

## RAIL COACH FACTORY KAPURTHALA

MD46221

DATE: 18.08.2021

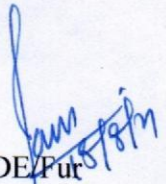
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Specification no. **MDTS 25360**

Rev. Nil Dated: **13.08.2021**

### **SCHEDULE OF TECHNICAL REQUIREMENTS FOR SEATS FOR LHB AC GS COACH**

  
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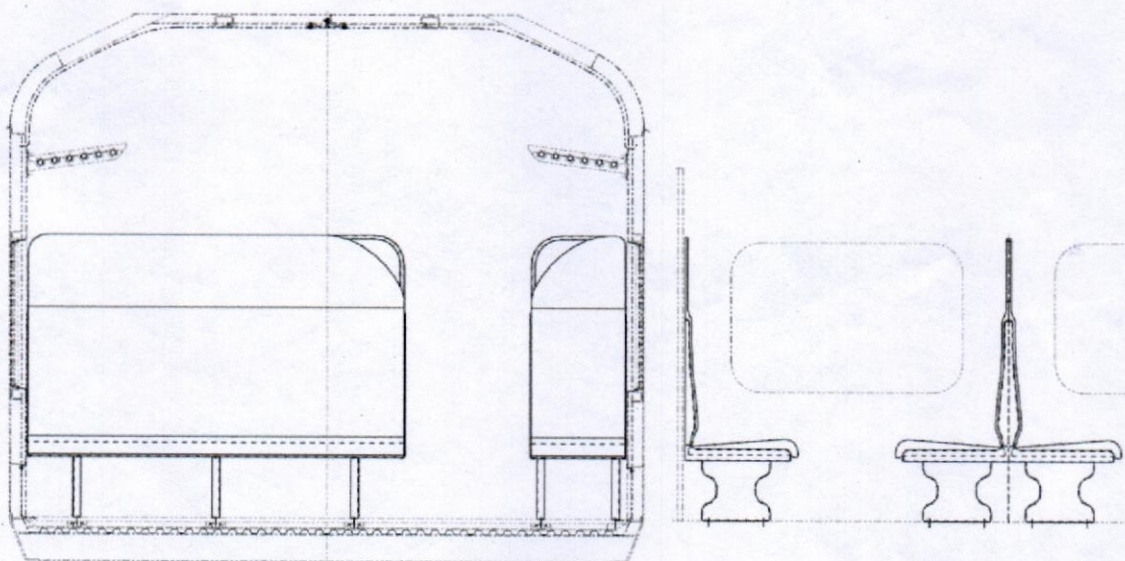
**RCF**

**KAPURTHALA**

Government of India  
Ministry of Railways  
**Rail Coach Factory**  
**Kapurthala**  
**Punjab 144602**  
ESTT: 1986

एलएचबी वातानुकूलित सामान्य वर्ग कुर्सी यान के लिए सीटों  
की तकनीकी आवश्यकताओं की अनुसूची

**SCHEDULE OF TECHNICAL  
REQUIREMENTS OF SEATS FOR  
LHB AC GS COACH**



<b>Specification Number</b>	MDTS-25360		
<b>Revision Number</b>	Nil	<b>Date of Issue</b>	13/08/2021

**BRIEF DESCRIPTION**

Schedule of technical requirements of seats for LHB AC GS coach.

## **FOREWORD**

This technical specification lays down general / technical, testing requirements of Seats to be fitted in LHB AC GS coaches of Indian Railways.

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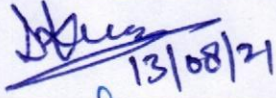
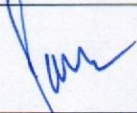
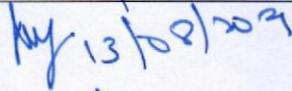
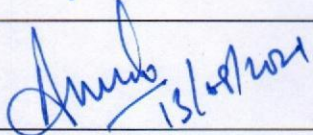
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#### LIST OF AMENDMENTS

S. No.	Amendment Date	Revision	Details
1.	07/07/2021	Nil	First issue.

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## 0. Introduction:

The LHB AC GS coaches introduced in Indian Railway first time to facilitate the lower income group passengers with air conditioned facility to provide them comfort in long distance journey due to utmost environment conditions in India.

## 1. Objective and Scope of the Specification:

This specification covers the general & technical requirements for supply and testing of seats along with accessories for LHB AC GS coaches.

## 2. List of standards referred: Table-1

S. No.	Standard	Title
1.	UIC 566	Loadings of coach bodies and their components.
2.	RDSO/Spec. C-K201	Specification for stainless steel sheets/plates for coaches of Indian Railways
3.	RDSO/Spec. C-9407	Schedule of technical requirement for wood based impregnated compressed laminates
4.	MMDTS 19020	Schedule of technical requirement for Flexible load bearing Polyurethane Foam Cushion
5.	RDSO/2013/CG-13	Silicon Foam as a cushioning material for Indian Railway passenger coaches
6.	MMDTS 19021	Schedule of technical requirement for Fire barrier cloth for Seats and Berths
7.	RDSO/2008/CG-07	Schedule of technical requirement for Vinyl Coated Upholstery Fabric (Artificial Leather)
8.	EN45545-2	Requirements for fire behaviour of materials and components
9.	IS:4229	Textiles - Nylon sewing threads for aerospace purposes
10.	IS:1720	Specification for Cotton Sewing Threads

## 3. Abbreviations / Terminology: Table-2

S. No.	Abbreviations / Terminology	Expansion / Explanation
1.	RCF	Rail Coach Factory
2.	CDE	Chief Design Engineer
3.	LHB	Linke-Hofmann-Busch the ToT partner for RCF/KXH.
4.	AC	Air Conditioned
5.	GS	General Seating
6.	FEA	Finite Element Analysis
7.	FRP	Fibre-reinforced plastic
8.	RDSO	Research Designs and Standards Organization
9.	PU	Polyurethane
10.	WTC	Work Test Certificate
11.	OEM	Original Equipment Manufacturers

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#### 4. General arrangement & mounting dimensions:

- 4.1 The general arrangement of seats and mounting of the seats shall be as per following general arrangement drawing:

**Table-3**

S.No.	Coach Type	General Arrangement Drg. No. of Seats
1	LHB AC GS	LG61007

(Latest alteration/revision of above drawings should be referred)

- 4.2 Firm should submit drawings of seat assembly indicating mounting arrangements, manufacturing details and overall dimensions to CDE/RCF for approval before bulk supply.

#### 5. Service Conditions:

- 5.1 The mechanical strength of the seat has to meet the requirements of UIC 566. According to this, the design and fastening of the seat is to be made such that the mounted seat can withstand static loads as per para-11 of this specification. The equipment shall be sturdy and suitable for the following service conditions normally to be met in service.
- 5.2 The firm shall also conduct strength/stress FEA analysis of the proposed design of seats.

- 5.3 **Ambient Environmental conditions:** **Table-4**

Relative humidity	Up to 100% during rainy season
Altitude	Max. 1200 mtrs. above sea level
Ambient temperature	-50 <sup>0</sup> C to 55 <sup>0</sup> C

- 5.4 **Working conditions:** **Table-5**

Train speed	160 Kmph Max.
Vibration and shocks:	
Max. Acceleration (vertical)	3.0 g
Max. Acceleration (Lateral)	2.0 g
Max. Acceleration (Longitudinal)	5.0 g
Frequency and Amplitude:	
Sinusoidal form of vibration, the frequency (f) lies between 1 HZ and 50 HZ and their amplitude (a), expressed in mm, is given as function f by the equation:	
a = 25/f for the values of ( f between 1 HZ and 1 HZ )	
a = 250 f <sup>2</sup> for the values of ( f between 1 HZ and 1 HZ )	

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## 6. Functional and Technical Requirements:

- 6.1 Seat manufacture should display very good styling in design of chairs to have aesthetics of international standards. Seat & backrest shall be designed on the basis of following anthropometric data of Indian population. The average of North India and South India data against 95 percentile is to be taken as reference.

**Table-6**

*Measurement table for the region 'North India'*

Measurement	Percentile (Men)			Percentile (Women)			Min.	Max.
	5	50	95	5	50	95		
Body height	1580	1670	1770	1450	1540	1630	1450	1770
Sitting height	820	870	920	770	820	870	770	920
Eye level of a sitting person	710	750	800	650	690	730	650	800
Reach (fingertips)	760	800	850	700	740	780	700	850
Width of the shoulders (bideloid)	360	380	430	320	340	370	320	430
Width of the shoulders (acromion)	350	370	390	285	310	340	285	390
Width of the hip(of a standing person)	280	295	320	285	310	340	280	340
Knee height	500	530	560	460	490	515	460	580
Length of the lower leg with foot	390	415	440	360	380	410	360	440
Distance between elbow and grip axle	310	340	370	280	310	340	280	370
Length buttocks-knee	550	580	620	500	530	570	500	620
Length of the legs with buttocks	940	1000	1060	880	940	1000	880	1060
Sitting width	280	300	340	290	315	360	280	340
Hand length	180	190	200	150	160	170	150	200
Hand width	80	85	90	70	75	80	70	90
Foot length	230	250	270	205	220	235	205	270
Head circumference	515	550	580	495	525	555	495	580
Head length (depth)	180	190	200	170	180	190	170	200
Head width	135	145	155	125	135	145	125	155

*Measurement table for the region 'South India'*

Measurement	Percentile (Men)			Percentile (Women)			Min.	Max.
	5	50	95	5	50	95		
Body height	1530	1620	1720	1390	1500	1600	1390	1720
Sitting height	770	820	880	740	800	850	740	880
Eye level of a sitting person	660	700	740	620	670	720	620	740
Reach (fingertips)	730	780	840	670	720	770	670	840
Width of the shoulders (bideloid)	370	400	440	330	360	390	330	440
Width of the shoulders (acromion)	355	375	395	310	330	350	310	395
Width of the hip(of a standing person)	270	285	300	280	300	320	270	320
Knee height	470	510	550	440	470	505	440	550
Length of the lower leg with foot	380	405	430	345	375	400	345	430
Distance between elbow and grip axle	300	325	350	275	300	325	275	350
Length buttocks-knee	530	560	600	480	515	550	480	600
Length of the legs with buttocks	920	980	1030	850	920	980	850	1030
Sitting width	275	290	320	280	310	350	275	350
Hand length	180	190	200	145	155	165	145	200
Hand width	75	85	90	65	70	75	65	90
Foot length	225	245	265	200	215	230	200	265
Head circumference	530	550	580	475	510	540	475	580
Head length (depth)	170	180	195	165	175	185	165	195
Head width	135	145	150	120	130	140	120	150

- 6.2 Contours of the moulded cushions should be ergonomically perfect to provide adequate comfort and generally as per the dimensions indicated in the respective drawings.

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### 6.3 **Frames:**

- 6.3.1 The frame of seats should be made of SS Grade-409M of RDSO/Spec. C-K201 or equivalent offered in the tender & approved by CDE/RCF.
- 6.3.2 Frames of seat and back rest should be sturdy enough to withstand normal misuse by Railway passengers.
- 6.3.3 The seat frame and all other visible bare metallic or non metallic parts to be powder coated of the colour matching to interior furnishing and should have a good finish at weld joints. There should be no sharp edges.
- 6.3.4 Structural supports should be suitably concealed.
- 6.3.5 Material of frame may be upgraded to superior stainless steel Grade-AISI 202 or J4 grade of M/s Jindal Steel with prior approval of CDE/RCF.

**Table-7**

*Chemical Composition (%) SS for J4 grade of M/s Jindal Steel*

C	S	P	Si	Mn	Cr	Ni	Cu
0.1 (Max.)	0.01 (Max.)	0.08 (Max.)	0.75 (Max.)	8.5-10.0	15.0-16.0	1.00-2.00	1.5-2.0

- 6.3.6 Welding of the frame to be done by MIG process and the material of electrode should match with the material of frame.

### 6.4 **Mounting arrangements:**

- 6.4.1 Mounting of seats should have easy access for tightening of fasteners.
- 6.4.2 The concept of mounting the seats on the floor shall be identical for similar seats to ensure inter-changeability.
- 6.4.3 Mounting holes should be drilled with the help of template/jig to ensure consistency of manufacture.

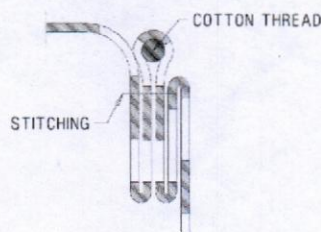
### 6.5 **Seats**

- 6.5.1 The seats dimensions shall confirm to the respective RCF drawings.
- 6.5.2 Stainless steel sheet of thickness 1mm with suitable supports of Grade-409M or AISI 202 or J4 grade (chemical composition as tabulated in Clause 4.3.5) of M/s Jindal Steel or equivalent offered in the tender & approved by CDE/RCF to be used as a support/base for cushion in seat & backrest. Alternatively, 6 mm. thick compreg for seat cushion and 4 mm. thick compreg for backrest cushion to RDSO/Spec. C-9407 may be used.
- 6.5.3 The seats shall have no sharp edges or corners anywhere.
- 6.5.4 Seat cushion and Backrest cushion shall be ergonomically designed and easily dismountable (modular design).
- 6.5.5 No disturbing noises or vibration shall be emitted by the seat or any component in service.
- 6.5.6 Hard wood or wood based materials not to be used anywhere in manufacturing of the chair.
- 6.5.7 On the aisle side, FRP Side Cover shall be provided for concealing and aesthetic purpose.
- 6.5.8 Suitable metallic or non-metallic partition frame as per reference arrangement drawing to be provided above the backrest.
- 6.5.9 The seating arrangement shall be modular and of suitable size to enable to enter inside the bare shell through opening of body side doors. It should be easy to handle while assembly inside the coach.
- 6.5.10 Ergonomically designed Grab handle shall be provided at a suitable height over the back rests on the aisle side which shall not protrude in aisle area.
- 6.5.11 Handle shall be fixed after joining /assembly of two four seater /one seater back to back in the coach, in such a way that it should become an integral part of the seat module.

### 6.6 **Fasteners:**

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- 6.6.1 All fasteners and metal parts shall be suitably concealed.
- 6.6.2 Only stainless steel cross recessed (star Philips head) screws shall be used. Stainless steel Hex. Socket head screws (Allen head) with spring washer shall be used at load bearing locations.
- 6.7 Cushioning Material:**
- 6.7.1 Cushion for seat and back rest shall be directly moulded from Polyurethane foam to MMDTS 19020 or Silicon foam to RDSO spec. no. RDSO/2013/CG-13 or as specified in P.O.
- 6.7.2 The minimum foam thickness shall be 50 mm in seating area and 40 mm in the backrest area.
- 6.7.2 Moulded cushion shall have integral PU/Silicon skin.
- 6.7.3 A sample of P.U./Silicon foam of size 570x570x50(thick) shall be submitted along with prototype seat to RCF for approval before start of the bulk manufacture of chairs.
- 6.8 Fire Barrier:**
- Fibre-glass woven cloth as per MMDTS 19021 or alternate approved by CDE/RCF shall be provided all around PU foam (if PU foam is used as cushioning material) including between upholstery and cushion as fire protection measure.
- 6.9 Upholstery:**
- 6.9.1 Vinyl Coated Upholstery Fabric (Artificial Leather) to RDSO specification no. RDSO/2008/CG-07 or latest superior synthetic fire resistant EN45545-2 HL-3 complied cloth/fabric in aesthetically pleasing hues/colors design pattern and having better material properties as specified RDSO spec. shall be used for covering of seats and back rest.
- 6.9.2 Vinyl coated upholstery fabric is to be procured from RDSO approved sources only. Manufacturer's name shall be duly embossed at the rear side of the artificial leather at regular intervals.
- 6.9.3 A sample of artificial leather shall be approved from CDE/RCF for colour shade, texture and finish before bulk manufacture of chairs. Supplier should also submit WTC from the OEM as per RDSO specification along with supply.
- 6.9.4 Upholstery Stitching**
- 6.9.4.1 Sewing thread to IS: 4229-1992, Gr. 6.6, VAR.L2 to be used for stitching of upholstery.
- 6.9.4.2 Thread should be dyed & bonded and the colour of thread should match with the colour of upholstery, the pitch of the stitch shall be 2 to 3 mm.
- 6.9.4.3 Stitching at corners to be done by using cotton thread of Dia. 3mm to IS:1720-1978 as shown in the figure below.



**Figure 1** (STITCHING DETAIL AT CORNERS)

**7. Color Scheme:**

**7.1 Colour Scheme for the Seats:**

**Table-8**

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S.N.	Component	Colour Shade/pattern
1.	Frame, mounting legs, side cover and other visible metallic & non-metallic parts	Powder coating (Thickness-50 to 80 Microns and Gloss-80 to 90 at 600) to colour shade matching with interior furnishing
3	Upholstery for seats & backrest	ALNAC-03 or as approved by CDE/RCF

- 7.2 Colour scheme for prototype sample to be got approved in advance from CDE/RCF before submission of the prototype for approval along with drawings by the supplier.
- 7.3 RCF reserves the right to change colour shade considering the aesthetics of seats in coach during prototype approval.

#### 8. **Weight:**

Maximum weight of seats shall not exceed as given below:

Single seater module	:	21 Kgs.
4-seater module	:	80 Kgs.

#### 9. **Warranty:**

The supplier shall give warranty for the complete seat including individual parts against failing or proving unsatisfactory in service due to defective design, material or workmanship within 84 months from the date of supply or 72 months from the date of commissioning of coach, whichever is earlier and shall replace the same at his own cost and risk. Name of manufacturer with month & year of manufacture along with manufacturing details on metallic plate should be displayed at some suitable location not visible to passengers, ordinarily.

#### 10. **Documents to be submitted by supplier for prototype approval**

The following documentation for the assembly of the seats is to be prepared by the supplier for submission along with the prototype assembly.

1. A set of documents consisting of drawings and part lists. It should also consist of the drgs. of subassemblies of frame, seat, backrest, cushion etc. with mounting arrangement, material & manufacturing details.
2. Clearly organised instructions for mounting and adjusting the seats, changing the seat and other parts.
3. Maintenance and repair instructions.
4. WTC from OEM for all parts procured from sub-vendors.
5. Test certificates of all the tests mentioned in this spec. from a reputed test laboratory.
6. Ergonomic analysis report to be submitted along with the seating system design.

#### 11. **Testing of prototype & regular production assemblies (Type Test)**

The supplier shall supply one prototype of seat along with the documents indicated above for approval before commencing bulk supply. General dimensions of the seat shall be as per Para-2 of this specification. The prototype and drawings shall be examined from all view points and supplier shall incorporate changes suggested by RCF on the basis of this review

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in the prototype and drawings. The bulk manufacture shall be undertaken only after the approval of prototype and drawings.

Testing of the seat shall be done in the same condition as fixed in the coaches. The following static load test shall be applied to prototype samples:

- i) 150 kgf vertical load to be applied per person to the seat cushion by using press board of hard board of circular area 615 sq. cm in the location of sitting area.
- ii) 50 kgf of horizontal load to be applied per person to the frame at the top aisle side corner of back rest of seat sets.
- iii) 50 kgf of horizontal load to be applied per person at the centre of back rest by using press board of hard board of circular area 615 sq. cm normal to the surface.

The above tests shall not give rise to any deformation in any component. The requirement of prototype is applicable for first supply of a supplier for approval of proto type. However, RCF shall have the right to repeat prototype approval process in subsequent order also. In this regard RCF decision shall be final.

## **12. Up gradation of design**

Supplier may offer alternate design of seats for all the above or any of the above clauses with a view to upgrade the design. Clause-wise justification shall be given by the supplier in such case. Seats having lower weight shall be preferred. Specification details may be deviated from those specified above, if sufficient technical justification is available. However, RCF's decision on all such matters shall be final.