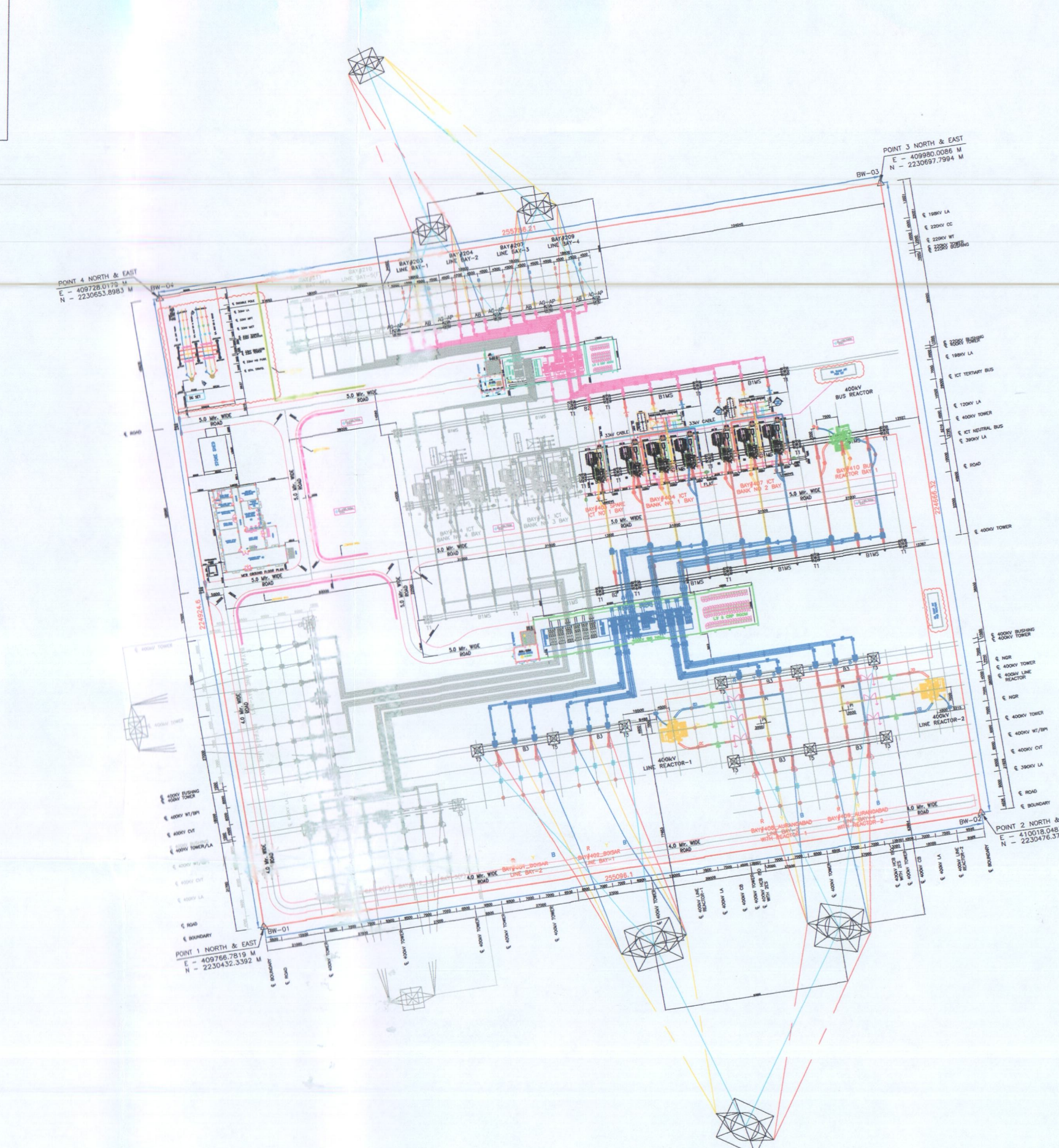
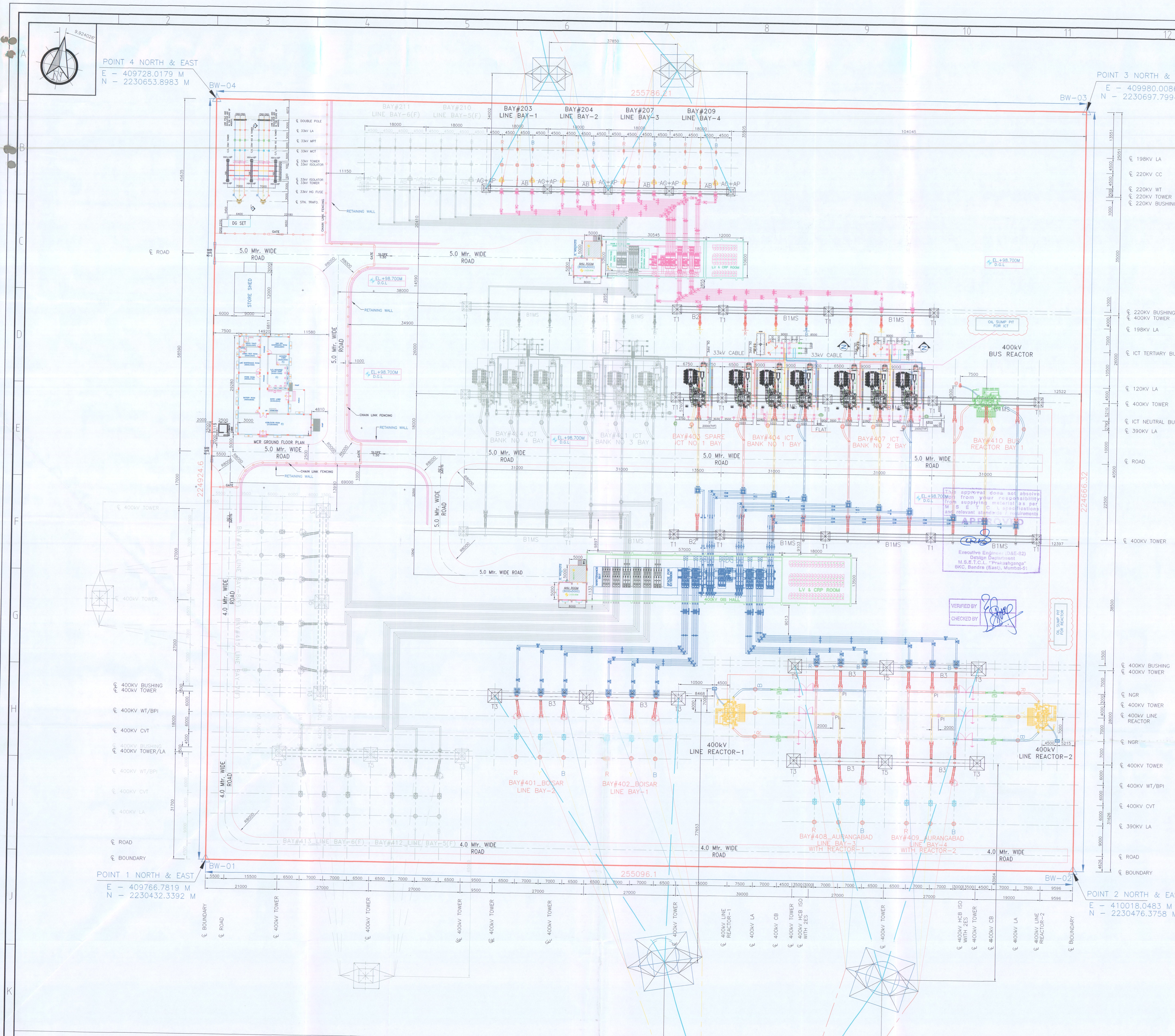




KEY PLAN

REFERENCE :

- 1) TECHNICAL SPECIFICATION
- 2) TENDER BOQ AND SCOPE

LEGEND:

- PRESENT SCOPE
- FUTURE / NOT IN SCOPE
- BOUNDARY WALL
- FENCE
- TENSION INSULATOR
- SUSPENSION INSULATOR

NOTES :

- 1) ALL DIMENSIONS ARE IN mm, UNLESS OTHERWISE SPECIFIED.
- 2) LA's, BPI's, CT's & OTHER EQUIPMENTS COMING IN WITHDRAWAL DIRECTION OF ICT/TRANSFORMER & REACTOR SHALL HAVE REMOVABLE TYPE SUPPORT STRUCTURE AND PLINTH /BOLT TOP TO BE FLUSHED WITH RAIL LEVEL.
- 3) 400KV LIGHTING ARRESTOR (LA) AND 220KV LIGHTING ARRESTOR (LA) REQUIRED FOR SPARE ICT (1x167MVA) & REACTORS SHALL BE CONSTRUCTED TO SUIT SITE CONDITION.
- 4) ALL BUS HEIGHT REFER FROM GRAVEL LEVEL.
- 5) PLINTH HEIGHT OF FOUNDATION WILL BE +450mm FROM THE FINISHED GROUND LEVEL (FGL) & GRAVEL THICKNESS I.E. YARD LEVEL SHALL BE 150mm FROM FGL.
- 6) SHIELD WIRE WILL BE USED FOR DIRECT STROKE LIGHTNING PROTECTION WHEREVER THEY ARE AVAILABLE.
- 7) POSITION OF EARTHWIRE SHALL BE AS PER DSLP STUDY REPORT AND LAYOUT.
- 8) EQUIPMENT SHOWN ARE INDICATIVE. RESPECTIVE EQUIPMENT DRAWINGS SHALL BE REFERRED FOR EQUIPMENT'S EXACT DIMENSIONS AND DETAILS.
- 9) GRADED SLOPE/RETAINING WALL SHALL BE PROVIDED FOR LEVEL DIFFERENCE.
- 10) LOCATION & QUANTITY OF LIGHTING MASTS (LM) SHALL BE REFERRED TO THE OUTDOOR SWITCHYARD ILLUMINATION LAYOUT.
- 11) SUPPLY AND TERMINATION OF LINE SIDE SHIELD WIRE, TENSION CLAMP, INSULATOR STRING WITH HARDWARE AND CONDUCTOR ARE NOT IN PRESENT SUBSTATION SCOPE.
- 12) TENTATIVE LOCATION OF OIL SUMP PIT IS SHOWN IN LAYOUT & SIZE SHALL BE FINALIZED AS PER REACTOR & ICT DRAWINGS.
- 13) NIPPS OIL SUMP PIT LOCATION SHALL BE FINALIZED AFTER RECEIPT OF NIPPS TANK DRG.
- 14) DETAIL SECTIONS OF ICT TERTIARY & NEUTRAL ARRANGEMENT SHALL BE SHOWN SEPARATELY.
- 15) POWER SUPPLY TO STATION TRAFU. TO BE EXTENDED FROM MSEDCL.
- 16) PHASE POSITION OF 400KV & 220KV WAVE TRAP AND 220KV CC TO BE CONFIRMED BY MSETCL, HOWEVER THE FOUNDATION SHALL BE MADE IN ALL THE PHASE OF LINE BAY.
- 17) GIS EQUIPMENTS AND BUS DUCT DETAILS INCLUDING ALL ACCESSORIES SHALL BE AS PER GIS OEM DRAWINGS.
- 18) LOCATION OF LINE REACTOR 1 & 2 DEPENDS ON LINE LENGTH.
- 19) CHANGE IN 33KV YARD AS PER EXECUTED PROJECT & SYSTEM REQUIREMENT

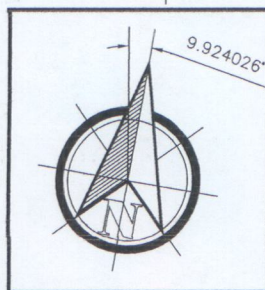
REV. NO.	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
R2	24.09.2025	33KV YARD, AHU ROOM, FENCING, RETAINING WALL & REACTOR OIL SUMP LOCATION UPDATED	S.G.K.	P.K.S.	G.M.S.
R1	05.09.2025	FOR REVIEW AND APPROVAL	N.H.K.	G.M.S.	G.M.S.
R0	02.07.2025	FOR REVIEW AND APPROVAL	R.N.	G.M.S.	G.M.S.
REV. NO.	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
REVISION HISTORY					

CLIENT : MAHARASHTRA STATE ELECTRICITY TRANSMISSION CO. LTD.
PLOT NO. C-19, E-BLOCK, PRAKASHGANGA, BANDRA-KURLA COMPLEX
BANDRA (E) MUMBAI - 400 051

PROJECT : ESTABLISHMENT OF 400/220KV GIS SUBSTATION ALONGWITH ASSOCIATED TRANSMISSION LINE AT-SAROLE KHURD (PIMPALGAON) TAL-NIPHAD, DIST. NASHIK UNDER NASHIK ZONE AGAINST TURNKEY CONTRACT

LOA NO. : MSETCL/CO/Projects/PRE-Tender/T-2412/07271 Dated 15.10.2024

NAME	SIGN	DATE
DRAWN	S.G.K.	02.07.2025
CHECKED	P.K.S.	02.07.2025
APPROVED	G.M.S.	02.07.2025
DRG. NO. :	ELP/PRJ30/PG/002	REV. R2
SHEET NO. :	1 OF 2	



BOQ 400kV EQUIPMENTS :

SR NO.	ITEM DESCRIPTION	LEGENDS	QTY.
01	400kV, 3150A, 63kA/3sec, 3-PHASE GIS LINE BAY WITH CSD - 3000-1500-750/1A (5C)	-	04 SET
02	400kV, 3150A, 63kA/3sec, 3-PHASE GIS ICT BAY WITH CSD - 3000-1500-750/1A (5C)	-	02 SET
03	400kV, 3150A, 63kA/3sec, 1-PHASE GIS SPARE ICT BAY WITHOUT CSD - 3000-1500-750/1A (5C)	-	01 SET
04	400kV, 3150A, 63kA/3sec, 3-PHASE GIS BUS REACTOR BAY WITH CSD - 3000-1500-750/1A (5C)	-	01 SET
05	400kV, 3150A, 63kA/3sec, 3-PHASE GIS BUS COUPLER BAY WITHOUT CSD - 4000-2000-1000/1A (5C)	-	01 SET
06	400kV, 4000A, 63KA-3 SEC, 3-PHASE GIS MAIN BUSBAR WITH PT BAY (3C). $\frac{400kV}{\sqrt{3}}$ / $\frac{110V}{\sqrt{3}}$	-	02 SET
07	400kV, 4000A, 63KA-3 SEC, 1-PHASE GIS AUXILIARY BUSBAR	-	01 SET
08	400kV, 3150A, 63KA-3 SEC, 1-PHASE SF6 TO AIR INSULATED POLYMER BUSHING	-	22 SET
09	400kV, 3150A, 50kA/3sec, 3-PHASE C2-M2 CLASS CIRCUIT BREAKER WITH CSD		02 SET
10	400kV, 3150A, 63kA/3sec, 3-PHASE, HCB ISOLATOR WITH 1 E/S		02 SET
11	390kV, 10KA, CLASS III LIGHTNING ARRESTER (1-PH) PORCELAIN TYPE - 10500MM CR.		12 Nos.
12	390kV, 10KA, CLASS III LIGHTNING ARRESTER (1-PH) POLYMER TYPE - 10500MM CR.		16 SET
13	SUPPORT INSULATORS 8KN ALONG WITH GRADING RING (1-PH)		04 Nos.
14	SUPPORT INSULATORS 8KN ALONG WITH GRADING RING (1-PH) FOR WT	-	24 Nos.
15	167MVA, 400/220/33kV, 1-PH ICT		07 Nos.
16	125MVAR, 400kV, 3-PH BUS REACTOR		01 Nos.
17	80MVAR, 400kV, 3-PH LINE REACTOR		02 Nos.
18	400kV, 3150A/1mH, 1-PH PEDESTAL TYPE WAVE TRAP		08 Nos.
19	120kV LIGHTNING ARRESTER POLYMER (1-PH)		01 No.
20	400kV, CAPACITIVE VOLTAGE TRANSFORMER (1-PH) 4400pF $\frac{400kV}{\sqrt{3}}$ / $\frac{110V}{\sqrt{3}}$ / $\frac{110V}{\sqrt{3}}$ / $\frac{110V}{\sqrt{3}}$		12 Nos.
21	NEUTRAL GROUNDING RESISTOR		02 Nos.

BOQ 220kV EQUIPMENTS :

SR NO.	ITEM DESCRIPTION	LEGENDS	QTY.
01	245kV, 2000A, 50KA-3 SEC, 3-PHASE GIS LINE BAY - 2000-1000/1A (5C)	-	04 SET
02	245kV, 2000A, 50KA-3 SEC, 3-PHASE GIS ICT BAY - 1600-800/1A (5C)	-	02 SET
03	245kV, 2000A, 50KA-3 SEC, 3-PHASE GIS BUS COUPLER BAY - 2400-1200/1A (5C)	-	01 SET
04	245kV, 3150A, 50KA-3 SEC, 3-PHASE GIS MAIN BUSBAR WITH PT BAY, 3C. $\frac{220kV}{\sqrt{3}}$ / $\frac{110V}{\sqrt{3}}$	-	02 SET
05	245kV, 3150A, 50KA-3 SEC, 1-PHASE GIS AUXILIARY BUSBAR	-	01 SET
06	245kV, 2000A, 50KA-3 SEC, 1-PHASE SF6 TO AIR INSULATED POLYMER BUSHING	-	19 SET
07	198kV STATION CLASS, LONG DURATION DISCHARGE CLASS 3, PRESSURE RELEIF CLASS A, LINE DISCHARGE CURRENT 10kA, SURGE ARRESTER (PORCELAIN TYPE)		12 Nos.
08	198kV STATION CLASS, LONG DURATION DISCHARGE CLASS 3, PRESSURE RELEIF CLASS A, LINE DISCHARGE CURRENT 10kA, SURGE ARRESTER (POLYMER TYPE)		7 Nos.
09	245kV, 6KN, BPI FOR CONDUCTOR SUPPORT (FOR WT) (FOR ANY TWO PHASES)	-	24 Nos.
10	220kV, 1250A/0.5mH, 1-PH PEDESTAL TYPE WAVE TRAP		08 Nos.
11	220kV, 6600pF, 1-PH COUPLING CAPACITOR (FOR ANY TWO PHASES)		08 Nos.

BOQ 33kV EQUIPMENTS FOR ICT TERTIARY ARRANGEMENT:

SR NO.	ITEM DESCRIPTION	LEGENDS	QTY.
01	36kV NCT, 2000/1A, 2C		3 Nos.
02	54kV, 10kA, STATION CLASS, SURGE ARRESTER (POLYMER) (1-PH)		6 Nos.
03	39kV, 10kA, STATION CLASS, SURGE ARRESTER (POLYMER) (1-PH)		6 Nos.
04	33kV POTENTIAL TRANSFORMER		6 Nos.
05	33kV BUS POST INSULATOR		60 Nos.
06	36kV ISOLATOR WITHOUT EARTHING BLADE 800A, 25KA, 3 SEC. (3-PH)		2 SET

BOQ 33kV EQUIPMENTS FOR STATION TRAF0 YARD :

SR NO.	ITEM DESCRIPTION	LEGENDS	QTY.
01	33kV/433V, 500kVA, DY11, STATION TRANSFORMER, Z=5%		2 Nos.
02	36kV ISOLATOR WITHOUT EARTHING BLADE 800A, 25KA, 3 SEC. (3-PH)		5 SET
03	36kV HORN GAP FUSE (3-PH), 10A		2 SET
04	30kV, 10kA, STATION CLASS, SURGE ARRESTER (PORCELAIN (1-PH.))		6 Nos.
05	33kV METERING CURRENT TRANSFORMER		6 Nos.
06	33kV METERING POTENTIAL TRANSFORMER		6 Nos.

SYSTEM PARAMETER :

SR NO.	DESCRIPTION OF PARAMETER	SYSTEM VOLTAGE			
		400kV	220kV	33kV	ICT TERTIARY SYSTEM
01	SYSTEM OPERATING VOLTAGE	400kV	220kV	33kV	33kV
02	MAXIMUM SYSTEM VOLTAGE	420kV	245kV	36kV	52kV
03	RATED FREQUENCY	50Hz	50Hz	50Hz	50Hz
04	NO. OF PHASES	3	3	3	3
05	FULL WAVE IMPULSE WITHSTAND VOLTAGE (1.2/50 MICRO SEC.)	1425kVP	1050kVP	170kVP	170kVP
06	ONE MINUTE POWER FREQUENCY DRY & WET WISTAND VOLTAGE (rms)	630kV	460kV	70kV	70kV
07	CORONA EXTINCTION VOLTAGE	320kV	156kV	N/A	N/A
08	MAX. RADIO INTERFERENCE VOLTAGE FOR FREQUENCY BETWEEN 0.5MHz & 2MHz AT 320kV RMS FOR 400kV SYSTEM & 156kV RMS FOR 220kV SYSTEM	1000 microV	1000 microV	N/A	N/A
09	MINIMUM CREEPAGE DISTANCE	25mm/kV (10500mm)	25mm/kV (6125mm)	25mm/kV (900mm)	25mm/kV (900mm)
10	RATED SHORT CIRCUIT CURRENT FOR 3 SEC. DURATION	63kA	50kA	31.5kA	31.5kA
11	SYSTEM NEUTRAL EARTHING	SOLIDLY EARTH	SOLIDLY EARTH	SOLIDLY EARTH	UN-EARTH

SR NO.	DESCRIPTION OF PARAMETER	SYSTEM VOLTAGE			
		400kV	220kV	33kV	ICT TERTIARY SYSTEM
12	MINIMUM CLEARANCE				
i	PHASE TO PHASE	4200mm	2100mm	320mm	320mm
ii	PHASE TO EARTH	3500mm	2100mm	320mm	320mm
iii	SAFETY CLEARANCE	6500mm	4300mm	3000mm	3000mm
iv	GROUND CLEARANCE	8200mm	6500mm	3700mm	3700mm
13	INSULATOR				
a)	TENSION DISC INSULATOR	160KN	120KN	120KN	N/A
b)	SUSPENSION DISC INSULATOR	120KN	70KN	70KN	N/A
c)	BPI FOR CONDUCTOR SUPPORT	8KN	6KN	4KN	4KN
d)	BPI FOR ISOLATOR	8KN	4KN	4KN	4KN
e)	BPI FOR WAVE TRAP	8KN	4KN	N/A	N/A
14	NO. OF DISC INSULATOR				
a)	TENSION STRING HARDWARE	24 Nos.	15 Nos.	4 Nos.	N/A
b)	SUSPENSION DISC INSULATOR	23 Nos.	14 Nos.	N/A	N/A

400kV CONDUCTOR & STRINGING DETAILS :

DESCRIPTION	CONDUCTOR CONFIGURATION	INSULATOR STRING/PHASE
EQUIPMENT CONNECTION FOR LINES, ICT & REACTORS	TWIN AAAC 640 MORCULLA CONDUCTOR WITH 450mm SUB-CONDUCTOR SPACING	DOUBLE TENSION 160KN DISC
DROPPERS FOR LINES, ICT & REACTORS	TWIN AAAC 640 MORCULLA CONDUCTOR WITH 450mm SUB-CONDUCTOR SPACING	SINGLE SUSPENSION 120KN DISC
EARTHWIRE	7/3.66mm G.I. WIRE (10.98mm DIA)	N/A

220kV CONDUCTOR & STRINGING DETAILS :

DESCRIPTION	CONDUCTOR CONFIGURATION	INSULATOR STRING/PHASE
EQUIPMENT CONNECTION FOR LINES	SINGLE AAAC 640 MORCULLA CONDUCTOR	SINGLE TENSION 120KN DISC
EQUIPMENT CONNECTION ICT	TWIN AAAC 640 MORCULLA CONDUCTOR WITH 350mm SUB-CONDUCTOR SPACING	SINGLE TENSION 120KN DISC
FLYOVER BUS FOR ICT INTERCONNECTION	TWIN AAAC 640 MORCULLA CONDUCTOR WITH 450mm SUB-CONDUCTOR SPACING	DOUBLE TENSION 120KN DISC
DROPPERS FOR LINES	SINGLE AAAC 640 MORCULLA CONDUCTOR	SINGLE SUSPENSION 70KN DISC
DROPPERS FOR ICT	TWIN AAAC 640 MORCULLA CONDUCTOR WITH 350mm SUB-CONDUCTOR SPACING	SINGLE SUSPENSION 70KN DISC
EARTHWIRE	7/3.66mm G.I. WIRE (10.98mm DIA)	N/A

33kV STN. TRAF0 YARD CONDUCTOR & STRINGING DETAILS :

DESCRIPTION	CONDUCTOR CONFIGURATION	INSULATOR STRING/PHASE
MAIN BUS	TWIN AAAC 640 MORCULLA CONDUCTOR WITH 140mm SUB-CONDUCTOR SPACING	SINGLE TENSION 120KN DISC
EQUIPMENTS INTERCONNECTION	SINGLE AAAC MORCULLA CONDUCTOR	N/A
EARTHWIRE	7/3.66mm G.I. WIRE (10.98mm DIA)	N/A

BOM 220kV STRUCTURE :

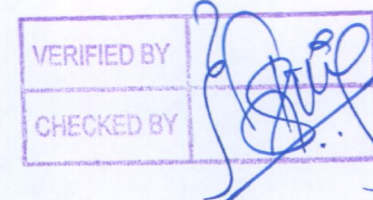
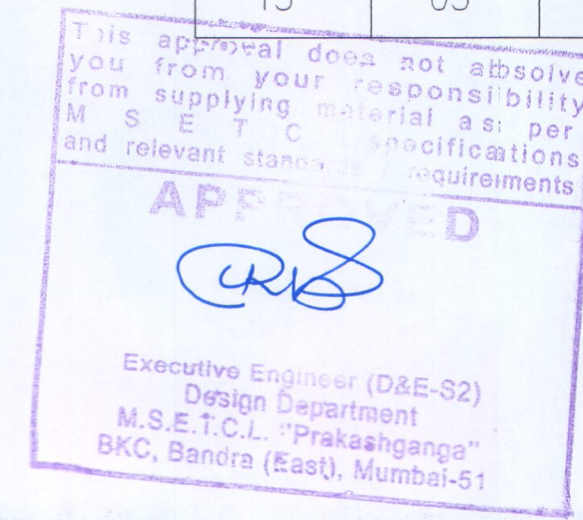
TOWER WITH PEAK		BEAM	
TYPE	QTY. IN Nos.	TYPE	QTY. IN Nos.
AG+AP	05	AB	04
T1 (ON ICT SIDE)	04	B1MS	02
		B2	01

BOM 33kV STRUCTURE :

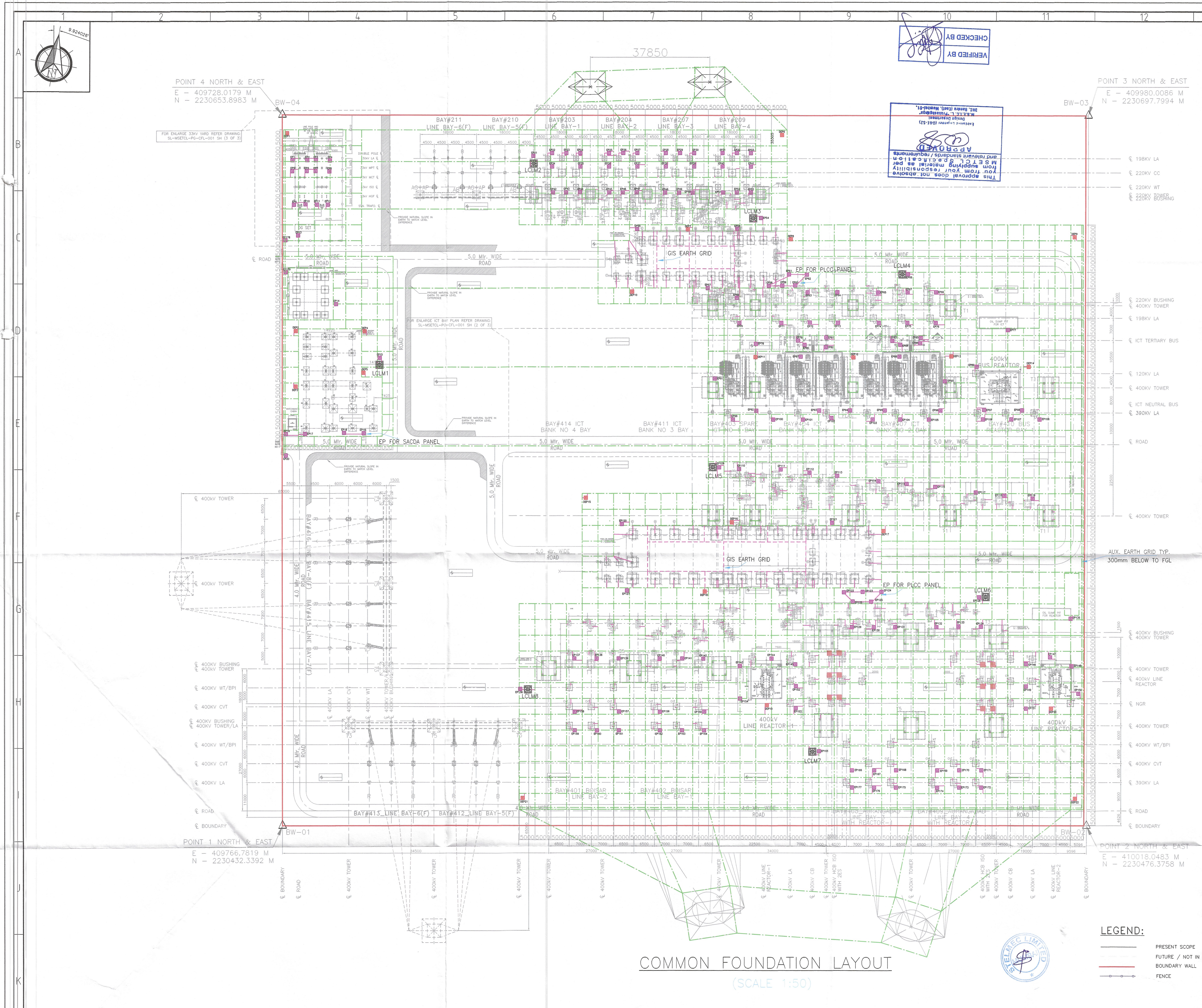
TOWER WITH PEAK		BEAM	
TYPE	QTY. IN Nos.	TYPE	QTY. IN Nos.
HH+HP	06	HA	03

BOM 400kV STRUCTURE :

TOWER WITH PEAK		BEAM	
TYPE	QTY. IN Nos.	TYPE	QTY. IN Nos.
T1	10	B2	02
T3	06	B1MS	06
T5	03	B3	06



R2 24.09.2025		33kV YARD, AHU ROOM, FENCING, RETAINING WALL & REACTOR OIL SUMP LOCATION UPDATED.	S.G.K.	P.K.S	G.M.S
R1 05.09.2025		FOR REVIEW AND APPROVAL	N.H.K	G.M.S	G.M.S
R0 02.07.2025		FOR REVIEW AND APPROVAL	R.N	G.M.S	G.M.S
REV. NO.	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
REVISION HISTORY					
CLIENT : MAHARASHTRA STATE ELECTRICITY TRANSMISSION CO. LTD. PLOT NO. C-19, E-BLOCK, PRAKASHGANGA, BANDRA-KURLA COMPLEX BANDRA (E) MUMBAI - 400 051					
PROJECT : ESTABLISHMENT OF 400/220kV GIS SUBSTATION ALONGWITH ASSOCIATED TRANSMISSION LINE AT-SAROLE KHURD (PIMPALGAON) TAL-NIPHAD, DIST. NASHIK UNDER NASHIK ZONE AGAINST TURNKEY CONTRACT					
LOA NO. : MSETCL/C0/Projects/PRE-Tender/T-2412/07271 Dated 15.10.2024					
DRAWN		S.G.K.	SIGN	DATE	
CHECKED		P.K.S		02.07.2025	
APPROVED		G.M.S		02.07.2025	
DRG. NO. :		ELP/PRJ30/PG/002	REV.		
SHEET NO. :		2 OF 2			
SCALE :		11:300			
TITLE :		ELECTRICAL LAYOUT PLAN DRAWING FOR 400/220kV GIS PIMPALGAON SUBSTATION			



- NOTES :-
- 1) All dimensions are in mm. unless otherwise specified.
 - 2) Only equipment earthing area, risers for tower and electrode arrangement are represented in the drawing. every equipment shall be connected to main earth mat on both x and y direction grid as per typical equipment earthing shown here. also refer drg no. TYP.ETHLP/PRJ30/PG/020. for details of equipment earthing.
 - 3) Earthing conductor in outdoor areas shall be buried at least 600mm below finished ground level unless stated otherwise.
 - 4) Earthing conductor around the building shall be buried in earth at a minimum distance of 1500mm from the outer boundary of the building.
 - 5) Wherever earthing conductor crosses cable trenches underground service ducts, pipes, tunnels, railway tracks etc. it shall be laid minimum 300mm below them and shall be circumvented in case it fouls with equipments/structure foundations.
 - 6) Wherever specifically shown in drawings or not, steel/rcc columns, metallic stairs etc shall be connected to the nearby earthing grid conductor by two earthing leads. electrical continuity shall be ensured by bonding different sections of hand rail and metallic stairs
 - 7) Metallic pipes, conduits and cable tray section for cable installation shall be bonded to ensure electrical continuity and connected to earthing conductors at regular interval apart from intermediate connections, beginning points shall also be connected to earthing system.
 - 8) Metallic conduits shall not be used as earth continuity conductor.
 - 9) Wherever earthing conductor crosses or runs along metallic structure such as gas, water, steam conduits etc. and steel reinforcement in concrete it shall be bonded to the same.
 - 10) Light poles, junction boxes on the poles, cable boxes/glands, lockout switches etc shall be connected to the earthing conductor running along with the supply cable which in turn shall be connected to earthing grid conductor at a minimum two points whether specifically shown or not.
 - 11) Railway tracks within switchyard area shall be earthed at a spacing of 30m and also at both ends.
 - 12) Earthing conductor shall be buried 1000mm outside the switchyard fence. all the gates & every alternate post of the fence shall be connected to earthing grid.
 - 13) The stone spreading shall also be done 200mm outside switchyard fence. the criterion for stone spreading shall be followed in line with requirement specified elsewhere in the specification.
 - 14) Flexible earthing connectors shall be provided for the moving parts.
 - 15) 50mm x 8mm g.i. flat shall run on the top tier and all along the cable trenches and the same shall be welded to each of the racks, further this flat shall be earthed at both ends and at an interval of 30m. the m.s. flat shall be finally painted with two coats of red oxide primer and two coats of post office red enamel paints.
 - 16) Connection between equipment earthing lead and main earthing conductor and between main earthing conductor shall be welded type. for the rust protection the welds should be treated with red oxide afterward coated with two layers of bitumen compound to prevent corrosion.
 - 17) Auxiliary earthing mat comprising of 75x12mm ms flat closely spaced (300mmx300mm), 1500mm length conductor shall be provided at depth of 300mm from fgl below the operating handles of mom boxes of the isolators. mom boxes shall be directly connected to aux. mat.
 - 18) PLCC electrodes shall be connected with each other & shall be kept isolated from main earth mat grid.
 - 19) SCADA electrodes shall be connected with each other & shall be kept isolated from main earth mat grid.

EARTH GRID OF OUTDOOR SWITCHYARD BOQ & LEGENDS

SR.NO	LEGEND	DESCRIPTION	BOQ QTY.	PROP.QTY.
1		NON TREATED EARTHING SET CI PIPE 150mm DIA, 3 MTR LONG	124 Nos.	179Nos.
2		NON TREATED DIP EARTHING SET 40mm DIA, MS ROD, 22MTR LENGTH	---	22 Nos.
3		EARTH GRID 75X12mm MS	49.49MT = 6970MTR	110.05 MT = 15500 MTR.
4		AUX EARTHMAT 75X12mm MS, 300x300mm SPACING, 1500mm LENGTH, QTY=12NOS.	---	---
5		EARTH RISER 75X10mm MS	500MTR	1150MTR.
6		TINNED COPPER FLAT 50X6mm FOR GIS HALL EARTH GRID	400MTR	500MTR.
7		TINNED COPPER FLAT 25X3mm FOR STN. TRFO, PLCC AND SCADA PANEL	200MTR	200MTR.

LEGEND:

- PRESENT SCOPE
- FUTURE / NOT IN SCOPE
- BOUNDARY WALL
- FENCE

COMMON FOUNDATION LAYOUT (SCALE 1:50)

REFERENCE :-

1. APPROVED ELECTRICAL PLAN LAYOUT DRAWING NO. ELP-PRJ30-PG-002_R2
2. EARTHING DESIGN CALCULATION REPORT

REV. NO.	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
RO	23.02.2026	FOR REVIEW AND APPROVAL	N.H.K	P.K.S	G.M.S
REVISION HISTORY					

CLIENT : MAHARASHTRA STATE ELECTRICITY TRANSMISSION CO. LTD.
PLOT NO. C-19, E-BLOCK, PRAKASHGANGA, BANDRA-KURLA COMPLEX
BANDRA (E) MUMBAI - 400 051

PROJECT : ESTABLISHMENT OF 400/220kV GIS SUBSTATION ALONGWITH ASSOCIATED TRANSMISSION LINE AT-SAROLE KHURD (PIMPALGAON) TAL-NIPHAD, DIST. NASHIK UNDER NASHIK ZONE AGAINST TURNKEY CONTRACT

LOA NO. : MSETCL/CO/Projects/PRB-Tender/T-2412/07271 Dated 15.10.2024

NAME	SIGN	DATE
DRAWN	N.H.K	23.02.2026
CHECKED	P.K.S	23.02.2026
APPROVED	G.M.S	23.02.2026
DRG. NO. :		
EARTH GRID/PRJ-30/PG/019		
SHEET NO. : 01 OF 01		

MAHARASHTRA STATE ELECTRICITY TRANSMISSION CO LTD.

From: Office of the Additional Executive Engineer, EHV S/S Proj. S/Dn, MSETCL. Office Address:- Raka Plot, Shivaji Nagar, Near Koyana Colony, Jail Road, Nasik Road - 422101. Email: adee5612@mahatransco.in Website: http://www.mahatransco.in	To: The Executive Engineer, E.H.V. Project Division, MSETCL, Nasik.
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Addl.EE/EHV/Proj/SS/Sub-Dn/NSK/ 81

Date: 16/4/2025

Sub: Re-Submission of Earth resistivity test reports in respect of 400/220kV GIS Sarole Sub-station awarded to M/s. Stelmec Ltd.

Ref:-

1. MBR No. 145/09, Dtd. 22.01.2021
2. LOA No. MSETCL/CO/Projects/Pre-tender/T-2412/7271, Dtd. 15.10.2024
3. SL-EPC/MSETCL/Pimpalgaon/FL-02/PMG/014, Dtd. 10.03.2025
4. EE/EHV/PROJ/DIV/NSK/TECH/0263, Dtd. 13.03.2025
5. Addl.EE/EHV/Proj/SS/Sub-Dn/NSK/54, Dtd. 17.03.2025
6. SE/EHV PC/NSK/Tech/No. 0550, Dtd. 08.04.2025
7. EE/EHV/PROJ/DIV/NSK/TECH/0417, Dtd. 15.04.2025---Returning of resistivity reports.

With reference to above subject, the work of establishment of 400/220kV Sarole GIS S/S is awarded to M/s. Stelmec Ltd. vide LOA under ref. (2). This office has verified & submitted the Earth resistivity report to your good office vide letter under ref. (5).

The Earth resistivity test was carried out in presence of this office representative & submitted earth resistivity test values verified with actual values noted on site. All earth resistivity test values found correct as per site values.

However, the reports are returned by your good office vide letter under ref. (7) for certification. Now, reports are certified by this office & hence, forwarded for further needful please.

Submitted for your information and n.a. please.

Encl: Earth resistivity test reports-02 sets.



(Vijay Patil)

Addl. Executive Engineer
EHV S/S Proj. S/Dn, Nashik.

o/c

MAHARASHTRA STATE ELECTRICITY TRANSMISSION CO LTD.

From: Office of the Additional Executive Engineer, EHV S/S Proj. S/Dn, MSETCL. Office Address:- Raka Plot, Shivaji Nagar, Near Koyana Colony, Jail Road, Nasik Road - 422101. Email: adee5612@mahatransco.in Website: http://www.mahatransco.in	To: The Executive Engineer, E.H.V. Project Division, MSETCL, Nasik.
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Addl.EE/EHV/Proj/SS/Sub-Dn/NSK/ 54 Date: 17/03/2025

Sub: Submission of Earth resistivity test reports in respect of 400/220kV GIS Sarole Sub-station awarded to M/s. Stelmec Ltd.

Ref:-

1. MBR No. 145/09, Dtd. 22.01.2021
2. LOA No. MSETCL/CO/Projects/Pre-tender/T-2412/7271, Dtd. 15.10.2024
3. SL-EPC/MSETCL/Pimpalgaon/FL-02/PMG/014, Dtd. 10.03.2025
4. EE/EHV/PROJ/DIV/NSK/TECH/0263, Dtd. 13.03.2025

With reference to above subject, the work of establishment of 400/220kV Sarole GIS S/S is awarded to M/s. Stelmec Ltd. vide LOA under ref. (2).

M/s. Stelmec Ltd. has submitted the Earth resistivity test reports (03 sets) for 400/220kV Sarole GIS S/S to your good office vide letter under ref. (3) & same is forwarded to this office vide letter under ref. (4). The values of resistivity for 05 nos. of pits at sarole site were taken on dtd. 25.02.2025 in the presence of representative of this subdivision. The details are as below:

S.No.	Description	Document ref. no.	Remark
1.	Earth resistivity test report	250306/06.03.2025	Hardcopy-03 sets.

The Earth resistivity test was carried out in presence of this office representative & submitted earth resistivity test values verified with actual values noted on site. All earth resistivity test values found correct as per site values. Hence forwarded for further needful please.

Submitted for your information and n.a. please.

Encl: Earth resistivity test reports-02 sets.



(Vijay Patil)

Addl. Executive Engineer
EHV S/S Proj. S/Dn, Nashik.

o/c

ELECTRICAL RESISTIVITY TOMOGRAPHY **REPORT**

CLIENT NAME : STELMEC LIMITED

**OFFICE ADDRESS : 506/507, 55 CORPORATE AVENUE, SAKI
VIHAR ROAD, ANDHERI (E), MUMBAI –
400072.**

**SITE ADDRESS : GIS SUB - STATION AT SAROLE KHURD
(PIMPALGAON), TAL. NIPHAD, DIST.
NASHIK, MAHARASHTRA.**

PROPOSED WORK : MSETCL 400/220 kV GIS SUB - STATION

CENTRIX
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ENGINEERING SOLUTIONS PVT. LTD.
The Construction Material Testing Laboratory

Working for excellence

NABL ACCREDITED LABORATORY AS PER IS/ISO/IEC 17025: 2017

CIN : U42909PN2024PTC227535 9145-1000-60 centrixtestings@gmail.com www.centrixengg.com

Plat No. 15, G4, GAT No. 2328, Ganga Club Road, Ubale Nagar, Wagholi, Haveli, Pune - 412207

**REPORT NO:
250306-02**

**ISSUED ON:
06-03-2025**



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3.0	ERT PLOT LAYOUT	5
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ANNEXURES

- Photographs – site

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1.0 INTRODUCTION

Electrical Resistivity Test (ERT) was carried out at proposed construction for MSETCL 400/220 kV GIS Sub-station at Sarole Khurd (Pimpalgaon), Niphad, Nashik, MH. Vertical Electrical Sounding was carried out at 5 locations. The test was carried out using Wenner's Configuration as per IS 3043-1987. ERT was conducted at the site for an electrode spread (a) maximum of 6.0 m in order to ascertain earth resistance details.

2.0 PRINCIPLE

This arrangement uses four electrodes equally spaced along a straight line. It is the simplest and the most symmetrical arrangement. It is designed to measure the potential difference between M and N as shown in Fig.2. The formula for calculating apparent resistivity from a Wenner's measurement is:

$$\rho_a = 2\pi a \left(\frac{\Delta V}{I} \right)$$

Where 'a' is the spacing between adjacent electrodes, V is the potential drop and I the applied current.

The measurement of electrical resistivity requires that four electrodes be placed in contact with the surface material as shown in Fig. 1. The geometry, separation of the electrode array and spacing are selected on the basis of the application and required depth of investigation. A direct current, or a very low frequency alternating current, is passed into the ground through a pair of current electrodes, and the resulting potential drop is measured across a pair of potential electrodes as shown in Fig.1. The resistance is then derived as the ratio of the voltage measured across the potential electrodes and the current electrodes. The apparent resistivity



of subsurface materials is the resistance multiplied by a geometric factor determined by the geometry and spacing of the electrode array. The apparent resistivity depends on resistivity contrast between adjacent layers.

The apparent resistivity depends not only on the nature of Geo-electric section but also on geometric configuration of the electrodes used for the measurement. This apparent resistivity is different from true resistivity unless the subsurface materials are homogeneous.

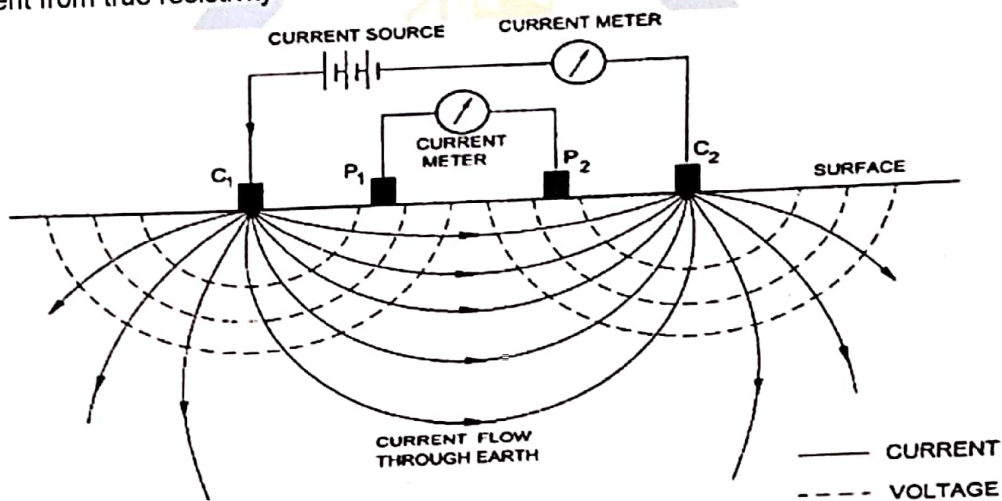
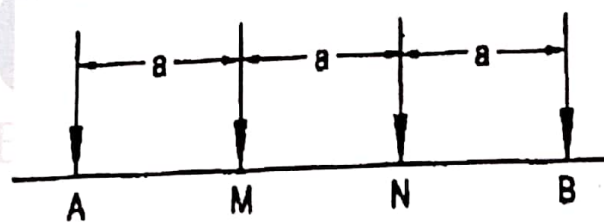


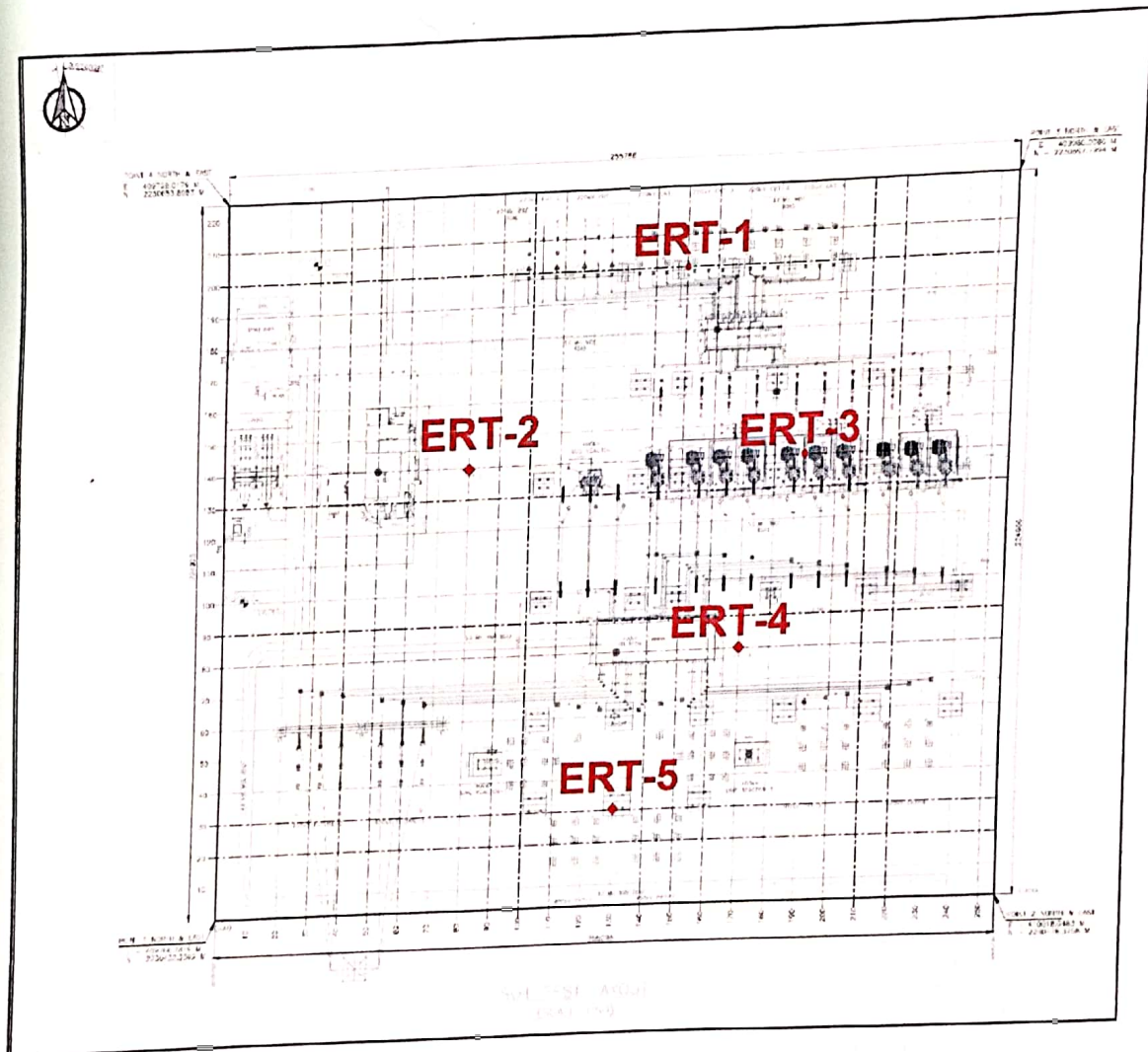
Figure 01



WENNER SPREAD

Figure 02

BOREHOLE LAYOUT - PLOT



ERT (IS: 3043 - 1987)

Customer Name	STELMEC LIMITED		
Office Address	506/507, 55 Corporate Avenue, Saki Vihar Road, Andheri (E), Mumbai - 400 072.		
Project	Proposed MSETCL 400/220 kV GIS Sub-station at Sarole Khurd (Pimpalgaon), Tal.-Niphad, Dist.-Nashik, MH.		
Location	ERT-1	Testing Date:-	25-02-2025

Method Used : Wenner Four Pin Equal Probe Spacing.

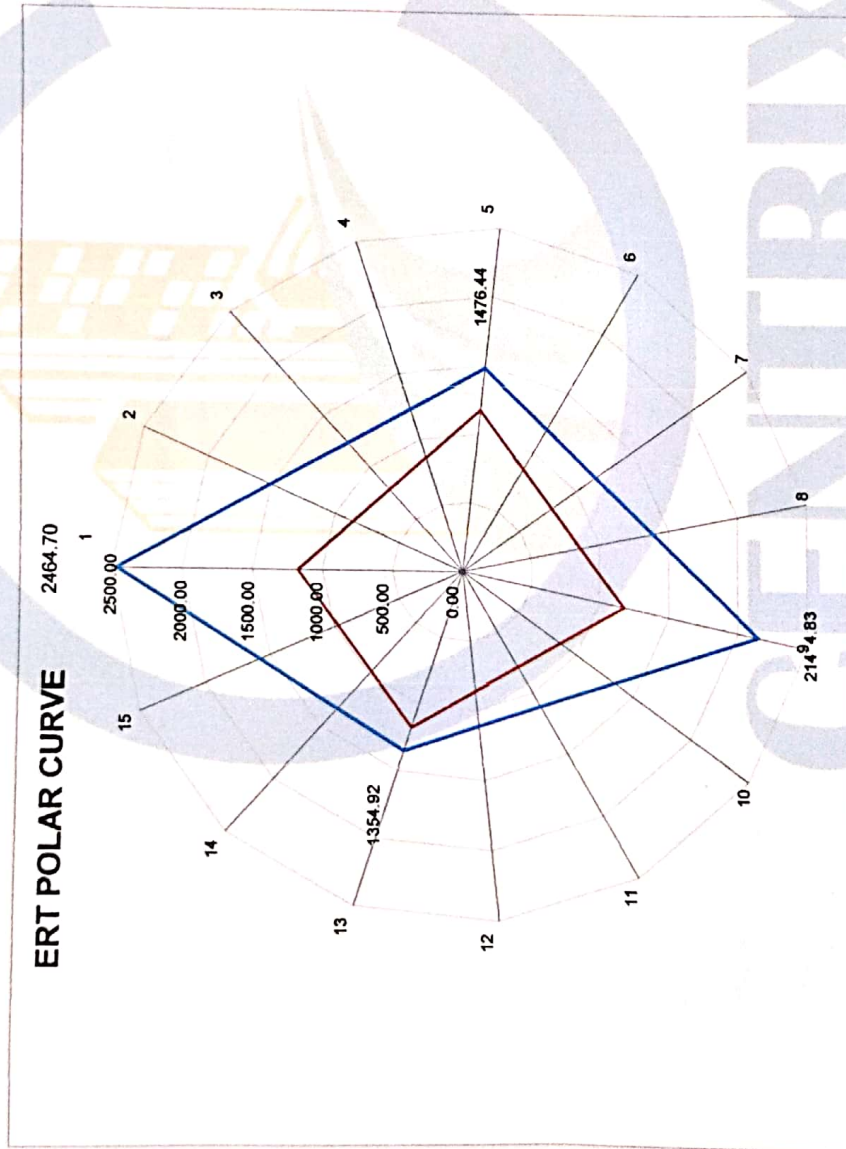
ERT		N-S		E-W		NW-SE		NE-SW		Average Apparent Resistivity P_{avg} , Ohm-m
Sr. No.	Direction	Resistance	P (N)	Resistance	P (E)	Resistance	P (S)	Resistance	P (W)	
		(m)	Ohm-m	Ohm	Ohm-m	Ohm	Ohm-m	Ohm	Ohm-m	
1	1	57.00	358.29	56.00	352.00	51.00	320.57	76.00	477.71	377.14
2	2	70.00	880.00	58.00	729.14	58.00	729.14	54.00	678.86	754.29
3	3	93.00	1753.71	67.00	1263.43	69.00	1301.14	56.00	1056.00	1343.57
4	4	47.00	1181.71	45.00	1131.43	52.00	1307.43	28.00	704.00	1081.14
5	5	65.00	2042.86	30.00	942.86	59.00	1854.29	36.00	1131.43	1492.86
6	6	110.00	4148.57	38.00	1433.14	72.00	2715.43	30.00	1131.43	2357.14
7	7	95.00	4180.00	45.00	1980.00	90.00	3960.00	38.00	1672.00	2948.00
8	8	72.00	3620.57	50.00	2514.29	92.00	4626.29	41.00	2061.71	3205.71
9	9	71.00	4016.57	52.00	2941.71	44.00	2489.14	58.00	3281.14	3182.14
Average Apparent Resistivity										1860.22
Resistivity, $\rho = 2\pi a R$										



POLAR CURVE

Location : ERT-1

ERT POLAR CURVE



Area of polygon = 4341146.78
 Mean Resistivity = 1175.51 Ohm M

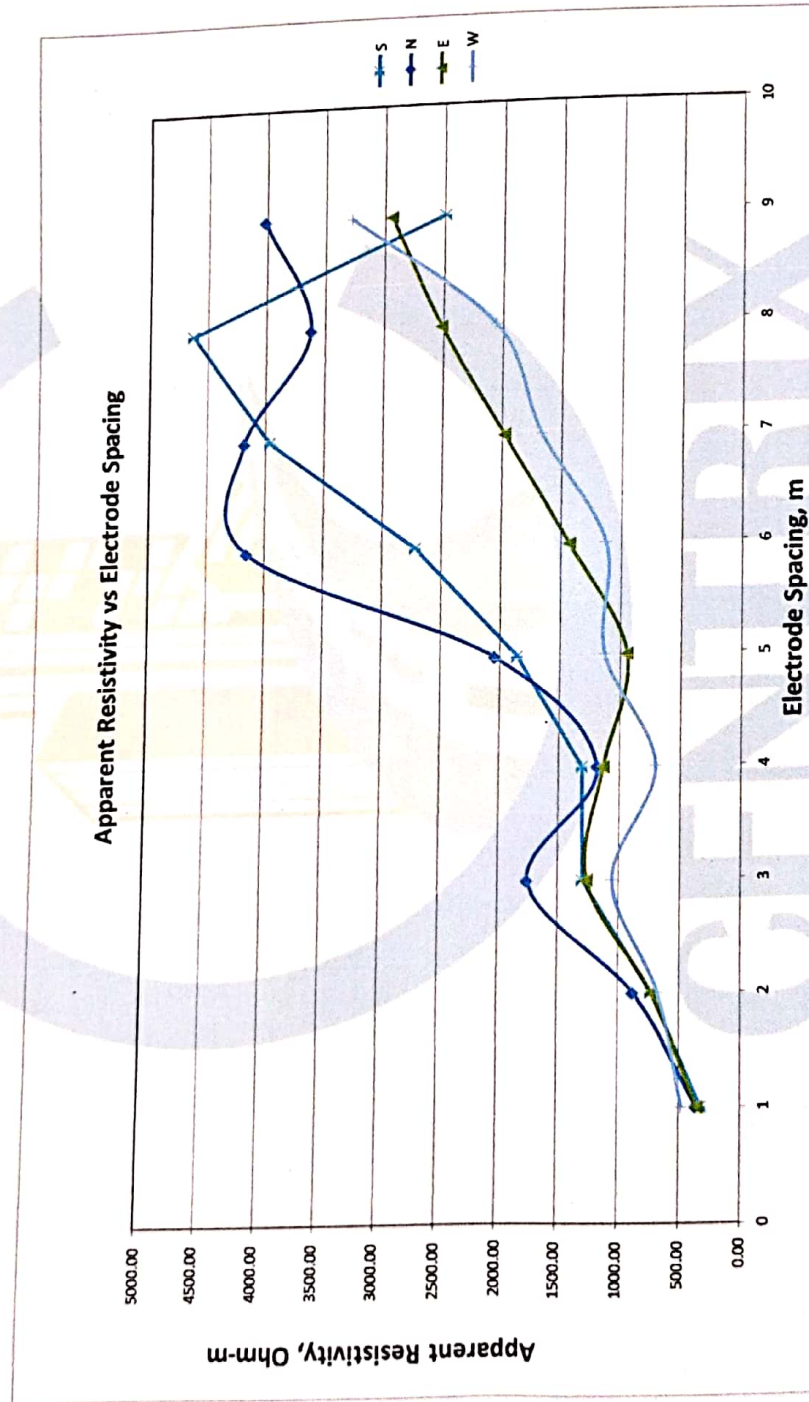


Note: 1=N-S, 2=S-W, 3=NE-SW, 4=NW-SE



Apparent Resistivity vs Electrode Spacing

Location : ERT-1



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ERT (IS: 3043 - 1987)

Project Location	Proposed MSETCL 400/220 kV GIS Sub-station at Sarole Khurd (Pimpalgaon), Tal.-Niphad, Dist.-Nashik, MH.	Testing Date:-	25-02-2025
	ERT-2		

Method Used : Wenner Four Pin Equal Probe Spacing.

ERT		N-S		E-W		NW-SE		NE-SW		Average Apparent Resistivity P_{as} , Ohm-m
Sr. No	Direction Electrodes Spacing, a (m)	Resistance Ohm	$P (N)$ Ohm-m	Resistance Ohm	$P (E)$ Ohm-m	Resistance Ohm	$P (S)$ Ohm-m	Resistance Ohm	$P (W)$ Ohm-m	
1	1	68.00	427.43	46.00	289.14	165.00	1037.14	60.00	377.14	532.71
2	2	52.00	653.71	51.00	641.14	188.00	2363.43	96.00	1206.86	1216.29
3	3	72.00	1357.71	63.00	1188.00	89.00	1678.29	85.00	1602.86	1456.71
4	4	46.00	1156.57	37.00	930.29	54.00	1357.71	110.00	2765.71	1552.57
5	5	82.00	2577.14	24.00	754.29	42.00	1320.00	89.00	2797.14	1862.14
6	6	90.00	3394.29	36.00	1357.71	32.00	1206.86	32.00	1206.86	1791.43
7	7	99.00	4356.00	39.00	1716.00	39.00	1716.00	48.00	2112.00	2475.00
8	8	114.00	5732.57	37.00	1860.57	96.00	4827.43	52.00	2614.86	3758.86
9	9	62.00	3507.43	40.00	2262.86	85.00	4808.57	79.00	4469.14	3762.00
Average Apparent Resistivity										2045.30

Resistivity, $\rho = 2 \pi a R$

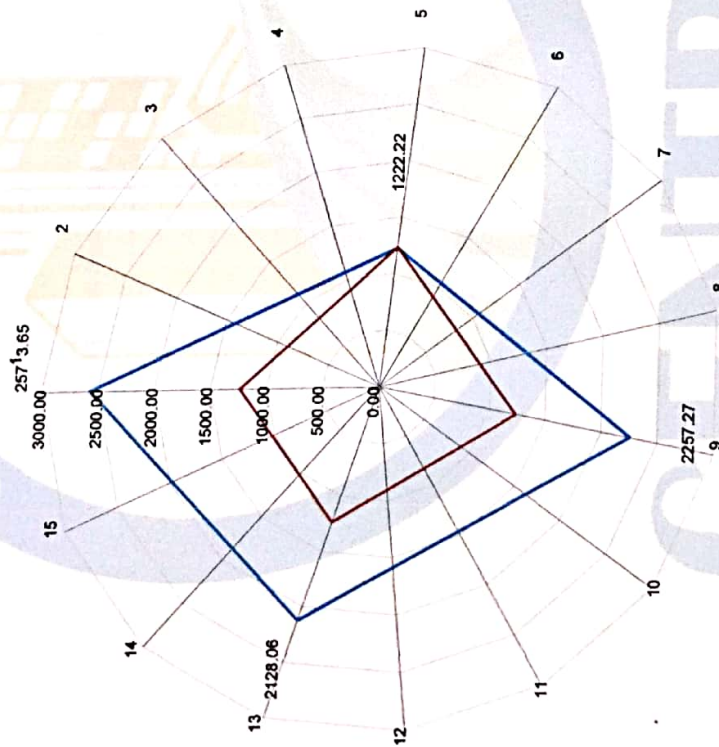


ENGINEERING SOLUTIONS

POLAR CURVE

Location : ERT-2

ERT POLAR CURVE



Area of Polygon = 4786490.36
Mean Resistivity = 1234.34 Ohm M

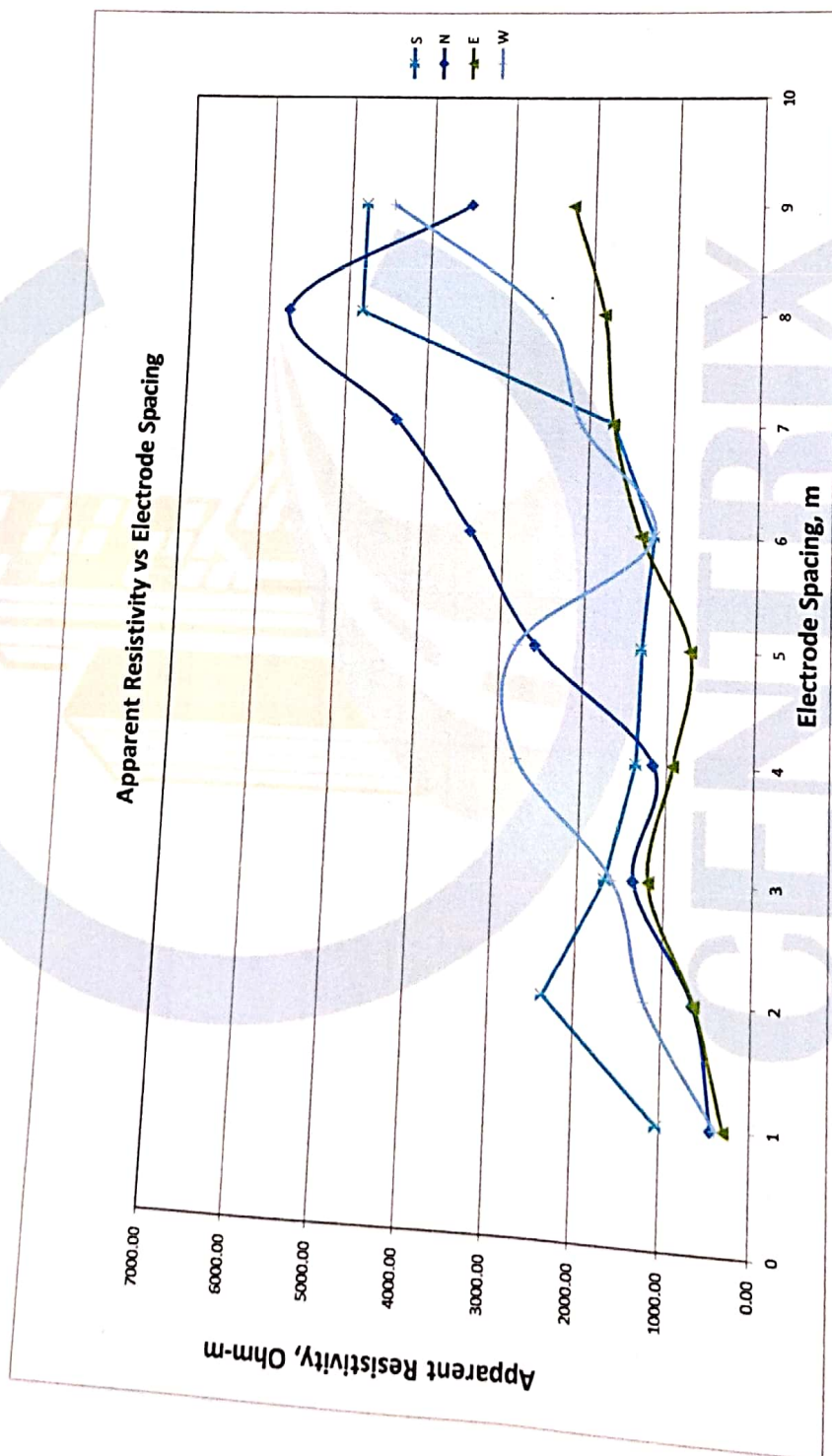
Note: 1=N-S, 2=S-W, 3=NE-SW, 4=NW-SE





Apparent Resistivity vs Electrode Spacing

Location : ERT-2



ENGINEERING SOLUTIONS

ERT (IS: 3043 - 1987)

Project Location	Proposed MSETCL 400/220 kV GIS Sub-station at Sarole Khurd (Pimpalgaon), Tal-Niphad, Dist-Nashik, MH.	Testing Date:-	25-02-2025
	ERT-3		

Method Used Wenner Four Pin Equal Probe Spacing.

ERT		Direction								Average Apparent Resistivity P_{avg} , Ohm-m
Sr. No.	Electrodes Spacing, a (m)	N-S		E-W		NW-SE		NE-SW		
		Resistance	P (N)	Resistance	P (E)	Resistance	P (S)	Resistance	P (W)	
1	1	59.00	370.86	180.00	1131.43	78.00	490.29	32.00	201.14	548.43
2	2	76.00	955.43	120.00	1508.57	105.00	1320.00	80.00	1005.71	1197.43
3	3	85.00	1602.86	98.00	1848.00	55.00	1037.14	75.00	1414.29	1475.57
4	4	42.00	1056.00	51.00	1282.29	62.00	1558.86	29.00	729.14	1156.57
5	5	31.00	974.29	76.00	2388.57	59.00	1854.29	38.00	1194.29	1602.86
6	6	50.00	1885.71	50.00	1885.71	78.00	2941.71	60.00	2262.86	2244.00
7	7	79.00	3476.00	69.00	3036.00	92.00	4048.00	72.00	3168.00	3432.00
8	8	46.00	2313.14	70.00	3520.00	68.00	3419.43	102.00	5129.14	3595.43
9	9	51.00	2885.14	55.00	3111.43	70.00	3960.00	95.00	5374.29	3832.71
Average Apparent Resistivity										2120.56

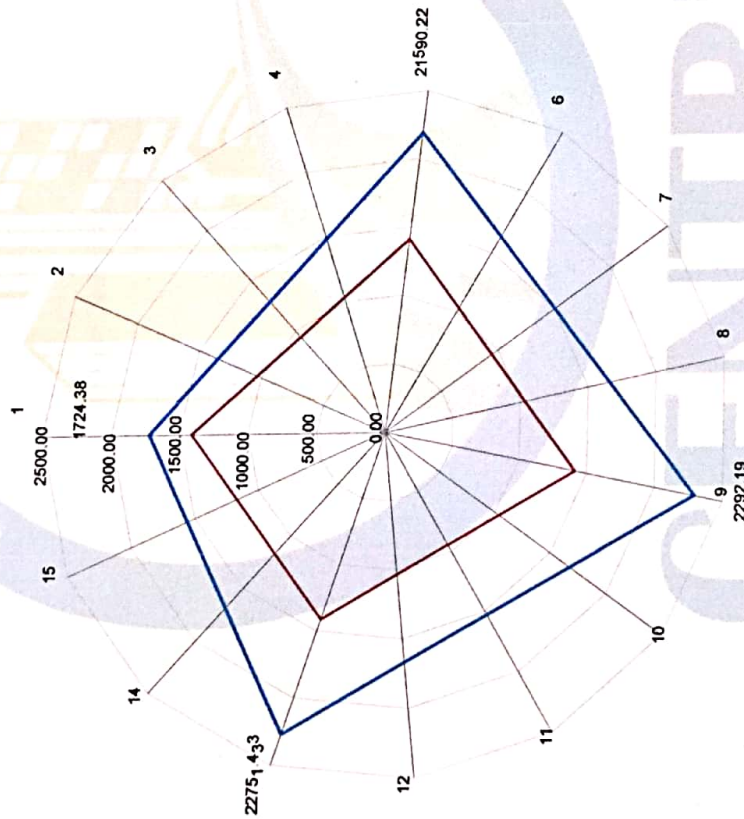
Resistivity, $\rho = 2\pi a R$



POLAR CURVE

Location: ERT-3

ERT POLAR CURVE



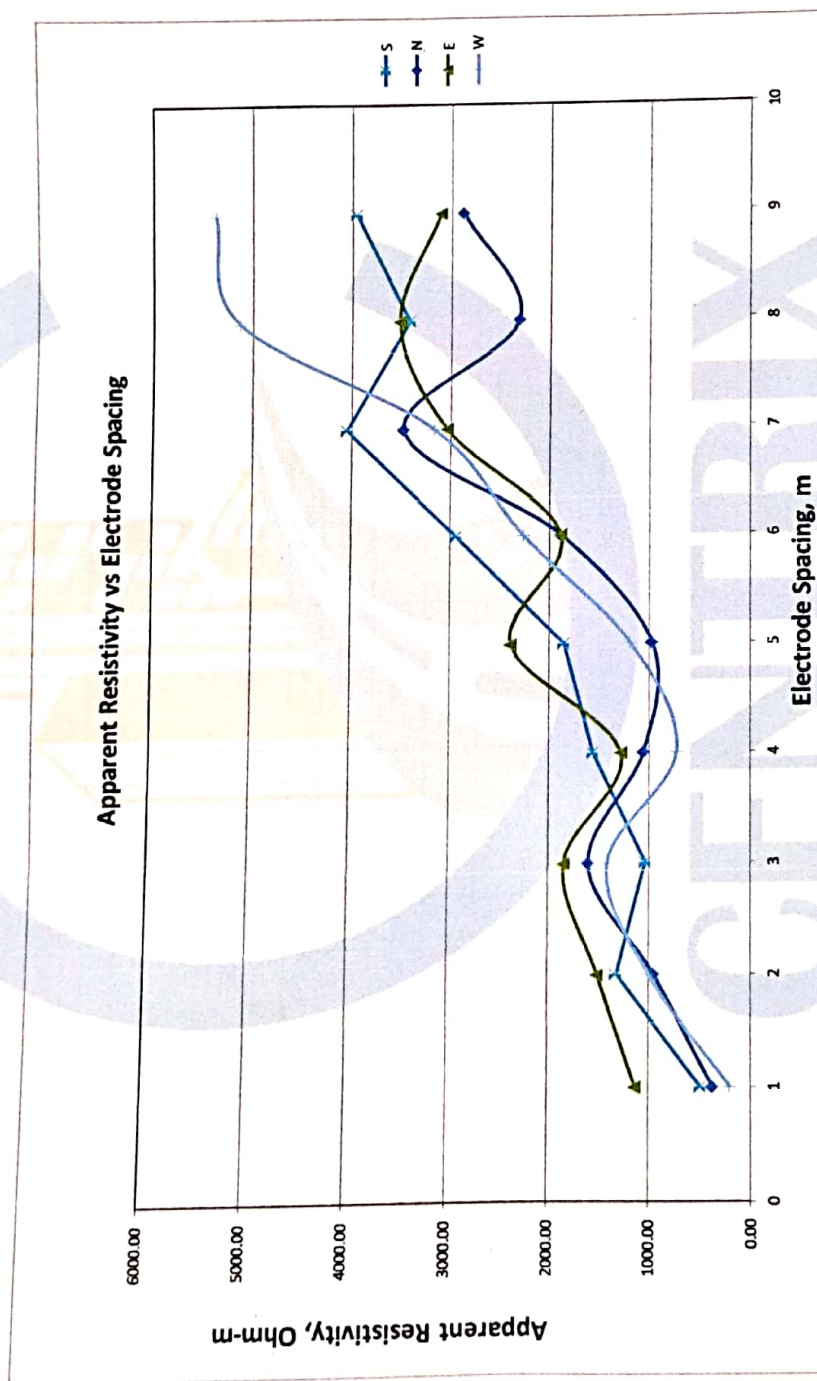
Area of Polygon = 6263742.79
Mean Resistivity= 1412.02 Ohm M



Note: 1=N-S, 2=S-W, 3=NE-SW, 4=NW-SE

Apparent Resistivity vs Electrode Spacing

Location : ERT-3



ERT (IS: 3043 - 1987)

Project Location	Proposed MSETCL 400/220 kV GIS Sub-station at Sarole Khurd (Pimpalgaon), Tal.-Niphad, Dist.-Nashik, MH.	Testing Date:-	25-02-2025
	ERT-4		

Method Used : Wenner Four Pin Equal Probe Spacing.

ERT		N-S		E-W		NW-SE		NE-SW		Average Apparent Resistivity P_{avg} , Ohm-m
Sr. No.	Direction	Resistance	P (N)	Resistance	P (E)	Resistance	P (S)	Resistance	P (W)	
	Electrodes Spacing, m									
	(m)	Ohm	Ohm-m	Ohm	Ohm-m	Ohm	Ohm-m	Ohm	Ohm-m	
1	1	78.00	490.29	33.00	207.43	12.00	75.43	55.00	345.71	279.71
2	2	97.00	1219.43	30.00	377.14	50.00	628.57	78.00	980.57	801.43
3	3	55.00	1037.14	55.00	1037.14	58.00	1093.71	90.00	1697.14	1216.29
4	4	72.00	1810.29	72.00	1810.29	92.00	2313.14	95.00	2388.57	2080.57
5	5	152.00	4777.14	79.00	2482.86	79.00	2482.86	33.00	1037.14	2695.00
6	6	95.00	3582.86	102.00	3846.86	85.00	3205.71	48.00	1810.29	3111.43
7	7	62.00	2728.00	90.00	3960.00	100.00	4400.00	74.00	3256.00	3586.00
8	8	40.00	2011.43	41.00	2061.71	65.00	3268.57	60.00	3017.14	2589.71
9	9	35.00	1980.00	50.00	2828.57	70.00	3960.00	51.00	2885.14	2913.43
Average Apparent Resistivity										2141.51

Resistivity, $\rho = 2 \pi a R$



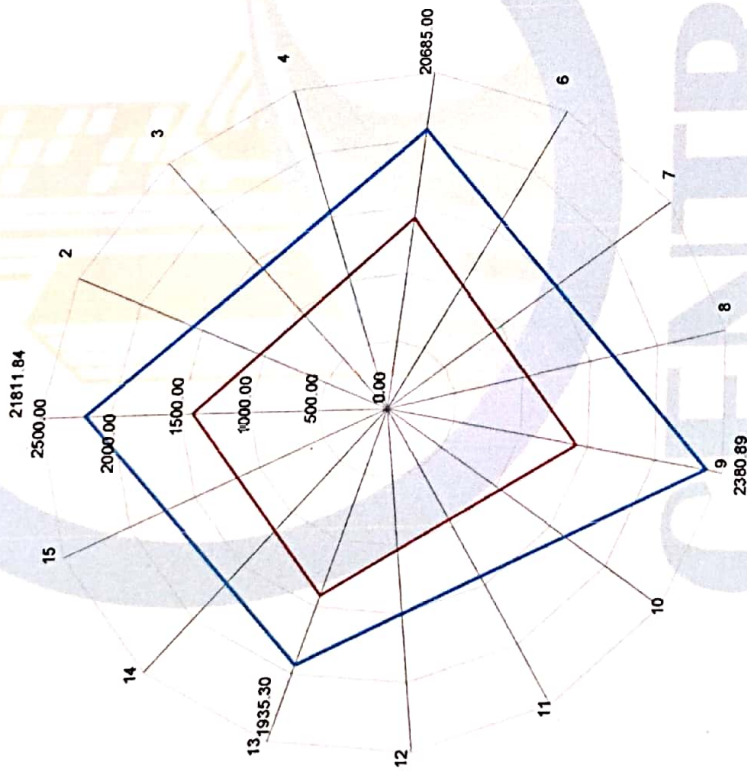
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POLAR CURVE

Location : ERT-4

ERT POLAR CURVE

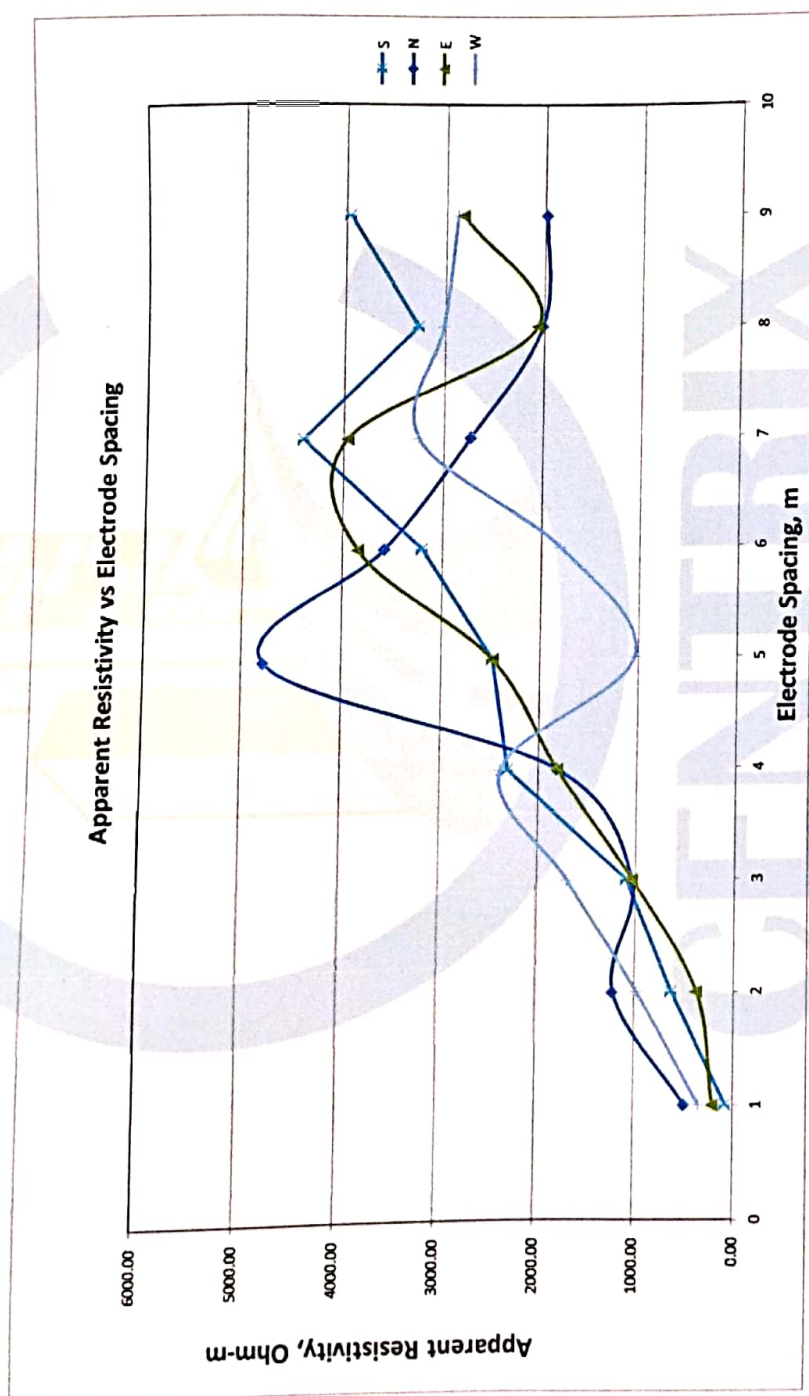


Area of Polygon = 6277404.99
Mean Resistivity = 1413.56 Ohm M

Note: 1=N-S, 2=S-W, 3=NE-SW, 4=NW-SE

Apparent Resistivity vs Electrode Spacing

Location : ERT-4



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ERT (IS: 3043 - 1987)

Project	Proposed MSETCL 400/220 kV GIS Sub-station at Sarole Khurd (Pimpalgaon), Tal.-Niphad, Dist.-Nashik, MH.	Testing Date:-	25-02-2025
Location	ERT-5		

Method Used : Wenner Four Pin Equal Probe Spacing.

ERT		N-S		E-W		NW-SE		NE-SW		Average Apparent Resistivity P_{avg} , Ohm-m
Sr. No.	Direction Electrodes Spacing, a (m)	Resistance	P (N) Ohm-m	Resistance	P (E) Ohm-m	Resistance	P (S) Ohm-m	Resistance	P (W) Ohm-m	
1	1	75.00	471.43	27.00	169.71	110.00	691.43	35.00	220.00	388.14
2	2	12.00	150.86	35.00	440.00	105.00	1320.00	42.00	528.00	609.71
3	3	35.00	660.00	37.00	697.71	50.00	942.86	90.00	1697.14	999.43
4	4	72.00	1810.29	47.00	1181.71	82.00	2061.71	101.00	2539.43	1898.29
5	5	95.00	2985.71	35.00	1100.00	60.00	1885.71	72.00	2262.86	2058.57
6	6	80.00	3017.14	47.00	1772.57	35.00	1320.00	95.00	3582.86	2423.14
7	7	81.00	3564.00	52.00	2288.00	47.00	2068.00	52.00	2288.00	2552.00
8	8	60.00	3017.14	72.00	3620.57	80.00	4022.86	71.00	3570.29	3557.71
9	9	71.00	4016.57	82.00	4638.86	70.00	3960.00	50.00	2828.57	3861.00
Average Apparent Resistivity										2038.67

Resistivity, $\rho = 2 \pi a R$

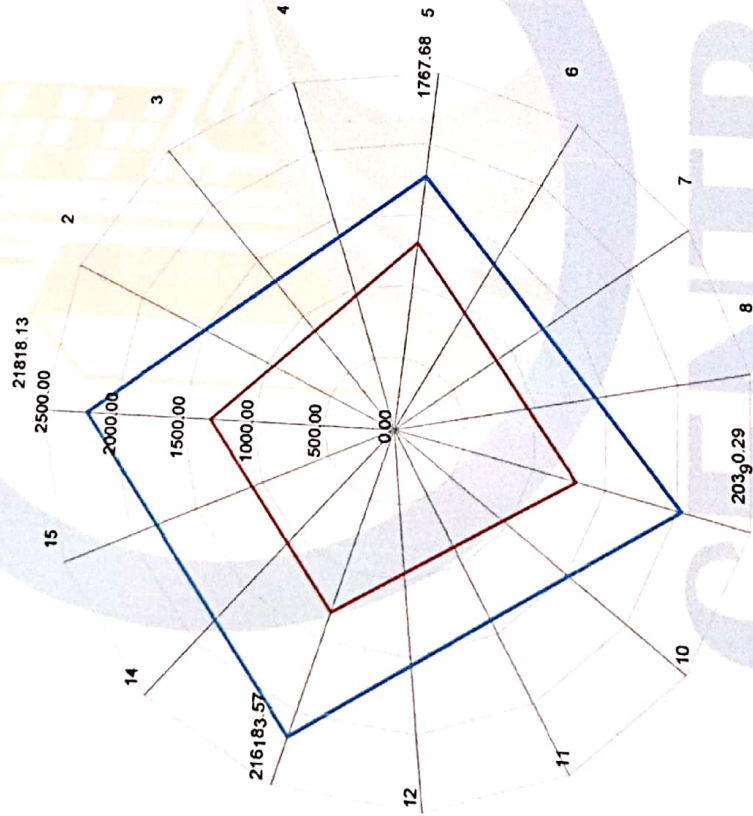


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POLAR CURVE

Location: ERT-5

ERT POLAR CURVE



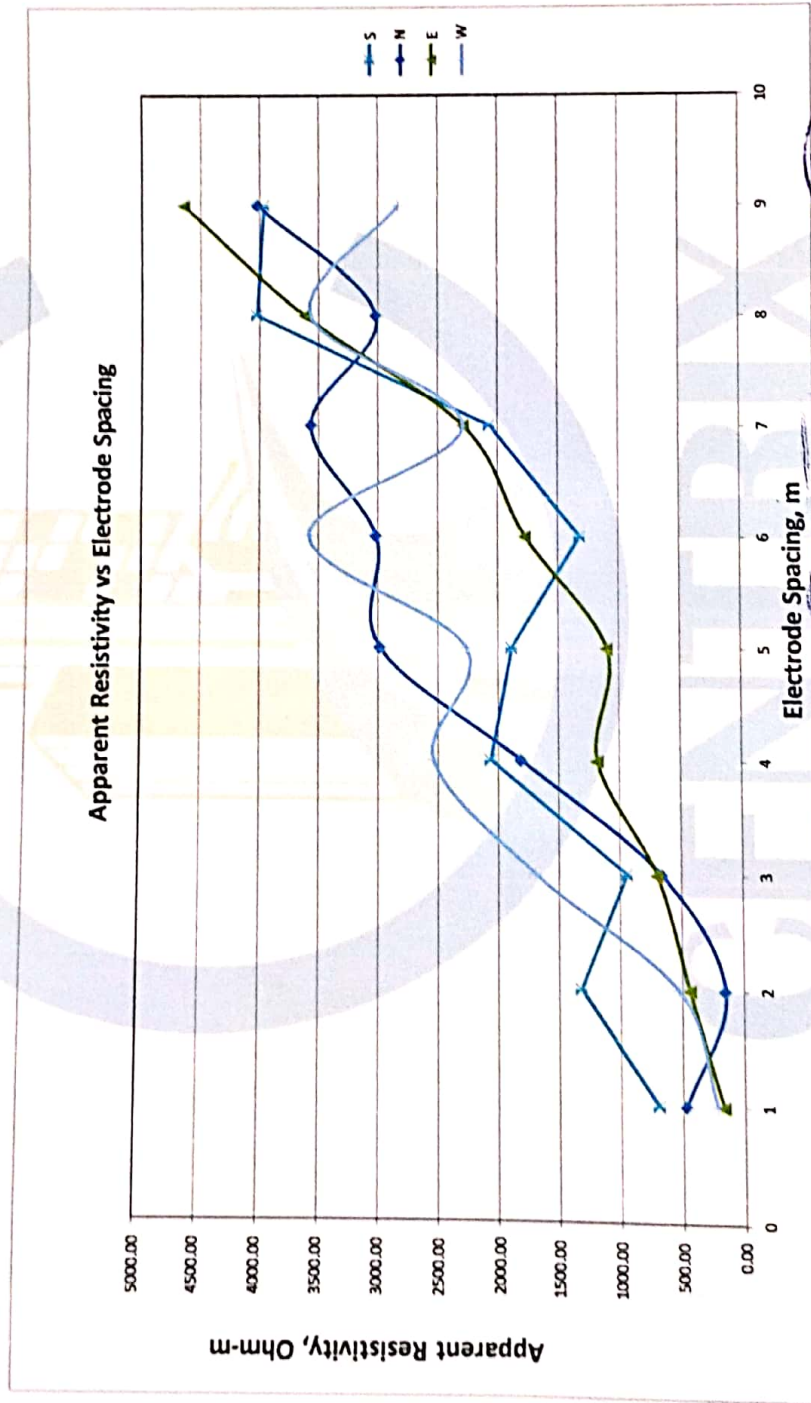
Area of Polygon = 5301236.64
Mean Resistivity = 1299.01 Ohm M



Note: 1=N-S, 2=S-W, 3=NE-SW, 4=NW-SE

Apparent Resistivity vs Electrode Spacing

Location : ERT-5



Sachin Patankar
Sachin Patankar
(Authorised Signatory)



Assistant Engineer
Assistant Engineer
EHV S/S Project S/Dn
M.S.E.T.C. Ltd. NASIK

Nashik MSETCL
Additional Executive Engineer
EHV S/S Project Subdivision
Nashik MSETCL