ANNEXURE:-
DRG. NO. CLW/ES/3/SK-1/0192
DRG. NO. CLW/ES/3/SK-2/0192/G
DRG. NO. CLW/ES/3/SK-3/0192/H
DRG.NO. 1209-15-143-002 ALT 13

TECHNICAL SPECIFICATION FOR

AUXILIARY CIRCUIT CUBICLE-2 (HB-2)

FOR 3-PHASE ELECTRIC LOCOMOTIVES.

Specification No : CLW/ES/3/0192 ALT. K

ISSUE DATE: 15.02.1998

ISSUED BY :

DY.CHIEF ELECTRICAL ENGINEER/D-II
CHITTARANJAN LOCOMOTIVE WORKS
P.O.CHITTARANJAN – 713331
DIST.BARDHAMAN (WEST), WEST BENGAL (INDIA)

ALTERATION RECORD SHEET

Amendment No.	Date of Amendment	Page No.	Alt.	Reason	Authority
1.	03.01.2004	3, 4, 5, 6,7, 13,14,15&16	A	Implementation of modification Release no: 460, 434,429	Sd/-
2.	29.04.2010	15 to 19	B	Sheet no. 15 to 18 added and Drg. No. CLW/ES/3/SK-1/0192 is added at sheet no.19	Sd/-
3.	21.06.2010	12	C	Modification sheet no. RDSO/2008/EL/MS/0367/Rev. 0 dated 29.08.08 is included. Clause no. 10.1 of page no. 11 has been added.	Sd/-
4.	17.02.2017	17	D	Specn. no. of Bare Panel has been corrected and sources are modified at sheet no. 17.	Sd/-
5.	25.05.2018	15	E	OEM/ Part-I is replaced by CLW Approved Sources (the term only)	Sd/-
6.	12.03.2019	4,5,7, 15,16	F	Schematic position and quantity has been modified & Circuit Breaker Oil Pump Converter has been deleted.	Sd/-
7	24.03.2021	12	G	MS – 413 , paralleling of interlock of Aux. Contactor of 3 phase locomotive.	Sd/-
8	11.02.2022	4, 6, 7, 15 & 16	H	Modification to drive MR Blower & SCMR by three phase, 20 A 1 Pole & 6 A 1 Pole CB have been replaced by 6 A 3 Pole AC. Capacitor start & Run (22 & 47 µF) and Time Relay MR Blower has been deleted vide letter no. C- D&D/T/42/(Pt) dt. 27.01.22	Sd/-
9		5, 6, 7, 8, 9, 10, 12, 17, 18	I	Manufacturer name for list of electrical components should be as per CLW approved Vendor Directory on UVAM and type no. has been deleted. Sources for SS Hardware added in page no. 13. 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
10		17	J	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-2.	As Signed

11			K	(i) “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. as per RDSO letter no. EL/2.1.8 dated 11.07.2024	

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

SPECIFICATION FOR AUXILIARY CIRCUITS, CUBICLE-2 (HB2)

TABLE OF CONTENTS

1. INTRODUCTION

Auxiliary Cubicle 2 i.e.HB2 is a panel of contactors, switches, circuit breakers etc. It controls 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. Snubber circuit to Contactor main compressor (47.2A, 52.4A, 52.7A)
2. Contactor Main Compressor (47.2/2,52.4,52.7)
3. Earth fault Relay , auxiliary converter (89.2)
4. Circuit breaker , oil cooling unit , transformer/ converter (59.1/2)
5. Circuit breaker , scavenge blower to traction motor blower and oil cooling unit (55.1/2)
6. Circuit breaker , traction motor blower (53.1/2)
7. Earthing resistor earth fault detection auxiliary converter (90.3/1-2)
8. Current sensor , auxiliary circuits (42.3/2)
9. Current sensor , auxiliary circuits (42.3/1)
10. Circuit breaker, scavenge blower to machine room blower (56.1/2)
11. Circuit breaker, machine room blower (54.1/2)
12. Circuit breaker, main compressor (47.1/2)
13. Circuit breaker, transformer oil pump (62.1/2)
14. Connectors
15. Wiring and other accessories
16. Terminal Blocks
17. Contactor Scavenge Blower (52.4)
18. Capacitor Input filter Aux. Converter (49.1)
19. Resistor Input filter Aux. Converter (49.2)
20. Contactor Oil pumps (52.5)
21. Snubber circuit to item 52.5 (52.5A)
22. Aux Contactor to item 52.4 & 52.5 (52.6)
23. Choke Input filter aux. converter (49.3)
24. CB for AC System (64.1)

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 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 area	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 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.

Current Sensor Auxiliary Circuit

Scheme Position : 42.3
Required Number : 2
Identification : HIET428008P0002

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 1:5000-1000 A- 40 ohm

Connector 9 Pole

Scheme Position : 42.3A
Required Number : 2
Identification : HETT401293P0001

Details :
Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 9 Pole GR. 13 -13A, M. BUCHSE

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

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

Circuit Breaker AC

Scheme Position : 56.1, 54.1, 55.1, 64.1
Required Number : 4
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 : 62.1
Required Number : 1
Identification : HBTB585552R3033

Details :

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

Earth Fault Relay Aux Converter

Scheme Position : 89.2
Required Number : 1
Identification : HBVW400011R0001

Details :

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

Earthing Resistor Earth fault Detection Aux. Converter

Scheme Position : 90.3
Required Number : 2
Identification : NBT300210P0087
Details:

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 3.9 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*

Contactor Type – 3 , Scavenge Blower

Scheme Position : 52.4, 52.7
Required Number : 03 nos.
Identification : HBTB585683R2927

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 80 A /125 A- 750 V – 3 POLES

Capacitor input Filter Aux. Converter

Scheme Position : 49.1
Required Number : 3
Identification : HIES309976P0001

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 0.22 µF/ 2000 V

RESISTOR INPUT FILTER AUX. CONV.

Scheme Position : 49.2
Required Number : 4 nos.
Identification : HIET402702P1029

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 220 ohm/ 80 W /LOW IND

Circuit Breaker Type -16

Scheme Position : 47.1
Required Number : 1

Nominal Data : 40 A, 690 V, 3 POLE

Snubber Circuit to item 52.4

Scheme Position : 52.4A
Required Number : 2
Identification : 3EHW470024R0005

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : TRANSZORB + DIODE , 110/120 V DC

CONTACTOR OIL PUMPS WITH AUX. CONTACT LAIDN13

Scheme Position : 52.5
Required Number : 2
Identification : 3EHE428074R0001

Details :
Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 150 A/1000 V – 3 POLES

SNUBBER CIRCUIT TO ITEM 52.5

Scheme Position : 52.5 A
Required Number : 2
Identification : 3EHE428099P0001

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : VARISTOR 110 V AC /DC

AUX. CONTACTOR TO ITEM 52.4 & 52.5

Scheme Position : 52.6
Required Number : 2
Identification : HBTB585402R0821

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 110 V DC- 1345 ohm – 1 NO

CHOKE INPUT FILTER AUX. CONVERTER

Scheme Position : 49.3
Required Number : 1

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 100 µH

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 quality 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 HB2 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

Operational 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 of environmental temperature and air humidity according to 7.1 “conditions within the machine room”.

7.3 Reliability

Operational condition	:	according to 7.2
Availability rate	:	98%
Lifetime of the loco	:	min. 36 years (Maintenance, spare parts, lifetime)

NOTE :-

1) The name and year of manufacture of the firm should be embossed on the item.
2) Hardwares are to be used should be any of the following make :
   a) UNBRAKO (Precision fastener)
   b) Laxmi precision (LPS)
   c) Sundaram fastener (TVS)
   d) All spring washer of Forbes Gokak ltd., Moka Mumbai only.
3) *SS Hardware required in the assembly are to be procured from CLW approved sources list for SS Hardwares.*

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/Design 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 sub-assemblies within the panel

3. Suitable checking fixtures are to be made for checking the dimensions of the complete assembled panels. Certificates for raw materials and fasteners to be provided.

4. 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 2 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 by 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 hardwares.
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 the 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

15. The tenderer shall confirm that the equipments are as either used in 3 phase AC locomotive manufactured by Indian Railways . Any equivalent components will need CLW's prior approval

16. Modification sheet no. RDSO/2008/EL/MS/0367/Rev '0' dated 29.08.08 is included

17. MS-413 , paralleling of interlock of Aux. Contactor of 3- phase locomotives.

Annexure-I (HB-2)

18. Details of Sub-components to be procured from CLW approved sources

Sl. No	Description	Specn.No.	Sch.Pos.	ABB Identification No.	Qty/Panel
1.	Current Sensor	CLW/ES/3/0084/A or latest	42.3	HIET428008P0002	2 Nos.
2.	Connector	CLW/ES/3/0124/M or latest	42.3A	HETT401293P0001	2 Nos.
3.	Circuit Breaker– Type- 17	CLW/ES/3/0096/G or latest	53.1 59.1	HBTB585554R3083 HBTB585557R1200	2 Nos.
4.	Contactor for Scavenge Blower, AC System	CLW/ES/3/0095/C or latest	52.4/1 52.4/2 52.7	HBTB585683R2927	3 Nos.
5.	Capacitor Input filter Auxiliary Converter	CLW/ES/3/0448 or latest	49.1	HIES309976P0001	3 Nos.
6.	Resistor Input filter Auxiliary Converter	CLW/ES/3/0464/A or latest	49.2	HIET402702P1029	4 Nos.
7.	Contactor for Main Compressor	CLW/ES/3/0095/C or latest	47.2	HBTB585683R2927	1 No.
8.	Snubber Circuit to Contactor for Main Compressor (Type 3)	CLW/ES/3/0067/A or latest	47.2A 52.7A	3EHW470024R0005	2 Nos.
9.	Snubber Circuit to Contactor Scavenge Blower	CLW/ES/3/0067/A or latest	52.4A	3EHW470024R0005	2 Nos.
10.	Contactor Oil Pump with Aux. Contactor LAIDN13	CLW/ES/3/0201/A or latest	52.5	3EHE428074R0001	2 Nos.
11.	Snubber Circuit to Oil Pump with aux. Contactor LAIDN13	CLW/ES/3/0202 or latest	52.5A	3EHE428099P0001	1 No.
12.	Circuit Breaker to Scavenge Blower TM,	CLW/ES/3/0096/G or latest	55.1, 64.1, 56.1 & 54.1	HBTB585552R3013 HBTB585557R1200	2 Nos.

	AC System				
13.	Circuit Breaker to Scavenge Blower MR	CLW/ES/3/0096/G or latest	56.1	HBTB585552R1013 HBTB585557R1200	1 No.
14.	Circuit Breaker to Oil Pump Transformer	CLW/ES/3/0096/G or latest	62.1	HBTB585552R3033 HBTB585557R1200	1 No.
15.	Contactor Type – 6	CLW/ES/3//0034/B or latest	52.6	HBTB585402R0821	2 Nos.
16.	Choke Input Filter Auxiliary converter	CLW/MS/3/0448 or latest	49.3		3 Nos.
17.	Earth fault Relay Aux. Converter	CLW/ES/3/0090/B or latest	89.2	HBVW400011R0001	1 No.
18.	Earthing Resistor Earth fault detection Aux. Converter	CLW/ES/0014/C or latest	90.3	NBT300210P0087	2 Nos.
19.	Key Lock	CLW/ES/3/0049/E or latest	1004.4	HSBA331645R0002	1 No.
20.	Keeper Key Lock	CLW/ES/3/0049/E or latest	1004.4	HSBA331645R0005	1 No.
21.	Bare HB-2 Panel	CLW/MS/3/0047 Alt.12 or latest		3EHP130167	1 No.
22.	Screw Type Terminal Block	CLW/ES/3/0645/B or latest			
23.	Cable (Electron Beam irradiation)	CLW/ES/3/0645 or latest			

19. 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)	D.E Test applied 2.27 KV for one minute *between Insulator and body*	Yes	No
(v)	Voltage test between terminals of Capacitor & terminal to casing	Yes	No
(vi)	Measurement if resistance	Yes	Yes
(vii)	Measurement of resistance of Earthing Resistors	Yes	Yes
(viii)	Fire –retardant test of all insulating material	Yes	No
(ix)	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 *
(x)	Vibration Test (Optional)	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.*

20. IMPORTANT INFORMATIONS

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

20.2 The Cable for wiring of HB-2 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.

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

21. ANNEXURE:

21.1 All specification of components, sub components.

21.2 All necessary amendments according to TOT modification or RDSO modification have to be incorporated by the firm in consultation in the CLW.

21.3 *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.*

21.4 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-2.

22. References

22.1 Cable cutting chart – 3EHP431445

22.2 Identification no. of cable list of Control Cubicle-2 (HB-2) – 3EHP431445 along with Modification release 460 (MO.16). identification no. of Aux. Cubicle-2 (HB-2) 3EHP130177.

22.3 The Cabling will be according to 3EHP601578

22.4 Documents referred for Cabling are 3EHP431445, 3EHP130177 & 3EHF601578.

Note: *The above mentioned references are for guidance only.*