



INDIAN RAILWAYS

SCHEDULE OF TECHNICAL REQUIREMENTS

No. AB/RB-40-2016 (Rev. 2)

FOR

Upgraded Class E (6"X11") Cartridge Tapered Roller Bearings used on
Cast Steel Bogies (Narrow/Wide Jaw) of Freight Stock of Indian Railways
For 22.9/25T Axle load application

S. No.	Month & Year of issue	Revision / Amendment	Page No.	Reason for Amendment
1.	August-2018	Revision-1	-	-
2.	June-2021	Revision-2	-	To make the specification more enabling with focus on functional requirements

ISSUED BY

RESEARCH DESIGNS AND STANDARDS ORGANISATION
MINISTRY OF RAILWAYS
MANAK NAGAR, LUCKNOW - 226 011 (INDIA)

SCHEDULE OF TECHNICAL REQUIREMENTS**No. AB/RB-40-2016 (Rev. 2)**

**FOR UPGRADED CLASS E (6"X11") CARTRIDGE TAPERED ROLLER BEARINGS USED ON
CAST STEEL BOGIES (NARROW/ WIDE JAW) OF FREIGHT STOCK OF INDIAN RAILWAYS
FOR 22.9/25 T AXLE LOAD APPLICATION.**

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Schedule of Technical Requirements No. AB/RB-40-2016 (Rev.2) for Upgraded Class “E” (6”X11”) Cartridge Tapered Roller Bearings Used on Cast Steel Bogies (Narrow/Wide Jaw) of Freight Stock of Indian Railways for 22.9/25 T Axle load application

1. Introduction

AAR approved Class ‘E’ (6” X11”) Cartridge Tapered Roller Bearings (CTRBs) are fitted on bogies of freight stock on Indian Railways. As per clause 4 of AAR M-934, these CTRBs are suitable for 11.93t (26.3 kips) static load. The proposed design of Upgraded Class ‘E’ (6” X11”) CTRB shall be fully interchangeable with the AAR standard Class ‘E’ in space envelope requirements. Upgraded Class ‘E’ (6” X11”) CTRB consists of low torque grease seal in place of conventional grease seal and polymer/ polyamide cage in place of metallic cage.

Low torque Grease Seal provides lower rolling resistance resulting in less fuel consumption, reduces seal torque, lower operating temperature resulting in less incidences of hot axles and enhanced overall bearing performance.

Polymer/ Polyamide cage is light in weight, reduces ‘dry bearing’ lockup, improves interface with roller surface and more reliable performance under high magnitude dynamic conditions such as wheel flat etc. The inherent lubricity of polymer/ polyamide material has the potential to provide relief in the event of ‘loss of lubrication’ in bearings.

2. Definitions

S. No.	Abbreviation	Definition
a)	PURCHASER	President of Republic of India.
b)	IR	Indian Railways
c)	RDSO	Research Designs and Standards Organisation, Manak Nagar, Lucknow – 226 011, India
d)	TENDERER	Firm/Company that submits offer for supply as per this specification
e)	CONTRACTOR	The firm/company that submits offer for supply of material as per this specification and on whom he contract is placed/will be placed.
f)	INSPECTING AUTHORITY	The organization or its representative nominated by the purchaser to inspect the supplies on his behalf
g)	SUB- TENDERER	Any firm / company from whom the Tenderer may obtain an item of supply not manufactured by the Tenderer himself.
h)	GRL	Gross Rail Loads
i)	AAR	Association of American Railroads
j)	IRS	Indian Railway Standard
k)	IS	Indian Standard
l)	ROH	Routine Overhaul

m)	POH	Periodical Overhaul
n)	FEA	Finite Element Analysis
o)	Kmph or Km/h	Kilometer per hour
p)	CTRB	Cartridge Tapered Roller Bearing
q)	CASNUB Bogies	(a) Three piece, rigid plank cast steel Bogie to RDSO specification No.WD-21-CASNUB-22NLB-93 (latest revision/ amendment) (b) WD-17-CASNUB-22HS-Bogie-92 (latest revision/ amendment)
r)	IRF-108 HS bogies	Three piece, rigid plank cast steel Bogie to RDSO specification No. WD-28-IRF-108 HS (latest revision/ amendment)
s)	LCCF bogies for container flat wagon (BLCA/BLCB)	Cast steel bogies with friction damping arrangement to Specification No. CONTR-LCCF20 (C)-96, (latest revision/ amendment)
t)	OEM	Original Equipment Manufacturer
u)	t	Tones (=1000 Kg)
v)	STR	Schedule of Technical Requirements

3. Scope

3.1	<p>This STR covers the technical requirements for manufacture, supply and mounting of “Upgraded Class “E” Cartridge Taper Roller Bearing” to be fitted in place of existing AAR approved Standard Cartridge Taper Roller Bearing Class ‘E’ size (6”X11”) bearings complete for use on standard axle to Drg. No. WD-89025-S-02 for freight stocks fitted with bogies like CASNUB HS, CASNUB NLB, IRF-108 HS & LCCF bogies of Indian Railways, with following items (to be supplied at the option of purchaser):</p> <ul style="list-style-type: none"> (a) End Cap (b) Cap Screws to RDSO drawing No. WD-18016-S-01 Item no. 1 (c) Narrow/Wide Jaw Adapter to RDSO Drawing No. WD-89067-S/9 (latest Alt.) and SK-78527 (latest Alt.) respectively. (d) Side frame Key with bolt, nut, washer and split pin to RDSO Drawing No. SK 69594 (latest Alt.) (e) Locking Plate to RDSO Drg. No. WD-87019/S-1 (latest Alt.)
3.2	<p>This schedule also covers the requirements of manufacture and supply of following spares at the option of the purchaser; Double Cup, Cone Assembly, Spacer Seal wear ring, Backing ring, End Cap , Cap screws, Grease Seal, Adapter, Side frame key and Locking plate to RDSO Drg. Nos. as mentioned above.</p>

4. Loading and Operational Requirements

a.	Track Gauge	:	1676 mm
b.	Maximum / Normal Axle Load	:	25 t/22.9 t
c.	Weight of one wheel set	:	1450 Kg (BOXN)/ 1180 Kg (BLC Wagon)
d.	Maximum / Normal speed of the wagon	:	110/100 km/h
e.	Weight of wagon Empty condition Loaded (max.)/Normal (GRL)	:	21 - 30t 100t / 91.6t
f.	Type of brake system	:	Air Brake (Graduated release)
g.	Type of wheel Braking	:	Tread Braking (one brake block per wheel)

h.	Maximum braking force per wagon in loaded condition	:	16870 kg
i.	Wheel Tread Diameter (New) For all bogies except Container bogie	:	1000 mm
	For LCCF 20 (Container Bogie)	:	840 mm
j.	Wheel Tread Diameter (condemning) For all other bogies except Container bogie	:	906 mm
	For LCCF 20 (Container Bogie)	:	780 mm
k.	Geographical area	:	India
l.	Atmospheric temperature range	:	+ 50° C maximum (-) 10° C minimum
m.	Loaded to empty ratio of wagon operation	:	80% and 20%

5. Technical requirements for Upgraded Class “E” CTRB

S. No	Parameters	Requirements
1	Bearing materials	The bearing components like Seal, Cage etc may be selected so as to give enhanced reliability/performance under loading & operational condition given in clause 4 of this STR.
2	Nos. of Rollers per row	24
3	Surface finish	Hone finish or as decided by manufacturer for best performance of their offered CTRB.
4	Basic dynamic load rating	Should be higher or equal to existing Class ‘E’ CTRB.
5	Grease	As per clause 2.1 of STR No.WD-24-MISC-2003 (Rev.1).
6	Grease Seal	Grease seal shall confirm to RDSO specification No. WD-63-Misc-2020.
7	Cage	Polyamide/Polymer cage having very low resistance to roller rotation as compared to existing conventional cage and should be proven as durable and reliable.

6. Other Details

- 6.1 The Upgraded Class “E” CTRBs covered by this Schedule shall be suitable for RDSO axle journal to Drg. No. WD-89025/S-2 (latest Alt.).
- 6.2 The Cup, Cone assembly, Backing ring, Seal wear rings, Seals, End cap & Spacer shall conform to AAR Specification for Freight Car Journal Roller Bearings [No. M-934-2012 or latest / Manual of Standards & Recommended Practices Section H for Class “E” (6” X 11”) Roller Bearings]
- 6.3 The CTRBs shall be fitted on all types of CASNUB/LCCF bogies using axle journal to Drg. No. WD-89025/S-2 (latest Alt.).

It shall give a minimum L10 = 1200,000 km as per the conditions specified in AAR M-934-2012 or latest MSRP Section H.

- 6.4 Narrow and Wide Jaw Adapter shall be suitable for bogie frame jaw pedestal to RDSO Drawing No. WD-89067/S-3 (latest Alt.) and WD-85054/S-3 (latest Alt.) respectively.
- 6.5 Break up of indigenous and imported components to be supplied by the bidder should be clearly spelt out in the offer.
- 6.6 Grease shall be as per clause 2.1 of RDSO STR No. WD-24-MISC-2003 (Rev.1)
- 6.7 The manufacturer supplying Locking plate, Side frame key and Narrow/ Wide Jaw Adapter shall have infrastructure, manufacturing & testing facilities and quality control requirement as per Schedule of Technical requirement No. QMS-19:2009 or latest, QMS-24:2009 or latest and QMS-26:2009 respectively. The manufacturer must comply all the requirements laid down in these schedules.

7. Qualifying criteria

Only those offers will be considered eligible for further evaluation, which meet the following criteria:

- 7.1 The Upgraded Class “E” CTRB must be offered by bearing manufacturer having unconditional AAR approval for CTRB Class “E” running on worldwide railway system. The bearing manufacturer or their principals should have experience in design, development and manufacturing of CTRB with improved performance and load rating should be higher or equal to existing Class ‘E’ CTRB.
- 7.2 The firm shall possesses valid final AAR unconditional approval certificate for CTRB Class ‘E’ provided with low torque seal and polymer/polyamide cage.
- 7.2.1 Indigenous manufacturers not fulfilling the above mentioned eligibility criteria mentioned in Para 7.1 and 7.2 but having conditional approval of AAR for CTRB Class “E” with polymer/ polyamide cage and low torque seal may be considered for placement of ‘Developmental Orders’ by the Purchaser. However, in this case, tenderer shall furnish a copy of all the test results as per AAR-M-959-2007 (latest revision) for Grease Seal, AAR-M-934-2015(latest revision) for polymer/ polyamide cage and other additional tests carried out on AAR/ AAR approved test rig to validate the Grease Seal and bearing design, valid AAR M-1003 certificate for bearing manufacturing and other supporting documents.
- 7.3 The tenderer shall furnish drawing, procedure of inspection of High-Capacity Class ‘E’, dimensional checks and condemning limits for various components.
- 7.4 The bearing components like Seal, Cage etc may be selected so as to give enhanced performance/reliability under Loading and Operational Requirements given in clause 4 of this STR.
- 7.5 The tenderer shall ensure that Tools/Gauge/machinery/equipment etc. used for existing CTRB mounting /maintenance/recondition to RDSO’s STR AB/RB-39-2002 (latest revision/

amendment)are also applicable for 'Upgraded Class "E" CTRB as per this Scheduled also. In case, any additional /differ Tools/Gauge/machinery/equipment etc. are required then details shall be mentioned in the proposal.

8 Technical particulars to be furnished with tender offer

- 8.1 All information as mentioned in Clause 6 and 7 of this STR.
- 8.2 A copy of the Quality Assurance Programme (QAP) and quality control procedures followed for manufacture of 'Upgraded Class "E" CTRBs".
- 8.3 A copy of the drawing of offered bearings/components indicating salient dimensions, material specifications and marking details such as date of manufacture, size, manufacturer's code and material code etc.
- 8.4 Material type/ grade etc. for Cup, Cone and Rollers
- 8.5 Total weight of one Bearing
- 8.6 Name and brand of Grease used in "Upgraded Class "E" CTRB"
- 8.7 Grease Seal part no. / design number/ name to be used.
- 8.8 Polymer/Polyamide cage part no. / design no. to be used.

9 Inspection

- 9.1 The successful bidder will be required to submit their drawings, Quality Control Procedures followed in their works as approved by their Principal and Quality Assurance Programme (QAP) to RDSO for approval. QAP shall consist of critical dimensions/parameters of various components of bearings, physical/ mechanical & chemical properties of it such as Cup, Cone and Rollers etc. QAP should also cover mechanism of quality control on the activities outsourced by the bearing manufacturer with clear cut mention of parameters to be checked along with the periodicity of checks.

The said approved QAP and Quality control procedures/drawings may be used for next/consecutive successful bid after intimation the same to Inspecting Authority and Wagon Directorate of RDSO. In this regard, the firm should give a declaration that there is no change in QAP/ Quality control procedure/ drawings during submission of their bid documents at the time of bidding to avoid re-submission of QAP.

However, the firm should submit revised QAP and quality control procedure/drawings for approval to RDSO in case there are any changes such as design/material/parameters/approval status/ interrupted production/ changes of facilities etc.

- 9.2 The inspection of material will be carried out at contractor's premises by authorized representatives(s) of RDSO as per manufacturers drawing, physical & chemical properties, various critical dimensions as per Quality Assurance Programme (QAP) as approved by RDSO.
- 9.3 Contractor shall provide such additional material or test pieces as may be required for testing and checking compliance with specification, at his cost and in his premises in the presence of representatives(s) of IR. Such tests may include laboratory/bench or any other tests required for validation of design of bearings.
- 9.4 Contractor shall provide free of charge labour, material tools, gauge and appliance etc. required by the inspection authority for inspecting at manufacturing location.

10 Guarantee

- 10.1 The Upgraded Class "E" CTRBs" shall be guaranteed for satisfactory performance for a period of 48 months after supply or 36 months after putting in to service whichever is earlier. The guarantee shall cover design, material and workmanship.
- 10.2 The supplier at his expenses shall replace the defective lot of bearings attributed to defective/ faulty design, defective material or poor workmanship supplied against relevant contract.
- 10.3 In case of warranty replacement of the bearing, the period of 36 months would commence when the replaced bearing is commissioned in service. The sole judge in this case would be the purchaser.
- 10.4 The supplier shall actively associate with IR for initial satisfactory fitment of bearings in Railway Workshop/Wagon Builder.

11 Packing

The bearing shall be packed as under:

- i) Only one bearing shall be packed in a wooden/Carton box.
- ii) Plastic wedges and plastic straps shall be used to prevent damage during transit.
- iii) Rust preventive oil shall be used to cover all the surfaces.
- iv) Bearing shall be suitably wrapped/packed in oil/grease resistant paper /polyethene before being packed in the box.
- v) Bearing shall be finally packed in pallets or wooden cases depending upon mode of transport. These pallets or wooden boxes will be strapped with steel/nylon band and lead seal on wire, by Inspecting Authority before shipment.
- vi) Supplier has to ensure proper packing of each and every item to protect them against ingress of dust, dirt and moisture before dispatch.

The supplier will be responsible for proper packing and shall ensure that these packing methods are adequate for handling at Indian Ports and Inland Rail/Road Transport and in Railway workshops.

12. Field Performance Monitoring

The supplier shall regularly collect data and samples of “Upgraded Class “E” CTRB”, from the supply made by it, from field to access the actual life obtained, nature of defects occurring in the service and should take necessary corrective action to improve quality. Half-yearly report should be submitted to Director General (Wagon), RDSO on data, samples collected and corrective action taken. This shall also be a part of Quality Assurance Plan of the supplier.

The supplier should have a system for online monitoring of customer complaint for their proper and timely redressal as well as analysis.

13 Maintenance Manual

The firm shall supply free of cost a minimum of 25 hard copies along with soft copies of the detailed maintenance manual for maintenance and overhaul purposes along with supplies.

These copies shall be mailed to the Director General (Wagon), R.D.S.O., Lucknow-226011. The Maintenance Manual should, inter-alia, cover the following:

- a) Description of the bearing
- b) Procedure for examination of the bearing
- c) Initial and condemning limits for the components
- d) Instructions for periodical maintenance and complete overhauling
- e) Drawings and part number details.

The successful bidder shall also supply free of cost copies of pocket manuals at the rate of two copies per thousand bearings supplied with minimum number of 10 copies.

14 Vendor-Changes in Approved status

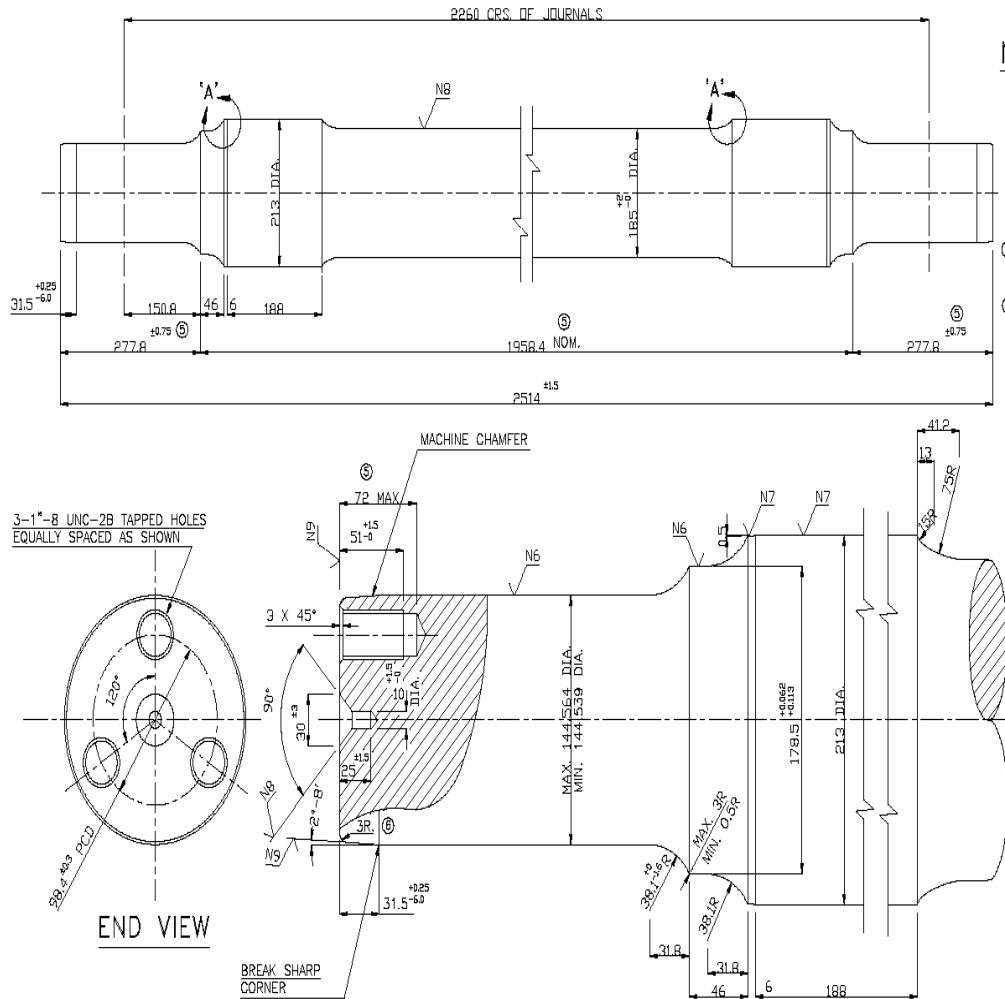
All the provisions contained in RDSO's ISO procedures laid down in Document No. QO-D-8.1-11 dated 22.01.2021(titled “Vendor-Changes in Approved status”) and subsequent versions/amendments thereof, shall be binding and applicable on the successful vendor/vendors in the contracts floated by Railways to maintain quality of products supplied to Railways.

15 Clarifications

Additional information or clarification required, if any, may be obtained from Director General (Wagon), Research Designs and Standards Organisation, Manak Nagar, Lucknow – 226 011, India.

16 List of enclosed drawing

- 16.1 RDSO's Axle to Drawing No. WD-89025/S-2 (latest Alt.)
- 16.2 RDSO's Wheelsets (1000 mm) to Drawing No. WD-89025/S-1 (latest Alt.)
- 16.3 RDSO's Wheelsets (840 mm) Drawing No. CONT-9404-S-12 (latest Alt.)



NOTE :-

1. STAMPING SHALL BE AS PER DRG. SK-92114 OF IRS R-19/93 PL. I.
2. SELECTIVE ASSEMBLY OF WHEELS & AXLE WILL BE DONE SO AS TO OBTAIN AN INTERFERENCE BETWEEN WHEEL SEAT AND BORE OF 1 mm. PER METRE DIA. OF WHEEL SEAT & TO ENSURE ASSEMBLY PRESSURE BUILD UP OF 400 TO 600 KG. PER mm. DIA. OF WHEEL SEAT.
3. RADII TO BE GROUND UNTIL FREE FROM TOOL MARKS & SCRATCHES.
4. FOR ROUGH AXLE, REFER TO DRG. NO. WD-92038/S-1, ITEM-1.
5. CONDEMNING WHEEL SEAT DIA. = 207 mm.
6. AXLE SHALL CONFORM TO IRS SPEC. NO. R-16-95. ©
7. FOR ASSEMBLY REFER DRG. NO. WD-89025/S-1.
8. TAPER ON JOURNAL DIA. SHALL NOT EXCEED 0.010 mm. OVER LENGTH OF JOURNAL TAPER WITHIN PERMITTED TOLERANCES MUST HAVE ITS SMALLEST DIAMETER AT THE OUTER END I.e. AT THE ENTRY END OF THE CTRB CONE BORE.
9. THE QUALITY SHALL NOT EXCEED 0.015 mm. ON THE JOURNAL PORTION.

SURFACE FINISH DETAIL
AT 'A' ON FILLET RADIUS

DETAILS OF JOURNAL

DRG. REFERENCE:-W/WL-4901

SURFACE ROUGHNESS VALUE TO IS:3073	Gr. NUMBER	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
15 12	Ra, μm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50
	SYMBOL	▽▽▽	▽▽	▽▽	▽	▽	▽	▽	▽	▽	▽	▽	▽

⑥	-	WD-03079	JR. RADIUS SHOWN AT THE AXLE END AND SPECIFICATION R-16 UPDATED.	11/03	
⑤	-	WD-97014	NOTE NO. 8 & 9 ADDED, DIM. 277.8 ^{+0.75/-0.63} & 1958.4 ^{+0/-0} CHANGED TO 277.8 ^{+0.75/-0.72} & 1958.4 NOM. RESPECTIVELY.	4/97	
④	-	WD-9402	REVISED & REDRAWN	3/94	
	ALT.	ITEM	AUTHY	DATE	ASSEMBLY DRG.

SUPERSEDED BY			22.9t. AXLE LOAD	
SUPERSEDES	SCALE	DATE	AXLE	
	PASSED	H.KATTIYAR		
	CHECKED	R.K. Talwar		
15 12	DRAWN	R.K. Talwar		
	TRACED		WD-89025-S-02	
	ISSUED	VL-45/88 10/86		
B.G.	R.D.S.O.	GROUP		
[W]				

