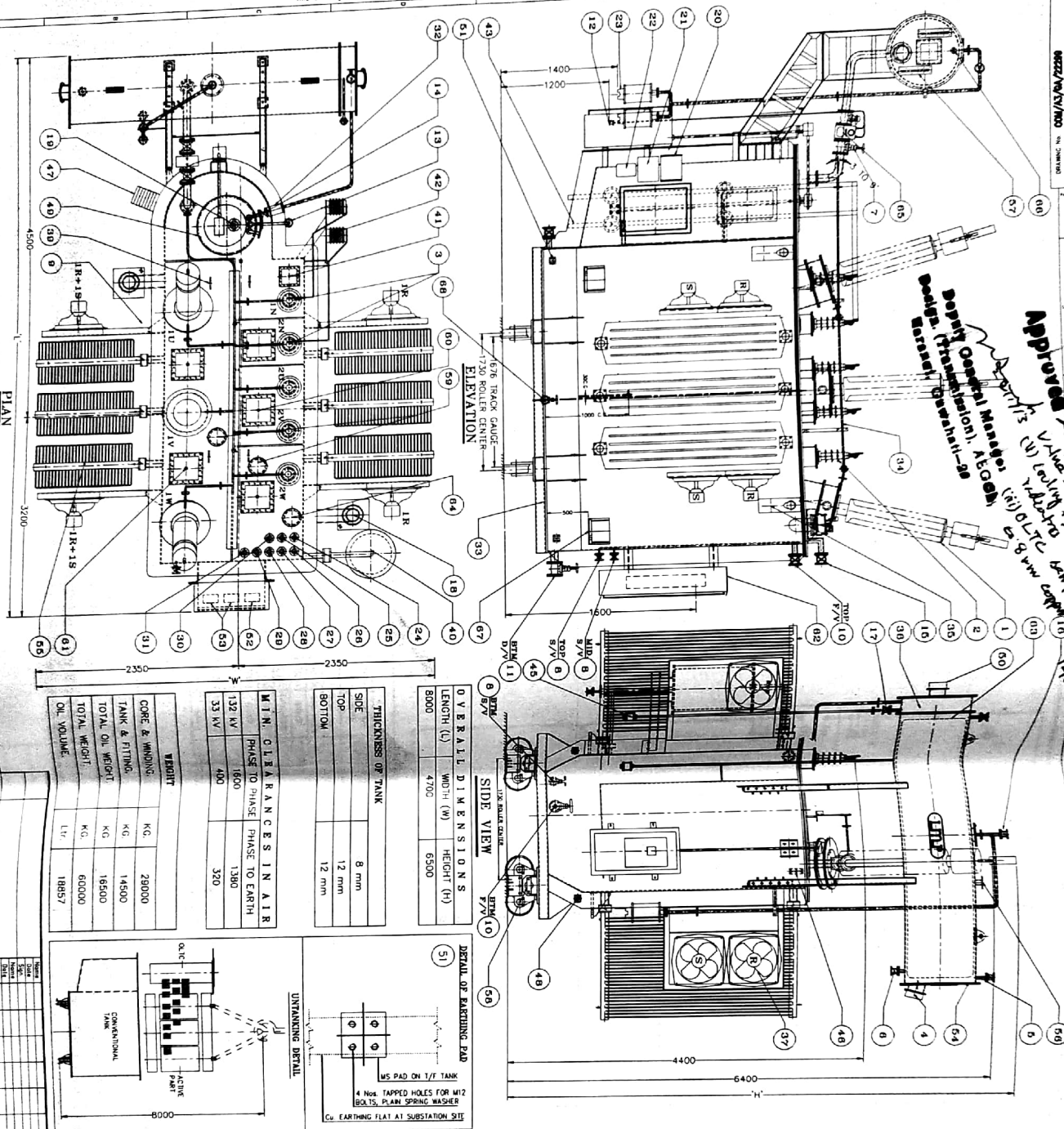


9022/AV/100 04 DRAWING



Approved by *[Signature]*  
 Subject to D. Vaidya's final approval.  
 Value shall be as per drawing. No work to be done on this drawing without the approval of the Engineer in Charge.  
 Design (Transmission) - 8000  
 Material (Transmission) - 8000

**OVERALL DIMENSIONS**

LENGTH (L)	WIDTH (W)	HEIGHT (H)
8000	4700	6500

**THICKNESS OF TANK**

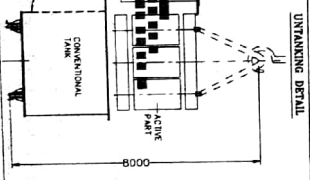
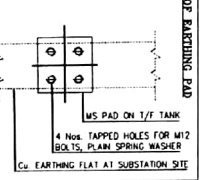
SIZE	THICKNESS
TOP	8 mm
BOTTOM	12 mm

**MIN. CLEARANCES IN AIR**

PHASE TO PHASE	PHASE TO EARTH
132 kV	1800
33 kV	400
	320

**WEIGHT**

DESCRIPTION	KG
CORE & WINDING	28000
TANK & FITTINGS	14500
TOTAL OIL WEIGHT	18500
TOTAL WEIGHT	60000
OIL VOLUME	18857 Lt



NO.	DESCRIPTION	QTY	UNIT	REMARKS
66	SLIDE VALVE (HV & LV SIDE)	2	M.S.	
67	ARRESTOR	4	M.S.	
68	ARRESTOR PADS	4	M.S.	
69	AIR CELL FAILURE ALARM SWITCH	1	M.S.	
70	BROCHURE 2 RELAY DOUBLE FLOAT TYPE WITH A & T CONTACT	2	Bottom	
71	POCKET FOR CORE FRAME EARTHING	1	M.S.	
72	MARSHALLING BAG	1	M.S.	
73	MARSHALLING BAG	1	M.S.	
74	AM RELEASE PLUG FOR TRANSFORMER	1	M.S.	
75	AM RELEASE COVER WITH FLANGE, ROBED COVER & LIFTING LUG	1	M.S.	
76	CITRIMMIAL BOX FOR HV & LV W/ CT	1	M.S.	
77	FLANGED TEE BE CONNECTION	1	M.S.	
78	PRESSURIZED OIL LEVEL GAUGE FOR MAIN CONSERVATOR	1	M.S.	
79	FLANGED TEE BE CONNECTION	1	M.S.	
80	FLANGED TEE BE CONNECTION	1	M.S.	
81	FLANGED TEE BE CONNECTION	1	M.S.	
82	FLANGED TEE BE CONNECTION	1	M.S.	
83	FLANGED TEE BE CONNECTION	1	M.S.	
84	FLANGED TEE BE CONNECTION	1	M.S.	
85	FLANGED TEE BE CONNECTION	1	M.S.	
86	FLANGED TEE BE CONNECTION	1	M.S.	
87	FLANGED TEE BE CONNECTION	1	M.S.	
88	FLANGED TEE BE CONNECTION	1	M.S.	
89	FLANGED TEE BE CONNECTION	1	M.S.	
90	FLANGED TEE BE CONNECTION	1	M.S.	
91	FLANGED TEE BE CONNECTION	1	M.S.	
92	FLANGED TEE BE CONNECTION	1	M.S.	
93	FLANGED TEE BE CONNECTION	1	M.S.	
94	FLANGED TEE BE CONNECTION	1	M.S.	
95	FLANGED TEE BE CONNECTION	1	M.S.	
96	FLANGED TEE BE CONNECTION	1	M.S.	
97	FLANGED TEE BE CONNECTION	1	M.S.	
98	FLANGED TEE BE CONNECTION	1	M.S.	
99	FLANGED TEE BE CONNECTION	1	M.S.	
100	FLANGED TEE BE CONNECTION	1	M.S.	

**NOTES:**

- ALL DIMENSIONS ARE IN mm
- POSITION OF FITTINGS SHOWN ARE APPROXIMATE. LIFTY (1) TO BE MADE AT THE TIME OF MANUFACTURING TO CHANGE AT THE TIME OF MANUFACTURING
- ALL DIMENSIONS WILL HAVE ± 0.5% TOLERANCE
- WEIGHT WILL HAVE ± 5% TOLERANCE
- PAINING: AS PER ACCEL. IS
- EXTERNAL PAINT: SHADE RAL: 7032

(1) 20 mm TANK SLIGHT ON HV SIDE  
 (2) FOR TRANSFORMER ARRANGEMENT REF. Dwg. COM/AS/19/22309/10  
 (3) FOR ROLLER, RA, SLIDE & FOUNDATION REF. Dwg. COM/AS/19/22309/10

**REVISIONS:**

NO.	DESCRIPTION	DATE	BY	CHKD.
01	ISSUED AS PER Dwg. DATED ON 29/12/12			

**PROJECT:** CONSTRUCTION OF NEW 132kV SUBSTATION UNDER POWER ASSEM SECTOR IN ENHANCEMENT INVESTMENT PROGRAM

**CLIENT:** ASSAM ELECTRICITY GRID CORPORATION LIMITED

**DESIGNER:** IMP POWERS LIMITED

**DATE:** 21/12/2012

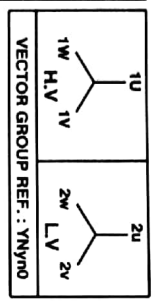
**SCALE:** 1:1

**DRAWING NO.:** COM/AS/19/22309

**TOTAL SHEETS:** 01

**IMP POWERS LIMITED**  
MUMBAI/SILVASSA - INDIA

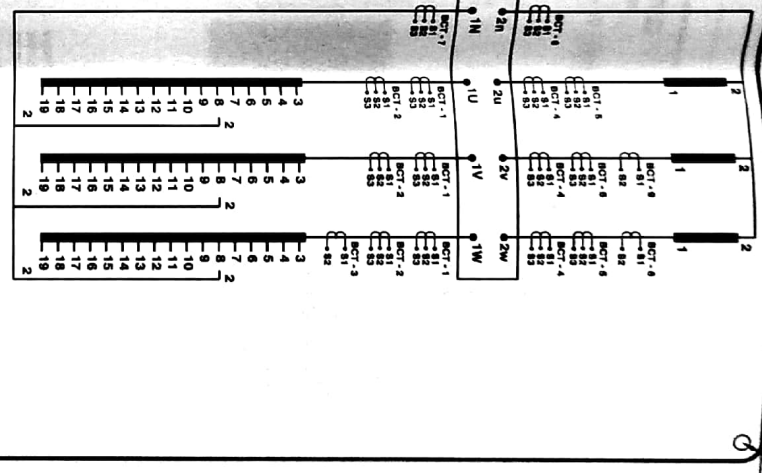
TRANSFORMER SPECIFICATION REFERENCE: IS-2026-1981		QUANTITY	%
MAKERS SERIAL NO.	30000/25000	TYPE OF COOLING	
HVA (ONAN/ONAF)	132000	IMPEDANCE VOLTAGE AT 75°C	
VOLTS AT NO LOAD	33000	FREQUENCY	50 Hz
AMPERES (ONAN/ONAF)	87.47/108.35	MASS OF CORE & WDG. ASS'Y.	29000 kg.
PHASE	3	MASS OF TANK & FITTINGS	14500 kg.
YEAR OF MANUFACTURE	3	MASS / VOLUME OF OIL	16500/18857 kg./mtr.
DIAGRAM REF. NO.	NP-22300	TOTAL MASS	60000 kg.
CUSTOMER'S REF. NO.			



INSULATION LEVELS: IMPULSE/PF  
H.V. WDG. : 650 KVp/275 KVrms  
L.V. WDG. : 170 KVp/70 KVrms

POSITION OF O.L.T.C.	H.V. VOLT	H.V. AMPS	L.V. VOLT	L.V. AMPS	H.V. TAPINGS ACROSS	L.V. TAPINGS ACROSS	CONNECTED
1	2	3	4	5	6	7	8
1	136600	104.14	33000	33000	2-19		2-19
2	136650	106.39	33000	33000	2-18		2-18
3	135700	106.68	33000	33000	2-17		2-17
4	136350	107.99	33000	33000	2-16		2-16
5	132900	109.35	33000	33000	2-15		2-15
6	130350	110.73	33000	33000	2-14		2-14
7	128700	112.15	33000	33000	2-13		2-13
8	127850	113.61	33000	33000	2-12		2-12
9	125400	115.10	33000	33000	2-11		2-11
10	123750	116.64	33000	33000	2-10		2-10
11	122100	118.21	33000	33000	2-09		2-09
12	120450	119.83	33000	33000	2-08		2-08
13	118800	121.48	33000	33000	2-07		2-07
14	117150	123.21	33000	33000	2-06		2-06
15	115500	124.97	33000	33000	2-05		2-05
16	113850	126.78	33000	33000	2-04		2-04
17	112200	128.64	33000	33000	2-03		2-03

CLIENT : ASSAM ELECTRICITY GRID CORPORATION LIMITED  
CUSTOMER : ALSTOM T&D INDIA LTD.



SR NO.	LOCATION	CODE	RATIO	CLASS	WINDING	TYPE	REMARKS	APPROXIMATE WGT.
BCT1	1U/1V/1W	3000-1000-1000	1/1	1000	1000	1000	METERING	3
BCT2	2U/2V/2W	3000-1000-1000	1/1	1000	1000	1000	METERING	3
BCT3	1V	3000-1000-1000	1/1	1000	1000	1000	METERING	3
BCT4	2V	3000-1000-1000	1/1	1000	1000	1000	METERING	3
BCT5	1U/1V/1W	3000-1000-1000	1/1	1000	1000	1000	METERING	3
BCT6	2U/2V/2W	3000-1000-1000	1/1	1000	1000	1000	METERING	3
BCT7	1U/1V/1W	3000-1000-1000	1/1	1000	1000	1000	METERING	3
BCT8	2U/2V/2W	3000-1000-1000	1/1	1000	1000	1000	METERING	3
BCT9	1U/1V/1W	3000-1000-1000	1/1	1000	1000	1000	METERING	3
BCT10	2U/2V/2W	3000-1000-1000	1/1	1000	1000	1000	METERING	3

- NOTE :
1. S. S BACKGROUND WITH BLACK LETTERS
  2. MATERIAL : STAINLESS STEEL PLATE (1mm TK)
  3. \* MARKING WILLBE PUNCHED AFTER FINAL TESTING.

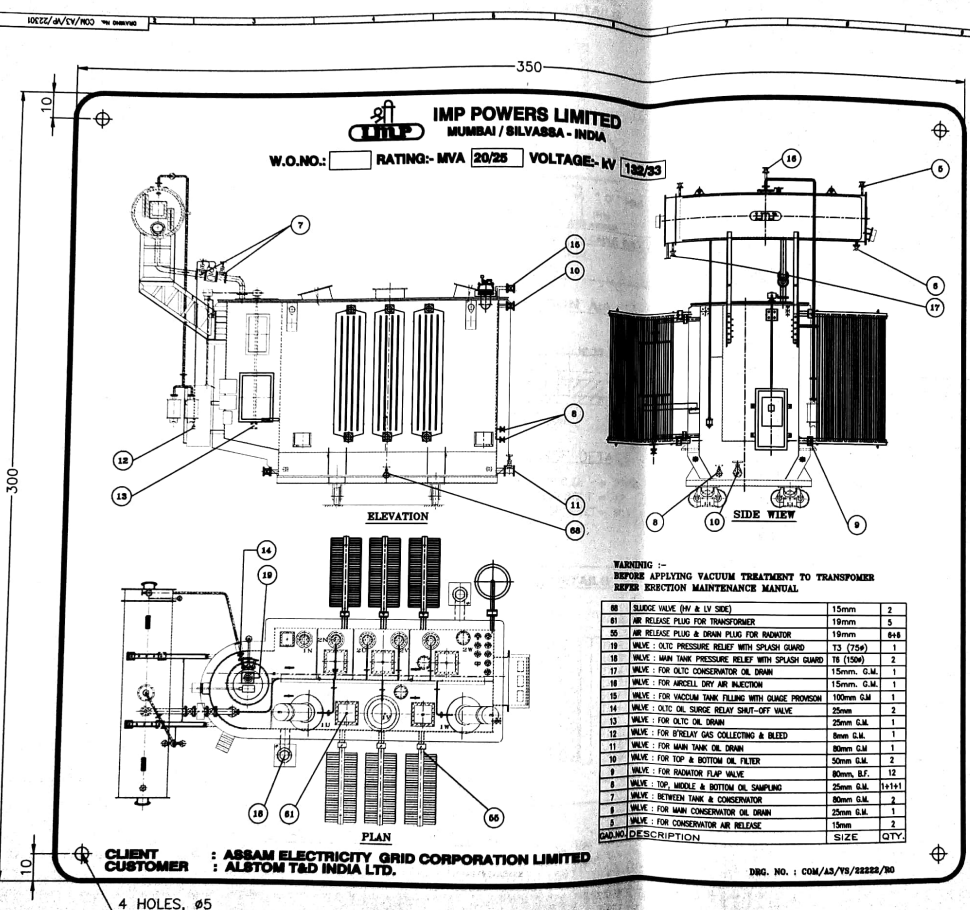
350

270

4ø. 4 HOLES

*Approved*  
**Chief General Manager**  
Mumbai, Maharashtra, India

PROJECT : CONSTRUCTION OF NEW 132KV SUBSTATION UNDER POWER ASSAM SECTION IN ENHANCEMENT INVESTMENT PROGRAM	
DRAWING NO. : NP-22300	
DATE : 21/12/2012	
ISSUED BY : [Signature]	DATE : 21/12/2012
CHECKED BY : [Signature]	DATE : 21/12/2012
APPROVED BY : [Signature]	DATE : 21/12/2012



IMP POWERS LIMITED  
MUMBAI / SILVASSA - INDIA  
W.O.NO.:  RATING:- MVA /25 VOLTAGE:- kV /33

**WARNING -**  
BEFORE APPLYING VACUUM TREATMENT TO TRANSFORMER  
REFER ERECTION MAINTENANCE MANUAL

NO	DESCRIPTION	SIZE	QTY
08	SLURGE VALVE (W & LV SIDE)	15mm	2
01	AIR RELEASE PLUG FOR TRANSFORMER	19mm	5
05	AIR RELEASE PLUG & DRAIN PLUG FOR RADWATER	19mm	648
19	VALVE : OILC PRESSURE RELIEF WITH SPLASH GUARD	T3 (75#)	1
18	VALVE : MAIN TANK PRESSURE RELIEF WITH SPLASH GUARD	T3 (150#)	2
17	VALVE : FOR OILC CONSERVATOR OIL DRAIN	150mm G.M.	1
16	VALVE : FOR AIRCELL DRY AIR INJECTION	150mm G.M.	1
15	VALVE : FOR VACUUM TANK FILING WITH GAUGE PROVISION	100mm G.M.	1
14	VALVE : OILC OIL SURGE RELAY SHUT-OFF VALVE	25mm	2
13	VALVE : FOR OILC OIL DRAIN	25mm G.M.	1
12	VALVE : FOR BURELAY GAS COLLECTING & BLEED	50mm G.M.	1
11	VALVE : FOR MAIN TANK OIL DRAIN	80mm G.M.	1
10	VALVE : FOR TOP & BOTTOM OIL FILTER	50mm G.M.	2
9	VALVE : FOR RADWATER FLAP VALVE	80mm B.F.	12
8	VALVE : TOP, MIDDLE & BOTTOM OIL SURGING	25mm G.M.	19191
7	VALVE : BETWEEN TANK & CONSERVATOR	50mm G.M.	2
6	VALVE : FOR MAIN CONSERVATOR OIL DRAIN	25mm G.M.	1
5	VALVE : FOR CONSERVATOR AIR RELEASE	15mm	2

CLIENT : ASSAM ELECTRICITY GRID CORPORATION LIMITED  
CUSTOMER : ALSTOM T&D INDIA LTD.  
4 HOLES, Ø5

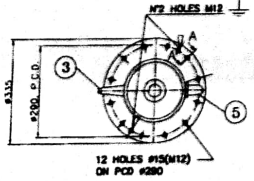
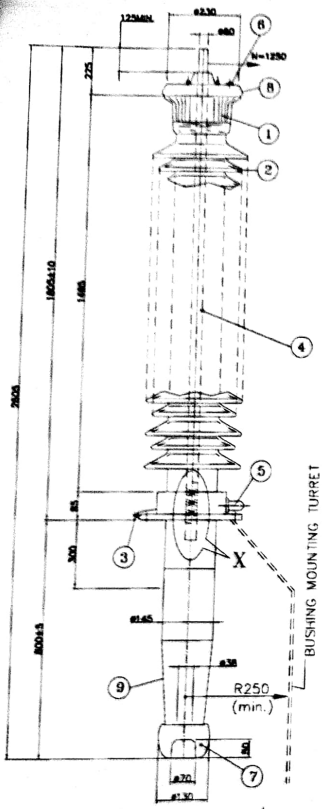
DRG. NO. : COM/AS/79/2222/70

Approved  
Deputy General Manager  
Design (Transmission), AEGM  
Barsoi, Guwahati-78

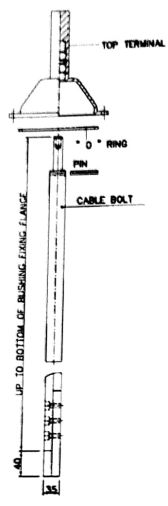
Manufacturer: IMP POWERS LIMITED	DRN: AMB	DATE: 21.12.2012
IMP	CHK: YKZ	DATE: 21.12.2012
ASSEM ELECTRICITY GRID CORPORATION LIMITED	APPR: PNV	DATE: 21.12.2012
PROJECT: CONSTRUCTION OF NEW 132KV SUBSTATION UNDER POWER ASSAM SECTOR IN ENHANCEMENT INVESTMENT PROGRAM		
SUBSTATION: ALL AIS & GIS S/S		
CONTRACT No: COM-DI/ADB-2/7/-2/AEGL/ASS/132KV/PRI-9-B/DZ DL14.09.12		
TITLE: VALVE SCHEDULE PLATE FOR 20/25 MVA, 132/33 KV TRANSFORMER		
ALSTOM T&D INDIA LTD.	DRAWING No:	TOTAL SHEETS
GRID	COM/AS/79/22301	SCALE

NO	DESCRIPTION	DATE	REVISION	BY	CHKD	APPROVED	EDT

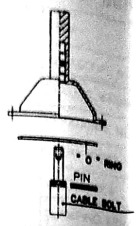
DDKZ/SU/IV/ROD



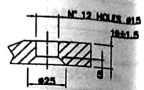
**DETAIL OF DRAW ROD WITH CONNECTOR**



**TOP TERMINAL FIXING DETAILS**

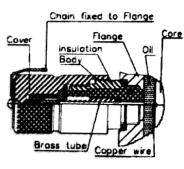


**SECTION A-A**

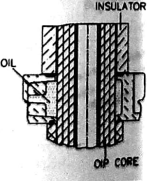


**FLANGE DETAILS**  
 MTG. P.C.D. = 290.4  
 NO. OF BOLT = 12  
 SIZE OF BOLT = M12

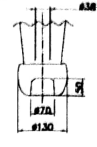
**TEST TAP DETAILS**



**CORE DETAILS**



**LOWER SIDE INSULATOR**



**Alternate shed**



**DETAIL - X**



**TECHNICAL DETAIL**

- (1) RATED VOLTAGE : 145 kV
- (2) RATED CURRENT : 1250 Amps.
- (3) ONE MINUTE WITHSTAND VOLTAGE : 275kV
- (5) IMPULSE WITHSTAND VOLTAGE : 650 kVp
- (6) MINIMUM CREEPAGE DISTANCE : 25 mm/kV
- (7) TYPE OF CONNECTION : DRAW ROD
- (8) ANGLE OF INSTALLATION FROM VERTICAL : 15' max.
- (9) BUSHING PERFORMANCE CONFORMS TO : IS: 2099
- (10) MAKE : AREVA/ABB
- (11) CANTILEVER LOAD (TENSION) : 1250 N
- (12) OIL QUANTITY : 12Ltr.
- (13) RATED FREQUENCY : 50Hz
- (14) BUSHING WEIGHT : 125kg
- (15) RATING OF SHORT CIRCUIT LEVEL : 25 x in 3sec.

SR. NO.	DESCRIPTION	QTY.	MATERIAL	REMARK
1	OIL LEVEL GAUGE	1	PRISMATIC	--
2	UPPER INSULATOR	1	PORCELAIN	BROWN GLAZE
3	AIR OUT LET SCREW 1/2" BSP	1	BRASS	--
4	DRAW ROD WITH CONNECTOR	1	COPPER	--
5	POWER FACTOR TAP	1	BRASS	--
6	OIL/NITROGEN FILLING PLUG (1/2" BSP)	1	BRASS	TIN PLATED
7	BASE PLATE/BOTTOM STRESS SHIELD	1	ALUMINIUM	EPOXY COATED
8	OIL EXPANSION CHAMBER	1	ALUMINIUM	EPOXY COATED
9	LOWER INSULATOR COVER	1	PORCELAIN	BROWN GLAZE

**MAKE :** AREVA/ABB

**NOTE :**

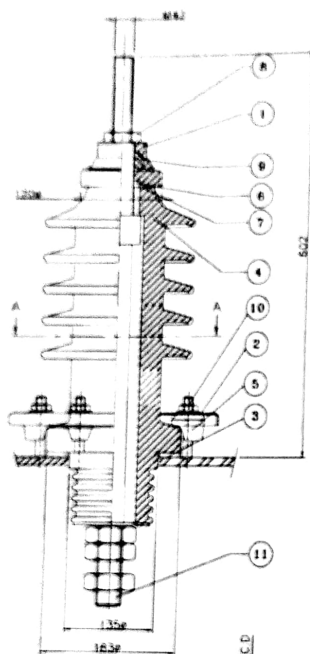
- 1). OIL IMPREGNATED PAPER CONDENSER TYPE
- 2). BUSHING SHOULD NOT BE OPENED OR TOPPED UP WITH OIL WITHOUT SPECIFIC INSTRUCTIONS
- 3). ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED

*Approved subject to L2 shall be 1170mm instead of 800mm*

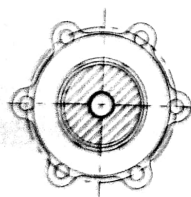
Deputy General Manager  
 (Transmission), AEGC,  
 Warangal, Gawahati-99



IMP POWERS LIMITED  
 ASIAN ELECTRICITY GRID CORPORATION LIMITED  
 PROJECT: CONSTRUCTION OF NEW 132kV SUBSTATION UNDER POWER ASSAM SECTOR IN ENHANCEMENT INVESTMENT PROGRAM  
 DRAWING No. AL AS 18 57  
 CONTRACT No. COB-S/AS-3/13-2/AREVA/ABB/132kV/PROG-5/02-DL/14.08.12  
 142kV, 1250amps, O.L.P. HV BUSHING FOR 30/25 MVA, 132/23 kV  
 ALSTOM ALSTOM INDIA LTD. DRAWING No. TOTAL SH. No. 100/15/22302 SCALE

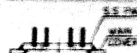


M14, 6 HOLES ON 200 P.C.D.



SECTION A-A

BUSHING MOUNTING DETAIL



**A - BUSHING PART DETAILS**

SR.NO.	DESCRIPTION	MATERIAL	QTY
11	STEM	COPPER	1
10	HEXAGONAL NUT	M.S. GALVANISED	6
9	SEALING WASHER FOR STEM	HARD NEOPRENE	1
8	HEXAGONAL NUT	BRASS	1
7	SEALING WASHER FOR GENERAL PURPOSE	GASKET	1
6	VENT SCREW	BRASS	1
5	CLAMPING ARRANGEMENT	ALUMINIUM	6
4	INSULATOR	PORCELAIN	1
3	SEALING WASHER	GASKET	1
2	WASHER	M.S. GALVANISED	6
1	CAP	BRASS	1

**B - BUSHING TECHNICAL DETAILS**

A RATED VOLTAGE	16 KV
B RATED CURRENT	2000 A
C APPLICABLE STANDARD	S 1341/2099
D INSULATING COVER SHED PROFILE	S 1341/2099
E TYPE OF BUSHING	PLAIN PORCELAIN TYPE
F FULL WAVE IMPULSE WITHSTAND	170 kVp
G ONE MINUTE DRY WITHSTAND	75 kVrms
H ONE MINUTE WET WITHSTAND	75 kVrms
I ANGLE FOR INSTALLATION	95° (MAX)
J CREEPAGE DISTANCE	900 mm
K PROTECTED CREEPAGE DISTANCE	450 mm
L CANTILEVER LOAD TENSION	2000 N
M SHORT TIME CURRENT/DURATION	2 Secs
N P.D. LEVEL	NA
O TAN DELTA VALUE	NA
P TEMPERATURE RISE	75°C
Q WEIGHT (APPROX)	10 kg
R MAKE	WSP/CD

*Approved*  
*20/1/83*  
*Senior General Manager*  
*Engg. (Transmission), ALCOA*  
*Malaya*

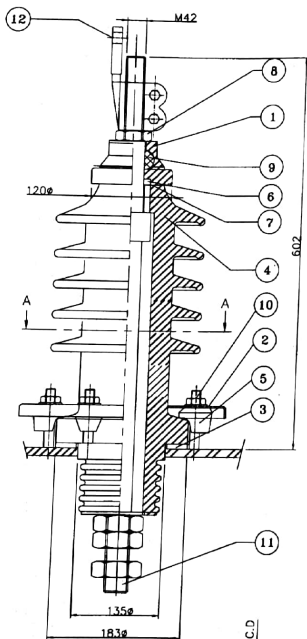
**NOTES:-**  
 1. ALL DIMENSIONS ARE IN mm.



T.M.P. POWERS LIMITED  
 HEAD OFFICE: 11, MARKET STREET, SINGAPORE 05.  
 BRANCHES: KUALA LUMPUR, JOHORE BAHRU, PENANG, SEREMBAN, TAMPAR, TEBING KEMPAS, TUNJUNG PRAK, WILSON ROAD, SINGAPORE.

**ALSTON ELECTRIC LTD**  
 CONSTRUCTION OF NEW 132KV SUBSTATION UNDER  
 POWER ADDON SCHEM IN ENHANCEMENT INVESTMENT PROGRAM  
 PROJECT NO: 132-3/2000-L/3 - LOCAL AREA/132-3/20-0/23-0/14-02/13  
 L.V. UNIT BUSHING WEIGHT RECORD FORM FOR 25/70 kV, 132/23 kV

FORM NO.	ISSUE NO.	TOTAL	ISSUED	REMA
001/ALAM/2283	1			



**A - BUSHING PART DETAILS**

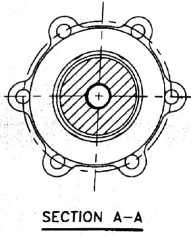
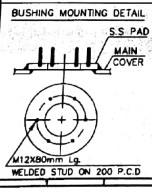
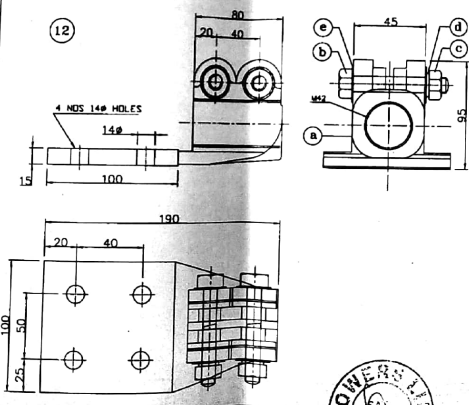
SR.NO.	DESCRIPTION	MATERIAL	QTY.
12	CONNECTING LUG./PALM	BRASS	1
11	STEM	COPPER	1
10	HEXAGONAL NUT	M.S. GALVANISED	6
9	SEALING WASHER FOR STEM	HARD NEOPRENE	1
8	HEXAGONAL NUT	BRASS	1
7	SEALING WASHER FOR GENERAL PURPOSE	GASKET	1
6	VENT SCREW	BRASS	1
5	CLAMPING ARRANGEMENT	ALUMINIUM	6
4	INSULATOR	PORCELAIN	1
3	SEALING WASHER	GASKET	1
2	WASHER	M.S. GALVANISED	6
1	CAP	BRASS	1

**B - BUSHING TECHNICAL DETAILS**

A. RATED VOLTAGE	: 36 kv.
B. RATED CURRENT	: 2000 A
C. APPLICABLE STANDARD	: IS : 3347/2099
D. INSULATING COVER SHED PROFILE	: IS : 3347/2099
E. TYPE OF BUSHING	: PLAIN PORCELAIN TYPE
F. FULL WAVE IMPULSE WITHSTAND	: 170 kvp
G. ONE MINUTE DRY WITHSTAND	: 70 kvrms
H. ONE MINUTE WET WITHSTAND	: 70 kvrms
I. ANGLE FOR INSTALLATION	: 90° (MAX.)
J. CREEPAGE DISTANCE	: 900 mm
K. PROTECTED CREEPAGE DISTANCE	: 450 mm
L. CANTILEVER LOAD TENSION	: 2000 N
M. SHORT TIME CURRENT/DURATION	: 3 Secs.
N. P.D. LEVEL	: NA
O. TAN DELTA VALUE	: NA
P. TEMPERATURE RISE	: 75°c
Q. WEIGHT (APPROX)	: 10 kg.
R. MAKE	: WSI/CJI

**C - BUSHING PALM DETAILS**

SR.NO.	ITEMS	MATERIAL	PROCESS	QTY.
e	PLAIN WASHER (3mm THK.)	BRASS	DRAWN/FORGED	4
d	SPRING WASHER (3mm THK.)	BRASS	DRAWN/FORGED	2
c	HEX NUT	BRASS	DRAWN/FORGED	2
b	BOLT M12 (70mm Lg.)	BRASS	DRAWN/FORGED	2
a	MAIN BODY	BRASS (AS PER IS-3347)	GRADE-3	1



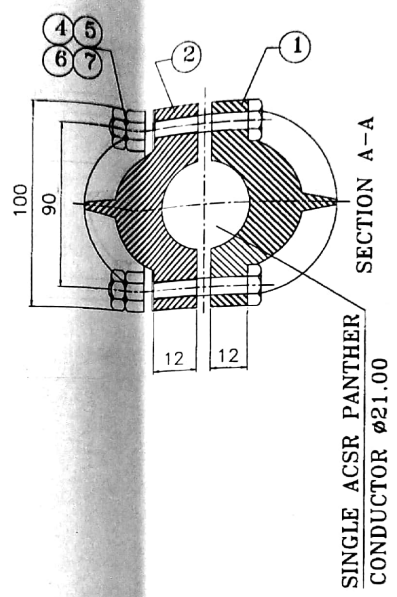
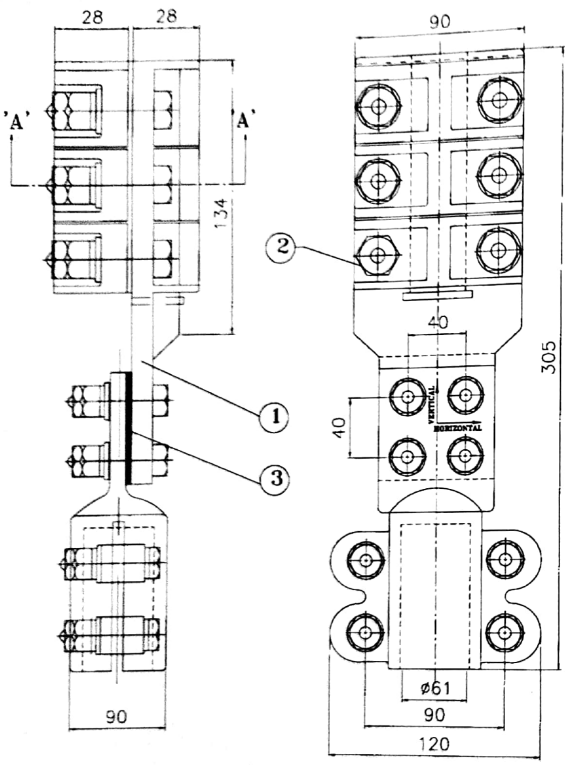
Ø14, 6 HOLES ON 200 P.C.D

**Approved**  
 Deputy General Manager  
 (Transmission), A.E.G.C.  
 Hardhat :-

1. ALL DIMENSIONS ARE IN mm



Manufacturer: **IMP POWERS LIMITED**  
 ASSAM ELECTRICITY GRID CORPORATION LIMITED  
 PROJECT: CONSTRUCTION OF NEW 132kV SUBSTATION UNDER POWER ASSAM SECTOR IN ENHANCEMENT INVESTMENT PROGRAM  
 CONTRACT No. COM-DI/MS-2/11-3/AGC/MS/132KV/MS-2/DE/DL14.06.12  
 FILE: ALL 132 & 220 KV  
 DRAWING No. COM/A3/RS/22304  
 SCALE: 1/10



SR.	DESCRIPTION	MATL.	QTY.
7.	SPRING WASHER M10		14
6.	PLAIN WASHER M10		14
5.	HEX. NUT M10	M.S. HOT DIP GALVANIZED	14
4.	HEX. BOLT M10		14
3.	BI METALIC SHEET (2Thk.)	CU/AL	1
2.	CLAMP BODY	AL ALLOY	2
1.	CLAMP BODY	AL ALLOY	1

*Approved Subject to make shall be Madhav /with/*  
*Sanjay Kumar*  
 Deputy General Manager  
 (Transmission), ASEC,  
 Barsoi, Gumbhat-8

- NOTES:-
1. REF. ISI NO. : IS 5561
  2. TEMP. RISE AT NORMAL CONTINUOUS RATING : 45°C
  3. NORMAL CURRENT RATING : 1250 Amps
  4. QUANTITY REQUIRED : 3 NOS./KMER
  5. ALL DIMENSIONS ARE IN mm.
  6. RATED VOLTAGE : 145 kV
  7. CONNECTIVITY UNIVERSAL TAKE OFF (HORIZONTAL/VERTICAL)
  8. ALL SHARP EDGES SHALL BE ROUNDED OFF.
  9. BOLT TIGHTENING TORQUE M10 : 19.5 Nm
  10. MAKES : ELECTROMECH & TRANSTECH/RASTRHAUDYOC/ACC/UTSAV/NOOTAN/MJIND.
  11. MIN THICKNESS AT ANY POINT OF CURRENT CARRYING PART SHALL NOT BE LESS THAN 12mm

NO.	REV.	DATE	BY	CHKD.	APPD.	DESCRIPTION

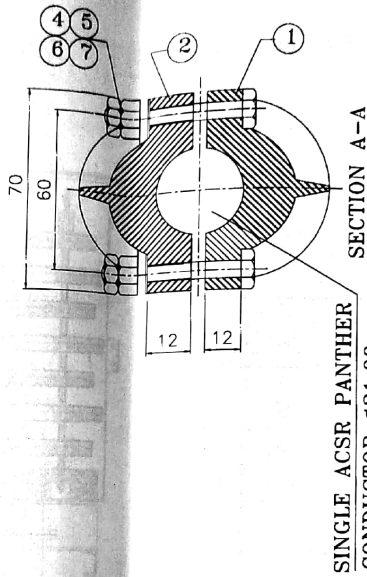
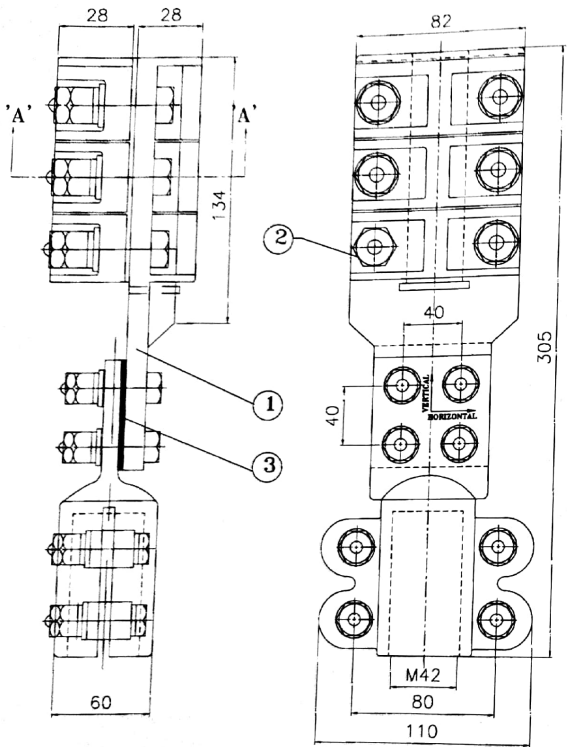
IMP POWERS LIMITED  
 ASSAM ELECTRICITY GRID CORPORATION LIMITED

PROJECT: CONSTRUCTION OF NEW 132kV SUBSTATION UNDER POWER ASSAM SECTOR IN ENHANCEMENT INVESTMENT PROGRAM

CONTRACT No. COM-01/MS-2/P-3/NEEL/MS/132kV/PM-9/02 DL14.08.12

ITEM: BI-METALLIC TERMINAL CONNECTOR OF HV BUSBAR FOR 20/25 MVA, 132/33 KV

ALSTOM ALSTOM INDIA LTD.  
 DRAWING No. COM/A3/BS/22305



SINGLE ACSR PANTHER  
CONDUCTOR Ø21.00

SR.	DESCRIPTION	MATL.	QTY.
7.	SPRING WASHER M10	M.S. HOT DIP GALVANIZED	14
6.	PLAIN WASHER M10		14
5.	HEX. NUT M10		14
4.	HEX. BOLT M10		14
3.	BI METALIC SHEET (2Thk.)	CU/AL	1
2.	CLAMP BODY	AL ALLOY	2
1.	CLAMP BODY	AL ALLOY	1

- NOTES:-
- REF. ISI NO. : IS 5561
  - TEMP. RISE AT NORMAL CONTINUOUS RATING : 45°C
  - NORMAL CURRENT RATING : 2000 Amps.
  - QUANTITY REQUIRED : 3NOS./X/MER
  - ALL DIMENSIONS ARE IN mm.
  - RATED VOLTAGE : 36 kV
  - CONNECTIVITY UNIVERSAL TAKE OFF (HORIZONTAL/VERTICAL)
  - ALL SHARP EDGES SHALL BE ROUNDED OFF.
  - BOLT TIGHTENING TORQUE M10 : 19.5 Nm
  - MAKES : ELECTROMECH & TRANSTECH/RASTHRAUDYOG/AC/UISAV/NOOTAN/MILIND
  - MIN THICKNESS AT ANY POINT OF CURRENT CARRYING PAET SHALL NOT BE LESS THAN 12mm



*Approved subject to make shall be NORTAN/11/14MD*  
 22/11/23  
 Deputy General Manager  
 Design (Transmission), A&T/2  
 Maratel, Guwahati-78

IMP POWERS LIMITED  
 ASSAM ELECTRICITY GRID CORPORATION LIMITED

PROJECT: CONSTRUCTION OF NEW 132kV SUBSTATION UNDER POWER ASSAM SECTOR IN ENHANCEMENT INVESTMENT PROGRAM

CONTRACT NO: COM-D1/AGS-2/7-2/AGS/ISS/132kV/PWS-9/02 DL14.08.12

FILE: B-METALLIC TERMINAL CONNECTOR OF LV BUSHING FOR 20/25 MVA, 132/33 KV

ALSTON ALSTON INDIA LTD. DRAWING No. TOTAL SHEETS 01/01

COM/AS/RS/22306



IMP - Powers Ltd

2.0 POWER TRANSFORMER

S.No.	Description	Unit	20/25MVA, 132/33kV X'Mers
1.0	Name and address of manufacturer for the following items		[ Our Sub-vendor list is enclosed ]
i	Transformer		IMP Powers Limited - Silvassa
ii	Transformer core		NSL / AKS / VZ / PC
iii	Windings		IMP
iv	Insulating materials		RB / WM / SW
v	Transformer oil		APAR / SAVITA
vi	Bimetallic connectors		MILIND / UTSAV / VINAYAK / NOOTAN
vii	Onload tap changer		EASUN - MR
viii	Off load tap changer		Not Applicable
ix	Buchholz Relays		ATVUS / P & F / SUKRUT
x	Temperature indicator		PC / PM
2.0	Service ( Indoor / Outdoor )		Outdoor
3.0	Normal continuous rating in KVA under site condition at all taps		
i	HV Winding	kVA	25000
ii	LV Winding	kVA	25000
4.0	Rated Voltage		
i	HV Winding	kV	132
ii	LV Winding	kV	33
5.0	Rated frequency	Hz.	50
6.0	No. of phases		Three
7.0	Type of transformer		3 - phase , Oil immersed
8.0	Connections		
i	HV winding		Star
ii	LV winding		Star
9.0	Connection symbols		YNyn0
10.0	Tappings		
i	Range	%	+5% to -15%
ii	Number of steps	Nos.	16 steps, 17 Positions
iii	Position of tappings on HT winding for high voltage variation		At HV Neutral End
11.0	Reference ambient temperature		
i	Maximum ambient temp	°c	45
ii	Maximum daily average ambient temp.	°c	45
iii	Minimum daily average ambient temp.	°c	-5
iv	Maximum yearly weighted average ambient temp.	°c	32
12.0	Maximum temperature rise over ambient temperature		
i	In oil by thermometer	°c	50
ii	In winding by resistance measurement	°c	55
iii	Limit for hot spot temperature for which the transformer is designed	°c	98 ( at weighted ambient of 32°c)
iv	Type & details of winding hot spot temperature detector		Dial Type
v	Temperature gradient between windings and oil	°c	14
vi	Type of maximum winding temperature indicator		Dial Type
13.0	Voltage to earth for which the star point will be insulated	kVrms	HVN : 38kVrms ; LVN : 70kVrms ONAN / ONAF
14.0	Cooling Type		
15.0	Losses		
i	a	Fixed (iron) losses at rated frequency, voltage, normal tap & at 75°c	kW 14
	b	Tolerances, if applicable to (a) above	% Nil
ii	a	Load losses (copper) at rated current at principal Tap at 75°c	kW 70
	b	Tolerances, if applicable to (a) above	% Nil
iii	a	Auxiliary losses ( collar ) at rated MVA	kW 1
	b	Tolerances, if applicable to (a) above	% Nil
iv	a	Total Losses	kW 85 ( 14 + 70 + 1 = 85 )
	b	Tolerances, if applicable to (a) above	% Nil
16.0	Maximum Current density in winding at MCR :		
i	HV winding	A/mm <sup>2</sup>	2.8
ii	LV winding	A/mm <sup>2</sup>	2.8
17.0	Percentage Impedance voltage at rated current, normal ratio and 75°c expressed at rated MVA base between :		
i	HV to LV	%	10
a	Positive Sequence at		
	(i) At Principal tap	%	10

R01

**Approved**  
  
 Deputy General Manager,  
 Design. (Transmission), AEGG,  
 Barangi, Guwahati-20

IMP - Powers Ltd  
2.0 POWER TRANSFORMER

S.No.	Description	Unit	20/25MVA, 132/33kV X'Mers
	(ii) At Maximum tap	%	11
	(iii) At Minimum tap	%	9
	b Negative Sequence at		
	(i) At Principal tap	%	10
	(ii) At Maximum tap	%	11
	(iii) At Minimum tap	%	9
18.0	Percentage Reactance at rated MVA base, at rated current, Rated frequency and at principal tap and at 75°C		
	HV - LV		
	i At Principal tap	%	9.996
	ii At Maximum tap	%	10.99
	iii At Minimum tap	%	8.99
19.0	Resistance at 75°C		
	i HV winding		
	i At Principal tap	Ohm/ Ph	1.095
	ii At Maximum tap	Ohm/ Ph	1.162
	iii At Minimum tap	Ohm/ Ph	0.903
	ii LV winding		
	i At Principal tap	Ohm/ Ph	0.0477
	ii At Maximum tap	Ohm/ Ph	NA
	iii At Minimum tap	Ohm/ Ph	NA
20.0	Insulation level		
	i Separately source power frequency withstand voltage:		
	a HV winding	kV rms	38
	b LV winding	kV rms	70
	ii Induced over - voltage withstand :		
	a HV winding	kV rms	275
	b LV winding	kV rms	66
	iii Lightning impulse withstand voltage		
	a HV winding	kV peak	650
	b LV winding	kV peak	170
	iv Power frequency high - voltage tests :		
	a Test voltage for one min. withstand test on high voltage windings	kV rms	275 (Induced )
	b Test voltage for one min. withstand test on low voltage windings	kV rms	70 (Seperate Source )
	c Test voltage for one min. withstand test on neutral ends of windings	kV rms	HVN : 38kVrms ; LVN : 70kVrms
	v Lightning Impulse withstand tests		
	a Impulse test on high voltage winding 1.2/50 micro - sec. Full wave withstand	kVp	650
	b Impulse test on low voltage winding 1.2/50 micro - sec. Full wave withstand	kVp	170
21.0	Efficiency at 75°C at normal ratio, frequency and rated voltage;		
	i Full load	%	99.665
	ii 75% Load	%	99.716
	iii 50% Load	%	99.749
	iv 25% Load	%	99.707
22.0	Efficiency		
	i Maximum efficiency of the transformer	%	99.75
	ii The load at which the transformer shall operate at Maximum efficiency of the transformer	%	44.721
23.0	Regulation at full load at 75° c		
	i At unity power factor	%	0.78
	ii 0.8 power factor ( lagging )	%	6.528
24.0	Core Data		
	i Type of core construction		Three limb Type
	ii Grade of core material used		H1 - B or better grade
	iii Thickness of core plate Lamination	mm	0.23
	iv Whether core lamination are Grain oriented cold rolled		Yes

Approved Subject to HV winding reactance 1.043 ohm/ph  
 LV winding reactance 0.0455 ohm/ph at 75°C  
 Deputy General Manager  
 Design (Transmission), ALCOA  
 Barisal, Chittagong-20




IMP - Powers Ltd

2.0 POWER TRANSFORMER

S.No.	Description	Unit	20/25MVA, 132/33kV X'Mers
v	Details of oil ducts in core		
a	Whether in the plane and at right angle to the plane of winding		Yes
b	Across the plane of lamination		No
vi	i Insulation of core lamination		Carlite
ii	Insulation of core bolt ( If Applicable )		No Core bolt used
iii	Insulation of core bolt washers		No Core bolt washers used
iv	Insulation of core clamping plates		PCB Press Board
vii	Type of core joints		Mitred /5L / eq.
viii	Magnetizing current at normal ratio and frequency		
i	85 percent at rated voltage	%	Apx 0.8 % of full load current
ii	100 percent at rated voltage	%	Apx 1.0 % of full load current
iii	105 percent at rated voltage	%	Apx 1.25 % of full load current
iv	Power factor of magnetizing current at normal voltage ratio and frequency		0.056
ix	Whether core construction is with / without core bolts		Without Core Bolts
25.0	Flux density		
i	Designed continuous flux density at normal tap, rated voltage and rated frequency	Tesla	1.4
ii	Operating continuous flux density		
i	At normal tap	Tesla	1.4
ii	At maximum tap of	Tesla	1.4
iii	At minimum tap of	Tesla	1.4
iii	Designed maximum operating flux density which the transformer can withstand for one minute at normal tap		125% for 1 minute
iv	Designed maximum operating flux density which the transformer can withstand for 5 seconds at normal tap		140% for 5 seconds
26.0	Inter - taps insulation		
i	Extent of extreme end turns reinforcement		)
ii	Extent of turn adjacent to tapping reinforced		)
iii	Test voltage for 10 seconds 50 Hz. inter turn insulation test on (a)		) Not Applicable
iv	Test voltage for 10 seconds 50 Hz. inter turn insulation test on (b)		)
v	Test voltage for 10 seconds 50 Hz. inter turn insulation test on (c)		)
27.0	Windings		
i	Material		Electrolytic Copper Conductor
ii	Type of windings		
a	HV windings		Disc winding with PICC strip
b	LV windings		Disc winding with PICC strip
iii	Insulation of HV Winding		Class A Paper
iv	Insulation of LV Winding		Class A Paper
v	Insulation between Windings		PCB Cylinder + Wedges + oil
vi	Whether HV windings are interleaved		Yes Partially Interleaved
vii	Whether windings are preshrunk		Yes
viii	Whether adjustable coil clamps are provided for HV and LV windings		Yes
28.0	Continuous rating in kVA under following conditions		
a	At 40°C ambient air temperature at site	kVA	As per CP 1010/ IS 6600 loading guides
b	At 30°C ambient air temperature at site	kVA	As per CP 1010/ IS 6600 loading guides
c	At 20°C ambient air temperature at site	kVA	As per CP 1010/ IS 6600 loading guides
29.0	Transformer tank		
i	Material		Low Carbon Mild Steel
ii	Thickness		
a	Sides	mm	8
b	Bottom	mm	12
c	Cover	mm	12
iii	Details of Painting ( Inter / Outer surface )		As per tender Specification
30.0	Dimensions of transformers		
i	Max height to top of bushings	mm	6500
ii	Over - all length	mm	8000
iii	Over - all breadth	mm	4700

R01

**Approved**  
  
 Deputy General Manager  
 Design. (Transmission), AECOM  
 Warangal, Guwahati-20

IMP - Powers Ltd  
2.0 POWER TRANSFORMER

S.No.	Description	Unit	20/25MVA, 132/33kV X'Mers			
31.0	Weight data of transformer components					
i	Weight of core	kg	18800			
ii	Weight of copper winding	kg	6500			
iii	Weight of core and windings	kg	29000			
iv	Weight of tank, fittings and accessories	kg.	14500			
v	Volume and weight insulating oil in the conservator	Litre/kg	600 / 525			
vi	Total weight of the insulating oil in the transformer including oil in the conservator ( main and on load tap change )	kg	16500			
vii	Total weight of complete three phase transformer.	kg	60000			
32.0	Bushing data :		HV	HVN	LV	LVN
i	Type of bushing insulator		OIP Condenser	Plain porcelain	Plain porcelain	Plain porcelain
ii	Material of bushing ( inner part / outer part )		Porcelain	Porcelain	Porcelain	Porcelain
iii	Weight of bushing insulator	kg	130	12	12	12
iv	Quantity of oil in one bushing	Litre	12	N.A.	N.A.	N.A.
v	Minimum dry withstand & flash over power frequency voltage of bushing	kV	275	70	70	70
vi	Minimum wet withstand & flash over power frequency voltage of bushing	kV	275	70	70	70
vii	Minimum withstand and flashover impulse level	kV	NA	NA	NA	NA
viii	Voltage rating	kV	145	36	36	36
ix	Current rating	Amps.	1250	2000	2000	2000
x	Thermal short time current and duration	kA & Sec	As per IS : 2099 / IS : 3347			
xi	Rated Dynamic current and its duration		As per IS : 2099 / IS : 3347			
xii	Cantilever with stand loading	N	1600	2000	2000	2000
xiii	Clearance in oil					
a	Phase to Phase	mm	40	18	18	18
b	Phase to Earth	mm	35	16	16	16
xiv	Creepage distance in oil and air	mm/kV	25	25	25	25
xv	Minimum level of immersing / medium ( oil )	mm	As per IS : 2099 / IS : 3347			
xvi	Max. pressure of immersing medium ( oil )		As per IS : 2099 / IS : 3347			
xvii	Free space required at top for removal of bushings	mm	3000	2000	2000	2000
xviii	Angle of mounting		As per IS : 2099 / IS : 3347			
33.0	Conservator ( Main Transformer and OLTC )					
i	Total volume of the Conservator	m <sup>3</sup>	10% of total oil volume			
ii	Volume of conservator between the highest and lowest level	m <sup>3</sup>	7.5% of total oil volume			
34.0	Oil Preservation					
i	Whether Flexi Separator provided	Yes / No	Yes			
ii	Whether Thermosyphone provided	Yes / No	Yes			
iii	Volume of Silicagel		1 kg for every 3500 Ltrs of oil			
35.0	Calculated time Constants for natural cooling	hours	3			
36.0	Type of axial coil supports :					
i	HV winding		PCB Blocks + Spacers			
ii	LV winding		PCB Blocks + Spacers			
37.0	Details of On load tap changer/ Off Circuit tap changer					
i	Make		Easun - MR			
ii	Type		High speed resistor type			
iii	Rating					
a	Voltage Rating		66 to suit 132kV Neutral End Application			
b	Rated current		200			
c	Step voltage	V	952.6			
d	Number of steps		16 Steps, 17 Positions			
iv	Whether Divertor switch provided with gas vent and bucholz relay	Yes/ No	Yes			
v	Whether a separate oil surge relay with trip contacts provided	Yes/ No	Yes			
vi	Whether Remote control panel provided with control scheme for simultaneous operation of Tap changer when transformers running in parallel and independent control when in independent operation		Yes			
vii	Details of motor device unit housed in kiosk Mounted of tap changer		Drive Mechanisum			
viii	Pressure relief valve		Spring operated type			
ix	Details of equipment in the OLTC kiosk		OLTC Control equipments			

R01

Appr.   
Deputy General Manager (Transmission) AEGEE  
Warangal, G.W.No. 111/3  
11/1/20

IMP - Powers Ltd

2.0 POWER TRANSFORMER

S.No.	Description	Unit	20/25MVA, 132/33kV X'Mers
x	Details of OLTC panels		
a	Automatic tap changer relay		Provided
b	Literature of all the relay		Provided
c	Dimensions of OLTC , Panel L x B x H	mm	610 x 610 x 2312
d	Thickness of sheet	mm	2 to 3
e	Degree of protection		IP:54
f	Details of equipment supplied		Remote indicating instruments
38.0	Despatch details :		
i	Approx. Mass of heaviest package	kg.	40000
ii	Approx. dimensions of largest Package		
a	Length	mm	5500
b	Breadth	mm	2600
c	Height	mm	4000
39.0	Un-tanking height	mm	8000
40.0	Bimetallic Connections		
i	Normal current rating	A	1250
ii	Short time current rating	A	25 times the rated current
iii	Tensile strength	kg.	As per IS:5561
iv	Maximum temperature limit	°C	35
v	Dimensional sketch enclosed indicating tolerances	Yes / No	Yes, shall be furnished
vi	Minimum clearance		HV LV
a	Phase to Phase	mm	1600 400
b	Phase to earth	mm	1380 320
41.0	Insulation resistance between		
i	HV winding	M Ohm	More than 1000
ii	LV winding	M Ohm	More than 1000
iii	Winding to earth	M Ohm	More than 1000
42.0	Any other information		Nil



R01

NOTE : ANY SUB-STATION ITEMS LIKE OIL STORAGE TANK; OUTDOOR CT/PT/LA ; NIFPES ; ON-LINE DGA EQUIP. ETC ARE NOT IN IMP SCOPE OF SUPPLY.

**Approved**  
*[Signature]*  
 Deputy General Manager  
 Design. (Transmission), AEGG  
 Barangi, Guwahati-20