रेल डिब्बा कारखाना , कपूरथला

MD35131 **Date**: **01.05.24**

Sub: Issue of Specification MDTS 21323 rev 04 for Schedule of technical requirements for supply and manufacture of Stainless Steel **Roof assembly** for LHB coaches.

Please find enclosed copy of Specification No. MDTS 21323 rev 04 for Schedule of technical requirements for supply and manufacture of Stainless Steel Roof Assembly for LHB coaches for information and necessary action please.

KULWINDER SINGH
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Date: 2024.05.01 16:46:36 +05'30'
Dy.CME/Design (S&B)

CME/QA CPLE CWE/Fur CMM/ HSQ CMM/TKJ CWE/Shell

Dy.CMM/LHB/HSQ Dy.CMM/G Dy.CMM/Fur Dy CME/Shell Dy CME/Mfg

SSE/Filing Section
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Dy CME/D-2, Dy CME/DP

CDE/MCF, CDE/ICF, CDE/RCF

Schedule of Technical Requirements for supply and manufacture of Stainless-steel Roof Assembly for LHB Coaches

Name	Designation	Signature	Level
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Kulwinder Singh	Dy.CME/Design (S&B)	KULWINDER SINGH Digitally signed by KULWINDER SINGH Date: 2024.04.19 16:52:27 +05'30'	Reviewed
Lalit Kishore	CDE	LALIT KISHORE Digitally signed by LALIT KISHORE Date: 2024.05.01 16:20:24 +05'30'	Approved

Issue/ Rev.	Clause	Detail of changes	Date
01	10.2	Para deleted	**27/05/2019**
02	3.5 & 3.6 4.1.2 5.1 5.5.1 8.1 to 8.6.16 8.4 to 8.54 10.2 14.0 15.1 to 15.8 19	Clauses added for adoption of new processes & IRIS Certification by the Firms. Bed size 1.5x3m included in clause. Clause modified for procurement of material from abroad, approval from CDE/ RCF is required. Clause added for confirmation of filler metal to weld various combination of metals. Clauses added for manufacturing processes. Clauses included for jig & fixtures guidelines. Clause added for quality of spot weld. Clause incorporated for requirements for welding activities. Clauses for prototype inspection modified. Clause added for warranty.	**20/03/2020**
03	5.5.1 5.5.2 to 5.5.2.1 5.5.2.2	Clause revised to remove (409M) in table. Clauses added for treatment of weld area. Clause added to Standard Practice for Cleaning,	**08/01/2024**

		Descaling and Passivation of Stainless-Steel parts as per ASTM A380/A380M-17	
04	3.2 5.5.2 5.5.2.2	Clause deleted. Clause revised for treatment of weld area in Ferritic SS and Austenitic SS separately. Clause deleted.	**18/04/2024**

1.0 GENERAL:

This schedule covers infrastructure requirements for manufacture, testing and supply of completely finished fabricated Roof Assembly for LHB coaches.

2.0 SCOPE OF SUPPLY:

Manufacture of stainless-steel Roof Assembly for LHB coaches is to be supplied in all respect conforming to the relevant drawing & schedule of requirement of tender schedule.

3.0 CERTIFICATIONS & OTHER REQUIREMENT:

3.1 The tenderer shall have valid ISO 9001-2015 series certification.

3.2 Clause deleted.

3.3 The tenderer shall provide list of M&P and past performance documents.

3.4 The tenderer shall have adequate manufacturing facilities mentioned in Para 4, 5, 6 & 7. Complete Roof Assembly shall be manufacture as per specified drawings and specification mentioned in purchase order.

3.5 The tenderer shall have to also follow IRIS guidelines & terms in capacity of a regular tender for RCF.

3.6 Firm may adopt new processes for manufacturing of Roof Assembly for improving the quality without financial implication with the approval from CDE/RCF.

4.0 AVAILABILITY OF INFRASTRUCTURE FACILITY AT MANUFACTURER PREMISES IN WORKING ORDER:

4.1 **ESSENTIAL M&P REQUIREMENT**:

4.1.1 Straightening machine for Straightening sheet before laser profile cutting and fabrication work.

4.1.2 Firm should have at least one CNC Laser cutting machine of effective bed size (min. 1.5 M width x3 M length) to suit cutting requirements of roof components.
However, developmental order can be placed on a firm having tie up in form of MoU with the agency having CNC laser cutting machine in-house in working order. A copy of MoU is to be submitted along with the tender, in absence of above offer shall be deemed as incomplete and may not be considered.

4.1.3 Firm should have Cold roll forming machine with suitable roller for forming of roof sheet. This Cold roll forming machine is required for single piece manufacturing of roof sheet of approx. 21-meter length.
However, development order can be placed on a form having valid tie-up in the form of MoU with the agency having these machines in-house in working order. A copy of MoU is to be submitted along with the tender in absence of above, offers shall be deemed as incomplete and may not be considered.

4.1.4 Automatic/CNC/Robotic Spot-welding machine of suitable capacity with adequate clear space to handle 18 meters long sub-assemblies with handling arrangement.

4.1.5 CNC/Hydraulic Press brake of at least 200T capacity and suitable width for forming of roof components.

4.1.6 At least one shearing machine of cutting capacity up to 4 mm.

4.1.7 Special purpose roll bending machine with Tool & die for Roof Arch profile bending.

4.1.8 Adequate numbers of hand grinders for removal of fibs & burrs shall be available. Grinding wheels shall be free from iron, iron oxide, zinc or other undesirable materials that may cause contamination on the surface.

4.1.9 Tenderer should have adequate numbers of TIG and MIG welding sets with calibrated digital display (400 Amp. or more) and suitable shielding media.
TIG with only Argon gas and MIG welding shall be used only with try mixt gas 90% argon+5% O_2+5 %CO_2 gas.

4.1.10 Level surface table of size 2meters x 3meters.

4.1.11 Suitable degreasing/d-rusting facilities for items other than Stainless Steel.

5.0 RAW MATERIAL, CONSUMABLES AND WORKING AREA:

5.1 Procurement of raw material/sheets should be done from the reputed stainless-steel producer in country such as 1. M/S Sail, 2. M/s Jindal. For any other reputed material producer in country or abroad, approval of RCF is required.

5.2 Proof of procurement of raw material for roof assembly from OEM or from his authorized distributor along with material test certificate confirming to specified grade of steel shall be submitted from OEM along with supply.

5.3 Separate covered area approx. 2000 sq.mtr. for manufacturing only stainless steel required to avoid iron contamination and also having adequate space underneath for storage of raw material e.g. sheets, billets, round corner squares, rounds etc.

5.4 The covered area should have display board showing different material grade's color shades/codes nominated to different grades of steel to avoid mix up of materials.
Evidence for the above shall be submitted along with tender document.

5.5 Electrodes, hardware should be procured with test certificate from the authorized distributor of RDSO approved sources / manufacturers only.

5.5.1 All the joints shall be welded using filler metal 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	X2CrNi12 to RDSO SPEC. C-K201	E308L
2	X5CrNi1810 to RDSO SPEC. C-K201(304)	X5CrNi1810 to RDSO SPEC. C-K201(304)	
3	X2CrNi12 to RDSO SPEC. C-K201	X5CrNi1810 to RDSO SPEC. C-K201(304)	
4	X2CrNi12 to RDSO SPEC. C-K201	IRS: M41-97	E309L
5	X5CrNi1810 to RDSO SPEC. C-K201 (304)	IRS: M41-97	

5.5.2 **Treatment of Weld areas (except spot welding) of stainless-steel fabricated items:**

- For Ferritic stainless-steel surface, weld joints shall be free from blackish spot i.e.to be removed by soft buff wheels, soft grinding or manual scotch brite.
- For Austenitic stainless-steel surface, Standard Practice for Cleaning, Descaling and Passivation refer to ASTM A380/A380M-17.

5.5.2.1 Weld area contaminates such as free iron, oxide scales, rust, grease, oil, metal chips, dirt or other non-volatile deposits might adversely affect the metallurgical or sanitary condition or stability of the weld. These may impair the normal corrosion resistance or result in later contamination of the stainless steel or cause product contamination at later stage and should be cleaned and descaled.

6.0 MATERAIL HANDLING EQUIPMENTS:

6.1 Firm should have suitable material handling facilities such as overhead crane, fork-lifter, hoist and mobile crane. Handling equipment such as nylon slings, hooks and lift truck fork should be protected with clean wood/plastic/nylon to eliminate contact with the iron surface.

6.2 Manipulators for carrying down hand welding.

6.3 Firm shall have necessary jigs and fixtures to ensure geometrical tolerances & dimension as specified in the drawing.

7.0 MEASURING AND INSPECTION AND TESTING EQUIPMENTS:

7.1 Firm should have calibrated measuring instruments like digital Vernier caliper, digital Micrometer, Measuring tape, Steel scale, welding gauges, thread gauges and straight edge etc.

7.2 Dye penetration testing for welding joints.

7.3 Macro etch test for fusion of fillet weld.

7.4 Peel test and Chisel test of spot weld as per DIN 8.1.M.2007.

7.5 Root bend, Face bend test for butt welds.

7.6 Each completed assembly of the roof shall be tested for water leakage at the works of the manufacturer. Appropriate test scheme and rig may be devised for the same to the satisfaction of RCF design representative.

7.7 The manufacturer shall have in house/ tie-up arrangement for carrying out Spectro and mechanical analysis of the material with NABL accredited labs at their own expense as and when required.

8.0 GENERAL PRACTICE TO BE FOLLOWED DURING MANUFACTURE:

8.1 The Sub-assemblies shall be manufactured as per the relevant drawings issued by RCF/HSQ using fixtures. For first time supplier the prototype shall be approved by RCF/HSQ design office before series production.

8.2 Sheets and plates shall be carefully straightened and flattened in straightening machine before laser cutting. Welded components and members shall be correctly matched and accurate levels. Clearances shall be ensured to result in perfect welds.

8.3 Certain minor modifications in the assembly if required have to be done as advised by RCF/HSQ Design office.

8.4 The firm shall have necessary jigs and fixtures to ensure dimensions as specified in the drawings.

8.5 Jig& fixture of roof must have stopper, locator & dowelling to ensure position of members as per drawings of roof assembly.

8.5.1 Firm should incorporate locaters / dowelling, reference points as per RCF advices in the Jigs / Fixtures for roof assembly.

8.5.2 Stopper of jig to be replaced periodically to ensure accuracy of side wall.

8.5.3 Jigs and fixtures should be calibrated periodically with advance measuring instruments.

8.5.4 Jigs and Fixtures should have pneumatic & mechanical clamping.

8.6 Fabrication process for manufacturing of roof assembly:

8.6.1 Clean the jig surface for spatter with brush before laying the roof component on the jig.

8.6.2 Place Roof Arches/Final roof arch/Stiffening angles (PP & NPP End) in the jig as per assembly drawings and clamp the components properly.

8.6.3 Lay roof sheets as per drawings on the components placed in the jig.

8.6.4. Position and tighten the packing belt so that the roof sheet match properly with the roof arch using tightening belts. Additional packing material may be used wherever required.

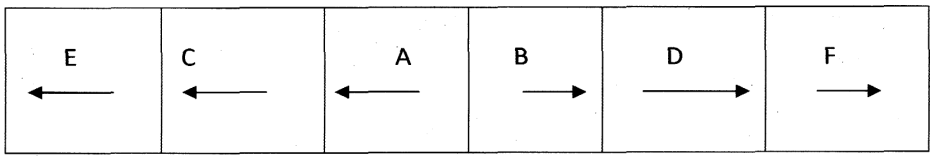
8.6.5 Perform tack welding to joint roof sheets with each other and roof arch with roof sheets at the matching surfaces.

8.6.6 Tack weld roof sheets with Roof Arch from bottom.

8.6.7 Complete the longitudinal weld of roof sheets with each other.

8.6.8 Complete the weld Corrugation termination at both ends of roof assembly.

8.6.9 Complete welding should be done with sequence as given below:



CENTRE

WELDING DIRECTION

8.6.10 Unclamp the welded assembly.

8.6.11 Grind the weld joints for proper finish by using hand grinder.

8.6.12 Inspect roof assembly for any welding defects. Rectify welding defects like pin holes etc. by re-welding.

8.6.13 Spot weld roof sheet with roof arches by CNC Spot welding machine.

8.6.14 Check all the welding joints of roof sheet longitudinal and transverse by DPT (die penetration test) to ensure leak proof joints.

8.6.15 Pin holes thus detected are to be blocked with the help of welding to make roof assembly water proof.

8.6.16 Now weld the brackets/backpieces/Cross brace as mentioned in relevant drawings.

9.0 PRECAUTIONS:

The firm shall take the following precautions during manufacture / supply of stainless-steel assemblies.

- The outer surface should have no visible marks. No surface preparation will be done at RCF. Therefore, supplier shall prepare surface on which PU painting as per requirement can be directly done.
- Joint area to be welded must be clean. Use only stainless-steel wire brush.
- Joint area must be free of grease, oil, water, dirt, finger marks.
- The outer surface should have no visible welding marks.
- Use good commercial solvent cleaner to clean the weld area before welding.
- Arc strikes adjacent to weld must be avoided.
- Avoid excessive heat input.
- Grind the weld flux.
- Size of Spot weld shall be chosen as mentioned in applicable drawings Spot size shall not be less than 6 mm for 2 mm or less thickness and not less than 9mm for above 2mm up to 3mm thick sheets.

10.0 FINISH:

10.1 Exterior of roof panels shall be without bulges or depression that could be visible after painting. A prototype sample should be submitted to RCF by New vendors for prior approval before bulk manufacturer of assembly.

10.2 Quality of spot weld (Argon Gas Purging)- Spot welding shall be carried out in inert gas atmosphere to avoid any discoloration. Suitable arrangement shall be made in machine to admit inert gas (Argon gas to purity 99.995 % min). There shall not be any heat tint/color in the resultant spots.

11.0 MAN POWER:

Only qualified welders with ITI or equivalent shall be deployed. 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.

12.0 QUALITY CONTROL REQUIREMENTS:

There shall be a system to ensure trace ability 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.

12.1 Process flow chart.

12.2 Stage wise inspection details from raw materials stage to finished product.

12.3 Check list for critical monitoring of stages to be prepared and followed**.**

12.4 Various parameters to be checked and level of acceptance of such parameters indicated and method to ensure and control over them.

12.5 Disposal system of rejected raw material and components.

12.6 The Quality Assurance Plan (QAP) to be submitted for approval.

13.0 DOCUMENTATION:

Following documentation should be maintained:

i) Incoming raw material register.

ii) Stage inspection results including finished products results as per QAP.

iii) Record of internal rejection and its analysis vis-à-vis action plan.

iv) Record of final products inspection by external agencies.

v) Record of maintenance schedule of machinery and plant.

vi) Record of training imparted, Quality assurance, safety parameters and maintenance of machinery etc.

14.0 REQUIREMENT OF WELDING ACTIVITIES:

14.1 Welder qualified with ITI or equivalent qualification and qualified as per ISO:9606-1 for all critical joints, position shall be only employed. Laser weld and Spot-welding operator shall be qualified as per ISO 14732.

14.2 Supervisor shall have sufficient welding knowledge having minimum qualification of diploma in mechanical engineering. Firm shall identify and nominate a welding coordinator responsible for all welding operations. The welding coordinator should preferably have qualified as per ISO 14731 of IWE/IWT/IWS, diploma awarded by Indian Institute of Welding or certificate from WRI/Trichy or AWTI/ICF.

14.3 Inspection and testing personnel shall have qualification as per ISO 9712 level-2 or SNT-TC-1A level 2.

14.4 All welding plants should be calibrated as per ISO 17662/BS EN 50504.

14.6 Proper grinding using iron free grinding disc followed by buffing shall be done on all weld joints other than spot weld.

14.7 Record of above details shall be maintained for verification.

15.0 FIRST ARTICLE INSPECTION:

15.1 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 i.e., welding and spot welding.

15.2 First article inspection of complete Side wall to be carried out after passing above special processes.

15.3 External provider shall carryout FAI as per ISO/TS22163:2017 requirement prior to submission of documents to RCF, Kapurthala.

15.4 FAI (First Article Inspection) shall be carried out as per requirement of ISO/TS 22163:2017.

15.5 Validation of all process shall be carried out as per requirement of ISO/TS 22163:2017.

15.6 After passing above FAI's Bulk supply will be made after First article approved by CDE/RCF.

15.7 Audit inspection shall be done during regular production in the firm for certify quality of Under frame Complete.

15.8 Firm has to fulfill all the requirements of IRIS to ISO/TS22163:2017.

15.9 First Article Inspection to be done for new vendors, design change, material change and new process involved in manufacturing.

15.10(*) First Article Inspection or Prototype Inspection or Pilot Sample.

16.0 ROUTINE INSPECTION:

16.1 Quality of weld joints

16.1.1 Weld joints shall have uniform beading and smooth change over from weld deposited to parent metal and through fusion between adjacent of weld metals and between weld metal and parent metal.

16.1.2 Weld joints shall be free from cracks, creates, under cuts, Overlaps, porosity inclusion, blow holes etc.

16.1.3 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.

16.1.4 Slag shall be thoroughly removed and cleaned after each under pass.

16.1.5 Welds shall be ground to increase life and to prevent fatigue failure.

16.1.6 Adequate measures shall be taken by manufacturer to avoid distortion during welding, minor distortion if any shall be corrected preferably by mechanical methods.

16.1.7 All linear discontinuities are unacceptable and shall be repaired by chipping or grinding subsequent welding. After rectification of defects in welding the area shall be reexamined by dye penetration test to insure defect free weld joint.

16.2 Inspection of Weld Quality:

16.2.1 Routine inspection of each finished item shall be carried out as follows for spot welds:

A. Paper test: A stiff white paper shall be passed at random locations (at least two locations in each window bay) between spot welded members to ensure that the welding took place and there is no gap. If paper passes freely then the item stands rejected.

B. Chisel test: A chisel should be driven between two spot welds until one or both welds break. The fractured nugget should form cup and cone shaped fracture and size of nugget should be approximate to the size of spot weld. This test is to be done at two random locations to ensure fusion of spot weld. If the result is not satisfactory, the item stands rejected. If the result is satisfactory, the tested area should be levelled by tinkering and TIG welded.

16.2.2 Dye penetration test for seam welds

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.

16.3 Rectification of weld defects

16.3.1 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.

16.3.2 Further rectification shall not be allowed if linear discontinuity is observed again during checking after rectification.

16.3.3 A test reports shall be submitted for review to inspecting agency.

16.3.3.1 Approval from RCF to be obtained for rectification of non-conformance. Such rectified products to be identified separately during delivery.

16.3.3.2 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.

17.0 MARKING/QR CODING:

The tenderer name or initial with month and year of manufacture shall be marked in the finished products unless otherwise specified in the relevant drawings.

18.0 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.

The surface shall be properly protected against rubbing /impact/ scratches during transportation via wagon / truck / trailers by wooden blocks / rubber pads at suitable locations in the transportation fixtures.

Due care should be taken to avoid mechanical damage during loading / transit / unloading. The packing should be such that while un packing the consignment at RCF there should be no damage / dent mark to the finished products. As far as possible recyclable material to be used in packing of sub-assemblies.

Transit insurance shall be in the scope of supplier.

19.0 WARRANTY:

The manufacturer shall warranty the Roof 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 Side wall 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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