



**Government of India
Ministry of Railways**

**QMS-10:2015
(Revision 01)**

***Schedule of Technical Requirements
For Infrastructural, Manufacturing & Testing facilities
and Quality Control
For***

**High Tensile CBC Coupler (Spec. 48-BD-08 & 56-BD-07)
&
High Capacity Draft Gear (49-BD-08)**

Items undertaken approval under the STR

S. No.	Assly./Item Name	Assly./Item	Drg. No.	Spec. No.	Remarks
1.	Arrgt. of HT Center Buffer Coupler (Non-transition)	Assly.	WD-81010-S/3	48-BD-08, May 2008.	
2.	Striker Casting wear plate	Item	WD-87056-S-1	-DO-	
3.	Striker Casting	Item	WA/BD-4460	-DO-	
4.	Yoke Pin Support	Item	WA/BD-4462	-DO-	
5.	Details of Transition & Non-transition CBC	Assly.	SK-62724	-DO-	

***Note:** - Approval shall be given for this set & not for individual item.

**Quality Assurance (Mechanical) Directorate
Research Designs & Standards Organisation
Manak Nagar, Lucknow – 226011**

1.0 SCOPE

- 1.1 The schedule of technical requirements covers the infrastructure required & norms for manufacturing of High tensile centre buffer coupler & its components for fitment in freight stock as per STR-48-BD-08, 49-BD-08 & 56-BD-07.

2.0 REQUIREMENTS

- 2.1 The vendor should be registered with RDSO as “A” class foundry in accordance with IS-12117-96
- 2.2 The firm shall have obtained ISO-9000 or Q.S. Certification for manufacturing & supply of steel casting.
- 2.3 The vendors seeking approval for manufacturing high capacity draft Gear should have also Memorandum of Understanding signed with the collaborator that the indenting manufacturer is authorised to produce the draft gears in India for sale to Indian Railways. Also should have a certification from the collaborator that the indigenously manufactured draft gear has already been tested in their premises to satisfy all the requirements under AAR-M-901E.

3.0 GENERAL REQUIREMENTS & MANUFACTURING FACILITIES

- 3.1 Melting, Moulding, Fettling, heat treatment, gauging & assembly activities should be carried out under a covered shed with adequate height and space with minimum 02 nos. EOT cranes of 5 Ton capacity each for each bay covering these activities.
- 3.2 Covered area with adequate storage space for raw material such as sand, scrap Foundry return, Lime, Coke, Ferro-alloys and Refractories for furnace and ladle etc. with crane or conveyor facility.
- 3.3 Adequate material handling equipment viz. Mobile crane/EOT crane/Fork lifter/Payloader/Magnetic crane/Tractor Trolley/Loading Tempo should be available for handling of material at all stages of production.
- 3.4 Atleast one number tilting type Electric Arc furnace having ladle refining facilities with minimum 1 ton capacity should be available.
- 3.5 Charging buckets of suitable sizes for charging of scrap & different alloys in the furnace should be available.

- 3.6 Portable immersion pyrometer/immersion pyrometer with provision of recording and optical/infrared pyrometer should be available for measuring temperature at suitable location. These should be calibrated once in a month or more often.
- 3.7 Facility should be available for safe storage of Scrap, Foundry returns, Ferro Alloys etc. duly identified and segregated to avoid contamination.
- 3.8 Ladle pre-heating facility should be available with arrangement to measure Temperature.
- 3.9 Oxygen lancing in the furnace and Ladle argon purging from bottom with separate ladle should be available for removal of entrapped Gases during melting.
- 3.10 Insulating Ladle Lining Board or High Alumina bricks should be used for Ladle lining.
- 3.11 Ensure that a system of double slag process i.e. oxidizing and reducing is employed alongwith minimum 20 points Carbon boil in the oxidizing period.
- 3.12 A system should exist for ensuring that the heat treatment is done melt-wise in one batch to ensure that the properties of the component for the entire batch remains same. This is necessary since the testing is done on sample basis which is picked up from a heat.
- 3.13 A System of bath analysis by spectrometer at least at 4 stages e.g. Opening bath, Carbon boil bath, addition bath /reducing bath and final bath should be followed and recorded in log sheet of furnace with time/date of analysis.
- 3.14 Weighing machine of minimum 500 kgs. for measuring various raw materials during Charging in the Furnace should be available.

4.0 SAND PREPARATION

- 4.1 Sand drier and cooling arrangement of adequate capacity for drying incoming sand with suitable automatic transportation arrangement, sand shallow/hooper for fresh and reclaimed sand should be available.
- 4.2 Separate Automatic sand continuous mixer for moulding and core making is required. The mixture should be microprocessor based where the ratio of all the Ingredients are programmed and controlled accordingly. Use of resin sand preferred to ensure quality castings. Intensive mixer with calibrated dosing of important ingredients is essential.
- 4.3 Mechanised moulding line or jolting machines with squeezing facilities for Mould preparation should be available.
- 4.4 Only no-bake core should be used.
- 4.5 Knock off core to be used for elimination of gas cutting.
- 4.6 Alkali/Zircon base mould wash should be used on moulds and cores.

5.0 HEAT TREATMENT

- 5.1 Heat treatment facilities should be capable of handling the entire production. No subletting of Heat treatment is permissible. The heat treatment furnace should either Oil/Gas fired or electrically controlled
- 5.2 The heat-treatment furnace should be equipped with multipoint automatic Continuous temperature recording arrangement with minimum one thermocouple at 5 ft length of furnace covering different zones with automatic temperature control of micro processor type. Separate temperature indicator for each thermocouple should be available.
- 5.3 System should exist for calibration of the thermocouples, temperature indicator and recorders once in 6 months and the furnace to be calibrated once in a year.
- 5.4 Water quenching facility with a capacity to accommodate water of mass 5 times the mass of the total charge which is to be quenched should be available with proper water circulation system to ensure that the temperature is within control.
- 5.5 Arrangement should be available for agitation of the quenching medium and noting the temperature.
- 5.6 System should exist to ensure immediate quenching of casting after Heat Treatment to avoid drop in temperature.
- 5.7 Arrangement of proper sealing of the Doors of Heat Treatment furnace should be available to avoid oxidation/scale formation on the surface of the castings. There should be positive pressure inside to avoid the entry of air from outside.
- 5.8 The Heat Treatment recorder/Graph should have sealing arrangement to avoid tampering.
- 5.9 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. The burners should be calibrated once every three months.

6.0 MACHINE FACILITIES

- 6.1 Adequate number of D.C welding machine should be available.
- 6.2 Arrangement of Arc air gauging should be available for removal of runner, Raiser, fins etc. with minimum input of heat into castings.
- 6.3 Dressing equipment viz. disc face grinder, swing grinder, pencil grinder etc. should be available in sufficient number.
- 6.4 Shot blasting equipment conveyor (MONORAIL) type or rotatory table type/hanger type should be available for shot blasting of the castings before and after heat treatment (shot size SS 1000 as per BS 4606).
- 6.5 Electrode pre-heating arrangement with automatic temperature controller should be available.
- 6.6 Hydraulic press minimum 100T capacity with roller bed arrangement for fitment of pre-shortner in Draft gear.
- 6.7 Draft gear tup hammer testing machine with computerised recording arrangement with all accessories for carrying out tup hammer test as per AAR-M-901-E should be available.

7.0 LABORATORY & TESTING EQUIPMENT

SAND LABORATORY

- 7.1 The fresh sand, backing sand are to be tested for Green Shear, Green compression strength, moisture content, permeability etc. and shear strength, impact Penetration test etc. for 'no-bake' sand. For these test the following equipment should be available which are to be calibrated once in a year.
 - i) Rapid moisture teller
 - ii) Sand permeability testing equipment
 - iii) Sand shatter Index testing equipment
 - iv) Sand Sieve shaker
 - v) Universal Sand testing equipment
 - vi) Sand flowability testing equipment
 - vii) Sand Muller of 2.0 to 5.0 Kg. capacity
 - viii) Methylene Blue test equipment for clay
 - ix) Chemical weighing balance
 - x) Oven with temperature indicator
- 7.2 Ensure that for checking horizontal & vertical hardness of mould & core, mould hardness tester and scratch hardness tester are available.

CHEMICAL LABORATORY

- 7.3 For conducting chemical analysis of bath sample, pit sample, ladle sample & the product computerized Spectrometer with Automatic printer should be available in an air-conditioned room with sufficient nos. of channel.
- 7.4 Metallographic polishing equipment viz. cut off machine, belt polishing/rotary polishing Machine are required for preparation of test samples adjacent to spectro room.
- 7.5 Wet analysis facilities including strohleim apparatus for carbon testing , conducting chemical test of raw material, refractories, ferro alloys, etc. should be available in addition to Spectro.
- 7.6 Muffle furnace of 0 – 1200 degree C with temperature recorder should be available for chemical analysis and Jominy test. This should be calibrated as per the laid down frequency.
- 7.7 Hot air oven, Hot Plate, electrical oven and other accessories & chemical agents necessary for wet analysis should be available including platinum crucibles (at least 2 nos.).

PHYSICAL LABORATORY

- 7.8 Universal testing machine of 40T capacity with Load meter with a least count of 50 kg. and graphical recording/Computer recording & printing facility for conducting tensile test on test samples of each heat should be available. The testing machine should be calibrated at least once in a year.
- 7.9 Impact testing machine 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. The machine is to be calibrated as per the laid down frequency.
- 7.10 Bend testing facility and profile checking gauge should be available.
- 7.11 Fracture toughness testing facility for conducting test samples at – 57 °C.
- 7.12 Shadow graph for checking the correct notch shape and dimension on the impact test specimen.
- 7.13 Minimum 2 types of Fixed bench type heavy duty hardness checking equipment viz. BHN &HRC. The instrument should have optical instrument/digital display attachment for giving direct reading.

- 7.14 Portable hardness tester for checking hardness of heavy castings in shop floor.
- 7.15 Liquid penetrant testing facility for checking welding cracks should be available.
- 7.16 Ensure the availability of Magnetic particle inspection facilities of casting.
- 7.17 'D'-meter and Ultrasonic examination facility for checking thickness of casting and to quantify the extent of defect should be available.
- 7.18 Radiographic examination facility with well equipped standard room and projector for viewing of radiographic films should be available.
- 7.19 Relevant ASTM E-446 reference radiographs for classifying the radiographic quality levels should be available.
- 7.20 Ensure that Metallurgical Microscope with minimum x 50 – x 1000 times magnification with photographic facility should be available.
- 7.21 Pull test facility up to 500T capacity for conducting pull test of Yoke, Knuckle, Coupler Body. The arrangement should be such as to simulate the actual service condition and to measure the permanent set according to the Specification.
- 7.22 Sufficient number of drilling machines/boring machines of maximum 100 mm capacity with suitable bed for holding coupler components should be available.
- 7.23 Centre lathe of 8" chuck dia for machining Knuckle Pin, Yoke Pin and test samples.
Power saw arrangement for sectioning of castings (other than oxy-cutting) should be available.
- 7.24 Electrical/ Diesel air compressor of sufficient capacity should be available.

8.0 GAUGES

- 8.1 Three sets of gauges as per the approved gauging scheme for dimensional Checking of castings as per STR 48-BD-08 , 49-BD-08 & 56-BD-07 should be available (List of gauges is given in Annexure "A").
- 8.2 Ensure that adequate number of calipers, Verniers, Scale, Divider etc. are available and are calibrated as per the laid down frequency.
- 8.3 Bench for checking operation of Coupler and interchangeability of parts should be available.
- 8.4 Ensure that the arrangement for checking couplerability is available.

- 8.5 Lay out of different castings gauges and metallic templates should be available for checking various patterns and cores at regular intervals.
- 8.6 SCRATA comparator for checking the surface defects should be available. The system should exist to ensure that the defects are checked and recorded.
- 8.7 Adequate number of patterns/preferable aluminum type for each of the component should be available.
- 8.8 Computer Aided Designing facility for methoding & other production requirement.

9.0 TECHNICAL EXPERTISE REQUIREMENT

- 9.1 Process Engineering (Methods)/Patterns shop should be headed by Post Graduate in Foundry Engineer with minimum 3 years experience or Bachelor degree in Metallurgical/ Foundry Engineering with 5 years experience.
- 9.2 The person In-charge of the Metallurgical area should be at least Graduate (Metallurgical Engineering) with 5 years relevant experience.
- 9.3 The Quality-in-charge should be graduate Engineer with relevant field Experience of minimum 5 years or Diploma Holder with minimum 12 years Experience.
- 9.4 The Melters engaged in Melting & operation of Arc Furnace should be Science Graduate/ Diploma Holder with 3 years relevant experience.
- 9.5 There should be separate Supervisors & Quality Control Inspectors for Each section who should be Diploma Holders with relevant 3 years experience.
- 9.6 Heat-Treatment section should be headed by Graduate Engineer who Should be exclusively In-charge & responsible for Heat-treatment.
- 9.7 Welders employed in welding of casting should be trained as per IS. The Welders should be tested & qualified at a frequency of not less than once in 2 years.
- 9.8 Ensure that a person, having competency to work on computer and proficiency in CAD, is available.

10. QUALITY SYSTEM ORGANIZATION & DOCUMENTATION

- 10.1 For each pattern, documentation of pattern design, gating & risering Design, moulding materials & methods, pouring temperature. Heat treatment cycle, casting identification etc. should be available.

- 10.2 Documentation should be maintained for the drawing dimension, expected Pattern dimensions actual pattern dimension & actual casting dimension for the sample as pilot casting.
- 10.3 System of discussion and debate of problems encountered and corrective action taken should be there and all information should be recorded and circulated periodically to all the departments.
- 10.4 Daily Foundry rejection of each job should be recorded together with the Cause and analysed for taking corrective action.
- 10.5 A detail Furnace Log Sheet for each heat should be available. Details of charging & addition with chemical analysis report of bath sample, pit sample and ladle sample, Pouring & tapping temperature, details of charging & melting time.
- 10.6 Records of testing of I/C raw materials, shift wise sand testing report for Moulding & core making should be maintained for easy traceability.
- 10.7 Heat-treatment cycle should be prescribed before hand and the chart should be scrutinised by the authorized representative of Quality Control section and not by production staff. Records should be kept for acceptance of heat-treated testing serial number wise.
- 10.8 Inspection check sheet for various stages i.e for Incoming raw material, Inspection of pattern, core, moulding, pouring, physical & chemical checking of individual heats should be maintained for checking by RDSO. Dimensional & gauging report of each casting should be maintained.
- 10.9 System should exist for the following:
- A) Quality plan
 - B) Incoming raw material register with TC reference of supplier as well as internal test result.
 - C) Stage inspection vis-a-vis test result
 - D) Calibration records
 - E) Casting records sl.no. wise component wise month wise
 - F) Register for heat treatment indicating charge wise loading sl.no wise. Temperature graph must be pasted on the heat treatment register.
 - G) Weight record of each item at least once in a month.

11.0 TRAINING

- 11.1 Training needs for all personnel to be identified and regular training should be organised in different section of foundry.
- 11.2 Inspection staff conducting non-destructive test should be adequately trained and qualified from recognised agency.

ANNEXURE 'A'

LIST OF GAUGES FOR COUPLER COMPONENTS

COUPLER HEAD		
<u>S.No.</u>	<u>Description</u>	<u>Drawing No.</u>
1.	10A Contour Gauge	WD-84073-S-1-RC
2.	Bottom Anticreep-Vertical Location	WD-84073-S-2-RC
3.	Bottom Anticreep Horizontal Location	WD-84073-S-3-RC
4.	Top Anticreep-Vertical Location	WD-84073-S-4-RC
5.	Pivot Lug	WD-84073-S-5-RC
6.	Pin Protector	WD-84073-S-6-RC
7.	Pulling Lug Gauge - Knuckle side	WD-84073-S-7-RC
8.	Pivot Pin	WD-84073-S-8-RC
9.	Lock Chamber	WD-84073-S-9-RC
10.	Lock Hole	WD-84073-S-10-RC
11.	Rotary Lug	WD-84073-S-11-RC
12.	Shank End Pin Hole	WD-84073-S-12-RC
COUPLER PARTS		
1.	Knuckle Bottom Pulling Lug	WD-84073-S-41-RC
2.	Knuckle Movable Point	WD-84073-S-42-RC
3.	Knuckle Hub	WD-84073-S-43-RC
4.	Knuckle Tail Height	WD-84073-S-44-RC
5.	Knuckle Top Pulling Lug	WD-84073-S-45-RC
6.	Knuckle Tail Shelf	WD-84073-S-46-RC
7.	Knuckle Pin Hole	WD-84073-S-47-RC
8.	Knuckle Length	WD-84073-S-48-RC
9.	Lock Contour Guard-Arm Side	WD-84073-S-56-RC
10.	Lock Contour Knuckle Side	WD-84073-S-57-RC
11.	Lock Toggle	WD-84073-S-58-RC
12.	Lock Parallel and Thickness	WD-84073-S-59-RC
13.	Lock Slot	WD-84073-S-60-RC
14.	Lock Toggle Arm Width-GO & NO GO	WD-84073-S-61-RC
15.	Knuckle Thrower Contour	WD-84073-S-66-RC
16.	Knuckle Thrower Trunion	WD-84073-S-67-RC
17.	Lock Lift Assembly	WD-84073-S-76-RC
18.	Composite Gauge for Connector	WD-84073-S-77-RC
19.	Composite Gauge for Hook	WD-84073-S-78-RC
20.	Composite Gauge for Toggle	WD-84073-S-79-RC
21.	Knuckle Pivot Pin Dia & Length GO & NO- GO	WD-84073-S-96-RC

	COUPLER SHANK	
1.	Shank Height	WD-84073-S-15-RC
2.	Shank Butt Width	WD-84073-S-17-RC
3.	Pin Hole Shank Wall Thickness	WD-84073-S-18-RC
4.	Butt Rear Wall Thickness	WD-84073-S-19-RC
5.	Pivot Pin Hole	WD-84073-S-20-RC
6.	Shank Height with Wear Plate	WD-84073-S-21-RC
7.	Shank Length (Non-Transition)	WD-84073-S-22-RC
8.	Shank Butt End Contour	WD-84073-S-23-RC
9.	Spherical Butt & Pin Hole	WD-84073-S-24-RC
10.	Shank Butt Height	WD-84073-S-25-RC
DRAFT GEAR		
The vendors shall submit the gauging procedure including the gauge drawings for approval from RDSO after getting it approved from the collaborator.		

MAJOR STEPS FOR APPROVAL OF HIGH TENSILE CBC & HIGH CAPACITY DRAFT GEAR

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 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. In case of high capacity draft gear Memorandum of Understanding with the collaborator for permission to manufacture and supply the draft gear on Indian Railway should be submitted along with the certification from the collaborator that the indigenously manufactured draft gear has been tested and satisfies the requirement M-901E.
8. Perusal of the documents.
9. Clearance to manufacture proto type as per STR if above details are considered satisfactory.
10. Development of three sets of gauges for CBC Coupler and its components and their approval for the gauges wherever necessary.
11. Testing of the proto type
12. Accordance of approval
13. Interchangeability of components of different manufacturers.

.....