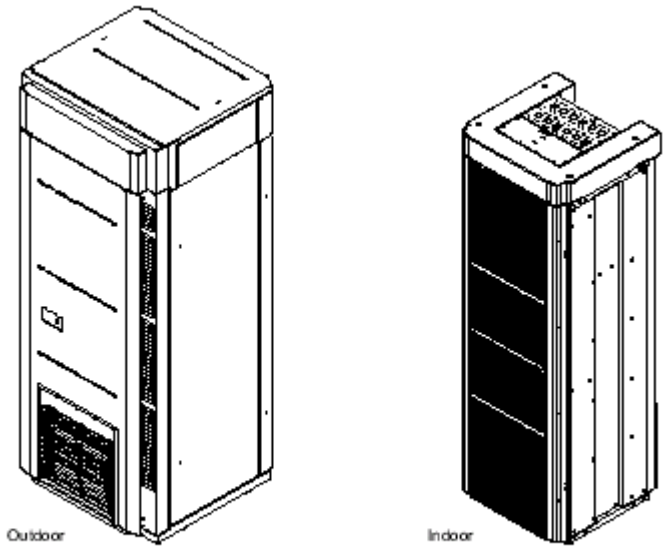
SITE ENGINEERING STANDARDS FOR BSNL NORTH ZONE PROJECT (TO BE FOLLOWED STRICTLY ON SITE)

(BY ANIL KOUL)

SITE REQUIREMENTS (OVERVIEW)

EQUIPMENT TYPES (ULTRASITE BTS)

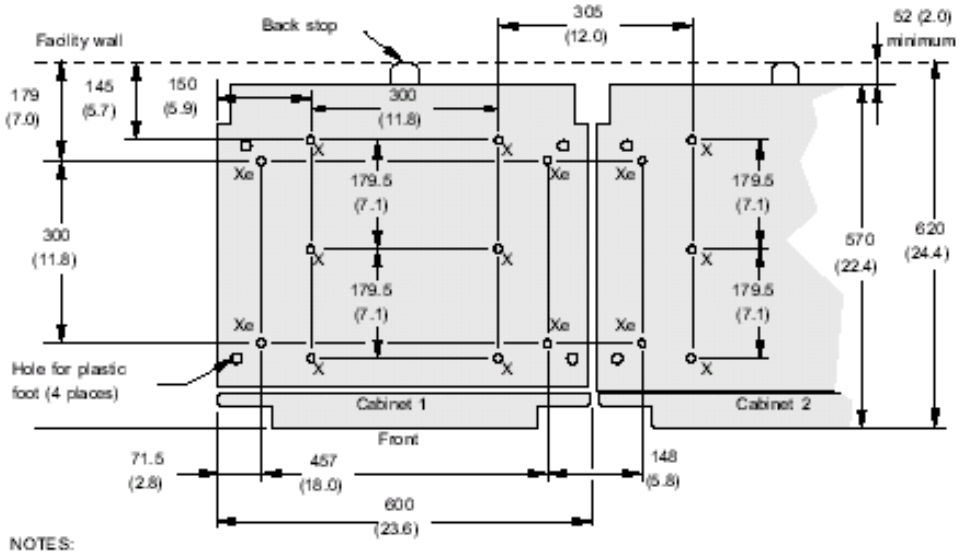
EQUIPMENT DIMENSIONS AND WEIGHT



Nokia UltraSite EDGE BTS Outdoor and Indoor cabinets

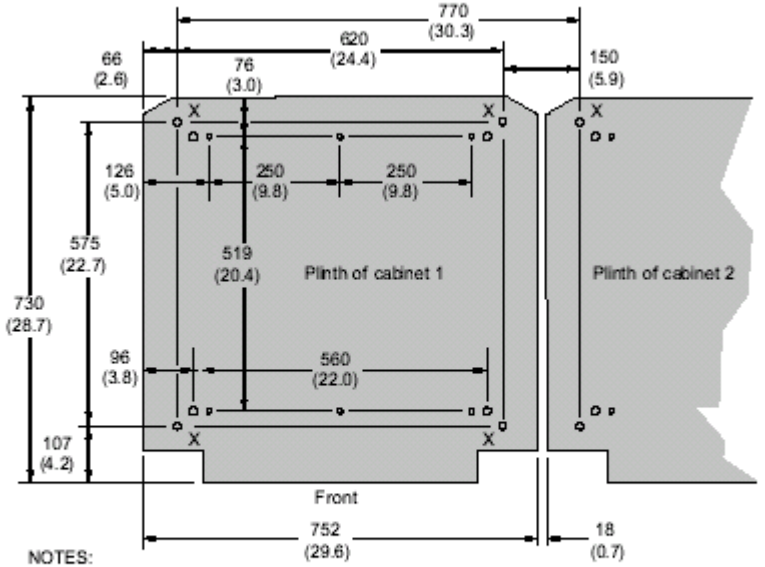
Parameter	Outdoor (CRMA with OAKA)	Indoor (CRMA with IAKA)
Height	1940 mm 76.4 in.	1800 mm 70.9 in.
Depth	750 mm 29.5 in.	620 mm* 24.4 in.
Width	770 mm 30.0 in.	600 mm 23.6 in.
Maximum cabinet weight (with units)	350 kg 770 lb	270 kg 594 lb
Maximum cabinet weight (without	150 kg 330.7 lb	84 kg 185.2 lb

SITE FOOTPRINT



NOTES:
1. Xe - Location of earthquake anchor holes
2. X - Location of additional anchor holes
3. Dimensions: mm (in.)

Cabinet base measurements for multiple Indoor cabinets



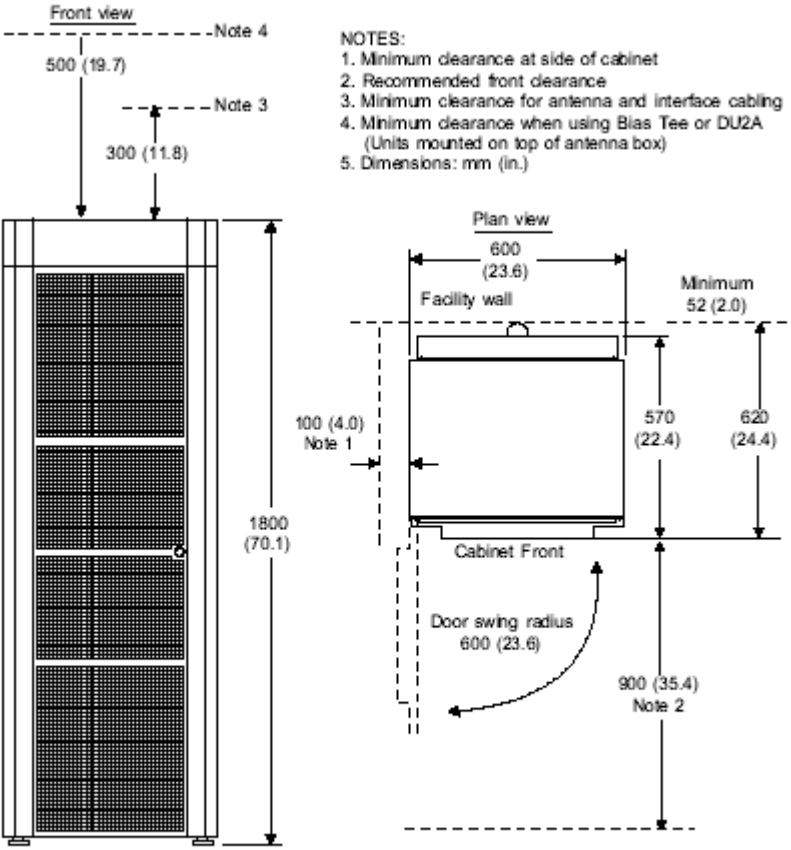
NOTES:
1. X - Location of plinth anchor holes
2. Dimensions: mm (in.)

Plinth measurements for multiple Outdoor cabinets

TO BE USED FOR BSNL NORTH ZONE ONLY

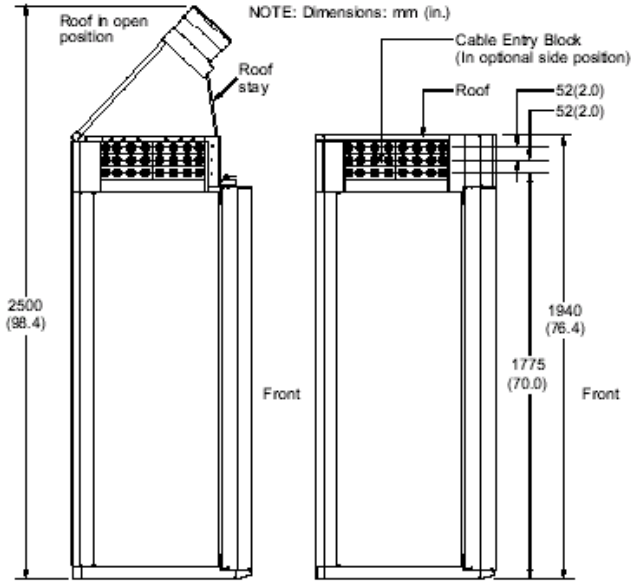
NOKIA

CABINET CLEARANCES

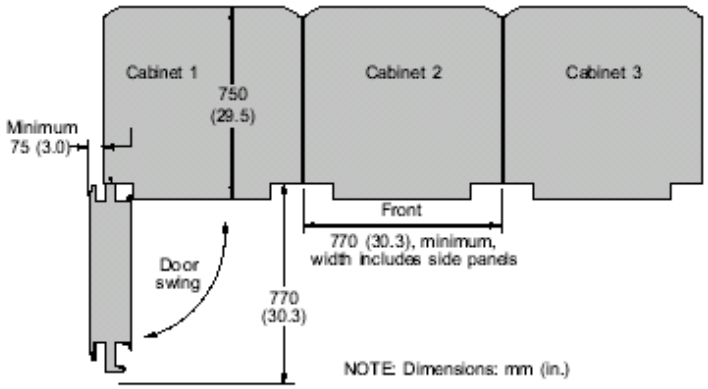


NOTES:
1. Minimum clearance at side of cabinet
2. Recommended front clearance
3. Minimum clearance for antenna and interface cabling
4. Minimum clearance when using Bias Tee or DU2A (Units mounted on top of antenna box)
5. Dimensions: mm (in.)

Clearance recommendations for Indoor cabinet installation



Top clearance recommendations for Outdoor cabinet



Clearance recommendations for Outdoor cabinets

Caution

Do not block air intake to the back of the Indoor cabinet. The recommended back clearance of 52 mm (2.0 in.) ensures proper air intake for the Unit Cooling fans of the cabinet core.

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

POWER REQUIREMENTS

Minimum wire size for Power conductors

Configuration	Power Conductor Wire Size[1]
PWSA (AC)	13.3 mm^2 (6 AWG)
PWSB (-48 VDC	33.6 mm^2 (2 AWG)
PWSC (+24 VDC	95 mm^2 (3/0 AWG)

Electrical properties for Nokia UltraSite EDGE BTS 800, 900, 1800, and 1900

Property		12 TSxx In-door	6 TSxx Midi Indoor	12 TSxx Out-door[3]	6 TSxx Midi Outdoor[4]
Nominal Input Voltage	AC	230 VAC, 50/60 Hz			
	-48 DC	-48 VDC			
	+24 DC	+24 VDC			
	BATA	230 VAC, 50/60 Hz			
Operating voltage Range	AC	184 to 276 VAC, 45-66 Hz			
	-48 DC	-38 to -60 VDC			

[4] BATA power demand includes support of 6-TRX IBBU plus an additional 12 TRX cabinet.

	Indoor ultrasite						Outdoor ultrasite						METROSITE		
Description	22	222	333	444	666	2+2+2/4+4+4	22	222	333	444	666	2+2+2/4+4+4	22	22	22
Power consumption ($P = I_L * 48$)	1002.00	1413.00	2172.00	2736.00	4184.00	4220.00	1137.00	1548.00	2307.00	2871.00	4454.00	4489.00	550.00	550.00	550.0
Load current (I_L Amp)	18.56	26.17	40.22	50.67	77.48	78.15	21.06	28.67	42.72	53.17	82.48	83.13	10.19	10.19	10.19
Back Up time	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	4.00	2.00
Battery Capacity, calculated	195.32	275.44	423.39	533.33	815.59	822.61	221.64	301.75	449.71	559.65	868.23	875.05	107.21	53.61	26.80
Battery Capacity, specified	200.00	300.00	600.00	600.00	1000.00	1000.00	240.00	300.00	600.00	600.00	1000.00	1000.00	120.00	80.00	80.00
Recharge Time (hrs.)	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Charging Current @ C10	19.53	27.54	42.34	53.33	81.56	82.26	22.16	30.18	44.97	55.96	86.82	87.50	10.72	5.36	2.68
Total Rectifier Capacity required.(A)	38.09	53.71	82.56	104.00	159.04	160.41	43.22	58.84	87.69	109.13	169.30	170.63	20.91	15.55	12.87
Rectifier module Capacity (A)	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
No. of rectifier required	1.52	2.15	3.30	4.16	6.36	6.42	1.73	2.35	3.51	4.37	6.77	6.83	0.84	0.62	0.51
No. of rectifier recommended	2.00	3.00	4.00	5.00	7.00	7.00	2.00	3.00	4.00	5.00	7.00	7.00	1.00	1.00	1.00
N+1	3.00	4.00	5.00	6.00	8.00	8.00	3.00	4.00	5.00	6.00	8.00	8.00	2.00	2.00	2.00
System Type	2+1*25A	3+1*25A	4+1*25A	5+1*25A	7+1*25A	7+1*25A	2+1*25A	3+1*25A	4+1*25A	5+1*25A	7+1*25A	7+1*25A	1+1*25A	1+1*25A	1+1*25

Metrosite

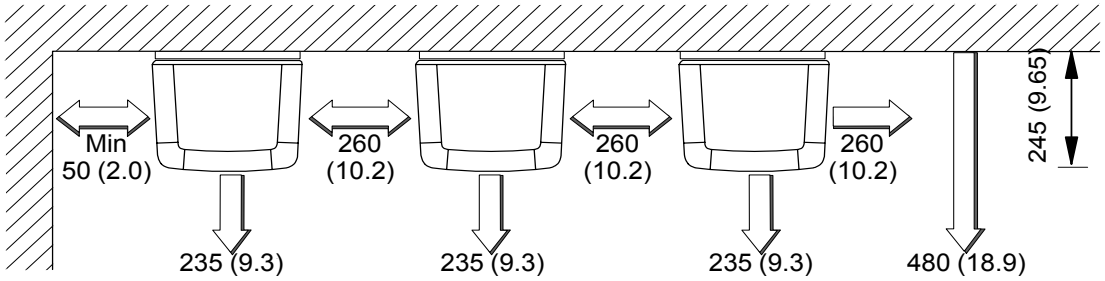
TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

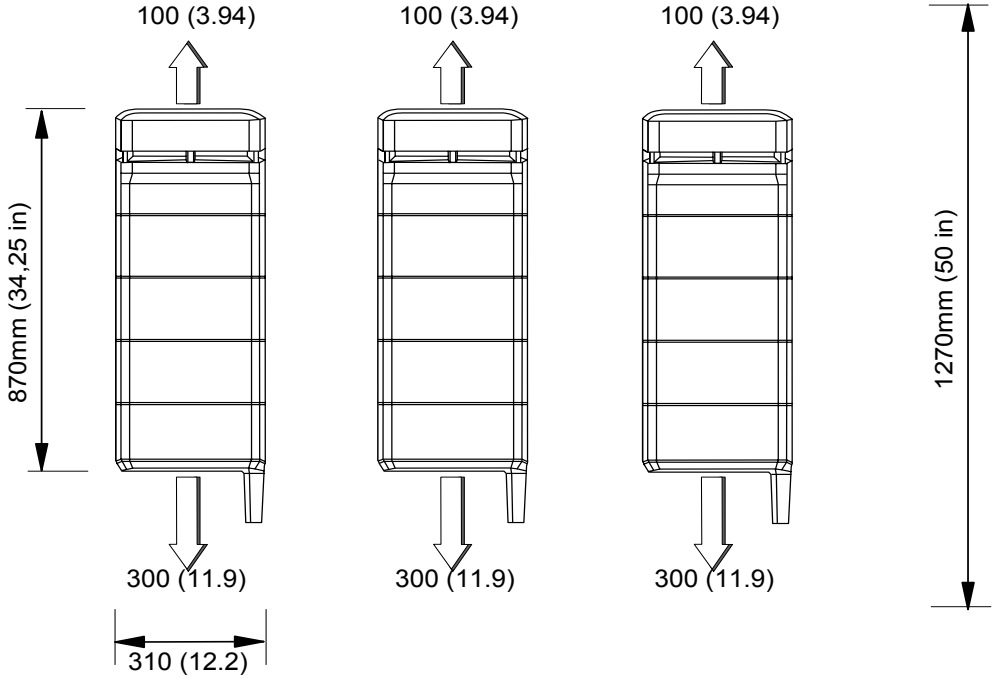
MetroSite Space Requirement

Top view

NOTE: DIMENSIONS mm (inch)



Front view



 SITE ENGINEERING STANDARDS/ANIL KOUL

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

Nokia Metrosite Base Station, Technical Specifications

MetroSite BTS connectors

Interface connector	Number of connectors	Connector type	Cable type/diameter
Antenna connector	1 for each TRX	N	1/4" or 3/8" RF cable
External Alarms and Controls	1 (10 alarm inputs, 4 control outputs)	26 pin mini D (female)	13-pair 28 AWG, 106 Ω Flexible SCSI-2 Cable type CL2/FT1

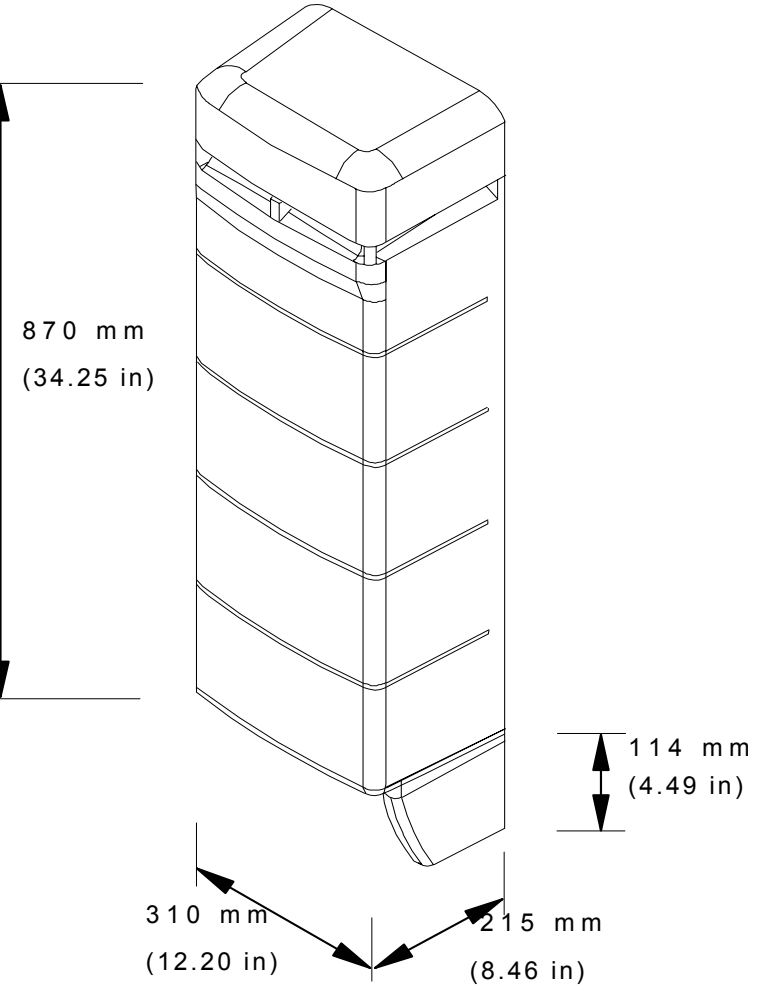
Transmission interfaces of Nokia MetroSite BTS

Interface	Number	Connector type/note
FC RRI	1	TNC (50 Ω), flexbus connection to outdoor unit
FXC RRI	2	TNC (50 Ω), flexbus connection to outdoor unit
FC E1/T1	2 1	BT43 (75 Ω) TQ (120/100 Ω)
FXC E1 (75 Ω)	8	BT43
FXC E1/T1 (120/100 Ω)	4	TQ

Common technical data

Property	Value	Note
Height	870 mm 34.25 in	1270 mm (50 in) with the cable cover
Width	310 mm 12.2 in	-
Depth	215 mm 8.5 in	-
Weight	40 kg (88.4 lb) with four TRXs	Approximately 18 kg (39.8 lb) without TRXs. Heaviest single part 8 kg (17.7 lb).
Low temperature limit	-40 °C -40 °F	
High temperature limit	+50 °C +122 °F	
Ingress protection class	IP55 UL 50-3R	
Acoustic noise, max. (1W TRX BTS)	55 dB (A)	Sound power
Acoustic noise, max. (5W TRX BTS)	61 dB (A)	Sound power
Nominal voltage (external supply voltage)	230 VAC 110 VAC -36/48/60 VDC	3 power supply versions s for 1W and 5W alternative
Permitted operating voltage fluctuation	184 to 276 VAC 85 to 145 VAC -29 to -72 VDC	(44 to 65 Hz) (44 to 65 Hz)

Nokia Metrosite Base Station, Technical Specifications



Permitted operating voltage fluctuation and fuses

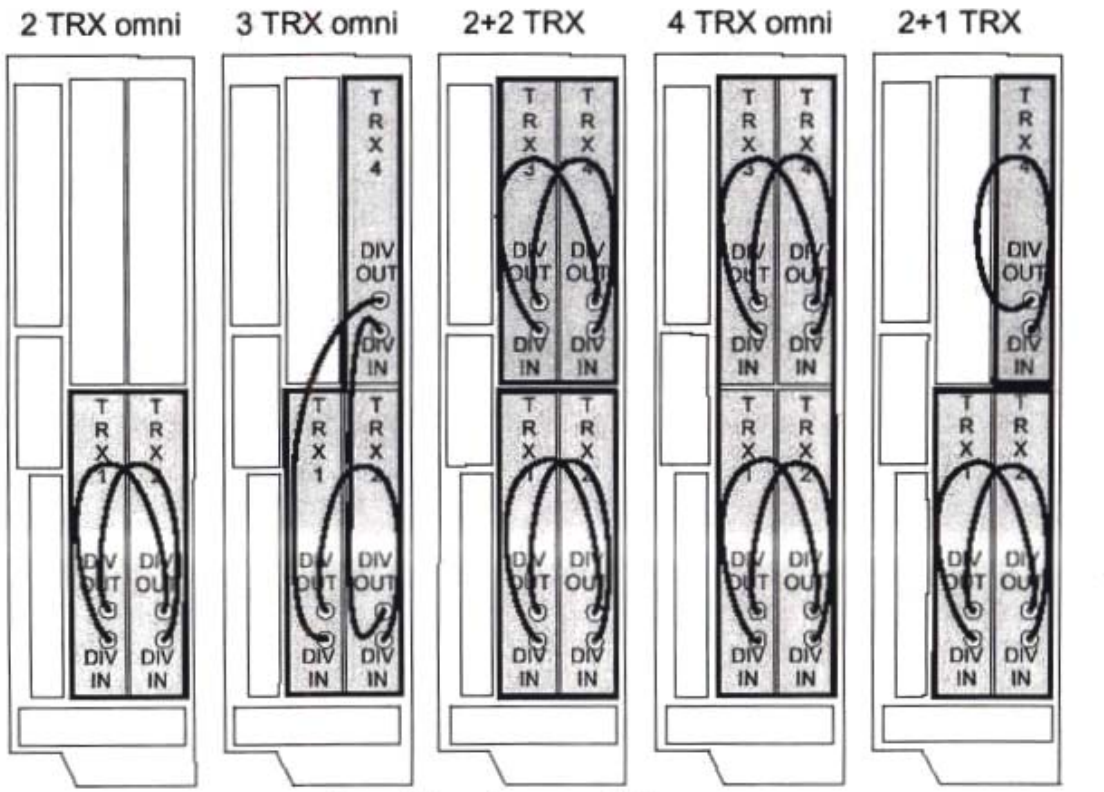
Nominal operating voltage	Permitted operating voltage fluctuation
230 VAC	±20%
110 VAC	±25%
36/48/60 VDC	±20%

It is recommended that the AC mains be protected with a lightning and transient overvoltage protector (mains wire-in protector). This protection is not included in Nokia MetroSite BTS.

Connectors, cables and recommended fuses

Power supply type	Connector type at the end of cable	Cable	Recommended fuse for cable protection
AC supply 230 V	IEC 320 (female)	multicore cable 3x0.75 ... 3x1.5 mm^2 (18-$^1/_2$ AWG ... 15-$^1/_2$ AWG)	10A for 1.5 mm^2 (15-$^1/_2$ AWG) 6A for 0.75 mm^2 (18-$^1/_2$ AWG)
AC supply 110 V	IEC 320 (female) with notch	multicore cable 3x1.5 mm^2 (15-$^1/_2$ AWG)	10 A
DC supply 36/48/60 V	Anderson Power Pole	multicore cable 3x2.5 mm^2 or 3 single wires 2.5 ... 4.0 mm^2 (13 AWG ...11 AWG)	no recommendation, refer to local regulations

Metrosite Configurations



Possible antenna solutions

2 TRX omni	3 TRX omni	2+2 TRX	4 TRX omni	2+1 TRX
- 2 single port antennas - 1 dual port antenna	- 1 dual port and 1 single port antenna - 3 single port antennas	- 2 dual port antennas - 4 single port antennas	- 2 dual port antennas - 4 single port antennas	- 1 dual port and 1 single port antenna - 3 single port antennas

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

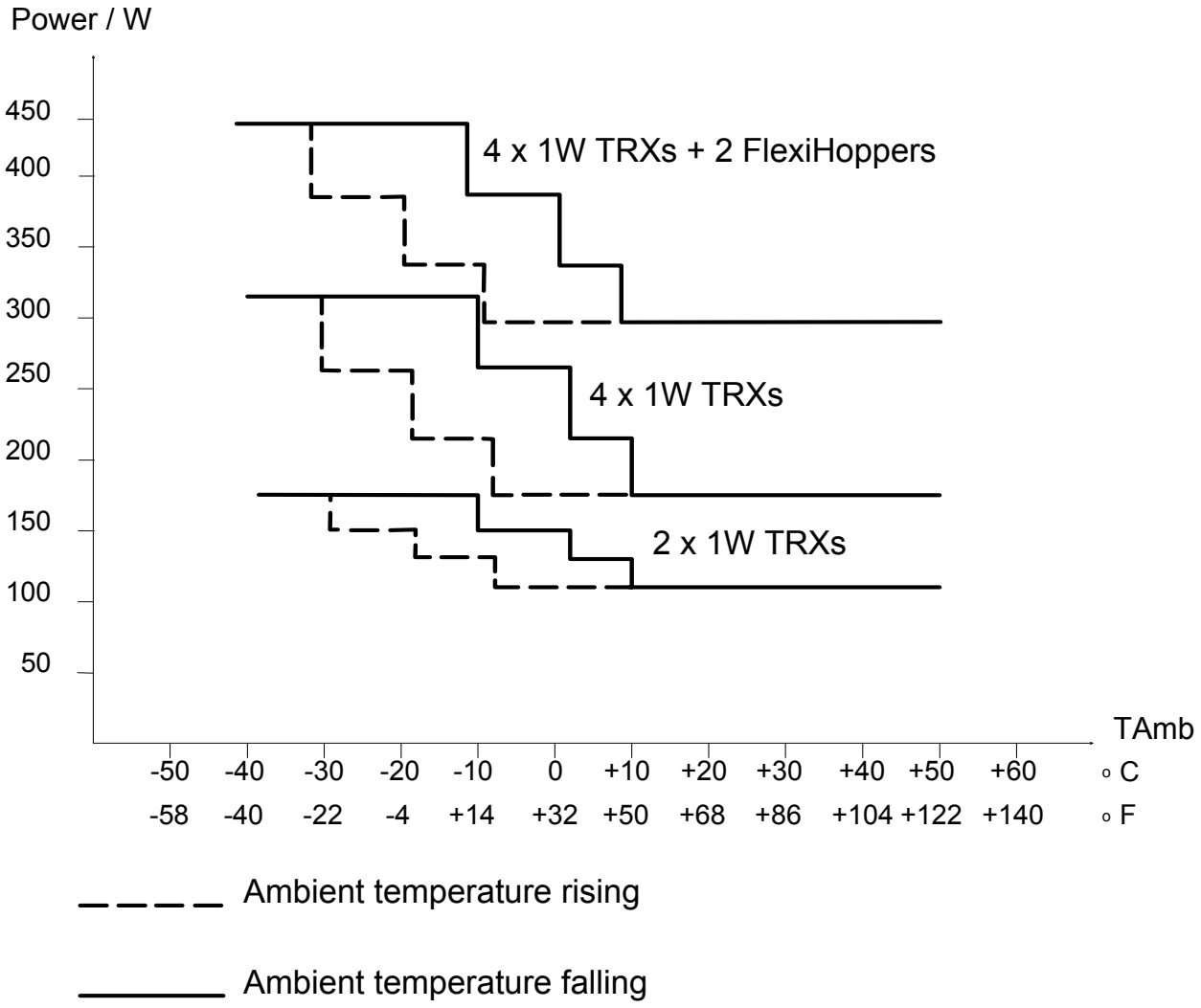
Nokia Metrosite Base Station, Technical Specifications

HW interfaces of Nokia MetroSite BTS

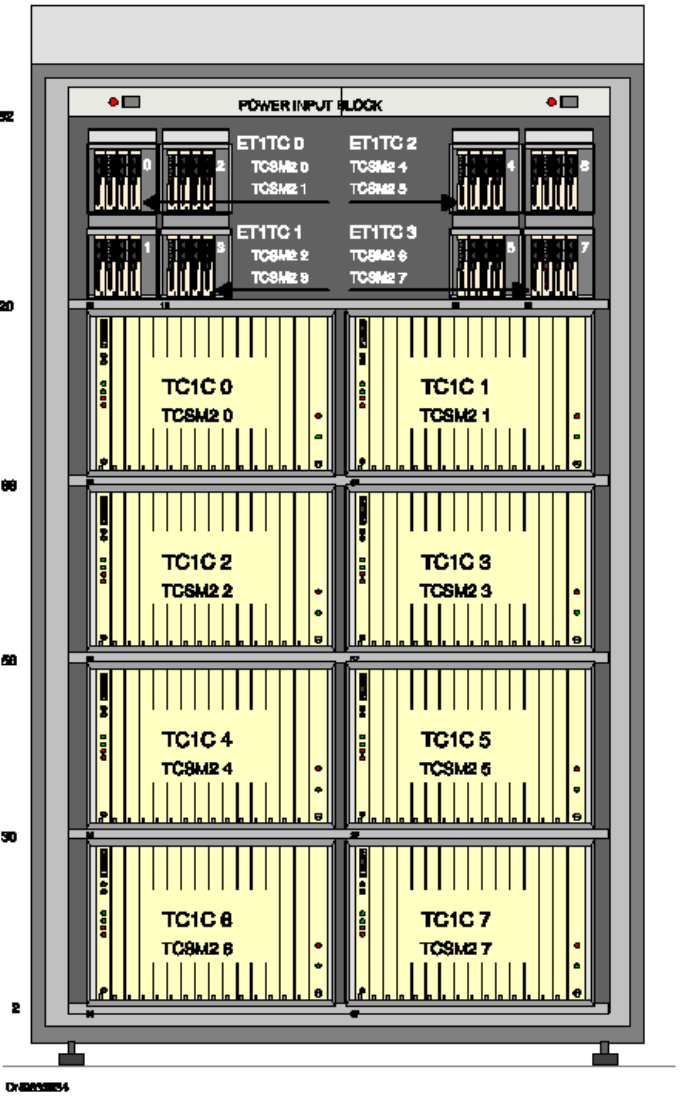
Interface	Number	Connector type/note
Antenna Connectors	1 - 4	N (female), one for each TRX
RX-diversity connectors	2 - 8	SMA (female), two for each TRX
AC supply 230 V	1	IEC 320 (male)
AC supply 110 V	1	IEC 320 (male), with a notch
DC supply DC 36 /48 /60 V	1	Anderson Power Pole
Grounding	1	Cable clamp
External alarms and controls	1	10 alarm inputs 26 pin mini D (female) 4 control outputs
Extension connectors	2	Out/In: 50 pin mini D (female)
13 MHz clock interface	1	MCX (female)
Frame clock	1	MCX (female)
Q1 interface	1	TQ
Local management port (LMP)	1	BQ, RS-232

Nokia Metrosite Base Station, Technical Specifications

Power consumption of Nokia MetroSite BTS



TRANSCODER RACK



gure . The TC2E rack layout.

TCSM2 -240 kg (527.5 lb.)

POWER(W) -392W

	TCSM2
Height, frame	1880 mm (6.17 ft)
Top structure	90 mm (3.6 in)
Adjustable feet*	50 mm (2.0 in)
Height, total	2020 mm (6.63 ft)
Width	800 mm (31.5 in)
Depth	450 mm (17.7 in)

·Leave a free space of at least 1000 mm (3.3 ft) both in front of and behind each rack; this allows access to ea rack from the front and the back.

·Leave a space of at least 500 mm (1.6 ft) between the ends of the rack row(s) and the walls.

·Above the racks, there must be at least 500 mm (1.6 ft) of working space.

BSC3i RACK

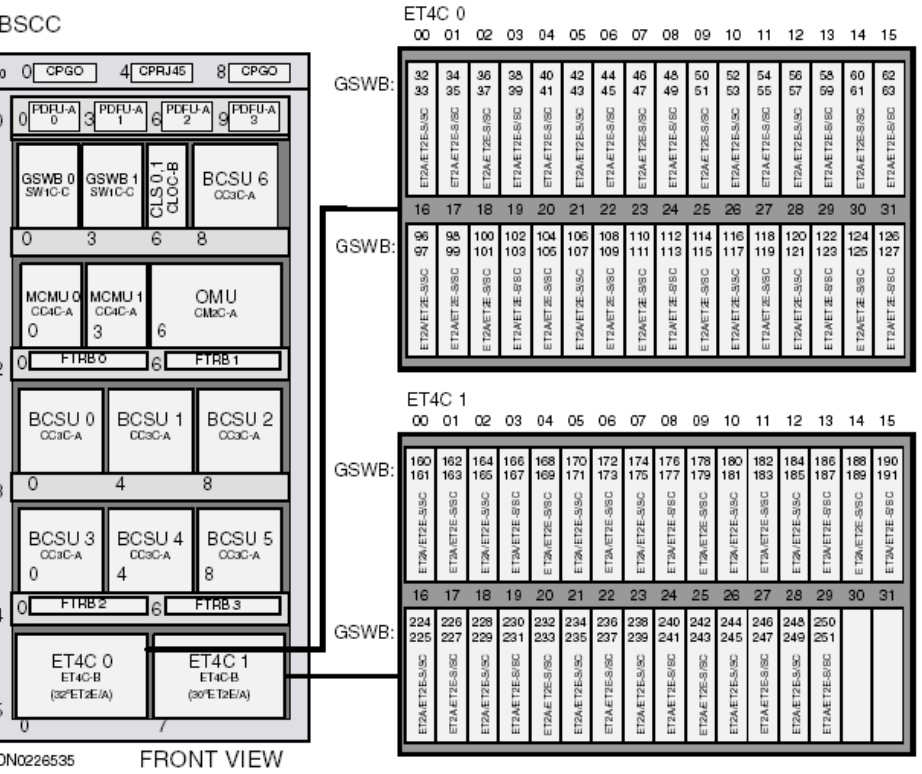
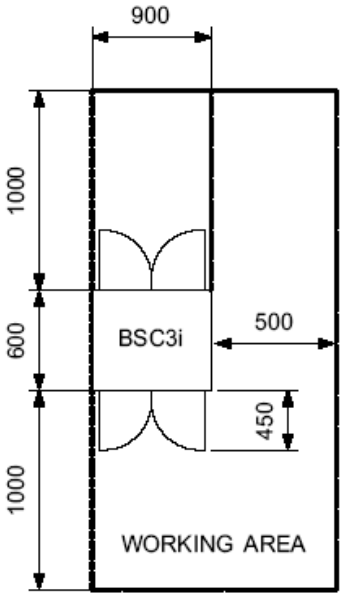


Figure 2. Functional Unit and cartridge postitions in the BSCC.

POWER(W) -1800W

TCSM2 -350 kg

DIMENSIONS:900X600X2000



•Leave a free space of at least 1000 mm (3.3 ft) both in front of and behind each rack; this allows access to ea rack from the front and the back.

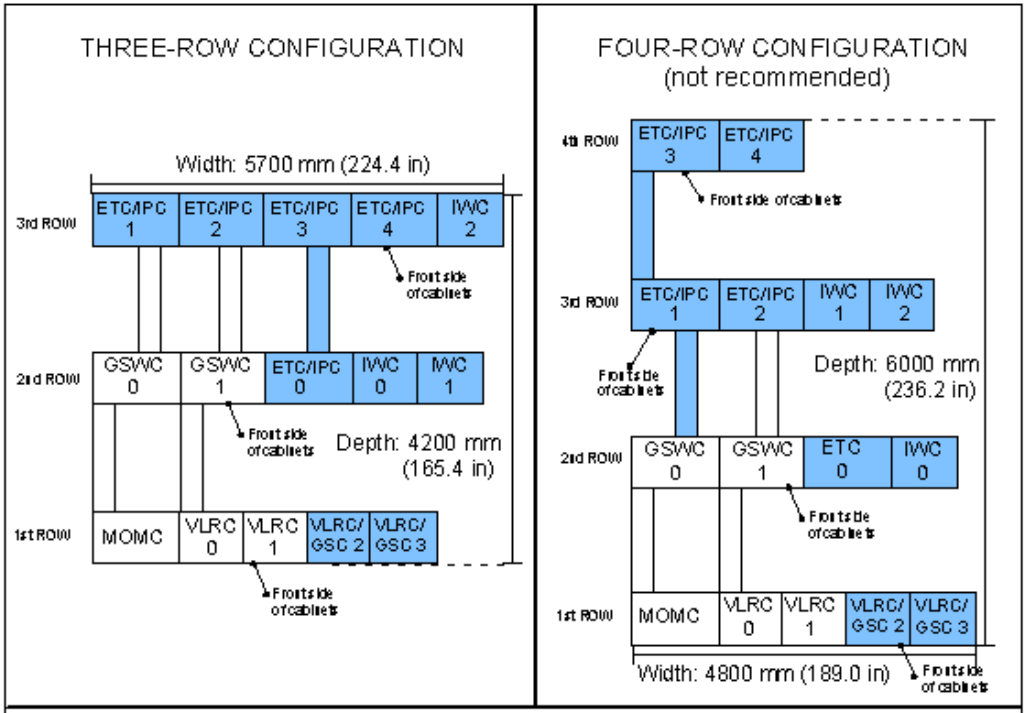
·Leave a space of at least 500 mm (1.6 ft) between the ends of the rack row(s) and the walls.

·Above the racks, there must be at least 500 mm (1.6 ft) of working space.

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

MSC RACK



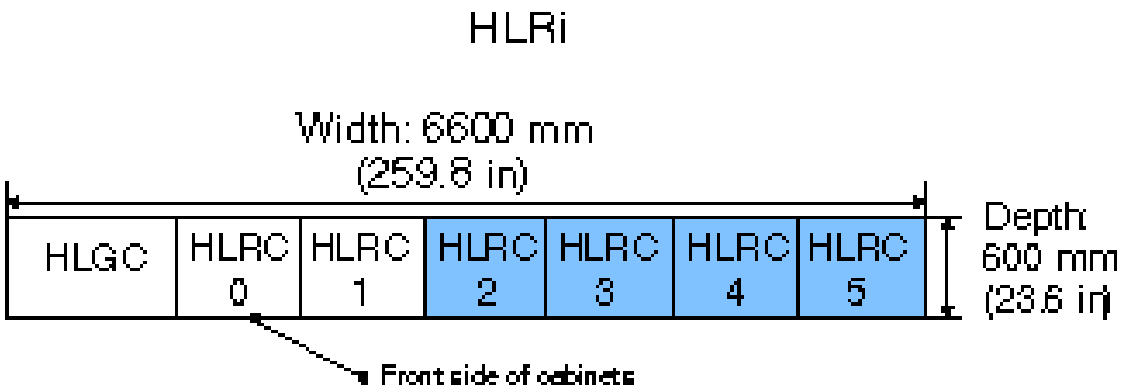
MSC(MOMC,GSW,ETC)=1200X600X2200
MSC(IWC,VLR)=900X600X2200

HLR(HLGC)=1200X600X2000

- Leave a free space of at least 900 mm both in front of and behind each rack; this allows access to each rack from the front and the back.
- Leave a space of at least 500 mm between the ends of the rack row(s) and 900-1200 FROM ONE SIDE FOR THE ACCESS.
- Above the racks, there must be at least 500 mm (1.6 ft) of working space.

TO BE USED FOR BSNL NORTH ZONE ONLY
NOKIA

HLR RACK



HLR(HLGC)=1200X600X2000

•Leave a free space of at least 900 mm both in front of and behind each rack; this allows access to each rack from the front and the back.

·Leave a space of at least 500 mm between the ends of the rack row(s) and 900-1200 FROM ONE SIDE FOR THE ACCESS.

·Above the racks, there must be at least 500 mm (1.6 ft) of working space.

NSS POWER CONSUMPTION

TOTAL DC POWER CONSUMPTION

ETWORK ELEMENT	NO OF RACKS	POWER (W)	MCB RATING PER RACK	MCB RATING PER ELEMENT
SC 400K CAT-A	13 RACKS	13100	2*63	24*63
SC 200K CAT-B	12 RACKS	12350	2*63	24*63
LR	7 RACKS	6650	2*63	14*63
CSM	29 RACK	11600	2*63	30*63
SC 3i	4 RACK	7200	2*63	8*63
GSN	2 RACK	2200	2*63	4*63
TS racks	2 RACK	5760	1*80	2*80
UXES	12 +6 MUX(2 RACKS)	1800	2*100	4*100
U	8 FIU	800	1*10	8*10
ETROHUB rack	8 RACK	4000	1*20	8*20
INVERTER SYSTEM				
ETWORK ELEMENT	NO OF RACKS	POWER (VA)	POWER (W) I/P FOR INVERTER	MCB RATING PER RACK
SS	1 RACKS	4000	4000	6*20 SINGLE PHASE
RP	1 RACK	1400	1400	2*32A
DU TERMINALS	14 TERMINALS	7000	7000	14*6A

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

VAS ELEMENTS POWER CONSUMPTION

ETWORK ELEMENT	NO OF RACKS	POWER (VA)	INDUSTRIAL SOCKETS
MSC	3 RACKS	10155 VA	6X20A SINGLE POLE
ISC	4 RACKS	6440 VA	8X20A SINGLE POLE
A	1 RACK	4022 VA	2X20A SINGLE POLE
T	1 RACK	10400 VA	6X20A SINGLE POLE
S	1 RACK	1683 VA	2X20A SINGLE POLE
S	1 RACK	5.5KVA	6X20A SINGLE POLE
IS	1 RACK	4022 VA	2X20A SINGLE POLE
RS-GPRS SUPPORT NODE	1 RACK	12000 VA	3X20A SINGLE POLE
ARGING GATEWAY	1 RACK	3000 VA	2X20A SINGLE POLE
	20 RACKS	55 KVA	16X32A SINGLE PHASE
LLING SYSTEM			
LLING SYSTEM	19 RACK	90000 VA	8X60A ,8X20A,14X60A,4X32A,2X15A

TO BE USED FOR BSNL NORTH ZONE ONLY

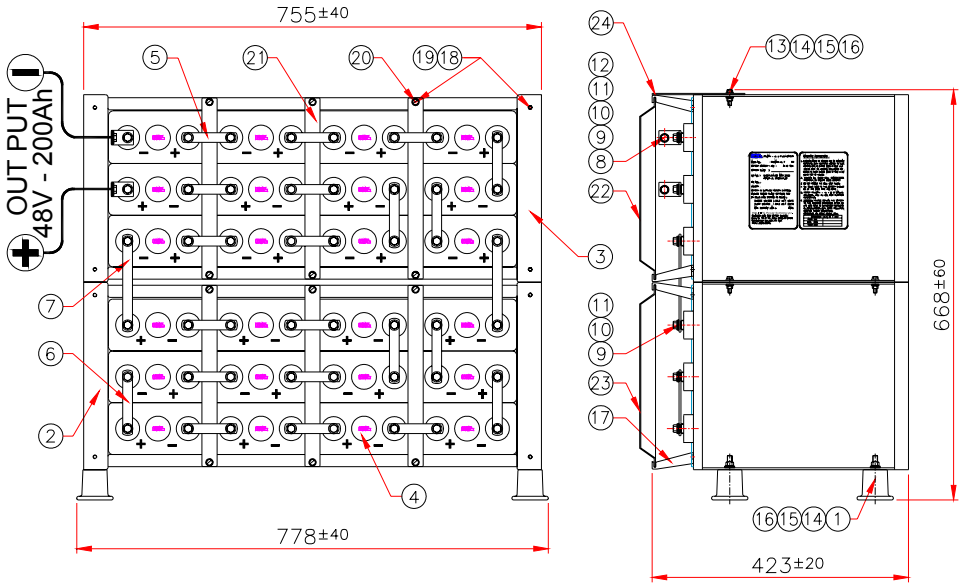
NOKIA

INDOOR SITES

BTS DESIGN WITH HBL BATTERIES

HBL BATTERY

200AH BATTERY (HBL)



ELEVATION SIDE VIEW

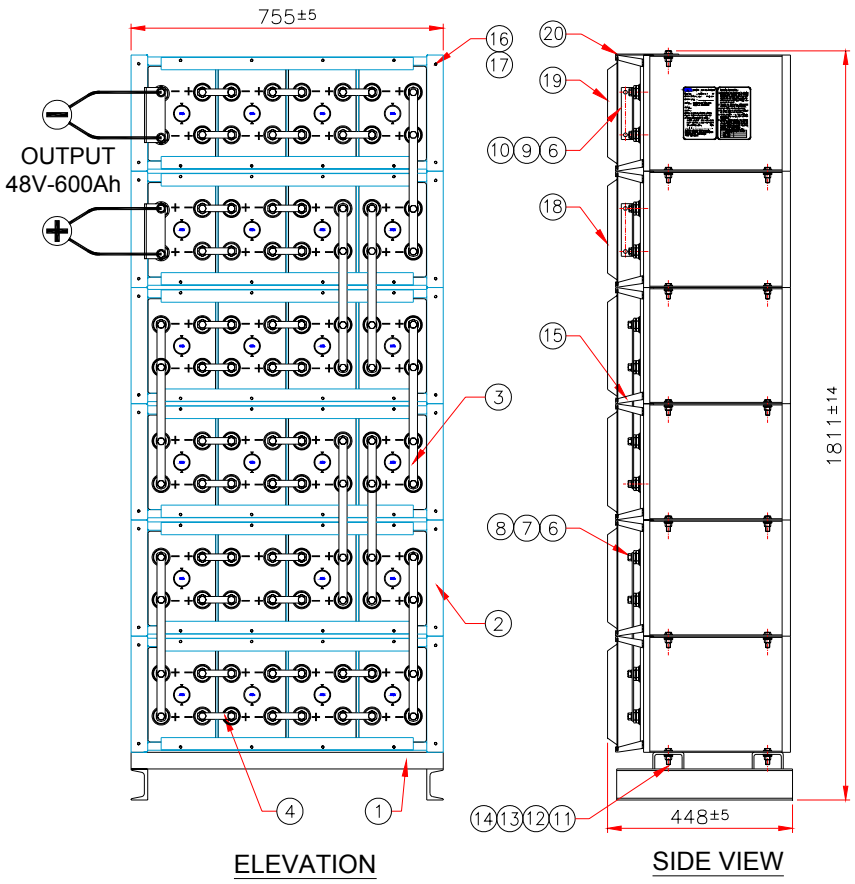
8) NUMBER STICKERS FROM 1 TO 24 INDICATING POSITION OF THE CELL IN BATTERY STRING ARE PROVIDED IN ACCESSORIES.
7) MODULE WITH SCREEN PRINTING OF BOTH SL.No. & IMPORTANT INSTRUCTIONS SHOULD BE PLACED AT TOP OF THE STACK.
6) FLOOR LOADING : 1.53 MT/Sq.M
5) TOTAL SYSTEM WEIGHT : 348 Kg.
4) No. OF TIER/STACK : 2/1
3) No. OF MODULES : 2
2) ELEVATION SHOWN WITHOUT FRONT & TOP COVERS.
1) OUTPUT CABLE TO BE SUPPLIED BY THE USER.

NOTES:–

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

600AH BATTERY (HBL)



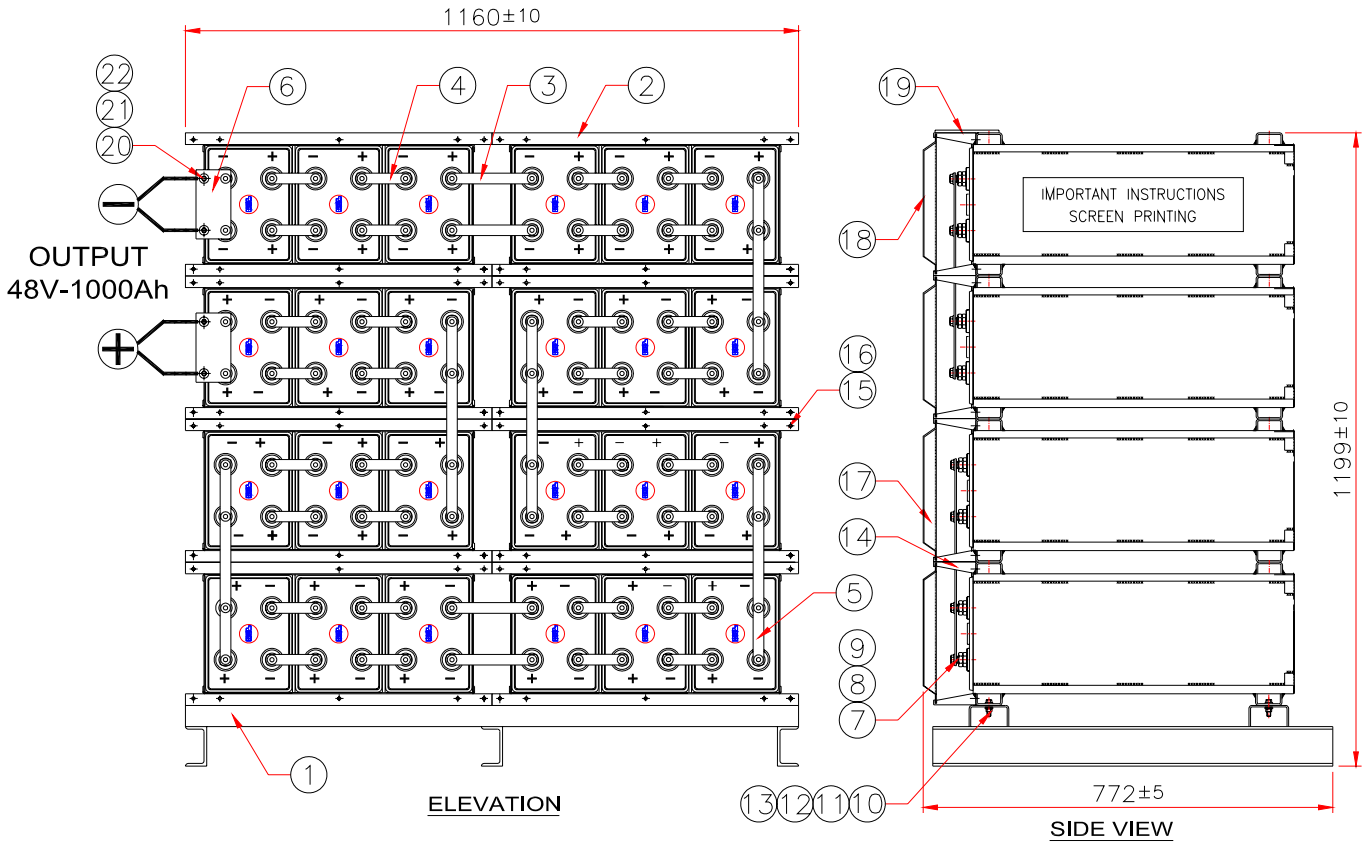
7) NUMBERS FROM 1 TO 24 INDICATING THE POSITION OF THE CELL IN BATTERY STRING ARE PROVIDED IN ACCESSORIES BOX.
6) MODULE WITH SL.No. AND IMPORTANT INSTSRUCTIONS STICKER SHOULD BE PLACED AT THE TOP OF THE STACK.
5) FLOOR LOADING : 3.035 MT/Sq.m(Approx.)
4) TOTAL SYSTEM WEIGHT : 1015 Kgs (Approx.)
3) No. OF MODULES : 6 No's.
2) ELEVATION SHOWN WITHOUT FRONT AND TOP COVERS.
1) OUTPUT CABLE TO BE SUPPLIED BY THE USER.

NOTE:–

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

1000AH BATTERY (HBL)



NOTES:-

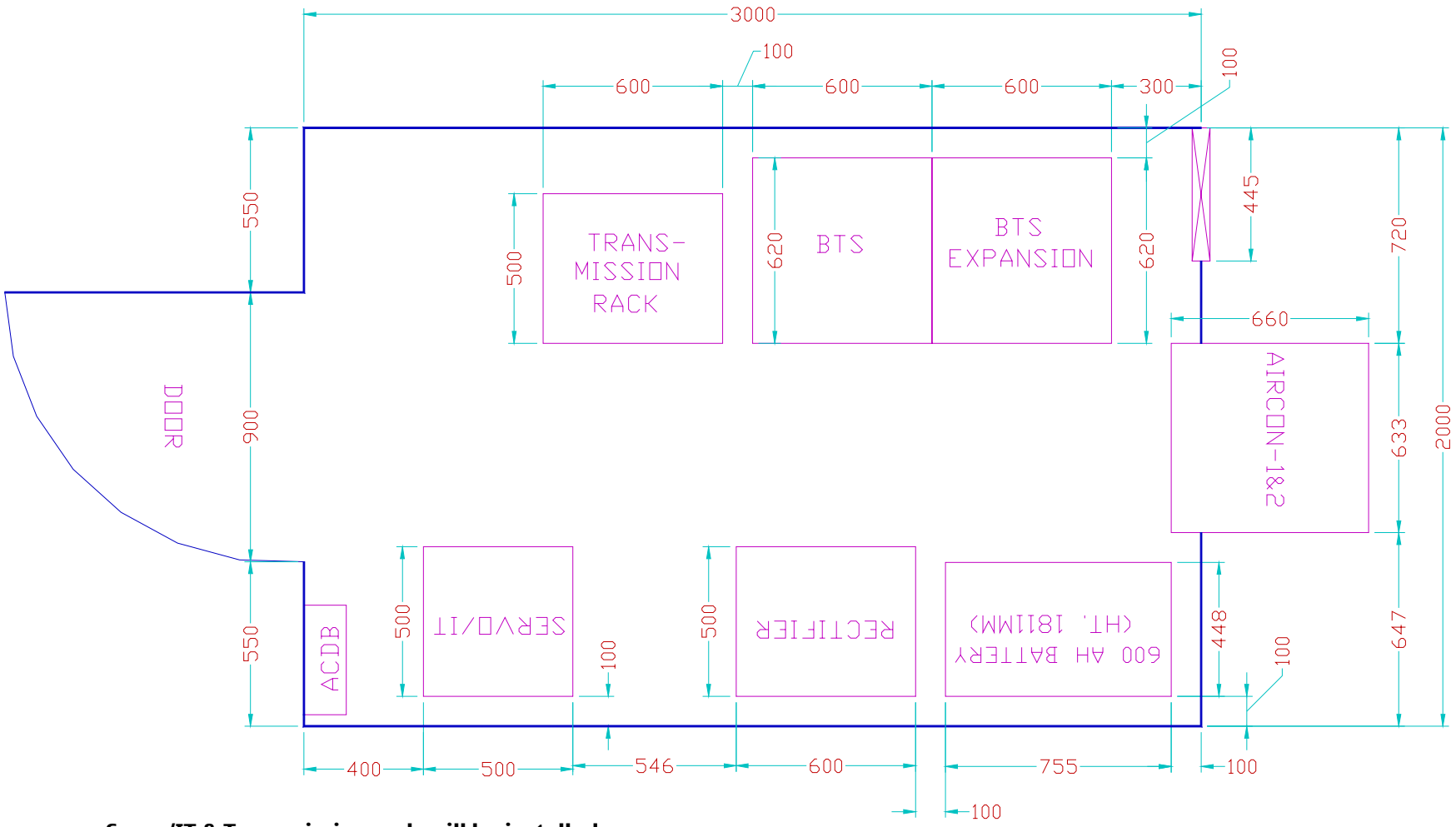
7) NUMBERS FROM 1 TO 24 INDICATING POSITION OF THE CELL IN BATTERY STRING ARE PROVIDED IN ACCESSORIES BOX.
6) MODULE WITH SCREEN PRINTING OF BOTH SL.No. & IMPORTANT INSTRUCTIONS SHOULD BE PLACED AT THE TOP OF THE STACK.
5) FLOOR LOADING : 1.956 MT/Sq.M
4) TOTAL SYSTEM WEIGHT : 1752 Kg.(Approx.)
3) NO.OF STACKS/MODULES : 2/8
2) ELEVATION SHOWN WITHOUT FRONT & TOP COVERS.
1) OUTPUT CABLE TO BE SUPPLIED BY THE USER.

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRA 444 INDOOR WITH 600AH HBL BATTERIES

ULTRASITE INDOOR-444(3X2X2.5m SHELTER)



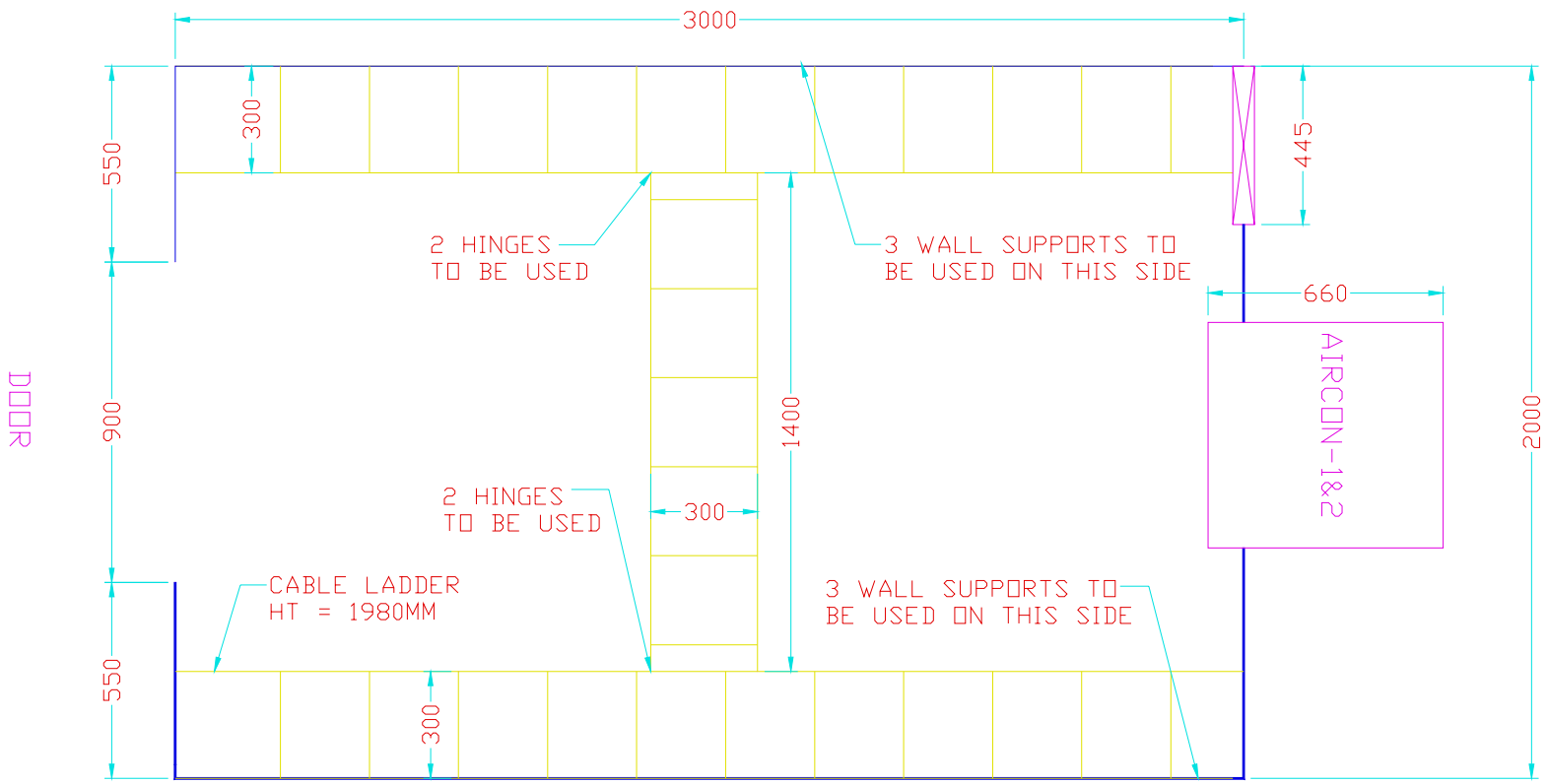
TOP VIEW

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-444(3X2X2.5m SHELTER)



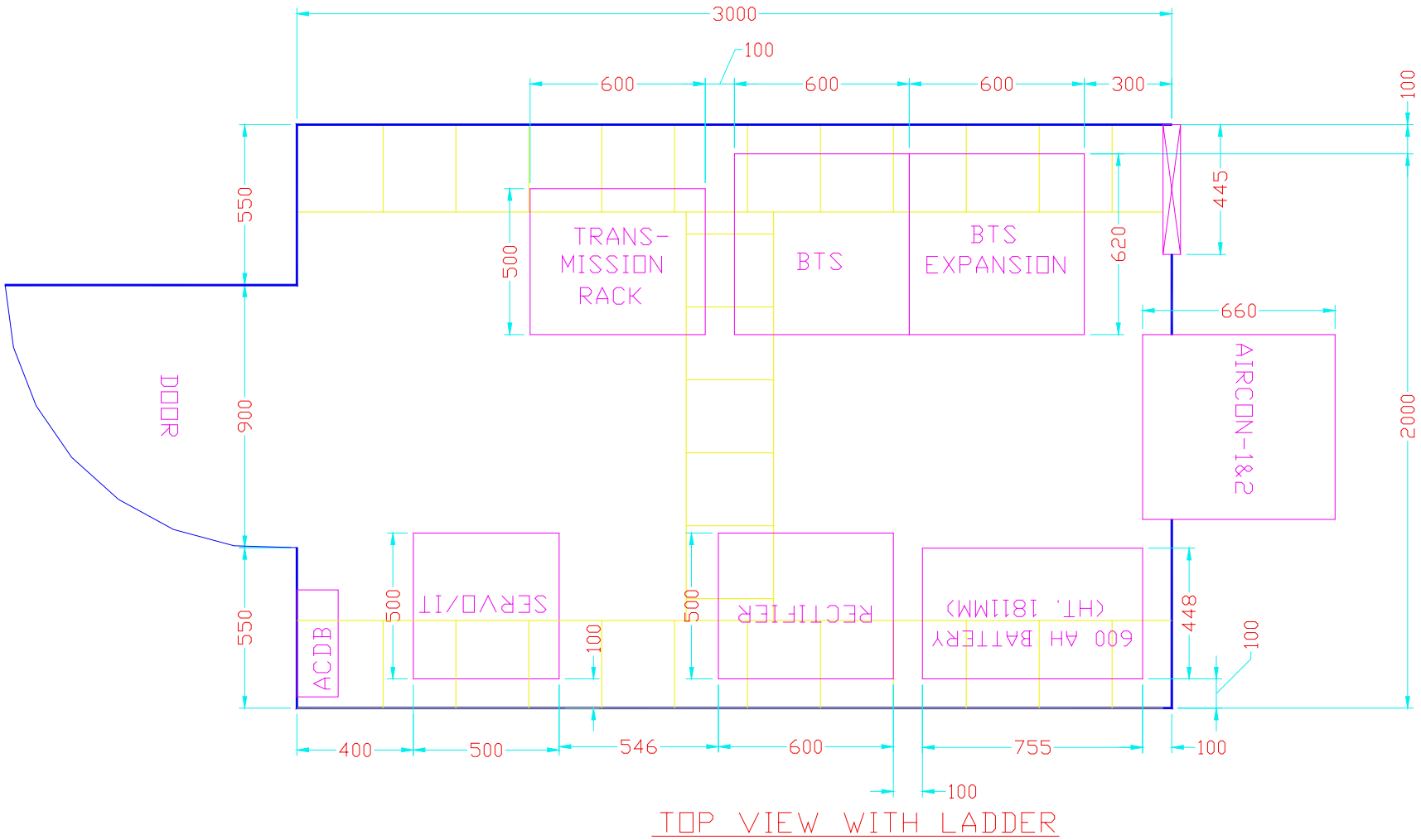
LADDER VIEW

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-444(3X2X2.5m SHELTER)



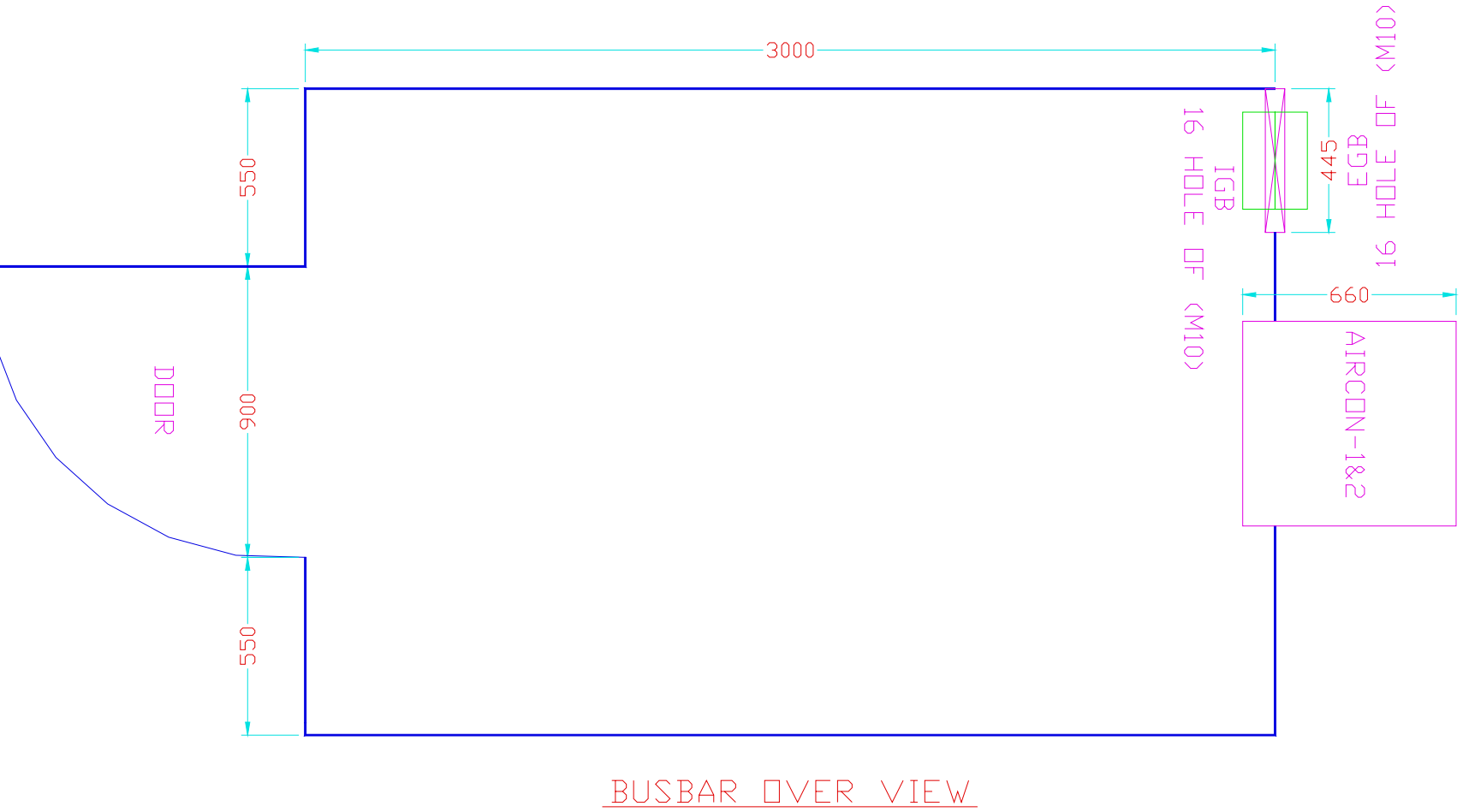
TOP VIEW WITH LADDER

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-444(3X2X2.5m SHELTER)



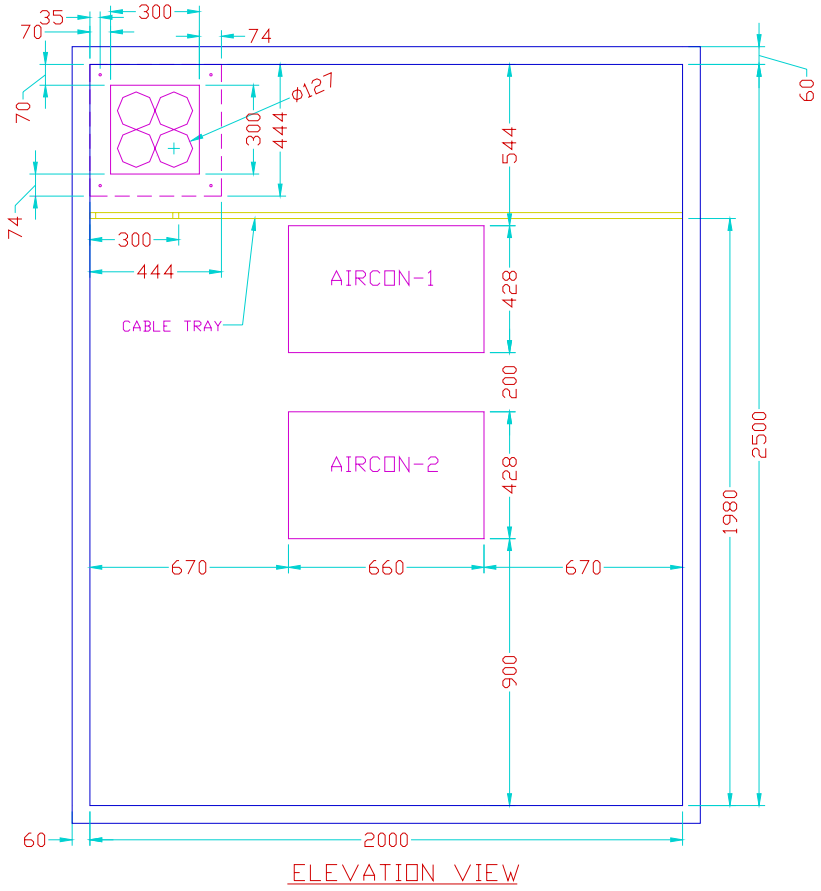
BUSBAR OVER VIEW

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-444(3X2X2.5m SHELTER)

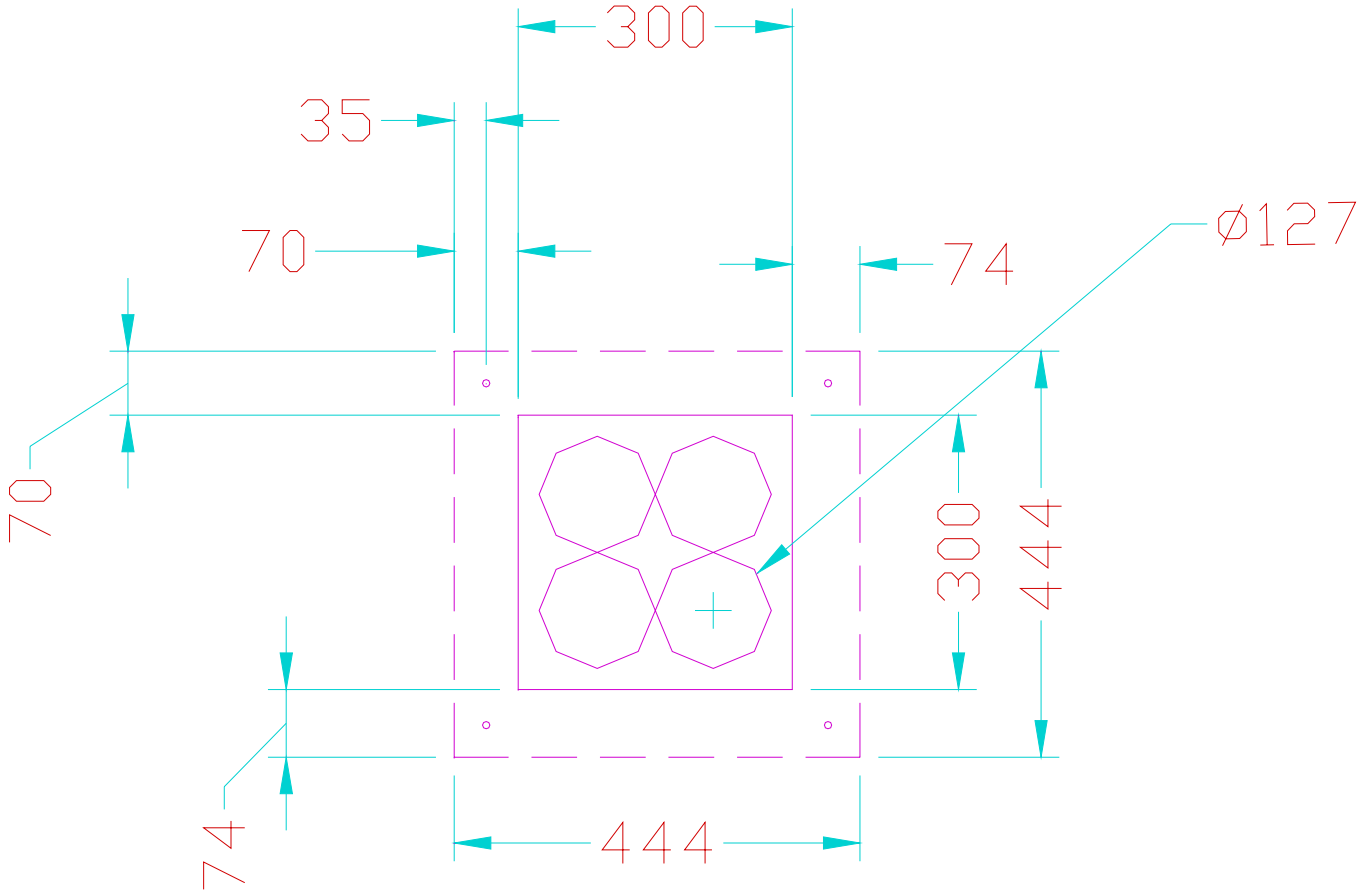


Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-444(3X2X2.5m SHELTER)



WFT OVERVIEW

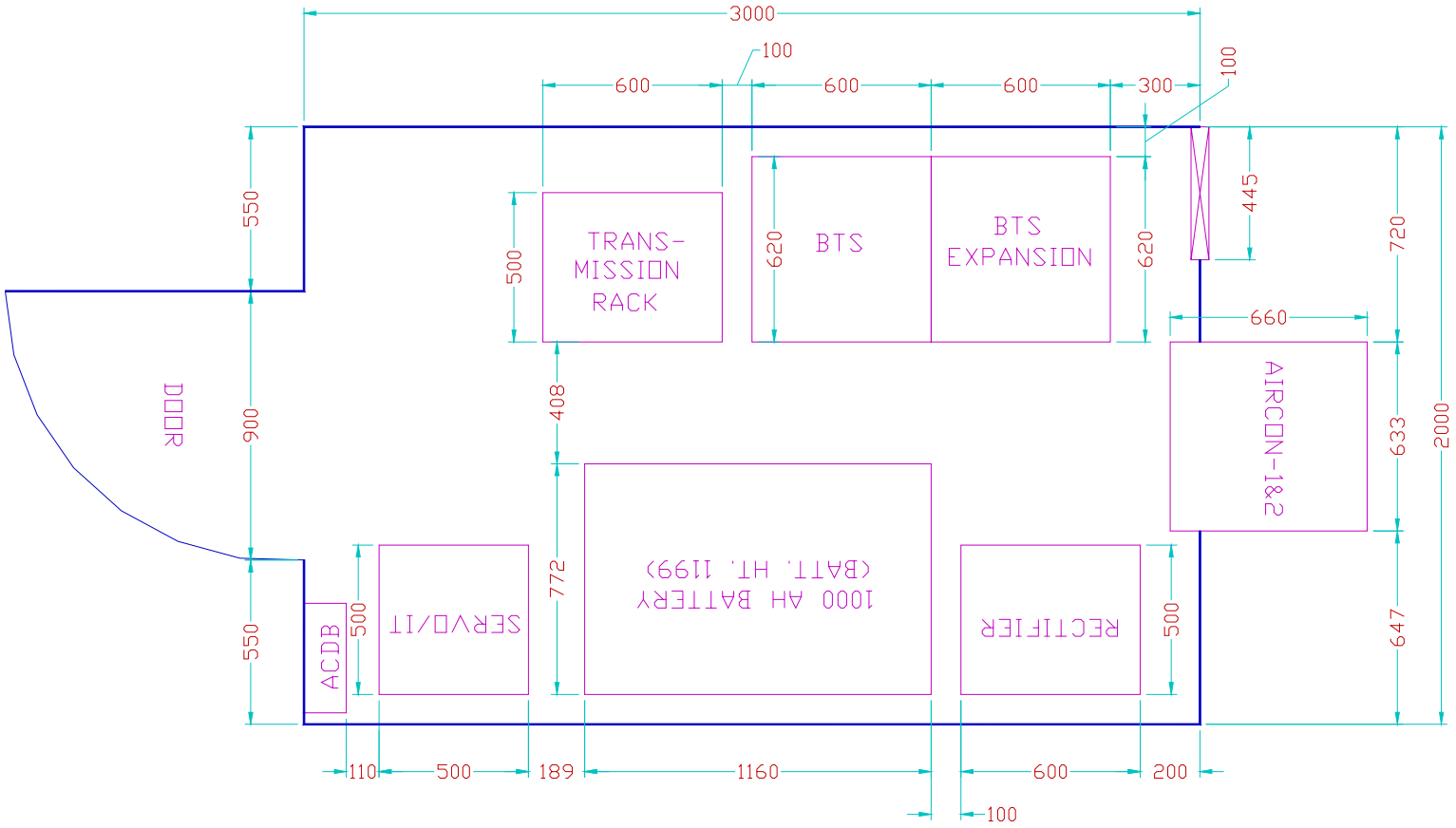
Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRA 666 INDOOR WITH 1000AH HBL BATTERIES

ULTRASITE INDOOR-666(3X2X2.5m SHELTER)



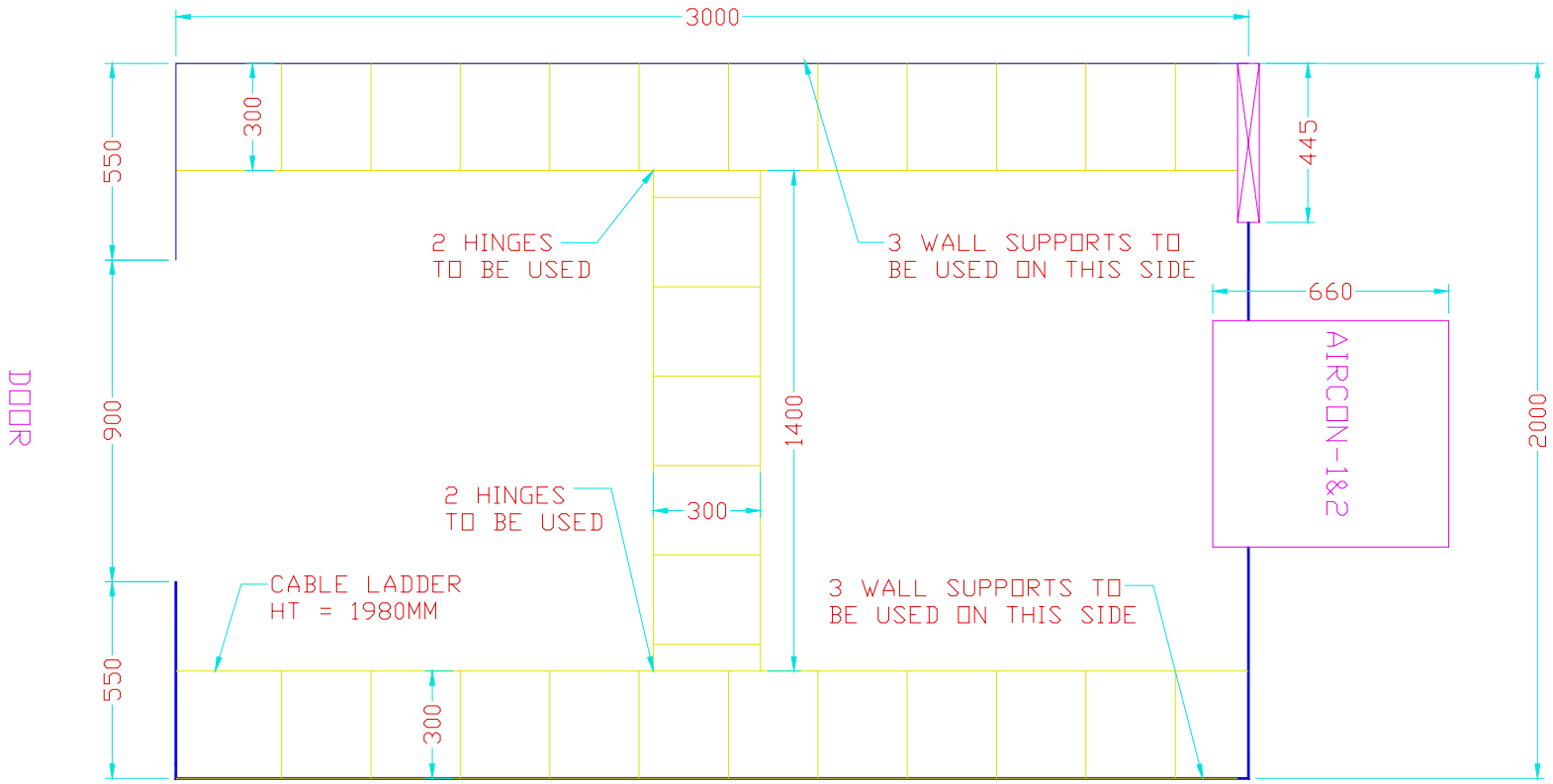
TOP VIEW

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-666(3X2X2.5m SHELTER)



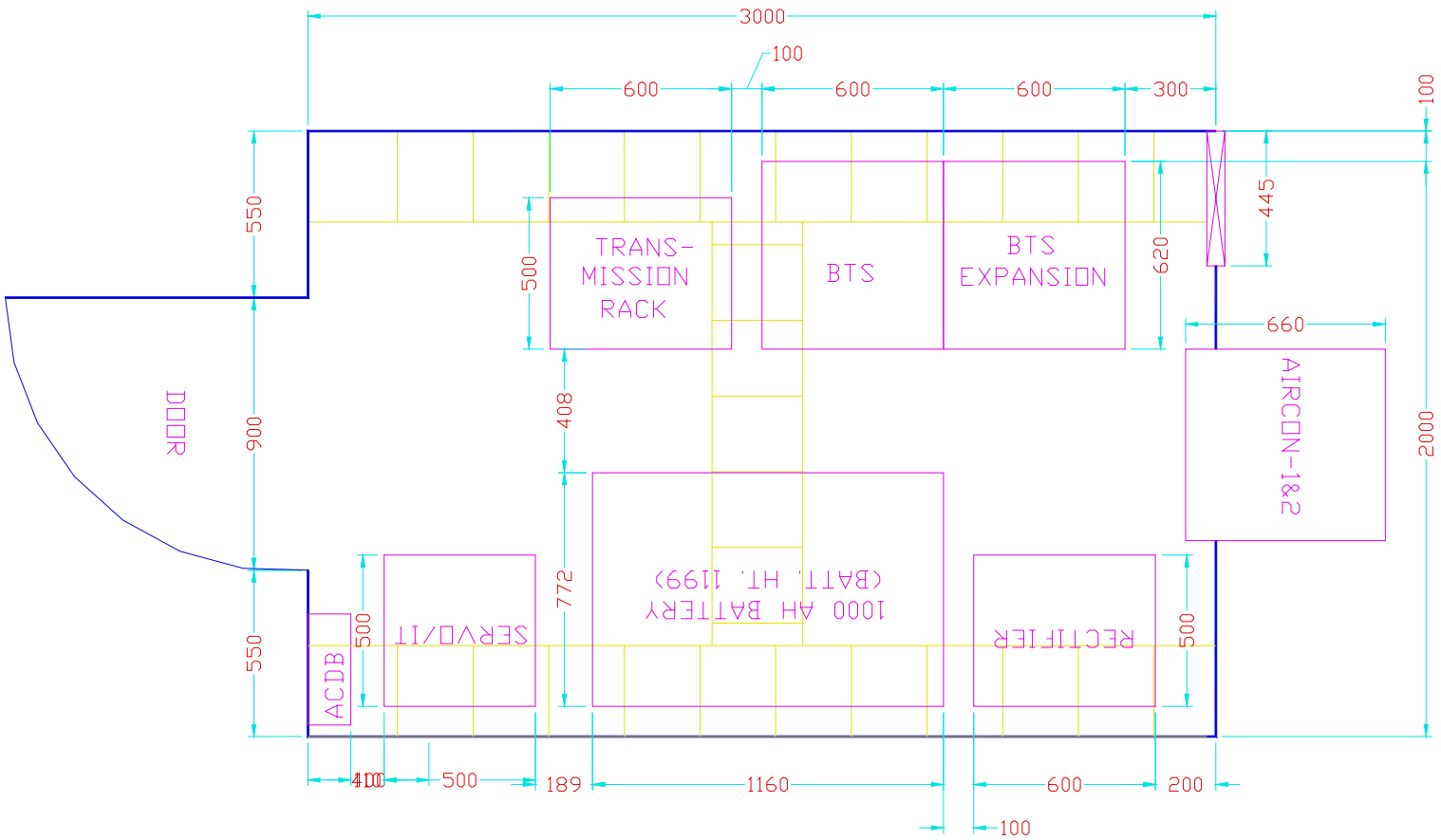
LADDER VIEW

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-666(3X2X2.5m SHELTER)



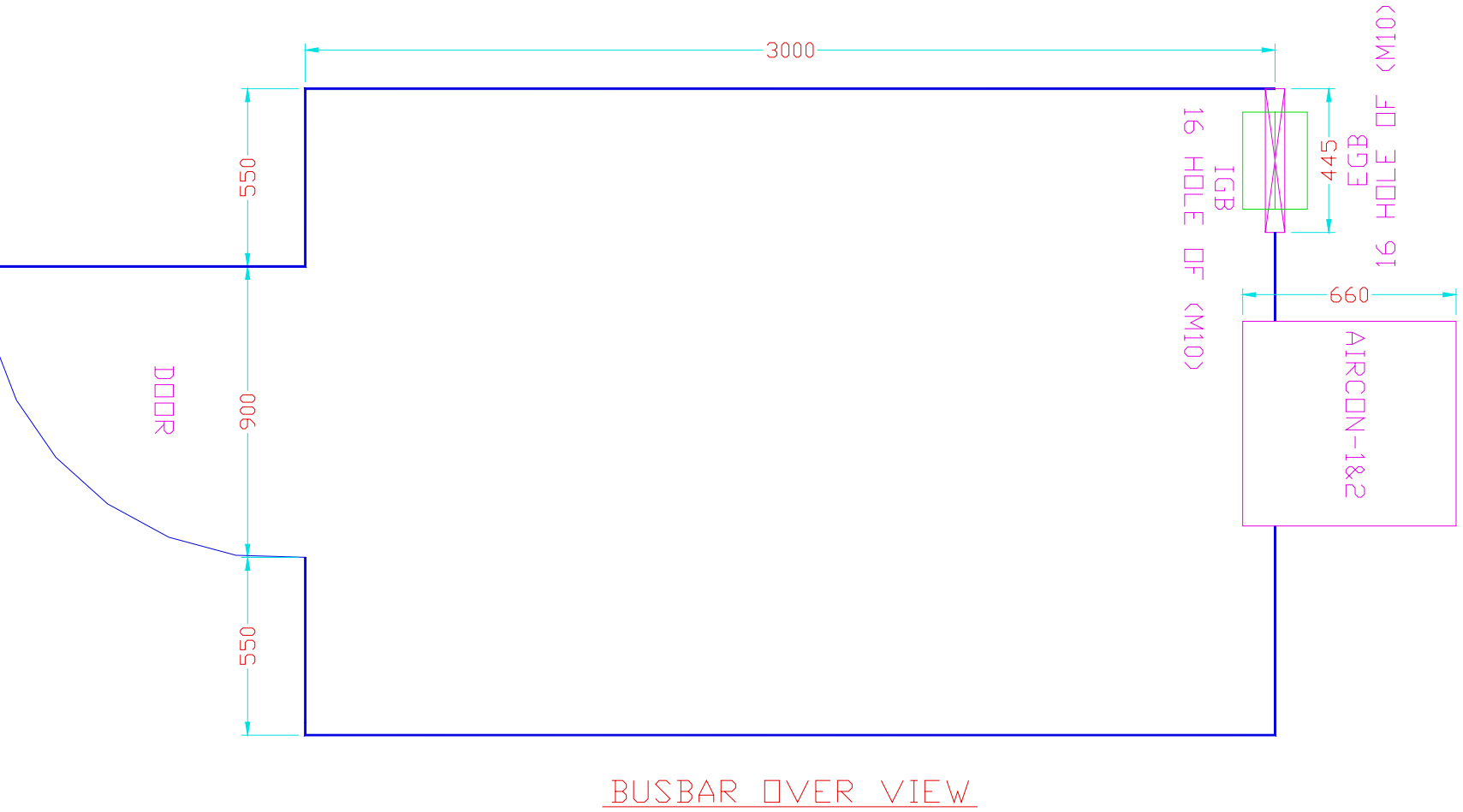
TOP VIEW WITH LADDER

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-666(3X2X2.5m SHELTER)



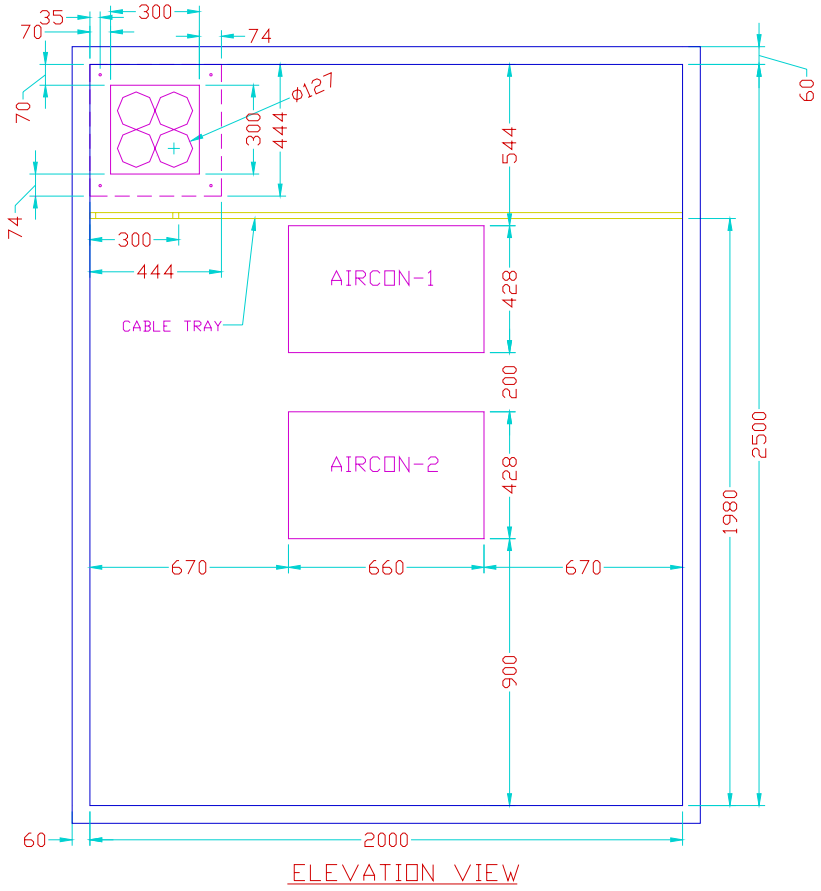
BUSBAR OVER VIEW

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-666(3X2X2.5m SHELTER)

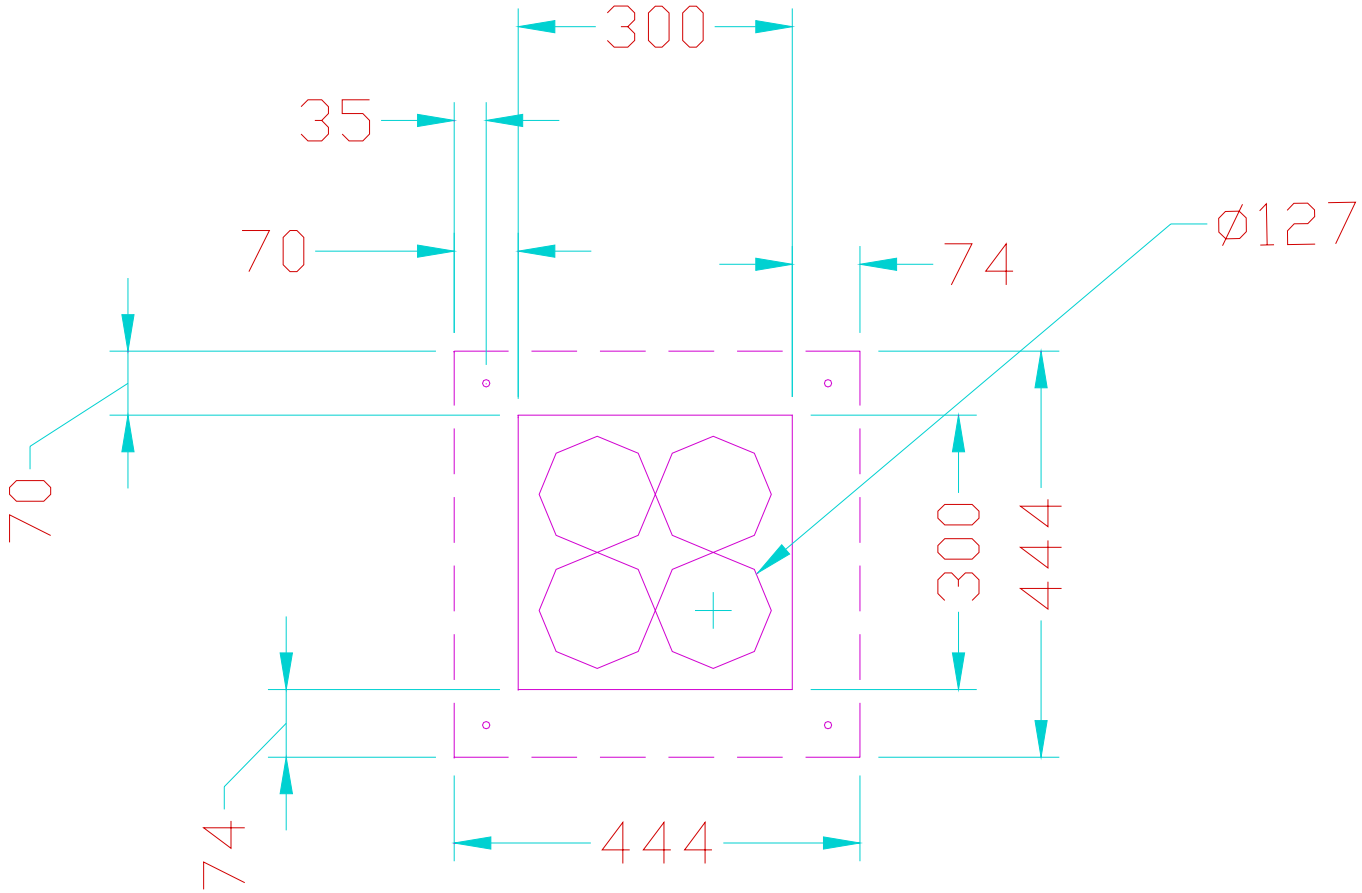


Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-666(3X2X2.5m SHELTER)



WFT OVERVIEW

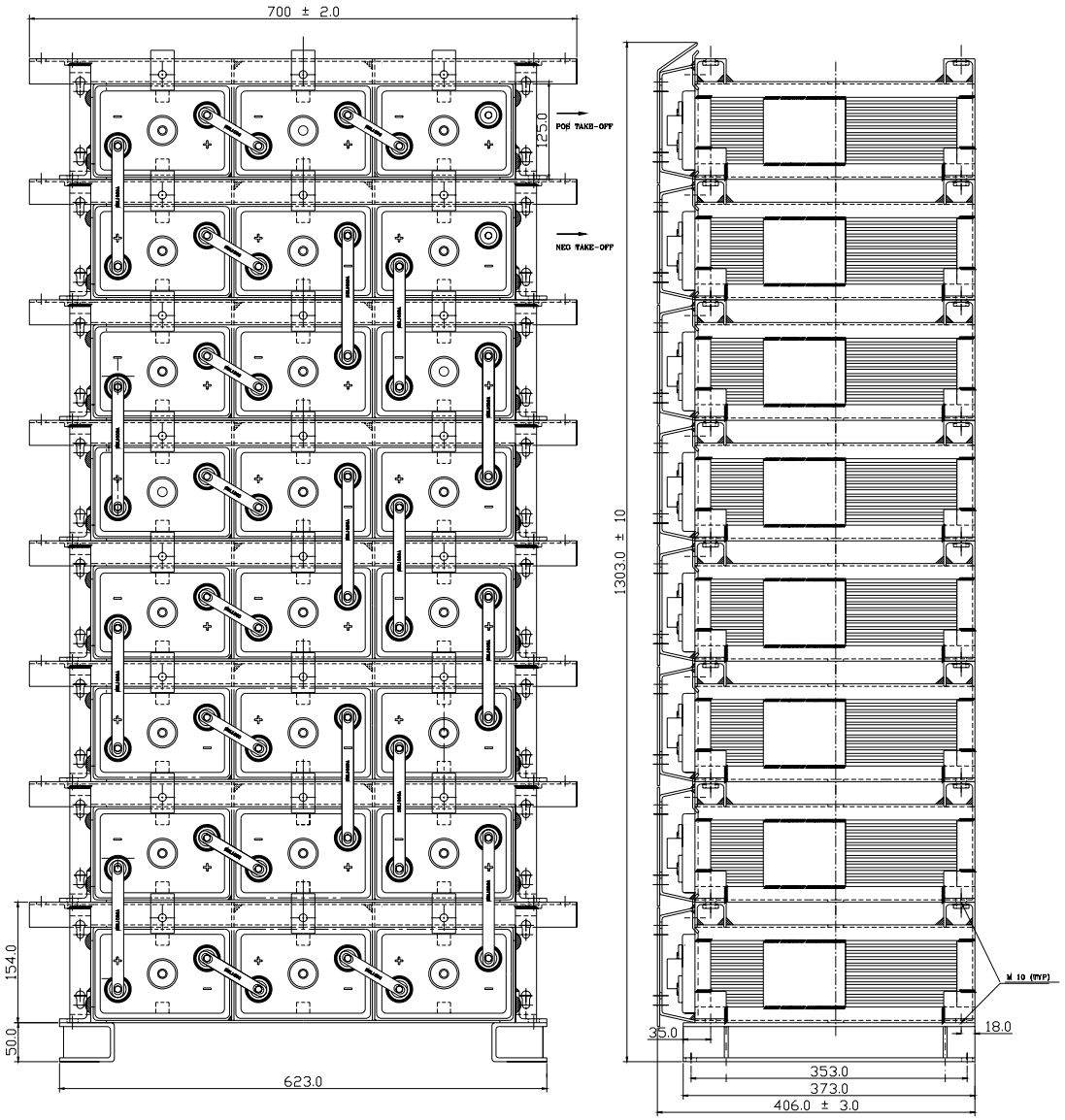
Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

BTS DESIGN WITH EXIDE BATTERIES

EXIDE BATTERY

200AH BATTERY (EXIDE)



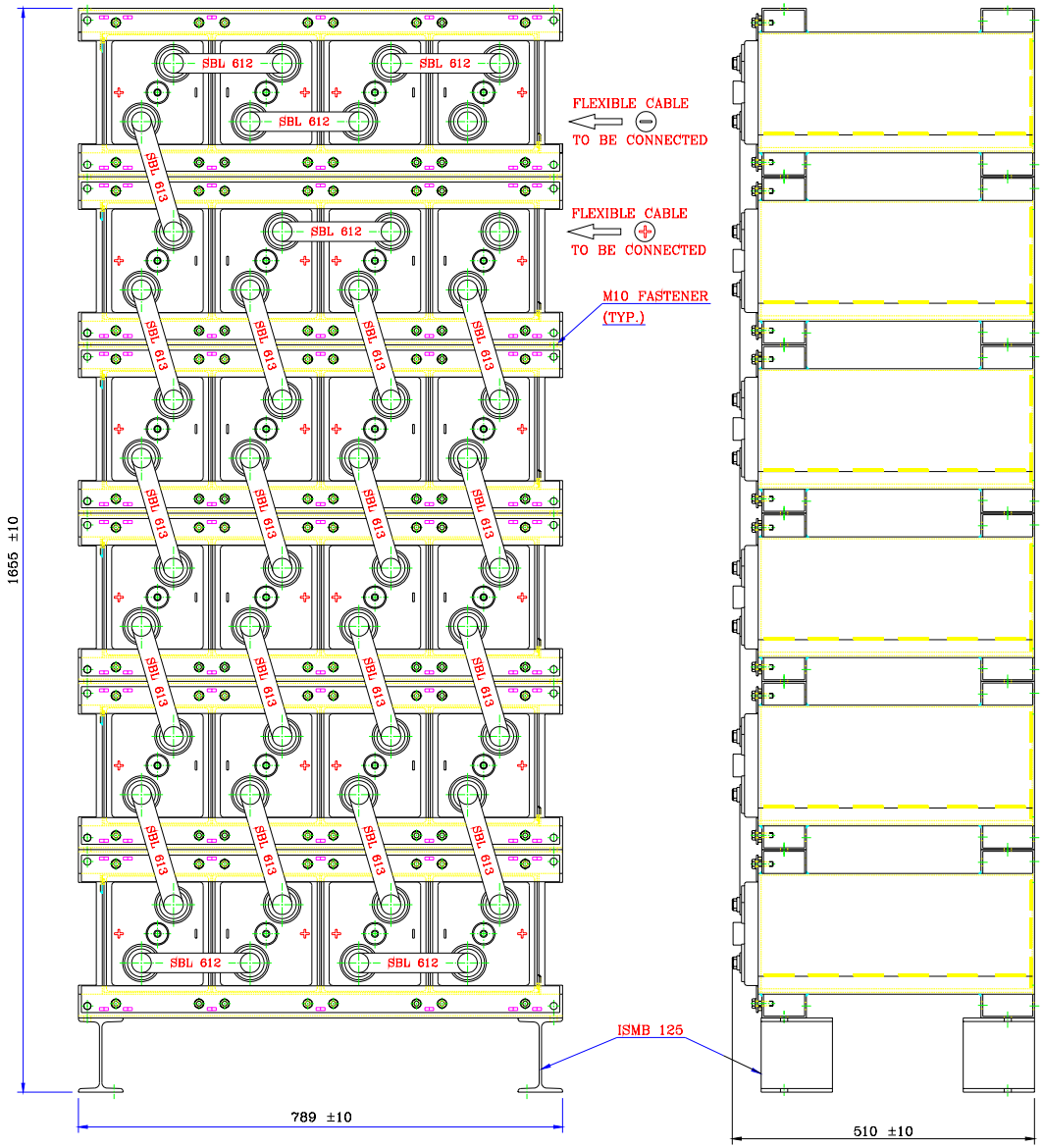
DIM:
700X410X1313
(WXDXH)mm

SITE ENGINEERING STANDARDS/ANIL KOUL

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

600AH BATTERY (EXIDE)



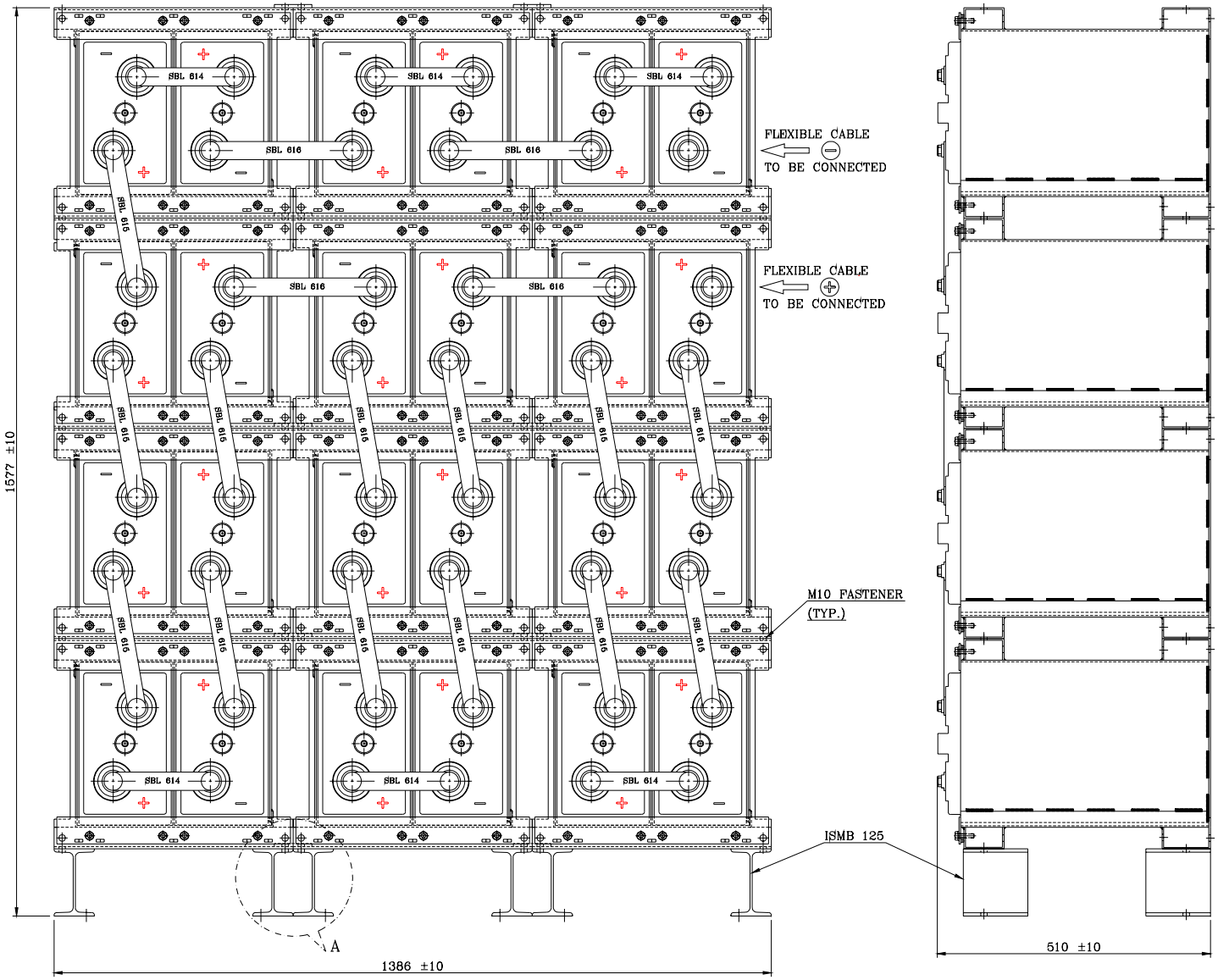
DIM:
799X520X1665
(WXDXH)mm

SITE ENGINEERING STANDARDS/ANIL KOUL

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

1000AH BATTERY (EXIDE)



DIM:
1396X520X1587
(WXDXH)mm

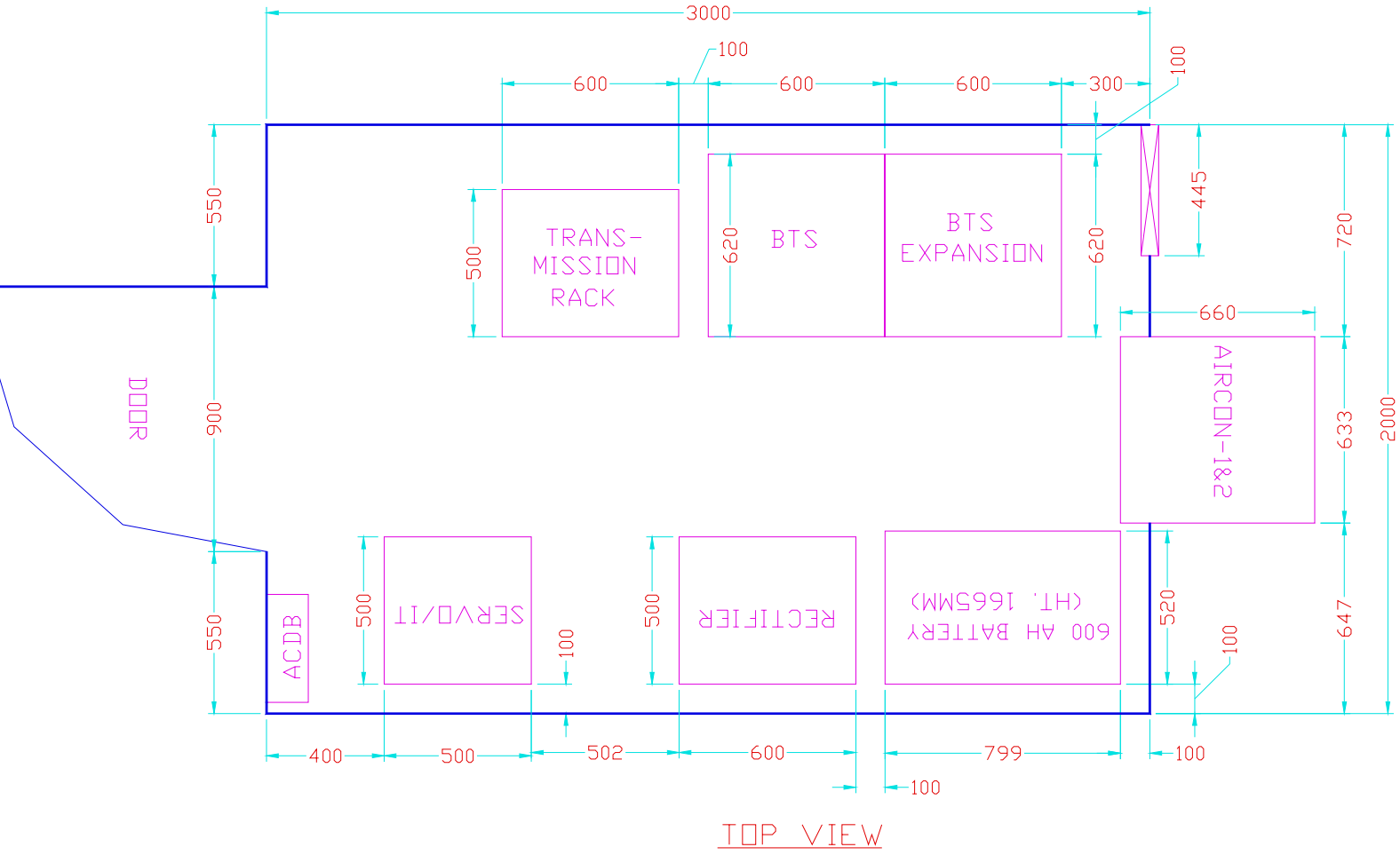
SITE ENGINEERING STANDARDS/ANIL KOUL

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRA 444 INDOOR WITH 600AH EXIDE BATTERIES

ULTRASITE INDOOR-444(3X2X2.5m SHELTER)



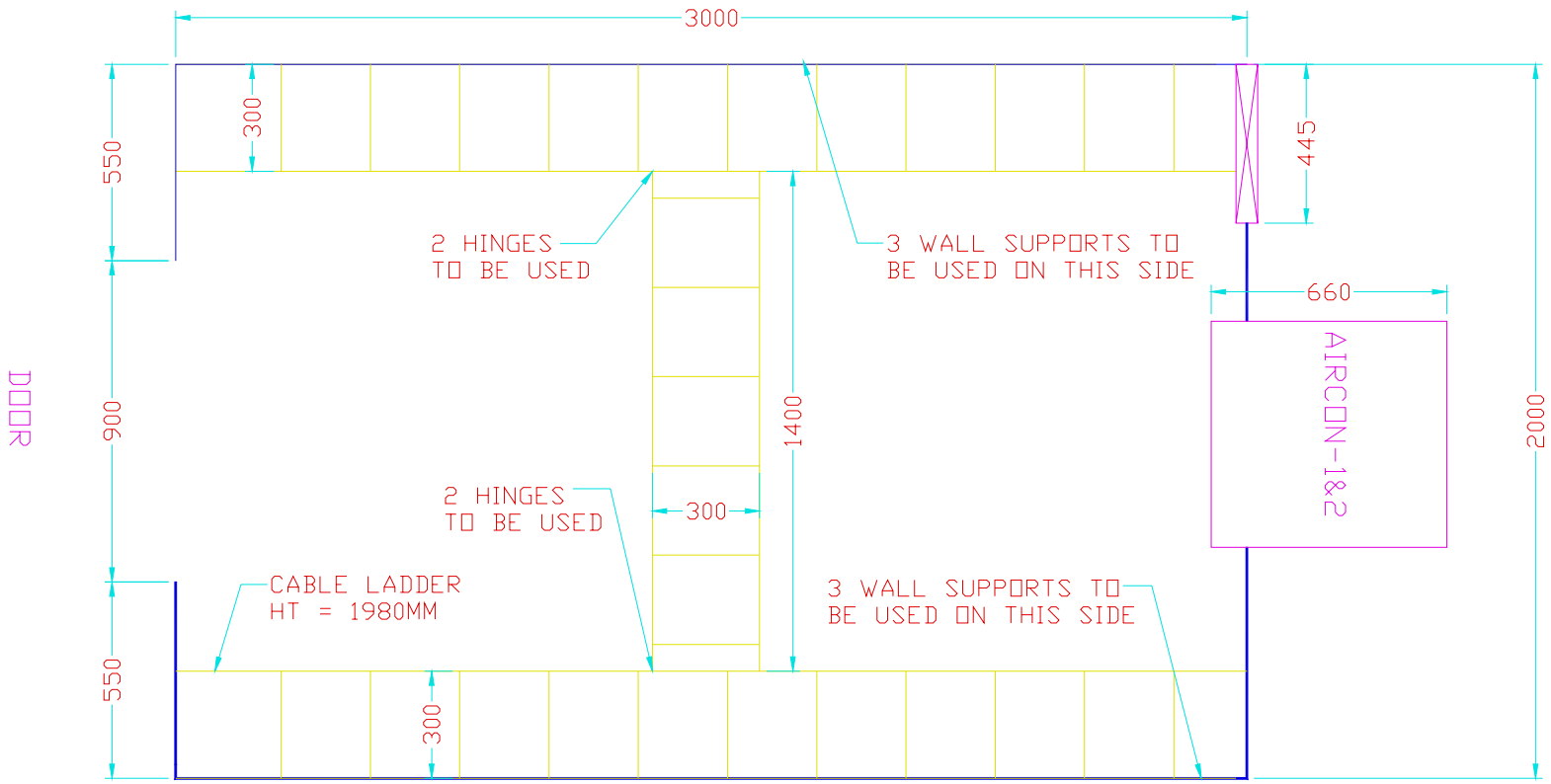
TOP VIEW

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-444(3X2X2.5m SHELTER)



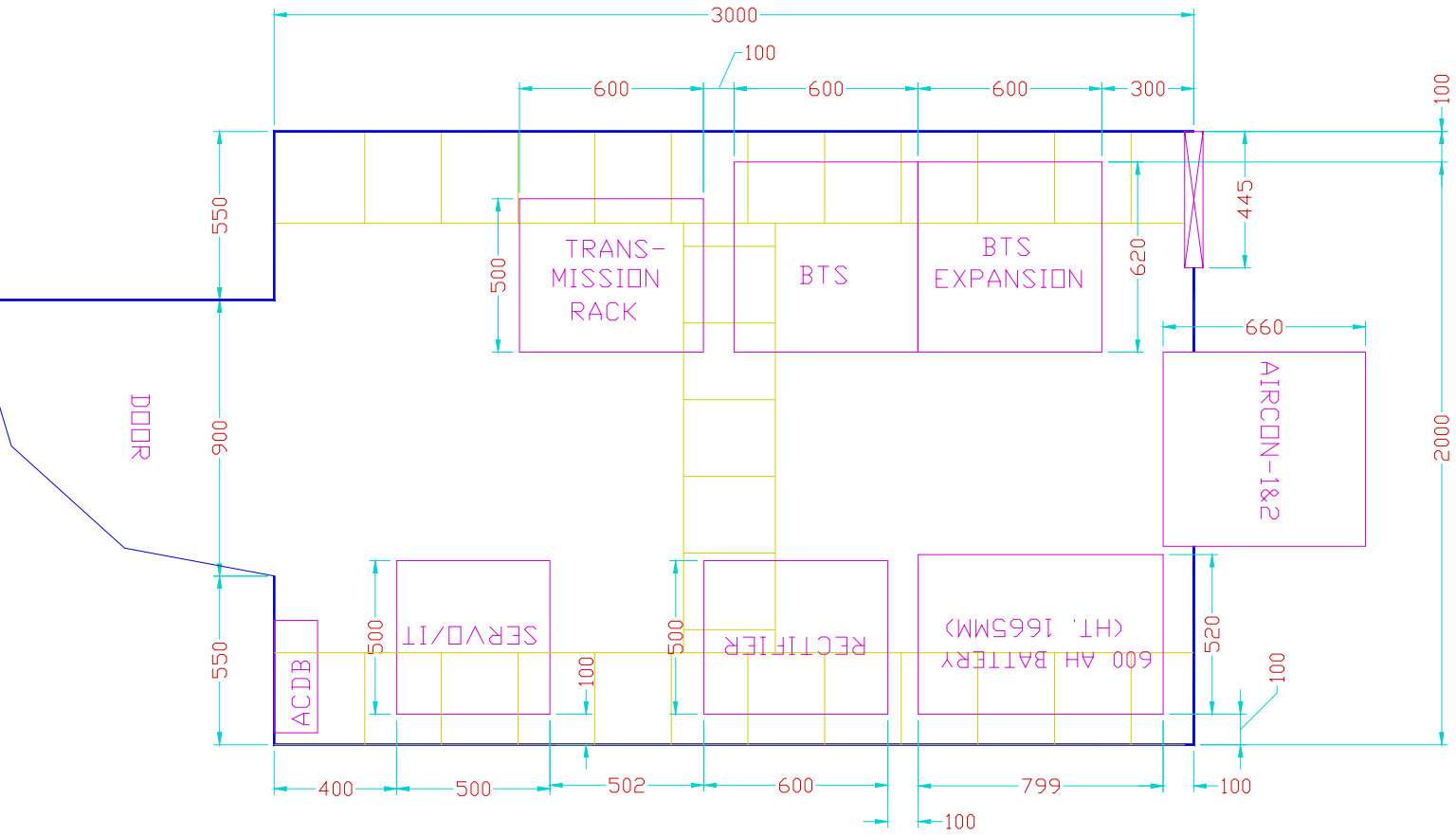
LADDER VIEW

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-444(3X2X2.5m SHELTER)



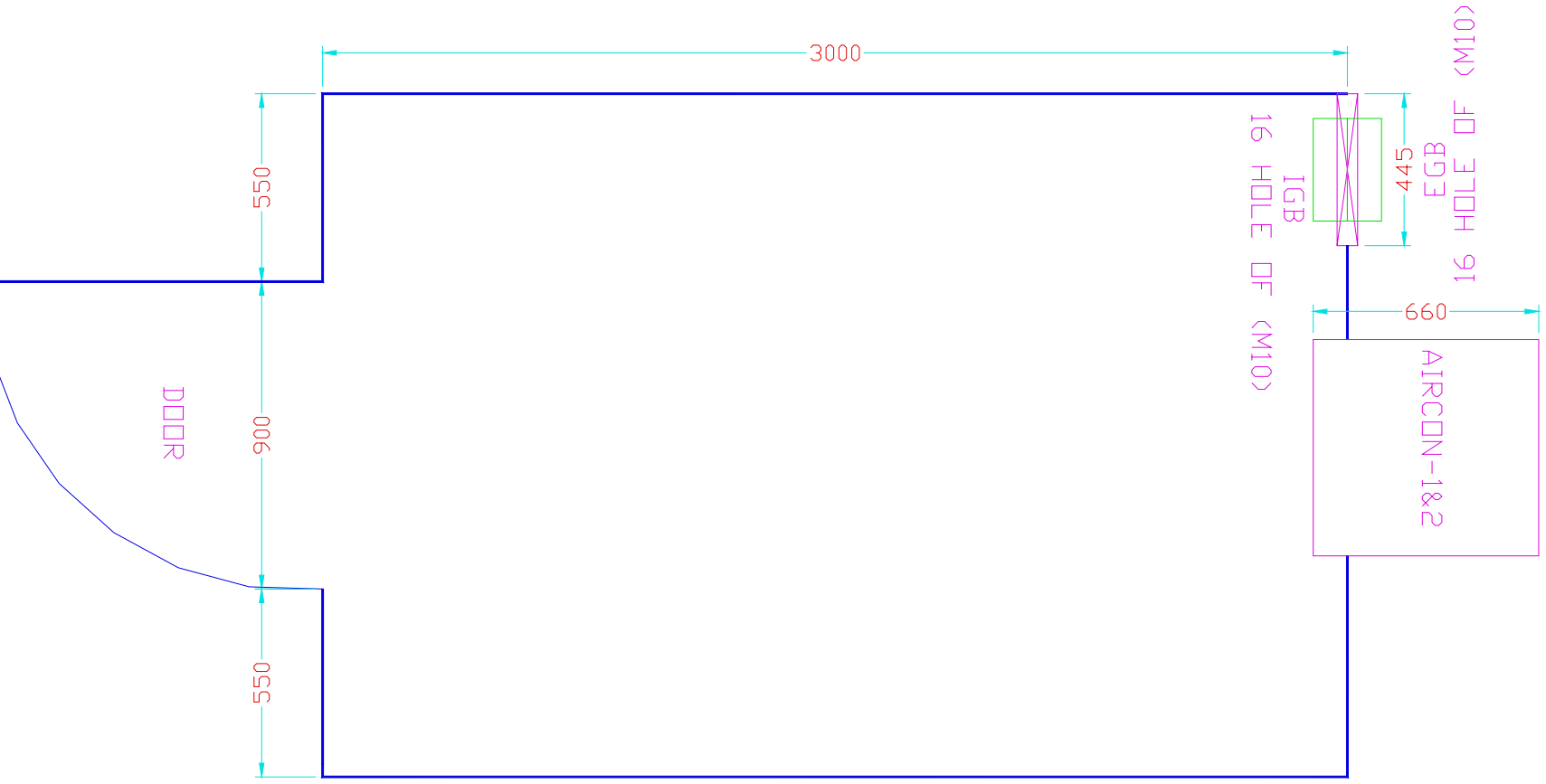
TOP VIEW WITH LADDER

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-444(3X2X2.5m SHELTER)



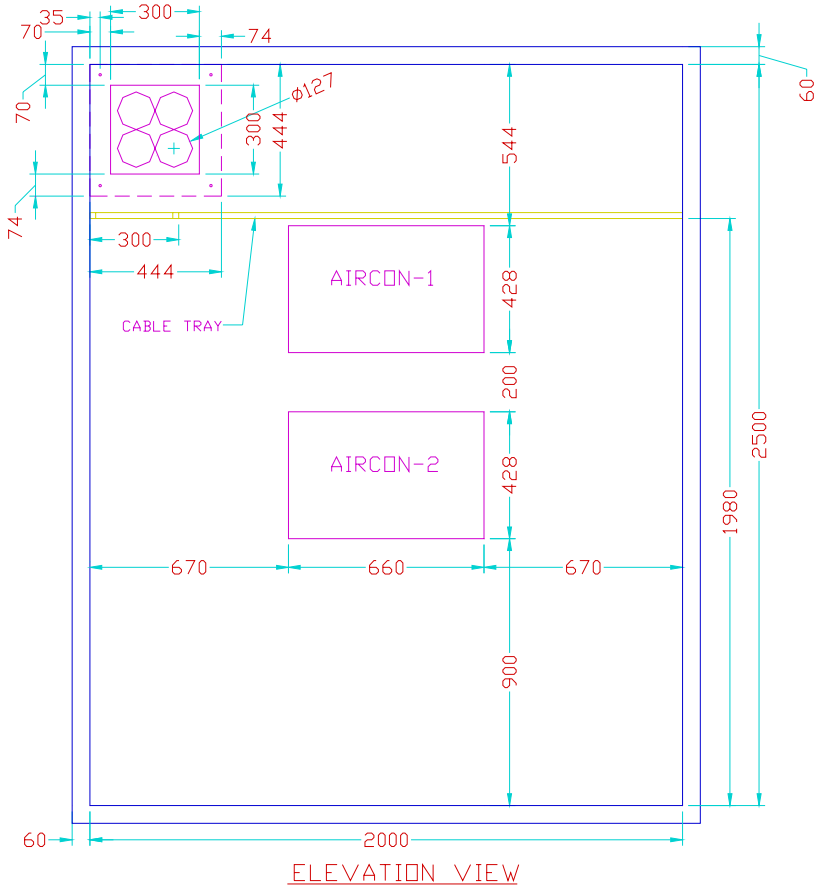
BUSBAR OVER VIEW

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-444(3X2X2.5m SHELTER)

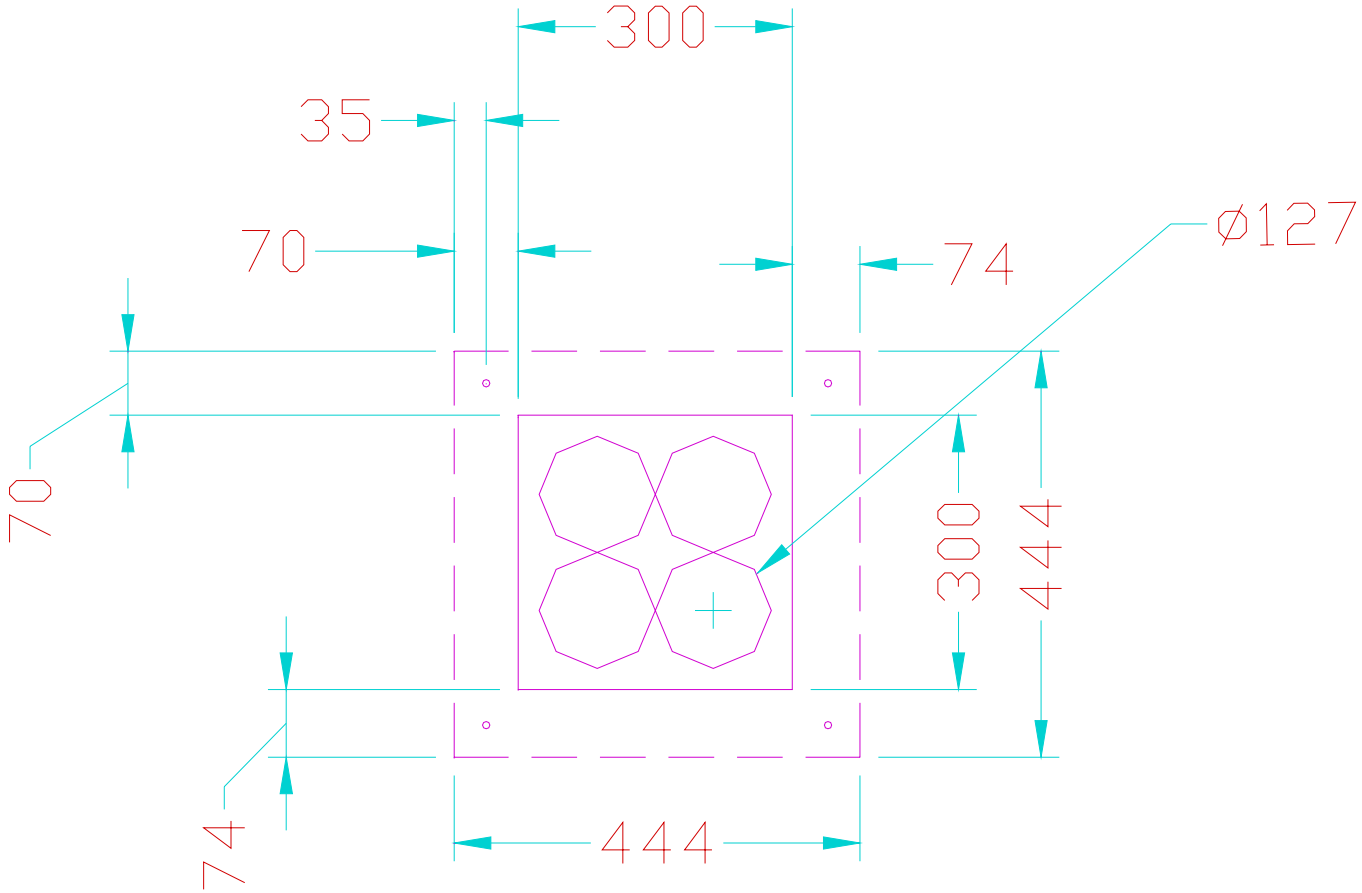


Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-444(3X2X2.5m SHELTER)



WFT OVERVIEW

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

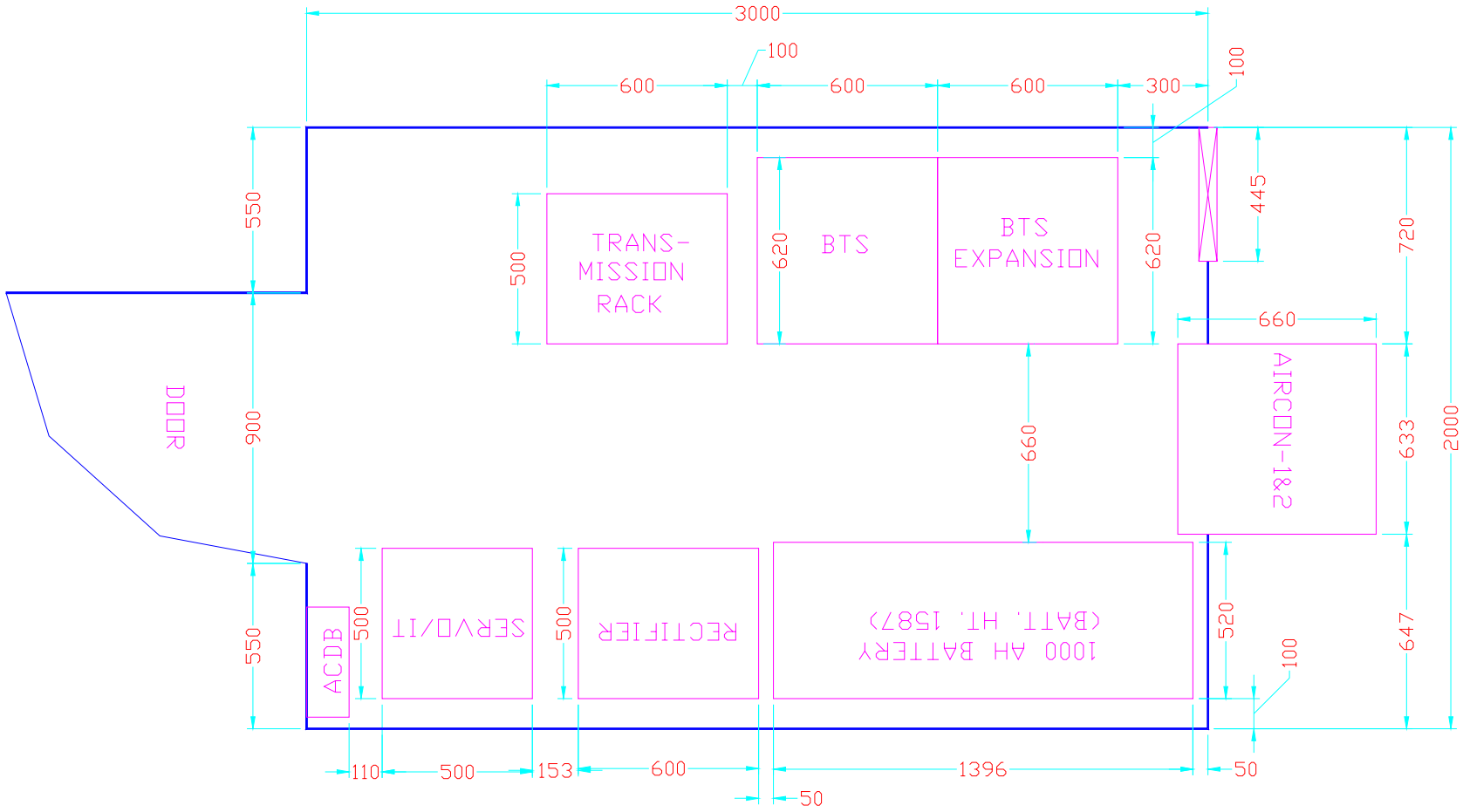
NOKIA

ULTRA 666 INDOOR WITH 1000AH EXIDE BATTERIES

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-666(3X2X2.5m SHELTER)

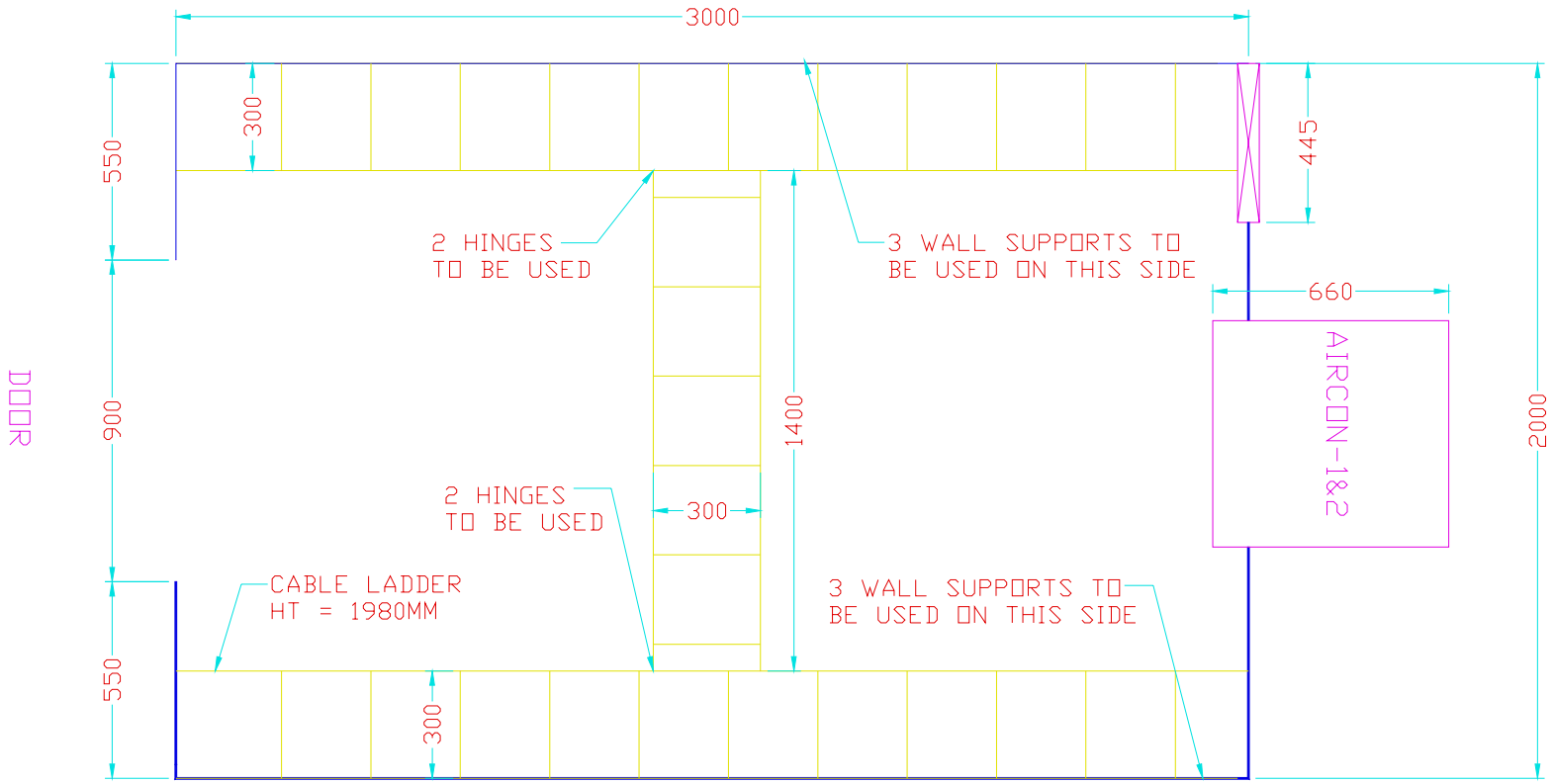


Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-666(3X2X2.5m SHELTER)



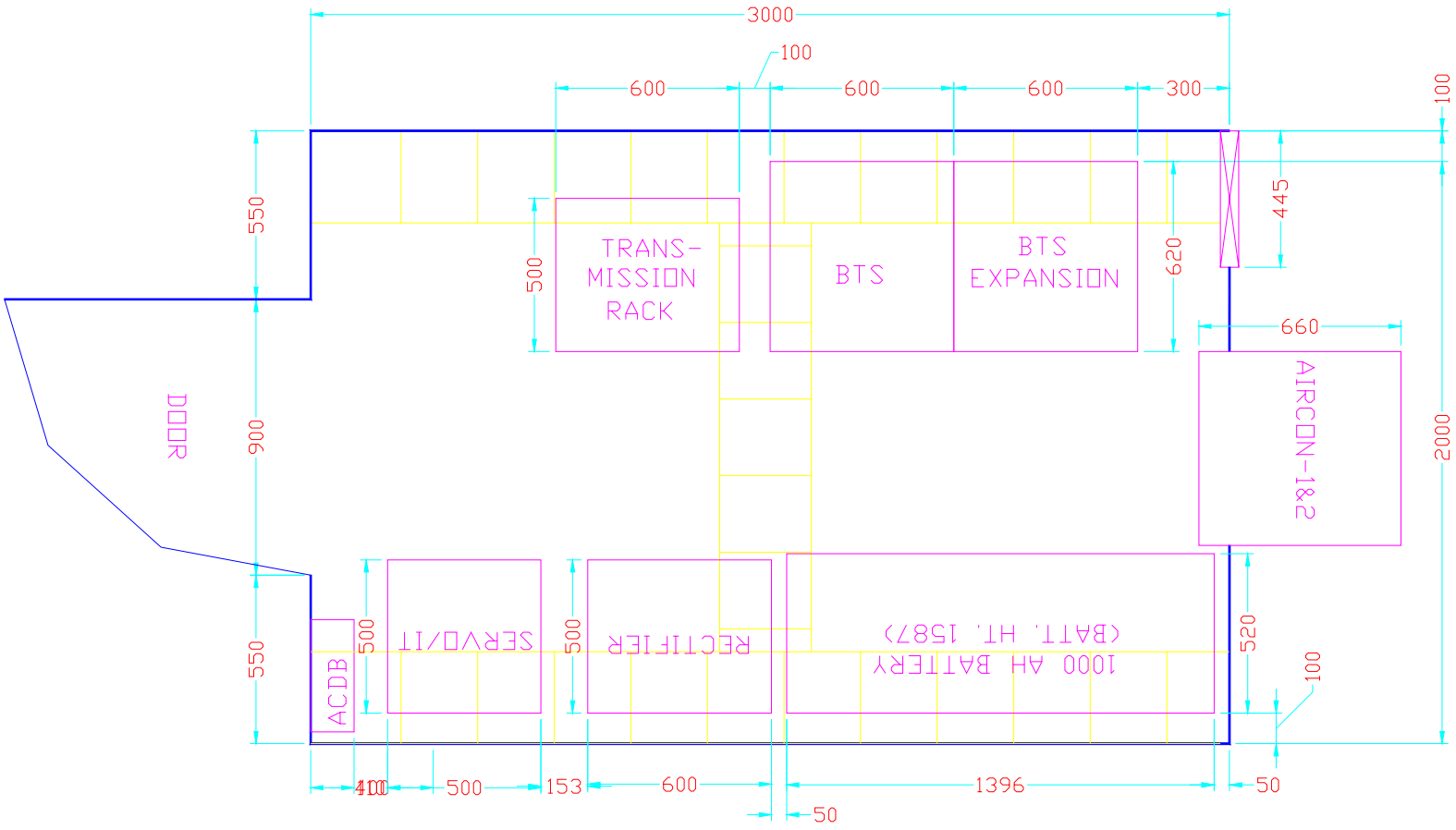
LADDER VIEW

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-666(3X2X2.5m SHELTER)



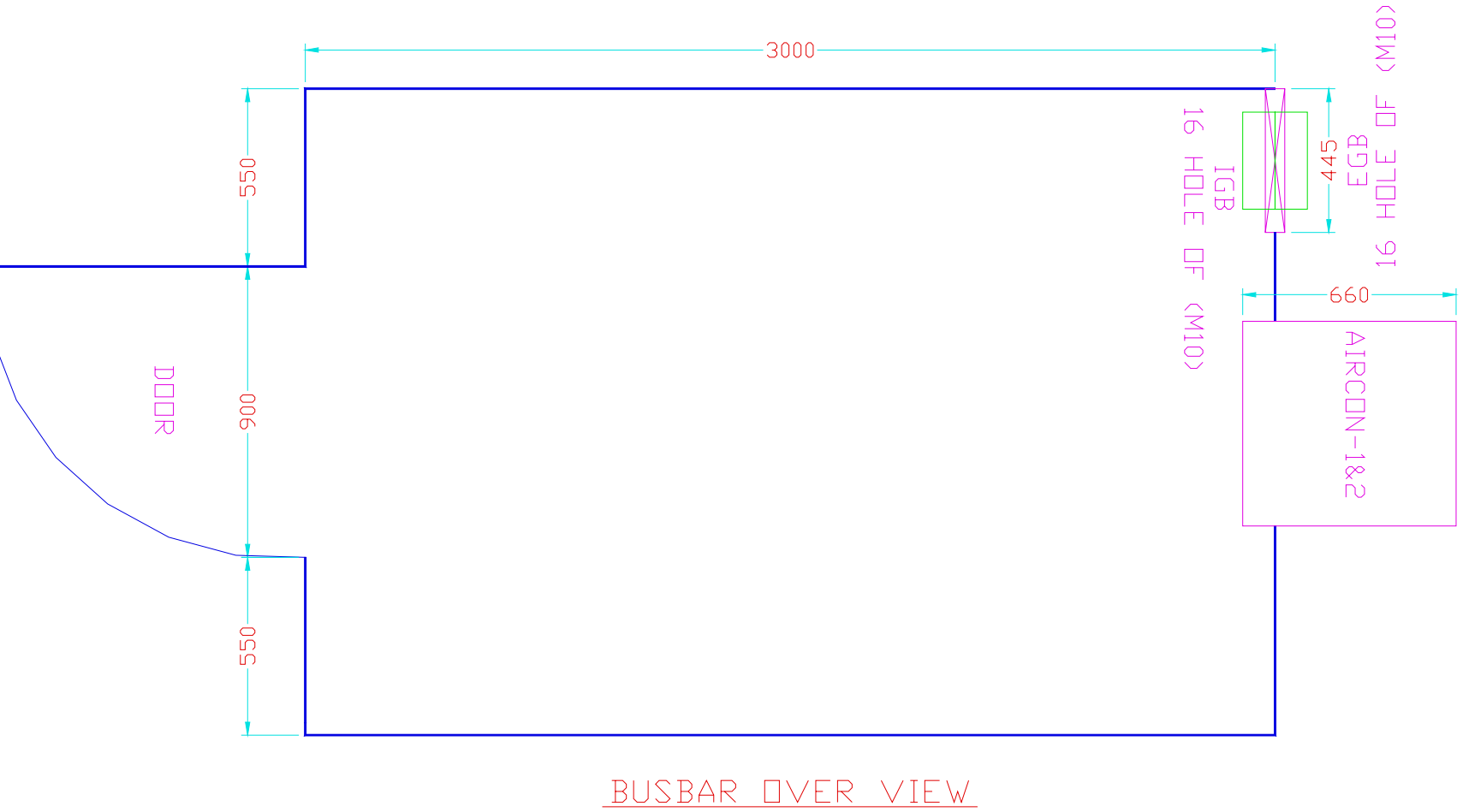
TOP VIEW WITH LADDER

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-666(3X2X2.5m SHELTER)



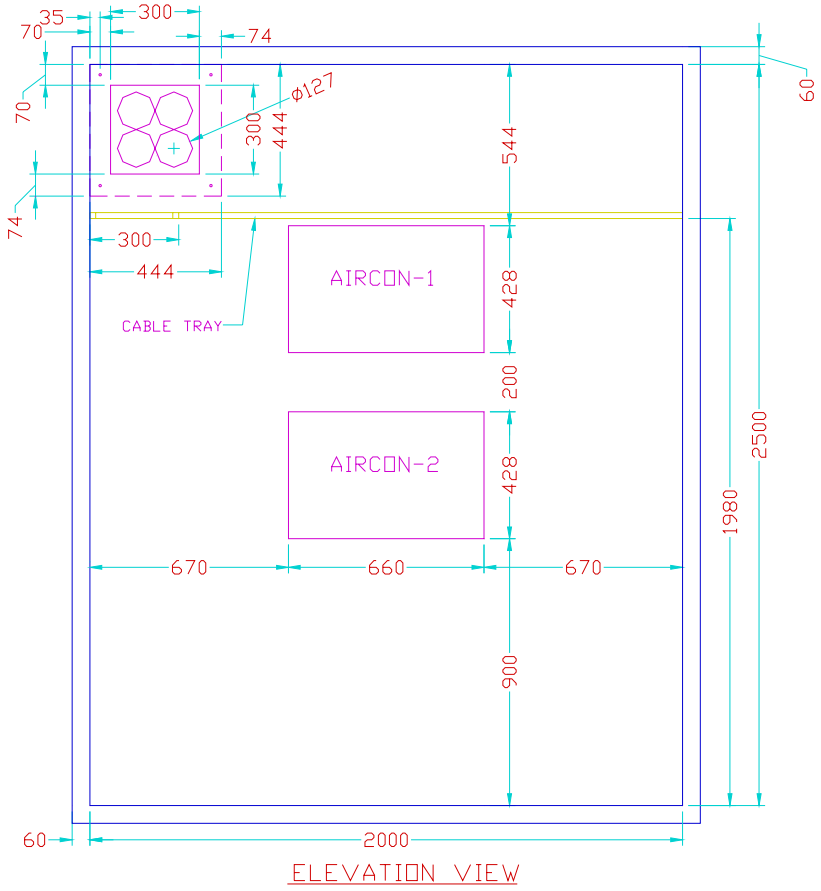
BUSBAR OVER VIEW

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-666(3X2X2.5m SHELTER)

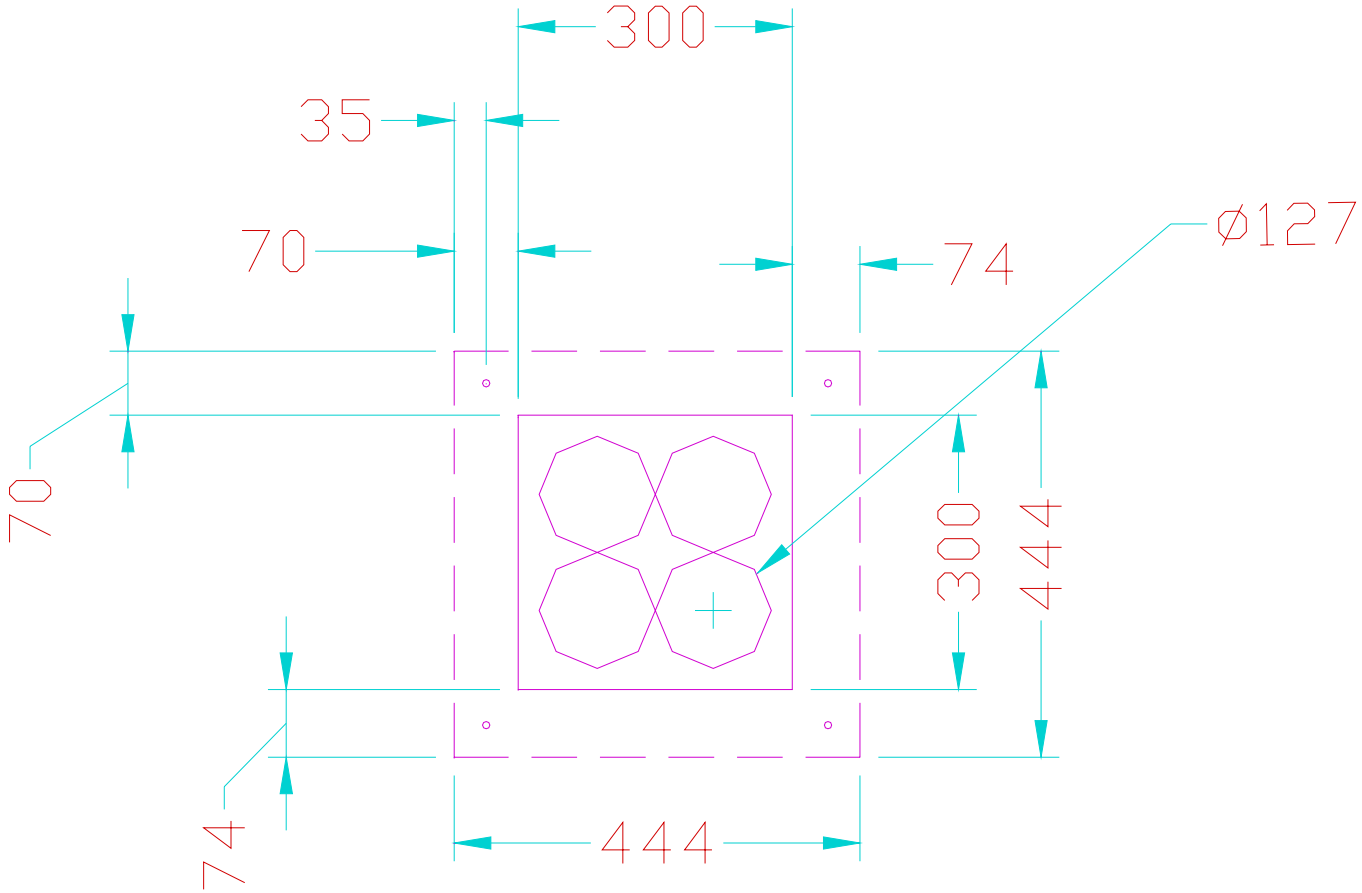


Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-666(3X2X2.5m SHELTER)



WFT OVERVIEW

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

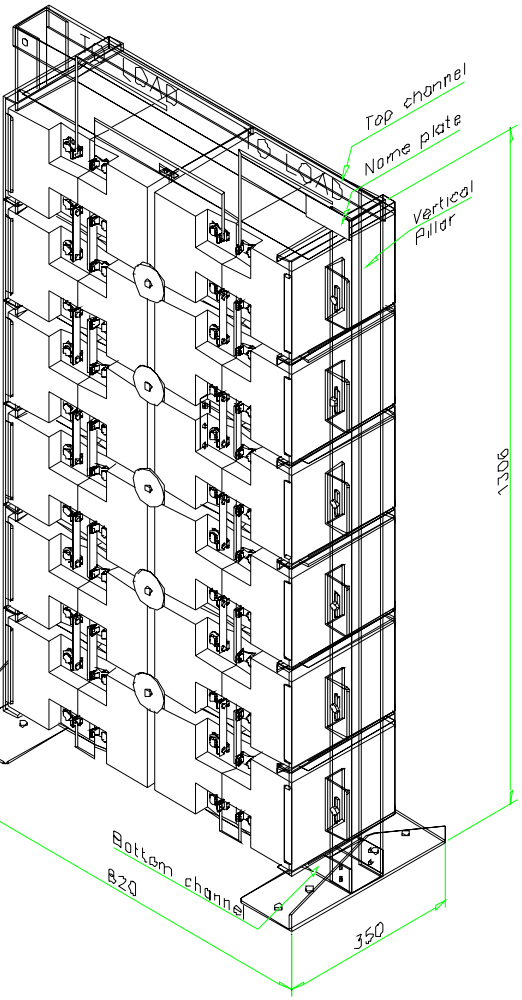
TO BE USED FOR BSNL NORTH ZONE ONLY

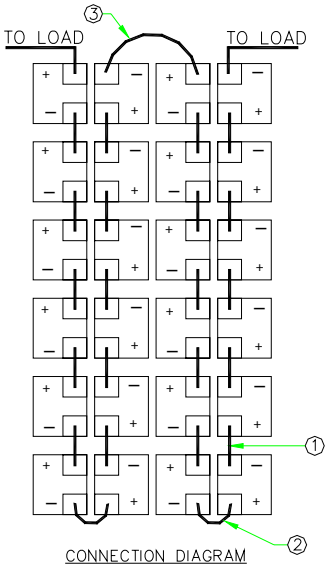
NOKIA

BTS DESIGN WITH AMARA RAJA BATTERIES

AMARA RAJA BATTERY

200AH BATTERY (AMARA RAJA)





NOTE:

a. Batteries are located inside the tray of MS HRCA sheet Painted with RAL7040(Window grey)colour. These trays are mounted in the rack.

b. Place two vertical pillers and fix the bottom and top channels ,then stack the modules in betwween vertical pillers and fasten with approprite hardware supplied along with rack.

c. All cell connectors are made of sleeve/coated copper busbar.

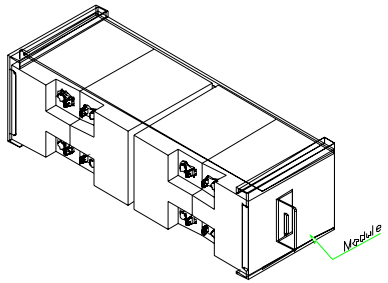
d. No separate foundation is required for installation of battery bank.

e. No special ventilation is required. Normal ventilation is sufficient.

f. Floor area required for battery bank is 820 x 350 mm.

g. 0.5 to 1 mt. aisle space on all sides should be provided to permit initial installation serviec and surveillance.

DIM:
820X350X1306
(WXDXH)mm



INSTALLATION DIAGRAM

	DESCRIPTION	DIMENSION	QTY/CON	QTY/SYS
3	10 sq .mm elastomeric cable	450mm length	1	1
2	10 sq .mm elastomeric cable	200mm length	1	2
1	Inter module connector	130x20x2	1	20

CONNECTOR DETAILS

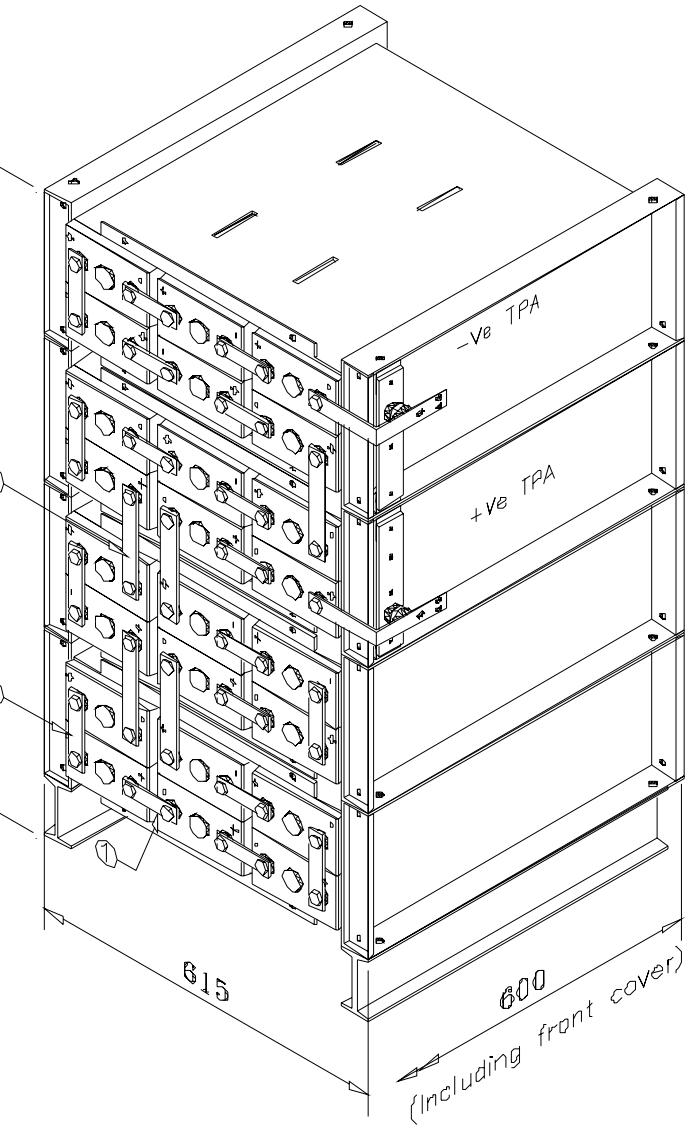
Type of cell	ART200
Total no of cells	24
Volts per cell	2V
No.of modules	6
Total system weight (Approx)	410kgs

SYSTEM DETAILS

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

600AH BATTERY (AMARA RAJA)



NOTE:

a. Batteries are located inside the trays of MS HRCA sheet painted with RAL 7040(Window grey)colour. Trays are mounted on I-beams.(ISLB100)

b. All cell connectors are made of lead coated copper busbar.

c. No separate foundation is required for installation of battery bank.

d. No special ventilation is required.Normal ventilation is sufficient.

e. Terminal plate comprises of lead coated terminal strip designed for 90 A current.

f. Floor area required for battery bank is 615x600 sq mm.

g. 0.5 to1mts aisle space on all sides should be provided to permit initial installation service and surveillance.

h. For any correspondence quote DRG.NO:

SNo	DESCRIPTION	DIMENSION	QTY/CON	QTY/SYS
3	Inter module connector	231x25x2	1	05
2	Inter cell connector(V)	173x25x2	1	06
1	Inter cell connector(H)	120x25x2	1	12

CONNECTOR DETAILS

Type of cell	F 600 F
Total no of cells	24
Volts per cell	2V
No of modules	4
Total system weight (Approx)	1020Kgs

SYSTEM DETAILS

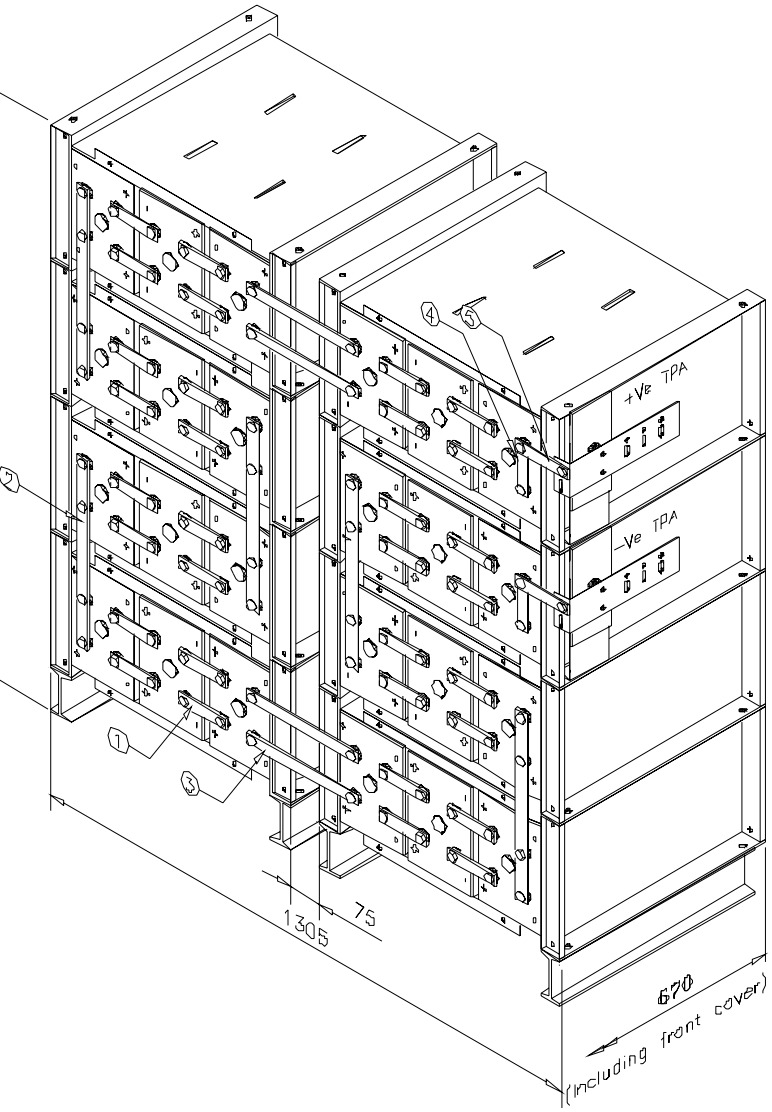
DIM:
615X600X1512
(WXDXH)mm

SITE ENGINEERING STANDARDS/ANIL KOUL

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

1000AH BATTERY (AMARA RAJA)



DIM::
1305X670X1144
(WXDXH)mm

NOTES:

a. Batteries are located inside the trays of MS HRCA sheet painted with RAL7040(Window grey)colour.Trays are mounted on I-beams.
b. All cell connectors are made of lead coated copper busbar.
c. No seperate foundation is required for installation of battery bank.
d. No special ventilation isrequired.Normal ventilation is sufficient.
e. Terminal plate comprises of sleeve/coated terminal strip designed for 150 A current.
f. Floor area required for battery bank is 1305x670 sq mm
g. 0.5 to 1 mts aisle space on all sides should be provided to perm initial installation service and surveillance.
h. For any correspondence quote DRG.NO:

ITEM NO	DESCRIPTION	DIMENSIONS	QTY/CON	QTY/SYS
	End cell connector	135x25x3	1	02
	Inter post connector	120x20x2	1	02
	Inter stack connector	280x20x2	1	04
	Inter module connector	384x25x3	1	05
	Inter cell connector(H)	120x20x2	1	32

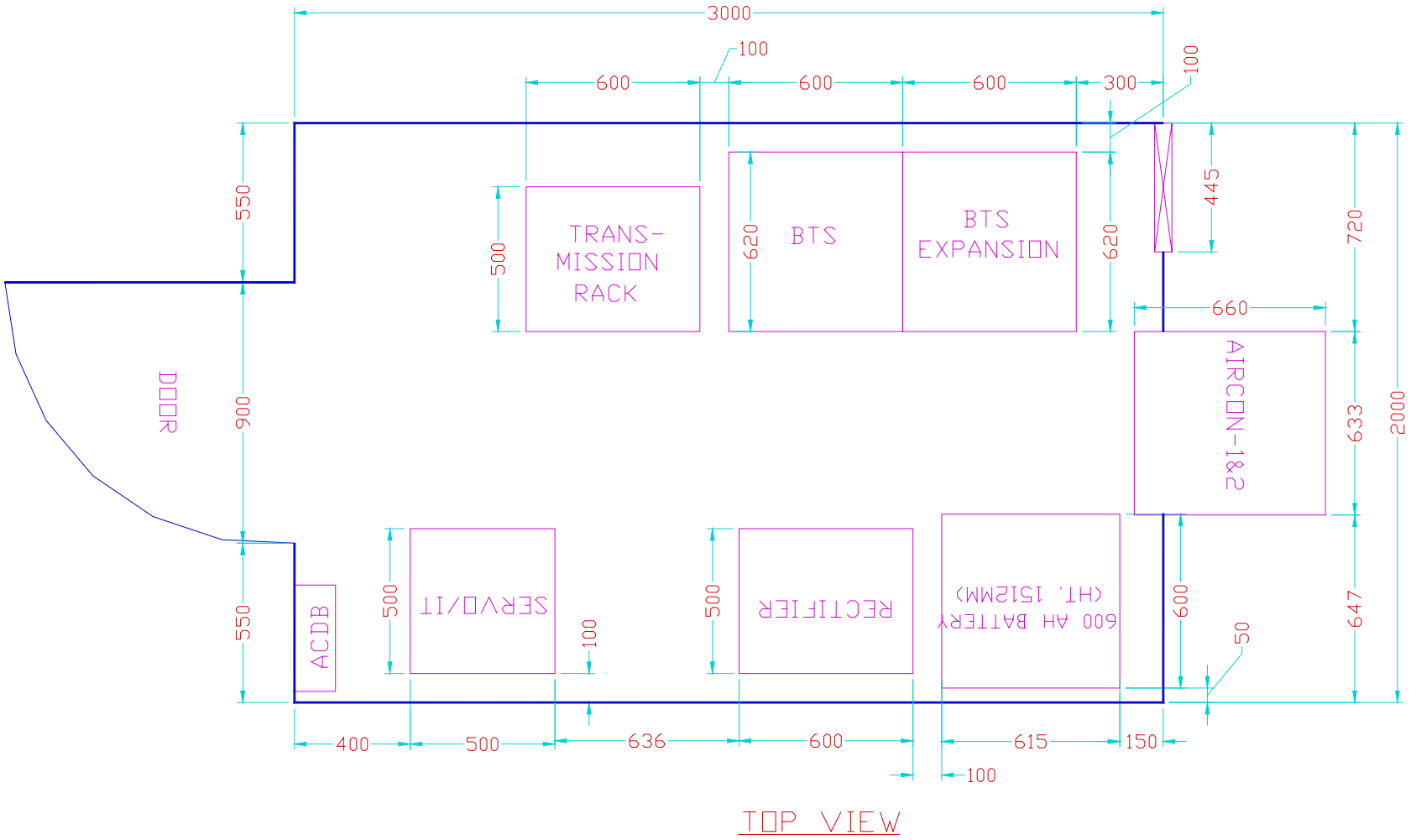
CONNECTOR DETAILS

SYSTEM DETAILS	
Type of cell	F 1000 PP
Total no.of cells	24
Volts per cell	2V
No.of modules	8
Total system weight (Approx)	1735Kgs

TO BE USED FOR BSNL NORTH ZONE ONLY

ULTRA 444 INDOOR WITH 600AH AMARA RAJA BATTERIES

ULTRASITE INDOOR-444(3X2X2.5m SHELTER)



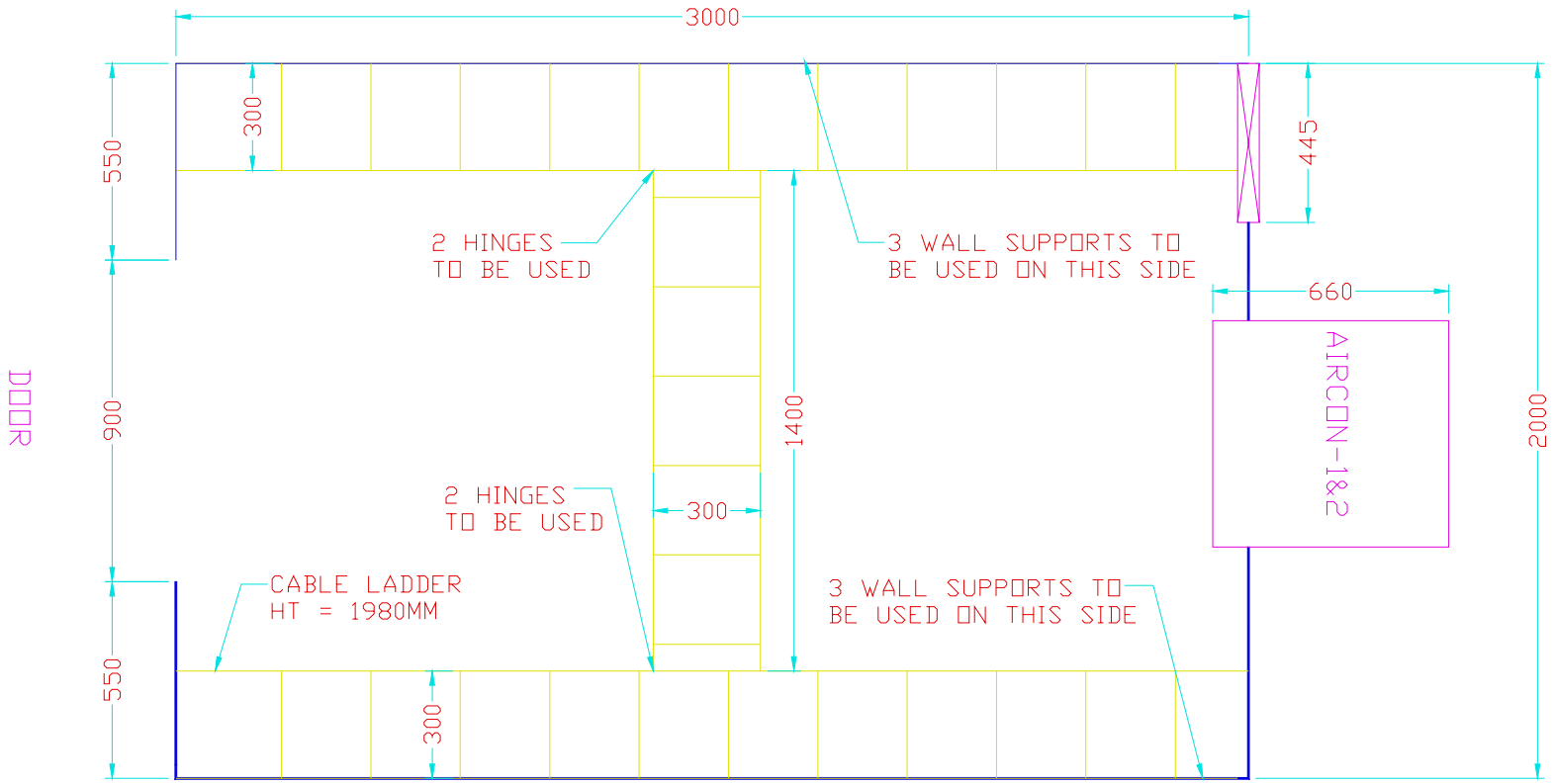
TOP VIEW

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-444(3X2X2.5m SHELTER)



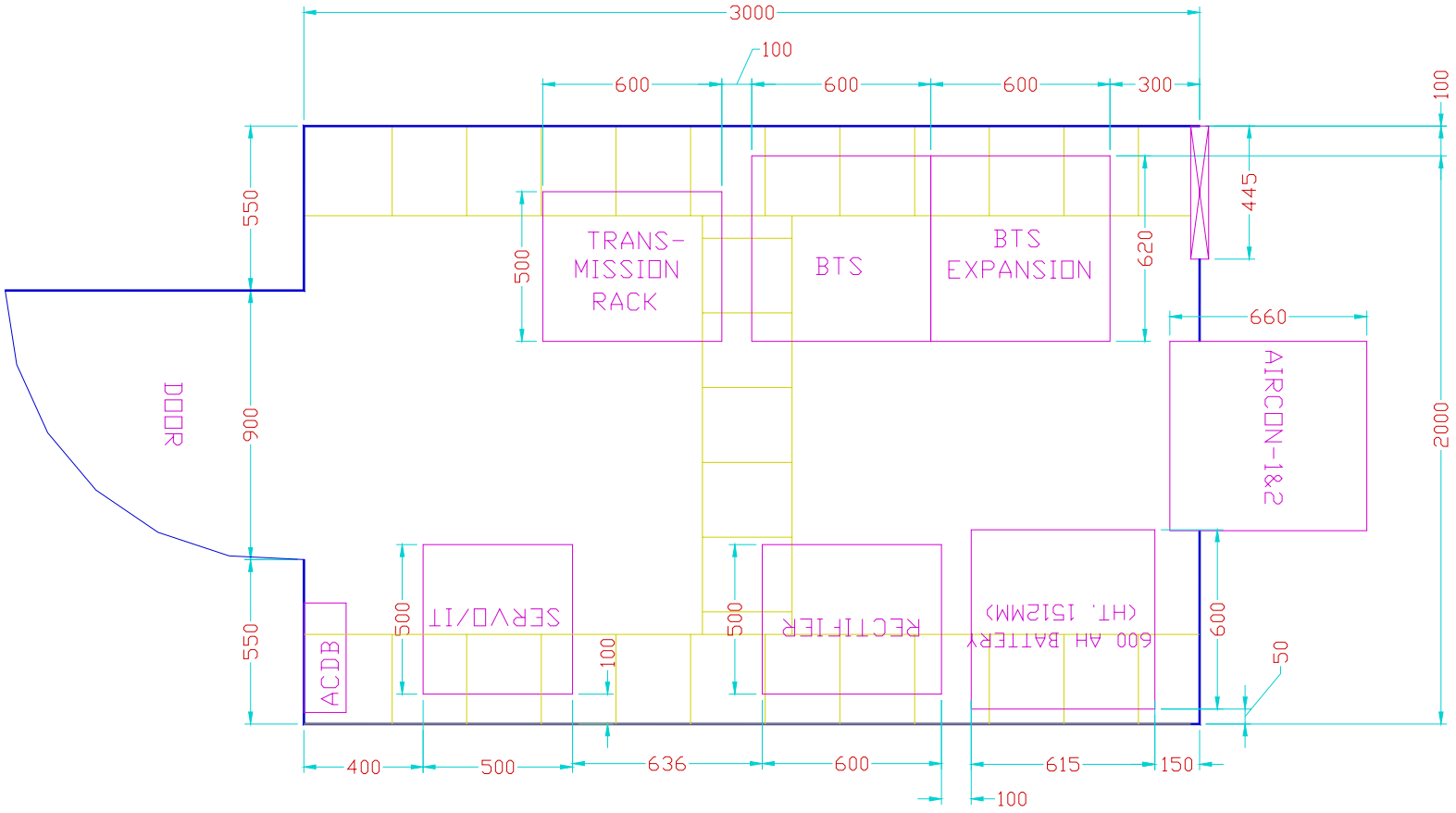
LADDER VIEW

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-444(3X2X2.5m SHELTER)



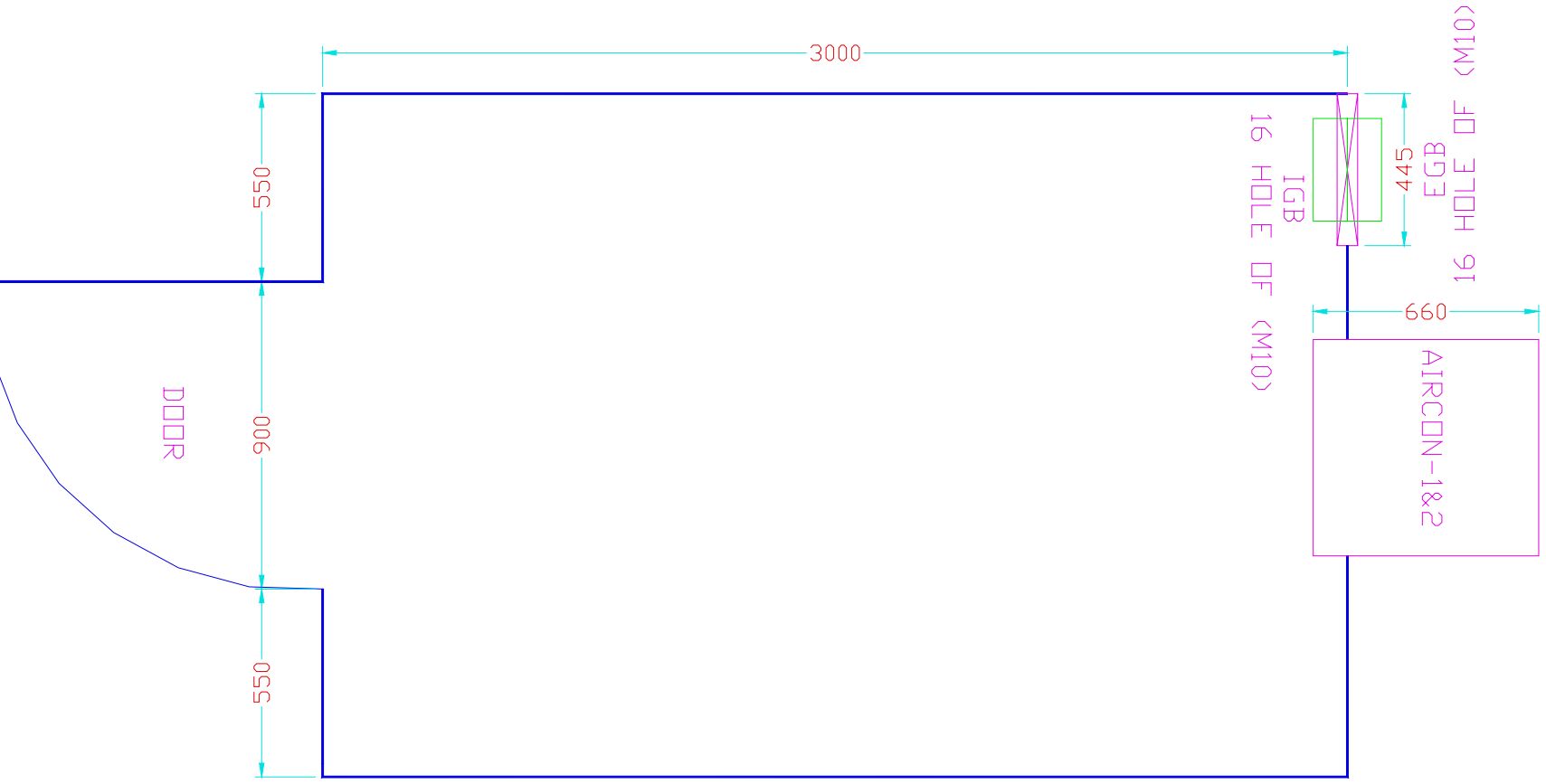
TOP VIEW WITH LADDER

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-444(3X2X2.5m SHELTER)



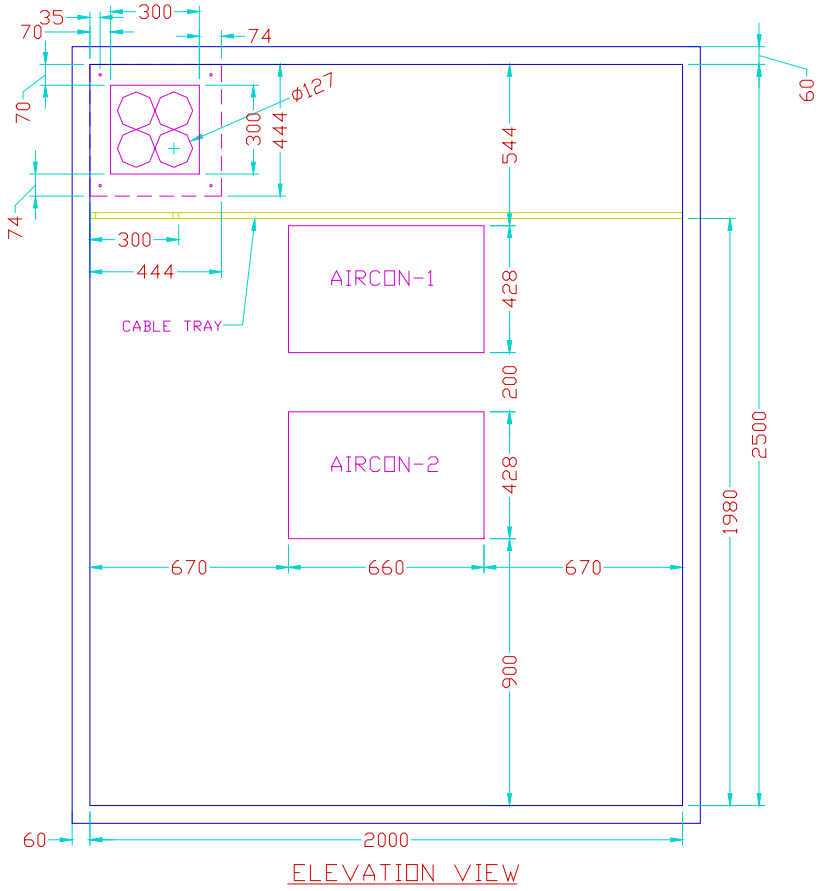
BUSBAR OVER VIEW

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-444(3X2X2.5m SHELTER)

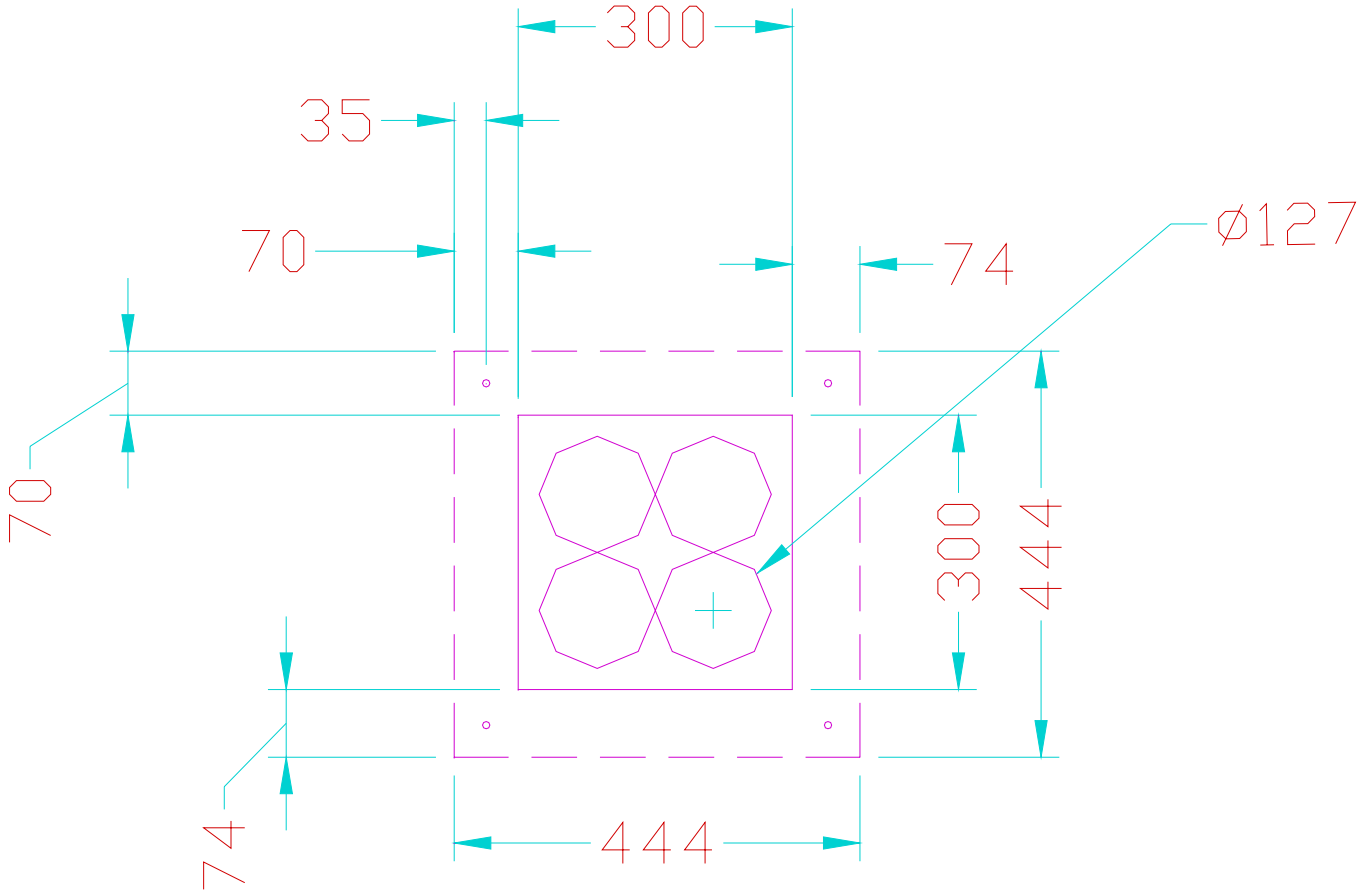


Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-444(3X2X2.5m SHELTER)



WFT OVERVIEW

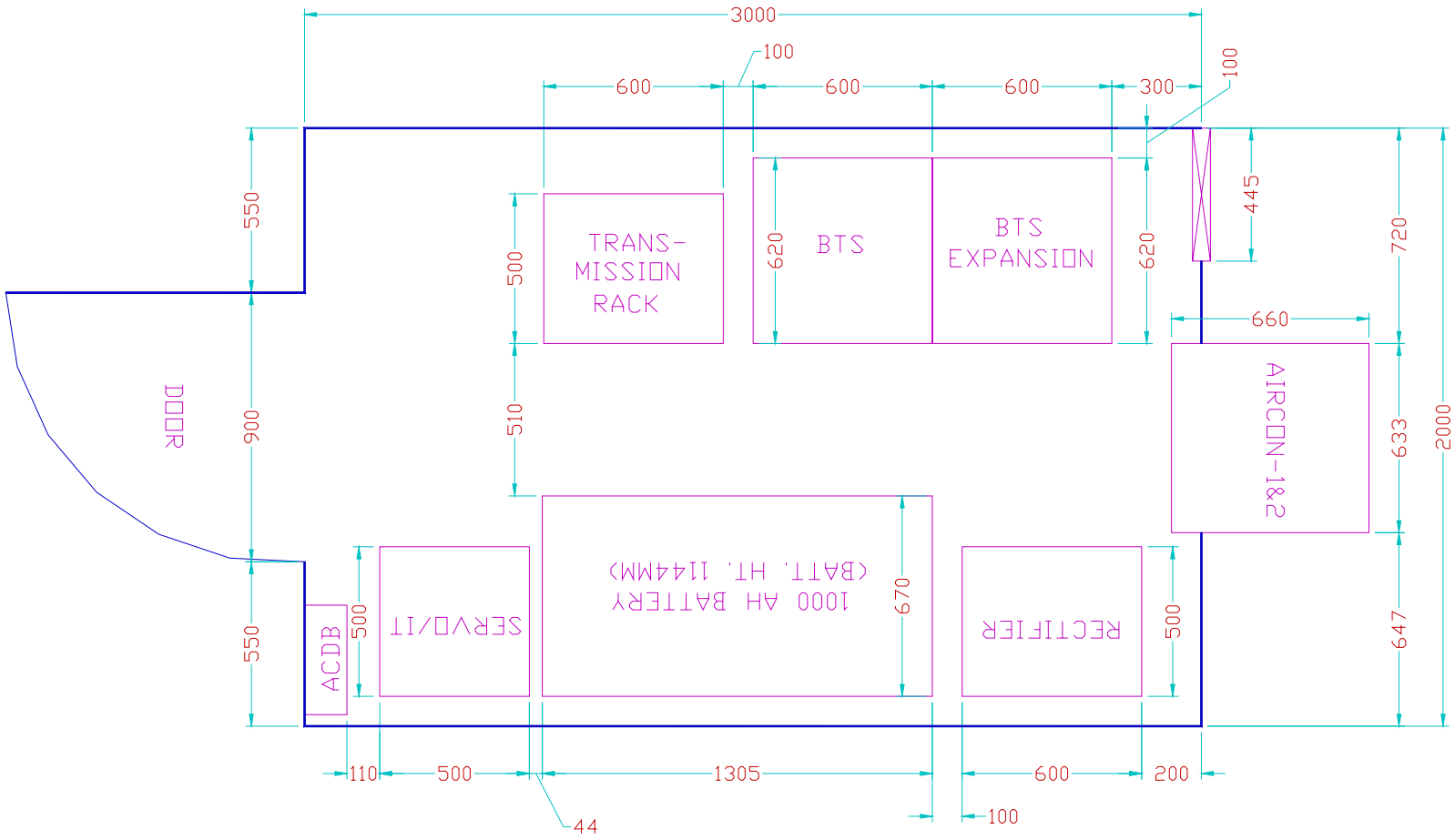
Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRA 666 INDOOR WITH 1000AH AMARA RAJA BATTERIES

ULTRASITE INDOOR-666(3X2X2.5m SHELTER)



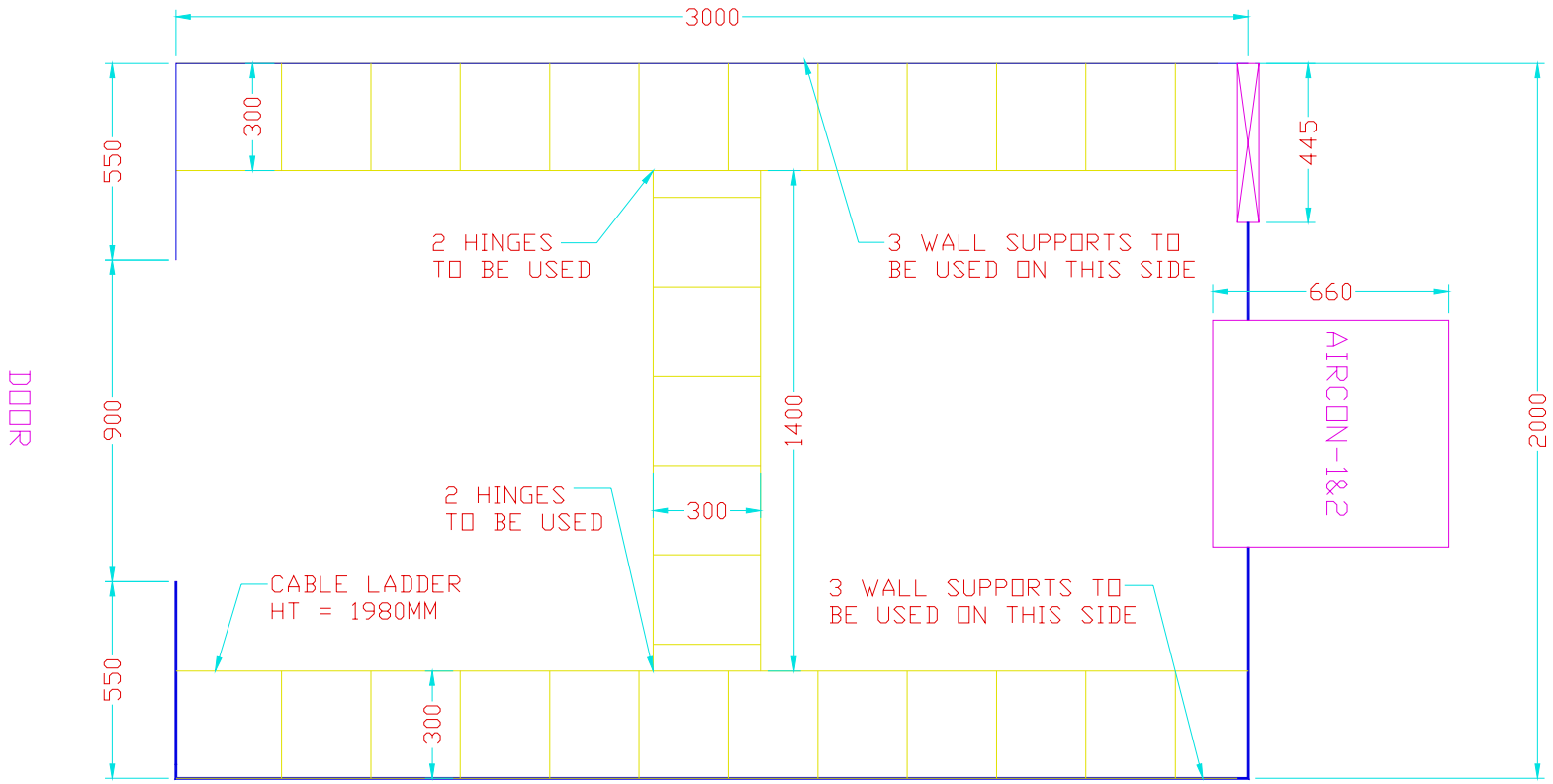
TOP VIEW

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-666(3X2X2.5m SHELTER)



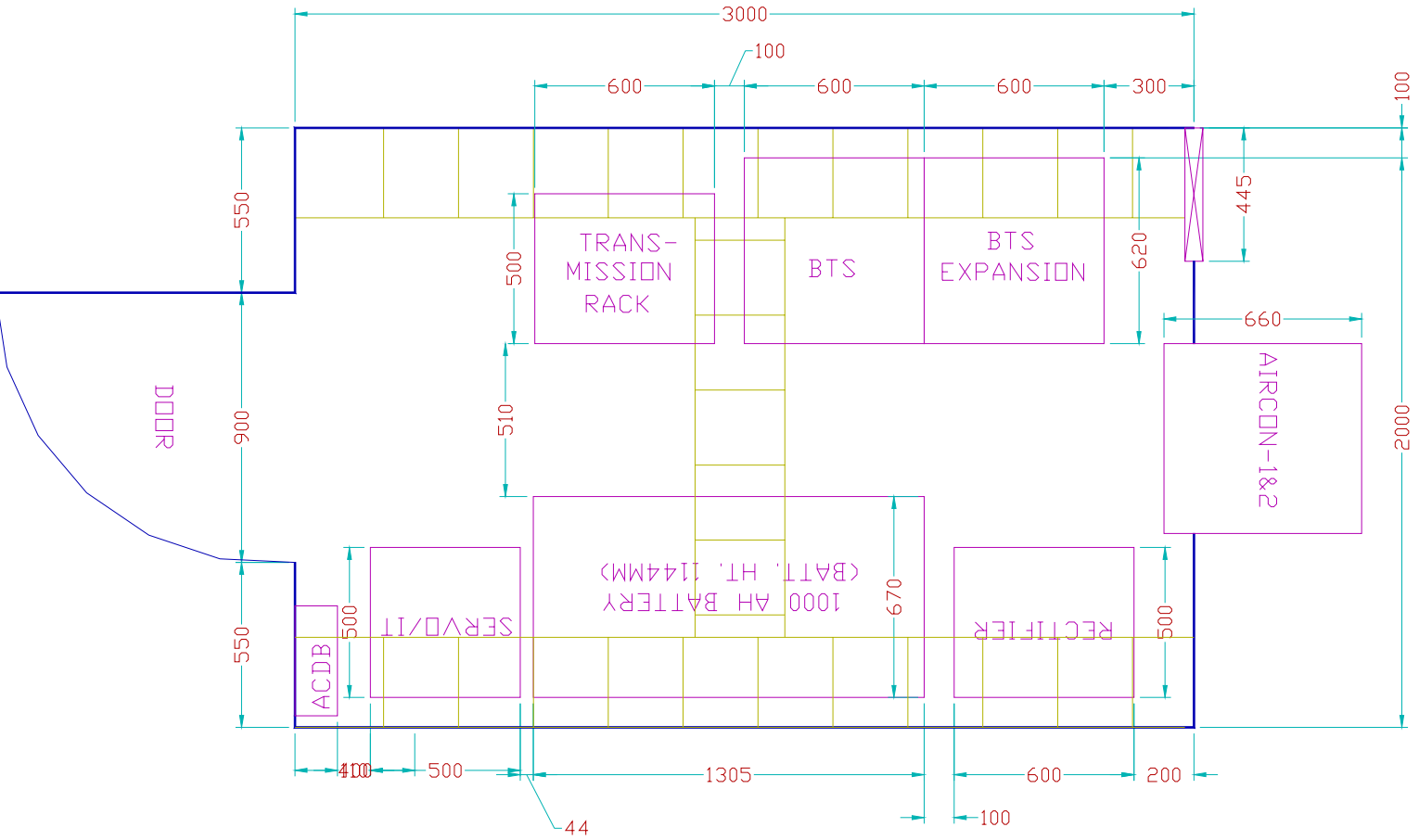
LADDER VIEW

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-666(3X2X2.5m SHELTER)



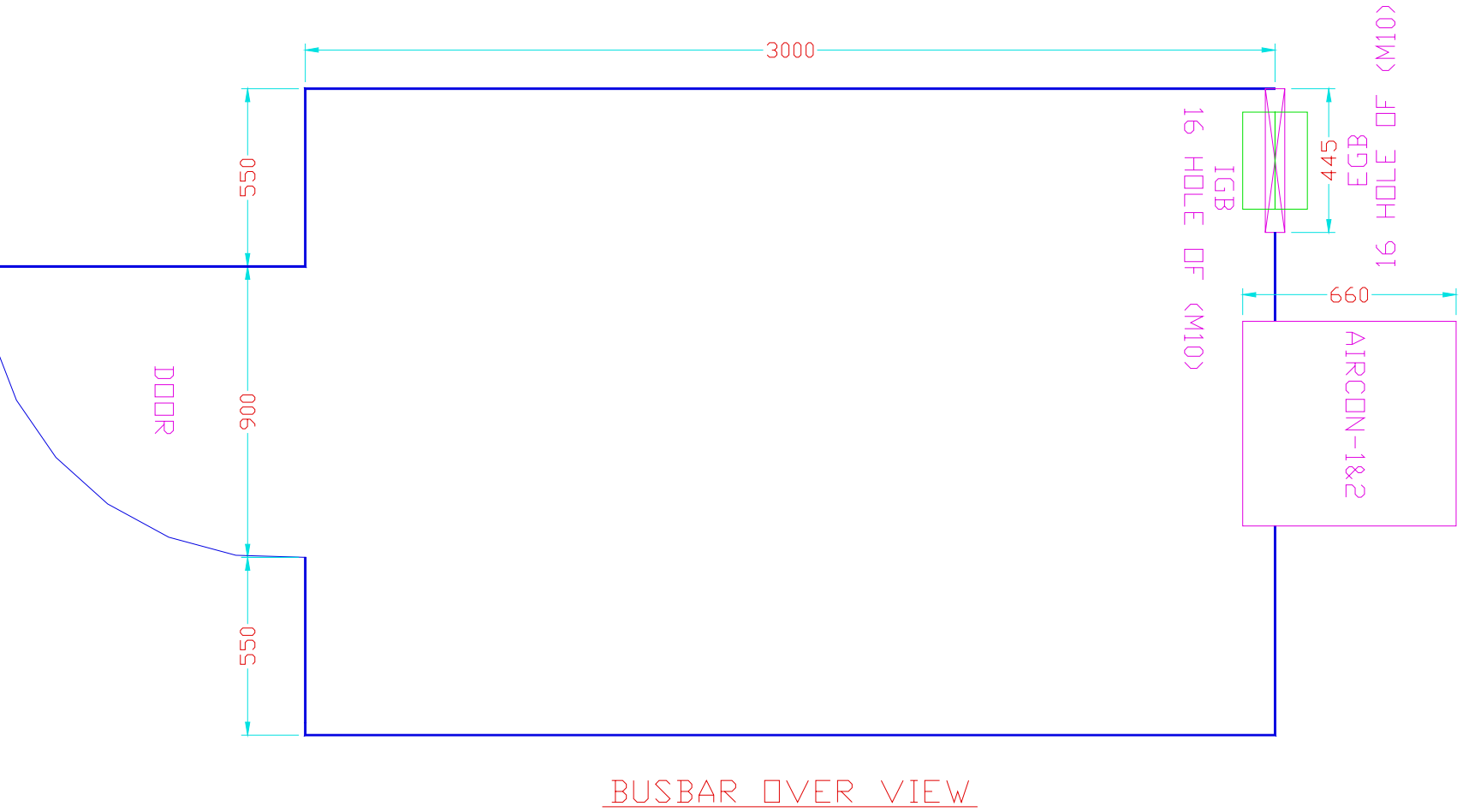
TOP VIEW WITH LADDER

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-666(3X2X2.5m SHELTER)



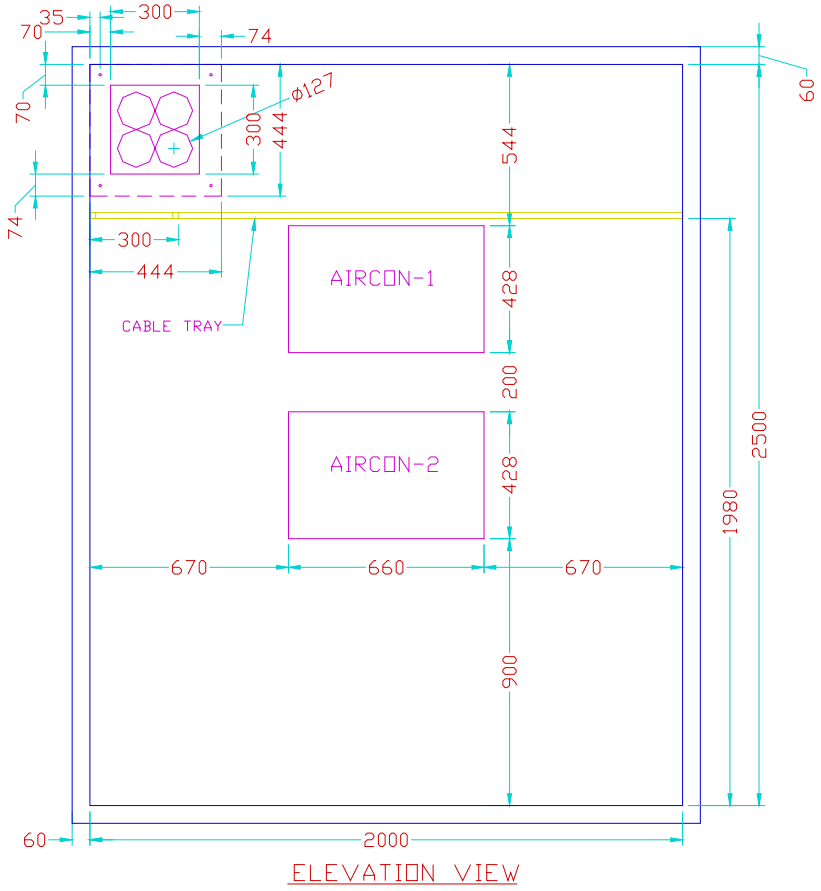
BUSBAR OVER VIEW

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-666(3X2X2.5m SHELTER)

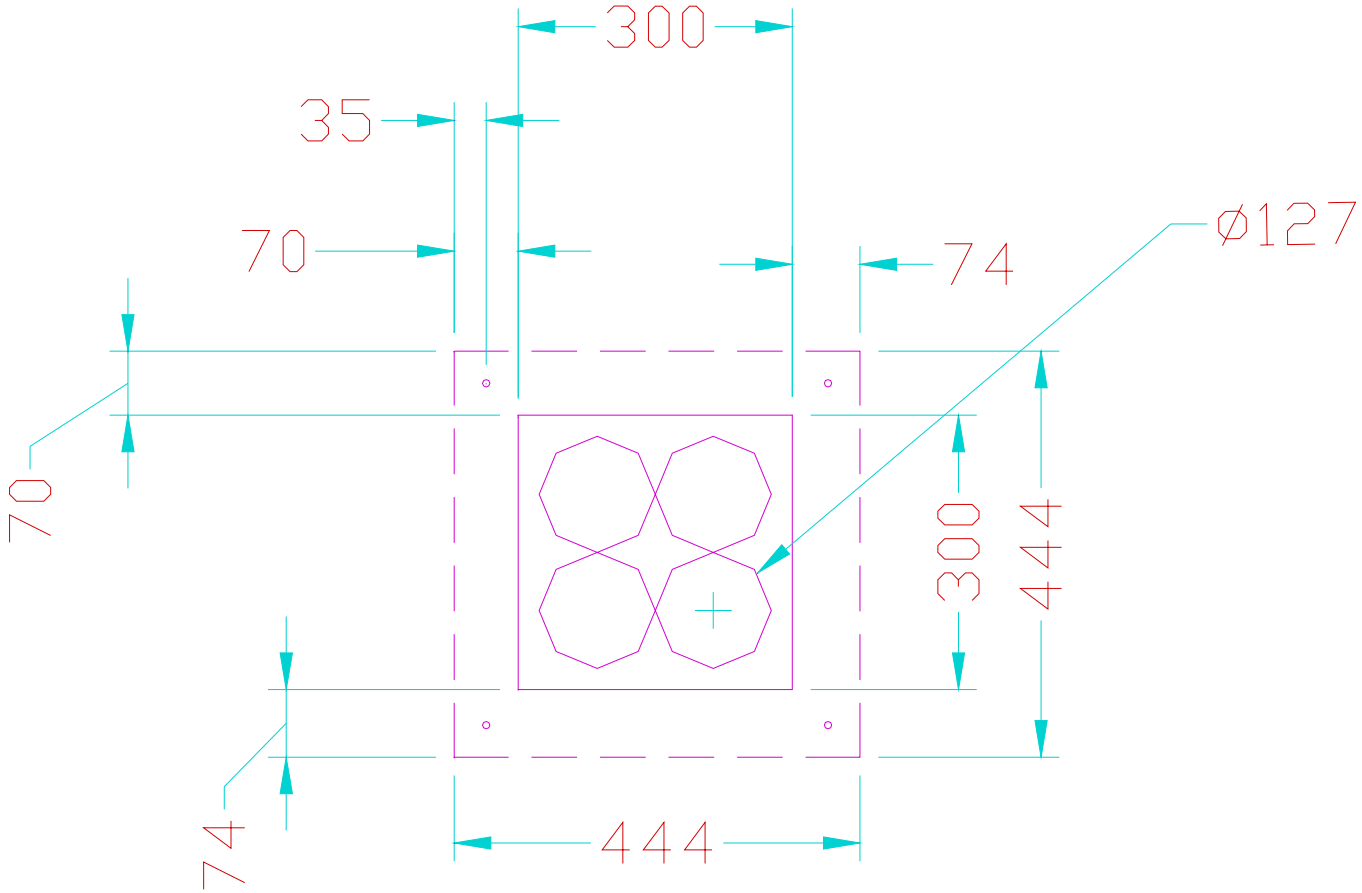


Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE INDOOR-666(3X2X2.5m SHELTER)



WFT OVERVIEW

Servo/IT & Transmission rack will be installed where ever reqd
WFT position can vary on site as per tower position

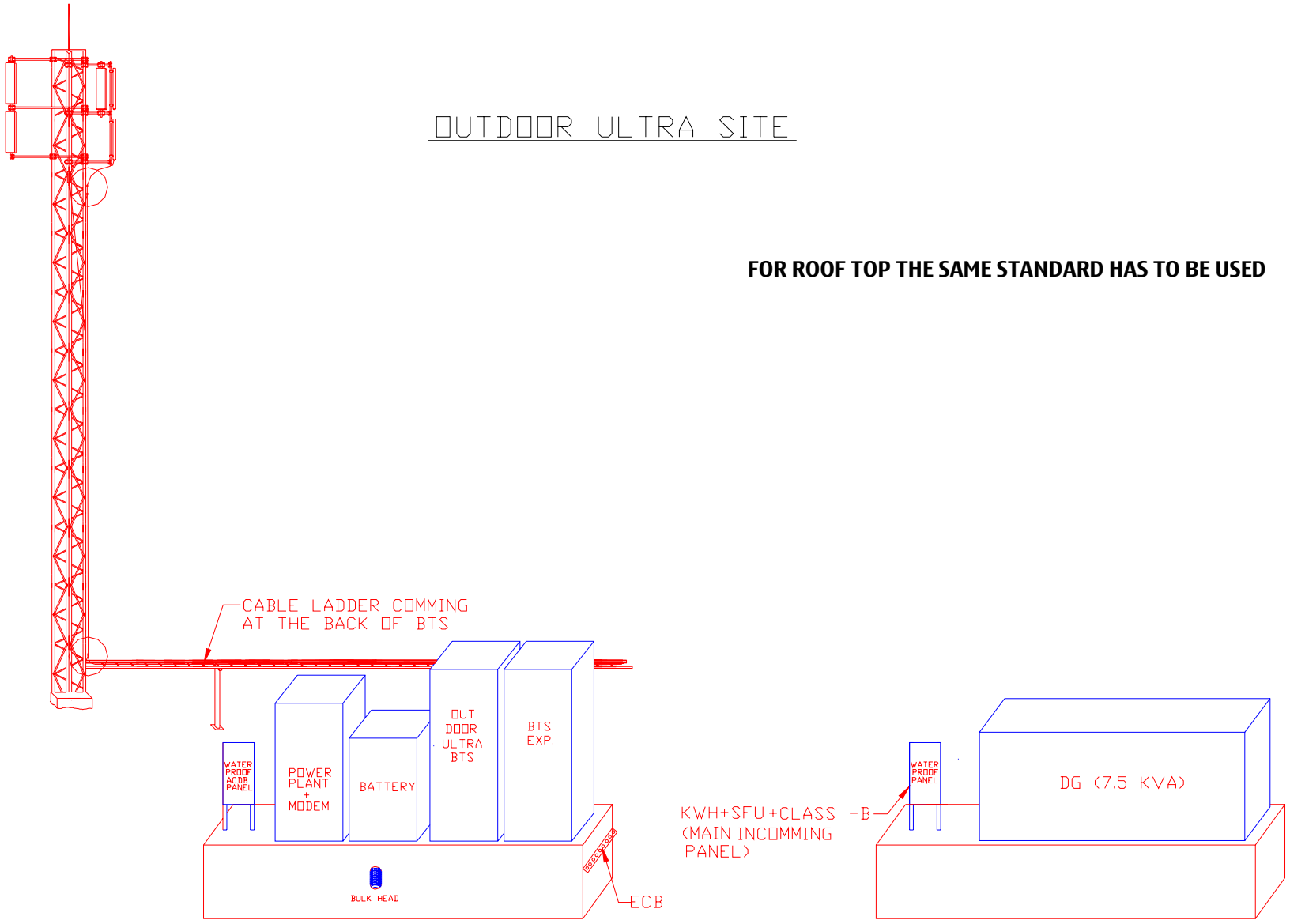
TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

OUTDOOR SITE

OUTDOOR BTS DESIGN

ULTRASITE OUTDOOR



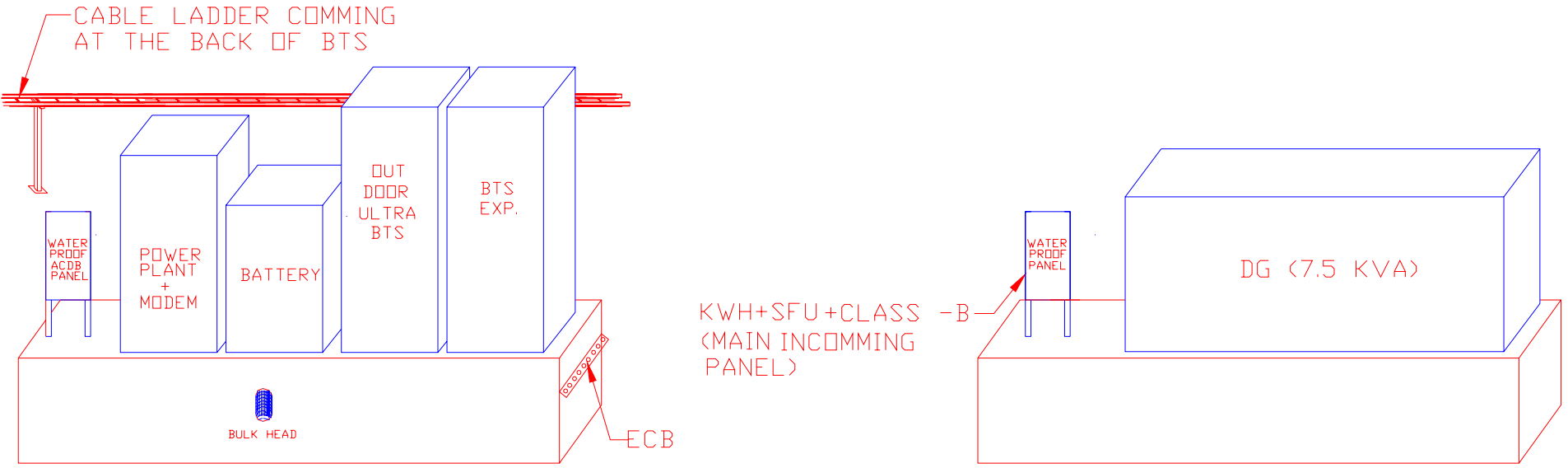
FOR ROOF TOP THE SAME STANDARD HAS TO BE USED

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ULTRASITE OUTDOOR

FOR ROOF TOP THE SAME STANDARD HAS TO BE USED



  SITE ENGINEERING STANDARDS/ANIL KOUL

TO BE USED FOR BSNL NORTH ZONE ONLY

HBL OUTDOOR CABINET FOR BATTERIES

HBL 200AH CABINET

NOTES

ALL DIMENSIONS ARE IN mm
SHEET THICKNESS/TYPE :

1. STRUCTURE : 2 mm CRCA SHEET
   BASE CHANNEL : ISMC 100 CHANNEL
2. FRONT DOOR : 2 mm CRCA SHEET
3. REAR COVER : 2 mm CRCA SHEET

TYPE OF DOOR LOCK : INDUSTRIAL CAM LOCK WITH INTERCHANGABLE KEY AND ALSO PAD LOCKING PROVISION.

VENTILATION : FROM FRONT BOTTOM & REAR TOP

LOUVERS COVERED WITH PERFORATED SHEET INSIDE, HOLE DIA IS < 1 mm

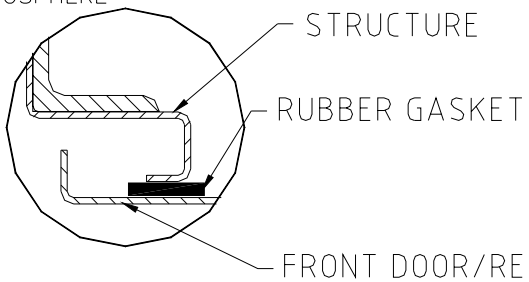
PAINT DETAILS: COOL PAINT

DOOR SWING : 120° (APPROX)
ACCESSIABILITY : FROM FRONT
CABLE ENTRY : FROM BOTTOM
(CABLE DETAILS TO BE PROVIDED BY CUSTOMER)
CABINET TO BE GROUTED
(PROVISION IS PROVIDED FOR GROUNTING)

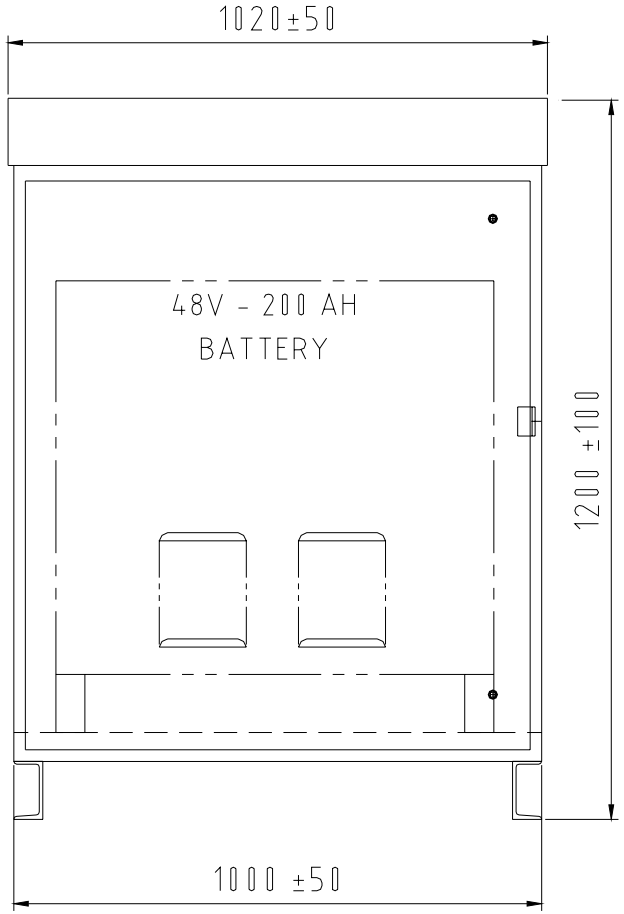
BATTERY TO BE INSTALLED INSIDE OF THE CABINET

THIS CABINET SHOULD NOT BE INSTALLED IN ROOMS

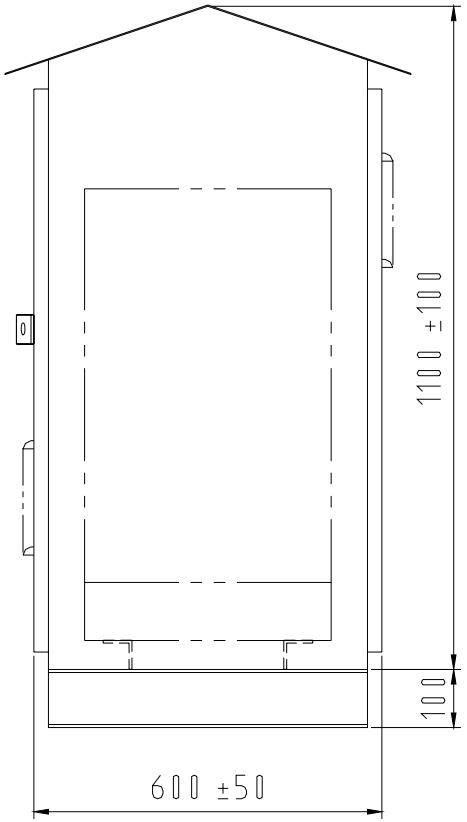
THIS CABINET IS DESIGNED FOR INSTALLATION IN OPEN ATMOSPHERE



GASKET ARRANGEMENT DETAILS



FRONT VIEW



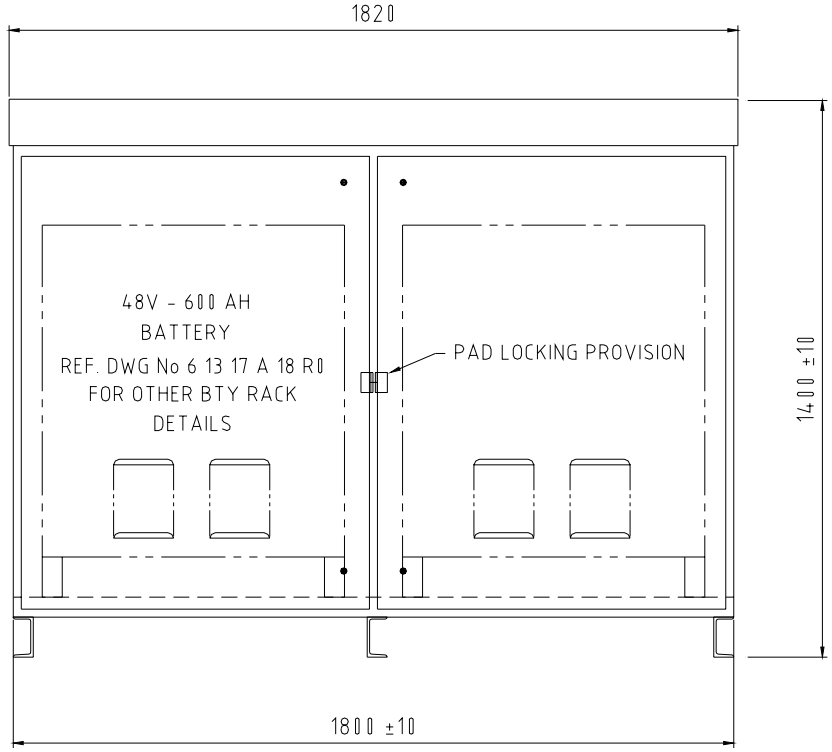
SIDE VIEW

DIM:
1100X650X1300
(WXDXH)mm

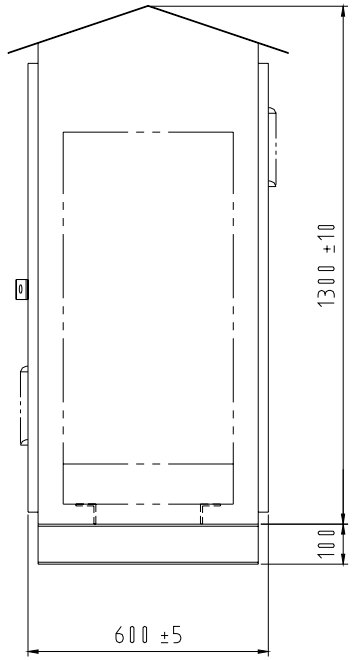
TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

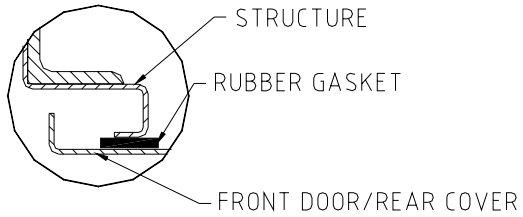
HBL 600AH CABINET



FRONT VIEW



SIDE VIEW



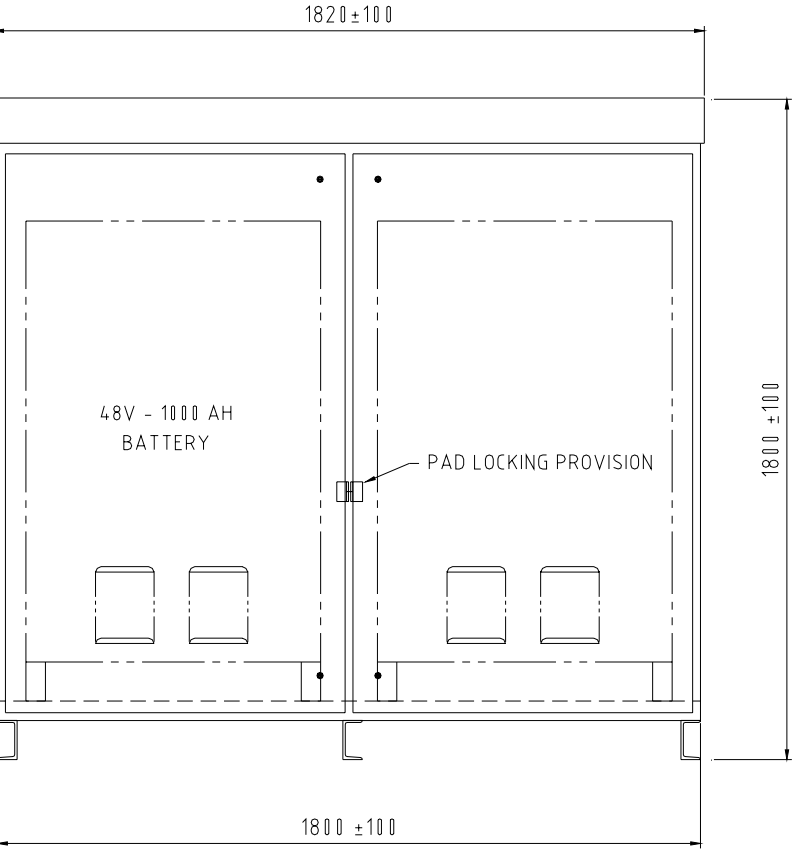
GASKET ARRANGEMENT DETAILS

DIM:
1820X610X1410
(WXDXH)mm

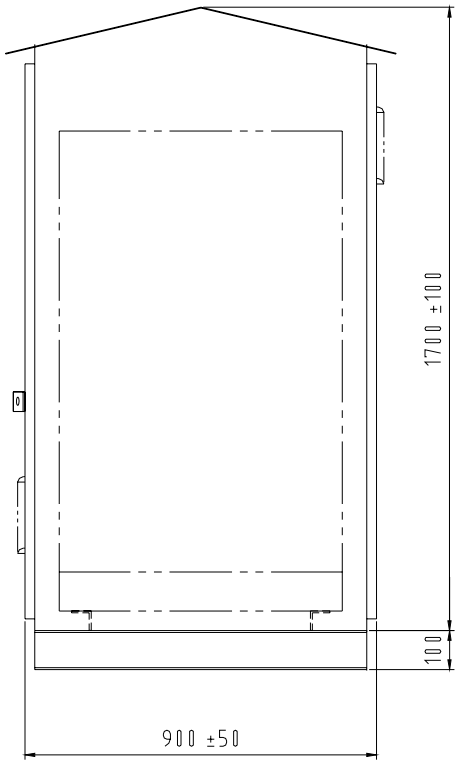
TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

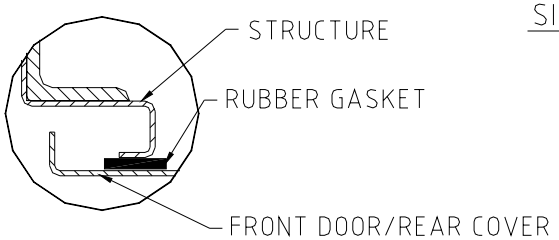
HBL 1000AH CABINET



FRONT VIEW



SIDE VIEW



GASKET ARRANGEMENT DETAILS

NOTES

* ALL DIMENSIONS ARE IN mm
* SHEET THICKNESS/TYPE :
  1. STRUCTURE : 2 mm CRCA SHEET
     BASE CHANNEL : ISMC 100 CHANNEL
  2. FRONT DOOR : 2 mm CRCA SHEET
  3. REAR COVER : 2 mm CRCA SHEET
* TYPE OF DOOR LOCK : INDUSTRIAL CAM LOCK WITH INTERCHANGABLE KEY AND ALSO PAD LOCKING PROVISION.
* VENTILATION : FROM FRONT BOTTOM & REAR TOP
* LOUVERS COVERED WITH PERFORATED SHEET INSIDE, HOLE DIA IS < 1 mm
* PAINT DETAILS: COOL PAINT
* DOOR SWING : 120° (APPROX)
* ACCESSIABILITY : FROM FRONT
* CABLE ENTRY : FROM BOTTOM (CABLE DETAILS TO BE PROVIDED BY CUSTOMER)
* CABINET TO BE GROUTED (PROVISION IS PROVIDED FOR GROUNTING)
* BATTERY TO BE INSTALLED INSIDE OF THE CABINET
* THIS CABINET SHOULD NOT BE INSTALLED IN ROOMS
* THIS CABINET IS DESIGNED FOR INSTALLATION IN OPEN ATMOSPHERE

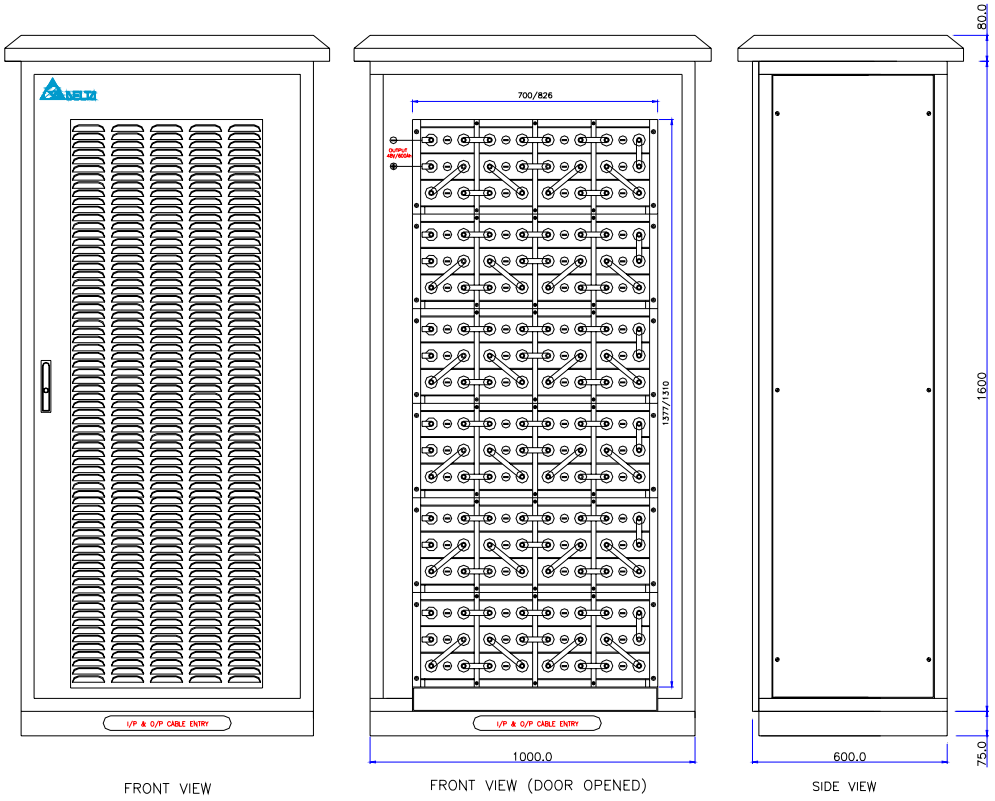
DIM:
1900X950X1900
(WXDXH)mm

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

EXIDE OUTDOOR CABINET FOR BATTERIES

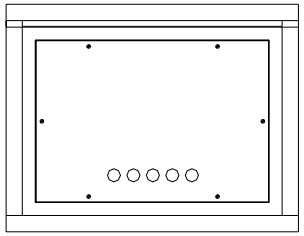
EXIDE 200AH CABINET



FRONT VIEW

FRONT VIEW (DOOR OPENED)

SIDE VIEW



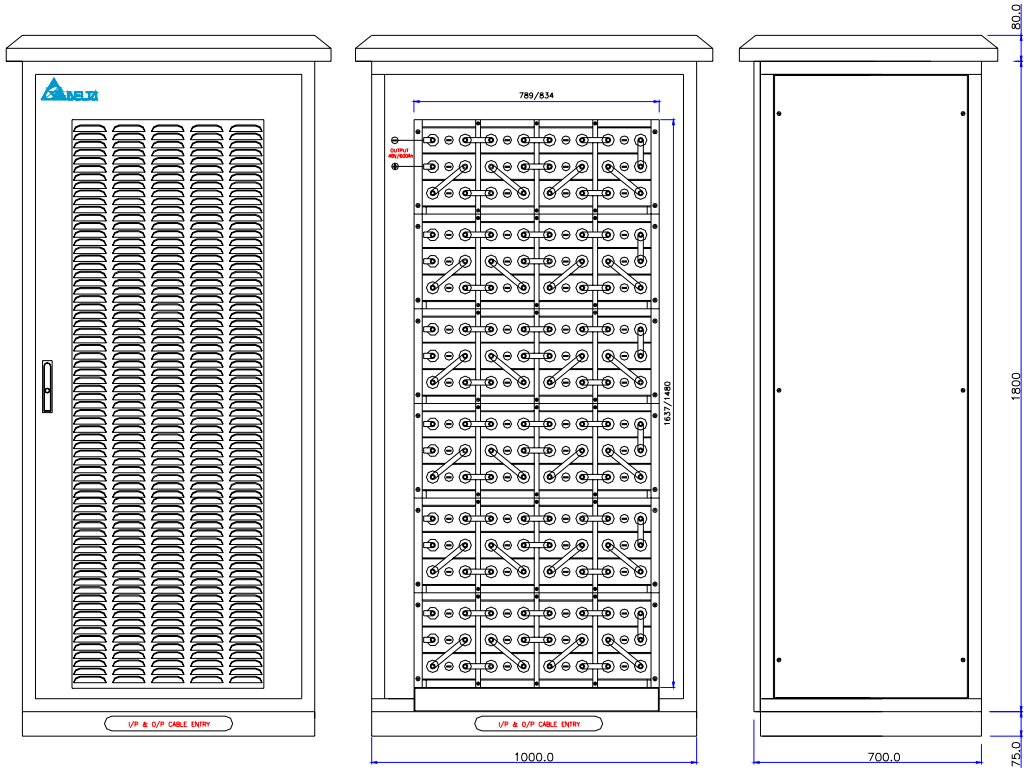
BOTTOM VIEW

DIM:
1000X600X1680
(WXDXH)mm

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

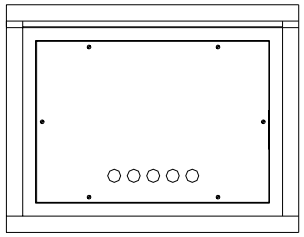
EXIDE 400AH CABINET



FRONT VIEW

FRONT VIEW (DOOR OPENED)

SIDE VIEW



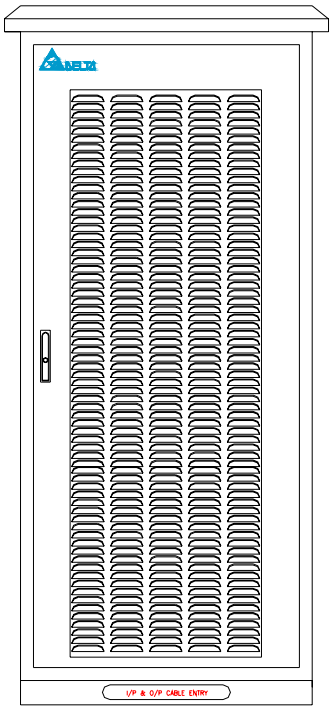
BOTTOM VIEW

DIM:
1000X700X1900
(WXDXH)mm

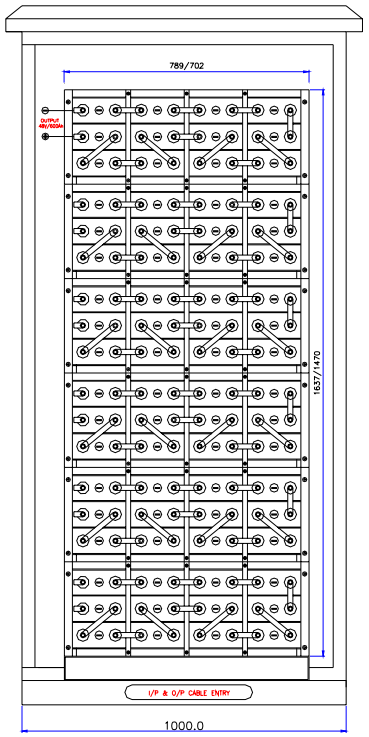
TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

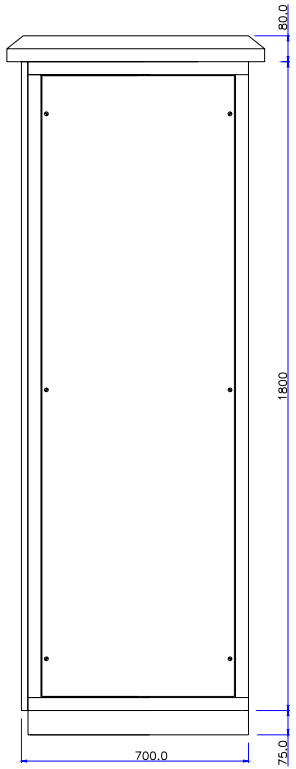
EXIDE 600AH CABINET



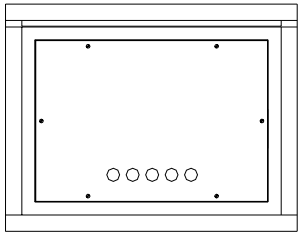
FRONT VIEW



FRONT VIEW (DOOR OPENED)



SIDE VIEW



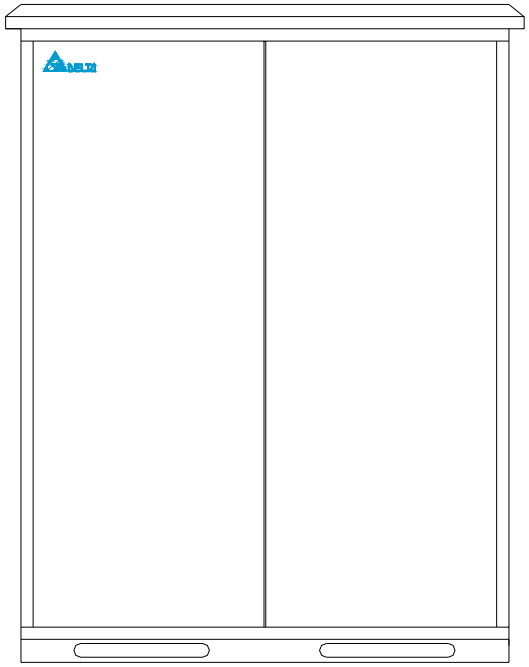
BOTTOM VIEW

DIM:
1000X700X1900
(WXDXH)mm

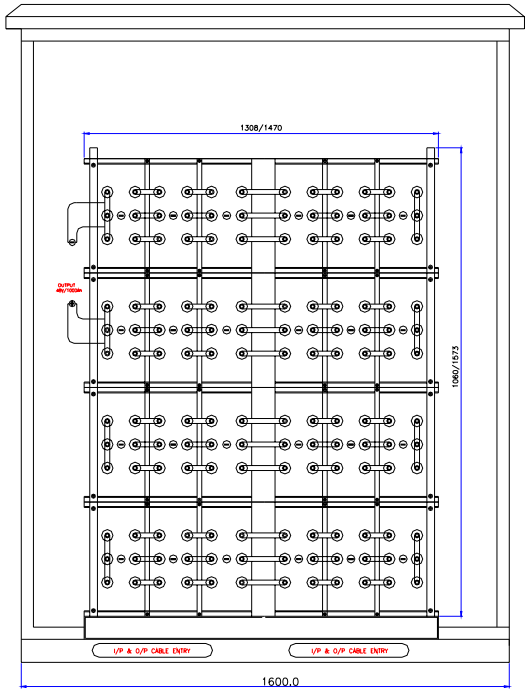
TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

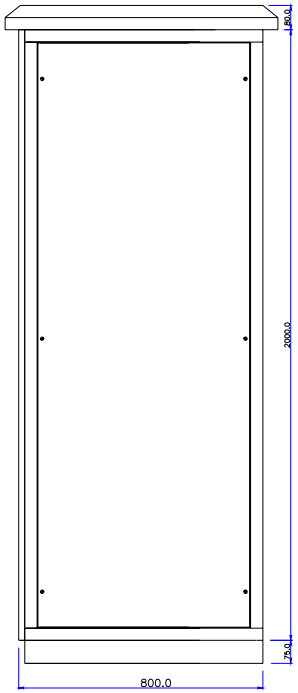
EXIDE 1000AH CABINET



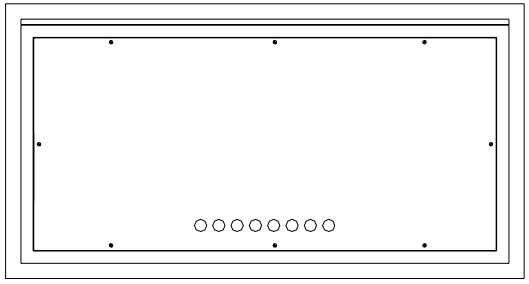
FRONT VIEW (DOOR OPENED)



FRONT VIEW (DOOR OPENED)



SIDE VIEW



BOTTOM VIEW

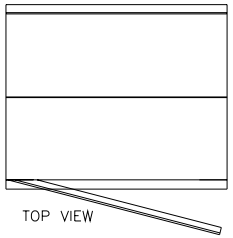
DIM:
1600X800X2000
(WXDXH)mm

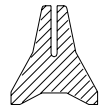
TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

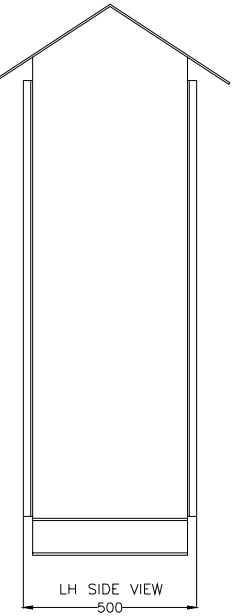
AMARA RAJA OUTDOOR CABINET FOR BATTERIES

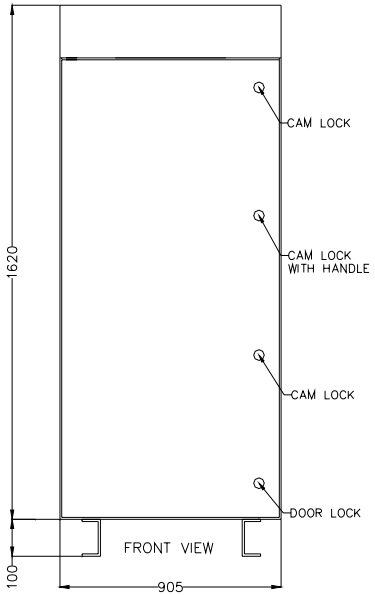
AMARA RAJA 200AH CABINET

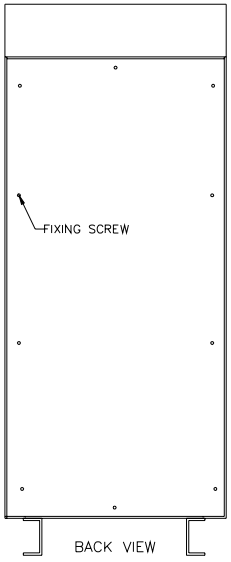


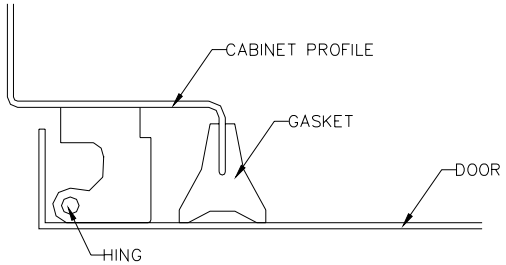


CROSS SECTIONAL VIEW OF GASKET
MATERIAL: NEOPRENE RUBBER



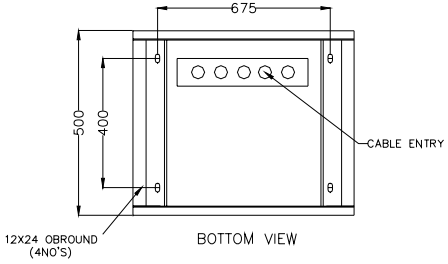






GASKET ARRANGEMENT IN CABINET

DIM:
905X500X1720
(WXDXH)mm



NOTE:–

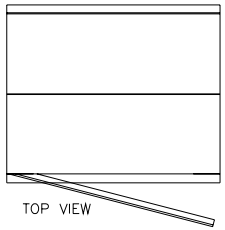
1. All dimensions are in mm.
2. Material of the cabinet is CRCA MS as per IS 513.
3. Accessibility for all components shall be from front door only.
4. RH side view is similar to LH side view.
5. Floor area required for cabinet with battery bank is 905X500.
6. Ventilation is provided at the bottom of the cabinet&rear top.
7. Louvers provided on rear top and shall be protected with fine wire mesh.
8. Door swing 120° approximately.

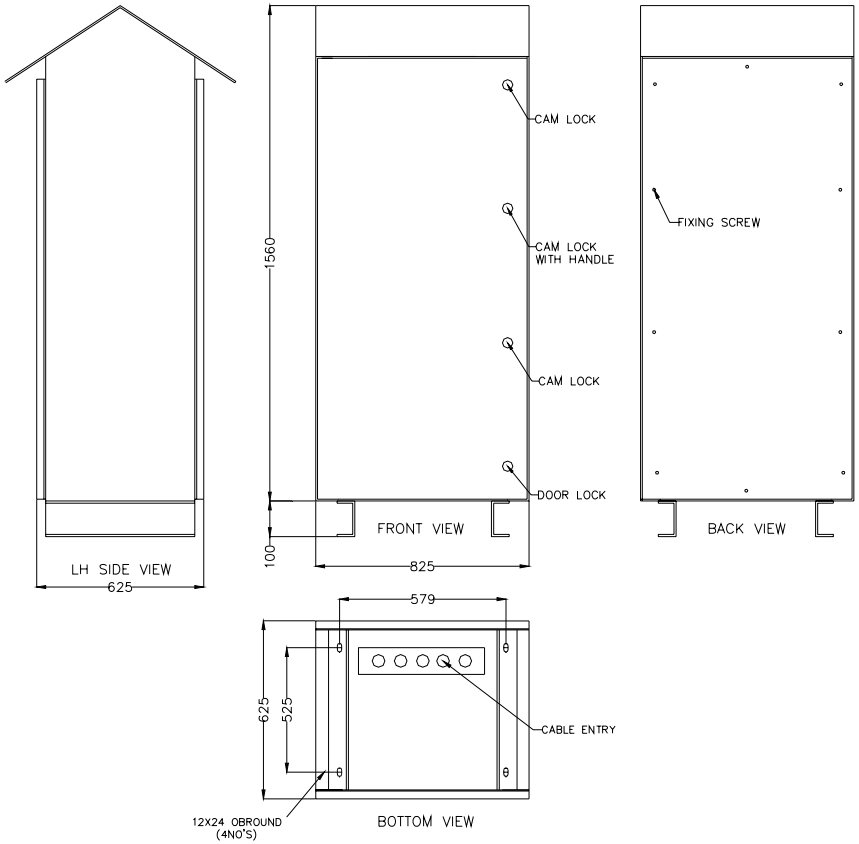
SITE ENGINEERING STANDARDS/ANIL KOUL

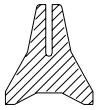
TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

AMARA RAJA 400AH CABINET

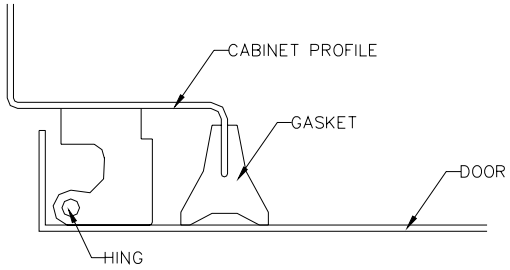






CROSS SECTIONAL VIEW OF GASKET

MATERIAL: NEOPRENE RUBBER



GASKET ARRANGEMENT IN CABINET

DIM: 825X625X1660 (WXDXH)mm

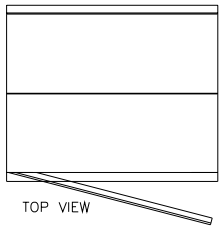
NOTE:–

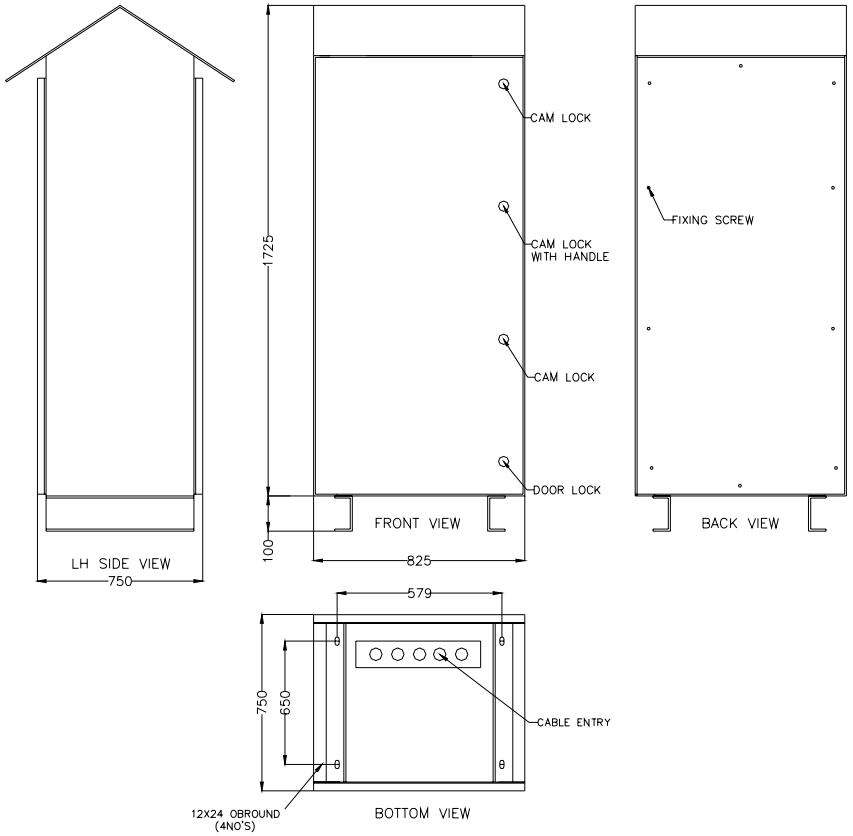
1. All dimensions are in mm.
2. Material of the cabinet is CRCA MS as per IS 513.
3. Accessibility for all components shall be from front door only.
4. RH side view is similar to LH side view.
5. Floor area required for cabinet with battery bank is 825x625
6. Ventilation is provided at the bottom of the cabinet&rear top.
7. Louvers provided on rear top and shall be protected with fine wire mesh
8. Door swing 120° approximately.

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

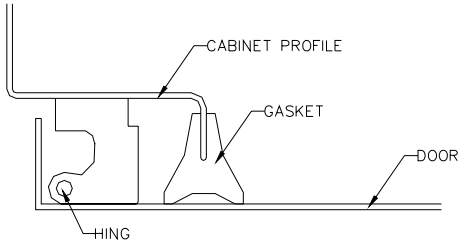
AMARA RAJA 600AH CABINET





CROSS SECTIONAL VIEW OF GASKET

MATERIAL: NEOPRENE RUBBER



GASKET ARRANGEMENT IN CABINET

DIM:
825X750X1825
(WXDXH)mm

NOTE:–

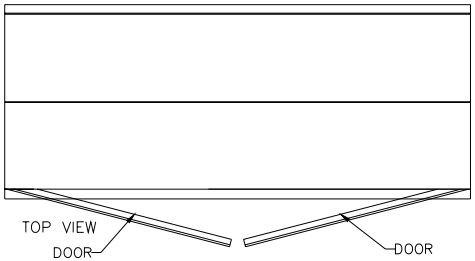
1. All dimensions are in mm.
2. Material of the cabinet is CRCA MS as per IS 513.
3. Accessibility for all components shall be from front door only.
4. RH side view is similar to LH side view.
5. Floor area required for cabinet with battery bank is 825x750.
6. Ventilation is provided at the bottom of the cabinet&rear top.
7. Louvers provided on rear top and shall be protected with fine wire mesh.
8. Door swing 120° approximately.

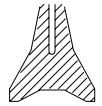
SITE ENGINEERING STANDARDS/ANIL KOUL

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

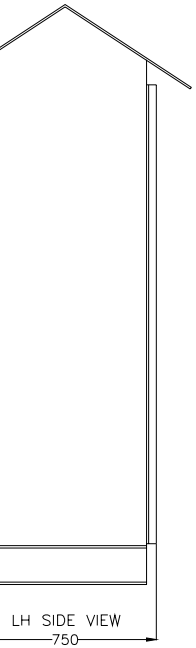
AMARA RAJA 1000AH CABINET

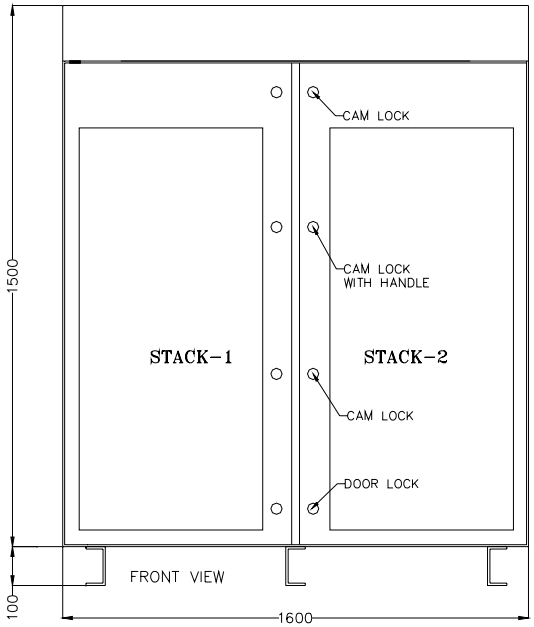


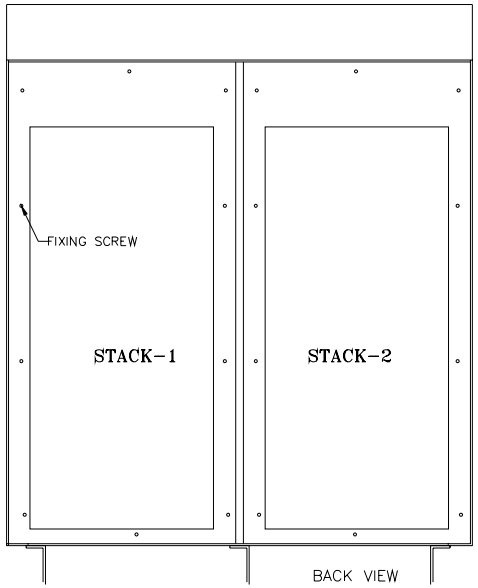


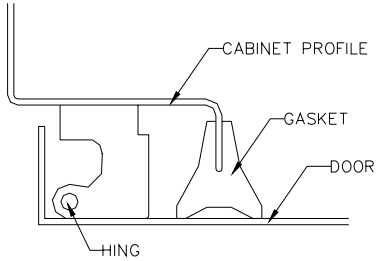
CROSS SECTIONAL VIEW OF GASKET

MATERIAL: NEOPRENE RUBBER

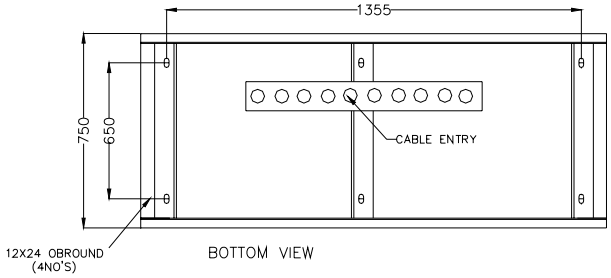








GASKET ARRANGEMENT IN CABINET



DIM:
1600X750X1600
(WXDXH)mm

NOTE:–

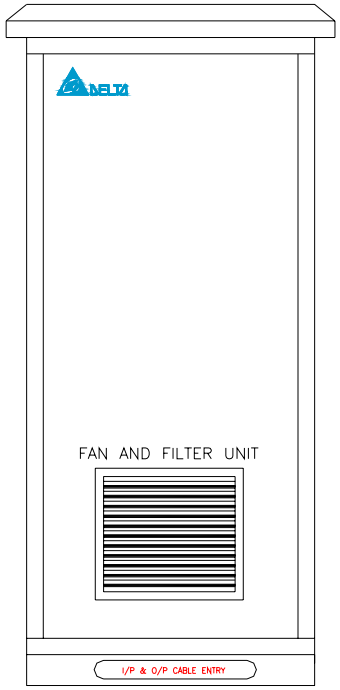
1. All dimensions are in mm.
2. Material of the cabinet is CRCA MS as per IS 513.
3. Accessibility for all components shall be from front door only.
4. RH side view is similar to LH side view.
5. Floor area required for cabinet with battery bank is 1600x750.
6. Ventilation is provided at the bottom of the cabinet&rear top.
7. Louvers provided on rear top and shall be protected with fine wire mesh.
8. Door swing 120° approximately.

TO BE USED FOR BSNL NORTH ZONE ONLY

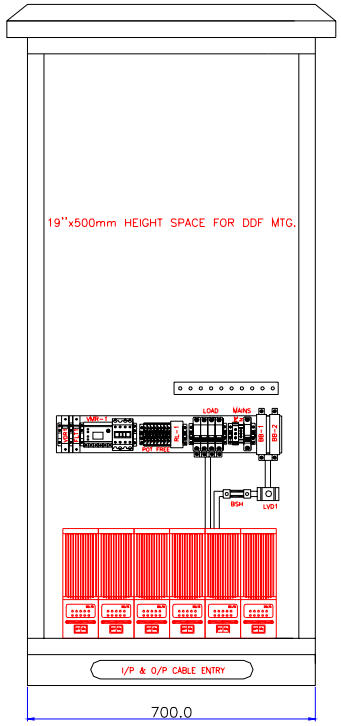
NOKIA

OUTDOOR POWER SYSTEM CABINET

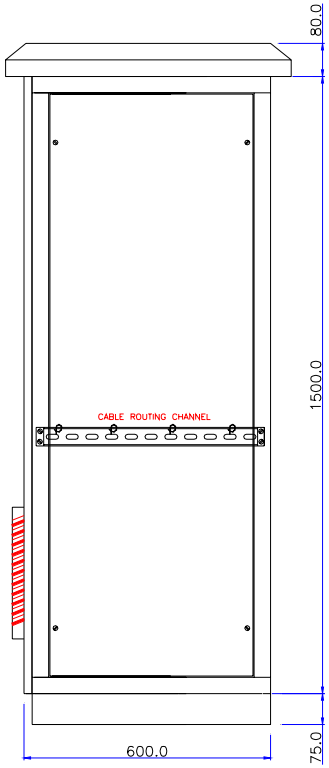
OUTDOOR POWER CABINET



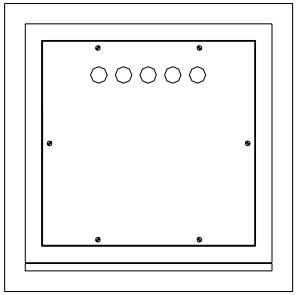
FRONT VIEW



FRONT VIEW (DOOR OPENED)



SIDE VIEW



BOTTOM VIEW

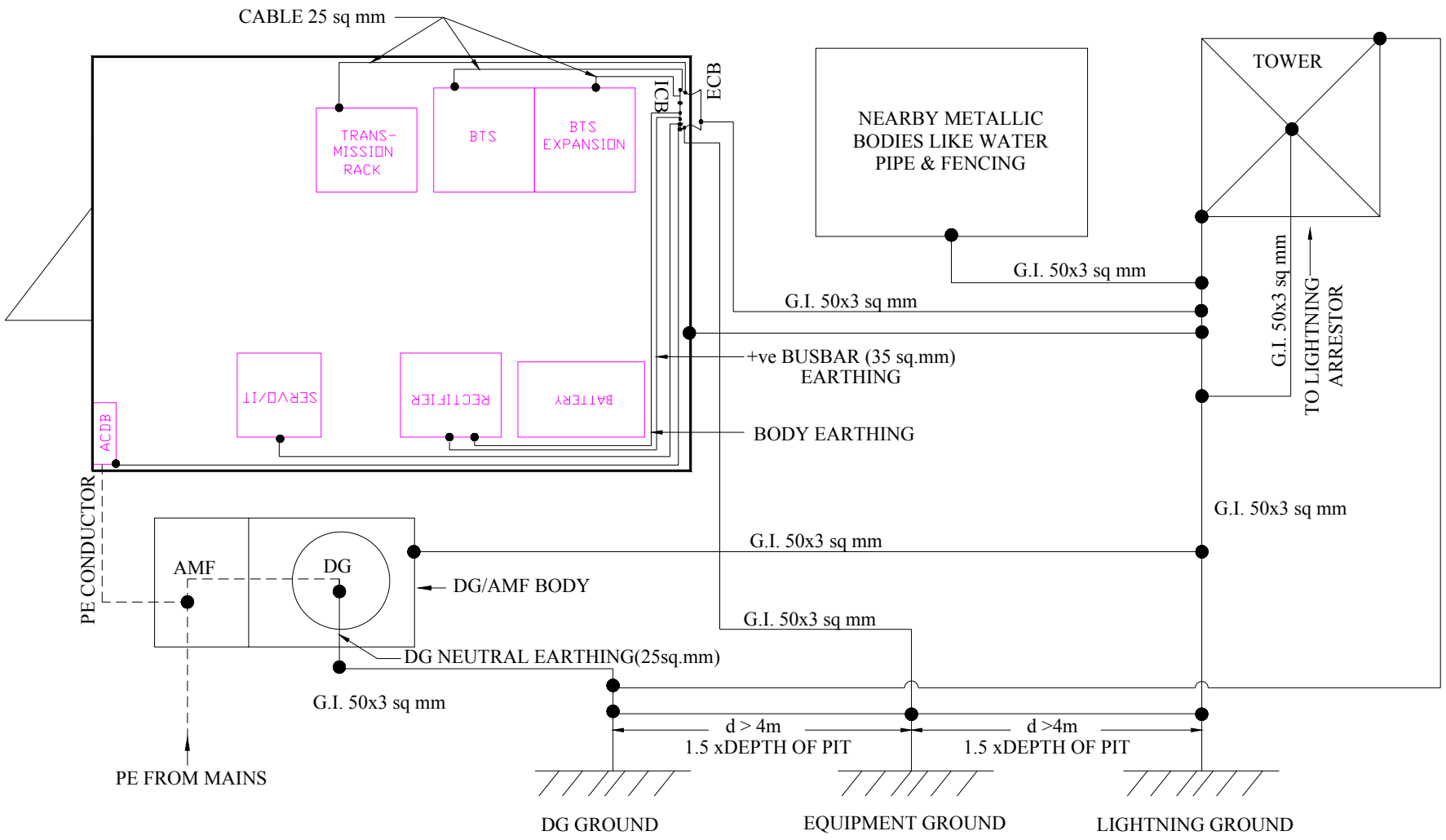
TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

EARTHING

RTT EARTHING

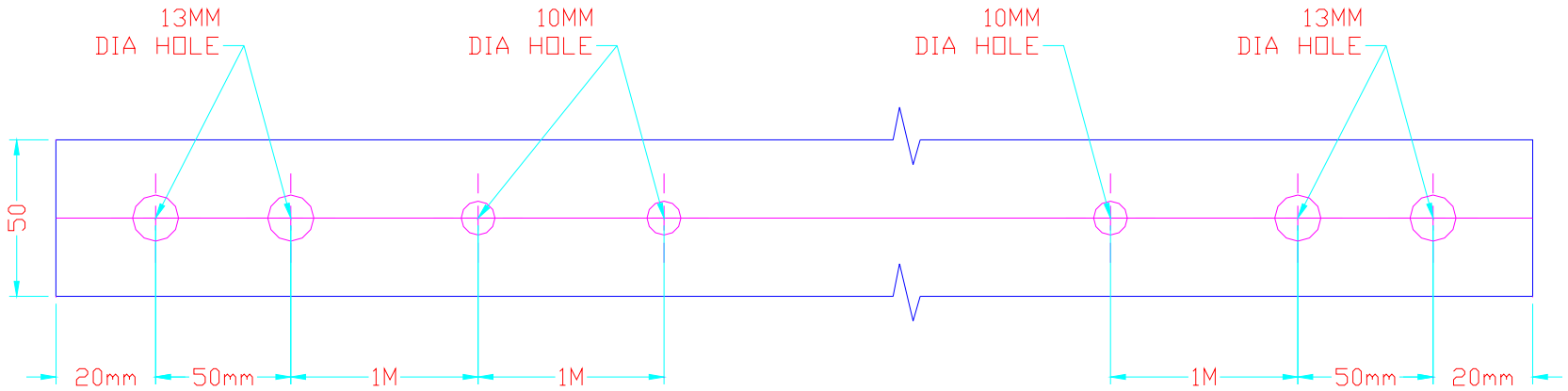
NON BSNL BTS SITE EARTHING SCHEME



TO BE USED FOR BSNL NORTH ZONE ONLY

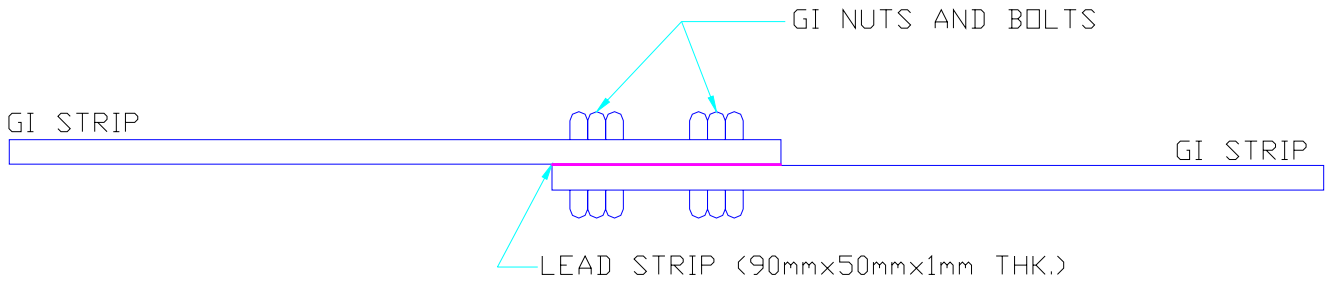
NOKIA

50X3 GI STRIP AND EARTH JOINT



(a) GI STRIP (50x3mm)

(a) GI STRIP (50x3mm)



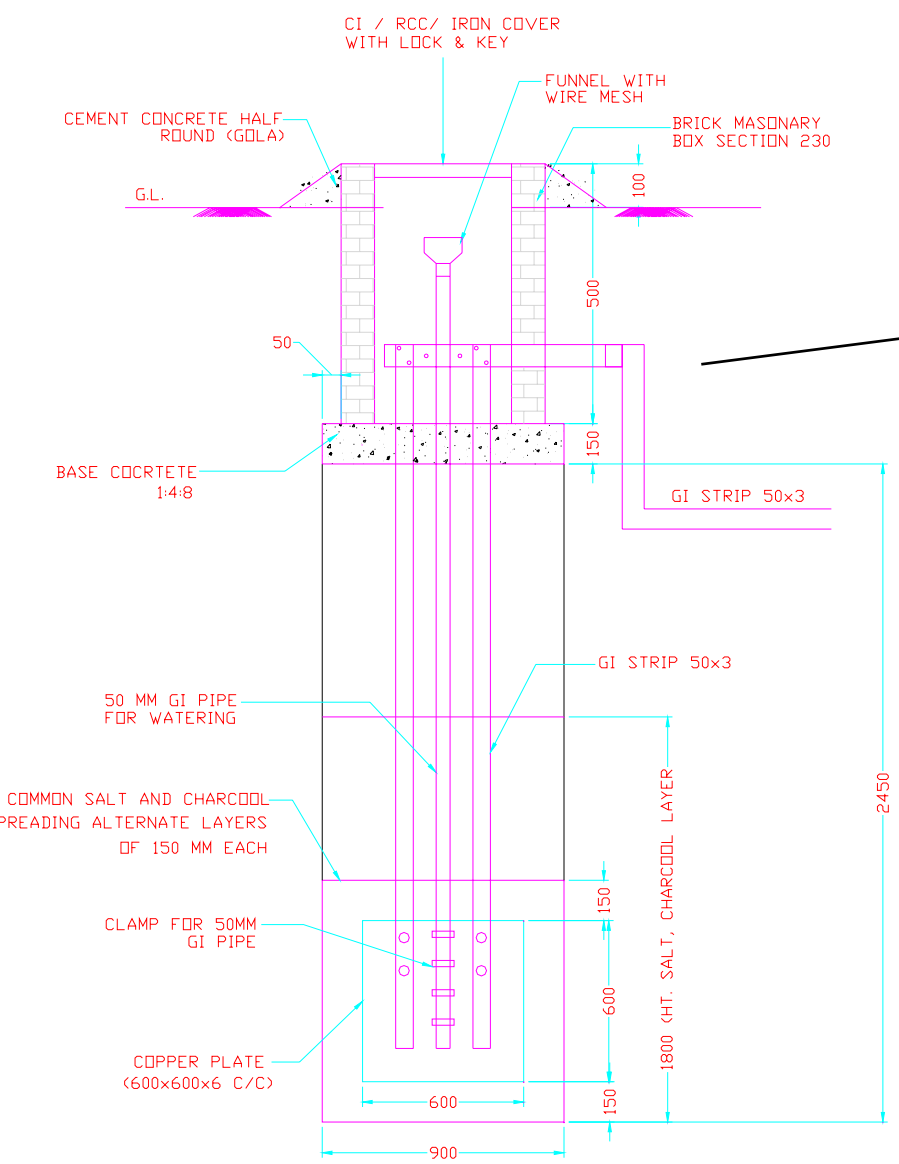
(b) RING EARTH JOINT

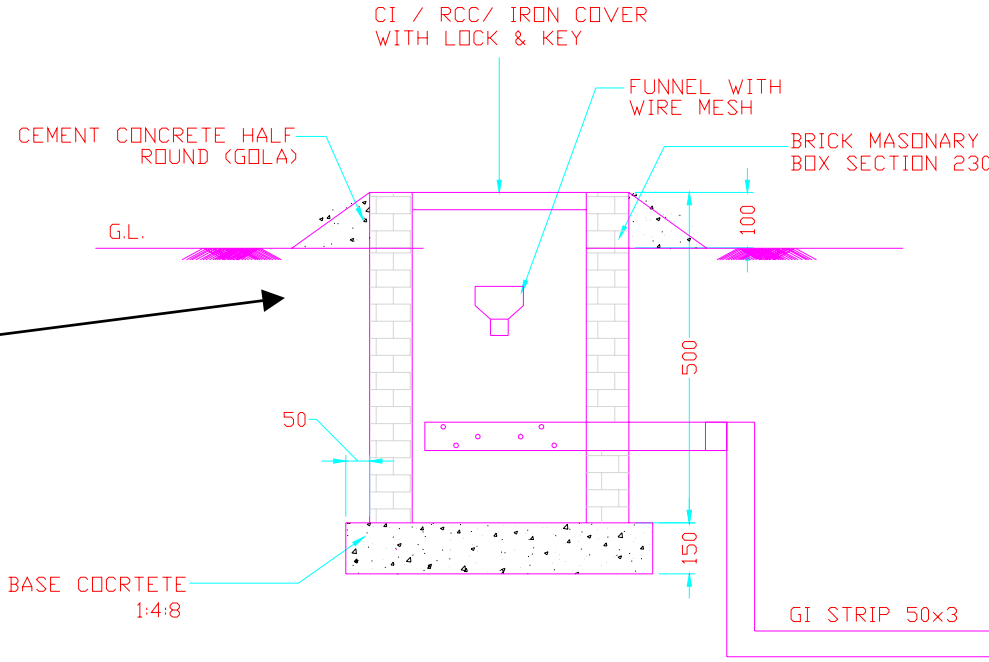
NOTE:
JOINT SHOULD BE MADE WATER PROOF

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

PLATE EARTHING

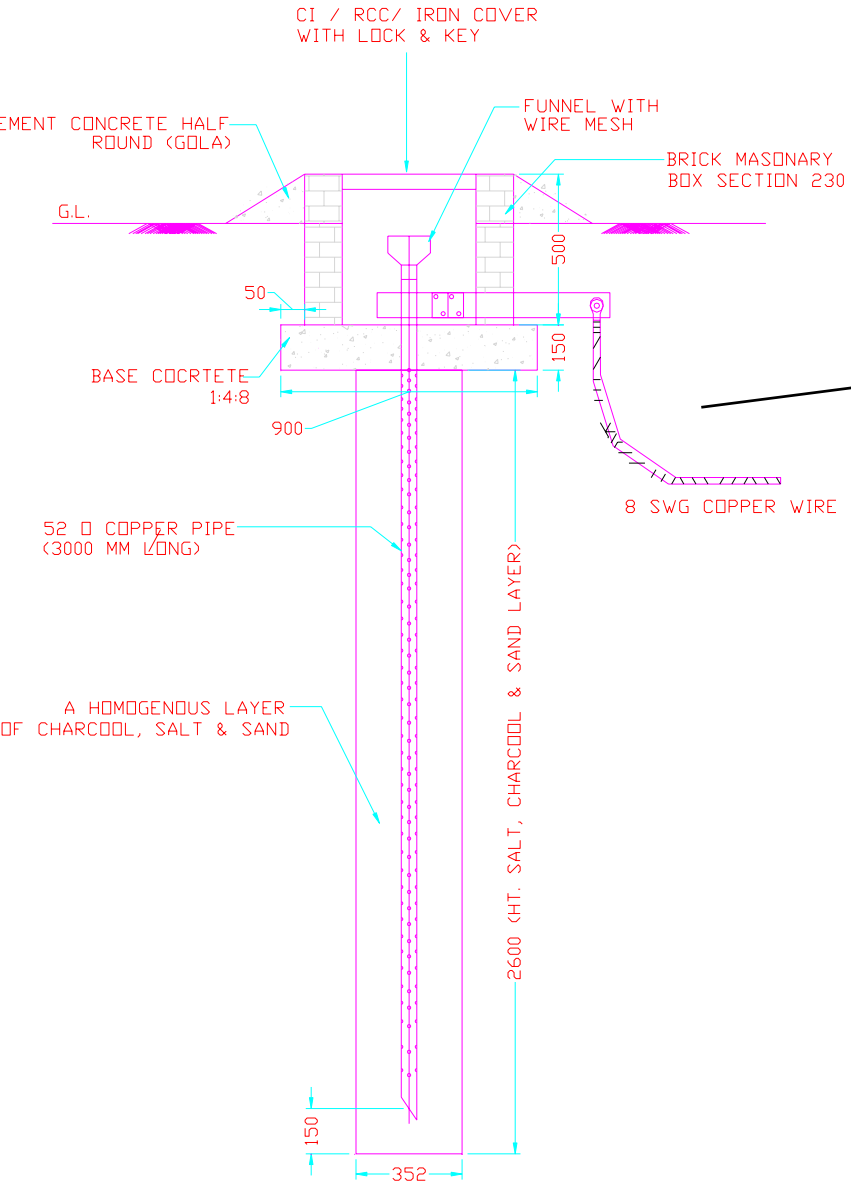


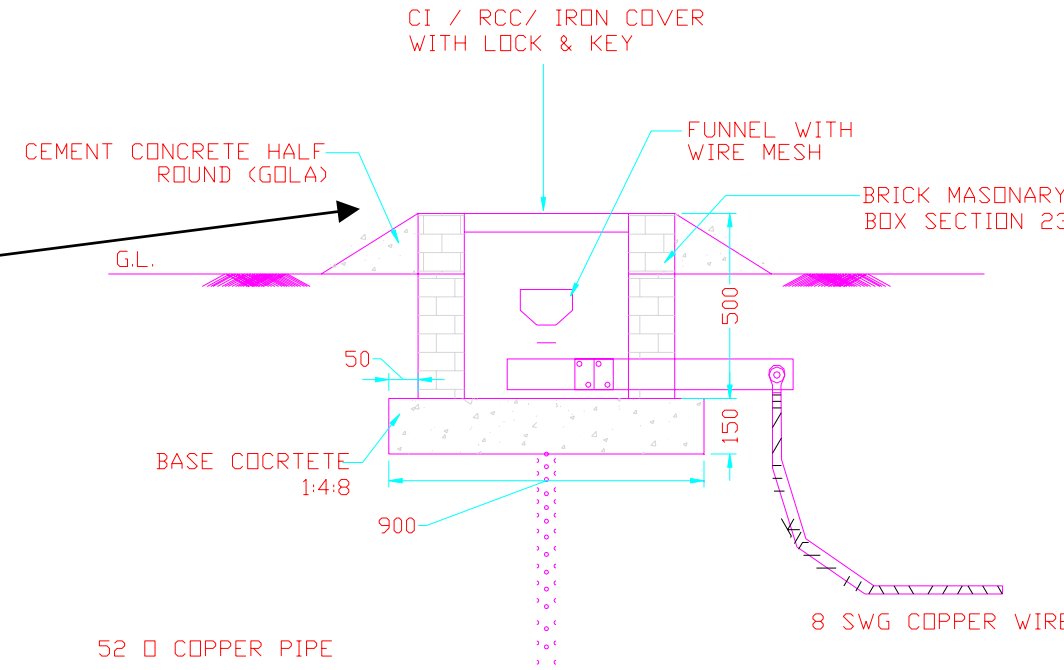


TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

PIPE EARTHING





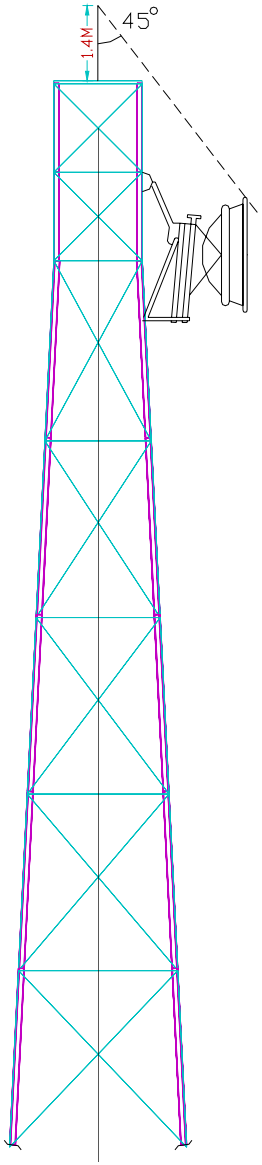
TO BE USED FOR BSNL NORTH ZONE ONLY

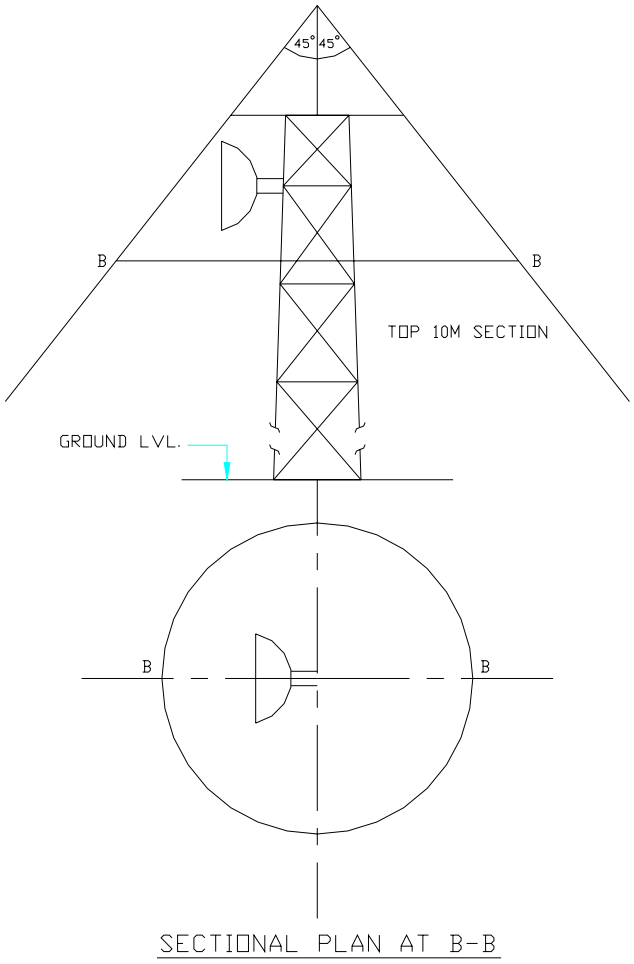
NOKIA

50X3 GI STRIP AND EARTH JOINT

- The G.I strips are to be connected to each other as shown in fig . The joints are to be properly wrapped and sealed by waterproof tape to avoid any ingress of moisture at the joint. While laying the G.I strips for ring earth, it should not be bent sharply at right angles, but should be laid in smooth curve of not less than 1 m radius.

45 DEG PROTECTION



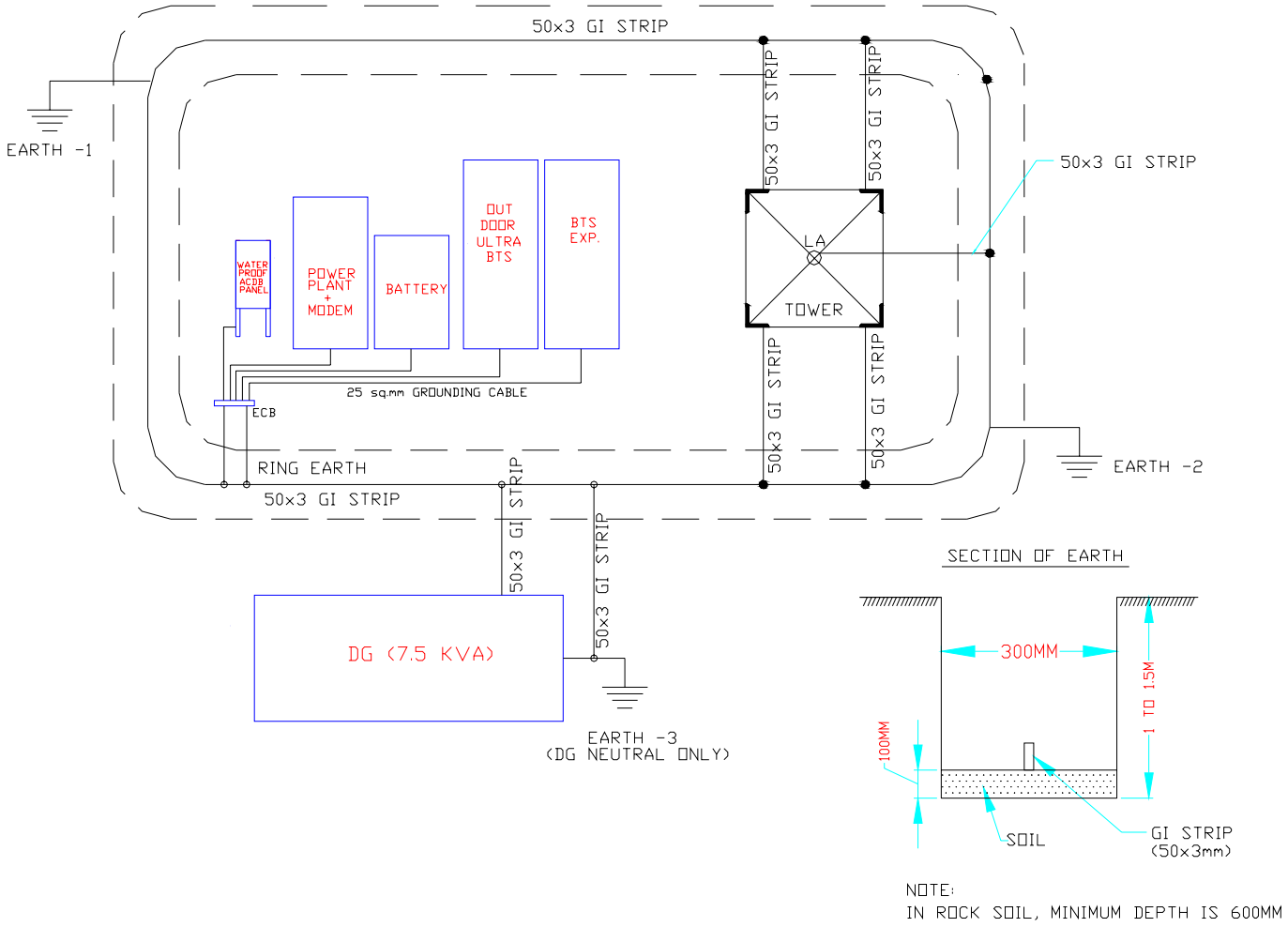


The zone of protection adopted (45 degree angle)

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

RING EARTH FOR GREEN FIELD WITH OUTDOOR BTS



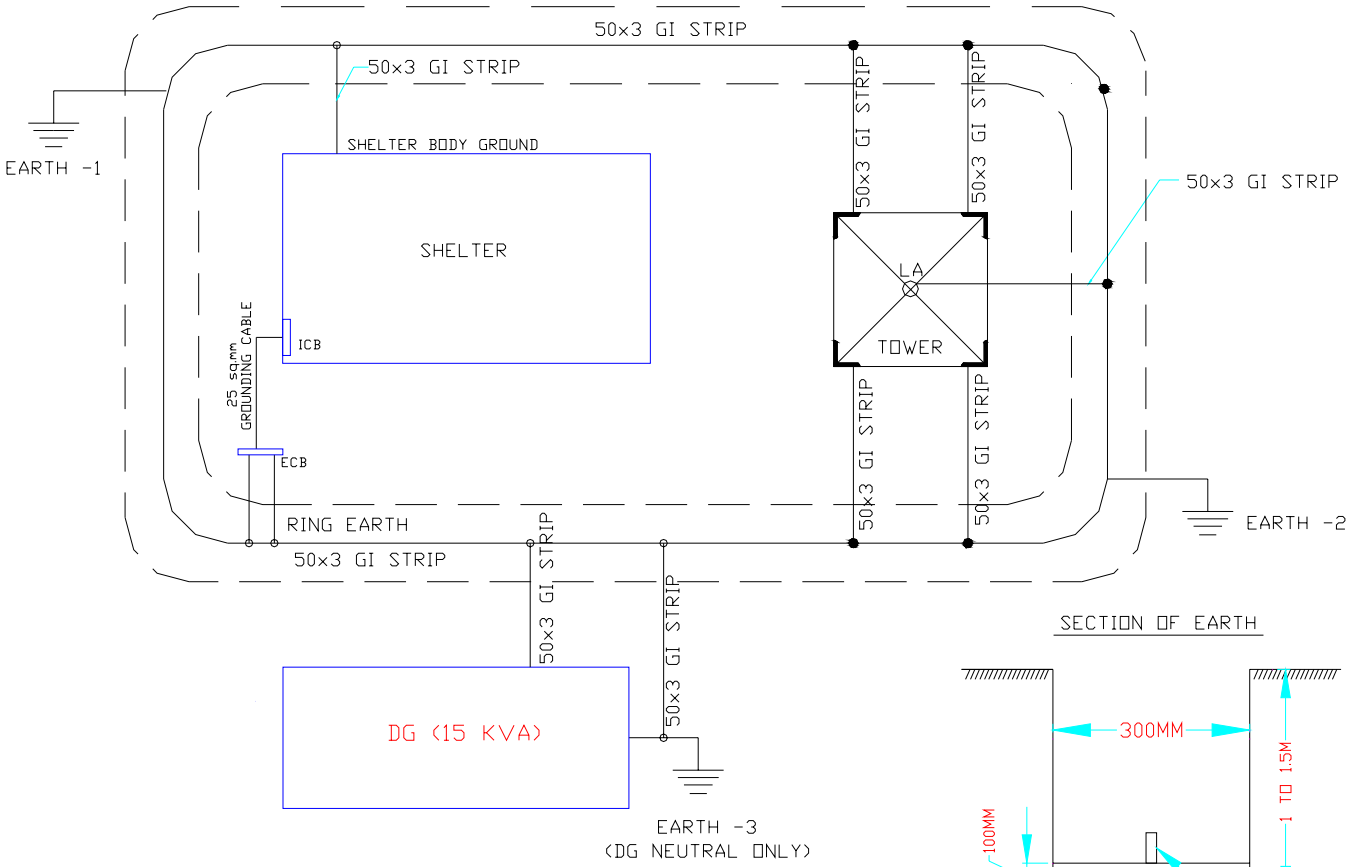
TRENCH FOR EARTH — — —

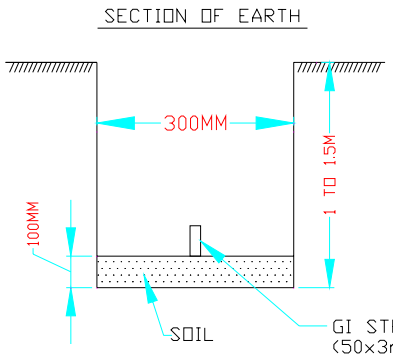
GI STRIP ———

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

RING EARTH FOR GREEN FIELD WITH SHELTER





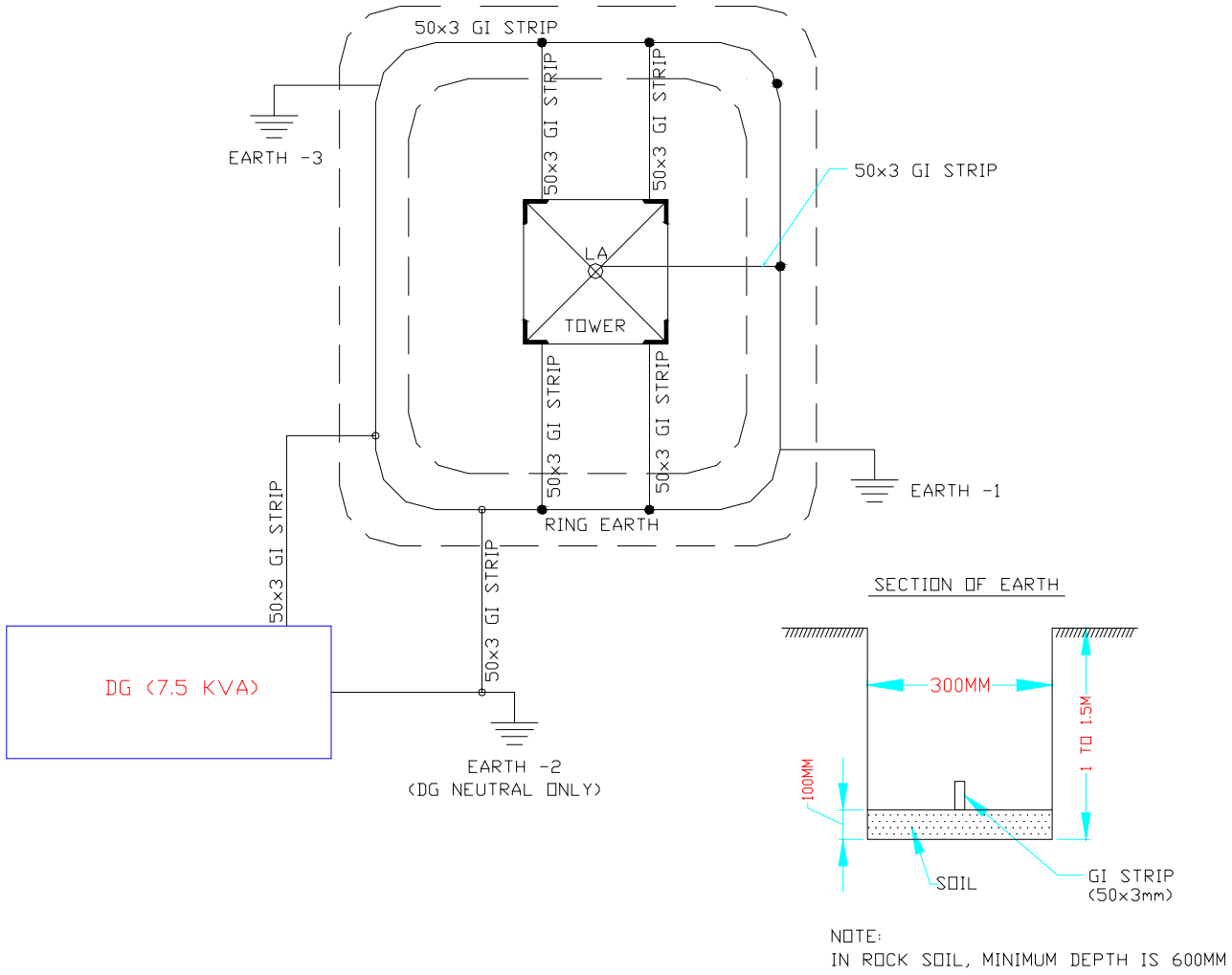
IN ROCK SOIL, MINIMUM DEPTH IS 600MM

TRENCH FOR EARTH

GI STRIP

TO BE USED FOR BSNL NORTH ZONE ONLY

RING EARTH FOR GREEN FIELD WITH METROSITE



TRENCH FOR EARTH

GI STRIP

TO BE USED FOR BSNL NORTH ZONE ONLY

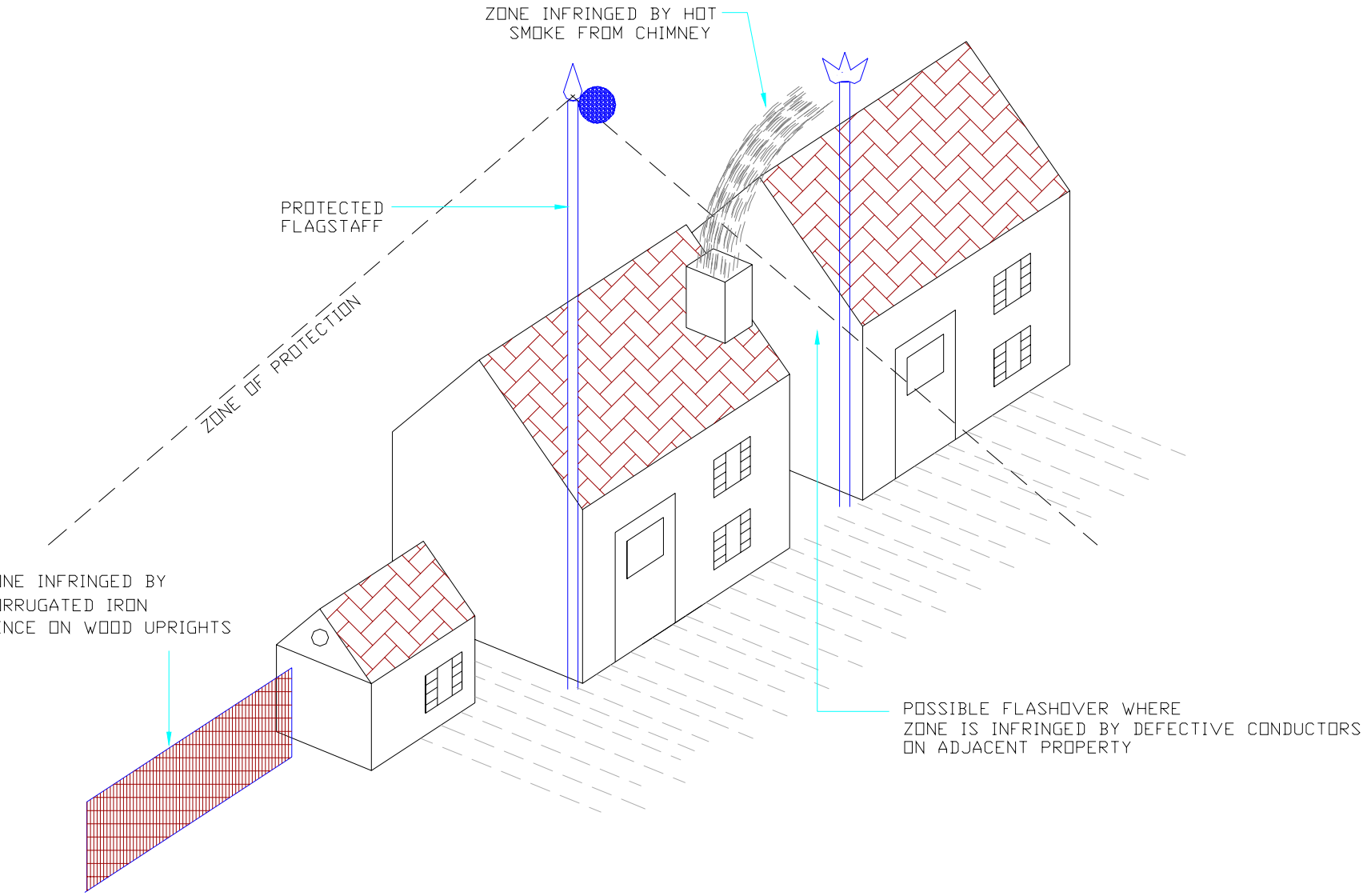
NOKIA

RING EARTH

- The ring earth around the telecom equipment and tower is shown in fig , a trench 30 cms wide and normally 150 cms deep is dug.

  The depth should not be less than 60 cms in any case. A G.I (Galvanized Iron) strip of 50 x 3 mm is laid in the trench. The trench should be minimum 1 m away from the equipment. In the case of black cotton soil, the trench should be sufficiently deep to avoid cracking of soil in summer. In case of rocky and hard murram soil, the depth may be 60 to 90 cms. In case of rocky, hard murram and black cotton soil, the trench should not be filled by the excavated material and instead foreign good earth, ie, yellow soil or ash, which are fine and cohesive in nature should be used. While filling the trench, the earth may be rammed in layers, so as to give cohesiveness and compactness to the soil.

LIGHTNING ARRESTOR



TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

LIGHTNING ARRESTOR

Sometimes it may be necessary to produce a spike for protection from neighboring building structure, in order to protect it from damaging our building and structure . Smoke and hot gases from neighboring chimney tends to attract the lightning disc to it. These are illustrated in fig . Hence, the zone protection adopted should also see all these possibilities also.

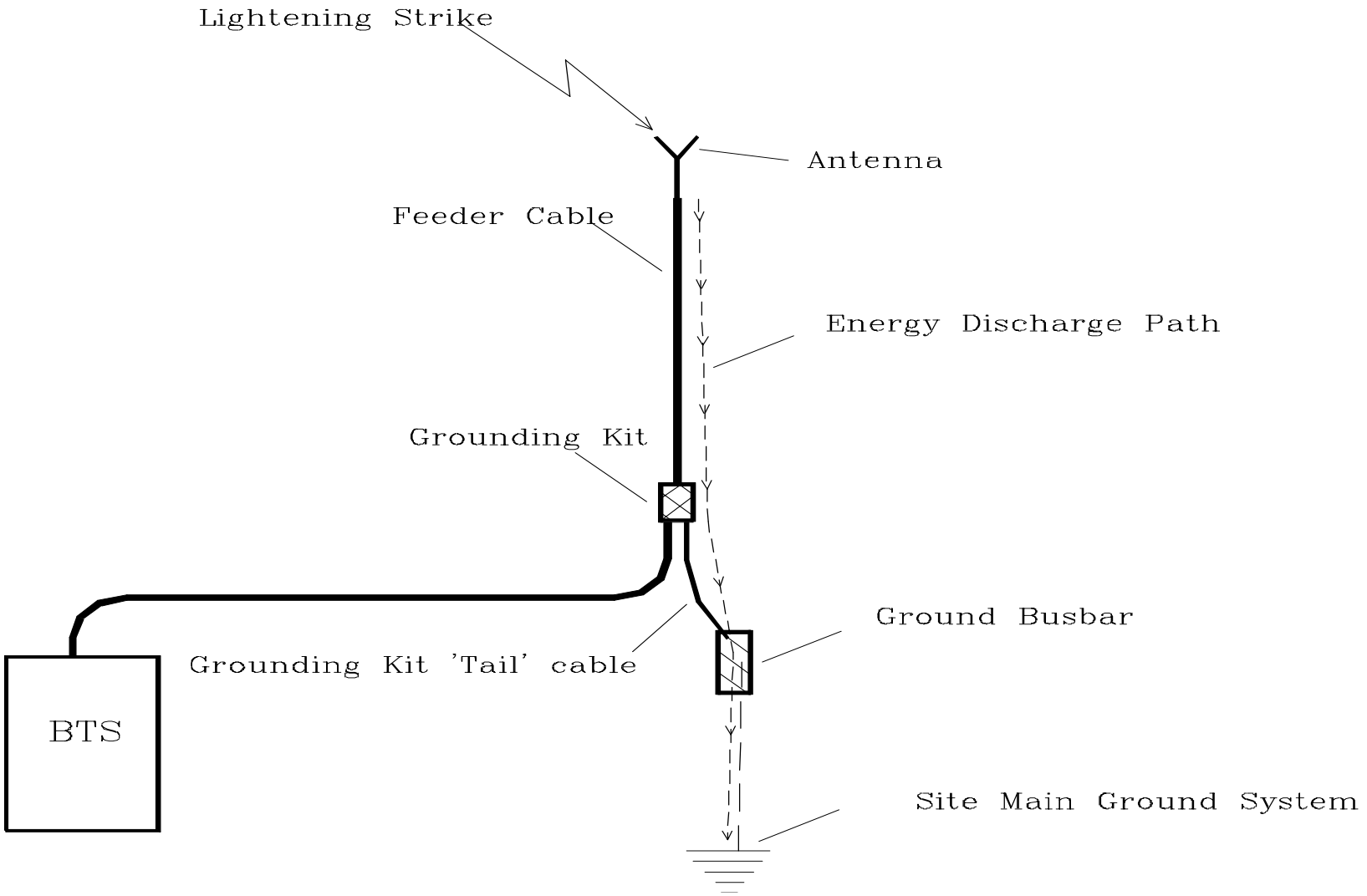
Generally the tower is the tallest structure in the compound of a microwave and it protects the area under 45 degree cone from apex, from lightning. However at times an antenna is put at the top of the tower and with its dish, feeds, and shields protruding away from the tower, then a part of the antenna may not come into the protection zone offered by the tower, even with existing 1m high lightning spikes fitted on the tower. The height of the lightning spike may have to be increased sufficiently in such circumstances.

In extreme cases, in order to bring the antenna structure under the protection zone, the height of the lightning spike is to be raised by 4 to 5 meters by putting an additional G.I pipe of 10cm diameter. The additional G.I pipe should be rigidly supported by means of steel wire ropes tightened by means of bull dog grips as shown . The existing spike is to be filled at the topmost point of this 5m pipe. This raising of lightning spike may not be required, if antenna of 4m is not proposed at the top position of the tower.

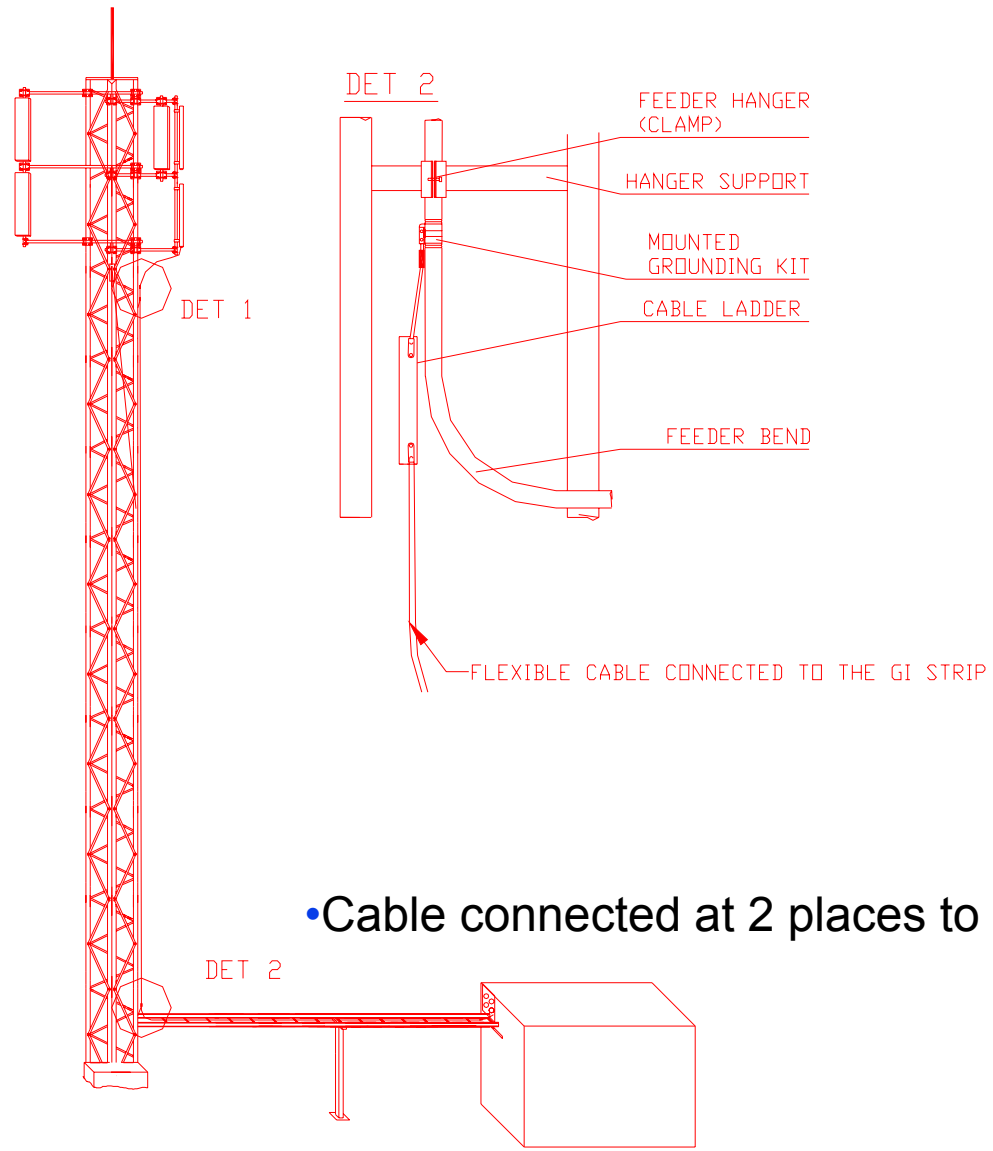
IMPORTANT POINTS IN EARTHING

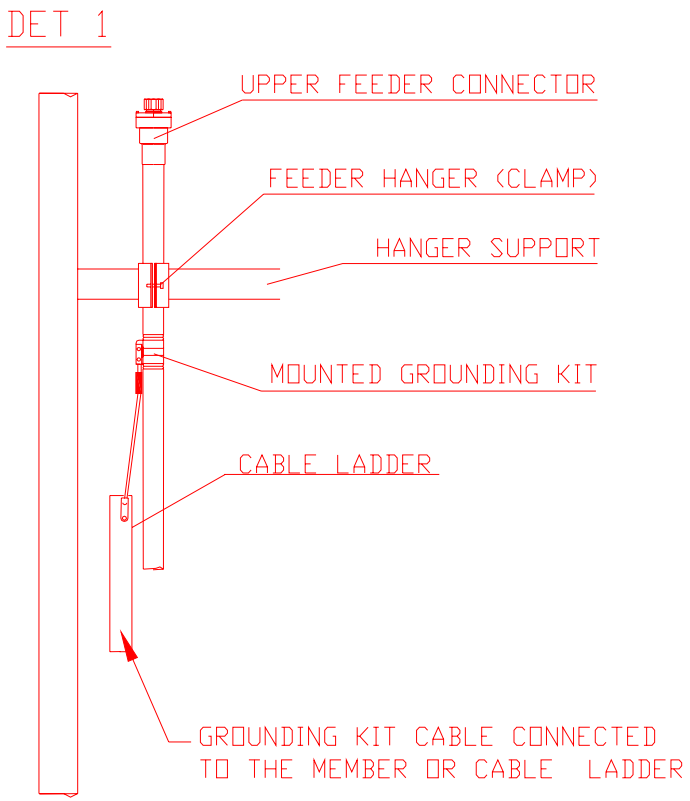
- (I) Chemical treatment of earth using salts, etc. are not recommended as the chemical treatment does not last long and needs to be checked periodically.
- (II) Earth conductor should not be encircled with clamps while taking it along wall. This is essential to eliminate the high inductive reactance that will impede the flow of surge current along the conductor in case of lightening.
- (III) Earthling conductor should not pass through any metallic conduit or pipe as this will increase surge impedance.
- (IV) There should be no sharp bends along the entire lengths of earth conductors. Bending should be done with a radius of one meter.
- (V) In digital systems equipments contain active devices such as FET , MOSFET & CMOS which are static sensitive components and can be permanently damaged if it comes in contact with humans possessing electrostatic potential. As such antistatic floor tiles or mats should be installed and connected to earth. If antistatic floor is not provided, an antistatic wrist strap, which is properly earthed, should be used while working on such equipments.
- (VI) All joints of similar metals should be whether proof.

GROUNDING PRINCIPLE



FEEDER GROUNDING – Shelter / Room Feeder Entry

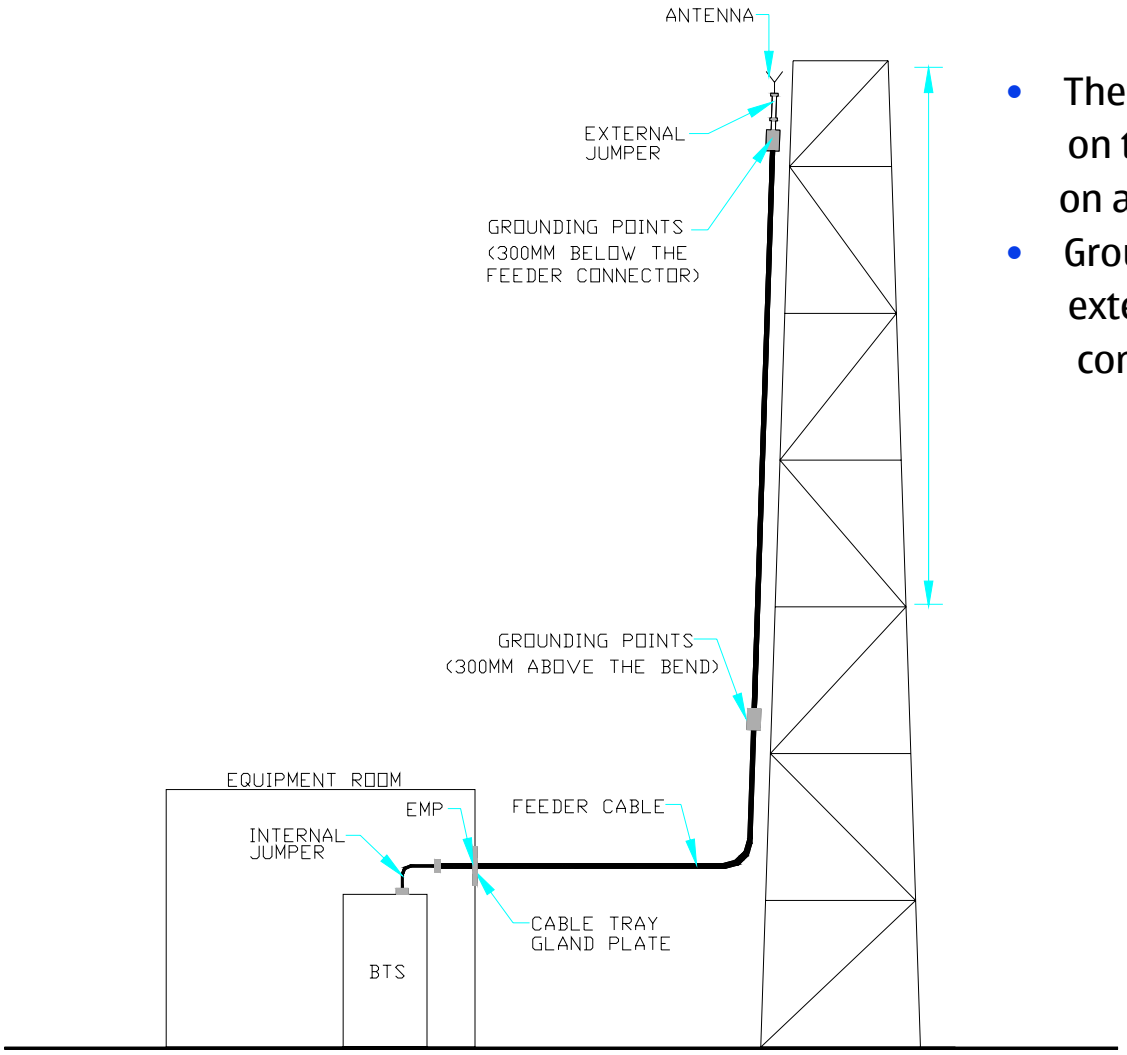




- Cable connected at 2 places to GI strip

TO BE USED FOR BSNL NORTH ZONE ONLY

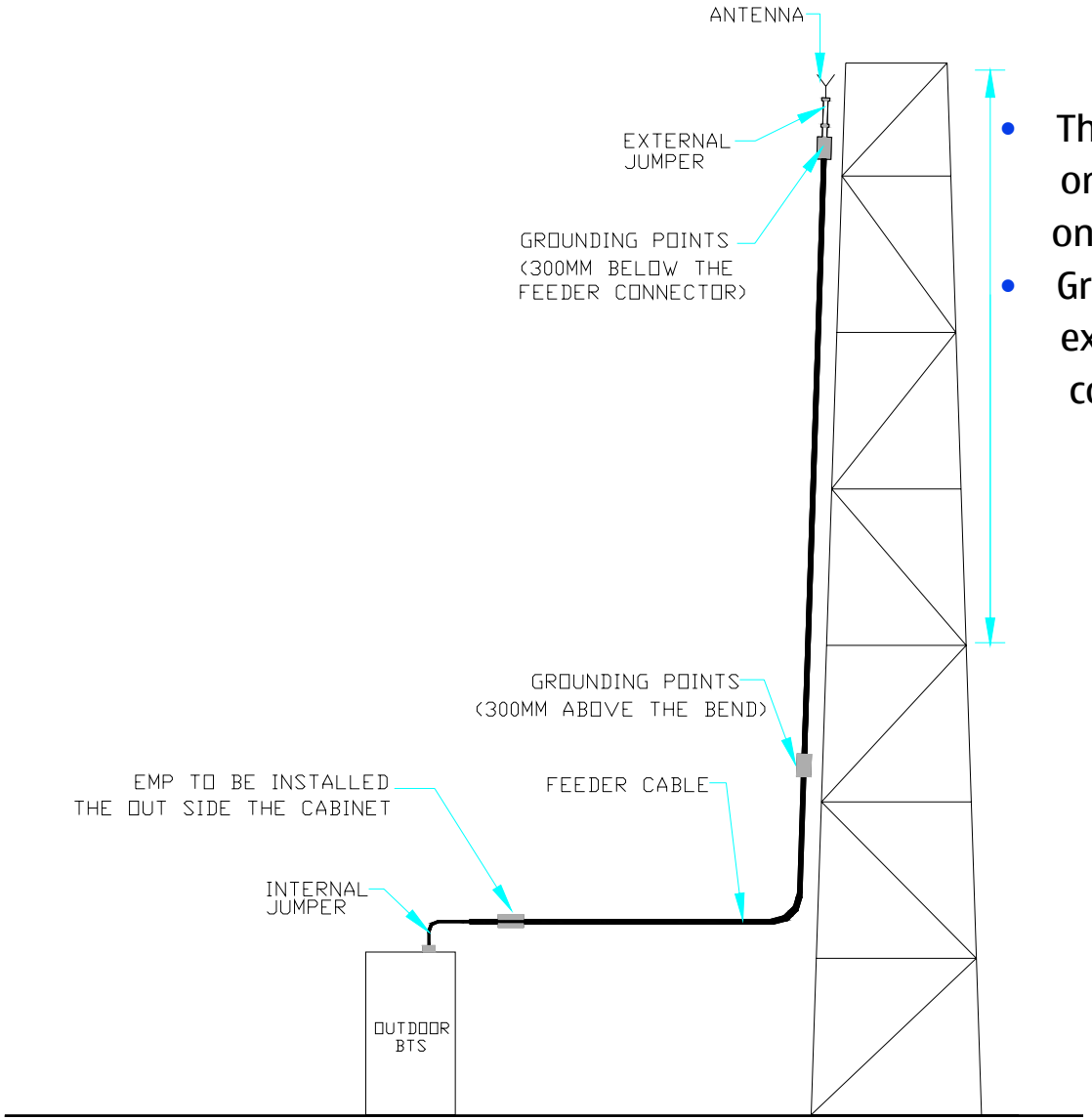
FEEDER GROUNDING – FOR INDOOR



- The grounding kit must always be positioned on the straight part of feeder cable and never on a bend or curve in the cable.
- Grounding kit's earthing cable can be cut or extended to make grounding cable connection to busbar as straight as possible.

. All feeders should be individually earthed at the top and at the bottom of the tower by earthing kits .

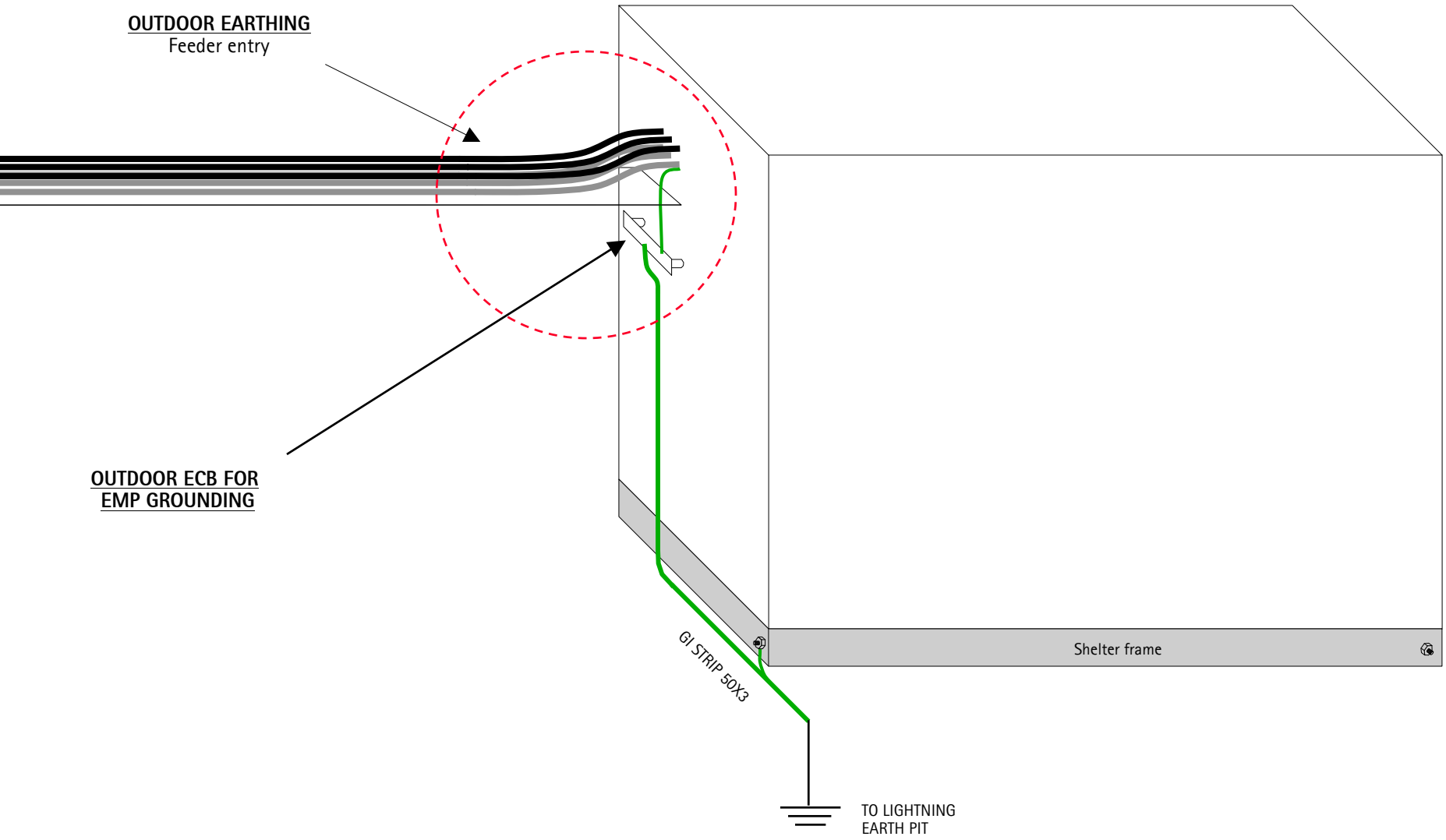
FEEDER GROUNDING – FOR OUTDOOR



- The grounding kit must always be positioned on the straight part of feeder cable and never on a bend or curve in the cable.
- Grounding kit's earthing cable can be cut or extended to make grounding cable connection to busbar as straight as possible.

TO BE USED FOR BSNL NORTH ZONE ONLY

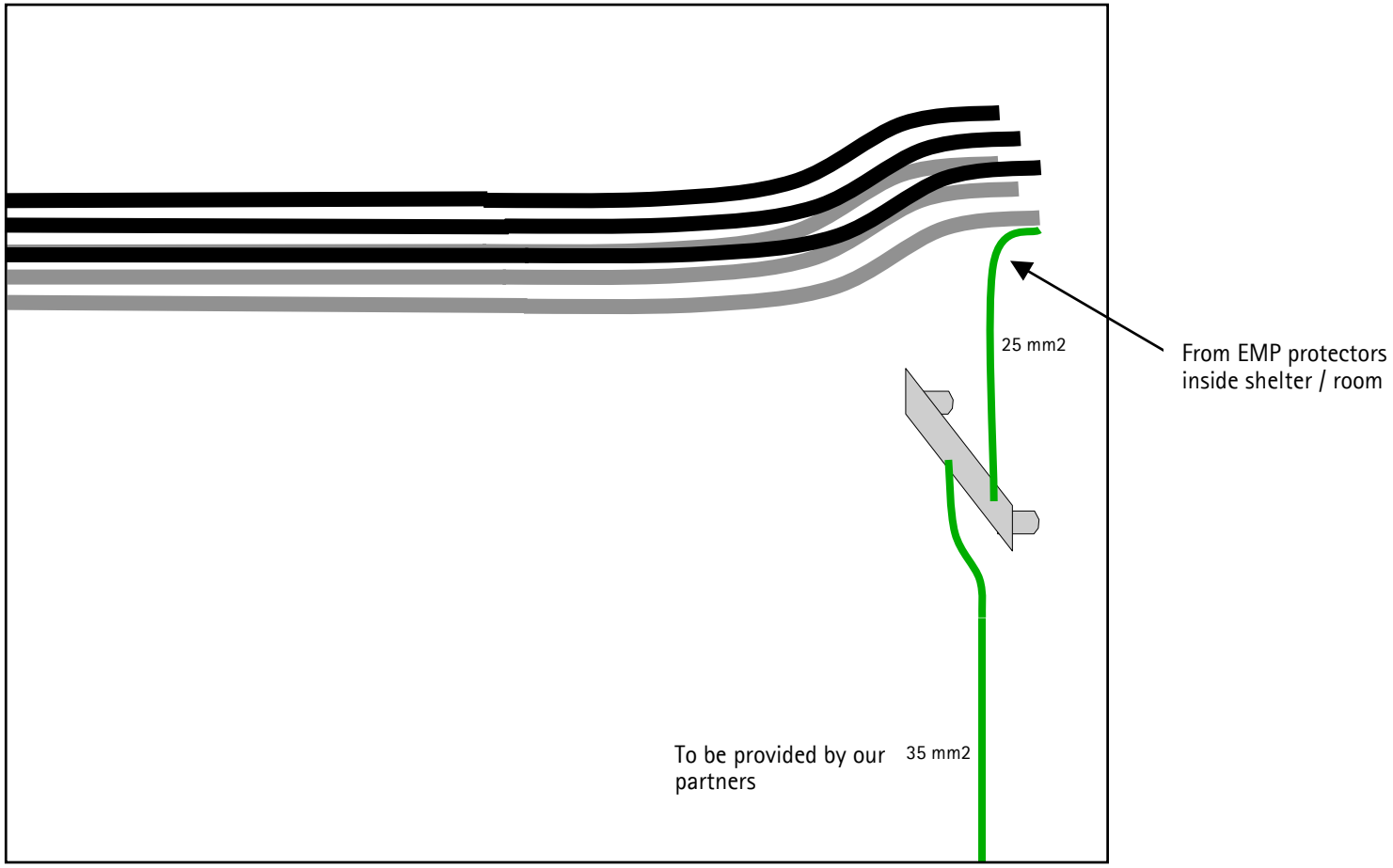
OUTDOOR EARTHING - Shelter



TO BE USED FOR BSNL NORTH ZONE ONLY

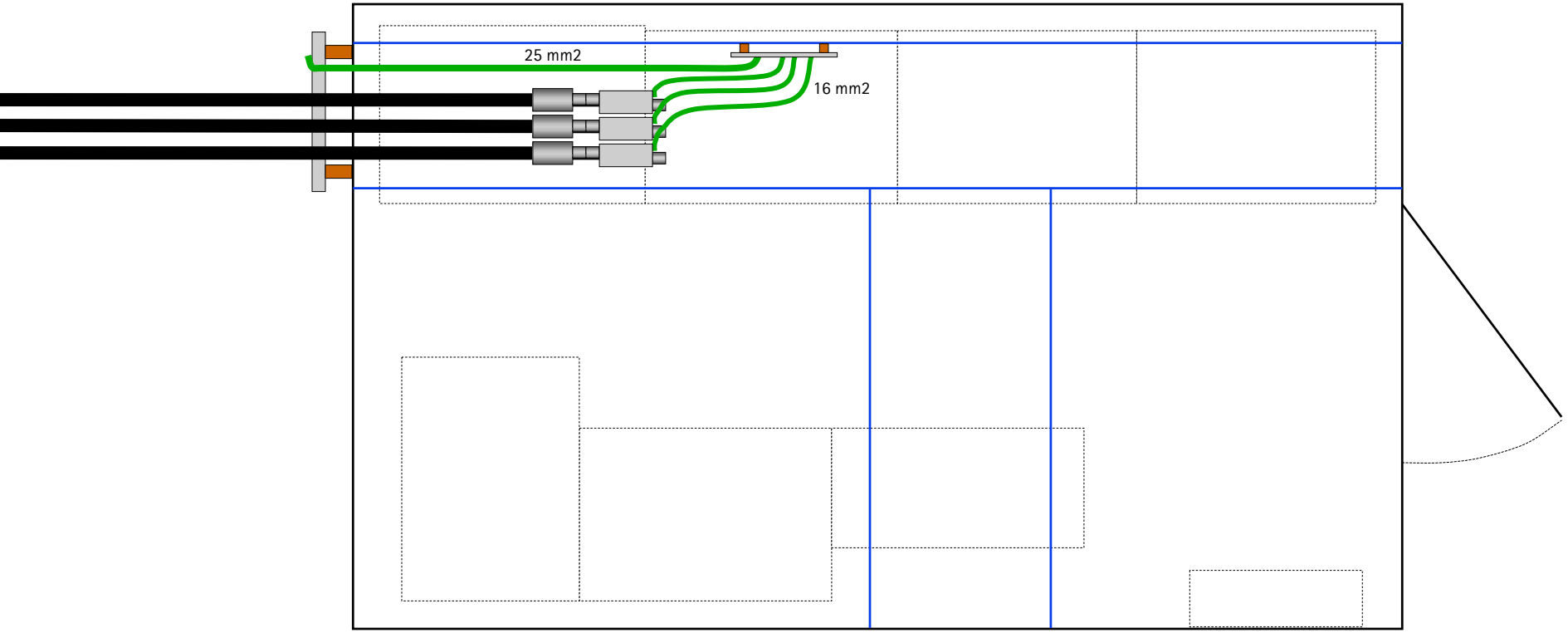
NOKIA

OUTDOOR EARTHING - Shelter / Room Feeder Entry



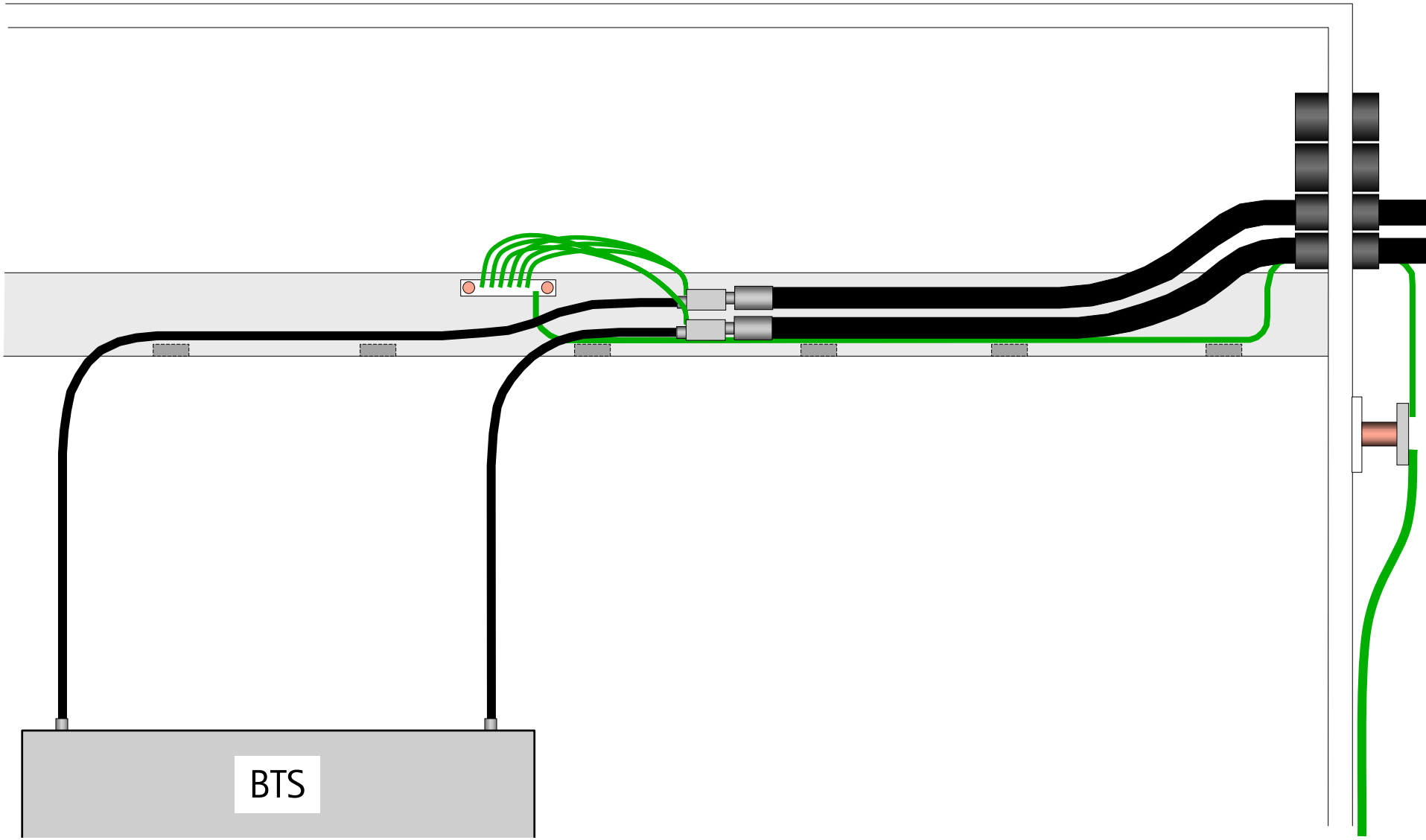
TO BE USED FOR BSNL NORTH ZONE ONLY

INDOOR EARTHING - EMP Protection

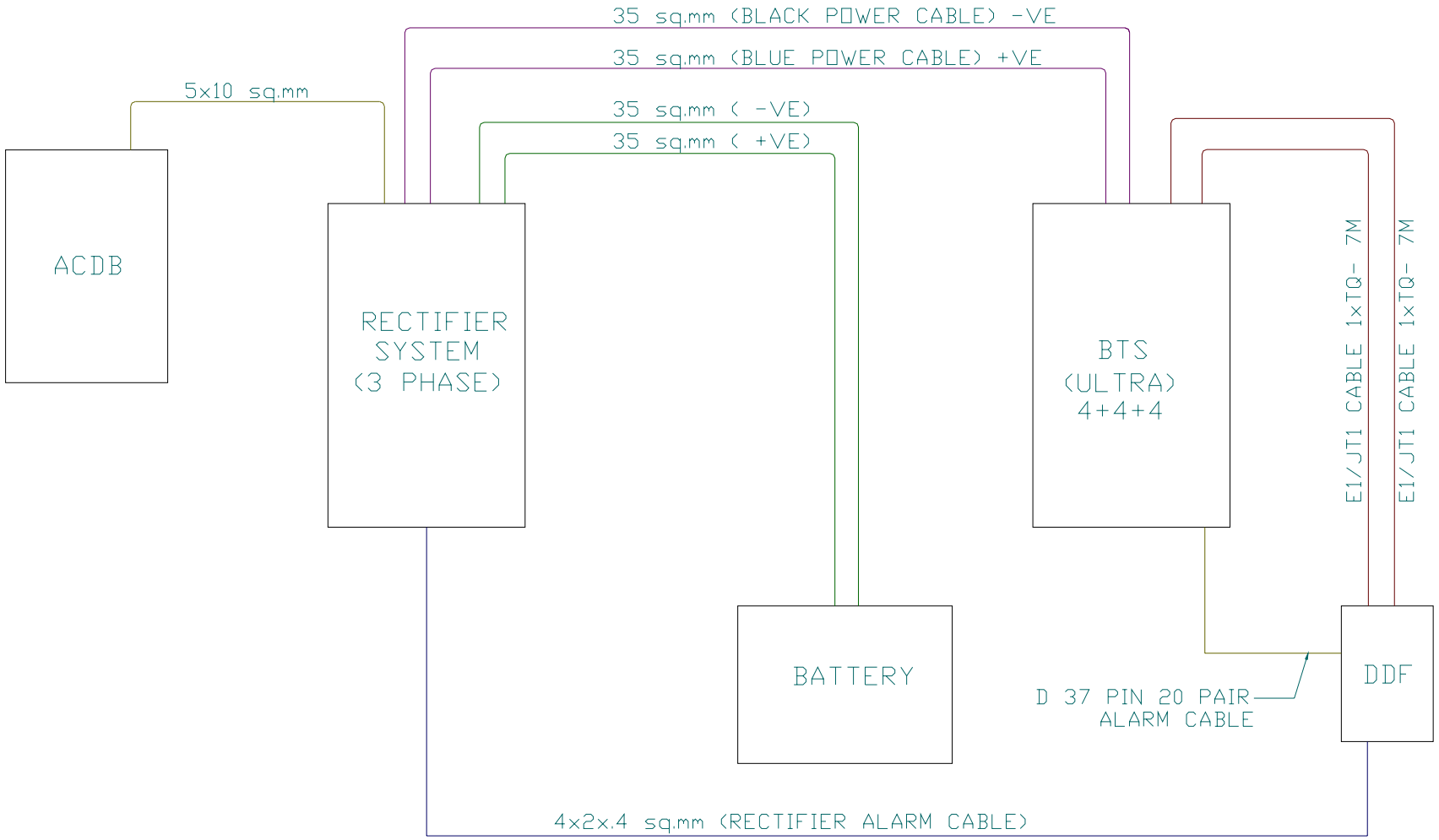


Lightning arrestor cables connect to a separate busbar on the cable rack and from there leading out and connect to the outdoor feeder entry busbar.

INDOOR EARTHING - EMP Protection



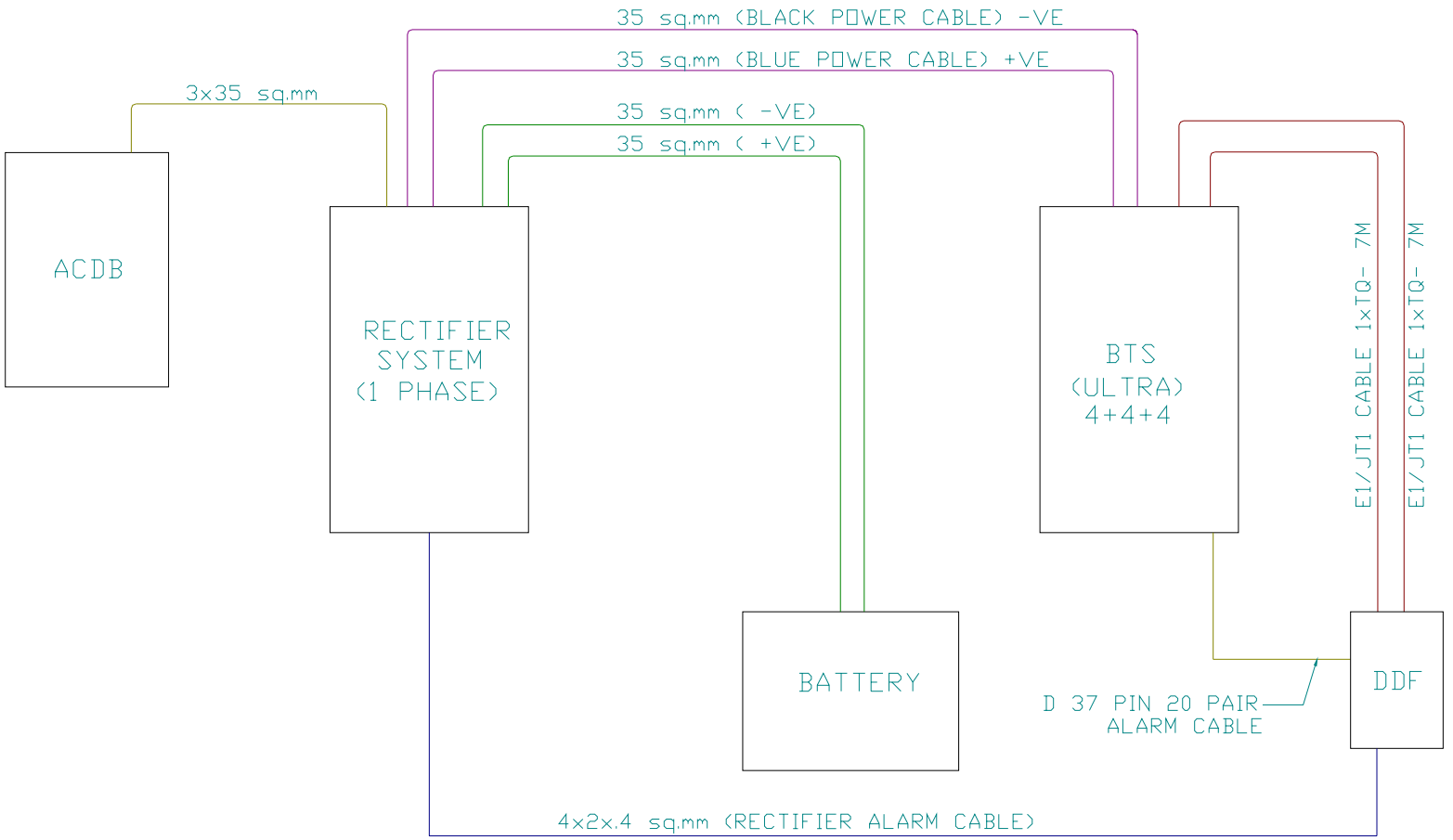
444 ULTRA WITH 3 PHASE POWER SYSTEM(CABLING INSTRUCTIONS)



TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

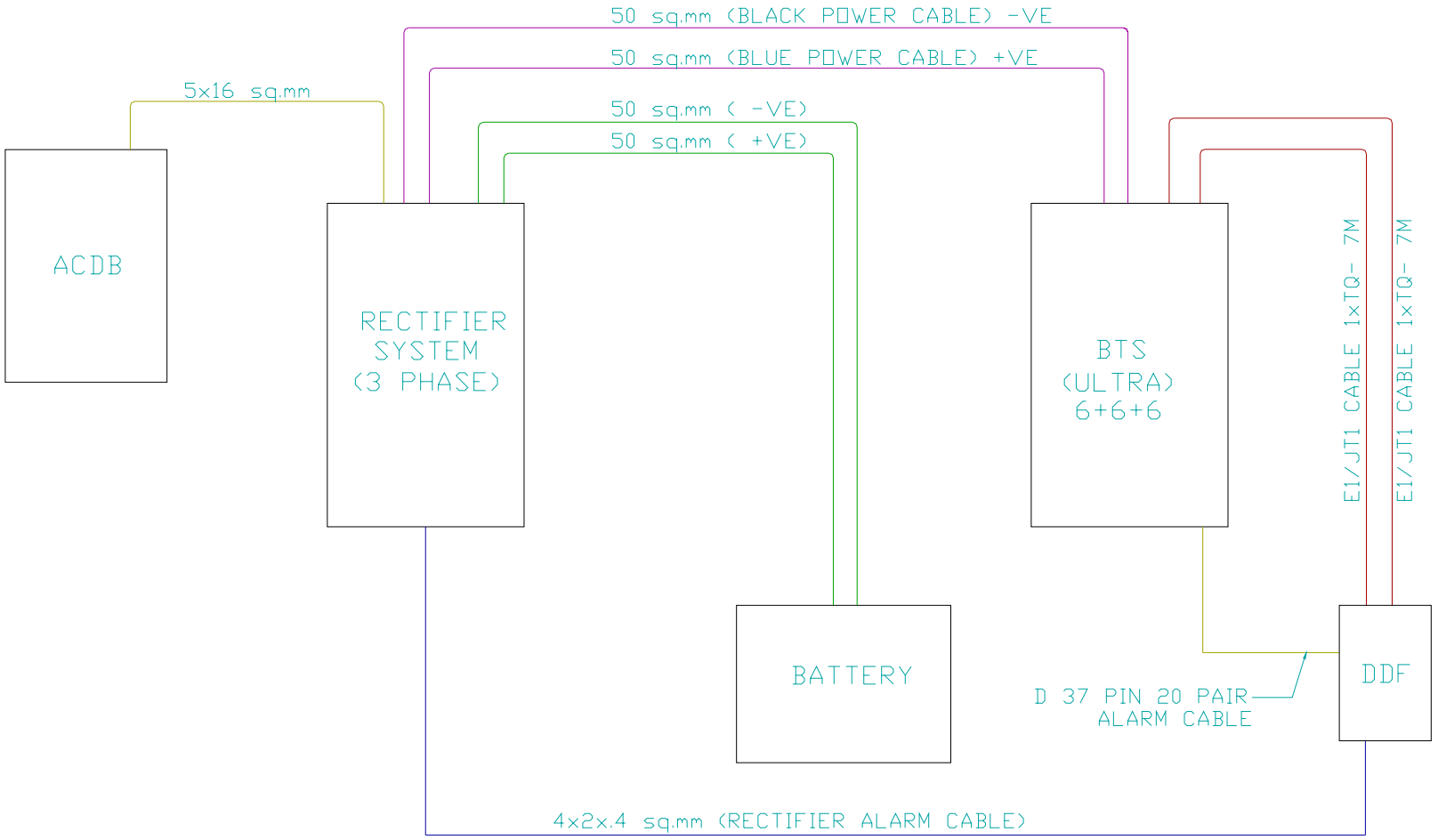
444 ULTRA WITH 1 PHASE POWER SYSTEM(CABLING INSTRUCTIONS)



TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

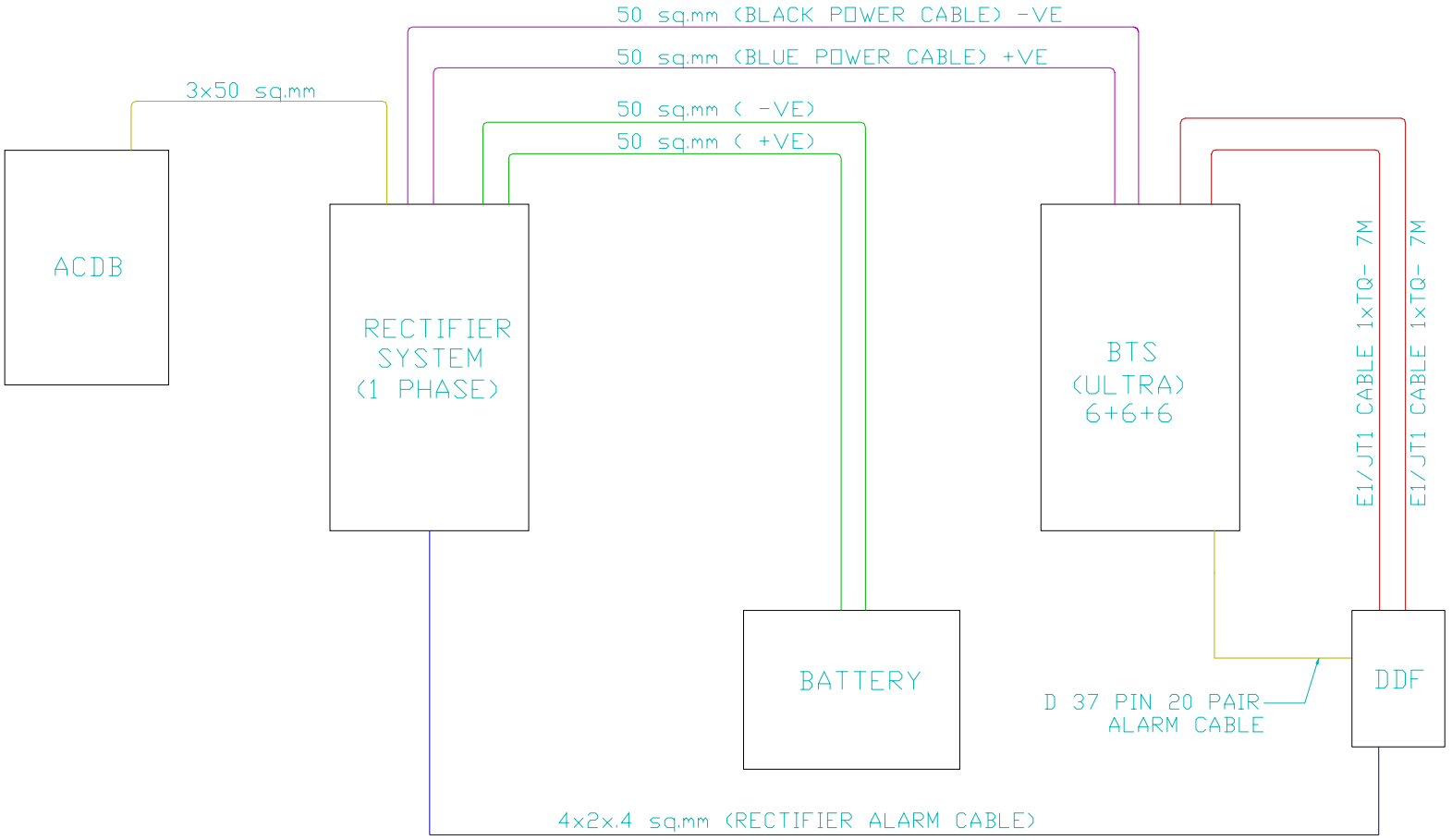
666 ULTRA WITH 3 PHASE POWER SYSTEM(CABLING INSTRUCTIONS)



TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

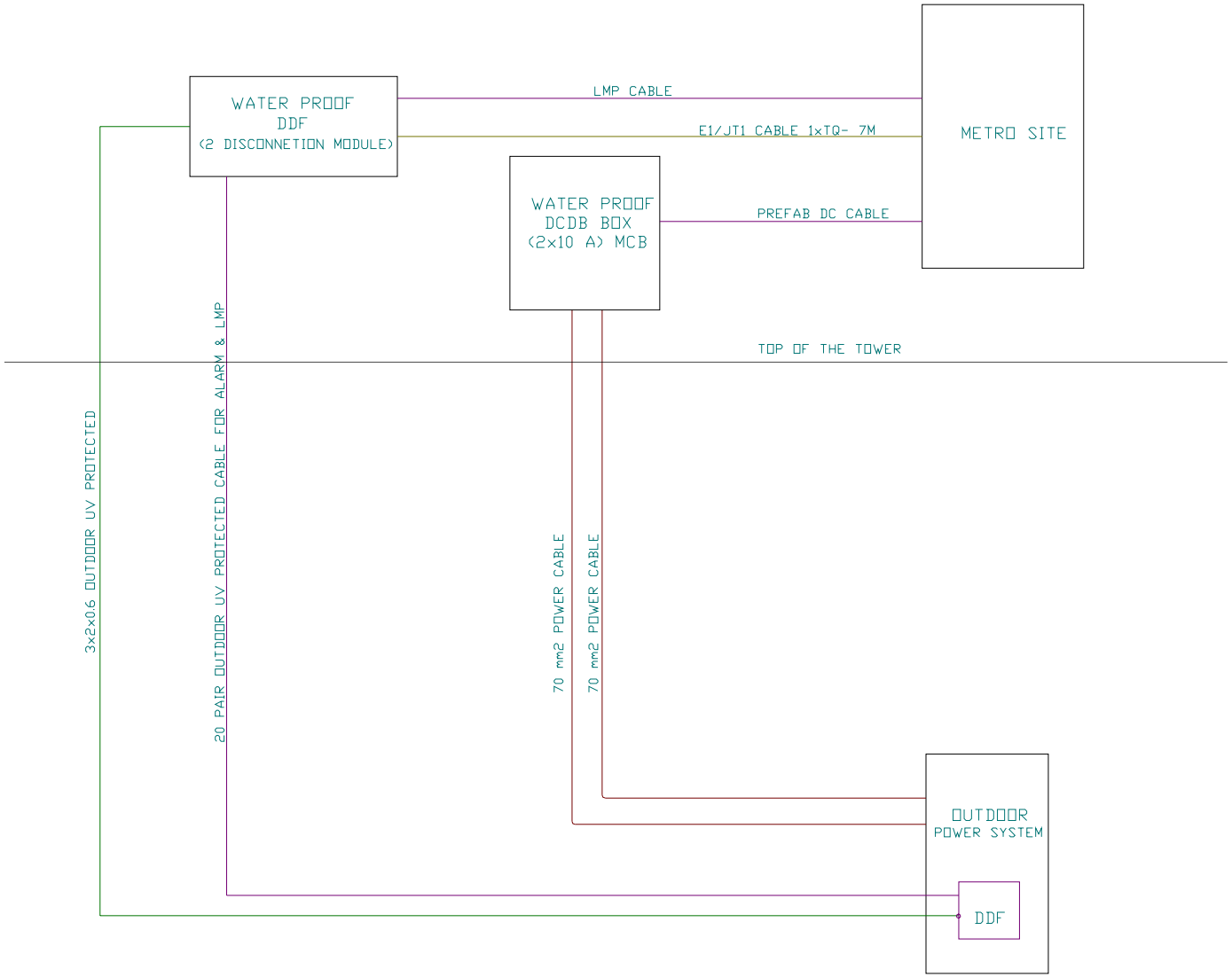
666 ULTRA WITH 1 PHASE POWER SYSTEM(CABLING INSTRUCTIONS)



TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

22 METRO WITH 1 PHASE POWER SYSTEM(CABLING INSTRUCTIONS)

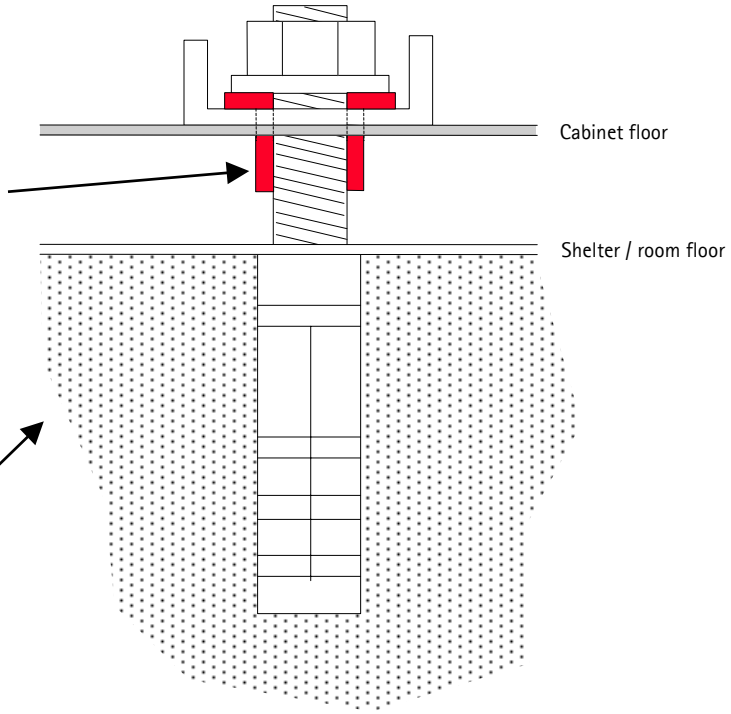


TO BE USED FOR BSNL NORTH ZONE ONLY

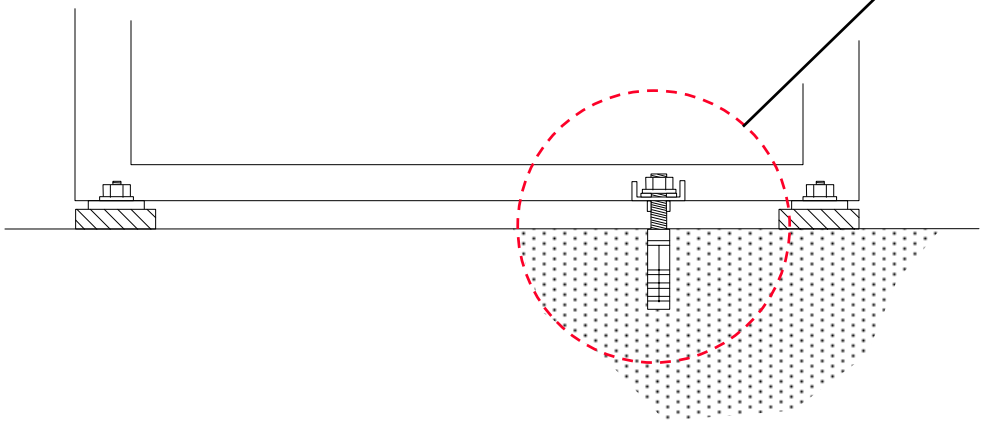
GENERAL CABLING

INDOOR EARTHING - Equipment Isolation

Insulation bush



All equipments,boxes and cable racks be isolated from shelter structure / frame using insulation bushes.

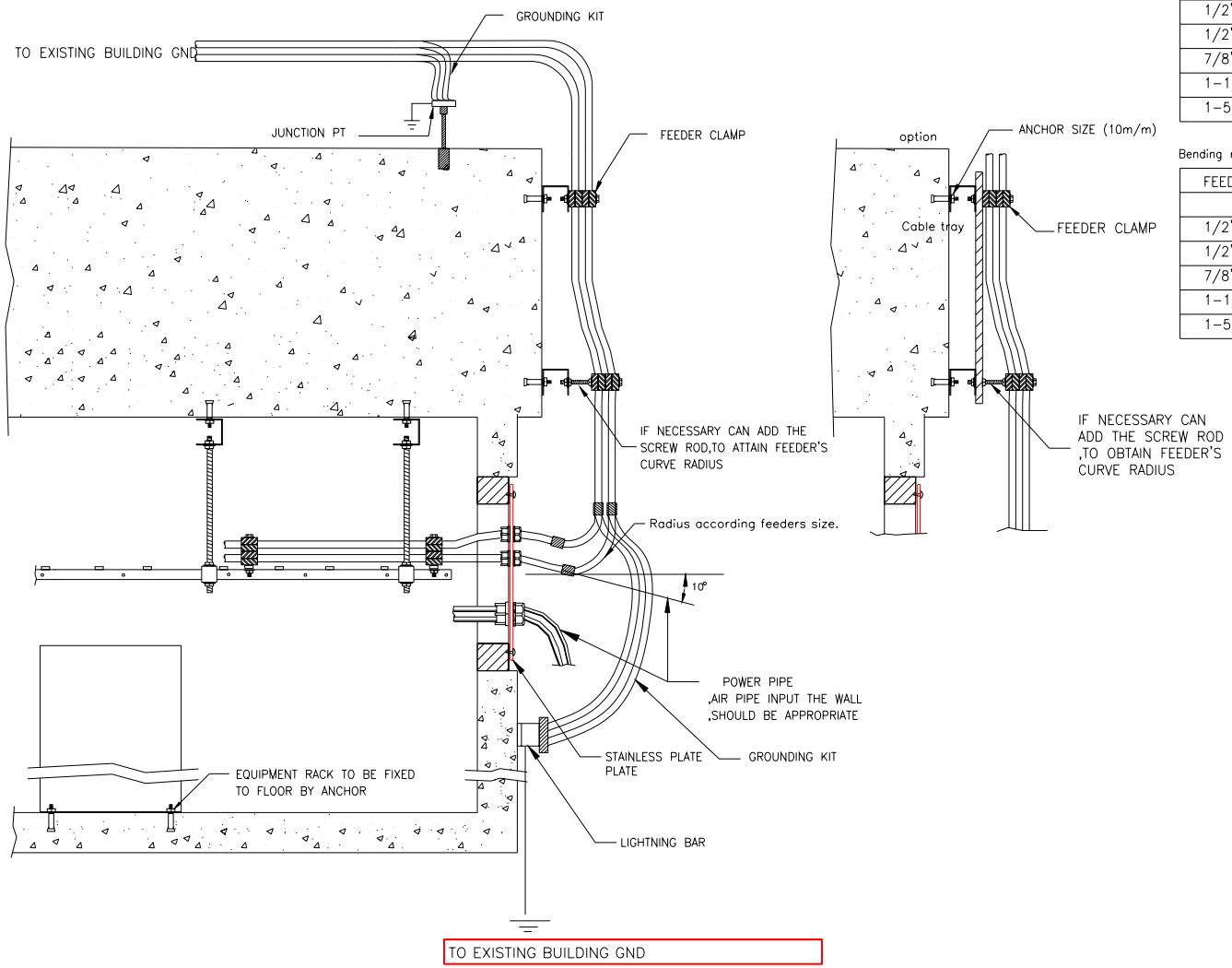


TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

EXAMPLE FEEDER ROUTING INSIDE A ROOM

ROUTING INSIDE A ROOM



Attenuation losses for all the feeders at different frequencies are as follow

FEEDER TYPE	ATTENUATION (db/100m)		
	900Mhz	1800Mhz	2200Mhz
1/2" superflex	10.6	15.7	17.7
1/2" feeder	7.13	10.6	11.9
7/8" feeder	3.94	5.88	6.63
1-1/4" feeder	2.88	4.36	4.94
1-5/8" feeder	2.33	3.56	4.05

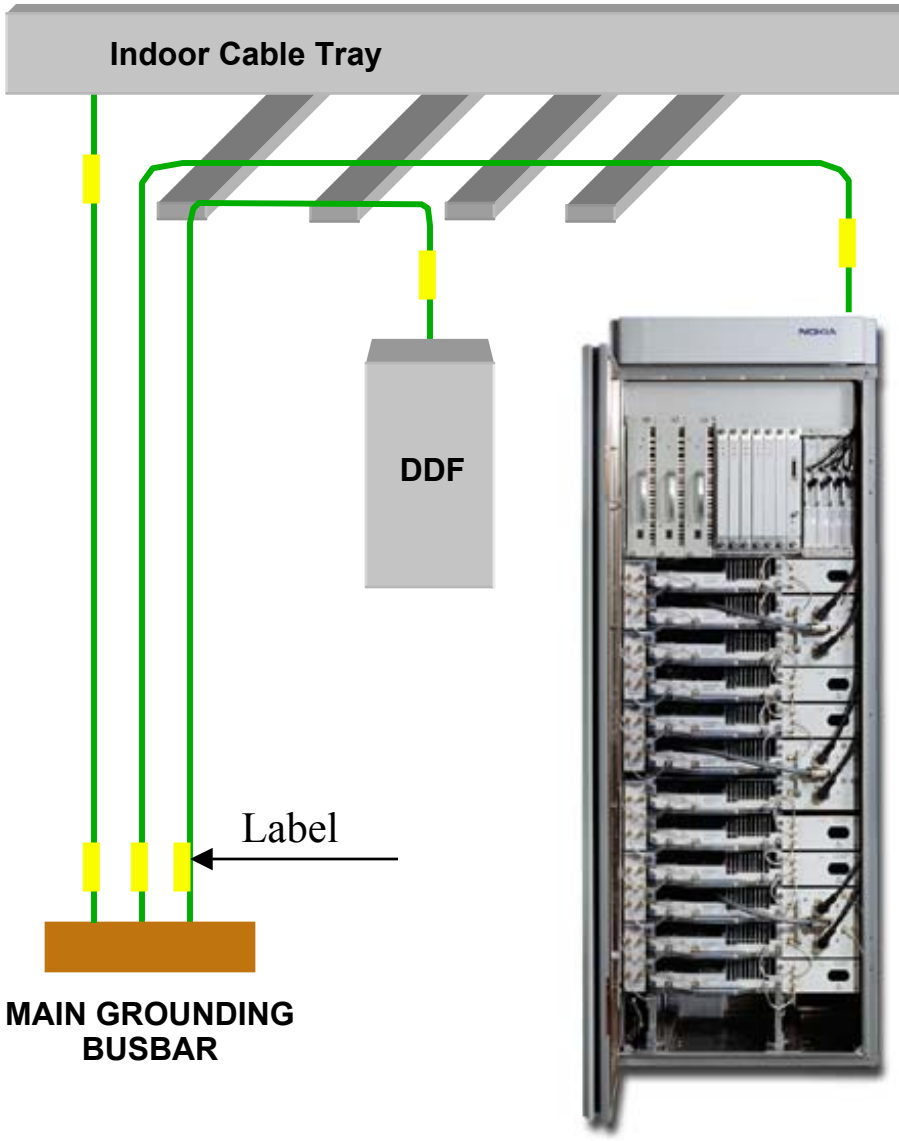
Bending radius for all the feeders are as followes:

FEEDER TYPE	BENDING RADIUS(mm)	
	Single	Repeated
1/2" superflex	15	30
1/2" feeder	80	160
7/8" feeder	120	250
1-1/4" feeder	200	350
1-5/8" feeder	250	500

TO BE USED FOR BSNL NORTH ZONE ONLY

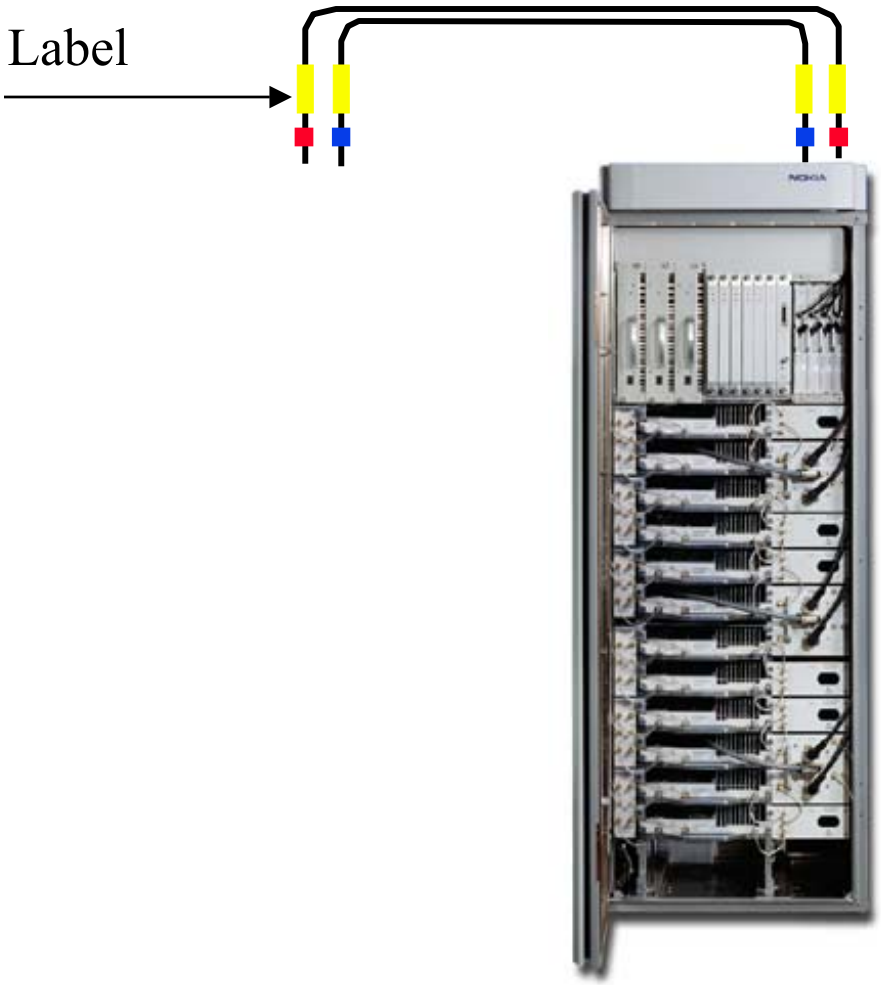
NOKIA

INDOOR GROUNDING CABLING



- UltraSite grounding cable size is 25mm^2.
- DDF grounding cable size is 25mm^2.
- EMP busbar grounding cable size is 25mm^2.
- Right cable lugs have to be suitable for grounding cable.
- All cables have to be labeled on both end of the cable.
- Proper tools have to be used during grounding cable installation.
- All cables have to be fixed properly.

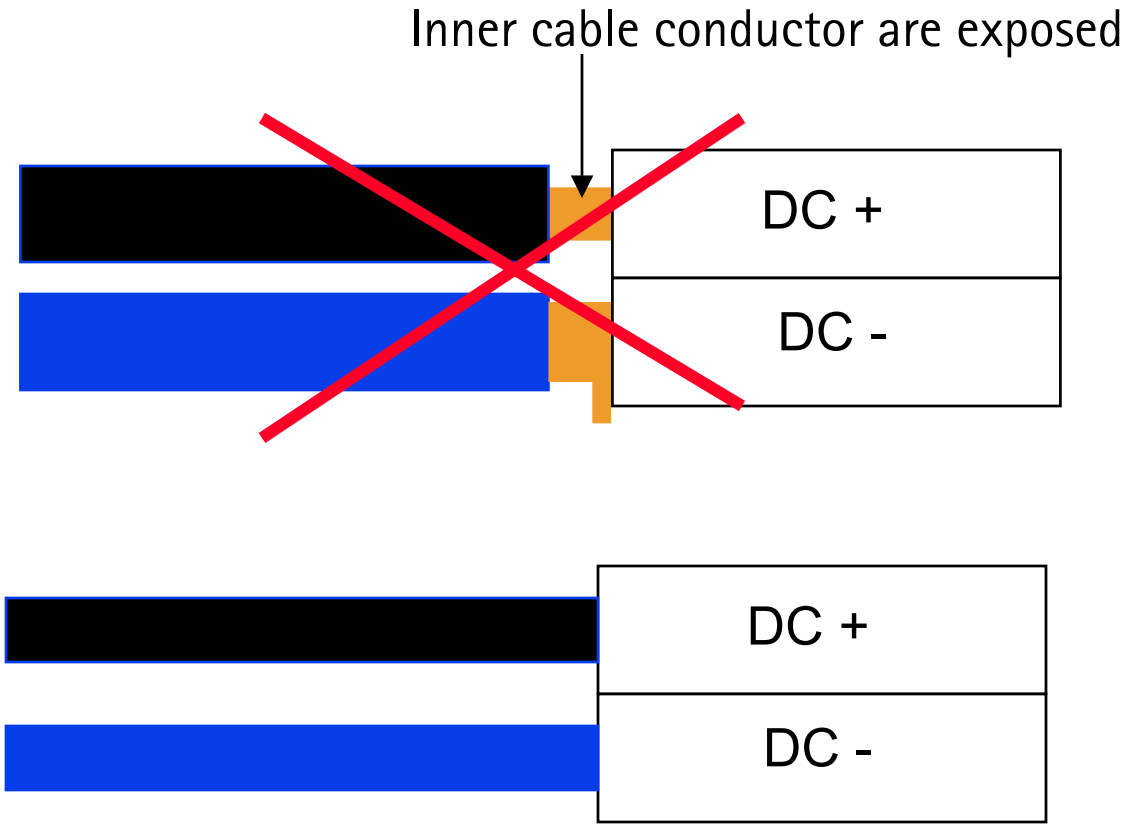
DC POWER CABLING



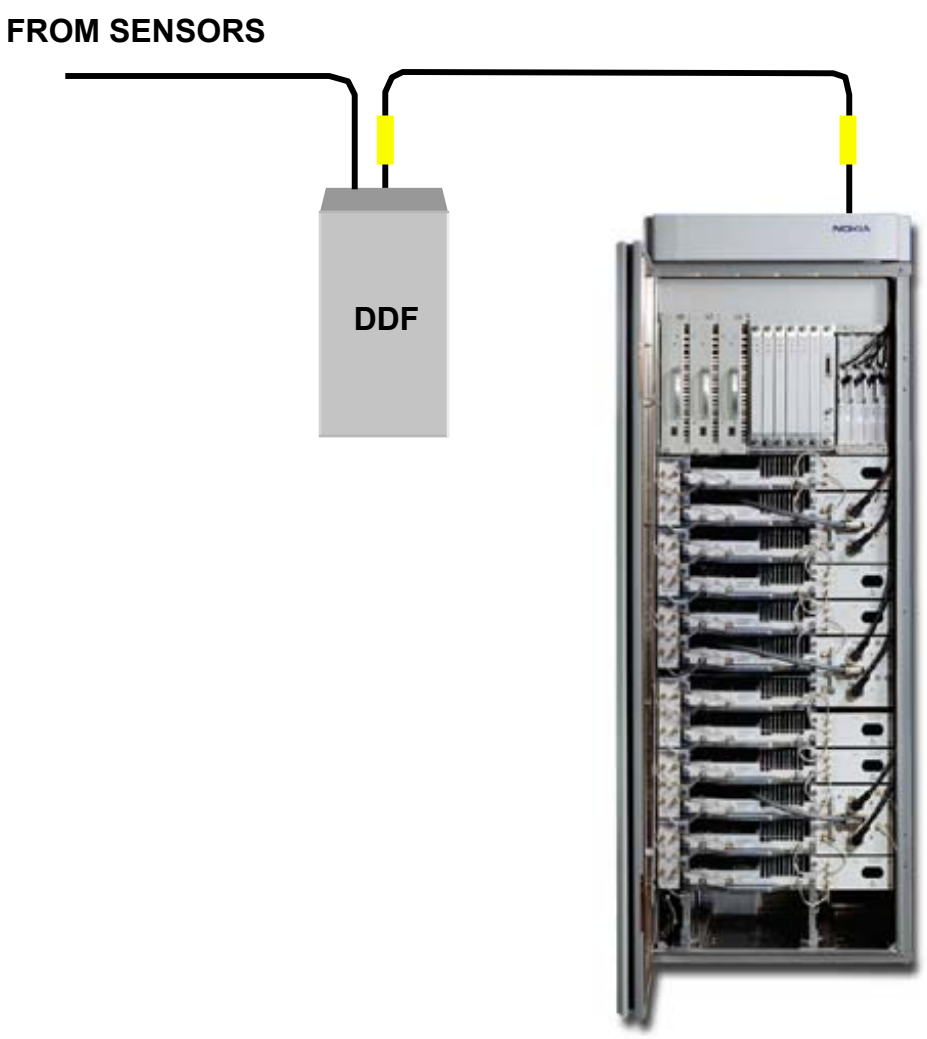
- UltraSite DC power cable size is 35mm^2 and 50mm^2 and DC supply breaker size is 80A for 444 and 100A FOR 666
- Maximum cable length have to be calculated using maximum power consumption.
- If coloured cables are not used then cables have to be marked with black and blue tape.
- All cables have to be labeled on both end of the cable.
- Proper tools have to be used during power cable installation.
- All cables have to be fixed properly.

MAKE ACCEPTABLE CONNECTION

- Proper tools has to be always used.
- Cable size should match to the connector.
- Strip cable correctly.



ALARM/E1 CABLING



- UltraSite alarm cable type is D37 – open.
- UltraSite E1 120ohm connector type is TQ
- Prefabricated cable should be used.
- Connector have to be correct type.
- All cables have to be labeled on both end of the cable.
- Proper tools have to be used during alarm cable installation.
- MDF alarm connector type is Disconnection module.
- Cabling from the BTS have to be connected on upper side of disconnection module.
- Cabling from the sensors have to be connected on bottom side of disconnection module.
- Proper tools have to be used during alarm cable installation.
- All cables have to be fixed properly.
- All cables have to be fixed properly.

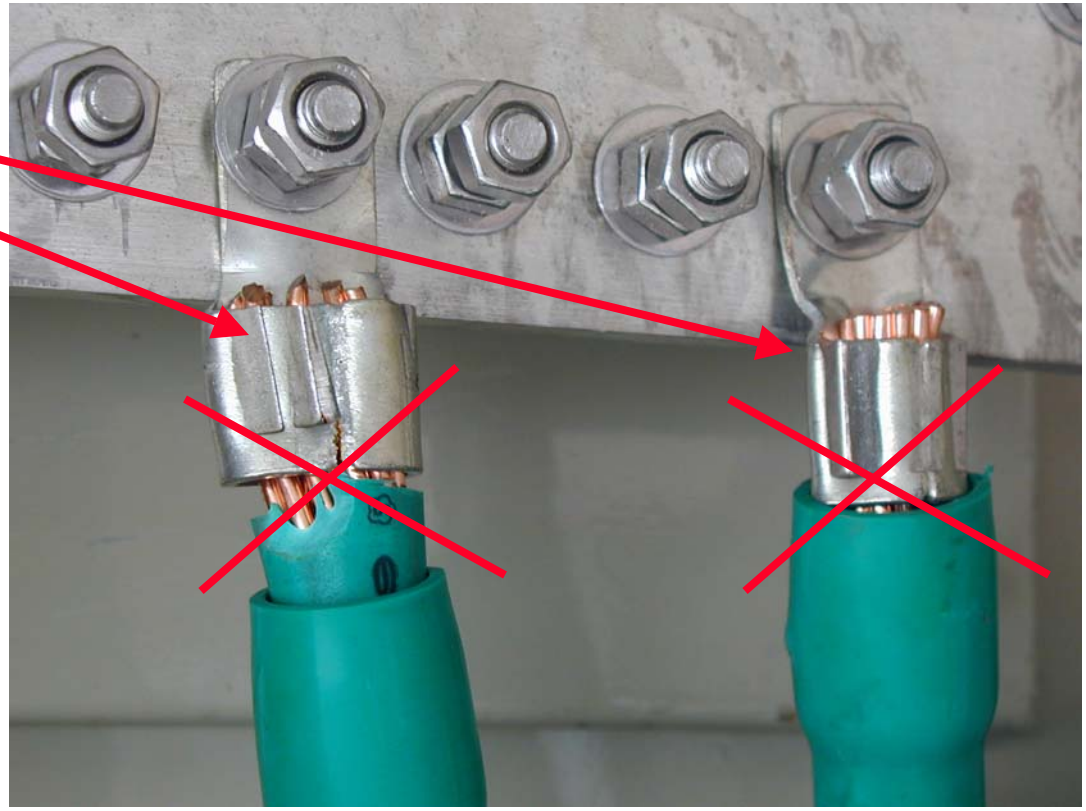
INDOOR GROUNDING CABLING

- Example of good installation of grounding busbar

USE OF PROPER TOOLS

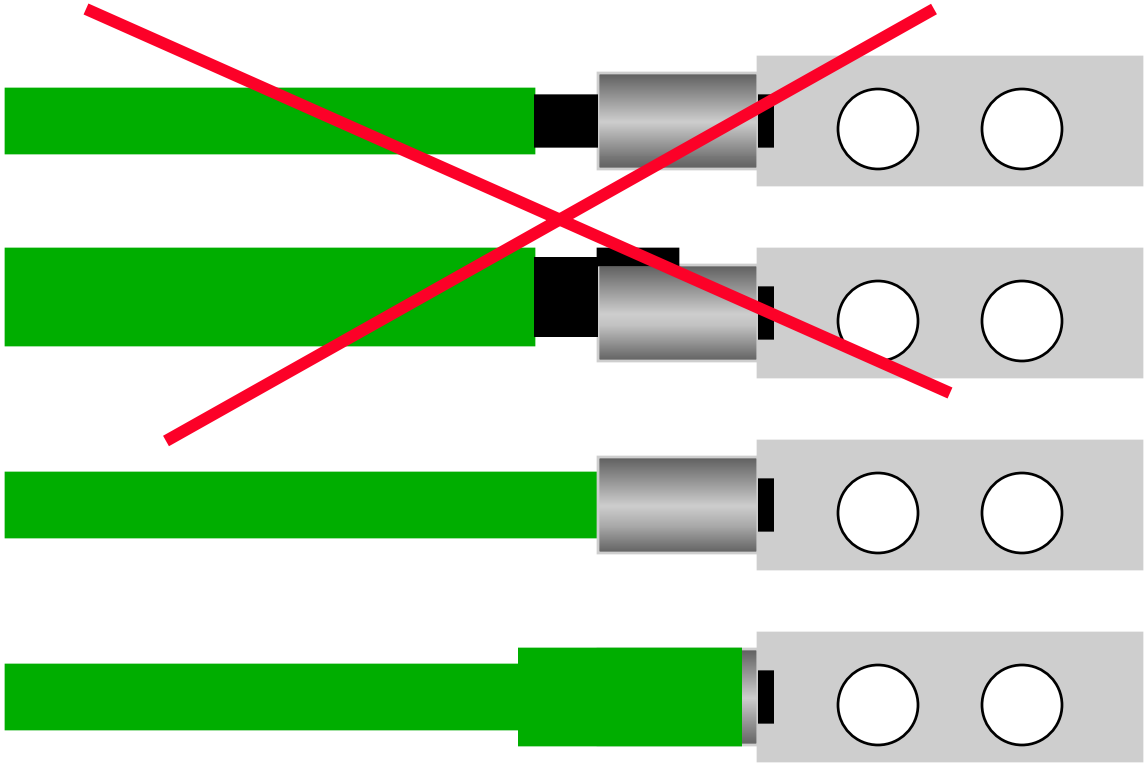
- Proper tools has to be always used.
- If crimping fails, cable lug has to be changed and new crimping applied.
- Lugs should match the cable size.
- Hex crimp have to be used.

Not OK :
Crimping not acceptable



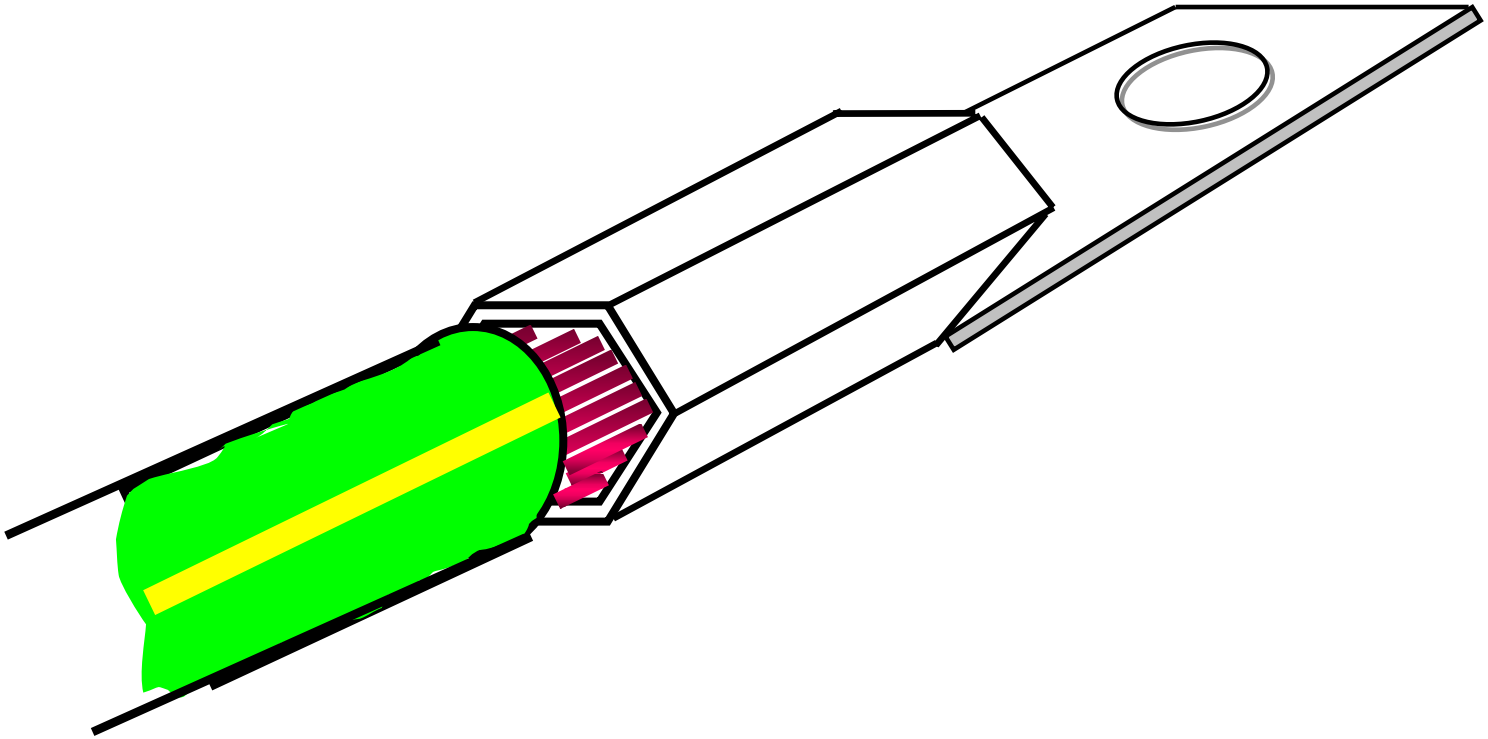
MAKE ACCEPTABLE CONNECTION

- Proper tools has to be always used.
- Lugs should match the cable size.
- Strip cable correctly.
- Hex crimp have to be used.
- Connection have to be protected by tape.

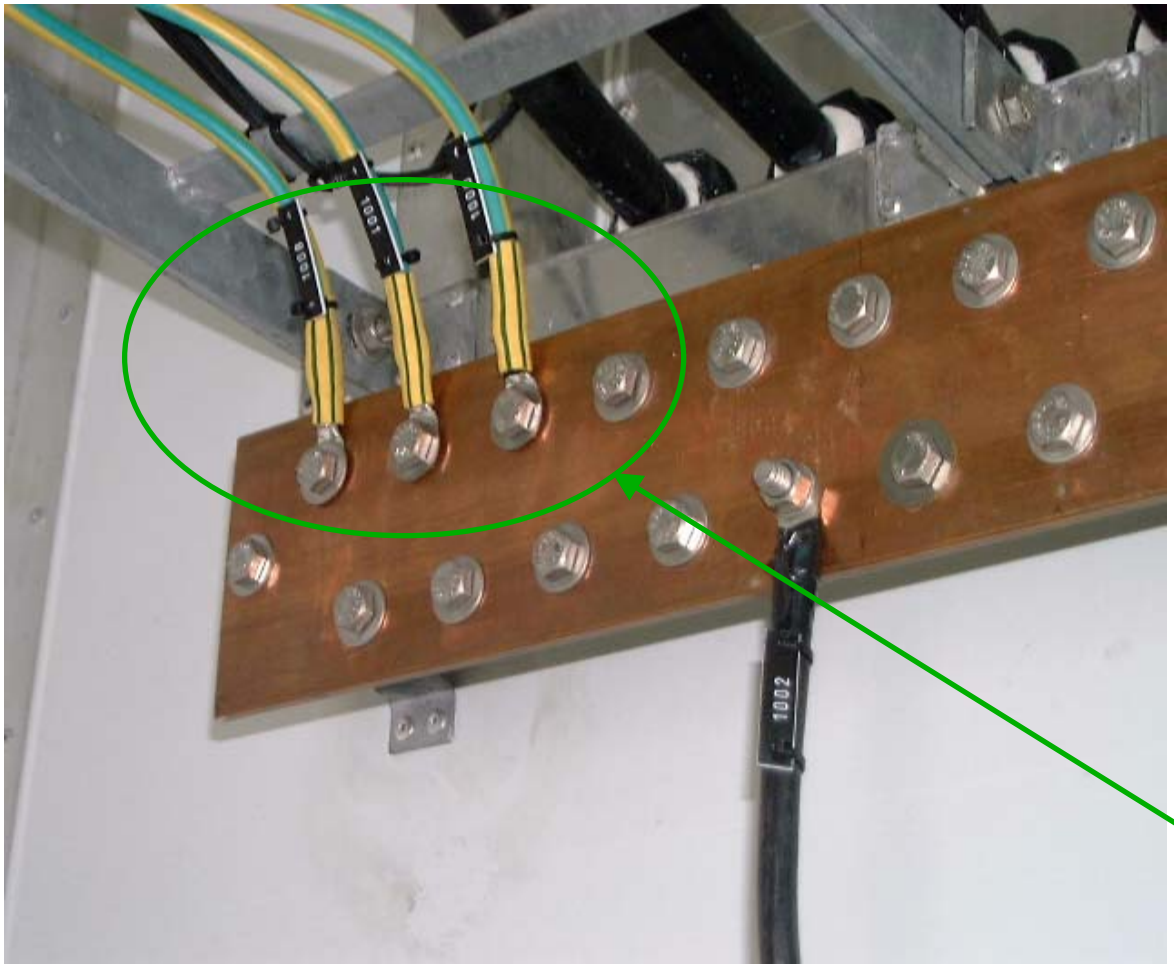


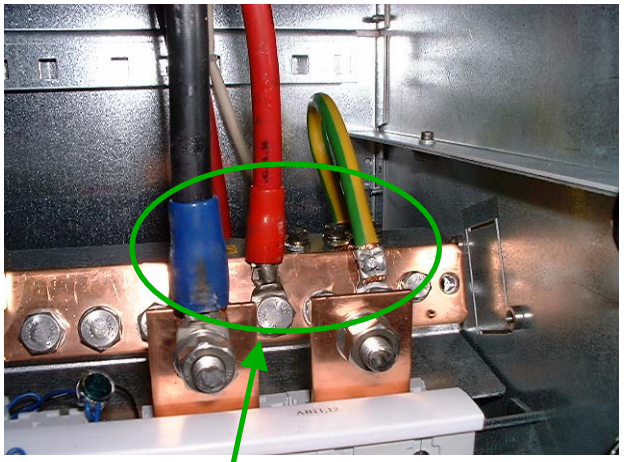
MAKE ACCEPTABLE CONNECTION

- Cable lug correctly hex crimped..
- Connection have to be protected by heat shrink. Do not use electrical tape.



MAKE ACCEPTABLE CONNECTION





Correct tape on crimp joint

Correct tape on crimp joint

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

COMMON MACRO :ANTENNA LINE SYSTEM

ItemDescription

1 The antennas can be either vertically polarised or cross polarised and directional or omni-directional antenna.

2 The jumper cable is a flexible low loss cable (1/2"), which is used at the ends of the feeder. It protects the connectors from the forces caused by the feeder cable.

3 7/16 connector are made of silver plated brass or a special grade of copper. All connectors are IP68-classified.

4 The grounding kit ensures that the Antenna line is DC grounded as a protection against lightning.

5 The RF-feeder is corrugated coaxial cable. It can be of different sizes, i.e. 1/2", 7/8" and 1 5/8", depending on the length of the mast and the desired attenuation.

6 Cable clamps are made of stainless steel and plastic and they are easy and quick to install. Design of the clamps prevents over tightening of a feeder cable.

7 A compact EMP protector protects the BTS against lightning and over voltage that may occur down the antenna line.

8 The wall feed through kit facilitates the connection of the feeders to the inside of a building without the ingress of water.

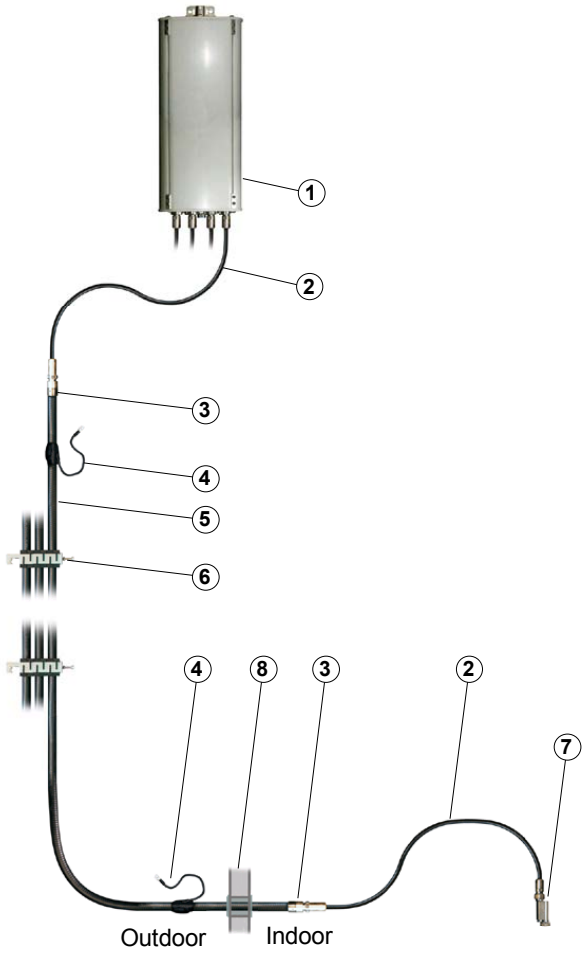
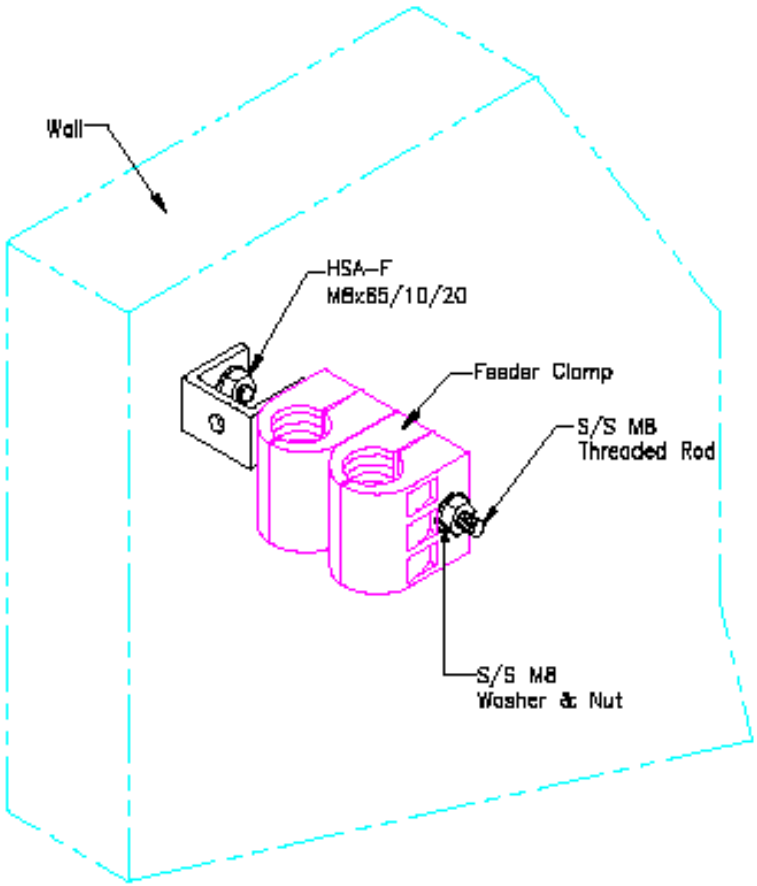


Fig 1. Antenna Line System without MHA

FEEDER CABLING SUPPORT

- Feeder cable fixing to cable ladder with copper wire

FEEDER CABLING SUPPORT



1 Unit PVC Feeder Clamp

2 Units PVC Feeder Clamp

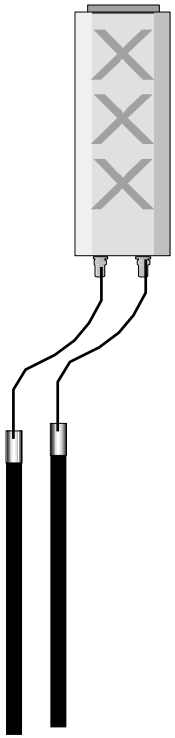
3 units PVC FEEDER CLAMP

TO BE USED FOR BSNL NORTH ZONE ONLY

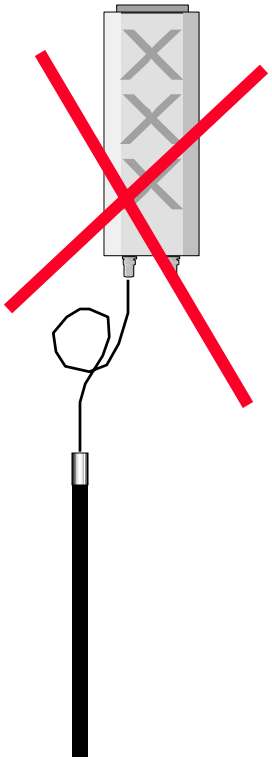
NOKIA

JUMPER CABLES INSTALLATION

OK

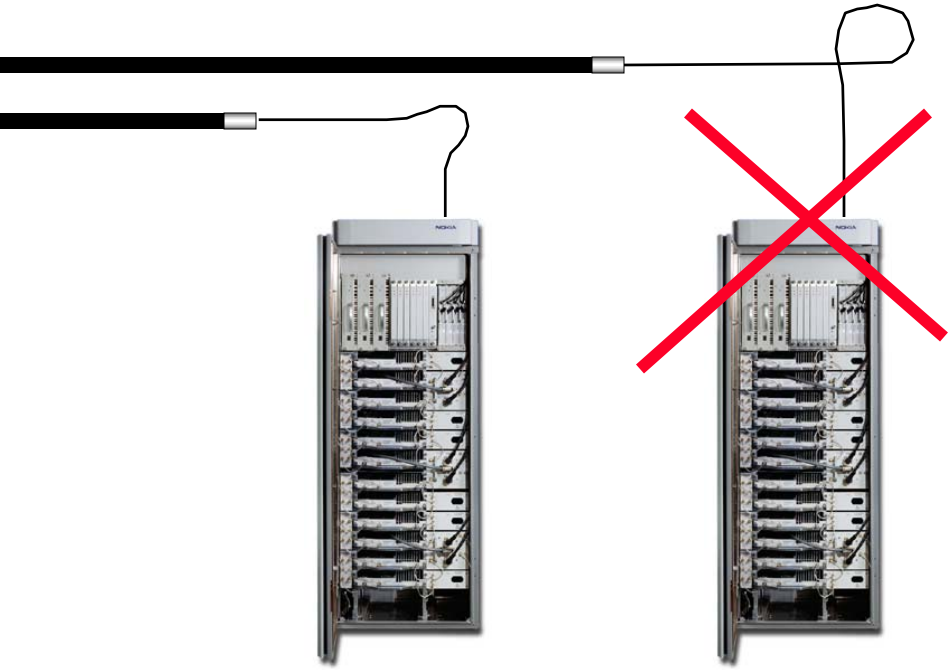


Not OK



- Jumper Cables have to be installaed a straight as possible.
- Avoid additional bendings.
- Follow manufacturers bending instructions.
- Proper tools have to be used during jumper installation.
- All cables have to be fixed properly.
- Prefabricated jumpers have to be use always when possible.
- On existing sites most practical soluti should be used.
- Think about future.

JUMPER CABLES INSTALLATION

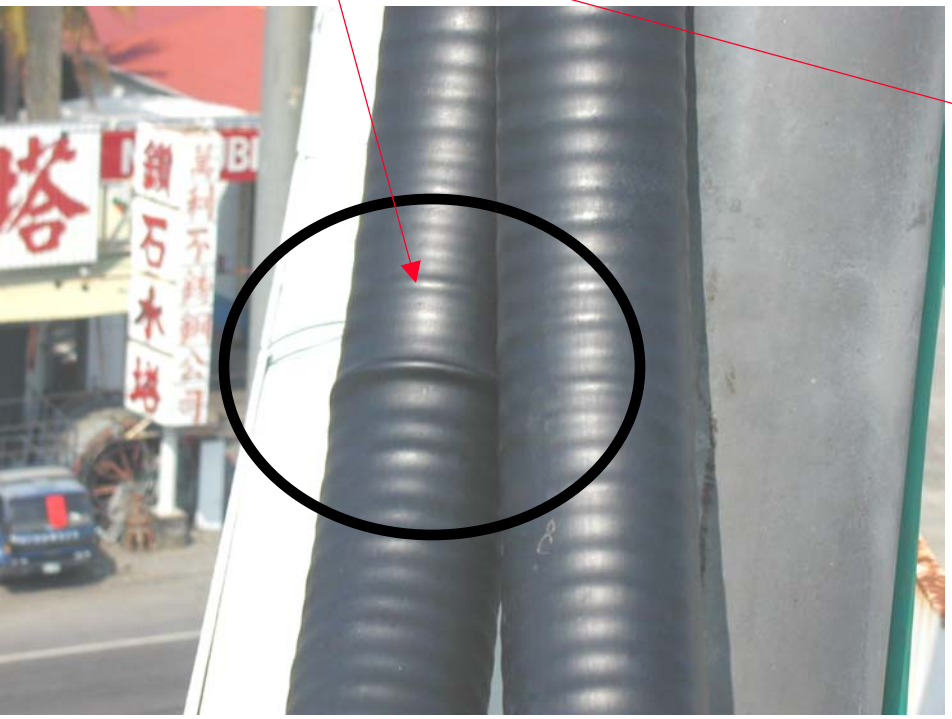


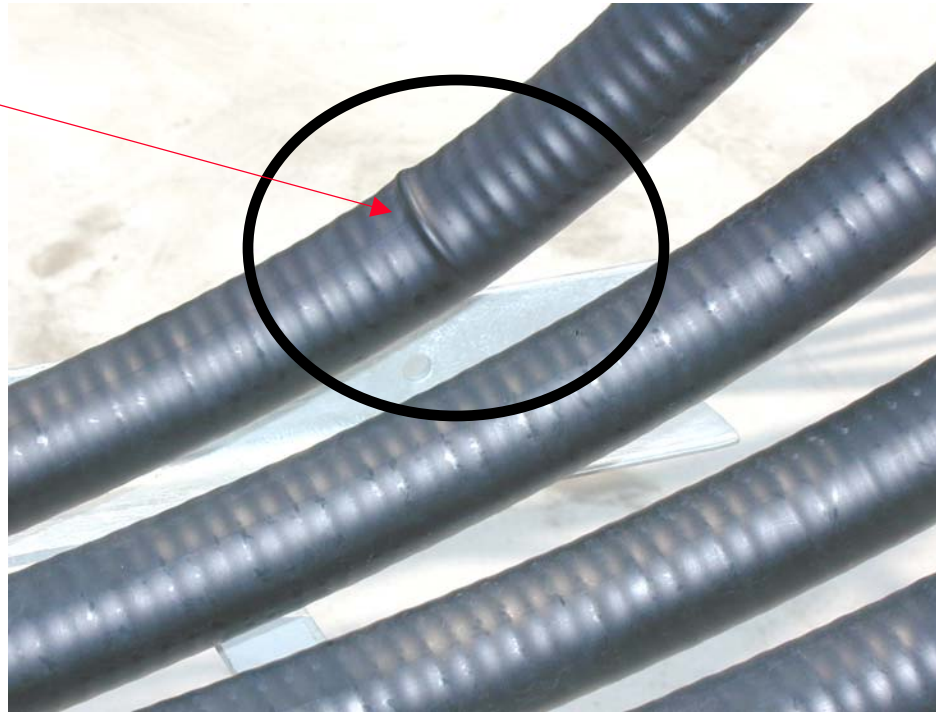
- Jumpers Cables have to be installaed as straight as possible.
- Avoid additional bendings.
- Follow manufacturers bending instructions.
- Proper tools have to be used during jumper installation.
- All cables have to be fixed properly.
- Prefabricated jumpers have to be used always when possible.
- On existing sites most practical solution should be used.
- Think about future.

FEEDER CABLES INSTALLATION
BENDING

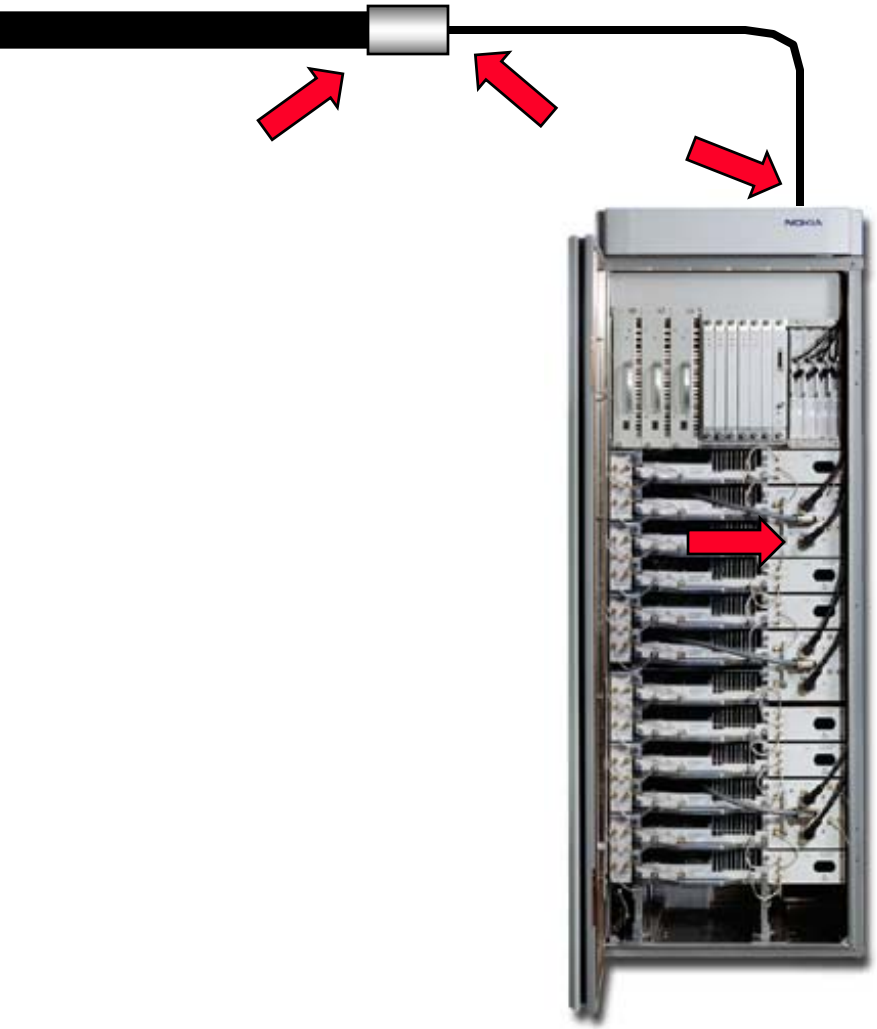
- Feeder bending radius guidelines has to be always followed to avoid damaging the feeder which causes more cable loss (see antenna and feeder installation document)
- NOT allowed:

NOT OK





FEEDER CABLES INSTALLATION
FEEDER CONNECTION



- Proper tools have to be used.
- All connections have to be tightened with correct torque.
  - SMA connector 1Nm
  - N connector 1Nm
  - 7/16 connector 25Nm

FEEDER CABLES INSTALLATION
FIXING THE RF FEEDER CABLES

- TAKE CARE OF sharp edges !
- recommended clamp distance for cables 1/2” to 7/8” is 1.5m.
- clamps FIXED TOO TIGHT cause rising of the return loss
- take care of NOT TO DROP plastic cushions
- cables shall be terminated by the resistive load (or source) impedance equal to the characteristic impedance, which generally is 50 Ω

FEEDER ENTRY POINT (FEP)

- USE PROPER ENTRY GLANDS.
- SEAL WALL ENTRY PROPERLY.

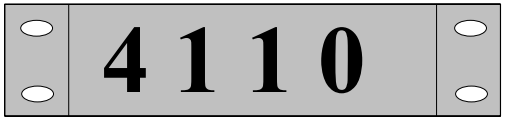
TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

CABLE MARKING

- Labels has to be seen visibly and when many cables are together labels has to be in same line and direction.
- Labelling may be customer specific and differ from Nokia Standard.

CABLE MARKING



Label Example - Preferably Stainless Steel outdoor

	SECTOR 1			*SECTOR 2*			*SECTOR 3*			*STM*
Feeder Cable	**Tx (Tx/Rx)**	**Rx**	**RxD**	**Tx (Tx/Rx)**	**Rx**	**RxD**	**Tx (Tx/Rx)**	**Rx**	**RxD**	
Cable Label Number	**4110**	**4111**	**4112**	**4120**	**4121**	**4122**	**4130**	**4131**	**4132**	**4000**

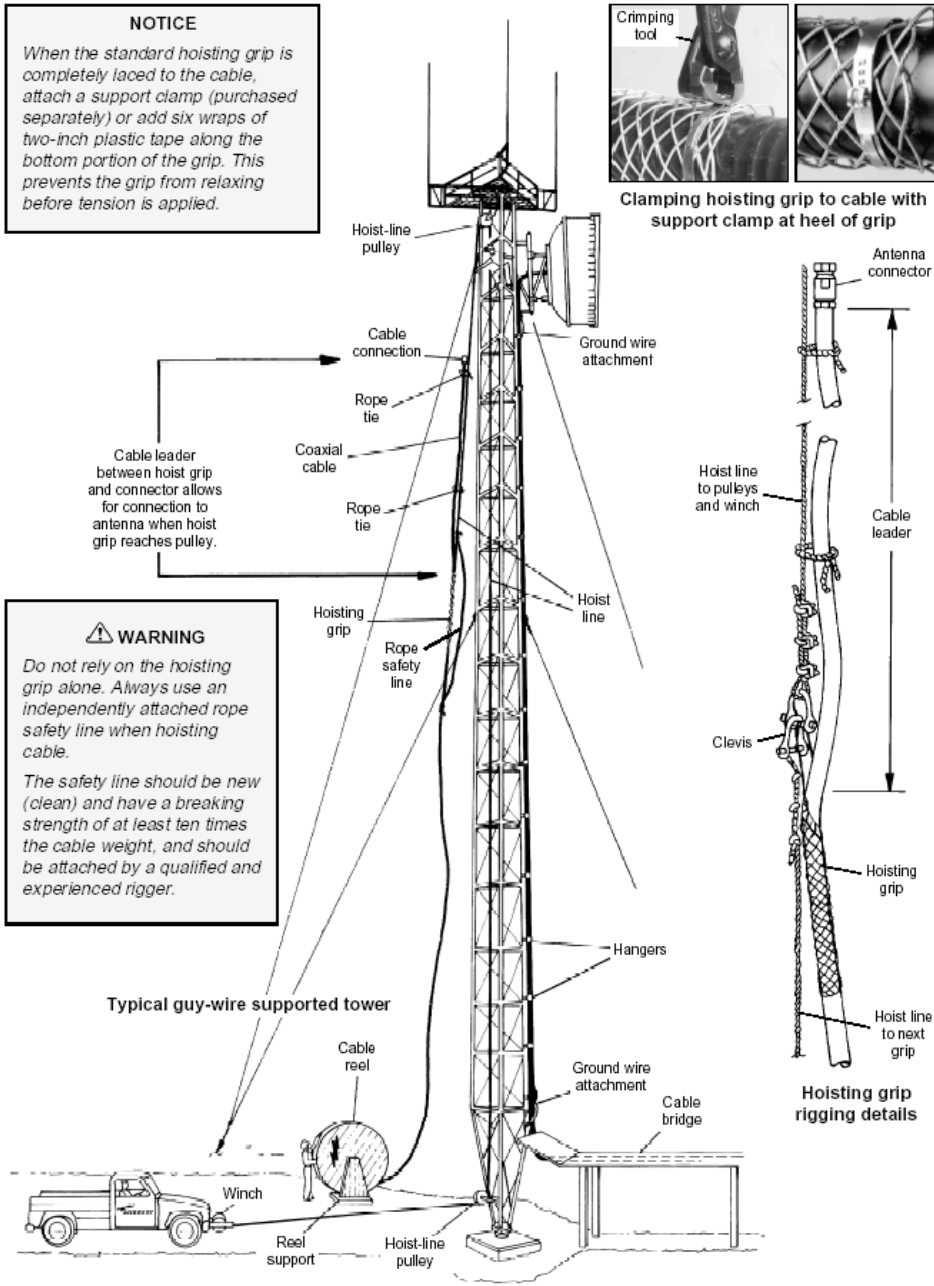
Note: This is the generic Nokia system and some projects may have to adopt a customer specific meth

FEEDER LINE WORK INSTRUCTIONS

HELAIX® Cable Instructions

1. Inspecting and Preparing the Cable
Inspect the cable for possible shipping damage.

Before you hoist the cable, be sure to:
• Attach the connector at the antenna end of the cable
using the instructions supplied with the connector.
• Pressure-test the assembly and apply a weatherproof
covering for the assembly.



HELAIX® Cable Instructions

2. Hoisting the Cable

Hoist Line. Use a hoist line that supports the total weight of the cable. Refer to the table for approximate cable weights per foot and per meter to calculate total cable weight.

Pulleys. Use a strong pulley at both the top and bottom of the tower to guide the hoist line, as illustrated.

Cable Reel. Support the cable reel on an axle so that the reel can rotate freely as the cable is hoisted and the cable is pulled from the bottom. Have a crew member control the rotation of the reel. Short lengths of cable are shipped coiled and tied. Uncoil these cables along the ground away from the tower before hoisting them.

Standard and Support type Hoisting Grips.

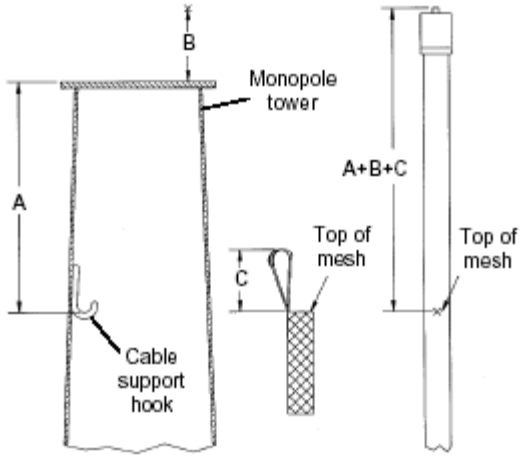
Hoisting grips are interlaced wire that fit around the cable so that the looped handle at the upper end can be pulled to cause gripping of the cable. Grips are placed at intervals of 200 ft (60 m) along the cable. The standard hoisting grip has open loops along its length. The grip is first wrapped around the cable and then the loops are laced together for hoisting. This type can be wrapped over cable that has a connector installed. (A support clamp, available separately, is used to clamp the hoisting grip to the cable so that grip handle can be placed on a support hook in a monopole tower.) The support hoisting grip is designed to be compressed and slid onto the cut end of the cable before connector attachment. When positioned at the desired location after cable attachment, the heel of the grip is clamped to the cable with a support clamp (included). This is done so that the grip can be used to support the cable from a support hook in a monopole tower.

HELAIX® Cable Instructions

Clamping Cable for Hoisting in Monopole Tower.

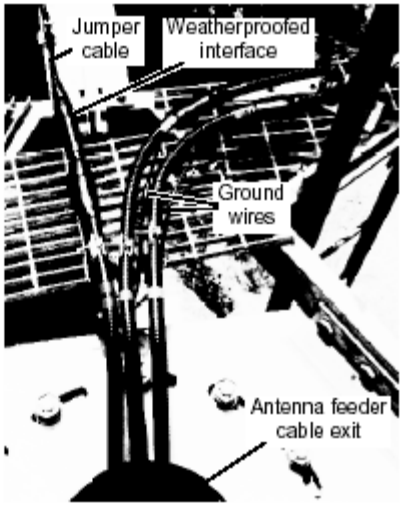
Some calculations need to be made before clamping the hoisting grip to the cable so that it can be hoisted to a support hook in a monopole tower. Three measurements need to be taken and added together. First, the distance from the top exit of the monopole to the interior cable support hook should be measured, if not provided by the manufacturer. This is much easier when done on the ground before the tower is erected. Second, measure the distance from the top mesh of the hoisting grip to the top of the handle. Third, calculate the length of cable protruding from the top exit of the monopole.

These three distances added together give the distance from the top of the cable connector to the point where the top of the hoisting grip's mesh should be located after attachment. When the location is found, the hoisting grip can then be clamped down with the support clamp, using the special crimping tool. If the calculation demonstrates an insufficient length of leader cable, an additional hoisting grip may be required lower on the cable being hoisted.



Interior hook and support measurements that must be made before clamping down the hoisting grip

Self-supporting monopole tower



Top of monopole showing cables anchored to platform

HELAIX® Cable Instructions

Hoisting Procedure. Place a weatherproof protective covering over the connector on the cable end to prevent damage during hoisting. Attach a hoisting grip near the end of the cable, allowing a sufficient length, called a leader, of at least 5 ft (1.5 m) to reach the antenna input from the hoisted cable position. Tie the cable leader to the hoist line so that it does not dangle during hoisting. When installing cable lengths more than 200 ft (60 m), add hoisting grips at intervals of 150 to 200 ft (45 to 60 m). When additional grips are used, tie the cable to the hoist line between the grips with fiber-reinforced tape at 50-ft (15-m) intervals. Make sure to allow slight slack in the cable - not in the hoist line - between grips and maintain that slack during hoisting. This slack in the cable indicates that the load is properly distributed. Hoist the cable slowly and carefully. Prevent kinking by retarding rotation of the cable reel to control uncoiling of the cable. Avoid snags when hoisting or routing cable through and around tower members. Careless handling can cause kinks, dents, and scrapes in the cable. Carefully apply an even pressure when bending the cable. Do not make a cable bend smaller than the minimum bending radius given in the table. If routing is so confined that a smaller bend is required, use a jumper cable.

HELAIX® Cable Instructions

3. Anchoring the Cable

After raising the cable to the correct height, anchor it to the support structure, starting at the top.
Cable attachment to tower lighting conduit is not recommended because this may result in damage to the conduit. Such damage may cause water entry into the conduit and eventual lighting performance problems. All cable should be supported within 1 to 2 feet (30 to 61 cm) of the antenna feed termination and of any cable connector. Otherwise, cable hanger spacing should be as recommended in the hanger literature for the cable type being installed. Allow enough cable at the antenna end to accommodate fine adjustments in antenna position and to prevent strain at the antenna input connection. Maintain cable support with the hoist line until anchoring is completed.

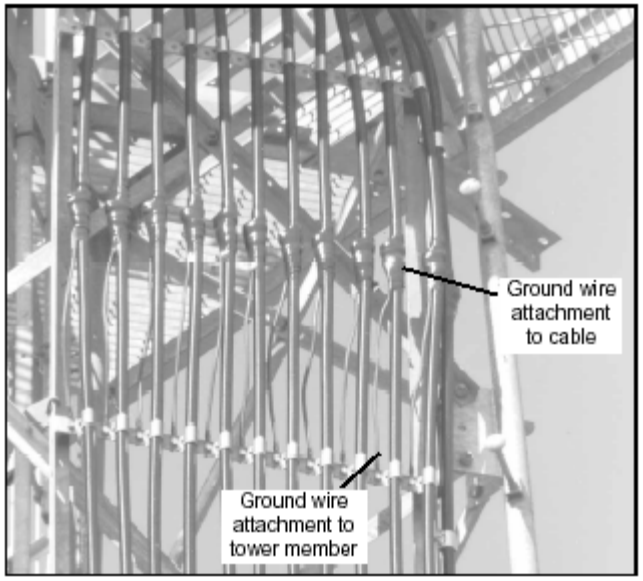
HELAIX® Cable Instructions

4. Grounding

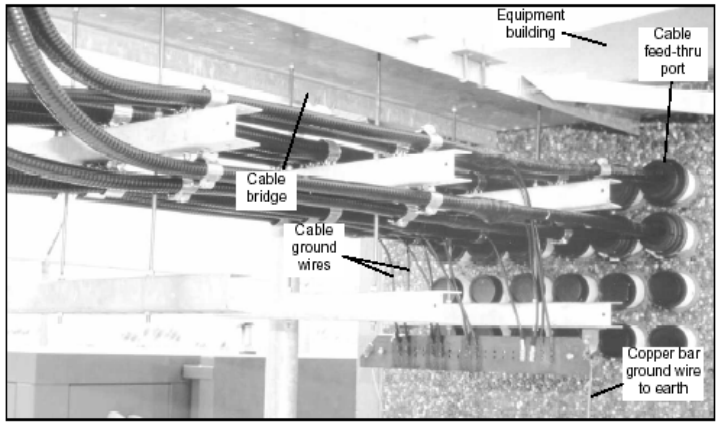
Grounding Cable. The top and bottom of the cable attached to the tower should be electrically grounded to the tower with Andrew grounding kits for lightning protection. The antenna input connection cannot serve as the top ground point. Local building codes should be followed, which may require grounding the cable outside, near the wall of the equipment building. The cable should also be grounded near the wall inside the building (per NEC Article 810-55 and 820-33 grounding requirements).

Surge Protectors. Surge protectors capable of withstanding multiple lightning strikes may be installed at the end of the cable that enters building. The surge protector is fitted to the cable end and includes a bulkhead connector interface that mounts to a ground plate with a washer and nut.

Grounding to Earth. Grounding should be continued from the tower and equipment building to an interconnected grounding system in the earth. Such a system generally consists of a group of buried ground rods welded to an underground loop of wire.

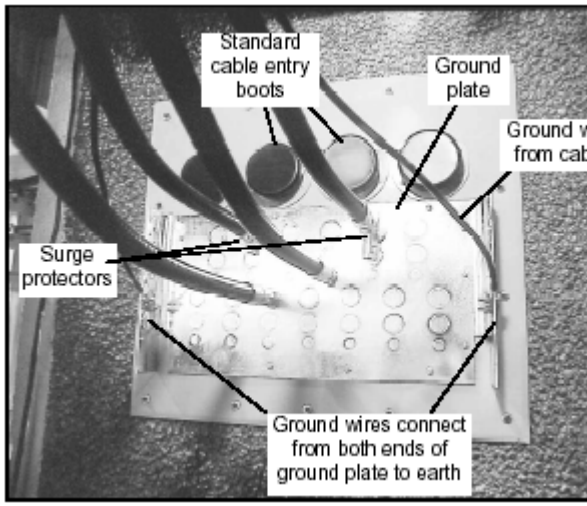


Ground wire attachment of vertical cable run



Ground wire attachment of horizontal cable run

HELAIX® Cable Instructions



5. Horizontal Cable Runs

The cable may be routed horizontally from the base of the tower to the equipment building either above or below ground.

Above-ground Cable. Attach the above-ground cable to the horizontal support member, such as a cable bridge, with the same type hangers and spacings used in the vertical run. Exposed horizontal runs must be protected from the weight of accumulated ice and damage from falling ice or other objects by means of an ice shield.

Wall or Roof Feed-thru Ports. HELIAX® feed-thru ports are recommended when a cable must pass through a roof or wall of a building. Single ports or panels which contain groups of ports are available.The ArrestorPort™ II Integrated Cable Entry/Ground System is a panel with ports and a ground plate to accommodate the mounting of surge protectors.

Buried Cable. Buried cable should be located below the frost line (depth) of the area and at least 3 ft (1 m). This will protect the cable from damage by heavy vehicles. Surround the cable with a 4-inch (102-mm) layer of sand to protect the jacket from stones or other sharp objects. Place location markers at convenient intervals over buried cables, especially at the locations of cable splices.

HELAIX® Cable Instructions

6. Cable Connections

Connector Instructions. Step-by-step installation instructions are included with each connector. Clamping and coupling torque values are given to ensure that components are tightened within established mechanical tolerences. Also included are photographs and illustrations of the tools required. Tools for cutting and chamfering cable conductors are available from Andrew to shorten installation time and provide more precise fitting of connectors.

Connector Coupling Torque Values

Type N	7-16 DIN
lbf·in (N·m)	lbf·in (N·m)
15-20 (1.7-2.3)	220-265 (25-30)

Connector Pin Depth

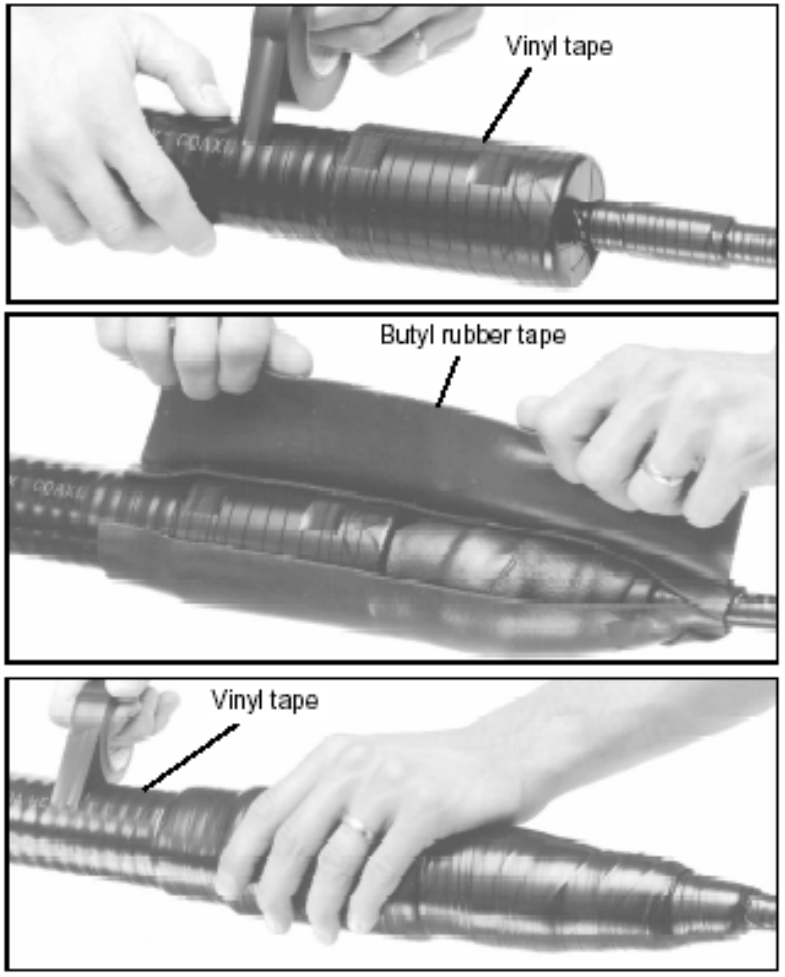
Connector	Inches	Millimeters
N female	0.187/0.207	4.75/5.26
N male	0.208/0.230	5.28/5.84
7-16 DIN female	0.70/0.082	1.78/2.08
7-16 male	0.058/0.070	1.47/1.78

Connector Attachment Tips. The following tips are given as a general guide for connector attachment:

- Straighten the last 6 inches (150 mm) of 1/4” to 1/2” cables before starting connector attachment.
- Straighten the last 12 inches (300 mm) of 5/8” to 2-1/4” cables before starting connector attachment.
- Use an accurate scale for all measurements.
- Avoid scoring the outer conductor when removing the cable jacket with a knife.
- Deburr conductors with a knife or file.
- Ensure that foam and conductor surfaces are free of debris and grease.
- Make sure that if a self-tapping pin is used, it is fully screwed into the inner conductor.
- Use a pin depth gauge to measure pin depth of the assembled connector. Incorrect depth can cause connector damage during coupling.
- Make sure that if a soldered inner connector pin is used, it is parallel to the inner conductor axis; otherwise, connector damage could result during coupling.
- Use a coil of rosin-core flux type solder with 63% tin, 37% lead, and a flux weight of 2.4% for best results on solder version connectors. For small inner connector pins, use a solder diameter of 0.031” and 0.062” for larger pins.
- Make sure that O-rings and gaskets are placed in the correct locations.
- Apply a thin coat of silicone grease to O-rings and gaskets only where indicated in the instructions. Some interface gaskets, for example, do not require grease.
- Form the cable before coupling the connector to the mating connector for properly aligned entry.

HELAIX® Cable Instructions

Weatherproof Cable Connections. Protect cable connections that are exposed to wind and tower vibrations, such as a jumper connection from the main feeder to the antenna, with a weatherproofing kit. Use the 3M™ Cold Shrink™ Weatherproofing Kit or the standard Connector/Splice Weatherproofing Kit. Either kit will prevent the connection from loosening due to vibrations. The standard kit also provides moisture protection for buried cable connections.



Standard Connector/Splice Weatherproofing Kit

Notice

The installation, maintenance, and removal of antenna systems requires qualified, experienced personnel. Andrew installation instructions are written for such personnel. Antenna systems should be inspected once a year by qualified personnel to verify proper installation, maintenance, and coondition of equipment.

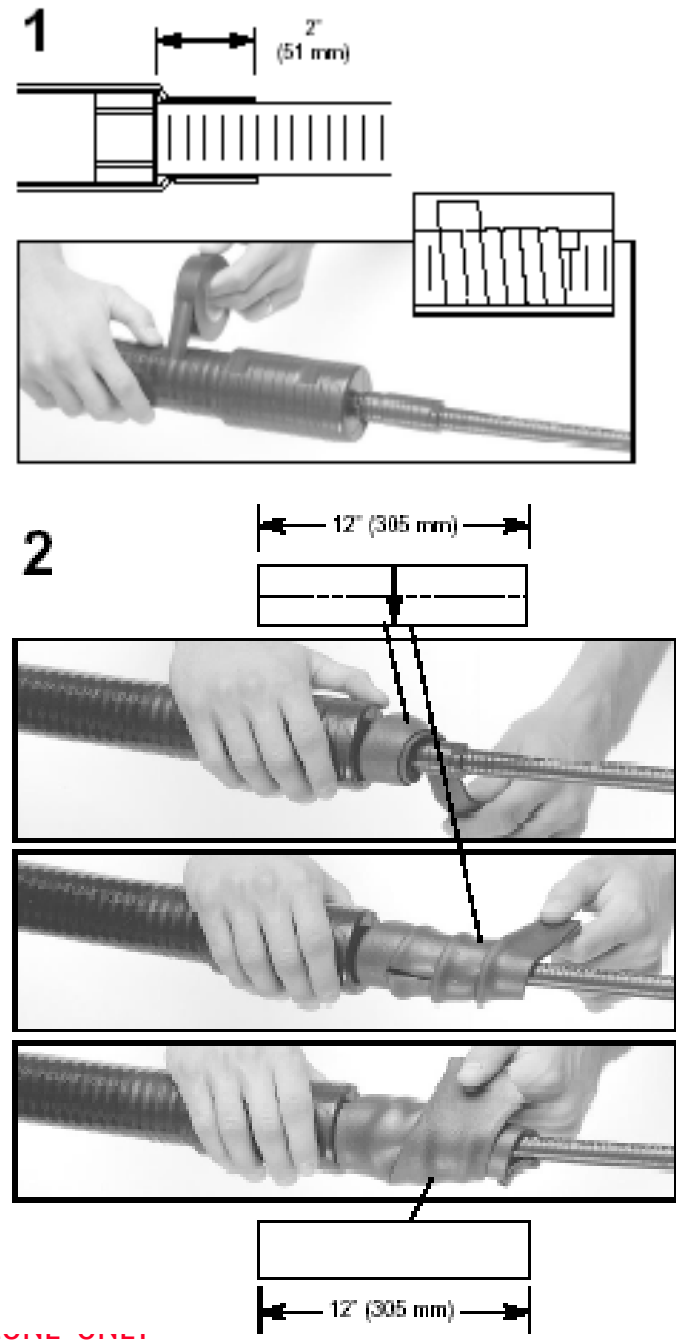
Andrew disclaims any liability or responsibility for the results of improper or unsafe installation practices.

HELAIX® Products

Weatherproof Installation Instructions

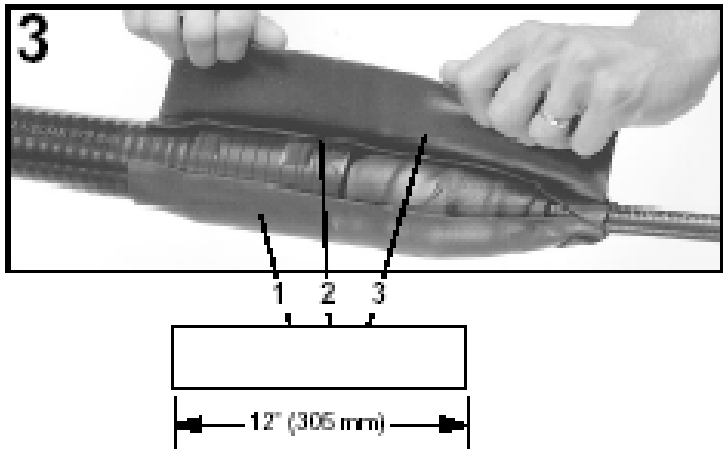
Note: To ensure adhesion, tape must be above 32°F (0°C).
Nota: Para asegurar adhesion, la cinta debe estar a más de 0°C.
Note: Effectuer la pose de la bande à une température au-dessus de 0°C pour assurer une bonne adhésion.
Hinweis: Damit das Band richtig klebt, muss es eine Temperatur von über 0°C.
Nota: Para assegurar a adesão, a fita isolante deve estar a uma temperatura superior a 0°C.

Connectors	Steck-Verbinder
Conectores	Conectores
Connecteurs	



HELAIX® Products

Weatherproof Installation Instructions



DO NOT PULL THE TAPE during the last few turns. *Pulled tape applies tension to the adhesive and will cause the tape to eventually unravel.*

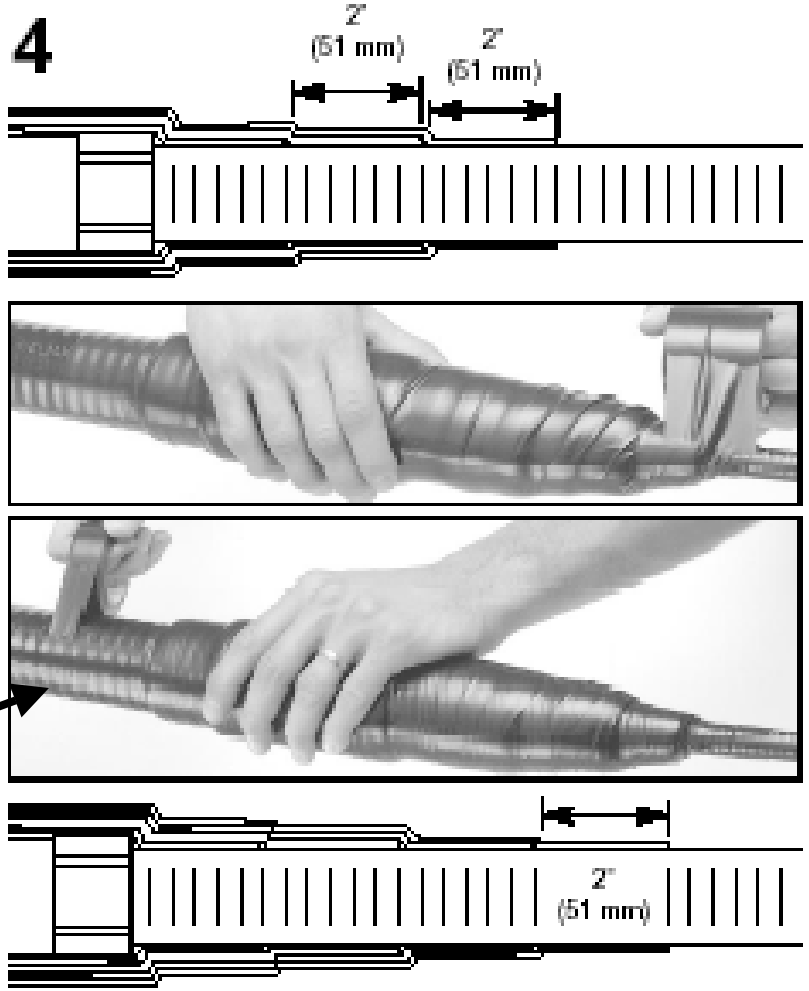
NO ESTIRE LA CINTA al realizar las últimas vueltas. *La cinta estirada aplica tensión al adhesivo y con el tiempo la cinta se desenvolverá.*

NE PAS TIRER SUR LA BANDE pendant les derniers tours. *Une bande tendue exercera une tension sur l'adhésif, ce qui entraînera l'effilochage de la bande.*

VERMEIDEN SIE EIN DEHNEN DES BANDES bei den letzten paar Umwicklungen. Dehnen des *Bandes beeinträchtigt die Klebefläche und bewirkt ein Abrollen des Bandes.*

NÃO PUXE A FITA durante as últimas voltas. *A fita esticada aplica tensão ao adesivo e faz com que a mesma acabe por desenrolar.*

缠绕最后几圈时切勿拉紧胶带。
被拉紧的胶带对胶粘施加张力，从而导致胶带最终剥掉。

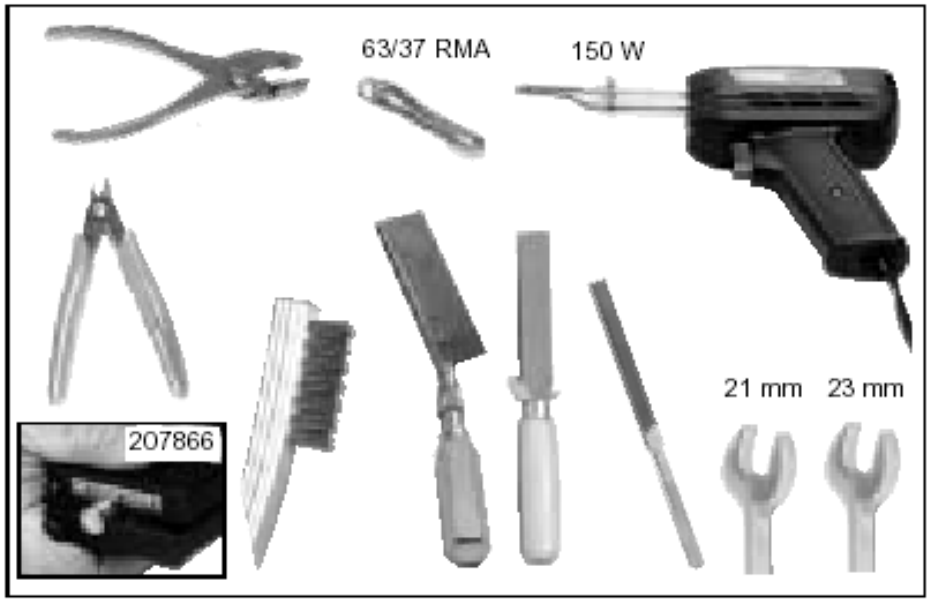


HELAIX® Products

7-16 DIN Connectors for LDF4-50A ½" Cable

L4PDM

L4PDF
L4PDF-BH



FAX-On-Demand: +1-708-873-3614 • North America: 1-800-861-1700
Tips and Techniques (SP50047) available by FAX-On-Demand.
Los consejos prácticos y técnicas (SP50047) pueden solicitarse por fax.

Conseils et techniques (SP50047) disponibles par fax à la demande.
Tips und Anleitungen (SP50047) auf Faxanfrage erhältlich.
Consigli e procedure (SP50047) disponibili via FAX su richiesta

Dicas e Técnicas (SP50047) disponíveis via pedido por fax.
提示與方法（SP50047）可以通過電傳獲得

1

Trim cable jacket.

Recortar la envuelta del cable.

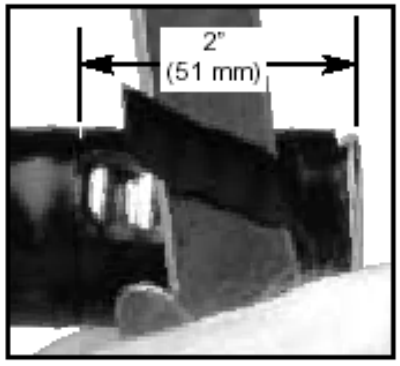
Coupez la gaine du câble.

Kabelmantel abziehen.

Retire a capa do cabo.

Rifilare la guaina del cavo.

切整電纜外皮



2

Add O-ring, grease, and clamping nut.

Añadir la junta tórica, la grasa y la tuerca sujetadora.

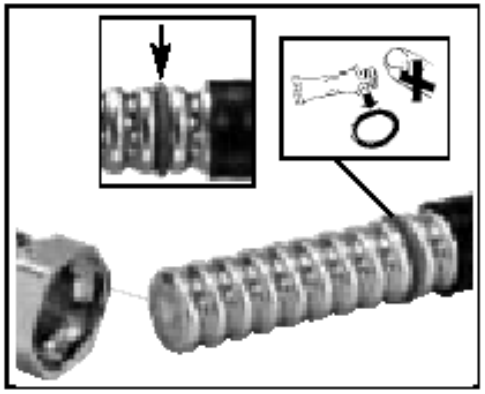
Mettez en place le joint torique, de la graisse et l'écrou de serrage.

O-Ring und Klemmutter vor Montage einfetten.

Coloque o anel O ring, graxa e a porca de aperto.

Aggiungere l'O-ring, il grasso e il dado di bloccaggio.

加O型圈，油脂和緊固螺母



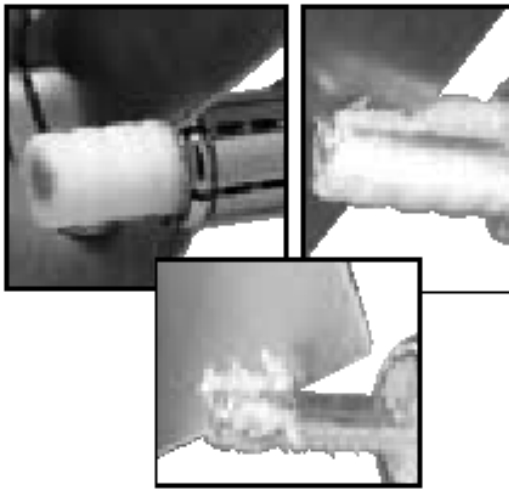
HELAIX® Products

7-16 DIN Connectors for LDF4-50A ½" Cable

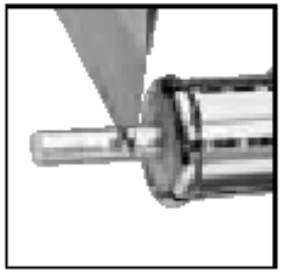
t outer conductor.
rtar el conductor externo.
upez le conducteur extérieur.
ßenleiter zurückschneiden.
rte o condutor externo.
gliare il conduttore esterno.
外導體

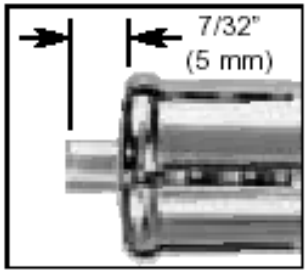
4

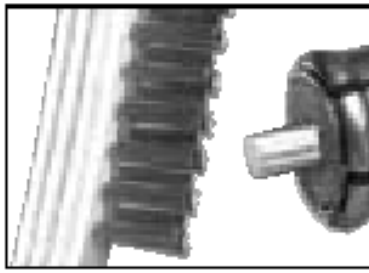
Remove foam and adhesive.
Retirar el material de espuma y el adhesivo.
Enlevez la mousse et l'adhésif.
Verschäumung und Klebeband entfernen.
Remova a espuma e o adesivo.
Eliminare la schiuma e l'adesivo.
去除泡沫塑料和粘漏劑



m inner conductor. Remove debris.
rtar el conductor interno. Retirar los restos.
upez le conducteur intérieur. Enlevez les débris.
enleiter abschneiden. Metallspäne entfernen.
npe o condutor interno. Remova os detritos.
ilare il conduttore interno. Eliminare i detriti.
整內心導體







HELAIX® Products

7-16 DIN Connectors for LDF4-50A ½" Cable

6

ompress foam.

omprimir el material de espuma.

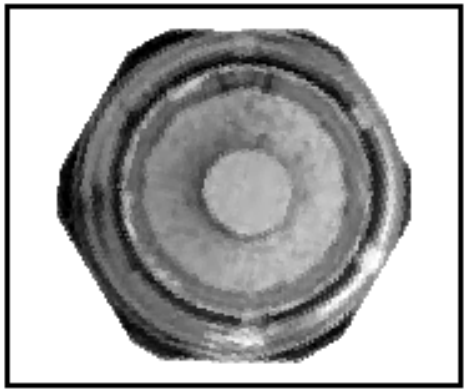
omprimez la mousse.

erschäumung zusammendrücken.

omprima a espuma.

omprimere la schiuma.

壓泡沫塑料



7

are outer conductor, examine flare, remove debris.

campanar el conductor externo, examinar la forma
e campana y retirar los restos.

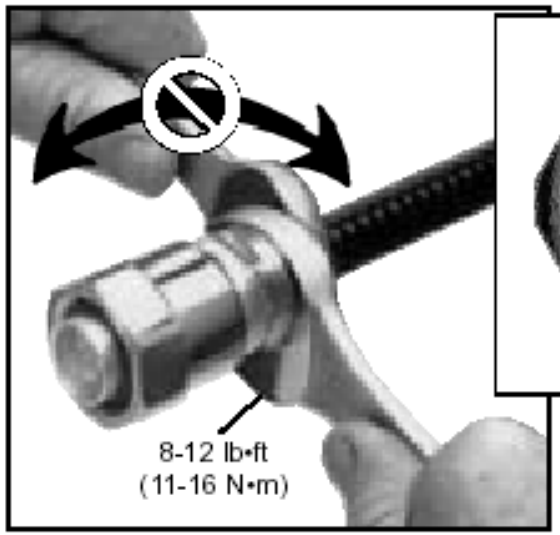
vasez le conducteur extérieur, examinez
vasement et enlevez les débris.

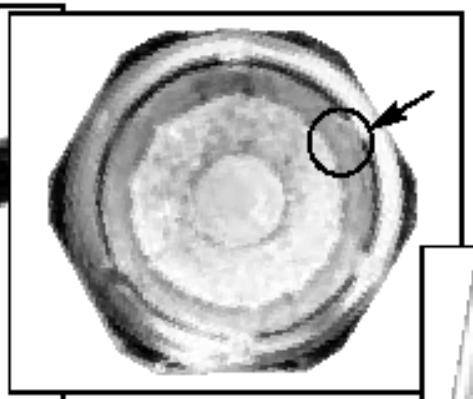
ußenleiter aufweiten, Öffnung prüfen und
etallspäne entfernen.

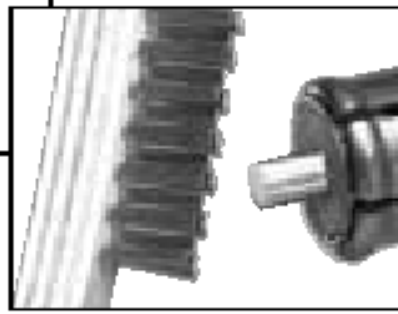
angear o condutor externo, examinar o
ngeamento e remover os detritos.

vasare il conduttore esterno, verificare la
vasatura, eliminare i detriti

張外導體，檢查擴張表面，去除殘餘







NOKIA

HELAIX® Products

7-16 DIN Connectors for LDF4-50A ½" Cable

8

Solder pin, cut off excess solder. Add insulator, O-ring, and grease.

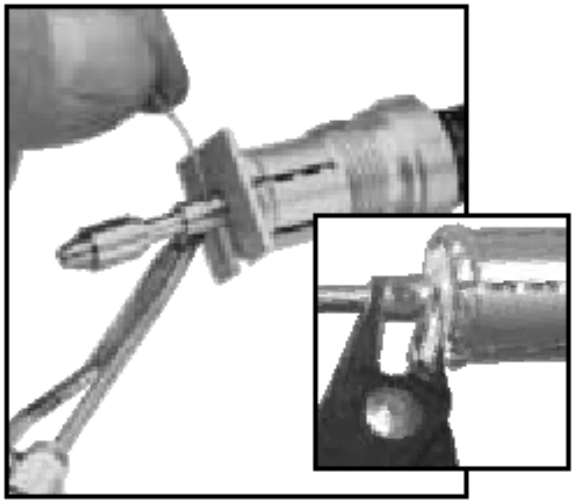
Soldar la clavija, recortar el exceso de material para soldar. Añadir el aislador, la junta tórica y la grasa.

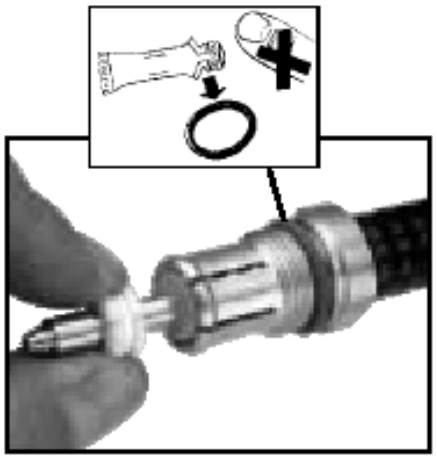
Soudez la broche, coupez l excès de soudure. Mettez en place l'isolant, le joint torique et graissez.

Stift löten, überschüssiges Lötmetall entfernen. Isolator und O-Ring vor Montage einfetten.

Solde o pino, corte o excesso de estanho. Acrescente isolante, anel em O ring e graxa.

焊接銷針，切除多余的焊錫。加絕緣體，，加O型圈和油脂





9

Reassemble connector.

Montar nuevamente el conector.

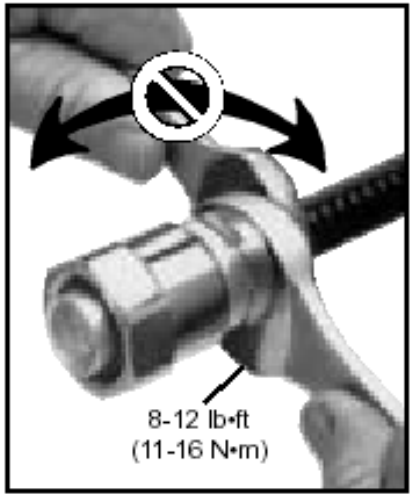
Réassemblez le connecteur.

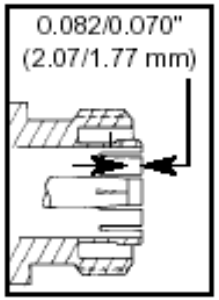
Steckverbindung wieder zusammenbauen.

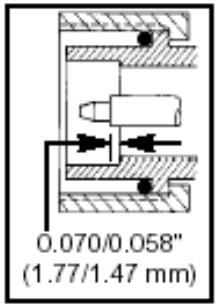
Reinstale o conector.

Rimontare il connettore

重新裝配接頭







10

Coupling torque.

Par de acoplamiento.

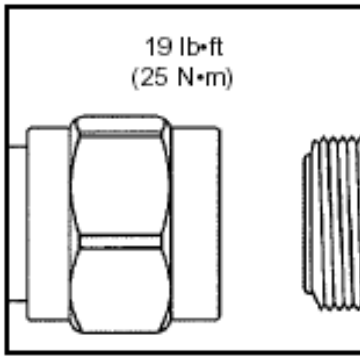
Couple de serrage.

Anschlußdrehmoment.

Torque de conjugação.

Coppia di serraggio

配合扭矩

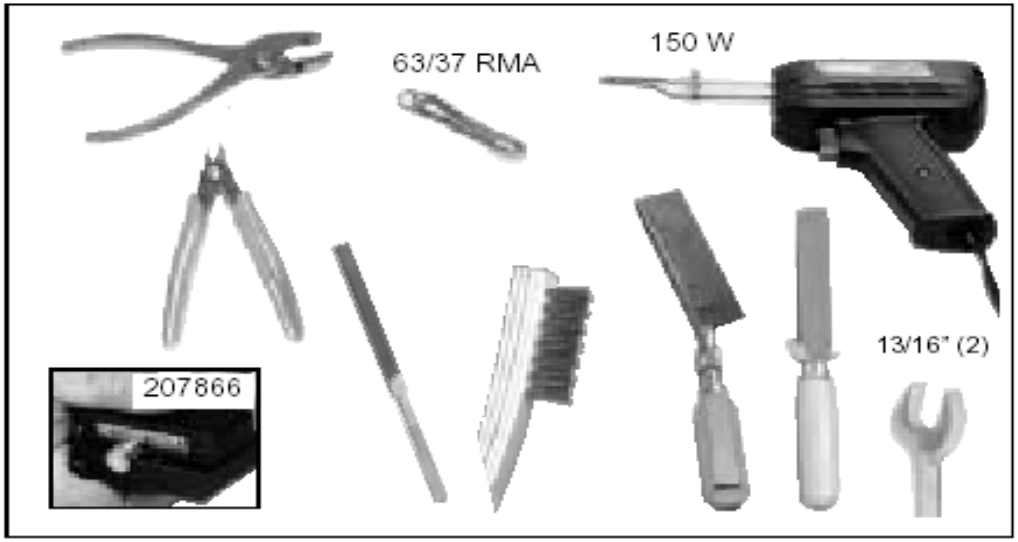


HELAIX® Products

Type N Connectors for LDF4-50A ½" Cable

L4PNF
L4NF
L4PNF-BH
L4PNF-PM

L4PNM
L4PNM-H
L4NM
L4NM-H



FAX-On-Demand: +1-708-873-3614 • North America: 1-800-861-1700

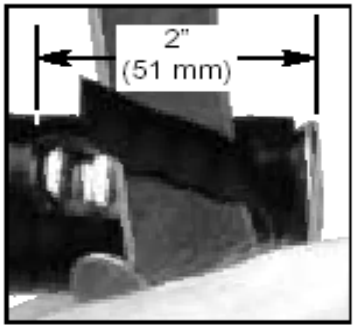
Tips and Techniques (SP50047) available by FAX-On-Demand.
Los consejos prácticos y técnicas (SP50047) pueden solicitarse por fax.

Conseils et techniques (SP50047) disponibles par fax à la demande.
Tips und Anleitungen (SP50047) auf Faxanfrage erhältlich.

Dicas e Técnicas (SP50047) disponíveis via pedido por fax.
提示與方法（SP50047）可以通過電傳獲得

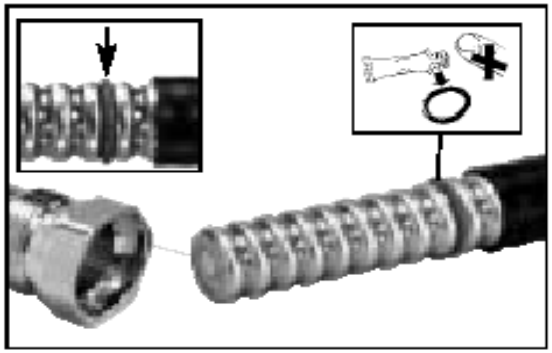
1

Trim cable jacket.
Recortar la envuelta del cable.
Coupez la gaine du câble.
Kabelmantel abziehen.
Retire a capa do cabo.
Rifilare la guaina del cavo.
切整電纜外皮



2

Add O-ring, grease, and clamping nut.
Añadir la junta tórica, la grasa y la tuerca sujetadora.
Mettez en place le joint torique, de la graisse et l'écrou de serrage.
O-Ring und Klemmutter vor Montage einfetten.
Coloque o anel O ring, graxa e a porca de aperto.
Aggiungere l'O-ring, il grasso e il dado di bloccaggio.
加O型圈，油脂和緊固螺母

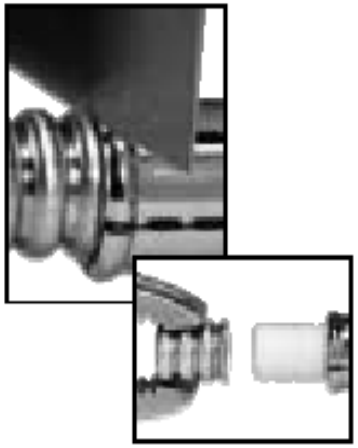


HELAIX® Products

Type N Connectors for LDF4-50A ½" Cable

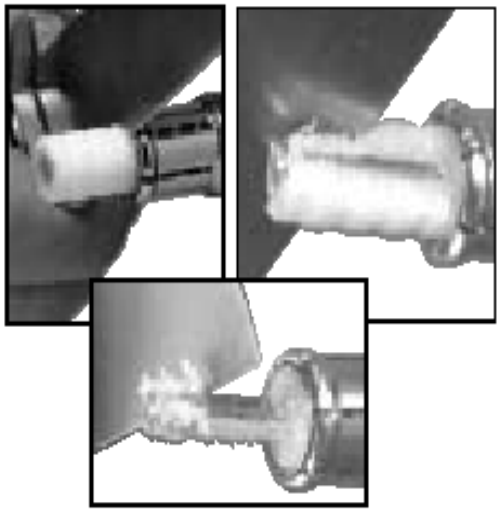
3

Cut outer conductor.
Cortar el conductor externo.
Coupez le conducteur extérieur.
Außenleiter zurückschneiden.
Corte o condutor externo.
Tagliare il conduttore esterno
切外導體



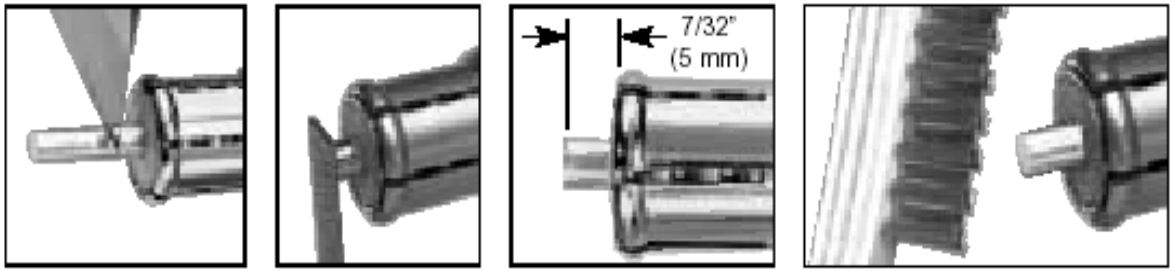
4

Remove foam and adhesive.
Retirar el material de espuma y el adhesivo.
Enlevez la mousse et l'adhésif.
Verschäumung und Klebeband entfernen.
Remova a espuma e o adesivo.
Eliminare la schiuma e l'adesivo
去除泡沫塑料和粘漬劑



5

Trim inner conductor. Remove debris.
Cortar el conductor interno. Retirar los restos.
Coupez le conducteur intérieur. Enlevez les débris.
Innenleiter abschneiden. Metallspäne entfernen.
Limpe o condutor interno. Remova os detritos.
Rifilare il conduttore interno. Eliminare i detriti.
切整內心導體。去除殘渣



HELAIX® Products

Type N Connectors for LDF4-50A ½" Cable

6

Compress foam.

Comprimir el material de espuma.

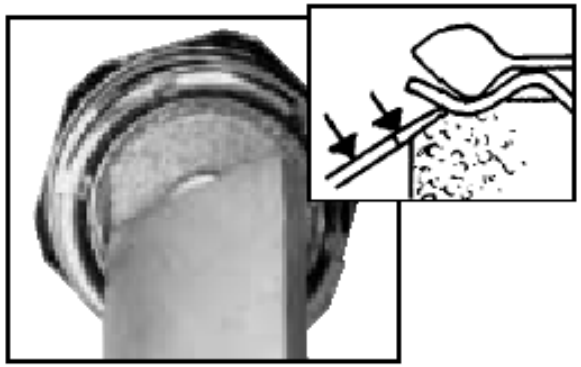
Comprimez la mousse.

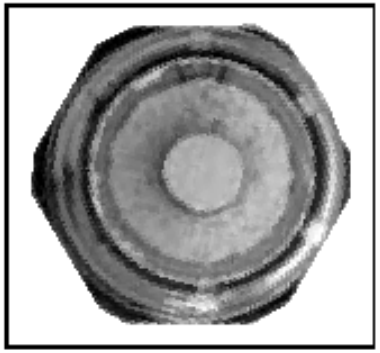
Verschäumung zusammendrücken.

Comprima a espuma.

Comprimere la schiuma.

壓緊泡沫塑料





7

Flare outer conductor, examine flare, remove debris

Acampanar el conductor externo, examinar la forma de campana y retirar los restos.

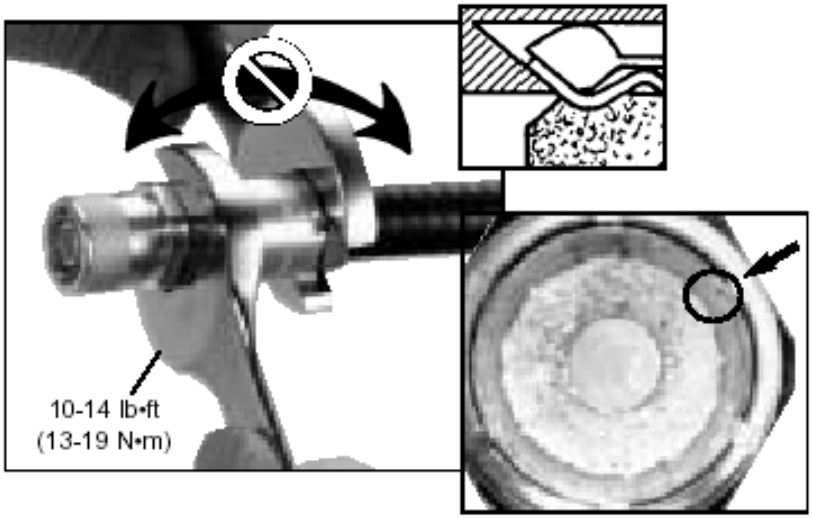
Evasez le conducteur extérieur, examinez l évasement et enlevez les débris.

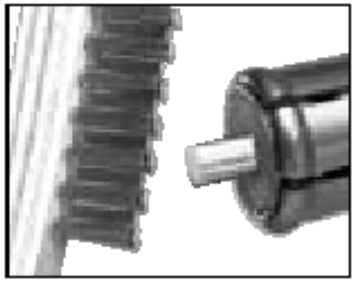
Außenleiter aufweiten, Öffnung prüfen und Metallspäne entfernen.

Flangear o condutor externo, examinar o flangeamento e remover os detritos.

Svasare il conduttore esterno, verificare la svasatura, eliminare i detriti

擴張外導體，檢查擴張表面，去除殘餘





HELAIX® Products

Type N Connectors for LDF4-50A ½" Cable

8

Solder pin, cut off excess solder, and add O-ring and grease.

Soldar la clavija, recortar el exceso de material para soldar, añadir la junta tórica y la grasa.

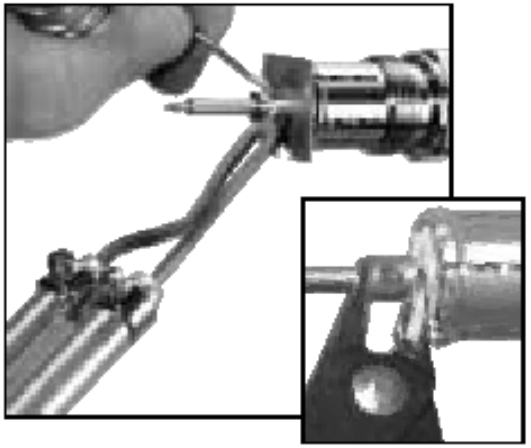
Soudez la broche, coupez l excès de soudure, ajoutez un joint torique et graissez.

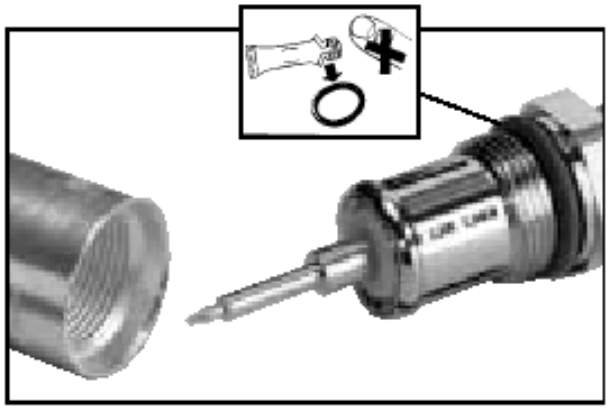
Stift löten, überschüssiges Lötmetall entfernen, O-Ring vor Montage einfetten.

Solde o pino corte o excesso de estanho. Acrescente o anel em O ring e aplique graxa.

Saldare il perno, tagliare la saldatura in eccesso e aggiungere l'O-ring e il grasso.

焊接銷針，切除多余的焊錫，加O型圈和油脂





9

Reassemble connector.

Montar nuevamente el conector.

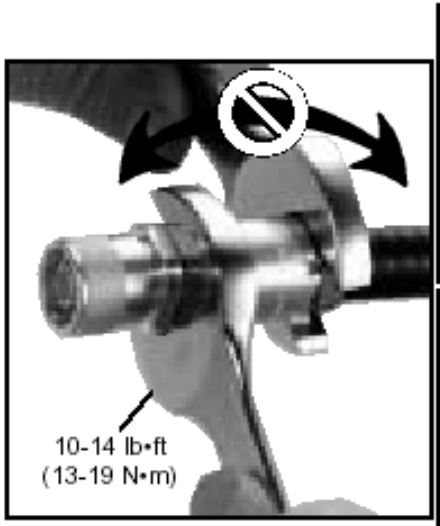
Réassemblez le connecteur.

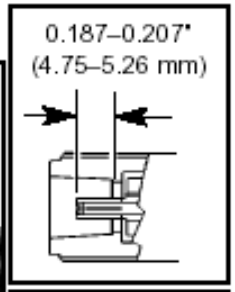
Steckverbindung wieder zusammenbauen.

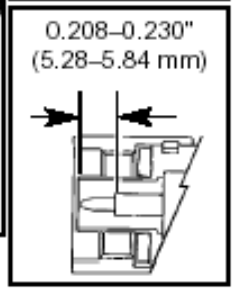
Reinstale o conector.

Rimontare il connettore.

重新裝配接頭







10

Coupling torque.

Par de acoplamiento.

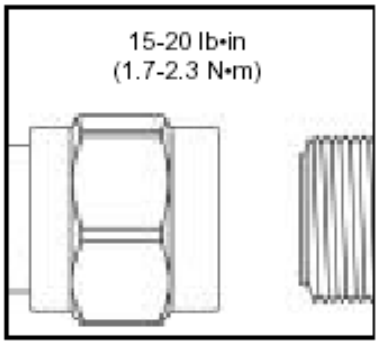
Couple de serrage.

Anschlußdrehmoment.

Torque de conjugação.

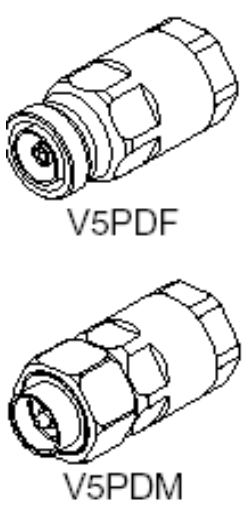
Coppia di serraggio:

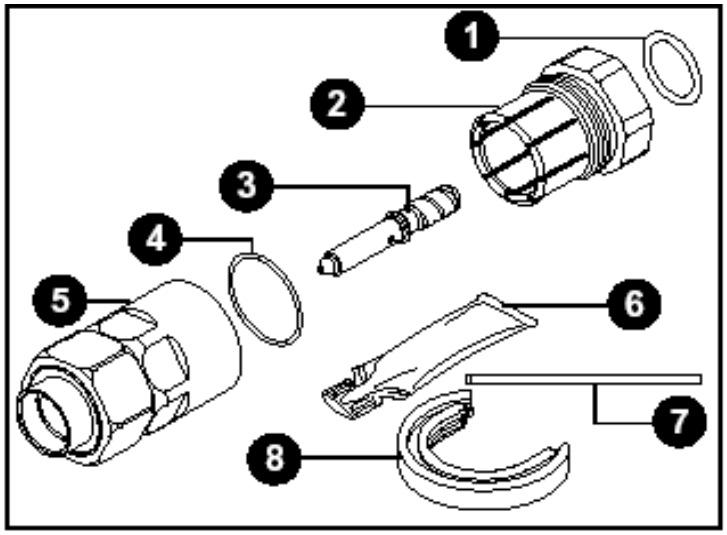
配合扭矩：

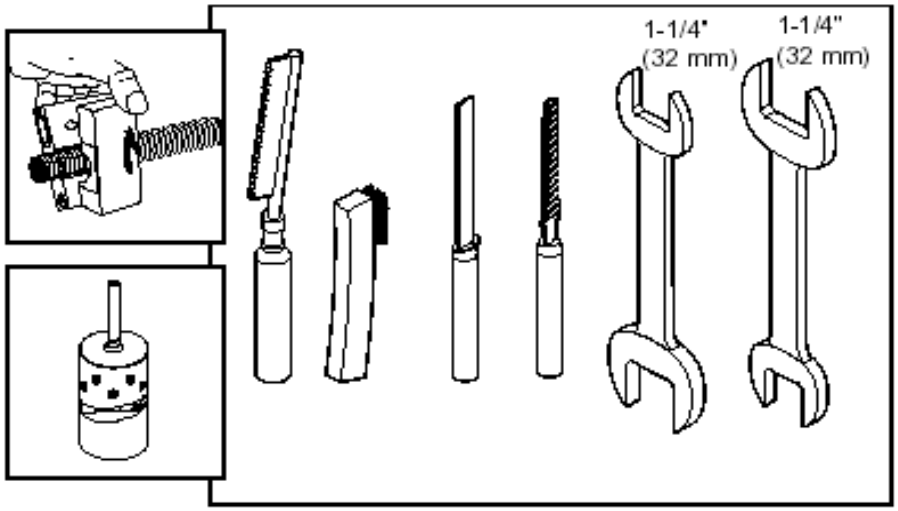


HELAIX® Products

DIN Connectors for VXL5-50 7/8” Cable







FAX-On-Demand: +1-708-873-3614 • North America: 1-800-861-1700.

Tips and Techniques (SP50047) available by FAX-On-Demand.
Los consejos prácticos y técnicas (SP50047) pueden solicitarse por fax.

Conseils et techniques (SP50047) disponibles par fax à la demande.
Tips und Anleitungen (SP50047) auf Faxanfrage erhältlich.

Dicas e Técnicas (SP50047) disponíveis via pedido por fax.
提示與方法（SP50047）可以經由電傳獲得

1

Trim cable jacket.

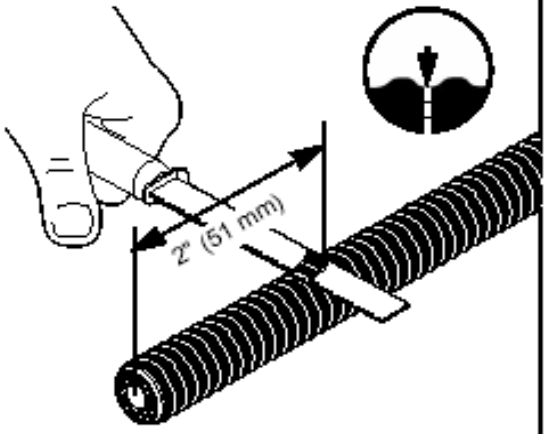
Recortar la envuelta del cable.

Coupez la gaine du câble.

Kabelmantel abziehen.

Retire a capa do cabo.

切整電纜外皮



2

Cut the cable flush with the front of the saw guide using a fine-toothed saw.

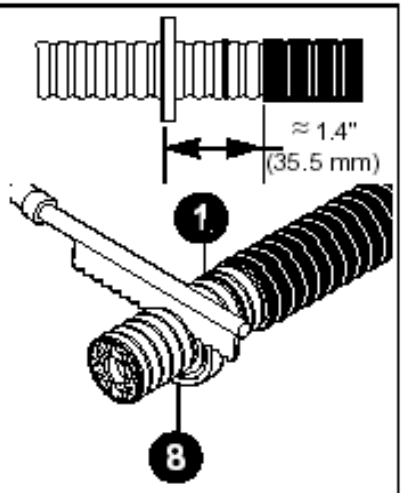
Corte el cable a nivel con la parte frontal de la guía de sierra utilizando una sierra de dientes finos.

Coupez le câble pour l'aligner sur l'avant du guide de la scie à l'aide d'une scie à dents fines.

Das Kabel bündig mit der Vorderseite der Sägeführung abschneiden, dazu eine Säge mit feiner Zahnung verwenden.

Corte o cabo com a parte da frente do guia de serra usando uma serra de dentes finos.

使用細齒鋸條切割電纜，切割時務必使其與鋸導的前端平齊。



HELAIX® Products

DIN Connectors for VXL5-50 7/8” Cable

3

Add O-ring, grease, and clamping nut.

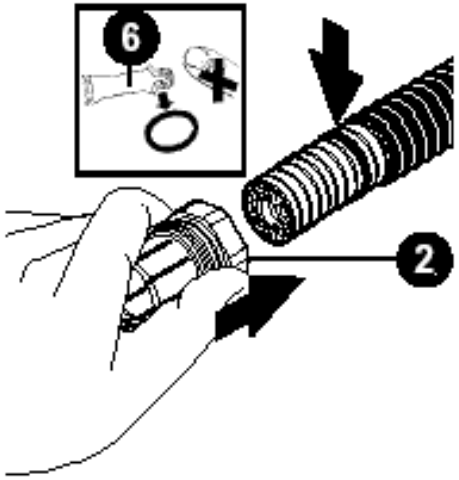
Añadir la junta tórica, la grasa y la tuerca sujetadora.

Mettez en place le joint torique, de la graisse et l'écrou de serrage.

O-Ring und Klemmutter vor Montage einfetten.

Coloque o anel O ring, graxa e a porca de aperto.

加O型圈，油脂和緊固螺母



4

Remove debris.

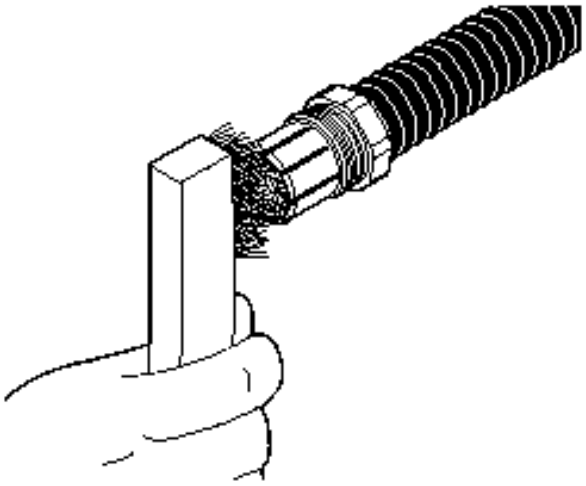
Retirar los restos.

Enlevez les débris.

Metallspäne entfernen.

Remova os detritos.

去除殘渣



5

Compress foam.

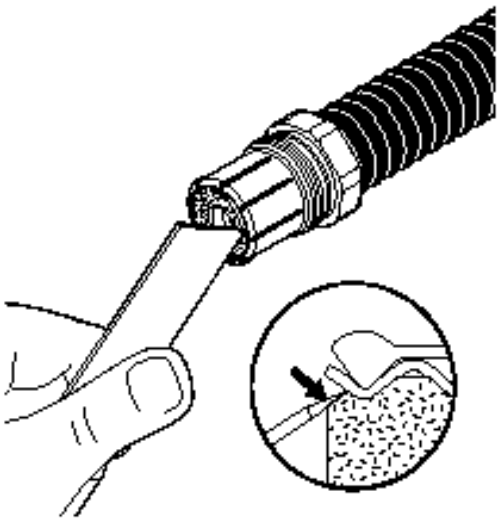
Comprimir el material de espuma.

Comprimez la mousse.

Verschäumung zusammendrücken.

Comprima a espuma.

壓緊泡沫塑料



6

Flare outer conductor and examine flare.

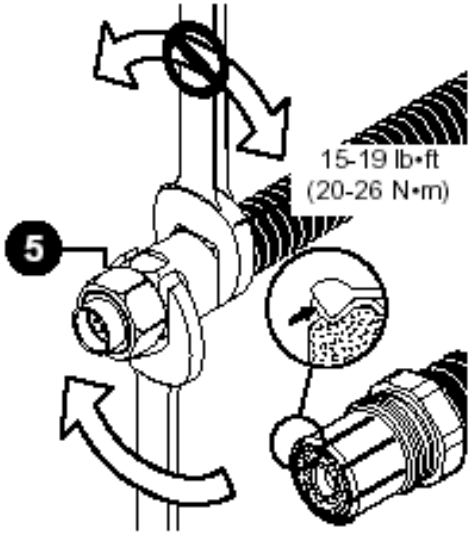
Acampanar el conductor externo y examinar la forma de campana.

Evasez le conducteur extérieur et examinez l évasement.

Außenleiter aufweiten und Öffnung prüfen.

Flangear o condutor externo e examinar o flangeamento.

擴張外導體並檢查擴張表面



HELAIX® Products

DIN Connectors for VXL5-50 7/8” Cable

7

Screw in connector pin

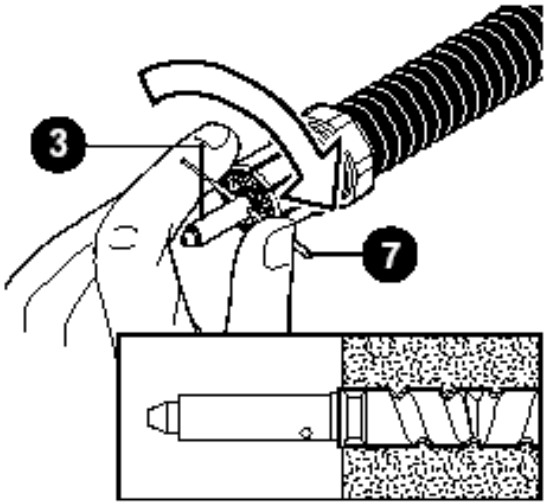
Añadir el obturador roscado.

Mettez en place le joint d étanchéité fileté.

Gewindering und Klemmutter.

Parafuse o pino do conector.

將接頭銷針擰入



8

Add O-ring and grease

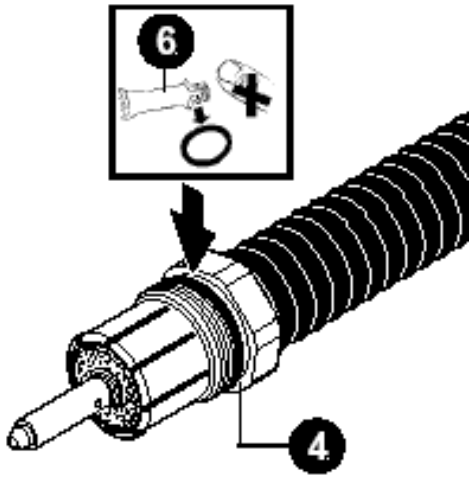
Añadir la junta tórica y grasa.

Mettez en place le joint torique et graissez.

O-Ring vor Montage einfetten.

Coloque o anel em O ring e graxa.

加O型圈和油脂



9

Reassemble connector.

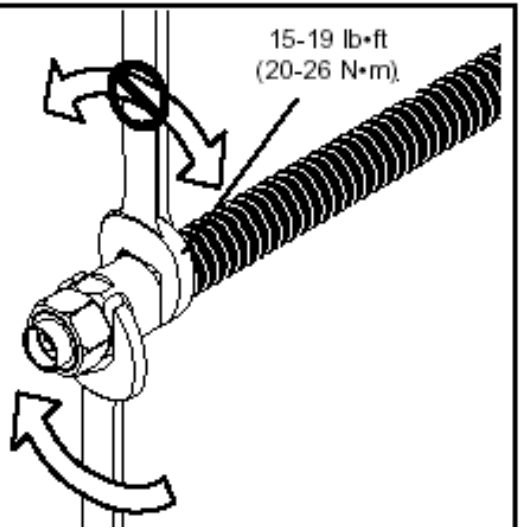
Montar nuevamente el conector.

Réassemblez le connecteur.

Steckverbindung wieder zusammenbauen.

Reinstale o conector.

重新裝配接頭



10

Coupling torque.

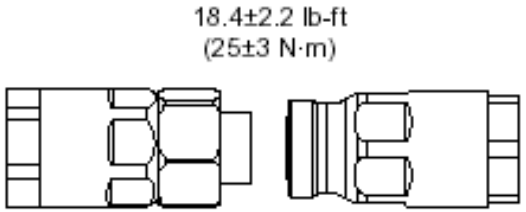
Par de acoplamiento.

Couple de serrage.

Anschlußdrehmoment.

Torque de conjugação.

配合扭矩



NOKIA

HELAIX® Products

Surge Arrestor Installation

Description

These surge arrestors are designed to protect equipment from damaging transients induced by lightning strikes and allow the capability to pass DC current to your TMA or GPS equipment.

Installation

The arrestor is a *bidirectional* RF device. Thus either RF port may be connected to the equipment side or the antenna side of the transmission line interface to provide equivalent protection. Do not leave the APTDC Surge Arrestor RF ports exposed in outdoor applications.

The Bulkhead grounding option is accomplished through the surge arrestor body at the point of attachment to the bulkhead. The standard mounting option is accomplished through the surge arrestor body at the point of attachment through the threaded rod. Both options must be attached to a master ground bar or the systems earth ground ring to ensure a low impedance path to ground. During installation, all grounding contact surfaces must be clean, dry, and free of oxidation.

HELAIX® Products

Surge Arrestor Installation

Microwave Performance Testing

These surge arrestors can be readily tested for microwave performance using any network analyzer. VSWR (return loss) and insertion loss are specified for the operating bandwidth only. Fault location testing can be performed through the arrestor with the appropriate test equipment; that is, a vector network analyzer with time domain capability. Some test equipment manufacturers refer to this type of fault location testing as Frequency Domain Reflectometry (FDR).

Notice

The installation, maintenance, or removal of antenna systems requires qualified, experienced personnel. Andrew installation instructions are written for such personnel. Antenna systems should be inspected once a year by qualified personnel to verify proper installation, maintenance, and condition of equipment.

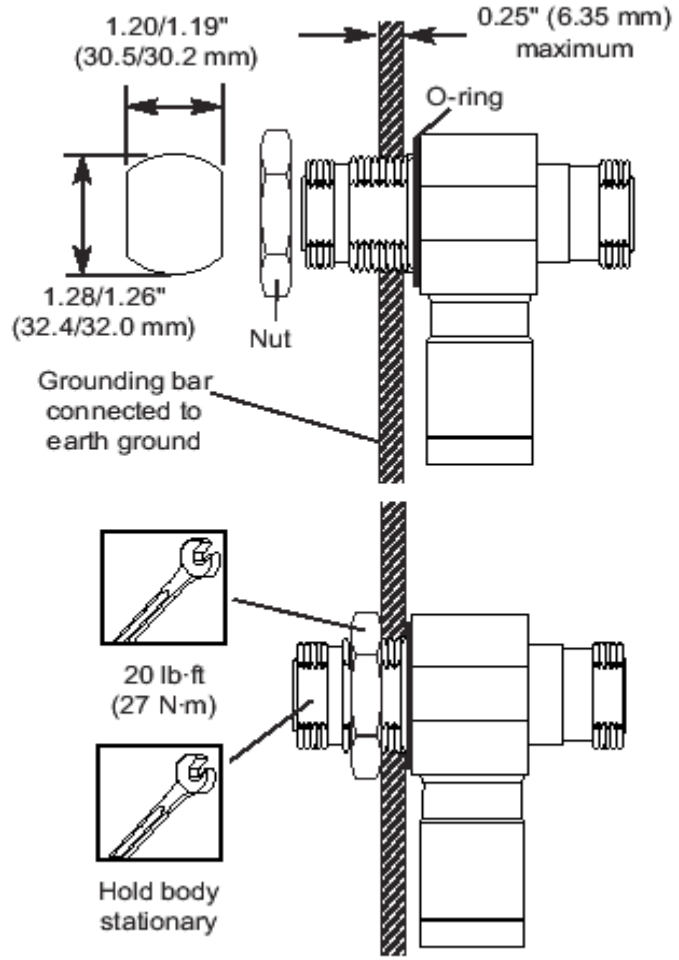
Andrew disclaims any liability or responsibility for the results of improper or unsafe installation practices.

HELAIX® Products

Surge Arrestor Installation

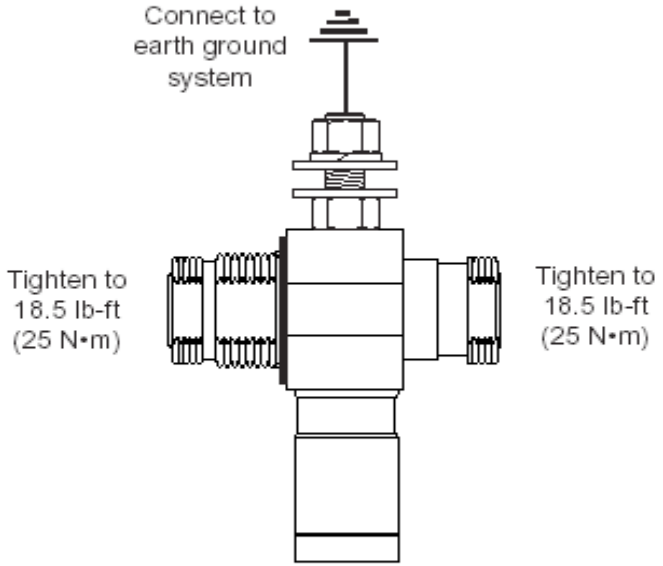
(All interfaces shown are 7-16 DIN Female)

Bulkhead Mounting Option



Note: For Type N Bulkheads, the mounting torque should be 70 lb-in (7.9 N-m)

Standard Mounting Option



Note: For Type N interfaces, the mating torque spec is 15 lb-in (1.7 N-m)

DDF CABLING

DDF CABLING EXAMPLE

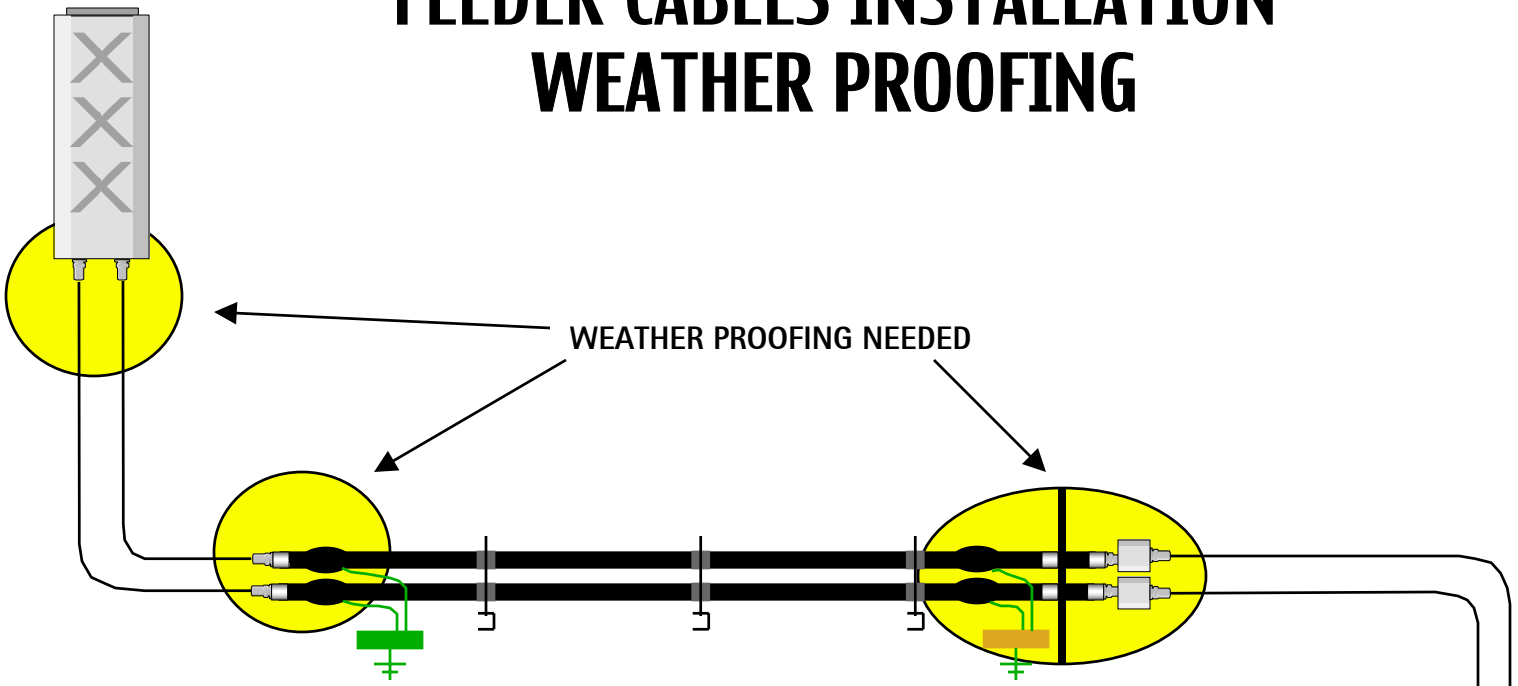
- Examples of cable installation:

NO

YES

WATERPROOFING

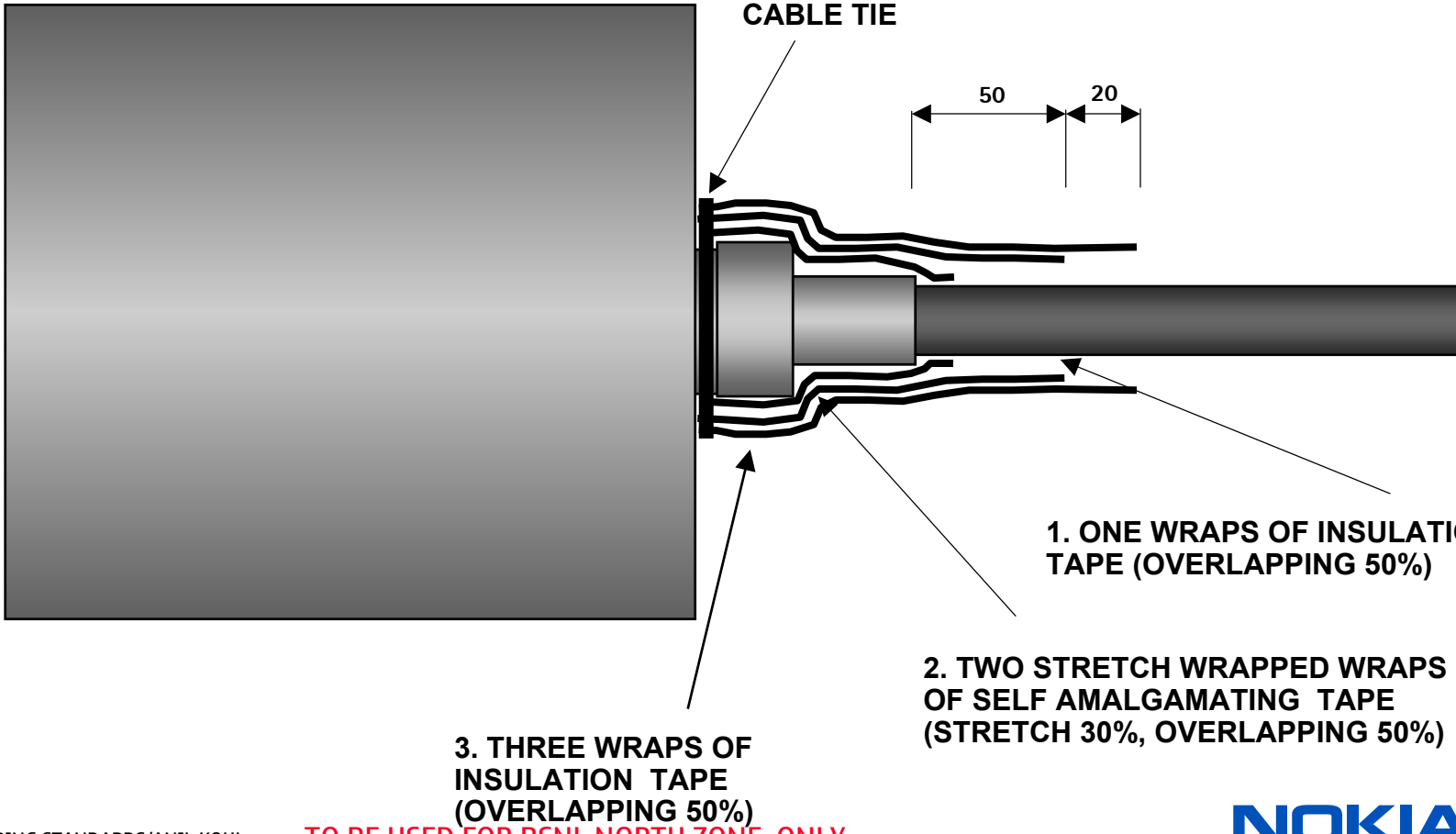
FEEDER CABLES INSTALLATION
WEATHER PROOFING



- All ourdoor antenna line connections, grounding kits and wall entries have to be weather proofed.
- Connections where weather proofing is needed:
  - Feeder to feeder
  - Feeder to antenna
  - Feeder to EMP (if located outdoor)
- Grounding kits have to be sealed according to manufacturer instructions.
- Wall feed through have to be properly sealed.
- Ensure that all connectors are on correct torque before sealing!

FEEDER CABLES INSTALLATION
CONNECTION RF FEEDER TO ANTENNA, COMBINER OR MHA

- 1. CONNECTION TO BE TAPED USING APPROVED TYPE OF INSULATION TAPE
- 2. CONNECTION TO BE TAPED USING APPROVED TYPE OF SELF AMALGAMATING TAPE
- 3. CONNECTION TO BE TAPED USING APPROVED TYPE OF INSULATION TAPE

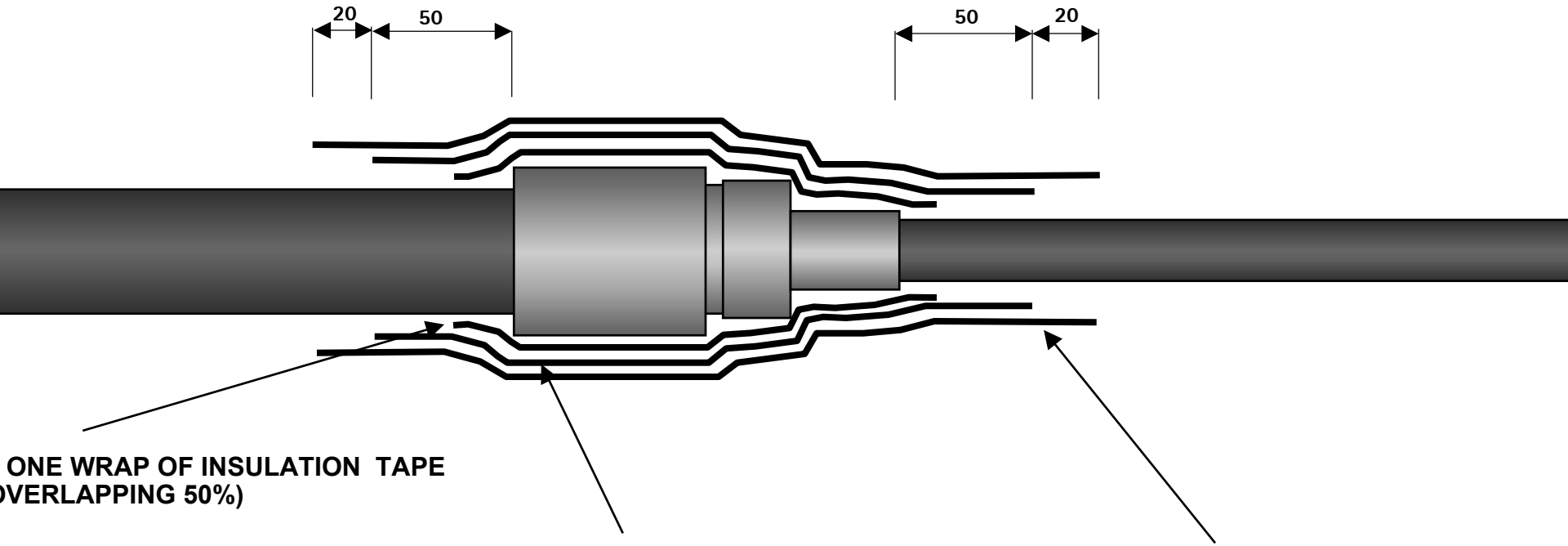


TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

FEEDER CABLES INSTALLATION
CONNECTION BETWEEN RF FEEDERS AND JUMPER

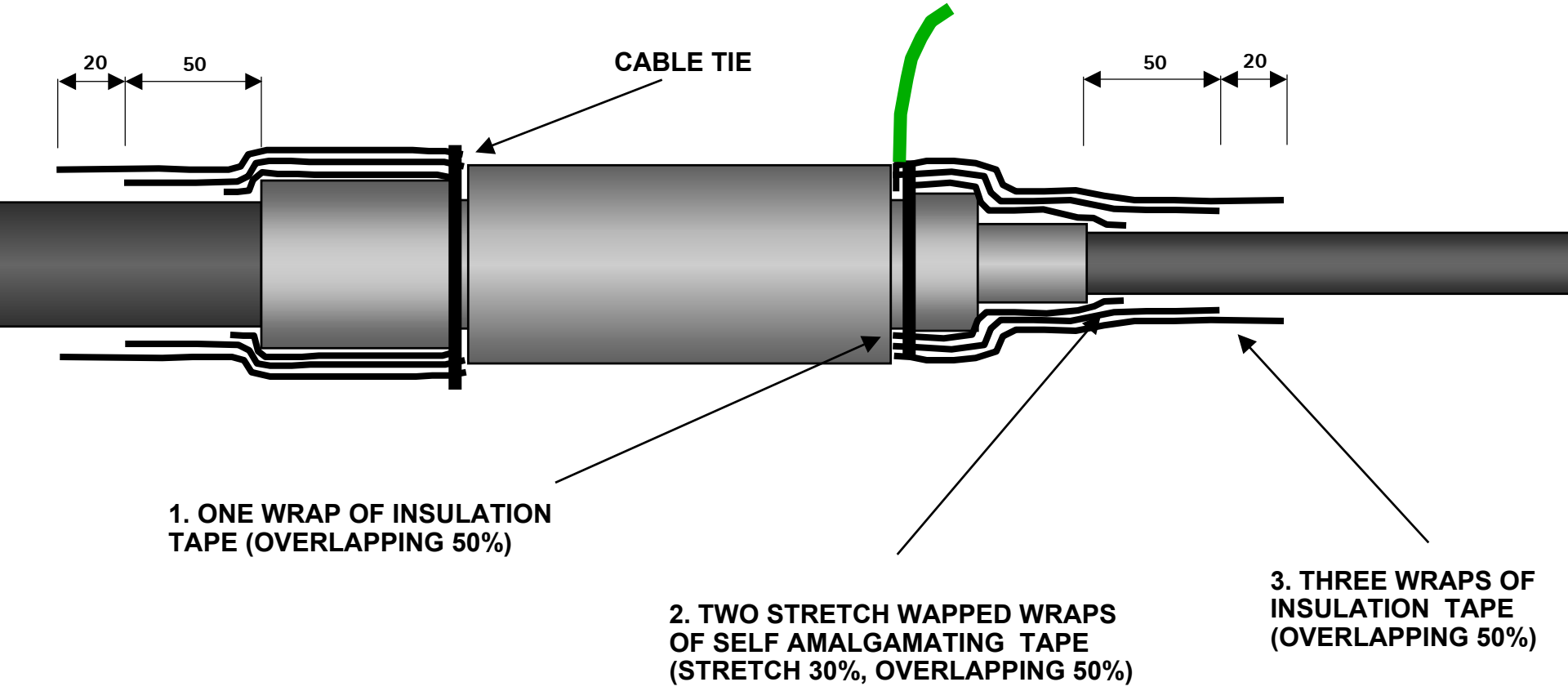
- 1. CONNECTION TO BE TAPED USING APPROVED TYPE OF INSULATION TAPE
- 2. CONNECTION TO BE TAPED USING APPROVED TYPE OF SELF AMALGAMATING TAPE
- 3. CONNECTION TO BE TAPED USING APPROVED TYPE OF INSULATION TAPE



TO BE USED FOR BSNL NORTH ZONE ONLY
NOKIA

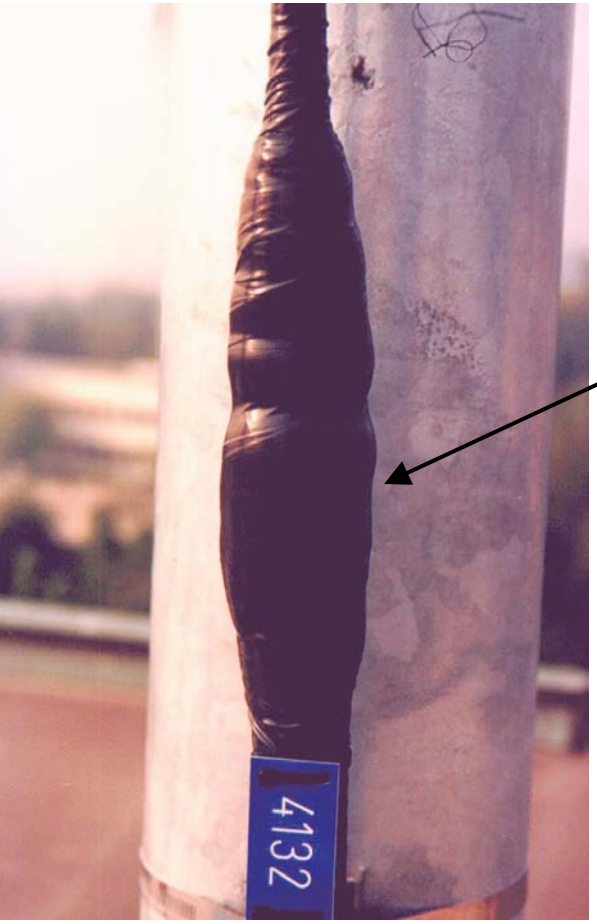
FEEDER CABLES INSTALLATION
CONNECTION BETWEEN RF FEEDER TO EMP(OUTDOOR)

- 1. CONNECTION TO BE TAPED USING APPROVED TYPE OF INSULATION TAPE
- 2. CONNECTION TO BE TAPED USING APPROVED TYPE OF SELF AMALGAMATING TAPE
- 3. CONNECTION TO BE TAPED USING APPROVED TYPE OF INSULATION TAPE



  SITE ENGINEERING STANDARDS/ANIL KOUL TO BE USED FOR BSNL NORTH ZONE ONLY

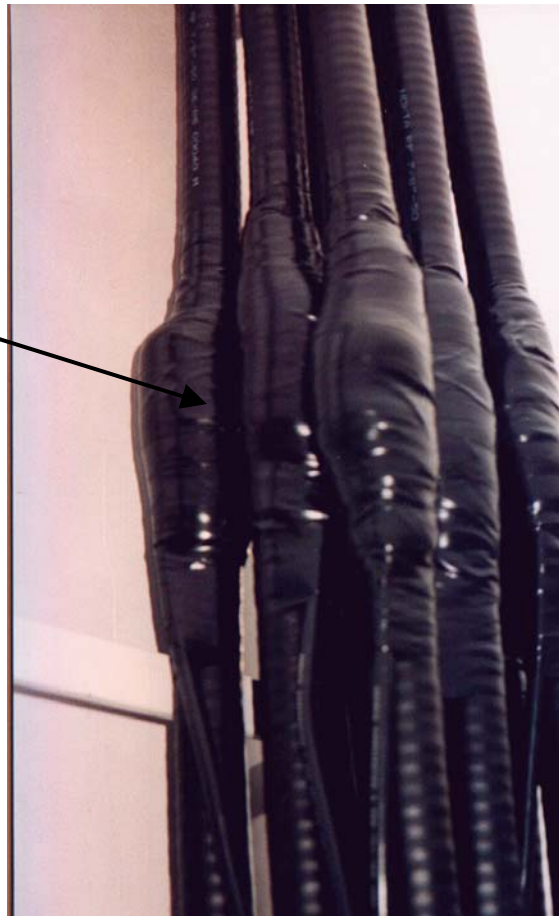
Waterproofed Connector.



-CONNECTION TO BE TAPED USING VINYL ELECTRIC TAPE

-CONNECTION TO BE SEALED USING RUBBER SPLICING TAPE

-CONNECTION TO BE TAPED USING VINYL ELECTRIC TAPE



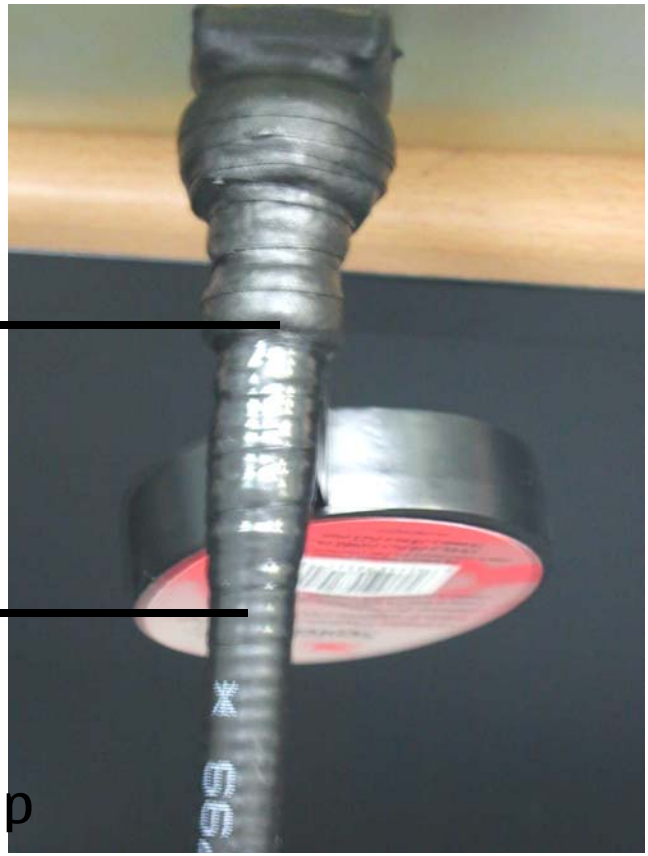
TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

Proper taping of jumper

- Apply two rounds of self amalgamating tape, taping will end to top

Tape on feeder 50mm



- Start insulation round from down and apply three round of tape, so taping will end to the top

Proper taping of jumper

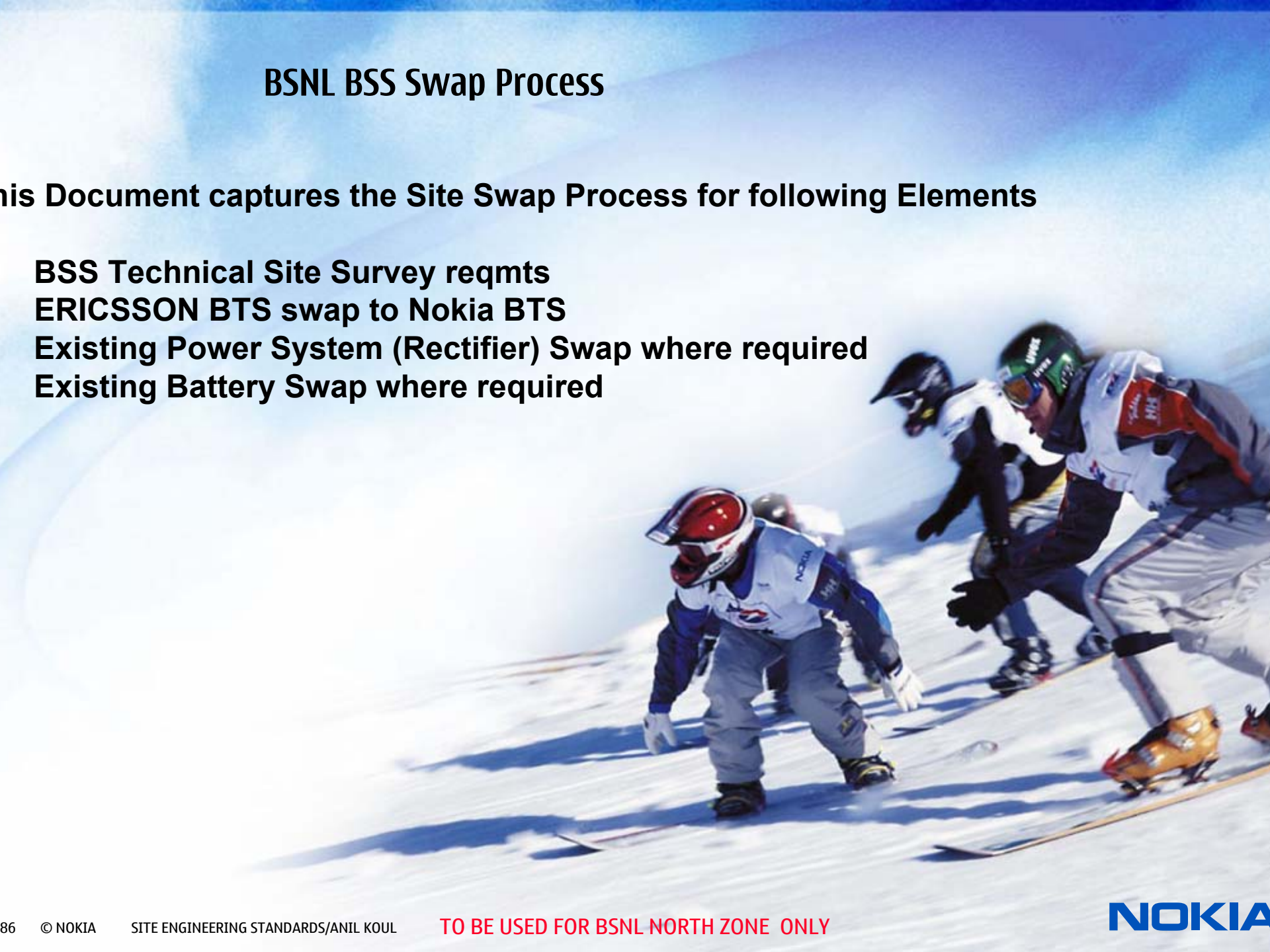
- Finally secure tape ending with cable tie to prevent tape loosening and applying better waterproofing to jumper connector and antenna connection point

SWAP PROCESS

BSNL BSS Swap Process

his Document captures the Site Swap Process for following Elements

- **BSS Technical Site Survey reqmts**
- **ERICSSON BTS swap to Nokia BTS**
- **Existing Power System (Rectifier) Swap where required**
- **Existing Battery Swap where required**



TSS : ERICSSON BSS to Nokia BSS Swap Process

- BSNL Network is 120ohm NW and has Krone DDF for BTS/MW/Ext_Alm patching.
  - ++ This means ONLY cross-connect patching during change over.
- Installation of the Nokia BTS in the existing site.
  - Technical Site Survey (TSS):
    - Feasibility of installing Nokia Eqpt/DDF with existing eqpt
    - Site wise ref. Drawings are available indicating positioning details.
    - Reqmt for Laying of Extra Feeders cables if Required. (Out door work)
      - E.g. for sites requiring Sector additions or Feeder replacements
    - Check availability or Installtion of new MCB(s) in the existing Power System for Nokia BTS (and access radios as reqd).
      - MCB ratings reqd: Nokia BTS 1*80A, Nokia MW Radio 1*6 A, Nokia Metrohub 1x16A, Nokia BSC 2x63A
    - Check availability or Installtion of new Rect Module in the existing Power System for Nokia BTS/BSC (and access radios as reqd).
      - Power Consumption of Nokia BTS222 1413W, BTS444 2736W, MWR 70W, BSC 1800W
    - Feeder VSWR Meas and BTS Top Power Meas
  - TSS Outputs
    - Site layouts (existing+co-location+post_swap)
    - VSWR/BTS_Top_Pwr Readings – any conserns/feedback
    - Site BoQ fo BTS/Rectifier/MCBs/MW/Batt/BSC as reqd

TSS : ERICSSON BSS to Nokia BSS Swap Process
RETURN LOSS VS VSWR

RETURN LOSS (dB)	VSWR
46.064	1.01
40.086	1.02
36.607	1.03
34.151	1.04
32.256	1.05
30.714	1.06
29.417	1.07
28.299	1.08
27.318	1.09
26.444	1.10
25.658	1.11
24.943	1.12
24.289	1.13
23.686	1.14
23.127	1.15
22.607	1.16
22.120	1.17
21.664	1.18
21.234	1.19
20.828	1.20
20.443	1.21
20.079	1.22
19.732	1.23
19.401	1.24
19.085	1.25
18.783	1.26
18.493	1.27
18.216	1.28
17.949	1.29
17.690	1.30

RETURN LOSS (dB)	VSWR
17.445	1.31
17.207	1.32
16.977	1.33
16.755	1.34
16.540	1.35
16.332	1.36
16.131	1.37
15.936	1.38
15.747	1.39
15.563	1.40
15.385	1.41
15.211	1.42
15.043	1.43
14.879	1.44
14.719	1.45
14.564	1.46
14.412	1.47
13.842	1.51
13.708	1.52
13.577	1.53
13.449	1.54
13.324	1.55
13.201	1.56
13.081	1.57
12.964	1.58
12.849	1.59
12.736	1.60
12.625	1.61
12.518	1.62
12.412	1.63
12.308	1.64
12.207	1.65
12.107	1.66
12.009	1.67
11.913	1.68

RETURN LOSS (dB)	VSWR
11.818	1.69
11.725	1.70
11.634	1.71
11.545	1.72
11.457	1.73
11.370	1.74
11.285	1.75
11.202	1.76
11.120	1.77
11.039	1.78
10.960	1.79
10.881	1.80

VSWR SHOULD BE LESS THAN 1.2(ONLY FEEDER LINE WITHOUT ANTENNA

IF IT IS MORE THAN 1.2 ,THEN THE CORRECTIVE ACTION SHOULD BE TAKEN.

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ERICSSON BTS to Nokia BTS Swap Timelines
* for SWAP night *

It is assumed that the Nokia BTS is Installed and stand alone commissioned before the swap night

Where ERICSSON BTS is protected in loop, the Nokia BTS is integrated on the redundant path to Nokia BSC

Times Lines for SWAP night

• Nokia team arrives at site	2000 hrs
• Nokia cutover preparation	2000 – 0100 hrs
• VSWR and BTS Top Pwr Meas for ERICSSON BTS	0100 – 0130 hrs
• Cut-over to Nokia BTS	0130 – 0330 hrs
• Drive Test verification and confirmation of swap	0330 – 0500 hrs
• Revert to ERICSSON BTS in case of Drive test failure	0500 – 0600 hrs

The above timelines has to be checked with BSNL

ERICSSON BTS SITES

ERICSSON BTS on site works both on +24V and –48V DC

If the EXISTING BTS works on +24V then batteries and power plant will also be swapped with the BTS.

If the ERICSSON BTS on site work on –48V DC,then existing power plant and batteries will be used with NOKIA BTS.

ERICSSON BTS to Nokia BTS Swap Process

Nokia BTS Standalone commissioning.

- Power for Nokia BTS to be tapped from existing power system.
- External alarms to be configured and EA cable to be connected to the BTS on final intgn.
- If the existing BTS has loop protection - use the redundant direction to bring up the Nokia BTS.

Change over to Nokia BTS –Requires "OUTAGE" (~ 2 Hrs Max) between 01.30am and 3.30am.

- Steps 1 - Connecting Feeder cables
- Step 2- Connecting A-bis Cable from Dir-1/2 or from Both
- Step 3- Integration from BSC. Observe the system.

ERICSSON BTS Removal:

- During Site survey, it needs to ensured that old BTS can be taken out while Nokia BTS is installed in temp position ELSE
- Old BTS to be removed when Nokia BTS is getting located to final position. (site specific)
- At some specific sites, relocating Nokia BTS to the " Final Position " - May Require "OUTAGE" (~ 2 Hrs Max). For this:
  - Lock Nokia BTS > Move BTS wilh all Cables to final position (feeder+Pwr+Abis) > Unlock Nokia BTS

ERICSSON BTS to Nokia BTS Swap Process

Step 1: 0100-0130am : Changing feeder cables .

- Identify the feeders which will be connected to Nokia BTS
- Remove the jumper connected to the existing BTS
- BTS Top power meas per TRx
  - this could be done during site survey – requires outage / TRx (5-10min /Feeder/TRx)
- Feeder VSWR testing (DTF parameters to be chkd, Ret Loss Meas)
  - this could be done during site survey – requires outage (5-10min per feeder)
- Connect Jumper cable to the Nokia BTS Top
  - Site specific jumpers to be made depending on the site/survey
- Temp/final routing of feeder cables

ERICSSON BTS to Nokia BTS Swap Process

Step 2- Connecting A-bis cable

- Make one or two jumpers (BTS FXC-E1 TQ to DDF). Length is site specific.
- Check the Cellular Transmission E1 Port(s) for Dir-1/Dir-2 for the BTS patching.
  - If the existing ERICSSON BTS is in loop, move/patch the redundant path to Nokia BTS Dir-1
  - Move the Dir-2 path after the site is On-Air and accepted by RF drive test team.
  - Check for loop protection.

Step3 - integration from BSC.

- Nokia BTS to be unlocked from the BSC
- Observe the site during the day

Power System Swap Process
where required

- If the EXISTING BTS works on +24V then batteries and power plant will also be swapped with the BTS
- Requires OUTAGE (Typical outage : 10-12 Hrs max)
  - To avoid any " OUTAGE " , Generator Set is required at the site , so that DC Power is always available.
  - Installation of new power
    - Install the system and lay the AC input and DC load cables
    - Power-ON and commission the the new Rectifier System
    - Terminate DC load cables from the new Rectifier system to the Network Elements
  - Put the Generator on and remove the existing power plant

- The existing power plant and batteries with the relocated with ERICSSON BTS

Battery Swap Process
where required

- New batteries to be installed after removing existing batteries.
  - To avoid any " OUTAGE " , Generator Set is required at the site , so that DC Power is always available
  - Check whether old cable can be used with the new bank or not. Chk the cable termination lugs to ensure connection
  - Make GENSET ON and run the power system on GenSet
  - Remove the old batteries
  - Install the new batteries
  - Connect the new batteries to the new power system
  - Charge the batteries as per recommendations from battery manufacturer

ATTENUATION AND BENDING RADIUS

FEEDER BENDING/PULLING FORCE

FEEDER TYPE	BENDING RADIUS(mm)	
	Single	Repeated
3/8" superflex	13	25
1/2" superflex	15	30
1/2" feeder	80	160
7/8" feeder	120	250
1-1/4" feeder	200	350
1-5/8" feeder	250	500

FEEDER TYPE	MAX PULLING FORCE(N)
3/8" superflex	400
1/2" superflex	500
1/2" feeder	1100
7/8" feeder	1800
1-1/4" feeder	2500
1-5/8" feeder	3000

TO BE USED FOR BSNL NORTH ZONE ONLY

ANDREW FEEDER ATTENUATION TABLE

onnector losses (according to Andrew formula: 0.05*sqrt(F/GHz)

		900 MHz		1800 MHz	2200 MHz
		0.05		**0.07**	**0.075**
connector	**A/dB**				
connectors	**A/db**	0.10		0.14	0.15
umper (1.5m)	**A/dB**	0.266		0.389	0.429
umpers	**A/dB**	0.532		0.778	0.858
MP Loss		0.1		0.1	0.1

otal connector+jumper loss+emp	**900 MHz**	**1800 MHz**	**2200 MHz**	
	0.632	0.00	0.878	0.958

Feeder attenuation dB/100 m typical

	1/2"	**7/8" flexA**	**7/8"**	**1 -1/4"**	**1 5/8"**	
4 MHz	6.85	4.19	3.87	2.76	2.28	
00 MHz	10.10	6.21	5.75	4.16	3.59	
00 MHz	11.20	6.97	6.46	4.69	3.93	

with 1/2" feeder jumpers at emp end will be used
with other feeder 2 jumpers will be used

Total attenuation in the antenna line

Feeder length	900	
	1/2"	7/8"
0	0.1	0.6
10	0.8	1.0
20	1.5	1.4
30	2.2	1.8
40	2.8	2.2
50	3.5	2.6
60	4.2	3.0
70	4.9	3.3
80	5.6	3.7
90	6.3	4.1
100	7.0	4.5
110	7.6	4.9
120	8.3	5.3
130	9.0	5.7
140	9.7	6.1
150	10.4	6.4

TO BE USED FOR BSNL NORTH ZONE ONLY
NOKIA

NK FEEDER ATTENUATION TABLE

onnector losses

	900 MHz		1800 MHz	2200 MHz
	0.9		1.8	2.2
connector A/dB	0.05		0.05	0.05
connectors A/dB	0.10		0.10	0.10
jumper (1.5 A/dB	0.2		0.27	0.3
jumpers A/dB	0.4		0.54	0.6
mp loss A/dB	0.1		0.1	0.1

otal connector+jumper loss+emp	900 MHz		1800 MHz	2200 MHz
	0.60		0.74	0.80

Feeder attenuation dB/100 m typical

	RF1/2"		RF7/8"	RF1 -1/4"	RF1 5/8"	
00 MHz	6.88		3.74	2.7	2.23	
800 MHz	10.1		5.51	4.03	3.4	
200 MHz	11.3		6.18	4.54	3.85	

vith 1/2" feeder jumpers at emp end will be used
vith other feeder 2 jumpers will be used

Total attenuation in the antenna line

	900	
Feeder length	RF1/2"	RF7/8"
0	0.20	0.6
10	0.89	0.9
20	1.58	1.3
30	2.26	1.7
40	2.95	2.1
50	3.64	2.4
60	4.33	2.8
70	5.02	3.2
80	5.70	3.5
90	6.39	3.9
100	7.08	4.3
110	7.77	4.7
120	8.46	5.0
130	9.14	5.4
140	9.83	5.8
150	10.52	6.2

MATERIALS

NON BSNL SITE

INDOOR ULTRASITE

NEW SITE 444 ULTRA INDOOR (3 PHASE)IN SHELTER

MATERIAL TYPE	QTY	UNIT	REMARKS
g bolt(M10 ,2.5 inch length with washer) galvanized	12	PCS	4 bolts for power system,4 FOR BTS,2 for busbar
on Washer	12	PCS	4 for power system,4 FOR BTS ,4 FOR DDF
mm2 Copper Grounding Cable y/g	50	M	20 for power system(10 for +ve gnd and 10 for body gnd),10 M FOR 1 BATTERY STRING AND LOOP TO 2 STRING 10M FOR BTS,10 M FOR DDF BOX
mm2 Lug 10 mm hole	15	PCS	4 for power system,4 FOR 2 BATTERY RACK,2 FOR BTS,2 FOR DDF BOX
ble tie 2,5*100 black (100 pcs)	1	PCS	
ble tie 4,8*200 black (100 pcs)	1	PCS	
ble tie 7,6*380 black (100 pcs)	1	PCS	
10 mm 2 installation cable	10	M	AC cable from ACDB to RECT
mm2 Lug 10 mm hole	4	PCS	FOR AC CABLE
*0,4 installation cable(FOR RECT ALARM)	10	M	RECT ALARM CABLE
mm2 Copper Black Installation Cable	20	M	10 M FOR 1 BATTERY STRINGS AND 10M FOR BTS DC POWER (+VE)
mm2 Copper Blue Installation Cable	20	M	10M FOR 1 BATTERY STRINGS AND 10M FOR BTS DC POWER (-VE)
mm2 Lug 10 mm hole	7	PCS	3 FOR 1 BATTERY STRING AND 1 FOR DC CABLE
ood screw no. 6 x 40 (60 Nos)	1	PKT	
bon-Cable Clamp rail white	10	PCS	for routing of cable propery
w terminal, 4.28mm	100	PCS	to be fixed in ribbon
ll prop no. 6 x 37mm - 60 Nos.	1	PKT	
gen Indoor Lable Set	1	PCS	
ulation tape 15mm x 10 m Black	2	PCS	
ulation tape 15mm x 10m Yellow	1	PCS	
ulation tape 15mm x 10m Blue	1	PCS	
ulation tape 15mm x 10m Red	1	PCS	
rm cable,3rd BTS,10 m 20 PAIR CABLE	1	PCS	ALARM CABLE
7 Pin Connector	1	PCS	ALARM CABLE CONNECTOR
-A-50 with back mount frame with lock	1	PCS	BOX TO PUT MAX 5 MODULES
connection EARTH MODULE 2/10 RED Module	1	PCS	MODULES TO TERMINATE GROUND
connection MODULE 2/10 Module ,marking 1--------0	3	PCS	MODULES TO PUT EXTERNAL ALARMS

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

NEW SITE 444 ULTRA INDOOR (1 PHASE)IN SHELTER

MATERIAL TYPE	QTY	UNIT	REMARKS
bolt(M10 ,2.5 inch length with washer) galvanized	12	PCS	4 bolts for power system,4 FOR BTS,2 for busbar
on Washer	12	PCS	4 for power system,4 FOR BTS ,4 FOR DDF
mm2 Copper Grounding Cable y/g	50	M	20 for power system(10 for +ve gnd and 10 for body gnd),10 M FOR 1 BATTERY STRING AND LOC TO 2 STRING 10M FOR BTS,10 M FOR DDF BOX
mm2 Lug 10 mm hole	15	PCS	4 for power system,4 FOR 2 BATTERY RACK,2 FOR BTS,2 FOR DDF BOX
le tie 2,5*100 black (100 pcs)	1	PCS	
le tie 4,8*200 black (100 pcs)	1	PCS	
le tie 7,6*380 black (100 pcs)	1	PCS	
*0,4 installation cable(FOR RECT ALARM)	10	M	RECT ALARM CABLE
mm2 Copper Black Installation Cable	30	M	10 M FOR 1 BATTERY STRINGS AND 10M FOR BTS DC POWER (+VE) +10 for AC cable (L)
mm2 Copper Blue Installation Cable	30	M	10 M FOR 1 BATTERY STRINGS AND 10M FOR BTS DC POWER (-VE) +10 for AC cable (N)
mm2 Copper Grounding Cable	10	M	10 for AC cable (G)
mm2 Lug 10 mm hole	9	PCS	3 FOR 1 BATTERY STRING+ AND 1 FOR DC CABLE+2 FOR AC CABLE
od screw no. 6 x 40 (60 Nos)	1	PKT	
bon-Cable Clamp rail white	10	PCS	for routing of cable propery
v terminal, 4.28mm	100	PCS	to be fixed in ribbon
l prop no. 6 x 37mm - 60 Nos.	1	PKT	
gen Indoor Lable Set	1	PCS	
ulation tape 15mm x 10 m Black	2	PCS	
ulation tape 15mm x 10m Yellow	1	PCS	
ulation tape 15mm x 10m Blue	1	PCS	
ulation tape 15mm x 10m Red	1	PCS	
rm cable,3rd BTS,10 m 20 PAIR CABLE	1	PCS	ALARM CABLE
Pin Connector	1	PCS	ALARM CABLE CONNECTOR
-A-50 with back mount frame with lock	1	PCS	BOX TO PUT MAX 5 MODULES
connection EARTH MODULE 2/10 RED Module	1	PCS	MODULES TO TERMINATE GROUND
connection MODULE 2/10 Module ,marking 1--------0	3	PCS	MODULES TO PUT EXTERNAL ALARMS

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

NEW SITE 666 ULTRA INDOOR (3 PHASE)IN SHELTER

MATERIAL TYPE	QTY	UNIT	REMARKS
g bolt(M10 ,2.5 inch length with washer) galvanized	12	PCS	4 bolts for power system,4 FOR BTS,2 for busbar
on Washer	12	PCS	4 for power system,4 FOR BTS ,4 FOR DDF
mm2 Copper Grounding Cable y/g	50	M	20 for power system(10 for +ve gnd and 10 for body gnd),10 M FOR 1 BATTERY STRING AND LOO TO 2 STRING 10M FOR BTS,10 M FOR DDF BOX
mm2 Lug 10 mm hole	15	PCS	4 for power system,4 FOR 2 BATTERY RACK,2 FOR BTS,2 FOR DDF BOX
ble tie 2,5*100 black (100 pcs)	1	PCS	
ble tie 4,8*200 black (100 pcs)	1	PCS	
ble tie 7,6*380 black (100 pcs)	1	PCS	
16 mm 2 installation cable	10	M	AC cable from ACDB to RECT
mm2 Lug 10 mm hole	4	PCS	FOR AC CABLE
*0,4 installation cable(FOR RECT ALARM)	10	M	RECT ALARM CABLE
mm2 Copper Black Installation Cable	30	M	10 M FOR 1 BATTERY STRINGS AND 20M FOR 2 BTS DC POWER (+VE)
mm2 Copper Blue Installation Cable	30	M	10 M FOR 1 BATTERY STRINGS AND 20M FOR 2 BTS DC POWER (-VE)
mm2 Lug 10 mm hole	9	PCS	3 FOR 1 BATTERY STRING AND 2 FOR DC CABLE
ood screw no. 6 x 40 (60 Nos)	1	PKT	
bon-Cable Clamp rail white	10	PCS	for routing of cable propery
w terminal, 4.28mm	100	PCS	to be fixed in ribbon
ll prop no. 6 x 37mm - 60 Nos.	1	PKT	
gen Indoor Lable Set	1	PCS	
ulation tape 15mm x 10 m Black	2	PCS	
ulation tape 15mm x 10m Yellow	1	PCS	
ulation tape 15mm x 10m Blue	1	PCS	
ulation tape 15mm x 10m Red	1	PCS	
rm cable,3rd BTS,10 m 20 PAIR CABLE	1	PCS	ALARM CABLE
7 Pin Connector	1	PCS	ALARM CABLE CONNECTOR
-A-50 with back mount frame with lock	1	PCS	BOX TO PUT MAX 5 MODULES
connection EARTH MODULE 2/10 RED Module	1	PCS	MODULES TO TERMINATE GROUND
connection MODULE 2/10 Module ,marking 1--------0	3	PCS	MODULES TO PUT EXTERNAL ALARMS

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

NEW SITE 666 ULTRA INDOOR (1 PHASE)IN SHELTER

MATERIAL TYPE	QTY	UNIT	REMARKS
bolt(M10 ,2.5 inch length with washer) galvanized	12	PCS	4 bolts for power system,4 FOR BTS,2 for busbar
on Washer	12	PCS	4 for power system,4 FOR BTS ,4 FOR DDF
mm2 Copper Grounding Cable y/g	50	M	20 for power system(10 for +ve gnd and 10 for body gnd),10 M FOR 1 BATTERY STRING AND LOC TO 2 STRING 10M FOR BTS,10 M FOR DDF BOX
mm2 Lug 10 mm hole	15	PCS	4 for power system,4 FOR 2 BATTERY RACK,2 FOR BTS,2 FOR DDF BOX
le tie 2,5*100 black (100 pcs)	1	PCS	
le tie 4,8*200 black (100 pcs)	1	PCS	
le tie 7,6*380 black (100 pcs)	1	PCS	
*0,4 installation cable(FOR RECT ALARM)	10	M	RECT ALARM CABLE
mm2 Copper Black Installation Cable	40	M	10 M FOR 1 BATTERY STRINGS AND 20M FOR 2 BTS DC POWER (+VE) +10 for AC cable (L)
mm2 Copper Blue Installation Cable	40	M	10 M FOR 1 BATTERY STRINGS AND 20M FOR 2 BTS DC POWER (-VE) +10 for AC cable (N)
mm2 Copper Grounding Cable	10	M	10 for AC cable (G)
mm2 Lug 10 mm hole	10	PCS	3 FOR 1 BATTERY STRING+ AND 2 FOR DC CABLE+2 FOR AC CABLE
od screw no. 6 x 40 (60 Nos)	1	PKT	
bon-Cable Clamp rail white	10	PCS	for routing of cable propery
v terminal, 4.28mm	100	PCS	to be fixed in ribbon
l prop no. 6 x 37mm - 60 Nos.	1	PKT	
gen Indoor Lable Set	1	PCS	
ulation tape 15mm x 10 m Black	2	PCS	
ulation tape 15mm x 10m Yellow	1	PCS	
ulation tape 15mm x 10m Blue	1	PCS	
ulation tape 15mm x 10m Red	1	PCS	
rm cable,3rd BTS,10 m 20 PAIR CABLE	1	PCS	ALARM CABLE
Pin Connector	1	PCS	ALARM CABLE CONNECTOR
-A-50 with back mount frame with lock	1	PCS	BOX TO PUT MAX 5 MODULES
connection EARTH MODULE 2/10 RED Module	1	PCS	MODULES TO TERMINATE GROUND
connection MODULE 2/10 Module ,marking 1--------0	3	PCS	MODULES TO PUT EXTERNAL ALARMS

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

OUTDOOR ULTRASITE

NEW SITE 444 ULTRA OUTDOOR (3 PHASE)IN SHELTER

MATERIAL TYPE	QTY	UNIT	REMARKS
nor Bolts -M10 *25L	8	PCS	4 bolts for power system,4 FOR BTS
n Washer	8	PCS	4 for power system,4 FOR BTS.
mm2 Copper Grounding Cable y/g	40	M	20 for power system(10 for +ve gnd and 10 for body gnd),10 M FOR 1 BATTERY STRING AND LOOP TO 2 STRING 10M FOR BTS
mm2 Lug 10 mm hole	15	PCS	4 for power system,4 FOR 2 BATTERY RACK,2 FOR BTS
le tie 2,5*100 black (100 pcs)	1	PCS	
le tie 4,8*200 black (100 pcs)	1	PCS	
le tie 7,6*380 black (100 pcs)	1	PCS	
0 mm 2 installation cable	10	M	AC cable from ACDB to RECT
mm2 Lug 10 mm hole	4	PCS	FOR AC CABLE
0,4 installation cable(FOR RECT ALARM)	5	M	RECT ALARM CABLE
mm2 Copper Black Installation Cable	20	M	10 M FOR 1 BATTERY STRINGS AND 10M FOR BTS DC POWER (+VE)
mm2 Copper Blue Installation Cable	20	M	10M FOR 1 BATTERY STRINGS AND 10M FOR BTS DC POWER (-VE)
mm2 Lug 10 mm hole	7	PCS	3 FOR 1 BATTERY STRING AND 1 FOR DC CABLE
gen Indoor Lable Set	1	PCS	
ulation tape 15mm x 10 m Black	2	PCS	
ulation tape 15mm x 10m Yellow	1	PCS	
ulation tape 15mm x 10m Blue	1	PCS	
ulation tape 15mm x 10m Red	1	PCS	
m cable,3rd BTS,10 m 20 PAIR CABLE	1	PCS	ALARM CABLE
Pin Connector	1	PCS	ALARM CABLE CONNECTOR
k mount frame to terminate 5 modules	1	PCS	BOX TO PUT MAX 5 MODULES
connection EARTH MODULE 2/10 RED Module	1	PCS	MODULES TO TERMINATE GROUND
connection MODULE 2/10 Module ,marking 1--------0	2	PCS	MODULES TO PUT EXTERNAL ALARMS

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

NEW SITE 444 ULTRA OUTDOOR (1 PHASE)IN SHELTER

MATERIAL TYPE	QTY	UNIT	REMARKS
hor Bolts -M10 *25L	8	PCS	4 bolts for power system,4 FOR BTS
on Washer	8	PCS	4 for power system,4 FOR BTS.
mm2 Copper Grounding Cable y/g	40	M	20 for power system(10 for +ve gnd and 10 for body gnd),10 M FOR 1 BATTERY STRING AND LO TO 2 STRING 10M FOR BTS
mm2 Lug 10 mm hole	15	PCS	4 for power system,4 FOR 2 BATTERY RACK,2 FOR BTS
le tie 2,5*100 black (100 pcs)	1	PCS	
le tie 4,8*200 black (100 pcs)	1	PCS	
le tie 7,6*380 black (100 pcs)	1	PCS	
*0,4 installation cable(FOR RECT ALARM)	5	M	RECT ALARM CABLE
mm2 Copper Black Installation Cable	30	M	10 M FOR 1 BATTERY STRINGS AND 10M FOR BTS DC POWER (+VE) +10 for AC cable (L)
mm2 Copper Blue Installation Cable	30	M	10 M FOR 1 BATTERY STRINGS AND 10M FOR BTS DC POWER (-VE) +10 for AC cable (N)
mm2 Copper Grounding Cable	10	M	10 for AC cable (G)
mm2 Lug 10 mm hole	9	PCS	3 FOR 1 BATTERY STRING+ AND 1 FOR DC CABLE+2 FOR AC CABLE
gen Indoor Lable Set	1	PCS	
ulation tape 15mm x 10 m Black	2	PCS	
ulation tape 15mm x 10m Yellow	1	PCS	
ulation tape 15mm x 10m Blue	1	PCS	
ulation tape 15mm x 10m Red	1	PCS	
rm cable,3rd BTS,10 m 20 PAIR CABLE	1	PCS	ALARM CABLE
Pin Connector	1	PCS	ALARM CABLE CONNECTOR
k mount frame to terminate 5 modules	1	PCS	BOX TO PUT MAX 5 MODULES
connection EARTH MODULE 2/10 RED Module	1	PCS	MODULES TO TERMINATE GROUND
connection MODULE 2/10 Module ,marking 1--------0	2	PCS	MODULES TO PUT EXTERNAL ALARMS

TO BE USED FOR BSNL NORTH ZONE ONLY

NEW SITE 666 ULTRA OUTDOOR (3 PHASE)IN SHELTER

MATERIAL TYPE	QTY	UNIT	REMARKS
hor Bolts -M10 *25L	8	PCS	4 bolts for power system,4 FOR BTS
on Washer	8	PCS	4 for power system,4 FOR BTS.
mm2 Copper Grounding Cable y/g	40	M	20 for power system(10 for +ve gnd and 10 for body gnd),10 M FOR 1 BATTERY STRING AND LOO TO 2 STRING 10M FOR BTS
mm2 Lug 10 mm hole	15	PCS	4 for power system,4 FOR 2 BATTERY RACK,2 FOR BTS
le tie 2,5*100 black (100 pcs)	1	PCS	
le tie 4,8*200 black (100 pcs)	1	PCS	
le tie 7,6*380 black (100 pcs)	1	PCS	
16 mm 2 installation cable	10	M	AC cable from ACDB to RECT
mm2 Lug 10 mm hole	4	PCS	FOR AC CABLE
*0,4 installation cable(FOR RECT ALARM)	5	M	RECT ALARM CABLE
mm2 Copper Black Installation Cable	30	M	10 M FOR 1 BATTERY STRINGS AND 20M FOR2 BTS DC POWER (+VE)
mm2 Copper Blue Installation Cable	30	M	10M FOR 1 BATTERY STRINGS AND 20M FOR 2 BTS DC POWER (-VE)
mm2 Lug 10 mm hole	10	PCS	3 FOR 1 BATTERY STRING AND 1 FOR DC CABLE
gen Indoor Lable Set	1	PCS	
ulation tape 15mm x 10 m Black	2	PCS	
ulation tape 15mm x 10m Yellow	1	PCS	
ulation tape 15mm x 10m Blue	1	PCS	
ulation tape 15mm x 10m Red	1	PCS	
rm cable,3rd BTS,10 m 20 PAIR CABLE	1	PCS	ALARM CABLE
Pin Connector	1	PCS	ALARM CABLE CONNECTOR
k mount frame to terminate 5 modules	1	PCS	BOX TO PUT MAX 5 MODULES
connection EARTH MODULE 2/10 RED Module	1	PCS	MODULES TO TERMINATE GROUND
connection MODULE 2/10 Module ,marking 1--------0	2	PCS	MODULES TO PUT EXTERNAL ALARMS

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

NEW SITE 666 ULTRA OUTDOOR (1 PHASE)IN SHELTER

MATERIAL TYPE	QTY	UNIT	REMARKS
hor Bolts -M10 *25L	8	PCS	4 bolts for power system,4 FOR BTS
on Washer	8	PCS	4 for power system,4 FOR BTS.
mm2 Copper Grounding Cable y/g	40	M	20 for power system(10 for +ve gnd and 10 for body gnd),10 M FOR 1 BATTERY STRING AND LOO TO 2 STRING 10M FOR BTS
mm2 Lug 10 mm hole	15	PCS	4 for power system,4 FOR 2 BATTERY RACK,2 FOR BTS
le tie 2,5*100 black (100 pcs)	1	PCS	
le tie 4,8*200 black (100 pcs)	1	PCS	
le tie 7,6*380 black (100 pcs)	1	PCS	
*0,4 installation cable(FOR RECT ALARM)	5	M	RECT ALARM CABLE
mm2 Copper Black Installation Cable	40	M	10 M FOR 1 BATTERY STRINGS AND 20M FOR 2 BTS DC POWER (+VE) +10 for AC cable (L)
mm2 Copper Blue Installation Cable	40	M	10 M FOR 1 BATTERY STRINGS AND 20M FOR 2 BTS DC POWER (+VE) +10 for AC cable (N)
mm2 Copper Grounding Cable	10	M	10 for AC cable (G)
mm2 Lug 10 mm hole	10	PCS	3 FOR 1 BATTERY STRING+ AND 2 FOR DC CABLE+2 FOR AC CABLE
gen Indoor Lable Set	1	PCS	
ulation tape 15mm x 10 m Black	2	PCS	
ulation tape 15mm x 10m Yellow	1	PCS	
ulation tape 15mm x 10m Blue	1	PCS	
ulation tape 15mm x 10m Red	1	PCS	
rm cable,3rd BTS,10 m 20 PAIR CABLE	1	PCS	ALARM CABLE
Pin Connector	1	PCS	ALARM CABLE CONNECTOR
k mount frame to terminate 5 modules	1	PCS	BOX TO PUT MAX 5 MODULES
connection EARTH MODULE 2/10 RED Module	1	PCS	MODULES TO TERMINATE GROUND
connection MODULE 2/10 Module ,marking 1--------0	2	PCS	MODULES TO PUT EXTERNAL ALARMS

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

BSNL SITE

INDOOR ULTRASITE

NEW SITE 444 ULTRA INDOOR IN BSNL BUILDING-NO RAISED FLOOR

MATERIAL TYPE	QTY	UNIT	REMARKS
hor Bolts -M10 *25L	8	PCS	4 bolts for power system,4 FOR BTS,2 for busbar
on Washer	12	PCS	4 for power system,4 FOR BTS ,4 FOR DDF
mm2 Copper Grounding Cable y/g	60	M	20 for power system(10 for +ve gnd and 10 for body gnd),10 M FOR 1 BATTERY STRING AND LOC TO 2 STRING 10M FOR BTS,10 M FOR DDF BOX
mm2 Lug 10 mm hole	15	PCS	4 for power system,4 FOR 2 BATTERY RACK,2 FOR BTS,2 FOR DDF BOX
ble tie 2,5*100 black (100 pcs)	1	PCS	
ble tie 4,8*200 black (100 pcs)	1	PCS	
ble tie 7,6*380 black (100 pcs)	1	PCS	
mm2 Copper Black Installation Cable	VARIABLE	M	10M FOR BTS DC POWER (+VE)
mm2 Copper Blue Installation Cable	VARIABLE	M	10M FOR BTS DC POWER (-VE)
mm2 Lug 10 mm hole	7	PCS	3 FOR 1 BATTERY STRING AND 1 FOR DC CABLE
od screw no. 6 x 40 (60 Nos)	1	PKT	
bon-Cable Clamp rail white	15	PCS	for routing of cable propery
w terminal, 4.28mm	150	PCS	to be fixed in ribbon
l prop no. 6 x 37mm - 60 Nos.	1	PKT	
gen Indoor Lable Set	1	PCS	
ulation tape 15mm x 10 m Black	2	PCS	
ulation tape 15mm x 10m Yellow	1	PCS	
ulation tape 15mm x 10m Blue	1	PCS	
ulation tape 15mm x 10m Red	1	PCS	
rm cable,3rd BTS,10 m 20 PAIR CABLE	1	PCS	ALARM CABLE
7 Pin Connector	1	PCS	ALARM CABLE CONNECTOR
x-A-50 with back mount frame with lock	1	PCS	BOX TO PUT MAX 5 MODULES
connection EARTH MODULE 2/10 RED Module	1	PCS	MODULES TO TERMINATE GROUND
connection MODULE 2/10 Module ,marking 1--------0	3	PCS	MODULES TO PUT EXTERNAL ALARMS

MATERIAL TYPE	QTY	UNIT	REMARKS
0 mm2 Copper Black Installation Cable	35	M	1 RUNS OF 35M FOR +ve busbar
0 mm2 Copper Blue Installation Cable	35	M	1 RUNS OF 35M FOR -ve busbar
0 mm2 Lug 10 mm hole	4	PCS	Shoe for 150MM2 POWER CABLE
ble tie 7,6*380 black (100 pcs)	1	PCS	

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

NEW SITE 444 ULTRA INDOOR IN BSNL BUILDING-RAISED FLOOR

MATERIAL TYPE	QTY	UNIT	REMARKS
hor Bolts -M10 *25L	4	PCS	4 bolts for power system,4 FOR BTS,2 for busbar
(200MM LENGTH) FULLY THREADED BOLT WITH 4 NUT,2 CHECK TS AND 4 WASHERS	4	M	
n Washer	12	PCS	4 for power system,4 FOR BTS ,4 FOR DDF
mm2 Copper Grounding Cable y/g	60	M	20 for power system(10 for +ve gnd and 10 for body gnd),10 M FOR 1 BATTERY STRING AND LOOP TO 2 STRING 10M FOR BTS,10 M FOR DDF BOX
mm2 Lug 10 mm hole	15	PCS	4 for power system,4 FOR 2 BATTERY RACK,2 FOR BTS,2 FOR DDF BOX
le tie 2,5*100 black (100 pcs)	1	PCS	
le tie 4,8*200 black (100 pcs)	1	PCS	
le tie 7,6*380 black (100 pcs)	1	PCS	
mm2 Copper Black Installation Cable	VARIABLE	M	10M FOR BTS DC POWER (+VE)
mm2 Copper Blue Installation Cable	VARIABLE	M	10M FOR BTS DC POWER (-VE)
mm2 Lug 10 mm hole	7	PCS	3 FOR 1 BATTERY STRING AND 1 FOR DC CABLE
od screw no. 6 x 40 (60 Nos)	1	PKT	
oon-Cable Clamp rail white	15	PCS	for routing of cable propery
v terminal, 4.28mm	150	PCS	to be fixed in ribbon
l prop no. 6 x 37mm - 60 Nos.	1	PKT	
gen Indoor Lable Set	1	PCS	
ulation tape 15mm x 10 m Black	2	PCS	
ulation tape 15mm x 10m Yellow	1	PCS	
ulation tape 15mm x 10m Blue	1	PCS	
ulation tape 15mm x 10m Red	1	PCS	
rm cable,3rd BTS,10 m 20 PAIR CABLE	1	PCS	ALARM CABLE
Pin Connector	1	PCS	ALARM CABLE CONNECTOR
-A-50 with back mount frame with lock	1	PCS	BOX TO PUT MAX 5 MODULES
connection EARTH MODULE 2/10 RED Module	1	PCS	MODULES TO TERMINATE GROUND
connection MODULE 2/10 Module ,marking 1--------0	3	PCS	MODULES TO PUT EXTERNAL ALARMS

MATERIAL TYPE	QTY	UNIT	REMARKS
0 mm2 Copper Black Installation Cable	35	M	1 RUNS OF 35M FOR +ve busbar
0 mm2 Copper Blue Installation Cable	35	M	1 RUNS OF 35M FOR -ve busbar
0 mm2 Lug 10 mm hole	4	PCS	Shoe for 150MM2 POWER CABLE
ble tie 7,6*380 black (100 pcs)	1	PCS	

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

METROSITE

METROSITE INDOOR FOR IBC

MATERIAL TYPE	QTY	UNIT	REMARKS
Anchor Bolts -M10	8	PCS	4 bolts for METROSITE ,4 FOR POWER SYSTEM
Nylon Washer	12	PCS	4 for power system,4 FOR BTS ,4 FOR DDF
25 mm2 Copper Grounding Cable y/g	50	M	20 for power system(10 for +ve gnd and 10 for body gnd),10 M FOR 1 BATTERY STRING AND LOOP TO 2 STRING 10M FOR BTS,10 M FOR DDF BOX
25 mm2 Lug 10 mm hole	15	PCS	4 for power system,4 FOR 2 BATTERY RACK,2 FOR BTS,2 FOR DDF BOX
Cable tie 2,5*100 black (100 pcs)	1	PCS	
Cable tie 4,8*200 black (100 pcs)	1	PCS	
Cable tie 7,6*380 black (100 pcs)	1	PCS	
4*2*0,4 installation cable(FOR RECT ALARM)	10	M	RECT ALARM CABLE
3x 16 mm 2 installation cable	10	M	AC cable from ACDB to RECT
16 mm2 Lug 10 mm hole	4	PCS	FOR AC CABLE
35 mm2 Copper Black Installation Cable	10	M	10 M FOR 1 BATTERY STRINGS A
35 mm2 Copper Blue Installation Cable	10	M	10 M FOR 1 BATTERY STRINGS A
35 mm2 Lug 10 mm hole	4	PCS	
Wood screw no. 6 x 40 (60 Nos)	1	PKT	
Ribbon-Cable Clamp rail white	10	PCS	for routing of cable propery
Row terminal, 4.28mm	100	PCS	to be fixed in ribbon
Wall prop no. 6 x 37mm - 60 Nos.	1	PKT	
3rd gen Indoor Lable Set	1	PCS	
Insulation tape 15mm x 10 m Black	2	PCS	
Insulation tape 15mm x 10m Yellow	1	PCS	
Insulation tape 15mm x 10m Blue	1	PCS	
Insulation tape 15mm x 10m Red	1	PCS	
3/8" Jumper DIN Female/Angle N Male, 1.5Meter Length	2	PCS	JUMPER CABLE FOR FEEDER
Box-A-50 with back mount frame with lock	1	PCS	BOX TO PUT MAX 5 MODULES
Disconnection EARTH MODULE 2/10 RED Module	1	PCS	MODULES TO TERMINATE GROUND
Disconnection MODULE 2/10 Module ,marking 1--------0	2	PCS	MODULES TO PUT EXTERNAL ALARMS

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

METROSITE OUTDOOR(INSTALLED ON 40M TOWER)

MATERIAL TYPE	QTY	UNIT	REMARKS
Waterproof DCDB BOX (2X10A MCB) with mounting mech for mounting on top of tower	1	PCS	TO BEMOUNTED ON TOP OF TOWER
WATER PROOF DDF Box-A-20 with 2 modules with back mount frame with lock(INSTALLED ON TOP OF TOWER	1	PCS	BOX TO PUT MAX 2 MODULES
Anchor Bolts -M10	4	PCS	4 FOR POWER SYSTEM
Hex Bolt M-10 X 19 mm with washer & Nut	8	PCS	To terminate DCDB ON TOP OF TOWER
Nylon Washer	12	PCS	4 for power system,4 FOR BTS ,4 FOR DCDB
25 mm2 Copper Grounding Cable y/g	40	M	20 for power system(10 for +ve gnd and 10 for body gnd),10 M FOR 1 BATTERY STRING AND LOOP TO 2 STRING 10M FOR BTS
25 mm2 Lug 10 mm hole	15	PCS	4 for power system,4 FOR 2 BATTERY RACK,2 FOR BTS,2 FOR DDF BOX
Cable tie 2,5*100 black (100 pcs)	1	PCS	
Cable tie 4,8*200 black (100 pcs)	1	PCS	
Cable tie 7,6*380 black (100 pcs)	1	PCS	
4*2*0,4 installation cable(FOR RECT ALARM)	5	M	RECT ALARM CABLE
3x 16 mm 2 installation cable	10	M	AC cable from ACDB to RECT
16 mm2 Lug 10 mm hole	2	PCS	FOR AC CABLE
35 mm2 Copper Black Installation Cable	10	M	10 M FOR 1 BATTERY STRINGS A
35 mm2 Copper Blue Installation Cable	10	M	10 M FOR 1 BATTERY STRINGS A
35 mm2 Lug 10 mm hole	4	PCS	
70 mm2 Copper Black Installation Cable	50	M	FOR POWER PLANT TO DCDB ON TOP OF TOWER
70 mm2 Copper Blue Installation Cable	50	M	FOR POWER PLANT TO DCDB ON TOP OF TOWER
70 mm2 Lug 10 mm hole	4	PCS	
Wood screw no. 6 x 40 (60 Nos)	1	PKT	
3rd gen Indoor Lable Set	1	PCS	
Insulation tape 15mm x 10 m Black	2	PCS	
Insulation tape 15mm x 10m Yellow	1	PCS	
Insulation tape 15mm x 10m Blue	1	PCS	
Insulation tape 15mm x 10m Red	1	PCS	
Alarm cable,20 PAIR for outdoor environment UV protected	50	PCS	ALARM CABLE
3/8" Jumper DIN Female/Angle N Male, 1.5Meter Length	4	PCS	JUMPER CABLE FOR FEEDER
Back mount frame to terminate 5 modules	1	PCS	BOX TO PUT MAX 5 MODULES
Disconnection EARTH MODULE 2/10 RED Module	1	PCS	MODULES TO TERMINATE GROUND
Disconnection MODULE 2/10 Module ,marking 1--------0	2	PCS	MODULES TO PUT EXTERNAL ALARMS

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

METROSITE OUTDOOR(INSTALLED ON 60M TOWER)

MATERIAL TYPE	QTY	UNIT	REMARKS
Waterproof DCDB BOX (2X10A MCB) with mounting mech for mounting on top of tower	1	PCS	TO BEMOUNTED ON TOP OF TOWER
WATER PROOF DDF Box-A-20 with 2 modules with back mount frame with lock(INSTALLED ON TOP OF TOWER	1	PCS	BOX TO PUT MAX 2 MODULES
Anchor Bolts -M10	4	PCS	4 FOR POWER SYSTEM
Hex Bolt M-10 X 19 mm with washer & Nut	8	PCS	To terminate DCDB ON TOP OF TOWER
Nylon Washer	12	PCS	4 for power system,4 FOR BTS ,4 FOR DCDB
25 mm2 Copper Grounding Cable y/g	40	M	20 for power system(10 for +ve gnd and 10 for body gnd),10 M FOR 1 BATTERY STRING AND LOOP TO 2 STRING 10M FOR BTS
25 mm2 Lug 10 mm hole	15	PCS	4 for power system,4 FOR 2 BATTERY RACK,2 FOR BTS,2 FOR DDF BOX
Cable tie 2,5*100 black (100 pcs)	1	PCS	
Cable tie 4,8*200 black (100 pcs)	1	PCS	
Cable tie 7,6*380 black (100 pcs)	1	PCS	
4*2*0,4 installation cable(FOR RECT ALARM)	5	M	RECT ALARM CABLE
6x 16 mm 2 installation cable	10	M	AC cable from ACDB to RECT
16 mm2 Lug 10 mm hole	2	PCS	FOR AC CABLE
35 mm2 Copper Black Installation Cable	10	M	10 M FOR 1 BATTERY STRINGS A
35 mm2 Copper Blue Installation Cable	10	M	10 M FOR 1 BATTERY STRINGS A
35 mm2 Lug 10 mm hole	4	PCS	
70 mm2 Copper Black Installation Cable	70	M	FOR POWER PLANT TO DCDB ON TOP OF TOWER
70 mm2 Copper Blue Installation Cable	70	M	FOR POWER PLANT TO DCDB ON TOP OF TOWER
70 mm2 Lug 10 mm hole	4	PCS	
Wood screw no. 6 x 40 (60 Nos)	1	PKT	
3rd gen Indoor Lable Set	1	PCS	
Insulation tape 15mm x 10 m Black	2	PCS	
Insulation tape 15mm x 10m Yellow	1	PCS	
Insulation tape 15mm x 10m Blue	1	PCS	
Insulation tape 15mm x 10m Red	1	PCS	
Alarm cable,20 PAIR for outdoor environment UV protected	70	PCS	ALARM CABLE
5/8" Jumper DIN Female/Angle N Male, 1.5Meter Length	4	PCS	JUMPER CABLE FOR FEEDER
Back mount frame to terminate 5 modules	1	PCS	BOX TO PUT MAX 5 MODULES
Disconnection EARTH MODULE 2/10 RED Module	1	PCS	MODULES TO TERMINATE GROUND
Disconnection MODULE 2/10 Module ,marking 1--------0	2	PCS	MODULES TO PUT EXTERNAL ALARMS

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

MICROWAVE

MICROWAVE MATERIALS(RG223)

72M RG223 LENGTH (60m TOWER)			
RIAL TYPE	**QTY**	**UNIT**	**REMARKS**
23	72	M	72M FOR 1 ODU
tie 7,6*380 black (100 pcs)	0.80	PCS	FOR RG223 ROUTING
lf-amal tape 25mm*10m	0.25	PCS	FOR SEALING
ot. PVC tape	0.25	PCS	FOR UV PROTECTION
m2 Copper Grounding Cable y/g	3	M	3 M for ODU grounding
olt M-10 X 19 mm with washer & Nut	1	PCS	To terminate Gnding cable on GI strip
m2 Lug 10 mm hole	2	PCS	LUG FOR GND CABLE
TOTAL COST			

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

MICROWAVE MATERIALS (FXC E1/T1)

M CABLE TO BE USED INDOOR BTS

MICROWAVE WITH FXC E1/T1 444(2 PCM)

ERIAL TYPE	QTY	UNIT	REMARKS
ONNECTION 10 pair Module	1	PCS	MODULES TO PUT 2MB PCM
1/JT1 Cable 120 ohm, solid, 1xTQ-Open, 7m(FOR INDOOR USE)	2	PCS	PCM CABLE FOR FXC E1/T1 CARD

M CABLE TO BE USED OUTDOOR BTS

MICROWAVE WITH FXC E1/T1 444(2 PCM)

ERIAL TYPE	QTY	UNIT	REMARKS
ONNECTION 10 pair Module	1	PCS	MODULES TO PUT 2MB PCM
1/JT1 Cable 120 ohm, solid, 1xTQ-Open, 7m(FOR OUTDOOR USE)	2	PCS	PCM CABLE FOR FXC E1/T1 CARD

TROSITE- OUTDOOR ON TOWER

OWAVE WITH FXC E1/T1 22(2 PCM) METROSITE 60M TOWER

ERIAL TYPE	QTY	UNIT	REMARKS
0.6 PCM CABLE (OUTDOOR UV PROTECTED)	70	m	CROSSCONNECTION CABLE (FROM DDF TO TOWER TOP DDF)
1/JT1 Cable 120 ohm, solid, 1xTQ-Open, 7m(FOR OUTDOOR USE)	2	PCS	PCM CABLE FOR FXC E1/T1 CARD

OWAVE WITH FXC E1/T1 22(2 PCM) METROSITE 40M TOWER

ERIAL TYPE	QTY	UNIT	REMARKS
0.6 PCM CABLE (OUTDOOR UV PROTECTED)	50	m	CROSSCONNECTION CABLE (FROM DDF TO TOWER TOP DDF)
1/JT1 Cable 120 ohm, solid, 1xTQ-Open, 7m(FOR OUTDOOR USE)	2	PCS	PCM CABLE FOR FXC E1/T1 CARD

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

LADDER

LADDER MATERIALS

LADDER IN SHELTER

MATERIAL TYPE	QTY	UNIT
25 mm2 Copper Grounding Cable y/g	2	M
25 mm2 Lug 10 mm hole	6	PCS
Hex Bolt M-8 X 19 with washer & Nut	6	PCS
Ladder A-300 x 3 Mtrs	2.7	Each
Wall Support A 300 x L 365mm	6	Each
Hinger for A300 Ladder	4	Each

LADDER IN ROOM

MATERIAL TYPE	QTY	UNIT
25 mm2 Copper Grounding Cable y/g	4	M
25 mm2 Lug 10 mm hole	12	PCS
Hex Bolt M-8 X 19 with washer & Nut	12	PCS
Ladder A-300 x 3 Mtrs	4	Each
Wall Support A 300 x L 365mm	12	Each
Hinger for A300 Ladder	4	Each

FEEDER

FEEDER/WFT MATERIALS

7/8" FEEDER LINE

7/8" HELIAX Coaxial Cable/Meters LDF5-50-N1	VARIABLE	M
7/8" cable Grounding Kit, Factory Att., 1-Hole Lug SGL5-06B1	12	PCS
1/2" Jumper DIN Male/DIN Female, 1.5 Meter Length F4A-PDMDF-1M5	12	PCS
Connector 7/16 male for 7/8 cable(RF cable)L5PDM-RPC one pc connecto	12	PCS
EMP 7/16 Female - Male 800-2500MHz (CS72338.50) NOK-DFDM-WBGL	6	PCS
Weatherproofing Kit 221213	2	PCS
Round menber with 1/2" clamp	6	PCS
Clamp Block Plastic 6 x 7/8" (complete set)	VARIABLE	PCS

WFT

MATERIAL TYPE	QTY	UNIT
EP-5-4(5" dia with 4 Entry) WITH BLINDER	1	PCS
CB5 -78-3 (3 7/8" CABLES IN 1 BOOT)	2	PCS
CB5-12-3(3 1/2" CABLES IN 1 BOOT)	1	PCS

CONNECTORS/ CABLE/PIN CONFIGURATION

LMP CABLE FOR ULTRASITE

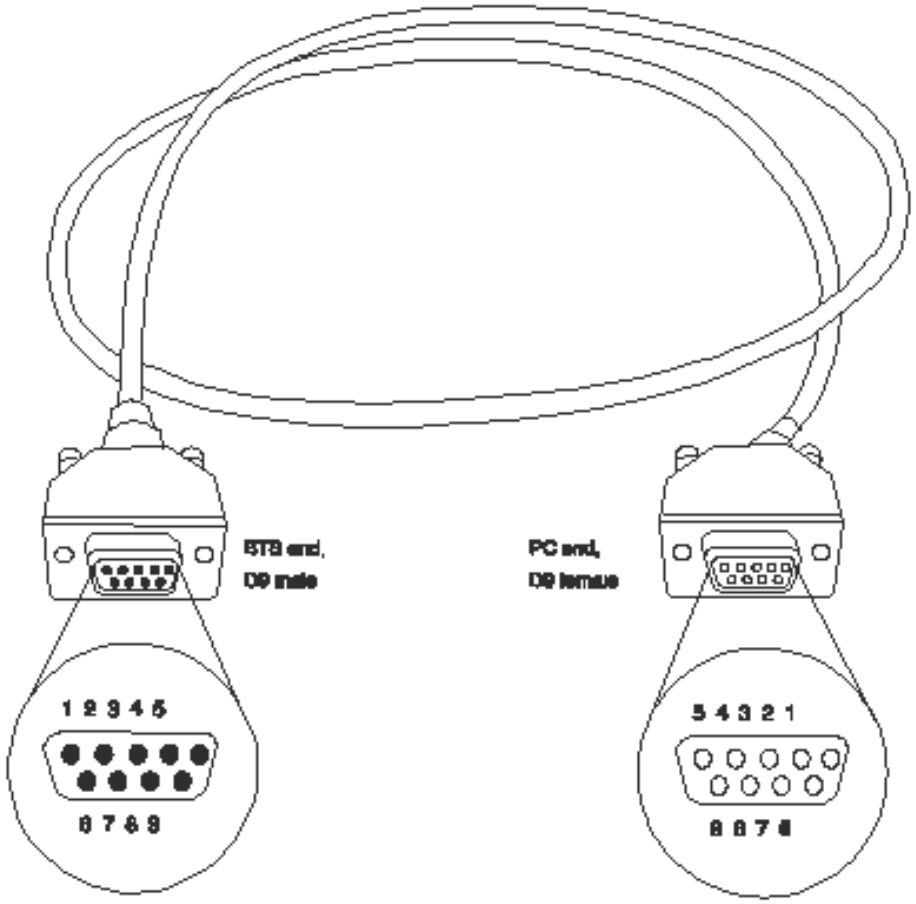


Figure . LMP cable

BTS end, D9 male, pin number	PC end, D9 female, pin number	PC end, D25 female, pin number
2, LMP in	3, transmitted data	2, transmitted data
3, LMP out	2, received data	3, received data
5, ground	5, ground	7, ground

LMP CABLE FOR METROSITE

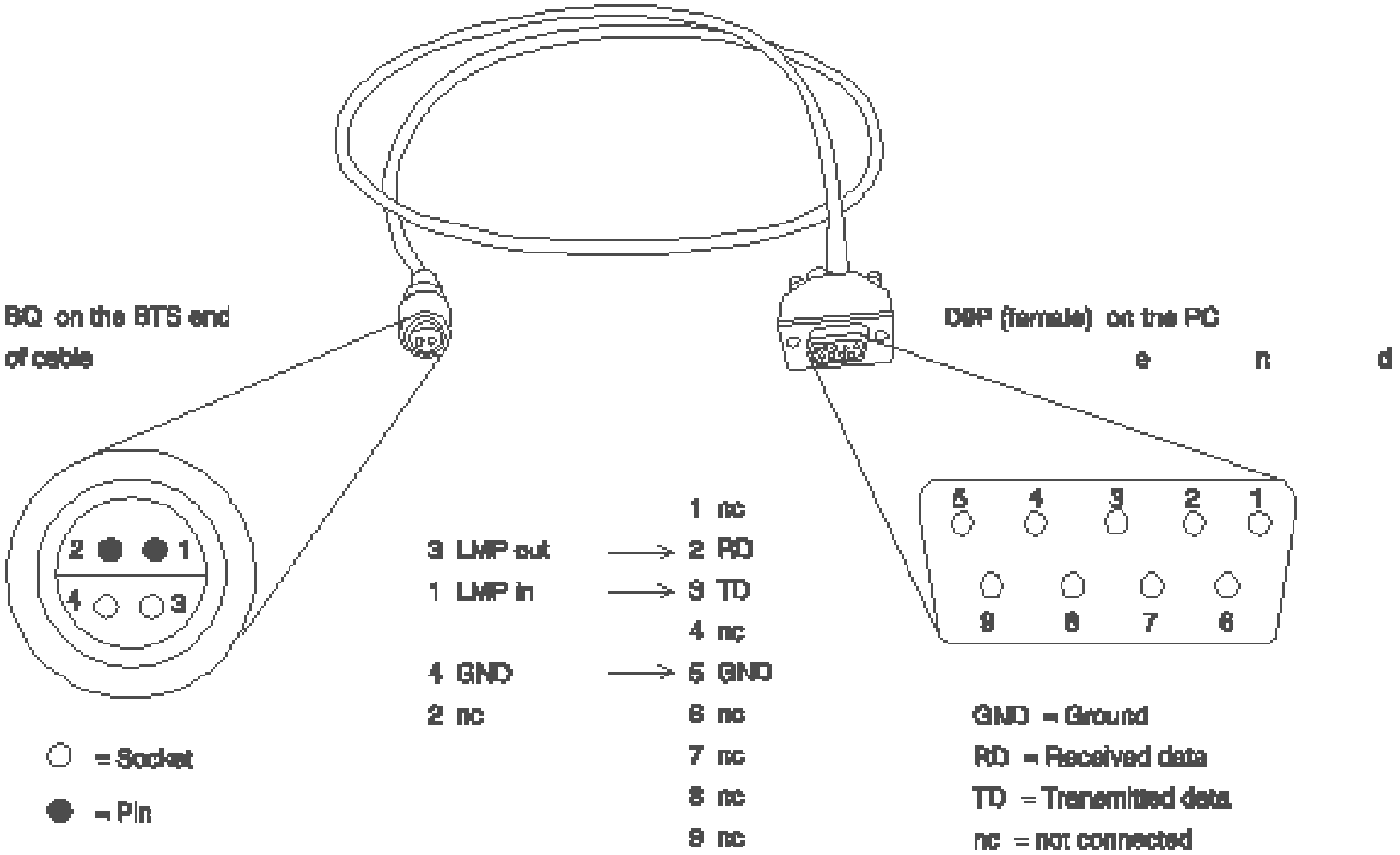


Figure . LMP cable connectors

TQ CONNECTOR FOR FXC E1/T1

Connectors

E1 interface in FXC E1 and FXC E1/T1 units (G.703, G.704) T1 interface in FXC E1/T1 unit (T1.403, T1.102)	BT43 75 Ω, female, in FXC E1 TQ 120 Ω in FXC E1/T1 TQ 100 Ω in FXC E1/T1

Table FXC E1 and FXC E1/T1 connectors

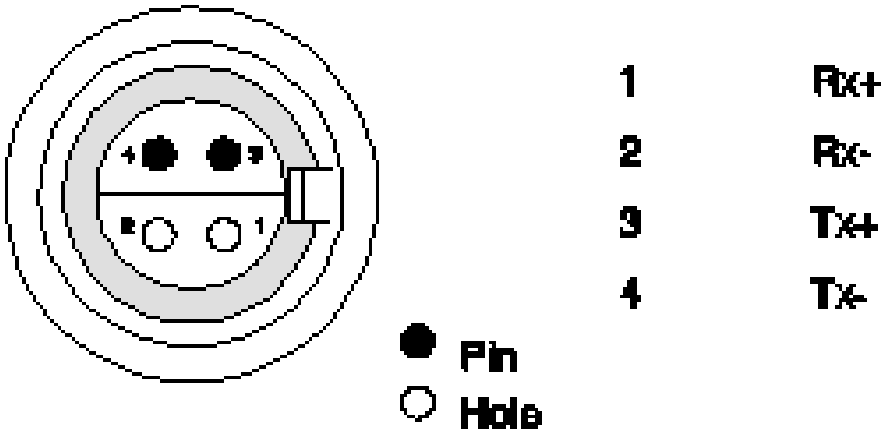
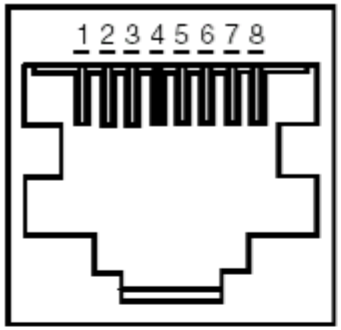


Figure TQ connector

RJ45 CONNECTOR FOR FIU PCM

RJ45 CONNECTOR CONNECTION



1	Out +
2	Out -
4	In +
5	In-

Figure 2M balanced interface of RJ-45 connector

PIN NO	COLOUR
1	ORANGE/WHITE
2	WHITE/ORANGE
4	BLUE/WHITE
5	WHITE/BLUE

BSC ET CARDS

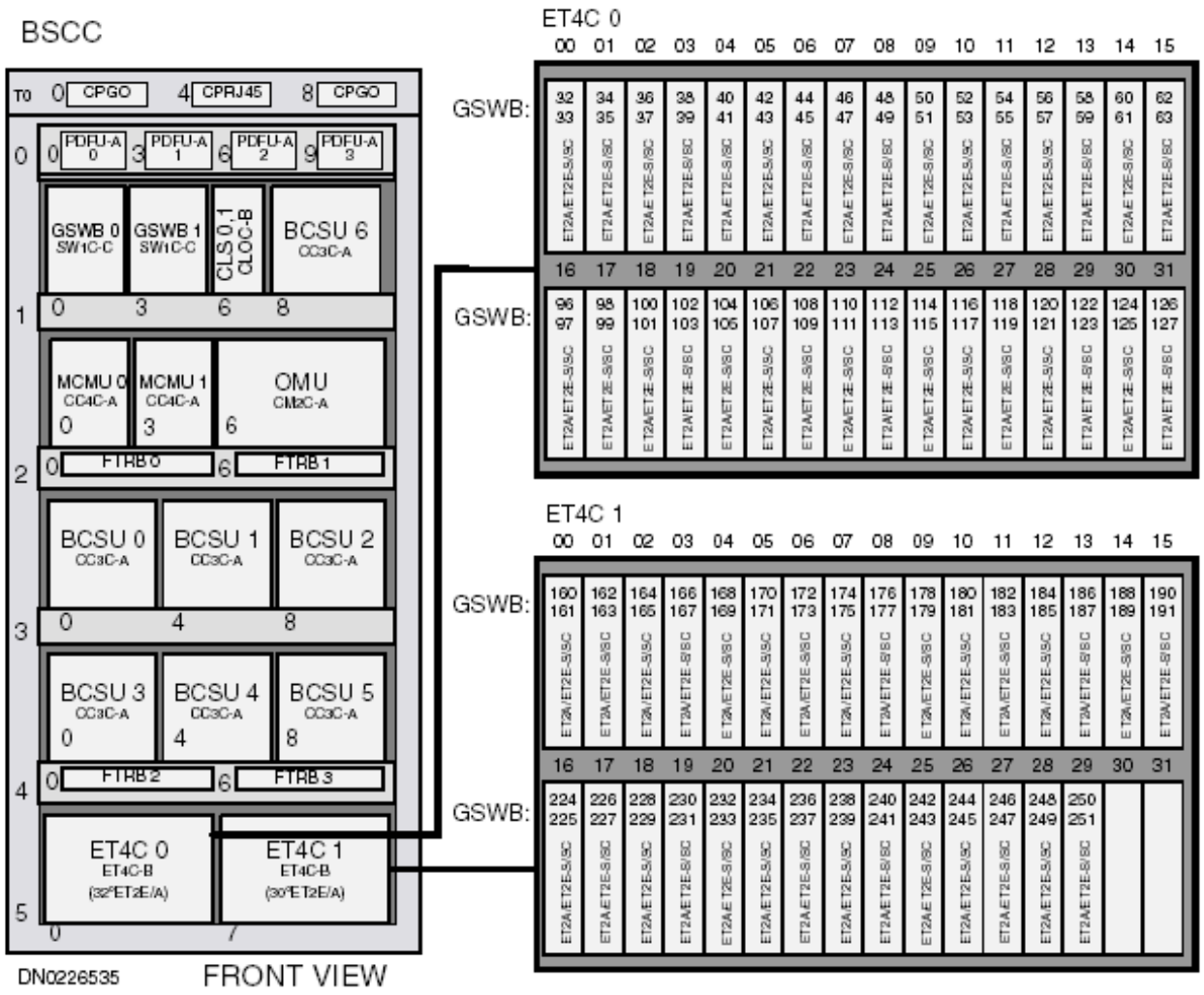
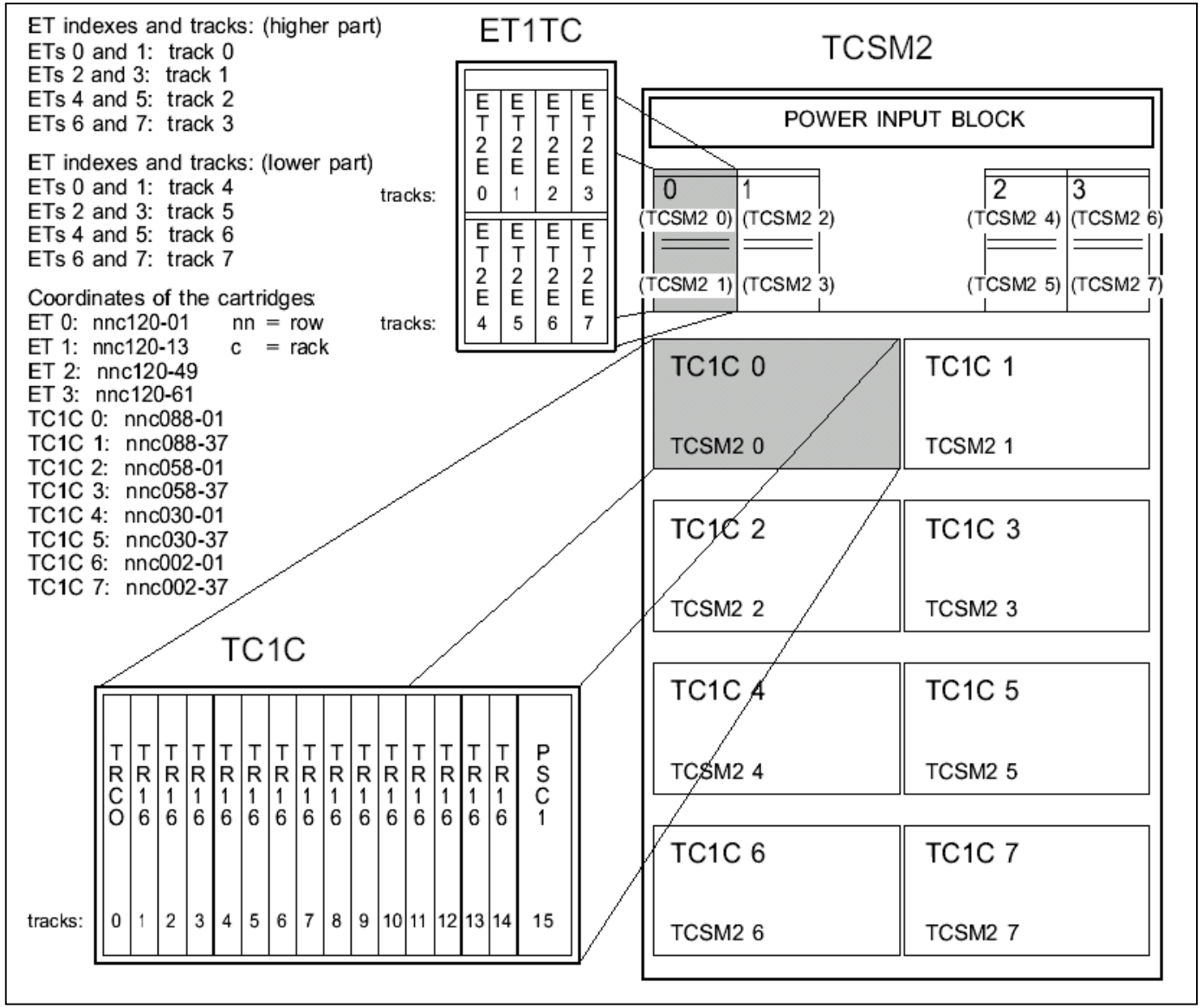


Figure 2. Functional Unit and cartridge postitions in the BSCC.

TRANSCODER ET CARDS



MSC PCM

E1 trunk cable connector, pin configuration

Pin	Signal	Colour	Remarks	
1	R	orange / white	Incoming direction	RX+
2	T	white / orange		RX-
3				
4	R	blue / white	Outgoing direction	TX+
5	T	white / blue		TX-
6				
7				
8				

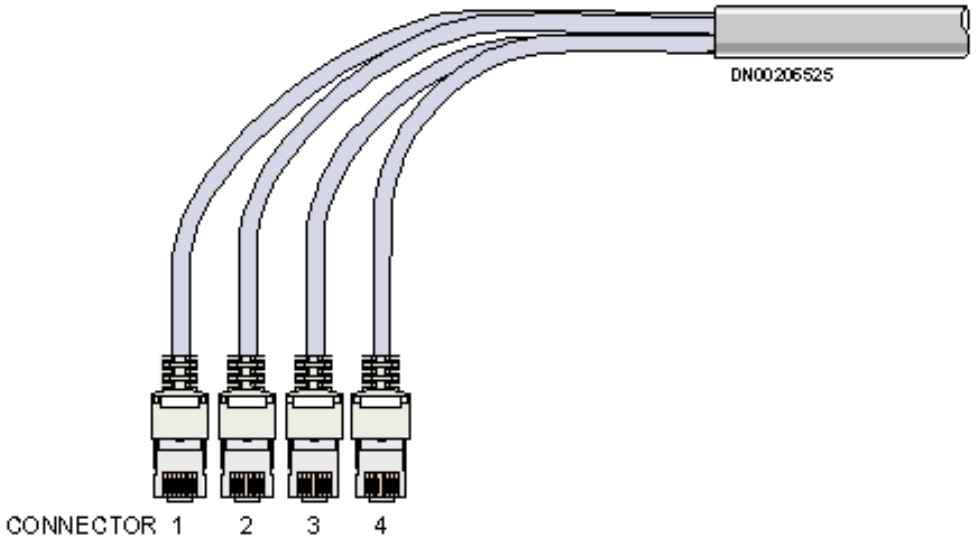


Figure: CNIA cable assembly (panel end connectors mounted)

Table: Recommended cable type for E1 trunk cables (CNIA)

Cable type:	4x(2x2) insulated pairs, twisted, double shielded, cross section 0.4 mm^2 (type: Milliflex3 SH G26/4)
Cable connector:	RJ45 modular connector plug (8-pole)

BSC PCM

5.5.1 E1 (PCM) trunk interfaces (balanced)

The balanced (symmetrical) PCM trunk circuit interfaces are cabled from the front connector (Euroconnectors) of the ETSI ET2 plug-in unit by using, for example, the pair-protected CPK cable. The cable has four connectors that can be connected to two ETSI ET2 plug-in units, which means four PCM interfaces. The branches of the cable are marked, and the "1" branches are connected to the first plug-in unit.

The group sheath of the cable mut be grounded via the grounding element of the rack. The sheath should be grounded at the exchange end only

See the tables below.

Cable type:	KLVMAAM 8x(2x0.4+0.4)+0.4 (Nokia type: CPK)
Cable connector:	Euroconnector C3x7 female IDC AWG26-24 casing for 1/4 Euroconnector

Table 27. E1 (PCM) trunk cable.

Connection of conductors	Pin	Signal	Colour	Pairs of the cable
Incoming E1 (PCM)	b2	RISxB	White	Odd cable pair
direction	b3	RISxA	Blue	(1,3,5,7)
	a3	SG0	Screen	
Outgoing E1 (PCM)	b5	TISxB	White	Even cable pair
direction	b6	TISxA	Blue	(2,4,6,8)
	a6	TSG0	Screen	

x = Interface 0 or 1

1 Small Length	1	WHITE	RISx B
		BLUE	RISx A
	2	WHITE	TISx B
		BLUE	TISx A
1 Big Length	3	WHITE	RISx B
		BLUE	RISx A
	4	WHITE	TISx B
		BLUE	TISx A
No number small length	5	WHITE	RISx B
		BLUE	RISx A
	6	WHITE	TISx B
		BLUE	TISx A
No number big length	7	WHITE	RISx B
		BLUE	RISx A
	8	WHITE	TISx B
		BLUE	TISx A

BSC/MSC ALARM CABLE

CYR CABLE

Pin	Colour	00	01
1	blue/white	AEI0	AEO0
2	white/blue	AEI1	AEO1
3	orange/white	AEI2	AEO2
4	white/orange	AEI3	AEO3
5	green/white	AEI4	AEO4
6	white/green	AEI5	AEO5
7	brown/white	AEI6	AEO6
8	white/brown	AEI7	AEO7
9	grey/white	AEI8	AEO8
10	white/grey	AEI9	AEO9
11	blue/yellow	AEI10	AEO10
12	yellow/blue	AEI11	AEO11
13	orange/yellow	AEI12	AEO12
14	yellow/orange	AEI13	AEO13
15	green/yellow	AEI14	AEO14
16	green/yellow	AEI15	AEO15
17	brown/yellow	AEI16	
18	yellow/brown	AEI17	
19	grey/yellow	AEI18	
20	yellow/grey	AEI19	
21	blue/purple	AEI20	
22	purple/blue	AEI21	
23	orange/purple	AEI22	
24	purple/orange	AEI23	
25			

Table . Signals on panel connectors 00 and 01 (external alarm inputs 00, AEIx and outputs 01, AEOx). Column Colour shows the wire coding for cable type CYR (00 and 0

LAN CONNECTOR

LAN connector

Connector type: RJ45 modular connector (8-pole)

Table: LAN cable connector, pin configuration

Pin	Signal	Colour	Remarks
1	TD+	White / Orange	Transmit (Tx)
2	TD-	Orange	Transmit (Tx)
3	RD+	White / Green	Receive (Rx)
4		Blue	
5		White / Blue	
6	RD-	Green	Receive (Rx)
7		White / Brown	
8		Brown	

Table: Recommended cable types for LAN cables (CNI)

Cable type:	4 pairs, twisted, shielded (S-FTP), Cat. 5, AWG24/26
Cable connector:	Shielded RJ45 modular connector (8-pole), Cat. 5.

LABELLING

LABELLING ON BTS SITES

NUMBER OF BAG	SPECIFIC USE	CODE	SIZE	COLOUR	QUANTITY
1 EARTHING CABLES	Main Earthing 25 mm²	1000	10×40	black	2
	(Site Earthing Busbar 25 mm²)	1001	10×40	black	2
	Feeder Earthing 25 mm²	1002	10×40	black	2
	BBU or SSS Earthing, + pole	1003	10×40	black	2
	Spare	1004	10×40	black	2
	BBU or SSS Earthing 16 mm²	1005	10×40	black	2
	MDF/DDF Earthing 4-16 mm²	1006	10×40	black	2
	Transmission Earthing 16 mm²	1007	10×40	black	2
	Spare	1008	10×40	black	2
	Spare	1009	10×40	black	2
	BTS, Earthing of Basic Cabin 16 mm²	1110	10×40	black	2
	BTS, Earthing of Extension Cabin 16 mm²	1120	10×40	black	2
2 AC SUPPLY CABLES	AC Main Supply	2000	10×40	black	2
	1st Rectifier Supply Cable	2001	10×40	black	2
	2nd Rectifier Supply Cable	2002	10×40	black	2
	Spare	2003	10×40	black	2
	Spare	2004	10×40	black	2
	Spare	2005	10×40	black	2
3 DC SUPPLY CABLES	DC Cables of 1st Battery String	3000	10×40	black	2
	DC Cables of 2nd Battery String	3001	10×40	black	2
	DC Cables of 3rd Battery String	3002	10×40	black	2
	DC Cables of 4th Battery String	3003	10×40	black	2
	PSA, Transmission Supply	3004	10×40	black	2
	Spare	3005	10×40	black	2
	Spare	3006	10×40	black	2
	DC Supply for BTS-Rack	3110	10×40	black	2
	Redundant DC Supply for BTS-Rack	3111	10×40	black	2
	DC Supply for BTS-Extension Rack	3120	10×40	black	2
	Redundant DC Supply for BTS-Ext. Rack	3121	10×40	black	2

LABELLING ON BTS SITES

4 RF CABLES	STM Feeder	4000	22×50	black	2
	RX/TX 1st MW-Link Feeder	4010	10×40	black	2
	RX/TX 2nd MW-Link Feeder	4011	10×40	black	2
	RX/TX 3rd MW-Link Feeder	4020	10×40	black	2
	RX/TX 4th MW-Link Feeder	4021	10×40	black	2
	Spare	4030	10×40	black	2
	Spare	4031	10×40	black	2
	Spare	4040	10×40	black	2
	Spare	4041	10×40	black	2
	1st Sector TX/RX Feeder	4110	22×50	white	2
	1st Sector RXd Feeder	4111	22×50	white	2
	2nd Sector TX/RX Feeder	4120	22×50	Red	2
	2nd Sector RXd Feeder	4121	22×50	Red	2
	3nd Sector TX/RX Feeder	4130	22×50	Blu	2
	3nd Sector RXd Feeder	4131	22×50	Blu	2
	4rd Sector TX/RX Feeder	4140	22×50	Black	2
	4rd Sector RXd Feeder	4141	22×50	Black	2
	5rd Sector TX/RX Feeder	4150	22×50	Black	2
	5rd Sector RXd Feeder	4151	22×50	Black	2
	6rd Sector TX/RX Feeder	4160	22×50	Black	2
	6rd Sector RXd Feeder	4161	22×50	Black	2
5 PCM CABLES TRANSMISSION	TRU1 O & M / Q1_1	5000	10×40	Black	2
	RX/TX 1 120Ω (TQ connector)	5110	10×40	Black	2
	RX/TX 2 120Ω	5111	10×40	Black	2
	RX/TX 3 120Ω	5120	10×40	Black	2
	RX/TX 4 120Ω	5121	10×40	Black	2
	RX 1 75Ω (BT43 connector)	5130	10×40	Black	2
	TX 1 75Ω	5131	10×40	Black	2
	RX 2 75Ω	5140	10×40	Black	2
	TX 2 75Ω	5141	10×40	Black	2
	RX 3 75Ω	5150	10×40	Black	2
	TX 3 75Ω	5151	10×40	Black	2
	RX 4 75Ω	5160	10×40	Black	2
	TX 4 75Ω	5161	10×40	Black	2
	Fibre optic TX	5210	10×40	Black	2
	Fibre optic RX	5220	10×40	black	2
	For Customer Use	5230	10×40	black	2
	For Customer Use	5240	10×40	black	2

TO BE USED FOR BSNL NORTH ZONE ONLY
NOKIA

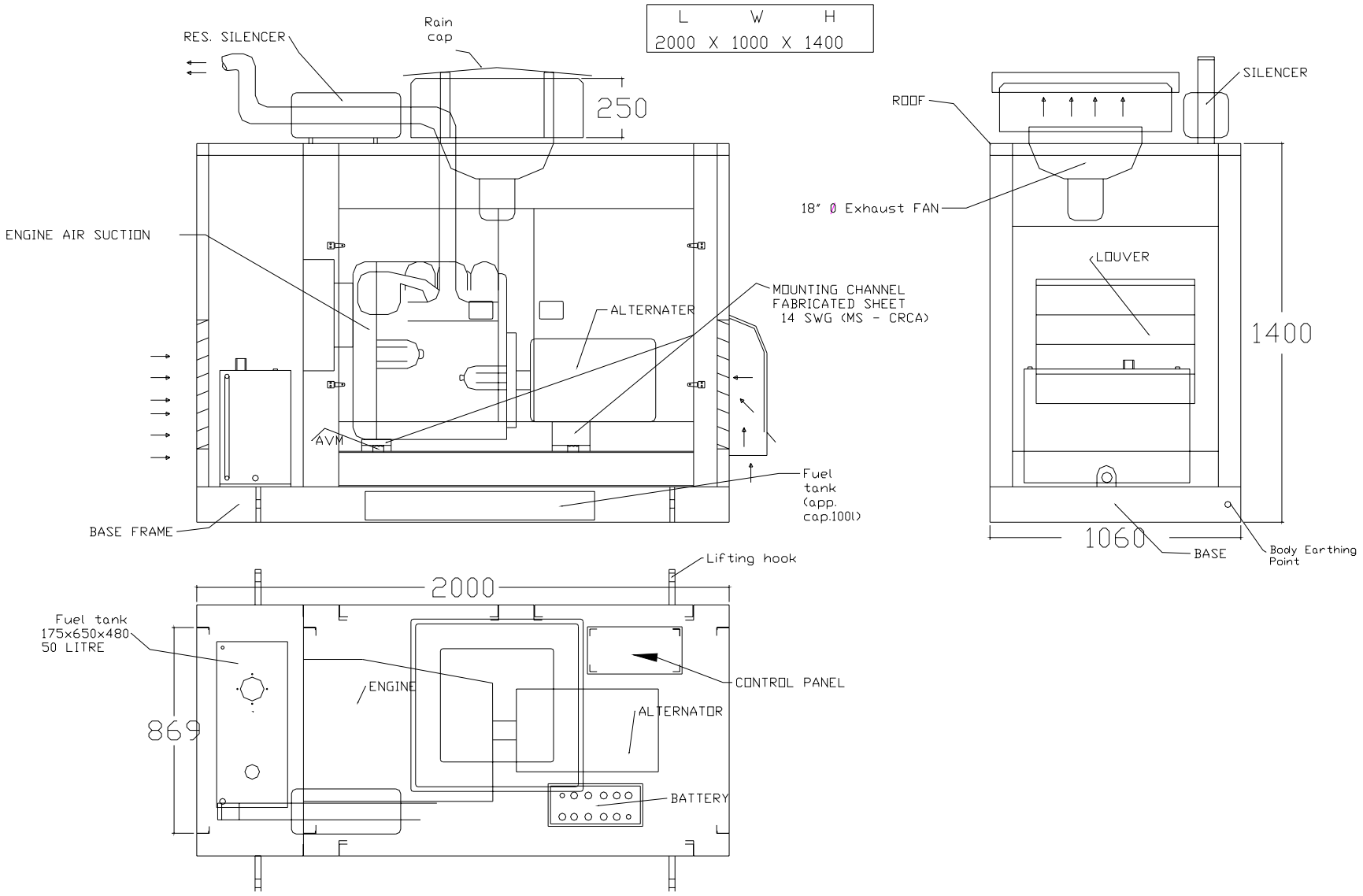
LABELLING ON BTS SITES

NUMBER OF BAG	SPECIFIC USE	CODE	SIZE	COLOUR	QUANTITY
6 ALARM CABLES	BBU monitoring	6000	10×40	black	2
	External Alarm	6001	10×40	black	2
	External Alarm	6002	10×40	black	2
	External Alarm	6003	10×40	black	2
	External Alarm	6004	10×40	black	2
	External Alarm	6005	10×40	black	2
	External Alarm	6006	10×40	black	2
	External Alarm	6007	10×40	black	2
	External Alarm	6008	10×40	black	2
	External Alarm	6009	10×40	black	2
	Customer Controls 0-5 and Alarms 0-11	6110	10×40	black	2
	Customer Alarms 12-23	6120	10×40	black	2
	Support Alarms	6130	10×40	black	2

CABLE TIES: 2,4 x 92 mm black 300 pcs
4,8 x 186 mm black 50 pcs

DG DRAWINGS

7.5 KVA DG DWG



TO BE USED FOR BSNL NORTH ZONE ONLY

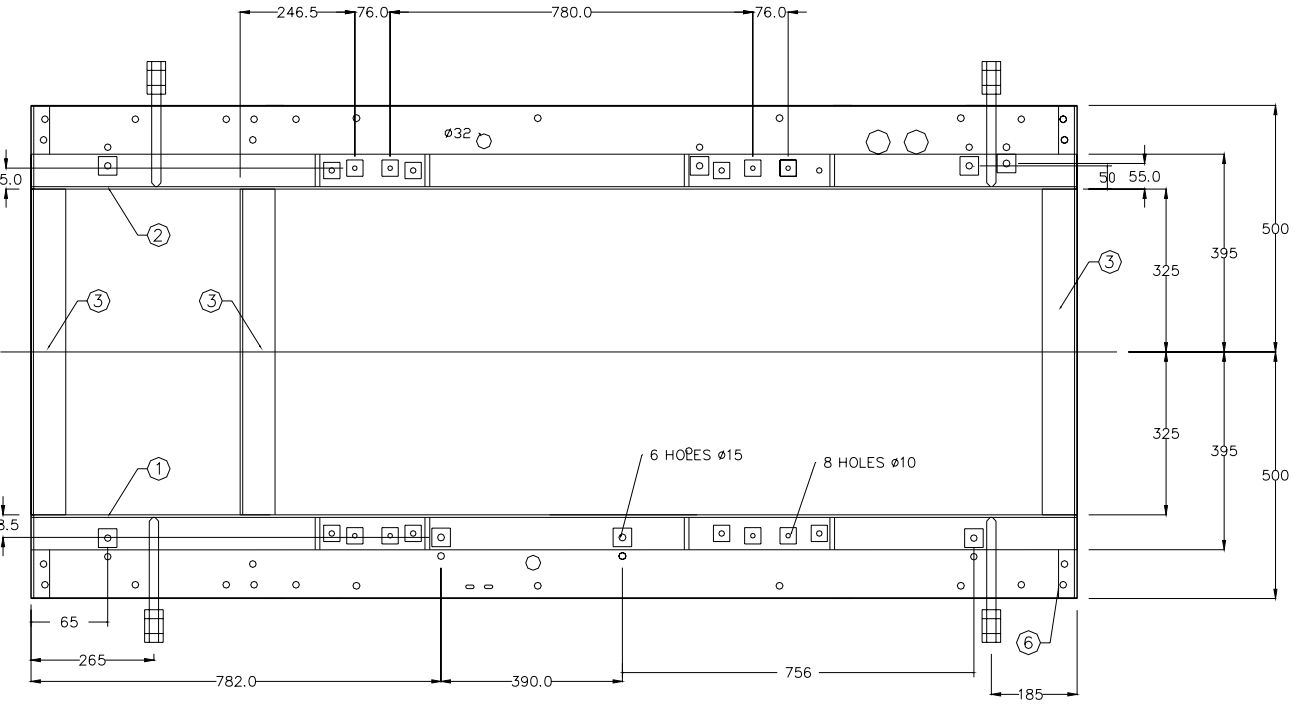
NOKIA

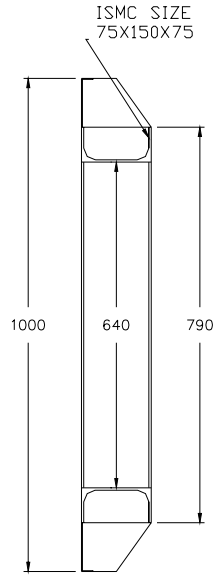
7.5 KVA DG DWG

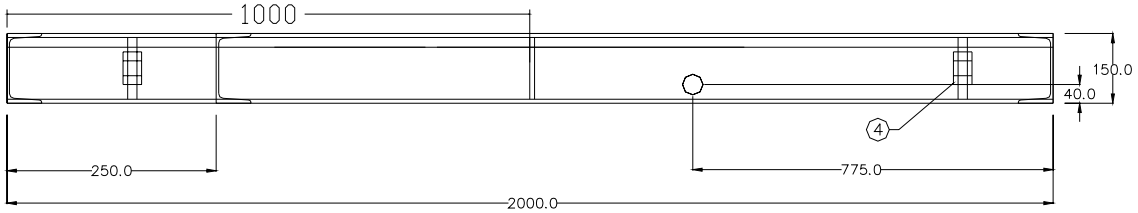
* RCC/PCC Foundation Size : 2500 L X 1200mm W (For 15 kva and 7.5 Kva both)
* Fuel tank position & dimensions can be changed, to have optimum operational performance.
* Dimension and position of accessories can also be changed keeping in mind keeping in mind users convenience.
* Dimensions are only indicative since, Product innovation is continuous process, Hence data given is subject to change without notice.
* All dimensions in mm.

1.	SHEET USED FOR ENCLOSURE - MS CRCA TH. - 16 SWG
2.	BASE CHANNEL ISMC - 75X150X75
3.	AVM -4Nos. RR100/DUNLOP/POLYBOND
4.	BATTERY - 88AH x 12v
5.	DOORS- 2 Each side - Size 619x790
6.	Insulation - Resin bonded rockwool of density 96Kg/m3.
7.	Perforated Sheet- G.I.-24swg
8.	Paint shade Enclosure-New Ivery(ppg320) Base frame, Roof top : Pepsi blue (A159)

7.5 KVA DG DWG







* 7.5 KVA SILENT DG SET BASE FRAME WITH TA-2 ENGINE.

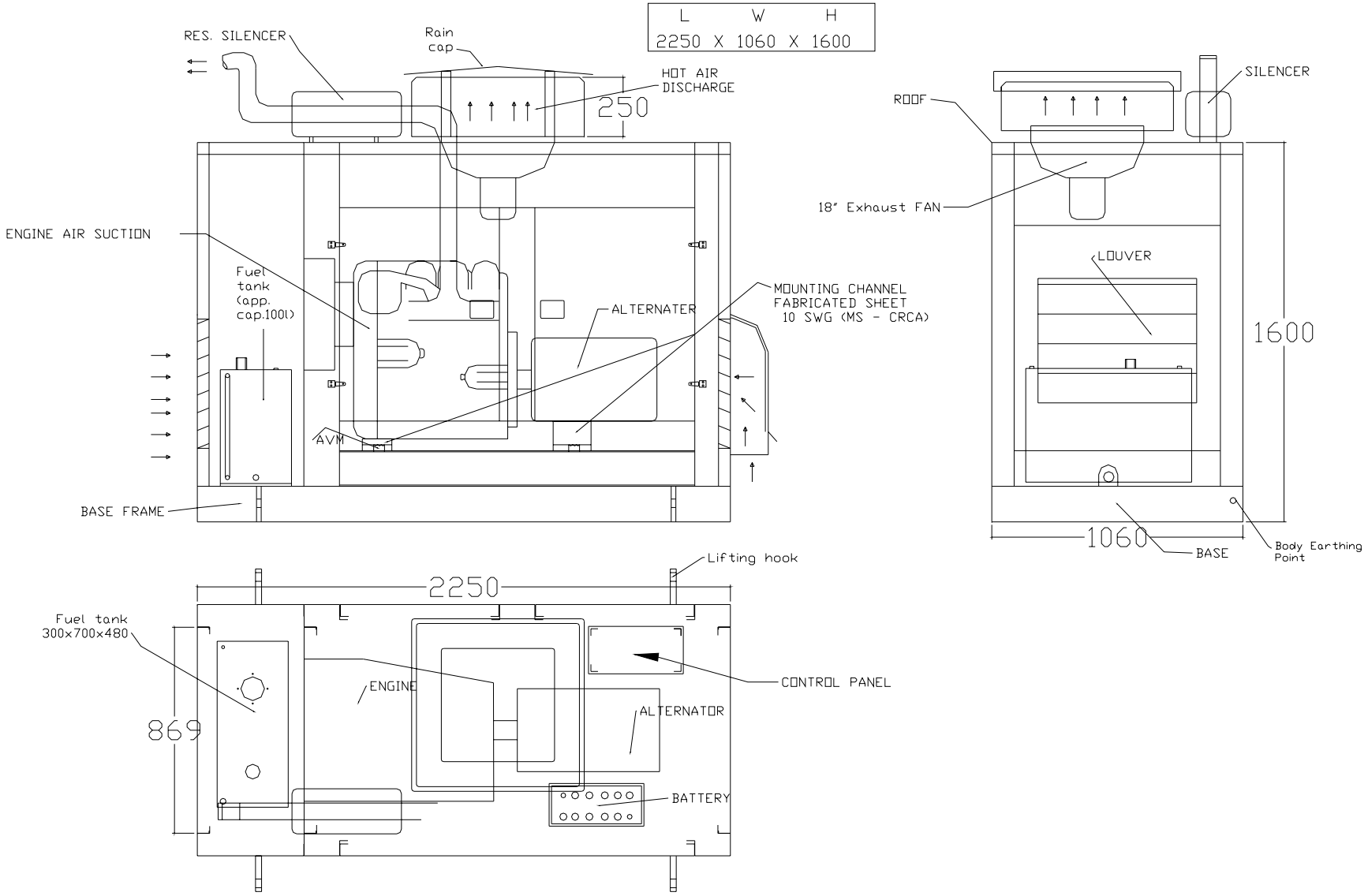
PART NO	DESCRIPTION	QTY
1	ISMC 150 X 2250 LONG	01
2	ISMC 150 X 2250 LONG	01
3	ISMC 150 X 700 LONG	03
4	LIFITING PLATES	04
5	RIBS	08
6	BRACKET FOR CANOPY SUPPORT	04

* 8 HOLES (4 EACH SIDE) 16 MM DIA FOR MOUNTING/TIGHTING, D.G. SET BASE FRAME ON BEAMS/CHANNEL AT ROOF TOP INSTALLATION. (IF REQUIRED) / ON RCC/PCC FOUNDATION. D.G. SET IS TO BE PLACED AS IT IS.

TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

15 KVA DG DWG



TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

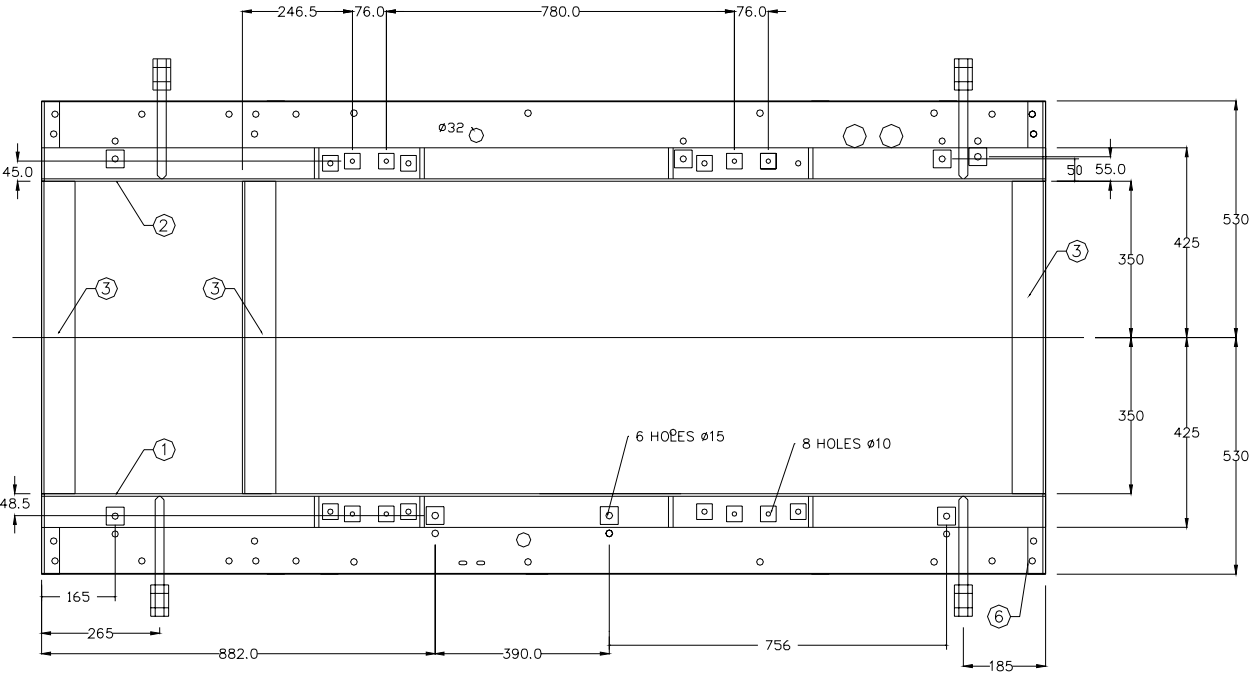
15 KVA DG DWG

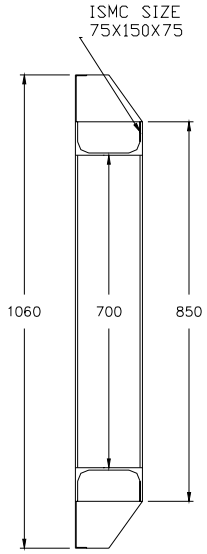
* RCC/PCC Foundation Size : 2500 L X 1200mm W (For 15 Kva and 7.5 Kva)
* Fuel tank position & dimensions can be changed, to have optimum operational performance.
* Dimension and position of accessories can also be changed keeping in mind keeping in mind users convenience.
* Dimensions are only indicative since, Product innovation is continuous process, Hence data given is subject to change without notice.
* All dimensions in mm.

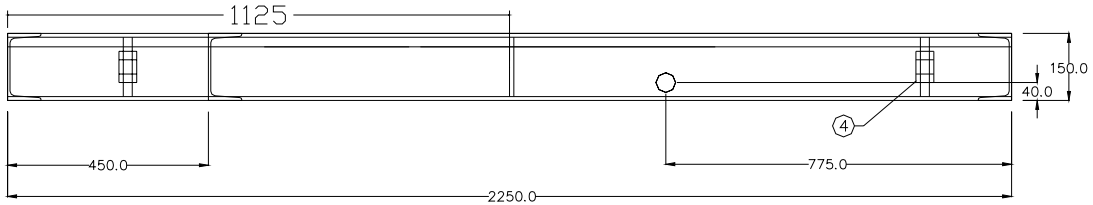
1.	SHEET USED FOR ENCLOSURE - MS CRCA TH. - 16 SWG
2.	BASE CHANNEL ISMC - 75X150X75
3.	AVM -4Nos. RR100/DUNLOP/POLYBOND
4.	BATTERY - 120AH x 12v
5.	DOORS- 2 Each side - Size 669x890
6.	Insulation - Resin bonded rockwool of density 96Kg/m3.
7.	Perforated Sheet- G.I.-24swg
8.	Paint shade Enclosure-New Ivery(ppg320) Base frame, Roof top : Pepsi blue (A159)
9.	Front door 1 no.

TO BE USED FOR BSNL NORTH ZONE ONLY

15 KVA DG DWG







* 15 KVA SILENT DG SET BASE FRAME WITH HA294 ENGINE.

PART NO	DESCRIPTION	QTY
1	ISMC 150 X 2250 LONG	01
2	ISMC 150 X 2250 LONG	01
3	ISMC 150 X 700 LONG	03
4	LIFITING PLATES	04
5	RIBS	08
6	BRACKET FOR CANOPY SUPPORT	04

* 8 HOLES (4 EACH SIDE) 16 MM DIA FOR MOUNTING/TIGHTING, D.G. SET BASE FRAME ON BEAMS/CHANNEL AT ROOF TOP INSTALLATION. (IF REQUIRED) / ON RCC/PCC FOUNDATION. D.G. SET IS TO BE PLACED AS IT IS.

ALL DIMENSIONS IN mm.

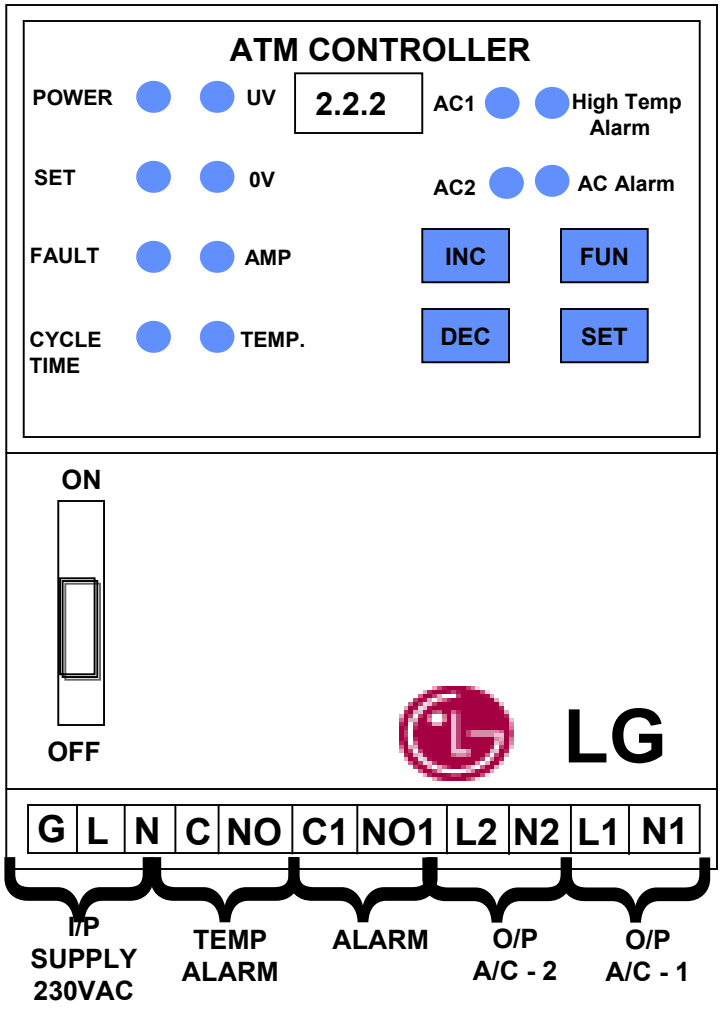
TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

ELECTRICAL

AIRCON(LG)

CONTROLLER OUT LOOK



FEATURES

- Controls 2 A/Cs (Window/Split)
- Display room temperature
- A/Cs ON time setting (1~12HRS)
- Protects from
  - Over Load
  - Over voltage
  - Under voltage
- Raises alarm in
  - Room temp. more then 28 deg
  - Fault conditions(OV,UV,OL)
- Increases efficiency as one A/C runs at one time
- Memory backup
- Manual Reset In case of Faults.

SPECIFICATION

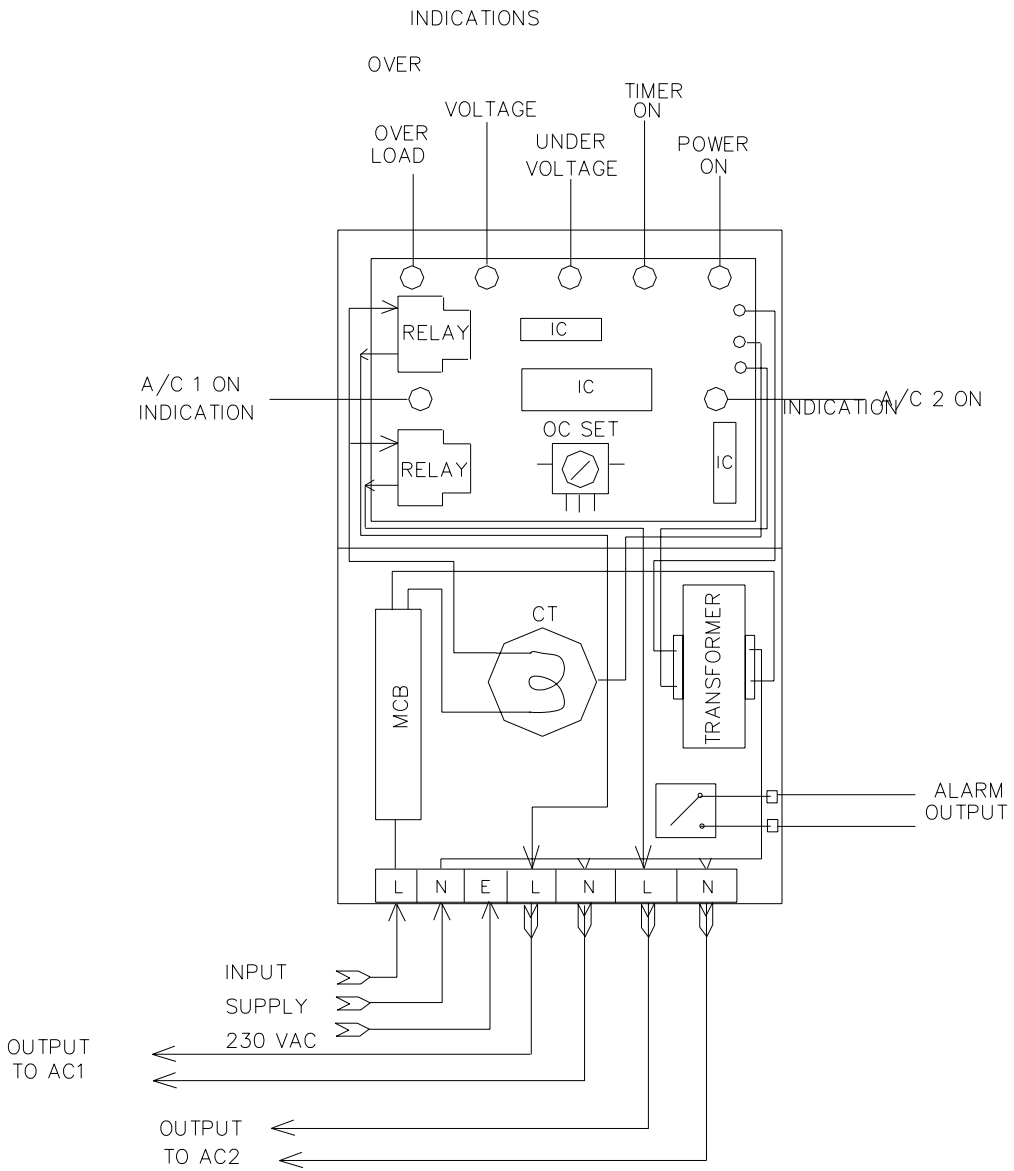
- System supply : 230VAC +/- 15%
- Out put contact rating : 25Amps
- On time delay : 2 minutes 15 secs

ATM CENTERS CONTROLLER

DETAIL FEATURE / SPECIFICATION

S.N	FEATURE
1	Input power supply : Single phase, 230V, 50 Hz
2	Output power supply : Single phase, 230V, 50 Hz (Two A/Cs)
3	A/C -1 starts after 2 min 15 secs once the controller is switched ON. During this period the Display LED will glow.
4	Depending on A/C load,the load in controller to be selected (Load setting)
5	Depending on A/C run time, the time in controller to be selected (Time setting)
6	Controller trips the A/C if there is over voltage / under voltage, MCB is not trip Over voltage : 260 V, Under voltage : 160 V .(Raise alarm in case position remains same for 10 min.)
7	Controller trips the A/C if there is over load, MCB is trip & alarm will be raised, provision for alarm is provided (NO/NC points) and after 3 minutes another A/C will run till reset.
8	Room temperature display is provided in the Controller. One thermocouple is provided which senses the room temp. & display for this is provided. Once the room temp. is more then 28 deg, the controller raises alarm (NO/NC points are provided)
9	In Case of power failure, 3 minutes of time gap before A/C is switched ON, memory back up for run time is provided
10	During changeover time of A/Cs the second A/C should start after 1 minute

BLOCK DIAGRAM



ELECTRICAL WIRING BOQ/SLD

INDOOR Electrical BOQ - THREE Phase-without Stabilizer/IT

INDOOR Electrical BOQ - THREE Phase-without Stabilizer/IT

	Description of work	Unit	Qty
	20 Way MCB DB with individual Bus Bars for R,Y,B,N & E to accommodate followings MCBs (with 3 Nos. Blanking Plates)	Nos	1
	a) 6A SP MCB - 5 Nos(tube,bulk,emergency light,avaitation lamp,spare)		
	b) 32A SP MCB for air conditioners - 1Nos		
	c) 16A SP MCB for 5/15 A power sockets 1 Nos		
	d) 63A/100mA ELCB cum MCB for mains - 1 nos.		
	e) 40A 4P MCB for rectifier - 1Nos		
	a) Supply and fixing of modular switch board with surface mounted box containing following items for lightning	Nos	1
	a)6A piono switch -2 no(lightning and bulb head)	Nos	1
	a) 5 A socket/socket (for emergency light)with surface mounted box -1 nos	Nos	1
	Wiring for 5 A power point in surface mounted MS conduit with 650 V grade, 2 X 1.5 Sqmm mutilstrand PVC insulated copper wires with one 2.5 sqmm earth wire complete.	Nos	1
	a) 5/15A socket/switch with surface mounted box -1 nos	Nos	1
	Wiring for 5/15 A power point in surface mounted MS conduit with 650 V grade, 2 X 4 Sqmm mutilstrand PVC insulated copper wires with one 2.5 sqmm earth wire complete.	Nos	1

5	Supply and Fixing of MS powder coated DB with concealed/surface mounted MS box for A/c unit, including termination	Nos	
	20A industrial type power socket-1 nos		
	20 A SP MCB –1 Nos		
	Wiring for power point for A/C units in surface MS conduit with 650 V grade, 6 Sqmm mutilstrand PVC insulated copper wires with one 4 sqmm earth wire complete.	Nos	
6	Supply and Fixing of 2 X 36W flourosent Tube Light fixtures with electronic ballast	Nos	
	Supply and Fixing of bulk head fitting	Nos	
	Wiring for lighting point in surface pvc conduit with 650 V grade, 2X1.5 Sqmm mutilstrand PVC insulated copper wires complete.		
	Primary	Nos	re
	secondary	Nos	re
7	Supplying and fixing 415V,63A,TPN fuse disconnector units with 3 nos. 125A size HRC fuses, (Make :L&T -Model FN63,TPN) in MS sheet enclosure		

INDOOR Electrical BOQ - THREE Phase-without Stabilizer/IT

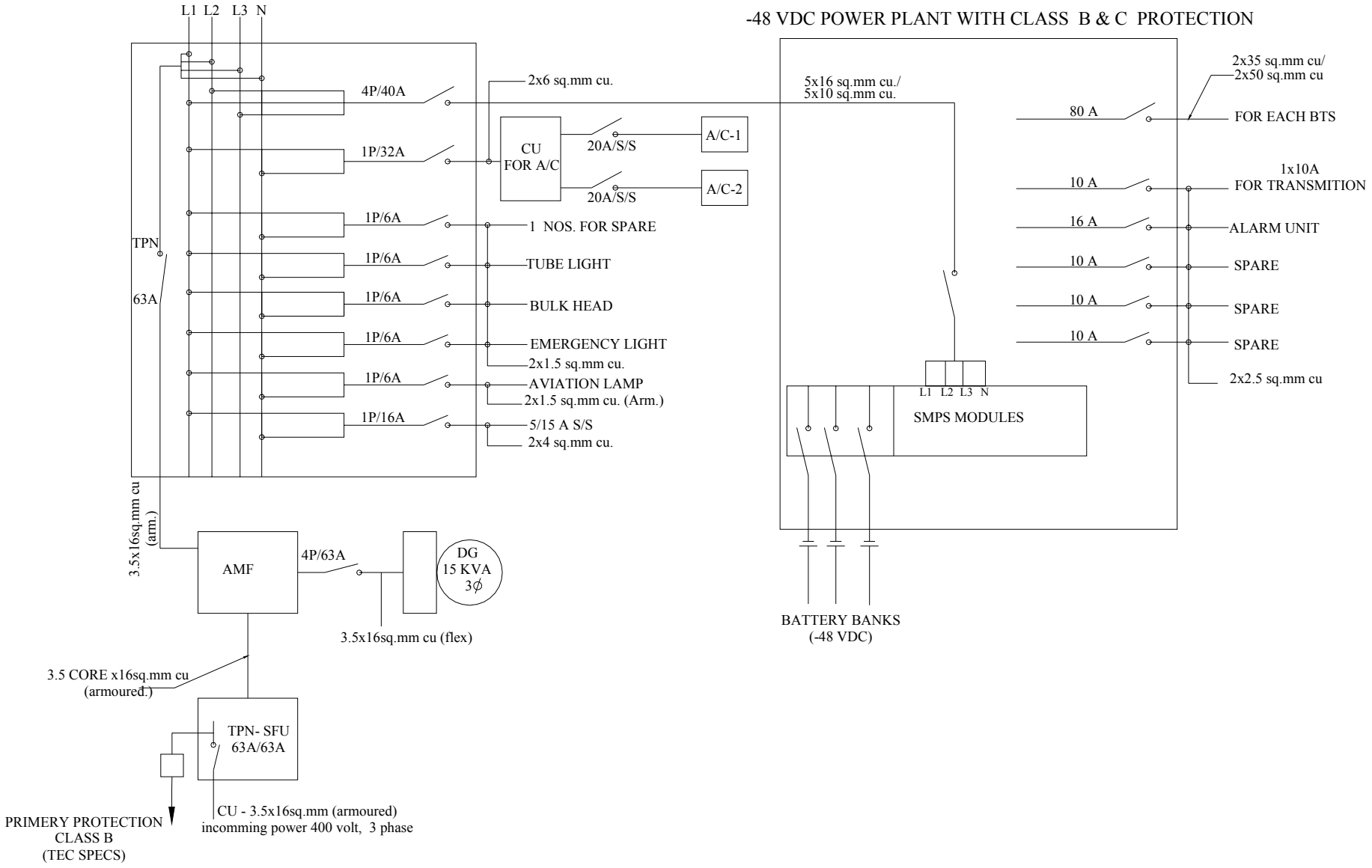
8	**EXTERNAL ALARM WIRING**		
	Supply of 6 Pair Telephone cable - 0.5 sq.mm single strand tinned copper wire. (ddf to smoke ,door ,temp,DG)	L.S	As reqd.
	Laying of the above 6 pair cables in 20mm dia PVC Conduits of AKG/Settia Make	L.S	As reqd.
	Supply and Fixing of Ferrules for each pair as per our number scheme	L.S	As reqd.
	Note on External Alarm wiring :-		
	The 6 Pair cables should be routed in the following manner:		
	From DG AMF Panel to Network Equipment - 2 Runs of the 6 pair cable in single conduit		
	From the Temperature /smoke sensor to the Network equipment- 1 R of 6 pair cable.		
	From Door / Fire Alarm Panel to the Network equipment- 1Run of 6 pair cable.		
9	**ANTI STATIC EARTHING**		
	Supply and Laying of 4 sq.mm multi stranded copper flexible wires of 650v grade in electrical casing and capping .The connection to be made using copper ring type lugs.	L.S	As reqd.
	Note on External Alarm wiring :-		
	The 4 sq.mm wires to be connected from the copper strips of the anti static flooring to the internal earth bar.	L.S	As reqd.

10	**Safety System**		
	DC OPERATED WITH HOOTER INSTALLED INSIDE THE SYSTEM AND ALSO INCLUDED (Fire Detection, Room Temp Detection, Door alarms with all sensors) with complete wiring ,installation and commisioning	no	1
	Fire Extenguisher ABC Type 1.5 kg	no	1
	Emergency Light	no	1
11	**EXTERNAL/INTERNAL CABLING**		
	1.1kV grade, **single core, 25 sq.mm**, unsheathed, PVC insulated, copper conductor **flexible cable**, ISI marked and manufactured as per IS 694/1990	L.S	As reqd.
	1.1kV grade, **single core, 10 sq.mm**, unsheathed, PVC insulated, copper conductor **flexible cable**, ISI marked and manufactured as per IS 694/1990	L.S	As reqd.
	Armoured copper power cable 3 .5 Core 16sq.mm Cable WITH SADDLES /CLAMPS ,GLANDS ,LUGS and screws (for power cabling)	L.S	As reqd.
	Flexible copper power cable 4 Core 16sq.mm Cable WITH SADDLES /CLAMPS ,LUGS and screws (for power cabling)	L.S	As reqd.
	PVC Flexible conduit pipe(Wirebraided) 53mm	L.S	As reqd.
	PVC Flexible conduit pipe 25mm G.I. Braided	L.S	As reqd.
	Supplying 50mm dia of **'B' class GI pipe** Make Jindal - where ever reqd	L.S	As reqd.
12	**Grounding bus bar**		
	Copper bus bar with 16 holes M10 with ISOLATOR with nut boltsand washers (300x100x6)	PCS	2
	Copper bus bar with 6 holes M10 with ISOLATOR (75x75x6) with nut boltsand washers	PCS	1

INDOOR Electrical BOQ - THREE Phase-without Stabilizer/IT

13	**Earthing**		
	Providing of 600x600x6mm GI plate earth electrode with 50mm GI pipe with all its accessories, including excavation, backfilling, disposal of debris of surplus material, testing complete as per specification enclosed. Earthing pit six shall be 3M Depth x EARTH PIT should have following arrangement (1)GI frame with cast iron cover hinged with lockable arrangement (2)Funnel with wire mesh All other arrangement as per drawing enclosed	Pit	3
	Supplying and laying the following **50mmX3mm hot dip galvanized GI strip** including fixing accessories , stainless steel bolts,GI nuts -bolts and washers	L.S	As reqd.

LINE DIAGRAM - THREE Phase-without Stabilizer/IT



TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

INDOOR Electrical BOQ - SINGLE Phase-without Stabilizer/IT

INDOOR Electrical BOQ - SINGLE Phase-without Stabilizer/IT

.No	Description of work	Unit	Qty
	20 Way MCB DB with individual Bus Bars for R,N & E to accommodate followings MCBs (with 3 Nos. Blanking Plates)	Nos	1
	a) 6A SP MCB - 5 Nos(tube,bulk,emergency light,avaitation lamp,spare)		
	b) 32A SP MCB for air conditioners - 1Nos		
	c) 16A SP MCB for 5/15 A power sockets 1 Nos		
	d) 150A/100mA ELCB cum MCB for mains - 1 nos.		
	e) 100A DP MCB for rectifier - 1Nos		
2	a) Supply and fixing of modular switch board with surface mounted box containing following items for lightning	Nos	1
	a)6A piono switch -2 no(lightning and bulb head)	Nos	1
3	a) 5 A socket/socket with surface mounted box -1 nos	Nos	1
	Wiring for 5 A power point in surface mounted MS conduit with 650 V grade, 2 X 1.5 Sqmm mutilstrand PVC insulated copper wires with one 2.5 sqmm earth wire complete.	Nos	1
4	a) 5/15A socket/switch with surface mounted box -1 nos	Nos	1
	Wiring for 5/15 A power point in surface mounted MS conduit with 650 V grade, 2 X 4 Sqmm mutilstrand PVC insulated copper wires with one 2.5 sqmm earth wire complete.	Nos	1
5	Supply and Fixing of MS powder coated DB with concealed/surface mounted MS box for A/c unit, including termination	Nos	2
	20A industrial type power socket-1 nos		
	20 A SP MCB –1 Nos		
	Wiring for power point for A/C units in surface MS conduit with 650 V grade, 6 Sqmm mutilstrand PVC insulated copper wires with one 4 sqmm earth wire complete.	Nos	2
6	Supply and Fixing of 2 X 36W flourosent Tube Light fixtures with electronic ballast	Nos	1
	Supply and Fixing of bulk head fitting	Nos	1
	Wiring for lighting point in surface pvc conduit with 650 V grade, 2X1.5 Sqmm mutilstrand PVC insulated copper wires complete.		
	Primary	Nos	As reqd.
	secondary	Nos	As reqd.
7	Supplying and fixing 230V,150A,1P fuse disconnector units with 1 nos. 125A size HRC fuses, (Make :L&T -Model) in MS sheet enclosure		1

INDOOR Electrical BOQ - SINGLE Phase-without Stabilizer/IT

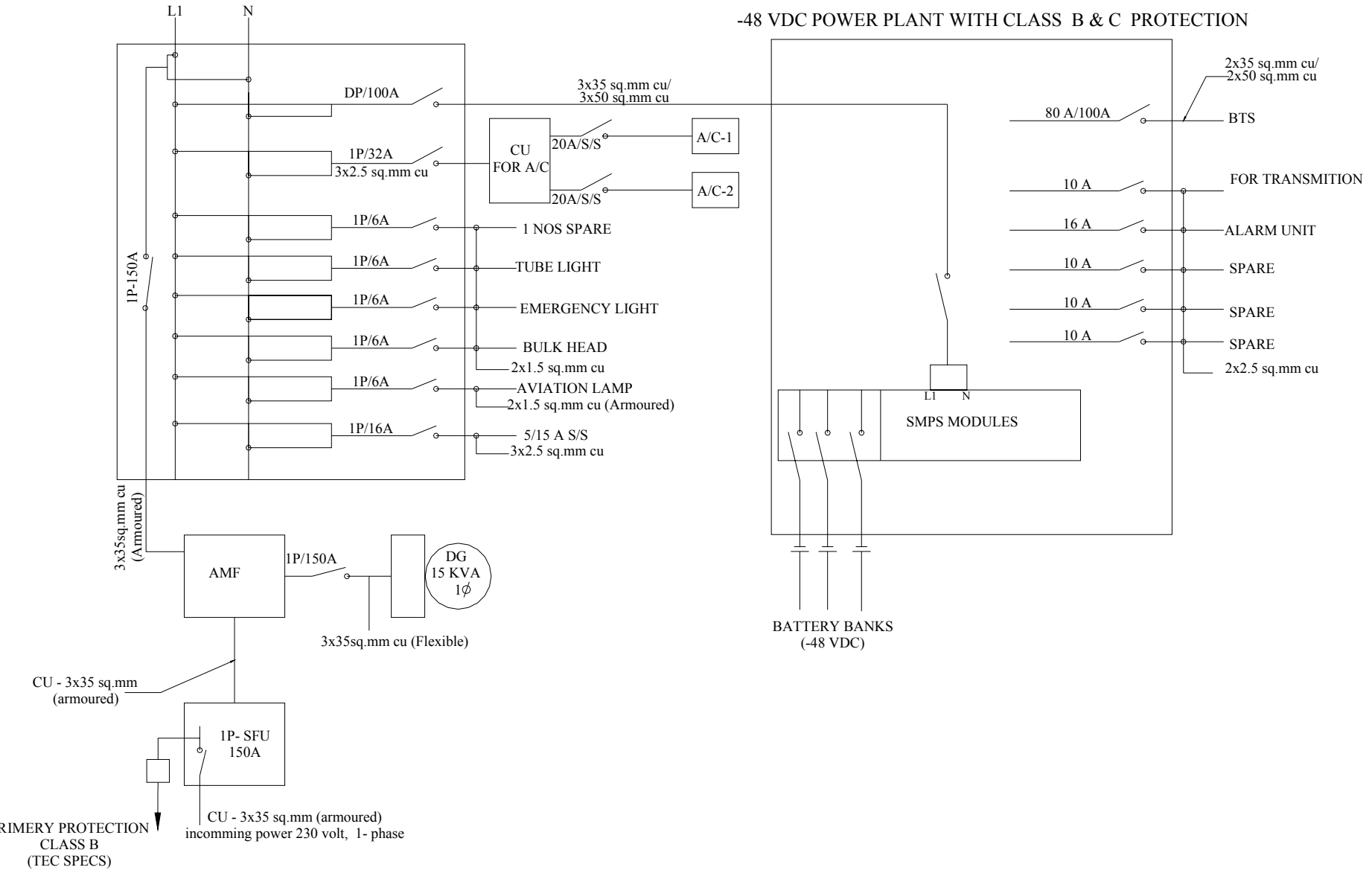
	EXTERNAL ALARM WIRING		
	Supply of 6 Pair Telephone cable - 0.5 sq.mm single strand tinned copper wire. (ddf to smoke ,door ,temp,DG)	L.S	As reqd.
	Laying of the above 6 pair cables in 20mm dia PVC Conduits of AKG/Settia Make	L.S	As reqd.
	Supply and Fixing of Ferrules for each pair as per our number scheme	L.S	As reqd.
	Note on External Alarm wiring :-		
	The 6 Pair cables should be routed in the following manner:		
	From DG AMF Panel to Network Equipment - 2 Runs of the 6 pair cable in single conduit		
	From the Temperature /smoke sensor to the Network equipment- 1 R of 6 pair cable.		
	From Door / Fire Alarm Panel to the Network equipment- 1Run of 6 pair cable.		
	ANTI STATIC EARTHING		
	Supply and Laying of 4 sq.mm multi stranded copper flexible wires of 650v grade in electrical casing and capping .The connection to be made using copper ring type lugs.	L.S	As reqd.
	Note on External Alarm wiring :-		
	The 4 sq.mm wires to be connected from the copper strips of the anti static flooring to the internal earth bar.	L.S	As reqd.

10	**Safety System**		
	DC OPERATED WITH HOOTER INSTALLED INSIDE THE SYSTEM AND ALSO INCLUDED (Fire Detection, Room Temp Detection, Door alarms with all sensors) with complete wiring ,installation and commisioning	no	
	Fire Extenguisher ABC Type 1.5 kg	no	
	Emergency Light	no	
11	**EXTERNAL/INTERNAL CABLING**		
	1.1kV grade, **single core, 25 sq.mm**, unsheathed, PVC insulated, copper conductor **flexible cable**, ISI marked and manufactured as per IS 694/1990	L.S	re
	1.1kV grade, **single core, 10 sq.mm**, unsheathed, PVC insulated, copper conductor **flexible cable**, ISI marked and manufactured as per IS 694/1990	L.S	re
	Armoured copper power cable 3 Core 35 sq.mm Cable WITH SADDLES /CLAMPS ,GLANDS ,LUGS and screws (for power cabling)	L.S	re
	Flexible copper power cable 3 Core 35 sq.mm Cable WITH SADDLES /CLAMPS ,LUGS and screws (for power cabling)	L.S	re
	PVC Flexible conduit pipe(Wirebraided) 53mm	L.S	re
	PVC Flexible conduit pipe 25mm G.I. Braided	L.S	re
	Supplying 50mm dia of **'B' class GI pipe** Make Jindal - where ever reqd	L.S	re

INDOOR Electrical BOQ - SINGLE Phase-without Stabilizer/IT

12	**Grounding bus bar**		
	Copper bus bar with 16 holes M10 with ISOLATOR with nut boltsand washers (300x150x6)	PCS	2
	Copper bus bar with 6 holes M10 with ISOLATOR (75x75x6) with nut boltsand washers	PCS	1
13	**Earthing**		
	Providing of 600x600x6mm GI plate earth electrode with 50mm GI pipe with all its accessories, including excavation, backfilling, disposal of debris of surplus material, testing complete as per specification enclosed. Earthing pit six shall be 3M Depth x EARTH PIT should have following arrangement (1)GI frame with cast iron cover hinged with lockable arrangement (2)Funnel with wire mesh All other arrangement as per drawing enclosed	Pit	3
	Supplying and laying the following **50mmX3mm hot dip galvanized GI strip** including fixing accessories , stainless steel bolts,GI nuts -bolts and washers	L.S	As reqd.

LINE DIAGRAM - SINGLE Phase-without Stabilizer/IT



TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

OUTDOOR Electrical BOQ - THREE Phase-without Stabilizer/IT

OUTDOOR Electrical BOQ - THREE Phase-without Stabilizer/IT

N	Description of work	Unit	Qty
	10 Way MCB DB with individual Bus Bars for R,Y,B,N & E to accommodate followings MCBs (with 3 Nos. Blanking Plates)	Nos	1
	a) 6A SP MCB - 5 Nos(tube,bulk,emergency light,avaitation lamp,spare)		
	c) 16A SP MCB for 5/15 A power sockets 1 Nos		
	d) 63A/100mA ELCB cum MCB for mains - 1 nos.		
	e) 40A 4P MCB for rectifier - 1Nos		
	a) Supply and fixing of modular switch board with surface mounted box containing following items for lightning	Nos	1
	a)6A piono switch -2 no(lightning and bulb head)	Nos	1
	a) 5 A socket/socket (for emergency light)with surface mounted box -1 nos	Nos	1
	Wiring for 5 A power point in surface mounted MS conduit with 650 V grade, 2 X 1.5 Sqmm mutilstrand PVC insulated copper wires with one 2.5 sqmm earth wire complete.	Nos	1
	a) 5/15A socket/switch with surface mounted box -1 nos	Nos	1
	Wiring for 5/15 A power point in surface mounted MS conduit with 650 V grade, 2 X 4 Sqmm mutilstrand PVC insulated copper wires with one 2.5 sqmm earth wire complete.	Nos	1

5	Supply and Fixing of 2 X 36W flourosent Tube Light fixtures with electronic ballast	Nos	1
	Supply and Fixing of bulk head fitting	Nos	1
	Wiring for lighting point in surface pvc conduit with 650 V grade, 2X1.5 Sqmm mutilstrand PVC insulated copper wires complete.		
	Primary	Nos	As reqd.
	secondary	Nos	As reqd.
6	Supplying and fixing 415V,63A,TPN fuse disconnector units with 3 nos. 125A size HRC fuses, (Make :L&T -Model FN63,TPN) in MS sheet enclosure		1
7	**EXTERNAL ALARM WIRING**		
	Supply of 6 Pair Telephone cable - 0.5 sq.mm single strand tinned copper wire. (ddf to DG)	L.S	As reqd.
	Laying of the above 6 pair cables in 20mm dia PVC Conduits of AKG/Settia Make	L.S	As reqd.
	Supply and Fixing of Ferrules for each pair as per our number scheme	L.S	As reqd.
	Note on External Alarm wiring :-		
	The 6 Pair cables should be routed in the following manner:		
	From DG AMF Panel to Network Equipment - 2 Runs of the 6 pair cable in single conduit		

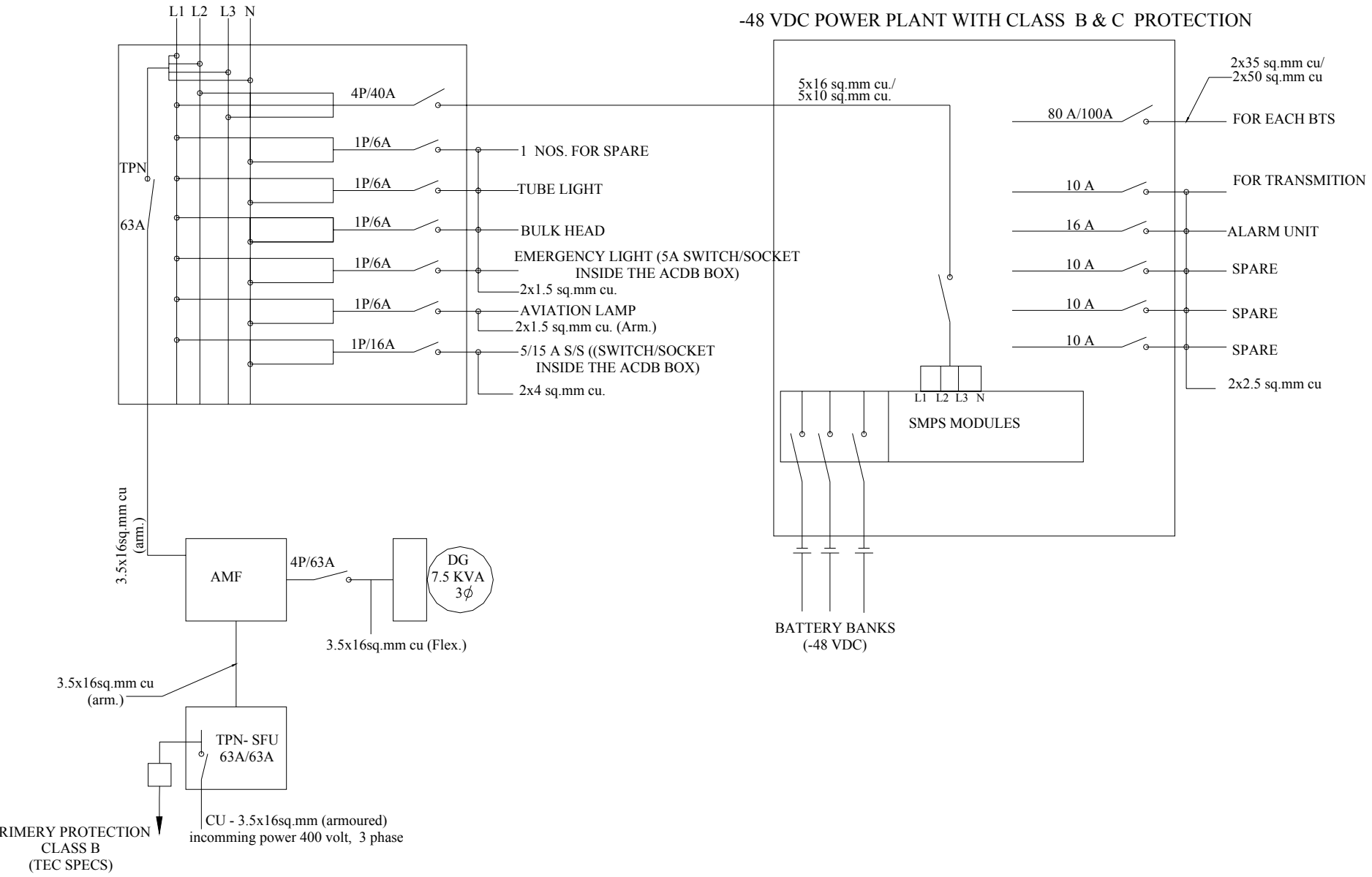
OUTDOOR Electrical BOQ - THREE Phase-without Stabilizer/IT

8	**Safety System**		
	Fire Extenguisher ABC Type 1.5 kg	no	1
	Emergency Light	no	1
9	**EXTERNAL/INTERNAL CABLING**		
	1.1kV grade, **single core, 25 sq.mm**, unsheathed, PVC insulated, copper conductor **flexible cable**, ISI marked and manufactured as per IS 694/1990	L.S	As reqd.
	1.1kV grade, **single core, 10 sq.mm**, unsheathed, PVC insulated, copper conductor **flexible cable**, ISI marked and manufactured as per IS 694/1990	L.S	As reqd.
	Armoured copper power cable 3 .5 Core 16sq.mm Cable WITH SADDLES /CLAMPS ,GLANDS ,LUGS and screws (for power cabling)	L.S	As reqd.
	Flexible copper power cable 4 Core 16sq.mm Cable WITH SADDLES /CLAMPS ,LUGS and screws (for power cabling)	L.S	As reqd.
	PVC Flexible conduit pipe(Wirebraided) 53mm	L.S	As reqd.
	PVC Flexible conduit pipe 25mm G.I. Braided	L.S	As reqd.
	Supplying 50mm dia of **'B' class GI pipe** Make Jindal - where ever reqd	L.S	As reqd.
10	**Grounding bus bar**		
	Copper bus bar with 16 holes M10 with ISOLATOR with nut boltsand washers (300x100x6)	PCS	2
	Copper bus bar with 6 holes M10 with ISOLATOR (75x75x6) with nut boltsand washers	PCS	1

OUTDOOR Electrical BOQ - THREE Phase-without Stabilizer/IT

11	**Earthing**		
	Providing of 600x600x6mm GI plate earth electrode with 50mm GI pipe with all its accessories, including excavation, backfilling, disposal of debris of surplus material, testing complete as per specification enclosed. Earthing pit six shall be 3M Depth x EARTH PIT should have following arrangement (1)GI frame with cast iron cover hinged with lockable arrangement (2)Funnel with wire mesh All other arrangement as per drawing enclosed	Pit	3
	Supplying and laying the following **50mmX3mm hot dip galvanized GI strip** including fixing accessories , stainless steel bolts,GI nuts -bolts and washers	L.S	As reqd.

LINE DIAGRAM - THREE Phase-without Stabilizer/IT



TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA

OUTDOOR Electrical BOQ - SINGLE Phase-without Stabilizer/IT

OUTDOOR Electrical BOQ - SINGLE Phase-without Stabilizer/IT

Sl.No	Description of work	Unit	Qty
1	10 Way MCB DB with individual Bus Bars for R,N & E to accommodate followings MCBs (with 3 Nos. Blanking Plates)	Nos	1
	a) 6A SP MCB - 5 Nos(tube,bulk,emergency light,avaitation lamp,spare)		
	c) 16A SP MCB for 5/15 A power sockets 1 Nos		
	d) 150A/100mA ELCB cum MCB for mains - 1 nos.		
	e) 100A DP MCB for rectifier - 1Nos		
2	a) Supply and fixing of modular switch board with surface mounted box containing following items for lightning	Nos	1
	a)6A piono switch -2 no(lightning and bulb head)	Nos	1
3	a) 5 A socket/socket (for emergency light)with surface mounted box -1 nos	Nos	1
	Wiring for 5 A power point in surface mounted MS conduit with 650 V grade, 2 X 1.5 Sqmm mutilstrand PVC insulated copper wires with one 2.5 sqmm earth wire complete.	Nos	1
4	a) 5/15A socket/switch with surface mounted box -1 nos	Nos	1
	Wiring for 5/15 A power point in surface mounted MS conduit with 650 V grade, 2 X 4 Sqmm mutilstrand PVC insulated copper wires with one 2.5 sqmm earth wire complete.	Nos	1
5	Supply and Fixing of 2 X 36W flourosent Tube Light fixtures with electronic ballast	Nos	
	Supply and Fixing of bulk head fitting	Nos	
	Wiring for lighting point in surface pvc conduit with 650 V grade, 2X1.5 Sqmm mutilstrand PVC insulated copper wires complete.		
	Primary	Nos	req
	secondary	Nos	req
6	Supplying and fixing 230V,150A,1P fuse disconnector units with 1 nos. 125A size HRC fuses, (Make :L&T -Model) in MS sheet enclosure		
7	**EXTERNAL ALARM WIRING**		
	Supply of 6 Pair Telephone cable - 0.5 sq.mm single strand tinned copper wire. (ddf to DG)	L.S	req
	Laying of the above 6 pair cables in 20mm dia PVC Conduits of AKG/Settia Make	L.S	req
	Supply and Fixing of Ferrules for each pair as per our number scheme	L.S	req
	Note on External Alarm wiring :-		
	The 6 Pair cables should be routed in the following manner:		
	From DG AMF Panel to Network Equipment - 2 Runs of the 6 pair cable in single conduit		

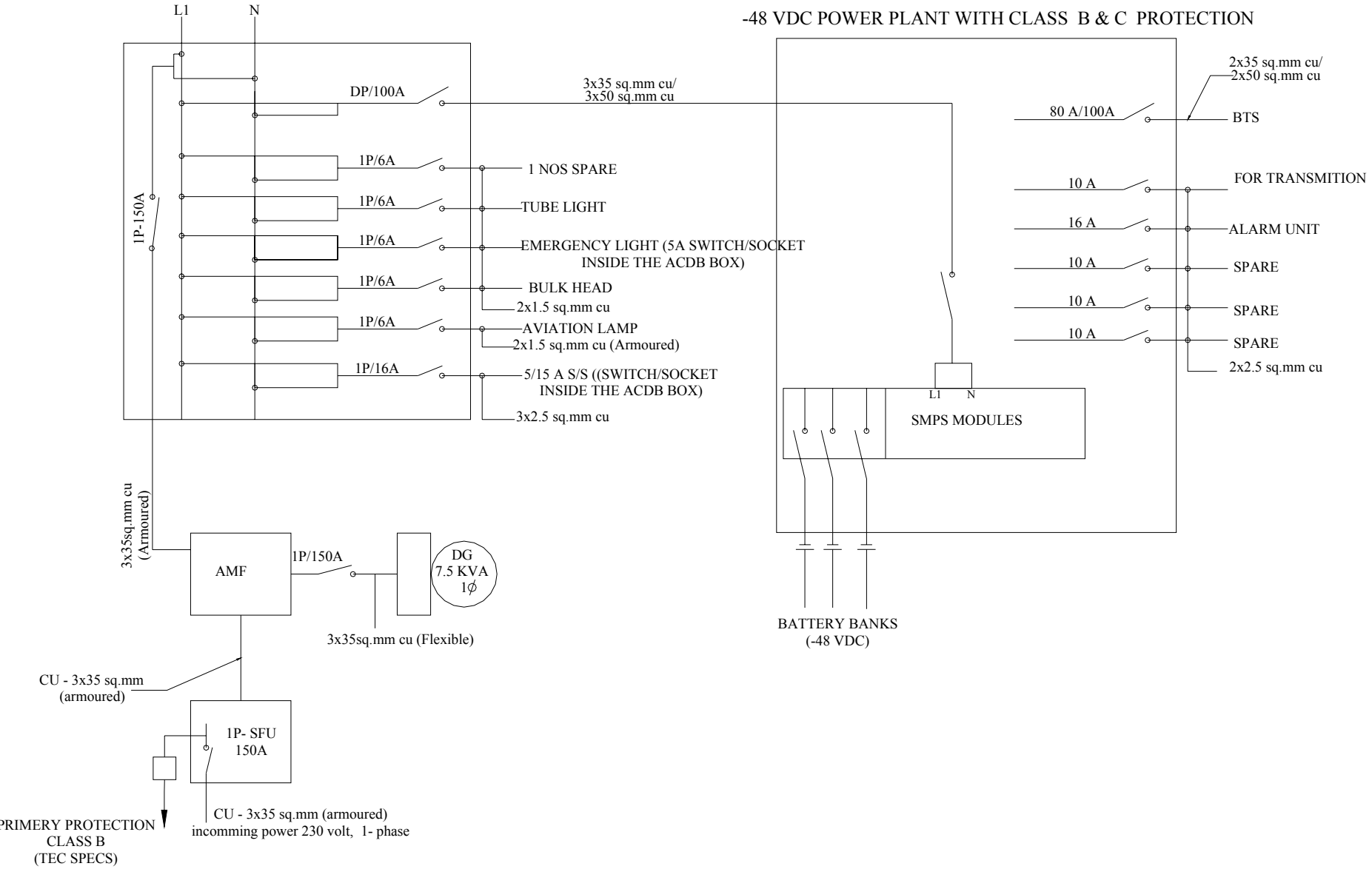
OUTDOOR Electrical BOQ - SINGLE Phase-without Stabilizer/IT

8	**Safety System**		
	Fire Extenguisher ABC Type 1.5 kg	no	1
	Emergency Light	no	1
9	**EXTERNAL/INTERNAL CABLING**		
	1.1kV grade, **single core, 25 sq.mm**, unsheathed, PVC insulated, copper conductor **flexible cable**, ISI marked and manufactured as per IS 694/1990	L.S	As reqd.
	1.1kV grade, **single core, 10 sq.mm**, unsheathed, PVC insulated, copper conductor **flexible cable**, ISI marked and manufactured as per IS 694/1990	L.S	As reqd.
	Armoured copper power cable 3 Core 35 sq.mm Cable WITH SADDLES /CLAMPS ,GLANDS ,LUGS and screws (for power cabling)	L.S	As reqd.
	Flexible copper power cable 3 Core 35 sq.mm Cable WITH SADDLES /CLAMPS ,LUGS and screws (for power cabling)	L.S	As reqd.
	PVC Flexible conduit pipe(Wirebraided) 53mm	L.S	As reqd.
	PVC Flexible conduit pipe 25mm G.I. Braided	L.S	As reqd.
	Supplying 50mm dia of **'B' class GI pipe** Make Jindal - where ever reqd	L.S	As reqd.

OUTDOOR Electrical BOQ - SINGLE Phase-without Stabilizer/IT

10	**Grounding bus bar**		
	Copper bus bar with 16 holes M10 with ISOLATOR with nut boltsand washers (300x100x6)	PCS	2
	Copper bus bar with 6 holes M10 with ISOLATOR (75x75x6) with nut boltsand washers	PCS	1
11	**Earthing**		
	Providing of 600x600x6mm GI plate earth electrode with 50mm GI pipe with all its accessories, including excavation, backfilling, disposal of debris of surplus material, testing complete as per specification enclosed. Earthing pit six shall be 3M Depth x EARTH PIT should have following arrangement (1)GI frame with cast iron cover hinged with lockable arrangement (2)Funnel with wire mesh All other arrangement as per drawing enclosed	Pit	3
	Supplying and laying the following **50mmX3mm hot dip galvanized GI strip** including fixing accessories , stainless steel bolts,GI nuts -bolts and washers	L.S	As reqd.

LINE DIAGRAM - SINGLE Phase-without Stabilizer/IT



TO BE USED FOR BSNL NORTH ZONE ONLY

NOKIA VALUES/CULTURE

Nokia Values

- Respect for the individual
- Continuous learning
- Customer satisfaction
- Achievement

Service culture- RARE

- R- Responsiveness
- A- Assurance
- R- Reliability
- E-Empathy

RARE Culture

NOKIA
CONNECTING PEOPLE

7. Relationship Management of CS

Reliability

Ability to perform promised service dependably and accurately;
Technical competence
Keeping timetables/promises
Things are done right in one go

Assurance

Ability to convey trust and confidence;
Preparation
Appearance
Knowledge

Empathy

The provision of individualized attention to customers
Ability to understand customer needs and problems
Active listening
Positive thinking

Responsiveness

The willingness to help customers and to provide promt service
Reactive and proactive customer care
Sense of responsibility

Team work

Smooth PROJECT
(7 Months)

THANK YOU