

I/64281/2024



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भारत सरकार —रेल मंत्रालय
अनुसंधान अभिकल्प और मानक संगठन
लखनऊ — 226011

Government of India - Ministry of
Railways

Research Designs & Standards Organisation
Lucknow – 226011

पत्र सं० एम डब्ल्यू/ बीवीसीएम

दिनांक: 12.08.2024

All Wagon Builders and Manufacturing workshops.

विषय : Improvements in Brake Van (Improved chairs, panelling, solar lighting system, improved door locking and other amenities).

संदर्भ : 1. This office letter No. MW/BVCM dated 18.06.2024.

2. Railway Board letter No. 2013/M (N)/60/10 (E-3320409) dated 15.07.2024

- Based on Directions from Railway Board to improve brake van with special emphasis on Guard's chair; a detailed exercise covering new designs, optimization/improvement in existing designs, multiple fitment trials, structured feedback from users, joint study etc. was undertaken by RDSO with Zonal Railways. Based on this exercise comprehensive recommendation were sent to Railway Board vide reference 1 above, which has been considered in Board's office.
- Accordingly, Railway Board vide reference 2 above, have approved following improvement for manufacturing of BVCM type brake vans :

SN	Relevant Drawings of Brake Vans	Description Improved Item	Drg. No. for improved item
1	WD-15009-S-13	Modified Guard Chair (New design)	WD-15009-S-13 it.25
2	WD-15009-S-13	Foot Rest (Fabricated)	WD-15009-S-13 it.27
3	WD-17039-S-03	Coat Hook	RCF Drg. No. CC64254
4	WD-17039-S-04	Angles (75x75x8) for Chair base Support (Structure Steel)	WD-170339-S-04 it.27
5	WD-17039-S-06	Walkie-Talkie stand (Fabricated), bottle holder & support angle with grab handle.	WD-17039-S-06 it.29, 28, 26&27 respectively.
6	WD-15009-S-13	Door lock with universal Key	WD-15009-S-13 it.28 (Modified)
7	WD-17039-S-06	Polyamine Epoxy Resin Flooring on floor of inside cabin	Polyamine Epoxy Resin flooring as per spec no. MDTs-44289
8	WD-17039-S-06	Fleet Graphics Film in Cabin (Interior)	RDSO specification No. RDSO/2010/CG08 (latest)
9	WD-24050-S-07 Sheet-I & Sheet-II	Electrical work along with solar panel including light & fan	WD-24050-S-07 Sheet-I & Sheet-II

- These works are being undertaken to improve working condition of train managers'. Therefore, in the design of guard chair applicable standards for better ergonomics,

I/64281/2024

safety, durability & maintainability have been considered and incorporated in the relevant drawings. Similar approach has been taken in other improved features of the guard van mentioned in para 2 above. Therefore, to ensure the intended improvements it is utmost important that all the items including Guard's chair is procured and fitted strictly as specified in the relevant drawing.

4. Keeping above in view following line of action is decided for undertaking this improvement in BVCM type brake vans by all wagon builders:
- All items must be procured strictly as per drawing only from reputed/ approved sources as applicable.
 - For prototype wagon; complete material list covering make, model, purchase details, warranty, inspection certificate, photographs etc. shall be submitted to wagon dte. RDSO for evaluation and approval. Only approved material shall be used for prototype fitment.
 - Stage inspection of prototype fitment shall be witnessed by respective QAM or Design Dte. Wagon builder will inform date of start of fitment to this office at least one week in advance.
 - Prototype BVCM manufactured by each wagon builder shall be inspected and approved by Wagon Design Dte.
 - Based on approved prototype; make, model, specification, inspection, warranty etc. of each item shall be finalised for each wagon builder and a separate QAP on the same shall be approved by Wagon Design dte. No change in any approved item; not limited to only make, model, specification, warranty, inspection etc. shall be permitted without prior approval of Wagon Dte. RDSO.

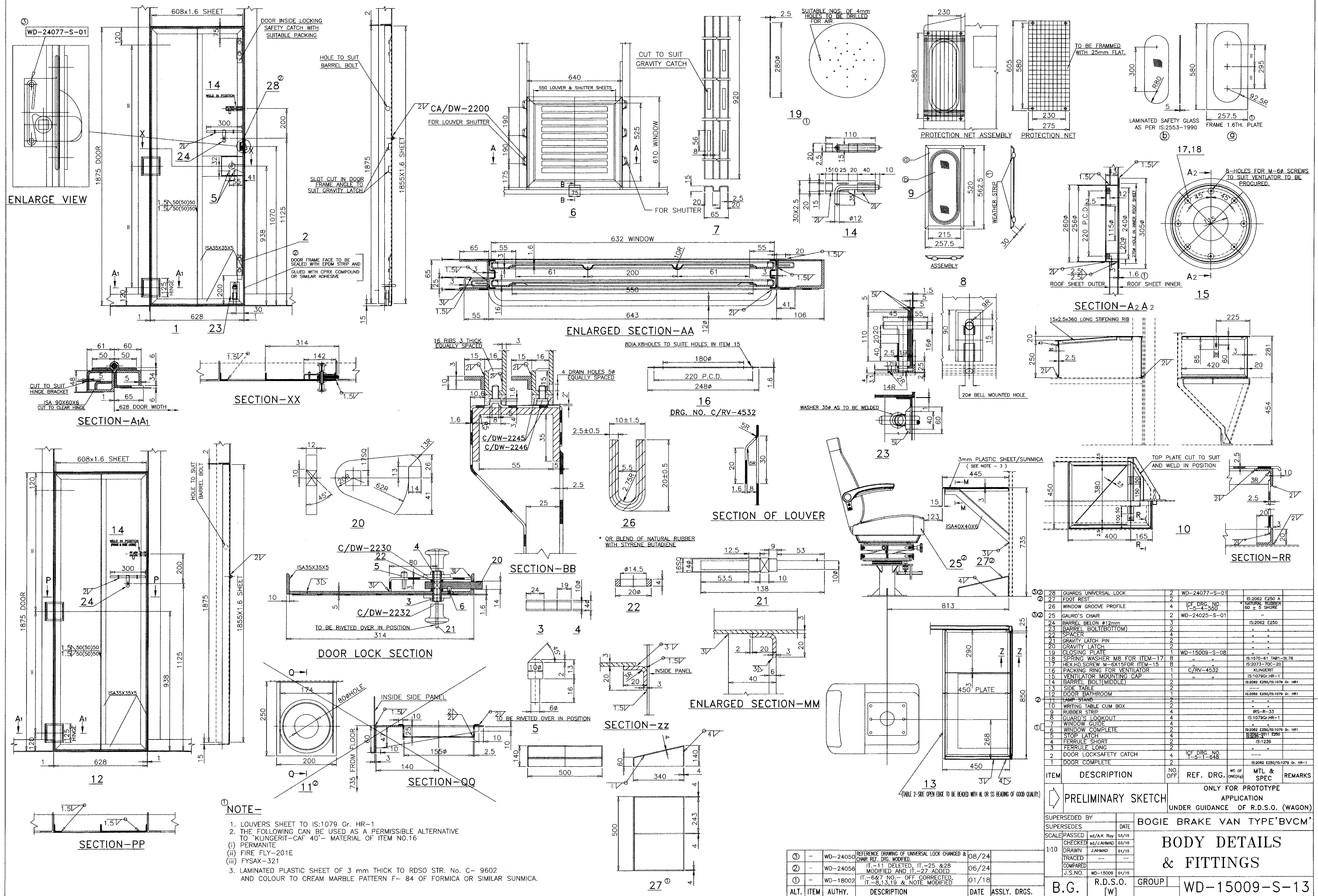
As approved by Railway Board, all wagon Builders are hereby directed to take prompt action on above lines to incorporate above improvements in new BVCM Brake vans rolling out after 30th September 2024. Admissible RAD shall be applicable.

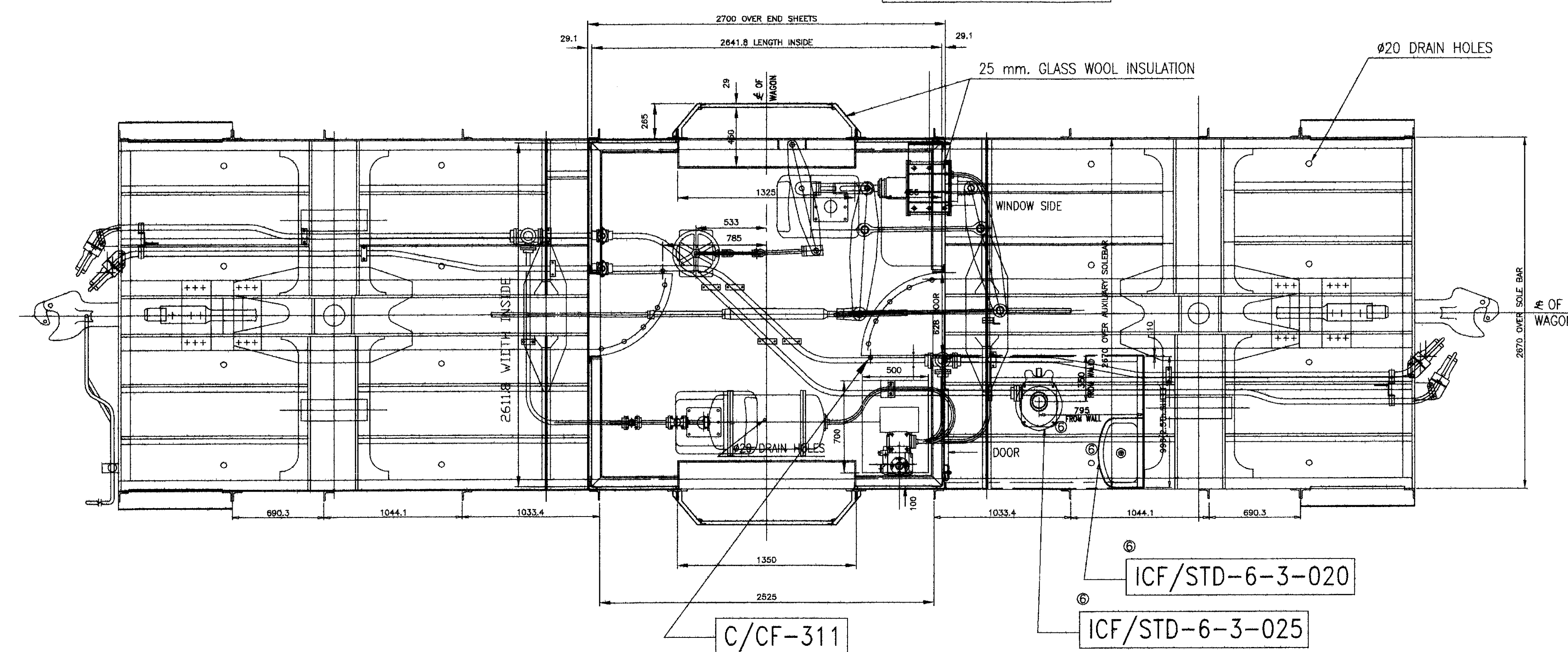
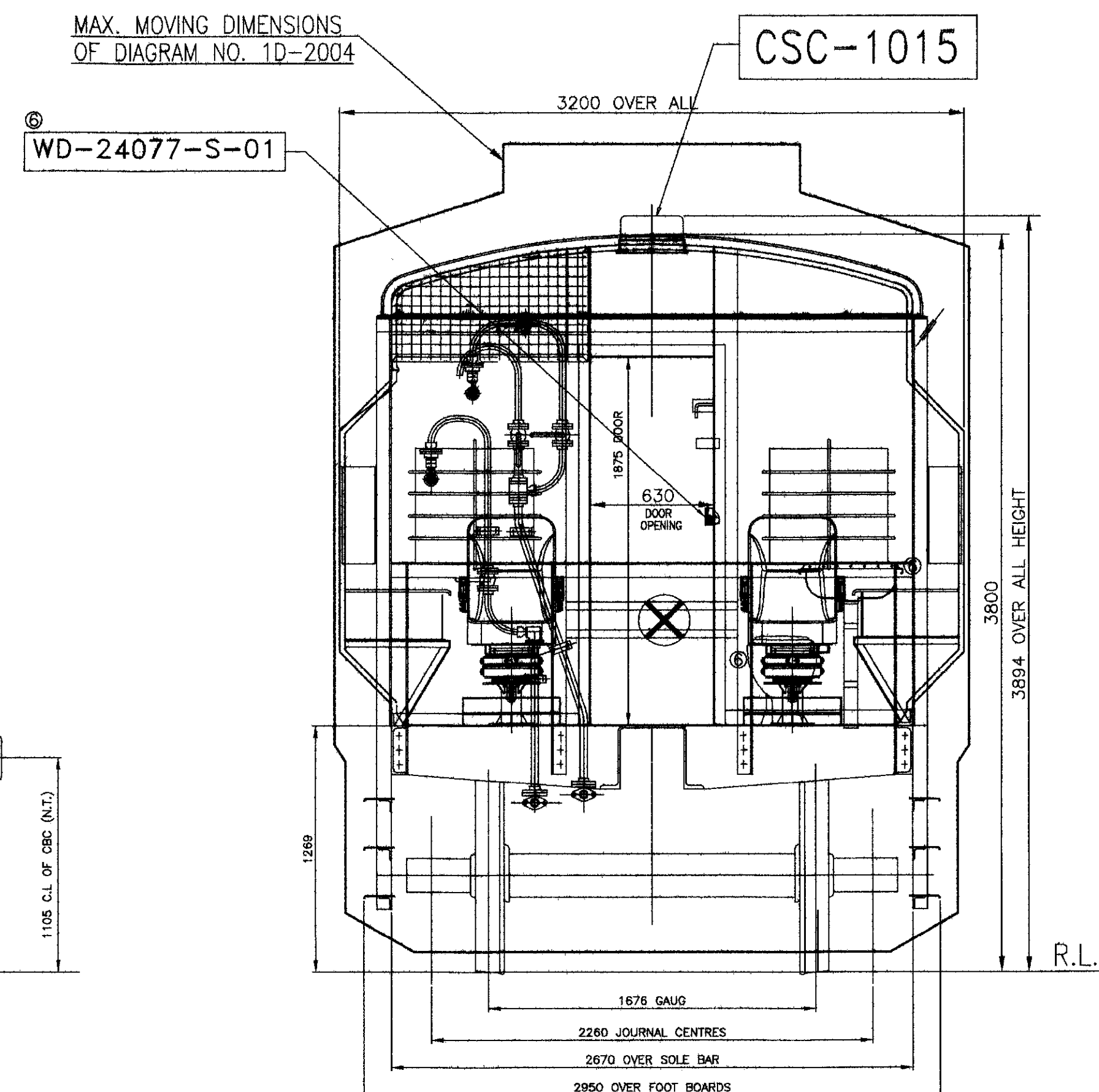
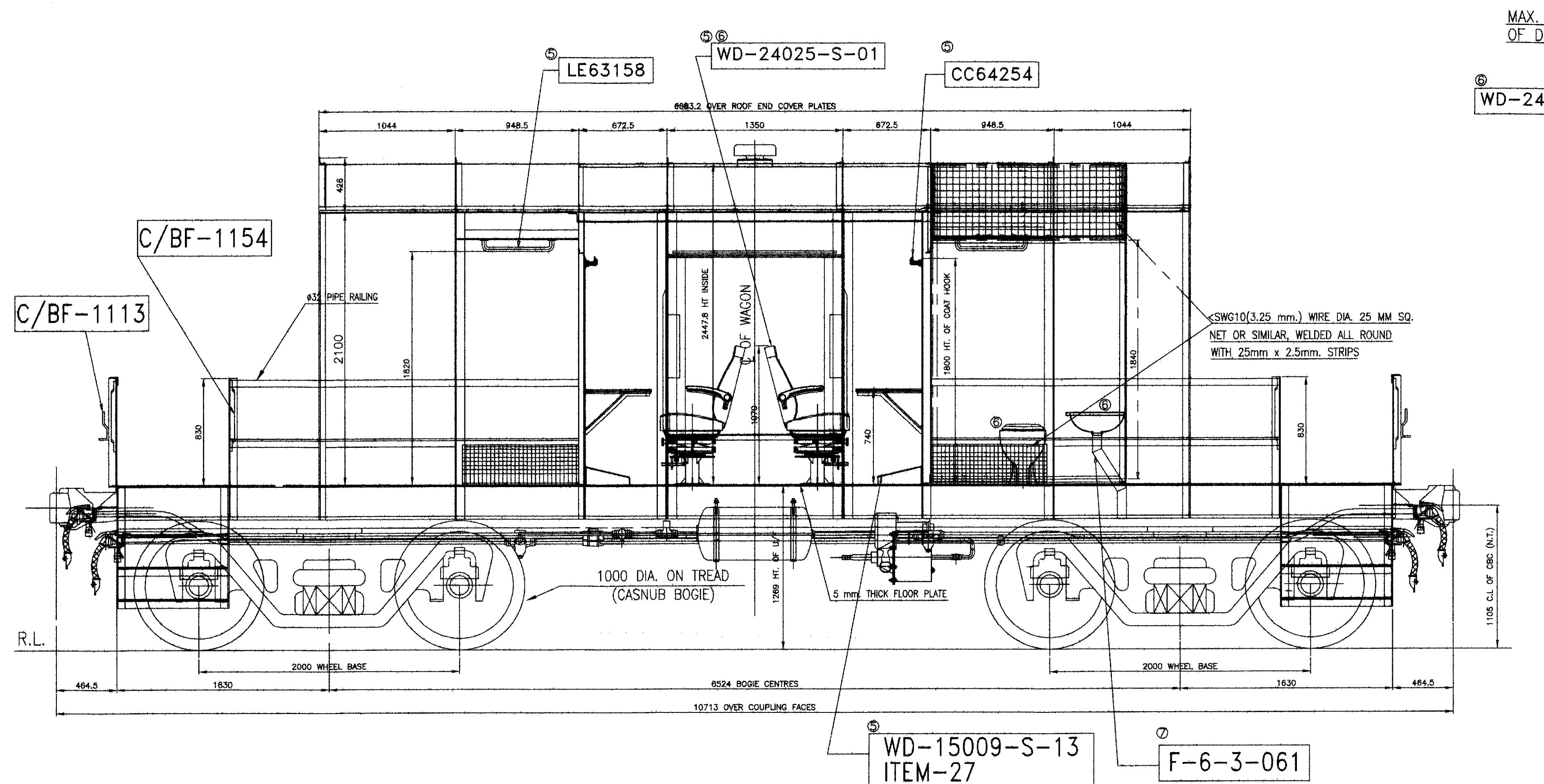
D.A: As above

(संजय कुमार)
निदेशक / माल डिब्बा- ।।।

Copy to:

- EDME (Frt.), Railway Board, Rail Bhawan, New Delhi for information.
- ED/QAM/Delhi, Mumbai & Kolkata for information & n/a.



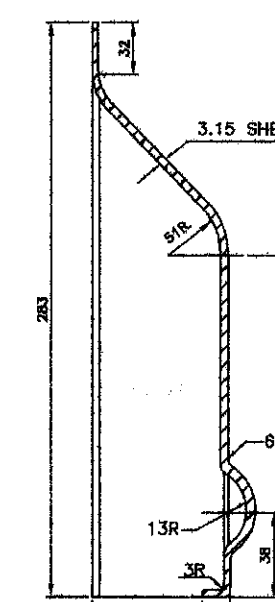
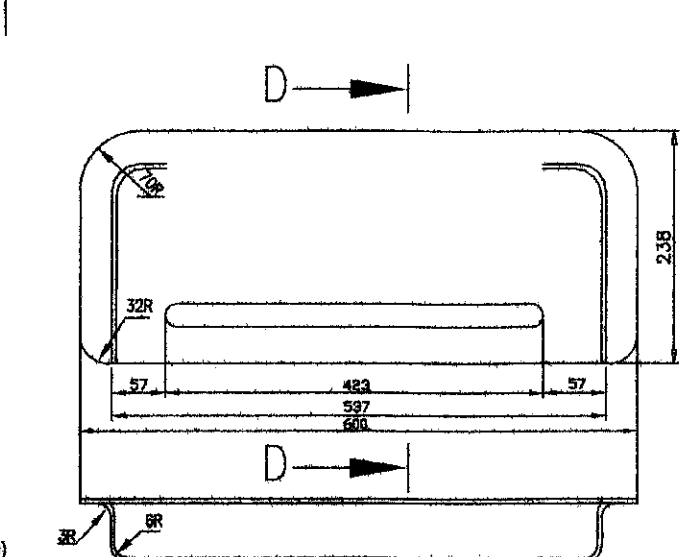
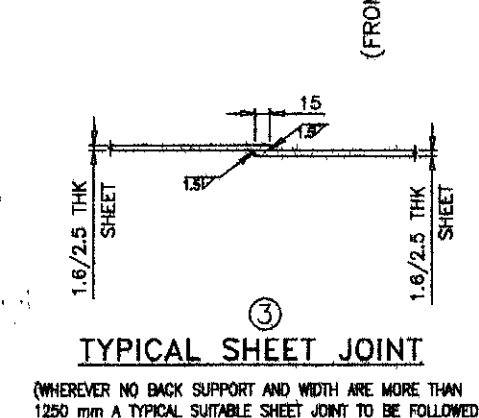
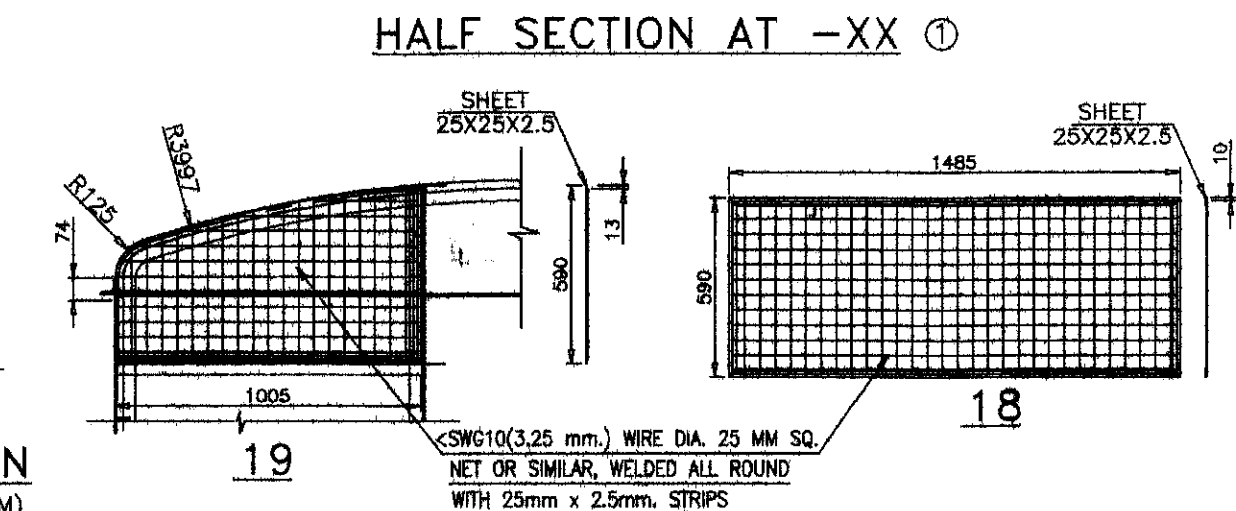
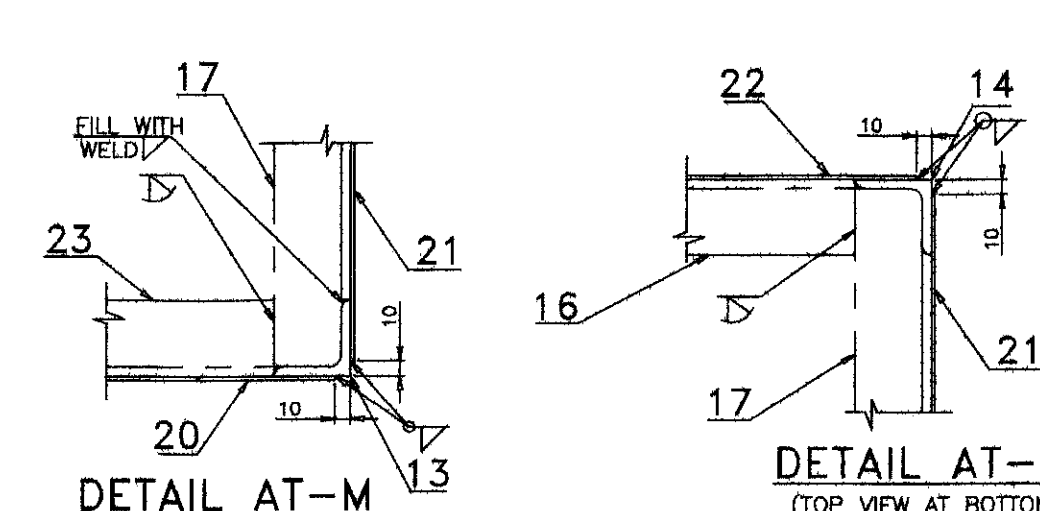
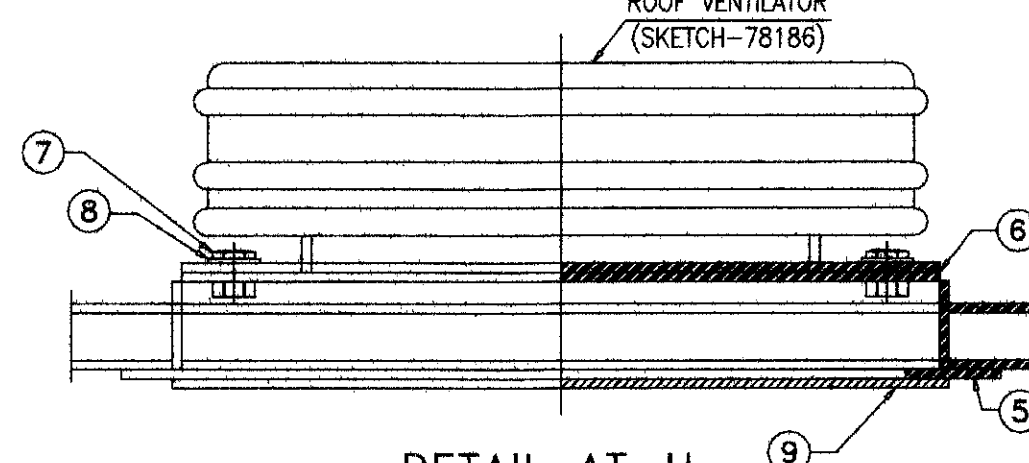
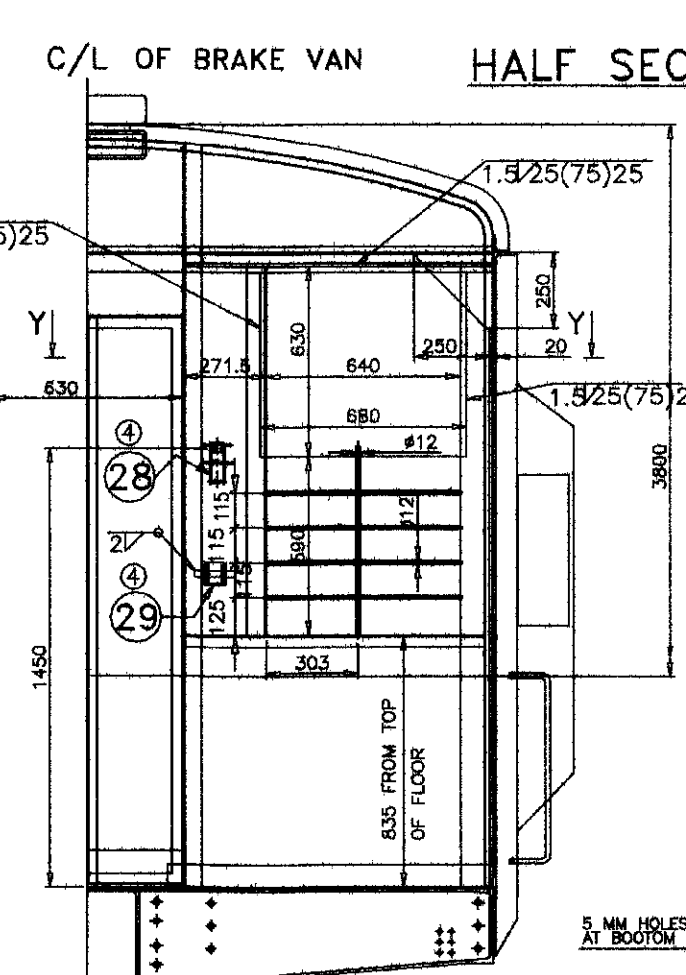
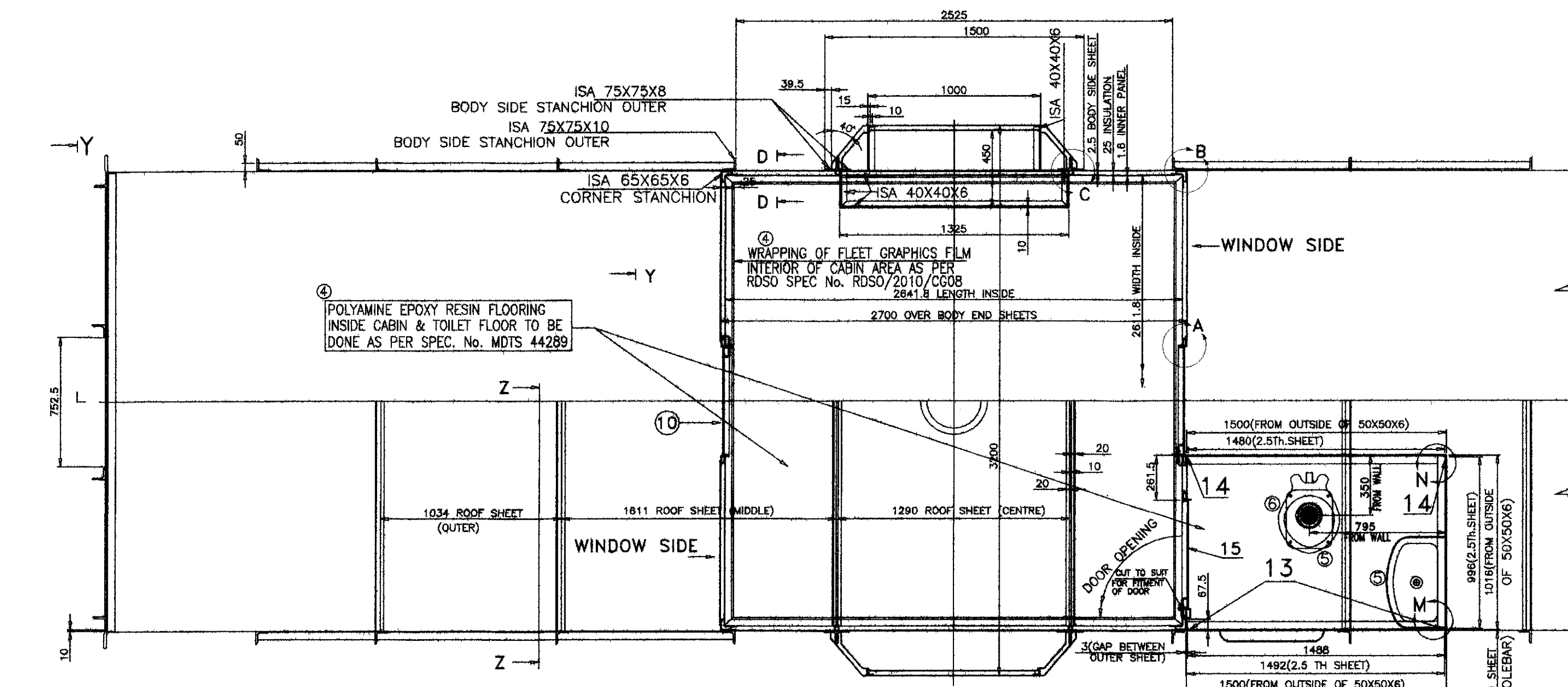
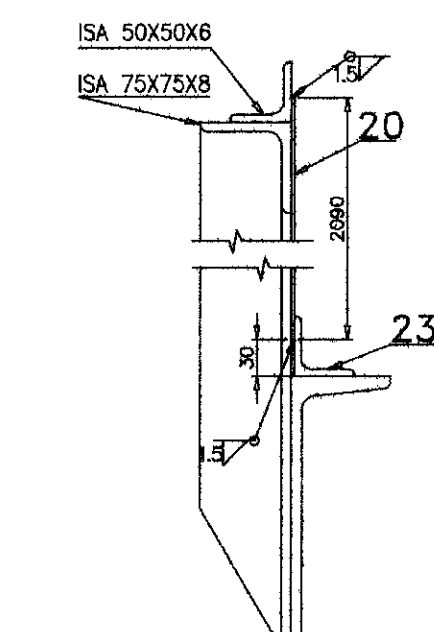
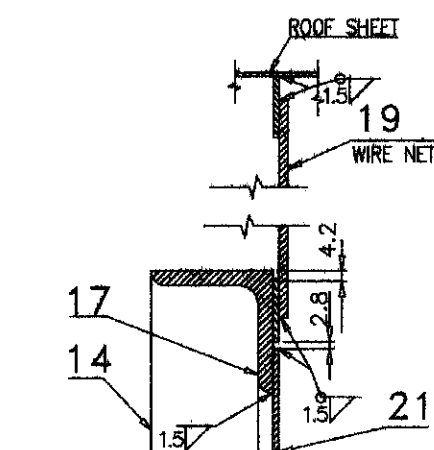
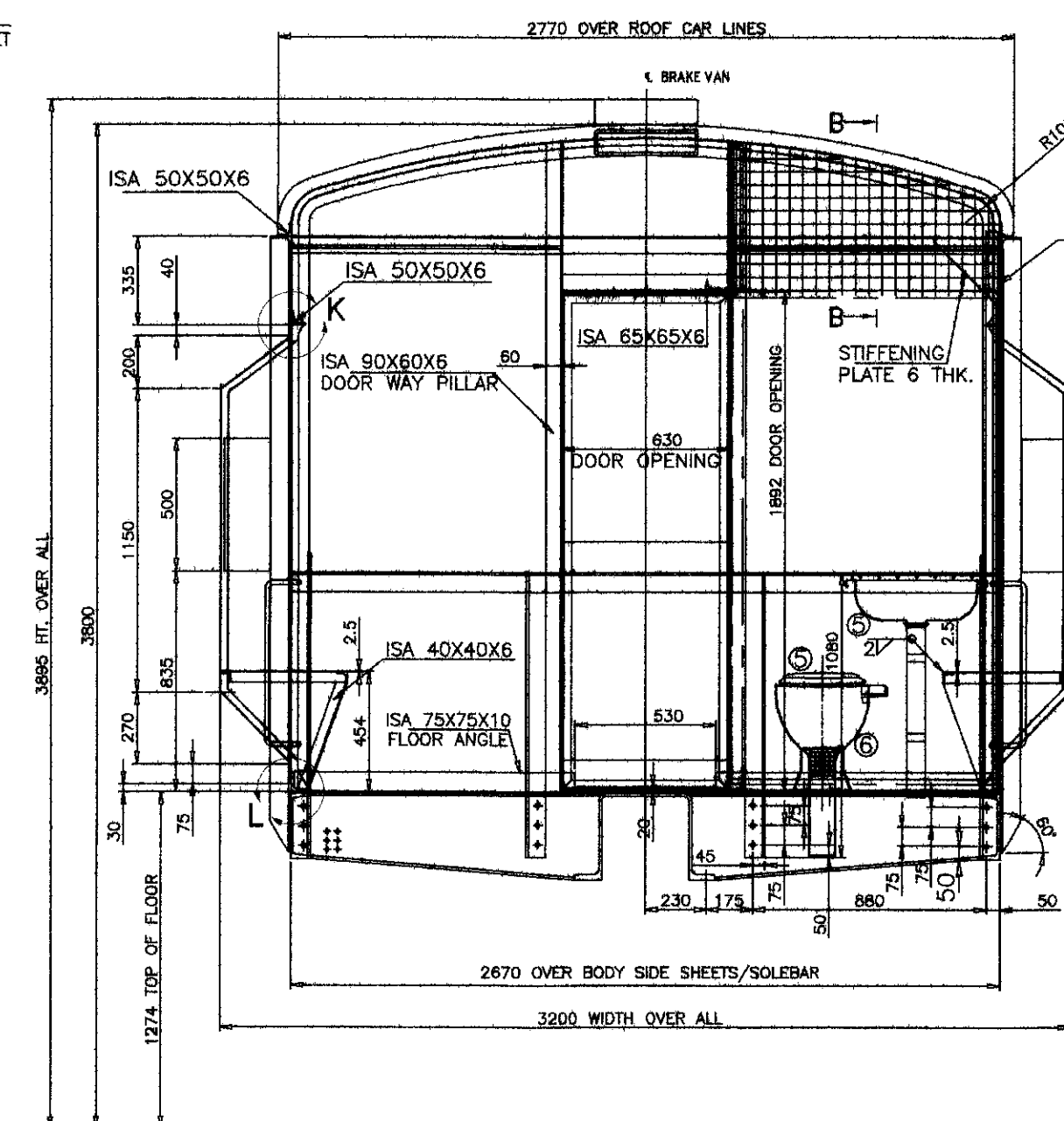
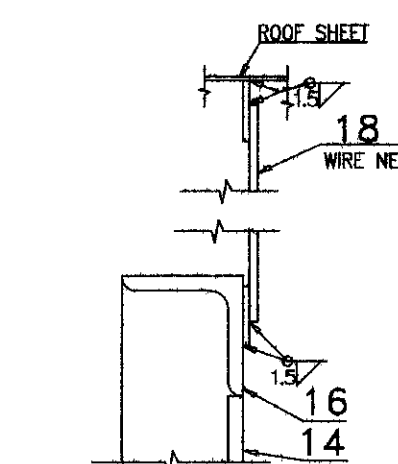
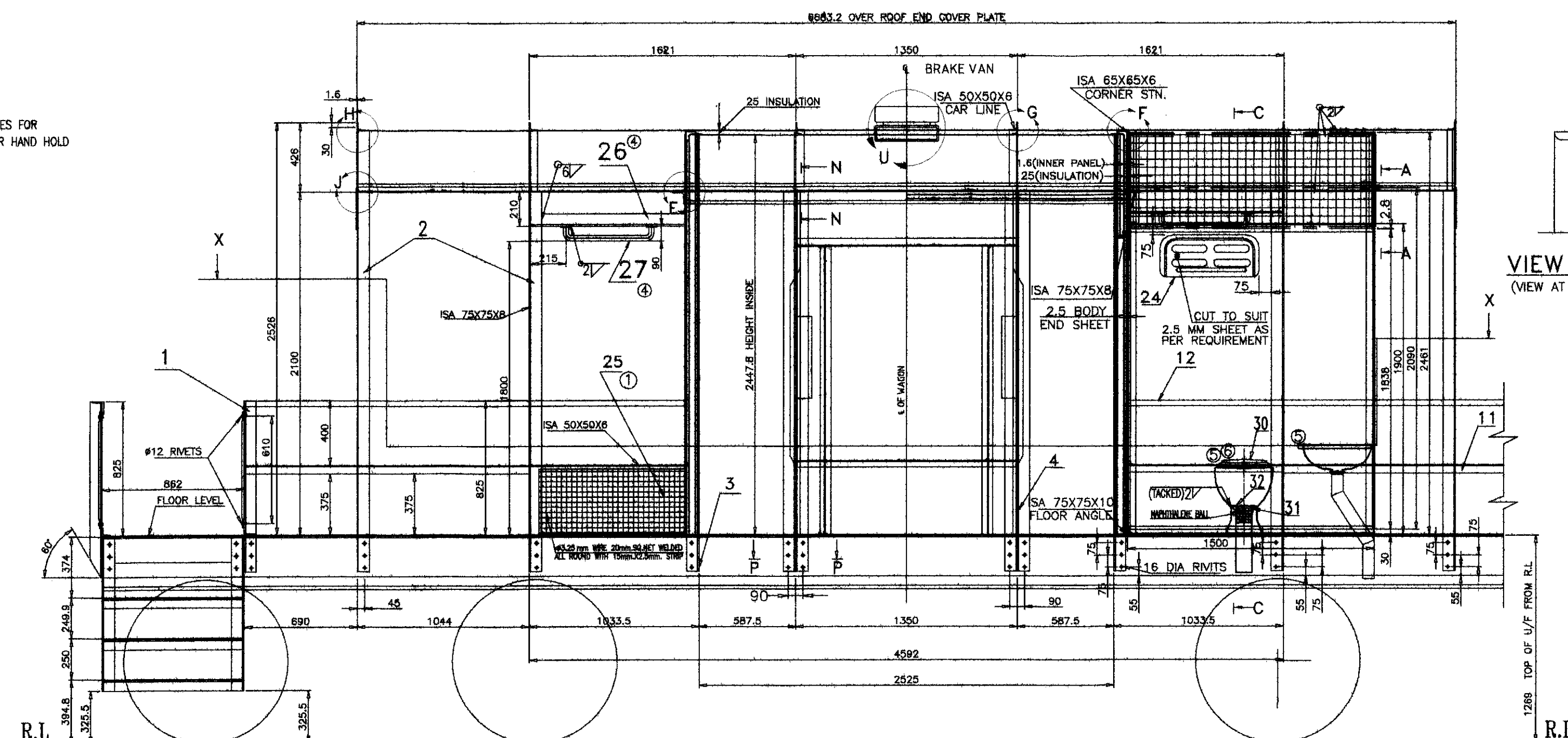
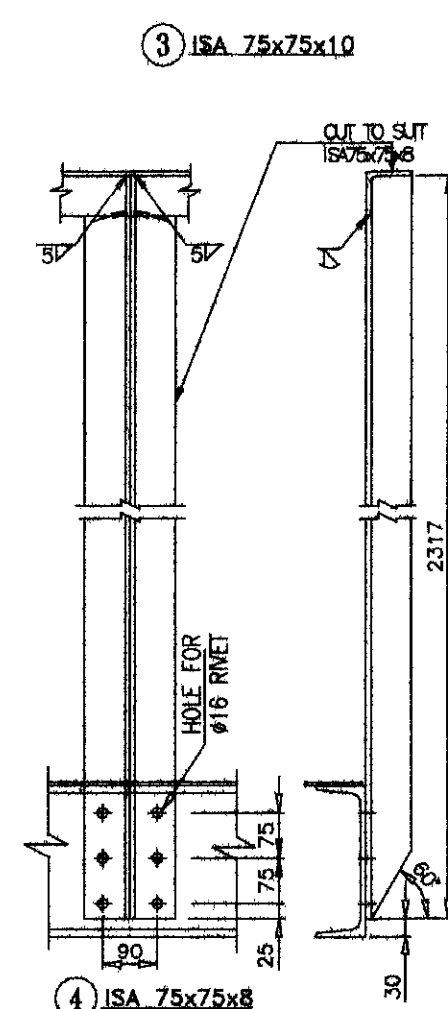


NOTE:-


1. THE WAGON SHALL BE FITTED WITH:
 - 1.1 TWIN PIPE GRADUATED RELEASE AIR BRAKE EQUIPMENT TO RDSO SPECIFICATION No. 02-ABR-2002 (LATEST REVISION & AMENDMENT) AND AIR BRAKE PIPE & PIPE JOINTS TO RDSO SPECIFICATION No. 04-ABR-2002 (LATEST REVISION & AMENDMENT).
 - 1.2 AUTOMATIC HIGH TENSILE CENTER BUFFER COUPLER OF KNUCKLE TYPE TO RDSO STR No. 70-BD-10 (LATEST REVISION & AMENDMENT) AND DRAFT GEAR TO RDSO STR No. 49-BD-08 (LATEST REVISION & AMENDMENT).
 - 1.3 CASNUB 22HS(MODIFIED) BOGIE TO RDSO SPECIFICATION No. WD-17 CASNUB 22HS BOGIE-92 (LATEST REVISION & AMENDMENT) . CONFORMING TO BOGIE INDEX DRG. No. WD-17013-S-01 AND BOGIE GENERAL ARRANGEMENT DRG. No. WD-17013-S-02.
2. FOR INTERIOR FITTING REFER DRG. NO. WD-15009-S-13
3. WHEREVER RIVETS ARE USED, ALTERNATIVELY SUITABLE SIZE WITH ACTUAL GRIP LENGTH LOCK BOLTS MAY BE USED IN LIEU OF RIVETS.

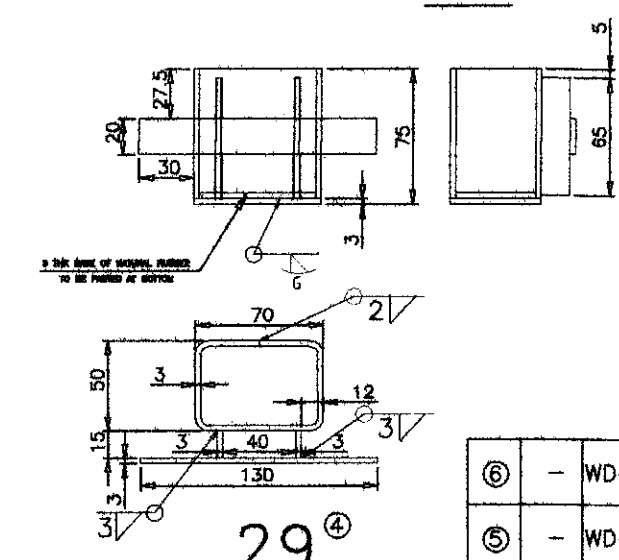
ALT	ITEM	AUTHY	DESCRIPTION	DATE	ASSEMBLY DRAWING
⑦	WD-24086		REFERENCE DRAWING NO. OF CHUTE COMPLETE FOR WASH BASIN OUTLET PIPE ADDED	09/24	
⑧	WD-24050		CHAR. CHAMKODE REFERENCE DRAWING MODIFIED/UNIVERSAL LOCK REF. ADDED & VIEW MODIFIED/VIEW OF WASH BASIN ADDED.	08/24	
⑤	WD-24056		CHMR/HANDHOLD/COAT HOOK CHANGED AND FOOTREST ADDED	06/24	
④	WD-20061		NOTE- 3 ADDED	12/20	
③	WD-18038		NOTE- 1.1, 1.2 & 1.3 MODIFIED	05/18	
②	WD-17060		NOTE 1.2 MODIFIED	10/17	
①	WD-17059		NOTE 1.2 MODIFIED	10/17	

PRELIMINARY SKETCH		ONLY FOR PROTOTYPE APPLICATION UNDER GUIDANCE OF R.D.S.O. (WAGON)	
SUPERSEDED BY	DATE	BOGIE BRAKE VAN TYPE 'BVCM'	
SUPERSEDES	DATE		
SCALE PASSED	DATE		
CHECKED	DATE		
DRAWN	DATE		
TRACED	DATE		
J.SHEET	DATE		
B.G.	R.D.S.O.	GROUP	WD-17039-S-03
	[W]		




①
NOTE:—

1. FOR BODY & ROOF JOINTS DETAILS REFER DRG. No. SK-75528 (RIVETTED SECTION TREATED AS WELDED ONE)
- 2.1.1 Ø16 RIVETS SHOWN AS:  , ALTERNATIVELY SUITABLE SIZE WITH ACTUAL GRIP LENGTH LOCK BOLTS MAY BE USED IN LIEU OF RIVETS.
- 1.2 FOR ITEMS NOS. AT DETAILS 'U' REFER TO DRG. No. WD-15009-S-13
- 1.3 FOR TYPE OF VENTILATOR REFER DRG. No. CSC-1015 ALTERNATIVELY FOR ROOF VENTILATOR RDSO SKETCH-78186 CAN BE USED.
- 1.4 SUITABLE ONE NO. MIRROR AS PER DRG. No.ICF/STD-6-3-008 OR EQUIVALENT, TOWEL HANGER TO DRG. No.ICF/STD-6-3-010 OR EQUIVALENT SOAP DISH DRG. No.ICF/STD-6-3-011 OR EQUIVALENT, WASH BASIN TO DRG. No.ICF/STD-6-3-020 OR EQUIVALENT TO BE PROVIDED AT SUITABLE LOCATION INSIDE TOILET CABIN.
- 1.5 BODY SIDE SHEET (OUTER) TO BE OF 2.5 mm THK , INNER & ROOF SHEETS TO BE OF 1.6 mm THK OF IS:1079 Gr.HR-1/IS:2062 E250 Cu TO BE USED WHERE EVER IT IS NOT MENTIONED IN DRG.
- 1.6 SUITABLE COMMODO WITH CHUTE TO BE PROVIDED BY TAKING CARE OF ANY INFRINGEMENT .
- 1.7 INSIDE CABIN FLOOR TO BE COATED WITH POLYAMINE EPOXY RESIN AS PER RCF SPEC. No. MDTs 44289.
- 1.8 INTERIOR OF CABIN TO BE WRAPPED WITH FLEET GRAPHICS FILM AS PER RDSO SPEC. No. RDSO/2010/CG08.
- 1.9 COMMODO TO DRG. No.ICF/STD-6-3-025 WITH SUITABLE CHUTE TO BE PROVIDED BY TAKING CARE OF ANY INFRINGEMENT .

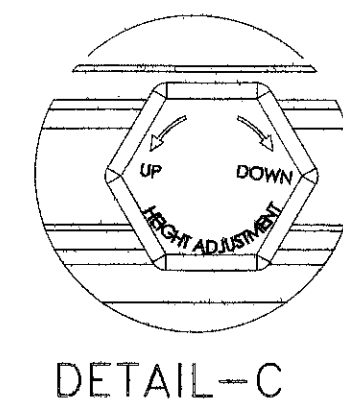
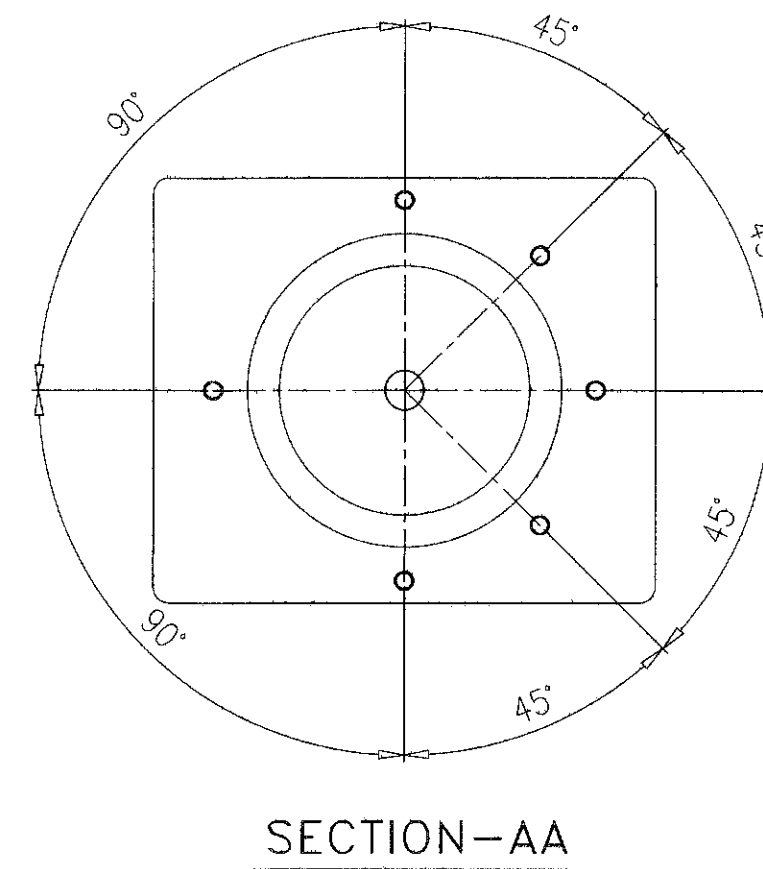


⑥	-	WD-24086	PLUFF FOR WATERLESS URINAL, SHUTT RUB AND WATERLESS URINAL, SHUTT RUB IN DESCRIPTION. TABLE & SS SHUTT RUB DETAIL ADDED.	09/24
⑤	-	WD-24056	COMMODE VAPOR & LOCATION MODIFIED AND WASH BASIN VAPOR ADDED	08/24
④	-	WD-24055	SUPPORT ANGLE, GRAB HANDLING, BOTTLE, WALKER, PALCE, HOLDUP-GRAB HANDLING & EPOXY FLOORING ADDED	06/24
③	-	WD-22026	TYPICAL SHEET JOINT ADDED	03/22
②	-	WD-20061	NOTE 1.1 MODIFIED	12/20
①	-	WD-18002	ITEM 2-63, WALL SECTION AT TOILETRY REFLECTED 10/25-2004, NOTE MODIFIED.	01/18
ALT	ITEM	ALT/ITEM	DESCRIPTION	DATE
				ASSEMBLY DRAWING

32	PUFF FOR WATERLESS URINAL	1	—		
33	SS SHEET TUB FOR MANTHRALE DRAIN	1	—		
34	WATERLESS WASHX URINAL	1	—		
35	WALKIE-TALKIE HOLDER	2			MOVING TO 1F 12/25-2-25
36	BOTTLE HOLDER	2	AB64134		PL. NO. 0119229
37	GRAB HANDLE	3	LE 6058 100		
38	SUPPORT ANGLE ISA 76X57X10	3		IS-2062:2011 E250 A	
39	NET FRAME WITH STRIP	3			
40	24 SIDE VENTILATOR (LOUVER)	1			
41	BASE HORIZONTAL ANGLE AT SOLEAR SIBT (SA 50X50X6, L=1468)	1			
42	QUITEY SHEET AT SOLEAR SIBT CENTRE (149X2183BX2.5 THK)	1		IS-2062:2011 E250 WITH CU	
43	QUITEY SHEET AT SOLEAR SIBT (96X183BX2.5 THK)	1		" "	
44	QUITEY SHEET AT SOLEAR SIBT (149X2183BX2.5 THK)	1		" "	
45	NET FRAME WITH STRIP (WAGON END SIBT)	1		" "	
46	NET FRAME WITH NET (WAGON CENTER SIBT)	1		" "	
47	BASE HORIZONTAL ANGLE AT ENDHSGR HORIZONTAL ANGLE	2		" "	
48	BASE HORIZONTAL ANGLE AT WAGON CENTER (149X2183BX2.5 THK)	1		IS-2062:2011 E250 WITH CU	
49	DOOR BATHROOM	1	HD-1500B-5-13 100-12		
50	SUPPORT ANGLE AT WAGON CENTER (SA 50X50X6, L=2481)	2		IS-2062:2011 E250 A WITH CU	
51	SUPPORT ANGLE AT SOLEAR SIBT (SA 50X50X6, L=1474)	2		" "	
52	SS RAILING PFE #32 (L=2882)	4		SS-1234 (NEW BUT)	
53	RAILING HORIZONTAL ANGLE SA 50X50X6 (L=2882)	2		SS-2021-2011 E250 A WITH CU	
54	DOOR COMPLETE	2	HD-1500B-5-13		
55	CLOSING PLATE	1	HD-1500B-5-13		
56	SPRING WASHER ME (FOR ITEM-7)	8	HD-1500B-5-13		
57	HEX HEAD SCREW M6X15 (FOR ITEM-5)	8	HD-1500B-5-13		
58	PACKING RING FOR VENTILATOR	1	HD-1500B-5-13 ITEM-18		
59	VENTILATOR MOUNTING CAP FOR 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
60	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
61	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
62	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
63	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
64	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
65	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
66	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
67	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
68	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
69	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
70	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
71	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
72	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
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88	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
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90	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
91	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
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95	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
96	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
97	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
98	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
99	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	
100	BOV 25X 75X75X8 (L=2031)	8		SS-1234 E250 A WITH CU	

ITEM	DESCRIPTION	REF. DRGS.	DATE	INITIALS	SPEC. MARKS
					ONLY FOR PROTOTYPE
					APPLICATION
					UNDER GUIDANCE OF R.D.S.O. (WAGON)
<div>  PRELIMINARY SKETCH </div>					
<div> <div>SUPPOSED BY</div> <div>SUPERDESIGNER</div> <div>DATE</div> </div>					
<div> <div>SCALE</div> <div>PASSED</div> <div>DATE</div> </div>					
125	CHECKED BY	06/17			
	DRAWN BY	06/17			
	TRACED BY	06/17			
	SHEET NO	06/17			
<div> <div>B.G.</div> <div>R.D.S.O.</div> <div>GROUP</div> </div>					
<div> <div>WD-17039-S-06</div> </div>					

TOLERANCE TO BE FOLLOWED AS PER IS: 2102 C COARSE CLASS

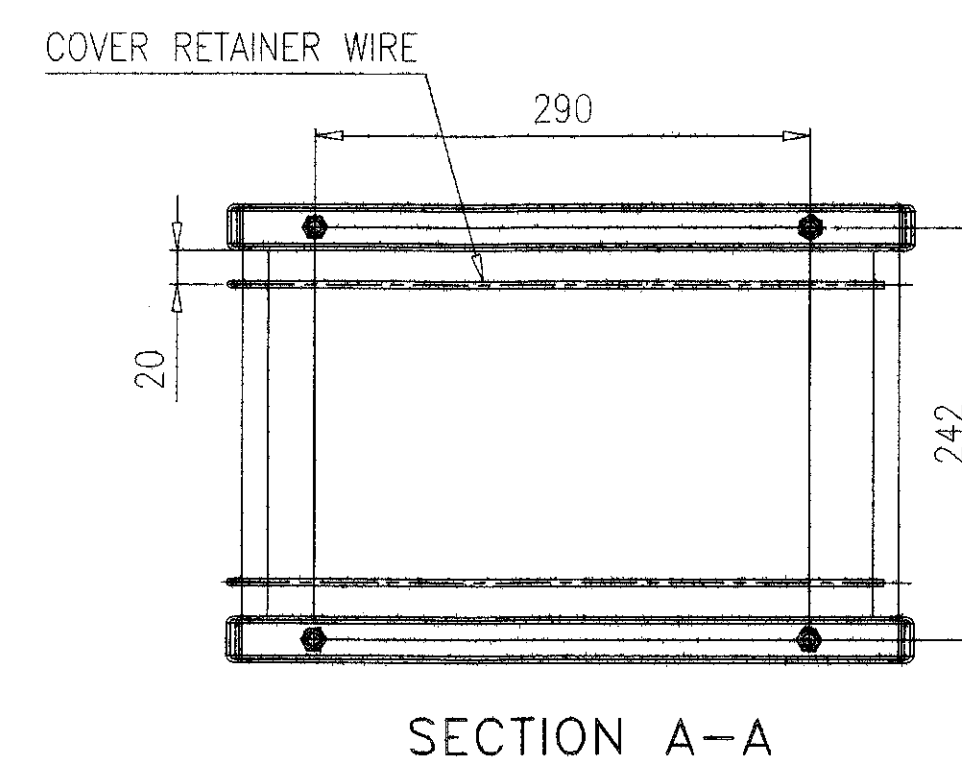
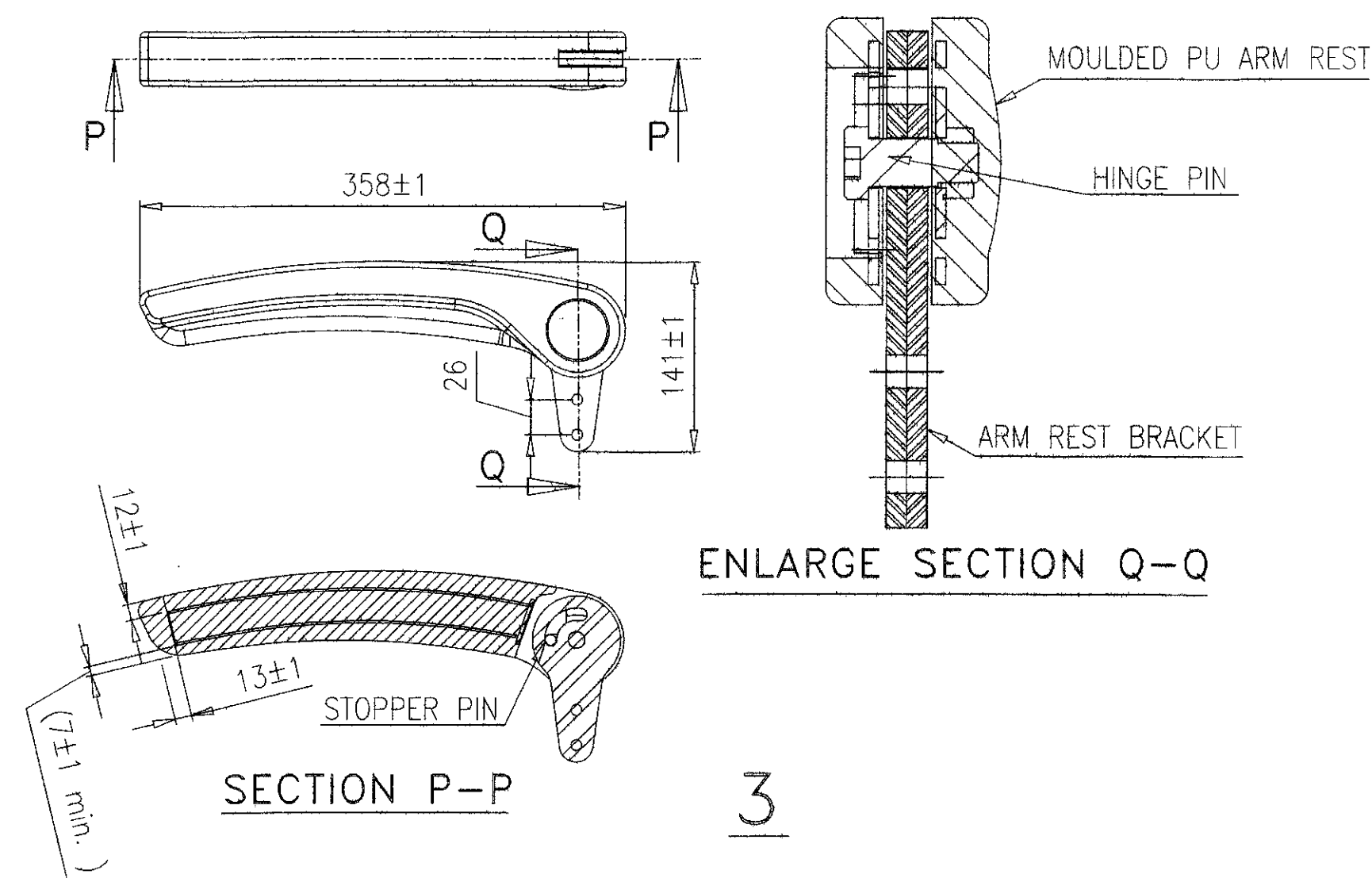
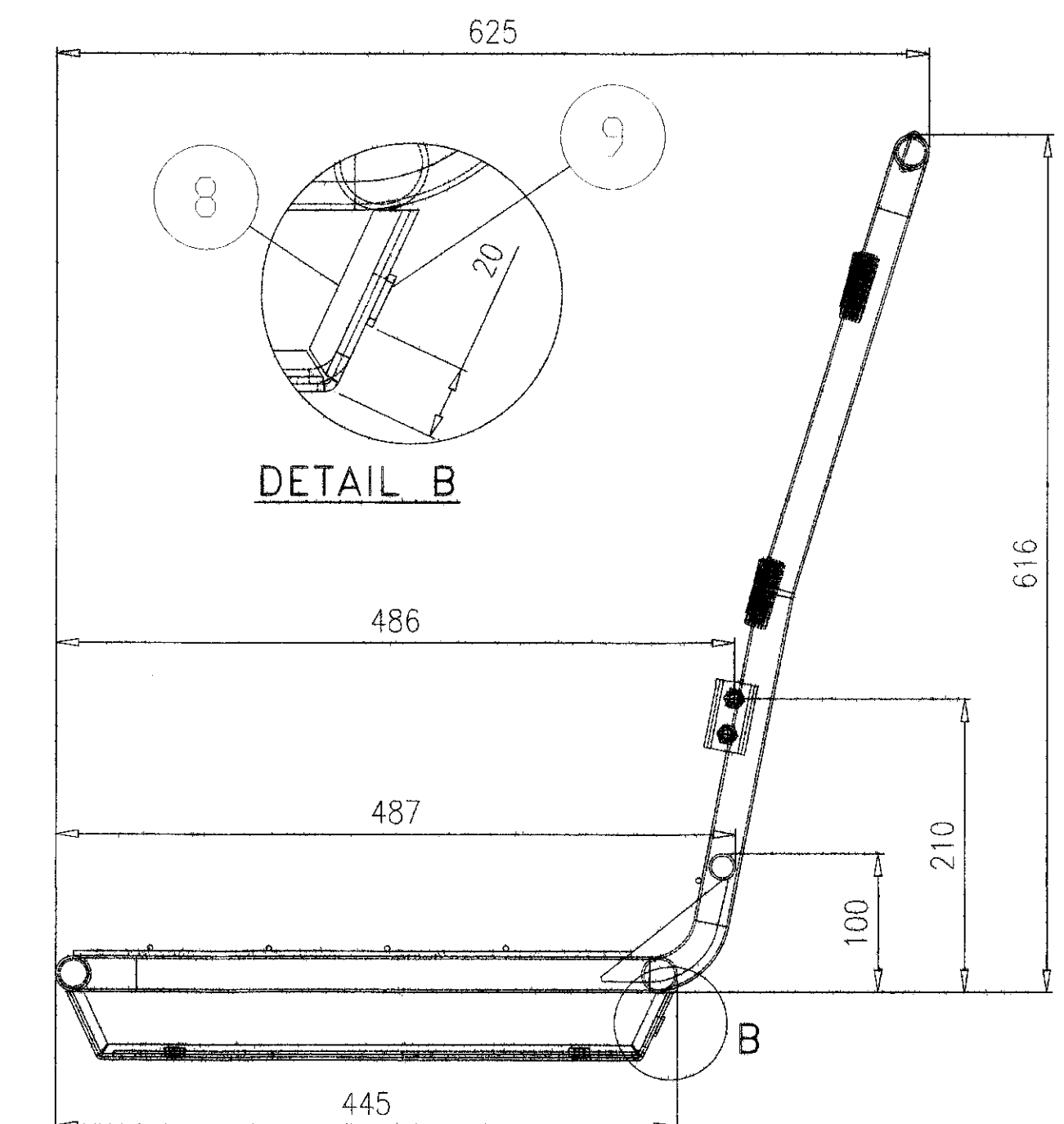
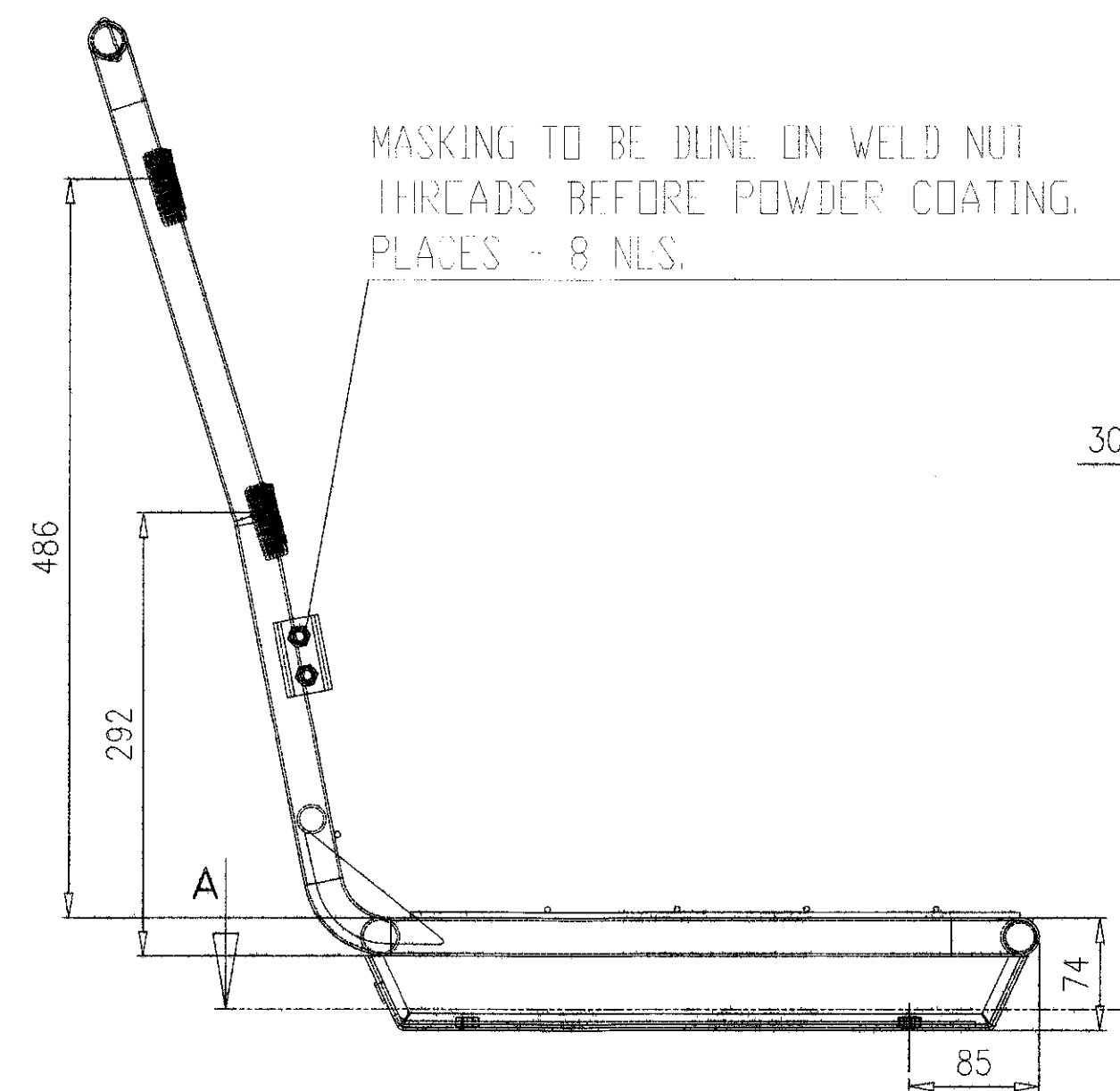
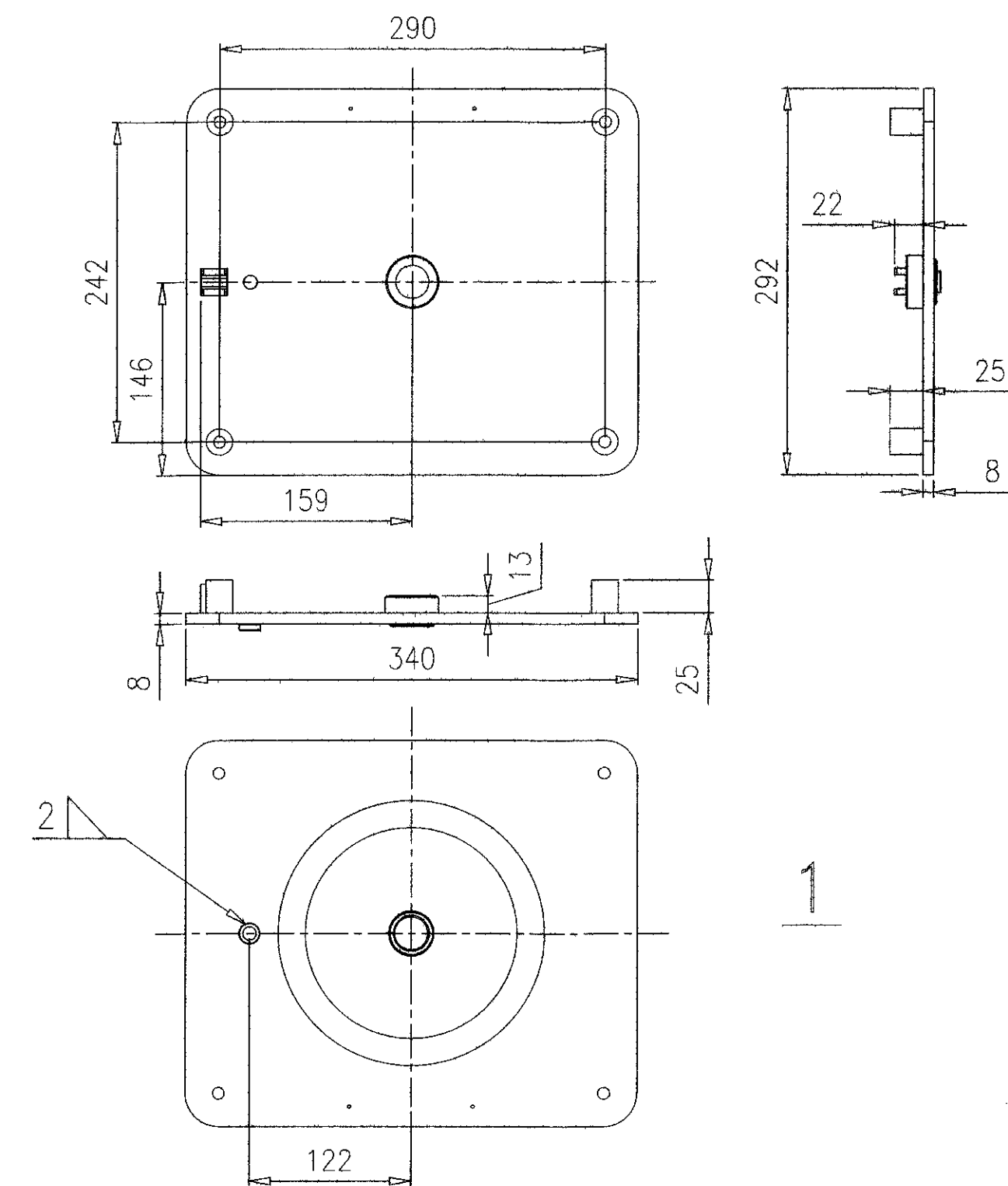


7	ARM REST	2	WD-24025-S-1A (SH-2 IT.3)			
6	SEAT WITH BACKREST	1	WD-24025-S-1A (SH-2 IT.2)			
5	HEIGHT ADJUSTMENT KNOB	1	-			
4	LEVER FOR ROTATION	1	-			
3	BEARING PLATE UPPER	1	WD-24025-S-1A (SH-2 IT.1)			
2	BEARING PLATE LOWER	1	-			
1	BASE PLATE (8 THK)	1	-			IS:2062 E250 Gr-A
ITEM	DESCRIPTION & DIMENSION	NO. OFF PER SEAT	REFERENCE DRG.	Wt. OFF	MTL. & SPEC	REMARKS
SUPERSEDED BY			GOODS BRAKE VAN TYPE 'BVZC'/'BVZI'/'BVCM			
SUPERSEDES		DATE				
SCALE	PASSED	08/24	<div style="text-align: center;"> <h1>GUARD'S SEAT FOR GOODS BRAKE VAN</h1> <p>(SHEET- 1 OF 2)</p> </div>			
	CHECKED	8/24				
	DRAWN	J.AHMAD 3/24				
	TRACED	— —				
	COMPARED	— —				
	J.S.NO.	WD-24025 3/24				
B.G.		R.D.S.O.	GROUP	WD-24025-S-01		
		[W]				

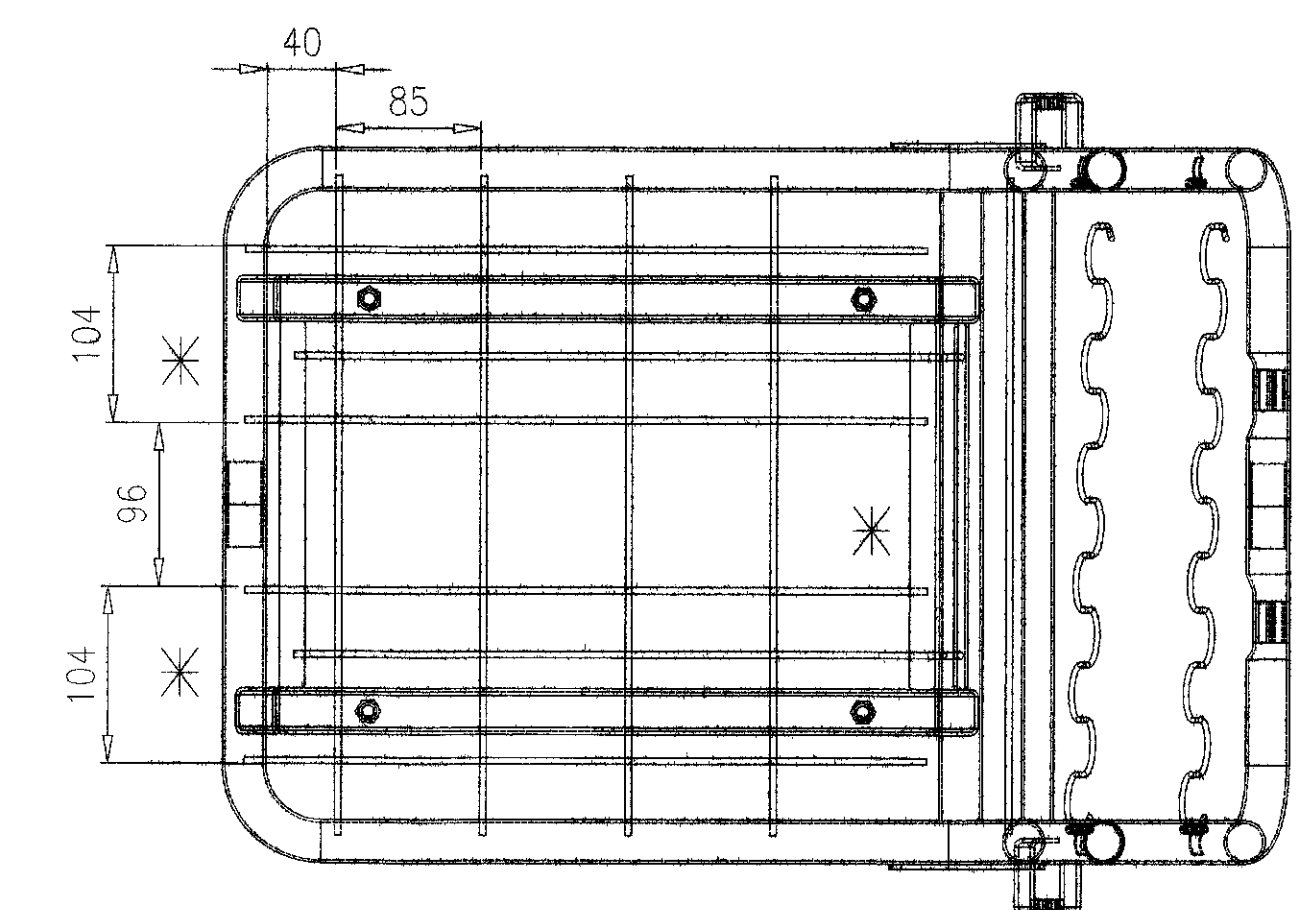
ALT.	ITEM	AUTHY.	DESCRIPTION	DATE
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POWDER COATING DETAILS:
 COLOUR : RAL 9005 (Matt black)
 THICKNESS : 60 – 100 μ m
 GLOSS : 30 \pm 15 GU AT 60°

TOLERANCE TO BE FOLLOWED AS PER IS: 2102 C COARSE CLASS



2

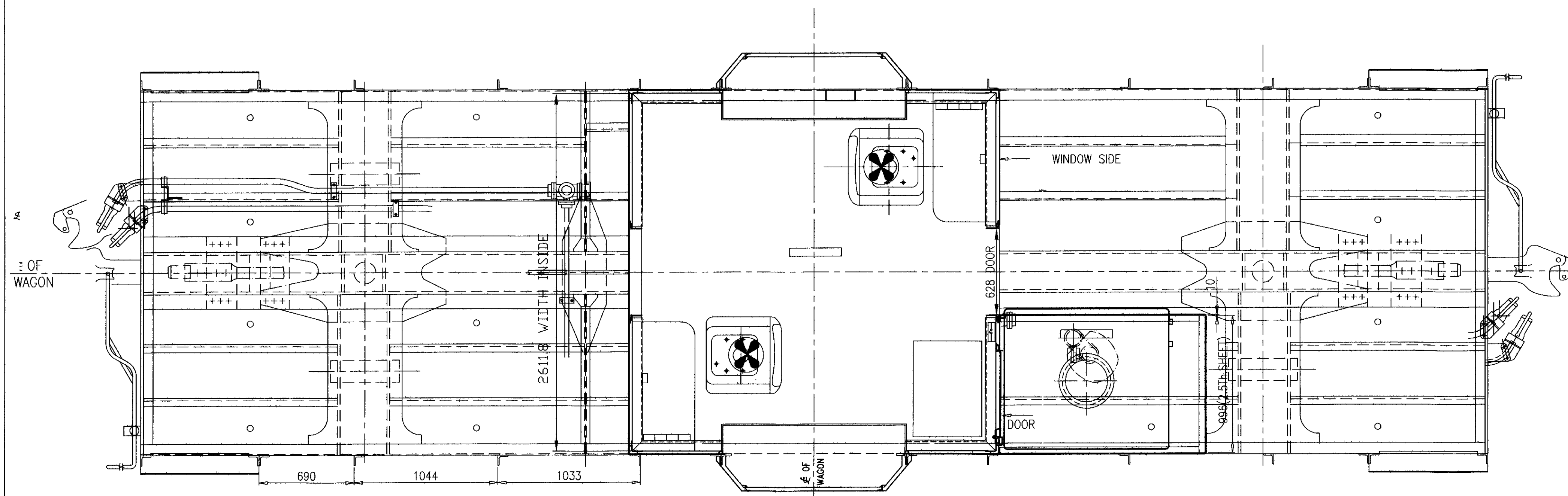
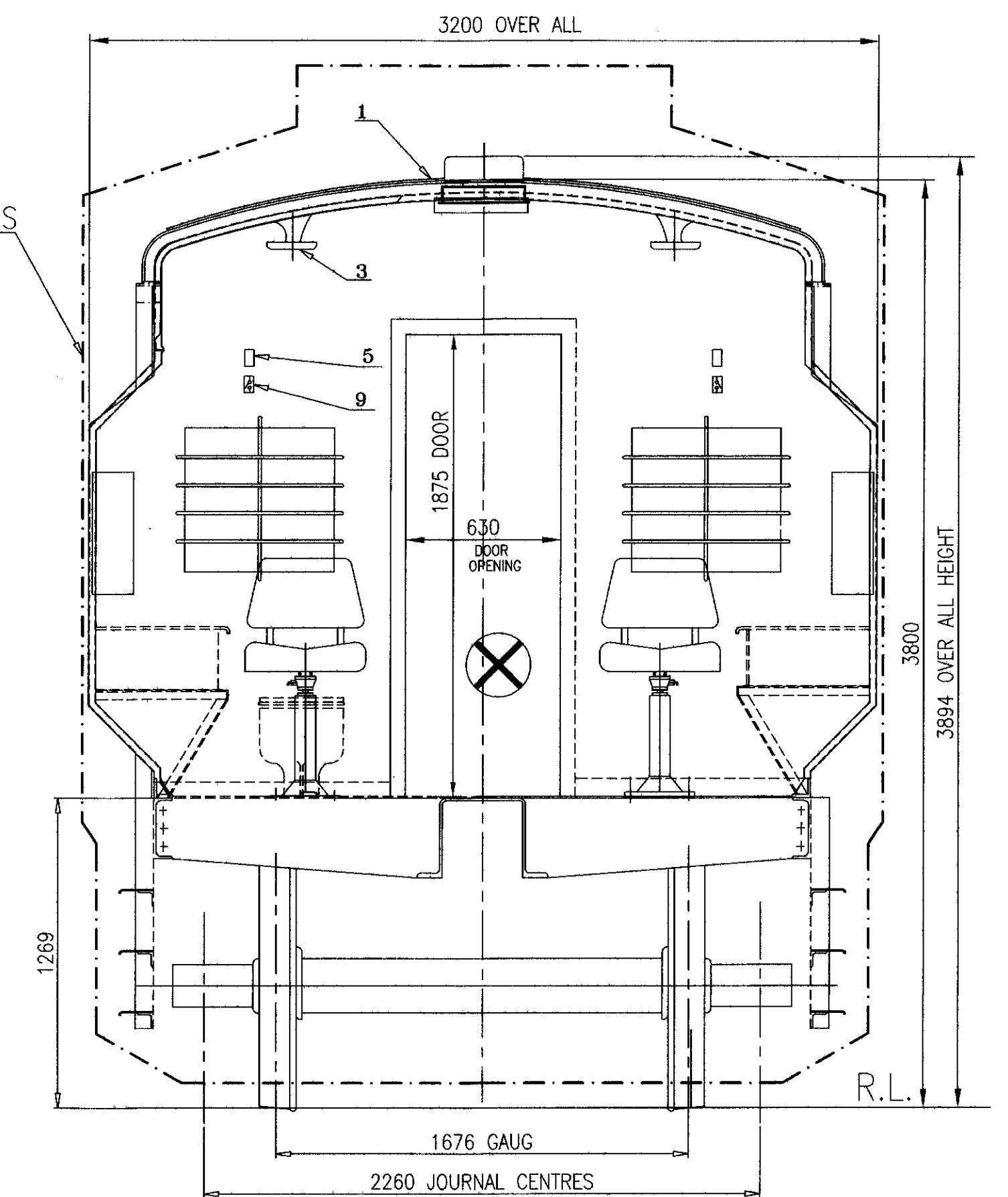
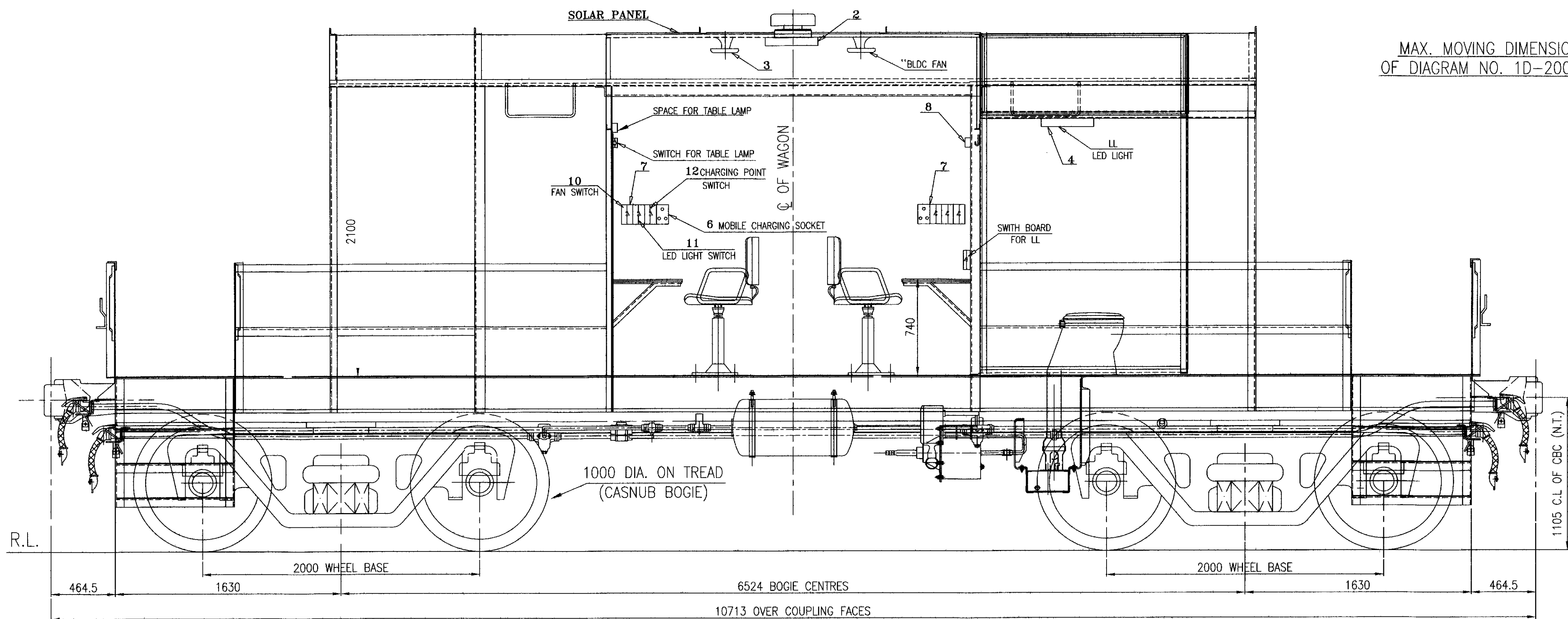


* MARKED DRAIN HOLE 6-NOS. Ø 6.5

REMARKS: ONLY PROFILE & CONTROLLING DIMENSIONS ARE SHOWN. ALL DIMENSIONS ARE IN MM.

3	ARM REST	2					
2	SEAT WITH BACKREST	1					
1	BEARING PLATE UPPER	1					
ITEM	DESCRIPTION & DIMENSION	NO. OFF PER SEAT	REFERENCE DRG.	WT. OFF	MTL. & SPEC.	REMARKS	
SUPERSEDED BY			GOODS BRAKE VAN TYPE 'BVZC'/'BVZI'/'BVCM				
SUPERSEDES			DATE				
SCALE PASSED			08/24				
CHECKED			08/24				
DRAWN			J.AHMAD 3/24				
TRACED			---				
COMPARED			---				
J.S.NO.			WD-24025 3/24				
B.G.			R.D.S.O. [W]			GROUP	
						WD-24025-S-01	

ALT.	ITEM	AUTHY.	DESCRIPTION	DATE
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12	SWITCH FOR MOBILE CHARGING	2	WD-24050-S-07 (SHEET-II)				
11	SWITCH FOR LED COMPARTMENT LIGHT	2	WD-24050-S-07 (SHEET-II)				
10	SWITCH FOR FAN	2	WD-24050-S-07 (SHEET-II)				
9	SWITCH FOR TABLE LAMP	2	WD-24050-S-07 (SHEET-II)				
8	SWITCH FOR LAVATORY LIGHT	1	WD-24050-S-07 (SHEET-II)				
7	SWITCH MAIN BOARD	2	WD-24050-S-07 (SHEET-II)				
6	MOBILE CHARGING SOCKET	2	WD-24050-S-07 (SHEET-II)				
5	TABLE LAMP	2	WD-24050-S-07 (SHEET-II)				
4	LAVATORY LIGHT	1	WD-24050-S-07 (SHEET-II)				
3	FAN (FIXED 400mm SWEEP)	2	WD-24050-S-07 (SHEET-II)				
2	LED COMPARTMENT LIGHT	2	WD-24050-S-07 (SHEET-II)				
1	SOLAR PANEL	1	WD-24050-S-07 (SHEET-II)				
ITEM	DESCRIPTION	NO. OF WAGON	REF. DRGS.	WT. OF ONE (kg)	MATL.	SPEC.	REMARKS

ONLY FOR PROTOTYPE APPLICATION UNDER GUIDANCE OF R.D.S.O. (WAGON)

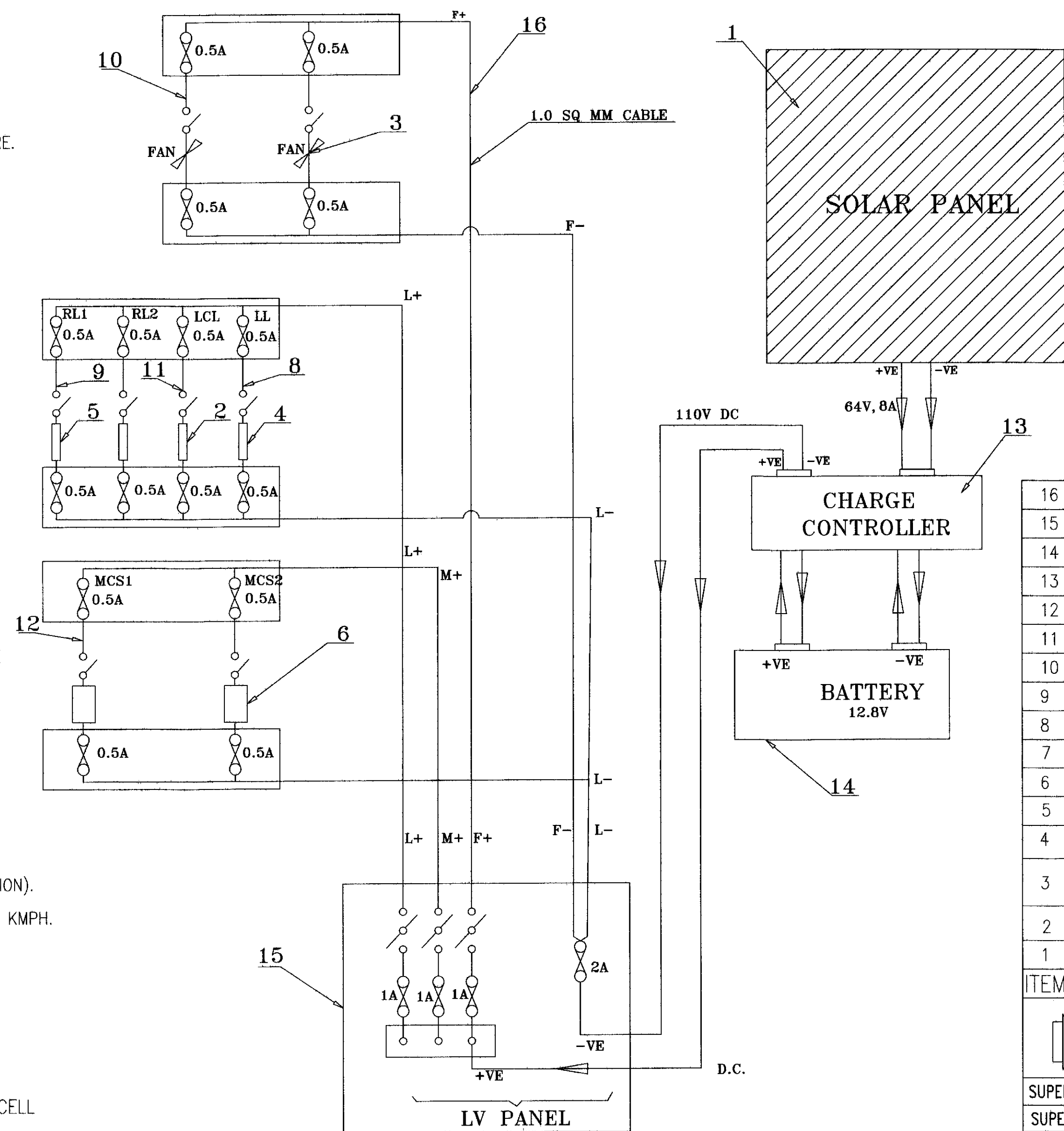
PRELIMINARY SKETCH		BOGIE BRAKE VAN TYPE 'BVCM'	
SUPERSEDED BY	DATE	FITMENT OF SOLAR SYSTEM WITH LIGHT & FAN	
SUPERSEDES	05/24		
SCALE PASSED	05/24		
CHECKED	05/24		
DRAWN	05/24		
TRACED			
J.SHEET	WD-24050 05/24		
B.G.	R.D.S.O. [W]	GROUP	WD-24050-S-07 (SHEET-I)

ALT ITEM AUTHY DESCRIPTION DATE ASSEMBLY DRAWING

NOTE:-

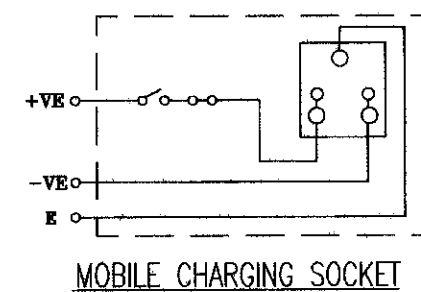
1. FLEXIBLE SOLAR PHOTO VOLTAIC (SPV) MODULE SHALL BE OF POLYCRYSTALLINE CELL WITH ETHYLENE TETRA FLOURO ETHYLENE AS TOP LAYER WITH MINIMUM PEAK WATTAGE W_p OF 500W AND ATLEAST 9 BYPASS DIODES.
2. FLEXIBLE PV MODULE SHALL BE HIGHLY RELIABLE, FLEXIBLE AND LIGHT WEIGHT AND HAVE SERVICE LIFE OF MORE THAN 25 YEARS.
3. FLEXIBLE SPV MODULE SHALL BE POTENTIAL INDUCED DEGRADATION (PID) RESISTANT AND TESTED FOR PID AS PER IEC 62804.
4. FLEXIBLE SPV MODULE MUST QUALIFY SALT MIST CORROSION TESTING AS PER IEC 61701.
5. CONVERSION EFFICIENCY OF SPV MODULE SHALL NOT LESS THAN 15% AND FILL FACTOR SHALL NOT BE LESS THAN 72%.
6. FLEXIBLE SPV SHALL BE FIXED WITHOUT PIERCING ROOF AND CAPABLE OF WITHSTANDING BODY VIBRATION THERMAL VARIATION OF WAGON
7. SPV ENCAPSULATION SHALL BE COMPATIBLE WITH THERMAL EXPANSION OF SILICON CELLS AND MOISTURE PROOF.
8. SPV TERMINAL BLOCK SHALL BE IEC 61215 CERTIFIED AND HAVE WATER PROOF DESIGN (MIN. IP65) AND HAVE PROVISION FOR OPENING/REPLACING CABLES.
9. MARKINGS:
 - (i) NAME, MONOGRAM OR SYMBOL OF MANUFACTURER OF SOLAR MODULE
 - (ii) NAME OF THE MANUFACTURER OF SOLAR CELLS
 - (iii) TYPE OR MODEL NUMBER
 - (iv) SERIAL NUMBER
 - (v) POLARITY OF TERMINALS OR LEADS (COLOR CODING IS PERMISSIBLE)
 - (vi) OPEN CIRCUIT VOLTAGE AND OPERATING VOLTAGE
 - (vii) MAXIMUM SYSTEM VOLTAGE FOR WHICH THE MODULE IS SUITABLE.
 - (viii) OPERATING CURRENT AND SHORT CIRCUIT CURRENT
 - (ix) DATE AND PLACE OF MANUFACTURE
 - (x) WEIGHT OF THE MODULE
 - (xi) MODULE W_p AND TOLERANCE
10. FOR BATTERY BANK LITHIUM FERRO PHOSPHATE BATTERY SHALL BE USED WITH MINIMUM CAPACITY OF 12.8V/110Ah
11. BATTERY SHOULD BE FREE FROM FIRE HAZARD AND SEALED IN SUITABLE CASING.
12. OPERATING CONDITION OF BATTERY BANK AS PER IEC 62133-2:2017/IS 16046 AND SHALL WITHSTAND VIBRATION AND SHOCKS AS PER IEC 61373.
13. BATTERY BANK MUST HAVE MORE THAN 3000 CHARGE CYCLES AT 90% DEPTH OF DISCHARGE.
14. BATTERY MANAGEMENT SYSTEM (BMS):
 - (i) BMS SHOULD BE ABLE TO MONITOR PARAMETER LIKE VOLTAGE, CURRENT, TEMPERATURE, ETC. OF BATTERY BANK
 - (ii) BMS SHOULD HAVE PROTECTION LIKE OVER VOLTAGE, UNDER VOLTAGE, SHORT CIRCUIT, REVERSE POLARITY AND OVER TEMPERATURE.
 - (iii) BMS SHOULD BE SYCRONIZED WITH CHARGE CONTROLLER UNIT AND SHOULD BE CAPABLE OF CELL BALANCING.
15. BATTERY PACK ALONG WITH OTHER ACCESSORIES SHOULD BE KEPT IN ANTI PILFERAGE DEVICE WITH LOCKING MECHANISM
16. MAXIMUM POWER POINT TRACKING (MPPT) SOLAR CHARGE CONTROLLER UNIT (CCU) SHALL BE PROVIDED BETWEEN SOLAR ARRAY, DC LOADS AND LITHIUM FERRO PHOSPHATE BATTERY.
17. CCU SHOULD HAVE INTEGRATED ENERGY METER, VOLT METER, AMPS METER, DATA LOGGER, GPS TRACKER, GPRS BASED REMOTE MONITORING SYSTEM AND GRAPHICAL USER INTERFACE PROVIDED WITH ADEQUATE PROTECTION.
18. CCU SHALL HAVE 'TEMPERATURE COMPENSATION' FEATURE AND RESET BUTTON TO RESET/REFRESH THE SYSTEM AND OTHER BUTTONS TO OPERATE LCD DISPLAY
19. CCU SHOULD HAVE FOLLOWING LIST OF INDICATIONS THROUGH LEDS/LCD DISPLAYS:
 - (i) CHARGE CONTROLLER ON/OFF
 - (ii) CHARGE CONTROLLER OVER VOLTAGE/UNDER VOLTAGE.
 - (iii) CHARGE CONTROLLER OVER TEMPERATURE.
 - (iv) DISPLAY ON SCREEN AS PV VOLTAGE, PV CURRENT, BATTERY VOLTAGE, BATTERY CURRENT, LOAD VOLTAGE, LOAD CURRENT.
 - (v) SOLAR GENERATION ON DAILY BASIS AND CUMULATIVE.
20. CCU SHOULD HAVE GROUND FAULT DETECTION DEVICE.
21. COMBINED UNIT BOX SHOULD BE MADE OF 1.5MM SS SHEET AND SHOULD ENCLOSE BATTERY, CCU, GPRS/GPS, DATA LOGGER, ETC. THE BOX SHALL BE FIXED WITH SS ANGLES WITH WELDING ALL AROUND TO PREVENT VANDALISM AND PILFERAGE.
22. ELECTRICAL WIRING SHALL BE PROTECTED BY METALLIC CONDUITS WELDED TO THE STRUCTURE.
23. 110V BLDC FANS AND 110V LED LIGHTS WITH TAMPER PROOF FITTINGS TO BE PROCURED BY RDSO APPROVED SOURCES.
24. COMPONENTS AND HARDWARE SHALL BE VANDAL AND THEFT RESISTANT. ALL PARTS SHALL BE CORROSION-RESISTANT AND HARDWARE SHOULD BE STAINLESS STEEL.
25. METHOD OF FIXING SPV ON BVZI/BVCM WAGON ROOFTOP:
 - (A) MODULE MOUNTING STRUCTURE:
 - (i) MODULE MOUNTING STRUCTURE SHOULD BE MADE OF HOT DIPPED GALVANIZED MS ANGLE OF SUITABLE SIZE. WELDING ELECTRODES IF REQUIRED, SHALL BE COMPATIBLE WITH ROOF MATERIAL AND SHOULD NOT DAMAGE THE ROOF.
 - (ii) BOLTS, NUTS, SHIMS ETC. SHALL BE ZINC PLATED AND FASTENERS SHALL BE OF STAINLESS STEEL SS-304.
 - (iii) MODULE MOUNTING STRUCTURE SHALL BE DESIGNED THAT IT SHALL OCCUPY MINIMUM SPACE WITHOUT SACRIFICING OUTPUT FROM SPV PANELS AND SHALL ALLOW EASY REPLACEMENT OF SPV PANELS IF REQUIRED.
 - (iv) OVERALL MOUNTING ARRANGEMENT FOR BVZI/BVCM WAGON SHALL BE WITHIN IRSOD (INDIAN RAILWAYS SCHEDULE OF DIMENSION).
 - (v) THE SUPPORT STRUCTURE, DESIGN AND FOUNDATION SHALL NORMALLY BE DESIGNED TO WITHSTAND WIND SPEED UP TO 200 KMPH.
 - OR
 - (B) FLEXI SOLAR PANEL PASTING ARRANGEMENT:
 - (i) FIXING SCHEME SHOULD WITHSTAND THE VIBRATIONS IN WAGON BODY FOR LIFE TIME OF PANELS
 - (ii) MATERIAL USED FOR PASTING SHOULD BE ANTI-CORROSIVE.
 - (iii) DOUBLE SIDED ACRYLIC FOAM TAPE OR ELASTIC ADHESIVE SEALANT SHALL BE USED IF REQUIRED.
 - (iv) ACRYLIC FOAM TAPE SHALL BE MINIMUM 1 INCH WIDE AND THICKNESS RANGE OF 2-2.5 MM. HAVING CLOSED CELL CONSTRUCTION TO AVOID INGRESS OF WATER/AIR.
 - (v) ACRYLIC FOAM TAPE SHALL HAVE MINIMUM FOAM DENSITY OF 700 KG/M^3 AND SURFACE RESISTIVITY OF 10^{14} OHM/M^2
 - (vi) ACRYLIC FOAM TAPE SHALL CONFORM TO ASTM D 3330 FOR PEEL ADHESION (300N/100MM) AND HAVE AT LEAST 10,000 MINUTES OF STATIC SHEAR RESISTANCE AS PER ASTM D3654.
 - (vii) ACRYLIC FOAM TAPE SHOULD HAVE BEEN TESTED AGAINST SUSTAINED WIND SPEED OF MINIMUM 200 KMPH AS PER ASTM E330 WITH TEST REPORT CORROBORATED WITH NABL ACCREDITED LAB OR INTERNATIONAL LAB OF REPUTE.
 - (viii) ACRYLIC FOAM TAPE SHALL HAVE BEEN TESTED FOR ITS STRENGTH RETENTION, UNDERWATER SUBMERSION FOR MINIMUM 5 YEARS AND HAVE 25 YEARS OF SERVICE LIFE MODELING.

- (ix) ACRYLIC FOAM TAPE SHALL DISPLAY THE MANUFACTURER LOGO WITH CLEAR MENTION OF LOT/BATCH NUMBER AND YEAR OF PRODUCTION
 - (x) ELASTIC ADHESIVE SEALANT SHALL BE A SINGLE COMPONENT MOISTURE CURING POLYURETHANE SEALANT WITH NORMAL CURING UNDER ATMOSPHERIC CONDITIONS.
 - (xi) ADHESIVE SHALL HAVE SHORE A HARDNESS BETWEEN 55 AND 60 AS PER ASTM C661 AND ELONGATION AT BREAK MORE THAN 300% (AS PER ASTM D412).
 - (xii) EDGE SEALING TAPE OF MINIMUM 2 INCH WIDE AND 2 MM THICK TRANSLUCENT, SINGLE SIDE COATED PRESSURE SENSITIVE ACRYLIC ADHESIVE TAPE WITH IONOMER BACKING, HAVING ELONGATION OF 530% AT BREAK WHEN TESTED AS PER ASTM D3759.
 - (xiii) UV STABLE ADHESIVE PROMOTER/PRIMER CONTAINING ACRYLATE POLYMER SHALL BE APPLIED BEFORE APPLICATION OF ACRYLIC TAPE.
 - (xiv) UV STABLE ADHESIVE PROMOTER/PRIMER SHALL HAVE VISCOSITY LESS THAN 25CPS AND FAST DRYING PROPERTIES, THAT IS COMPATIBLE WITH ACRYLIC BASED ADHESIVE.
26. BRANCH WIRING FOR CONNECTION OF ELECTRICAL EQUIPMENTS TO ROUTED THROUGH FLEXIBLE POLYAMIDE CONDUIT AS PER RDSO SPECIFICATION NO. RDSO/PE/SPEC/AC/0138-2009 (REV.1)
 27. ROTARY SWITCH PANELS/LV PANEL TO BE PROVIDED AS PER ICF DRAWING NO. GS6-7-2-602.
 28. AEROSOL BASED FIRE SUPPRESSION SYSTEM TO BE PROVIDED IN THE LV PANEL AS PER RDSO LETTER NO. EL/7.1.108/MSSBC/MAIN DATED 17.07.2023
 29. CODE OF PRACTICE FOR WIRING FOR 110V DC SELF GENERATION TRAIN LIGHTING SYSTEM AS PER RDSO SPECIFICATION NO. EL/TL/48 REV.1-2005 NEEDS TO BE FOLLOWED.
 30. CODE OF PRACTICE FOR TRAIN LIGHTING MAINTENANCE ON PREVENTION OF FIRES ON 110V DC SELF GENERATING COACHES AS PER RDSO SPECIFICATION NO. EL/TL/56-1992 NEEDS TO BE FOLLOWED.
 31. THE FITMENT AND MOUNTING OF ELECTRICAL EQUIPMENTS INSTALLED IN THE BOGIE BRAKE VAN MAY BE ENSURED AT ZONAL RAILWAY LEVEL.

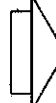


SCHEMATIC DIAGRAM FOR WIRING

CIRCUIT	DISCRIPTION	WATTAGE	QUANTITY	TOTAL LOAD
LCL	LED COMPARTMENT LIGHT	9W	1	9W
LL	LAVATORY LIGHT	9W	1	9W
TL1/TL2	TABLE LAMP	2W	2	4W
F	FAN (FIXED 400mm SWEEP)	32W	2	64W
MCS	MOBILE CHARGING SOCKET	5W	2	10W
TOTAL				110W



16	2.5 SQ MM. CABLE	1			RDSO SPEC. NO. ELRS/ SPEC/ELC/0019, REV.4	
15	LV PANEL	1			EN 61439-1	
14	BATTERY	1			IEC 62133-2:2017/ IS 16046	
13	CHARGING CONTROLLER	1			IEC 60068-2(1,2,14,30)/ EQUIVALENT BIS STD.	
12	SWITCH FOR MOBILE CHARGING	2			IS: 3854-1997	
11	SWITCH FOR LED COMPARTMENT LIGHT	2			IS: 3854-1997	
10	SWITCH FOR FAN	2			IS: 3854-1997	
9	SWITCH FOR TABLE LAMP	2			IS: 3854-1997	
8	SWITCH FOR LAVATORY LIGHT	1			IS: 3854-1997	
7	SWITCH MAIN BOARD	2			-	
6	MOBILE CHARGING SOCKET	2			IS: 1293-2019	
5	TABLE LAMP	2			RDSO SPEC. NO. RDSO/ PE/SPEC/TL/0091-2016 (REV.1)	
4	LAVATORY LIGHT	1			RDSO SPEC. NO. RDSO/ PE/SPEC/TL/0091-2016 (REV.1)	
3	FAN (FIXED 400mm SWEEP)	2			RDSO SPEC. NO. RDSO/ PE/SPEC/TL/0021/2005 (REV.3) WITH AMENDMENT NO.1	
2	LED COMPARTMENT LIGHT	1			RDSO SPEC. NO. RDSO/ PE/SPEC/TL/0091-2016 (REV.1)	
1	SOLAR PANEL	1			IEC: 61215 Ed 2/IS: 14286	
ITEM	DESCRIPTION	NO. OFF PER WAGON	REF. DRGS.	WT. OF ONE (Kg)	MATL&SPEC	REMARKS

	PRELIMINARY SKETCH		ONLY FOR PROTOTYPE APPLICATION	
			UNDER GUIDANCE OF R.D.S.O. (WAGON)	

SUPERSEDED BY			BOGIE BRAKE VAN TYPE 'BVCM'		
SUPERSEDES		DATE			
SCALE	PASSED	05/24			
1:25	CHECKED	05/24	FITMENT OF SOLAR SYSTEM WITH LIGHT & FAN		
	DRAWN	05/24			
	TRACED				
	J.SHEET	WD-24050			
B.G.		R.D.S.O.	GROUP	WD-24050-S-07 (SHEET-II)	
		[W]			

ALT	ITEM	AUTHY	DESCRIPTION	DATE	ASSEMBLY DRAWING
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