

REVISION OF SPECIFICATION / STR

Ref: RDSO/2007/CG-08 with Draft Amendment slip no. 2

Item Name: Cast Steel Axle Box Housing

1. RDSO is reviewing the specification/STR to cater to the latest technological developments in the field, modify clauses not relevant in the present context and making them more enabling with focus on functional requirements.
2. It is requested that your comments / suggestions with regard to improvements / modifications in specification / STR of this item may be submitted in the following format alongwith the justification for the changes required.

Part A: Basic Information

SN	Particulars	Information
1	Name	
2	Designation	
3	Professional Qualification	
4	Organization / Firm's Name	
5	Address for Correspondence	
6	Contact No.	
7	Email ID	
8	In case of Firm / Individual: Manufacturing experience of item (or similar Item) on which comments are offered	
9	Where relevant: Whether any technical document to support suggested changes is available / enclosed for better appreciation	

Part B: Comments / suggestions on the specification

SN	Clause No. of RDSO STR / Spec	Clause, as exists in RDSO STR / Spec	Clause , as it should read after incorporation of comments / suggestions in the RDSO Spec / STR	Justification for changes

Comments may be sent to:

Joint Director/VDG/Carriage
Research Designs and Standards Organization
Manak Nagar, Lucknow – 226011

Email: dirvdg1@rdsso.railnet.gov.in Or dirvdg1@gmail.com

INDIAN RAILWAYS

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**SPECIFICATION
FOR
CAST STEEL AXLE BOX HOUSING**

S. No.	Month/Year of Issue	Revision/ Amendment	Page No.	Reason for Amendment
1.	March - 2008	-	-	First issue
2.	July - 2009	Amendment Slip No. 1	5	Clause No. 5.8.
3.	June - 2020	Amendment Slip No. 2	7	Clause No. 13 & 13.1 is modified.

Issued By**Research Designs and Standards Organization
Manak Nagar, Lucknow - 226 011**

Signature			
Name & Designation	Prepared By: Vinay Kumar Yadav JE/Design/Carriage	Checked By: Praveen Kumar Dy. Director/VDG/Carriage	Approved By: Shobhit Pratap Singh Jt. Director/VDG/Carriage

Ref: CG-WI-4.2.4 (Ver. -1)	Page 1 of 2	Date of Issue: June- 2020	Spec. No. RDSO/2007/CG-08
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Amendment Slip No.-2

AMENDMENT SLIP NO.2 OF JUNE 2020 TO RDSO SPECIFICATION NO. RDSO/2007/CG-08 FOR SPECIFICATION FOR CAST STEEL AXLE BOX HOUSING.

Read the existing clause No. 13 and 13.1 of RDSO Specification No. RDSO/2007/CG-08 as under:

13. WARANTEE:

13.1 Warranty shall be as per standard IRS condition for both rough machined and finish machined axle box housings. Suppliers shall replace free of cost of such casting which may develop defects in service.

DRAFT

Signature			
Name & Designation	Prepared By: Vinay Kumar Yadav JE/Design/Carriage	Checked By: Praveen Kumar Dy. Director/VDG/Carriage	Approved By: Shobhit Pratap Singh Jt. Director/VDG/Carriage

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Consulting

Signature:

Designation

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De'g/SS

SPECIFICATION

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1.	March- 2008	-	-	First issue
2	July-2009	Amendment Slip No.1	5	Clause 5.8

March- 2008

Issued by:

RESEARCH DESIGNS & STANDARDS ORGANISATION
Manak Nagar, Lucknow-226 011.

Amendment Slip No. 1 of July 2009 to specification No. RDSO/2007/CG-08
for cast steel axle box housing

Read clause 5.8 as under:

The foundry should satisfy the requirements of category 'A' foundries specified and updated by Bureau of Indian standards/RDSO from time to time. The foundry shall have at least one number tilting type electric arc furnace having ladle refining facility of adequate capacity and facility for oxygen lancing and argon pouring for removal of entrapped gases. To ensure the chemistry of the castings, direct reading vacuum spectrometer shall be available. The molten metal meeting the specified chemistry shall only be used for producing castings.

The tapping and pouring temperature of the molten metal shall be standardized by the foundry and the same shall be determined for each heat. Pouring time for axle box housing casting shall also be arrived at.

There should be a positive method to trace the last two castings poured.

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SCHEDULE OF TECHNICAL REQUIREMENTS FOR CAST STEEL AXLE BOX HOUSING

1. SCOPE:

- 1.1 This schedule covers the technical requirements for the manufacture and supply of cast steel axle box housing to be used on ICF design MG/BG and EMU coaches fitted with self aligning double row spherical roller bearing.

2. SCOPE OF SUPPLY:

- 2.1 The castings shall be supplied in either rough machined or finish machined condition as per the requirements as shown in the relevant drawing. The rough machining of main bore shall be accurately concentric to leave uniform wall thickness all round. The tolerance specified in the relevant drawing shall be strictly adhered to. The ribs between the body of the housing and spring seat shall be correctly formed, as no deviations are acceptable.
- 2.2 The supplier shall supply one axle box per heat with integrated test bars to the purchaser. The test bar shall be stamped after they are normalized along with the casting.

3. SPECIFICATION:

- 3.1 The axle box housing shall conform to this schedule of technical requirements, relevant drawings with latest alteration number and latest relevant specifications. In case of conflict among the STR /drawings/ other specifications, the drawings shall take precedence over the STR and the specification. The STR shall take precedence over the specifications.

Class-I tolerance to IS: 4897 shall be followed on thicknesses wherever the tolerances have not been specified.

4. MATERIAL:

- 4.1 The axle boxes shall be of cast steel to specification IS: 1030-1998 Grade 230-450W with guaranteed weldability. Castings shall be free from blowholes, sand inclusions and porosities.
- 4.2 Rectification of casting defects by welding is permitted only on written agreement with the purchaser. Cases of such nature shall be individually referred to the purchaser and prior approval shall be obtained in this regard.

5. MANUFACTURE:

5.1 Steel Casting:

Steel casing shall be manufactured as per the following requirements:

5.2 Raw Material quality –General:

All basic foundry processes e.g. moulding, core making, heat treatment, fettling, and weld reclamation shall be done in house for all steel castings. No deviation shall

generally be permitted. In exceptional circumstances, specific approval of Inspecting Officer shall be necessary which will be for a limited duration.

5.3 The foundry shall lay down the specification of all raw materials used in the manufacture of castings and follow the same. The foundry shall use appropriate quality of raw materials i.e. silica-sand, steel scarp, foundry returns & Ferro - alloys, whose quality shall be ensured through relevant tests. Quality of all additives to sand, molten metal and mould/core wash shall be standardized, checked and only acceptable quality raw material and additives shall be used. Record of all raw materials and additives, their quality characteristics shall be maintained which shall be made available to inspecting officer to facilitate scrutiny and establish traceability.

5.4 **Sand preparation:**

The foundry shall lay down the characteristics of all sand mixes i. e molding sand, core sand, facing sand and shall have proper arrangement for sand drying and preparation of sand mix of consistent quality and the characteristics of each batch shall be checked to ensure conformance to standard arrived at by the foundry. Sand mix of unacceptable quality shall not be processed.

5.5 **Moulding.**

Moulds shall be prepared from sand mix of predetermined composition and characteristics to ensure consistency.

Mould shall be prepared by machine moulding. Mould hardness shall be checked for each mould to ensure proper compaction. Damaged moulds shall not be used for producing castings. Repair of the moulds can be carried out if the same does not affect the casting quality. Suitable arrangement shall be made in the mould to obtain manufacturer's identity as per clause - 9.1. All moulds shall be given a 'wash' of appropriate quality on the entire surface coming in contact with the molten metal to ensure proper surface finish and undesirable metal mould reaction.

5.6 **Core- Making.**

All cores shall be made in house, the sand, the binder and the additives shall be of appropriate quality. Damaged core shall not be used for producing casting.

5.7 **Running, gating and risering:**

Based on sound foundry practices and adequate experimental castings, the foundry shall standardize the running, gating and risering system of all axle box housing castings to produce sound casting. The methoding system shall be standardized, proper records maintained and any alteration in the system shall be intimated immediately for obtaining approval.

Knock-off riser shall be used wherever possible, to eliminate damage to the casting during finishing operation. All surface of the core coming in contact with the molten metal and where surface finish is important to ensure proper seating of the mating components shall be provided with core wash.

5.8 Melting and Pouring:

The foundry shall have proper melting unit and facilities for refining the molten metal. To ensure the chemistry of the castings, direct reading vacuum spectrometer shall be available. The molten metal meeting the specified chemistry shall only be used for producing castings.

The tapping and pouring temperature of the molten metal shall be standardized by the foundry and the same shall be determined for each heat. Pouring time for axle box housing casting shall also be arrived at.

There should be a positive method to trace the last two castings poured.

5.9 Finishing Operation:

The castings shall be dressed and cleaned using mechanical arrangements. Runners and risers shall be removed without damaging the surface finish and dimensions of the castings.

Generally, no grinding shall be necessary except for removal of the parting line. Adequate precaution shall be taken to ensure that deep grinding marks, notches are not left on the surface.

After dressing and ensuring its freedom from sand, runner, risers etc., the castings shall be shot blasted to achieve desired degree of cleanliness.

6. HEAT TREATMENT:

6.1 All heat treatment furnaces shall be equipped with adequate number of pyrometers and recorders. Facility for output chart indicating time verses temperature shall be available for each furnace.

6.2 Plans for placement of castings in the furnace shall be standardized to ensure uniformity of heat treatment for each casting of particular batch and the same shall be followed without any deviation.

6.3 Castings shall be normalized by heating the castings at a rate not exceeding 100 °C per hour, soaking the castings for a sufficient time to bring it uniformly at a temperature exceeding the transformation temperature of the steel within 50 °C to ensure elimination of cast structure followed by cooling in still air. The heat treatment cycle shall be recorded for each batch and made available to the inspecting authority.

7. MICROSTRUCTURE

Microstructure examination of heat treated castings presenting each cast shall be conducted on the sample taken out from the normalizing lug provided in axle box housing and the grain size shall be uniform and of size ASTM 6 or finer. The microstructure shall not reveal cast dendritic structure.

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8. QUALITY ASSURANCE PROGRAMME

- 8.1 The manufacturer shall have a quality assurance system conforming to ISO 9001-2000.
- 8.2 All activities relating to quality assurance shall be the responsibility of Quality Manager who shall form the interface with the inspecting authority. The relevant records for maintaining quality for each of the following items shall be maintained and made available to the inspecting authority.
- 8.3 Pattern and Core Boxes
- 8.4 Sand Preparation
- 8.5 Moulding and Core making
- 8.6 Assembly of Core
- 8.7 Metal Pouring
- 8.8 Heat treatment
- 8.9 Visual examination
- 8.10 Gauging scheme
- 8.11 System to ensure quality of casting
- 8.12 System for disposal of defective axle box housings identified during various stages of manufacture and implementation of QAP, so that such castings are not mixed up with lot being offered for inspection.
- 8.13 Records to identify the manufacturing details/tests if castings with Serial Number marked on castings.
- 8.14 Records of the mechanical and chemical test reports covering the heats representing the purchased castings. The period for which records will be preserved can be decided between supplier and purchasing/inspecting authority.

9. MARKING:

- 9.1 Each axle box shall be supplied with manufacturer's name/ initials, embossed as shown on the drawing No. ICF /SK-0-2-191. The heat number, month and year of manufacture shall be punched as shown on the drawing No. ICF /SK-0-2-191.

10. INSPECTION:

The metallurgical and surface inspection shall be carried out by the purchaser or by their authorized representative in the following manner:

- 10.1 Scrutiny of the analysis of every heat offered for inspection from the heat book, which shall be maintained by the supplier.
- 10.2 Scrutiny of the results before the castings are accepted for inspection.

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- 10.3 Surface inspection of rough machined castings to ensure freedom from defects.
- 10.4 Radiographic examination shall be carried out by the supplier as furnished in the clause 1.3.2 of Annexure-A.
- 10.5 Stamping and certification of castings shall be done in the standard form.
- 10.6 The supplier shall furnish all results of chemical analysis, mechanical tests, radiographic and other tests to the purchaser, accompanied by a list of axle box numbers corresponding to the relevant heat numbers.

11. FINISH MACHINED AXLE BOX HOUSING:-

- 11.1 The casting used for finish machining shall conform to this specification.
- 11.2 Finish machined axle box shall be free from blowholes, porosities, sand inclusions and other casting defects.
- 11.3 The holes shall be jig drilled in one setting so that there is no mismatch, if drilled from both ends.
- 11.4 The manufacturers shall ensure the following packing conditions while supplying finish machined axle box housing:
 - i The manufacturer shall ensure that the finish machined axle box housings are not damaged during transit.
 - ii Suitable covers shall be provided on both the ends of the bore to prevent entry of dust and also to avoid damage to end faces of axle box.
 - iii Each finish machined axle box housing shall be packed individually in wooden boxes.

12. FACILITIES OF RADIOGRAPHIC EXAMINATION:

- 12.1 Facilities for radiographic examination shall preferably be available at the supplier's premises, and if not available, tests shall be carried out at any Government Testing Center or at Railway premises (where such facilities are available) at supplier's cost.

13. GUARANTEE:

- 13.1 Suppliers of both rough machined and finish machined axle box housings shall guarantee replacement free of cost of such casting which may develop defects within one year from the date of fitment or within three years from the date of receipt of supply whichever is earlier.

13.2 Suppliers of rough machined axle box housings shall also under take to replace free of cost at the purchaser's premises all such castings which on machining show blow holes, porosities, sand inclusions and other casting defects unacceptable to purchaser.

14. SUPPLY OF ADVANCE SAMPLES: APPLICABLE ONLY FOR VENDER WHO HAVE NOT SUPPLIED THIS ITEM DURING THE LAST FIVE YEARS TO ICF, RCF OR BEML.

14.1 FOR ROUGH MACHINED AXLE BOX HOUSINGS:

The successful tenderer shall have to supply free of cost, six samples of axle box housings for tests and approval. The tenderer shall not proceed with the series manufacture of axle boxes until these advance samples have been approved in writing by the purchaser. Should these advance samples fail to meet the tests, the order for axle box for liable cancellation without compensation. These advance samples will be machined to dimensions indicated in the drawing and examined for blowholes and porosities and tests as indicated in Annexure -A.

14.2 FOR FINISH MACHINED AXLE BOX HOUSINGS:

The successful tenderer shall have to supply free of cost four samples of axle box housings for tests and approval. The tenderer shall not proceed with the series manufacture of axle boxes until these advance samples have been approved in writing by the purchaser. Should these advance samples fail to meet the tests, the order for axle box for liable cancellation without compensation. These advance samples shall be tested as indicated in Annexure-A.

15. PAINTING (FOR BOTH ROUGH MACHINED & FINISH MACHINED AXLE BOX HOUSING):

15.1 Machined bore of the axle box housing shall be coated with grease or rust prevented oil.

15.2 The castings shall be thoroughly cleaned and painted with red oxide zinc chromate primer to spec. IS: 2074-1992 on all surfaces except the bore.

ANNEXURE-A

1.0 TESTS:

The following is the summary of the various tests to be conducted before accepting the boxes.

1.1.0 SELECTION OF TEST PIECES:

1.1.1 ADVANCE SAMPLES SUPPLIED BY VENDERS WHO HAVE NOT SUPPLIED THIS ITEM DURING THE LAST FIVE YEARS TO ICF /RCF OR BEML:

Test pieces for tensile, bend and impact tests and drilling for chemical analysis will be taken from random positions of the body of the casting.

1.1.2 FOR REGULAR SUPPLIER:

The purchaser may agree to cast the integrated test pieces along with the axle box housings themselves at suitable places to represent particular cast and lot.

1.2.0 DESTRUCTIVE TEST:

1.2.1 MECHANICAL TEST:

The axle box housing shall conform to the material specification and properties as given in IS: 1030-1998 for Grade 230-450 W.

1.2.2 IMPACT TEST:

Impact test shall be carried out in accordance with IS: 1030-1998 Grade 230-450W clauses 13.3. The impact strength shall not be less than 45 J.

1.2.3 HARDNESS TEST:

Brinell hardness using 10mm ball and 3000 kg load shall be taken at various positions after suitably grinding the surface. Average of not less than four tests shall be taken. The brinell hardness number thus obtained shall be 140-160.

1.2.4 CHEMICAL ANALYSIS:

Drillings taken as per clause 1.1.0 shall be analysed for Carbon, Manganese, Sulphur and Phosphorous in addition to scrutiny of analysis from each heat which the supplier is required to supply as per clause 7.6 of this specification.

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1.3.0 NON-DESTRUCTIVE TEST:

1.3.1 VISUAL-EXAMINATION:

The axle box housings either rough machined or finish machined to dimensions shown on the respective drawings shall be examined for blowholes and porosities etc.

1.3.2 RADIOGRAPHIC EXAMINATION:

The axle box housing after rough machining or finish machining as the case may be shall be subjected to radiographic examination to the extent of 2% of the castings from each heat subject to a minimum of one per heat. The acceptable radiographic standard shall be ASTM-E 446 vol.-I/vol-II-Level -IV. The X-Ray/Iridium 192 radiation beam shall be focused on the castings from various directions as indicated in the attached sketch ICF/D/218 for examination of the soundness of the castings at all places. Prints from the radiograph shall be supplied to the purchaser by the manufacturer.