

SECTION 1

SCOPE, SPECIFIC TECHNICAL REQUIREMENTS AND QUANTITIES.

1.0 SCOPE

This technical specification covers the requirements of Erection , Testing & commissioning of 765kV Switchyard Equipment as listed in BOQ.

1.1 The ETC work is required for the following Project

Name of Customer: POWERGRID CORPORATION OF INDIA LTD.
Name of the Project: Indigenous development of 765kV Equipment at POWERGRID WARDHA S/S

1.2 Scope of Work:

The scope of work under the contract shall cover the erection , commissioning & testing at Project site for the equipments mentioned in BOQ.

1.0.2 Following equipments/tools tackles will be brought to the site as and when required for accomplishing the task and will be taken back by the contractor, if any other testing instrument other than listed below is required for the testing/commissioning , same shall be arranged by the contractor without any price implication to BHEL.

- | | |
|--|-------|
| 1. Oil filtration Plant | 1 No. |
| 2. Gas Filling and evacuation Equipment | 1No. |
| 3. Breaker Operational analyzer | 1 No. |
| 4. SF6 Gas leak detectors | 1No. |
| 5. General tools/tackles/testing instruments | 1 set |
| 6. Construction Equipment | 1 Set |

FIRST ANGLE PROJECTION

10000 26 864 E 498 DRG. NO. 3 498 102 103 104 105 106 107

(ALL DIMENSIONS ARE IN MM)

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SHEET NO.	DESCRIPTION	REVISION
01	CONTENTS & TITLE BLOCK	00
02	AUX. SUPPLY/HEATING & LIGHTING CKT.	00
03	POWER CKT.	00
04	POWER CKT.	00
05	POWER CKT.	00
06	POWER CKT.	00
07	CONTROL CKT.	00
08	CONTROL CKT.	00
09	CONTROL CKT.	00
010	CONTROL CKT.	00
011	CONTROL CKT.	00
012	CONTROL CKT.	00
013	CONTROL CKT.	00
014	CONTROL CKT.	00
015	SIGNALLING CKT.	00
016	SIGNALLING CKT.	00
017	SIGNALLING CKT.	00
018	SIGNALLING CKT.	00
019	CT CKT.	00
020	INDICATOR DIAGRAM	00
021	INDICATOR DIAGRAM	00
022	TERMINAL BLOCKS	00
023	TERMINAL BLOCKS	00
024	TERMINAL BLOCKS	00
025	LIST OF PARTS	00
026	LIST OF PARTS	00

LIST OF REFERENCE DRGS.

SL. NO.	TITLE	DRG. NO.
1	GEN. ARRGT. OF COOLER CONTROL CABINET (FLOOR MOUNTED)	34986200002 (SHINOJIT04)
2	SCHEMATIC DIAGRAM OF TAP CHANGER CONTROL	

tap changer diagram required

REF. DRG. NO.

SIGN. DATE

INVENTORY NO.

REV. DATE

ALT. CKD. APPD.

REV. DATE

ALT. CKD. APPD.

REV. DATE

ALT. CKD. APPD.

REV. DATE

ALT. CKD. APPD.

NO. OF UNIT	ONE
LOCATION	765/400/220KV SEIMI SUB-STATION
LDA NO.	C-0812-3048-3/CA-1/2549 DATED 30/05/2008
SPECIFICATION NO.	C/ENG62/SPEC/TR6-SEIMI
TYPE OF PRODUCT	500 MVA, 765/230/132KV, 1 PHASE AUTO TRANSFORMER
TYPE OF PRODUCT	POWERGRID CORPORATION OF INDIA
ADDITIONAL INFORMATION	60001-A-512-01
STATUS OF DRAWING/PRINT	DEPT CODE WEIGHTAGE SCALE
DISTRIBUTION OF PRINTS	TRE 406 -- NTS
TRE-1, TRM-3, TRX-1	TITLE
DIAGRAM OF COOLER CONTROL GEAR	DRG. NO. 3 49862 00001
SHEET 01 OF 026	REV 00

case price to be reviewed by me

FIRST ANGLE PROJECTION

DWG NO. 3490000175

ALL DIMENSIONS ARE IN mm

APPROXIMATE WEIGHT		KG
CAPACITOR ASSY.		1750
E.M. UNIT		260
OIL (E.M. UNIT)		90
TOTAL		2100
OIL QTY. IN E.M. UNIT		105 LTR.

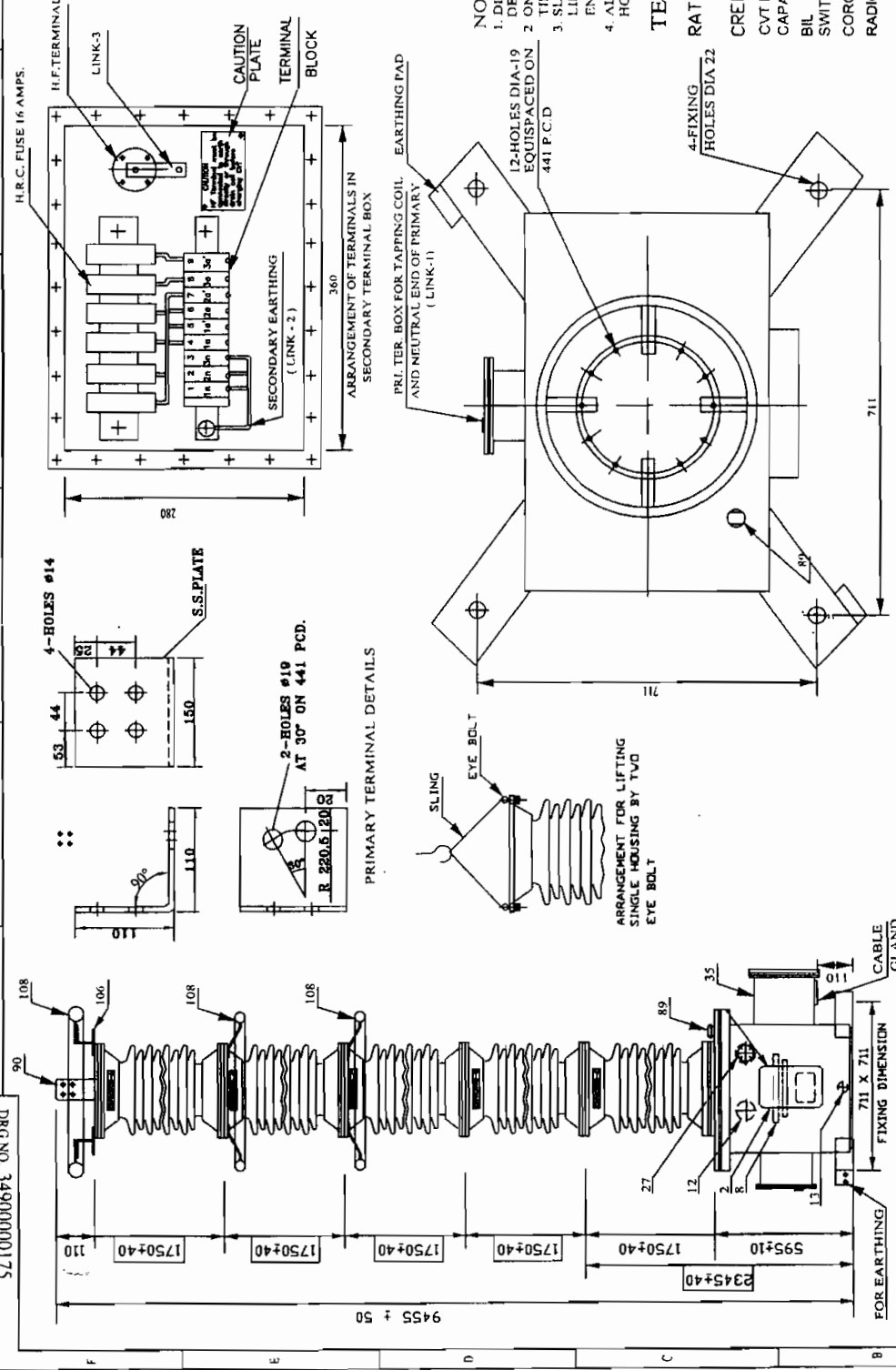
TABLE OF FITTING	
2	RATING AND DIAGRAM PLATE
3	LIFTING AND EARTHING PAD 12 TK.
8	NAME PLATE AND MONOGRAM
12	OIL GAUGE
13	DRAIN PLUG
27	PRESSURE RELEASE DEVICE
35	SECONDARY TERMINAL BOX
89	NITROGEN FILLING SCHRADER VALVE CAP
90	PRIMARY TERMINAL DIA 30X100LG. M.S.
106	SLING GUIDE
108	CORONA RING

NOTES

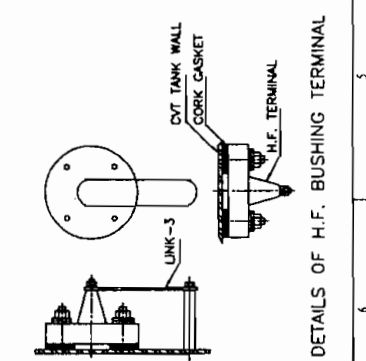
1. DIMENSIONS SHOWN THUS ☐ ARE OVERALL DESPATCH DIMENSIONS EXCLUSIVE OF PACKING.
2. ONLY ONE HOUSING SHOULD BE LIFTED AT A TIME.
3. SLING GUIDE IT, NO.106 TO BE USED ONLY WHILE LIFTING THE CVT & IT MUST BE REMOVED BEFORE ENERGISATION
4. ALL EXPOSED FERROUS PARTS SHALL BE HOT DIP GALVANISING

TECHNICAL PARTICULARS

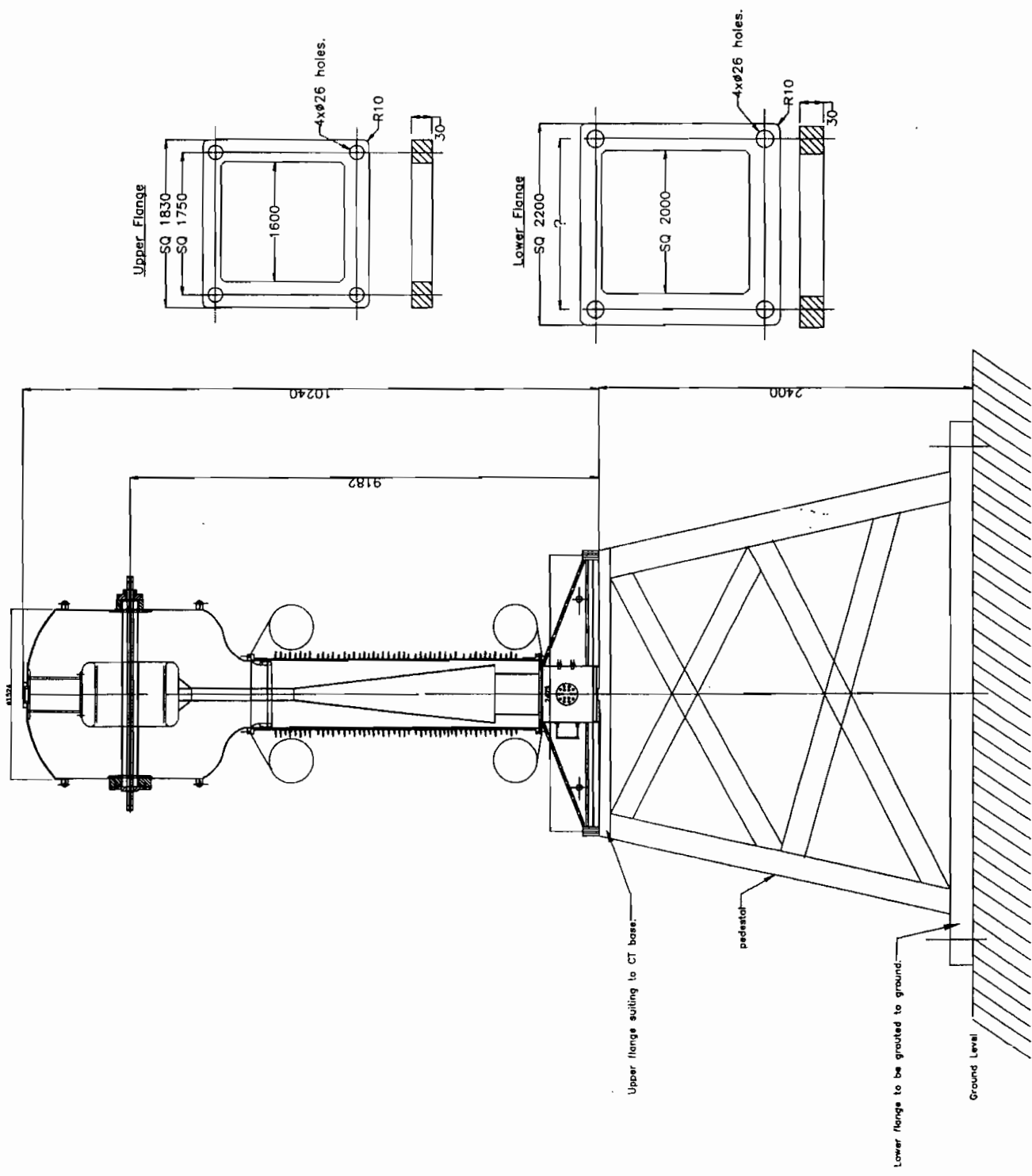
RATIO $\frac{765000}{\sqrt{3}} / \frac{110}{\sqrt{3}} / \frac{110}{\sqrt{3}} / \frac{110}{\sqrt{3}}$ VOLT S
CREEPAGE DISTANCE : 20 MM/ KV
CVT RATING = 765 KV
CAPACITANCE = 8800 pF
BIL = 830 KV/2100 kVp
SWITCHING IMPULSE = 1550 kVp
CORONA EXTINCTION VOLTAGE = 508 KV
RADIO INTERFERENCE VOLTAGE = 2500 MICRO VOLT AT 508 KV (0.5 TO 2 mHz)



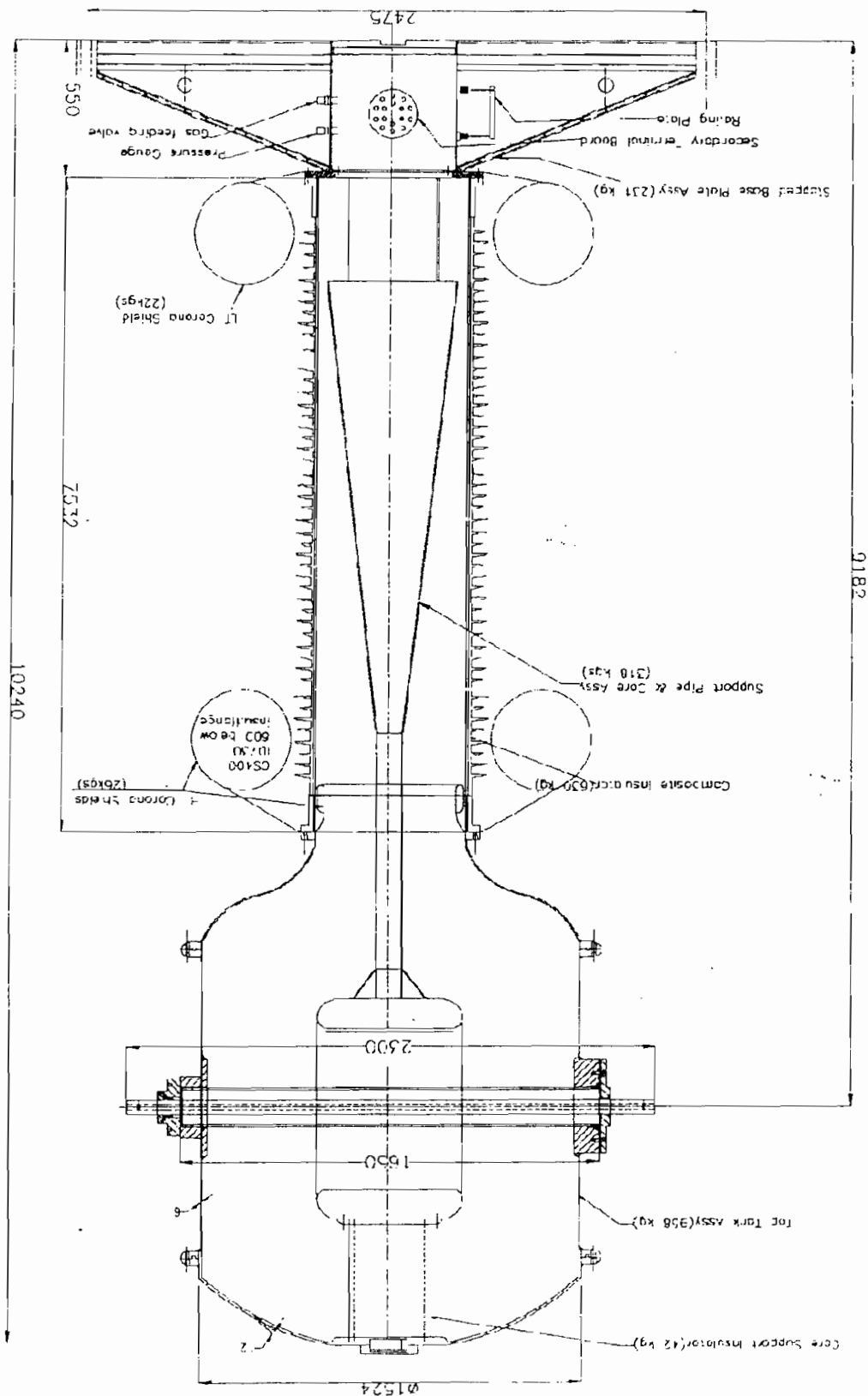
CUSTOMER		POWER GRID CORPORATION OF INDIA LIMITED	
PROJECT		DEVELOPMENT AND FIELD TRIAL OF 765 KV EQUIPMENTS	
CONTRACT AGREEMENT		AT SEDONI 765KV SUBSTATION	
ADDITIONAL INFORMATION		NO. C-01812-S048-3/CA-1/2549 DATE: 30.05.2008	
STATUS OF DRAWING		U	
DISTRIBUTION OF PRINTS		BIE-1 TRN-3 TRX-1	
REV	DATE	ALTERED	DECEDED
ZONE		IMPROVED	
TITLE :		OUTLINE GENERAL ARRANGEMENT OF 8800PFT 800KV CAPACITOR VOLTAGE TRANSFORMER	
DRAWING NO.		34910000175	
SHEET NO.		1	



To be verified at site



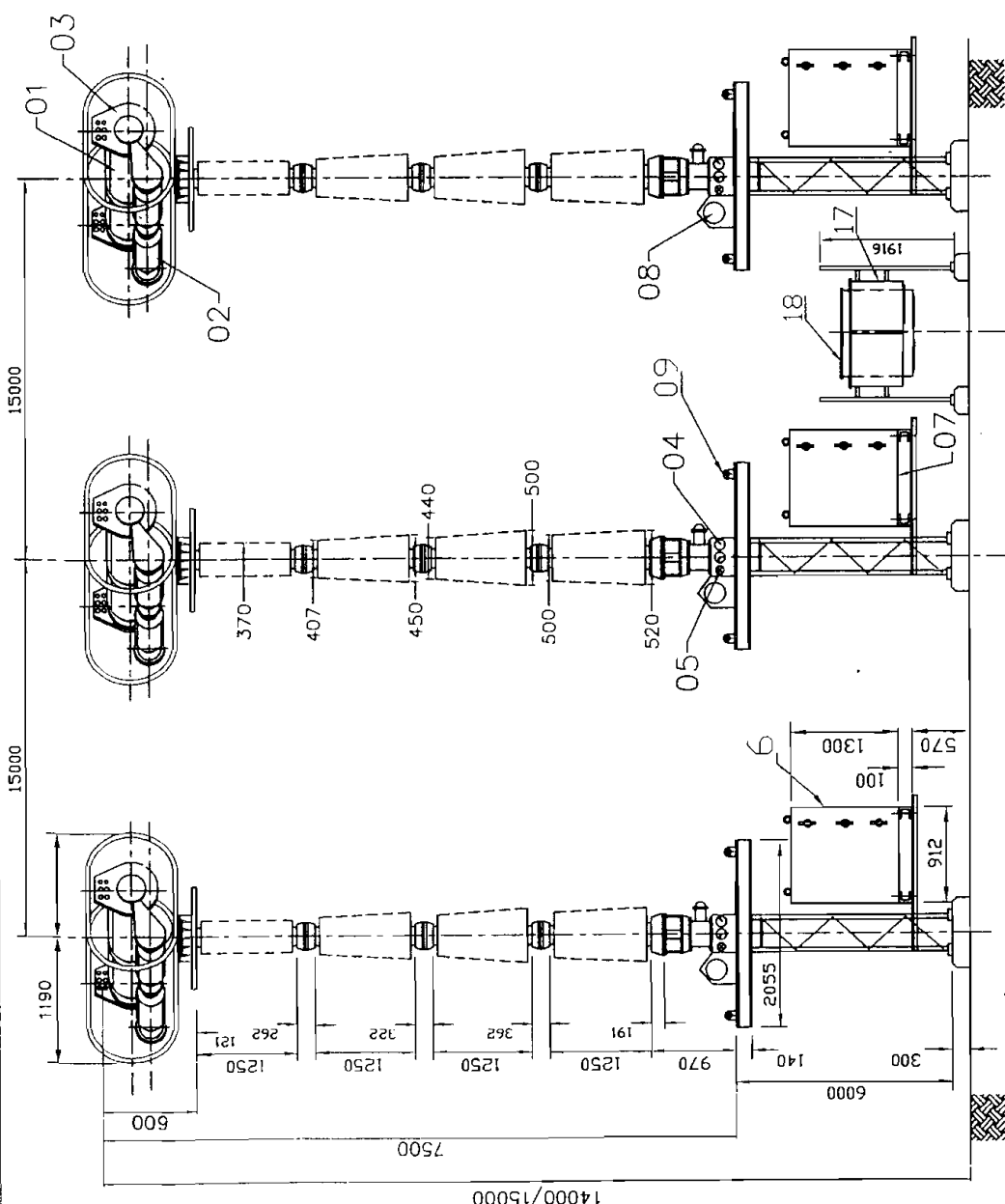
Site Mounting arrangement of 765 KV SF6 CT



weight of the assembly with gas = 2300 kgs(cpp).
 Base Details - Foundation holes (4x30) spaced in 1750 mm square.
 Diagonal distance between holes = 2475 mm

OCA of 800 kv SF6 CT

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm.)



MAIN ITEMS:

- 1 INTERRUPTER UNIT
- 2 GRADING CAPACITOR
- 3 TERMINAL PAD OF ALUMINIUM
- 4 SF6 GAS/OIL PRESSURE GAUGE, DENSITY MONITOR
- 5 INLET FOR SF6 GAS FILLING
- 6 CONTROL UNIT (REF. DRG. No. 3-518-33-96606)
- 7 CABLE GLAND PLATE (260X410)
- 8 ACCUMULATOR
- 9 LIFTING LUGS FOR TRANSPORTATION
- 10 CORONA RING ON TERMINAL SIDE
- 11 CORONA RING ON SUPPORT COLUMN SIDE
- 12 SUPPORT INSULATORS
- 13 HYDRAULIC MECHANISM WITH AUXILIARY SWITCH
- 14 ON/OFF INDICATOR
- 15 2 Nos. EARTH TERMINALS ARRANGED DIAGONALLY
- 16 SUPPORT STRUCTURE (REF. DRG. No. 3-518-33-96602)
- 17 LOCAL CONTROL CABINET (REF. DRG. No. 3-518-33-96607)
- 18 MARSHALLING BOX (REF. DRG. No. 3-518-33-96609)
- 19 RUPTURE DISC

ELEVATION

TYPE OF PRODUCT	NAME OF CUSTOMER/ PROJECT
1	2
3	4
5	6
7	8
9	10
11	12
13	14
15	16
17	18
19	20
21	22
23	24
25	26
27	28
29	30
31	32
33	34
35	36
37	38
39	40
41	42
43	44
45	46
47	48
49	50
51	52
53	54
55	56
57	58
59	60
61	62
63	64
65	66
67	68
69	70
71	72
73	74
75	76
77	78
79	80
81	82
83	84
85	86
87	88
89	90
91	92
93	94
95	96
97	98
99	100

800kV SF6 C.B. TYPE 3AT4



EHARAT HEAVY ELECTRICALS LIMITED
HYDERABAD

OUTLINE DIAGRAM

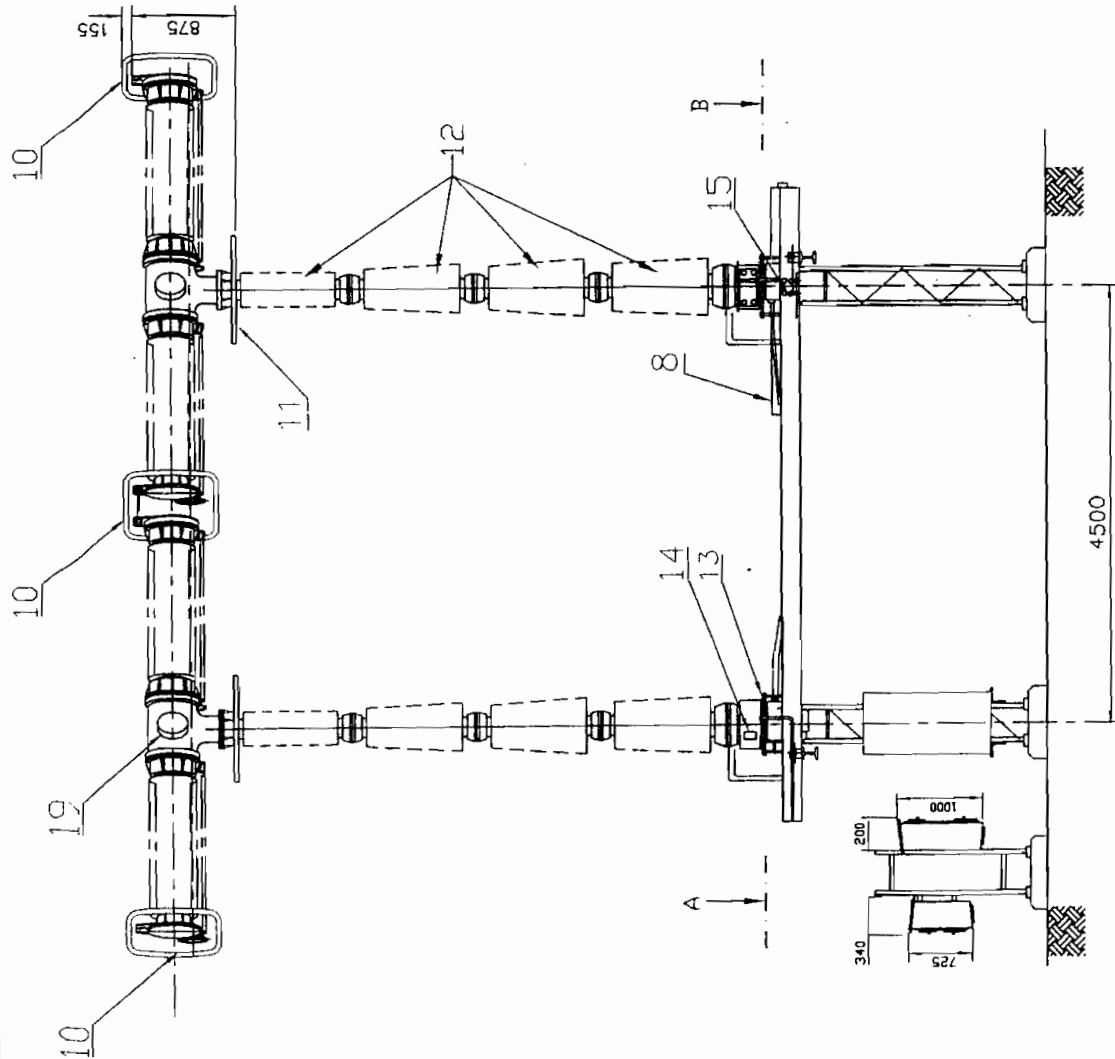
No. OF SHEETS	03
SHEET No.	01
CCN	REV

SCALE	JOB NO.	REV.
1/4" = 1'	3-518-33-06601	00

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

10996-33-815-3

DRG No.



SIDE VIEW

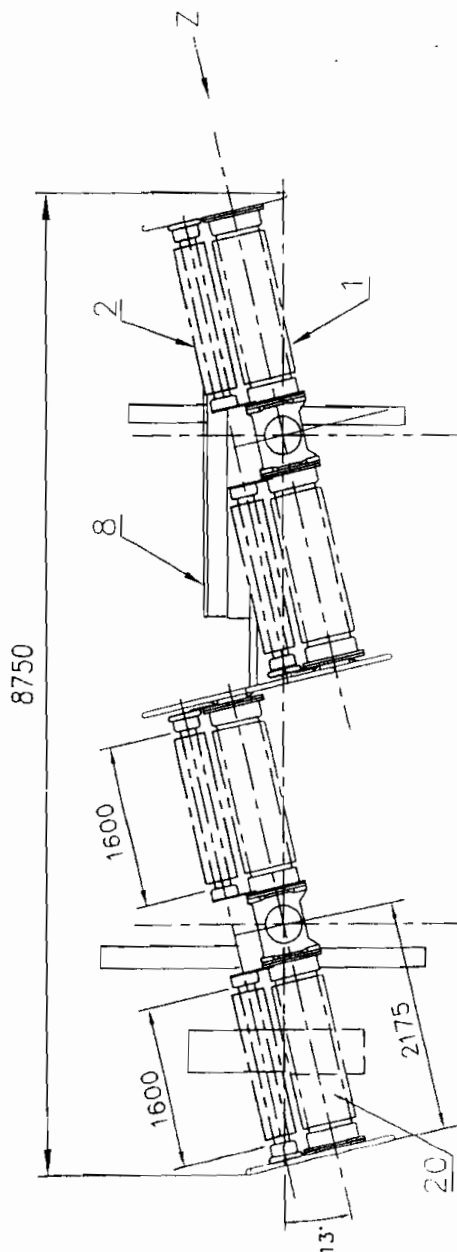
NOTES:

1. MINOR DEVIATIONS FROM THE DIMENSIONS STATED ARE PERMISSIBLE.
2. PERMISSIVE TERMINAL LOAD (P) (IN AXIAL DIRECTION ON EACH SIDE) STATIC 2000N UPTO WIND PRESSURE OF 154 Kg/M Sq.
3. TOTAL CREEPAGE DISTANCE TO EARTH 21000 mm
4. DYNAMIC LOAD DUE TO OPERATION OF BREAKER 40000N PER POLE IN VERTICAL DIRECTION IN ADDITION TO DEAD WEIGHT OF BREAKER.
5. PAINT: SIEMENS GREY RAL 7032 OF I.S. 5

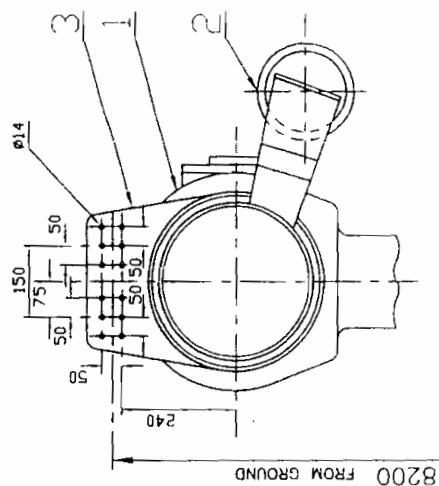
WEIGHT IN Kgs. (APPROX.)

BREAKER TYPE	: 3AT4
BREAKER NET	: 18500
SF6 FILLING [7.5 BAR (20°C)]	: 100
OIL FILLING	: 120
SUPPORT STRUCTURE	: 2500
TOTAL	: 21220

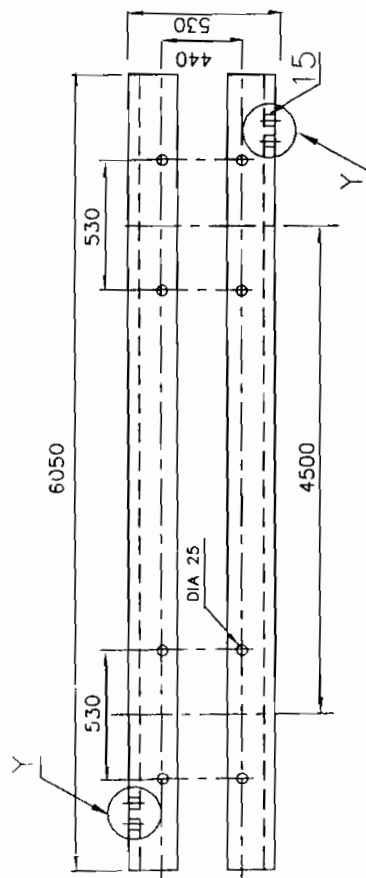
REV	DATE	ALTERED	CHECKED	REV	DATE	ALTERED	CHECKED	DISTRIBUTION OF PRINTS	DEPT	CODE	SCALE	JOB No.	REV
									SGD	4.35	N.T.S	3-518-33-815-3	02
BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD													03
OUTLINE DIAGRAM													02
INVENTORY No.													REV



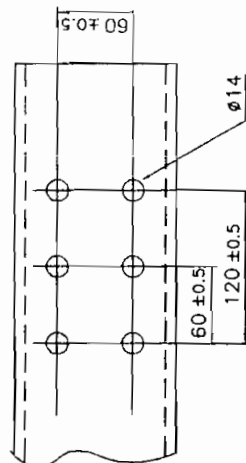
PLAN



VIEW 'Z'



SECTION A-B

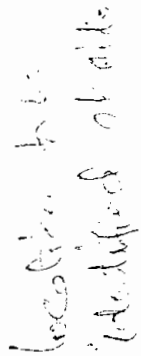


EARTHING DETAILS
DETAIL - Y

[illegible]

INVENTORY NO

DRG NO.	5 498 QD 00002
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[illegible]

PLAN VIEW

FORM NO.	3 498 00 00002
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END VIEW

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INVENTORY NO.

SIGNATURE

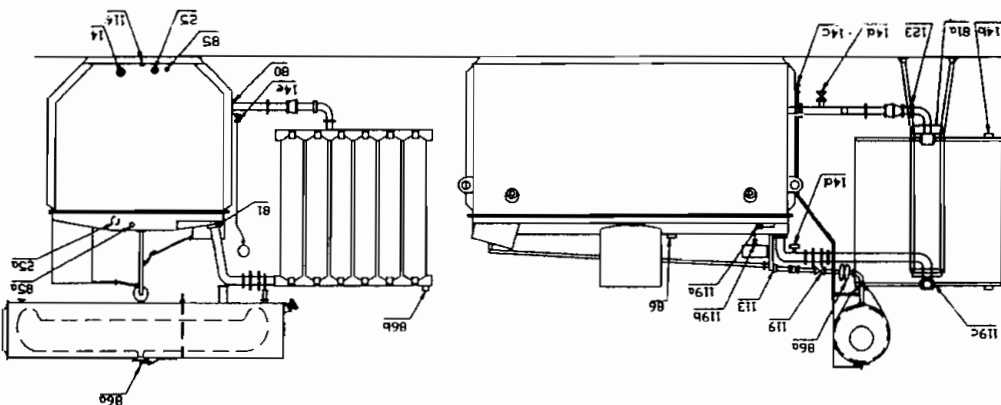
REF. DRG. NO.

FIRST ANGLE PROJECTION

DRG. NO. 61 867 E IN DWG

VALVE SCHEDULE

MVA-RATING 500 VALVE SCHEDULE PLATE DRG. NO. 3 498 19 00006 ELECTRICAL SPEC. NO. 601140



ITEM	DESCRIPTION	QTY.
------	-------------	------

14	100 NB C.I. VALVE FOR TOTAL DRAINAGE AT BOTTOM TANK	1
14b	25 DIA GATE VALVE FOR DIVERTER	1
14c	50 NB C.I. VALVE FOR MAIN CONSERVATOR FOR DRAIN	1
14d	50 NB C.I. FILTER VALVE FOR COOLING SYSTEM	1
14e	15 NB DRAIN GATE VALVE FOR AUXILIARY CONSERVATOR	1
25	50 NB FILTER CI VALVE FOR BOTTOM TANK	1
25a	50 NB FILTER CI VALVE WITH SAMPLING ATTACHMENT FOR TOP TANK	1
80	150 NB BUTTERFLY VALVE FOR OIL INLET	4
81	150 NB BUTTERFLY VALVE FOR OIL OUTLET	4
81a	150 NB BUTTERFLY VALVE FOR HEADERS	8
85	15 NB SAMPLING GATE VALVE FOR TOP TANK WITH PROVISION FOR FIXING RUBBER HOSE 10MM SIZE	2
86	1/2" BSP AIR RELEASE VALVE FOR TOP TANK	1
86a	1/4" BSP AIR RELEASE PLUG FOR MAIN CONSERVATOR AND PIPE WORK	2
86b	3/4" BSP AIR RELEASE PLUG FOR COOLING SYSTEM (RADIATOR PIPE WORK, HEADERS & EXPANSION JOINTS)	54
113	80 NB ISOLATING BUTTERFLY VALVE FOR BUCHOULZ RELAY	1
114	1/2" BSP DRAIN PLUG FOR BOTTOM TANK	2
114b	3/4" BSP DRAIN PLUG FOR COOLING SYSTEM (RADIATOR PIPE WORK & HEADERS)	54
119	80 NB ISOLATING CI VALVE FOR BUCHOULZ RELAY	1
119a	25 NB ISOLATING GATE VALVE FOR G.L.T.C. PROTECTIVE RELAY	1
119b	25 NB VALVE AUXILIARY CONSERVATOR (ISOLATING GATE VALVE)	1
119c	80 NB ISOLATING BUTTERFLY VALVE FOR RADIATORS	96
123	150 NB ISOLATING BUTTERFLY VALVE FOR PUMP & MOTOR SET & D.F.T.	8

NOTES:-

- FOR NORMAL WORKING OF TRANSFORMER KEEP ALL THE VALVES OPEN EXCEPT VALVES ITEM 14, 14a, 14b, 14c, 14d, 14e, 25, 25a, 86, 86a, 86b, 114, 114b, 119, 119a, 119b, 119c.
- OPERATOR SHOULD REFER MAINTENANCE INSTRUCTION BEFORE APPLYING VACUUM TREATMENT.

BHARAT HEAVY ELECTRICALS LIMITED

BHOPAL

NOTES TO SUPPLIER/SHOP:-

- FOR INSTRUCTION REFER DRG. NO. 34990000062.
- FOR MOUNTING PAD REFER DRG. NO. 44991500008 IT.002

6 VIEWS 9

R15

REV. NO.	3 498 19 00006	REV.	00
DRG. NO.	3 498 19 00006	DRG. NO.	00
VALVE SCHEDULE PLATE		VALVE SCHEDULE PLATE	
TITLE	VALVE SCHEDULE PLATE	TITLE	
DEPT. CODE	60081-A-512-01	DEPT. CODE	
STATUS OF DRAWING	ISSUED	STATUS OF DRAWING	
SCALE	1:1	SCALE	
DATE	10/10/2006	DATE	
DRAWN BY	DRG. NO. 34990000062	DRAWN BY	
CHECKED BY	DRG. NO. 34990000062	CHECKED BY	
APPROVED BY	DRG. NO. 34990000062	APPROVED BY	
REVISIONS		REVISIONS	
REVISION NO.		REVISION NO.	
REVISION DESCRIPTION		REVISION DESCRIPTION	
REVISION DATE		REVISION DATE	
REVISION BY		REVISION BY	
REVISION CHECKED BY		REVISION CHECKED BY	
REVISION APPROVED BY		REVISION APPROVED BY	

REV	DATE	ALT	REV	DATE	ALT
		CKD			CKD
		APPD			APPD

ALL DIMENSIONS ARE IN MM

FOR PROTECTION

DRG. NO. 3 488 00 00009

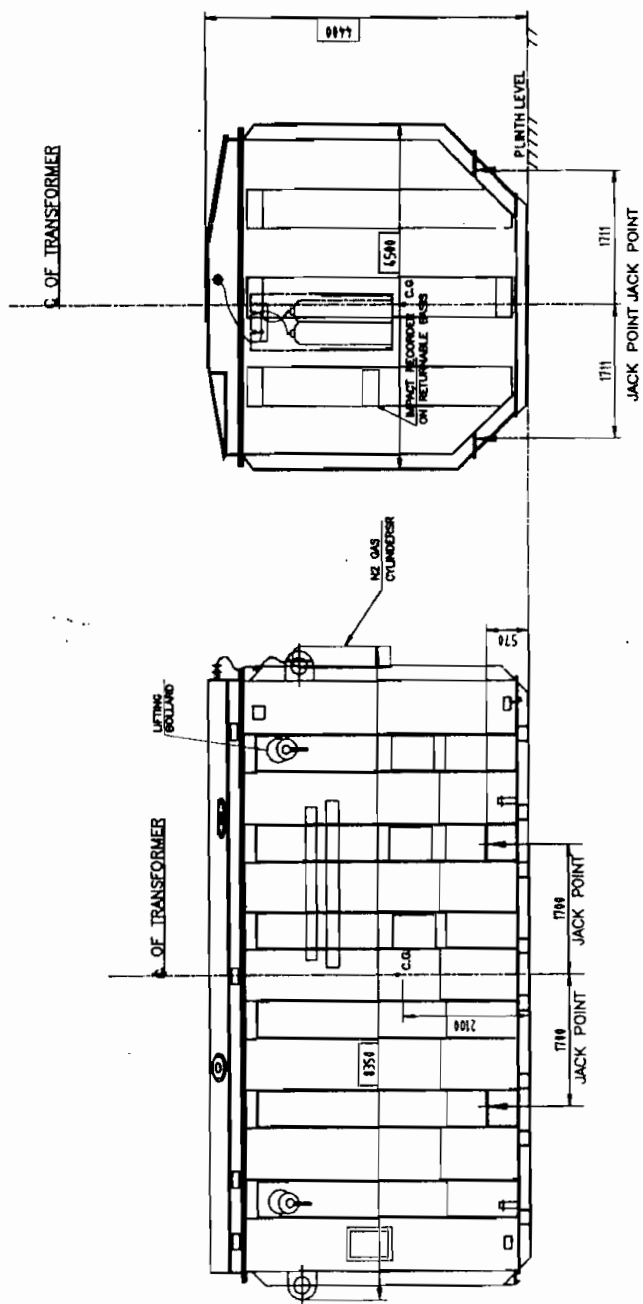
BHARAT HEAVY ELECTRICALS LTD.

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04640000138/02

SIGNATURE

INVENTORY NO.



NOTES-

1. DIMENSIONS SHOWN THUS ARE OVERALL SHIPPING DIMENSIONS
2. APPROXIMATE SHIPPING WEIGHT 239 TONNES (GAS FILLED)
3. N2- GAS FILLED IN TRANSFORMER AT 0.15 KG/CM AND TO BE MAINTAINED DURING TRANSPORT AND STORAGE.

NO. OF UNIT		DATE		TITLE	
1		10/01/2000		SHIPPING DIAGRAM	
DRAWN BY: S. K. SINGH		CHECKED BY: S. K. SINGH		DATE: 10/01/2000	
DESIGNED BY: S. K. SINGH		APPROVED BY: S. K. SINGH		DATE: 10/01/2000	
LITERATURE PRODUCT		W.O. 68881-A-572-41		DEPT. 11111	
NAME OF COMPANY/PROJECT		W.O. 68881-A-572-41		DEPT. 11111	
NOMINAL INFORMATION		W.O. 68881-A-572-41		DEPT. 11111	
STATUS OF DRAWING		W.O. 68881-A-572-41		DEPT. 11111	
DISTRIBUTION OF PRINTS		W.O. 68881-A-572-41		DEPT. 11111	
TITRE		W.O. 68881-A-572-41		DEPT. 11111	
SHEET NO.		3		488 00 00009	
REV.		00		00	

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INVENTORY NO.

SIGN. DATE

REF. DRG. NO.

FIRST ANGLE PROJECTION

40000 00 684 51 IN 300

(ALL DIMENSIONS ARE IN MM)

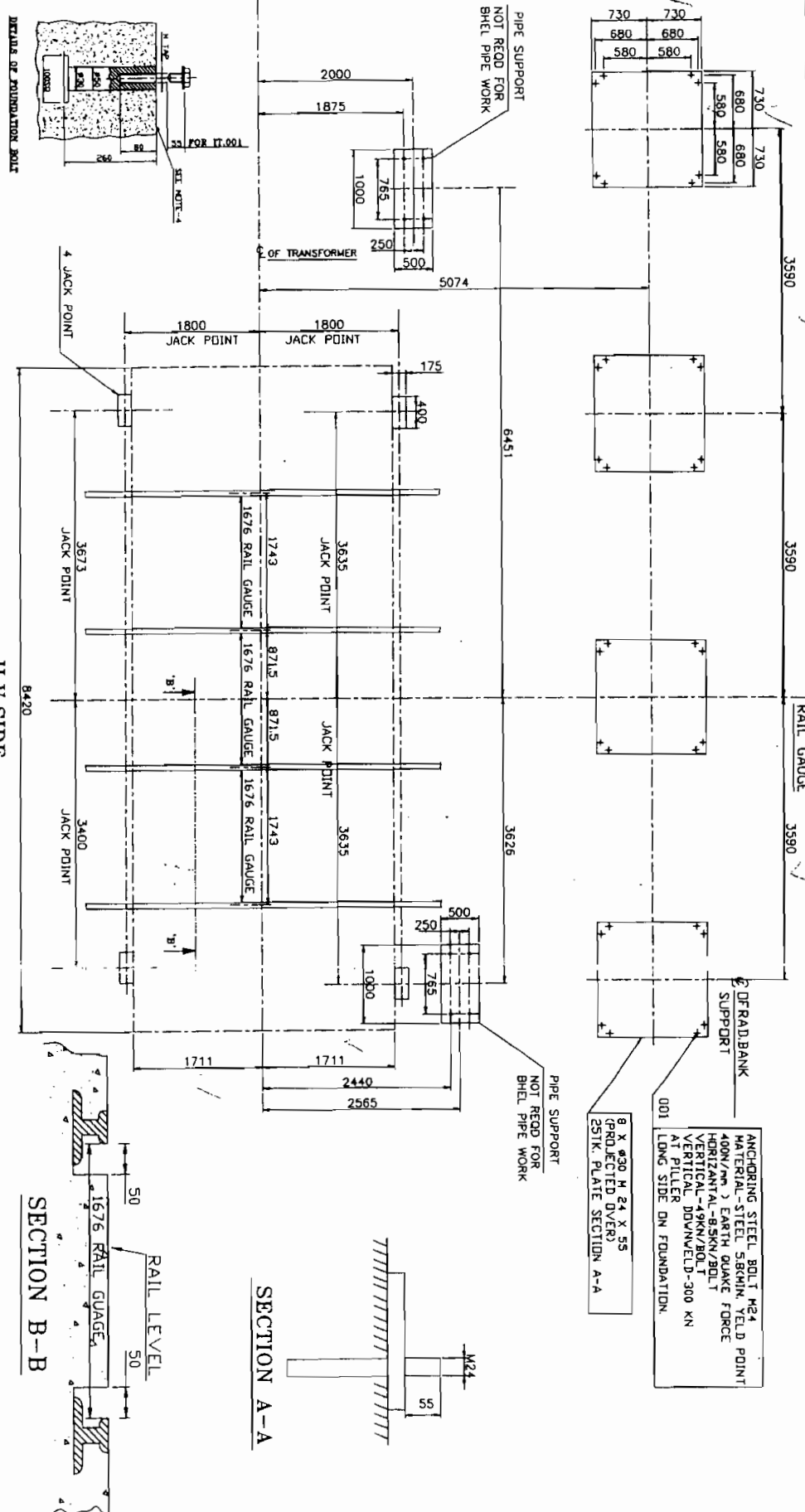


TABLE FOR FOUNDATION BOLTS

BOLT SIZE	NO. OF BOLTS	DESCRIPTION	NO. OF FOUNDATIONS	ITEMS EACH
M 24	32	RADIATOR SUPPORT	4	1460 X 1460 20000

NOTES:-

- 1- FOUNDATION AS SHOWN ARE AVAILABLE AT SITE.
- 2- ALL CONCRETE FOUNDATIONS SHOULD BE IN LEVEL AS SHOWN IN SECTION B-B & SECTION A-A.

REV DATE

ALT

REV DATE

ALT

REV DATE

ALT

REV DATE

ALT

REV DATE

ALT

REV DATE

ALT

REV DATE

ALT

NO. OF UNIT	ONE
LOCATION	766/400/800Y SECON SUB-STATION.
LOCAL NO.	C-0811-8046-3/CA-1/7644/PLATED 30/08/08.
SPECIFICATION NO.	C/ENGD/800/76-SECON
TITLE OF PRODUCT	600 MVA 766/13/400/3/3S IV 1 PH AUTO TRANSFORMER
NAME OF COMPANY/PROJECT	POWERGRID CORPORATION OF INDIA
ADDITIONAL INFORMATION	0001
STATUS OF DRAWING	REV
DISTRIBUTION TO PRINTS	REV
FILE NO.	REV
TITLE	FOUNDATION PLAN
REV.	00

SECTION B-B

SECTION A-A

FIRST ANGLE PROJECTION

50000 00 867 3 IN 596

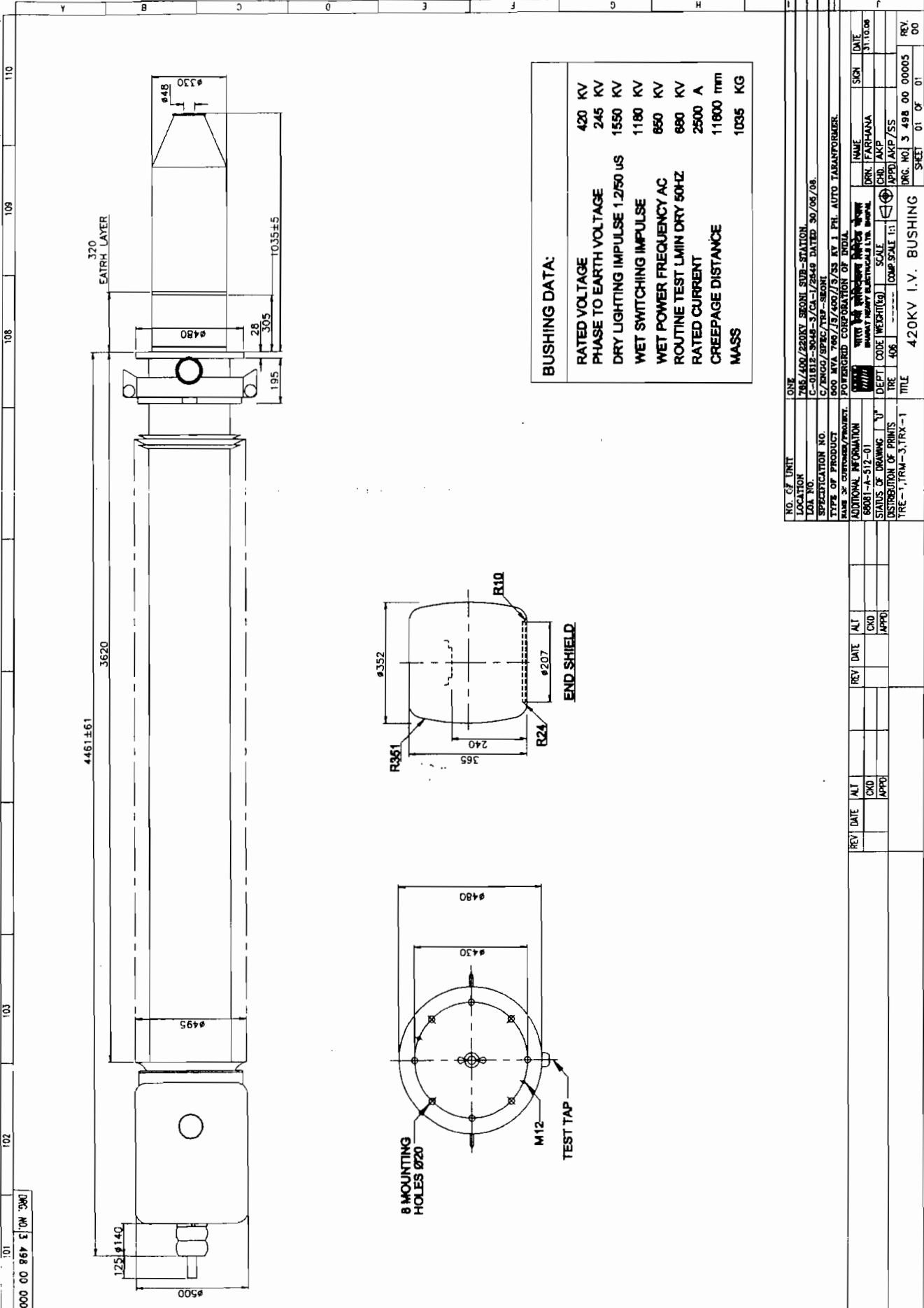
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REF. DRG. NO.

SIGN. DATE

INVENTORY NO.

(ALL DIMENSIONS ARE IN MM)

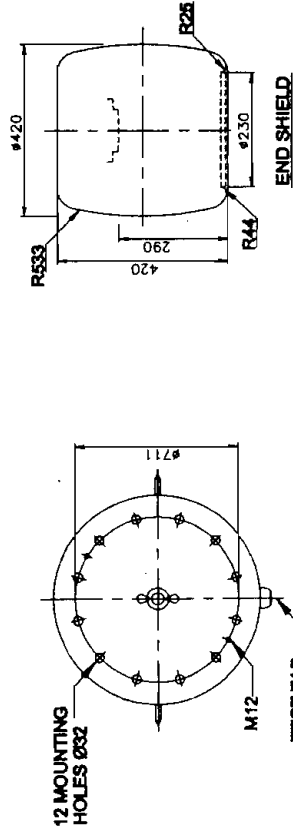
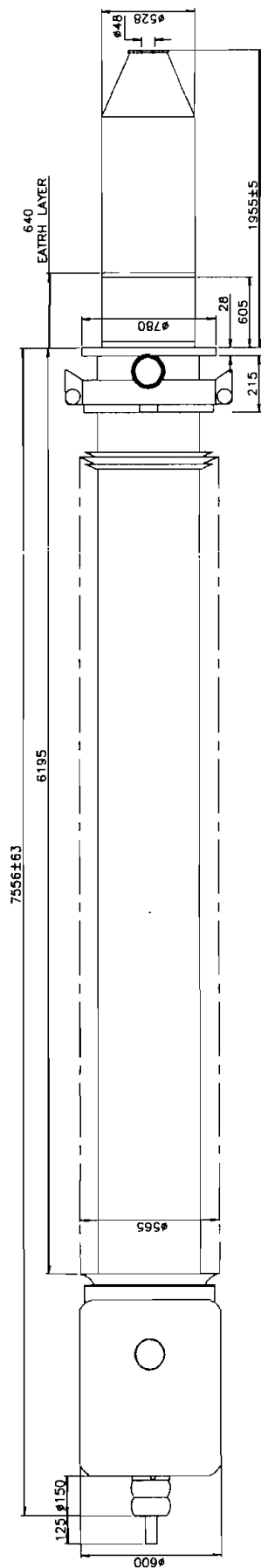


NO. OF UNIT	ONE				
LOCATION	785/400/220KV SEONI SUB-STATION				
LOA NO.	C-01812-S046-3/CA-1/2849 DATED 30/06/08.				
SPECIFICATION NO.	C/ENCO/SPCC/TRP-SEONI				
TYPE OF PRODUCT	800 MVA 765/13/400/13/55 KV 1 PH. AUTO TRANSFORMER.				
NAME OF CONTRACTOR/PROJECT.	POTENTIAL CORPORATION OF INDIA				
STATUS OF DRAWING	DESIGN				
DISTRIBUTION OF PRINTS	DRN. FARHANA CHK. AKP APPD. AKP/SS				
REV. DATE	ALT	REV. DATE	ALT	REV. DATE	ALT
01	OKD		OKD		OKD
	APPD		APPD		APPD
TITLE					
420KV I.V. BUSHING					
SHEET 01 OF 01					

DRAW THROUGH LEAD TYPE[illegible]

INVENTORY NO.	
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BUSHING DATA:

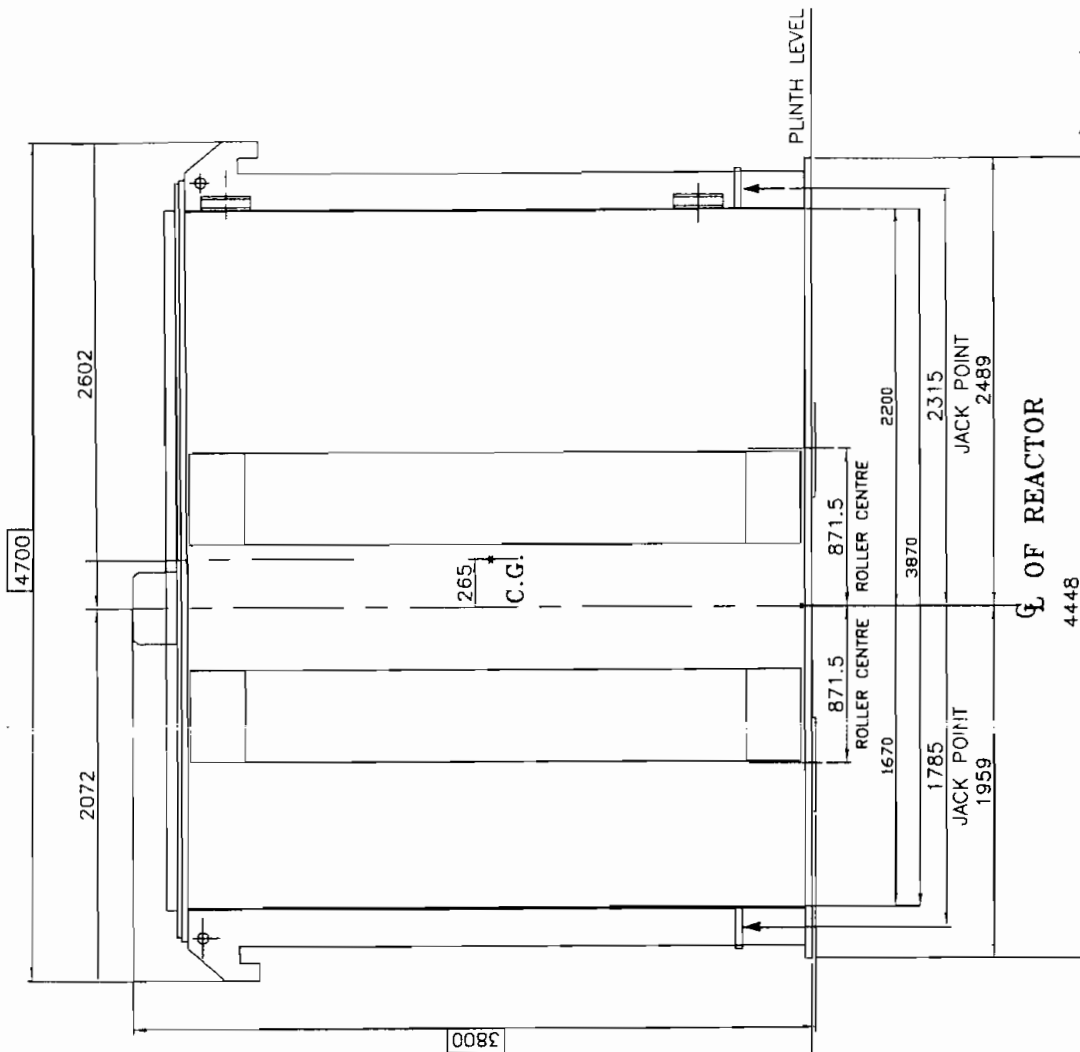
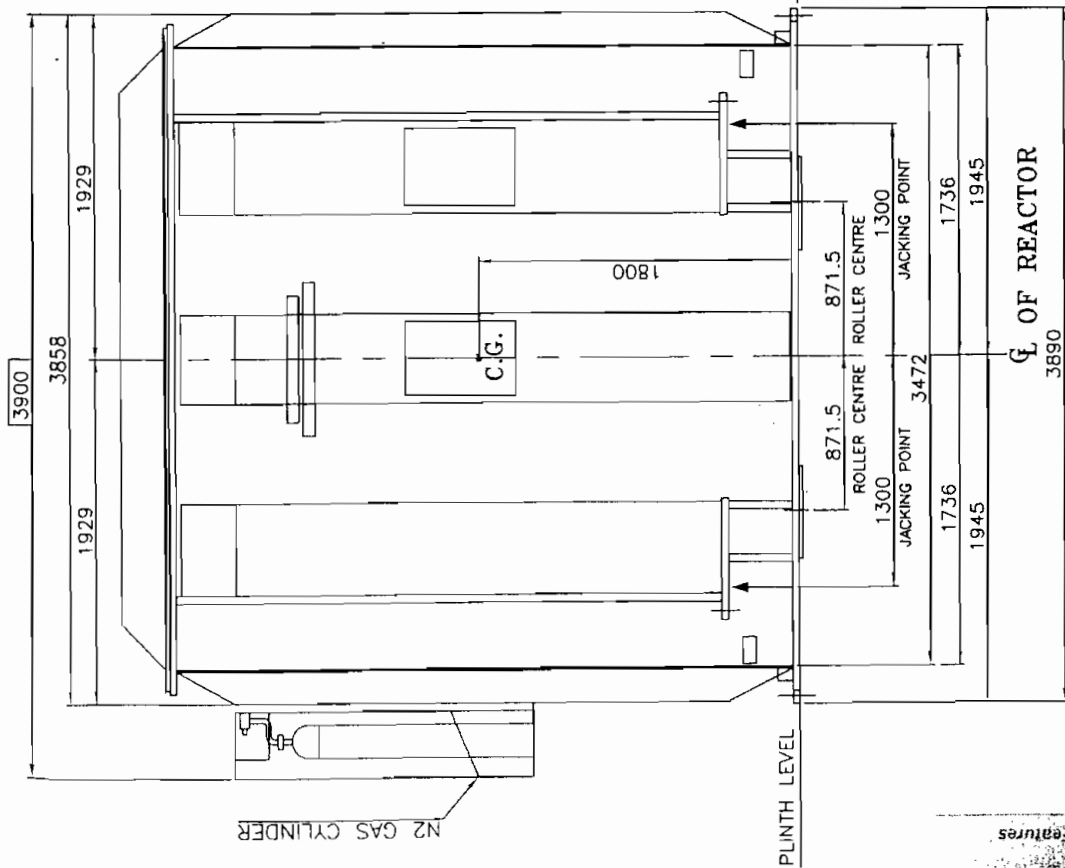
RATED VOLTAGE	800 KV
PHASE TO EARTH VOLTAGE	485 KV
DRY LIGHTING IMPULSE 1.2/50 US	2550 KV
WET SWITCHING IMPULSE	1920 KV
WET POWER FREQUENCY AC	1000 KV
ROUTINE TEST LMIN DRY 50HZ	1000 KV
RATED CURRENT	2500 A
CREEPAGE DISTANCE	20000 mm
MASS	2915 KG

[illegible]

REV	DATE	ALT	REV	DATE	ALT
		CKD			CKD
		APPO			APPO

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DRG. NO.	3 469 00 00500
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location to be identified at site

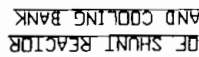
OTES:-

DIMENSIONS SHOWN THUS ARE OVERALL SHIPPING DIMENSIONS.
APPROXIMATE SHIPPING WEIGHT WITHOUT OIL 68 TONNES.

[illegible]

COMP.C/DTR04005BP/34690000600.DWG.

Complete



COMP.C/DTR04005BP/34690000796.DWG.

102

103

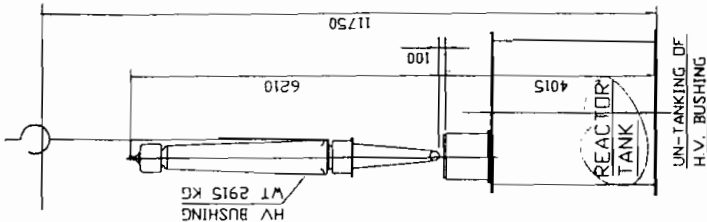
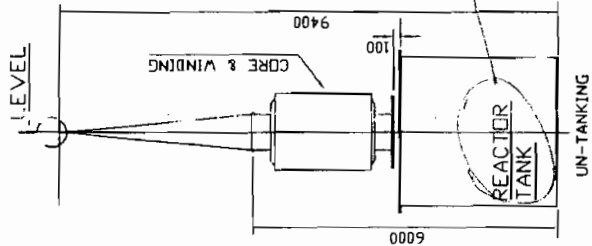
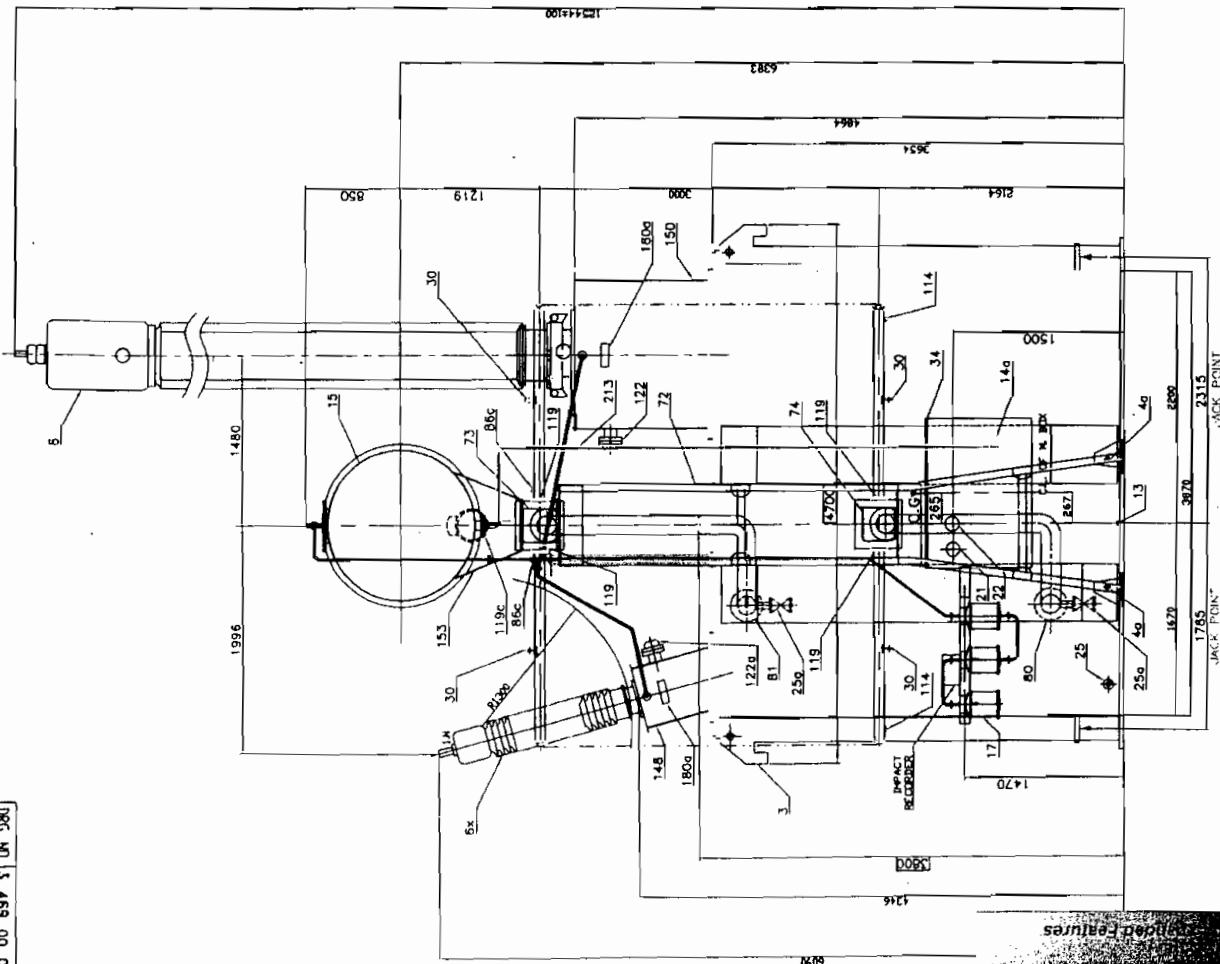
105

106

108

109

110



MIN. AIR CLEARANCES

	800 KV	145 KV
PHASE TO PHASE	NA	NA
PHASE TO EARTH	6150	1300

NOTES:-

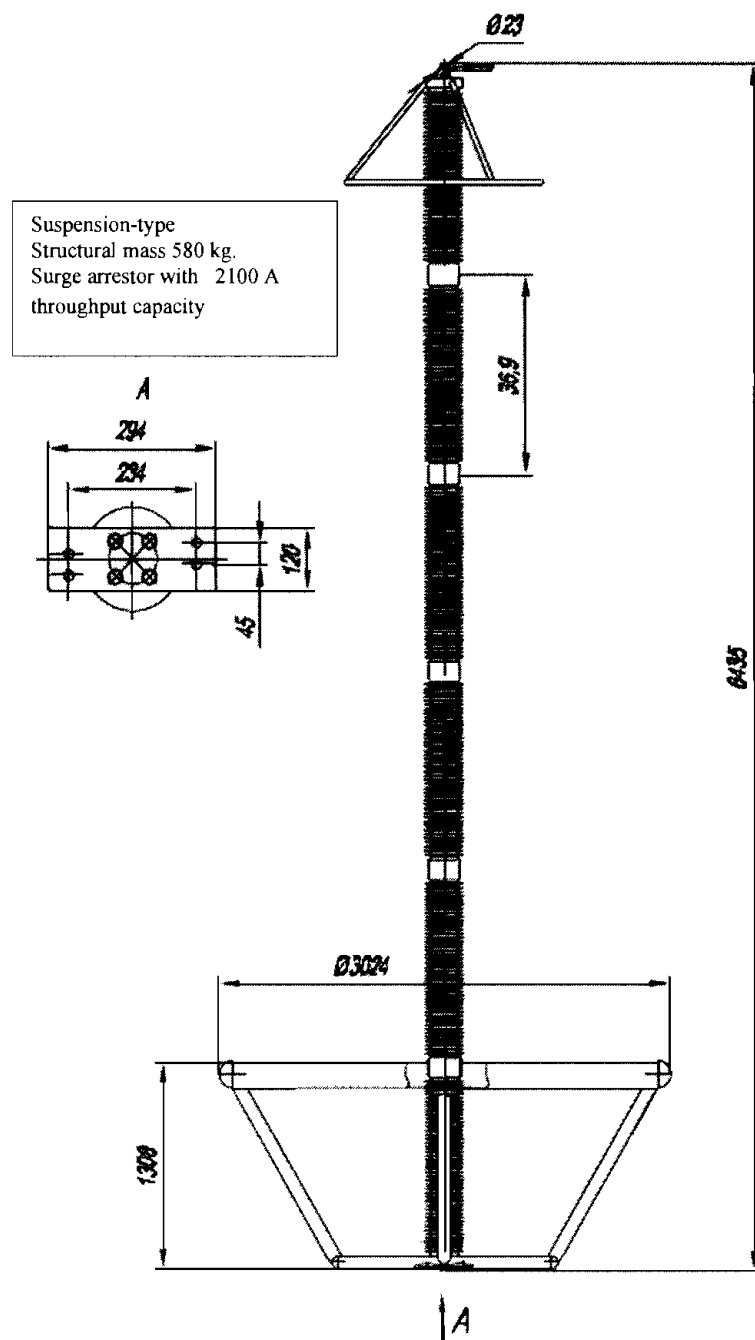
1. WHEN REFERRING THIS DRAWING PLEASE QUOTE HVAR & V.O. NO.
2. PAINTING AT OUTSIDE THE REACTOR TANK IS AS PER SHADE NO. 697 OF IS:5.
3. WIRING FROM INSTRUMENT CTS. ETC. ARE NOT SHOWN FOR CLARITY.
4. FOUNDATION BOLTS ARE IN THE SCOPE OF BHEL SUPPLY.
5. FOR PART LIST OF DGA REFER DRAWING NO. 34690000797
6. DIMS. SHOWN THIS ARE OVERALL SHIPPING DIMENSIONS EXCLUSIVE OF PACKING.
7. DIMENSIONS SHOWN ARE WITH REF. TO PLINTH LEVEL.

IMPORTANT NOTE:-

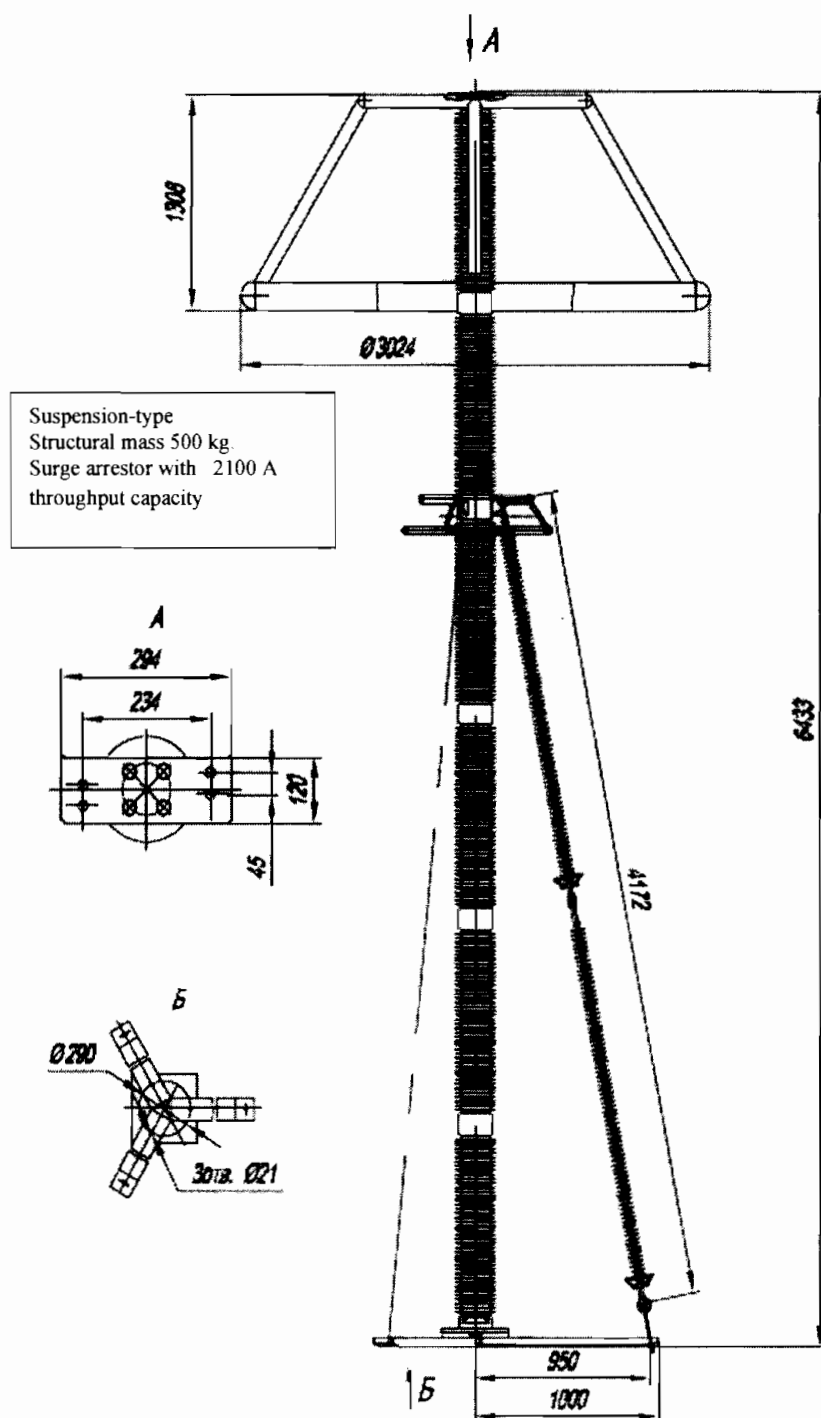
1. THE DESIGN FEATURES SHOWN ON THIS DRAWING GENERALLY IN LINE WITH IS:5553/IEC - 289 APPLICABLE STANDARD & AGREED CUSTOMER SPECIFICATION MEETS THE STATUTORY, REGULATORY & SAFETY REQUIREMENTS WITH RESPECT TO EARTHING ARRANGEMENT, DANGER & OTHER LABELS, CLEARANCES IN AIR PROVISION FOR PRESSURE RELIEF DEVICE, GAS ACTUATED RELAY AND ANTI-EARTHQUAKE CLAMPING ARRANGEMENT.

NO. OF UNIT	ONE
LOCATION	765/400/220KV SEONI SUB-STATION.
LOA NO.	C-01812-S048-3/CA-1/2549 DATED 30/05/08.
SPECIFICATION NO.	C/ENG/SPEC/SR-SEONI
TYPE OF PRODUCT	BOMVAR 765/400KV 1-PHASE SHUNT REACTOR
NAME OF CUSTOMER/PROJECT	POWERGRID CORPORATION OF INDIA LTD.
ADDITIONAL INFORMATION	W.D. BHARAT HEAVY ELECTRICALS LTD. BHUPALNAGAR, M.P.
W.D. 68082-A-517-01	DEPT. CODE WEIGHT (kg)
STATUS OF DRAWING "UP"	SCALE
DISTRIBUTION OF PRINTS	TRE 406
TRC-1, TRM-3, TRX-1	TITLE
REV. NO. 3 459 00 00796	DGA ARRGT. END VIEW
REV. 00	SHEET 03 OF 03
DATE 30/10/08	SIGN

TECHNICAL SPECIFICATION FOR 750 KV SURGE ARRESTORS



SA Type	Rated Voltage class KV	Max long time operating Voltage, KV	Min breakdown current, KA	Throughput capacity at square pulse of 2000 mks, A	Discharge voltage, not exceed KV						specific dissipation energy of throughput current (I)
					Switching surge (I) at wave 30/60 mks and magnitude			Lightning surge (I) at wave 8/20 mks and magnitude			
ОПНн 750/455	750	455	20	2100	0.5KA	1KA	2KA	5KA	10KA	20KA	Kilojoules/KV
					1108	1155	1182	1275	1340	1445	10.9



SA Type	Rated Voltage class KV	operating Voltage, KV Max	breakdown current, KA Min	Throughput capacity at square pulse of 2000 mks, A	Discharge voltage, not exceed KV						Specific dissipation energy of throughput current (I)
					Switching surge (I) at wave 30/60 mks with magnitude			Lightning surge (I) at wave 8/20 mks with magnitude			
ОПНп 750/478	750	478	20	2100	0.5KA	1KA	2KA	5KA	10KA	20KA	Kilojoules/KV
					1164	1213	1242	1339	1407	1518	10.9

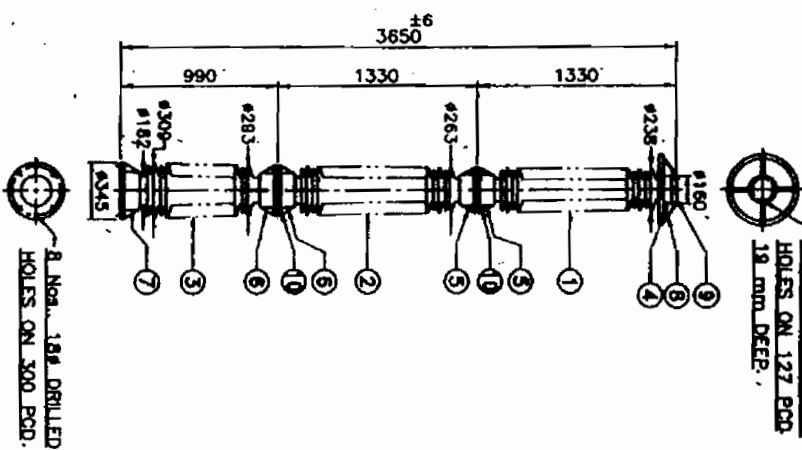
DRG No.
5.6483.00
REV. 1

NOTES:-

1. GENERAL TOLERANCE: $\pm(0.04d+1.5)$ mm. WHEN 'd' IS ≤ 300 mm. $\pm(0.02d+6)$ mm. WHEN 'd' IS > 300 mm. WHERE 'd' IS THE DIMENSION IN mm.
2. SHED PROFILE WILL BE ALTERNATE LONG AND SHORT AS PER IEC 815.
3. EXCESS SAND WILL BE PAINTED BROWN.
4. POLUTION LEVEL AS PER IEC 815 HEAVY (CLASS III).
5. ALL FERROUS PARTS SHALL BE HOT DIP GALVANISED AS PER IS: 2633 / IS: 2624.
6. MINIMUM STEEL DIA AT THE TOP OF INSULATOR STACK SHALL BE 100 mm.
7. FLAT WASHER SHALL BE CIRCULAR OF A DIA 2.5 TIMES THAT OF BOLT AND OF SUITABLE THICKNESS.
8. NOM. HTS. TAPPED HOLES ON 127 PCD.
9. HOLES ON 127 PCD.

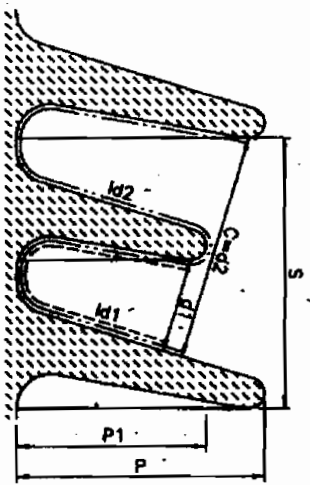
ALL DIMENSIONS ARE IN mm.

This doc is for internal details / Customer particulars
-Outside revision control-



400 kV IEC: 815	PART-1	PART-2	PART-3
C	≥ 30 mm	60.55	59.12
s/p	≥ 0.8	1.10	1.08
ht/dt	< 5	3.92	4.04
ht/dt	< 3	3.97	4.05
p-p1	≥ 10	15	15
h/h	≤ 4	3.50	3.56
ht+2p1+3	> 0.7	1.11	

SHED PARAMETERS
(BASED ON NOMINAL DIMENSIONS)



TECHNICAL PARTICULARS

01. HIGHEST STEEL VOLTAGE	kV (rms)	420
02. MINIMUM NOMINAL OVERPAGE DISTANCE	mm	10500
03. DRY ONE MINUTE POWER FREQUENCY WITHSTAND VOLTAGE	kV (rms)	660
04. WET ONE MINUTE POWER FREQUENCY WITHSTAND VOLTAGE	kV (rms)	660
05. DRY POWER FREQUENCY FLASHOVER VOLTAGE	kV (rms)	720
06. WET POWER FREQUENCY FLASHOVER VOLTAGE	kV (rms)	700
07. IMPULSE WITHSTAND VOLTAGE (+ve & -ve)	kV (peak)	1550
08. IMPULSE FLASHOVER VOLTAGE (+ve)	kV (peak)	1600
09. IMPULSE FLASHOVER VOLTAGE (-ve)	kV (peak)	1650
10. WET SWITCHING SURGE WITHSTAND VOLTAGE (+ve & -ve)	kV (peak)	1050
11. MINIMUM CORONA EXTINCTION VOLTAGE	kV (r.m.s)	320
12. RADIO INTERFERENCE VOLTAGE (MICRO VOLT AT 1MHz)	Micro volt	< 500
13. CANTILEVER STRENGTH (UPRIGHT)	Kg	800
14. TORSIONAL STRENGTH	KgM AS PER IEC.	9000
15. TENSILE STRENGTH	Kg	18000
16. COMPRESSIVE STRENGTH	Kg	18000
17. APPLICABLE STANDARD	IS:2544, IEC 60168, 60273, 60815	
18. WEIGHT OF COMPLETE STACK (Approx)	Kg	318.0

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REF:

ITEM	DESCRIPTION	QTY. IN	SCALE	NTS	CHKD.	APD.	REMARKS
1	TOP INSULATOR	1	420 kV WITH C.C. RING				
2	MIDDLE INSULATOR	1	CYLINDRICAL POST INSULATOR				
3	BOTTOM INSULATOR	1	W.S. INDUSTRIES (INDIA) LIMITED				
4	TOP CAP	1	CHENNAI (MAADRAS)				
5	TOP INTERMEDIATE FLANGES	2	DRN. 1/2				
6	BOTTOM INTERMEDIATE FLANGES	2	DRG. No. 5.6483.00				
7	BOTTOM FLANGE	1	REV. 1				
8	CORONA CONTROL RING	1	SHEET: 1 OF 5				
9	WET AND FLAT WASHER	1					
10	WET AND FLAT WASHER	1					
11	WET AND FLAT WASHER	1					
12	WET AND FLAT WASHER	1					
13	WET AND FLAT WASHER	1					
14	WET AND FLAT WASHER	1					
15	WET AND FLAT WASHER	1					
16	WET AND FLAT WASHER	1					
17	WET AND FLAT WASHER	1					
18	WET AND FLAT WASHER	1					
19	WET AND FLAT WASHER	1					
20	WET AND FLAT WASHER	1					

REVISION
1. Dwg. REVISED AS PER DCR DT. 02.08.08 FROM D & E DEPT. M.T. 02.08.08

8 Nos. 18. DRILLED HOLES ON 300 PCD.

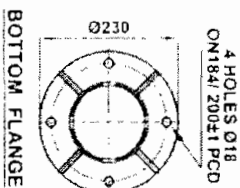
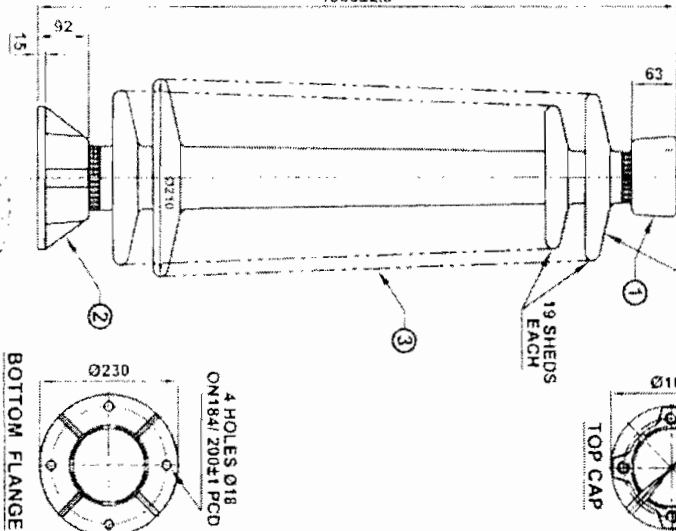
IEC EMBLEM
INDIA
MONTHS/YEAR

4 HOLES M16
ON 127.51 PCD



19 SHEETS
EACH

1500±2.5



GUARANTEED TECHNICAL PARTICULARS

GENERAL

1. Applicable standards IS: 2544 / IS: 5350 / IEC: 60168 / IEC: 60273 / IEC: 60815
2. TYPE: Solidcore post insulator
3. General Tolerance: $\pm (0.04d + 1.5)$ mm. When 'd' is ≤ 300 mm.
 $\pm (0.0025d + 6)$ mm. When 'd' is > 300 mm.
Where, 'd' is the dimension in mm.

4. Colour of Glaze: BROWN
5. All ferrous parts are Hot dip galvanized
6. Pollution level as per IEC: 60815 (Class - III)
7. Min. Nom. Creepage distance mm. 3625
8. Weight of Complete Stack kg. 65

MECHANICAL VALUES

1. Ultimate Cantilever strength (Height) kN 6.0
2. Ultimate Torsional strength kNm. 3.0
3. Tensile strength kN. 70
4. Compression strength kN. 140

ELECTRICAL VALUES

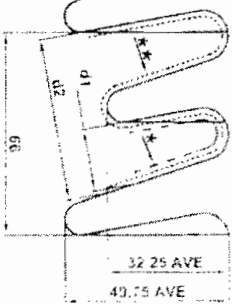
1. Nominal system voltage kV (rms) 132
2. Highest system voltage kV (rms) 145
3. One minute power frequency withstand voltage (dry) kV (rms) 285
4. One minute power frequency withstand voltage (wet) kV (rms) 275
5. One minute power frequency flashover voltage (dry) kV (rms) 300
6. One minute power frequency flashover voltage (wet) kV (rms) 280
7. Lightning impulse withstand voltage (1.2/50 μ sec. +Ve/-Ve wave) kVp 650
8. Impulse flashover voltage (+Ve) kVp. 700
9. Min. Corona extinction voltage (-Ve) kVp 710
10. Min. Corona extinction voltage kV. 105

RADIO INTERFERENCE VOLTAGE DATA

- Test voltage to ground kV 105
Max. RIV at 1 MHz μ V. < 500

* = Id1
** = Id2

SHED PROFILE



145 kV	AS PER IEC: 60815	AS PER ACTUAL
C	2.10 mm	54.5
S/P	2.03	1.32
Wt/ut	< 5	3.28
Wt/d2	< 5	3.15
P1 - P2	2.15	17.5
Lt/St	3.4	2.75
Inclination of sheds	TOP $> 5^\circ$ BOT. $\geq 2^\circ$	18° 10°
2P1+2P2+S	2.07	1.13

IT. NO.	DESCRIPTION	MATERIAL	DRG. NO.	QTY	FINISH
6	FLAT WASH-ER M16	M.S		8	Galvanized
5	SPRING WASH-ER M16	SPRING STEEL		8	ELECTRO GALV.
4	HEX. BOLT & NUT M16	M.S		8	Galvanized
3	SHELL	PORCELAIN	PFI 7426	1	BR. GLAZE
2	BOT. FLANGE	M.C.L. / S.G.L	T/H2 77426	1	Galvanized
1	TOP CAP	M.C.L. / S.G.L	T/H1R0330004	1	Galvanized

BHARAT HEAVY ELECTRICALS LTD.



132 kV SOLIDCORE POST INSULATOR

TITLE:

VENDOR: **IEC** INSULATORS & ELECTRICALS COMPANY.
MAHADEEP (M.P.)
PROP. HINDUSTAN VIDYUT PRADIKTA LTD.
CUSTOMER: **POWERGRID CORPORATION OF INDIA LIMITED**
NEW DELHI
NOA NO. - C-33020-S162-1/CA-II/3004 dated 27.03.2009 & C-33020-S162-1/CA-II/3005 dated 27.03.2009
PROJECT: 40% FIXED SERIES COMPENSATION ON 400KV WARDHA RAIPUR D/C LINE AT WARDHA

CONTRACTOR:

DRAWING No. **C Q S 1 3 2 P 0 1 2**

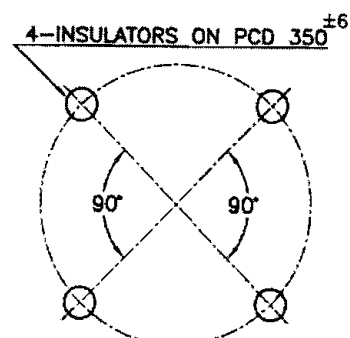
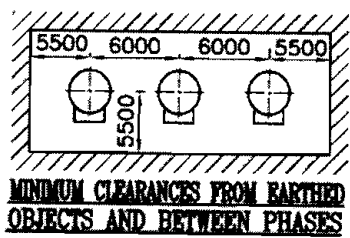
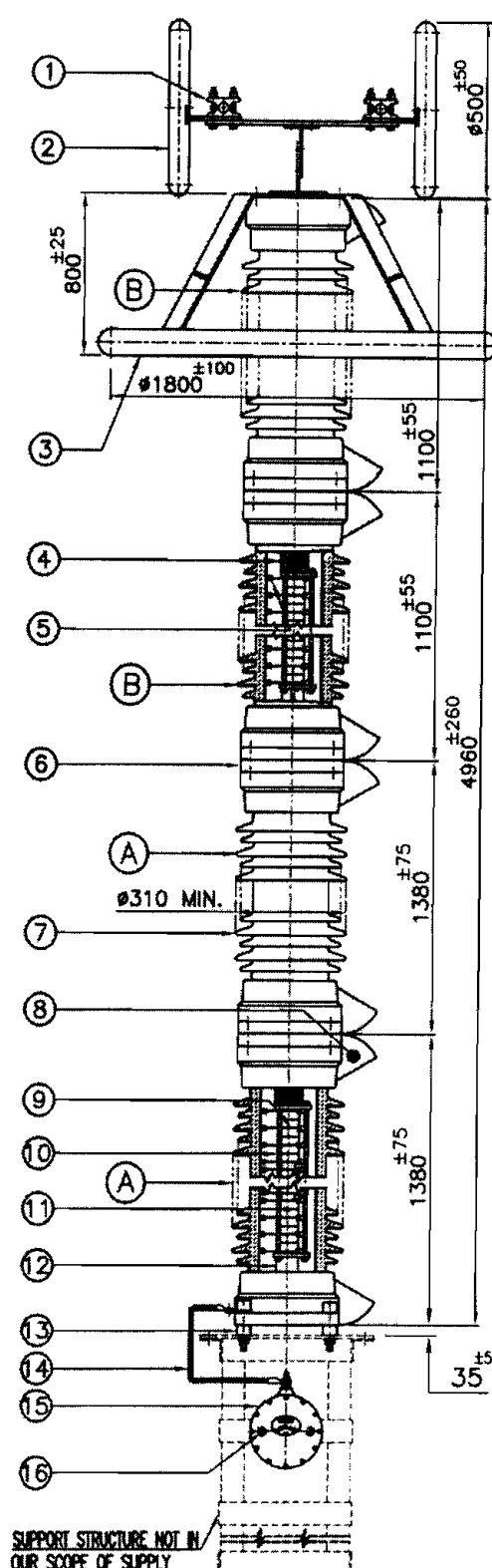
RELEASED FOR ☒ PRELIMINARY ☐ TENDER ☐ INFORMATION ☐ APPROVAL ☐ CONSTRUCTION

SCALE: NTS

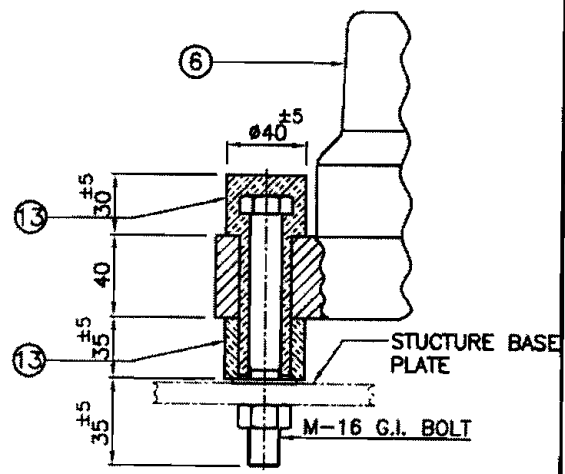
DRWN: ANIL S
CHKD: ANIL S
APPD: ANIL S

SHEET: 01 OF 01

PROJECTION: 1st



ARRESTER BASE MOUNTING DETAILS



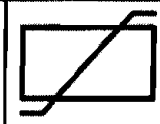
INSULATING BASE SECTION

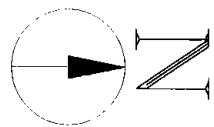
ARRESTER MODEL	ARRESTER RATING kV	DISCHARGE CURRENT kA	UNIT RATING-kV	
			A	B
ZAP-360-SM	360	20	108	72

- | | |
|--------------------------|---|
| 8. PRESSURE RELEASE PORT | 16. EARTHING & FIXING TERMINATION |
| 7. ARRESTER HOUSING | 15. SURGE MONITOR |
| 6. END CASTING | 14. CONNECTING LEAD (35 Sq mm INSULATED AL CABLE 1.5M LENGTH) |
| 5. BUMPER | 13. INSULATING BASE |
| 4. COMPRESSION SPRING | 12. SPACER |
| 3. GRADING RING | 11. ZnO. ELEMENT |
| 2. CARONA RING | 10. INSULATING TIE ROD |
| 1. TWIN TERMINAL CLAMP | 9. CONTACT ELECTRODE |

CONTRACTOR : BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION PROJECTS DIVISION
CUSTOMER : ALAKNANDA HYDRO POWER COMPANY LTD.,
PROJECT : 400kV SWITCH YARD AT HEP SHRINAGAR
P.O.No. : 4588182 DATED : 04/08/2008








TITLE: METAL OXIDE SURGE ARRESTER		MATL: ALL M.S. PARTS ARE HOTDIP GALVANISED	
DRG. No.: G92HC-ZAP-400162-SM DRN. BY: <i>Dr. Kumar</i>		REV. No.: 0 DATE: 29/08/2008	
SCALE: N.T.S. APPRD. BY: <i>cm</i>		OBLUM ELECTRICAL INDUSTRIES PRIVATE LIMITED A-16&17 ASSISTED PRIVATE INDUSTRIAL ESTATE BALANAGAR HYDERABAD - 37 A.P. (INDIA)	
ALL DIMENSIONS ARE IN m.m.			





- 7 - CONDUCTOR TENSION FOR EARTH WIRE CONSIDERED - 0.8MT

BILL OF EQUIPMENTS - 765kV:- (BHEL SCOPE)

SLNO	DESCRIPTION	QTY.	SYMBOL	MATER
1.	500WVA (750/250/400/250)WAT AT (1"PH.) (1 SPARE)	01		BHEL
2.	BUS REACTOR (800MMX750MMX1PH.) (1 SPARE)	01		BHEL
3.	3 Phase CIRCUIT BREAKER (150A/40KA 1 SEC)	01		BHEL
4.	CURRENT TRANSFORMER 3000A/40VA 1 SEC. 1-PH.	01		BHEL
5.	750W CAPACITIVE VOLTAGE TRANSFORMER 80000V. 1-PH.	01		BHEL
6.	750W BUS POST INSULATOR	06		
7.	4000W BUS POST INSULATOR	04		

Legend:-

7. $T_{\mathbb{P}^1}^{\text{vir}} = \text{Sym}^2(\mathcal{O}_{\mathbb{P}^1} \oplus \mathcal{O}_{\mathbb{P}^1}(-2))$ is a vector bundle of rank 3 on \mathbb{P}^1 .

POWER GRID CORPORATION OF INDIA LTD.
NAME OF CUSTOMER/PRODUCT (A Govt. Indus. Enterprise)