Reasoned Documents

Ref: Comments received from all concerned for Rev.1 to RDSO Specification No. RDSO/2014/CG-02.

<table>
<tr><th>SN</th><th>Clause No.</th><th>Description</th><th>Comments of NEI/NBC</th><th>Comments of SKF</th><th>Comments of M/s Schaeffler</th><th>Comments of ICF</th><th>RDSO Remarks</th></tr>
<tr><td>1.</td><td>1.0</td><td>SCOPE</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>1.1</td><td>This specification covers the technical requirements of design, manufacture, supply, mounting, service performance, testing and acceptance criteria of UIC-130 Pre-sealed, Preset and Pre-Lubricated Cartridge Taper Roller Bearings (CTRB) for use on coaches of LHB and Vande Bharat design on Indian Railways.</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>1.2</td><td>This specification describes the requirements of CTRB for wheel-sets with pressed brake discs for LHB Design and wheel mounted brake discs for Vande Bharat design with control arm arrangement.</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>1.3</td><td>This specification also covers the requirements of manufacture and supply of the following spares:
<table>
<tr><th>S. No.</th><th>Description</th><th>Remarks</th></tr>
<tr><td>1.</td><td>Cone Assembly /Set of Inner Rings</td><td rowspan="10">To be procured from RDSO approved bearing manufactures and as per their drawing approved by RDSO, if applicable.</td></tr>
<tr><td>2.</td><td>Double Cup/Outer Ring</td></tr>
<tr><td>3.</td><td>Cone Spacer/Spacer/Central Spacer</td></tr>
<tr><td>4.</td><td>Rollers</td></tr>
<tr><td>5.</td><td>Polymer Cage</td></tr>
<tr><td>6.</td><td>Seal Sleeve/Spacer</td></tr>
<tr><td>7.</td><td>Backing Ring</td></tr>
<tr><td>8.</td><td>Seals</td></tr>
<tr><td>9.</td><td>Distance rings (inboard/outboard)/</td></tr>
<tr><td>10.</td><td>Polymer distance ring Inboard side/Retaining Ring</td></tr>
<tr><td>11.</td><td>Grease</td><td>Unless otherwise specified, grease, to be procured from RDSO approved bearing manufactures as per their approved make of grease.</td></tr>
</table></td><td>Cone Assembly.

Cone Assembly is set of Inner Rings, Rollers, and Cages.
Set of inner rings are not equivalent to Cone Assembly.

Distance rings/Wear ring (inboard/outboard)

Distance ring is also called as Wear Ring with reference to AAR terminology.</td><td></td><td></td><td></td><td>S.No.1 is modified as set of inner ring in clause No.1.3.

Wear Ring to be added in the S.No.9 and accordingly, modified.</td></tr>
</table>

1.4

Reference Documents

This specification draws reference to some of the following relevant standards unless specified otherwise, the latest version of the relevant standards shall be taken as reference.

S. No.	Spec. No.	Description
1	EN 12080	Railway Applications Axleboxes –Rolling bearings
2	UIC 515-1	Passenger rolling stock –trailer bogies-Running gear-General provisions applicable to the components of trailers bogies
3	EN 12081	Railway Applications Axleboxes –Lubricating Grease
4	UIC-814	Technical Specification for official testing and supply of grease intended for the lubrication of railway vehicle roller bearing axle boxes.
5	EN 12082	Railway Applications Axleboxes –Performance testing
6	UIC 515-5	Powered and trailing stock Bogie-Running gear "Test for Axle-boxes"
7	EN ISO 683-17	Heat treated steel, alloy steels and free cutting steels – Part-17: Ball and roller bearing steels
8	EN ISO 6508-1	Metallic materials- Rockwell hardness test- Part-1:Test method (scales A,B,C,D,E,F,G,H,K,N,T) (ISO 6508-1:2005)
9	EN ISO 6508-2	Metallic materials- Rockwell hardness test- Part-2 verification and calibration of testing machines (scales A,B,C,D,E,F,G,H,K,N,T) (ISO 6508-2:2005)
10	EN ISO 6508-3	Metallic materials- Rockwell hardness test- Part-3 calibration of reference blocks (scales A,B,C,D,E,F,G,H,K,N,T) (ISO 6508-3:2005)
11	ISO 281	Rolling bearings – Dynamic load rating and rating life.
12	ISO 492	Rolling bearings – Radial bearings- Tolerances.
13	EN ISO 6507-1	Metallic materials- Vickers hardness test- Part -1 test method.

	1.5	<table><tr><td>14</td><td>ISO 2639</td><td>Steels -- Determination and verification of the depth of carburized and hardened cases</td></tr><tr><td>15</td><td>IS: 3073</td><td>Assessment of surface roughness</td></tr><tr><td>16</td><td>LHB document No. 17.565 Partial Document 100 ver.01</td><td>Wheel set bearing</td></tr><tr><td>17</td><td>LHB document No. 17.565 Partial Document 103 ver.00.</td><td>Wheel set bearing for 18t wheel set load (BG) and v=200 km/h</td></tr></table> Latest version of all above reference specifications shall be considered. All the provisions contained in RDSO's ISO procedures laid down in Document No. QO-D-8.1-11 dated 07.07.2023 (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.	ISO:18203 ISO: 2639:2002 standard has been revised by ISO: 18203:2016				ISO:2639 to be replaced with new version as ISO: 18203:2016
2	2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7	**GENERAL** Technical details to be submitted in duplicate by the tenderer along with the offer. In order to facilitate examination of tender offer, the same shall be accompanied by clause by clause compliance of this specification, either confirming acceptance of the clause and elaborating wherever necessary or indicating deviations there from. The tenderer shall strictly adhere to this specification. However, in the event of the tenderer being unable to conform to any clause of this specification, deviations from the same shall be clearly indicated. In addition, the tenderer shall submit a consolidated statement of deviations. Tender offer shall be accompanied by information listed in **Appendix 'A'**. Tenderer shall submit in duplicate, copies of English translation of standards other than those quoted in this specification except Indian Standards along with their offers. Tender offer not accompanied by details indicated at Clause 2.1 to 2.6 above are liable to be ignored without further reference.					

	2.8	Research Designs and Standards Organization, Lucknow-226 011 is hereinafter referred to as RDSO.					
3	3 3.1 3.2	**CONTRACTOR'S RESPONSIBILITY** The Contractor shall be completely responsible for design, manufacture, supply, prototype mounting, service performance and testing and acceptance criteria in accordance with this specification and for the satisfactory and efficient performance of the CTRB in service irrespective of- i) any approval which the Purchaser/ RDSO may have given for the design features; and ii) tests/ inspection carried out by the Purchaser / RDSO or his nominee. The Contractor shall further, not withstanding any exercise by the Purchaser / RDSO of the power of superintendence, be responsible for sufficiency of packing, marking etc. of all the parts of the work to ensure their delivery without damage. The Contractor shall comply with the instructions of Purchaser/ RDSO or his nominee, if in his opinion, more precautions than those taken by the Contractor are necessary for the proper execution and safe delivery of all the parts of the work.					
4	4.00 4.1 4.2 4.3 4.4 4.5	**APPROVAL OF DESIGN** The Contractor shall have a set of their/ Collaborator's working drawing in metric units giving assembly and component details. The drawings shall be fully dimensioned with requisite tolerances etc. and provided with other details such as material specification, heat treatment process, and surface finish. Weight of the each bearing component shall also be indicated on the relevant drawings. These drawings shall be made available whenever required by Inspecting Authority/ Purchaser/ RDSO. Tests according to the standards/ specifications covered in this specification or as agreed to by the Contractor and Purchaser to which the components and the assembly shall be subjected to by the Contractor at his works to establish the quality of the product and its satisfactory working shall be indicated in the drawings/QAP. Unless otherwise specified in this specification CTRB shall pass an approval procedure as agreed and documented in accordance with Clause (4.0) of DIN EN 12080-2022-11 by the Purchaser and the Contractor. A valid copy of AAR approval certificate (of the collaborator in the case of an indigenous manufacturer) for the similar type of CTRB offered. For programmed indigenization under collaboration of a manufacturer please refer Clause (22) of this specification. After approval, the RDSO shall be notified of any change of design and specification which may influence the function, as well as transfer of work to a different					

	4.6	manufacturing plant. The Contractor shall require a new approval procedure as covered in Annexures E & F of DIN EN 12080-2022-11. Before regular manufacturing, the plan, the service life computation as per ISO 281 latest revision in proof of the statistical load-carrying capacity and endurance test report are to be submitted to the Purchaser/RDSO. A set of comprehensive technical instructions for mounting /removal and manufacturer of CTRB offered are to be submitted to the Purchaser/RDSO.					
5	5.0 5.1 5.1.1 5.1.2 5.1.3 5.1.4 5.1.5 5.2 5.2.1 5.2.2 5.2.3 5.2.4	**DESIGN INPUTS OF CTRB** **For LHB Coaches** **Axle Journal** The CTRB covered in this specification shall be suitable for axle journal to RCF Drg. No. LW 02100 latest revision. **Control Arm** The CTRB covered in this specification shall be suitable for control arm to RCF Drg. Nos. 1267716,1267717,1277122 & 1268845 latest revision. **Security Disc** The CTRB covered in this specification shall be suitable for security disc to RCF Drg. No. 1902094 latest revision. The CTRB covered in this specification shall be suitable for axle end cover to RCF Drg. No. 1268835, 1902713 & 1902714 latest revision. The CTRB covered in this specification are intended to be installed on bogies, which are in use on Broad Gauge of Indian Railways. The main details are as below; a) Axle load: 18t b) Max. speed in running order:200 kmph c) Height of center of gravity of coach: 2000 mm d) The running technique service trials of the vehicles take place at 200 kmph +10% **For Vande Bharat Coaches** **Axle Journal** The CTRB covered in this specification shall be suitable for axle journal to RDSO Drg. No. RDSO/CG/DRG-2300D1 latest revision. **Control Arm** The CTRB covered in this specification shall be suitable for control arm to RDSO Drg. No. RDSO/CG/DRG-2300D2, RDSO/CG/DRG-2300D3 & RDSO/CG/DRG-2300D4. **Control Arm Bush** The CTRB covered in this specification shall be suitable for control arm bush to RDSO Drg. No. RDSO/CG/DRG-2300D5 latest revision. **Bearing End Pad**		1. Provision for dowel pin in existing design to ensure proper circularity & cylindricity of bore while in assembled condition. 2. Mandatory pairing of upper & lower control arm based on unique serial number while assembly (new or shop schedule). 3. Consideration for re-designing of axle box as one unit (not split housing) Reason: - Absence of dowel pin doesn't ensure proper positioning of upper & lower control arm & may lead to excessive load at certain areas which may lead to bearing failure.	All the drawings mentioned under these clauses are required.		1. Currently the control arm is purchased/replaced in pair. Hence, issue of cylindricity and circularity are minimize. 2. Existing design of axle box in two pieces is used since the inception of LHB in IR. Hence, re-designing of axle box as one unit (not split housing) is not considered as of now. 3. All drawings may be obtained from carriage directorate as per extant instruction of RDSO/PUs.

		The CTRB covered in this specification shall be suitable for Bearing End Pad to RDSO Drg. No. RDSO/CG/DRG-2300D6, RDSO/CG/DRG-2300D7 & RDSO/CG/DRG-2300D8 latest revision. **Axle Box End Cover** The CTRB covered in this specification shall be suitable for Bearing Axle Box End Cover to RDSO Drg. No. RDSO/CG/DRG-2300D9, RDSO/CG/DRG-2300D10, RDSO/CG/DRG-2300D11, RDSO/CG/DRG-2300D12, RDSO/CG/DRG-2300D13, RDSO/CG/DRG-2300D14, RDSO/CG/DRG-2300D15 & RDSO/CG/DRG-2300D16 latest revision. The CTRB covered in this specification are intended to be installed on bogies, which are in use on Broad Gauge of Indian Railways. The main details are as below; a) Axle load: 17t. b) Max. speed in running order: 200 kmph. c) Height of center of gravity of coach from rail-level: Not exceed to 1830 mm.					
6	6.0 6.1 6.2 6.3 6.3.1 6.3.2	**CTRB DESIGN** Bearings shall be a Double Row Pre-sealed Preset and Pre-lubricated Cartridge Taper Roller Bearing equipped with seals and shall be with cylindrical bore. The bearing shall be of a similar design which is proven in service on Rolling Stock either on IR or in any other Railway system in the world in a similar application. CTRB's functional dimensions, and internal clearance, axial and/or radial, depending on the type of design of CTRB, shall conform to the values documented as per clause (4.2) of DIN EN 12080-2022-11 and mentioned in the drawing approved by the firm. The methods for radial and/or axial clearance inspection can be agreed and documented in line with clause (4.2) of DIN EN 12080-2022-11. Diameter (in mm) of axle-box housing/control arm bore and journal dia. on which these bearings are to be housed shall be as under: **For LHB Coaches** **Description** | **18.00t Axle Load CTRB** Dia of Axle Box Housing bore (Lower Control Arm) | $230^{+0.122/+0.050}$ (F8) Dia of Axle Box Housing bore (Upper Control Arm) | $230.05^{+0.1}$ Dia of journal | $130^{+0.068/+0.043}$ (p6) **For Vande Bharat Coaches** **Description** | **17.00t Axle Load CTRB** Dia of Axle Box Housing bore (Lower Control Arm) | $262.5^{+0.32/0}$ (H11) Dia of Axle Box Housing bore (Upper Control Arm) | $262.0^{+0.05/0}$ (H7) Control Arm Bush | $230.0^{+0.05/0}$ (H7)					

		Dia of journal | $130^{+0.068/+0.043}$ (p6)					
	6.4	The variation in diameter of rollers on one bearing shall not exceed 0.003 mm.	The variation in dia. of rollers on one bearing shall not exceed 0.005 mm. Reason: - The AAR standard M-934 also allow 0.005 mm roller dia. Variation in one cone assembly.				AAR is widely used for Goods Application. Hence, no change is envisaged.
	6.5	Tolerance on the length of rollers shall be +0.102/-0.254 mm for CTRB covered in this specification.					
	6.6	Variation in width of individual inner ring/cone shall be as per the drawings submitted by the supplier.					
	6.7	Surface finish shall be checked in accordance with IS: 3073. In case manufacturer adopt to any other standard, English translation of standard as per which surface finish is measured shall be supplied by the Contractor whenever required by Purchaser/RDSO /Inspecting Authority.					
	6.8	Cone, double cup and rolling elements shall have Rockwell hardness (HRC) between 57 to 66 HRC. There shall not be more than 4 HRC difference between the values measured. i) On all the rings of one roller bearing. ii) On all the rolling elements in one roller bearing.					
	6.9	Surface hardness shall be inspected according to the Rockwell method, referred in EN ISO 6508-1 to 3. For case hardened steel roller bearing, surface hardness may be measured by the Vicker HV 30 method referred to EN ISO 6507-1, or by another equivalent method agreed and documented in accordance with Clause (4.2) of DIN EN 12080-2022-11.					
7	7.0	MATERIALS					
	7.1	Steel Grade					
	7.1.1	Steel should be selected from the grades specified in EN ISO 683-17. Alternative steel grades selected by bearing manufacturers may be used by agreement between Purchaser and Contractor. However, the Contractor shall provide complete details of alternative materials to the Purchaser/RDSO.					
	7.1.2	Inclusion Rating					
	7.1.2.1	The inclusion rating shall meet the requirements of EN ISO 683-17. For steel with special composition, metallurgical quality or manufacturing processes the inclusion content shall be documented in accordance with Clause (4) of DIN EN 12080-2022-11.					
	7.1.2.2	The method of determining the inclusion content shall be agreed between Purchaser and Contractor.					
	7.1.3	The steel used for manufacture of bearings shall be free from defects such as pipes, seams, laminations, excessive inclusion of non-metallic impurities and such other internal defects as would render the material unsuitable for the purpose for which it is intended. On microscopic examination it shall show fine grain size and shall be free from signs of overheating.					

	7.1.4	In case the CTRB offered by the tenderer have been manufactured using materials other than to standards given above, the tenderer shall indicate details of the following:					
	7.1.4.1	Specification of materials (English translation of standards shall be submitted along with the offer).					
	7.1.4.2	Hardness of the component for which the steel to grade indicated at Sub-Clause 7.1.4.1 above is proposed to be used.					
	7.1.4.3	Inclusion rating and microstructure of steel proposed to be used for manufacture of rings and rollers shall be indicated by Contractor.					
	7.1.4.4	Drawing showing the constructional arrangement of the bearing.					
	7.1.4.5	Details of successful application of such bearings on Rolling Stock in the following format: i) Name of Railway System ii) Year of supply. iii) Number of CTRB supplied. iv) Designation of CTRB supplied. v) Axle load. vi) Operating Speed. vii) Report from the Railway System regarding the performance of the bearing.					
	7.2	CTRB shall be fitted with a polymer cage. The material for polymeric cage shall be as per Annexure-D of DIN EN 12080-2022-11 (latest version).					
8	8.0	**MANUFACTURE**					
	8.1	**Steel Manufacturing**					
	8.1.1	The process of steel manufacture in mass production shall be such that the metallurgical characteristics are the same as those of the rolling bearings submitted for the approval procedure.					
	8.2	**Heat Treatment**					
	8.2.1	The heat treatment processes for the CTRB components shall be such that the hardness values as specified in clause 6.8 and physical properties as specified in clause 9.0 of this specification are achieved. The heat treatment shall be such that all the CTRB produced in a production batch are treated uniformly.					
	8.2.2	The heat treatment cycle shall be such that dimensional stability of CTRB components under operating conditions covered in this specification is maintained over service life of CTRB.					

	8.3	**Traceability**					
	8.3.1	The supplier shall set up and maintain a system of identification and traceability of finished products, which allows the detection, based on an identification mark, of the following elements: i) Material origin including the chemical analysis of every heat and steel manufacturing batch. ii) Heat treatments. iii) Inspection of boundary dimensions as well as inspection of soundness. iv) Batch number..					
9	9.0	**PHYSICAL PROPERTIES**					
	9.1	Rings and rolling elements shall be free from any defects especially on working surface, which can be harmful to their function (such as burrs, scratches, rust stains, nicks and dents). There shall be no grinding burns during the different grinding operations.					
	9.2	CTRB's cage shall exhibit no defects that might affect its function (such as burrs, scratches). To avoid crack initiation, the connection between the cage bars and the annular body shall be smooth and conform to rounding-off shown on the detail drawing. If not otherwise documented in Clause (4.2) of DIN EN 12080-2022-11, the requirements of cages of polymeric material shall be as per Annexure-D of DIN EN 12080-2022-11 (latest version).					
	9.3	**Soundness of Rings and Rolling Elements**					
	9.3.1	The soundness shall be inspected by the manufacturer. The method is described in Annexures A, B and C of DIN EN 12080-2022-11 (latest version). Any alternative methods to be used, which give equivalent results, shall be agreed and documented in accordance with Clause (4.2) of DIN EN DIN EN 12080-2022-11. Soundness of rings and rolling elements shall conform to Class 1 as defined in Annexure-A of DIN EN 12080-2022-11 (latest version).					
	9.3.2	**Internal Soundness of Rings** The reference method for the inspection of internal soundness of rings is described in Annexure-A of DIN EN 12080-2022-11 (latest version). When tested, no ring shall exhibit defect indication on the raceway, or in a section of 4mm depth below the raceway, with the amplitude greater or equal to observed with the master defect corresponding to the soundness class in question in accordance with Annexure-A of DIN EN 12080-2011-01. Larger defects are tolerated at deeper than this section, though the defect indications shall not be more than twice the amplitude of that observed with the master defect.				Clause-9.3.2 to 9.3.4 & 14.6 –for specification DIN EN 12080- year may be verified.	Version of EN 12080 to be corrected as EN12080:2022-11 or latest.
	9.3.3	**Soundness of Ring Surfaces** The reference method for the inspection of surface soundness of rings is described in Annexure-B of DIN EN 12080-2022-11 (latest version). When tested, no evidence of defects shall be observed on any of the ring surfaces. Surface soundness inspection of rings can also be carried out with an approved equivalent standardized					

		inspection method, e.g. calibration and test procedure analogous to the eddy current testing of rollers as covered in Annexure-C of DIN EN 12080-2022-11 (latest version).					
	9.3.4	**Soundness of Roller Raceway Surfaces** The reference method for the inspection of the raceway surface soundness of rollers is described in Annexure-C of DIN EN 12080-2011-01 (latest version). When tested, no roller shall exhibit defect indications on its raceway with amplitude greater than or equal to observed with the master defect as defined in Annexure-C DIN EN 12080-2022-11 (latest version).	Soundness of Roller Raceway Surfaces The reference method for the inspection of the raceway surface soundness of rollers is described in Annexure-C of DIN EN 12080-2022-11 (latest version). When tested, no roller shall exhibit defect indications on its raceway with amplitude greater than or equal to observed with the master defect as defined in Annexure-C of DIN EN 12080-2022-01. Reason: - Old standard no. is mentioned.				Version of EN 12080 to be corrected as EN12080:2022-11 or latest.
	9.3.5	For rolling bearings manufactured of case–hardened steel, the effective depth of the hardened case shall be documented in accordance with Clause (4) of DIN EN 12080-2022-11. The depth of the hardened case is determined as a function of the change on hardness of the transversal cross section of a test piece or a prepared sample. The hardness shall be measured in accordance with EN ISO 6507-1 and EN ISO 2639 or another process agreed and documented in accordance with Clause (4) of DIN EN 12080-2022-11. At this depth, the Vikers hardness shall be at least 550 HV1.					ISO:2639 to be replaced with new version as ISO:18203:2016 in clause no. 9.3.5.
10	10.0 10.1	**PERFORMANCE** **Environmental Conditions** The CTRBs together with the running gear are subject to the following environmental conditions: • Temperature variations: - 20^0 C to +70^0 C • Relative humidity: 30% to 100% • Exposure to: • Rain, snow, ice, ozone, salty air (coastal areas) and smog. • Sand, sandstorms, brake dust, and industrial environments. • Damage from flying stones raised from the ballast track bed. • Oil and grease residue, feces, kitchen waste • Both acidic and basic cleaning products to RDSO spec.: M&C/PCN/101 • Frequency of cleaning: every 2-5 days		Direct Water jet spray on the front cover should be avoided.			The bearing resides inside the axle box housing so that waterjet is not directly coming in contact to bearing. Hence, no change is envisaged.

		The axle box with mounted CTRBs is cleaned together with the running gear before inspection with pressurized water jet water and temperature up to 50^0C.					
	10.2	**Computation of Loads** Until the existence of binding UIC or EN norms, the following assumptions are valid for proof of statistical load-carrying capacity: Single wheel force horizontal/lateral = 80 kN Vertical force per wheel = 110 kN However, dynamic load on account of wheel shelling etc. have not been considered in above loads.					
	10.3	**Performance Requirements** The CTRBs must provide the following performance: Interval for additional lubrication, inspection, and operating safety not less than $1.2x10^6$km Service life not less than $3.0x10^6$km The CTRBs shall meet requirements detailed in para 10.1 such as penetration by foreign particles, dampness, and cleaning products. A possible penetration must not hinder the operating safety within an inspection interval of $1.2x10^6$ km or 60 months whichever is earlier.		Interval for additional lubrication, inspection, and operating safety not less than $1.2x10^6$ km or 36 months whichever is earlier. Reason: - In reference to camtech manual volume 3 OEM documentation part 1-IRCAMTECH/GWL/20-21/T-18/MM/1.0 Aug 2020, section 5.3, page 17, When cleaning a vehicle/bogie/wheel set, care must be always taken that the water nozzle is not aimed at gearbox and bearing system seals. Moisture inside the bearing/gearbox reduces the effectiveness of the lubrication grease and causes the bearing steel			1. Max. time limit for re-lubrication as 60 months has been taken from FIAT Spec. 17565.100 03, which is maximum time for maintenance. 2. In CAMTECH manual, time limit specified for re-lubrication as 36 months considering critical safety item. 3. How ever, CTRBs supplied by OEMs in supposed to run in service up to 60 months without re-lubrication.
	10.4	The occurrence of fretting corrosion on contact surfaces within the CTRBs and in between CTRBs and axle is to be protected using the latest appropriate technical measures in such a way that operating safety of the CTRB in a given interval according to paragraph 10.3 is ensured.					

				oxidation which in turn will lead to bearing defects. Possible penetration need to specify because bearing grease health will be affect if any external element will goes inside the bearing. (like moisture corrosion).			
11	11.0 11.1 11.2 11.3	**PROTOTYPE MOUNTING/DISMOUNTING** The assembly, locking and initial lubrication of the prototype CTRB shall be done in India by the supplier. The suppliers shall also arrange to supply necessary equipments and tools for prototype mounting/dismounting the CTRB against Railways requirement, if any. Unless otherwise specified, prototype batch of CTRB of 200/256/128 Nos. (as applicable) shall be supplied by manufacturers for prototype mounting. It would be the responsibility for the CTRB supplier to check and certify the fitness of the axle journal before undertaking the prototype mounting of the CTRB and that the tolerances on the journals are adequate for a correct fit. The supplier should keep proper records for prototype mounting indicating the details of the following: a) Date of mounting. b) Manufacturers code of axle. c) Month and year of manufacture of axle d) Consecutive no. of axle e) Journal inspection: Visual f) Journal diameter: By gauge g) Shoulder diameter of axle: By gauge h) Cartridge bearing serial no. and manufacturers code i) Force during mounting of CTRB j) Final seating force of CTRB. k) Lateral/end play l) Cap screw torque. .		Which Qty. to be consider for LHB & Vande Bharat has to be specified based on application. For Example, 200 nos. – LHB, 256 - Vande Bharat 128? Need to discuss, how is it considered & where it would be used.			128 Nos. are not stand for any type of coach, it's just a typo error. It has been corrected.
12	12.0 12.1 12.2	**WORKMANSHIP** The rolling elements shall be free from defects of workmanship and material which may affect their serviceability.					

		The surfaces of the bore, outside diameter, sides and load carrying areas shall be smooth and shall not show any damaged/corroded areas.					
13	13.0 13.1	**RETOUCHING** Retouching of the bearing or its components with or without the intention of concealing a defect is prohibited.					
14	14.0 14.1 14.2 14.3 14.4 14.5 14.6	**LUBRICATION** The grease used in CTRB shall meet the requirements detailed in EN 12081(latest version). When it is specified that the rolling bearings shall be delivered pre-lubricated with grease, this shall be with grease approved by RDSO in accordance with EN 12081 (latest version). The grease type, the quantity and its distribution shall be documented in accordance with Clause (4) of DIN EN 12080-2022-11. The supplier shall furnish the test results of grease to be used for initial lubrication of CTRB. The supplier shall guarantee/warranty satisfactory performance of their bearings with the brands of grease used by them. The tenderer should give specific recommendations for the roller bearing offered regarding: i) Period for change of grease and quantity of grease required for each replenishment/change. ii) Period of grease seal change. iii) Period for dismantling and complete bearing examination. **Rust Protection** All bearing elements shall be delivered protected against corrosion with a product free from toxic or harmful substance. The compatibility of the preservative with the lubricating grease shall be guaranteed and documented in accordance with Clause (4) of DIN EN 12080-2011-01.					
15	15.0 15.1 15.2	**QUALITY ASSURANCE PROGRAMME** Contractor shall submit his internal Quality Assurance Programme (QAP) in triplicate to the Purchaser/RDSO. In this, the frequency of various checks, details of nature of work involved in the checks and records maintained regarding these checks shall be indicated. The details of tools and gauges to be used during inspection of bearing /bearing components shall be also indicated in the QAP. Contractor shall, on demand by the Purchaser/ RDSO or Inspecting Authority nominated by Purchaser, make the records of checks carried out during internal quality assurance available for scrutiny.					

	15.3 15.4	Contractor should have the ISO 9001 certification for manufacture of CTRB. The personnel responsible for non-destructive testing shall be qualified and certified to the system used should offer equivalence with EN 473. Break-up of indigenous and imported components to be used in the CTRB shall be clearly spelt out.					
16	16.0 16.1 16.2 16.3	**MARKING** The marking area shall be agreed and documented in accordance with Clause (11) of DIN EN 12080-2022-11. Each bearing shall carry on the its outer ring visibly and indelibly the following markings: i) Contractor's Name/Code/Trade mark/Country of origin. ii) Production plant code, if there is more than one plant. iii) Complete designation of the bearing. iv) Consecutive number of the bearing. v) Month and year of manufacture. Drawing showing the marking arrangement, proposed to be followed by the tenderer shall be submitted along with the offer. The supplier is responsible for the selecting marking process for marking as per clause 16.1 above on the CTRB. However, Marking by Laser is desirable and by electric pencil is prohibited.					
17	17.0 17.1 17.1.1 17.1.2 17.1.3 17.1.4 17.1.5 17.1.6	**PACKING** The bearing shall be packed as under: Only one bearing shall be packed in a wooden/Carton box Plastic wedges and plastic straps shall be used to prevent damage during transit. Rust preventive oil shall be used to cover all the surfaces. Bearing shall be suitably wrapped/packed in oil/grease resistant paper /polyethene before being packed in the box. 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.	Only one bearing shall be packed in a wooden/Carton box if required. When bearings are delivered in bulk no need to pack the individual bearing in individual wooden/Carton box. It should be applicable for singly supply. Plastic/Laminated Corrugated wedges	Packing design responsibility should come under OEM. Each box should contain 6 Nos. of Roller Bearings. Requirement is as per consignee requirement packaging instruction PI 167. Each roller bearing should be wrapped			Clause No.17.1.1 to be modified as below: Set of bearing shall be packed in a wooden/carton box as per the purchase order.

		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.	and plastic straps shall be used to prevent damage during transit if applicable. Reason: - There is no need to use plastic straps in the CTRB design in which all parts are interconnected and there are no loose parts so it should be optional so that according to the design of CTRBs OEMs can use plastic straps if required.	with water proof bubble paper sheet, separated with corrugated sheet & 6 bearings completely covered by VCI bag so that it should not rub during transit. Requirement is as per consignee requirement packaging instruction PI 167. In view of Clause 17.1.3 -This is not applicable as rings are phosphated. In view of Clause 17.1.4 - Covered in 17.1.2			
18	18.0 18.1 18.1.1 18.1.2 18.1.3 18.2 18.2.1 18.2.2 18.2.3 18.3	**ACCEPTANCE CRITERIA** **General** Inspection shall be carried out by Purchaser or Inspection Authority nominated by Purchaser. Inspection of the bearings shall be carried out at the Contractor's premises. For this purpose, the Contractor shall provide, free of charge, labour and appliances required by Inspecting Officer for inspecting whole of the work under contract, whether inspected at his own or his Sub-Contractor's works. **Presentation of Delivery** On completion of manufacture including marking as per Clause 16.0, fully assembled bearings shall be presented for inspection in lots. Bearings with the same designation, belonging to the same manufacturing batch and presented at the same time shall constitute a lot. The bearings shall be in unpacked condition, if not specified otherwise. **Temperature**	Sampling Inspection shall be carried out by Purchaser or Inspection Authority nominated by Purchaser. Reason: - In line with the clause 18.5 Sampling Inspection.				No change is envisaged.

	18.3.1	All measurements shall be carried out at ambient temperature. The gauges and measuring instruments and the parts to be inspected shall be stabilised at this temperature before any test is carried out.					
	18.4	**General Inspection**	Inspection as per Clauses 18.4.2 to 18.4.6 shall be carried out on each of the bearing in the lot offered by the bearing manufacturer. Reason: - Bearing functional dimensions (Cone bore, Cup O.D. and Cup Width) are measured during Bearing manufacturing after grinding so same shall be checked and ensured by bearing manufacturer.				No change is envisaged.
	18.4.1	Inspection as per Clauses 18.4.2 to 18.4.6 shall be carried out on each of the bearing in the lot offered.					
	18.4.2	The diameter of bore of finished inner ring/cone and outside diameter of outer ring/double cup shall be measured as per procedure agreed to between the manufacturer and Inspecting Authority/RDSO.					
	18.4.3	Width of finished outer ring/double cup shall be measured as per procedure agreed to between the manufacturer and Inspecting Authority/RDSO.					
	18.4.4	Internal clearance of each sample bearing shall be measured as per procedure agreed to between the manufacturer and Inspecting Authority/RDSO.					
	18.4.5	Appearance of bearings shall be visually examined (without magnification). All essential portions of the roller bearings shall be clean and free from defects such as porosity, burrs, hardening cracks, grinding marks, indentations, rust marks etc.,					
	18.4.5	Functioning of all bearings shall be checked, as per the method agreed to between the manufacturer and Inspecting Authority/RDSO.					
	18.4.6	Only those bearings of a lot which meet requirements in respect of Clauses 18.4.2 to 18.4.6 stipulated on approved drawings above shall form the lot for the purpose of Sampling Inspection as per Clause 18.5.					
	18.5	**Sampling inspection**					
	18.5.1	Inspecting Authority shall select bearings at random from each lot presented for carrying out Sampling Inspection as per Clauses 18.5.3 to 18.6.3. The size of sample to be selected for these tests shall be as indicated below: No. of bearings in the lot — No. of sample bearings to be selected Up to 100 — 2 101-250 — 3 Over 250 — 4					
	18.5.2	Sample bearings selected as per Clause 18.5.1 shall be indelibly marked.					
	18.5.3	Functional dimensions of the sample bearings shall be as documented in Clause 6.2.					

	18.5.4	Radial run-out of inner and outer rings and internal clearances in the sample bearings shall be as documented in Clause 6.2.					
	18.5.5	The length and diameter of all rollers on each of sample bearings shall be measured and variation therein determined and values obtained shall be as given in Clause 6.5 and Clause 6.4 respectively.					
	18.5.6	Magnetic Particle Test shall be carried out on rings of each sample bearing. It shall be carried out as per Annexure-B of DIN EN 12080-2022-11 (latest version). The rings should not show any signs of cracks or harmful defects. After this test, bearing components shall be de-magnetized.					
	18.5.7	Before and after the tests as per Clause 18.5.6 sample bearings shall be checked as per method, agreed between Purchaser and Contractor for residual magnetism. The residual magnetism shall not exceed 0.5mT.					
	18.5.8	Eddy current inspection of rollers shall be carried out on rollers of each sample bearing. It shall be carried out as per Annexure-C of DIN EN 12080-2022-11 (latest version). The raceway surface of rollers should not show any signs of grinding cracks, heat treatment or hardening cracks lines and scores due to drawing, marks etc.					
	18.5.9	Internal soundness inspection of rings shall be carried out on each sample bearing. It shall be carried out as per Annexure-A of DIN EN 12080-2022-11 (latest version). The rings shall conform to Clause 9.3.2.					
	18.6	**Hardness Testing**					
	18.6.1	Hardness of both rings and three rollers of each sample bearing shall be checked as per Clauses 6.8 and 6.9.					
	18.6.2	Expansion testing of inner ring of each of the sample bearing shall be carried out as per Clause (9) of DIN EN 12080-2022-11.					
	18.6.3	Surface finish of both rings and three rollers of sample bearing shall be checked in accordance with IS: 3073. However, at the time of prototype bearing testing, surface finish of all rollers of sample bearings shall be checked.					
	18.6.4	In case any of the sample bearings when tested as per Clauses 18.5.3 to 18.6.3 does not meet the requirements of this specification, the whole lot shall be rejected.					
	18.7	**Chemical Composition Analysis**					
	18.7.1	Manufacturer shall furnish ladle analysis, microstructure and inclusion rating of steel for each heat. This shall correspond to the stipulations in the approved drawings.					
	18.7.2	Manufacturer shall furnish actual chemical composition of cage material of which cages on bearings in a lot offered have been manufactured. This shall correspond to the stipulations in the approved drawings. Cage material should be in accordance with Clause D.3 of Annex D of DIN EN 12080-2022-11 (latest version).					

<table>
<tr><td></td><td>18.7.3

18.7.4</td><td>Inspector may order retest on rings, rollers and cage of one bearing out of every 1000 bearings inspected.

In case the results of tests at Clause 18.7.3 or the analysis in Clauses 18.7.1 and 18.7.2 do not conform to stipulations on approved drawings, the whole lot of bearings shall be rejected.</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>19</td><td>19.0

19.1</td><td>INSPECTION BY MANUFACTURER

Inspection Plan

If not otherwise documented in accordance with Clause (4.2) of DIN EN 12080-2022-11, the sampling plan and the number of inspections to be undertaken by the supplier shall be accordance with Table -3 of Clause (12) of DIN EN 12080-2022-11.</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>20</td><td>20.0

20.1</td><td>SERVICE PERFORMANCE TESTING

The performance testing of axle box for all type of rolling stock is to be done as per DIN EN 12082-2021-09 (latest version) to ensure suitability for the required service, i.e. assembly of box housing, bearing, sealing and grease is well suited for the service requirements. This testing is made up of two stages, a “Rig performance test”, and other “Field test”. Test parameters and minimum performance requirements for rig performance test for vehicles in operation on main lines are as specified in Clause (5) and Clause (6) and Annexure-A of EN 12082-2021-09.</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>21</td><td>21.0

21.1

21.2</td><td>21.0 FIELD PERFOPRMANCE MONITORING

Field trial of CTRBs for LHB coach manufactured & supplied by new suppliers shall be conducted as per RDSO’s Trial Scheme No. RDSO/CG/TS-18004 (latest version).

Field trial of CTRBs for Vande Bharat design coaches manufactured and supplied by supplier (as detailed below) shall be conducted as per RDSO’s trial scheme No. RDSO/CG/TS-18004 (Latest Version).

<table><tr><th>Existing Status of Vendor</th><th>Past Supply of CTRB for Vande Bharat design Coaches.</th><th>Field Trial Mandate</th></tr><tr><td>New source</td><td>NA</td><td>256 Nos. (2 rakes of Vande Bharat) of proposed CTRB shall undergo field trial for one (1) year.</td></tr></table></td><td>Past Supply of CTRB for Vande Bharat /LHB Coaches.

The load and speed conditions of LHB and Vande Bharat is equivalent. Past supply of RDSO approved source since more than 06 months should be consider for no trial category.</td><td>As mentioned in Paragraph 1.5, both (LHB and Vande Bharat Bogie) technologies are different and not much field experience available in India. Design of both the bogies is similar but not same.
Both bogies are equipped with different suspension arrangements and are running at different RPMs.
Axle Box design in both bogies are different - 2piece design in LHB & 3-piece design in Vande Bharat. Also, bearing component characteristics are also different (Improved raceway roughnesses, Advance controlled roller OD deviation in one bearing & Improved Heat Treatment known</td><td>Since all the parameters (Load carrying capacity, wheel dia. gravity from centre of bogie) pertaining to LHB bearing is superior than bearing used on Vande Bharat bogies and the base bearing construction is also similar to the bearing used on LHB Bogie hence request you to please consider the approval of LHB bearings for LHB bogies as approved for Vande Bharat bogies for developmental source.</td><td></td><td>Considering that LHB and Vande Bharat are running at operational speed 160 kmph. and there is a minor difference in dimension of bearing. However, it is worth mentioning the VB is running in rake formation. So any failure on account of bearing will severely affect the train</td></tr>
</table>

	21.3	<table><tr><td>Developmental source of CTRB for LHB coaches</td><td>NA</td><td>256 Nos. (2 rakes of Vande Bharat) of proposed CTRB shall undergo field trial for one (1) year.</td></tr><tr><td rowspan="2">Existing approved supplier of CTRB for LHB coaches.</td><td>Supplied more than 256 nos. of CTRBs in the past and the same is running successfully for more than 6 months.</td><td>No trial needed. Firm shall be included as approved source for CTRB of Vande Bharat.</td></tr><tr><td>Not Supplied</td><td>256 Nos. (2 rakes of Vande Bharat) of proposed CTRB shall undergo field trial for 6 months.</td></tr></table> The supplier shall regularly collect data and samples of previous supply from field to assess actual life obtained nature of defects occurring in the service and should take necessary action to improve quality. Half yearly report should be submitted to Director General (Carriage), Lucknow on data, samples collected and corrective action taken. This shall also be part of QAP of the supplier.		**as Xbite 2 in SKF terms**) therefore, both LHB and Vande Bharat bearings are considered different, and separate STRs have to be followed. As Vande Bharat (Trainset concept - difficult to remove individual coach) is a more critical application and during field failure, the chance of consequential damages would be more severe, hence the criteria for approval should be strengthened. ***The bearing must follow through complete approval cycle for any new entrant with no experience in Vande Bharat***..			operation. Keeping in mind, necessary field trial has been provided in the clause. Hence, no change envisaged.
22	22.0 22.1 22.2 22.3 22.4	**22.0 INDIGENISATION OF BEARING COMPONENTS** The following procedure would be followed for clearing indigenization of bearing components (cup, cone, roller, cage, seal wear rings, grease seal, spacer etc.). The component manufacturer will obtain drawings/specifications, know-how of manufacturing processes/manufacturing tolerances from bearing manufacturer and set up necessary machinery and plant to undertake manufacture of the component proposed for indigenization and submit a certificate from bearing manufacturer that the facilities set up are adequate for manufacture of the component to bearing manufacturer standard. The component manufacturer will then manufacture a batch size prescribed by the bearing manufacturer, which shall be sent to the collaborator for testing and approval. Should sampling be necessary from this batch, it shall be done by the RDSO using random sampling procedures. The bearing manufacturer will arrange to get the component and assembly fitted with such components tested as prescribed in DIN EN 12080-2022-11 (latest version). However, component testing may be done by the bearing manufacturer on their own machines and in their own laboratories or in any other laboratories					

		equipped to undertake such tests ensuring that the tests are similar to those done by UIC/AAR/EN with prior approval of purchaser.					
	22.5	On successful development of the component the component manufacturer will develop full testing and inspection facilities as prescribed by bearing manufacturer for mass production of the component and furnish details thereof to the Railways. Mass production of the component should normally be started after these facilities have been developed. If however, full testing and inspection facilities are not yet developed the manufactures will advise the Railways the places where testing/inspection will be done.					
	22.6	On being satisfied about adequacy of the testing/inspection procedures as prescribed by the bearing manufacturer, the component manufacturer will be permitted by RDSO to manufacture the component for use on Indian Railways subject to continued certification by the bearing manufacturer as per Clause 22.9 below.					
	22.7	The field experience gained with such bearings will be reviewed by RDSO at the end of every six months of service for two years to assess the actual performance of the bearings and the desirability of continuing indigenous manufacture. Should this review involve opening of the bearings the bearing manufacturers will be associated.					
	22.8	To facilitate this review, every time a fresh component is indigenized the bearing lot/lots fitted with such component will be given a distinctive identification marking by the component manufacturer. Details of the marking system would be worked out by the bearing manufacturer in consultation with RDSO and circulated to user Railways.					
	22.9	The bearing manufacturers will also periodically furnish to the Railway a certificate from their collaborator that they have the necessary facilities (including subcontractors for component manufacturers) to consistently manufacture bearings of desired quality and accuracy under mass production conditions. The collaborators, consistent with their quality standards shall specify the periodicity of this certificate. This should be done before commencement of the indigenization program.					
	22.10	All intended indigenization must be completed two years before the expiry of the collaboration agreement so that within the pendency of the collaboration unconditional license to manufacturers can be granted. Should the indigenization not be completed in this manner, the manufacturer will seek extension of collaboration.					
	22.11	All bearings with indigenously manufactured components will carry either the collaborator's name or the legend 'Manufactured under license by ….' This legend may be abbreviated to 'LIC …'.					
23	23.0	**MAINTENANCE INSTRUCTIONS**					

	23.1	With the delivery of the first lot of CTRB, the supplier shall provide all the necessary maintenance, inspection, and service instructions, including replacement parts list, in written form. In particular, construction and operating limits as well as required measuring points must be provided.	With the delivery of the first lot of CTRB, the supplier shall provide all the necessary maintenance manual, inspection, and Fitment /service instructions. In particular, construction and operating limits as well as required measuring points must be provided. Reworded for better clarity.				To be changed as advised.
	23.2	The supplier shall assist and advise Indian Railways regarding the process, machinery and plant required and train adequate staff for the purpose of setting up inspection, testing and servicing facilities in three Nominated Workshops at no extra cost. The setting up of maintenance facility will be at the discretion of the Purchaser.	NEI recommendation is Refurbishment is to be done by OEMs only.				Presently, CTRB are refurbished by OEM's only.
	23.3	The supplier shall agree to train officers and staff in disassembly, cleaning, inspection of bearing components, greasing and assembly of the CTRB at their works. Officers and Staff to be trained of each nominated Workshop shall be as below: - Officers/Supervisors - 5 nos. - Artisans -10 nos.	OEMs having all the infrastructure of CTRBs refurbishment like grinding and assembly facility so railway workshops cannot achieve the reliability same as OEMs.				scope of refurbishment of CTRB by railway/other agency should also be open. Hence, No change is envisaged.
	23.4	The successful bidder shall agree to supply, free of cost, one 'cut-model' of Cartridge bearings arrangement per contract, if ordered by Railways for educational purpose.					
	23.5	For every 500 bearings ordered, the Contractor shall supply one Maintenance Manual for guidance of Indian Railway Workshops/Maintenance Staff in maintenance of the bearings. However, the Contractors who are supplying CTRB to Indian Railways for first time shall supply 100 Maintenance Manual with first purchase order. The Manual shall be complete in all respect of – 1. Description of the CTRB. 2. Procedure for initial mounting and lubrication of the bearing, indicating quantity of lubricant per box. 3. Maintenance checks in service such as frequency of bearing examination, seal change, grease change etc. between major examinations. 4. Procedure for bearing extraction, examination and assembly, along with details of special tools required, if any, for this purpose. 5. Initial and condemning limits of clearances. 6. Details of other criteria for withdrawal of CTRB from service.					
	23.6	New Contractor shall submit the draft of Maintenance Manual to Purchaser/RDSO before its finalization.					

24	24.0	**WARRANTY**					
	24.1	The contractor shall ensure that design of CTRB is such that it performs satisfactory for a minimum period of 48 months after supply or 36 months after putting into service whichever is later. The warranty shall cover design, material, and workmanship.	The contractor shall ensure that design of CTRB is such that it performs satisfactory for a minimum period of 48 months after supply or 36 months after putting into service whichever is earlier. The warranty shall cover design, material, and workmanship. Universally warranty minimum period after supply or after putting in service considered whichever is early.				No change is envisaged.
	24.2	The period of warranty shall stand extended by the duration for which the CTRB remain inoperative under exercise of this Clause. In such cases, the period of 48 months after supply or 36 months after putting into service whichever is later would commence when the replaced bearings are commissioned in service. The sole judge in this case would be the Purchaser. Further, should any design modification be made any part of the device as a result of any defects/fault /lacunae/shortcoming in the original design feature, the period of 48 months after supply or 36 months after putting into service whichever is later for the purpose of deciding warranty of CTRB would commence from the date of modified part is commissioned into service.	The period of warranty shall stand extended by the duration for which the CTRB remain inoperative under exercise of this Clause. In such cases, the period of 48 months after supply or 36 months after putting into service whichever is earlier would commence when the replaced bearings are commissioned in service. The sole judge in this case would be the Purchaser. Further, should any design modification be made any part of the device as a result of any defects/fault /lacunae/shortcoming in the original design feature, the period of 48 months after supply or 36 months after putting				

			into service whichever is earlier for the purpose of deciding warranty of CTRB would commence from the date of modified part is commissioned into service. Universally warranty minimum is calculated and acceptable whichever is earlier after supply or after putting in service.				
25	25.0 25.1	**RECONDITIONING** The bidder shall also undertake reconditioning of CTRB as a complete unit, in case it is desired by the purchaser. The reconditioned bearing shall perform satisfactory in service and shall meet the requirements laid down in Clause (10) of this specification.		New Point: 1. Reconditioning can happen up to codal life of bearing in years or service life of 3Mkms whichever is earlier. 2. Packaging guidelines for purchaser to be defined for lot sent by Indian Railways to Manufacturers. This is to avoid bearing damage during transit.			Not agreed. Please refer the clause No. 10.3 regarding service life. Remarks are already given at S.No.17.
26	26.0 26.1	**DISPOSAL OF REJECTED BEARINGS** Bearings which are finally rejected shall be marked in distinguishable manner and shall be disposed off in such a manner as the Purchaser/RDSO /Inspecting Authority may direct.					
27	27.0 27.1 27.2 27.3 27.4	**RIGHTS OF PURCHASER/INSPECTING AUTHORITY/RDSO** Purchaser/RDSO/Inspecting Authority shall adopt any means he may consider necessary to satisfy himself that all materials or components specified are actually used throughout the construction. Purchaser/RDSO/Inspecting Authority shall have right to visit at any reasonable time and without previous notice, either Contractor's Works or his Sub-Contractor's Works to inspect the manufacture and quality of work at any stage. Purchaser/RDSO/Inspecting Authority shall have free and ready access to Contractor's Quality Assurance Records, Procedures etc. Purchaser/RDSO/Inspecting Authority shall have to reject any material that do not conform to the relevant standard specifications or have not been manufactured in accordance with approved practices. The rejected materials shall be marked in a distinguishable manner and shall be disposed off in such a manner as specified in QAP.					

28	*Appendix 'A'*	**INFORMATION TO BE SUBMITTED BY TENDERER ALONG WITH OFFER** 1. Drawing of the bearing showing: i) Boundary dimensions (width, outside diameter and bore diameter) along with tolerances. ii) Values of parameters necessary for calculation of life rating of the bearing as per ISO 281 i.e. number of rows of rollers per bearing, number of rollers per row, mean roller diameter, effective length of rollers, angle of contact and pitch circle diameter of rollers as defined in the ISO Standard). 2. Life rating calculations as per ISO 281 latest revision. 3. Confirmation that bearings are strictly in accordance with the specification. If there are deviations from any Clause, they must be clearly listed Clause wise. 4. Country of origin. 5. Details of extent to which bearings proposed to be offered are in use on Rolling Stock on other Railways, this information should include details of year wise supply to the Railway Systems and the numbers supplied in each year.				CTRB used in VB (ver-1), EMU-US & MEMU-US bogies are also similar with VB version-2 bogies. Hence RDSO is requested to include/ incorporate this CTRB in subject RDSO STR/ specification suitably.	Design input and boundary dimension of CTRB for VB Version-1/EMU-US is included in clause No. 5 and 6 respectively.