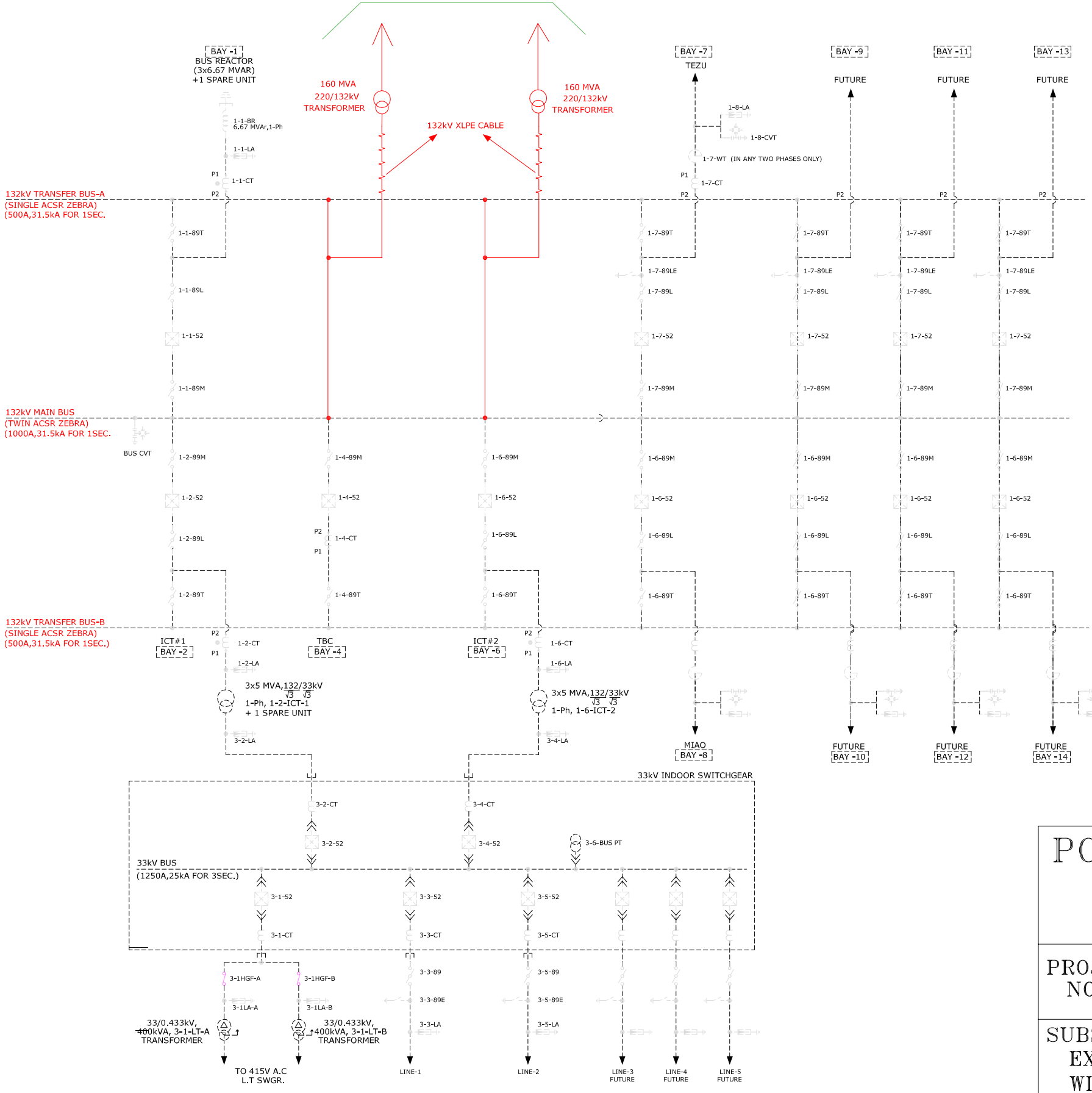
132KV NAMSAI S/S

1.0 Single Line Diagram

TO 220kV GIS



LEGEND

SCOPE UNDER NERSS-XV

FUTURE/EXISTING

NOTE:-

1. THE SLD DRAWING SHALL BE READ IN CONJUNCTION WITH GA & RFP DOCUMENT

REFERENCE DRAWING FOR BAY EXTN.

POWER GRID CORPORATION
OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

PROJECT:
NORTH EASTERN REGION STRENGTHENING SCHEME-XV

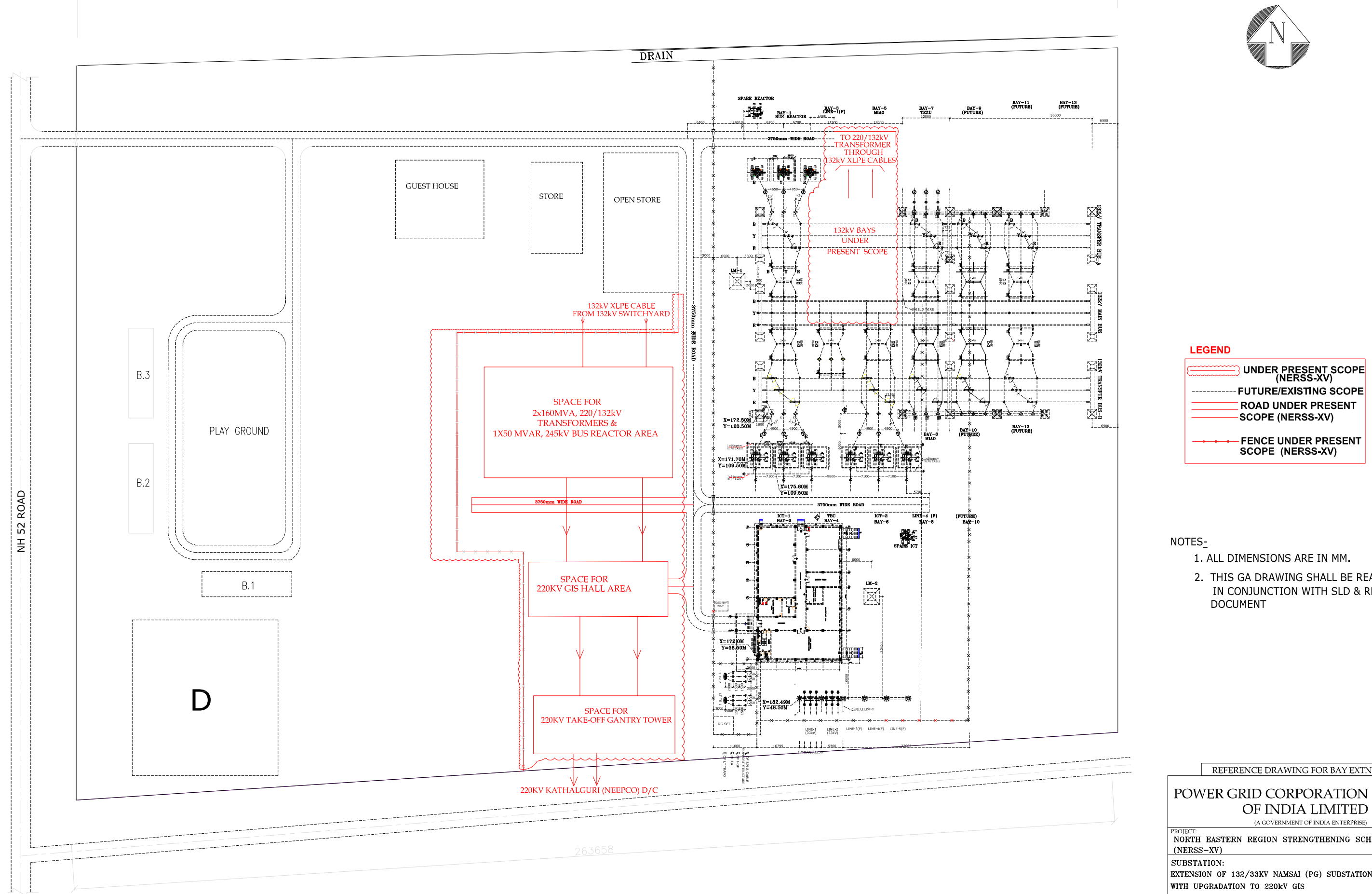
SUBSTATION:
EXTENSION OF 132/33KV NAMSAI (PG) SUBSTATION WITH UPGRADATION TO 220kV GIS

TITLE:
SINGLE LINE DIAGRAM

DRG.NO.
C/ENGG/NERSS-XV/TBCB/NAMSAI/SLD/01

REV.
00

2.0 General Arrangement



LEGEND

- UNDER PRESENT SCOPE (NERSS-XV)
- FUTURE/EXISTING SCOPE
- ROAD UNDER PRESENT SCOPE (NERSS-XV)
- FENCE UNDER PRESENT SCOPE (NERSS-XV)

NOTES-

1. ALL DIMENSIONS ARE IN MM.
2. THIS GA DRAWING SHALL BE READ IN CONJUNCTION WITH SLD & RFP DOCUMENT

REFERENCE DRAWING FOR BAY EXTN.

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

PROJECT:
NORTH EASTERN REGION STRENGTHENING SCHEME-XV (NERSS-XV)

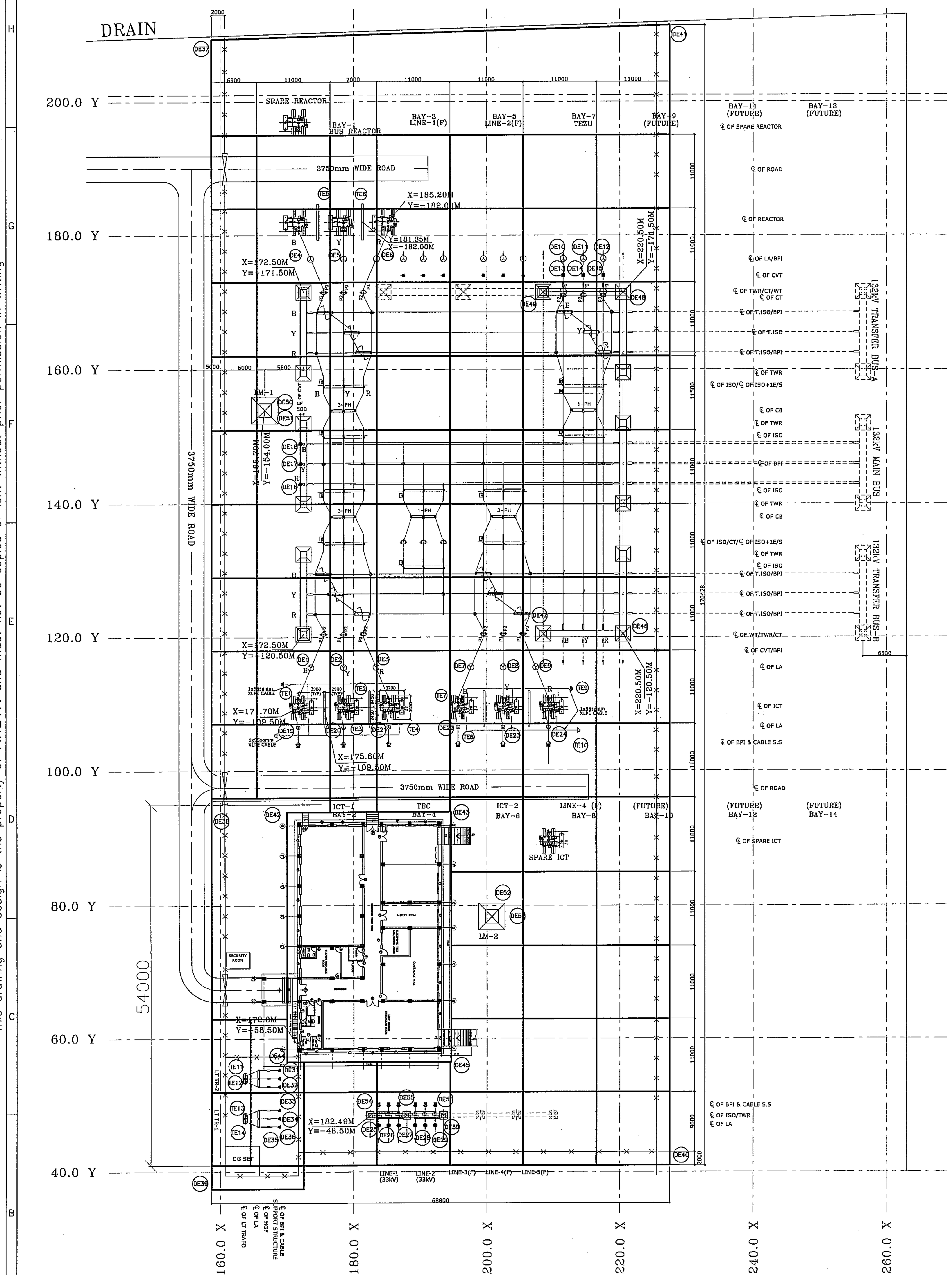
SUBSTATION:
EXTENSION OF 132/33KV NAMSAI (PG) SUBSTATION WITH UPGRADATION TO 220kV GIS

TITLE:
GENERAL ARRANGEMENT

DRG.NO.	REV.
C/ENGG/NERSS-XV/TBCB/NAMSAI/GA/01	00

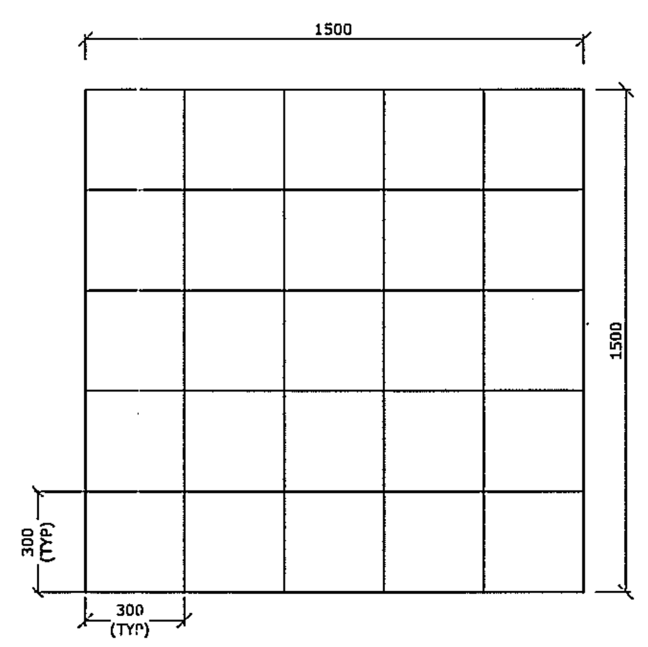
3.0 Earthmat Layout

DRAWING No. 5427PK045-NAM-E-SYD-EAR-0202



BILL OF QUANTITY FOR ELECTRODES

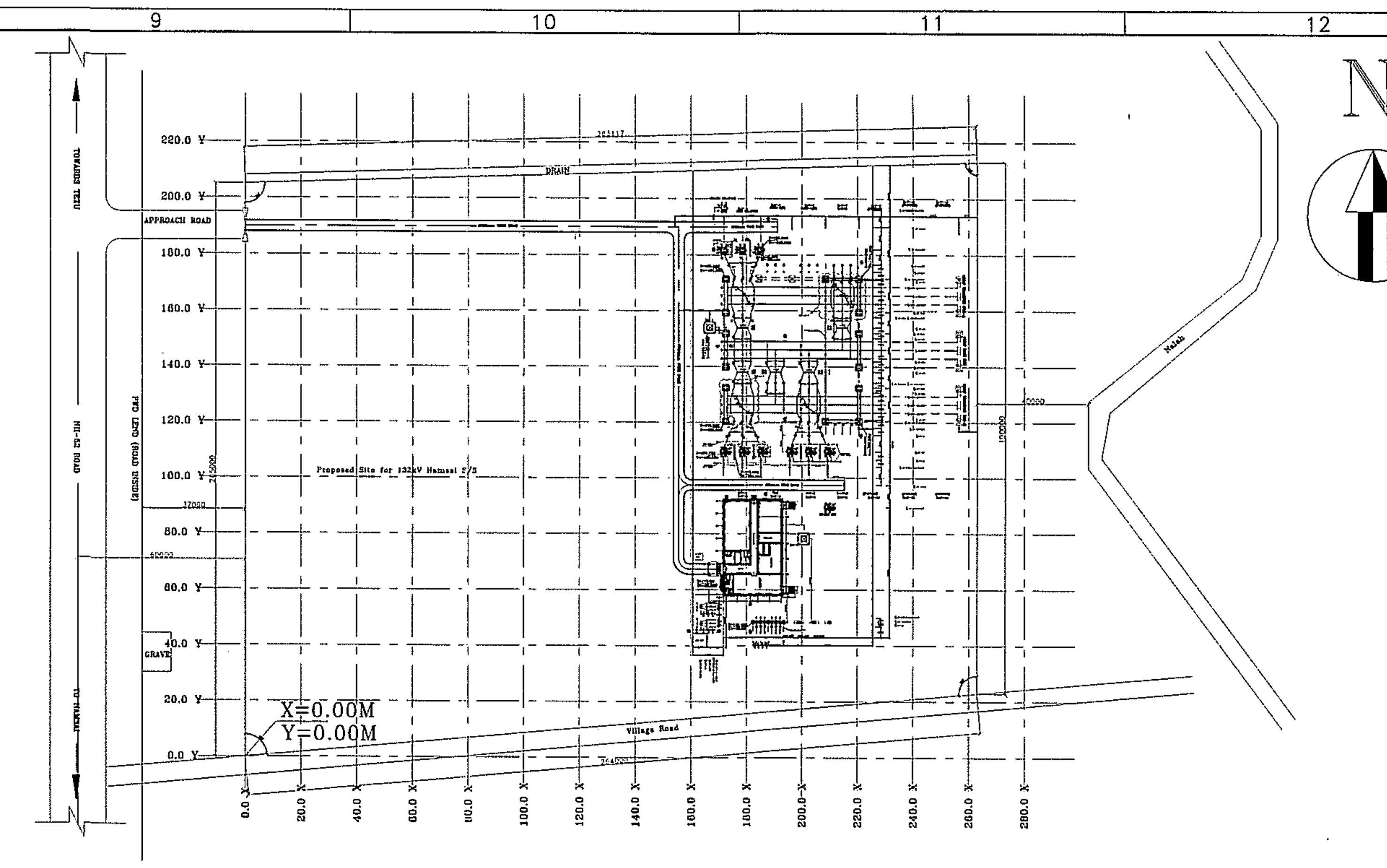
SL. NO.	DESCRIPTION	QTY	MARKED
1.	3M LONG 40MM DIA MS ROD ELECTRODE WITH UNTREATED PIT HAVING TEST LINK FOR LA, CVT, TOWERS WITH PEAK,LM, SWITCHYARD FENCE & CONTROL ROOM	56 Nos.	DE
2.	3M LONG 40MM DIA GALVANIZED PIPE ELECTRODE WITH TREATED EARTH PIT FOR 5MVA TRAFO ,6.67MVA REACTOR & LT TRAFO NEUTRAL	14 Nos.	TE
3.	40MM DIA MS ROD CONDUCTOR FOR MAIN GROUNDING EARTHMAT	2542 Mtrs.	——



AUXILIARY EARTHMAT

DESIGN FEATURES :

SL.No	EARTH ELECTRODE	PURPOSE	QTY
1.	DE46 TO DE56	TOWER SHIELD WIRE EARTHING AND OUTER & INNER MESH LM	11
2.	DE1 TO DE6	LA LOCATED AT ICT-1 TO BUS REACTOR BAY	06
3.	DE7 TO DE9	LA LOCATED AT ICT-2 BAY	03
4.	DE10 TO DE15	LA & CVT LOCATED AT NAMSAI TO ROING BAY	06
5.	DE16 TO DE18	CVT LOCATED AT MAIN BUS	03
6.	DE19 TO DE21	33kV LA LOCATED AT ICT#1	03
7.	DE22 TO DE24	33kV LA LOCATED AT ICT#2	03
8.	DE25 TO DE27	LA LOCATED AT 33kV LINE#1 SIDE	03
9.	DE28 TO DE30	LA LOCATED AT 33kV LINE#2 SIDE	03
10.	DE31 TO DE33	LA LOCATED AT LT TRF#1 SIDE	03
11.	DE34 TO DE36	LA LOCATED AT LT TRF#2 SIDE	03
12.	TE1 TO TE4	ICT#1 EARTHING	04
13.	TE5 TO TE6	BUS REACTOR EARTHING	02
14.	TE7 TO TE10	ICT#2 EARTHING	04
15.	TE11 TO TE14	LT TRAFO EARTHING	04
16.	DE37 TO DE45	SWITCHYARD & CONTROL ROOM EARTHING	09



KEY PLAN

श्रेणियां CAT-I
I. ✓ विनिर्देशन/निर्माण/हेतु अनुमोदित/जारी
II. विनिर्देशन/निर्माण/हेतु अनुमोदित/जारी बशर्ते दी गई टिप्पणियों एवं आशोधनों को सम्मिलित किया जाए। कृपया आशोधित दस्तावेज अनुमोदनार्थ प्रस्तुत करें।
III. टिप्पणियों सम्मिलित कर पुनः अनुमोदनार्थ प्रस्तुत करें।
IV. सूचनार्थ एवं रिकार्ड हेतु।
V अनुमोदित नहीं।
पावरग्रिड (हस्ताक्षर) (पदनाम) DE (तिथि) 04.04.12
पावर ग्रिड कारपोरेशन ऑफ इंडिया लि० अभियांत्रिकी (उपकेन्द्र), गुड़गाँव, हरियाणा

NOTES:-

FOR SWITCHYARD

1. EARTH MAT CONDUCTOR SIZE 40MM DIA SHALL BE BURIED AT A DEPTH OF 600 MM BELOW FGL.
2. SPACING BETWEEN TWO CONDUCTORS SHALL BE AS PER CALCULATION DOCUMENT. No.5427PK045-NAM-E-SYD-CAL-0106
3. EARTHING LAYOUT SHOWN IN THE DRAWING IS DIAGRAMMATIC ONLY. THE CONDUCTORS SPACING CAN BE CHANGED SLIGHTLY TO SUIT THE SITE CONDITION & AVOID EARTHMAT FOULING WITH FOUNDATION.
4. WHEREVER EARTHING CONDUCTOR CROSSES CABLE TRENCHES, PIPES, ROAD, RAIL TRACK ETC, IT SHALL BE LAID 300 MM BELOW THEM AND SHALL BE TAKEN AROUND IN CASE IT FOULS WITH THE EQUIPMENT STRUCTURE FOUNDATIONS.
5. RISERS/TAP CONNECTIONS FROM EARTH MAT SHALL BE CONNECTED TO THE EARTHING TERMINALS OF EQUIPMENT/STRUCTURES AS PER STANDARD EARTHING DETAIL DRAWING ENCLOSED WITH TECHNICAL SPECIFICATION.
6. CABLE TRENCH EARTHING WILL BE DONE WITH 50X6 MS FLAT AND RUN ALONG THE CABLE SUPPORTING STRUCTURE. EARTH FLAT OF CABLE TRENCH WILL BE CONNECTED TO THE MAIN EARTHING AT 30 Mtrs. INTERVAL. THE MS FLAT SHALL BE PAINTED WITH TWO COATS OF REDOXIDE PRIMER AND TWO COATS OF POST OFFICE RED ENAMEL PAINT.
7. RAIL TRACKS AND METALLIC PIPES WITHIN THE SWITCHYARD SHALL BE EARTHED AT A DISTANCE OF 30M AND ALSO AT BOTH ENDS.
8. EVERY ALTERNATE POST OF FENCE AND ALL GATES SHALL BE EARTHED. FLEXIBLE BRAIDS SHALL BE USED FOR EARTHING THE MOVING PARTS OF GATES.
9. AN AUXILIARY MAT 900 X 900MM SIZE FOR 132KV) WITH CONDUCTOR SIZE SAME AS MAIN EARTHMAT WITH SPACING OF 300 X 300MM SPACED SHALL BE PROVIDED AT A DEPTH OF 300 MM FROM GROUND LEVEL BELOW THE OPERATING HANDLES OF THE MECHANISM BOXES OF ISOLATORS AND EARTHING SWITCHES. MECHANISM BOXES SHALL BE CONNECTED TO THE AUXILIARY MAT AS PER STANDARD EARTHING DETAIL ENCLOSED WITH TECHNICAL SPECIFICATION.
10. ALL EARTH MAT CONDUCTORS AT THE CROSSINGS AND RISERS SHALL BE WELDED FOR STEEL CONDUCTORS AS PER EARTHING DETAIL DRAWING.
11. ALL WELDED JOINTS SHALL BE TREATED WITH RED LEAD PAINT AND THEN COATED WITH TWO LAYERS OF BITUMEN FOR BURIED JOINTS.
12. THE EARTH PIT CHAMBER SHALL BE CONSTRUCTED AFTER BURYING ELECTRODE.
13. EARTHING CONDUCTOR SHALL BE COVERED ON ALL SIDES BY A LAYER OF GOOD SOIL, FREE FROM ROCKS, STONES, LUMPS AND THEN FILLED UP.
14. A 40MM DIA 3000MM LONG MS EARTH ELECTRODE WITH TEST LINK, CI FRAME AND COVER SHALL BE PROVIDED TO CONNECT DOWN CONDUCTOR OF LA, CVT, TOWER WITH PEAK AND LIGHTNING MAST.
15. EARTHING CONDUCTOR AROUND THE BUILDING SHALL BE BURIED IN EARTH AT A MINIMUM DISTANCE OF 1500MM FROM OUTER BOUNDARY OF THE BUILDING.
16. EARTHING TERMINAL OF EACH LA & CVT SHALL BE DIRECTLY CONNECTED TO ROD EARTH ELECTRODE WHICH INTURN, SHALL BE CONNECTED TO STATION EARTHING GRID.
17. EQUIPMENT EARTHING PADS SHALL BE CONNECTED TO EARTHING GRID THROUGH 2 SHORT EARTHING LEADS OF 75 x 12MM G.S. FLAT.
18. EACH INDIVIDUAL STRUCTURE/EQUIPMENT SHALL BE EARTHED AND CONNECTED TO TWO DIFFRENT EARTHMAT GRID CONDUCTORS.
19. MINIMUM DISTANCE OF 6000MM SHALL BE MAINTAINED BETWEEN TWO TREATED (PIPE) ELECTRODES.

FOR CONTROL ROOM:- → separate drawing may be submitted with proper detail.

1. ONE CABLE RACK EARTHING CONDUCTOR SHALL BE RUN ON THE TOP RACK OF THE CABLE TRENCHES/CABLE RACKS IN THE CABLE VAULT. IT SHALL ALSO SERVE AS A SUB RING. IN THE BATTERY ROOM CONDUCTOR SHALL BE RUN ON THE WALL OF THE ROOM AT 100MM HEIGHT & CLEATED AT 750MM TO FORM A SUB RING.
2. THE SUB RINGS IN THE DIFFERENT ROOMS SHALL BE INTER CONNECTED WITH EACH OTHER TO FORM A MAIN EARTHING RING.
3. THE INSIDE MAIN EARTHING RING OF BATTERY ROOM & SWITCHGEAR ROOM SHALL BE CONNECTED AT THREE LOCATIONS TO THE CONDUCTOR BURIED OUTSIDE AT A DISTANCE OF 1500MM FROM THE WALL ALL AROUND THE BUILDING. THIS CONDUCTOR SHALL BE BURIED AT A DEPTH OF 600MM (SAME AS MAIN EARTH MAT OF THE SWITCHYARD) AND CONNECTED TO THE NEAREST SWITCHYARD MAIN EARTH MAT AT TWO LOCATIONS.
4. WHILE CROSSING THE WALLS THE EARTHING CONDUCTOR SHALL BE RUN THROUGH 100 MM DIA PVC PIPE SLEEVE/ DIRECTLY THROUGH WALL.
5. EARTHING OF INDOOR LT PANELS, CONTROL PANELS AND OUT DOOR MARSHALLING BOXES, JUNCTION BOXES & LIGHTING PANELS ETC. THROUGH 2 SHORT EARTHING LEADS OF 50 x 6MM G.S. FLAT.

CONTROLLED COPY
- ☑ APPROVAL ☐ AS BUILT
- ☐ PROTO ☐ CONSTRUCTION
- ☐ PLANNING ☐ REFERENCE
- ☐ MANUFACTURING ☐ INDENT
- ☐ RECORD ☐ EXECUTION

AREVA T&D AUTH. SIG.
Dt. 07 MAR 2012

REFERENCE NO.	DESCRIPTION
2. 5427PK045-NAM-E-SYD-CAL-0106	EARTHING DESIGN CALCULATION OF NAMSAI S/S
1. 5427PK045-NAM-E-SYD-AAR-0001	ELECTRICAL LAYOUT & SECTION OF 132/33kV NAMSAI S/S

LEGENDS
- ———— PRESENT SCOPE
- - - - - - FUTURE/OTHER SCOPE

REV.No.	DESCRIPTION	DATE	DRAWN	REVIWED	CHECKED ELE.	CHECKED CIVIL	CHECKED MECH.	APPROVED	STATUS
R0	FIRST ISSUE	Name	AS	SCJ	SCJ			DHM	FOR APPROVAL
		Date	05.03.12	05.03.12	05.03.12			05.03.12	
		Sign.							

CLIENT: पावर ग्रिड कारपोरेशन ऑफ इंडिया लिमिटेड POWER GRID CORPORATION OF INDIA LIMITED. (A Government of India Enterprise)
SAUDAMINI, PLOT No.-2, SECTOR-29, GURGAON-122 001 (HARYANA).

PROJECT: SUBSTATION PACKAGE: PB-S2 UNDER PALLATANA TRANSMISSION SYSTEM & BONGAIGAON TPS IN NER

NAME OF SUBSTATION: NAMSAI

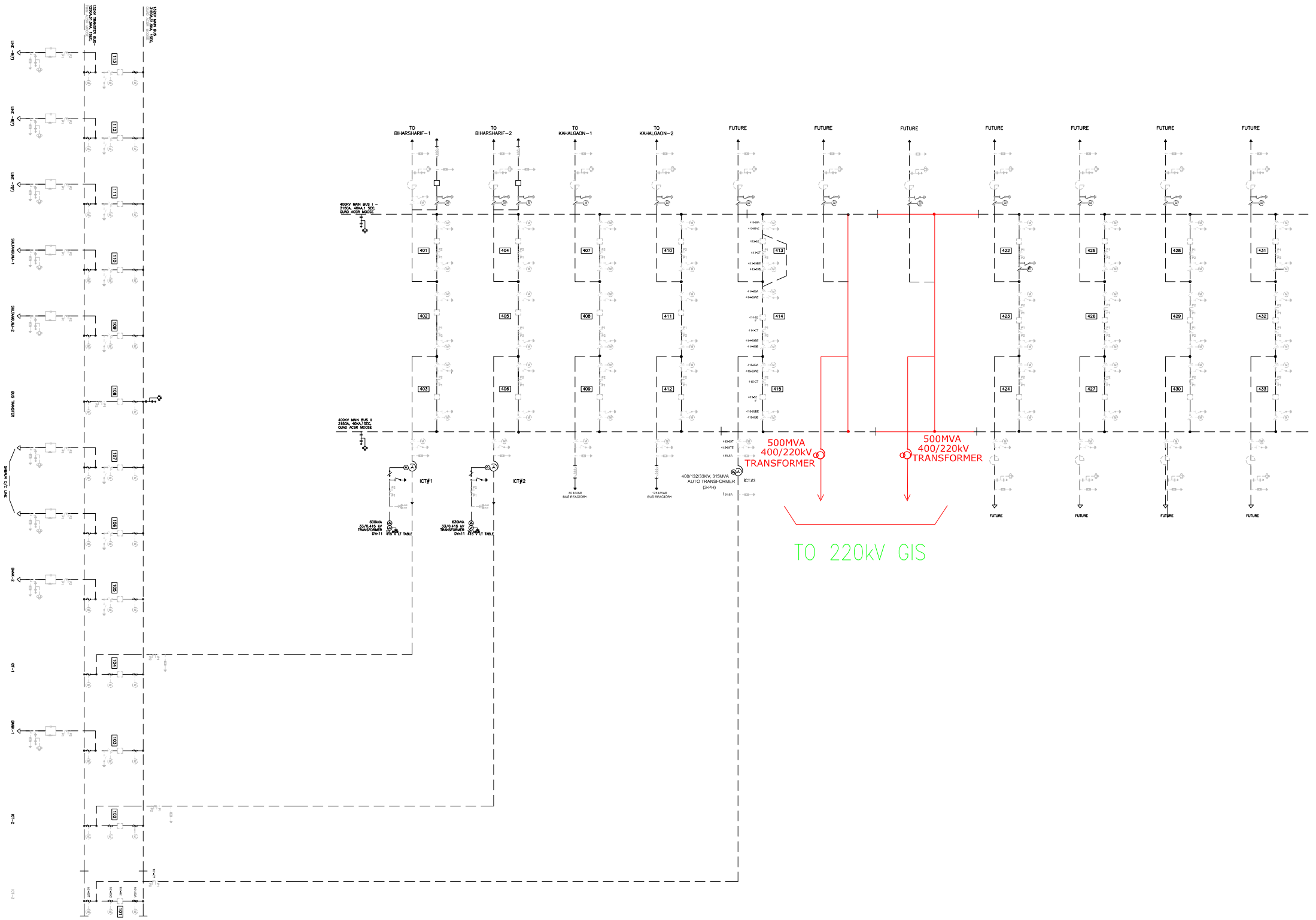
LOA No.: C-62002-S319-3/G7/NOA-I/3294 DATED 08/03/2010

TITLE: EARTHMAT LAYOUT FOR 132/33kV NAMSAI SUB-STATION

A1	AREVA T&D INDIA LTD, A 7, SECTOR-65, NOIDA - 201301, UTTAR PRADESH (INDIA).	DRAWING No. 5427PK045-NAM-E-SYD-EAR-0202	TOTAL SH. 001	SCALE 1:325	SH.No. 001	REV. 00

400 KV BANKA S/S

1.0 Single Line Diagram



NOTE:-

1. THE SLD DRAWING SHALL BE READ IN CONJUNCTION WITH GA & RFP DOCUMENT

REFERENCE DRAWING FOR BAY EXTN.

POWER GRID CORPORATION OF INDIA LIMITED
(A Government of India Enterprise)

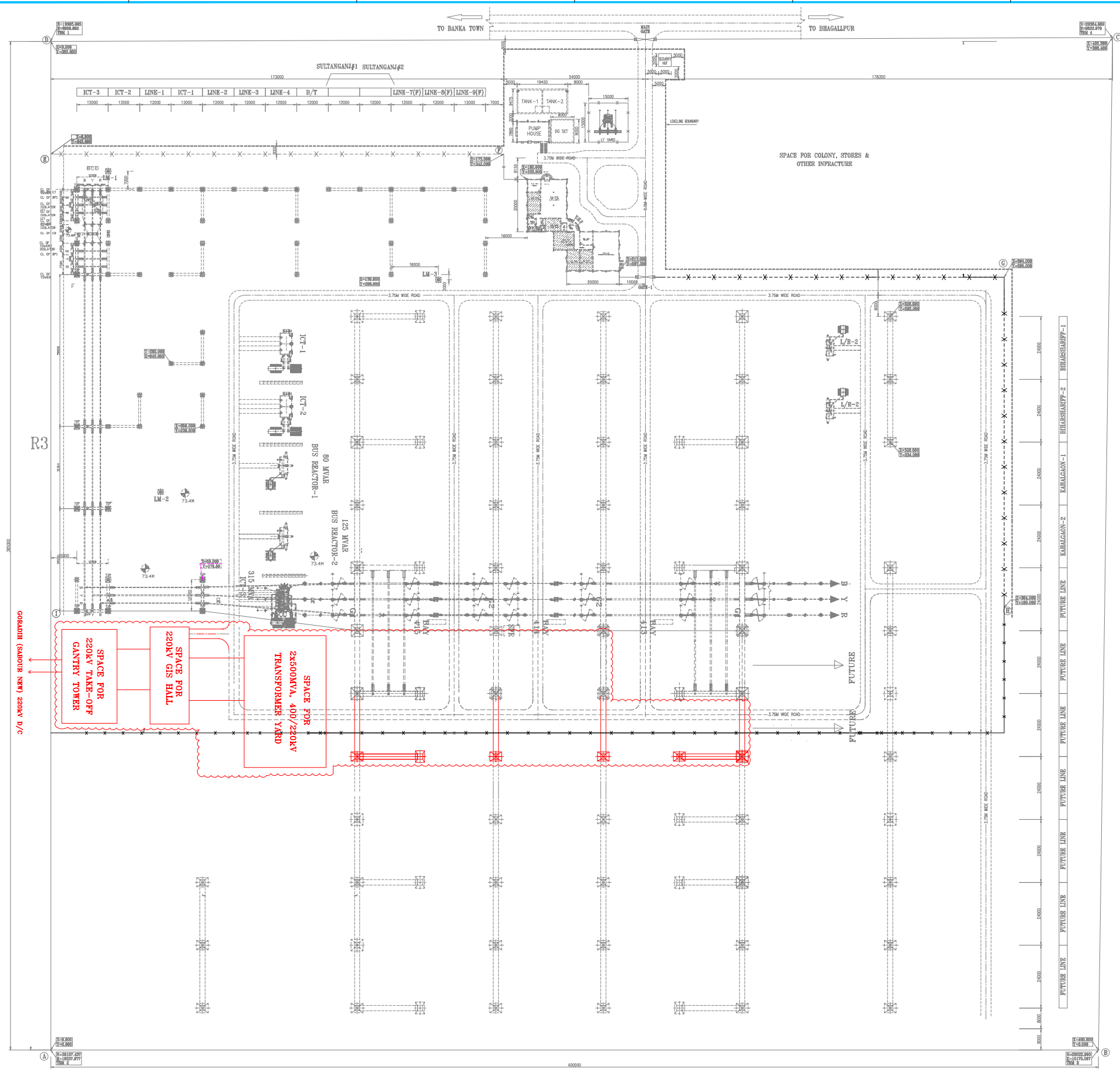
PROJECT: EASTERN REGION STRENGTHENING SCHEME XXV

TITLE: SINGLE LINE DIAGRAM OF
EXTENSION OF 400/132KV BANKA (POWERGRID) SUBSTATION WITH ADDITION OF 220KV GIS

DRAWING NO. C/ENGG/ERSS-XXV/TBCB/BANKA/SLD/01

REV.0

2.0 General Arrangement



LEGEND:-

- PRESENT SCOPE (ERSS-XXV)
- EXISTING/FUTURE SCOPE
- EXISTING FENCE
- EXISTING ROAD
- GANTRY UNDER PRESENT SCOPE (ERSS-XXV)
- EXISTING/FUTURE GANTRY

NOTE:-

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED
2. THE GA DRAWING SHALL BE READ IN CONJUNCTION WITH SLD & RFP DOCUMENT

REFERENCE DRAWING FOR BAY EXTN.

POWER GRID CORPORATION OF INDIA LIMITED
(A Government of India Enterprise)

PROJECT: EASTERN REGION STRENGTHENING SCHEME XXV

TITLE: GENERAL ARRANGEMENT FOR
EXTENSION OF 400/132KV BANKA (POWERGRID) SUBSTATION WITH ADDITION OF 220KV GIS

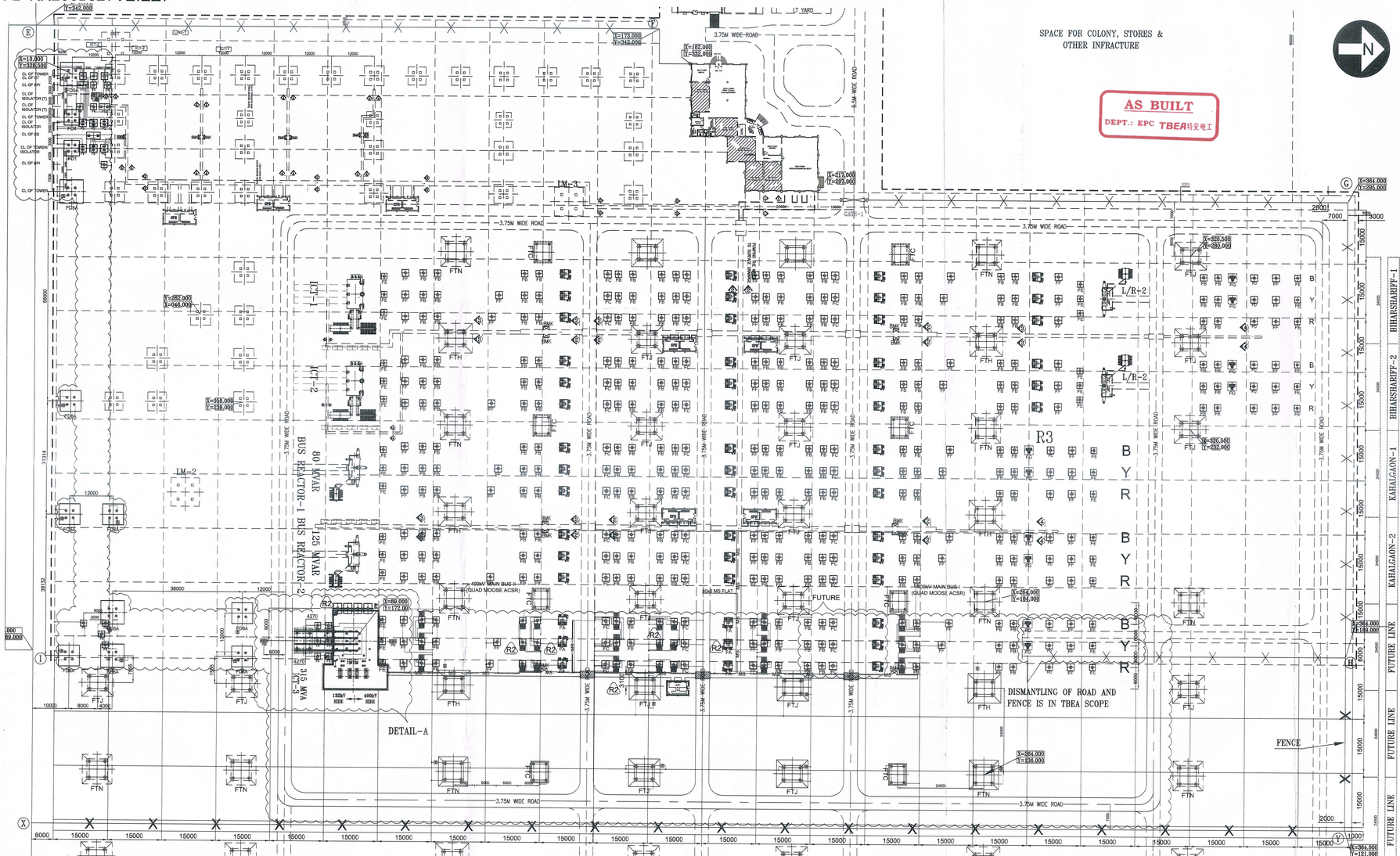
DRAWING NO.
C/ENGG/ERSS-XXV/TBCB/BANKA/GA/01

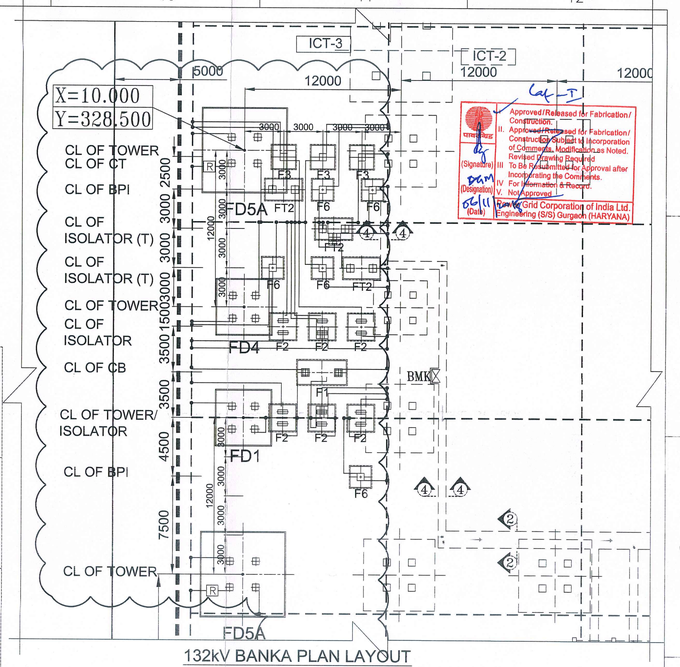
REV.0

SIZE A1

3.0 Earthmat Layout

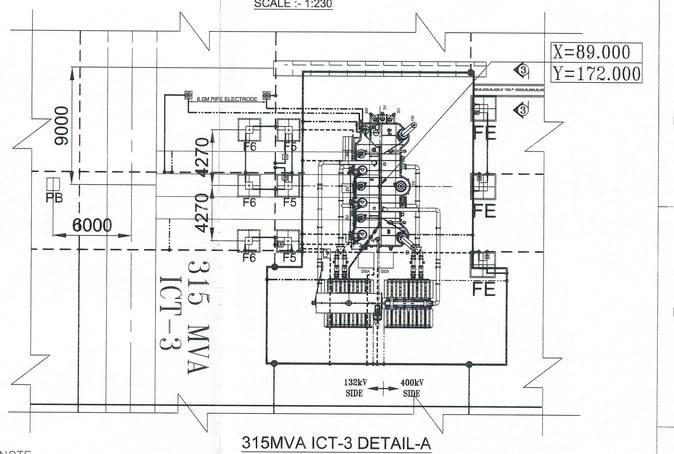
1TEIEA1725007XX, R2





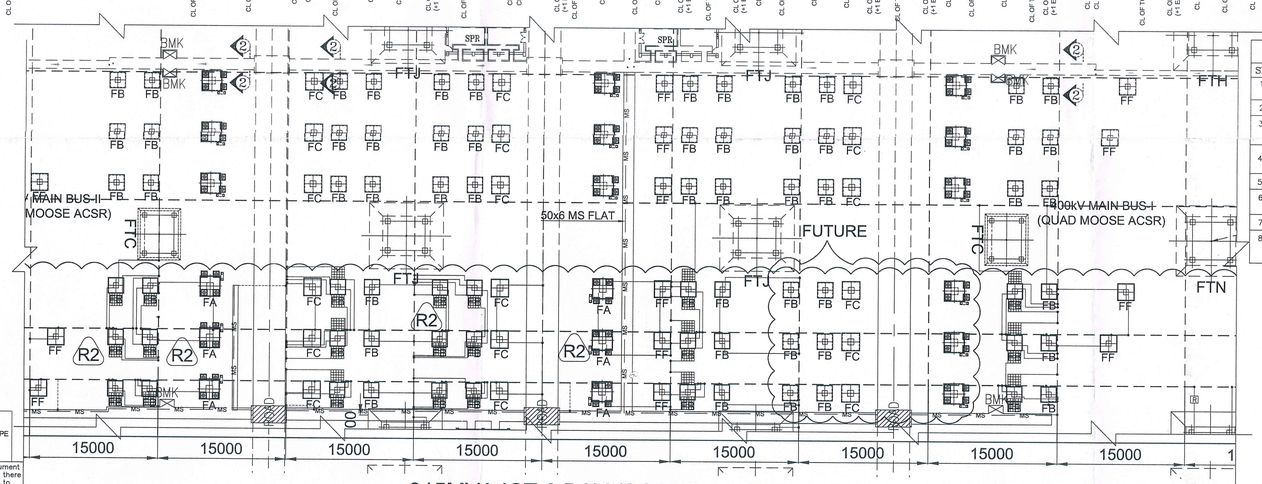
132kV BANKA PLAN LAYOUT

SCALE :- 1:230



315MVA ICT-3 DETAIL-A

SCALE :- 1:230



315MVA ICT-3 BAY (SCALE :- 1:350)

LEGENDS:-

TBEA PRESENT SCOPE

FUTURE/EXISTING SCOPE

FENCE

BILL OF MATERIAL

SR.	ITEM	PURPOSE	LEGENDS
1	40mm DIA MS ROD EXISTING MAIN MAT	EXISTING MAIN EARTHMAT	
2	40mm DIA MS ROD	MAIN MAT FOR AREA UNDER PRESENT SCOPE	
3	75X12mm GS FLAT	CONDUCTOR ABOVE GROUND & EARTHING LEADS (FOR EQUIPMENT, COLUMNS AND AUX. STRUCTURES,MOM BOXES)	
4	50X6mm GS FLAT	EARTHING OF INDOOR LT PANELS, CONTROL PANELS & OUT DOOR MARSHALLING BOXES, JN. BOXES & LIGHTING PANELS ETC.	
5	50X6mm MS FLAT	EARTHING CONDUCTOR ALONG INSIDE CABLE TRENCH	
6	40mm DIA MS ROD BELOW RISER	BELOW GROUND RISER CONNECTING FROM MAIN EARTH MAT TO EQUIPMENT / EQUIPMENT. STRUCTURE	
7	40mm PIPE ELECTRODE	315MVA ICT NEUTRAL (2 Nos.)	
8	40mm EARTH ELECTRODE	LA'S & CVT'S SHALL HAVE ROD ELECTRODE WITH TEST LINK & COVER. TOWER WITH PEAK SHALL HAVE ROD ELECTRODE WITH TEST LINK & COVER. (24 Nos.)	

NOTE:–

1. ALL DIMENSIONS ARE IN MM. UNLESS OTHERWISE SPECIFIED.
2. EARTHING CONDUCTOR RUNNING BELOW CABLE TRENCHES, DRAINS, ROADS & RAIL WILL BE LAID 300MM BELOW THEM.
3. EARTHING CONNECTIONS WITH EQUIPMENT EARTHING PAD SHALL BE BOLTED TYPE & BELOW GROUND LEVEL CONNECTIONS SHALL BE WELDED TYPE.FOR RUST PROTECTIONS WELDS SHALL BE TREATED WITH RED LEAD & AFTERWARDS COATED WITH BITUMEN COMPOUND TO PREVENT CORROSION.
4. 50X6 MS FLAT SHALL RUN ON THE TOP TIER AND ALL ALONG THE CABLE TRENCHES AND THE SAME SHALL BE WELDED TO EACH OF THE RACKS. THIS FLAT SHALL BE EARTHED AT BOTH ENDS @ 30M INTERVAL.
5. EQUIPMENT EARTHING CONNECTIONS ARE DIAGRAMATIC ONLY AND WILL BE DONE AS PER SITE CONDITION.
6. ALL EARTHING WILL BE DONE IN ACCORDANCE WITH IS:3043 UNLESS OTHERWISE SPECIFIED IN THE TECHNICAL SPECIFICATION.
7. 1500X1500MM AUXILIARY EARTHMAT COMPRISING OF 40mmø MS RODS CLOSELY SPACED (300mmx300mm) SHALL BE PROVIDED AT DEPTH OF 300mm FROM GROUND LEVEL. BELOW OPERATING HANDLES OF MOM/EOM BOX OF THE ISOLATOR. THIS WILL BE DONE AS PER THE ACTUAL LOCATION OF MOM & EOM BOX AT SITE.
8. AUXILIARY EARTHMAT FOR ISOLATOR OPERATING MECHANISM SHOWN IS INDICATIVELY ONLY. EXACT LOCATION SHALL BE AS PER THE APPROVED ISOLATOR DRAWINGS.
9. FOR EQUIPMENTS WHICH ARE IN TBEA SCOPE ONLY, EARTHING SHALL BE DONE BY TBEA.
10. ALL EQUIPMENT, STRUCTURES, STEEL/RCC COLUMNS, METALLIC STAIRS E.T.C. SHALL BE CONNECTED TO THE NEAR BY EARTHING GRID CONDUCTOR BY TWO EARTHING LEADS, ELECTRICAL CONTINUITY SHALL BE ENSURED BY BONDING LAND RAILS & METALLIC STAIRS.
11. FOR EARTHING DETAILS FOR VARIOUS EQUIPMENT REFER– C/ENGG/STD/EARTHINGS/09 (28 SHEETS) OF TECHNICAL SPECIFICATION, SECTION SWITCHYARD ERECTION REV–10
12. THIS DRAWING IS TO BE REFERRED FOR EARTHMAT AND RISERS ERECTION ONLY.

REFERENCE DRAWING No.

1. 400/132kV BANKA ELECT. PLAN & SECTION LAYOUT. DWG No. 1TEIEA1725002XX-PLAN (SH 01 OF 02), REV-2
2. 400/132kV BANKA FOUNDATION LAYOUT. DWG No. 1TEIEA1725005XX, REV-1
3. 400/132/33kV BANKA SUBSTATION (NEW) EARTHMAT LAYOUT PLAN. DWG No. GET-BNK-ELE-EMAT-005 (SH 01 OF 01), REV-0
4. 400/132kV BANKA CABLE TRENCH LAYOUT. DWG No. 1TEIEA1725006XX (SH 01 OF 01), REV-2

REV.	DESCRIPTION	DATE	DRN	CHK	APPR.
R2	REVISED AS PER PGCIL COMMENTS. AUX. MAT OF ISOLATOR REVISED.	30/10/2018	SRB	SRB	BKM
R1	REVISED AS PER PGCIL COMMENTS	12/07/2018	SKA	SRB	BKM
00	FOR APPROVAL.	06/06/2018	SKA	SRB	BKM

Package : Substation Package-SS01 for (I) Extension of 400kV Biharshariff S/s including Transformer; (II) Extension of 400/220kV Maithon S/s including Transformer; (III) Extension of 400/132kV Banka S/s including Transformer; (IV) Extension of 400/132kV Lakhisarai S/s including Transformer; (V) Extension of 220/132kV Rangpo GIS S/s including Transformer, 1no. 220kV GIS Bay & 1no 132 GIS Bay; (VI) Extension of 220/132kV Malda S/s including Transformer; (VII) Extension of 400kV Subhasgram S/s including Reactor; (VIII) Extension of 400kV Pumea S/s; (IX) Extension of 400/220kV Siliguri S/s; (X) Extension of 220kV Biharsharif (BSPTCL) S/s; (XI) 220kV Biharsharif (POWERGRID) - Biharsharif (BSPTCL) single circuit line section (approx 0.8kM length) for ICT inter-connection; (XII) Installation of Owner supplied 1X80MVAR, 765kV Reactor at Ranchi (Bero) S/s; associated with Eastern Region strengthening Scheme-XX

LOI No :
SUPPLY NOA: CC-CS/766-ER1/SS-3656/3/G5/NOA-I/7547 DATED -13 DEC. 2017
SERVICE NOA: CC-CS/766-ER1/SS-3656/3/G5/NOA-II/7548 DATED -13 DEC. 2017

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

PROJECT: PACKAGE-SS01 (PART-A) UNDER EASTERN REGION STRENGTHENING SCHEME-XX (ERSS-XX)

TITLE : 400/132kV BANKA SUBSTATION EARTHMAT LAYOUT

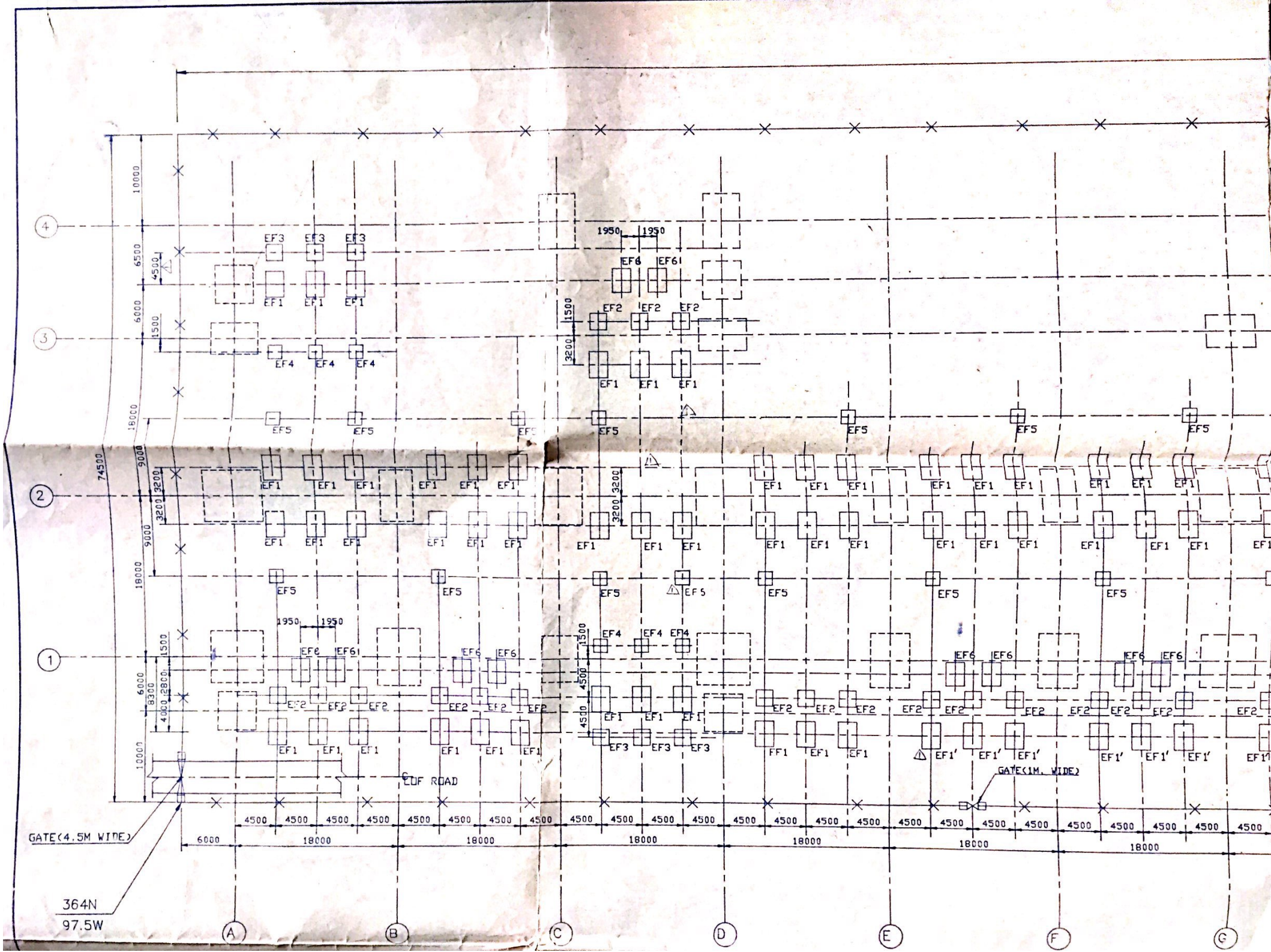
TBEA 特变电工 "TBEA Green Energy Park" National Highway 8, Miyagam, Karjan. Vadodara, Gujarat - 391440.

DRAWN	KALPESH
CHECKED	SAMIDHA
APPROVED	BKM
PASSED	VSG
DATE	06/06/2018
SCALE	1:650
DRAWING No.	1TEIEA1725007XX
SHEET No.	01 OF 01 R2

SIZE-A1

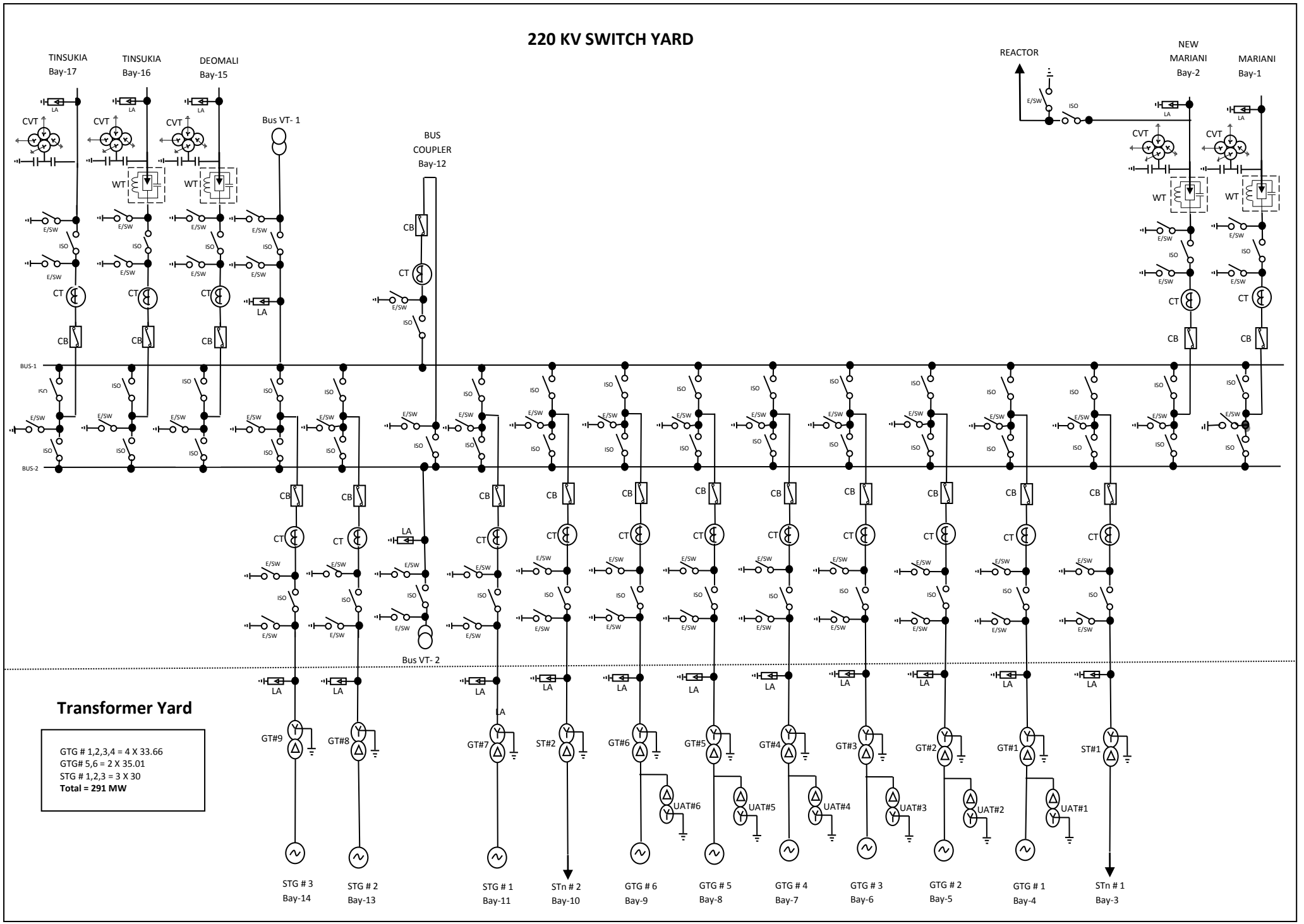
KATHALGURI (NEEPCO) S/S

1. General Arrangement Drawing



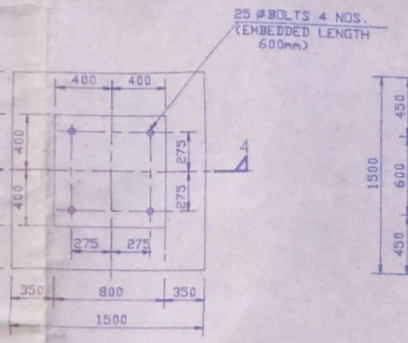
2. Single Line Diagram

Single Line Diagram of 220 KV Switch yard

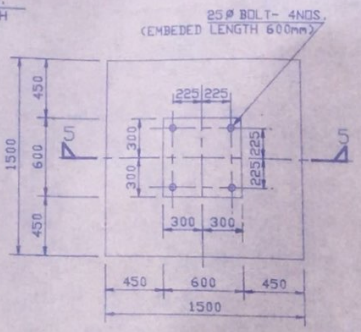


3. Layout Drawing

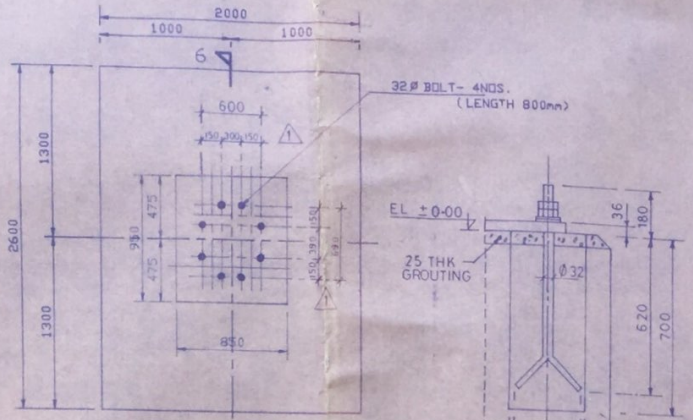
AYOUT PLAN



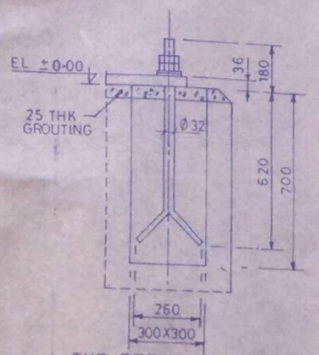
FOOTING -EF4
(CAPACITOR VOLTAGE TRANSFORMER & LIGHTNING ARRESTOR)



FOOTING -EF5
(FOR POST INSULATOR)



6
FOOTING -EF6
(FOR EACH PEDESTAL OF CIRCUIT BREAKER)



TYP. DETAIL OF FDN. FOR CKT. BREAKERS 1

REFERENCE BHEL DRGS.

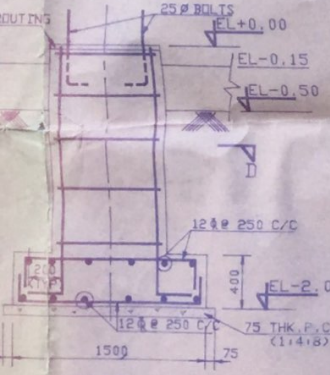
1. TR D 112 300 001.
2. 4 112 618 002 PAGE 1 OF 1.
3. SK-012 PAGE 1 OF 1.
4. 1-518-26-999-02.

NOTES: –

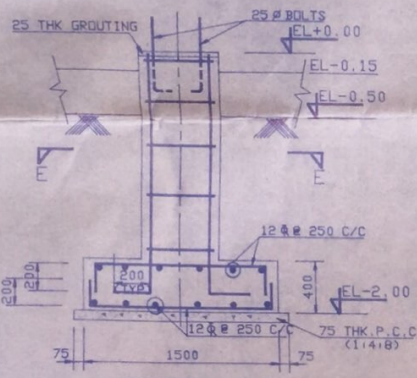
1. ALL DIMENSIONS ARE IN mm AND LEVELS ARE IN METRE.
2. EL ± 0.00 CORRESPONDS TO RL + 124.00M.
3. GRADE OF CONCRETE SHALL BE OF GRADE M 20 CONFORMING TO IS:456.
4. GRADE OF REINFORCEMENT SHALL BE FE 415 CONFORMING TO IS:1786.
5. CLEAR COVER TO MAIN REINFORCEMENT SHALL BE AS FOLLOWS.

	BOTTOM	TOP	SIDE
a) FOUNDATION RAFT	50	50	50
b) PEDESTAL	–	25	50

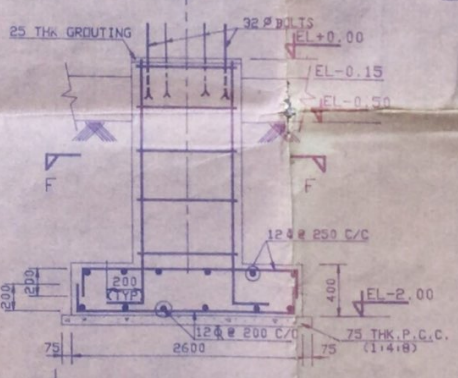
6. BEARING CAPACITY HAS BEEN ASSUMED TO BE 8.4T/M2 AT FOUNDATING LEVEL.
7. FOUNDATION SHALL REST OVER FIRM VIRGIN SOIL. LOOSE POCKETS IF ANY SHALL BE REMOVED & FILLED WITH PCC (1:4:8).
8. FOUNDATION BOLTS SHALL BE SUPPLIED BY MECHANICAL VENDOR.
1 9. THE CABLE TRENCH IN SWITCHYARD AREA SHALL BE LAID AFTER THE CONSTRUCTION OF EQUIPMENT FOUNDATION IS OVER AND THE SOIL IS BACKFILLED AND COMPACTED PROPERLY.



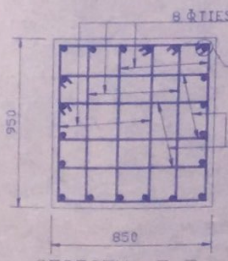
SECTION 4-4



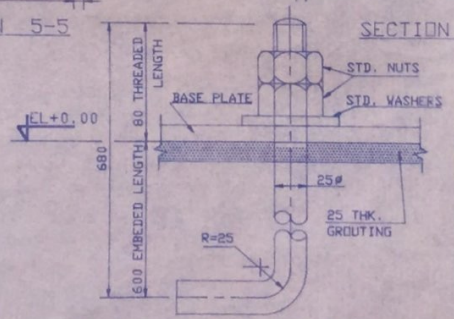
SECTION 5-5



SECTION 6-6



SECTION F-F



TYP. DETAIL OF FOUNDATION BOLT
(SUPPLIED BY BHEL) EXCEPT FOR CKT BREAKER FDN.

APPROVED
CERTIFIED BY NEEPCO
/EPDC/NTPC FOR
CIVIL CONSTRUCTION

11.4.94
अधीक्षण अभियन्ता (सी०)
Superintending Engineer (C.)
उत्तर पूर्वी विद्युत शक्ति निगम
North Eastern Electric Power Corpn. Ltd.
(भारत सरकार का उद्यम)
(A Govt. of India Enterprise)
नई दिल्ली/New Delhi-66

APPVD. DRG. RECVD. FROM SE(D), N. DELHI ON 21/4/94
VIDE C/NO 04/7/CIVIL-H/93/1029 DT. 11/4/94

REV	DESCRIPTION	APPD. NTPC	APPD. EPDC	DATE	DATE 11-02-94
0	RELEASED FOR APPROVAL			11.02.94	DRAWN
1	REVISED AS PER BHEL COMMENT			8/4/94	DESIGN
					CHECKED
					APPROVED
					SCALE

NEEPCO DRG. NO.

NORTH EASTERN ELECTRIC POWER CORPORATION LTD.
(A GOVT. OF INDIA ENTERPRISE)

PROJECT: ASSAM GAS BASED POWER PLANT
KATHALGURI

CONSULTING ENGINEERS

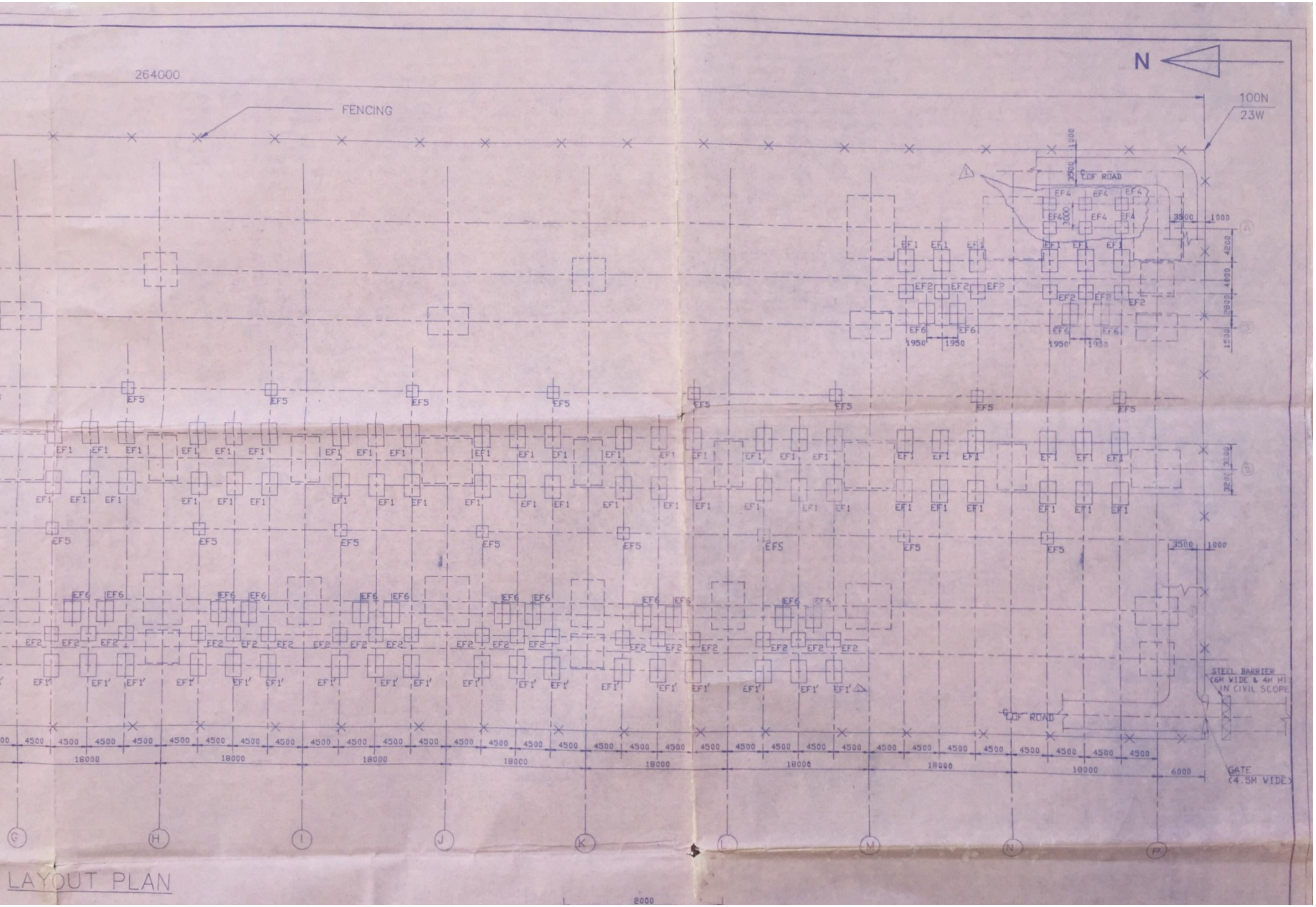
National Thermal Power Corporation Ltd.
(A GOVT. OF INDIA ENTERPRISE)

EPDC INTERNATIONAL
TOKYO, JAPAN

TITLE: LAYOUT & DETAIL OF EQUIPMENT FOUNDATIONS IN SWITCHYARD AREA

DRG. NO. 9119-02-BCC-034 REV 1

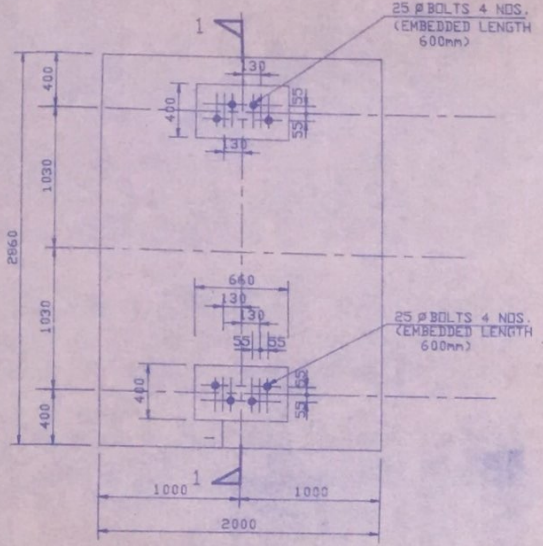
T&S/Y SD = 26(A)



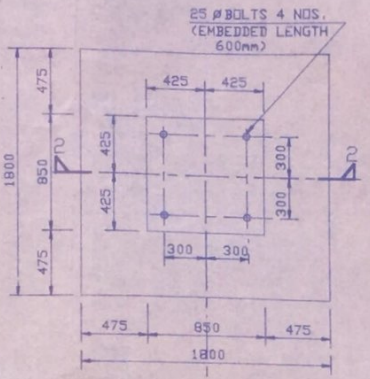
364N
97.5W

A B C D E F G

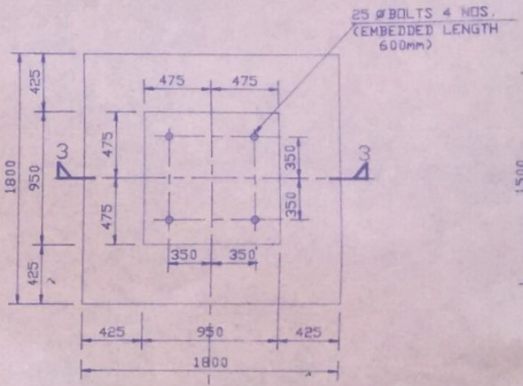
LAYOUT



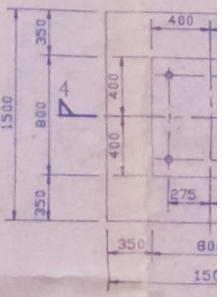
FOUNDATION PLAN - EF1 / EF1'
(FOR ISOLATER)



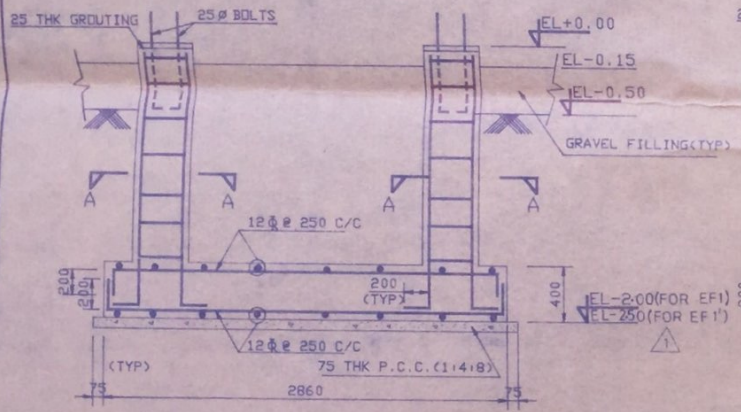
FOOTING - EF2
(FOR CURRENT TRANSFORMER)



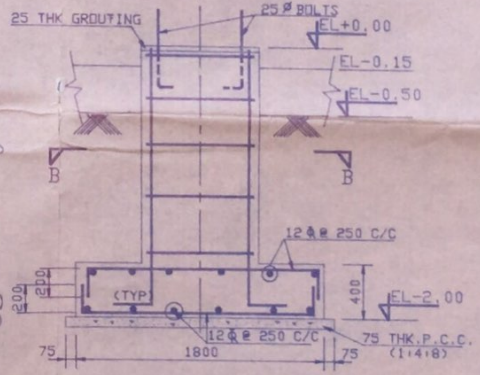
FOOTING -EF3
(FOR VOLTAGE TRANSFORMER)



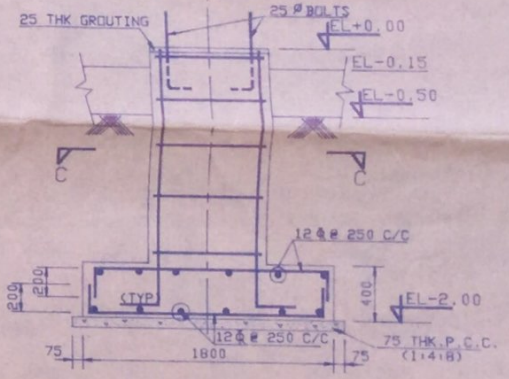
FOOTING
(FOR CAPACITOR V
& LIGHTNING



SECTION 1-1

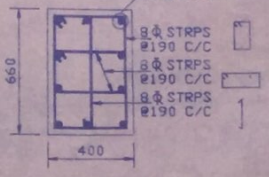


SECTION 2-2

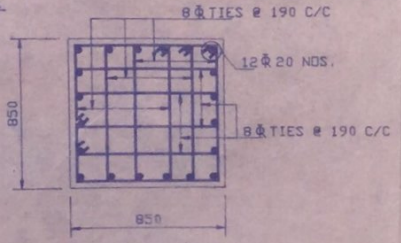


SECTION 3-3

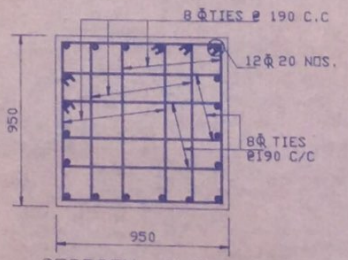
SECTI



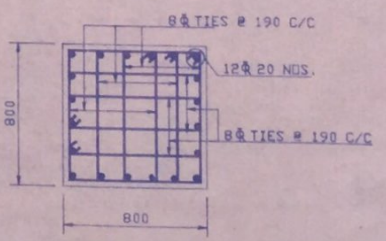
SECTION A-A



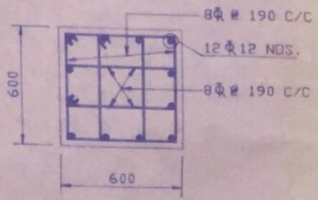
SECTION B-B



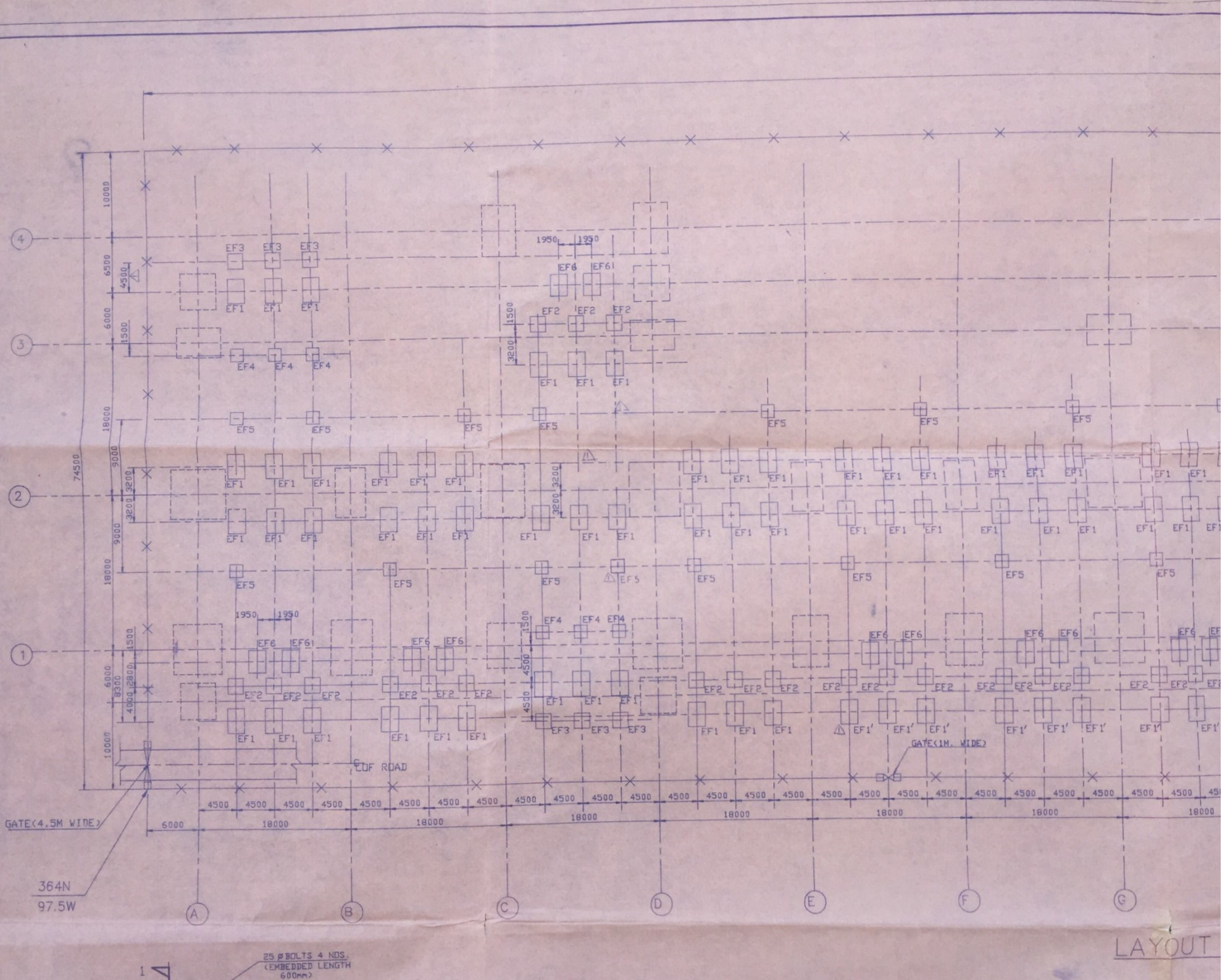
SECTION C-C



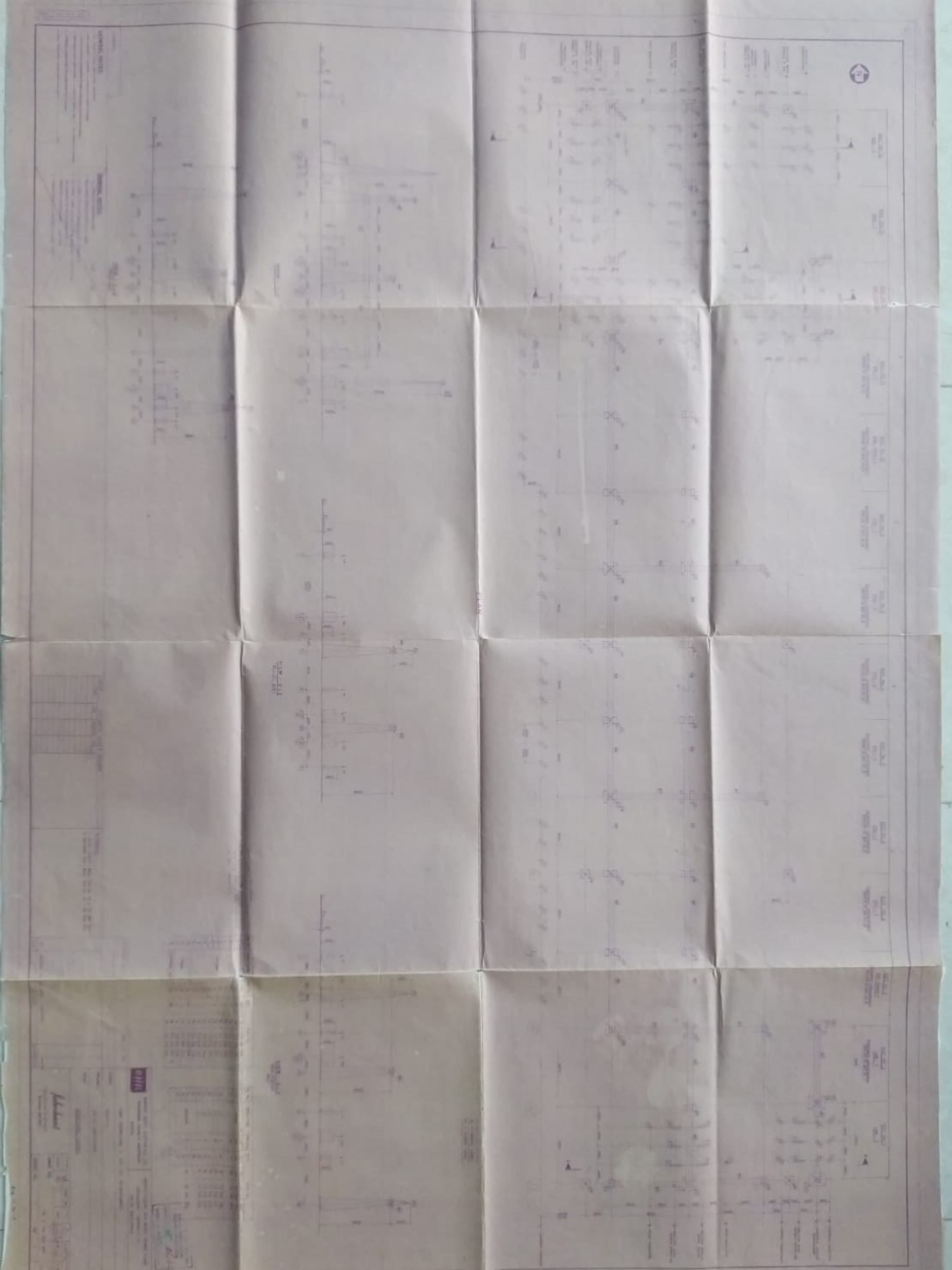
SECTION D-D



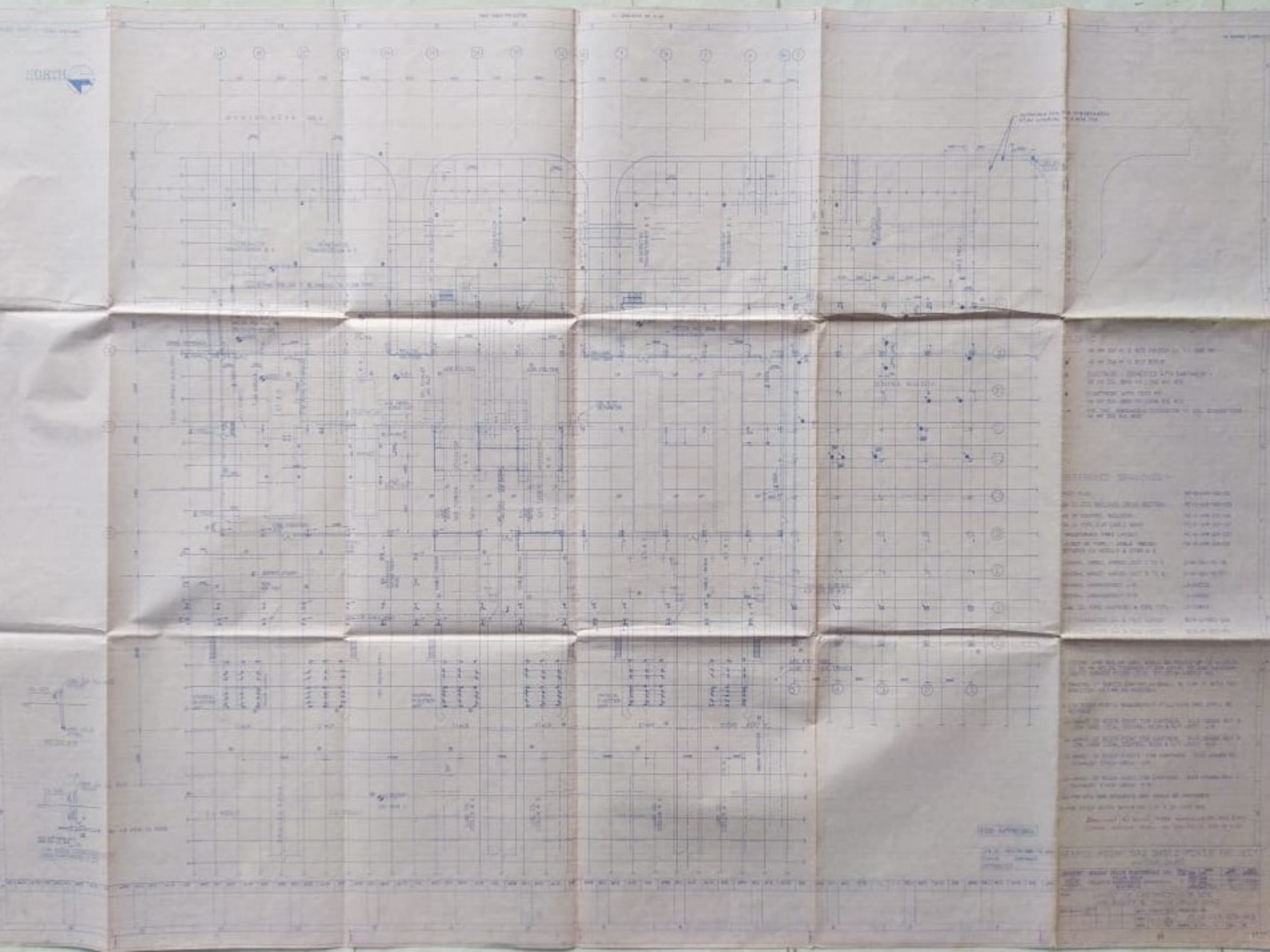
SECTION E-E



4. Plant Layout



5. Earth mesh Layout

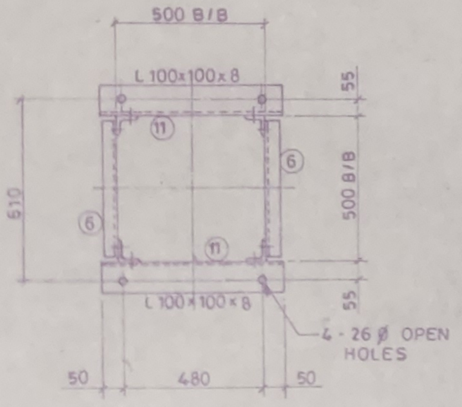


6. Structural Layout Drawing

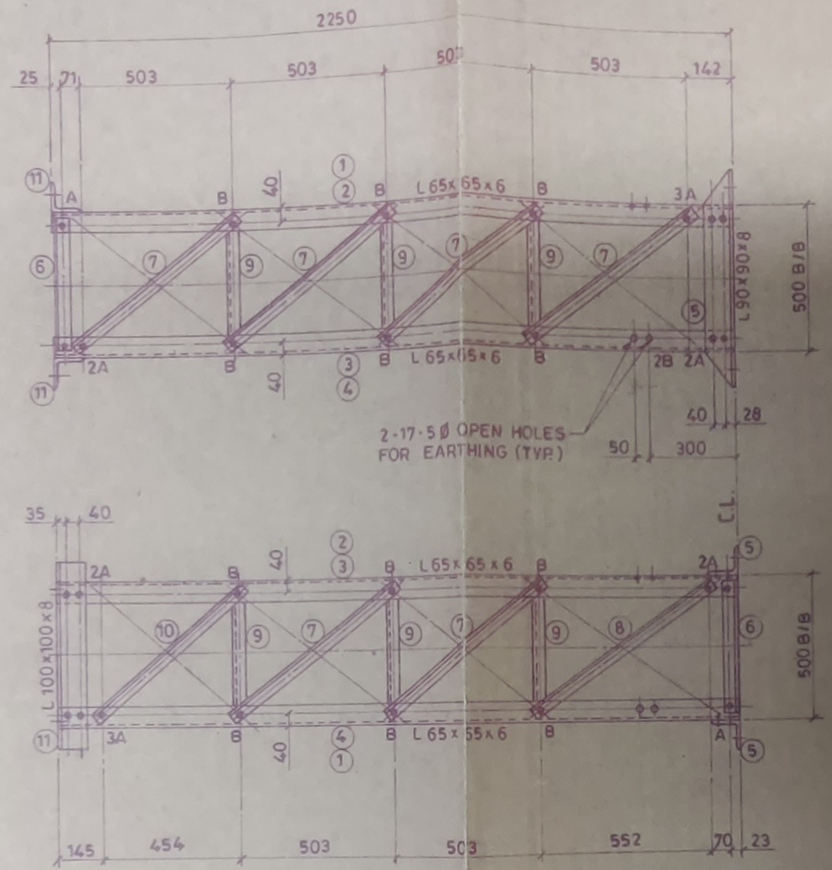
Based on approval dtd. 27-12-2012, the unit/set price was around

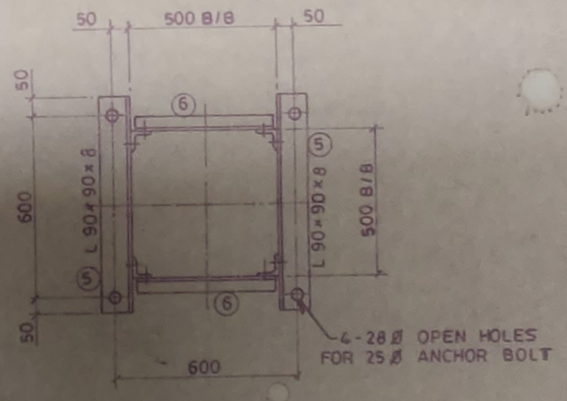
Badarghat | Kamalpur (TR) | 2x63

DWG. NO.
TB 3 112 618 020



TOP PLAN





BASE PLAN

निर्गत के लिए जारी किया गया
RELEASED FOR CONSTRUCTION
हस्ताक्षर/Sig.
दिनांक/Date 6/7/94

TYPE	DIA.	LENGTH	QTY.
SP W.	16	3·5 THK.	58
B	16	40	26
A	16	35	32

ST OF 16 Ø H R H BOLTS, NUTS & WASHERS

ITEM NOS. 1 TO 11

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS
2. ALL HOLES 17·5 Ø FOR 16 Ø BOLTS IF NOT STATED
3. 3·5 mm SPRING WASHER TO BE SUPPLIED WITH EVERY BOLT
4. SPRING WASHERS TO CONFORM TO IS-3063.
5. MIN EDGE SECURITY FOR 16 Ø BOLTS SHALL BE 23 mm FROM CUT EDGE
6. ALL ITEM NOS. TO BE PREFIXED WITH A1, A2 ETC

GENERAL NOTES:

7. ALL UNNOTED MEMBERS ARE L 45x45x5 WITH 23 BM
8. MILD STEEL BOLTS NUTS TO IS - 6639
9. ALL STEEL TO IS-226 UNLESS NOTED OTHERWISE
10. ALL STEEL ITEMS, BOLTS NUTS & WASHERS TO BE HOT DIP GALVANISED AS PER IS- 2629 & 2633
11. UNNOTED GUESSETS ARE 6 mm THICK
12. FABRICATION TO CONFORM TO IS 802 (PART-II)

APPROVED BY _____ VIDE LET. NO _____
DT. _____

REFERENCES
1. CT (BHEL MAKE) DRG. No. 24771050474
2. 25 Ø ANCHOR BOLT - DRG. No. 4 112 618 002

SYM	REVISION	APPRD	DATE
R1	STR. HEIGHT CHANGED TO 2250 FROM 2400 AS PER BHEL LETTER No. TBEM / 82025 / NEP / MD DT. 17-2-94		22-2-'94

BHEL
BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION PROJECTS ENGINEERING
BHOPAL

NEEPCO / ASSAM GAS BASED POWER PLANT
KATHALGURI - CONTRACT - 2
220 kV SWITCHYARD

IMEX ENGINEERING Co. PVT. LTD. SECUNDERABAD.

CLIENT: NEEPCO

PROJECT: 220 kV SWITCHYARD.

TITLE: DETAILS OF STRUCTURE FOR CT MKD. A

fabrikant
Structural Engineers
Bombay-400054

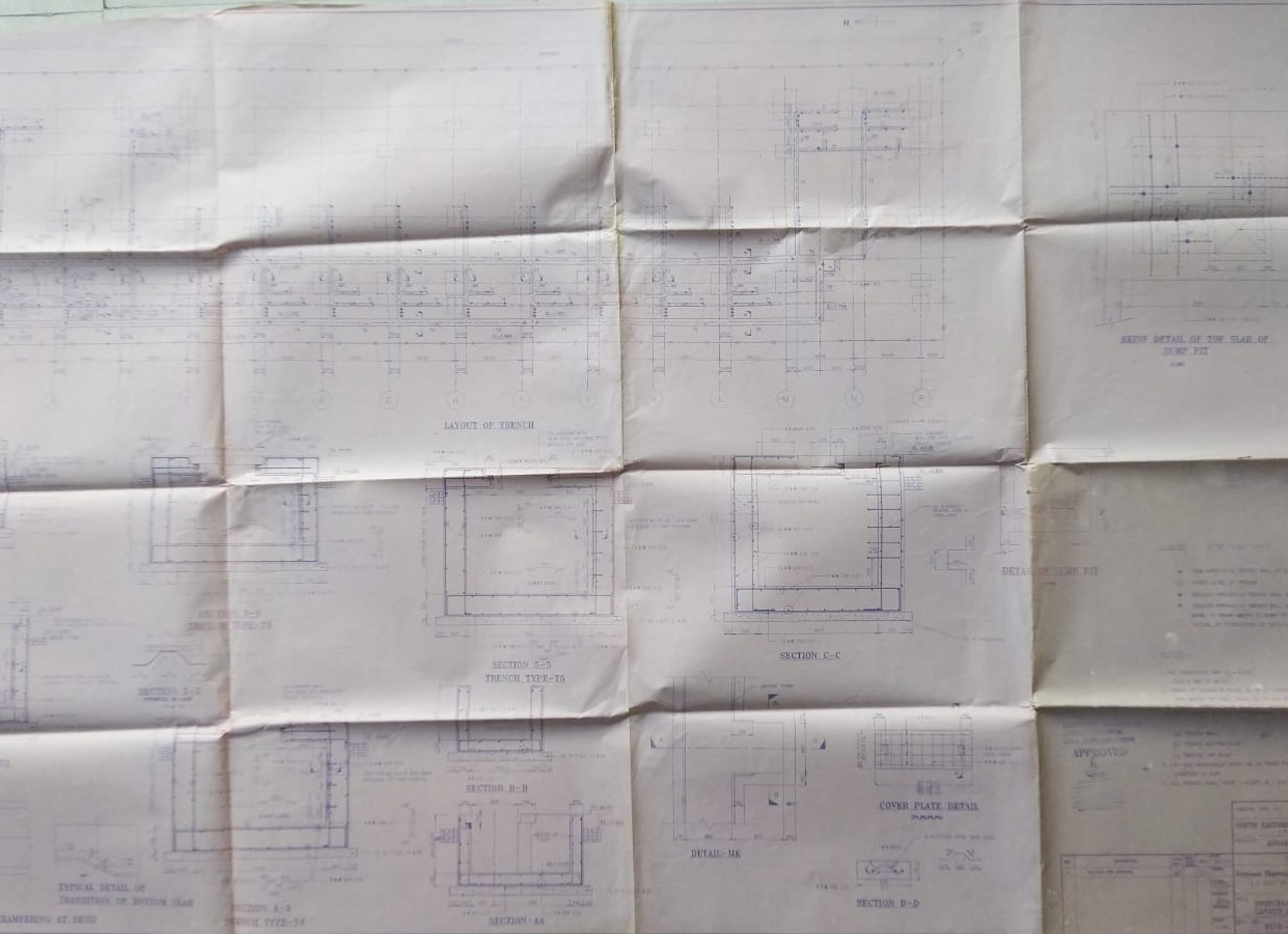
DRAWN		25-11-93	CHKD		2/12/93	SCALE
DESIGN	SSU		APPD		4/12	1:20

DWG. NO. TB 3 112 618 020 REV. R1

SHEET NO. 1 OF 1

T & SYSD, 120(1) Regd. No. 123

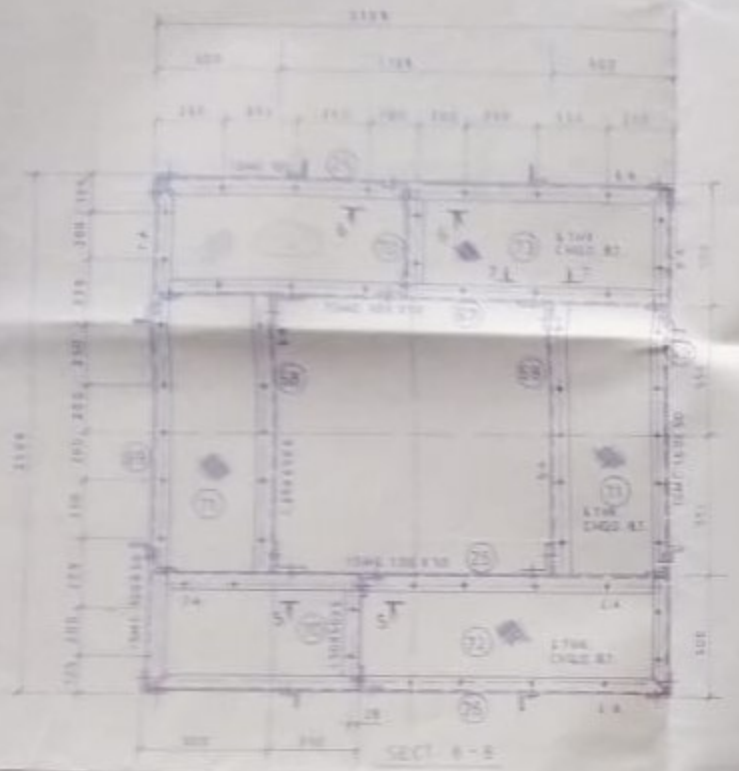
7. Trench Layout



LAYOUT OF TRENCH
BENDING DETAIL OF TOP SLAB OF SUMP PIT
SECTION 5-5
TRENCH TYPE-T5
SECTION C-C
DETAIL OF SUMP PIT
SECTION B-B
COVER PLATE DETAIL
DETAIL-MK
TYPICAL DETAIL OF TRANSITION OF BOTTOM SLAB
CHAMFERING AT BEND
SECTION-AA
SECTION D-D
APPROVED

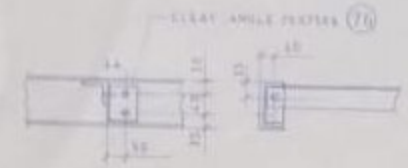
8. Lighting Mast Details

DWG. NO.
TB 2 112 618 015

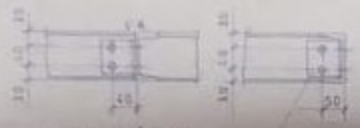


SECT. 8-8

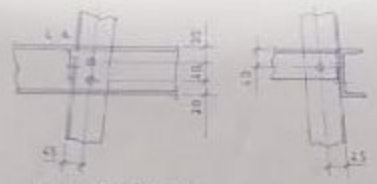
DETAILS OF PLATFORM



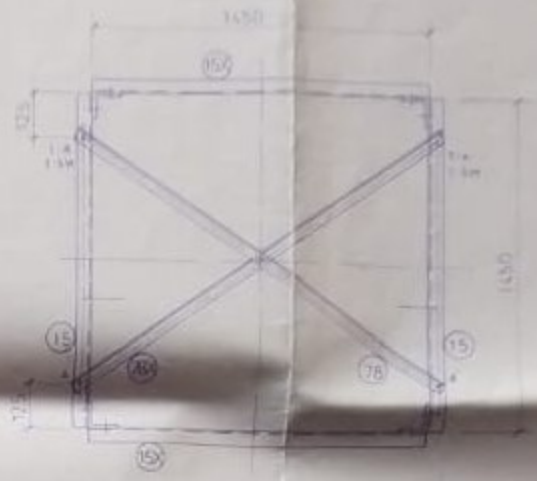
VIEW ON 5-5



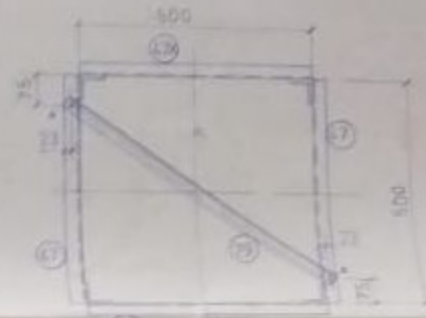
VIEW ON 6-6



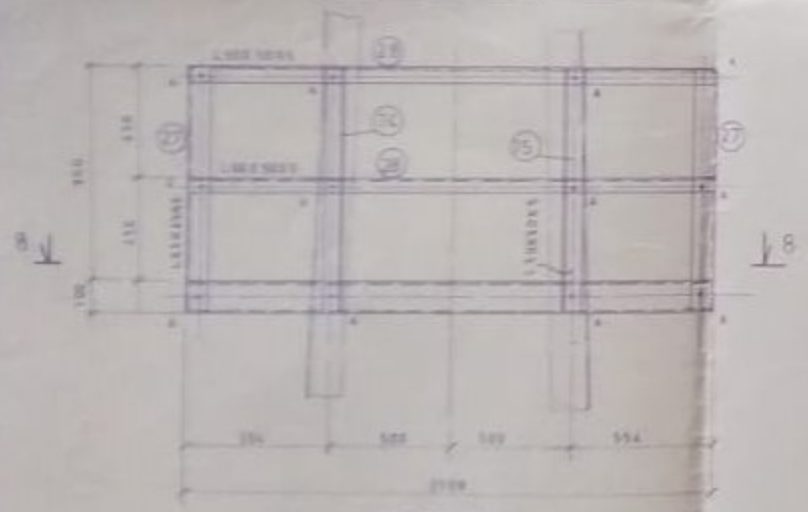
VIEW ON 7-7



VIEW ON 3-3



VIEW ON 4-4



ELEVATION

ITEM Nos. 67 to 79

GENERAL NOTES

GENERAL NOTES

LIST OF H.R.H. BOLTS, NUTS & WASHERS

	DIA	LENGTH	QTY

REFERENCES

1. DESIGN CAL NO KAT/DS/07
2. TB 1 112 618 015 SHT NO. 1 OF 2 FOR DET OF MAST

APPROVED BY ... VIDE LET. NO. ... DT. ...

RELEASED FOR CONSTRUCTION

NEEPCO/ASSAM GAS BASED POWER PLANT
KATHALGURI - CONTRACT-2
220 KV SWITCHYARD

BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION PROJECTS ENGINEERING
BHOPAL

IMEX ENGINEERING CO PVT LTD

CLIENT: NEEPCO

PROJECT: 220 KV SWITCHYARD

TITLE: DETAILS OF LIGHTNING MAST MKD-LM

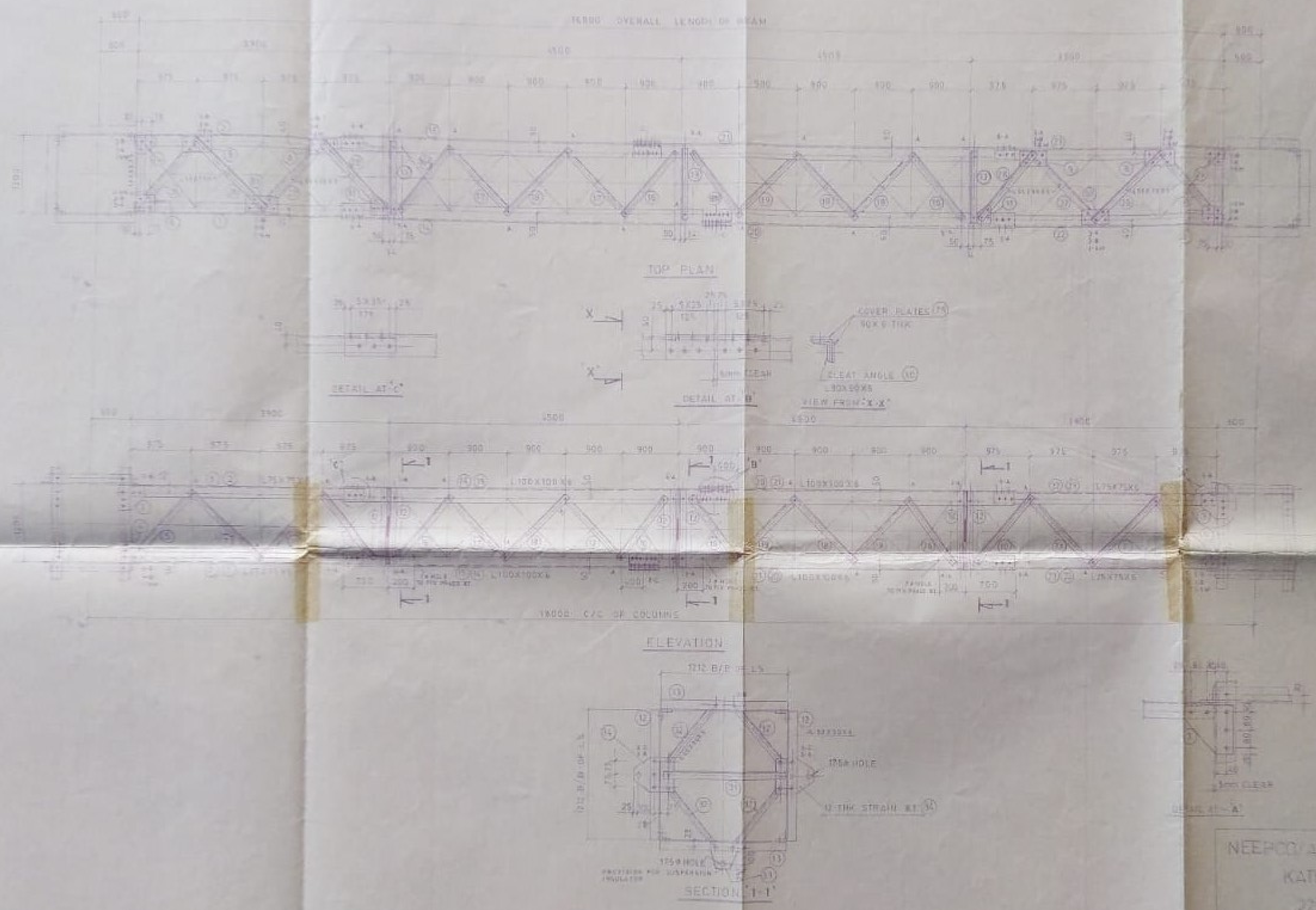
Fabricant
Structural Engineers
Bombay 400 054

DWG NO. TB 2 112 618 015 R

SHEET NO. 2 OF 2

Reg. SL. No 154

9. Beam Details



ITEM NOS. 1 TO 34

GENERAL NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS
2. ALL HOLES 17.5 ϕ FOR 16 ϕ BOLTS IF NOT STATED
3. 3.5mm SPRING WASHERS TO BE SUPPLIED WITH EVERY BOLT
4. SPRING WASHERS TO CONFORM TO IS 3063
5. MINIMUM SECURITY FOR 16 ϕ BOLTS SHALL BE ... FROM CUT EDGE
6. ALL ITEM NOS. TO BE MARKED WITH ...
7. ALL ... WEIGHERS ... (from BASE MARK)

GENERAL NOTES

8. HIGH STEEL BOLTS NUTS TO IS 1363
9. ALL STEELS TO CONFIRM TO ... UNLESS NOTED OTHERWISE
10. ALL STEEL ITEMS BOLTS NUTS & WASHERS TO BE HOT DIP GALVANISED AS PER IS 2629 & 2633
11. ... SOCKETS ARE ...mm THICK
12. FABRICATION TO CONFIRM TO IS 802 (PART II)

LIST OF 16 ϕ MM BOLTS, NUTS & WASHERS

TYPE	DIA	LENGTH	QTY
[illegible]	[illegible]	[illegible]	[illegible]

REFERENCES

1. DESIGN CAL. NO. [illegible]
2. COLUMN GA-DRG NO.-TB 1 112 618 005

APPROVED BY

(2)

NEEPCO/ASSAM GAS BASED POWER PLANT KATHALGURI - CONTRACT 2 220 kV SWITCHYARD

BHEL — BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION PROJECTS ENGINEERING
BHOPAL

IMEX ENGINEERING CO. PVT. LTD.

CLIENT: NEEPCO

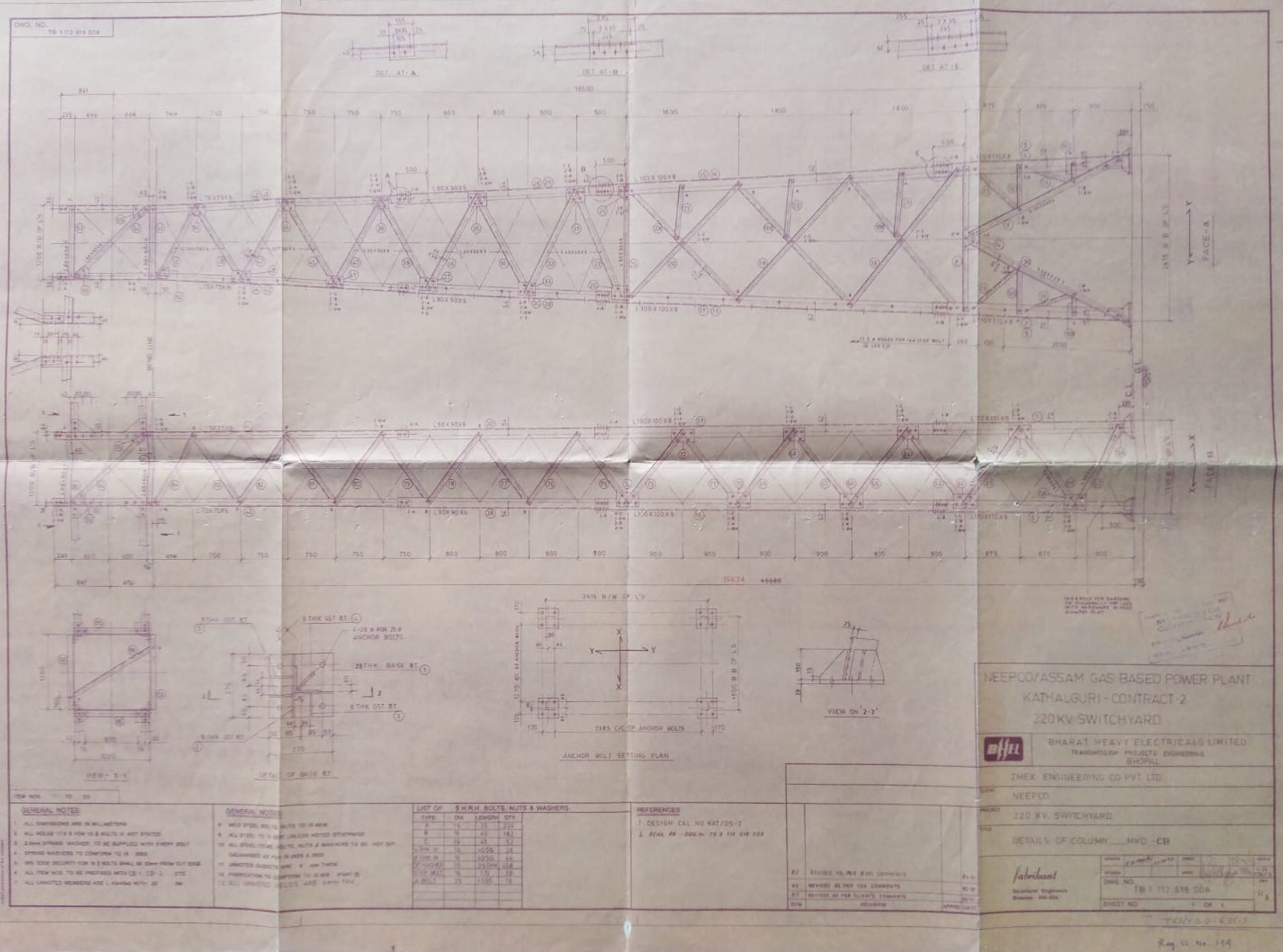
PROJECT: 220 KV SWITCHYARD

TITLE: DETAILS OF BEAM ... MKD. BA

DRG. NO. TB 1 112 618 002

Reg. D. No. 145

10. Column Details



DWG. NO.
TB 1 112 618 006
DET. AT-A
DET. AT-B
DET. AT-C
16500
BEND LINE
FACE-A
FACE-B
C.L.
G.L.
L100X100X8
L90X90X6
L75X75X5
2615 B/B OF L'S
2385 C/C OF ANCHOR BOLTS
1500 B.B OF L'S
ANCHOR BOLT SETTING PLAN
VIEW ON '2-2'
VIEW - 1-1
DETAIL OF BASE PT.
28THK. BASE PT.
4-28 Ø FOR 25 Ø ANCHOR BOLTS
8THK GST PT.
GENERAL NOTES
LIST OF Ø H.R.H. BOLTS, NUTS & WASHERS
REFERENCES
1. DESIGN CAL NO KAT/DS-2
NEEPCO/ASSAM GAS BASED POWER PLANT
KATHALGURI - CONTRACT-2
220 KV SWITCHYARD
BHEL
BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION PROJECTS ENGINEERING
BHOPAL
IMEX ENGINEERING CO PVT LTD
NEEPCO
220 KV. SWITCHYARD
DETAILS OF COLUMN ___ MKD -CB
fabrikant
DWG NO.
TB 1 112 618 006
SHEET NO.
1 OF 1
Reg. CL No. 199

11. CT Details

CT, 220KV, BAY=1, MORIANI

06 July 2011
11:54

ANNUAL ...

R - POLE

STANDARD	IS : 2705
HIGH SYSTEM VOLTAGE	245
INSULATION LEVEL	460 / 1050
FREQUENCY	50 Hz
SHORT TIME CURRENT (KA) (EXTERNAL TERMINAL)	31.5 / 1 Sec
CURRENT RATING AMPS	180

RATED PRM. CURRENT AMPS	150
DRAWING NO.	2477105047
ELEC. SPEC.	638917
SERIAL NO.	2224132
DIVISION	JHANSI
MANUFACTURING YEAR	1994
TOTAL WT. OF CTS OF Kg	1135

Y - POLE

STANDARD	IS : 2705
HIGH SYSTEM VOLTAGE	245
INSULATION LEVEL	460 / 1050
FREQUENCY	50 Hz
SHORT TIME CURRENT (KA) (EXTERNAL TERMINAL)	31.5 / 1 Sec
CURRENT RATING AMPS	180

RATED PRM. CURRENT AMPS	150
DRAWING NO.	2477105047
ELEC. SPEC.	638917
SERIAL NO.	2224131
DIVISION	JHANSI
MANUFACTURING YEAR	1994
TOTAL WT. OF CTS OF Kg	1135

B - POLE

STANDARD	IS : 2705
HIGH SYSTEM VOLTAGE	245
INSULATION LEVEL	460 / 1050
FREQUENCY	50 Hz
SHORT TIME CURRENT (KA) (EXTERNAL TERMINAL)	31.5 / 1 Sec
CURRENT RATING AMPS	180

RATED PRM. CURRENT AMPS	150
DRAWING NO.	2477105047
ELEC. SPEC.	638917
SERIAL NO.	2224133
DIVISION	JHANSI
MANUFACTURING YEAR	1994
TOTAL WT. OF CTS OF Kg	1135

भारत हेवी इलेक्ट्रिकल्स लिमिटेड

BHARAT HEAVY ELECTRICALS LTD.

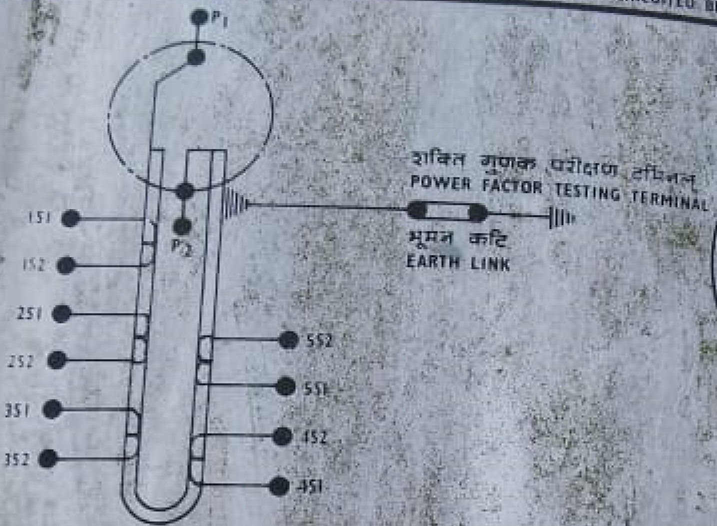
धारा परिणामित्र CURRENT TRANSFORMER

मानक STANDARD		IS 2705
अधिकतम तंत्र वोल्टता HIGHEST SYSTEM VOLTAGE	कि वो K.V	245
विद्युत रोधन स्तर INSULATION LEVEL	कि वो K.V	460/1050KVP
आवृति हर्ट्स FREQUENCY	Hz	50
अल्पावधि धारा SHORT TIME CURRENT	कि.ऐ. K.A	31.5/ 1 SEC

निर्धारित प्राथमिक धारा ऐम्पियर RATED PRMY CURRENT AMPS	800
आरेख संख्या DRAWING NO	14771050476
वैद्युत विनिर्देश ELEC SPEC	63992[illegible]
क्रम संख्या SERIAL NO	222432
डिवीजन DIVISION	झांसी JHANSI
निर्माण वर्ष MANUFACTURING YEAR	[illegible]

सावधान :- भार वियुक्त करने से पूर्व द्वितीयक टर्मिनल्स को अवश्य ही लघुपथन करें

CAUTION :- SECONDARY TERMINALS MUST BE SHORT CIRCUITED BEFORE THE BURDEN IS DISCONNECTED



द्वितीयक टर्मिनल्स विन्यास
SECONDARY TERMINALS ARRANGEMENT

टर्मिनल्स TERMINALS	अनुपात ऐम्पियर RATIO AMPS.	निर्धारण RATING वो.ऐ. V.A.	श्रेणी CLASS	जा.बि.वो./ उत्तेजक ऐ./द्वितीयक ओम 75° सें. पर K.P.V/EX. AMPS./ SECY. OHMS AT 75°C	द्वितीयक का प्रयोजन PURPOSE OF SECY.
1S1 — 1S2	800/1	—	PS	1200 V/ 20 mA at 600V/ 2.5 Ω	PROTECTION
2S1 — 2S2	800/1	—	PS	1200 V/ 20 mA at 600V/ 2.5 Ω	PROTECTION
3S1 — 3S2	800/1	40	0.5 ISF<5	———	METERING
4S1 — 4S2	800/1		PS	1200 V/ 25 mA at 600V/ 8.0 Ω	PROTECTION
5S1 — 5S2	800/1	—	PS	1200 V/ 25 mA at 600V/ 8.0 Ω	PROTECTION

(LF / BC CT)

भारत में निर्मित (W.O. NO. 03633P05000 &03635P05000) MADE IN INDIA

12. VT Details

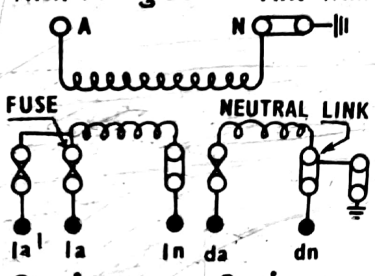
भारत हेवी इलेक्ट्रिकल्स लिमिटेड
BHARAT HEAVY ELECTRICALS LIMITED

वोल्टता परिणामित्र VOLTAGE TRANSFORMER

मानक STANDARD		IS 3156
अधिकतम तंत्र वोल्टता HIGHEST SYSTEM VOLTAGE	कि. वो. k.V.	245
आवृति FREQUENCY हर्ट्ज़	Hz.	50
विद्युति रोधन स्तर INSULATION LEVEL	कि. वो. k.V.	460/1050 KVP
नि. वो. गु./समय	R.V.F. / TIME	1.5 / 30 SEC.
न्यूट्रल NEUTRAL		EARTHED
वैद्युत विनिर्देश ELEC. SPEC.		631144

प्राथमिक वोल्ट्स	PRY. VOLTS	220000 / $\sqrt{3}$
द्वितीयक कुंडलन 1 SECY.WDG.1 (1a – 1n)	वो. VOLTS	110 / $\sqrt{3}$
	वो.ऐ.V.A.	300
	श्रेणी CLASS	0.5 / 3P
द्वितीयक कुंडलन 2 SECY.WDG.2 (da – dn)	वो. VOLTS	110 $\sqrt{3}$
	वो.ऐ. V.A.	50
	श्रेणी CLASS	3P
आरेख संख्या	DRAWING NO.	34861050080
क्रम संख्या	SERIAL NO.	222143
डिवीज़न	DIVISION	झाँसी/JHANSI
निर्माण वर्ष	MFG. YEAR	1994

प्राथमिक कुंडलन PRY. WINDING



द्वि. कुंडलन 1 SECY.WDG. 1 द्वि. कुंडलन 2 SECY.WDG. 2

(W.O. NO. 03636 P 05000)

भारत में निर्मित MADE IN INDIA

13. Isolator CT Arresters Details

SCHEDULE OF GUARANTED TECHNICAL PARTICULARS FOR ISOLATORS EXISTING DATA

Sl No	Description	Existing Technical data
1	Standard Applicable	IS: 9921 (Part ı to v)
2	Type of Installation	Outdoor
3	Mounting	Horizontal upright
4	Type of operating mechanism	Motor with manual handle for emergency operation
5	No. of poles	3
6	Rated voltage	245KV
7	Rated frequency	50Hz
8	Rated continuous current	1250 A as required
9	Rate short time current	31.5 KA V (rms) for 1sce
10	Rated peak short circuit current	80 KV (peak)
11	Number of insulator units per pole	2
12	Maximum temperature rise over ambient of 45°C	Within the values specified in table 4 of IS:9921 (part of 1982)
13	Pole of pole spacing	4500mm
14	Dry and Wet one minute power frequency withstand voltage ¡) Across the isolating distance ¡¡) To earth between poles	 530KV (rms) 460KV(rms)
15	1.2/50 micro-second impulse withstand voltage (positive and negative polarity) ¡)Across the isolating distance ¡¡)To earth and between poles	 1200 KV (peak) 1050 KV (peak)
16	Flashover voltage	570 KV
17	Total Cree page distance	5635 mm
18	Mechanical characteristics ¡) Tensile ¡¡) Compression ¡¡¡) Bending (cantilever) ¡v) Torsional	 8000Kg 27000Kg 600Kg 450Kg
19	Weights ¡) Weight of a 3-pole isolator complete with mechanism W/o insulators ¡¡) Weight of operating mechanism (approx.)	a) W/o earth switch. 950 kg b) With 1 earth switch. 1115 kg c) With 2 earth switch . 1300 kg 120 kgs
20	Auxiliary contacts ¡) Current carrying capacity ¡¡) Number of special type auxiliary contacts	Main Switch Earth Switch 10A 10 A 4 MBB ___

	¡¡¡) Number of auxiliary contacts suitable for Normally closed and Normally open position	12 No/12 NC 6 No/6 NC
21	Main contacts ¡) Type ¡¡) Material of main contact ¡¡¡) Thickness of silver coting	 Jaw & Fist type spring loaded slide –in contacts Hard drawn Electrolytic copper 25 microns (minimum)
22	Interlocks ¡) Type ¡¡) Rated voltage for electrical lock ¡¡¡) Maximum and minimum control voltage for electrical lock ¡v) Power required for electrical lock	 Electrical between main switching and corresponding circuit breaker Electrical & and Mechanical between Main Switch& Earth Switch 220 V DC -15% +10% 35 Watts
23	Motor operating devices ¡) Rated voltage ¡¡) Rated output of motor ¡¡¡) Voltage variation for satisfactory operation of motor ¡v) Insulation class	 3- phase , 415V , 50Hz A.C. supply 1 HP ±10% Class 'B'
24	Operating torque required for manual operation	36 kgm
25	Operating mechanism for earth switch	Manual , as per specification
26	Making capacity of earth switch	Not applicable tested only for short time current rating of 31.5 KA (rms) for 1 sec. with a peak short circuit current of 80 KA
27	Closing time of isolator	8 to 10 secs.
28	Opening time of isolator	8 to 10 secs.
29	Power for heating elements	80 Watts
30	Rated voltage of heating elements	230 V
31	Number of opening the isolator is capable of performing a) At 100% rated current b) At 50% rated current	 }More than 1000 operations

32	Capacity to interrupt line charging /magnetizing currents	0.7 Amps at 0.15 P.F. Assigned
33	Type of bearing	Double end sealed ball bearing
34	Location of bearing	Below the rotating post insulator
35	Rated current of terminal connector	Terminal connectors are not covered under our scope of supply
36	Maximum and minimum ambient temperature for the guaranteed ratings	As per site conditions
37	Maximum and minimum humidity for the guaranteed ratings	As per site conditions
38	Catalogues / Literature for the following furnished : a) Isolator & Earth switch b) Operating mechanism c) Support Insulator	)))

SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOT CURRENT TRANSFORMER EXISTING DATA

Sl No	Description	Existing Technical Data
1	Standard Applicable	IS 2705
2	CT Set No. /Core No	GEN/Station / Line & BC Circuit
3	Type and designation	Outdoor type
4	Rated voltage	245 KV
5	Rated Frequency	50Hz
6	Rated primary current	150 A GEN (R) , 50 A Station Circuit , 00 Line BC
7	Transformation ratio	150 / 1A GEN circuit , 50 / 1A Station Circuit , 1/000 Line BC
8	Accuracy class	REF DRG NO 24771050475-GEN CKT
9	Rated output(VA)	REF DRG NO 24771050475-STN CKT
10	Knee point voltage circuit (Not less than)	REF DGR NO 24771050475-LINE & BC
11	Turns ratio	1 / 150 for GEN , 1 / 50 STN , 1 / 800 LINE BC
12	Secondary resistance correction to 75°C ,OHMS	REF DRG NO 24771050475-GEN CKT
13	Maximum exiting current A) At Knee point voltage B) At 508 knee point voltage C) D) At 258 knee point voltage	REF DRG NO 24771050475- STN CKT REF DRG NO 24771050475 – LINE & BC CKT REF DRG NO 24771050475 REF DRG NO 24771050475 – GEN CKT
14	Instrument security factor foreore-3	≤5
15	Turns ratio error	±0.25%
16	Rated output at different taps	< - NA

17	One minute power frequency withstand test voltage of A) Primary winding B) Secondary winding	 460 KV RMS 4KV RMS
18	1.2 / 50 Micro-Second impulse withstand voltage of primary winding	±1050 KVP
19	Total Cree page distance (MM)	5635
20	Rated continuous thermal current	31.5 KA
21	Rated short time thermal current	31.5 KA
22	Rated time for 21 above (sec)	1 SEC
23	Rated Dynamic current	80 KAP
24	Time period for which the secondary winding can be left open when rated current is following in primary winding (sec)	60 SEC
25	Class of Insulation	'A' Immersed in oil
26	Temperature rise over an ambient of 50°C	45°C
27	Current rating of phase side terminal connector	1.2 X continuous current
28	Quantity of oil	AS PER OGA DRG NO
29	Total weight of CT	AS PER OGA DRG NO
30	Shipping dimension	AS PER OGA DRG NO
31	Shipping Weight	AS PER OGA DRG NO
32	Overall dimensions	AS PER OGA DRG NO
33	Maximum and minimum ambient temperature for the guaranteed ratings	AS PER IS 27.5
34	Maximum and minimum humidity for the guaranteed ratings	AS PER IS 2705

SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR ARRESTERS EXISTING DATA

Sl no	Description	Existing Technical data (Unit/Value)
1	Name of Manufacturer	OBLUM
2	Country of Origin	INDIA
3	Specification of which performance is based	IEC 99 – 4
4	Manufacturers type designation	METOVAR
5	Arrester Class	STATION CLASS
6	Type and rating of LA	OUTDOOR 216 KV (RMS)
7	Rated Frequency / Voltage	50HZ
8	Continuous Operating Voltage	184 KV (RMS)
9	Nominal Discharge current	10 KA
10	Long duration discharge class	CLASS - III
11	Energy dissipation capacity cumulative of sequential operation	As per discharge class - III
12	High current pressure relief	40 KA (RMS)
13	Reference current of arrester at ambient	3 mA

	temperature	
14	Components of the continuous leakage current at COV and at ambient temperature Resistive Capacitive	 0.5MA Crest 1.5 MA Crest
15	Watt loss at MCOV per KV of rated voltage	0.5 w / KV (Max)
16	Pressure relief class	A
17	Continuous operating voltage	184 KV (RMS)
18	Maximum residual voltage at lighting impulse of 8 / 20 microseconds At 5 KAP 10 KAP 20 KAP	 583 KV (Peak) 620 KV (Peak) 687 KV (Peak)
19	Maximum residual voltage at switching current impulse of 30/ 60 us 1000 AP maximum 2000 AP maximum	 480 KV (Peak) 510 KV (Peak)
20	Maximum residual voltage at steep front impulse at 10 KA current	670KV
21	Reference voltage of arrester at ambient temperature	Greater than or equal to rated voltage
22	Insulation level of arrester housing a) Lightning impulse withstand voltage (KVP) b) Switching impulse withstand voltage (KVP) c) Power frequency withstand voltage (KVP RMS)	 1050 KV (Peak) 750 KV (Peak) WET : 460 KV (Peak) DRY : 460 KV (Peak)
23	Temporary power frequency over voltage capability a) 0.1 Sec. (KVP RMS) b) 1 Sec. c) 10 Sec. d) 100 Sec.	 397 KV (Peak) 382 KV (Peak) 367 KV (Peak) 351 KV (Peak)
24	Cree page distance	6125 MM
25	Cantilever strength	1730 KGM
26	Number of units per arrester	3 Units each of 72 KV (RMS) rating
27	Weight of LA	330 KG ± 5%
28	Shipping / actual dimensions	47”× 3”× 20” ×1 thickness
29	Makes of components - Insulator housing - Insulator base - Surge counter - Discharge current meter	47”× 3”× 20” ×1 thickness OBLUM Standard Manufacturers Standard Manufacturers Standard Manufacturers

14. Switchyard Details (Site Data)

1.4 SYSTEM DETAILS AND SITE DATA

The system details & site data which form the basis for the substation design/equipment selection are as follows:-

1.4.1 System Description

The power supply to the 220 kV switchyard is fed from 9 x 30 (MW Gas Turbine 1 to 6 and steam Turbine 7 to 9) Generators. The power from switchyard is evacuated over 220 kV 2 Nos lines 1 & II. The power is also utilised for 2 Nos Station Aux. Transformers.

1.4.2 Site Data

Ambient temperatures

Maximum	45 deg C
Minimum	4.4 deg C
Design temp.	45 deg C
Max. relative humidity	87%
Average rainfall per annum	2759.4 mm
Max. height above MSL	123.7m
Max. wind speed	3.4 kM/pH
Seismic Co-effecient	Zone No V as per Is-1983/1975
Soil resistivity	670 ohm metre

1.4.3 System Data

1.	Main System	220 kV
	Normal Service Voltage (kV)	220
	Max. Service Voltage (kV)	245
	Frequency (HZ)	50 ± 5
	Lightning impulse withstand level (LIWL) except for transformer in kV peak	1050
	(LIWL) for transformer (kV peak)	900

Power frequency withstand (1 Min wet) kV rms.	460
System fault level (KA for 1 sec.)	31.5
Min total creepage distance (mm)	6125
Min. live part to earth clearance (mm)	2082
Min. ph-ph clearance (mm)	2400
Min. section clearance (mm)	4500
Min. Ground clearence	2500
System Earthing	- effectively - Earthed

2. Auxiliary System

a) LVAC System

415V, 3 phase, 4 wire, 50hZ, neutral effectively earthed system.

Variation in Voltage	+ 10%
Variation in frequency	+ 5%
Combined veriation of voltage and frequency	+ 10%

b) 220 V DC 2 wire system Normal voltage 220 V

System Nominal voltage `V'	= 220 V
Maximum service voltage `V'	= 242 V
Minimum service voltage `V'	= 198 V

1.4.4 Switching Scheme

The main buses, I & II for 220 kV Switchyard are twin "ZEBRA" ACSR spanning 3 bays of 18 m in each span of 54 m except for last span of 36 m which has 2 bays only. There are total 14 bays comprising 6 Nos Gas Turnine Generators, 2 Nos Generators, 3 Nos steam Turbine Generators, 2 Nos station Auxiliary transformers, 1 No hus coupler and 2 Nos line feeders.

Sequence off the bays are follows starting from the North end (Gas Turbine - I).

Bay No.

i) Line II

ii) Line I

iii) Station auxiliary Transformer - I

iv) Gas turbine Generator - 1

v) Gas turbine generator - 2
vi) Gas Turbine Generator - 3
vii) Gas Turbine Generator - 4
viii) Gas turbine Generator - 5
ix) Gas Turbine Generator - 6
x) Station auxiliary Transformer - 2
xi) Steam turbine Generator - 1
xii) Bus Coupler
xiii) Steam Turbine Generator - 2
xiv) Steam Turbine Generator - 3

1.5 Description of substation Layout

The sub-station is of outdoor execution, Main -I and Main II bus bars have been provided. Busbars have been strung on Gantries. Important features are as follows:

1.5.1 Air Clearnces

Clearances in mm	220 kV
Phase to phase	2400
phase to Earth	2082
Section Clearance	4500
Nearest part NOT AT EARTH POTENTIAL of an insultor supporting live conductor	2500

1.5.2 Bus Bar height in mm above Gravel Level

	220 kV
Equipment Interconnection (first level) (mm)	5600
Main I & Main II (mm)	10500
Jack Bus (mm)	16500

1.5.3 Conductor and Tension

1.5.3.1 220 kV

Main I & Main II		Twin "ZEBRA" ACSR per phase with 1000 kgf tension / sub conductor.
Jack Bus & Power House switchyard connection.	-	Single ZEBRA ACSR
Equipment connection		Single ACSR ZEBRA except for Bus coupler where TWIN ZEBRA is used.

1.5.4 Insulators

For 220 kV tension and suspension strings, 16 Nos discs have been used for single and TWIN ZEBRA ACSR.

1.5.5 lightning protection

1.5.5.1 Switchyard Area

Lightning protection for 220 kV area of the Sub-station is with the help of 10 Nos Lightning masts of height 27.5 m. These masts are independent of gantries columns.

1.5.5.2 Inter Connection Switchyard and Power House

The Protection for conductors connecting power home to switchyard and outgoing lines is with the help of shield wires.

1.5.6 Sub-Station Grounding

Sub-station grounding is provided by means of earth mat consisting of black mild steel rods of 40 mm dia buryied in gound at a depth of 1000 mm below finished suarface of gravel.

Substation earthing mat is inter connected with power station Earth mat at a few locations by 40 dia rod.

The cable racks in the main trenches and branch trenches are connected with the earth mat at few points.

40 dia rod has been used as tail risers upto gravel level for equipment, fence & all other places.