INTEGRAL COACH FACTORY CHENNAI- 600 038	ICF/MD/SPEC-252 ISSUE STATUS:01 Rev.:00 DATE: 10.08.2013
SCHEDULE OF TECHNICAL REQUIREMENTS FOR MANUFACTURE AND SUPPLY OF CAST STEEL SIDE BUFFER ARRANGEMENT FOR USE IN BG CONVENTIONAL COACHES OF INDIAN RAILWAYS .	
IDENTIFICATION SHEET	No. of pages: 18

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1. SCOPE:

1.1 This schedule covers the technical requirements for the manufacture and supply of cast steel Side buffer Arrgt. to be used on BG conventional coaches of Indian Railways .

2. SCOPE OF SUPPLY:

2.1. The Cast Steel Side buffer arrangement shall be supplied in full assembly condition as per the scope and requirements as shown in the ICF drawing No.ICF/STD-2-2-009 or RDSO Drg.No.Sk-98145 with latest alterations.

2.3 The supplier shall supply one buffer casing, buffer plunger and face plate per heat with integrated test bars at suitable places to the purchaser. The test bar shall be stamped after they are normalized along with the casting.

3. SPECIFICATION:

3.1 The Side buffer shall conform to this schedule of technical requirements, relevant drawings with latest alteration index 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.

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

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4. MATERIAL

4.1 The Side buffer casing and side buffer plunger shall be cast steel to specifications IS :1030-1998 Grade 230 - 450W and Face plate shall be cast steel to specifications IS :1030-1998 Grade 280 - 520W with guaranteed weldability. Castings shall be free from blow holes, 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.

4.3 Other fabrication/forging/rubber/hardware items shall be manufactured/procured to specifications as specified in the respective drawings according clause 5.2 to 5.5 of this specification.

5. MANUFACTURE:

5.1 Steel Castings:

Steel casings shall be manufactured in "A" Class foundries to IS: 12117-1996 as per the following requirements:

5.1.1 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 Purchaser shall be necessary for specific deviations which will be for a limited duration.

5.1.2 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 scrap, 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.

5.1.3 **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.

5.1.4 **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. All moulds shall be given a `wash' of appropriate quality

5.1.5 **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.

5.1.6 **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 Side buffer 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.

5.1.7 **Melting and Pouring**:

The foundry should satisfy the requirements of category `A' foundries specified and updated by Bureau of Indian standards/ RDSO from time to time. 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 Side buffer casting shall also be arrived at.

Furnace and ladles with bottom pouring facilities are preferred. There should be a positive method to trace the last two castings poured.

5.1.8 **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.

5.2 **Rubber :**

5.2.1 Buffer springs and recoiling springs shall be procured from RDSO approved sources to RDSO specification C-K210 with latest revision.

5.3 **Forging :**

5.3.1 Buffer spindle and Hex.nut M39 shall be manufactured by forging to the specification given in the respective drawing. The item shall be free from all relevant forging defects

5.3.2 Firm shall have adequate forging facilities to manufacture the buffer spindle.

5.3.3 In case the firm is outsourcing the item, the outsourced firm shall have the adequate forging facilities to manufacture the buffer spindle. Firm need to submit the necessary MOU in this regard with the outsourced firm along with the facilities available at the outsourced firm to forge the spindle.

5.3.4 Relevant test certificates and invoices if outsourced shall be produced during the time of inspection.

5.4 **Fabrication:**

5.4.1 Destruction tube shall be manufactured by fabrication to the specification given in the respective drawing. The item shall be free from all weld defects

5.4.2 Firm shall have adequate fabrication facilities to manufacture the Destruction tube .

5.4.3 In case the firm is outsourcing the item, the outsourced firm shall have the adequate fabrication facilities to manufacture the destruction tube . Firm need to submit the necessary MOU in this regard with the outsourced firm along with the facilities available at the outsourced firm to fabricate the destruction tube.

5.4.4 Relevant test certificates and invoices if outsourced shall be produced during the time of inspection.

5.5 **Hardware:**

5.5.1 Hardware items shall be procured from recognized sources to the specification provided in the drawings.

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5.5.2 Relevant test certificates and invoices shall be produced during the time of inspection.

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 Side buffer casing, plunger and face plates. The grain size shall be uniform and of size ASTM 6 or finer. The microstructure shall not reveal cast dendritic structure. The records shall be maintained and shall be submitted at the time of inspection.

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/system 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

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8.12 System to ensure and maintain A class foundry requirements to relevant specifications specified and updated by Bureau of Indian standards/ RDSO from time to time.

8.13 System to ensure quality of manufactured / outsourced forged, fabricated and hardware items

8.14 System for disposal of defective Side buffers identified during various stages of manufacture and implementation of QAP, so that such castings are not mixed up with lot being offered for inspection.

8.15 Records to identify the manufacturing details/ tests if castings with Serial Number marked on castings.

8.16 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 Marking of items in the buffer assy. shall be ensured as indicated in the respective drawings

9.2. The heat number shall be punched on buffer casing, buffer plunger and face plate.

9.3 A five digit unique number has to be punched for buffer casing and buffer plunger as shown in the respective drawings.

9.4 Makers identification, month and year of manufacture in raised letters at locations and size given in the drawings shall be provided. For marking of drawing Numbers, use of either RDSO or ICF drawing number is permitted.

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 result before the castings are accepted for inspection.

10.3 Surface inspection of machined castings to ensure freedom from defects.

10.4 Radiographic examination shall be carried out by the supplier as furnished in the clause 1.3.4 of Annexure-A

10.5 Stamping and certification of castings shall be done in the standard form.

10.6 Scrutiny of test certificates/results for other forge/fabrication/hardware items.

10.7 The supplier shall furnish all results of chemical analysis, mechanical tests, radiographic and other tests to the purchaser, accompanied by a list of Side buffer numbers corresponding to the relevant heat numbers.

11 MACHINING of SIDE BUFFER CASING , PLUNGER and FACE PLATE :-

11.1 The machining shall be accurately concentric to leave uniform wall thickness all round. The tolerance specified in the relevant drawing shall be strictly adhered to as no deviations are acceptable

11.2 The firm shall preferably have CNC machining centre.

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11.3 Machined Side buffer parts shall be free from blowholes, porosities, sand inclusions and other casting defects.

11.4 The fixing holes in buffer casing shall be jig drilled in one setting so that there is no mismatch.

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 suppliers' cost. The firm shall submit MOU with the agency in this regard.

13. GUARANTEE:

13.1 Suppliers of Side buffers shall guarantee replacement free of cost of such castings, which may develop defects within two years from the date of fitment or within three years from the date of receipt of supply whichever is earlier.

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

14.1 The successful tenderer shall have to supply free of cost four samples of Side buffers with integrated test bars for tests and approval. The tenderer shall not proceed with the series manufacture of Side buffers until these advance samples have been approved in writing by the purchaser. Should these advance samples fail to meet the tests, the order for Side buffer is liable for cancellation without compensation. The advance samples shall be tested as indicated in Annexure-A.

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15 PAINTING FOR SIDE BUFFER

15.1 Machined surfaces of the Side buffer shall be coated with rust prevention oil to IS:8221-1976 Tab-I Sl.No.1

15.2 The castings shall be thoroughly cleaned and painted with two coats of red oxide zinc chromate primer to spec. :IS:2074-1992 with Dry Film Thickness (DFT) of 35-70 microns on all surfaces except machined surfaces.

16 PACKING CONDITION

16.1 The manufacturers shall ensure the following packing conditions while supplying Side buffer Arrgt.

i) The manufacturer shall ensure that the Side buffers are not damaged during transit.

ii) Side buffer shall be packed as per ICF Drg. No. ICF/J&T/SK-1714

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ANNEXURE-A

1.0 TESTS:-

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

1.1.0 SELECTION OF TEST PIECES:-

1.1.1 ADVACE SAMPLES SUPPLIED BY VENDORS WHO HAVE NOT SUPPLIED THIS ITEM DURING THE LAST FIVE YEARS TO ICF/RCF:

Test pieces for tensile, bend and impact tests and drilling for chemical analysis (or suitable sample for spectrometric analysis) will be taken from random positions of the body of the casting.

1.1.2 FOR REGULAR SUPPLIERS:

The purchaser may agree to cast the integrated test pieces along with the buffer casing , buffer plunger and face plate themselves at suitable places to represent particular cast and lot.

1.2.0 DESTRUCTIVE TEST:

2% of casting subject to minimum of two numbers per batch shall be subjected to destructive test to ascertain that casting are free from porosity, Shrinkage, slag inclusions and other defects. Minimum two longitudinal and one transverse section at locations to be decided by the inspecting officer by visual observation of casting condition shall be made. Porous to a level of two percent of cross sectional area may be considered acceptable provided size of each blow hole is limited to 2mm both in diameter and length. Bunching of blow holes more than 3 numbers located less than 10mm apart shall be considered rejectable.

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1.2.1 MECHANICAL TEST:

The cast items of Side buffer shall conform to the respective material specifications and properties of specifications in respective drawings.

1.2.2 TENSILE TEST

Tensile test shall be carried out in accordance with IS:1030-1998 clause 13.2.

1.2.3 IMPACT TEST:

Impact test shall be carried out in accordance with IS:1030-1998 clause 13.3.

1.2.4 BEND TEST

Bend test shall be carried out in accordance with IS:1030-1998 clause 13.4.

1.2.5 BRINELL HARDNESS TEST

Brinell hardness number shall be in the range of 140-160BHN

1.2.6 CHEMICAL ANALYSIS:-

Drillings taken as per clause 1.1.0 shall be analysed for Carbon, Manganese, Sulphur and Phosphorous in addition to scrutiny from each heat which the supplier is required to supply as per clause 10.6 of this specification.

1.2.7 MICROSTRUCTURE

Microstructure examination of heat treated castings presenting each cast shall be conducted on the sample taken out from the normalizing lug

provided in Side buffer casing, plunger and face plates as explained in clause 7.0 of this specification.

1.3.0 NON-DESTRUCTIVE TEST :

1.3.1 VISUAL- EXAMINATION:

The Side buffers either cast or machined to dimensions shown on the respective drawings, shall be examined for blowholes, porosities etc.

1.3.2 ULTRASONIC EXAMINATION:

100% ultrasonic test shall be carried out on the castings as indicated in the attached Sketch-A. Acceptance standard for ultrasonic examination shall conform to level-2 of IS:9565-1986.

1.3.3 LIQUID PENETRATION EXAMINATION:

100% liquid penetrant test shall be carried out on the castings. Acceptance standard for liquid penetrate test shall conform to IS:11732. Cracks, hot tears other lamellar defects during liquid penetrate examination shall be cause for rejection.

1.3.4 RADIOGRAPHIC EXAMINATION:

The Side buffer casing and plunger after machining shall be subjected to radiographic examination to the extent of 10% of the castings from each batch as indicated in the attached Sketch -B, subject to a minimum of one per batch and 90% of samples selected must conform to acceptance standard. The acceptable radiographic standard shall be ASTM-E 446 Vol.-I/Vol.-II- Level-IV. Prints from the radiograph shall be supplied to the purchaser by the manufacturer.

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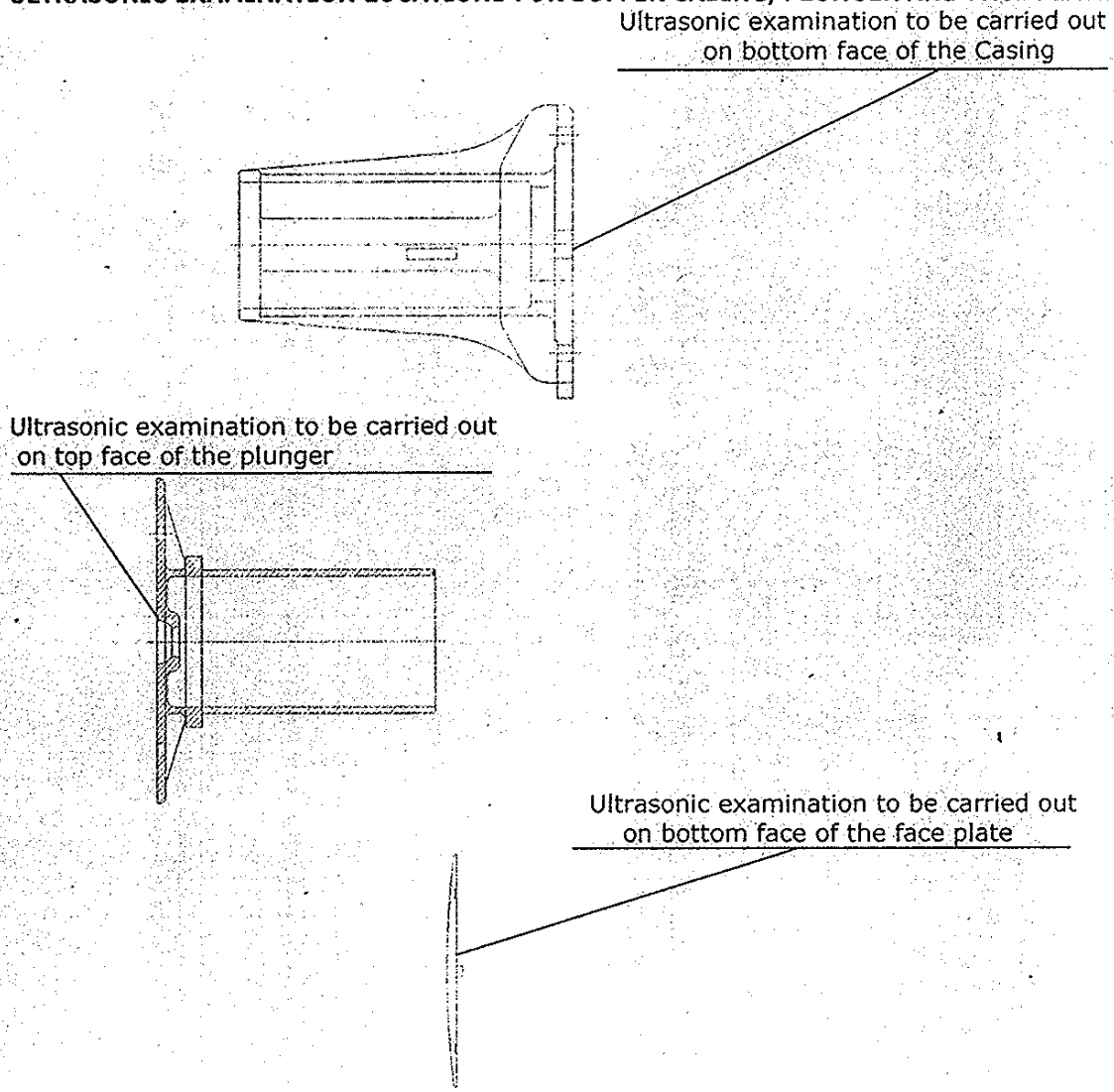
Sketch -A

ULTRASONIC EXAMINATION LOCATIONS FOR BUFFER CASING, PLUNGER AND FACE PLATE



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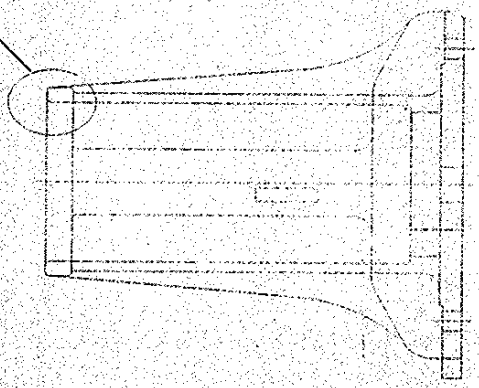
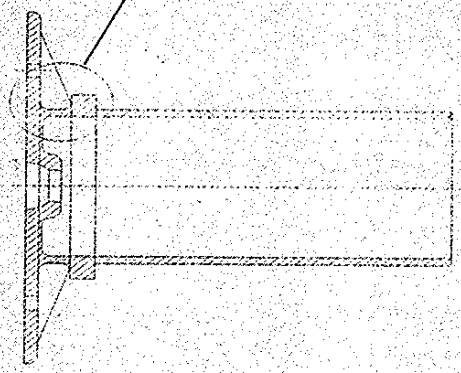
Sketch -B

RADIOGRAPHIC EXAMINATION LOCATIONS FOR BUFFER CASING AND PLUNGER

Radiographic examination to be carried out throughout the circumference



Radiographic examination to be carried out throughout the circumference



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Amendment Nos.	1	2	3	4	5
Date Of Issue	28/09/2015				

Clause amended as below.

Clause No.	Existing	Revised
5.5.1	Hardware items shall be procured from recognized sources to the specification provided in the drawings.	**Hardware items shall be procured from 'TVS' or 'UNBRAKO' or 'GKW' or 'LPS' only.**
5.5.2	Relevant test certificates and invoices shall be produced during the time of inspection.	**Purchase invoices of hardware shall be submitted during the time of inspection.**

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