

Specification No. : ICF/ELEC/OHE/008

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**Specification for Heater Unit with Blower for
Diesel Electric Tower Cars**

Issued By

Integral Coach Factory, Chennai - 38

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INTEGRAL COACH FACTORY CHENNAI - 600038	ICF/ELEC/OHE/008 REV. NO: 00 DATE: 03-05-2016
SUBJECT: SPECIFICATION FOR HEATER UNIT WITH BLOWER FOR DIESEL ELECTRIC TOWER CARS	Page 1 of 9

1.0 FOREWORD

- 1.1 Indian Railways are having Diesel Electric Tower Car (DETC) for inspection and maintenance of overhead equipment in Indian Railways.
- 1.2 The driving cabins in the DETC is provided with the Heater unit for heating the cabin to keep the comfort for the driver and the unit is manually operated by driver as and when required. The Heater Unit works on 110 volts, DC supply system.

2. SERVICE CONDITIONS

- 2.1 The equipment shall be sturdy and suitable for the following service conditions normally to be met in service:

SN	PARAMETER	DETAILS
2.1.1	Ambient	minus 10°C to +55°C
2.1.2	Train speed	130 Kmph
2.1.3	Humidity	Up to 100% during rainy season
2.1.4	Altitude	Max 1000 metres above sea level
2.1.5	Atmosphere	Very dusty atmosphere with dust of composite brake block shoe. Seasonal heavy snowfall and fog is expected in service.
2.1.6	Rainfall	Very heavy in certain areas, ranging from 1750mm to 6250mm of 120 days / annum.
2.1.7	Vibration	The equipment, system and their mounting arrangement shall be designed to withstand satisfactorily the vibration and shocks encountered in service as specified below: (a) Maximum vertical acceleration : 3.0 g (b) Maximum lateral acceleration : 3.0 g. (c) Maximum longitudinal acceleration : 5.0 g. (‘g’ being the value of acceleration due to gravity)
	The vibrations are sinusoidal form, the frequency ‘f’ lies between 1 Hz and 100 Hz and their amplitude ‘a’ expressed in mm is given as a function of ‘f’ by the equation: $a = 25/f$ for values of “f” between 1 Hz and 10 Hz $a = 250/f^2$ for values of “f” between 10 Hz and 50 Hz. For reference IEC: 60077 / IEC: 60571 to be followed.	

		
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INTEGRAL COACH FACTORY CHENNAI - 600038	ICF/ELEC/OHE/008 REV. NO: 00 DATE: 03-05-2016
SUBJECT: SPECIFICATION FOR HEATER UNIT WITH BLOWER FOR DIESEL ELECTRIC TOWER CARS	Page 2 of 9



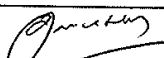
3. SCOPE

- 3.1. This specification covers the design, manufacturing, testing, supplying, commissioning and after sales service of Heater Unit in the driver's cab of Diesel Electric Tower car of Indian Railways.
- 3.2. The driver's cab will have nose cone front end. The interfacing with nose cone supplier for installation of heating unit shall be the responsibility of the supplier.
- 3.3. The scope of supply of each unit is as follows:

i)	Heating Unit	1 no.
ii)	Control Panel box (pre wired)	1 no.
iii)	Anti-vibration mountings	as required

4. TECHNICAL REQUIREMENT

SN	TECHNICAL PARAMETER	REQUIREMENTS
4.1	System Voltage available in the coach	110V, DC
4.2	Operating voltage range	90 to 140 V DC
4.3	Nominal operating voltage of Heating Unit	110V, DC
4.4	Heating unit rating	1 kW (min)
4.5	Blower Unit rating	300 (CMH) at 20mm stat pressure
4.6	Blower unit motor Rating	110V DC and wattage should meet the performance as per clause 4
4.7	Type of Blower Motor	DC Motor
4.8	Governing Specification for Motor	IS 4722
4.9	Enclosure Protection	IP23
4.10	Control & Protection	Electronic Thermostat, Over Heat Protection sensing, additional over heat fuse link type (in the event of overheat detection, the Heater unit shall be cut off)

		
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SUBJECT: SPECIFICATION FOR HEATER UNIT WITH BLOWER FOR DIESEL ELECTRIC TOWER CARS	Page 3 of 9

5. CONSTRUCTIONAL REQUIREMENT

- 5.1. The heater unit shall be sturdy in construction.
- 5.2. The complete body of the Heater Unit shall be made out of stainless steel. The frame work of the Heater Unit shall be made out stainless steel sheet to grade 304 with minimum thickness of 1.6mm. The frame work shall be of welded one.
- 5.3. There shall be thermal insulation for the whole unit. The Thermal insulation in the Heater Unit shall be of glass wool jacketed in the two layers of stainless steel sheet. This arrangement shall prevent fire propagation.
- 5.4. Two earthing bosses of dual metal with M6 screw connection shall be welded to both sides of the Heater unit for earthing to the coach body member.
- 5.5. Only fire retarding type material shall be used for the construction of Heater Unit. Prior approval shall be obtained for the material being used for the unit.
- 5.6. The overall arrangement drawing giving the details of dimensions, bill of material, weight, centre of gravity and fixing screw size, type of fasteners etc shall be submitted in the tender offer itself. The successful tenderer submit these details to ICF for approval before manufacturing Prototype unit.
- 5.7. All safety precautions and proven engineering manufacturing methods shall be adopted for the design and manufacturing the equipment. There shall not be any fire accident due to operation of the equipment inside the driver's cab with the extreme ambient conditions.
- 5.8. The maximum permissible dimensions of units are as per the drawing at ANNEXURE 1. Height, width, depth shown are maximum and reduced sizes are preferable subject to retaining the mountings as per the drawing only to ensure the interchangeability. However, exact dimension can be decided jointly between ICF and supplier during detailed design stage.

6 ELECTRICAL REQUIREMENT

- 6.1. The internal wiring connections shall be by copper bus bars and with hexagonal head screws for fastening. Brass screws are not acceptable. The heater unit elements shall be grouped in series parallel combination with standard element or formed type strip heater elements. The connections to the heater assembly shall be welded to the bus.

		
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SUBJECT: SPECIFICATION FOR HEATER UNIT WITH BLOWER FOR DIESEL ELECTRIC TOWER CARS	Page 4 of 9

- 6.2 The power connection of the heater unit shall be brought in to a plug-in type connector. The cable used for internal wiring shall be of e-beam or any approved type of ICF of adequate rating. The cables shall be run on heat resistant polyamide flexible conduits for internal connection.
- 6.3. Any terminal board arrangement used inside the heater unit shall be of fire retarding fibre glass SMC type only.
- 6.4. Each bank of heating unit shall be provided with over heat protection arrangement. This OHP sensing the over heat in temperature scale cuts off the power supply to the heater unit through the contactors. The temperature for set on is 150 degree C. On reaching this temperature the heater unit should be switched off.
- 6.5. The Heater Unit shall be provided with an additional over heat protection having physical fuse link (liquid filled glass bulb) to disconnect the power supply, physically cutting off the power supply to the heater in case of excessive heating.
- 6.6. Electronic Thermostat shall be provided at a suitable location inside the cab for sensing the air temperature. The sensing shall be 18 degree C to 22 degree C \pm -1 degree C. The sensed signal is sent to the control panel for control and operation of the Heater unit.
- 6.7. Pre wired power and control cables of fire retarding quality, separately connected to the plug-in type connectors to match the connectors of heater unit of sufficient length (can be verified with ICF) for interconnection between Heater unit to the control panel located in the cubicle shall be supplied along with the unit.
- 6.8. A drawing showing the complete arrangement of Heater unit, blower fan and Motor, the wiring arrangement, type of connection including the stud size for connection etc shall be submitted in the tender for approval by ICF.

7 CONTROL PANEL

- 7.1. There shall be one control panel for Heater Unit.
- 7.2. The tenderer shall submit the wiring scheme proposed to be adopted for Heater Unit, incorporating the requirements laid out vide this specification, for the prior approval of ICF.
- 7.3. There shall be an industrial hinge arrangement on left side and 2 fixing lugs on right side welded to the frame of the panel. The fixing hole shall be suitable for M8 hexagonal screw.
- 7.4. The cover of the panel shall be locking type.
- 7.5. The control panel shall consist of MCBs for main power supply, blower motor and heater. Contactor with overload arrangement for blower motor and for the heater shall be used individually. Ratings of the contactors shall be sufficient for the application. A bus bar shall be used for the distribution of the power supply.

		
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SUBJECT: SPECIFICATION FOR HEATER UNIT WITH BLOWER FOR DIESEL ELECTRIC TOWER CARS	Page 5 of 9

7.6 LED light indications for ON and OFF conditions of blower motor and heater shall be provided on the top of the control panel for easy visibility and knowing the status of the operation

7.7 In case of hot air supply from heater is not required; it should be possible to operate the blower motor alone without the heater for air circulation.

7.8 Digital meters shall be provided for continuous indication of temperature inside the coach and outside ambient temperature.

7.9 The control panel shall be provided with the following for operation and control of the Heater Unit:

- a) Contactors with overload arrangement to IS 13947
- b) Rotary Switch to IS 13947
- c) Temperature Controller, PCBs and other Solid State devices used in this circuit shall meet the requirement of RDSO specification ELRS/SPEC/S1/0015 OCT.2001.
- d) Miniature Circuit Breakers of different rating according to circuit requirement to IS8828 latest.
- e) Cage clamp terminal boards of WAGO/PHEONIX/WEIDMULLER connectors.

7.10 The control panel shall be wired with "e beam irradiated cables" to RDSO approved source

7.11 The connections to the respective circuit shall be with crimped type connectors.

7.12 The control circuit shall switch off the Heater when the blower motor trips on overload and in the event of restricted air flow over the heater element.

7.13 A rotary switch of sufficient rating shall be provided in the panel for selection of the function of Heater in the heating unit.

7.14 The control circuit of the panel shall work on 110V DC supply.

7.15 Plug-in type connectors of Harting/Amphenol/Hypertec/Weidmuller/other international brand for Power and the Control with sufficient length of cable shall be provided on the control panel and the same shall be connected to the Heater unit. 2.5sq.mm crimped type male & female connectors (mating connectors) with housing and glands shall be supplied.

8. INSPECTION

8.1 All materials and works covered by the specification shall be subjected to inspection by CEE/QC&C / ICF or authorised representative of ICF at the manufacturer premises.

8.2. All facilities for the conduction of Inspection /Tests shall be arranged by the manufacturer. The cost of the inspection and tests shall be borne by the supplier. Any testing facility that is not available with the supplier the tests may be conducted on any of the Govt .Recognised Testing Laboratories.

		
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SUBJECT: SPECIFICATION FOR HEATER UNIT WITH BLOWER FOR DIESEL ELECTRIC TOWER CARS	Page 6 of 9

- 8.3 Any specific charges for the conduction of tests either at the manufacturer premises or at any of the Govt. Recognised institution shall be indicated in the tender.
- 8.4 Any material or components of the equipment that does not conform to governing specifications or good engineering practice shall be rejected and must be replaced by the supplier on free of cost.
- 8.5 The Inspecting Engineer may at any time and without notice visit the contractor's works to see the progress and quality of the work. Every facility required for carrying out the tests shall be provided by the supplier, free of cost to the Inspecting Engineer.
- 8.6 No part or equipment shall be despatched or packed until it has been cleared by the Inspecting Officer. However such clearance shall in no way exonerate the supplier responsibility for satisfactory performance of the equipment.

9. TESTS

9.1 PROTOTYPE & TYPE TEST

One Heater Unit with all its protection circuit accessories and Control Panel shall be tested as per table below and on prototype approval only the manufacturing of the Heater Unit with accessories shall be manufactured and offered for further tests.

9.2 ROUTINE TEST:

Routine tests shall be conducted on all the Heater Units and control Panels by the manufacturer and the test results are submitted to the Inspecting authority for scrutiny. The Inspecting authority at any point of time of testing may call for all the tests or part of the tests and the manufacturer shall make all facility for carrying out the Inspection.

		
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SUBJECT: SPECIFICATION FOR HEATER UNIT WITH BLOWER FOR DIESEL ELECTRIC TOWER CARS	Page 7 of 9

SN	Description of the tests	Prototype & Type test	Routine Test
1	Dimensional verification Test of both the Heater unit and the Control Panel	Y	Y
2	Performance Test	Y	Y
3	Air Flow Test	Y	N
4	Heater unit capacity test	Y	N
5	High Voltage Test	Y	Y
6	Insulation Resistance Test	Y	Y
7	Type test on the Blower fan Motor as per IS 4722 latest	Y	N
8	Protection circuit test.	Y	Y
9	Environmental test as per IEC 60571 latest on solid state items in the panel	Y	N
10	Vibration test as per IEC 60571 latest on Heater unit and Control Panel	Y	N
11	Enclosure Protection Test as per IS 13947 latest	Y	N

10 GUARANTEE

- 10.1. The complete system with controls shall be warranted for satisfactory and trouble free operation for a period of at least 18 months from the date of commissioning or 24 months from the date of supply whichever is earlier. All aspects of workmanship and design shall be covered by this warranty. The supplier shall immediately provide arrangement for rectification of failures reported under warranty.
- 10.2. A certificate to the effect that after sales service will be rendered for Heater Unit and Control Panel with sensing accessories at all areas of Indian Railways. The name and address and Telephone numbers of the service personnel shall also be furnished. This information shall also be included in the maintenance manual.

11 SPECIAL AND IMPORTANT INSTRUCTIONS TO THE TENDERER

- 11.1 Only original equipment manufacturer of Heater Unit with Control Panel and with ISO 9001-2000 certification can participate in the Tender.
- 11.2 The supplier shall offer "clause by clause" comments on the specification either confirming acceptance of clause or indicate the deviation. Simple

		
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SUBJECT: SPECIFICATION FOR HEATER UNIT WITH BLOWER FOR DIESEL ELECTRIC TOWER CARS	Page 8 of 9

expressions like "No, Noted, Can be arranged," will not be enough. The offer with out the clause by clause comments will not be considered for the tender.

- 11.3. Full particulars of the deviation including technical details, its implications cost repercussions etc. shall be furnished.
- 11.4 Successful tenderer shall submit detailed calculations, supporting data, authenticating graphs/charts etc. shall form part of individual equipment specification for arriving at the rating of the same and the operating criteria.

12. MAINTENANCE MANUAL

- 12.1 The Maintenance Manual one number each shall be supplied along with each unit of Heater Unit. In addition 5 copies of the manual shall be supplied with every order. The manuals shall be supplied free of cost. The manual shall contain all technical details of the unit, rating, schematic diagrams, spare part details, addresses of service personnel with telephone number in all major Indian Cities. The after sales service shall be rendered without fail.

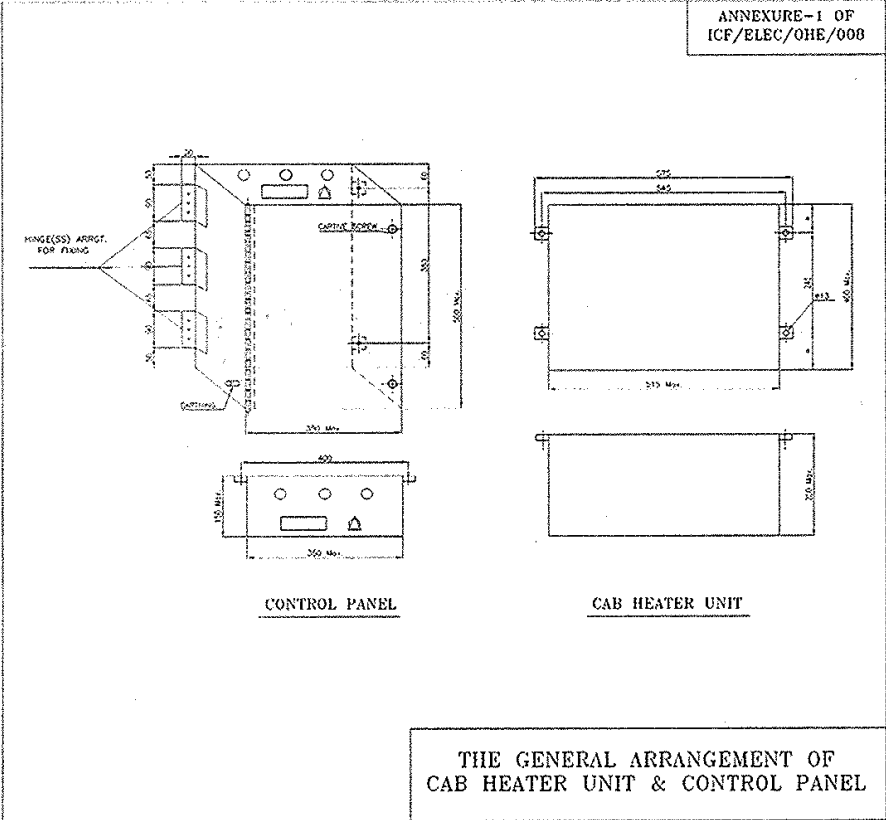
13. MARKING

The name plate shall be of anodized aluminum of suitable size and shall be either riveted or screwed to the body frame of the Heater unit and Control panel. The following information shall be displayed in a permanent and legible manner in a location where it is accessible and visible.

- a. Name of the manufacturer with address
- b. Type, Model, and Serial number with month, year and running serial number of the unit.
- c. Capacity
- d. Normal power supply, Voltage current. Power
- e. Heating Blower fan capacity
- f. Greasing , Bearing details
- g. Electrical circuit diagram (on the control Panel, apart from above details)
- h. Other installation, operation, maintenance instructions if any.
- i. The weight of the unit in kg.

		
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SUBJECT: SPECIFICATION FOR HEATER UNIT WITH BLOWER FOR DIESEL ELECTRIC TOWER CARS	Page 9 of 9



PREPARED BY	VERIFIED BY	APPROVED BY

INTEGRAL COACH FACTORY CHENNAI - 600038	ICF/ELEC/OHE/008 REV. NO: 00
SUBJECT: SPECIFICATION FOR HEATER UNIT WITH BLOWER FOR DIESEL ELECTRIC TOWER CARS	CS.01 DATE: 05-07-2017 Page 1 of 5

CORRECTION SLIP NO.01 TO SPECIFICATION NO. ICF/ELEC/OHE/008 REV.00

1) Clause 3.3 is modified and it shall be read as follows:

i)	Heating Unit	1 No.
ii)	Control Panel box (prewired) with display unit. (Display unit can be supplied as separate unit also)	1 No.
iii)	Anti-vibration mountings	if required
Note: Alternatively an integrated and compact single unit consists of Heater unit, control panel and display unit is also acceptable.		

2) Clauses 4.6, 4.8 and 4.10 are modified and it shall be read as follows:

SN	TECHNICAL PARAMETER	REQUIREMENTS
4.6	Blower unit motor Rating	<ul style="list-style-type: none"> 110V DC/24V DC (Brushless) and wattage should meet the performance as per clause 4. In case of 24 Volts operated motor is used, DC-DC converter of adequate capacity suitable for rolling stock conditions shall be used and its design parameter shall have prior approval of ICF. Use of AC motors is also acceptable, however it shall be used with inverter of adequate capacity suitable for rolling stock conditions and its design parameter shall have prior approval of ICF.
4.8	Governing Specification for Motor	IS 4722 or its equivalent.
4.10	Control & protection	Over heat detection to cut-off the heater unit in the event of overheat should be provided as per clause 6.4 & 6.5.

Remaining clauses under clause 4 are unchanged.

		
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INTEGRAL COACH FACTORY CHENNAI - 600038	ICF/ELEC/OHE/008 REV. NO: 00 CS.01 DATE: 05-07-2017 Page 2 of 5
SUBJECT: SPECIFICATION FOR HEATER UNIT WITH BLOWER FOR DIESEL ELECTRIC TOWER CARS	

4) **Clause 5.2 modified and it shall be read as follows**

The complete body of the Heater Unit shall be made out of stainless steel. The frame work of the Heater Unit shall be made out stainless steel sheet to grade 304 with minimum thickness of 1.5mm. The frame work shall be of welded type.

5) **Clause 5.8 modified and it shall be read as follows**

Due to space limitation in Driver's Cab I & Cab – II, different sizes of heater units are required as shown in Annexure-I. Height, width, depth are shown in maximum dimensions, however, reduced sizes of heater units are preferable duly retaining the mounting dimension as per the drawing to ensure the interchangeability. However, exact dimension can be decided jointly between ICF and supplier during detailed design stage.

6) **Clause 5.9 added**

In case of adoption of integrated and compact single unit consists of Heater assembly, control panel and display unit shall have overall dimension as per Annexure-II.

7) **Clause 6.4 modified and it shall be read as follows**

Each bank of heating unit shall be provided with over heat protection arrangement. This OHP sensing the over heat in temperature scale cuts off the power supply to the heater unit through the contactors/Electronic switching device. The temperature for set on is 150 degree C. On reaching this temperature the heater unit should be switched off.

8) **Clause 6.5 modified and it shall be read as follows**

The Heater Unit shall be provided with an additional over heat protection having physical fuse link (liquid filled glass bulb) to disconnect the power supply, physically cutting off the power supply to the heater in case of excessive heating. Option for using reliable thermostat is also acceptable, however which shall have prior approval of ICF.

9) **Clause 6.7 modified and it shall be read as follows**

Pre wired power and control cables of fire retarding quality, separately connected to the plug-in type connectors to match the connectors of heater unit of sufficient length (can be verified with ICF) for interconnection between Heater unit to the control panel located in the cubicle shall be supplied along

		
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SUBJECT: SPECIFICATION FOR HEATER UNIT WITH BLOWER FOR DIESEL ELECTRIC TOWER CARS	CS.01 DATE: 05-07-2017
	Page 3 of 5

with the unit. Connectors suitable for rolling stock application shall only be used. The make of connectors shall be submitted in the offer.

10) **Clause No. 7.10 modified and shall be read as under:**

The control panel shall be wired with "e-beam irradiated cables" to RDSO approved sources. Use of PTFE Cables conforming to JSS 51034(latest) is also acceptable.

11) **Clause 7.15 modified and it shall be read as follows**

Plug-in type connectors of Harting/Amphenol/Hypertec/Weidmuller/Allied make for Power and Control circuit with sufficient length of cable shall be provided on the control panel and the same shall be connected to the Heater unit. Male & female connectors of crimping type (mating connectors) suitable for 2.5sq.mm with housing and glands shall be supplied.

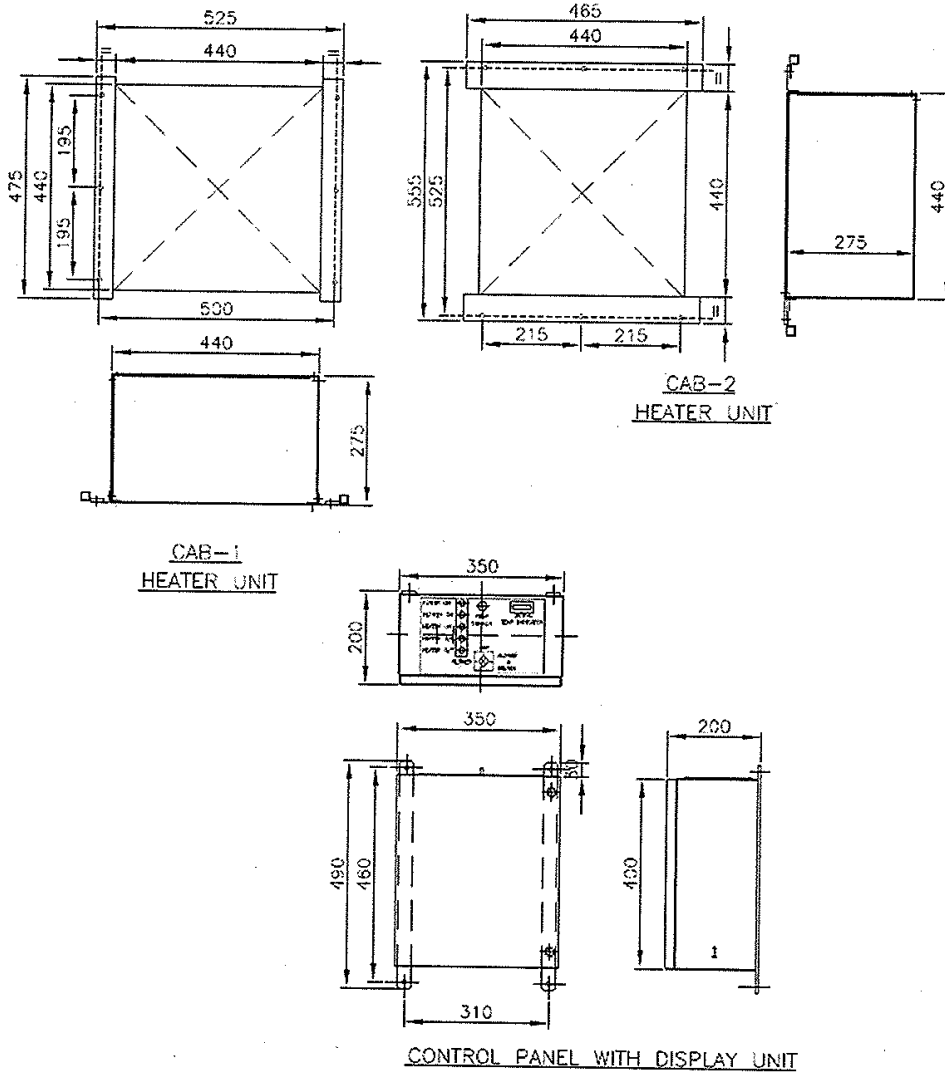
12) **Clause 9 modified and it shall be read as follows**

SN	Description of the tests	Prototype & Type test	Routine Test
1	Dimensional verification Test of both the Heater unit and the Control Panel	Y	Y
2	Performance Test	Y	Y
3	Air Flow Test	Y	N
4	Heater unit capacity test	Y	N
5	High Voltage Test	Y	Y
6	Insulation Resistance Test	Y	Y
7	Type test on the Blower fan Motor as per IS 4722 latest or its equivalent and test report to be submitted.	Y	N
8	Protection circuit test.	Y	Y
9	Vibration test as per IEC 60571 latest on Heater unit, Control Panel and Display panel.	Y	N

		
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INTEGRAL COACH FACTORY CHENNAI - 600038	ICF/ELEC/OHE/008 REV. NO: 00 CS.01 DATE: 05-07-2017 Page 4 of 5
SUBJECT: SPECIFICATION FOR HEATER UNIT WITH BLOWER FOR DIESEL ELECTRIC TOWER CARS	

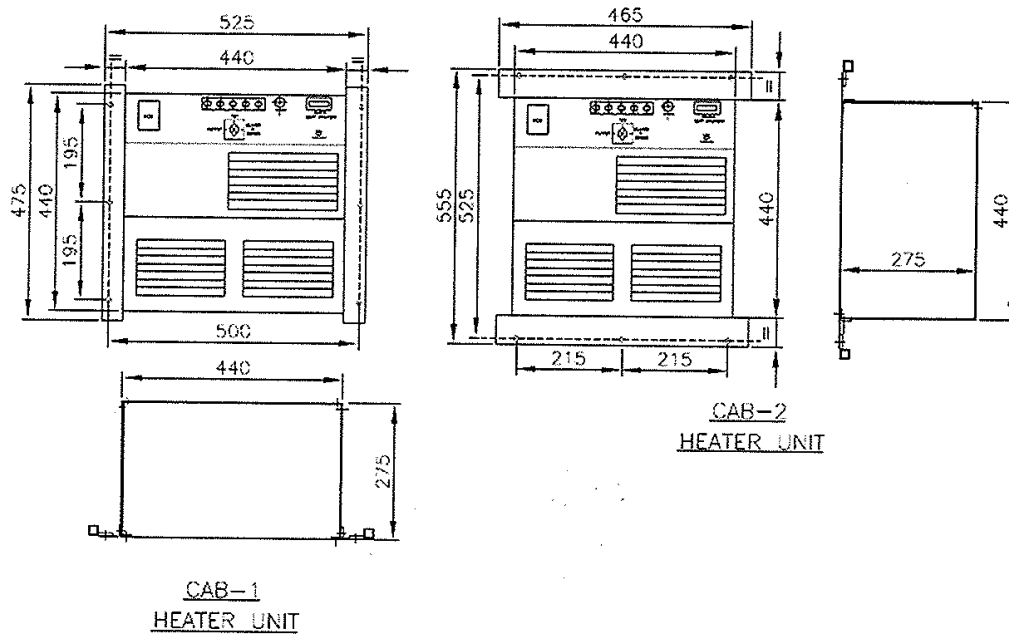
ANNEXURE I modified and it shall read as follows.



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SUBJECT: SPECIFICATION FOR HEATER UNIT WITH BLOWER FOR DIESEL ELECTRIC TOWER CARS	CS.01 DATE: 05-07-2017
	Page 5 of 5

ANNEXURE II added.



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