



**Government of India
Ministry of Railways**

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**Infrastructure, manufacturing, testing & quality control requirements
for**

- (i) Cast steel Casnub& CONCOR Bogies**
- (ii) Casnub/ CONCOR Bogie – Bolster**
- (iii) Casnub/ CONCOR Bogie – Side Frame**

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1.0 SCOPE

This schedule covers the technical requirements for manufacture, testing and quality control requirements for light weight Cast Steel Casnub bogies / CONCOR Bogies for Broad gauge Wagons and its Side frame & Bolster

2.1 REQUIREMENTS

Vendors seeking approval shall satisfy the requirements for class “A” foundry as per IS: 12117 (1996) or latest.

2.2 The firm should have acquired ISO 9000 series certification or QS certification.

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 each bay covering the below mentioned activities:

- I) Melting, Moulding , Fettling
- 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 provided with EOT crane and conveyor, magnetic chuck.

3.3 Ensure that at least one number tilting type electric arc furnace having laddle refining facility with minimum 5t capacity is available.

3.4 Minimum three numbers of Charging buckets of suitable capacity for scrap and foundry returns should be available.

3.5 Facilities for pre-heating of laddle should be available. Insulating Laddle Lining Board or High Alumina bricks should be used for Laddle lining. In case of use of cold laddle board, it should be ensured that there is no drop in temperature of molten metal & 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 Facilities should be available for oxygen lancing and Argon purging for removal of entrapped gases.

- 3.8 Adequate material handling Equipments viz. Mobile crane/EOT crane/Fork lifter/Payloader/Magnetic crane/Tractor Trolley>Loading Tempo/Tram beam/Pillar crane should be available for handling of material at all stages of production.
- 3.9 Weighing machine of minimum 500 Kg capacity for Ferro alloys charge and minimum 1 ton capacity for finished casting weighment.
- 3.10 Ensure that refractory pouring cups & down spruce are used.

4.0 SAND PREPARATION

- 4.1 Sand drier and cooling arrangement of adequate capacity for drying incoming sand with suitable automatic transportation arrangement.
- 4.2 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.
- 4.3 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.
- 4.4 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.
- 4.5 Jolt and Squeeze machine or mechanised moulding line should be available for moulding.
- 4.6 Mould cavity & core must be painted with mould wash Alkalic base / Zircon base in nature to reduce mould metal reaction.
- 4.7 Ensure that the facilities are existing for preparation of cores by „No bake“ method.

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 Gas fired or electric type.
- 5.2 Heat treatment furnace should be provided with multi point automatic continuous temperature recording arrangement with digital indicators for each point (one point at every five feet length).

- 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 indicators 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/Gas 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.
- 5.10 Induction hardening Machine or alternative equipment to achieve specified hardness in terms of Drg. No. WD-97049-S/3 should be available.

6.0 SHOT BLASTING MACHINE

- 6.1 Suitable shot blasting machine conveyor monorail type/ Twin table type/Hanger type should be available.
- 6.2 Casting to be given 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 content.
 - iii) Moisture content.
 - iv) Loss of Ignition
- 7.2 For testing incoming virgin sand, moulding sand, core sand the following equipment atleast one number each should be available.

- a) Permeability tester.
- b) Sand Rammer
- c) Quick moisture teller
- d) Chemical balance
- e) Sand sieve shaker
- f) Sand Muller of 2.0 to 5.0 Kg. capacity.
- 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.

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 Wet analysis facilities including Strohlein apparatus for carbon analysis, conducting chemical test of incoming raw materials, refectories, ferro alloys should be available in addition to spectro.

8.3 Metallographic polishing equipment viz. Cut off machine, Belt polishing/Rotary polishing Machine etc. should be available.

9.0 PHYSICAL LABORATORY

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

9.2 Direct reading hardness testing machine capacity 95-500 BHN should be available.

9.3 Impact testing machine 0-300J capacity for conducting Impact Test at room temperature and Sub-zero temperature with cold chamber with digital temperature indicator for sub-zero test arrangement should be available.

- 9.4 Shadowgraph facilities for assuring correct notch profile and dimension for impact test specimen.
- 9.5 Liquid penetrant test facilities for checking surface welding cracks.
- 9.6 Magnetic particle Inspection facilities for crack detection should be available.
- 9.7 Radiographic examination facilities with well equipped standard room should be Available.
- 9.8 Relevant ASTM E-446 reference radiograph for comparing level of radiographic quality should be available.
- 9.9 Metallurgical microscope with 1000 x magnification.
- 9.10 SCRATA comparator for assessing surface quality.
- 9.11 Person in charge of the metallurgical area is at least Graduate in metallurgical with not less than 5 years experience.
- 9.12 Staff conducting test like chemical analysis, Sand testing of mechanical properties have adequate skill and competence and have under gone training to give the reasonable reliability.
- 9.13 Skill of such staff is periodically qualified by making them carry out test on blind samples.
- 9.14 Muffle furnace 0-1200 degree C with temperature recorder should be available for chemical analysis and Jominy test with calibration on yearly basis.
- 9.15 Hot air oven, Hot plate, Electrical oven and other accessories and chemical agents necessary for wet analysis should be available including platinum crucibles (atleast 2nos.)

10.0 STATIC LOAD TESTING

- 10.1 Load testing arrangement for Bogie with 100t hydraulic power pack should be available
- 10.2 Proof load and destructive load testing arrangement for side frame and bolster with Hydraulic power pack of 300 tonnes capacity should be available.

11.0 MACHINING FACILITIES

- 11.1 The firm should have a machine shop equipped with the following machines.
 - Plane miller machine of suitable capacity for machining bolster surface.
 - Lathe machine.

Air Compressor.
Drilling machine.
Swing grinder.
Welding transformer DC
Welding rectifier DC
Power saw for sectioning sides frame/Bolster

- 11.2 Firm should have gauges as detailed in RDSO's specification number WD-31-Misc-99 & use these during & after machining operations.

12.0 QUALITY CONTROL REQUIREMENTS

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

The QAP shall be available as per requirements detailed in "Guidelines for vendor approval" issued by QA(Mech) Dte./RDSO.

- 12.3 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.
- 12.4 Inspection staff conducting non destructive testing is adequately trained and qualified by recognised agency and has adequate experience.
- 12.5 There exists quality manual of the firm indicating the extent of control over production and testing.
- 12.6 To ensure regular submission of foundry returns detailing rejection rate, cause of rejection corrective action taken on quarterly basis.

- 12.7 There exists a system of documentation in respect of rejection at customer end, warranty replacement, on line service failure of castings.
- 12.8 There exists system of recording plant, machinery control equipments remaining out of service, nature of repair done etc.
- 12.9 Welders engaged in welding works/reclamation works of castings must be qualified as per IS:7318 and must be revalidated at least once in 2 years.

13 GAUGING

- 13.1 Ensure that minimum three sets of gauges as per the stipulated specifications are available.

14 TRAINING

- 14.1 Training need for all personnel to be identified. Regular training should be organized covering personnel identified for a particular period.

15 DOCUMENTATION

- 15.1 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 one side frame and bolster at least once in a month.

MAJOR STEPS FOR APPROVAL OF CASNUB/CONCOR BOGIES

1. Application by the firm along with self assessment of their foundry in accordance with IS:12117(1996).
2. Visit by Director/Jt. Director to verify the compliance of IS:12117 by the firm.
3. Approval of the foundry as Class 'A'.
4. Application by firm seeking approval to supply casting components – couplers, Casnub/Concor bogies etc.
5. Scrutinising the capability of the firm on the basis of information given in the application form.
6. Visit by a team of RDSO officials to verify the manufacturing, testing and quality control requirements in accordance with relevant specification and STRs.
7. Submission of following documents by vendor - Documented procedure of manufacture, Methoding system for casting, as cast drawing details of castings, quality checks to be followed, gauging scheme, quality conformance testing arrangements, assembly procedure, quality assurance programme etc.
8. Perusal of the documents jointly by QA Mechanical Dte.
9. Clearance to manufacture proto type if above details are considered satisfactory.
10. Development of three sets of gauges for side frame, bolster, centre pivot assembly, side bearer housings, wedges, liners, brake block key, spring plank, other forged components, brake beam, pull rod, push rod and various pins etc. The approval for the gauges wherever necessary.
11. Testing of the proto type
12. Accordance of approval