Rail Coach Factory, Kapurthala

MD35131

Date: 09.06.2020

Sub: Issue of specifications for Schedule of technical requirements for supply and manufacture of Sub Assemblies of LHB & 3 Phase MEMU coaches.

Please find enclosed the following specifications for schedule of technical requirements for supply and manufacture of Sub Assemblies of LHB & 3 Phase MEMU coaches:

1.	SCHEDULE OF TECHNICAL REQUIREMENT FOR SUPPLY AND MANUFACTURE OF STAINLESS STEEL ROOF ASSEMBLY	MDTS21323	REV-02
2.	SCHEDULE OF TECHNICAL REQUIREMENT FOR SUPPLY AND MANUFACTURE OF STAINLESS STEEL SIDE WALL ASSEMBLY	MDTS21327	REV-01
3.	SCHEDULE OF TECHNICAL REQUIREMENT FOR SUPPLY AND MANUFACTURE OF STAINLESS STEEL END WALL ASSEMBLY	MDTS21332	REV-00
4.	SCHEDULE OF INFRASTRUCTURE REQUIREMENT FOR STAINLESS STEEL FABRICATION ITEMS	MDST 102	REV-03
5.	SCHEDULE OF INFRASTRUCTURE REQUIREMENT FOR ALL TYPES OF STAINLESS STEEL PARTITION FRAMES AND CHAIR PILLAR ASSEMBLIES FOR LHB COACHES	MDST 159	REV-01
6.	SCHEDULE OF INFRASTRUCTURE REQUIREMENT FOR UNDERFRAME COMPLETE FOR LHB COACHES	MDTS21320	REV-02
7.	SCHEDULE OF INFRASTRUCTURE REQUIREMENT FOR FRONT PART/END PART	MDTS21261	REV-03

All concerned are requested to take necessary action.

09/06/2020

(Kamal Kumar)
Dy CME/D-1

Encls: As above

Dy CPLE-II

SSE/Lib/Design
SSE/Record (With Original Specification)

Copy for kind information to:

Dy CPLE-III
Dy CQM-II
CDE
CPLE
CMM/HSQ

Schedule Of Infrastructural Requirements for Front Part and End Part assembly

NAME	DESIGNATION	SIGNATURE	DATE	LEVEL
Ramesh Chandra	SSE/UF/Design		20/03/20	Prepared
H P S Sodhi	SSE/UF/Design			Agreed
Kamal Kumar	DY. CME/D1			Reviewed
Manish Bhimte	CDE			Approved

Issue/Rev.	Detail of changes	Dated
01	• In clause 4(i), bed size of 4-axis CNC machining center changed to 1.5MX3MX0.8M from 2.5MX3.5MX1.0. • Clause 4(ii) pug welding machine deleted. • Clause 4(iv) beveling machine deleted as beveling can be done on 4-axis machine. • Numbering of clause 4 changed accordingly. • In Clause 5 (iv), hardness tester excluded from the availability list and included in the note.	18.09.14
02	• In clause 24, warranty for front part complete changed from 3 years to 84 months from the date of supply or 72 months from the date of service whichever is earlier, for material, manufacture and workmanship.	16.07.19
03	• In clause 8(iii) The tenderer shall have to also follow IRIS (ISO/TS 22163:2017) guidelines & terms in capacity of regular tender for RCF. • In clause 4(vi, viii, ix & x) Milling machine, Potable drilling machining, Suitable Material handling facilities & Manipulator for carrying out down hand welding added. • In clause 5(viii, ix & x) Bore gauge, Height gauge & Digital surface roughness tester replaced with Calibrated digital micrometer, Thread gauges & Measuring steel tape. • Clause 12 modified as per IRIS requirements. • Clause 20 modified from pilot sample approval to first article inspection as per IRIS requirements. • Direct part marking is added in clause 22.	20.03.20

Prepared by: Agreed by:

1. GENERAL:

This *specification covers the technical /* infrastructure requirements to be *complied by the tenderer for manufacture, testing and supply of completely finished fabricated front* part and end part assembly used in main line coaching stock.

2. SCOPE OF SUPPLY:

The fabricated and machined front part and end part assembly of under frame is to be supplied conforming in all respects to the relevant drawings & schedule of technical specification of tender.

3. AVAILABILITY OF INFRASTRUCTURE FACILITY AT MANUFACTURER'S PREMISES IN WORKING ORDER:

i. Minimum 4-axis CNC Machining center with probing facility (for reference and inspection), for machining of hub flanges and guides of the main cross member complete is required. Minimum bed size 1.5M X 3.0 M x 0.8 M suitable for machining of body bolster in single setting. Machine should have 3-axis movement in X, Y, Z-axis & one rotational movement of milling head for drilling and facing in range of ± 90° with least count of 2°. [*This facility is applicable for machining of main cross member of front part complete of LHB type coaches.*]

ii. CNC High definition Plasma or Laser profile cutting machine with capacity up to thickness of 14mm.

iii. Hydraulic Press brake of suitable capacity.

iv. Hydraulic press / straightening machine for plates and components.

v. Adequate numbers MAG/MIG welding sets with calibrated digital display (400 Amp. or more) and suitable shielding media.

vi. Milling machine for edge preparation of suitable capacity .

vii. Suitable facilities for degreasing/de-rusting of sheets/plate other than SS items shall be available.

viii. Adequate numbers of Potable drilling machining of suitable capacity up to dia 12 mm.

ix. Suitable Material handling facilities such as Over-head cranes, Fork Lifters, Hoist and mobile cranes of suitable capacity.

x. Manipulator for carrying out down hand welding of assemblies and sub assemblies.

xi. Shot blasting plant or equivalent facility for surface preparation in house.

xii. Painting facility in house.

xiii. Level surface table of size 1000mmX3000mm.

xiv. Stress relieving facilities suitable for minimum assembly size 3500 mm x 1000 mm. The detailed process for stress relieving after fabrication of body bolster complete is as under. (*This facility is applicable for body bolsters complete where stress relieving requirement is mention in the drawing / specification*). Valid Mou. for stress relieving is permitted for development

order only.

- The temperature of the furnace shall not exceed 315 ºc at the time body bolster placed in it.
- Above 315 ºc, The rate of heating shall not exceed 220 ºc per hour.
- Soaking temperature shall between 600 ºc to 650 ºc on reaching the temperature, The assembly shall be held within specified limits for a time not less than 15 minutes per 6 mm thickness of the higher thickness plates.
- During cooling cycle up to 315 ºc, Cooling of the job shall be done in a closed furnace at a rate not greater than 260 ºc per hour. From 315 ºc, The assembly may be cooled in still air.
- A 16x50x50 mm thick piece to be tack welded with bottom flange of body bolster for verification of micro structure after stress relieving.

4. AVAILABILITY OF TESTING EQUIPMENTS AT MANUFACTURERS PREMISES IN WORKING ORDER:

i. Apparatus to check chemical composition of steel sheet and plates.
ii. Universal testing machine of suitable capacity.
iii. Impact testing machine of suitable capacity.
iv. Hardness testing machine of suitable capacity.
v. Dye Penetration facility.
vi. Calibrated Welding gauges.
vii. Calibrated digital Vernier caliper size 300 mm.
viii. Calibrated digital micrometer - Ranging from 0 to 25 mm.
ix. Calibrated thread gauges. (Go and No Go)
x. Adequate numbers calibrated measuring steel tape 5 M length.
xi. Dry film thickness tester.

(Facilities mentioned at (i), (ii), (iii) & (iv) above, may not be in firm premises, but manufacturer should be ready for carrying out testing from NABL certified laboratory at their own expense as and when required)

5. REQUIREMENT OF TECHNICAL TRAINED SKILLED STAFF:

i. Firm should have certified welders for precision & heavy fabrication from Govt. approved /accredited labs.
ii. **Welder qualifications**: Qualified welders as per ISO:9606-1 shall be employed for fabrication work as per FIAT's welding procedure specification 22.026 part document 100 03. The welding shall reveal high standard of workmanship.

However, if welders employed are qualified to any other international approved standard, prior approval of RCF is to be taken.

6. RAW MATERIAL:

i. The chemical composition and mechanical properties of steel plates to be used shall conform to applicable drawings.

ii. Procurement of raw material/sheets should be done from the reputed stainless steel and corten steel producer in country such as M/S Sail, Jindal etc. For any other repute material producer in country or abroad, approval from CDE/ RCF is required.

iii. Wherever test certificates are not available, sample shall be drawn and tested both for chemical composition and physical properties in the presence of Inspecting representative of purchaser.

iv. All records of physical, chemical and mechanical properties tests shall be made available to Inspecting Agency. All plates to be taken up for manufacture shall be visually checked for surface defects such as cracks, dents, pitting, bend, rust, scales etc. and they shall be free from all these defects. Straightening of the plates shall be done with the help of either straightening machine or Hydraulic press. Hammering shall not be done to straighten the plates.

v. Procurement of raw material for front part and end part assembly from OEM or his authorized distributor along with material test certificate confirming to specified grade of steels shall be submitted to consignee along with supply.

7. OTHER REQUIREMENTS:

i. The tenderer shall have valid ISO 9001-2015 or latest series certification.

- It is desirable that the tenderer is accredited with ISO-3834 certificate.
- The tenderer shall have to also follow IRIS (ISO/TS 22163:2017) guidelines & terms in capacity of regular tender for RCF.
- The Forging/casting items must be procured / bought out only from approved sources of RDSO, ICF Chennai & RCF- Kapurthala.

8. MANUFACTURING PROCESS:

i. Inspection of Steel Plates

All Steel plates shall be cleaned and free from rust and scale and shall be examined visually for surface defects such as crack, dents, pitting, bend etc.

ii. **Straightness**

The straightness of sheets/plates for fabrication of Front Part and end part assembly to be used only after straightening, No hammering allowed and shall be straightened on hydraulic straightening machine.

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The straightness of single piece solebar and top cover sheet shall be ensured and shall not exceed 2 mm. Straightness of solebar and top cover sheet after complete fabrication of front part is to be cross checked and must be ensured.

iii. Material Properties (Physical & Mechanical)

The chemical composition & mechanical properties of all plates / sheets shall be confirmed by the manufacture to ensure conformity of properties from NABL certified lab along with the OEM test certificates.

iv. Cleaning, Cutting and bending

i. Cleaning of plates

All plates shall be cleaned so as to be free from the rust, dust, oil and scales etc.

ii. Cutting plan of plates

Cutting plan of plates shall be prepared as per provided drawing and then it is converted into cutting program.

iii. Cutting of plates

Plates shall be profile cut by CNC Plasma/ CNC Laser profile cutting machine.

iv. Bending

Bending of plates shall be done by hydraulic press break with required bending angle accuracy.

v. Edge Preparation

- Edge preparation shall be done by suitable machining.
- Weld joint dimension/edge preparation shall be as per the relevant drawings.
- To ensure intimate contact of fusion faces shall be grounded smooth and uniform and shall be free from crack, undercut, slag, gauges, oil, rust, dust, grease etc.
- Plates shall be inspected for dimensional accuracy before tack welding and record of the same shall be maintained.

vi. Tack welding of Assemblies & Dimensional inspection

Tack welding of all sub-assemblies/ main assembly i.e. Head stock, Main cross member, cross members shall be prepared in welding jig and inspected as per drawing.

vii. Complete Welding

Welding of all sub-assemblies/ main assembly shall be completed in jigs with proper sequence as per drawing/specification to avoid

twist/distortion. Down hand welding to be ensured by using suitable manipulator.

viii. **Machining of Main Cross Member / Body Bolster Complete of front part**

Machining of hub flanges and guides of main cross member complete shall be done after complete fabrication of front part on 4-axis CNC machining centre only.

ix. **Quality of weld joints**

- Weld joints shall have uniform beading and smooth change over from weld deposited to parent metal and thorough fusion between adjacent weld metal and parent metal.
- Weld joints shall be free from cracks, creates, under cuts, Overlaps, porosity, inclusion, blow holes etc.
- In butt weld area one extra run of welding shall be applied; excess metal shall then be ground off to be eliminate stress induced due to welding.
- The fillet weld profile shall be made concave by grinding so that smooth transition occurs at the toe of weld maintaining correct size of the welds.
- Slag shall be thoroughly removed and cleaned after each under pass.
- Welds shall be ground to increase life and prevent fatigue failure .
- Adequate measures shall be taken by manufacturer to avoid distortion during welding, minor distortion if any shall be corrected preferably by mechanical methods.
- All linear discontinuities are unacceptable.

x. **Inspection of Weld Quality:**

Dye penetration test:- Dye penetration test shall be conducted on complete weld lengths to ensure absence of cracks, undercuts, blow holes, porosity etc and record shall be maintained. Acceptance standard shall be as per **IS:3658**

xi. **Rectification of weld defects**

- All linear discontinuities are un-acceptable and shall be removed and repaired by chipping/grinding and subsequent welding and the area re-examined by the same method to verify complete rectification of observed defect.
- Further rectification shall not be allowed if linear discontinuity is observed again during checking after rectification.
- A test reports shall be submitted for review to inspecting agency.
- Approval from RCF to be obtained for rectification of non-conformance. Such rectified products to be identified separately during delivery.
- Special process monitoring records to be maintained and submitted to RCF as required. Welding should be carried out by qualified welders only. Process parameters to be maintained as per validated special process.

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xii. **Cleaning, Cutting, Edge preparation and welding:**

i. Plates shall be inspected for dimensional accuracy. Any distortion that occurs during cutting shall be straightened before tack welding.

ii. All the plates shall be degreased and de-rusted before commencing manufacturing operations.

iii. All nicks/cuts on the plates during cutting shall be finish ground before using them for sub-assembly/assembly.

iv. The surfaces and edges to be welded shall be ground smooth and uniform and shall be free from cracks, undercuts, slags, gauges etc. that would adversely affect the quality and the strength of the weld.

v. The weld joint dimensions/edge preparation shall be as per the relevant drawing/specification.

9. **FIXTURES AND MANIPULATORS:** The manufacturer shall prepare at least following Jigs & Fixtures for fabrication & machining and manipulator for down hand welding of front part and end part assembly for different stages before taking-up the manufacturing (There may be requirements of additional fixtures and manipulators, also):

i. Tacking jig for body bolster/ main cross member complete.
ii. Welding jig for body bolster/ main cross member complete.
iii. Tacking jig for coupler carrier complete.
iv. Tacking jig for head stock.
v. Welding jig for head stock.
vi. Tack welding fixture for Under frame front part.
vii. Welding fixture for Under frame front part.
viii. Machining fixture for body bolster.
ix. Manipulator for welding of body bolster and front part assembly.
x. Jigs and fixtures should be calibrated periodically with advance measuring instruments.
xi. Firm's should incorporate locaters / dowelling, reference points as per RCF advices in the Jigs / Fixtures for front part.
xii. Certain minor modifications in the assembly if required have to be done as advised by RCF/HSQ Design office.
xiii. Stopper of jig to be replaced periodically to ensure accuracy of front part.
xiv. Jigs and Fixtures should have pneumatic & mechanical clamping.
xv. Firm's have to incorporate locators/dowelling, reference points as per RCF advices in the Jig & Fixtures of front part.

10. **WELDING CONSUMABLE :**

i. The welding consumable shall be procured from the RDSO approved sources as indicated in RDSO vendor directory for MIG and MAG welding.
ii. Suitable shielding media MIG/MAG mixture as per (90 % Ar + 5% O2 + 5 % CO2) gas.

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iii. All the joints shall be welded using spool / electrode conforming to the table given below for various combination of metals.

S.no.	Parent Metal A	Parent Metal B	Filler Metal (Material no.) as specified in AWS
1	X2CrNi12 to RDSO Spec C-K201 (409M)	X2CrNi12 to RDSO Spec C-K201 (409M)	
2	X5CrNi1810 to RDSO Spec C-K201 (304)	X5CrNi1810 to RDSO Spec C-K201 (304)	E308L
3	X2CrNi12 to RDSO Spec C-K201 (409M)	X5CrNi1810 to RDSO Spec C-K201 (304)	
4	X2CrNi12 to RDSO Spec C-K201 (409M)	IRS: M41-97	E309L
5	X5CrNi1810 to RDSO Spec C-K201 (304)	IRS: M41-97	

11. FABRICATION OF FRONT PART AND END PART ASSEMBLY COMPLETE:

i. The front part and end part Complete is to be manufactured as per latest tendered drawings & specification and working instructions issued by planning for fabrication of various types of front part and end part complete to be followed.

ii. Firm may adopt new processes for manufacturing of front part for improving the quality without financial implication with the approval from CDE/RCF.

iii. As far as possible, all the weld joints shall be welded in down hand position, manipulators to be used if necessary.

iv. Weaving bead Technique and Inter-pass cleaning technique shall be adopted by grinding and using wire brushes.

v. Pug welding to be used wherever possible. Manual MAG welding may be done for the areas which are not accessible.

12. ACCEPTANCE STANDARD:

i. All linear discontinuities are un-acceptable and shall be removed and repaired by chipping or grinding and subsequent welding.

ii. When defects appear, they shall be rectified and the area shall be re-examined by the same method to verify that they have been rectified completely.

iii. All test reports of Dye Penetrate Test will be submitted for review to the Inspecting Agency.

13. GRIT/GARNET BLASTING: The CBC pocket shall be subjected to Grit/Garnet blasting for cleaning of rust, scales, spatters etc. before painting of the CBC pocket.

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i. Front part complete to be grit/garnet blasted to achieve required surface finish Sa 2.5 of ISO:8501 Part-1 before primer. Proper masking of machined surfaces to be ensured.

ii. It should be ensured before welding that the items which are bought out from trade and are received protected by coating of primer & oil for temporary corrosion protection, the cleaning should be ensured with wire brush in such a manner that bare metal surface is visible before welding work is done.

14. PAINTING:

i. Immediately after blasting, CBC pocket shall be coated with epoxy primer & painted with High Build Epoxy paint as specified in drawing no. MI005396.

All threaded /machined portions and area to be welded should be protected/masked before painting in all coaches. The masking of front part assembly shall be done as per applicable drawing no. MI005396 for LHB coaches.

15. MACHINING OF MAIN CROSS MEMBER:

i. Machining of body bolster shall be done on 4-axis CNC machining centre only as indicated in para 4 (i).

ii. main cross member should be suitably fixed on Machining center using proper fixture in such a way that machining shall be done in single setting to achieve the dimension tolerances and the surface roughness as per drawing of tender. Tolerance for un-toleranced dimensions should be followed as per IS:2102 (medium).

iii. Single setting means that a particular reference is taken by probe and machining is completed according to that reference taken and the program fed without any change in main cross member position.

16. STAGE INSPECTION: The stage inspection shall be carried out by manufacturer as indicated below and records should be made available to the inspecting agency:

i. Stage inspection of major sub-assemblies consisting of:
   a. main cross member Assembly before machining.
   b. Inspection of body bolster complete after machining.

ii. The Purchaser/Inspecting Agency shall have access at all reasonable times to the works where front part is manufactured and material is stored and shall have the right to inspect die, jig and fixtures and measuring instruments being used by the manufacturer. All the facilities, labour, appliances, gauges, measuring instruments etc. necessary for testing and inspection shall be provided by the manufacturer free of cost.

iii. Dimension Control Charts, Chemical and mechanical properties test certificates, Magnetic Particles Test Certificates, DPT and stage inspection reports etc. shall be supplied along with the Body bolster - to the purchaser.

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17. DIMENSIONS AND TOLERANCES:

i. All dimension/tolerances shall be as per details given in the drawings.
ii. Detailed dimension control charts/sheets shall be prepared for each body frame in which measurements of critical dimensions shall be recorded and kept for evaluation and verification by the inspecting agency.
iii. All the un-toleranced dimensions shall be in accordance with IS: 2102 (Medium).
iv. Gauges, fixtures and templates and accurate measuring instruments shall be used to ensure the correctness of the dimensions.

18. QUALITY ASSURANCE PLAN:

A Quality Assurance Plan which outlines the various stages and processes including inspection in order to obtain a Quality product shall be submitted to RCF, Kapurthala or Purchaser for approval. QAP shall be prepared on the lines as indicated in MDF00014. This shall be done and got approved by CDE/RCF, Kapurthala.

19. FIRST ARTICLE INSPECTION:

i. First article inspection(*) will be done by CDE/RCF. or its authorized agency for first time supply only. Successful tenderer would be required to submit quality assurance plan (QAP) and all relevant documents required for FAI including special processes. First article inspection exclusively to be performed for special processes i.e. Welding and Painting.
ii. First article inspection of complete Under Frame to be carried out after passing above two special processes.
iii. External provider shall carryout FAI as per ISO/TS 22163:2017 requirement prior to submission of documents to RCF, Kapurthala.
iv. FAI (First Article Inspection) shall be carried out as per requirement of ISO/TS 22163:2017.
v. Validation of all Special process (including outsourced Special Process) shall be carried out as per requirement of ISO/TS 22163:2017.
vi. After passing above, bulk supply will be made after First article approved by CDE/RCF.
vii. Audit inspection shall be done by CDE/RCF. or its authorized agency in the firm to certify quality of Under frame Complete during regular production.
viii. Firm has to fulfill all the requirements of ISO/TS 22163:2017.
ix. First article inspection to be done for new venders, design change, material change and new processes involved for fabrication.
x. Inspection agency should ensure during inspection, machining of hubs and guides of main cross member of front part shall be done after complete fabrication by firm on 4 axis machining centre only.
xi. (*) First article inspection or Prototype Inspection or Pilot sample.

20. CODE OF PRACTICE FOR QUALITY CONTROL AND INSPECTION:

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i. The manufacturers shall furnish to the purchasing/inspecting authorities information in respect of quality control systems in force at their works on various materials used in the manufacture of components.

ii. The manufacturers shall furnish to the Purchasing/Inspecting authorities the details of tests and inspection records and other relevant records as required under the quality control systems in force.

iii. These records and reports shall be maintained by the Competent Technical Authority of the manufacturer and shall be open to examination by the Purchasing/Inspecting Authorities at all reasonable time.

iv. Purchasing/Inspecting Authorities at their discretion may draw samples of products at any stage of production for conformity tests either at the works of the manufacturer or in an approved laboratory. In case the samples do not conform to the requirements of the specification, double the number of samples from the same lot/batch shall be drawn for re-tests. If any of the re-test samples do not conform to the requirements, the entire lot/batch shall be rejected.

21. DIRECT PART MARKING / IDENTIFICATION:

DPM/GTIN/CPID marking as per MCF spec no. MMDTS 19037 Rev. Nil or latest is the be done as per RCF advised.

22. PACKING:

i. All machined surfaces shall be applied with suitable rust preventive, which shall prevent it from corrosion & oxidation for a minimum period of one year of storage.

ii. The packing shall be such that all the machined surfaces be properly protected against rubbing/impact/scratches with other body or with mode of transportation i.e. wagon/truck/trailers etc.

23. WARRANTY: The manufacturer shall warrant the front part complete for a period of 84 months from the date of supply or 72 months from the date of service whichever is earlier, for material, manufacture and workmanship as regards trouble-free and satisfactory service performance. If any defects are noticed during service with regards to manufacture/welding quality of the front part complete, action shall be taken by the supplier to carry out any repairs/rectification or replacement at his cost. The decision of the purchaser in this regard shall be final.

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Prepared by: Agreed by: