ANNEXURE:- DRG.NO.CLW/ES/3/SK-1/0191/H
DRG.NO.1209-15-143-001 ALT 11

TECHNICAL SPECIFICATION FOR

AUXILIARY CIRCUIT CUBICLE-1 (HB-1)

FOR 3-PHASE ELECTRIC LOCOMOTIVES

Specification No : CLW/ES/3/0191 ALT. J

ISSUE DATE: 16.02.1998

ISSUED BY :

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ALTERATION RECORD SHEET

Amend. No.	Date of Amend.	Page No.	Alt.	Reason	Authority
1.	03/1/2004	3, 4, 5, 6,1516 & 17	A	Implementation of modification Release no: 460, 434,429	Sd/-
2.		20, 16 to 19	B	i) Modified drg. has been added in in Sheet N.20 . ii) Page No.16 to 19 has been added. iii) Clause no.10.1 of Page No.14 has been added.	Sd/-
3.	20.02.2017	18	C	Specn.no. of Bare Panel has been corrected and sources are modified at sheet 18.	Sd/-
4.	25.05.2018	16	D	OEM/ Part-I is replaced by CLW Approved Sources (the term only)	Sd/-
5.	12.03.2019	5, 7, 10, 16 to 18	E	Circuit Breaker for Oil Pump Converter has been deleted. Schematic position and Quantity have been modified in sheet 7 & 10.	Sd/-
6.	24.03.2021	18	F	MS-413, paralleling of interlock of Aux. Contactor of 3 Phase Locomotive	Sd/-
7.	11.02.2022	3,6,9, 16 & 17	G	Modification to drive MR Blower & SCMR by three phase, 20 A 1 Pole & 6 A 1 Pole AC Circuit Breaker have been replaced by 6 A 3 Pole AC CB. Capacitor start & Run (22 & 47 µF) and Time Relay MR Blower has been deleted vide lt. no. C-D&D/T/42 (Pt) dt.27.01.22	Sd/-
8.		5, 6, 7, 8, 9, 10, 15, 16, 17	H	Choke Input Filter Aux. Converter deleted from list of electrical components. Manufacturer name for list of electrical components should be as per CLW approved Vendor Directory on UVAM and type no. has been deleted. Complete Continuity test as per cable cutting chart to be done 100 % during routine test. D.E. Test applied between Insulator & body. Remark added for Crimping test marked as *. Final Cable cutting chart enclosed as Annexure-II. The references are for guidance only.	As Signed
9.		17	I	Energy saving scheme for 3-phase freight electric locomotives as per RDSO MS 482 Rev.1 has been incorporated in the cable connection chart of HB-1.	As Signed

10			J	Cable size (Cable 1121A/B, 1122A/B, 1123A/B) changed from 25 sq. mm to 35 sq.mm and 10 sq. mm cable (Cable 1121A/B, 1122A/B, 1123A/B to contactor 59.1 & 55.1) replaced with 16 sq.mm.	

Note:- Specifications have been digitized and all alterations have been incorporated.

SPECIFICATION FOR AUXILIARY CIRCUITS, CUBICLE (HB1)

PREPARED BY	CHECKED BY	APPROVED BY
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1. INTRODUCTION

Auxiliary cubicle 1 i.e.HB1 is a panel of contactors, switches, circuit breakers etc. It contains the input to several auxiliary assemblies of the locomotive like machine room blower, compressors, crew fan, cab heater etc.

SCOPE OF SUPPLY

THE TENDERER'S SCOPE OF SUPPLY INCLUDES THE TOTAL PANEL ALONG WITH FOLLOWING ITEMS

1. Contactor, main compressor (47.2)
2. Snubber circuit to Contactor, main compressor (47.2A/1)
3. Auxiliary contactor to item No.52 (52.3/4)
4. Auxiliary contactor to item No.52 (52.3/5)
5. Earth fault relay 415/110 V (89.5)
6. Circuit breaker , oil cooling unit transformer/ converter (59.1/1)
7. Circuit breaker , machine room blower, scavange blower to TM blower & MR blower (54.1/1, 55.1/1 & 56.1/1)
8. Circuit breaker , traction motor blower (53.1/1)
9. Snubber circuit to item No.52 (52 A/4)
10. Snubber circuit to item No.52 (52 A/5)
11. Contactor auxiliaries (52/4)
12. Contactor auxiliaries (52/5)
13. Transformer, auxiliary circuits 415/110 V (67)
14. Earthing resistor earth fault detection 415/110 V (90.41)
15. Earthing resistor earth fault detection 415/110 V (90.42)
16. Circuit breaker, crew fan (69.71)
17. Circuit breaker, cab heater (69.62)
18. Circuit breaker, cab ventilation (69.61)
19. Circuit Breaker, Scavange Blower to machine room blower (56.1/1)
20. Circuit Breaker, machine room blower (54.1/1)
21. Circuit breaker, main compressor (47.1/1)
22. Circuit breaker, oil pump transformer (62.1/1)
23. Fuse auxiliary 415/110 V (41)
24. Connectors
25. Wiring
26. Terminal block

2. CLIMATIC AND ENVIRONMENTAL CONDITION OF LOCO

Maximum atmospheric temperatures	Under Sun : + 70°C In shade : + 50°C
Humidity	100% saturation during rainy season.
Reference site conditions	1) Ambient Temp.max 55°C, min 0°C 2) The contractor will indicate the expected temperature rise in the machine room under reference site conditions. 3) Humidity : 60 % 4) Altitude : 100 m above sea level
Rainfall	Very heavy in certain areas. The locomotive will be designed to permit its running at running at 10 km /hr in flood water level of 102 mm above rail level.
Atmosphere during hot weather	Extremely dusty and desert terrain in certain areas.
Coastal areas	Locomotive and equipment will be designed to work in coastal areas in humid and salt laden atmosphere.
Vibration.	The equipment , sub system and their mounting arrangement will be designed to withstand vibrations and shocks encountered in service as specified in IEC:60077 corresponding unless otherwise prescribed.

3. LIST OF ELECTRICAL COMPONENTS

The following electrical components which are mounted in the cubicle shall be supplied by the panel supplier. Only the makes specified in CLW approved vendor directory shall be accepted. The detailed CLW specification of each of these items would be passed on to the successful tenderers.

Fuse 213

Scheme Position : 41
Required Number : 1
Identification : HBTB585605R1009

Details :

Manufacturer : As per CLW approved Vendor Directory on UVAM
Nominal Data : 1000 V-040 A- 20x127 mm

Fuse Base

Scheme Position : 41
Required Number : 1
Identification : HBTB585656R0131

Details :

Manufacturer : As per CLW approved Vendor Directory on UVAM
Nominal Data : 1500 V-100 A- 1 Pole

Circuit Breaker AC

Scheme Position : 53.1, 59.1
Required Number : 2
Identification : HBTB585554R3083

Details :

Manufacturer : As per CLW approved Vendor Directory on UVAM Nominal Data : 63A-690 VAC- 3 Poles

Aux. Contacts

Scheme Position : 47.1, 53.1, 54.1, 55.1, 56.1, 59.1, 62.1
Required Number : 7
Identification : HBTB585557R1200

Details :

Manufacturer : As per CLW approved Vendor Directory on UVAM
Nominal Data : AUX.CONTACT-2NO

Contactor Main Compressor

Scheme Position : 47.2
Required Number : 1
Identification : HBTB585683R2927

Details :
Manufacturer : As per CLW approved Vendor Directory on UVAM
Nominal Data : 80A/125A- 690 V-3 Poles

Circuit Breaker Type-16

Scheme Position : 47.1
Required Number : 1

Details :

Nominal Data : 40A, 690V, 3 Poles

Snubber Circuit

Scheme Position : 47.2A
Required Number : 1
Identification : 3EHW470024R0005

Details :

Manufacturer : As per CLW approved Vendor Directory on UVAM
Nominal Data : 110/120 VDC

Contactor

Scheme Position : 52
Required Number : 2
Identification : 3EHE428074R0001

Details :

Manufacturer : As per CLW approved Vendor Directory on UVAM
Nominal Data : 150A/1000V- 3 Poles

Varistor AO VDR

Scheme Position : 52 A
Required Number : 2
Identification : 3EHE428099P00001

Details :

Manufacturer : As per CLW approved Vendor Directory on UVAM
Nominal Data : 100 V AC/DC

Auxiliary contactor to item no.52

Scheme Position : 52.3
Required Number : 2
Identification : HBTB585402R0821

Details :

Manufacturer : As per CLW approved Vendor Directory on UVAM
Nominal Data : 110 VDC-1345 Ohm-1NO

Circuit Breaker AC

Scheme Position : 55.1, 54.1, 56.1
Required Number : 3
Identification : HBTB585552R3013

Details :

Manufacturer : As per CLW approved Vendor Directory on UVAM Nominal Data : 6 A-690 VAC- 3 Poles

Circuit Breaker AC

Scheme Position : 69.61, 69.71
Required Number : 2
Identification : HBTB585552R1013
Details :

Manufacturer : As per CLW approved Vendor Directory on UVAM
Nominal Data : 6 A-690 VAC- 1 Pole

Circuit Breaker AC

Scheme Position : 62.1/1
Required Number : 1
Identification : HBTB585552R3033

Details :

Manufacturer : As per CLW approved Vendor Directory on UVAM
Nominal Data : 16 A-690 VAC- 3 Poles

Transformer Single Phase

Scheme Position : 67
Required Number : 1
Identification : 3EHP590064R0015

Details :

Manufacturer : As per CLW approved Vendor Directory on UVAM
Nominal Data : 1000V-415/110v-15KVA

Circuit Breaker AC

Scheme Position : 69.62
Required Number : 1
Identification : HBTB585552R1033

Details :

Manufacturer : As per CLW approved Vendor Directory on UVAM
Nominal Data : 11 A-690 VAC- 1 Poles

Earth Fault Relay 415/110 V

Scheme Position : 89.5
Required Number : 1
Identification : HBVW400011R0001

Details :

Manufacturer : As per CLW approved Vendor Directory on UVAM
Nominal Data : 150 mA-43 Ohm

Earthing Resistor Earth Detection 415/110 V

Scheme Position : 90.41, 90.42
Required Number : 2
Identification : NBT300210P0079

Details:

Manufacturer : As per CLW approved Vendor Directory on UVAM
Nominal Data : 1.8 kOhm ±10%, 250W

Key Lock

Scheme Position : 1004.4
Required Number : 1
Identification : HSBA331645R0002

Details :

Manufacturer : As per CLW approved Vendor Directory on UVAM
Nominal Data : “C”- GREEN

Keeper of Key Lock

Scheme Position : 1004.4
Required Number : 1

Identification : HSBA331645R0005

Details :

Manufacturer : As per CLW approved Vendor Directory on UVAM

4. STANDARDS :

IEC 60077	:	Electrical traction equipment
NF.F.16.101	:	Rolling stock : Fire behavior : Materials choosing
NF.F.16.102	:	Rolling stock : Fire behavior : Effects on electrical equipment
3EHN600359	:	Insulation co-ordination
3EHN600385	:	Min. insulation distance for basis insulation within air

5. WIRING AND CABLING

1. The cables for wiring in the locomotives and equipments will use high grade electrolytic copper stranded conductors tinned as used in WAG-9 loco.

2. The cables will be of approved quantity and grade of insulation and sheath. They will be fire retarding type. In locations where high temperatures are likely to be met, special cables may be employed.

3. All connections will be terminated on terminal bars of approved design, provided for the purpose. The terminals and wire cable ends will be marked to facilitate correct connections.

4. Plugs and sockets and connectors will be used to connect pre-assembled units and to facilitate maintenance and ensure a better layout. The details of which will be passed on subsequently to the successful tenderer/s.

5. No cable having a conductor size of less than 2.5 sq.mm will ordinarily be used.

6. Smaller size cables for internal wiring panels, control cubicles, signal wiring, consistent with the mechanical and electrical requirements, may be adopted.

7. The layout of the cable should be such that contamination by oils is avoided.

8. Loading of power cables will not be more than 75% of its capacity.

9. Cables for terminal connections will have only crimped joints.

10. The Documents related to cabling of the panel would be passed on subsequently to the successful tenderer/s. All wiring and cabling should be as per CLW specification.

6. SHEET METAL STRUCTURE

The cubicle is of detachable type and shall comply with the dimensions and tolerances specified in relevant part drawings. The complete cubicle shall consist of a no.of panels secured to each other by Hex. Bolts/ screw, nuts, washers etc. made of stainless steel. The cubicle should be of sturdy construction so as not to vibrate loosely or excessively when mounted in the machine room. The dimensions and weight of the complete cubicle shall not be exceeded.

7. ENVIRONMENTAL AND OPERATIONAL CONDITIONS

The HB1 Cubicle shall be used under the following conditions.

7.1 Environmental conditions

Environmental condition within the machine room :

Air circulation	:	Weak forced cooling
Operational temperature	:	0…+65°C
Environmental air	:	salty, dusty
Air humidity	:	Condensation possible

7.2 Operational conditions

Operation time :

Daily approx.	:	16 hours (approx. 330 days per year)
Yearly approx	:	5.280 hours
Within 30 years approx	:	158, 400 hours

Environmental Conditions:

Rated values for environmental temperature and air humidity according to 7.1 “Condition within the machine room”.

7.3 Reliability

Operation condition	:	according to 7.2
Availability rate	:	98%
Lifetime of the loco	:	min. 30 years (Maintenance, spare parts, lifetime)

8. TEST CONDITIONS

8.1 TYPE TESTING :

a) Material certificate for materials used from an approved test house/supplier has to be produced during inspection and along with supplies.

b) Certificate for fasteners used and their material to be produced and supplied along with supplies.

c) Welding to be checked properly as per an approved test plan which has to be submitted to Dy. CEE/Design.

d) Panel should be electrically tested after wiring as per relevant standards. The components will be tested as per CLW's stipulations to be passed on to the successful tenderer.

e) All electrical equipments procured shall be tested at assembly stages. Test certificates shall be produced for OEM components. Any change will have to be taken prior approval of DY.CEE/CON/TU and it will involve complete type test.

8.2 ROUTINE TESTING :

The cubicle will be tested for the following routine test :

1. Integrity and completeness.
2. Testing of inter-connections and functionality of the different subassemblies within the panel
3. Suitable checking fixtures are to be made for checking the dimensions of the complete assembled panels
4. Certificates for raw materials and fasteners to be provided.
5. Complete cubicle and electrical items will be tested as per as per relevant IS.

9. STANDARDS/ UNITS

IS/ IEC- Standards will be accepted. Internally used BBC/ABB/adtranz if any should be mentioned together with corresponding IEC Standard. Only SI Units will be accepted.

10. SCOPE OF SUPPLY

One Auxiliary Cubicle 1 fully assembled with the equipments as given in clause 3 and duly tested as per clause 8 of this document.

10.1 All individual components of the Panel should be procured as per Annexure-I.

11. INSPECTION

1. Type/ routine inspection will be carried out authorized representative of Dy. CEE/Design.

2. The complete testing to be carried out as per clause 8 of this document.

12. SUPPLY OF DOCUMENTS (In addition to those indicated in bid documents of CLW)

i) Technical details composition and characteristics of the material including fasteners to be used for manufacture of cubicles
ii) Source(s) of raw materials and hardware.
iii) Manufacturing process.
iv) Type test plan including checks for vibration and welding.
v) Routine test plan.
vi) Details for similar items supplied for locomotive, if any.
vii) Source of the components being offered including cables.

13. SUBMISSION OF TENDER QUOTATION :

13.1 The tenderer shall give sufficient information to prove that his factory has adequate facilities and capacity to manufacture Complete Panel to meet fully the technical requirements of the specification and quality of materials and workmanship.

13.2 Quotation shall not be considered complete unless all information is furnished and are therefore liable to be rejected.

14. TECHNICAL DOCUMENTS TO BE SUPPLIED BY THE SUPPLIER :

i) Type test reports

ii) Routine test reports along with each set

iii) Detailed drawings

NOTE :- 1) The name & year of manufacture of the firm should be embossed on the item.

2) Hardware are to be used should be any of the following make:

a) Un-brako (Precision Fasteners)
b) Laxmi Precision (LPS)
c) Sundaram Fasteners (TVS)
d) All spring washer of Fobes Gohtak Ltd., Moka, Mumbai only.

Annexure-I (HB-1)

15. Following Sub-components to be procured from CLW approved sources

Sl. No	Description	Specn.No.	Sch.Pos.	ABB Identification No.	Qty/Panel
1.	Fuse Auxiliaries 415V/110V	CLW/ES/3/0092/D or latest	41	HBTB58605R1009 HBTB585685R0131	1 No.
2.	Circuit Breaker (AC) & its Contacts	CLW/ES/3/0096/L or latest	53.1 59.1	HBTB585554R3083 HBTB585557R1200	2 Nos. 7 Nos.
3.	Contactor for main Compressor	CLW/ES/3/0095/D or latest	47.2	HBTB585683R2927	1 No.
4.	Snubber Circuit	CLW/ES/3/0067/B or latest	47.2A	3EHW470024R0005	1 No.
5.	Contactor Auxiliaries	CLW/ES/3/0201/D or latest	52	3EHE428074R0001	2 Nos.
6.	Snubber Circuit to Contactor Auxiliaries	CLW/ES/3/0202/A or latest	52A	3EHE428099P0001	2 Nos.
7.	Auxiliary Contactor to Contactor Auxiliaries	CLW/ES/3/0034/C or latest	52.3	HBTB585402R0821	2 Nos.
8.	Circuit Breaker to Scavange Blower (TM & MR) and MR Blower	CLW/ES/3/0096/L or latest	55.1 54.1 56.1	HBTB585552R3013 HBTB585557R1200	3 Nos.
9.	Circuit Breaker to Cab Ventilation and Crew Fan	CLW/ES/3/0096/L or latest	69.61 69.71	HBTB585552R1013	2 Nos.
10.	Circuit Breaker Oil pump Transformer	CLW/ES/3/0096/L or latest	62.1	HBTB585552R3033 HBTB585557R1200	1 No.
11.	Auxiliary Transformer	CLW/ES/3/0098/B or latest	67	3EHP590064P0015	1 No.
12.	Circuit Breaker for Cab Heater	CLW/ES/3/0096/L or latest	69.62	HBTB585552R1033	1 No.
13.	Earth Fault Relay	CLW/ES/3/0090/C or latest	89.5	HBVW400011R0001	1 No.
14.	Earthing Resistor Earth Fault Detection	CLW/ES/3/0014/H or latest	90.41 90.42	NBT300210P0079	2 Nos.
15.	Key Lock	CLW/ES/3/0049/F or latest	1004.4	HSBA331645R0002	1 No.
16.	Bare HB-1 Panel	CLW/MS/3/047/Alt.12 or latest		3EHP130167	1 No

17.	Connector	CLW/ES/3/0124/O or latest			
18.	Screw Type Terminal Block	CLW/ES/3/0645/F or latest			
19.	Cable (Electron Beam Irradiation)	CLW/ES/3/0458/E, 0459/C or latest			
20.	Circuit Breaker Type 16 41A 3 Pole	CLW/ES/3/0096/L or latest	47.1	3EH-113456R0001	1 No.

16. MS-413, paralleling of interlock of Aux. Contactor of 3 Phase Locomotive.

17. Tests

Sl No.	Description	Type Test	Routine Test
(i)	Dimensional Checking	Yes	Yes
(ii)	Verification of Electrical & Mechanical equipments and its test reports	Yes	Yes
(iii)	Complete Continuity test as per cable cutting chart	Yes	Yes *(100%)*
(iv)	Measurement if resistance	Yes	Yes
(v)	Fire –retardant test of all insulating material	Yes	No
(vi)	Crimping test: - To check whether proper crimping tool with required pressure is applied so that there is no void in the cross section of the crimped cable	Yes*	Yes*
(vii)	Vibration Test (Optional)	Yes	No
(viii)	D.E Test applied 2.27 KV for one minute *between Insulator & body*	Yes	No

** Sample cable crimped by each tool of each size are to be sealed in front of the inspector which shall be tested as per EN 50343 for crimping quality. The issued certificate shall be valid for inspection crimping during 3 Months and same process is to be repeated again for next 3 Months.*

18. IMPORTANT INFORMATIONS

18.1 All the insulating material should have Fire Retardant Property as per CLW individual specn.

18.2 The Cable for wiring of HB-1 Panel will be with Electron beam irradiated cable only. The cable size and cabling have to be according to the CLW document which will be passed on subsequently to the successful tenders.

18.3 The Cable and terminal connections will have only proper crimping joints.

18.4 All necessary amendments according to TOT modification or RDSO modification have to be incorporated by the firm in consultation in the CLW at firms own cost.

18.5 Final Cable cutting chart has been enclosed as Annexure-II. RDSO's Modification Sheet should be implemented by panel manufacturer time to time as required for.

18.6 Energy saving scheme for 3-phase freight electric locomotives as per RDSO MS 482 Rev.1 has been incorporated in the cable connection chart of HB-1.

19. References

19.1 Document of cable list of Cubicle Aux. Circuit - 1 (HB- 1) – 3EHP431444 along with MR460(MO.16). Document of Aux.Circuit-1 (HB-1)-3EHP130161

19.2 Cable Looms Identification no. 3EHP130167R0100.

19.3 All documents referred for Cabling are 3EHP431444, 3EHP130161 & 3EHP130167R0100.

19.4 All specifications of components, sub components given in Annexure-I.

Note: The above mentioned references are for guidance only.