



भारत सरकार - रेल मंत्रालय Govt. of India – Ministry of Railways

भारतीय रेल सिग्नल इंजीनियरी और दूरसंचार संस्थान

Indian Railways Institute of Signal Engineering and Telecommunications

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IRISET/CoE/Kavach/Misc

Date: 03.08.2023

PED/RS/RDSO

CEE/D&D/CLW

Sub: Drawings w.r.t. Kavach fitment scheme in WAP-7, WAG-9 & WAP-5 new locomotives rolling out from PUs.

Ref: (i) This office letter of even no. Dt: 25.05.2023

(ii) This office letter of even no. Dt: 22.06.2023

(iii) CLW lr.no. C-D&D/T/29/Part/Kavach Dt: 29.06.2023

(iv) This office letter of even no. Dt: 06.07.2023

With reference to the above subject, the drawings prepared by CoE (Modern Signalling-Kavach) have been communicated to RDSO and CLW vide letter cited under ref (ii). Further the comments to the drawings submitted by CLW vide ref (iii) have been communicated by CoE to CLW vide letter cited under reference (iv).

Further, it is learnt from RDSO that the following equipment as per the dimensions mentioned below shall also be provided in the locomotive as per LTE requirement.

Sl. No.	Name of the equipment	No. of Equipment	Dimensions
1.	Cab Display Unit	2	340(W)×215(D)×178(H) mm
2.	LTE Router	2	477(W)×247(D)×115(H) mm
3.	LTE Router Antennae	2	489(W)×392(D)×100(H) mm
4.	Power Supply Unit	1+1	300(W)×200(D)×200(H) mm

As there is a space constraint in Cab1 side due to provision of Onboard Kavach, to ensure proximity of LTE antenna to LTE router, it is proposed to accommodate all the equipment related to LTE near Cab2 behind SB2(WAP7)/HB2(WAP-5 & WAG-9) in three phase locomotives. Further the power supply for LTE requirement (Battery Positive and Negative) will be tapped from SB-2 panel.

For mounting of Pulse Generators in WAP-7 and WAG-9 locomotives, only three axle boxes viz. 2, 5 and 11 are available. As leading axles are prone to wheel slipping, it is preferable to avoid the leading axles but such options are not available in three phase locomotives. Hence, considering the best possible scenario, the axle boxes 2 & 5 have been chosen. However, OEMs are requested to explore the possibility of designing suitable mounting for provision of Pulse Generator on axle box no. 10. On similar lines, in WAP-5 locomotives, it is proposed to mount Pulse Generators on axle boxes 2 & 3.

Based on the above requirements, the final drawings have been prepared. Further one additional drawing has been prepared based on the feedback received from the sheds to provide protection guard to RFID reader.

The list of final drawings is given below.

Sl.No.	Description	Prepared by
1.	Kavach Equipment Layout WAP-7 with Hotel load converter	CoE
2.	Kavach Equipment Layout WAG-9	
3.	Kavach Equipment Layout WAP-5	
4.	Guidelines for Installation of Onboard Kavach	
5.	RF Antenna Mounting Bracket	
6.	Cable Entry Plate	
7.	Mounting Bracket for Antenna GSM/GPS	
8.	Location of Antenna Base on Cab-1 Roof of Locomotive	
9.	Location of Antenna Base on Cab-2 roof of Locomotive	
10.	Rough Sketch of opening for Emergency Exhaust Cock Operation	
11.	Cable Interfacing for E-70 brake system	
12.	Cable Interfacing for CCB 2.0 brake system	
13.	Guard for RFID Reader WAP-7 and WAG-9 locomotives	
Corrected drawings pending from CLW		
14.	Cable numbering, modified locomotive circuits and Cable index	
15.	Cable routing plan	

The layouts of WAP-7, WAG-9 and WAP-5 have been signed jointly by CoE and RDSO(S&T directorate).

The draft drawings circulated earlier by CoE have been accepted all the OEMs. However, HBL has requested for provision of Isolation switch near MRB2 which is not accepted and HBL has been communicated to make an alternate arrangement to provide the isolation switch near Onboard Kavach unit to have uniformity in location of operation by user i.e. Loco Pilots. RDSO may explore early approval to suggested arrangement in view of standardization.

In view of the above, RDSO is requested to examine the drawings and approve the same at the earliest please.

Encl: As above

03.08.23

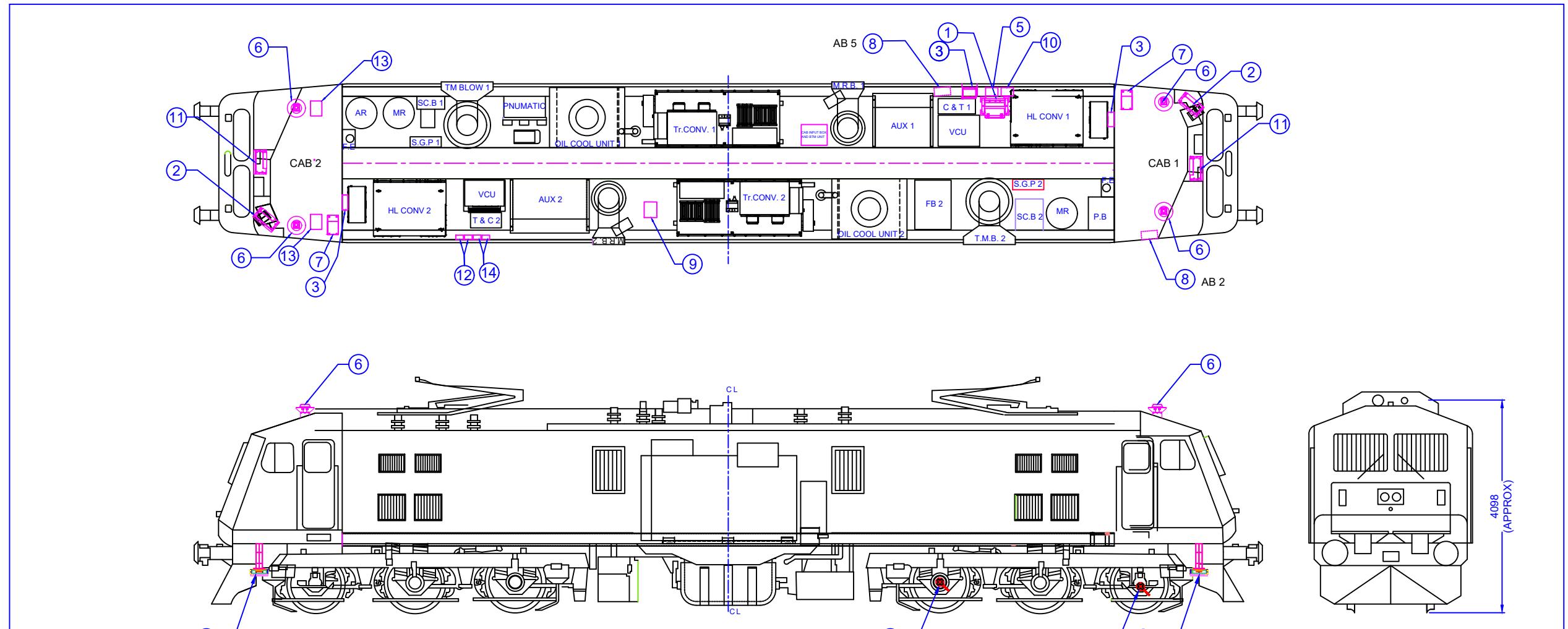
(ललित के मनसुखानी, Lalit K. Mansukhani),

Officer on Special Duty (OSD)

Centre of Excellence

C/- PED/SM/RB, PED/S&T/Dev/RB, PED/S&T/RDSO, PED/RS/RB - For kind information please
CELE/SCR, ED/Tele-II/RDSO - For information please

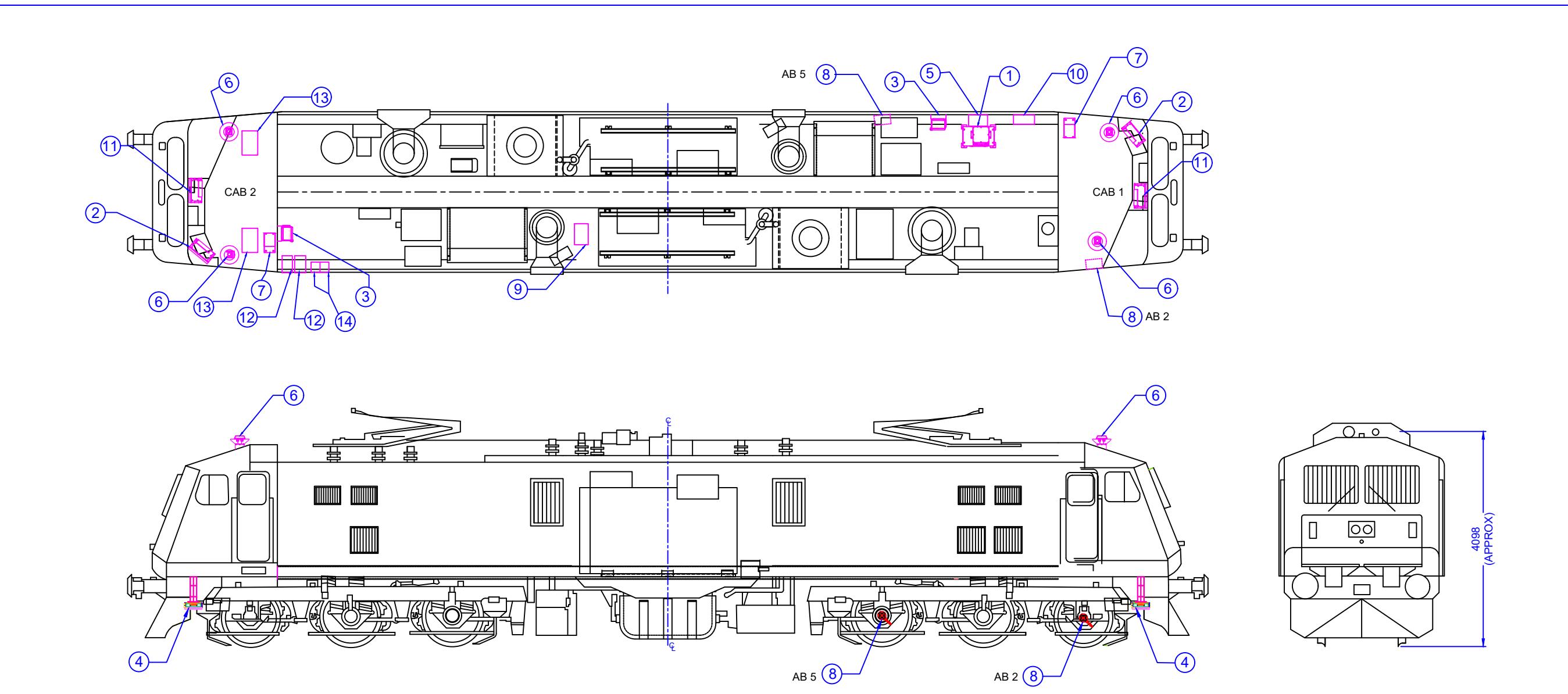
M/s Medha, HBL, Kernex, GG Tronics, QFTL for information and necessary action to explore
mounting of PG on axle box no. 10 in WAP-7 and WAG-9 locomotives



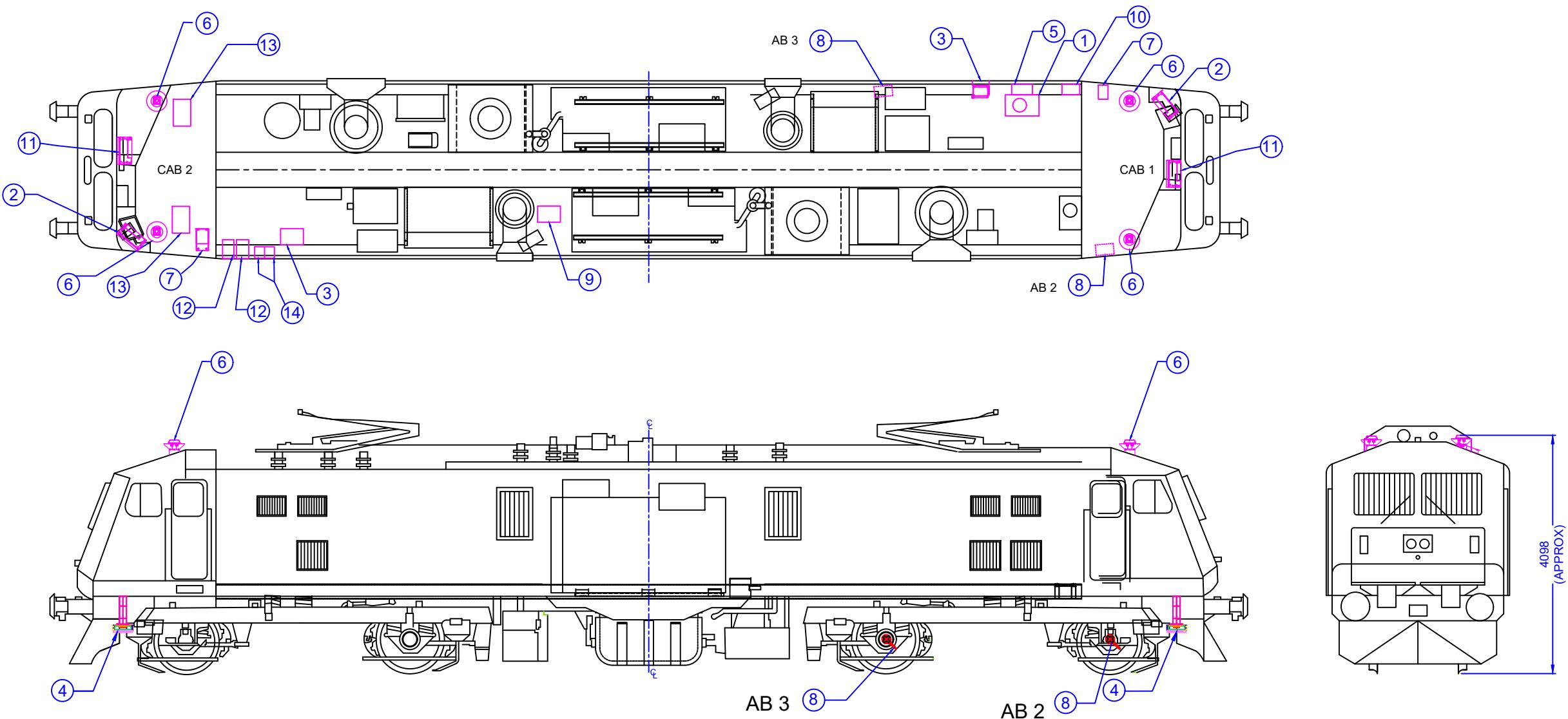
10	CAB INPUT BOX	NEAR ONBOARD KAVACH UNIT	14	POWER SUPPLY UNIT (1&2)	WALL MOUNT BEHIND SB2 PANEL
9	E70 INTERFACE UNIT (BIU) (HBL)	NEAR MRB 2	13	LTE ROUTER ANTENNA (1&2)	ROOF TOP CAB-2
8	PULSE GENERATOR (SPEED SENSOR) 1&2	ON AXLE BOX NO 2 & 5	12	LTE ROUTER (1&2)	WALL MOUNT BEHIND SB2 PANEL
7	GSM & GPS ANTENNA CAB 1 & 2	ROOF TOP CAB 1 & 2	11	CAB RADIO DISPLAY UNIT (1&2)	ON DRIVER DESK NEAR SPM
6	RF ANTENNA 1 & 2	ROOF TOP CAB 1 & 2			
5	ISOLATION BOX	ON TOP OF ONBOARD KAVACH UNIT			
4	RFID READER 1 & 2	BEHIND CATTLE GUARD CAB 1 & 2			
3	RADIO UNIT 1 & 2	ONE UNIT NEAR ONBOARD KAVACH AND THE OTHER EITHER AT CAB1 OR CAB 2 LP BACK SIDE			
2	DMI UNIT1 & 2	CAB 1&2 BELOW CAB FAN INFORNT OF LOCO PILOT			
1	ONBOARD KAVACH UNIT	CAB1 BETWEEN SB1 & HOTEL LOAD CONVERTER			
SNO	DESCRIPTION	LOCATION			

**KAVACH EQUIPMENT LAYOUT : WAP 7
WITH HOTEL LOAD CONVERTER**

Dir/Ele/CoE/Kavach	OSD/CoE	ED/Tele-II/RDSO
REF. :	SCALE - NTS	APPD. BY. (For Dg)
FIRST ISSUED		
SUPERSEDES		
R.D.S.O. ELECT. DTE.	SKEL - 5051 ALT-2.0	SUPERSEDED BY



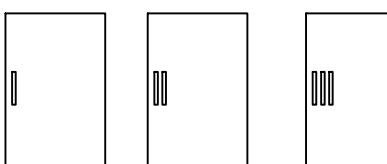
SNO	DESCRIPTION	LOCATION	Dir/Ele/CoE/Kavach	OSD/CoE	ED/Tele-II/RDSO
DT.			REF. :	SCALE - NTS	APPD. BY.
D			(For Dg)		
KAVACH EQUIPMENT LAYOUT : WAG 9					
1	ONBOARD KAVACH UNIT	BETWEEN MR1 & HB1			FIRST ISSUED
2	DMI UNIT 1&2	CAB 1&2 BELOW CAB FAN INFORNT OF LOCO PILOT			SUPERSEDES
3	RADIO UNIT 1 & 2	ONE UNIT NEAR ONBOARD KAVACH AND THE OTHER EITHER AT CAB1 OR CAB 2 LP BACK SIDE			
4	RFID READER 1 & 2	BEHIND CATTLE GUARD CAB 1 & 2			
5	ISOLATION BOX	ON TOP OF ONBOARD KAVACH UNIT			
6	RF ANTENNA CAB 1 & 2	ROOF TOP CAB 1 & 2			
7	GSM & GPS ANTENNA CAB 1 & 2	ROOF TOP CAB 1 & 2			
8	PULSE GENERATOR (SPEED SENSOR)	ON AXLE BOX NO 2 & 5			
9	E70 INTERFACE UNIT (BIU) (HBL)	NEAR MRB 2			
10	CAB INPUT BOX	NEAR ONBOARD KAVACH UNIT			
11	CAB RADIO DISPLAY UNIT (1&2)	ON DRIVER DESK NEAR SPM			
12	LTE ROUTER (1&2)	WALL MOUNT BEHIND HB2 PANEL			
13	LTE ROUTER ANTENNA (1&2)	ROOF TOP CAB-2			
14	POWER SUPPLY UNIT (1&2)	WALL MOUNT BEHIND HB2 PANEL			



10	CAB INPUT BOX	NEAR ONBOARD KAVACH UNIT	14	POWER SUPPLY UNIT (1&2)	WALL MOUNT BEHIND HB2 PANEL
9	E70 INTERFACE UNIT (HBL)	NEAR MRB 2	13	LTE ROUTER ANTENNA (1&2)	ROOF TOP CAB-2
8	PULSE GENERATOR (SPEED SENSOR) 1 & 2	ON AXLE BOX NO 2 & 3	12	LTE ROUTER (1&2)	WALL MOUNT BEHIND HB2 PANEL
7	GPS & GSM ANTENNA	ROOF TOP CAB 1 & 2	11	CAB RADIO DISPLAY UNIT (1&2)	ON DRIVER DESK NEAR SPM
6	RF ANTENNA 1 & 2	ROOF TOP CAB 1 & 2	* FIRE EXTINGUISHER SHALL BE SUITABLY SHIFTED TO INSIDE MACHINE ROOM AND ACCESS TO COCK AND GAUGE SHALL BE MADE AVAILABLE FROM LOCOMOTIVE CAB.		
5	ISOLATION BOX	ON TOP OF ONBOARD KAVACH UNIT			
4	RFID READER 1 & 2	BEHIND CATTLE GUARD CAB 1 & 2			
3	RADIO UNIT 1 & 2	BEHIND HB 1 & 2 PANELS			
2	DMI UNIT 1 & 2	CAB 1 & 2 BELOW CAB FAN INFRONT OF LOCO PILOT			
1	ONBOARD KAVACH UNIT	BEHIND CAB 1 WALL NEAR SB1 OR INSIDE THE LOCATION OF FIRE EXTINGUISHER 1 IN CAB 1 *			
D			Dir/Ele/CoE/Kavach OSD/CoE ED/Tele-II/RDSO REF. : SCALE - NTS APPD. BY. (For Dg)		
T			FIRST ISSUED		
C			SUPERSEDES		
DT.			R.D.S.O. ELECT. DTE. SKEL - 5048 ALT -02		
SNO	DESCRIPTION	LOCATION	SUPERSEDED BY		

Electrical Interface

- Provide three different bunch of wago connectors consisting of 25nos. of wago terminals each to enable drawing of cables for provision of Kavach System.



Wago terminals with 25 connectors for laying input and output cables

- In the first Wago connector, required 9nos. of cables from existing locomotive wiring to be terminated to enable connection of input cables to Kavach System.
- From first Wago connector, 4 more cables shall be laid from SB1 Wago to Pneumatic panel (sufficient length to reach bottom of the panel).
- From first Wago connector, 1more cable shall be laid from SB2Wago to SB1 Wago (feedback of traction cut off). 3051 and SP cables shall be shorted at PUs when Kavach is not provided.
- In the next two Wago connectors of 25 terminals, total 25 cables shall be drawn to each CAB1 and CAB2. These are output cables from Kavach System. Block diagram of proposed scheme is detailed in the SKEL-5074 ALT -0.0 and SKEL-5075ALT- 0.0.
- In CAB1, Suitable 'T' arrangement (in gauge pipes) with isolating cock and dummy shall be provided for the provision of pressure transducers of MR/BP/BC1/BC2.
- In each cab, suitable tapping shall be provided through isolating cock in MR pipe line for Provision of Auto Horn feature of Kavach.
- In each cab, suitable tapping one each in MR pipe line and BP pipe line shall be provided for the Vital emergency brake valves with dummy arrangement.
- Each CAB, LP side Crew Fan shall be shifted upwards by 100mm to facilitate mounting of OCIP (DMI) of KAVACH on left hand side (LP Side) above gauges.
- In WAP7 and WAG9 locos TM1/TM6 (for WAP5 locos TM1 and TM4) Junction box inspection cover shall be provided with 100mm diameter hole for drawing of RFID reader cables.
- Inspection door with Latch shall be provided in each cab to access isolation cock. The rough sketch of inspection door arrangement is given drawing no SKEL:5073 ALT - 0.0
- Mounting arrangement for RF Antenna and GPS/GSM Antenna shall be provided as per the enclosed drawings SKEL:5069 ALT-0.0 ,SKEL: 5071 ALT-0.0.
- 120×220mm opening shall be provided in the central corridor cable trench on both ends (one for each cab) near the door for routing of cables from On-board Kavach unit to RFID reader and Pulse generator cables.
- One circular hole of 80mm. dia shall be provided in each CAB on LP side behind the driver desk towards the wall for routing of OCIP (DMI) cables.
- As per the standardized layout , routing of cables shall be done in the side cable tray and machine room cable tray in the center along with securing of cables with necessary bunching rods.
- At Production Units (PUs) : A dedicated conduit of 25 mm dia. shall be provided from each RF/GSM-GPS antenna mounting into each CAB(as per drawing number SKEL:5072 ALT-0.0 and SKEL:5076 ALT-0.0) and terminated in the CAB for drawing of cables during provision of Kavach.Similarly dedicated conduit of 25mm dia. shall be provided for both LTE antennae on top of cab2 as per drawing number SKEL:5076 ALT-0.0.
- Supply of Installation drawings: All OEMs are requested to provide detailed installation drawings to S&T Dte/RDSO as per the standardized locations duly indicating various clearances from existing equipment.

Precautions to be taken

- 2524A (cab1 forward) and 2526B (cab2 reverse), 2526A (cab1 reverse) and 2524B (cab2 forward) shall not be merged during wiring. If CAB2 and CAB1 cables are merged then it may lead to spurious "brake electronics fail" message. This aspect shall be checked after carrying wiring at Loco Sheds. Whenever the cables are required to be merged, they can be taken to the card through a diode and merged on the card after diode.

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REF.:	SCALE -NTS	APPD. BY. (For Dg)	FIRST ISSUED
GUIDELINES FOR INSTALLATION OF ONBOARD KAVACH (Page 1 of 2)			SUPERSEDES
R.D.S.O. ELECT. DTE. SKEL -5068 ALT-0.0			SUPERSEDED BY

19. Cables, Pneumatic pipe lines, Pneumatic fittings, isolating cocks, magnet valves shall be procured from vendors as per approved vendor directory (list available in web portal IREPS).
20. The feedback status of isolation cocks of Vital EB and IRU bypass switch shall be maintained as 'HIGH' .(Onboard Kavach should get feedback voltage when cock is 'open' and IRU bypass switch is 'Normal').
21. The base plate of equipment shall not be welded directly on the side walls of the locomotive. For mounting of equipment on wall, welding of base plate from one channel to other shall be done. On top of the welded base plate the equipment mounting shall be done with suitable arrangement. All the welded plates shall be painted to avoid corrosion.
22. Protection guard as per drg no SKEL:5078 ALT-0.0 shall be welded on cattle guard to prevent damage to RFID readers during CRO.
23. A suitable sling arrangement shall be provided for each RFID reader to prevent it from falling.
24. During retro fitment of kavach in loco sheds the cables for roof mounted units shall be drawn through a GI pipe of 120 mm dia. with a crane neck to avoid the entry of water into locomotive. The pipe shall be welded to the roof base of the locomotive. Further the cables shall be routed through the flexible conduit and secured with bunching ties to the bunching rods which are welded on Locomotive roof.
25. Power Supply for LTE Equipment: Power supply for LTE equipment shall be drawn from the cables 2094 (110V +ve) and 2050 (110V -ve) which are available in the SB2 panel.
26. Fouling mark will be provided by Kavach as input to EoTT and EoTT will provide the Train Integrity as input to Kavach. The actual scheme of these variables is yet to be decided.

M/S Medha	M/S HBL	M/S Kernex	M/S GG Tronics	LTE Equipment Dimensions
Main Unit: L500×W380×H1150	Main Unit: L656×W409×H670	Main Unit: L600×W380×H835	Main Unit: L540×W390×H894	CAB Display Unit: L340×W215×H178
DMI Unit: L400×W200×H420	DMI Unit: L371×W157×H413	DMI Unit: L380×W120×H372	DMI Unit: L370×W99×H310	LTE Router: L477×W247×H115
Radio Unit: L310×W230×H340	Radio Unit: L310×W230×H340		Radio Unit: L260×W142×H180	LTE Router Antenna: L489×W392×H100
RFID Reader: L560×W440×H630	RFID Reader: L460×W380×H485	RFID Reader: L250×W240×H60	RFID Reader: L520×W360×H295	Power Supply : L300×W200×H200
	CAB Input Box: L305×W150×H400	CAB signal Junction Box: L200×W84×H202	Input/Output Distribution Box: L310×W142×H600	
RF Antenna: L410×W180×H260	RF Antenna: L410×W310×H260	RF Antenna: (RM) L400×W200×H420	RF Antenna: (RM) L280×W320×H420	
GPS/GSM Antenna: L450×W250×H250		GSM/GPS Antenna: L150×W100×H105	GSM/GPS Antenna: L182×W182×H155	
E70 Interface Unit	BIU Unit: L410×W168×H450	E70 Interface Box: L355×W200×H150		
		E70 Terminal Box: L200×W84×H322	Power Distribution Unit: L360×W142×H700	

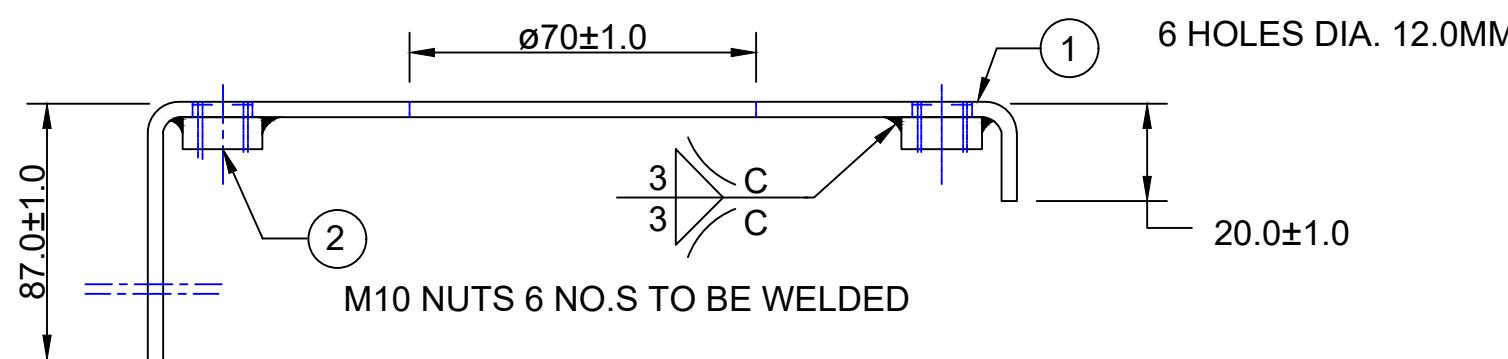
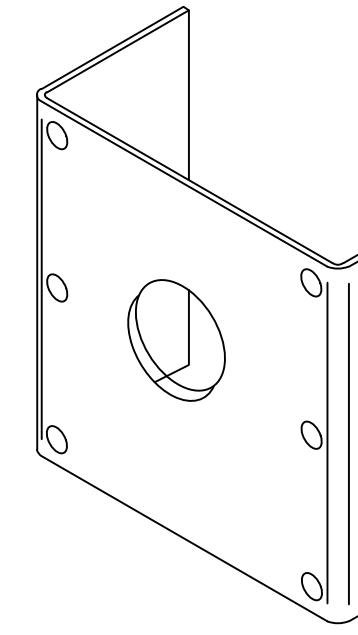
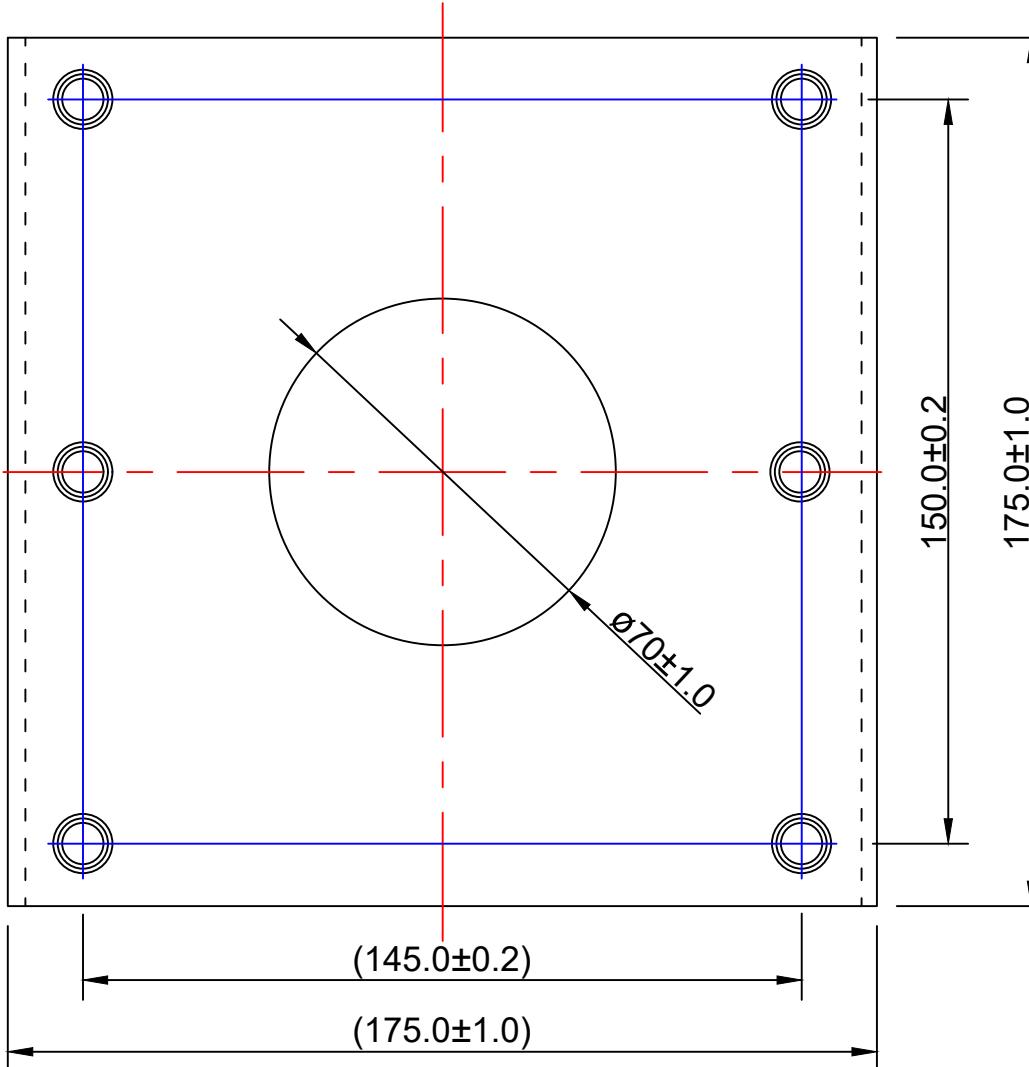
Note

1. As evident from the above table, there is a difference in sub equipments across OEMs. All the vital equipment and equipment involving LP interface (isolation switch) location have been standardized as per the sketch showing layout of equipment for WAP7 and WAG9 Locomotives. Any miscellaneous equipment which is specific to OEM may be provided in a convenient location as per the space availability in the locomotive duly considering the space required for maintenance of equipment.

2. In some makes all GSM/GPS antennae of Onboard Kavach are mounted inside single unit only.

REF. :	SCALE -NTS	APPD. BY. (For Dg)	FIRST ISSUED
GUIDELINES FOR INSTALLATION OF ONBOARD KAVACH (Page 2 of 2)			SUPERSEDES
R.D.S.O. ELECT. DTE. SKEL -5068 ALT-0.0			SUPERSEDED BY

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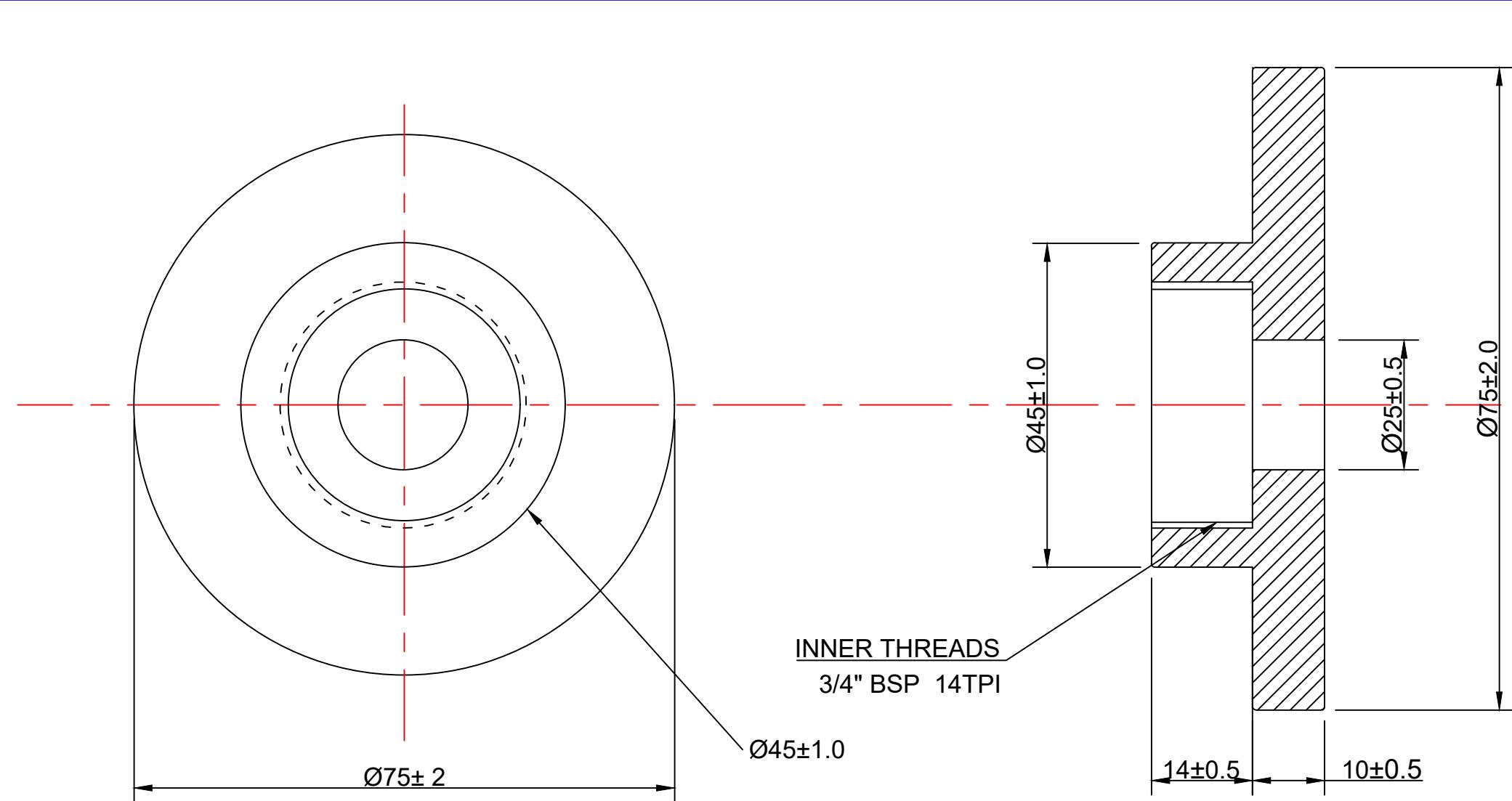


Notes :

1. MATERIAL: 3.0 ± 0.3 THICKNESS CRCA SHEET AS PER IS 513, GRADE CR2
2. COMPONENT SHOULD BE FREE FROM ALL SHARP EDGES, BURRS AND WELD FLASHES
3. FINISH:
 - a. PRETREATMENT : ZINC PHOSPHATING, AS PER SD-4027 OR ITS EQUIVALENT
 - b. TOP COAT: POWDER COAT TO BLACK TEXTURE RAL 9005, AS PER SD-3891 OR IT'S EQUIVALENT

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REF. :	SCALE - NTS	APPD. BY. (For Dg)
RF ANTENNA MTG. BRACKET		FIRST ISSUED
		SUPERSEDES
R.D.S.O. ELECT. DTE	SKEL -5069 ALT-0.0	SUPERSEDED BY

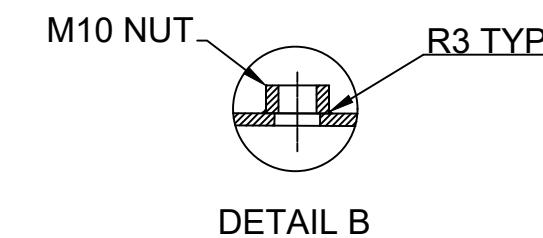
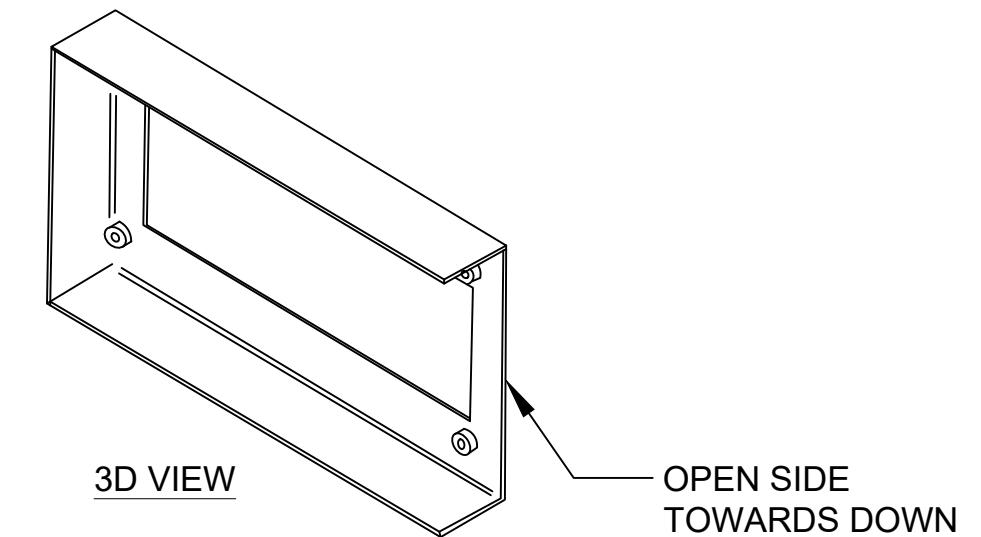
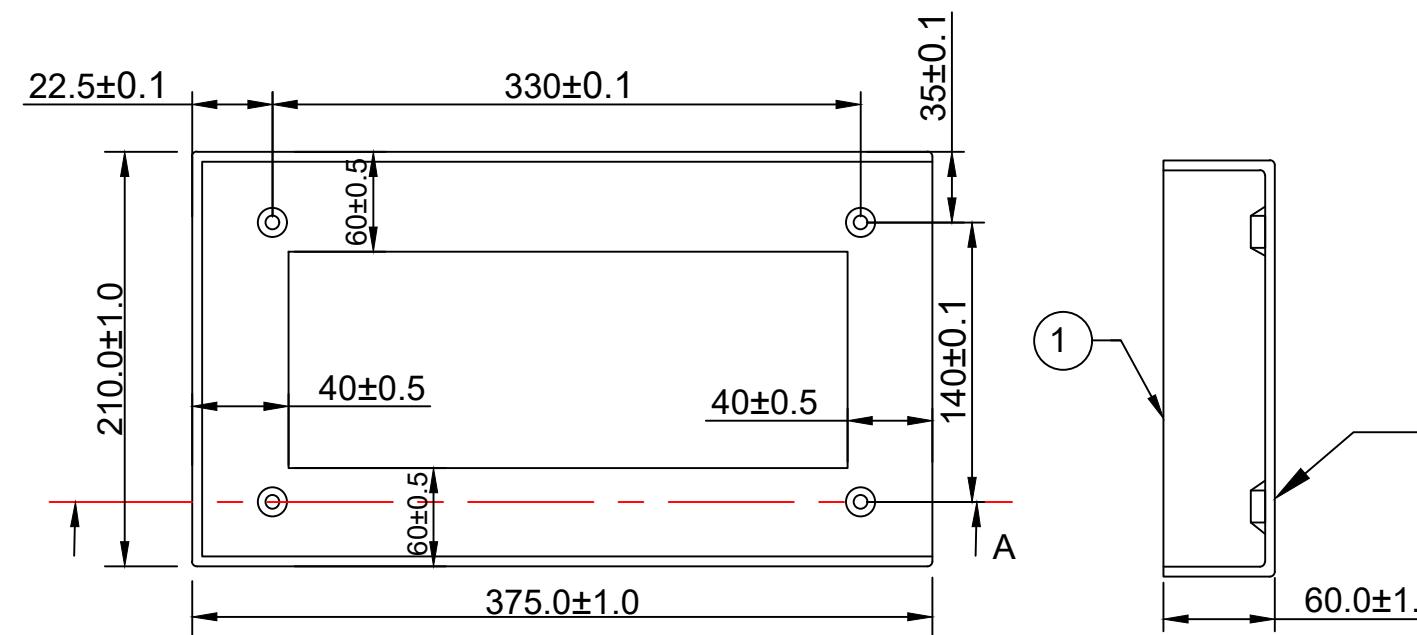


Notes :

1. MATERIAL : CRCA AS PER IS:513, GRADE CR2
2. REMOVE ALL SHARP EDGES AND BURRS
3. ALL DIMENSIONS IN MM
4. INNER THREADS TO BE SUITABLE FOR CABLE GLAND OF 3/4 "
5. THIS PLATE IS TO PROVIDE ON CAB ROOF FOR CABLE ENTRY AND TO BE WELDED AFTER DRILLING THE ROOF OF DIA. 30±3.0MM.

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REF. :	SCALE - NTS	APPD. BY. (For Dg)
CABLE ENTRY PLATE		FIRST ISSUED
SUPERSEDES		
R.D.S.O. ELECT. DTE.	SKEL -5070 ALT-0.0	SUPERSEDED BY

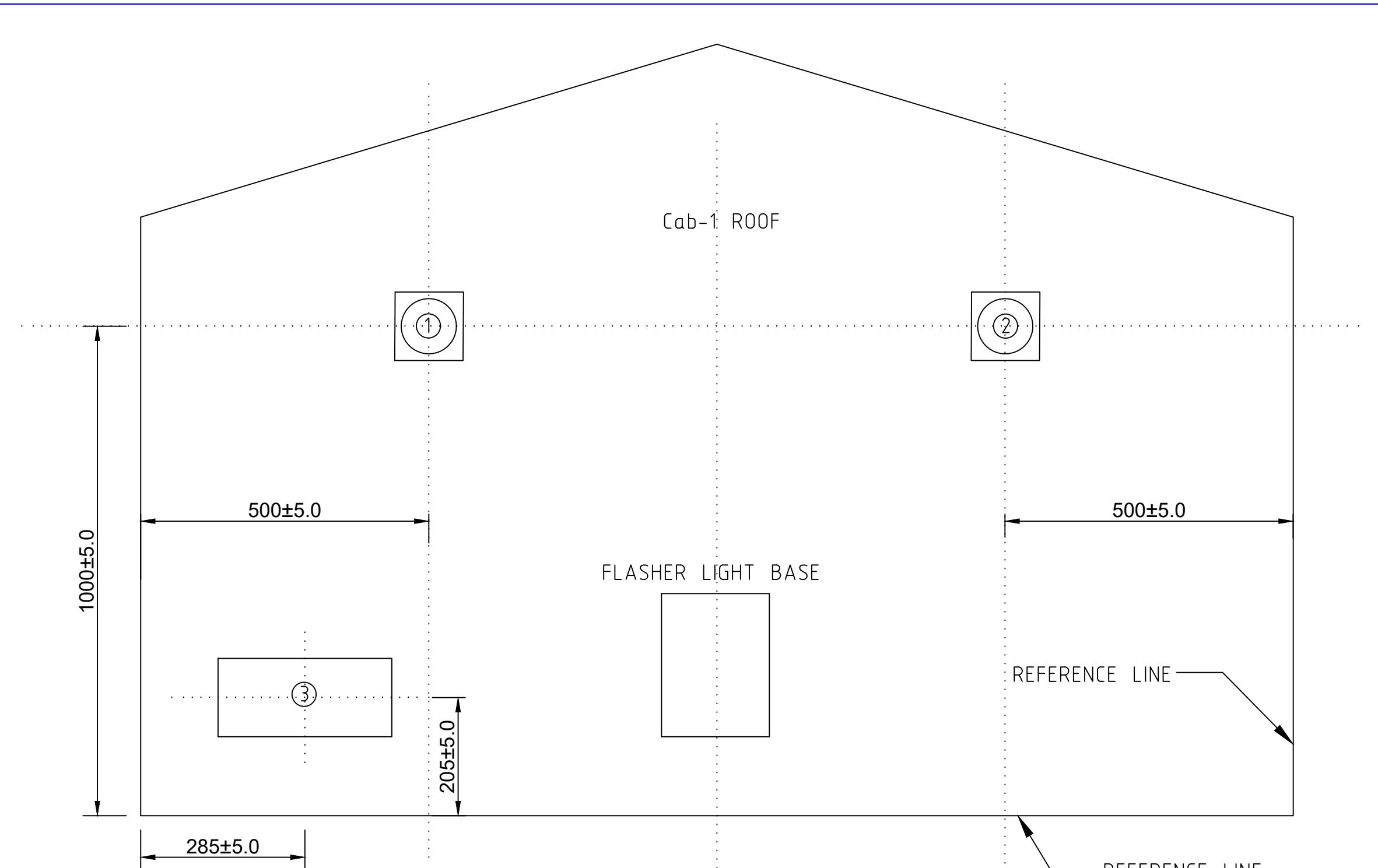


NOTES :

1. MATERIAL 3.0 ± 0.3 MM THICKNESS CRCA SHEET AS PER IS:513 GRADE CR2
2. COMPONENTS SHOULD BE FREE FROM ALL SHARP EDGES, BURRS AND WELD FLASHES
3. FINISH :
 - A. PRETREATMENT : ZINC PLATING 8-10 μm FOLLOWED BY HOT WATER SEALING , AS PER SD 3937
 - B. POWDER COATING : LIGHT GREY SEMI GLOSSY IS 5(631) AS PER SD 3892 & SD 3895
4. ALL DIMENSIONS ARE IN MM.
5. WHILE WELDING THIS BRACKET ON ROOF CARE TO BE TAKEN THAT OPEN SIDE IS DOWNTOWARDS (CAB DOOR SIDE)

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REF. :	SCALE - NTS	APPD. BY. (For Dg)
MTG.BRACKET FOR ANTENNA GPS/GSM		FIRST ISSUED
		SUPERSEDES
R.D.S.O. ELECT. DTE.	SKEL -5071 ALT-0.0	SUPERSEDED BY

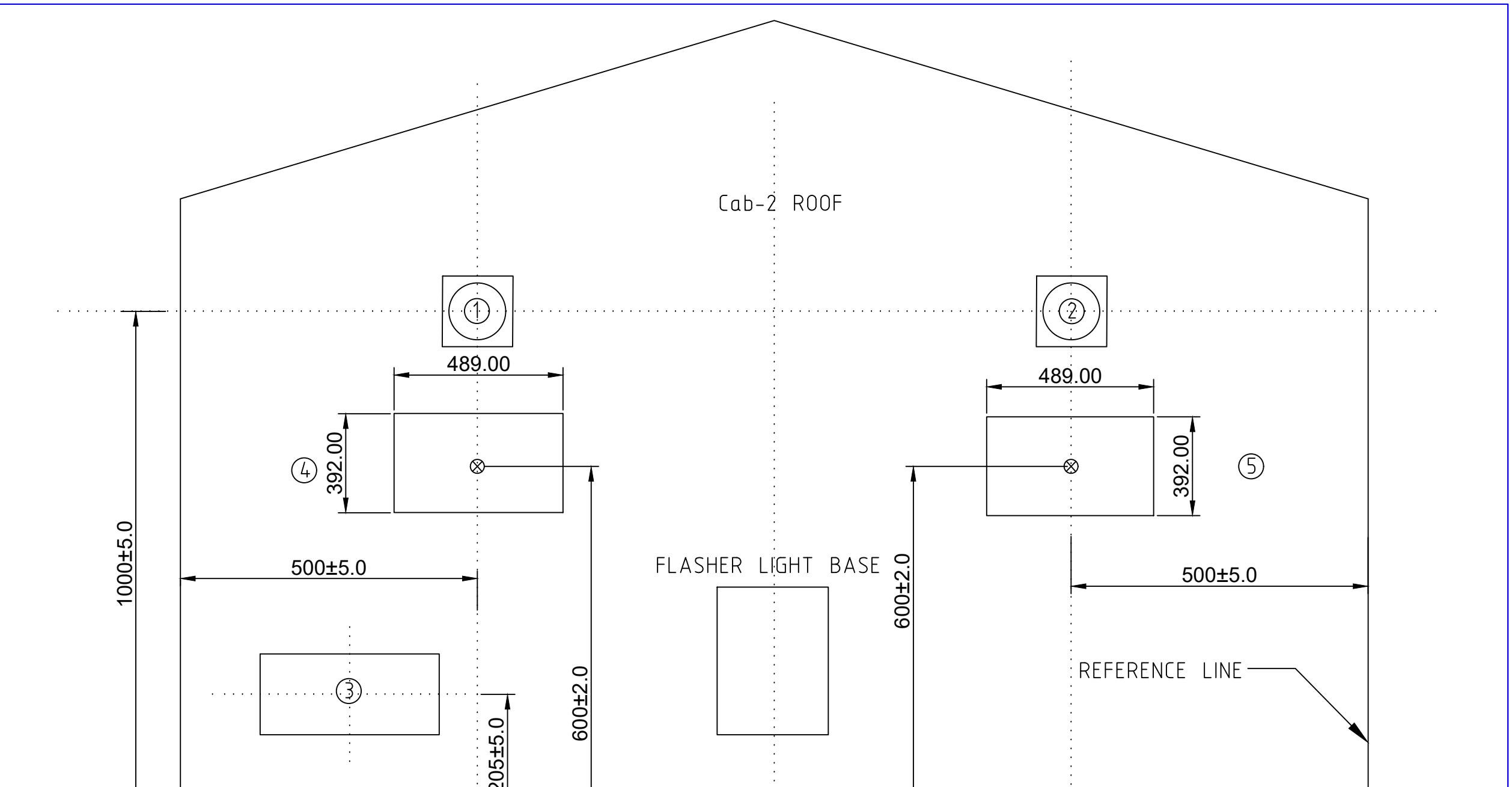


NOTES :

- a. 1,2 RF ANTENNA BASE
- b. 3 GSM & GPS ANTENNA BASE
- c. ALL DIMENSIONS IN MM.
- d. RF ANTENNA TOP SURFACE SHOULD NOT EXCEED BASE LEVEL OF FLASHER LIGHT

TOP VIEW

REF.:	SCALE -NTS	APPD. BY. (For Dg)
LOCATION OF ANTENNA BASE ON Cab-1 ROOF OF LOCOMOTIVE		FIRST ISSUED
		SUPERSEDES
R.D.S.O. ELECT. DTE.	SKEL -5072 ALT-0.0	SUPERSEDED BY



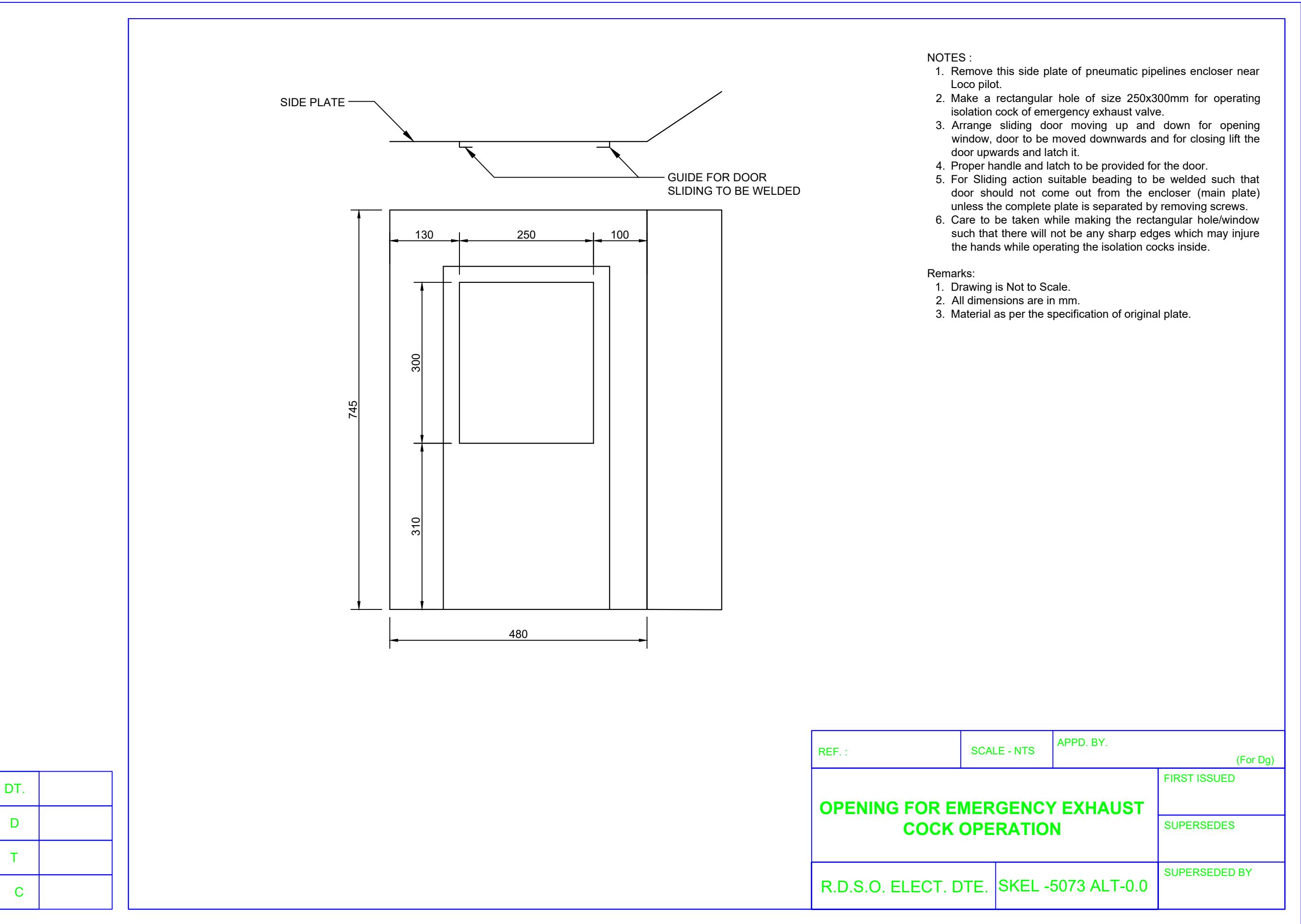
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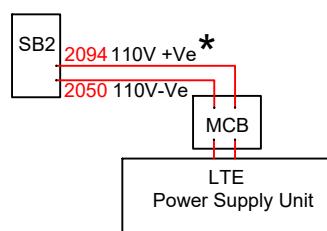
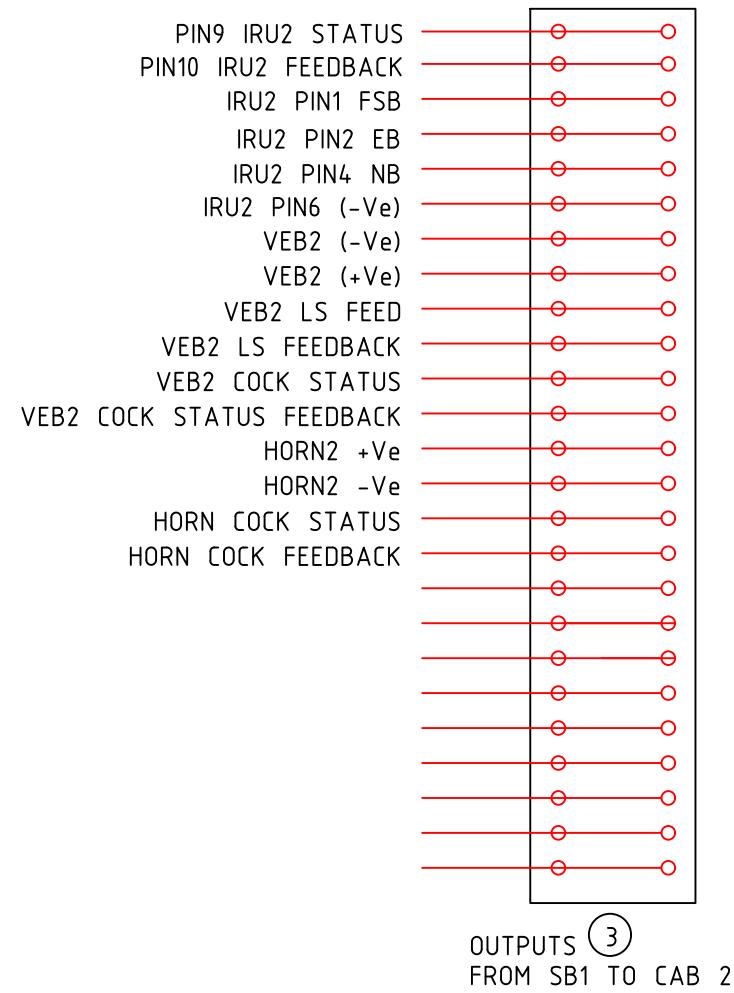
- a. 1,2 RF ANTENNA BASE
- b. 3 GSM & GPS ANTENNA BASE
- c. 4,5 LTE ANTENNA SIZE (489X392X100)
- d. RF ANTENNA TOP SURFACE SHOULD NOT EXCEED BASE LEVEL OF FLASHER LIGHT
- e. ALL DIMENSIONS ARE IN MM.
- f. THE ABOVE MENTIONED ANTENNAE ARRANGEMENT IS APPLICABLE FOR NEW INSTALLATIONS.FOR THE LOCOMOTIVES ALREADY FITTED WITH KAVACH, LTE ANTENNAE WILL BE PROVIDED AS PER THE SPACE AVAILABILITY.

LOCO BODY
TOP VIEW

REF.:	SCALE -NTS	APPD. BY. (For Dg)
LOCATION OF ANTENNA BASE ON Cab-2 ROOF OF LOCOMOTIVE		FIRST ISSUED
		SUPERSEDES
R.D.S.O. ELECT. DTE.	SKEL -5076 ALT-0.0	SUPERSEDED BY

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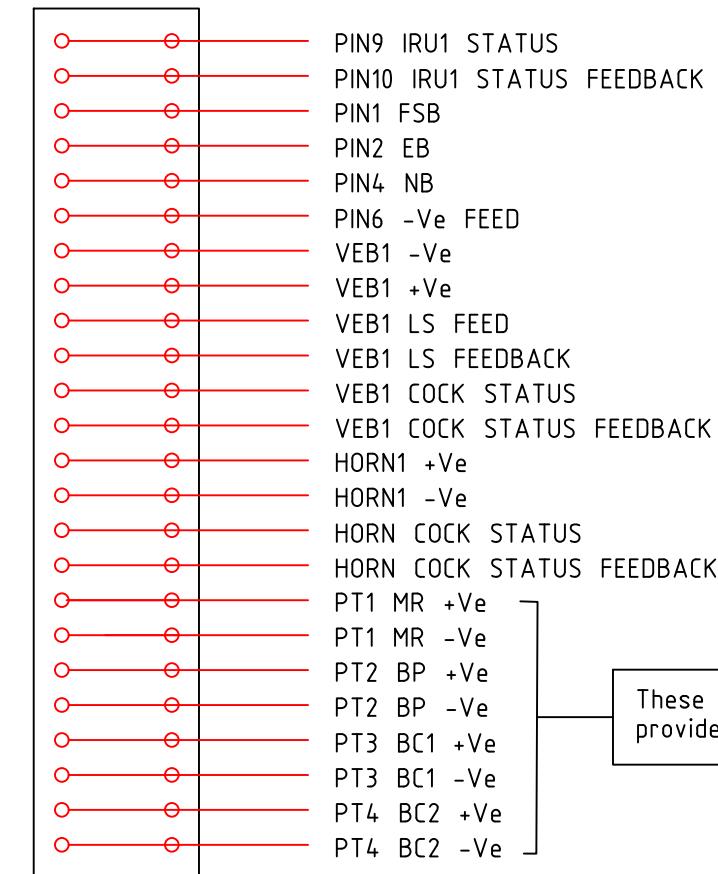
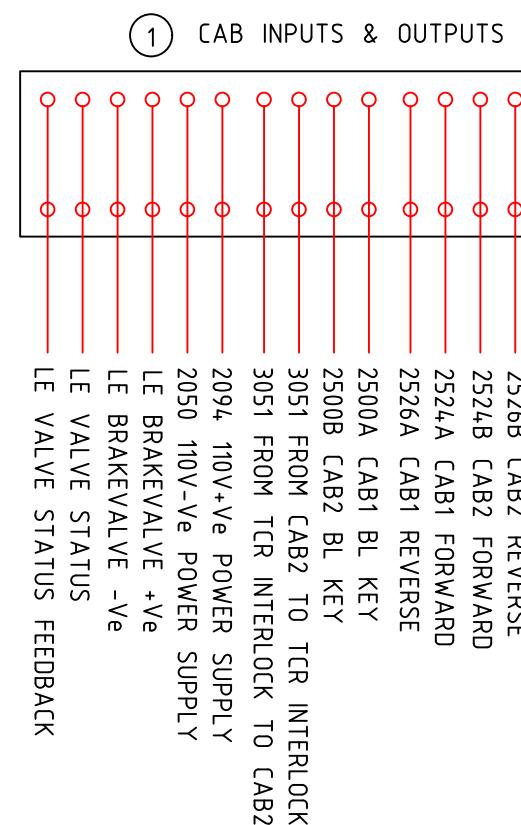
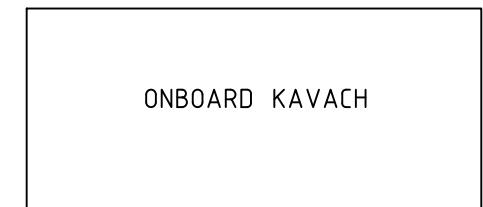


* The input power supply cables for LTE equipment (2094 & 2050) will be provided in the Sheds at the time of provision of LTE power supply unit.

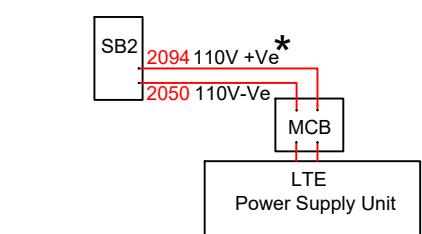
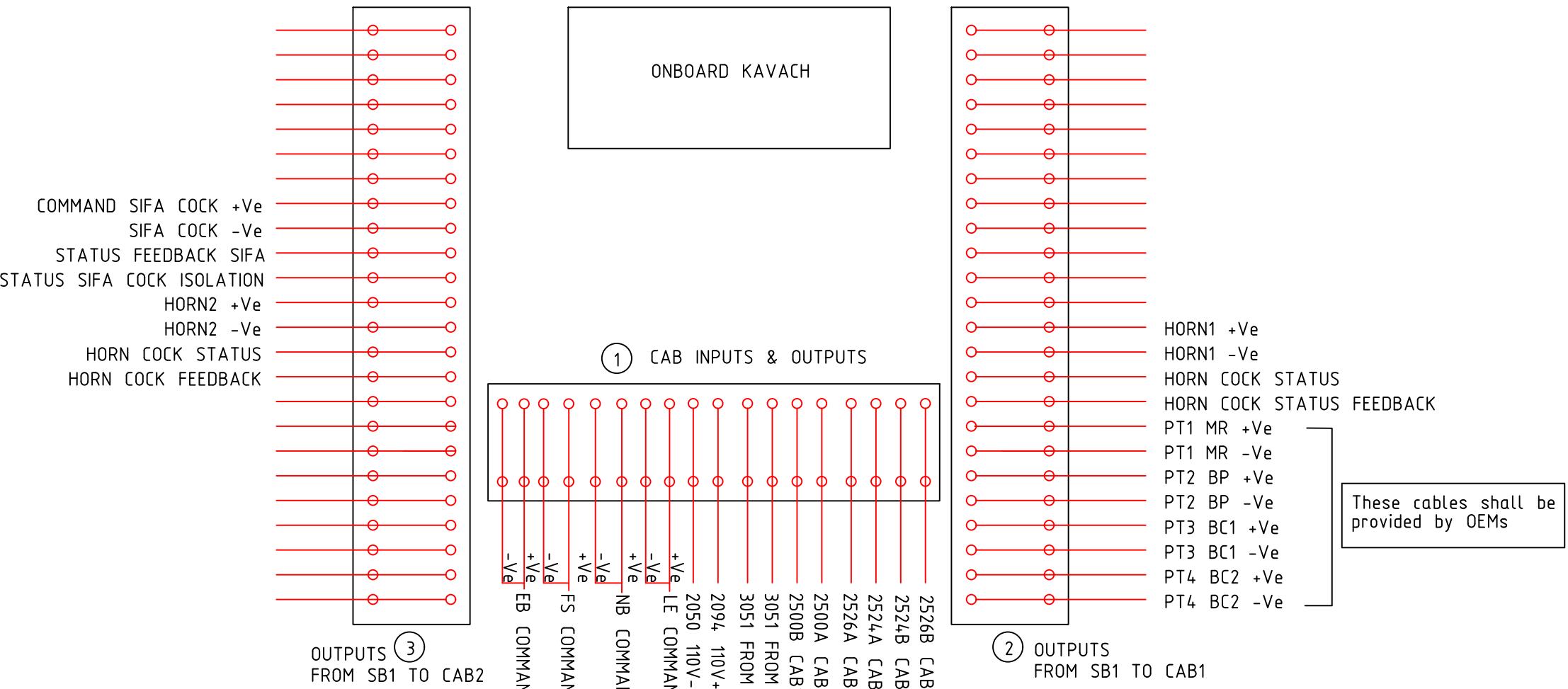
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NOTES :

1,2,3 WAGO CONNECTORS WITH 25 TERMINALS
PT PRESSURE TRANSDUCER
VEB VITAL EMERGENCY BRAKE
IRU INTERFACE RELAY UNIT
TCR TRACTION CUTOFF RELAY
LS LIMIT SWITCH / MICRO SWITCH



REF.:	SCALE - NTS	APPD. BY. (For Dg)
KAVACH INPUTS & OUTPUTS FOR E70 SYSTEM		FIRST ISSUED
		SUPERSEDES
R.D.S.O. ELECT. DTE.	SKEL -5074 ALT-0.0	SUPERSEDED BY



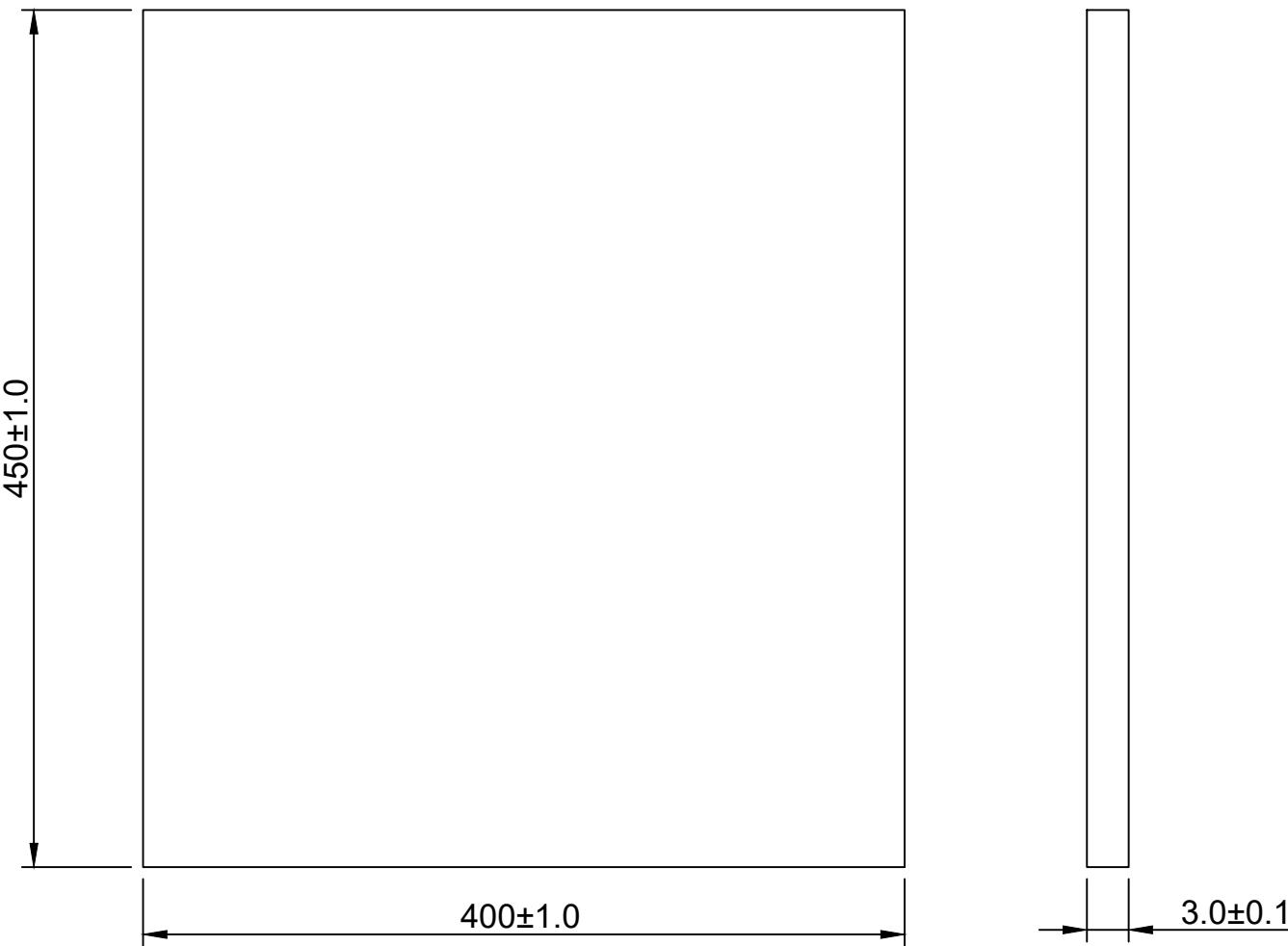
* The input power supply cables for LTE equipment (2094 & 2050) will be provided in the Sheds at the time of provision of LTE power supply unit.

NOTES :

1,2,3 WAGO CONNECTORS WITH 25 TERMINALS
 PT PRESSURE TRANSDUCER
 SIFA EMERGENCY BRAKE VALVE
 TCR TRACTION CUTOFF RELAY

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REF.:	SCALE - NTS	APPD. BY. (For Dg)	FIRST ISSUED
KAVACH INPUTS & OUTPUTS FOR CCB SYSTEM			SUPERSEDES
R.D.S.O. ELECT. DTE. SKEL -5075 ALT-0.0			SUPERSEDED BY



NOTE :

1. MATERIAL 3.0 ± 0.1 mm THICK CRCA SHEET AS PER IS:513 GRADE CR2
2. FINISH :
 - a. PRETREATMENT :ZINC PHOSPHATING, AS PER SD-4027 OR ITS EQUIVALENT
 - b. TOP COAT: POWDER COAT TO BLACK TEXTURE RAL 9005, AS PER SD-3891 OR IT'S EQUIVALENT

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PROCEDURE :

TOTAL FOUR PLATES REQUIRED FOR EACH LOCO.
TWO PLATES TO BE PROVIDED SIDE BY SIDE ON
CATTLE GUARD FROM INSIDE OPPOSITE TO RF
READER. 450mm SIDE TO BE KEPT VERTICALLY
AND TO BE WELDED.

REF.:	SCALE - NTS	APPD. BY. (For Dg)
GUARD FOR RFID READER WAP7 & WAG9 - LOCO'S		FIRST ISSUED
		SUPERSEDES
R.D.S.O. ELECT. DTE. SKEL -5077		SUPERSEDED BY