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**SPECIFICATION FOR
AXLE BOX COMPLETE WITH ROLLER BEARINGS
FOR USE ON WAG-9 & WAP-7
3-PHASE ELECTRIC LOCOMOTIVES
OF INDIAN RAILWAY**

ENCLOSURES:

1. ANNEXURE: 'A'

2. DRG. NO. : 1209-01.111-005 ALT. '3'
1209-01.111-006 ALT. '2'
1209-01.111-007 ALT. '2'

SPECIFICATION NO.: CLW/MS/3/003 ALT. '5'
ISSUE DATE : 27.01.1997

ISSUED BY:

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DETAILS OF ALTERATIONS

S. No.	Date of Amendment	Alt. No.	Description	Remarks	Authority
1.	16.04.1998	1	Heading on every Sheet was Technical Specification for Axle Box and Axle Roller Bearings. Matl. Specn. IS: 1030 Gr. 1 was IS: 1865 Gr. SG 500/7 Against clause 3.1 and clause 5.1.		Sd/- 16.04.98
2.	25.07.2001	2	Alt. No. for Drgs. Added.	Drgs. Altered later on.	Sd/- 25.07.01
3.	01.02.2002	3	Para 16 for hardwares added.	The name of hardware suppliers added to achieve the proper quality.	Sd/- 04.02.02
4.	29.01.2003	4	Matl. Specification IS: 1865 GR. SG 500/7 was IS: 1030 GR. 1 against clause 3.1 and clause 5.1.	Decided by the competent authority to switch over to SGCI Casting in line with original material specified by Adtranz.	Sd/- 29.07.03
5.	29.01.2008	5	<u>ON TOP SHEET:</u> The word 'with ' was without in the title column. For used locos WAP-7 added. <u>ON SHEET No. 4:</u> The word 'with ' was without. Used for locos WAP-7 added. <u>ON ALL THE SHEETS:</u> Title block altered accordingly.	For procurement of Axle Box Drg. (Unsealed) and Axle Box Housing from same unit. As per GM/CLW's Note No. SEC. 1/6 DT. 30.11.07 and RDSO's Advice Letter No. EL/3.2.108 (3-PHASE) Dt. 09.02.07.	Sd/- 30.01.08

Specification has been digitized and all alterations have been incorporated.

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TECHNICAL SPECIFICATION FOR AXLE BOX COMPLETE WITH ROLLER BEARINGS FOR USE ON WAG-9 & WAP-7 ELECTRIC LOCOMOTIVES.

1. SCOPE:

This specification covers the manufacture, supply, delivery and inspection of axle box and axle roller bearings for use on WAG-9 & WAP-7 Electric Locomotives. The supplier has to comply with the dimensions and intructions specified on the relevant drawings.

2. SCOPE OF SUPPLY:

Quality one set shall comprise quantity per loco as indicated in Annexure 'A' of this specification.

3. SPECIFICATIONS AND STANDARDS:

The following specifications and standards shall be the part of this specification.

3.1 IS: 1865 Gr. SG 500/7 Material to be used for SGCI Casting

3.2	IS : 3823 Pt. 2	Methods of evaluating static load rating of roller bearings.
3.3	IS : 3824 Pt. 2	Methods of evaluating dynamic load ratings of roller bearings.
3.4	IS : 4397	Cold rolled carbon steel strips for ball and roller bearing cages.
3.5	IS : 5935	Radial internal clearance in unloaded radial roller bearings.
3.6	IS: 5669	General plan of boundary dimensions for radial rolling bearings.
3.7	IS : 5692	Tolerance for radial rolling bearings.
3.8	IS : 6453	Technical supply condition for rolling bearings.
3.9	IS : 3073	Assessment of surface roughness.
3.10	IS : 1500-1983	Method for Brinell hardness test.
3.11	IS : 7754-1975	Micro structure test for SGCI casting.

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4. CLIMATIC AND ENVIRONMENTAL CONDITIONS:

4.1 Maximum atmospheric temperature:

- a) Under Sun : 70°C
b) In Shade : 50°C

4.2 Humidity : 100% saturation during rainy season.

4.3 Reference site conditions:

- a) Ambient temp. : 0°C Min., 47°C Max.
b) The contractor will indicate the expected temperature rise under reference site conditions.
c) Humidity : 60%
d) Altitude : 160m above mean sea level.

4.4 Rainfall : Very heavy in certain areas.

4.5 Atmosphere during hot weather: Extremely dusty and desert terrain in certain areas.

4.6 Coastal area :
Bearings will be designed to work in coastal areas in humid and salt laden atmosphere.

4.7 Vibration :
The axle box, bearing, sub-system and their mounting arrangement will be designed to withstand vibrations and shocks encountered in service as specified in corresponding IEC publications unless otherwise prescribed.

5 GENERAL:

5.1 The material for axle box housing shall comply with specn. No. IS : 1865 Gr. SG 500/7. Alternative material according to AS 1831, BS 2789 or ISO 1083 may be considered with prior approval of purchaser.

5.2 The bearing units shall be dimensionally suitable for mounting on the axle to Drg. No. 1209-01.011-002. Grease lubricated cylindrical roller bearing units shall be used. The bearing shall include on effective seal to keep grease inside the bearing and to provide it from any ingress of contamination. A labyrinth type seal shall be used.

5.3 The roller bearings shall generally conform to the technical supply conditions for roller bearings as per IS : 6453. Rollers and bearing races shall be manufactured from high quality bearing material. The material used for manufacture the rollers and races shall be furnished to purchaser along with the offer and got approved by him. Material used for other components such as end cap, cover, abutment ring etc. shall conform to the relevant drawings.

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6. APPROVAL OF DRAWINGS:

- 6.1 The manufacturer shall prepare and submit 2 sets of complete working drawings in metric units giving assembly and component details of roller bearing and axle box, for approval of the purchaser before manufacture.
- 6.2 All drawings shall be fully dimensioned. The requisite tolerances shall be shown on each dimension of the detailed drawings and the condemning sizes of wearing parts shall also be shown against the relevant dimensions.
- 6.3 Material specification for each component shall be indicated on the relevant drawing. If these are other than IS or IRS, then duplicate copies of such specifications in English shall be supplied to the purchaser.
- 6.4 Full calculations in support of the design capacity (Load rating) and life expectancy of the roller bearings shall be offered for approval of the purchaser.

7. TECHNICAL REQUIREMENTS:

- 7.1 The axle box housing and other components shall conform to the size and shape as shown on the relevant drawings.
- 7.2 The castings shall be cleaned by shot or sand blast before machining and painting. Any alternative cleaning method of castings shall have prior approval of the purchaser. Sharp corners shall be broken and burrs removed before painting. The painting shall be done in accordance with the paint specification. The finish colour shall be RAL 7009 Green Grey. The machining surfaces shall be protected with a rust resistant coating which can be easily removed prior to installation of the axle box.
- 7.3 The mechanical properties of each batch of castings shall be established by the manufacturer. The microstructure examination and the hardness may be sufficient provided that the manufacturer can demonstrate that his manufacturing control can ensure compliance with this specification. At least one batch of castings shall be provided with the results of 0.2 % proof stress test.
- 7.4 Test bars suitable for micro-structural examination and tensile property test shall be cast at the end of every treatment batch purchaser. The manufacturer shall provide the purchaser with at least four test bars suitable for the mechanical tests and three test bars for the micro-structural examination from each batch of castings.

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7.5 The bearing unit if asked by the purchaser in loose condition shall be supplied pre-lubricated and ready to mount unless otherwise mutually agreed upon by the purchaser and the manufacturer.

7.6 The end cap design shall be used to support the thrust loads of the bearing. Following technical data shall be for the design.

a) Axle static load	22.5 ton per axle
b) Unspring mass	3.9 ton per axle
c) Wheel set mass (without motor)	2750 kg.
d) Wheel diameter	1092 mm (New)
e) Maximum service speed	100 km/hour
f) Maximum test speed	110 km/hour
g) Type of suspension	Coil springs
h) Track	Broad gauge (1676 mm)
i) Bearing Inner diameter	150 mm
j) Bearing outer diameter	250 mm
k) Bearing width	180 mm

7.7 The components of the bearings and other parts of the axle box shall normally be fully interchangeable.

8. LIFE EXPECTANCY:

8.1 The bearings shall be designed for a minimum life expectancy of 2.2 million kilometers service. Life expectancy is defined as that life at which no more than 10% of the bearings may have been replaced solely due to fatigue of metal. This life expectancy definition is not to be construed as a basis for circumventing responsibility for short service life or any premature bearing failure related to material and workmanship.

8.2 Life expectancy calculations and additional supporting data showing service experience shall be provided. The calculated life of the bearing shall be stated. The dynamic capacity of the bearing shall be nominated.

8.3 Lubrication seals (including the wear rings, if used) shall be designed 2.2 million kilometers. During this period the lubricant retention properties shall be maintained to the extent that sufficient lubricant is retained in the bearing for proper lubrication of the bearing when it is lubricated in accordance with an approved maintenance schedule. The maintenance schedule prepared by manufacturer shall have prior approval of the purchaser.

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9. DOCUMENTS TO BE SUPPLIED:

Minimum ten copies of the maintenance manual shall be supplied incorporating the following information:

- Description of the bearings as well as radial and axial clearances.
- Mounting of the bearings indicating quantity of lubricant per box.
- Maintenance checks in service such as grease topping, bearing examination, seal change and grease change etc. between major examination.
- Procedure for bearing extraction, examination and assembly, special tools, if any for this purpose.
- Initial and condemning limits for components.
- Types/Brands of suitable grease/lubricants.

10. MARKING:

Each bearing shall have clear readable marking on one of its side face. The marking shall be as follows;

- Manufacturer's Name/ Trade mark.
- Complete designation of the bearing, defining type, dimensions, radial internal clearance etc.
- Year and month of manufacture with batch No.

11. PROTECTION AGAINST CORROSION:

The type of protection against corrosion shall be decided by the manufacturer depending on the packing material used under proper storage conditions. The anti-corrosive treatment shall be effective for at least twenty-four months in order to ensure a satisfactory functioning of the rolling bearing.

12. INSPECTION AND ACCEPTANCE:

- 12.1 The inspecting authority of the purchaser shall have free access to the works of the manufacturer at all times during manufacture. He shall be free to inspect the manufacture at any stage, to reject any material which do not conform to the terms of this specification.
- 12.2 Castings @ 5% from each batch shall be selected for inspection. If the sample is rejected, 10% castings shall be inspected. Any visual crack, discontinuities, sand inclusions, shrinks or porosity in castings is not acceptable. However, scattered holes in non- critical area of the castings that measure no more than 3 mm in depth and have solid bottom can be considered for acceptance.
- 12.3 Wall thickness at number of locations, bore for its size, taper, ovality and surface finish shall be meticulously checked.

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- 12.4 Machined housing and all other loose components such as end cap, cover, abutment ring etc. shall be checked for dimensions which should conform to the dimensions of relevant drawings.
- 12.5 Each bearing shall be checked for dimensions, appearance and finishings. The running surface shall be free from tool marks, chatter waves, grinding scratches, pits, rust, discolourisation and other surface imperfections.
- 12.6 Bearings @ 2% from the lot shall be selected for checking of its bore diameter, width, radial run out, hardness and magnetic particle testings duly approved by the purchaser.
- 12.7 Any deviation other than the specified values on the relevant drawings shall not be accepted. The rings and rollers should not show any sign of cracks or harmful defects.
- 12.8 After inspection, the inspector shall affix his stamp/seal on each assembled box as a token of the material passed by him.

13. GUARANTEE:

The manufacturer/ supplier shall have guarantee for the bearings and their satisfactory performance for the period of five years from putting into service or six years from the installation whichever is earlier. All aspects of workmanship and material will be covered by this guarantee.

14. PACKING AND DELIVERY:

- 14.1 The bearings, when supplied in loose condition, if asked by the purchaser, shall be prepared and pack in such a manner as will properly protect them from damage or deterioration during transit and storage prior to installation. The storage period of at least 24 months shall be considered.
- 14.2 The protective packing shall be suitable for transport and storage under tropical conditions of high temperature, high humidity, heavy rainfall and fungus-conducive and dusty environments.

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15. REFERENCE:

15.1 The axle box used by M/s ABB Transportation for WAG-9 class (Co-Co) Electric Locomotives is supplied by:

M/s SKF AUSTRALIA PTY LTD.,
P.O. BOX 93,
FORTITUDE VALLEY QLD.

15.2 TYPE:

- a) ABB Drg. No. IB011-00176, 00178, 00182, 00183, 00184 & 00507.
- b) Cylindrical roller bearing- CRU 150 to SKF REF BC2-0067A

16. HARDWARES COVERED IN THIS SPECIFICATION SHALL BE ANY OF FOLLOWING MAKE:

- a) UN-BRAKO (PRECISION FASTENERS)
- b) G.K.W
- c) LAXMI PRECISION
- d) SUNDARAM FASTENERS (TVS)

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ANNEXURE 'A' TO SPECIFICATION NO. CLW/MS/3/003, ALT. 5.

Sl. No.	Description	Drg. No.	Qty./Loco
1.	All components of axle box complete with earth contact except Item No. 16	1209-01.111-005, Alt. 3	As indicated in the drg. (04 Nos.)
2.	All components of axle box complete with Hasler transmitter except Item No. 13	1209-01.111-006, Alt. 2	As indicated in the drg. (01 No.)
3.	All components of axle box complete with blank cover	1209-01.111-007, Alt. 2	As indicated in the drg. (07 No.)
4.	Cylindrical Roller Unit, CRU-150 of SKF or similar.	1209-01.311-061, Alt.1	12 Nos.

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