

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.

(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



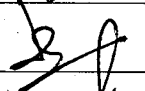
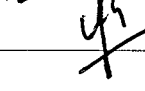
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Schedule of Technical Requirements For supply and manufacture of Stainless steel Side Wall Assembly

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Name	Designation	Signature	Date	Level
Puran Chand	SSE/Side Wall/Design		20/03/20	Prepared
Anmol Singh	SSE /ROOF/End Wall/Side Wall			Agreed
Kamal Kumar	Dy. CME/D-1			Reviewed
Manish Bhimte	CDE			Approved

Changes Data Rev-01

Issue/Rev.	Clause	Detail of changes	Date
01	3.5	Clause added for certification and accreditation with IRIS of ISO/TS 22163:2017.	28.02.2020
	3.6	Firm may adopt new processes for manufacturing without financial implication	
	4.1.13	Capacity & nos. of Torque wrenches added.	
	4.1.14	Clause added for Suitable de- greasing/ de- rusting facilities in essential M & P requirements.	
	5.1	Clause for raw mat. added for use of 1500MM/4000MM or single sheet after approval from CDE/ RCF is required.	
	5.2	Clause for raw mat. added that For any other reputed material producer in country or abroad, approval from CDE/ RCF is required.	
	5.6.1	Clause added for using filler metal for various combination of metals.	
	6.1	Clause revised for Material handling facilities as M & P requirements.	
	7.10	Clause added for suitable gauge for measuring & inspection.	
	7.11	Clause added for adequate arrangement for measuring undulation after fabrication of side wall.	


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
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8.4.1 - 8.4.8	Clause added for adequate Jig & Fixture	
8.5 -8.8	Clause for Fabrication process for manufacturing of Side wall added.	
11.1	Clause for concavity or convexity modified It should be between 1.5 mm to 2.5 mm.	
16.8	Clause added for quality of weld joints as IRIS requirement.	
16.9	Clause added for Inspection of weld quality as IRIS requirement.	
16.93	Clause added for Rectification of weld defects as IRIS requirement.	
16.10	Clause modified for spot weld test parameter. Clause added for Spot welding indentation measurement .	
17.0	Clause Revised for Prototype Inspection/First Article Inspection.	
21.0	Clause Revised for Marking/QR Coding.	
	Warranty Clause revised. (7 years from the date of supply & 6 years from the date of service, whichever is earlier)	


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1.0 GENERAL :

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

2.0 SCOPE OF SUPPLY :

Manufacture of stainless steel Side Wall 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 9001-2008 series certification.

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

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

3.4 The tenderer shall have adequate manufacturing facilities mentioned in Para 4, 5, 6 & 7 Complete Side Wall 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 and terms in capacity of a regular tender for RCF.

3.6 Firm may adopt new processes for manufacturing of Side wall assembly for improving the quality (like reduction of welding joints of side wall sheets , carline and roof flange) 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 Laser cutting machine of effective bed size (min. 1.5 M width x 3M length) (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) and Laser welding machine of effective bed size (min. 2.5M width x 3M length) with handling arrangement of 18 meter length OR Laser cutting cum welding machine of effective bed size (min. 2.5M width x 3M length) to suit the cutting and welding requirement of sidewall sheet joint.

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- 4.1.3 Firm should have Cold roll forming machine with suitable rollers for forming of carline ,roof flange and corrugated side wall sheet . This Cold roll forming machine is required for single piece manufacturing of carline , roof flange and corrugated side wall sheet of approx. 19 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 Hydraulic press with min 500 T for window forming for Non-AC Coaches .
- 4.1.5 Automatic /CNC/robotic Spot welding machine of min. 2.5 meter arm length with adequate clear space to handle 19 mtr. long sub assemblies with handling arrangement .
- 4.1.6 CNC Press brake of at least 100 tonne capacity with min. bed length of 3 meter for forming of Side Wall components.
- 4.1.7 At least one shearing machine of cutting capacity up to 5 mm and drilling machine for drilling and tapping capacity up to 20 mm thick stainless steel plates.
- 4.1.8 Roll bending machine/ Tool & die for Side Wall Arch profile bending.
- 4.1.9 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.
- 4.1.10 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 mixture gas (90% argon+5% O₂+5 %CO₂) gas.
- 4.1.11 Level surface table of size 2m x 3m.
- 4.1.12 One Surface Table to handle 19 mtr. long sub assemblies with handling arrangement for welding framework members.
- 4.1.13 Min. Four Torque wrenches having min. Capacity 120 Nm .
- 4.1.14 Suitable de- greasing/ de- rusting facilities for items other than Stainless Steel.
- 5.0 **RAW MATERIAL, CONSUMABLES AND WORKING AREA :**
- 5.1 Raw material size of sidewall sheet must be of Min. 1500MM/4000MM.
However, firm may use raw material of longer width/single sheet so as to reduce vertical joints after taking approval of CDE/RCF.
- 5.2 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.


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- 5.3 Procurement of raw material for Side Wall Assembly from OEM or his authorized distributor along with material test certificate confirming to specified grade of steels shall be submitted from OEM along with supply.
- 5.4 Separate covered area approx. 2000 sq. mtr.area having 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.
- 5.5 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.
- 5.6 Electrodes, hardware should be procured with test certificate from the authorized distributor of RDSO approved sources / manufacturers only.
- 5.6.1 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(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	

- 5.7 Treatment of Weld areas , except spot welding areas of stainless steel fabricated items. Pickling /passivation shall be done after completion of all welding. Firm shall indicate in their QAP about this process and shall conduct trials in test plates before applying on side wall .

- 5.7.1 Weld area contaminates such as free iron, oxide scales, rust,grease,oil, metal chips,dirt or other non volatile deposits might adversely affect the metalurgical 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.

Weld areas to be pickled and passivated as under :

- 5.7.2 Remove all solid floating particles, steel chipping, filing, dust, welding slag before start of the acid cleaning of weld areas. Nitric-Hydrofluoric acid solution is to be used to remove both metallic contamination and welding and heat treating scales. Surface to be descaled are to be pre cleaned prior to chemical treatment. The weld area should be in contact with the immersion solution until inspection shows that complete scale removal has been accomplished.

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Solutions in water for acid cleaning shall be as under :

Conc. HF4	6% by volume
Conc. HNO3	15-20% by volume
Immersion time	10 -15% Minutes (max.)
Temperature	30-40 degree Centigrade (When temp. is low exposure time may be increased)

5.7.2.1 Rinse the weld area with water after pickling & passivation.

5.7.2.2 A neutralizing treatment of weld area, after completion of acid cleaning and passivation by using aqueous caustic solution containing NaOH 10% by weight for a period of 5- 60 minutes should be used as final treatment to remove smut. After that through water rinsing and drying operation is to be carried out. The pH of the rinsing water shall be from 6-8.

NaOH	10% by weight
------	---------------

5.7.2.3 The process of acid cleaning, water rinsing, neutralization treatment, final fresh water rinsing must be done in sequence without giving any waiting time between the processes to avoid staining on the surface.

5.7.2.4 Free iron examination test (Ferroxyl test) should be carried out immediately after acid pickling and neutralization treatment to confirm that there is no free iron available on the weld surface. In case of positive test for free iron the whole process of acid pickling neutralization and water rinse should be repeated. Following solution should be used for ferroxyl test solution :

Distilled water	01 Liter
Nitric Acid (Conc.)	20 ml.
Potassium Ferricyanide	30 g.

Tanks for keeping acid solution, neutralizing solution and water for rinsing should be made of stainless steel plates with FRP Lining.

6.0 MATERAIL HANDLING EQUIPMENTS :-

6.1 Suitable Material handling facilities such as Over-head cranes, Fork Lifters, Hoist and mobile cranes of suitable capacity. 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 out down hand welding.

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

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
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 Spot welding indentation should be measured using digital depth gauge. The readings to be recorded in check sheet.
- 7.3 Dye penetration testing for welding joints.
- 7.4 Macro etch test for fusion of fillet weld.
- 7.5 Peel test and Chisel test of spot weld .
- 7.6 Root bend , Face bend test for butt welds.
- 7.7 Each completed assembly of the Side Wall 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.
- 7.8 Tensile testing machine having minimum 40 T capacity with necessary jig & fixture for tensile and bend test for ensuring the weld quality of laser welding on test samples every time prior to actual welding of side wall is essential at the manufacturer premises . However, development order can be placed on a form having valid tie-up in the form of MoU with NABL accredited labs at their own expenses as and when required. If sample fails in any of test specified for spot /laser welding , resetting of weld parameter shall be done so as to achieve required results. Proper records shall be maintained for this activities .
- 7.9 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.
- 7.10 Firm should have adequate gauges to ensure the dimensions (width, height & length) of carline assembly after welding with side wall .
- 7.11 Firm should have adequate arrangement (callibrated straight edge, filler gauge etc.) to measure the undulation after complete fabrication of side wall assembly.

8.0 MANUFACTURING PROCESS AND GENERAL PRACTICE TO BE FOLLOWED DURING MANUFACTURE :

- 8.1 The components and 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.


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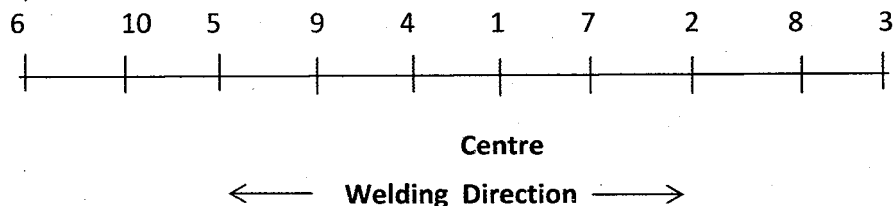
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- 8.3 Certain minor modifications in the assembly if required have to be done as advised by RCF/HSQ Design office.
- 8.4 The firm shall have necessary jigs and fixtures to ensure verticality and dimensions as specified in the drawings.
- 8.4.1 Jigs and fixtures should be calibrated periodically with advance measuring instruments.
- 8.4.2 Stopper of jig to be replaced periodically to ensure accuracy of side wall.
- 8.4.3 Jigs and Fixtures should have pneumatic & mechanical clamping.
- 8.4.4 Centre to be marked on side wall and this centre must match with centre of Side wall Jig
- 8.4.5 Suitable clamping fixture to cover min. 1.5-2 sq. meter area when framework is tack welded with sheeting on surface table before spot welding.
- 8.4.6 Firm's should incorporate locaters / dowelling, reference points as per RCF advices in the Jigs / Fixtures for sidewall assembly.
- 8.4.7 Jig & Fixture of side wall must have stopper & locator to ensure position of members as per jig & fixture of sidewall assembly.
- 8.4.8 Welded components or members shall be correctly matched and accurate levels and clearances shall be ensured to result in perfect welds.
- 8.5 Fabrication process for manufacturing Side Wall Assembly
- 8.5.1 Clean the Jig surface for spatters with brush before laying the side wall sheet on the jig.
- 8.5.1 Load the side wall sheet on Jig , while matching with locating stopper on the jig.
- 8.5.2 From both sides , at 4 points , weld the stainless steel strip with side wall sheet and stretch the side wall sheet at 4 points with 80 Nm Torque with the help of torque wrenches.
- 8.5.3 Set the voltage and current of the welding set.
- 8.5.4 Place and insert all the horizontal and vertical members and tack weld after clamping.
- 8.5.5 Provisionally tack weld all the members with side wall sheet.
- 8.5.6 Complete weld all the structure from centre to outside direction as a welding sequence.



- 8.5.7 De-clamp the top clamps.
- 8.5.8 Place and tack weld the roof flange parts with each other as per drawing and complete weld the parts.
- 8.5.9 Clamp the roof flange assembly.

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8.5.10 Tack weld the roof flange assembly with side wall sheet and complete weld with pillars.

8.5.11 Grind the welding joints, to keep all joints in one level.

8.5.12 Lift the side wall assembly with the help of nylon belts.

8.5.13 Overturn and place it on spot welding machine.

8.5.14 Spot weld the side wall assembly.

8.6 Manufacturing of Carline assembly

8.6.1 Manufacture the carline assembly as per drawing . For CRF manufacturing in single piece firm should get approval from CDE/RCF.

8.6.2 Place the sub assembly in jig and clamp the arches as per drawing.

8.6.3 Skip weld the arches as per drg. And remove the carlines from the jig.

8.6.4 Load the carline assembly on spot welding fixture to spot weld the carline assembly on spot welding machine.

Note- i) Stiffening angles will be welded with carline assembly after spot welded.

8.7 Load the spot welding fixture loaded with side walls and carlines on spot welding machine.

8.7.1 spot weld the side wall assembly and carline assemblies.

8.7.2 After spot welding side wall assembly and carline assemblies , shift the assemblies to side wall complete jig by using cranes for further fitment.

8.8 Place all the carline assemblies and side wall assemblies in the Jig & adjust it.

8.8.1 Clamp & weld the carline assemblies with each other to make it single piece & both assemblies also.

8.8.2 Complete weld the arches of carline with roof flange and tack weld the the roof flange with carline .

8.8.3 Rotate the side wall assembly in manipulator to keep the side wall assembly in inverted vertical position for brazing.

8.8.4 Braze (MIG Welding) the carline with side wall sheet from outside. Before brazing clean the joints of side wall assembly and carline with stainless steel wire brush.

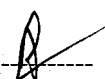
8.8.5 Weld the back pieces, brackets & channel assemblies as shown in location of back pieces on side wall drawings.

Note-Some back pieces & channel assemblies will be welded by shell assembly which infringe during fabrication of shell assembly & skin tensioning.

8.8.6 After welding remove the side wall assembly & keep it at designated place.

8.8.7 Grind the welding joints for proper level & deburring of window cutouts.


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9.0 SKIN STRETCHING :

(a) To ensure flatness/straightness of side wall surface , the sheets shall be stretched before further welding of stiffeners in the fixture by applying 80 Nm torque with the help of torque wrench preferably digital torque wrenches , from both sides ,at 4 points with the help of welding stainless strip with side wall sheet.

(b) Stretching shall be released only after completion of welding of all stiffeners allowing sufficient cooling time.

10.0 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 drgs. Spot size shall not be less than 6 mm for 2 mm or less thickness and not less than 9mm for above 2mm upto 3mm thick sheets.


11.0 FINISH :

11.1 Exterior of Side Wall panels shall be without bulges or depression that could be visible after painting. Concavity or convexity shall be less than 1.5mm to 2.5 mm in a length of 2.5 meters and in this proportion for shorter length. The indices of concavity or convexity should be taken as guidance for manufacturing. A prototype sample (2Nos.) should be submitted to RCF by any new vendor seeking approval for supply of these sub-assemblies for demonstrating the surface finish achieved by the firm and for prior approval before bulk manufacturer of sub-assemblies.

11.2 Post welding stainless steel wire brush cleaning using mechanized wire brush should be done for Side Wall sub-assemblies.

11.3 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


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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.

12.0 MAN POWER :

Only qualified welders 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.

13.0 This specification shall be read along with the respective drawings of Sidewall issued by Railway engineers/Purchaser.

14.0 QUALITY CONTROL REQUIREMENTS :-

14.1 There shall be a system to ensure tractability of the product from raw material stage to finished product stage.

14.2 Quality Assurance Plan (QAP) for the following aspects shall be ensured and approved by CDE/RCF.

- Process flow chart.
- Stage wise inspection details from raw materials 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.

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

14.4 Welding activities as per ISO:3834 & EN15085 requirements.

15.0 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 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.


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16.0 REQUIREMENT OF WELDING ACTIVITIES

- 16.1 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.
- 16.2 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.
- 16.3 Inspection and testing personnel shall have qualification as per ISO 9712 level-2 or SNT-TC-1A level 2.
- 16.4 All welding plants should be calibrated as per ISO 17662/BS EN 50504.
- 16.5 WPS (Welding procedure specification) shall be prepared for all critical joints & qualified as per ISO 15609, 15613 and 15614 for applicable parts.
- 16.6 Proper grinding using iron free grinding disc followed by buffing shall be done on all weld joints other than spot weld.
- 16.7 Record of above details shall be maintained for verification.

16.8 Quality of weld joints

- 16.8.1 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.
- 16.8.2 Weld joints shall be free from cracks, creates, under cuts, Overlaps, porosity, inclusion, blow holes etc.
- 16.8.3 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.
- 16.8.4 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.
- 16.8.5 Slag shall be thoroughly removed and cleaned after each under pass.
- 16.8.6 Welds shall be ground to increase life and prevent fatigue failure .
- 16.8.7 Adequate measures shall be taken by manufacturer to avoid distortion during welding, minor distortion if any shall be corrected preferably by mechanical methods.
- 16.8.8 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 re examined by dye penetration test to insure defect free weld joint.

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16.9 Inspection of Weld Quality

16.9.1 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.

16.9.2 Spot Weld Test

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 approx. 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 leveled by tinkering and TIG welded.

Some of the major points that determine the quality and strength of side wall fabrication are :

- I. Uniformity in pitch of spot welds.
- II. Area of the spot weld .
- III. Strength of spot welds.
- IV .Current used for creating spot weld for proper fusion of metals.
- V . Strength of laser weld of sheet used in the side wall.
- VI. Pitch of spot weld.
- VII. First time supplier of the side wall assembly or the Firm whose pilot sample of side wall of any variant of coach is not approved from RCF Kapurthala has to submit approx. 10 samples of the spot weld and laser weld prior to starting the main job of spot welding to the RCF Laboratory for strength testing of the spot weld. (by observing the cup & cone of the joint by subjecting it to breaking load) and laser weld. Following parameter are checked :-
 - i. Shear strength must be not less than 8.4 KN
 - ii. Nugget diameter must not be less than 7.0 mm.
 - iii. To test the strength of the laser weld , soundness of weld joint is tested in :-
 - a. Tension mode (generally not less than the strength of parent metal)
 - b. Compression test


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16.9.3 Quality requirement of all the spot welds shall be evaluated to weld performance class CP C2 of ISO 15085-Part-3 (for reference Annexure -A shall be followed) .

To ensure weld quality of laser welding, tensile strength and bend test shall be carried on test samples before welding the actual component. Minimum three sample each shall be tested for tensile and bend test. Tensile strength of laser welded sample shall not be less than the tensile strength of the parent (e.g. 450-650 N/mm² for grade 409M to RDSO/Spec CK-201). Bend test shall be carried out using mandrel having radius three times the thickness of the test sample. Test samples must pass the tests. If required, welding parameter of machine to be adjusted so as to achieve desired results of tensile and bend test.

Test sample for tensile test shall be 25 mm wide and 200 mm long having width wise laser welding at centre of the test piece (welded using 25 mm x100 mm long steel piece or larger size sheets and sample 25mmx200 mm drawn from it). For bend test sample having 50 mm width and 150 mm length shall be prepared having width wise laser welding at centre of test piece (welded using 75 mm long and 50 mm wide steel pieces or larger size sheets and sample 50 mm wide and 150 mm long drawn from it.) Record of this activity shall be maintained by the supplier. Inspecting agency shall also ensure the quality of laser welding during pilot sample approval.

16.9.4 Spot welding indentation should be measured using digital depth gauge and readings to be recorded in the inspection check list.

16.10 Rectification of weld defects


16.10.1 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.

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

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

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

16.10.3.2 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.


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
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17.0 FIRST ARTICLE INSPECTION:

- 17.1 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.
- 17.2 First article inspection of complete Sidewall to be carried out after passing above three special processes.
- 17.3 External provider shall carryout FAI as per ISO/TS 22163:2017 requirement prior to submission of documents to RCF, Kapurthala.
- 17.4 FAI (First Article Inspection) shall be carried out as per requirement of ISO/TS 22163:2017.
- 17.5 Validation of all Special process (including outsourced Special Process) shall be carried out as per requirement of ISO/TS 22163:2017.
- 17.6 After passing above, bulk supply will be made after First article approved by CDE/RCF.
- 17.7 Audit inspection shall be done by CDE/RCF. or its authorized agency in the firm to certify quality of Sidewall Complete during regular production.
- 17.8 Firm has to fulfill all the requirements of ISO/TS 22163:2017.
- 17.9 First article inspection to be done for new vendors, design change, material change and new processes involved in manufacturing.
- 17.10 First article inspection or Prototype Inspection or Pilot sample.


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18.0 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. DPM/GTIN/CPID as per MCF'S Spec.no. MMDTS 19037 is to be done as per RCF advise.

19.0 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 unpacking 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.

20.0 WARRANTY:

The manufacturer shall warrant the Side wall 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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