

Rail Coach Factory, Kapurthala

MD35131

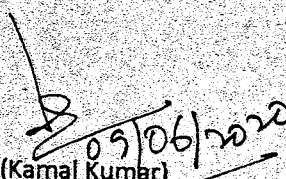
Date: 09.06.2020

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

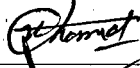

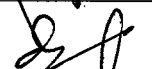
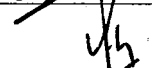
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**Schedule of Technical Requirements For Under Frame Complete of LHB
and 3 phase MEMU coaches**

Specification No. MDTs 21320, Rev-02

Dated: 20.03.2020

Page 1 OF 10

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/D-1			Reviewed
Manish Bhimte	CDE			Approved

Issue/Rev.	Detail of changes	Date
01	Bulk order will be placed on firm's who have successfully executed at least one regular order placed by MCF/ICF/RCF for supply of any type of complete under frame of LHB coaches or BG mainline Diesel/ Electric locomotive under frame to Railway production units i.e. DLW/DMW/CLW and should have complied minimum infrastructure mentioned in clause 5.	25.10.2018
02	<ol style="list-style-type: none">Essential M&P requirements of Cold roll forming machine, Milling machine and Stress relieving facilities added and material handling facility revised in clause 5.The tenderer shall have to also follow IRIS (ISO/TS 22163:2017) guidelines & terms in capacity of regular tender for RCF.Manufacturing process added in clause 7.Clause 20 modified from pilot sample approval to first article inspection as per IRIS requirements.Direct part marking is added in clause 22.	20.03.2020



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**Schedule of Technical Requirements For Under Frame Complete of LHB
and 3 phase MEMU coaches**

Specification No. MDTs 21320, Rev-02

Dated: 20.03.2020

Page 2 OF 10

1. GENERAL :

This schedule covers the technical/infrastructure requirements for manufacture, testing and supply of completely finished fabricated **Under frame complete** for LHB and 3 phase MEMU coaches used in mainline coaching stock.

2. SCOPE OF SUPPLY :

The completely finished fabricated **Under frame complete** for LHB or 3 phase MEMU coaches is to be supplied conforming in all respect to the relevant drawing & schedule of technical requirement of tender schedule.

3. OTHER REQUIREMENTS :

- 3.1. The tenderer shall have valid ISO 9001-2015 or latest series certification.
- 3.2. It is desirable that the tenderer is accredited with ISO-3834 certificate.
- 3.3. The tenderer shall have to also follow IRIS (ISO/TS 22163:2017) guidelines & terms in capacity of regular tender for RCF.
- 3.4. The tenderer shall provide list of latest M&P's available with past performance.
- 3.5. The tenderer shall have adequate manufacturing facilities mentioned in clause 5.
- 3.6. The front/end part assembly for LHB or 3phase MEMU coaches shall be manufactured as per tendered drawing and specification (MDTS 21261 with latest revision is applicable for LHB).
- 3.7. The forging/casting items must be procured/bought out only from approved sources of RDSO, ICF Chennai & RCF- Kapurthala.
- 3.8. 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 reputed material producer in country or abroad, approval from CDE/ RCF is required.
- 3.9. Procurement of raw material for Under frame 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.


4. AVAILABILITY OF INFRASTRUCTURE FACILITY AT MANUFACTURER PREMISES IN WORKING ORDER:-

4.1. ESSENTIAL M&P REQUIREMENT :

- 4.1.1. CNC High definition PLASMA or CNC LASER profile cutting machine with suitable capacity up to thickness of 16 mm.
- 4.1.2. Minimum 4-axis CNC machining centre with probing facility (for reference and inspection) for machining of hub flanges and guides of main cross member complete is required. Minimum bed size 1.5M x 3.0M x 0.8M suitable for machining of main cross member complete in single setting. Machine should have 3-axis movement in X, Y, Z axis and one rotational movement of milling head for drilling and facing in range of $\pm 90^\circ$ with least count of 2°. [This facility is applicable for machining of main cross member of front part complete of LHB type coaches.]



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**Schedule of Technical Requirements For Under Frame Complete of LHB
and 3 phase MEMU coaches**

Specification No. MDTs 21320, Rev-02

Dated: 20.03.2020

Page 3 OF 10

- 4.1.3. Cold roll forming machine suitable up to 10 mm thickness capacity. (*Tie-up arrangement is acceptable*)
- 4.1.4. Hydraulic Press brake of suitable capacity.
- 4.1.5. Milling machine for edge preparation of suitable capacity .
- 4.1.6. Hydraulic press/Straightening machine for Straightening plates and components.
- 4.1.7. Adequate numbers MAG/MIG welding sets with calibrated digital display (400 Amp. or more) and suitable shielding media.
- 4.1.8. Suitable facilities for degreasing/de-rusting of sheets/plate other than SS items shall be available.
- 4.1.9. Sand blasting plant or equivalent facility for surface preparation.
- 4.1.10. Suitable Painting facility with guns and air compressor.
- 4.1.11. Level surface table of size 1000mm x 3000mm or equivalent facility.
- 4.1.12. Adequate numbers of hand grinders for removal of fins & burrs.
- 4.1.13. Adequate numbers of Potable drilling machining of suitable capacity up to dia 12 mm.
- 4.1.14. Suitable Material handling facilities such as Over-head cranes, Fork Lifters, Hoist and mobile cranes of suitable capacity.
- 4.1.15. Manipulator for carrying out down hand welding of assemblies and sub assemblies.
- 4.1.16. Adequate numbers calibrated measuring steel tape 5 and 30 meter length.
- 4.1.17. Calibrated digital vernier Calipers of size 300 mm.
- 4.1.18. Calibrated digital micrometers - Ranging from 0 to 25 mm
- 4.1.19. Calibrated welding gauges.
- 4.1.20. Calibrated thread gauges. (Go and No Go)
- 4.1.21. Dye penetration testing kit facility.
- 4.1.22. 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.
- 4.1.22.1. The temperature of the furnace shall not exceed 315 °c at the time body bolster placed in it.
- 4.1.22.2. Above 315 °c, The rate of heating shall not exceed 220 °c per hour.
- 4.1.22.3. Soaking temperature shall between 600 °c to 650 °c on reaching the temperature, The assembly shall be held within specified limits for


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**Schedule of Technical Requirements For Under Frame Complete of LHB
and 3 phase MEMU coaches**

Specification No. MDTS 21320, Rev-02

Dated: 20.03.2020

Page 4 OF 10

a time not less than 15 minutes per 6 mm thickness of the higher thickness plates.

4.1.22.4. During cooling cycle up to 315 °c, Cooling of the job shall be done in a closed furnace at a rate not greater than 260 °c per hour. From 315 °c, The assembly may be cooled in still air.

4.1.22.5. A 16x50x50 mm thick piece to be tack welded with bottom flange of body bolster for verification of micro structure after stress relieving.

4.2. ESSENTIAL LAB REQUIREMENT :

4.2.1. The manufacturer shall have testing facilities in house or tie-up arrangement with NABL certified labs for carrying out spectro and mechanical analysis at their own expense as and when required..

5. SOLEBAR & TROUGH FLOOR: Sole bar, Trough floor and connecting sheet is to be used as cold rolled formed section in single piece only.

6. MANUFACTURING PROCESS:

6.1. 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.

Straightness

Sheets/ Plates for fabrication of Underframe to be used only after straightening, No hammering allowed and shall be straightened on hydraulic straightening machine. The straightness of single piece solebar and connecting sheet shall be ensured and variation shall not exceed 2 mm. Straightness of solebar including bottom of sole bar & connecting sheet after complete fabrication of under frame is to be cross checked and must be ensured.

6.2. 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.

6.3. Cleaning ,Cutting and bending

6.3.1. Cleaning of plates

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

6.3.2. Cutting plan of plates

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

6.3.3. Cutting of plates

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



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**Schedule of Technical Requirements For Under Frame Complete of LHB
and 3 phase MEMU coaches**

Specification No. MDTs 21320, Rev-02

Dated: 20.03.2020

Page 5 OF 10

6.3.4. Bending

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

6.4. 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.

6.5. Procurement of Major Bought outs:

6.5.1. The forging/casting items must be procured / bought out only from approved sources of RDSO/ ICF/RCF, Kapurthala.

6.6. Tack welding of Assemblies & Dimensional inspection

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

6.7. 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.

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

Machining of hubs and guides of main cross member complete shall be done after complete fabrication of front part on 4-axis CNC machining centre. Main cross member complete 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 tendered drawing. Tolerance for un-tolerance dimensions should be followed as per IS:2102 (medium).

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.

6.9. 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, craters, under cuts, Overlaps, porosity, inclusion, blow holes etc.



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**Schedule of Technical Requirements For Under Frame Complete of LHB
and 3 phase MEMU coaches**

Specification No. MDTs 21320, Rev-02

Dated: 20.03.2020

Page 6 OF 10

- 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.

6.10. Inspection of Weld Quality

6.10.1. Dye penetration test

Dye penetration test shall be conducted on sole bar joints, bio tank mounting brackets, hubs & guides and CBC pocket 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

6.11. 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 as per ISO: 9606-1 only. Process parameters to be maintained as per validated special process.

7. FABRICATION OF UNDERFRAME

- 7.1. The Under frame Complete is to be manufactured as per tendered drawings or specification and working instructions issued by planning for fabrication of various types of under frame complete must be followed.
- 7.2. Firm may adopt new processes for manufacturing of Under frame for improving the quality without financial implication with the approval from CDE/RCF.

8. FIXTURES AND MANIPULATOR :

- 8.1. The tenderer shall have facilities for edge preparation and also have adequate jigs and fixtures as per the requirements to ensure dimensional controls before commencement of bulk manufacturing.



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Schedule of Technical Requirements For Under Frame Complete of LHB and 3 phase MEMU coaches		
Specification No. MDTs 21320, Rev-02	Dated: 20.03.2020	Page 7 OF 10

- 8.2. Straightness of connecting sheet to be ensured by suitable locaters on under frame jig.
- 8.3. Under frame complete welding jig.
- 8.4. Under frame turning mechanism of suitable capacity is desired for consistency in quality of product for regular build-up of under frame production.
- 8.5. Calibrated fixtures for front part/end part should be available before commencing production.
- 8.6. Tender should note that jigs and fixtures to be verified during prototype inspection.
- 8.7. Centre to be marked on Under frame and this centre must match with centre of Side wall Jig.
- 8.8. Firm has to ensure proper seating of bottom solebar along full length on jig and suitable clamping for same to be ensured at minimum 1500mm space.
- 8.9. Firm's have to incorporate locaters/dowelling, reference points as per RCF advices in the Jig & Fixtures of Underframe.

9. WELDING CONSUMABLE :

- 9.1. The welding consumable shall be procured from the RDSO approved sources as indicated in RDSO vendor directory for MIG and MAG welding.
- 9.2. Suitable shielding media MIG/MAG mixture as per (90 % Ar + 5% O2 + 5 % CO2) gas.
- 9.3. All the joints shall be welded using spool / electrode conforming to the table given below for various combination of metals.

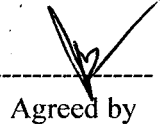
S.no.	Parent Metal A	Parent Metal B	Filler Metal (Material no.) as specified in AWS
1	X2CrNi12 to RDSO Spec C-K201 (409M)	X2CrNi12 to RDSO Spec C-K201 (409M)	E308L
2	X5CrNi1810 to RDSO Spec C-K201 (304)	X5CrNi1810 to RDSO Spec C-K201 (304)	
3	X2CrNi12 to RDSO Spec C-K201 (409M)	X5CrNi1810 to RDSO Spec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

10. MAN POWER :

Only qualified welders shall be deployed for welding work. Supervisors with minimum qualification of diploma in mechanical engineering, Industrial engineering and production technology shall be deployed for monitoring of production and quality control respectively.



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**Schedule of Technical Requirements For Under Frame Complete of LHB
and 3 phase MEMU coaches**

Specification No. MDTs 21320, Rev-02

Dated: 20.03.2020

Page 8 OF 10

11. QUALITY CONTROL REQUIREMENTS :-

There shall be a system to ensure traceability of the product from raw material stage to finished product stage. Quality Assurance Plan (QAP) for the following aspects shall be ensured and approved by CDE/RCF.

- 11.1. Process flow chart.
- 11.2. Inspection details from raw materials stage to finished product stage.
- 11.3. Various parameters to be checked and level of acceptance of such parameters indicated and method to ensure and control over them.
- 11.4. Disposal system of rejected raw material and components.
- 11.5. Necessary care is to be taken to ensure the twist on under frame and variation on diagonals are to be within ± 2 mm.

12. COVERED AREA AND SEPARATE AREA FOR WORKING :

The tenderer shall have adequate covered area for storage of raw material, finished products and work in progress clearly segregated. The stainless steel items should be stacked separate from other steel and iron products to avoid contamination. No person should walk on material stored, in process or finished assembly.

13. DOCUMENTATION :

Following documentation should be maintained:

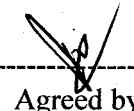
- 13.1. Incoming raw material register.
- 13.2. Stage inspection results including finished products results as per QAP.
- 13.3. Record of internal rejection and its analysis vis-à-vis action plan.
- 13.4. Record of final products inspection by external agencies.
- 13.5. Record of maintenance schedule of machinery and plant.
- 13.6. Record of training imparted, Quality assurance, safety parameters and maintenance of machinery etc.

14. FIRST ARTICLE INSPECTION:

- 14.1. First article inspection(*) will be done by CDE/RCF. or its authorized agency for first time supply. 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. Stress relieving, Welding and Painting.
- 14.2. First article inspection of complete Under Frame to be carried out after passing above three special processes.
- 14.3. External provider shall carryout FAI as per ISO/TS 22163:2017 requirement prior to submission of documents to RCF, Kapurthala.
- 14.4. FAI (First Article Inspection) shall be carried out as per requirement of ISO/TS 22163:2017.



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**Schedule of Technical Requirements For Under Frame Complete of LHB
and 3 phase MEMU coaches**

Specification No. MDTS 21320, Rev-02

Dated: 20.03.2020

Page 9 OF 10

- 14.5. Validation of all Special process (including outsourced Special Process) shall be carried out as per requirement of ISO/TS 22163:2017.
- 14.6. After passing above, bulk supply will be made after First article approved by CDE/RCF.
- 14.7. 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.
- 14.8. Firm has to fulfill all the requirements of ISO/TS 22163:2017.
- 14.9. First article inspection is to be done for new vendors, major design changes, material change and new processes involved in manufacturing.
- 14.10. 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.
- 14.11. (*) First article inspection or Prototype Inspection or Pilot sample.

15. SURFACE PREPARATION:

- 15.1. The CBC pocket shall be subjected to Grit/Garnet blasting for cleaning of rust, scales, spatters etc. before painting of the CBC pocket.
- 15.2. Under frame 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.
- 15.3. 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.

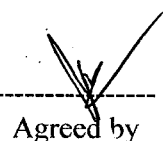
16. PAINTING :

The under frame is to be supplied primer/painted as given below details:-

- 16.1. Primer the hidden section i.e. ribs, lower flanges & sole bar.
- 16.2. Apply epoxy metal primer on Under Frame complete as per MDTS 094 with minimum DFT 60 micron.
- 16.3. All threaded /machined portions should be protected/masked before painting in all coaches.
- 16.4. The masking of Under frame complete or front part or end part assembly shall be done as per applicable drawing no. MI005396 for LHB, MI007248, MI007249, MI007252 for DMC and MI007250, MI007251 for TC 3 phase MEMU coaches.
- 16.5. Apply aluminum based primer to MDTS- 28272 Rev-00 or latest at hidden sections (which cannot be painted after fabrication) as under frame is more prone area to corrosion.
- 16.6. Apply aluminum based primer on supporting surface of cross members which touches with corrugated sheets to avoid bimetallic corrosion before the corrugated sheets are mounted.



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**Schedule of Technical Requirements For Under Frame Complete of LHB
and 3 phase MEMU coaches**

Specification No. MDTS 21320, Rev-02

Dated: 20.03.2020

Page 10 OF 10

17. DIRECT PART MARKING / IDENTIFICATION:

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

18. PACKING INSTRUCTION :

The supplier to ensure the safe transit and delivery of material up to consignee by adopting suitable mode of transport and handling transit damage if any shall be the cost of supplier. Corten steel parts like sole bar and cross member of under frame should not be in contact or rub against any iron surfaces during transportation by use of wooden/nylon blocks.

19. WARRANTY:

The manufacturer shall warrant the Under frame complete for a period of 84 months from the date of supply or 72 months from the date in 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 Under frame 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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