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1. Objective

Shell of a LHB Broad gauge Coach is broadly an assembly of underframe, side walls, roof and the end walls. This document is prepared to specify the technical requirements for manufacturing, testing, quality control, inspection and the supply of complete assembled shell of a LHB Coach suitable for operation on Broad Gauge (1676 mm) routes of Indian Railways as per the specifications/ Drawings mentioned in the subsequent Paras of this document.

2. Scope of the specification

2.1 The scope of this specification is manufacturing, testing, quality control, inspection and the supply of complete assembled shell of a LHB Coach suitable for operation on Broad Gauge (1676 mm) routes of Indian Railways.

2.2 The applicable specification and variant wise drawing of shell under the scope of this specification are given in Annexure-1 and Annexure-2 respectively. The Shell includes the following main sub-assemblies:

S.No.	Sub-assemblies
1.	Roof assembly including roof end part
2.	Side Walls assembly including lavatory side walls
3.	End wall assembly
4.	Underframe complete
5.	Door cut outs (both sides)
6.	SS AC trough for RMPU
7.	Steel partition walls and WTCC (if applicable as per coach GI drawing)

2.3 Variants of LHB Coaches covered in the scope of this specification:

S. No.	Type of Coach	S. No.	Type of Coach	S. No.	Type of Coach
i.	LWFAC	ii.	LWFCWAC	iii.	LWACCW
iv.	LWACCN	v.	LWFCZAC	vi.	LWSCZ
vii.	LWSCZAC	viii.	LWS AC	ix.	LWS
x.	LWSCN	xi.	LWLRRM	xii.	LWCBAC
xiii.	LSLRD	xiv.	LVPH		

2.4 The list of jigs and fixtures required for fabrication and assembly of the complete body shell and its subassemblies is given in Annexure-3.

3. Manufacturing Infrastructure

3.1 The manufacturer shall possess minimum infrastructure as per the latest version of specifications for schedule of technical requirements as given in Annexure-1.

3.2 Apart from above, necessary infrastructure required for manufacturing, handling, inspection and testing (except chemical and physical testing of the material, which can be done at NABL accredited lab) of complete shell assembly is to be developed in house by the manufacturer.

3.3 In house availability of Jig and fixtures to be ensured by the firm before prototype inspection in firm premises.

4. Scope of Supply

The scope of supply shall include manufacture, assembly and supply of completely assembled shell as per specification and drawings (Annexure-1 & 2) and duly meeting the requirements mentioned in this specification. Design of fixtures for transportation of the assembled shell assembly from the manufacturer's premises to the consignee at MCF shall be in the scope of shell manufacturer. Transportation (suitable and protective) from manufacturer's premises to the consignee at MCF shall be in the scope of firm.

5. Technical Requirements

5.1 Proper Gauges, jigs and fixtures are to be used to maintain the geometry of the total assembly. Jigs and fixtures shall be available with the shell manufacturer for each & every sub-assembly like under frame, roof, side wall, end wall, partition wall (if applicable) etc and also for assembly of the shell (Annexure-3).

5.2 Geometry to be maintained according to drawings and holes to be drilled by drilling jigs. Jigs & Fixtures prepared for the subject work to be duly calibrated.

5.3 Technical requirements/ processes/ practices contained in specifications referred in Annexure-1 and general instructions for MIG/ MAG welding given in RCF document No. PLW 0102 or latest are applicable under the scope of this specification. Changes duly supported with proper justification can be accepted with the approval of CDE/ MCF.

5.4 Firm shall comply the requirements of welding activities as per schedule of infrastructure requirements for stainless steel fabrication items No. MDST-102.

5.5 Finished assembly shall be free from cracks, flaws, lamination, rough jogged and imperfect edges and other harmful defects. Complete shell will be leak proof from water except the holes/ cut outs shown in drawing.

5.6 All sharp edges, burrs and slag to be removed by suitable grinders.

5.7 The Metal part of the shell should not be affected/eroded/corroded, when exposed in extreme climatic conditions of 100% relative humidity, or in wet weather, high ambient temperature of 60°C or heavy rainfall.

5.8 Any gouging crack or detrimental defects in the products will not acceptable.

5.9 Pickling and passivation treatment of all weld joints shall be done as per RCF MDST-102.

5.10 Skin tensioning process, procedure and surface finish/ undulation requirement of side walls sheets will be as done for LHB Body shell to RCF Work Instructions No.PLW0105. Concavity or convexity for exterior of side wall shall be as per MDTS-21327.

6. Quality Control Requirements:

6.1 The firm should have acquired ISO 9001 series certification having at least one of the sub-assembly of the full assembled shell (from Para 2.2) in the scope of certification.

6.2 It is desirable that the tenderer is accredited with ISO-3834 certificate.

6.3 The firm shall have accredited with IRIS as per ISO/TS 22163 guidelines.

6.4 The firm should have a system of traceability of the product from raw material stage to finished product stage. The system should also facilitate to identify the raw material composition from the finished product stage.

6.5 The firm shall have a Quality Assurance Plan (QAP) for shell assembly covering the following.:

- Process flow chart
- Stage wise inspection details from raw material stage to finished product.
- Check list for critical monitoring of stages (to be prepared and followed).
- Various parameters to be checked and level of acceptance of such parameters indicated

and method to ensure and control over them.

- Disposal system of rejected raw material and components.
- The format of QAP is available on link <https://mcf.indianrailways.gov.in/uploads/Format%20of%20QAP.pdf>. QAP to be submitted in the above format. Copy of the current version of format is attached as Annexure-4 for reference.

QAP to be submitted to CDE/ MCF for approval.

7. Documentation:

Documents as per the QAP are to be maintained.

8. Acceptance Criteria:

8.1 For individual sub-assemblies of the complete assembled shell- As per the relevant specification and the drawing given in Annexure-1 and Annexure-2.

8.2 For complete Shell Assembly:

8.2.1 Availability of all the sub-assemblies, components as per the relevant drawings.

8.2.2 Dimensional conformance as per the relevant drawing.

8.2.3 Quality of weld check and conformance as per PLW 0102.

8.2.4 Concavity or convexity as per PLW 0105 (latest).

8.2.5 Shower Testing- Complete shell shall be leak proof from water except the holes/ cut outs shown in drawing.

9. Inspection and Prototype approval.

9.1 Inspection of various sub-assemblies of the complete shell assembly shall be carried out at different stages in order to ascertain use of proper quality material, geometry, symmetry, dimensional accuracy of the assemblies in accordance with drawings, quality of welding during fabrication work and overall workmanship. The agency for inspection shall be as decided by MCF, who will be deputed at manufacture/ firm premises for stage and final inspection. Two stage inspection (including final inspection) shall be carried out as follows:

S. No.	Stages of inspection	Inspection Activity
1	Stage-1	Inspection of sub-assemblies and components viz. • Complete under frame with all under slung mounting • Roof • side walls • End Walls and • other components
2	Stage-2	Inspection of complete fabricated shell assembly and leakage testing

Only after clearance of Stage-1 inspection of al sub-assemblies, firm should proceed to shell assembly work.

9.2 Prototype Approval

9.2.1 Contractor shall manufacture the shells as per the requirements defined in this specification and offer the same to CDE/ MCF for approval.

9.2.2 The prototype inspection shall be carried out by the authorized representative of CDE/MCF at firm's premises.

9.2.3 The inspection shall be carried out in two stages as above.

9.2.4 All the modalities for prototype approval are to be facilitated by the shell manufacturer. If, any of the facility, within the ambit of this specification is to be carried out at third

party location/ lab, the same shall be arranged by the shell manufacturer at their own cost and expense.

9.2.5 Physical & chemical test of raw materials will be done at any NABL accredited test house. However, MCF reserves the right to carry out testing of samples at their own lab or NABL accredited lab at firm's cost.

9.2.6 Use of raw material to the specification and its sources shall be verified during stage inspections.

9.2.7 Final prototype clearance will be given after successful fitment and assembly of the Shell to manufacture the complete coach.

9.2.8 After supply of first shell, the deficiencies/any shortfall shall be checked and if any further modification/addition of new item is required, the same shall be implemented in first shell by the shell manufacturer at his own cost and expense.

9.3 **Bulk supply of shells**

The modifications advised during the prototype approval or design changes planned in the preceding activity shall be implemented and the supply of remaining shells shall be made accordingly.

9.4 Regular Orders:-

9.4.1 QAP approval by MCF.

9.4.2 Prototype approval by MCF.

9.4.3 Inspection of balance quantity by Third Party Inspection Agency.

9.5 For Developmental orders:

9.5.1 Capability cum Capacity Assessment

9.5.2 QAP approval by MCF.

9.5.3 Prototype approval by MCF.

9.5.4 Inspection of balance quantity by Third Party Inspection Agency.

10. Provisioning of facilities for working for rectification/modification work at MCF

10.1 MCF shall provide the following provisions, free of costs, for enabling the contractor working at MCF premises only.

1. MCF will provide suitable crane, material handling equipment and fork lifters with driver for handling of sub-assemblies/ body shells at MCF/RBL.
2. Power supply, Compressed Air and water etc. as available at MCF for working at site shall be provided by MCF/RBL. These shall be put to judicious use and only for activities related to the project.
3. Access to toilets and drinking water facilities shall be provided at MCF/RBL.

10.2 All the other facilities for rectification/modification work at MCF shall be arranged by the shell manufacturer at his own cost and expense.

11. General Terms & Conditions

GCC terms and conditions shall be applicable for the project. These are considered in addition to statutory, regulatory requirements and IRS standard conditions.

12. Guarantee/Warranty

The expected life of the shell structures is 35years. The supplier shall provide a warranty for all supplied items for a period of 10 (ten) years from date of fitment or 11 (eleven) years from the date

of supply whichever is earlier for material, manufacture and workman ship as regards to trouble-free and satisfactory service performance. If any defects are noticed during service, with regards to manufacture/ welding quality of the complete shell including its sub assemblies and components, action shall be taken by the manufacturer of the shell to carry out any repair/ rectification or replacement at his own cost.

Annexure-1

List of applicable specification

S/no	Sub-assemblies	Specification Description	Specification no.
1.	Roof assembly	Schedule of technical requirement for supply and manufacture of stainless-steel roof assembly	MDTS 21323 Rev-02 or latest
2.	Side Wall assembly	Schedule of technical requirement for supply and manufacture of stainless-steel side wall assembly	MDTS 21327 Rev-01 or latest
3.	End wall assembly	Schedule of technical requirement for supply and manufacture of stainless-steel End wall assembly	MDTS21332Rev-00 or latest
4.	Underframe complete	Schedule of infrastructure requirement for Underframe complete for LHB coach	MDTS21320 Rev-02 or latest
5.	Front part/End part	Schedule of infrastructure requirement for Front part/End part	MDTS21261 Rev-03 or latest
6.	Fabrication item	Schedule of infrastructure requirement for stainless steel fabrication item	MDST102 Rev-03 or latest
7.	Partition frames and chair Pillers	Schedule of infrastructure requirement for all types of stainless steel partition frames and chair Pillers	MDST159 Rev-01 or latest
8.	-	Schedule of infrastructure requirement for cold rolled formed (CRF) product for passenger coaches	MDTS11273Rev-00 or latest

Annexure-2

Details of variants of LHB Stainless Steel coach Shells and their applicable drawings

S No	Type of Coach	Drawing nos. (Latest Alteration shall be used)	
		Body Shell Assembly Stage-I	Body Shell Assembly Stage- II
i.	LWFAC	LA10158	LA10006
ii.	LWFCWAC	WA10149	WA10150
iii.	LWACCW	LW10196	LW10203
iv.	LWACCN	LE10112	LE10113
v.	LWCBAC	LH10100	LH10122
vi.	LWSCZAC	1.10113.1. 20.000.002	---
vii.	LWFCZAC	1 10112.0. 20.000.001	---
viii.	LWS AC	LG10426	LG10466
ix.	LWSCN	LS10272	LS10226
x.	LSLRD	LR10561	LR10562
xi.	LWLRRM	LP10372	---
xii.	LWSCZ	LJ10233	---
xiii.	LWS	LG10343	---
xiv.	LVPH	VP10146	---

Annexure-3

List of applicable drawings of Jigs and fixtures

Sl. No.	Description	Drawing nos. (Latest Alteration shall be used)
1	Welding Fixture for Body Shell Stage-I	XM006401
2	Welding Fixture for Body Shell Stage-II	XM006601
3	Welding Fixture for Body Shell Stage-III	93.10.71.6281 93.10.88.112
4	Welding Fixture for Under frame Stage-I	XM006501
5	Welding Fixture for Under frame Stage-II	93.10.71.6257
6	Holding fixture for console	93.10.71.6318
7	Welding Fixture for Front Part	XW024401 XW024501
8	Welding Fixture for Main cross member	93.10.71.6114 93.10.71.6115
9	Welding Fixture for End wall Assembly	XW024301
10	Welding Fixture for Roof Assembly for AC & Non-AC coaches	XM004101
11	Welding Fixture for Roof Assembly for AC-3Tier only	XM003301
12	Welding Fixture for Roof acceptance stand	93.10.71.6255
13	Welding Fixture for Sidewall Assembly	XW019001
14	Welding Fixture for Sidewall and Carline	XM004301