

# रेल डिब्बा कारखाना , कपूरथला

**MD35131**

**Date: 01.05.2024**

**Sub:** Issue of Specification MDTS 21332 rev 02 for Schedule of technical requirements for supply and manufacture of Stainless Steel End Wall Assembly

Please find enclosed copy of Specification No. MDTS 21332 rev 02 for Schedule of technical requirements for supply and manufacture of Stainless Steel End Wall Assembly for information and necessary action please.

Dy.CME/Design (S&B)

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**CDE/MCF, CDE/ICF, CDE/RCF**

## Schedule of Technical Requirements for supply and manufacture of Stainless-steel End Wall Assembly

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Issue/Rev.	Clause	Detail of changes	Date
<b>01</b>	<b>5.0</b> <b>6.1.1</b> to } <b>6.1.5</b> <b>6.2</b>	Clause revised to remove <u>(409M)</u> in table.  Clauses removed.  Clause added to Standard Practice for Cleaning, Descaling and Passivation of Stainless-Steel parts as per ASTM A380/A380M-17.	<b>08.01.2024</b>
<b>02</b>	<b>3.2</b>  <b>4.2.2</b>  <b>6.0</b>  <b>6.2</b>  <b>14.1</b>	Clause deleted.  Clause revised to add TIG welding.  Clause revised for treatment of weld area in Ferritic SS and Austenitic SS separately.  Clause deleted.  Clause for direct part marking DPM deleted.	<b>18.04.2024</b>

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## 1.0 GENERAL:

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

## 2.0 SCOPE OF SUPPLY:

Manufacture of stainless-steel End Wall Assembly for LHB coaches is to be supplied in all respect conforming to the relevant drawing with latest alteration & schedule of technical requirement of tender.

## 3.0 CERTIFICATION & OTHER REQUIREMENTS:

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 to manufacture complete Endwall as per clause 4 & 5.

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 Endwall assembly for improving the Quality without financial implication with the approval from CDE/RCF.

## 4.0 MUST INFRASTRUCTURE REQUIRED FOR MANUFACTURING OF STAINLESS-STEEL END WALL COMPLETE IN FIRM'S PREMISES IN WORKING ORDER:

### 4.1 Infrastructure for Stainless Steel profile cutting & Bending:

4.1.1 Separate covered area approx. 2000 sq. meters should be available to manufacture of stainless-steel End Wall to avoid iron contamination and also having adequate space underneath for storage of raw materials. The covered area should have display board showing different color shades nominated to different grades of steel to avoid mix up of material. Arrangement of painting with particular paint shade previously nominated according to the grade of steel should be available.

4.1.2 Fabrication should be confined to an area where only stainless-steel grade of material is being worked and should not be mixed with carbon steel.

4.1.3 Straightening machine for Straightening of sheet before laser cutting.

4.1.4 Firm should have at least one CNC Laser cutting machine of effective bed size (Min. 1.5 M width x 3M length) **OR** 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.

4.1.5 Drilling and taping capacity up to 20 mm. thick stainless-steel sheets, Lathe m/c with pipe threading facility etc. of suitable capacities should be available in working condition.

4.1.7 At least one CNC Press brake of min. 200 T capacity with bed length of 3 meters for

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bending of end wall components.

- 4.1.8 Adequate numbers of Hand Grinders for removal of fins & 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 Suitable Roll bending machine for manufacturing of arch complete of Endwall **OR** valid MoU for developmental order only.
- 4.1.10 Suitable de-greasing/de-rusting facilities for items other than Stainless Steel.
- 4.1.11 Evidence for the above clause 4.1.1 to 4.1.10 shall be submitted along with tender documents.

## 4.2 Infrastructure for fabrication involving welding activities:

- 4.2.1 At least one Spot welding machine of 2.5-meter arm length should be available in working condition for power car of end wall.
- 4.2.2 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% O<sub>2</sub>+5% CO<sub>2</sub>) gas.
- 4.2.3 The tenderer shall comply with IS: 822 regarding code of procedure for inspection of welds.
- 4.2.4 The firm shall have necessary jigs and fixtures to ensure verticality and dimensions as specified in the drawings.

## 4.3 Infrastructure for Handling & Transportation:

- 4.3.1 For components weighing more than 100 Kgs., at least 1 nos. Jib Crane/EOT crane of min. 2T capacity or other suitable material handling equipment of suitable capacity along with nylon sling with covering to avoid contamination.
- 4.3.2 Manipulator for down hand welding.

## 5.0 FILLER METAL QUALITY:

All the joints shall be welded using welding wire spools / 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	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)	

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4	X2CrNi12 to RDSO SPEC. C-K201	IRS: M41-97	E309L
5	X5CrNi1810 to RDSO SPEC. C-K201(304)	IRS: M41-97	

## 6.0 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.
- 6.1 Weld area contaminates such as free iron, oxide scales, rust, grease, oil, metal chips, dirt or other nonvolatile 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.
- 6.2 Clause deleted.

## 7.0 PROCUREMENT OF RAW MATERIAL:

- 7.1 Procurement of stainless Steel/Corten steel sheets should be done from reputed stainless steel/Corten steel manufacturer in country such as M/s. SAIL & M/S. Jindal or the authorized distributors along with material test certificate confirming to specified grade of steel. MTC shall be submitted from OEM along with supply. For any other indigenous/imported source approval from CDE/RCF is required.
- 7.2 Electrodes, hardware should be procured with test certificates from the authorized distributors of RDSO approved sources /manufacturers only.

## 8.0 MEASURING, INSPECTION & TESTING EQUIPMENTS:

- The tenderer shall have in house testing facility for the following.
- 8.1 **Chemical Lab:** The tenderer should have in house lab for chemical testing of material however testing at NABL approved lab is permissible at their own expense as and when required.
- 8.2 **Physical Lab:**
- 8.2.1 Universal Testing machine of 40T capacity with load deflection plotting arrangement and with necessary jig & fixture for tensile and bend test for ensuring weld quality of test samples. 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 these activities.
- 8.2.2 The tenderer shall have arrangement for conducting non-destructive test for welding as per requirement of purchaser in house or having valid tie up with

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NABL accredited labs at their own expense as and when required.

## 8.3 Measuring Instruments:

Firm should have following measuring instruments duly calibrated, at firm's premises.

8.3.1 Digital Vernier Calipers - 0 – 300 mm. range, Height gauge.

8.3.2 Digital Micrometer- 0 – 150 mm. range.

8.3.3 Measuring tape at least 3-Meters Range.

8.3.4 Steel scale - 0- 300mm., 0 - 1 meter.

8.3.5 Go & No-Go gauge.

8.3.6 Profile gauge.

8.3.7 Filler gauges & welding gauge.

8.3.8 Thread gauge.

8.3.9 Bevel protector.

## 8.4 Other equipment for Inspection:

8.4.1 Dye penetration testing Kit for welding joints.

8.4.2 Macro etch test for fusion of fillet weld.

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

8.4.4 Root bend & Face bend test for butt welds.

## 9.0 FIRST ARTICLE INSPECTION/PROTOTYPE INSPECTION:

9.1 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.

9.2 First article inspection of End wall complete to be carried out after passing above two special processes.

9.3 After passing above, bulk supply will be made after First Article approved by CDE / RCF.

9.4 Audit inspection shall be done during regular production in the firm for certify quality of End wall complete.

9.5 FAI (First Article Inspection) shall be carried out as per requirement of ISO/TS 2163: 2017.

9.6 External provider shall carryout FAI as per ISO/TS 22163:2017 requirement prior to submission of documents to RCF, Kapurthala.

9.7 Validation of all Special process (including outsourced Special Process) shall be carried out as per requirement of ISO/TS 22163:2017.

9.8 Firm has to fulfill all the requirements of IRIS to ISO/TS 22163:2017.

9.9 First article inspection to be done for new vendors, design change, material change and new processes involved in manufacturing.

9.10(\*) First article inspection or Prototype Inspection or Pilot Sample.

## 10.0 GENERAL PRACTICES TO BE FOLLOWED DURING MANUFACTURING & HANDLING:

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- 10.1 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.
- 10.2 Certain minor modifications in the assembly if required have to be done as advised by CDE/RCF.
- 10.3 The firm shall have necessary jigs and fixtures to ensure verticality and dimensions as specified in the drawings.
- 10.4 Jigs and fixtures should be calibrated periodically with advance measuring instruments.
- 10.5 Stopper of jig to be replaced periodically to ensure accuracy of endwall.
- 10.6 Jigs and Fixtures should have pneumatic & mechanical clamping.
- 10.7 Firm's should incorporate locaters / dowelling, reference points as per RCF advices in the Jigs / Fixtures for endwall assembly.
- 10.8 Jig & Fixture of end wall must have stopper & locator to ensure position of members as per jig & fixture of endwall assembly.
- 10.9 Handling equipment such as slings, hooks and lift truck forks should be protected with clean wood, cloth or plastic buffers to reduce contact with the iron surface.
- 10.10 Walking of the stainless-steel surface should be avoided, where un-avoidable, personal should wear clean shoe covers each time. Kraft paper, blotting paper, paper board or flannel or other protective material should be laid over areas where personals are required to walk. Supplier needs to make all these arrangements.
- 10.11 Shearing tables, press brakes, layout stand and other carbon steel work surfaces should be covered with clean kraft paper, blotting paper, paper board or flannel or other protective material to reduce the contact with carbon steel.
- 10.12 Hand tools, brushes, molding tools and other tools and supplies required for fabrication should be segregated from similar items used in the fabrication of carbon steel equipment and should be restricted to use on one material. Tools & supplies used with other materials should not be brought into the SS fabrication area.
- 10.13 Grinding wheels and sanding material should not contain iron, iron oxide, zinc or other undesirable material that may cause contamination on the surface. Grinding wheels, sanding material and wire brushes previously used on other metals should be used on stainless steel. Wire brushes should of stainless steel which is equal in corrosion resistance to the material being worked on.
- 10.14 Measures to protect the cleaned surfaces should be taken as soon as final cleaning is completed & should be maintained during all subsequent fabrication, inspection, storage and installation. The basic guidelines are as follows:
- 10.15 Do not remove wrappings and seals from incoming materials un till they are at use site, ready to be used or installed.
- 10.16 Do not store the finished cleaned materials and components stored directly on the ground or floor and do not permit these to come in contact with galvanized or carbon steels, Zinc, Lead, Brass etc.
- 10.17 Do not use carbon or galvanized steel wire for bundling and galvanized steel identification tags.
- 10.18 Quality of spot weld (Argon Gas Purging)- Spot welding shall be carried out in inert gas

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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/ colour in the resultant spots.

## 11.0 PRECAUTIONS:

- 11.1 The outer surface should have no visible welding marks. No surface preparation will be done at RCF. Therefor the supplier shall prepare surface on which PU paint as per requirement of RCF can be directly done.
- 10.2 Joint area to be weld must be clean. Use only stainless-steel wire brush.
- 10.3 Joint area must be free of grease, oil, water, dirt, finger marks.
- 10.4 Use good commercial solvent cleaner to clean the weld area before welding.
- 10.5 Arch strike adjacent to the weld must be avoided.
- 10.6 Avoid excessive heat input.
- 10.7 Grind the weld flush.
- 10.8 Size of spot weld shall be chosen as per DIN 8.1M:2007. Spot size shall not be less than 8mm. for 2mm. or less thickness sheets and not be less than 9 mm. for above 2 mm. up to 3mm. thick sheets.

## 12.0 WORKING INSTRUCTION:

Coach wise working instructions issued by Planning is to be followed for fabrication of End wall assembly.

## 13.0 MANPOWER:

- 13.1 Only qualified welder shall be deployed for welding works.
- 13.2 Supervisors with minimum qualification of diploma in mechanical engineering, Industrial engineering and Production technology shall be deployed for monitoring production and quality control respectively.
- 13.3 All supervisors and welders should have undergone training or welding technology at reputed institute viz. IIW, RWI or AWTI/ICF. Periodical refresher courses should also be attended by these staff.
- 13.4 Record of above details shall be maintained for verification.

## 14.0 QUALITY CONTROL REQUIREMENTS:

- 14.1 Clause deleted.
- 14.2 Quality Assurance Plan (QAP) for the following aspects shall be ensured and should be 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.



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- 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:

- 15.1. Incoming raw material register.
- 15.2 Stage inspection results including finished products results as per QAP.
- 15.3 Record of internal rejection and its analysis action plan.
- 15.4 Record of final products inspection by external agencies.
- 15.5 Record of maintenance schedule of machinery and plant.
- 15.6 Record of training imparted, Quality assurance, safety parameters and maintenance of machinery etc.

## 16.0 REQUIREMENTS OF WELDING ACTIVITIES:

- 16.1 Qualified welder as per ISO: 9606-1 for all critical joints, position shall be only employed. 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 co-ordinator 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 joint 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 joint shall be free from cracks, creates, under cuts, overlaps, porosity, inclusions, blow holes etc.
- 16.8.3 In butt weld area one extra run of welding shall be applied, excess metal shall than 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 welds.
- 16.8.5 Slag shall be thoroughly removed and clean after each under pass.
- 16.8.6 Weld 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.

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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 ensure defect free weld joint.

### 16.9 Routine Inspection for weld quality:

#### 16.9.1 Dye penetration test for seam welding:

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

#### 16.9.2 Spot weld test:

16.9.2.1 Testing of spot welds to be carried out in LHB power car end wall only as follows.

**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.

16.9.2.2 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, 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 & bend test. 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 welding at centre of the test pieces. For bend test sample having 50 mm width and 150 mm length shall be prepared having width wise welding at centre of test piece (welded using 75 mm long and 50 mm wide steel pieces or larger 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 welding during pilot sample approval.

### 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 report shall be submitted for review to inspection 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

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Welding should be carried out by qualified welders only. Process parameters to be maintained as per validated special process.

#### 17.0 MARKING /QR CODING:

Manufacturer's 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 FINISH:

- 18.1 Firm has to ensure undulation shall be less than 2 mm. In a length of 2.5 meters.
- 18.2 Exterior of panel sheets shall be without bulges or depression that could be visible after painting. Concavity or convexity shall be less than 2 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.
- 18.3 A prototype sample (02 nos.) 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 manufacturing of sub-assemblies.

#### 19.0 WARRANTY:

The manufacturer shall warranty the End 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 End wall complete, action shall be taken by the supplier to carry out any repair/rectification or replacement at his cost. The decision of the purchaser in this regard shall be final.

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