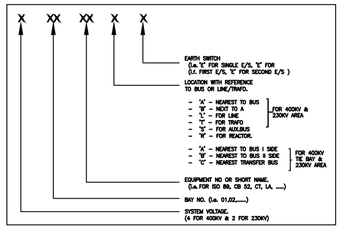
adani	**Categories:**
	☐ Cat-I — Approved. Good for Manufacturing/Construction/Fabrication.
	☑ Cat-I* — Approved with minor comments. No resubmission is required. To be incorporated in As-Built. Good for Manufacturing/ Construction/ Fabrication subject to incorporation of comments.
Reviewer	☐ Cat-II — Resubmission is required. Approved & Released for Manufacturing/ fabrication/ construction subjected to incorporation of comments.
	☐ Cat-III — Not Approved. Revise & Resubmit for Approval
	☐ Cat-IV — For Information & Records.
	☐ Cat-IV* — Incorporate Comments & resubmit for Information & records.
Approver	*Note: "Approval of this document does not absolve the Contractor/ Supplier/Fabricator from fulfilling Contractual obligations in any way"*

REV	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
4	26-12-2025	REVISED AS PER 230KV LINE BAY ADDED	JKS	SND	JJP
3	31-03-2025	REVISED AS PER COMMENTS	JKS	SND	JJP
2	12-02-2025	REVISED AS PER COMMENTS	JKS	SND	JJP
1	18-12-2024	REVISED AS PER COMMENTS	JKS	SND	JJP
0	04-12-2024	FIRST SUBMISSION	JKS	SND	JJP

OWNER & CLIENT	adani	KARUR TRANSMISSION LIMITED (KTL)	
EPC CONTRACTOR	ISO 9001:2015	AKSHAR ELECINFRA PRIVATE LIMITED	
PROJECT	KARUR TRANSMISSION LIMITED (KTL) - ADANI 400/220kV S/S		
TITLE OF DOCUMENT	400/230kV Switchyard Single Line Diagram		
DOCUMENT NO.	AEPL-P747-KTL-E-SLD-002	REV: R4	SHEET: 1 of 2

EPC CONTRACTOR: AEPL	CUST. DWG. NO	---	SUBMITTED FOR		SCALE: NTS		DATE
ISO 9001:2015	CUST. PROJ. NO	P-747	A	APPROVAL	PREPARED BY	JKS	26-12-2025
	SHEET SIZE	A4		INFORMATION	CHECKED BY	SND	26-12-2025
	DOC SOURCE	DOCX		CONSTRUCTION	APPROVED BY	JJP	26-12-2025

NOMENCLATURE FOR EQUIPMENT MARK NO:-



SYSTEM PARAMETERS:

SR NO	DESCRIPTION	400KV	230KV
1.0	RATED VOLTAGE	400KV	230KV
2.0	HIGHEST SYSTEM VOLTAGE	420KV rms	245KV rms
3.0	RATED FREQUENCY	50HZ	50HZ
4.0	MAX. FAULT LEVEL (1 SEC.)	63 KA	50 KA
5.0	RATED 1MIN POWER FREQ.WITHSTAND VOLTAGE	630KV rms	460KV rms
6.0	RATED SWITCHING IMPULSE VOLTAGE (DRY&WET)	1050Kfp	~~~
7.0	FULL WAVE IMPULSE WITHSTAND VOLTAGE FOR 1MIN.FREQ.FOR FOR OTHER EQUIPMENT FOR INSULATOR STRING	1300Kfp 1425Kfp 1550Kfp	950Kfp 1050Kfp 1050Kfp
8.0	a)MINIMUM CREEPAGE DISTANCE--FOR EQUIPMENT OTHER THAN INSULATOR STRING b)MINIMUM CREEPAGE DISTANCE--FOR INSULATOR STRING	10500mm (25MM/KV) 13020 (31mm/KV)	6125mm (25MM/KV) 7595mm (31mm/KV)
9.0	SYSTEM EARTHING	EFFECTIVELY EARTHED	EFFECTIVELY EARTHED

BILL OF QUANTITY – 230KV EQUIPMENT

ITEM CODE	DESCRIPTION	SYMBOL	QTY	UNIT
1	245KV, 1600A, 50KA/1SEC, OUTDOOR SF6,CIRCUIT BREAKER (3 PHASE)		2	NOS
2	245KV, 1600A, 5-CORE, 60VA/1SEC CURRENT TRANSFORMER		6	NOS
3	245KV, 1600A, HORIZONTAL DOUBLE BREAK ISOLATOR WITH ONE EARTH SWITCH (3-PHASE), 50KA/1SEC		2	NOS
4	245KV, 1600A, HORIZONTAL DOUBLE BREAK ISOLATOR WITH TWO EARTH SWITCH (3-PHASE), 50KA/1SEC		2	NOS
5	245KV, 1600A, HORIZONTAL DOUBLE BREAK ISOLATOR WITHOUT EARTH SWITCH (3-PHASE TANDEM ARRANGEMENT), 50KA/1SEC		4	NOS
6	216KV SURGE ARRESTOR – CLASS III		6	NOS

BILL OF QUANTITY – 400KV EQUIPMENT

SR NO	DESCRIPTION	SYMBOL	QTY	UNIT
1	420KV, 3150A 63kA/1SEC OUTDOOR SF6,CIRCUIT BREAKER (3 PHASE) WITH CSD	C	4	NOS
2	420KV, 3000A, 6 CORE, 63kA/1SEC CURRENT TRANSFORMER		12	NOS
3	420KV, 3150A, HORIZONTAL DOUBLE BREAK ISOLATOR WITH ONE EARTH SWITCH (3-PHASE), 63kA/1SEC		12	NOS
4	336KV SURGE ARRESTOR – CLASS IV		6	NOS
5	400/230KV ICT # 3(7') AND # 4(7')		2	NOS

Not in scope of M/s Akshar

FUTURE SCOPE

EXISTING SCOPE

LEGENDS:

BCU	BAY CONTROL UNIT
CSD	CIRCUIT SEPARATION DEVICE
50	INSTANTANEOUS OVER CURRENT RELAY
50N	INSTANTANEOUS EARTH FAULT RELAY
50BF	LOCAL BREAKER BACKUP (LBB) PROTECTION RELAY
51	IDMT NON-DIRECTIONAL OVER CURRENT RELAY
51N	IDMT NON-DIRECTIONAL EARTH FAULT RELAY
24	OVER FLUX PROTECTION
67	INVERSE TIME DIRECTIONAL OVER CURRENT RELAY
67N	INVERSE TIME DIRECTIONAL EARTH FAULT RELAY
87 BB	BUS BAR DIFFERENTIAL RELAY
87T	TRANSFORMER DIFFERENTIAL RELAY
26Q	OIL TEMP. ALARM AUXILIARY RELAY
26Q	OIL TEMP. TRIP AUXILIARY RELAY
49Q	WINDING TEMP. ALARM AUXILIARY RELAY
49Q	WINDING TEMP. TRIP AUXILIARY RELAY
BA	BUCHHOLZ ALARM AUXILIARY RELAY FOR MAIN TANK
BA	BUCHHOLZ TRIP AUXILIARY RELAY FOR MAIN TANK
64R	RESTRICTED EARTH FAULT RELAY
OLTC	OLTC OIL SURGE RELAY--ALARM
OLTC	OLTC OIL SURGE RELAY--TRIP
PRD	PRESSURE RELIEF DEVICE--TRIP
MOG	MAGNETIC OIL LEVEL GAUGE FOR MAIN TANK--TRIP

CT DETAILS FOR 400kV SUBSTATION
400kV CT (FOR TIE BAYS)

APPLICATION	CORE NO.	RATIO	BURDEN (VA)	KNEE POINT VOLTAGE	MAGNETIZING CURRENT @Vk (mA)	RCT (Ohm)	ACCURACY CLASS
PROTECTION	1	3000/2000/500/1A	---	3000/2000/500	20/30/120	15/10/2.5	PX
PROTECTION	2	3000/2000/500/1A	---	3000/2000/500	20/30/120	15/10/2.5	PX
METERING	3	3000/2000/500/1A	20	---	---	---	0.25
METERING	4	3000/2000/500/1A	20	---	---	---	0.25
PROTECTION	5	3000/2000/500/1A	---	3000/2000/500	20/30/120	15/10/2.5	PX
PROTECTION	6	3000/2000/500/1A	---	3000/2000/500	20/30/120	15/10/2.5	PX

CT DETAILS FOR 400kV SUBSTATION
400kV CT (FOR ICT BAYS)

APPLICATION	CORE NO.	RATIO	BURDEN (VA)	KNEE POINT VOLTAGE	MAGNETIZING CURRENT @Vk (mA)	RCT (Ohm)	ACCURACY CLASS
PROTECTION	1	3000/2000/500/1A	---	3000/2000/500	20/30/120	15/10/2.5	PX
PROTECTION	2	3000/2000/500/1A	---	3000/2000/500	20/30/120	15/10/2.5	PX
METERING	3	3000/2000/500/1A	20	---	---	---	0.25
METERING	4	3000/2000/500/1A	20	---	---	---	0.25
PROTECTION	5	3000/2000/500/1A	---	3000/2000/500	20/30/120	15/10/2.5	PX
PROTECTION	6	3000/2000/500/1A	---	3000/2000/500	20/30/120	15/10/2.5	PX

CT DETAILS FOR 230kV SUBSTATION
230kV CT (FOR ICT BAYS)

APPLICATION	CORE NO.	RATIO	BURDEN (VA)	KNEE POINT VOLTAGE	MAGNETIZING CURRENT @Vk (mA)	RCT (Ohm)	ACCURACY CLASS
PROTECTION	1	1600/800/1	---	1600/800	25 on 1600/1 Tap, 50 on 800/1 Tap	8/4	PX
PROTECTION	2	1600/800/1	---	1600/800	25 on 1600/1 Tap, 50 on 800/1 Tap	8/4	PX
METERING	3	1600/800/1	10	1600/800	---	---	0.2S
PROTECTION	4	1600/800/1	---	1600/800	25 on 1600/1 Tap, 50 on 800/1 Tap	8/4	PX
PROTECTION	5	1600/800/1	---	1600/800	25 on 1600/1 Tap, 50 on 800/1 Tap	8/4	PX

230kV CT (FOR LINE BAY)

APPLICATION	CORE NO.	RATIO	BURDEN (VA)	KNEE POINT VOLTAGE	MAGNETIZING CURRENT @Vk (mA)	RCT (Ohm)	ACCURACY CLASS
PROTECTION	1	1600/800/1	---	1600/800	25 on 1600/1 Tap, 50 on 800/1 Tap	8/4	PX
PROTECTION	2	1600/800/1	---	1600/800	25 on 1600/1 Tap, 50 on 800/1 Tap	8/4	PX
METERING	3	1600/800/1	20	1600/800	---	---	0.2S
PROTECTION	4	1600/800/1	---	1600/800	25 on 1600/1 Tap, 50 on 800/1 Tap	8/4	PX
PROTECTION	5	1600/800/1	---	1600/800	25 on 1600/1 Tap, 50 on 800/1 Tap	8/4	PX

CVT DETAILS FOR 230kV SUBSTATION
230kV CVT (FOR LINE BAY)

APPLICATION	CORE NO.	PRIMARY (kV)	SECONDARY (V)	OUTPUT (VA)	ACCURACY CLASS
PROTECTION	1	230/√3	110/√3	50	3P
PROTECTION	2	230/√3	110/√3	50	3P
METERING	3	230/√3	110/√3	50	0.2

Comment of Protection SLD shall be incorporated.

DRAWING RELEASE RECORD

REV.	DATE	PREPARED	REVIEWED				APPROVED	REVISIONS
			MECH.	CIVIL	ELECT.	I&C		
00	05-12-2024						JJP	ISSUED FOR APPROVAL
01	18-12-2024						JJP	REVISED AS PER COMMENT
02	12-02-2025						JJP	REVISED AS PER COMMENT
03	31-03-2025						JJP	REVISED AS PER COMMENT

DRAWING RELEASE RECORD

REV.	DATE	PREPARED	REVIEWED				APPROVED	REVISIONS
			MECH.	CIVIL	ELECT.	I&C		
04	26-12-2025						JJP	REVISED AS PER 230KV LINE ADDED

THIS DRAWING AND DESIGN IS THE PROPERTY OF AKSHAR GROUP OF COMPANIES AND MUST NOT BE COPIED OR LENT WITHOUT THEIR PERMISSION IN WRITING

	SIGN	DATE
DRAWN BY	JKS	26-12-2025
CHECKED BY	SND	26-12-2025
APPD. BY	JJP	26-12-2025

CLIENT : KARUR TRANSMISSION LIMITED (KTL)

PROJECT: ADANI 400/230kV KARUR S/S

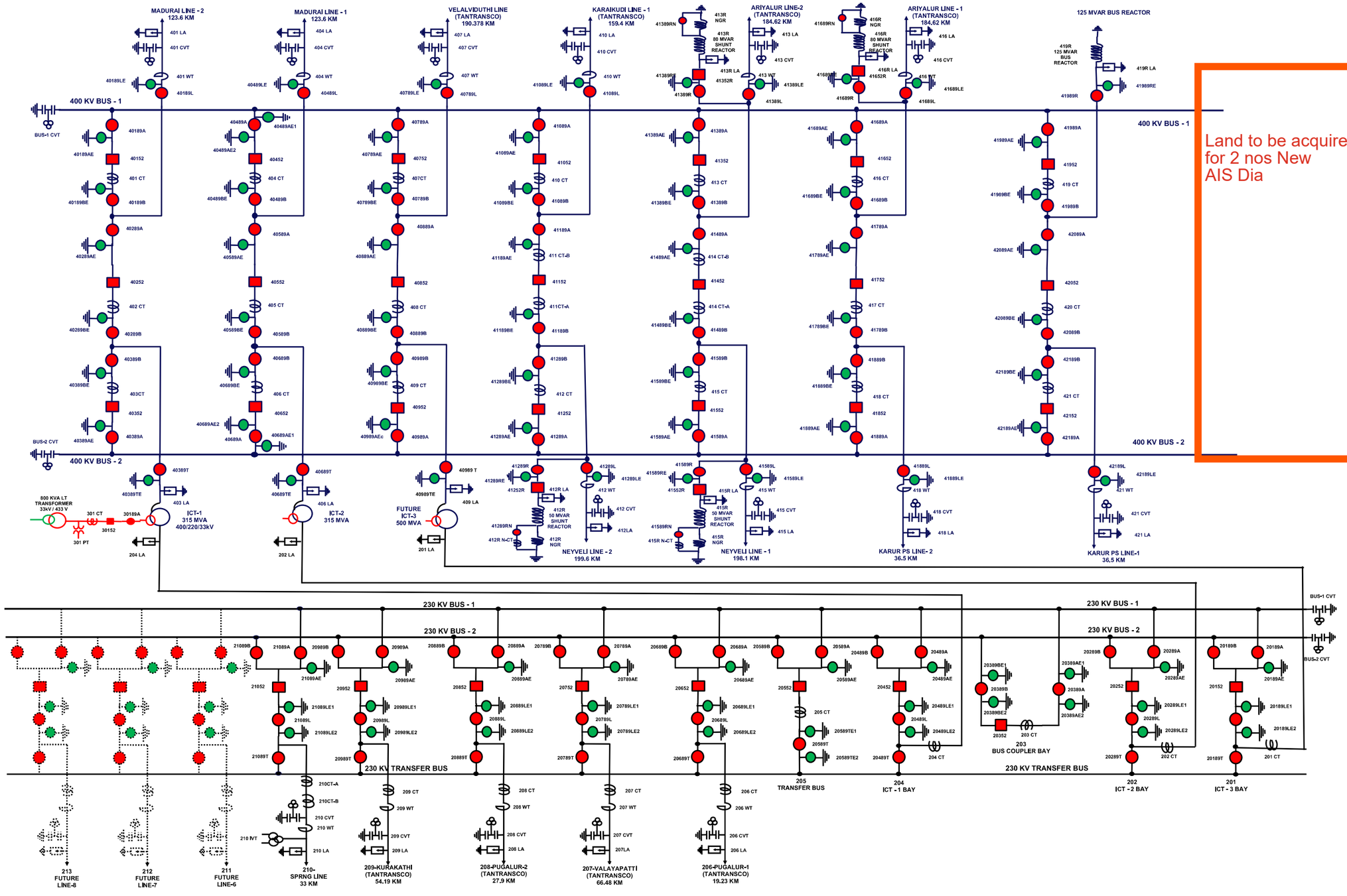
EPC CONTRACTOR: AKSHAR ELECINFRA PVT. LTD.
(A DIV. OF AKSHAR GROUP)
"AKSHAR HOUSE" 986/20/13,GIDC INDUSTRIAL ESTATE,DIAMOND PARK,MAKARPURA,VADODARA-390010
PHONE: (0091-265)2280084,2282873,2285548 FAX: (0091-265)2284584
E MAIL: niral.dave@akshar-group.com, design@akshar-group.com

SCALE : – TITLE : 400/230kV SWITCHYARD SINGLE LINE DIAGRAM

PROJECT CODE : P-747 DRAWING NO.: AEPL-P747-KTL-E-SLD-002 SHEET 1 OF 1 REV. 04

REVISE THIS DWG. USING CAD SYSTEM ONLY

SINGLE LINE DIAGRAM OF 400/230 kV KARUR SS

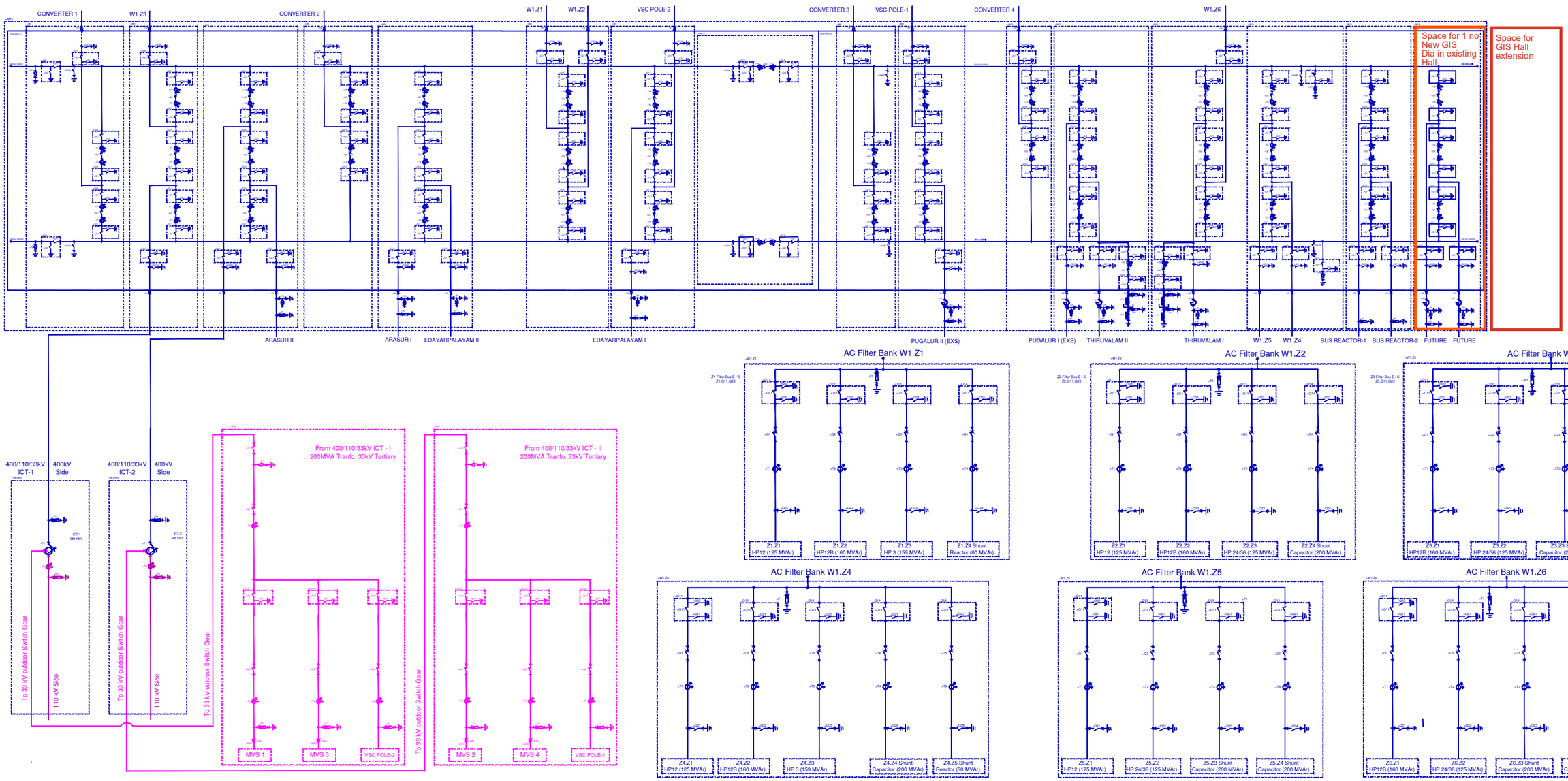


Land to be acquired for 2 nos New AIS Dia

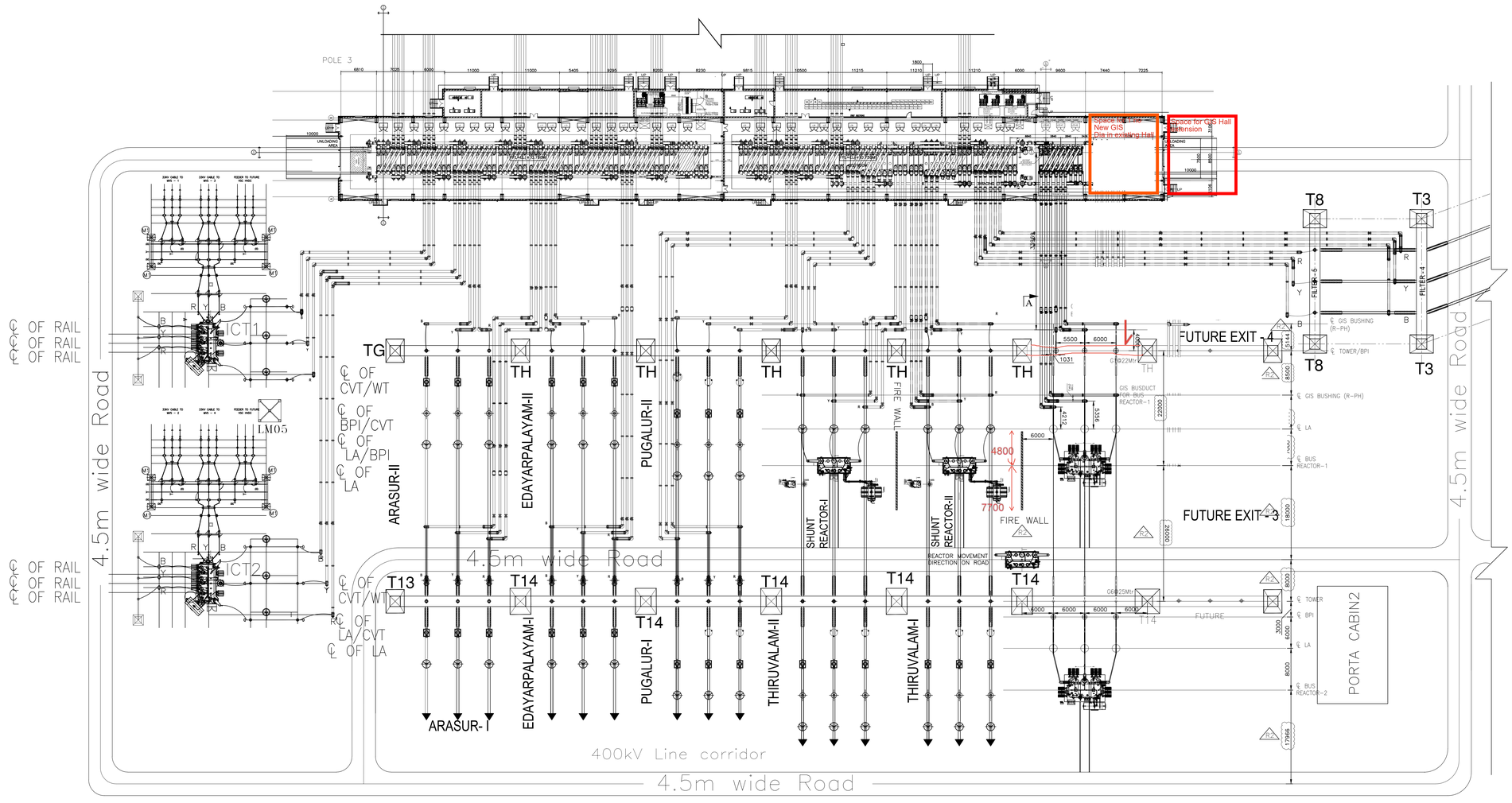
- INTER CONNECTING TRANSFORMER (ICT) 400/230/33 KV
- 400 KV, 80 MVAR SHUNT REACTOR WITH NGR & NGR BYEPASS ARRANGEMENT WITH BYE PASS ISOLATOR
- 400 KV, 50 MVAR SHUNT REACTOR WITH NGR & NGR BYEPASS ARRANGEMENT WITH BYE PASS ISOLATOR AND CURRENT TRANSFORMER
- 800 KVA AUXILIARY TRANSFORMER (33 KV / 433 V)
- CIRCUIT BREAKER
- CURRENT TRANSFORMER
- CAPACITIVE VOLTAGE TRANSFORMER
- ISOLATOR (HORIZONTAL DOUBLE BREAK)
- EARTH SWITCH
- LIGHTNING ARRESTOR
- WAVE TRAP
- 33KV POTENTIAL TRANSFORMER
- 400 KV SYSTEM
- 230 KV SYSTEM
- 33 KV SYSTEM
- 433 V SYSTEM

Pugalur (existing)/SLD, Rev 0

POWER GRID CORPORATION OF INDIA LTD, ±800kV, 6000MW PUGALUR HVDC TERMINAL



Pugalur (HVDC)/SLD, Rev 0



400kV SWITCHYARD GANTRY STRUCTURES:–

GANTRY TYPE	DESCRIPTION	STR. QTY
G1	400kV BEAM (SPAN=24M) AT 22MTRS. WITH CONDUCTOR TENSION 4T UNDER NORMAL CONDITION WITH ±30° DEVIATION	01 Nos.
G6	400kV BEAM (SPAN=24M) AT 25MTRS. WITH CONDUCTOR TENSION (4T) UNDER NORMAL CONDITION AND 5.3T UNDER SCF WITH ±30° DEVIATION	01 Nos.
TH	400kV TOWER 22M HEIGHT MIDDLE COLUMN WITH 7.5M PEAK, SUPPORTING TWO NO. BEAM G1 AT 22M LEVEL WITH CONDUCTOR TENSION OF 4T UNDER NORMAL CONDITION WITH ±30° DEVIATION	01 Nos.
T14	400kV TOWER 25M HEIGHT MIDDLE COLUMN WITH 7.5M PEAK, SUPPORTING ONE NO. BEAM G6 AT 25M AND SUITABLE FOR ANOTHER ONE NO. BEAM CONNECTION AT 15M WITH CONDUCTOR TENSION OF (4T) UNDER NORMAL CONDITION WITH ±30° DEVIATION	01 Nos.

BILL OF EQUIPMENTS – 400kV

SR. No.	DESCRIPTION	QTY (NOS.)	SYMBOL	MAKE	REMARKS
1.	336kV, LIGHTNING ARRESTER, (1PH)	06	⊕	OBLUM	--
2.	125MVAR, 400kV, BUS REACTOR (3PH)	02		T & R	OWNER SUPPLY
3.	420kV, BUS POST INSULATORS (1PH)	06		ABIL	--

NOTES:–

1)– ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE SPECIFIED

2)– MINIMUM CLEARANCE ARE AS PER PGCIL SPECIFICATION

	400KV
a) BETWEEN PHASES	4000mm (CONDUCTOR – CONDUCTOR CONFIGURATION) 4200mm (ROD – CONDUCTOR CONFIGURATION)
b) BETWEEN PHASE TO EARTH	3500mm
c) SECTIONAL CLEARANCE	6500mm
d) VERTICAL DISTANCE BETWEEN LOWEST PART OF THE INSULATOR AND GROUND LEVEL	2440mm

3)– THE PARAMETERS FOR WHICH THE SYSTEM IS DESIGNED ARE:

	400KV
a) SYSTEM OPERATING VOLTAGE	
b) MAX. SYSTEM VOLTAGE (RMS)	420KV
c) LIGHTNING IMPULSE WITHSTAND VOLTAGE : (DRY & WET–EXTERNAL)	±1425kVP
d) SWITCHING IMPULSE WITHSTAND VOLTAGE : (DRY & WET–EXTERNAL)	±1050kVP
e) ONE MIN. POWER FREQUENCY WITHSTAND VOLTAGE :	630kV(rms)
f) MINIMUM CREEPAGE DISTANCE	10500mm
g) MAXIMUM FAULT LEVEL :	50kA/1 Sec.
h) EQPT INTERCONNECTION	4" AL. TUBE TWIN ACSR MOOSE

4)– SUB–CONDUCTOR DETAILS — 400KV

a) SUB–CONDUCTOR SPACING — 450mm

5)– CONDUCTOR TENSION FOR EARTH WIRE CONSIDERED – 0.8MT FOR 400kV.

6)– PLINTH HEIGHT OF FOUNDATION WILL BE +300MM FROM THE FINISHED GOUND LEVEL (F.G.L.),

7)– INSULATOR STRINGS — 400KV SWITCHYARD

TENSION LONG ROD INSULATOR **(DOUBLE)** 120KN

SUSPENSION LONG ROD INSULATOR 120KN

8)– ~~WHILE REMOVING REACTOR, EQUIPMENTS ALONG WITH THE STRUCTURES BETWEEN THE TRANSFORMER & THE ROAD SHALL BE DISMANTLED.~~

There is no change in GIS equipment drawing in this revision

OUTDOOR GIS BUSDUCT QTY:–

1). 420kV, 3000A, 50kA, 1–PH SF6 GAS INSULATED BUS DUCT OUTSIDE GIS HALL – 237MTRS.

LEGEND:–

——— PRESENT SCOPE

– – – – – EXISTING/FUTURE SCOPE

REFERENCE DWG:–

1) GIS LAYOUT: 1HYG900057–2_RevAC

COMMENTS: PLEASE SHOW THE EXISTING BAYS/GIS ETC IN DOTTED LINES AND PRESENT SCOPE IN CONTINUOUS LINES FOR BETTER CLARITY. IN AS BUILT DRAWING SUBMISSION.

We reserve all rights in this document and in the information contained there in Reproduction,use or disclosure to third parties without express authority is strictly forbidden © ABB.

CONTROLLED COPY ABB INDIA LTD.

NOA No. CC-CS/912-NR1/SS-3934/3/G10/NOA-I/8876 DATED. 27.08.2019 (For Supply) CC-CS/912-NR1/SS-3934/3/G10/NOA-II/8877 DATED. 27.08.2019 (For Services)

CLIENT: Power Grid Corporation Of India Ltd. (A Govt.Of India Enterprise)

Substation Package SS22 for establishment of i) 400kV Hosur S/s Extn., ii) 400kV Madhugiri S/s Extn., iii) 400kV Dharmapuri S/s Extn., iv) 400kV Hiriyur S/s Extn., v) 400kV Pugalur S/s (AIS) Extn., vi) 400kV Pugalur HVDC (GIS) S/s Extn., vii) 400 / 220kV Gazuwaka S/s Extn., viii) 1x 500MVA, 400 / 220kV ICT at Gazuwaka under SRSS-XXV and i) 220 kV Cochin S/s Extn., ii) 400kV Kozikode S/s Extn. under SRSS-XXVI.

REV.	DATE	DESCRIPTION	DRN.BY	CHK.BY	APPD.BY
2	03.07.2020	REVISED SUBMISSION WITH SITE FEEDBACK FOR DIMENSION CHANGE BETWEEN EXISTING TH & T14 TOWERS & EXISTING ROAD DIMENSIONS			AS
1	13.02.2020	REVISED SUBMISSION	DS	NJ	AS
0	27.12.2019	FIRST SUBMISSION	DS	NJ	AS

nisha.jasani@sncilvalin.com

ABB INDIA LIMITED

PAPER SIZE-A0

EXTN. OF PUGALUR HVDC GIS S/S

PLAN LAYOUT

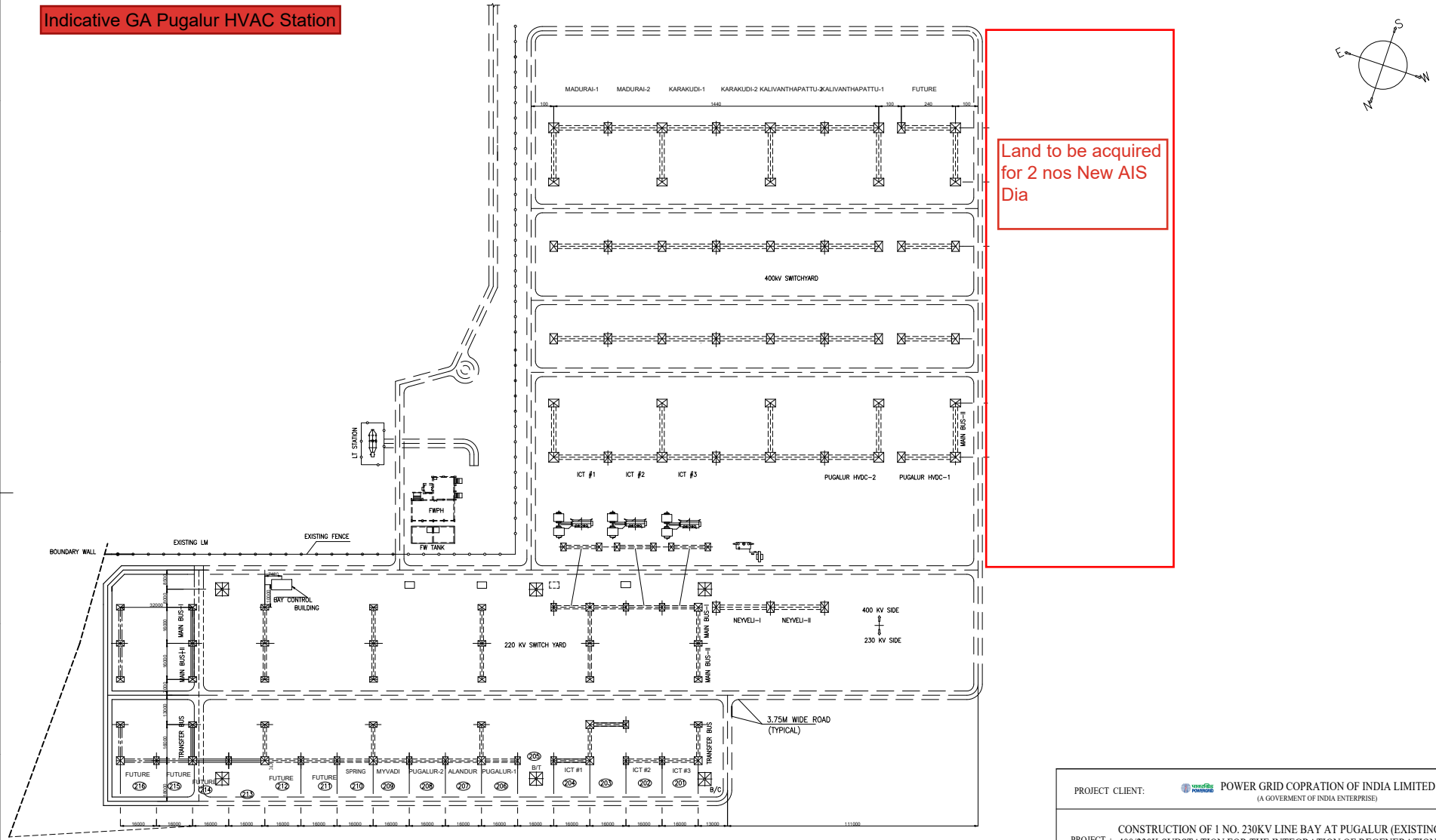
3VIN190681T0003

Scale 1:400

Total Sh 1

Sheet 1

Indicative GA Pugalur HVAC Station



Land to be acquired for 2 nos New AIS Dia

PLAN

LEGEND

- PRESENT SCOPE OF WORK
- EXISTING
- FUTURE

REV	DESCRIPTION	APPO	DATE	REF.DRWG, NO

PROJECT CLIENT: POWER GRID COPRATION OF INDIA LIMITED (A GOVERMENT OF INDIA ENTERPRISE)

PROJECT : CONSTRUCTION OF 1 NO. 230KV LINE BAY AT PUGALUR (EXISTING) 400/230K SUBSTATION FOR THE INTEGRATION OF REGENERATION PROJECT

CONTRACTOR : EDS INSTRUMENTS AND SYSTEMS (P) LTD. CHENNAI-600116

CONTRACTOR LOA No : NOA Ref: SRTS-II/C&M/WC-4370/NOA-4096/6105 Date:24.10.2025

TITLE : GENERAL ARRANGEMENT DRAWING. SHEET:01/01

DRAWN	CHECKED	APPROVED	DATE: 18-12-2025	SCALE	1:100
SKS	JCR	JCR			

DRG.NO. SS1216-EDSISPL- PGCL-KRAC-DWG-ELEC-002 REVISION : 0

adani	Categories:	
Kandarp Pathak Digitally signed by Kandarp Pathak Date: 2025.09.03 14:37:50 +05'30' Reviewer	☐ Cat-I	Approved. Good for Manufacturing/Construction/Fabrication.
	☑ Cat-I*	Approved with minor comments. No resubmission is required. To be incorporated in As-Built. Good for Manufacturing/ Construction/ Fabrication subject to incorporation of comments.
	☐ Cat-II	Resubmission is required. Approved & Released for Manufacturing/ fabrication/ construction subjected to incorporation of comments.
	☐ Cat-III	Not Approved. Revise & Resubmit for Approval
	☐ Cat-IV	For Information & Records.
	☐ Cat-IV*	Incorporate Comments & resubmit for Information & records.
AMIT KUMAR AGRAWAL Digitally signed by AMIT KUMAR AGRAWAL Date: 2025.09.03 14:55:15 +05'30' Approver	*Note: "Approval of this document does not absolve the Contractor/ Supplier/Fabricator from fulfilling Contractual obligations in any way"*	

REV	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
6	28-08-2025	REVISED AS PER UPDATION	JKS	SND	JJP
5	18-08-2025	REVISED AS PER UPDATION	JKS	SND	JJP
4	30-07-2025	REVISED AS PER UPDATION	JKS	SND	JJP
3	08-05-2025	REVISED AS PER COMMENTS	JKS	SND	JJP
2	16-04-2025	REVISED AS PER COMMENTS	JKS	SND	JJP
1	17-01-2024	REVISED AS PER COMMENTS	JKS	SND	JJP
0	14-12-2024	FIRST SUBMISSION	JKS	SND	JJP

OWNER & CLIENT	adani	KARUR TRANSMISSION LIMITED (KTL)
EPC CONTRACTOR	ISO 9001:2015	AKSHAR ELECINFRA PRIVATE LIMITED
PROJECT	KARUR TRANSMISSION LIMITED (KTL) - ADANI 400/220kV S/S	
TITLE OF DOCUMENT	400/230kV Switchyard Equipment Layout (Plan & Section)	
DOCUMENT NO.	AEPL-P747-KTL-E-LAY-001	REV: R6 / SHEET: 1 of 3

EPC CONTRACTOR: AEPL	CUST. DWG. NO	---	SUBMITTED FOR		SCALE: NTS		DATE
ISO 9001:2015	CUST. PROJ. NO	P-747	A	APPROVAL	PREPARED BY	JKS	28-08-2025
	SHEET SIZE	A4		INFORMATION	CHECKED BY	SND	28-08-2025
	DOC SOURCE	DOCX		CONSTRUCTION	APPROVED BY	JJP	28-08-2025

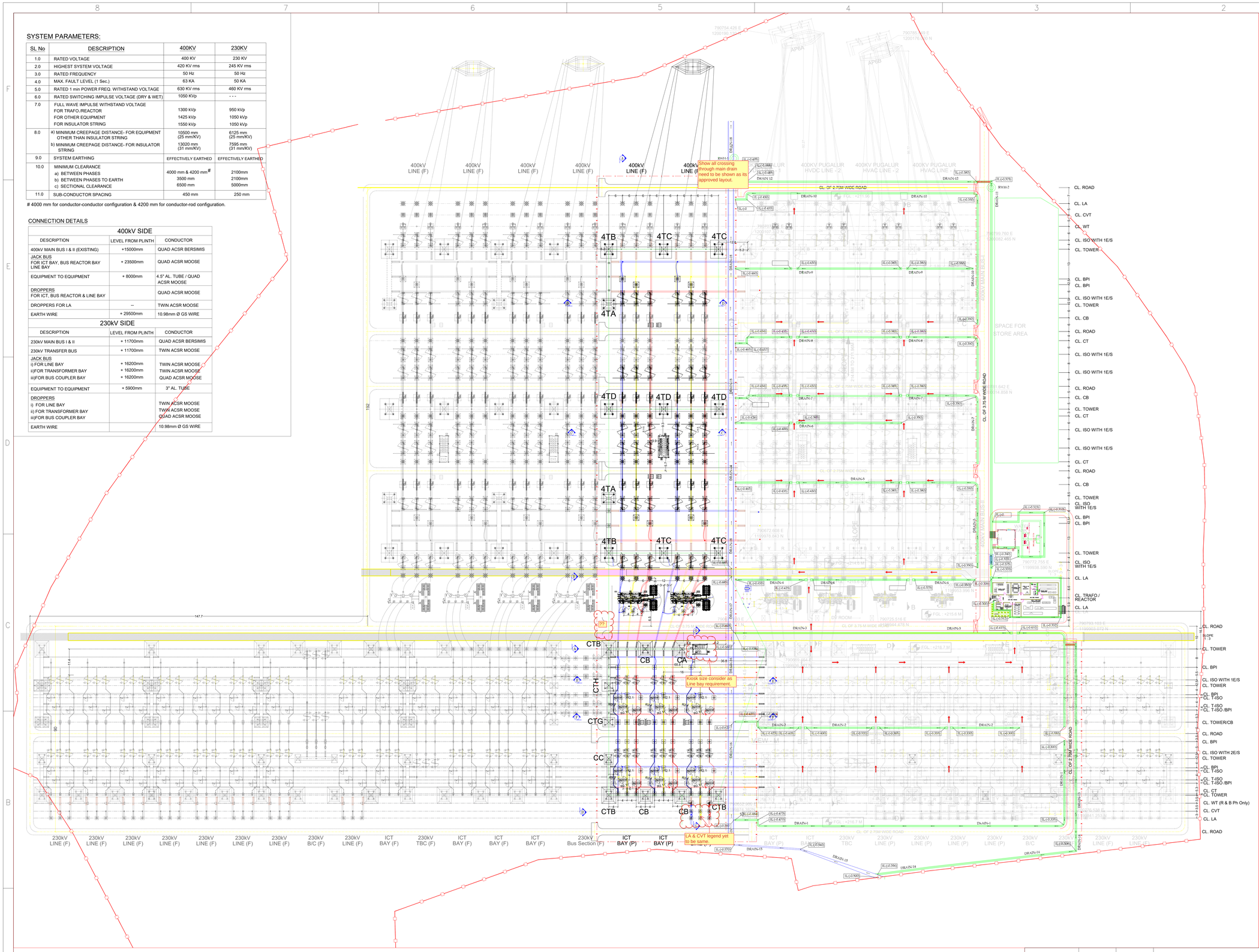
SYSTEM PARAMETERS:

SL No	DESCRIPTION	400KV	230KV
1.0	RATED VOLTAGE	400 KV	230 KV
2.0	HIGHEST SYSTEM VOLTAGE	420 KV rms	245 KV rms
3.0	RATED FREQUENCY	50 Hz	50 Hz
4.0	MAX. FAULT LEVEL (1 Sec.)	63 KA	50 KA
5.0	RATED 1 min POWER FREQ. WITHSTAND VOLTAGE	630 KV rms	460 KV rms
6.0	RATED SWITCHING IMPULSE VOLTAGE (DRY & WET)	1050 KVp	- - -
7.0	FULL WAVE IMPULSE WITHSTAND VOLTAGE FOR TRAFO./REACTOR FOR OTHER EQUIPMENT FOR INSULATOR STRING	 1300 kVp 1425 kVp 1550 kVp	 950 kVp 1050 kVp 1050 kVp
8.0	a) MINIMUM CREEPAGE DISTANCE- FOR EQUIPMENT OTHER THAN INSULATOR STRING b) MINIMUM CREEPAGE DISTANCE- FOR INSULATOR STRING	10500 mm (25 mm/KV) 13020 mm (31 mm/KV)	6125 mm (25 mm/KV) 7595 mm (31 mm/KV)
9.0	SYSTEM EARTHING	EFFECTIVELY EARTHED	EFFECTIVELY EARTHED
10.0	MINIMUM CLEARANCE a) BETWEEN PHASES b) BETWEEN PHASES TO EARTH c) SECTIONAL CLEARANCE	 4000 mm & 4200 mm # 3500 mm 6500 mm	 2100mm 2100mm 5000mm
11.0	SUB-CONDUCTOR SPACING	450 mm	250 mm

4000 mm for conductor-conductor configuration & 4200 mm for conductor-rod configuration.

CONNECTION DETAILS

400kV SIDE		
DESCRIPTION	LEVEL FROM PLINTH	CONDUCTOR
400kV MAIN BUS I & II (EXISTING)	+15000mm	QUAD ACSR BERSIMIS
JACK BUS FOR ICT BAY, BUS REACTOR BAY LINE BAY	+ 23500mm	QUAD ACSR MOOSE
EQUIPMENT TO EQUIPMENT	+ 8000mm	4.5" AL. TUBE / QUAD ACSR MOOSE
DROPPERS FOR ICT, BUS REACTOR & LINE BAY		QUAD ACSR MOOSE
DROPPERS FOR LA	--	TWIN ACSR MOOSE
EARTH WIRE	+ 29500mm	10.98mm Ø GS WIRE
230kV SIDE		
DESCRIPTION	LEVEL FROM PLINTH	CONDUCTOR
230kV MAIN BUS I & II	+ 11700mm	QUAD ACSR BERSIMIS
230kV TRANSFER BUS	+ 11700mm	TWIN ACSR MOOSE
JACK BUS i) FOR LINE BAY ii)FOR TRANSFORMER BAY iii)FOR BUS COUPLER BAY	 + 16200mm + 16200mm + 16200mm	 TWIN ACSR MOOSE TWIN ACSR MOOSE QUAD ACSR MOOSE
EQUIPMENT TO EQUIPMENT	+ 5900mm	3" AL. TUBE
DROPPERS i) FOR LINE BAY ii) FOR TRANSFORMER BAY iii)FOR BUS COUPLER BAY		 TWIN ACSR MOOSE TWIN ACSR MOOSE QUAD ACSR MOOSE
EARTH WIRE		10.98mm Ø GS WIRE



NOTES:
1. ALL DIMENSIONS ARE IN MTR UNLESS OTHERWISE SPECIFIED.
2. LOCATION/DETAILS OF LM & EARTH(SHIELD) WIRE SHOWN ARE TENTATIVE ONLY, THESE DETAILS SHALL BE CONFIRMED AFTER FINALIZATION OF DSLP CALCULATION/LAYOUT.
3. ACTUAL LOCATION OF BMK & SWITCHYARD PANEL ROOM (SPR) SHALL BE SHOWN IN CABLE TRENCH LAYOUT DRAWING.

BILL OF QUANTITY - 400kV EQUIPMENT (63kA for 1 Sec) :

ITEM CODE	DESCRIPTION	ACTUAL QTY.
1	420KV, 3150A, 63KA/1SEC, OUTDOOR SF6,CIRCUIT BREAKER (3 PHASE) INCLUDING INTERPOLE CABLING & INCLUDING ALL ACCESSORIES	4 NOS.
2	420kV, 3150A, 63kA, 1 - PH CURRENT TRANSFORMER WITH 120% EXTENDED CURRENT RATING	12 NOS.
3	420kV, 3150A, 63kA, ISOLATOR (DOUBLE BREAK) WITH ONE E/S (3 - PH)	12 NOS.
4	336kV SURGE ARRESTER, 1-PH	6 NOS.
5	400/230KV ICT # 3(F) AND # 4(F)	2 NOS.
6	400KV BPI	8 NOS.

(ICT BAY) BILL OF QUANTITY - 230kV EQUIPMENT (50kA for 1 Sec) :

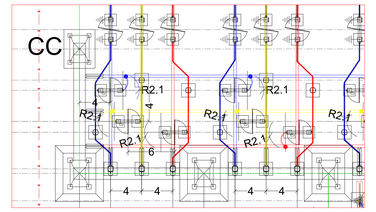
ITEM CODE	DESCRIPTION	ACTUAL QTY.
1	245KV, 1600A, 50KA/1SEC, OUTDOOR SF6,CIRCUIT BREAKER (3 PHASE) INCLUDING INTERPOLE CABLING & INCLUDING ALL ACCESSORIES	02 NOS.
2	245kV, 1600A, 5-CORE, 50kA/1SEC CURRENT TRANSFORMER	06 NOS.
3	245kV, 1600A, HORIZONTAL DOUBLE BREAK ISOLATOR WITH ONE EARTH SWITCH (3-PHASE), 50kA/1SEC	02 NOS.
4	245kV, 1600A, HORIZONTAL DOUBLE BREAK ISOLATOR WITH TWO EARTH SWITCH (3-PHASE), 50kA/1SEC	02 NOS.
5	245kV, 1600A, HORIZONTAL DOUBLE BREAK ISOLATOR WITHOUT EARTH SWITCH (3-PHASE TANDEM ARRANGMENT), 50kA/1SEC	04 NOS.
6	216KV SURGE ARRESTOR - CLASS III	06 NOS.
7	230KV BPI	14 NOS.
8	230KV HBPI	06 NOS.

(LINE BAY) BILL OF QUANTITY - 230kV EQUIPMENT (50kA for 1 Sec) :

ITEM CODE	DESCRIPTION	ACTUAL QTY.
1	245KV, 1600A, 50KA/1SEC, OUTDOOR SF6,CIRCUIT BREAKER (3 PHASE) INCLUDING INTERPOLE CABLING & INCLUDING ALL ACCESSORIES	01 NOS.
2	245kV, 1600A, 5-CORE, 50kA/1SEC CURRENT TRANSFORMER	03 NOS.
3	245kV, 1600A, HORIZONTAL DOUBLE BREAK ISOLATOR WITH ONE EARTH SWITCH (3-PHASE), 50kA/1SEC	01 NOS.
4	245kV, 1600A, HORIZONTAL DOUBLE BREAK ISOLATOR WITH TWO EARTH SWITCH (3-PHASE), 50kA/1SEC	01 NOS.
5	245kV, 1600A, HORIZONTAL DOUBLE BREAK ISOLATOR WITHOUT EARTH SWITCH (3-PHASE TANDEM ARRANGMENT), 50kA/1SEC	02 NOS.
6	216KV SURGE ARRESTOR - CLASS III	03 NOS.
7	245kV CVT, 4400pF	03 NOS.
8	220KV, 1600A, 50KA FOR 1SEC, 0.5mH WAVE TRAP (WITH BPI)	02 SET
9	220KV, HBPI	03 NOS.
10	220KV, LBPI	07 NOS.

LEGENDS:-

	PRESENT SCOPE
	FUTURE / NOT IN SCOPE
x x x x	FENCE
	BOUNDARY WALL
BMK	BMK



TANDEM ISOLATOR ARRANGEMENT (TYPICAL)

*M/s. Akshar shall be responsible during execution of all the bay's shall be align with existing bay's from X-Y Axis accordance its Tower height, Bus height, and FGL/FTL level.

DRAWING RELEASE RECORD

REV.	DATE	PREPARED	REVIEWED				APPROVED	REVISIONS
			MECH.	CIVIL	ELECT.	I&C		
00	14-12-2024						JJP	ISSUED FOR APPROVAL
01	30-12-2024						JJP	REVIESD AS PER COMMENT
02	16-04-2025						JJP	REVIESD AS PER COMMENT
03	16-06-2025						JJP	REVIESD AS PER COMMENT
04	05-08-2025						JJP	REVIESD AS PER UPDATION
05	18-08-2025						JJP	REVIESD AS PER UPDATION

DRAWING RELEASE RECORD

REV.	DATE	PREPARED	REVIEWED				APPROVED	REVISIONS
			MECH.	CIVIL	ELECT.	I&C		
06	28-08-2025						JJP	REVIESD AS PER UPDATION

THIS DRAWING AND DESIGN IS THE PROPERTY OF AKSHAR GROUP OF COMPANIES AND MUST NOT BE COPIED OR LENT WITHOUT THEIR PERMISSION IN WRITING

	SIGN	DATE
DRAWN BY	JKS	28.08.2025
CHECKED BY	SND	28.08.2025
APPD. BY	JJP	28.08.2025

CLIENT : KARUR TRANSMISSION LIMITED (KTL)

PROJECT: ADANI 400/220kV KARUR S/S

EPC CONTRACTOR: AKSHAR ELECINFRA PVT. LTD. (A DIV. OF AKSHAR GROUP)
"AKSHAR HOUSE" 986/20/13,GIDC INDUSTRIAL ESTATE,DIAMOND PARK,MAKARPURA,VADODARA-390010
PHONE: (0091-265)2280084,2282873,2285548 FAX: (0091-265)2284584
E MAIL: niral.dave@akshar-group.com, design@akshar-group.com

SCALE : -

TITLE : 400/230kV Switchyard Equipment Layout (Plan & Section)

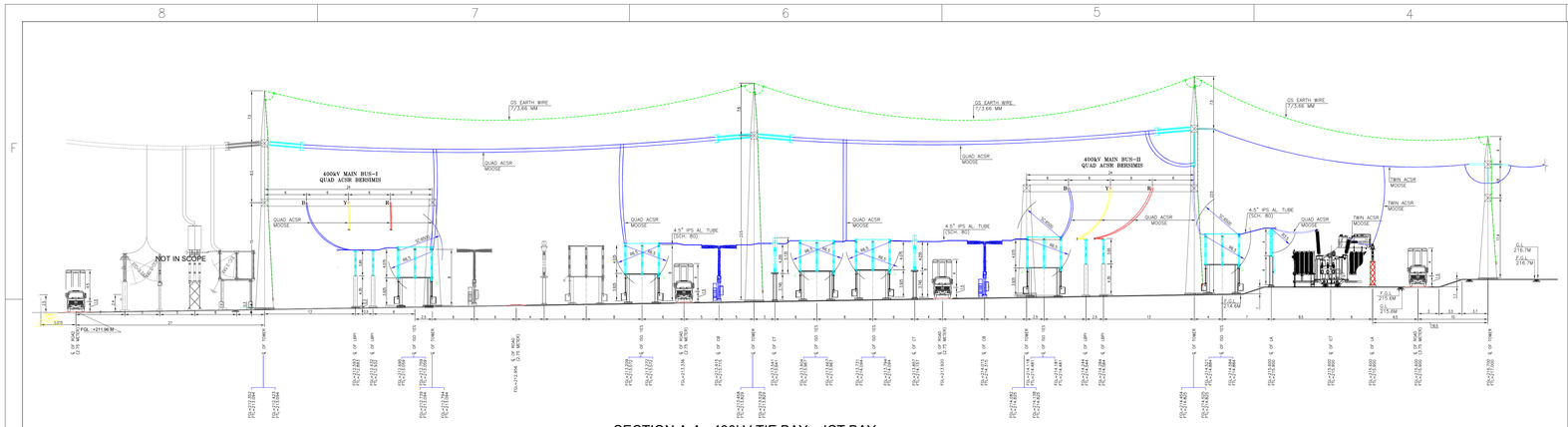
PROJECT CODE : P-747

DRAWING NO.: AEPL-P747-KTL-E-LAY-001

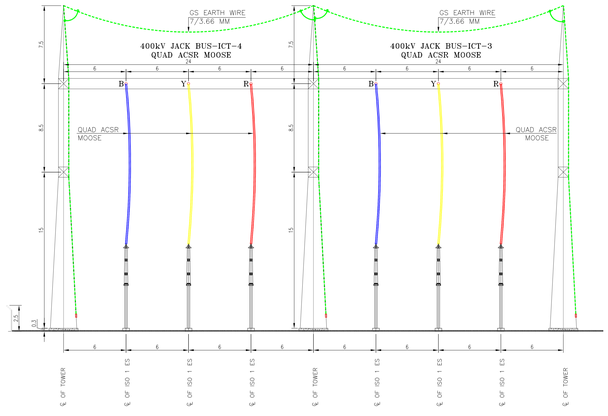
SHEET 1 OF 2

REV. 06

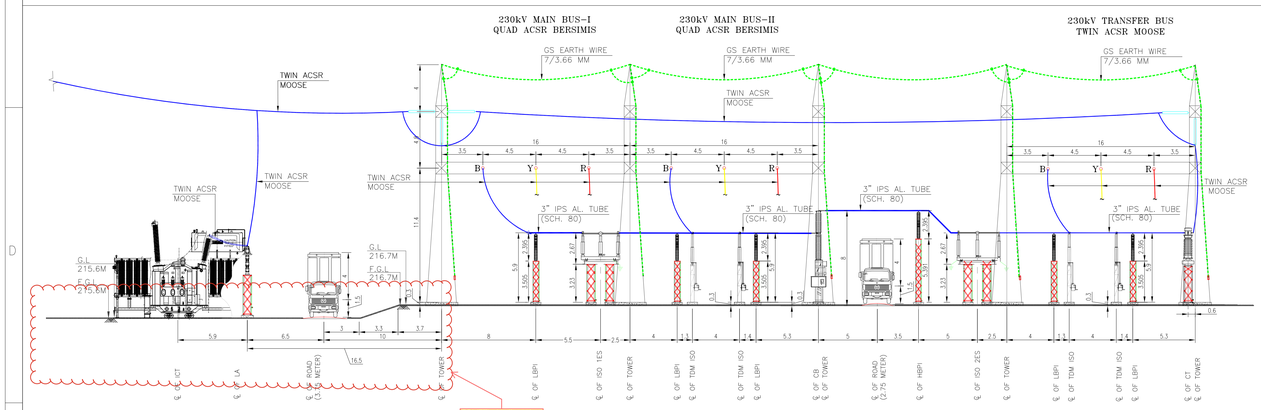
REVISE THIS DWG. USING CAD SYSTEM ONLY



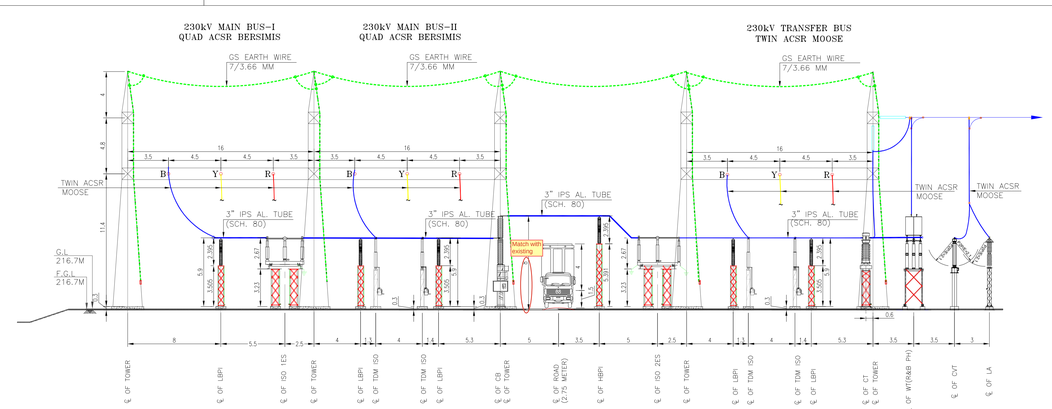
SECTION A-A : 400kV TIE BAY + ICT BAY



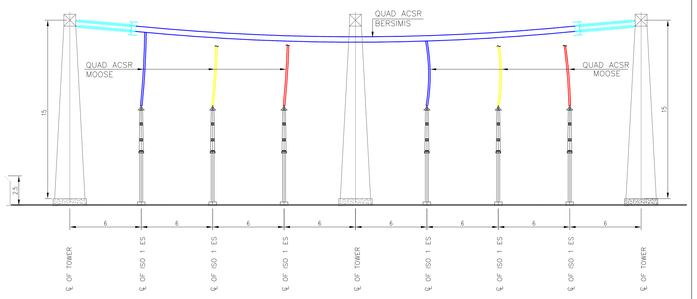
SECTION C-C : 400kV TIE BAY + ICT BAY



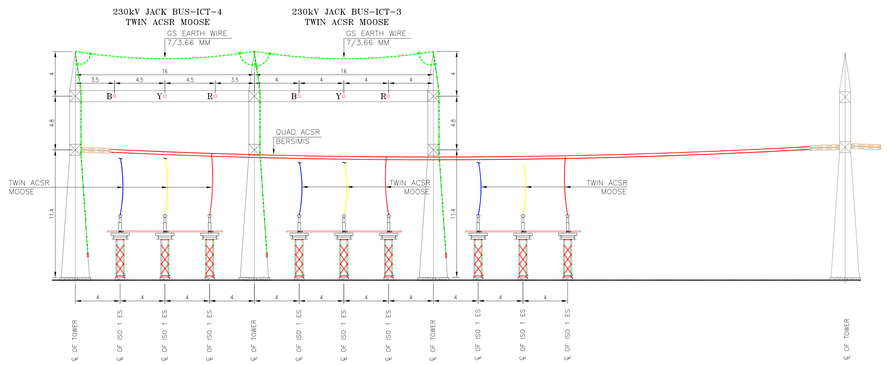
SECTION B-B : 230kV ICT BAY



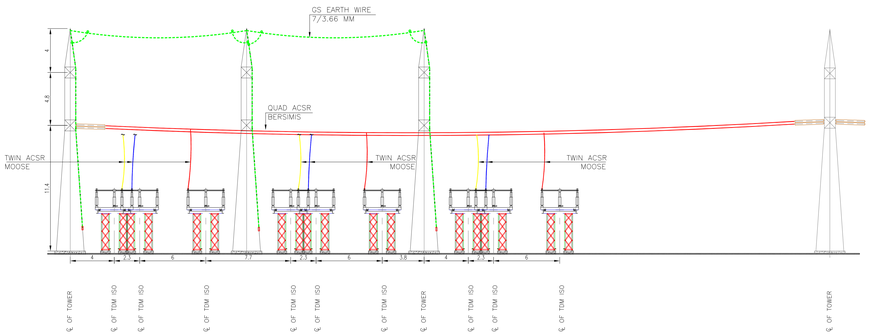
SECTION G-G : 230kV LINE BAY



SECTION D-D : 400kV TIE BAY + ICT BAY



SECTION E-E : 230kV ICT/LINE BAY



SECTION F-F : 230kV ICT/LINE BAY

DRAWING RELEASE RECORD

REV.	DATE	PREPARED	REVIEWED				APPROVED	REVISIONS
			MECH.	CIVIL	ELECT.	I&C		
00	14-12-2024						JJP	ISSUED FOR APPROVAL
01	30-12-2024						JJP	REVIESD AS PER COMMENT
02	16-04-2025						JJP	REVIESD AS PER COMMENT
03	16-06-2025						JJP	REVIESD AS PER COMMENT
04	05-08-2025						JJP	REVIESD AS PER UPDATION
05	18-08-2025						JJP	REVIESD AS PER UPDATION

DRAWING RELEASE RECORD

REV.	DATE	PREPARED	REVIEWED				APPROVED	REVISIONS
			MECH.	CIVIL	ELECT.	I&C		
06	28-08-2025						JJP	REVIESD AS PER UPDATION

THIS DRAWING AND DESIGN IS THE PROPERTY OF AKSHAR GROUP OF COMPANIES AND MUST NOT BE COPIED OR LENT WITHOUT THEIR PERMISSION IN WRITING

	SIGN	DATE
DRAWN BY	JKS	28.08.2025
CHECKED BY	SND	28.08.2025
APPD. BY	JJP	28.08.2025

CLIENT : KARUR TRANSMISSION LIMITED (KTL)

PROJECT: ADANI 400/220kV KARUR S/S

EPC CONTRACTOR: AKSHAR ELECINFRA PVT. LTD.
(A DIV. OF AKSHAR GROUP)
"AKSHAR HOUSE" 986/20/13,GIDC INDUSTRIAL ESTATE,DIAMOND PARK,MAKARPURA,VADODARA-390010
PHONE: (0091-265)2280084,2282873,2285548 FAX: (0091-265)2284584
E MAIL: niral.dave@akshar-group.com, design@akshar-group.com

SCALE : –

TITLE : 400/230kV Switchyard Equipment Layout (Plan & Section)

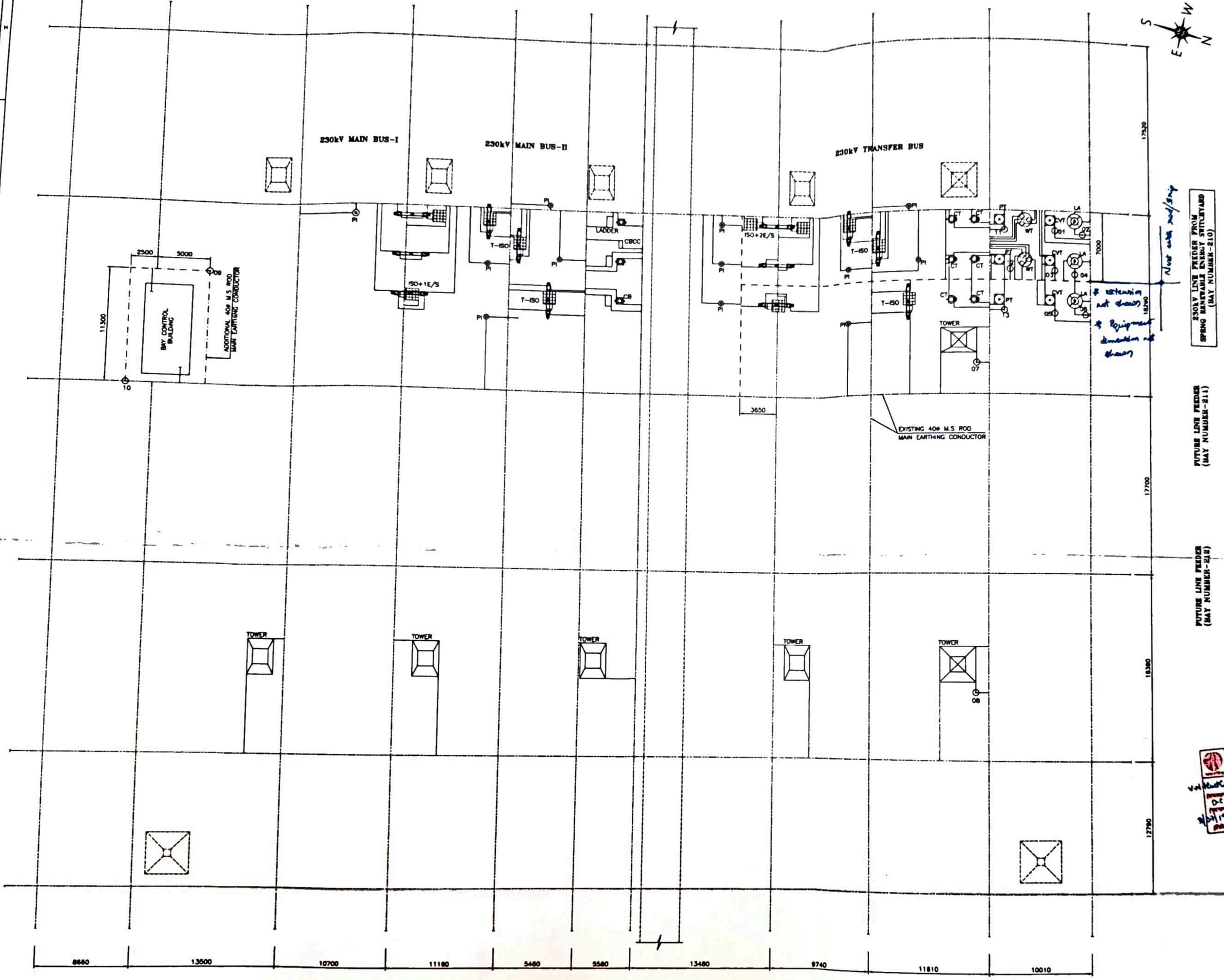
PROJECT CODE : P-747

DRAWING NO.: AEPL-P747-KTL-E-LAY-001

SHEET 2 OF 2

REV. 06

REVISE THIS DWG. USING CAD SYSTEM ONLY



PART PLAN

NOTES:

1. EARTHING SHALL BE IN ACCORDANCE WITH
   i) IS:3043-1987-CODE OF PRACTICE FOR EARTHING.
   ii) IEEE-80-1986
2. ALL EQUIPMENTS AND TOWERS SHALL BE EARTHED AT TWO DIAGONALLY OPPOSITE POINTS.
3. 75x12 mm G.S. FLAT SHALL BE USED FOR EQUIPMENT EARTHING AND 40mm DIA M.S. ROD SHALL BE USED FOR RISER.
4. ALL ABOVE GROUND CONNECTIONS SHALL BE BOLTED TYPE AND BELOW GROUND SHALL BE WELDED TYPE.
5. EARTHING CONDUCTOR CROSSING THE ROAD, TRENCH & PIPE SHALL BE LAID IN G.I. PIPE TO SUIT SITE CONDITIONS.
6. EARTH CONDUCTORS RUNNING ON STRUCTURES SHALL BE SUPPORTED BY SUITABLE CLAMPS AT EVERY 1000mm INTERVALS IN PERFORATED CABLE TRAYS OF SUITABLE WIDTH.
7. EARTHING LAYOUT/EARTHING PIT LOCATION IN DRAWING IS DIAGRAMMATIC ONLY. THE ELECTRODES AND EARTH STRIPS CAN BE CHANGED SLIGHTLY TO SUIT SITE CONDITIONS.
8. ALL EQUIPMENT STRUCTURES, COLUMNS, FENCE ETC. SHALL BE CONNECTED TO EARTHMAT RISERS AND SUBSIDIARY EARTH STRIP AT SUITABLE LOCATIONS.
9. EARTH STRIP SHALL BE COVERED ON ALL SIDES BY A LAYER OF GOOD SOIL FREE FROM ROCKS, STONES, LUMPS AND THEN FILLUP
10. WHENEVER THE EARTH STRIP CROSSES THE FOUNDATION IT SHALL BE TAKEN AROUND THE FOUNDATION.
11. THE SURFACES TO BE WELDED SHOULD BE CLEANED OF DIRT, OIL, GREASE & OXIDES BEFORE WELDING ANY OXIDE THAT MAY HAVE FORMED DURING WELDING MUST BE REMOVED FROM THE WELDED JOINT.
12. ALL WELDED JOINTS TO BE PAINTED WITH BITUMEN AFTER CLEANING THE JOINTS.
13. A MINIMUM DISTANCE OF 6M SHALL BE MAINTAINED BETWEEN TWO EARTH PITS.
14. EARTHING TERMINAL OF EACH LA SHALL BE DIRECTLY CONNECTED TO ROD EARTH ELECTRODE WHICH IN TURN, SHALL BE CONNECTED TO STATION EARTHING GRID.
15. A 40 MM DIA, 3000 mm LONG M.S EARTH ELECTRODE WITH TEST LINK, CI FRAME AND COVER SHALL BE PROVIDED TO CONNECT DOWN CONDUCTOR OF LA.
16. THE CONNECTION BETWEEN EARTHING PADS AND THE EARTHING GRID SHALL BE MADE BY TWO SHORT EARTHING LEADS (ONE DIRECT & ANOTHER THROUGH THE SUPPORT STRUCTURE) FREE FROM LINKS AND SPLICES.
17. FOR EARTHING OF EQUIPMENT REFER DETAIL OF EARTHING. (STANDARD EARTHING DETAILS GIVEN WITH SECTION : SWITCHYARD ERECTION, REV. 07 OF TECHNICAL SPECIFICATION – DOC. REF C/ENG/STD/EARTHINGS (28 SHEETS)
18. EARTHING OF RAIL TRACKS, CABLE TRENCHES, JUNCTION BOXES & MARSHALLING BOX SHALL BE DONE AS PER TECHNICAL SPECIFICATION REQUIREMENT.

If any deviation between given details and technical specifications, Technical Specification shall prevails

BILL OF QUANTITY FOR EARTHING:

SYMBOL	DESCRIPTION	UNIT	QUANTITY
- - - -	40mm DIA M.S ROD – ADDITIONAL MAIN EARTHING CONDUCTOR	m	115
———	40ϕ M.S ROD – RISER & AUXILARY MAT	m	1300
⊙	40ϕ, 3000 LONG M.S. ROD ELECTRODE	Nos.	13
	75 x 12 G.S FLAT – ABOVE GROUND EARTHING CONDUCTOR (FOR MAIN EQUIPMENT)	m	425
	50 x 6 G.S FLAT – ABOVE GROUND EARTHING CONDUCTOR (FOR JB, CBCC, BMK ETC.)	m	50
	30 x 6 M.S FLAT – FOR CABLE TRENCH EARTHING	m	125

LEGEND:

- - - - - - ADDITIONAL MAIN MAT CONSIDERED (40ϕ M.S ROD)
——— RISER (40ϕ M.S ROD)
——— EXISTING 40ϕ MAIN MAT EARTHING CONDUCTOR
ISO+2E/S – ISOLATOR WITH 2 E/S
ISO+1E/S – ISOLATOR WITH 1 E/S
T-ISO – TANDEM ISOLATOR
CT – CURRENT TRANSFORMER
CB – CIRCUIT BREAKER
PI – POST INSULATOR
LA – LIGHTNING ARRESTER
WT – WAVE TRAP
⊙ – 40ϕ, 3000 LONG M.S ROD ELECTRODE
▦ – AUXILARY MAT FOR ISOLATOR AND EARTH SWITCH MECHANISM BOX (40ϕ M.S ROD)

CMT-I

ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED

CONTRACTOR REFERENCE DRAWING:

1. GENERAL ARRANGEMENT – 230kV PUGALUR SUBSTATION EXTENSION – DRG. No. KPIC-SPR-PUG-DRG-E-001
2. ELECTRICAL LAYOUT – PLAN & SECTION – 230kV PUGALUR SUBSTATION EXTENSION – DRG. No. KPIC-SPR-PUG-DRG-E-003

EXISTING EARTHING LAYOUT REFERENCE:

1. EARTH MAT LAYOUT FOR 400/230kV PUGALUR SUBSTATION (NEW) AT K.PARAMATY VILLAGE – DRG. No. SYS-CS2818-P-EMAT-007 (M/s AREVA T&D INDIA LTD DRAWING)

REV.	DESCRIPTION	APPD.	DATE	REF.DRG.
1	DRAWING REVISED BASED ON POWERGRID COMMENTS.		22.07.19	

PROJECT CONSULTANT: POWER GRID CORPORATION OF INDIA LIMITED (A GOVERNMENT OF INDIA ENTERPRISE)

PROJECT: EXTENSION OF 400/230kV PUGALUR SUBSTATION (POWERGRID) FOR 1No. 230kV LINE BAY-BAY No. ϕ210

OWNER: SPRNG RENEWABLE ENERGY PVT LTD, PUNE – 411013

OEM/EPC: NORDEX INDIA PVT LTD, BANGALORE-560008

CONTRACT/LOA No.: SECI/C&PWPD/T4/LOA/SETL/P1/22067

TITLE: EARTHING LAYOUT

EPC: KSHEMA POWER & INFRASTRUCTURE COMPANY PRIVATE LTD

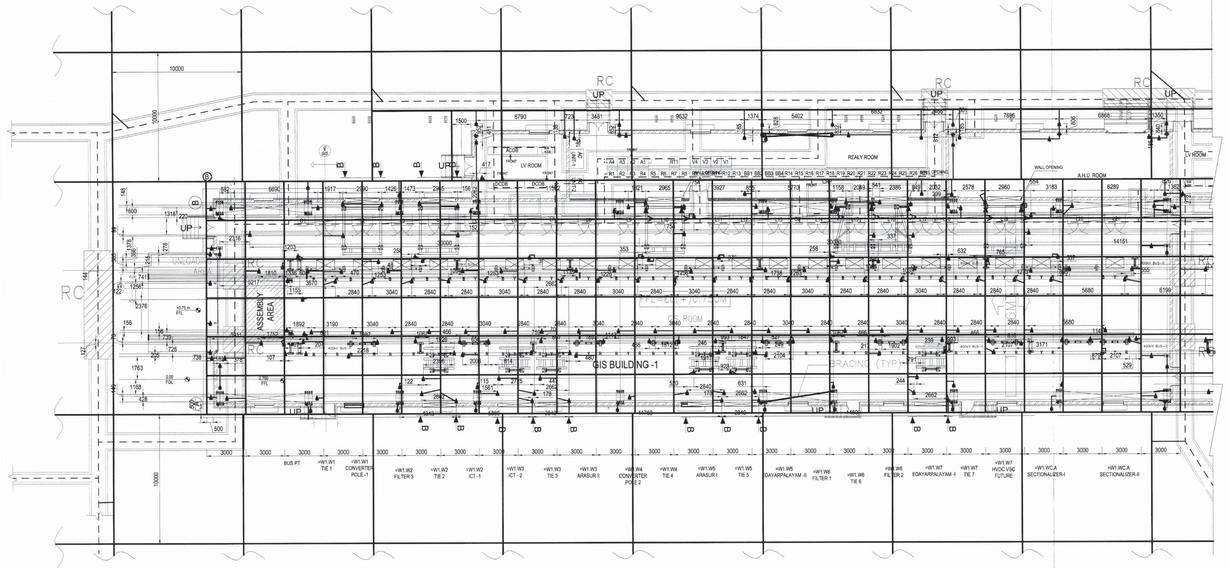
DRAWN	ASHOK
CHECKED	V.C.NIRMAL
APPROVED	A.K.CHIRALA
PASSED	
SCALE	1:200
DATE	25.05.2019
SHEET No. 1 OF 1	REVISION – '1'
DRAWING No.	KPIC-SPR-PUG-DRG-E-003

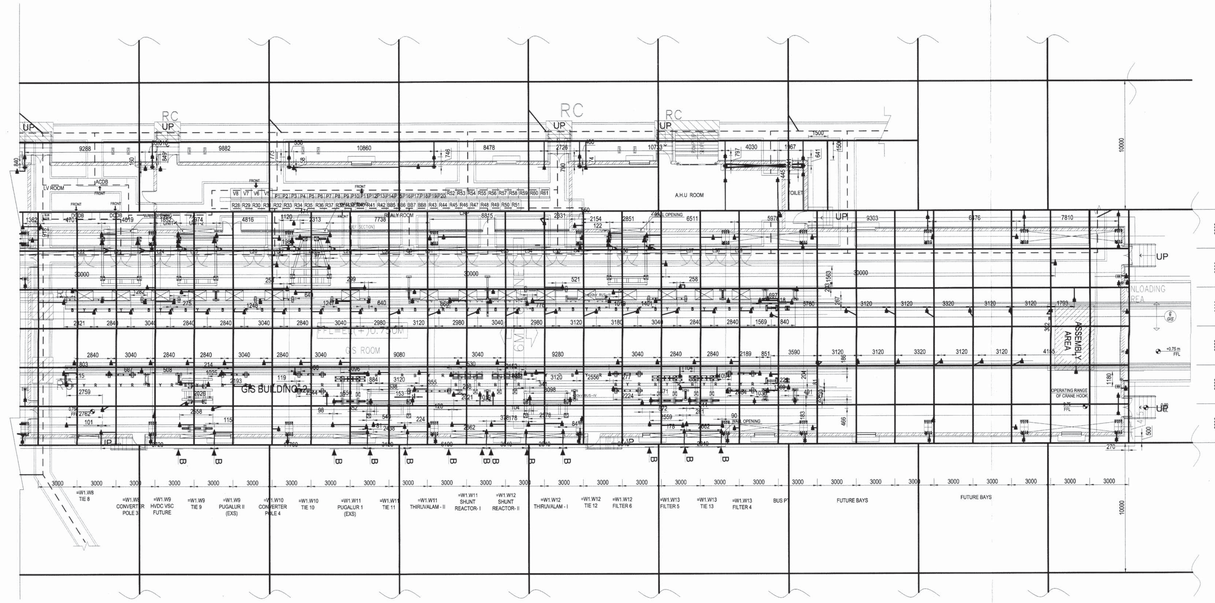
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

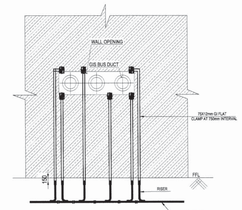
DRG. NO. TB-0-391-316-231

SHT. 01 OF 01



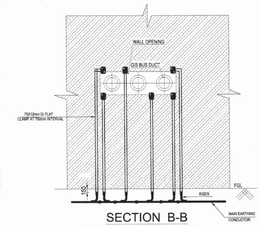


WALL OPENING FOR GIS BUS DUCT (3 PHASE) EARTHING FROM INSIDE THE BUILDING

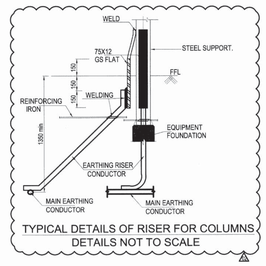


SECTION A-A
DETAILS NOT TO SCALE

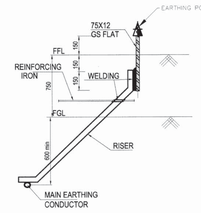
WALL OPENING FOR GIS BUS DUCT (3 PHASE) EARTHING FROM OUTSIDE OF THE BUILDING



SECTION B-B
DETAILS NOT TO SCALE



TYPICAL DETAILS OF RISER FOR COLUMNS
DETAILS NOT TO SCALE



TYPICAL DETAILS OF RISER FOR EARTHING POINT
DETAILS NOT TO SCALE

Notes:-

1) Main outdoor switchyard earthmat shall be connected to MS rod around the GIS building at regular grid spacing
2) GIS earthmat in indoor areas shall be buried 600mm below Finished Ground Level (FGL) i.e. same level as the main outdoor switchyard earthmat layout.
3) GIS enclosures and the structures are connected to GIS earthmat at several points through earthing points.
4) Indoor earthing point ⚠ is 75X12mm GS flat protruded 150 mm above Finished Floor Level (FFL).
5) All indoor earthing points ⚠ shall be connected to earthmat through risers in shortest path as per details of riser for earthing point.
6) Floor reinforcement iron has to be earthed to equalize the ground potential. All the earthmat risers crossing through the floor reinforcement shall be welded to nearby reinforcement iron.
7) Please refer to TB-4-391-316-227 for trench & tray, rail and other equipment earthing details
8) 75X12mm GS Flat and 50X6mm GS Flat shall not be laid below ground. Where ever shown in the drawing, it should be laid on above ground.
9) GIS Building column shall be earthed at two points

01

01

LEGEND:–

- MAIN EARTHMAT CONDUCTOR SIZE 40MM DIA. MS ROD
- EARTHMAT RISER CONDUCTOR SIZE 40MM DIA. MS ROD
- ⚠ EARTHING POINT(INDOOR), 75X12 mm GS FLAT PROTRUDED 150MM ABOVE FFL
- 75x12mm GS FLAT
- EARTHING POINT(OUTDOOR)
- 50x6mm GS FLAT (FOR TRENCH EARTHING AND ABOVE FFL (or) FGL)

REFERENCE:–

1) 1HYG900018-3 "Pugalur substation- Civil work requirements"
2) Dwg no. 1HYG900018-2, "Pugalur – GIS layout"

AS-BUILT
(No Change)

BHEL RELEASED FOR CONSTRUCTION DESTROY EARLIER PRINTS
SIGNED DATE 31.12.18
Transmission Projects Engineering Management

REV.	DATE	DRN	REV.	DATE	DRN	REV.	DATE	DRN	REV.	DATE	DRN	REV.	DATE	DRN	REV.	DATE	DRN	REV.	DATE	DRN	REV.	DATE	DRN
		DESN			DESN			DESN			DESN			DESN			DESN			DESN			DESN
		CHECKED			CHECKED			CHECKED			CHECKED			CHECKED			CHECKED			CHECKED			CHECKED
		APPROVED			APPROVED			APPROVED			APPROVED			APPROVED			APPROVED			APPROVED			APPROVED
ZONE			ZONE			ZONE			ZONE			ZONE			ZONE			ZONE			ZONE		

CA NO. CC-CS/651-SR2/HVDC-3063/7/G10/CA-1/5817-5821 date: 2017-01-25

ADDITIONAL INFORMATION W.O.No. 86006

STATUS OF DRAWING

DISTRIBUTION OF PRINTS

NAME OF CUSTOMER/PROJECT ±800kV, 6000MW HVDC Raigarh-Pugalur Terminals

BHEL भारत हेवी इलेक्ट्रिकल्स लिमिटेड ट्रांसमिशन परियोजना विभाग
BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION PROJECTS DIVISION

DRAWN	TT REDDY		11.10.17
CHECKED	SKS		11.10.17
APPROVED	AG		11.10.17

REV.	DATE	DRN	
01	11.10.18	TT REDDY	
		DESN	TT REDDY
		CHECKED	SKS
		APPROVED	AG
ZONE	Revised as per POWERGRID Comments vide C/ENGG/ HVDC/RP800/500/856 Date:18.12.2017 & as per site execution		

विभाग DEPT. | कोड CODE | कार्ड कोड CARD CODE | अनुपात / SCALE 1:200

शीर्षक/TITLE
GIS BUILDING EARTHMAT, PUGALUR STATION

ड्राईंग क्र./DRAWING NO. TB-0-391-316-231

पुनः/REV. 01

पृष्ठ क्र./SHEET No. 01 अगला पृष्ठ/NEXT SHEET ---

COMPUTER FILE NAME: 1381010XXXX-SSD-RDGLDWG
REF. DRG. NO.
SIGN. AND DATE
INVENTORY NO

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

Detailed Earthing design of GIS including various aspects like earthing of enclosures with circulating currents, calculations in respect of step & touch potentials in all enclosures to be submitted for approval separately

Approved as Category ✓ Cleared by Signature

FIRST ANGLE PROJECTION

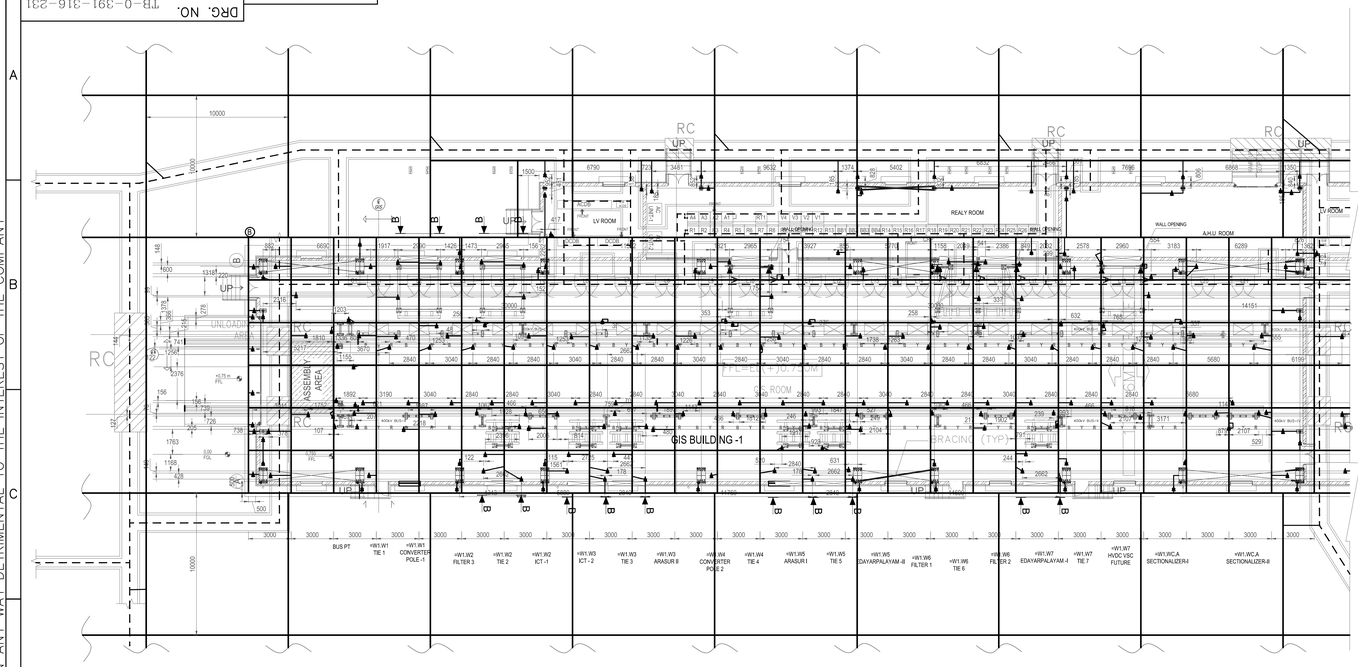
(ALL DIMENSIONS ARE IN mm)

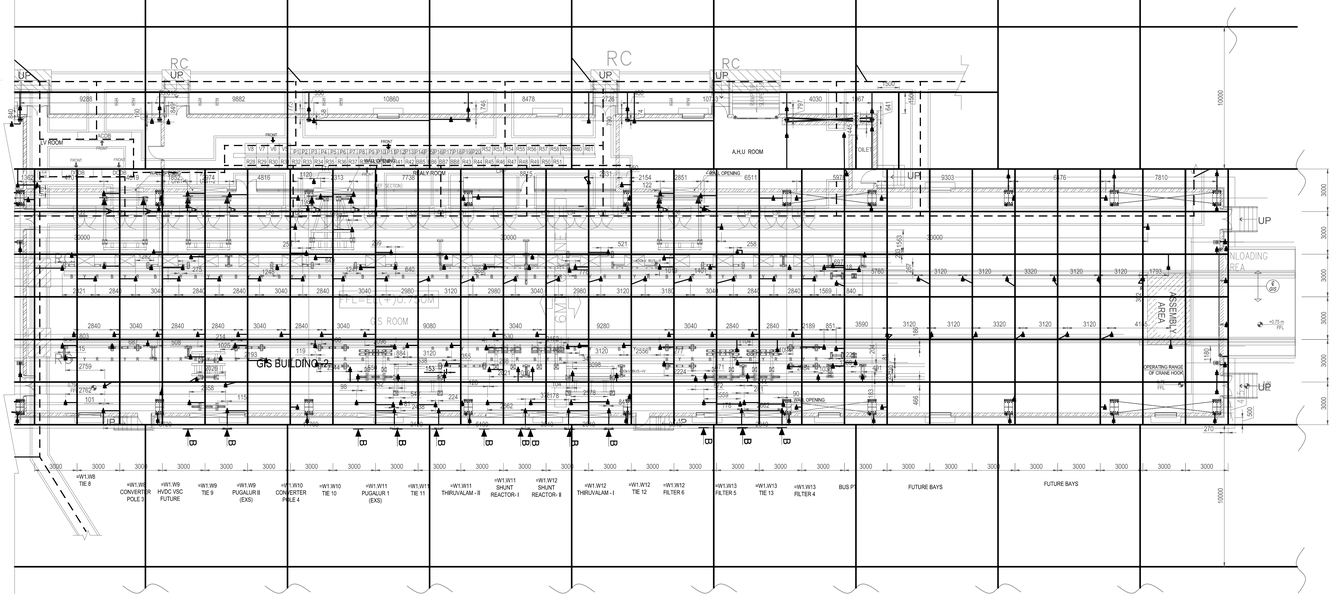
DRG. NO. TB-0-391-316-231

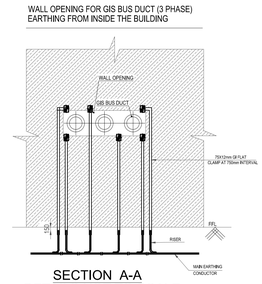
SHT. 01 OF 01

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

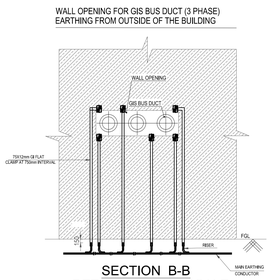
COMPUTER FILE NAME: 1381010XXXL-300-R00.DWG | REF. DRG. NO. | SIGN. AND DATE | INVENTORY NO



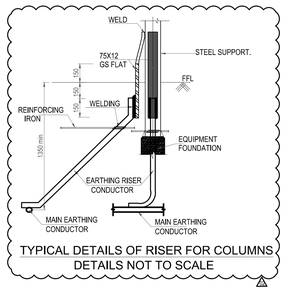




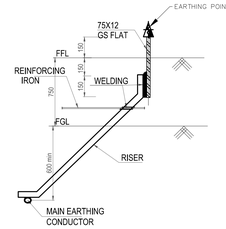
SECTION A-A
DETAILS NOT TO SCALE



SECTION B-B
DETAILS NOT TO SCALE



TYPICAL DETAILS OF RISER FOR COLUMNS
DETAILS NOT TO SCALE



TYPICAL DETAILS OF RISER FOR EARTHING POINT
DETAILS NOT TO SCALE

Notes:-

1) Main outdoor switchyard earthmat shall be connected to MS rod around the GIS building at regular grid spacing
2) GIS earthmat in indoor areas shall be buried 600mm below Finished Ground Level (FGL) i.e. same level as the main outdoor switchyard earthmat layout.
3) GIS enclosures and the structures are connected to GIS earthmat at several points through earthing points.
4) Indoor earthing point ⚠ is 75X12mm GS flat protruded 150 mm above Finished Floor Level (FFL).
5) All indoor earthing points ⚠ shall be connected to earthmat through risers in shortest path as per details of riser for earthing point.
6) Floor reinforcement iron has to be earthed to equalize the ground potential. All the earthmat risers crossing through the floor reinforcement shall be welded to nearby reinforcement iron.
7) Please refer to TB-4-391-316-227 for trench & tray, rail and other equipment earthing details 01
8) 75X12mm GS Flat and 50X6mm GS Flat shall not be laid below ground. Where ever shown in the drawing, it should be laid on above ground.
9) GIS Building column shall be earthed at two points 01

AS-BUILT
(No Change)

LEGEND:–

- MAIN EARTHMAT CONDUCTOR SIZE 40MM DIA. MS ROD
- EARTHMAT RISER CONDUCTOR SIZE 40MM DIA. MS ROD
- ⚠ EARTHING POINT(INDOOR), 75X12 mm GS FLAT PROTRUDED 150MM ABOVE FFL
- 75x12mm GS FLAT
- EARTHING POINT(OUTDOOR)
- 50x6mm GS FLAT (FOR TRENCH EARTHING AND ABOVE FFL (or) FGL)

REFERENCE:–

1) 1HYG900018-3 "Pugalur substation- Civil work requirements"
2) Dwg no. 1HYG900018-2, "Pugalur – GIS layout"

CA NO.	CC-CS/651-SR2/HVDC-3063/7/G10/CA-1/5817-5821 date: 2017-01-25
ADDITIONAL INFORMATION W.O.No. 86006	ग्राहक/परियोजना का नाम POWER GRID CORPORATION OF INDIA LIMITED
STATUS OF DRAWING	NAME OF CUSTOMER/PROJECT ±800kV, 6000MW HVDC Raigarh-Pugalur Terminals
DISTRIBUTION OF PRINTS	BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION PROJECTS DIVISION

	नाम /NAME	हस्ता./SIGN.	दि./DATE
बनाया DRAWN	TT REDDY		11.10.17
जाँचा CHECKED	SKS		11.10.17
स्वीकृत APPROVED	AG		11.10.17

REV.	DATE		
		DRN	
		DESN	
		CHECKED	
		APPROVED	
ZONE			

REV.	DATE		
01	11.10.18	DRN	TT REDDY
		DESN	TT REDDY
		CHECKED	SKS
		APPROVED	AG
ZONE	Revised as per POWERGRID Comments vide C/ENGG/ HVDC/RPB00/500/856 Date:18.12.2017 & as per site execution		

विभाग DEPT. | कोड CODE | अनुपात / SCALE 1:200 | कार्ड कोड CARD CODE

शीर्षक/TITLE: GIS BUILDING EARTHMAT, PUGALUR STATION

ड्राईंग क्र./DRAWING NO. TB-0-391-316-231 | पुनः/REV. 01

पृष्ठ क्र./SHEET No. 01 | अगला पृष्ठ/NEXT SHEET — —

SYSTEM PARAMETERS:

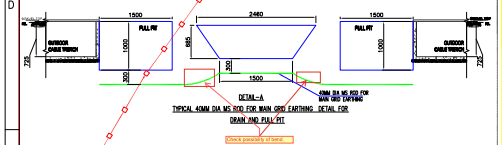
SL No	DESCRIPTION	400KV	230KV
1.0	RATED VOLTAGE	400 KV	230 KV
2.0	HIGHEST SYSTEM VOLTAGE	420 KV rms	245 KV rms
3.0	RATED FREQUENCY	50 Hz	50 Hz
4.0	MAX. FAULT LEVEL (1 Sec.)	63 KA	50 KA
5.0	RATED 1 min POWER FREQ. WITHSTAND VOLTAGE	630 KV rms	460 KV rms
6.0	RATED SWITCHING IMPULSE VOLTAGE (DRY & WET)	1050 KVp	---
7.0	FULL WAVE IMPULSE WITHSTAND VOLTAGE FOR TRAFO./REACTOR FOR OTHER EQUIPMENT FOR INSULATOR STRING	1300 kVp 1425 kVp 1550 kVp	950 kVp 1050 kVp 1050 kVp
8.0	a) MINIMUM CREEPAGE DISTANCE- FOR EQUIPMENT OTHER THAN INSULATOR STRING b) MINIMUM CREEPAGE DISTANCE- FOR INSULATOR STRING	10500 mm (25 mm/KV) 13020 mm (31 mm/KV)	6125 mm (25 mm/KV) 7595 mm (31 mm/KV)
9.0	SYSTEM EARTHING	EFFECTIVELY EARTHED	EFFECTIVELY EARTHED
10.0	MINIMUM CLEARANCE a) BETWEEN PHASES b) BETWEEN PHASES TO EARTH c) SECTIONAL CLEARANCE	4000 mm & 4200 mm # 3500 mm 6500 mm	2100mm 2100mm 5000mm
11.0	SUB-CONDUCTOR SPACING	450 mm	250 mm

4000 mm for conductor-conductor configuration & 4200 mm for conductor-rod configuration.

CONNECTION DETAILS

400kV SIDE		
DESCRIPTION	LEVEL FROM PLINTH	CONDUCTOR
400kV MAIN BUS I & II (EXISTING)	+15000mm	QUAD ACSR BERSIMIS
JACK BUS FOR ICT BAY, BUS REACTOR BAY LINE BAY	+ 23500mm	QUAD ACSR MOOSE
EQUIPMENT TO EQUIPMENT	+ 8000mm	4.5" AL. TUBE / QUAD ACSR MOOSE
DROPPERS FOR ICT, BUS REACTOR & LINE BAY		QUAD ACSR MOOSE
DROPPERS FOR LA	--	TWIN ACSR MOOSE
EARTH WIRE	+ 29500mm	10.98mm Ø GS WIRE

230kV SIDE		
DESCRIPTION	LEVEL FROM PLINTH	CONDUCTOR
230kV MAIN BUS I & II	+ 11700mm	QUAD ACSR BERSIMIS
230kV TRANSFER BUS	+ 11700mm	TWIN ACSR MOOSE
JACK BUS i) FOR LINE BAY ii)FOR TRANSFORMER BAY iii)FOR BUS COUPLER BAY	+ 16200mm + 16200mm + 16200mm	TWIN ACSR MOOSE TWIN ACSR MOOSE QUAD ACSR MOOSE
EQUIPMENT TO EQUIPMENT	+ 5900mm	3" AL. TUBE
DROPPERS i) FOR LINE BAY ii) FOR TRANSFORMER BAY iii)FOR BUS COUPLER BAY		TWIN ACSR MOOSE TWIN ACSR MOOSE QUAD ACSR MOOSE
EARTH WIRE		10.98mm Ø GS WIRE



NOTES:
1. ALL DIMENSIONS ARE IN MTR UNLESS OTHERWISE SPECIFIED.
2. LOCATION/DETAILS OF LIN & EARTH(SHIELD) WIRE SHOWN ARE TENTATIVE ONLY, THESE DETAILS SHALL BE CONFIRMED AFTER FINALISATION OF DSLP CALCULATION/LAYOUT.
3. ACTUAL LOCATION OF BMK & SWITCHYARD PANEL ROOM (SPR) SHALL BE SHOWN IN CABLE TRENCH LAYOUT DRAWING.

BILL OF QUANTITY - 400kV EQUIPMENT (63kA for 1 Sec) :

ITEM CODE	DESCRIPTION	ACTUAL QTY.
1	420kV, 3150A, 63kA/1SEC. OUTDOOR SF6 CIRCUIT BREAKER (3 PHASE) INCLUDING INTERPOLE CABLING & ERECTION & ALL ACCESSORIES	4 NOS.
2	420kV, 3150A, 63kA, 1-PH CURRENT TRANSFORMER WITH 1250/5 EXTENDED CURRENT RATIO	12 NOS.
3	420kV, 3150A, 63kA, ISOLATOR (DOUBLE BREAK) WITH CHE(E/S) (1-PH)	12 NOS.
4	336kV SURGE ARRESTER, 14kA	6 NOS.
5	400/230kV ICT (1 NO SPARE)	3 NOS.
6	400kV BPI	9 NOS.

(ICT BAY) BILL OF QUANTITY - 230kV EQUIPMENT (50kA for 1 Sec) :

ITEM CODE	DESCRIPTION	ACTUAL QTY.
1	245kV, 1600A, 50kA/1SEC. OUTDOOR SF6 CIRCUIT BREAKER (3 PHASE) INCLUDING INTERPOLE CABLING & ERECTION & ALL ACCESSORIES	02 NOS.
2	245kV, 1600A, 5-CORE, 50kA/1SEC CURRENT TRANSFORMER	06 NOS.
3	245kV, 1600A, HORIZONTAL DOUBLE BREAK ISOLATOR WITH ONE EARTH SWITCH (3-PHASE), 50kA/1SEC	02 NOS.
4	245kV, 1600A, HORIZONTAL DOUBLE BREAK ISOLATOR WITH TWO EARTH SWITCH (3-PHASE), 50kA/1SEC	02 NOS.
5	245kV, 1600A, HORIZONTAL DOUBLE BREAK ISOLATOR WITHOUT EARTH SWITCH (3-PHASE TANDEM ARRANGEMENT), 50kA/1SEC	04 NOS.
6	216kV SURGE ARRESTOR - CLASS III	09 NOS.
7	220kV BPI	14 NOS.
8	220kV HBPI	06 NOS.

(LINE BAY) BILL OF QUANTITY - 230kV EQUIPMENT (50kA for 1 Sec) :

ITEM CODE	DESCRIPTION	ACTUAL QTY.
1	245kV, 1600A, 50kA/1SEC. OUTDOOR SF6 CIRCUIT BREAKER (3 PHASE) INCLUDING INTERPOLE CABLING & ERECTION & ALL ACCESSORIES	01 NOS.
2	245kV, 1600A, 5-CORE, 50kA/1SEC CURRENT TRANSFORMER	03 NOS.
3	245kV, 1600A, HORIZONTAL DOUBLE BREAK ISOLATOR WITH ONE EARTH SWITCH (3-PHASE), 50kA/1SEC	01 NOS.
4	245kV, 1600A, HORIZONTAL DOUBLE BREAK ISOLATOR WITH TWO EARTH SWITCH (3-PHASE), 50kA/1SEC	01 NOS.
5	245kV, 1600A, HORIZONTAL DOUBLE BREAK ISOLATOR WITHOUT EARTH SWITCH (3-PHASE TANDEM ARRANGEMENT), 50kA/1SEC	02 NOS.
6	216kV SURGE ARRESTOR - CLASS III	03 NOS.
7	245kV CVT, 4400pF	03 NOS.
8	220kV, 1600A, 50kA FOR 1SEC, 0.2mH WAVE TRAP WITH BPI	02 SET.
9	220kV, HBPI	03 NOS.
10	220kV, LBPI	07 NOS.

LEGENDS:-

	PRESENT SCOPE
	FUTURE (NOT IN SCOPE)
	FENCE
	BOUNDARY WALL
	BAY

NOMENCLATURE OF EARTH PIT

DESCRIPTION	EP-NO.	QTY.	TYPE.
FOR 400KV LA EARTHING	EP- 1 TO 6	6 NOS.	MS
FOR 230KV LA EARTHING	EP- 7 TO 12, EP- 13 TO 15	9 NOS.	MS
FOR 230KV CVT EQUIPMENT EARTHING	EP- 16 TO 18	3 NOS.	MS
TOWER GANTRY EARTHING	EP- 19 TO 39	21 NOS.	MS
400KV KIOSK ROOM EARTHING	EP- 40 TO 40	01 NOS.	MS
230KV KIOSK ROOM EARTHING	EP- 45 TO 45	01 NOS.	MS
TRANSFORMER-1 NEUTRAL EARTHING	EP- 41 TO 42	02 NOS.	PIPE
TRANSFORMER-2 NEUTRAL EARTHING	EP- 43 TO 44	02 NOS.	PIPE
TOTAL EARTHING PITS	--	45 NOS	--

M/s. Akshar shall be take care of earthing material qty. at site.

BILL OF MATERIAL

SR NO.	DESCRIPTION	SYMBOL	QTY	UNIT
1	40MM DIA MS ROD FOR MAIN GRID EARTHING		7100	MTR.
2	40MM DIA MS ROD FOR RISER (CONNECTION FROM MAIN EARTHMAT TO ABOVE GROUND RISER)		950	MTR.
3	GS FLAT 75 X 12 MM RISER (RISER TO EQUIPMENT / STRUCTURE)	--	4800	MTR.
4	50X6MM GS FENCE EARTHING (for JB EARTHING STRAIGHT RUN & PANEL EARTHING)		1200	MTR.
5	AUXILIARY EARTH MAT FOR ISOLATOR 40MM DIA MS ROD		1950	MTR.
6	EARTH PIT 40MM DIA 3MTR LONG MS ROD ELECTRODE	R	40	NOS
7	EARTH PIT -- NEUTRAL EARTHING 40MM DIA 3MTR LONG PIPE ELECTRODE	P	4	NOS

NOTES:
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. THE EARTHING SYSTEM INSTALLATION WORK SHALL CONFORM TO THE REQUIREMENTS OF THE LATEST EDITIONS OF THE FOLLOWING STANDARDS/CODES:-
   A. IS:3043
   B. IEEE Std. 80
3. THIS DRG IS ONLY DIAGRAMMATIC REPRESENTATION OF EARTHING CONDUCTOR LAYOUT.AT ACTUAL CONDITION, CONDUCTOR WILL BE ROUTED IN SUCH MANNER SO THAT IT DOES NOT FOUL WITH ANY FOUNDATION, BUILDING ETC.
4. ALL THE EQUIPMENT AND GANTRY STRUCTURES ARE TO BE CONNECTED TO THE MAIN GROUNDING CONDUCTOR 40Ø ROD AT TWO POINTS DIAGONALLY OPPOSITE AS PER 'STANDARD EARTHING DETAILS'.
5. 40mm. DIA ROD ELECTRODE AS PER 'STANDARD EARTHING DETAILS' SHALL BE PROVIDED FOR LA,CVT,PEAK TOWER, MINIMUM DISTANCE OF 600mm SHALL BE MAINTAINED BETWEEN TWO TREATED (PIPE) ELECTRODE.
6. FOR LA, EARTHING LEAD FROM SURGE COUNTER TO MAIN EARTHMAT SHALL BE SHORTEST IN THE LENGTH AS PRACTICALLY AS POSSIBLE. EARTHING LEAD FROM LA SHALL NOT BE PASSED THROUGH ANY PIPE.
7. EARTHING CONDUCTOR AROUND THE BUILDING SHALL BE BURRIED AT A MINIMUMDISTANCE OF 1500mm FROM THE OUTER BOUNDARY OF THE BUILDING.
8. EARTHING CONDUCTOR RUNNING BELOW CABLE TRENCH, DRAINS, ROADS & RAIL WILL BE LAID 300mm BELOW THE BOTTOM OF ABOVE SAID ITEMS.
9. ALL WELDING JOINTS TO BE TREATED WITH RED OXIDE PRIMER AND AFTERWARDS COATED WITH TWO LAYER BITUMEN COMPOUND AND MS FLAT ON CABLE TRENCHES TO BE PAINTED WITH TWO COATS OF RED OXIDE PRIMER AND TWO COATS OF ZINC RICHED ENAMEL PAINT.
10. AUXILIARY EARTH MAT 1500x1500 WITH GRID SPACING 300MM WILL BE PLACED BELOW ISO MOM & EOM AT 300MM DEPTH FROM GROUNDING LEVEL. THIS WILL BE DONE AS PER THE ACTUAL LOCATION OF MOM & EOM BOX AT SITE.
11. ONE NO. 40mm DIA,3000mm LONG MS EARTH ELECTRODE WITH TEST LINK, C.I. FRAME & COVER SHALL BE PROVIDED TO CONNECT EACH DOWN CONDUCTOR OF SURGE ARRESTER CAPACITIVE VOLTAGE TRANSFORMER & TOWER WITH PEAK.
12. GRID CONNECTION BETWEEN EXISTING GRID AND NEW GRID WILL BE DONE BY LAYING THE CONDUCTOR BELOW THE MAIN DRAIN.

Plan and Section comment not incorporated.

DRAWING RELEASE RECORD

REV.	DATE	PREPARED	REVIEWED				APPROVED	REVISIONS
			MECH.	CIVIL	ELECT.	I&C		
00	07-06-2025						JJP	ISSUED FOR APPROVAL
01	09-09-2025						JJP	REVISED AS PER COMMENT
02	06-10-2025						JJP	REVISED AS PER COMMENT
03	10-11-2025						JJP	REVISED AS PER COMMENT

DRAWING RELEASE RECORD

REV.	DATE	PREPARED	REVIEWED				APPROVED	REVISIONS
			MECH.	CIVIL	ELECT.	I&C		

THIS DRAWING AND DESIGN IS THE PROPERTY OF AKSHAR GROUP OF COMPANIES AND MUST NOT BE COPIED OR LENT WITHOUT THEIR PERMISSION IN WRITING

	SIGN	DATE
DRAWN BY	JKS	10.11.2025
CHECKED BY	SND	10.11.2025
APPD. BY	JJP	10.11.2025

CLIENT : KARUR TRANSMISSION LIMITED (KTL)

PROJECT: ADANI 400/220kV KARUR S/S

EPC CONTRACTOR: AKSHAR ELECINFRA PVT. LTD.
(A DIV. OF AKSHAR GROUP)
"AKSHAR HOUSE" 808/20/13,GIDC INDUSTRIAL ESTATE,DABHOI PARK,WAKANPURA,VADODARA-390010
PHONE: (0091-2652)2280084,2282873,2285548 FAX: (0091-2652)2284584
E MAIL: ahd.dave@akshar-group.com, design@akshar-group.com

SCALE : --

TITLE : 400/230kV Switchyard Earthing Layout

PROJECT CODE : P-747

DRAWING NO.: AEPL-P747-KTL-E-LAY-002

SHEET 1 OF 1

REV. 03

REVISE THIS DWG. USING CAD SYSTEM ONLY