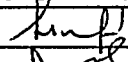
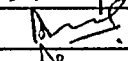
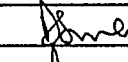
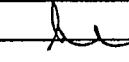
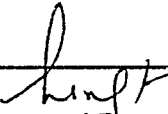


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		Dated 03.11.2005

SCHEDULE OF INFRASTRUCTURAL REQUIREMENTS FOR MANUFACTURING & TESTING FOR STEEL CASTING AXLE BOX HOUSING

NAME	DESIGNATION	SIGNATURE	DATE	LEVEL
Harish Kumar	SSE/TOT		03/11/05	Prepared
Joginder Singh	ADE/VD		3/11/05	Agreed
Amitabh Sinha	Dy CME/TOT		3/11/05	Reviewed
S K Aggarwal	CDE		6/11/05	Approved

Issue/Rev	Details of Changes	Date


Prepared By


Agreed By

SCHEDULE	SCHEDULE OF INFRASTRUCTURAL REQUIREMENTS FOR MANUFACTURING & TESTING FOR STEEL CASTING AXLE BOX HOUSING TO DRAWING NO. CC02101	MDST: 14 Rev: NIL PAGE 2 OF 7
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1.0 SCOPE :

This schedule covers the technical requirements for manufacture of steel casting, machining, testing and quality control of Axle Box Housing for Broad gauge coaches.

2.0 REQUIREMENTS

- 2.1 Vendors seeking approval shall satisfy the requirements for category "A" foundry as per IS 12117.
- 2.2 The firm should have acquired ISO 9000 series certification or QS certification.

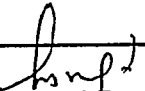
- 2.3 The firm should comply all the requirements regarding steel casting as per IS: 1030.

3.0 GENERAL INFRASTRUCTURAL AND MANUFACTURING FACILITIES

- 3.1 Covered shed with sufficient height and space provided with at least one number EOT Crane in main bay covering the below mentioned activities:

- I) Melting, Moulding , Fetting
- II) Heat Treatment
- III) Gauging & assembly
- IV) Load testing area.

- 3.2 Covered area with sufficient space for handling raw material like Sand, Scrap etc.
- 3.3 Ensure that at least one number tilting type electric arc furnace having ladle-refining facility with minimum 1.2 ton capacity is available.
- 3.4 Minimum three numbers suitable size of charging buckets of suitable capacity for scrap and foundry returns should be available.
- 3.5 Facilities for preheating of ladle should be available. Ladle lining should be of Kaltex or of High Alumina bricks. In case of use of cold laddle board, it should be ensured that there is no drop in temperature of molten metal and it is one time used only.
- 3.6 Separate identified area for different grade of scrap and foundry returns. should be available for avoiding wrong charging.
- 3.7 At least one no. forklift shall be available for material handling.


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SCHEDULE	SCHEDULE OF INFRASTRUCTURAL REQUIREMENTS FOR MANUFACTURING & TESTING FOR STEEL CASTING AXLE BOX HOUSING TO DRAWING NO. CC02101	MDST: 14 Rev: NIL PAGE 3 OF 7
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- 3.8 Weighing machine of 500 kg capacity for ferro alloys charge and finished casting weightment
- 3.9 Ensure that refractory pouring cups & down-sproudes are used.
- 3.10 The firm should have CNC Machining Center of suitable capacity for axle box housing machining *or shall have complete facility for doing the machining of the axle box housing.*
- 3.11 The firm should have compressor of suitable capacity.
- 3.12 The firm should have adequate nos. of hand grinders for the removal of fins and burrs.
- 3.13 The firm shall have adequate machining facility consisting of universal milling machine, centre lathe, radial drilling machine of suitable capacity and standard make.

4.0 SAND PREPARATION


- 4.1 Automatic sand continuous mixer machine for making 'Mould' and 'Core' should be available, the mixer should be intensive type with calibrated dozing of important ingredients or sand mixing muller with arrangement of ensuring correct mixing of ingredients.
- 4.2 Ensure that the system exist for testing of prepared sand as per the following frequency:
- i) Moulding sand 1 in every 5 batch.
 - ii) Core sand 1 in every 20 batch.
- 4.3 Whenever the sand is tested the following properties of prepared sands shall be checked.

Green Compressive Strength, Green Shear Strength, Moisture, Permeability, Shatter Index flowability, hardness etc.

The acceptance value for each test must be clearly specified and any sand not meeting the above parameters must not be used for mould/core making.

5.0 HEAT TREATMENT

- 5.1 Heat treatment facilities capable of handling the entire production must be available in house. Heat treatment furnace should be either oil fired or electric type.
- 5.2 Heat treatment furnace should be provided with digital indicators & cut off s for each point (one point at every five feet length).


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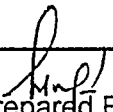
- 5.3 The heat treatment furnace must be calibrated using sufficient no of thermocouple for assessing temperature at different zones at various temperature ranges. The calibration is to be done at least once in a year.
- 5.4 Thermocouples, temperature indications should be calibrated at least once in 6 month.
- 5.5 Serial nos. of castings under heat treatment should be recorded in a register for traceability with temperature time curve and date. Display of temperature curve near the furnace for the guidance of the operator should be ensured.
- 5.6 Arrangement of proper sealing of doors of HT furnace should be available to avoid oxidation / scale formation on the surface of the casting. There should be positive pressure inside to avoid entry of air from outside.
- 5.7 The Heat Treatment recorder/Graph should have sealing arrangement to avoid tampering.
- 5.8 Positioning of the nozzles of oil fired furnace should be such that the flame does not come in direct contact with the castings.
- 5.9 The burners of HT furnace should be calibrated at every three months.


6.0 SHOT BLASTING MACHINE

- 6.1 Suitable shot blasting machine conveyor monorail type or Twin table type should be available.
- 6.2 Casting to be shot blasted before and after heat treatment using steel shot of size SS 1000, IS 4606.

7.0 SAND TESTING

- 7.1 All incoming sand must be tested before acceptance as per frequency set by QC Department. The following must be checked
- i) AFS grain size.
 - ii) Clay contents.
 - iii) Moisture content.
 - iv) Loss of Ignition
- 7.2 For testing incoming virgin sand, moulding sand, core sand the following equipment at least one number each should be available.
- a) Permeability tester.


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- b) Sand Rammer
- c) Quick moisture teller
- d) Chemical balance
- e) Sand sieve shaker
- f) Sand Muller for preparing test samples.
- g) Shatter Index tester.
- h) Dry compression strength tester.
- i) Sand mouldability / Compatibility tester
- j) Sand flowability tester
- k) Mould/Core hardness tester
- l) Methylene blue test equipment for clay.
- m) Portable hardness tester other than poldy

7.3 Ensure that the calibration of the above equipment is done once in a year.

8.0 CHEMICAL LABORATORY

8.1 Computerised emission spectrometer with automatic printer should be available for analysis and recording of steel composition at different stages of manufacturing.

8.2 Metallographic polishing equipment, Belt polisher etc. should be available.

9.0 PHYSICAL LABORATORY

9.1 Universal testing machine of 40T capacity minimum with graphical recording facilities for conducting tensile test of sample from each heat should be available. The machine is to be calibrated once in a year.

9.2 Brinell Hardness testing machine.

9.3 Impact testing machine 0-300J capacity for conducting impact test at room temperature and sub zero temperature should be available. Liquid Nitrogen container and stainless steel bath with digital temperature indicator for sub zero test arrangement must be available.

9.4 Shadowgraph facilities for assuring correct notch profile and dimension for impact test specimen as per drawing no. MI000152.

9.5 Liquid penetrate test facilities for checking surface welding cracks.

9.6 Magnetic particle Inspection facilities for crack detection should be available.

9.7 Metallurgical microscope with magnification up to 400x should be available.


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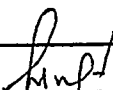
- 9.8 Person in charge of the metallurgical area should be atleast Graduate in metallurgical with not less than 5 years experience.
- 9.9 Staff conducting tests like chemical analysis, Sand testing of mechanical properties have adequate skill and competence and have under gone training to give the reasonable reliability.
- 9.10 Skill of such staff is periodically qualified by making them carry out test on blind samples.
- 9.11 Hot air oven, Hot plate, Electrical oven and other accessories and chemical agents necessary for wet analysis should be available including platinum crucibles (atleast 2 nos.)
- 9.12 The firm should have radiographic testing facility as per requirement of ASTM-E-446-81.


10.0 OTHER TESTING FACILITIES: The firm shall possess the following:

- The firm shall have adequate facilities for preparation of test sample. Facilities like machining, grinding, polishing etc. should be available in house.
- Adequate number of fine punches for stamping marking particulars on finished components.
- Adequate numbers of measuring instruments such as:
 - Digital Vernier Calipers - 0 mm to 300 mm
 - Vernier caliper – 0-600mm
 - Measuring scales – 3 meter
 - Inside & outside Micrometers - Ranging from 0 to 150 mm
 - GO & NO-GO gauges.
 - Profile gauges
 - Surface table
 - Height Gauge
 - Depth gauge
 - Surface roughness meters

11.0 QUALITY CONTROL REQUIREMENTS

- 11.1 There exists system of easy traceability of the product from casting stage to finished product stage.
- 11.2 Quality assurance plan for the product detailing various aspects like
- a) Organisation chart
 - b) Flow process chart


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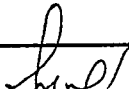
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- c) Stage Inspection details
- d) Various parameters to be maintained to ensure control
- e) Policy of disposal of rejected castings should be implemented and record is maintained for documentary evidence.

- 11.3 A graduate Engineer with at least 5 years experience or a Diploma holder must head the inspection/final quality control section with 10 years experience exclusively for inspection of castings.
- 11.4 Inspection staff conducting non destructive testing is adequately trained and qualified by recognized agency and has adequate experience.
- 11.5 There exists quality manual of the firm indicating the extent of control over production and testing.
- 11.6 To ensure regular submission of foundry returns detailing rejection rate, cause of rejection corrective action taken on quarterly basis.
- 11.7 There should exist a system of documentation in respect of rejection at customer end, warranty replacement, on line service failure of castings.
- 11.8 There should exist system of recording plant, machinery control equipment's remaining out of service, nature of repair done etc.
- 11.9 Welders engaged in welding works/reclamation works of castings must be qualified as per IS:7318 must be revalidated at least once in 2 years.

12.0 DOCUMENTATION

- 12.1 System should exist for documentation of the following:
 - a) Incoming raw-material register with TC reference of supplier as well as internal test result.
 - b) Stage inspection and test result
 - c) Calibration records
 - d) Casting records sl.no. wise, components wise, month wise.
 - e) Register for heat treatment indicating charge wise, loading serial no.wise Temperature graph must be pasted on the H.T register.
 - f) Weighment records of casting once in a month.

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