ANNEXURE-1

Stanadrd Scope Document for ETC Works		
	Document No:	ETC/BOQ/GIS/Note Rev00
1.1	Individual item may vary up to any extend and even may get deleted, however overall contract value may vary ±30%. Validity of variation shall be up-to contract stage.	
1.2	The scope of work includes loading/ unloading, handling, shifting to & from stores, proper storage, assembly, installation, pre-commissioning test and commissioning tests (as per FQP/ technical specification of BHEL/ PMC/ Customer). The Shifting of the material from store to site shall be done with truck/ trailor/ tractor, as per requirement. Loading of material/ Equipment shall be carried out by hydra/ crane on truck/ trailor/ tractor at store, unloading of the material from truck/ trailor/ tractor at site with done by hydra/ crane etc. complete in all respect. All T&P required for loading/ unloading/ shifting shall be in bidder's scope.	
1.3	Contractor shall supply the materiasl/ items/ consumables with prior permisison/ approval to BHEL/PMC/ Customer. The contractor shall offer the materiasl/ items/ consumables of proven design and make, which have already been extensively used and tested, as applicable.	
1.4	HV test kit for GIS shall be arranged by OEM/ BHEL on returnable basis. Testing shall be carried out under GIS OEM supervision. However, contractor shall provide all necessary assistance for carrying out the succesful testing. This testing may be required to carry out many times as per actual requirement at site subject to successibility of test. Any dismantling, if required for completion of work shall also be in contractor's scope.	
1.5	All the drawings/ technical specification/ relevant standars/ documents mentioned as per note or refered elsewhere shall be followed for ETC work at site. In case of non availability of any particular drawings/ docuemnts, its contractor's responsibility to mention and demand the same.	
1.6	Minor Civil works such as modification of civil foundations, making holes in the trenches/ control room building, grouting, fixing of hanger & rack assembly/ trench material/ earthing materials shall be in the scope of ETC contractor.	
1.7	Removal of gravel, if gravelling is already done, for connection of equipment earthing strip/ any other work to the existing mat (wherever earthing mat is already laid), and after completion of earthing, contractor shall make good by placing the gravel to bring it in original condition.	
1.8	Mentioned BOQ items shall be inclusive of miscellaneous works, such erection of clamps and connectors, fixing of lug etc, if applicable as per site requyirement.	
1.9	All painting materials, welding electrodes & other consumables shall be supplied by contractor, whether it is specifically mentioned or not. Paint / welding electrode/ consumables shall be subjected to BHEL/PMC/Customer approval.	
1.10	All ground connections shall be made by electric arc welding. All welded joints shall be allowed to cool down gradually to atmospheric temperature before putting any load on it. All arc welding with large diameter conductors shall be done with low hydrogen content electrodes.	
1.11	ETC of equiment/ materials covers complete erection, fixing of metallics/ connectors etc., if applicable.	
1.12	Welding of Aluminium tubes shall be in contractor's scope and joints shall be tested by radiography & dye penetration test. Arrangement of testing instrument, aluminum welding machnine, bending machines and any other equipment for complation of work shall be in Contractor's scope.	
1.13	Completete ETC package is under the scope of contractor. All T&P including oil filterating machine, hydra/ cranes etc. required to complete the work shall be in contractor's scope.	
1.14	Quantity of supply items under the contractor's scope are provisional and shall change as per site conditions and requirements.	
1.15	Testing instrument/ equipment/ kit, duly calibrated shall be arranged by ETC Contractor on returnable basis. The list of testing instrument/ equipment are indicative only and any other testing instrument/ equipment/ kit required for completion of work shall be in contractor's scope.	
1.16	Testing of manadatory spares or any other spare (if required by BHEL/PMC/Customer), cleaning and handing over to customer's store is also included in the scope of contractor. The site test reports for such tests shall also be generated by contrcator in such case.	
1.17	Statutary safety requirements shall be complied by contractor.	
1.18	**Site Fabrication & painting** Unless specified elsewhere seperately, site fabrication & painting requirement/procedure shall be as follows- The MS flat/ angle/ channel shall be finally painted with two coats of Red oxide primer and two coats of Zinc riched enamel paint. In GI hanger & rack assembly, GI cable tray, GI pipe & conduit, if minor fabrication is required, the same shall be applied with one coat of red lead primer, one coat of oil primer followed by two finishing coats of aluminium paint. Supporting steel shall be painted before laying of cables. The painting shall be done with one coat of red lead paint and two coats of approved bituminous aluminium paint.	

1.19	**Identification Mark/ Danger Plates** Unless specified elsewhere seperately, Identification Mark/ Danger Plates requirement/ procedure shall be as follows- All the phases are to be identified by painting the structures Red, Yellow and Blue by reflecting colour as per as built condition. Phase identification colour is to be provided around the top of the structure with colour band of 100 mm width at a height of approximately 2000mm from the finished ground level. Danger plates shall be fixed wherein HV/LV equipment/ Panel are installed. The scope of work covers phase colour discs, labels painting of equipment, phase colour painting, phase marking, bay identification board, danger plates, device number marking of equipment, keyboard etc as per site requirements. Supply & Mounting of phase color discs & Danger plates shall be as per IS: 2551-1982 & IS: 5-1978.
1.20	**Insulating mats** Unless specified elsewhere seperately, Insulating mats requirement/ procedure shall be as follows- The insulating mats shall be “class A” conforming to IS:15652-2006. The LV grade insulating mats shall be laid in front of all floor mounted AC and DC switchboards and control & relay panels located in control room building/ GIS building/ Switchyard panel room etc. The HV grade insulating mats shall be provided all around 66kV GIS. The insulating mats shall be made of elastomer material free from any insertions leading to deterioration of insulating properties. It shall be resistant to acid, oil and low temperature. Upper surface of the insulating mats shall have small aberration (rough surface without edges) to avoid slippery effects while the lower surface shall be plain or could be finished slip resistant without affecting adversely the dielectric property of the mat. Insulating mat, wherever applicable, shall be of pastable type, to be fixed permanently on the front and rear side of the panels except for the chequered plate area which shall not be pasted as per requirement. The insulating mats shall generally be fixed and joints shall be welded as per recommendations in Annexure-A of IS:15652. Width of insulating mats shall generally be of 1.5 meters/ as per site requirements, however, length of laying shall be as per site requirements.
1.21	**Cable tags and markers** Unless specified elsewhere seperately, Cable tags and markers requirement/ procedure shall be as follows- Each cable and conduit run shall be tagged with numbers that appear in the cable and conduit schedule. The tag shall be of aluminium with the number punched on it and securely attached to the cable conduit by not less than two turns of 20 SWG GI wire conforming to IS:280. Cable tags shall be of rectangular shape for power cables and of circular shape for control cables. Location of cables laid directly underground shall be clearly indicated with cable route marker made of galvanised iron plate. Location of underground cable joints shall be indicated with cable route marker with an additional inscription “Cable joints”. The cable route marker shall project 150 mm above ground and shall be spaced at an interval of 30 meters and at every change in direction. They shall be located on both sides of road and drain crossings as per relevant standard. Cable tags shall be provided on all cables at each end (just before entering the equipment enclosure), on both sides of a wall or floor crossing, on each duct/conduit entry and at each end & turning point in cable tray/ trench runs. Cable tags shall be provided inside the switchgear, motor control centres, control and relay panels etc., wherever required for cable identification, where a number of cables enter together through a gland plate.
1.22	**Grouting** Unless specified elsewhere seperately, Grouting procedure shall be as follows- Grouting of block outs, pockets, foundations, bolts holes and underside of base plates with cement, sand aggregate (of size 6 mm and down) grout 1:1:2 with non-shrink additive and shall be of strength not less than M30 including placing, curing, cleaning, surface preparation, testing, etc. complete with labour, materials, equipment, handling, testing, etc. all complete as per specifications, drawings and instructions of the Engineer.”

List of Drawings/ Documents

Document No:	ETC/BOQ/GIS/Note Rev00

The list of drawings/ documents are indicative and shall be subjected to change during contract.

Sl.No.	Drawing/ document description	Drawing/ drawing ref. no.
1	BOQ for Erection Testing & Commissioning (ETC) Works	ETC/BOQ/GIS/Main Rev00
2	BOQ for Mandatory Spares	ETC/BOQ/GIS/Spares Rev01
3	Notes for ETC works	ETC/BOQ/GIS/Note Rev00
	GIS	
4	Single line diagram of 66kV GIS	TB-3-402-316-050
5	Layout drawing (Plan & section drawing) for 66kV GIS	TB-3-402-316-052
6	Site unloading and storage procedure for 66kV GIS	TB-4-402-316-075
7	Typical Interface drawing for grouding, grounding phillosphy for 66kV GIS	TB-4-402-316-074
8	Returnable general tool list for contractor	Annexure A
9	Returnable testing tool list for contractor	Annexure B
	EHV cable	
10	Trench layout drawings for EHV cable	Annxeure G
11	Storage procedure for EHV cable	Annexure C
12	Cable laying procedure for EHV cable	Annexure D
13	Testing & commissioning procedure for EHV Cable	Annexure E
14	General tools & equipment for contractor	Annexure F
	Tranformer	
15	220/66kV Transformer layout drawing	Annexure H
16	220/33kV Transformer layout drawing	Annexure I
	CRP	
17	CRP Board formation drawing	Annexure J
	Hanger, rack & assembly	
18	Reference drawings for hanger, rack & tray assembly	Annexure K
	EIL Specification	
19	Battery limit interface document (electrical)	B016-606-16-50-OD-7810
20	Specification for electrical equipment installation	6-51-0081
21	Precommissioning & commissioning specification	B016-606-02-43-PCS-01
22	Specifications for field inspection, testing & commissioning	6-51-0087
23	Standard specification for erection of equipment & machinery	6-76-0001
24	Specification for cable installation	6-51-0082
25	Specifications for earthing installation	6-51-0084
26	Specification for HSE at Site	6-82-0001
27	Typical drawing for earth electrode, test pit & earthing plate	7-51-0101
28	Typical drawing for transformer earthing	7-51-0105
29	Typical drawing-Installation details for conduit pipe	7-51-0305
30	Typical section of cable trench	7-51-301

Annexure A-Returnable general tools list

Returnable Installation Tools List			
Sr.No	**Discription**	**Pictorial Representation**	**Qty/Set**
1	Hydraulic pressure cylinder RC 104		3
2	Hydraulic short stroke cylinder RCS 201		1
3	Hydr. Handpump P 80		4
4	High-pressure hose 3/8 inch-18 NPT 900 mm high-pressure hydraulic		4
5	Hhydraulic couplings CH 604 3/8 NPT plug		5
6	Combination wrench 12-parts 10 - 32mm DIN 3113		1
7	Adapter combination ratchet 10 mm		2
8	Adapter combination ratchet 24 mm		2
9	Adapter combination ratchet 17 mm		2
10	Adapter combination ratchet 19 mm		3
11	Adapter combination ratchet 13 mm		3
12	Adapter 1/2 inch to 3/8 inch DIN 3123		2
13	Adapter 1/4 inch to 3/8 inch DIN 3123		2
14	adapter 1/4 inch to 1/2 inch DIN 3123		2
15	Torque wrench 5 - 50 Nm 9 x 12 holder		1
16	Torque wrench 20 -200 Nm 14 x 18 holder		1

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Sr.No	Discription	Pictorial Representation	Qty/Set
17	plug-in ratchet 3/8" shank 9 x 12 size 5 735		2
18	Plug-in ratchet 1/2" shank 14 x 18 size 20 735		2
19	Square plug-in tool shank 9 x 12 size 5 734		1
20	Square plug-in tool shank 9 x 12 size 10 734		1
21	Open-end wrench plug-in tool shank 9 x 12 mm 17 mm 731/10		2
22	Open-end wrench plug-in tool shank 14 x18 mm 24 mm 731/40		2
23	Ring wrench plug-in tool shank 14 x18 mm 17 mm 732/40		2
24	Ring wrench plug-in tool shank 14 x18 mm 19 mm 732/40		2
25	Ring wrench plug-in tool shank 14 x18 mm 24 mm 732/40		2
26	Plug-in tool 10 mm SW Ring open 9 x 12		1
27	Plug-in tool 11 mm SW Ring open 9 x 12		1
28	Plug-in tool 12 mm SW Ring open 9 x 12		1
29	Plug-in tool 13 mm SW Ring open 9 x 12		1
30	Plug-in tool 17 mm SW Ring open 9 x 12		1

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Sr.No	Discription	Pictorial Representation	Qty/Set
31	Plug-in tool 19 mm SW Ring open 9 x 12		1
32	Plastic hammer cellulose actat 40 mm head diameter with ash wooden handle		2
33	All purpose pull jacks 750 kg carrying capacity 1.5m stroke		2
34	All purpose pull jacks 1,500 kg carrying capacity 1.5m stroke		1
35	Eurobox transport box 800 x 600 x 610 mm		2
36	Industrial Vaccum cleaner (MORE THAN 3000W)		1
37	Light metal spirit level Length 1,000 mm with 3 vials		1
38	ALU spirit level with a magnet Length 200 mm		1
39	Single open-end wrench 50 mm DIN 894		1
40	Single open-end wrench 30 mm DIN 894		1
41	Single open-end wrench 32 mm DIN 894		2
42	Angled screwdriver 13-parts T 6- T 50 long version		1
43	Socket spanner 1/4 inch +1/2 inch 63-parts Hexagon and TORX		1
44	Socket spanner 1/4 inch 29-parts Hexagon		1
45	Screwdriver Inserts 9-piece 1/2 inch 5- 17mm For hex. screws ¼inch and /		1
46	Ratchet 1/2 inch DIN3122 380 mm with plastic handle		2
47	Heavy-duty combo-pliers 200 mm head polished with Plastic handle		4

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Sr.No	Discription	Pictorial Representation	Qty/Set
48	Water pump pliers 250mm w.grooved joint head polished w.plastic handle		4
49	Mechanic's pliers angled jaws		4
50	Screwdriver Inserts 9-piece 1/2 inch 5- 17mm For hex. screws ¼inch and /		1
51	Round sling 2,000 kg load- 2 m circumference		4
52	Round sling 2,000 kg load - 5 m circumference, two ply		4
53	Round Slinge 3000 Kg ,8 m cirumference,(Effective Length 4 m)		4
54	Round sling 5,000 kg load - 3 m circumference, two ply		4
55	Round sling 5,000 kg load - 1 m circumference, two ply		4
56	Step ladder both sided Can be walked 2 x 6 steps 1.69 m		1
57	Pocket tape measure MBT EG II length 5m width 32 mm Spikes hooks, belt clip		2
58	Plastic folding rule 2 m EU class III		2
59	File brush 115 x 40 mm		3
60	Cable drum steel sheet with 50 m rubber cable 3x1.5 mm2		1
61	Files, 5 piece 200 mm cut 2 with beech handle in roll-up pouch		1
62	Plumb bob 300 g		2
63	Plumb line 50 m perlon white		2

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Sr.No	Discription	Pictorial Representation	Qty/Set
64	Hook wrench with nose 80 - 90 mm DIN 1810 A		1
65	Hexagon screwdriver 9-parts slide cover 1.5-10 mm ball-end		1
66	Socket spanner insert 13 mm 1/2 inch long version Bi-hexagon		1
67	Socket spanner insert 17 mm 1/2 inch long version Bi-hexagon		1
68	Socket spanner insert 19 mm 1/2 inch long version Bi-hexagon		1
69	Socket spanner insert 24 mm 1/2 inch long version Bi-hexagon		1
70	INHEX-insert 1/2" 8 mm 1054/8		2
71	STAHLWILLE INHEX-insert 1/2" 10 mm 1054/10		2
72	Plug in adaptor 14x18 to 9x12		2
73	Plug in adaptor 9x12 to 14x18		2
74	Screwdriver insert 8 mm 1/2 inch Length 120 mm for Hexagon socket screws		1
75	Screwdriver insert 10 mm 1/2 inch Length 140 mm for Hexagon socket screws		1
76	Screwdriver insert 12 mm 1/2 inch Length 140 mm for Hexagon socket screws		1
77	VDE rounded flat-nose pliers 200 mm curved 2 component grip		2
78	VDE side-cutters 180 mm head chrome-plated with two-component handle		2

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Sr.No	Discription	Pictorial Representation	Qty/Set
79	Crimp tool PZ 16 for wire end sleeves H 6 - H 16		1
80	Crimp tool PZ 3 for wire end sleeves H 0.5 - H 6		1
81	Slotted screwdriver 2.5 x 80 mm Plus-Series 100 VDE		1
82	Slotted screwdriver 3.0 x 100 mm Plus-Series 100 VDE		1
83	Slotted screwdriver 3.5 x 100 mm Plus-Series 100 VDE		1
84	Slotted screwdriver 4.0 x 100 mm Plus-Series 100 VDE		1
85	Slotted screwdriver 5.5 x 125 mm Plus-Series 100 VDE		1
86	Slotted screwdriver 6.5 x 150 mm Plus-Series 100 VDE		1
87	Slotted screwdriver 8.0 x 200 mm Plus-Series 100 VDE		1
88	Slotted screwdriver 10.0 x 200 mm Plus-Series 100 VDE		1
89	Slotted clamping screwdriver screwdriver 3.5 x 0.6 x 150 mm		1
90	Slot-head screwdriver 6-parts in carton		1
91	Crosspoint screwdriver screwdriver PH 0 VDE SoftFinish		1
92	Crosspoint screwdriver screwdriver PH 1 VDE SoftFinish		1
93	Crosspoint screwdriver screwdriver PH 2 DE SoftFinish		1
94	Crosspoint screwdriver screwdriver PH 3 VDE SoftFinish		1
95	Crosspoint screwdriver screwdriver PH 4 VDE SoftFinish		1

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Sr.No	Discription	Pictorial Representation	Qty/Set
96	Nut spinner 6 mm VDE SoftFinish		1
97	Nut spinner 8 mm VDE SoftFinish		1
98	Voltage testing screwdriver screwdriver 3 x 60 mm VDE 220-250 V		2
99	Screwdriver PZ 0 Plus-Series 100 VDE		1
100	Screwdriver PZ 1 Plus-Series 100 VDE		1
101	Screwdriver PZ 3 VDE		1
102	Screwdriver PZ 4 VDE		2
103	Multi-purpose scissors 205 mm non-rusting		1
104	Crimp pliers Harting 09 99 000 0110		1
105	Crimping lever pliers 180 mm for cable end sleeves self-adjusting		1
106	Cross-head screwdriver screwdriver PH 1 x 80 mm VDE		1
107	Cross-head screwdriver screwdriver PH 2 x 100 mm VDE		1
108	guid pin M12		6
109	Lifting Nut D12 mm		4
110	Lifting Nut D16mm		4

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Sr.No	Discription	Pictorial Representation	Qty/Set
111	Shackle 12mm		4
112	Shackle 16mm		4
113	CT insulating guide pin (5101192704)		8

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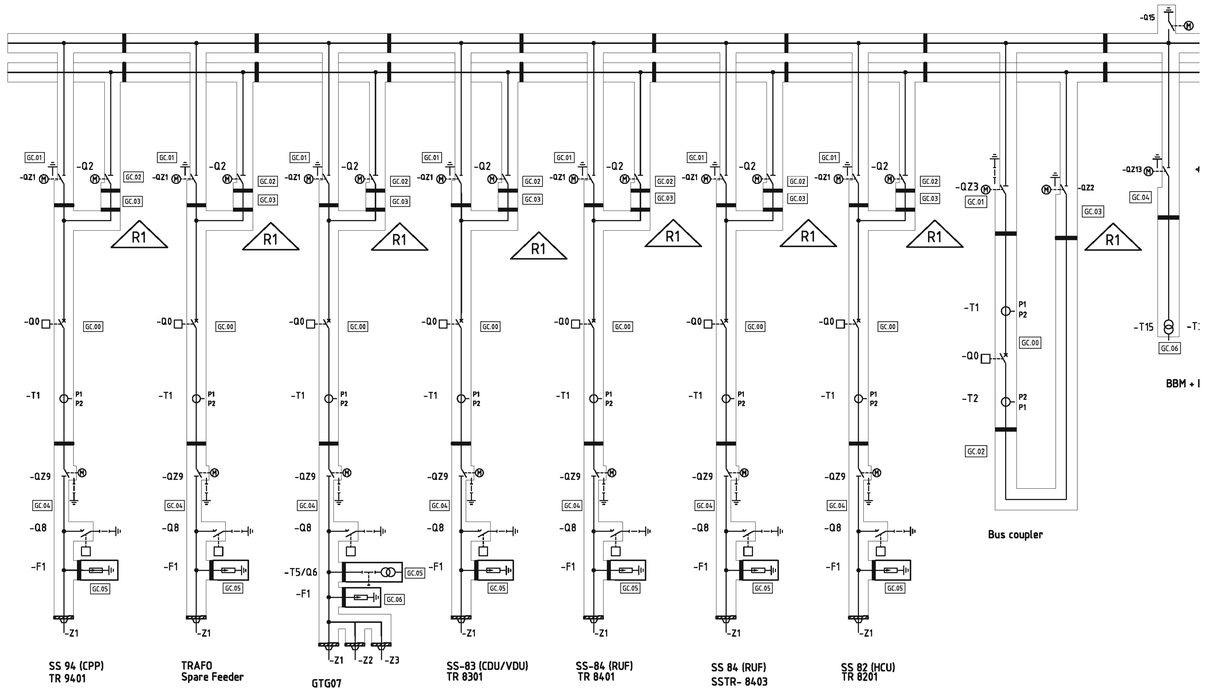
Annexure B- Returnable testing tools list

Commissioning Tools (15 No)			
Sr. No	**Description**	**Pictorial Description**	**Qty**
1	Multimeter (with Accessories)		1
2	Contact Resistance Meter		1
3	SF6-Analyzer multi-function instrument for dewpoint- and volume procent measurement		1
4	CT/VT Analyser		1
5	9 part - connector set		1

BUS BAR-1
66kV, 50 Hz, 2500 Amp,40kA for 1Sec.

BUS BAR-2
66kV, 50 Hz, 2500 Amp,40kA for 1Sec.



Gas compartment designation

Each gas compartment is equipped with a separate gas monitoring system, consisting of density monitor indicating red/green.

GC.04

Number of gas compartment

BHEL	CAT-1
A P P R O V E D This Approval does not relieve the Vendor of his responsibilities under the contract.	
SIGNED DKS	DATE 12.03.19
Transmission Business Engineering Management	

Scale
NTS

66kV GIS _HF

Rev.	Remarks	
04	Rev cloud for F09	11.0
03	Buffer compart add	28.
02	Customer comment	19.1
01	Customer comment	17.1
00	First Issue	12.1

REV.	DATE	ALTERED CHD/APPD	REV.	DATE	ALTERED CHD/APPD	REV.	DATE	ALTERED CHD/APPD	REV.	DATE	ALTERED CHD/APPD	REV.	DATE	ALTERED CHD/APPD	REV.	DATE	ALTERED CHD/APPD
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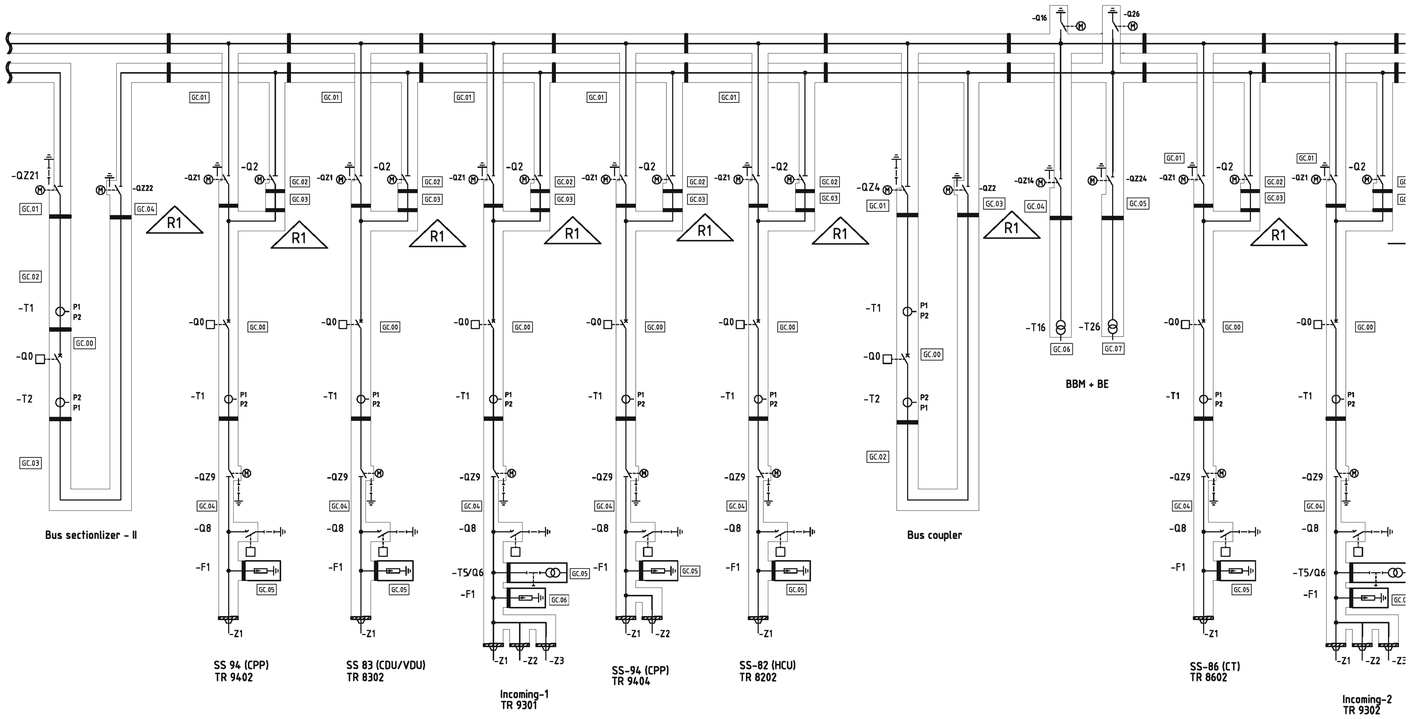
AKZ. AF-269 BHEL A/C-IPCL Vlakash

	=F15	=F16	=F17	=F18	=F19	=F20	=F21	(=F21)	=F22	=F23
	31274865	**31274866**	**31274867**	**31274868**	**31274869**	**31274870**	**31274871**	BUS- 3/4 VT	**31274872**	**31274873**
	Bay 15	Bay 16	Bay 17	Bay 18	Bay 19	Bay 20	Bay 27	BUS- 3/4 ES	Bay 21	Bay 22



BHEL	CAT-1
A P P R O V E D	
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66kV GIS _HF

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REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD
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AKZ.: AF-369 BHEL A/C HPCL Vishakh

Current transformer data

Bay	Reference designat.	Type	Core	Ratio (A/A)	Rated Output (VA)	Class	Remarks Vk(volts), Im(mA) @ Vk/2, Rct(ohm)
F03	T1	Protection	1	1200/1	-	PS	Vk=800 , Im<=30, Rct=12
		Protection	2	1200/1	-	PS	Vk=800 , Im<=30, Rct=12
		Protection	3	1200/1	-	PS	Vk=800 , Im<=30, Rct=12
		Protection	4	1200/1	10	5P	ALF=20
		Metering	5	1200/1	15	0.2	ISF≤5 (with choke coil)
		Protection	6	2500/1	-	PS	Vk=1300 , Im<=30, Rct=20
F12	T1	Protection	1	300/1	-	PS	Vk=200 , Im<=30, Rct=3
		Protection	2	300/1	-	PS	Vk=200 , Im<=30, Rct=3
		Protection	3	300/1	-	PS	Vk=200 , Im<=30, Rct=3
		Protection	4	300/1	10	5P	ALF=20
		Metering	5	300/1	15	0.2	ISF≤5 (with choke coil)
		Protection	6	2500/1	-	PS	Vk=1300 , Im<=30, Rct=20
F09, F18, F23	T1	Protection	1	1200/1	-	PS	Vk=800 , Im<=30, Rct=12
		Protection	2	1200/1	-	PS	Vk=800 , Im<=30, Rct=12
		Protection	3	1200/1	-	PS	Vk=800 , Im<=30, Rct=12
		Protection	4	1200/1	10	5P	ALF=20
		Metering	5	1200/1	15	0.2	ISF≤5 (with choke coil)
		Protection	6	2500/1	-	PS	Vk=1300 , Im<=30, Rct=20
F08, F14, F15, F21	T1	Protection	1	2500/1	10	5P	ALF=20
		Protection	2	2500/1	-	PS	Vk=1300 , Im<=30, Rct=20
	T2	Protection	1	2500/1	-	PS	Vk=1300 , Im<=30, Rct=20
		Metering	2	2500/1	15	0.2	ISF≤5 (with choke coil)
F10, F19	T1	Protection	1	600/1	-	PS	Vk=600 , Im<=30, Rct=8
		Protection	2	600/1	10	5P	ALF=20
		Metering	3	600/1	15	0.2	ISF≤5 (with choke coil)
		Protection	4	2500/1	-	PS	Vk=1300, Im<=30, Rct=20
F01, F16	T1	Protection	1	400/1	-	PS	Vk=800 , Im<=30, Rct=7
		Protection	2	400/1	10	5P	ALF=20
		Metering	3	400/1	15	0.2	ISF≤5 (with choke coil)
		Protection	4	2500/1	-	PS	Vk=1300, Im<=30, Rct=20
F04, F13, F17, F24	T1	Protection	1	400/1	-	PS	Vk=800 , Im<=30, Rct=3
		Protection	2	400/1	10	5P	ALF=20
		Metering	3	400/1	15	0.2	ISF≤5 (with choke coil)
		Protection	4	2500/1	-	PS	Vk=1300, Im<=30, Rct=20
F02, F05, F06, F07, F11, F20	T1	Protection	1	500/1	-	PS	Vk=750 , Im<=30, Rct=4
F22, F25, F26, F27		Protection	2	500/1	10	5P	ALF=20
		Metering	3	500/1	15	0.2	ISF≤5 (with choke coil)
		Protection	4	2500/1	-	PS	Vk=1300, Im<=30, Rct=20

Voltage transformer data

Bay	Reference Designat.	Type	Winding	Ratio (kV/kV)	Rated Output (VA)	Class	Remarks
F03, (F08), F09, F12	T5,T15,T25	Protection	1	66 : √3 / 0.11: √3	50	3P	-
F18, (F21), F23	T16,T26	Metering	2	66 : √3 / 0.11: √3	100	1	-

Rated voltage factor / Rated time — 1.2 U_N / Continuous
Rated voltage factor / Rated time — 1.5 U_N / 30 Sec.

DOCUMENT REVIEW DETAILS

1 No Comments

2 Proceed with manufacture / fabrication as per the commented document. Revised document required.

3 Document does not conform to basic requirements as marked. Resubmit for review.

R Retained for Records. V Void.

Signature with Date 07-JAN-2019

Name of Reviewer SAI ACHUTUNI (A738)

Transmittal No

Scale NTS	= HPCL + Visakh /	8DN8 switchgear
66kV GIS _HPCL Visakh		66kV GIS- GAS SCHEMATICS WITH SINGLE LINE DIAGRAM WITH CT VT PARAMETERS

Rev.	Remarks	Date	Name
03	Buffer compart add	28.11.18	BS
02	Customer comment	19.11.18	BS
01	Customer comment	17.10.18	BS
00	First Issue	12.10.18	BS

Date 28.11.2018 | Drawn BS | Appr. GQ | Norm

Siemens | (1) G71770 - AF269 - S005- 01 | Sheet 3 - 4

CAPTIVE POWER PLANT (CPP) PACKAGE
VISAKH REFINERY MODERNIZATION PROJECT (VRMP)
JOB NO. B016

OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC: ENGINEERS INDIA LIMITED (EIL), NEW DELHI

BHARAT HEAVY ELECTRICALS LTD. TBG, NOIDA

	NAME	SIGN.	DATE
DRN.	BS		12.10.18
CHD.	GQ		12.10.18
APPD.	SM		12.10.18

NO.OF VAR.

REV.	DATE	ALTERED	CHD/APPD	ZONE
01	19.11.18			

DEPT. PE&SD | CODE 450 | UNTOL. DIMS. GR. G/M/F | SCALE NTS | WEIGHT (KG) NA | REF. TO ASSY. DRG. NA | ITEM NO. NA | NO.OF ITEMS NA

TITLE
66kV GIS- GAS SCHEMATICS WITH SINGLE LINE DIAGRAM WITH CT VT PARAMETERS

CARD CODE N.A.

CUST DRNG NO. TB-3-402-316-050

BHEL DRNG NO. TB-3-402-316-050

REV. 01

SHT. No 3 | NO. OF SHT. 3 OF 4

Page 3 of 27

Rating		
Rated voltage		72.5 kV
Rated frequency		50 Hz
Rated lightning impulse withstand voltage		325 kV
Rated short-duration power frequency withstand voltage		140 kV
Rated dynamic withstand current		100 kA
Rated shorttime withstand current	1 s	40 kA
Rated shortcircuit breaking current		40 kA
Rated supply voltage		110 V DC
Rated supply voltage circuit breaker		110 V DC
Rated supply voltage isolator/earthing switch		110 V DC
Heater voltage		240/415 V AC
Rated normal current Busbar		2500 A
Rated normal current Feeder		2500 A
Rated normal current Coupler		2500 A

Legend		
Equipment		
Circuit breaker	-Q0	
Three position swtich insulated (DS+ES)	-QZ3 -QZ4, -QZ9 -QZ11, -QZ21	
Three position switch (not insulated) (DS+ES)	QZ12,-QZ22,-QZ14 -QZ1, -QZ2, QZ13,-QZ23,-QZ24	
High speed earthing switch (insulated)	-Q8	
earthing switch (not insulated)	-Q15, -Q16 -Q25,-Q26	
Current transformer	-T1, -T2	
Voltage transformer (with Manual isolating link)	-T5/ Q6	
Voltage transformer	-T15-,T25 -T16,-T26	
Surge arrester	-F1	
Gas tight bushing		
Cable sealing end (with isolating link)	-Z1, Z2, Z3	

SWITCHGEAR COLOR : RAL7032

Environmental factors	
Ambient temperature	min. -5 °C max. +50 °C

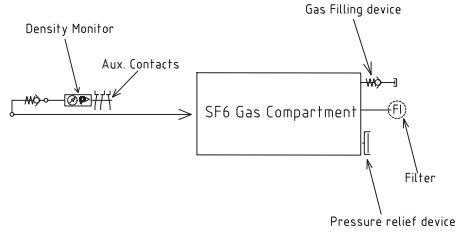
Note :-

1.1 - Device designation according to DIN 40719 part 2/ IEC publication no. 750/(1983)

1.2 - Each gas compartment is equipped with a seperate density monitor, static filter, gas filling device & pressure relief device.

1.3 - Each gas compartment is equipped with gas filling device (NRV) and all are in closed position.

1.4 - Provision for access to primary conductor is provided through insulated earthing switch which is in general used for primary current injection for CT core testing.



Gauge pressure at 20°C (relative)	Filling pressure (bar)	Loss of SF6 (bar) (Alarm)	Lockout SF6 Breaker block level (bar)	Rupture disc operating pressure (bar) (Alarm)	Design pressure (bar)
Circuit breaker	5.6	5.2	5.0	9.4	8.0

Gauge pressure at 20°C (relative)	Filling pressure (bar)	Loss of SF6 (bar) (Alarm)	Rupture disc operating pressure (bar)	Minimum SF6 density (bar) (Alarm/trip)	Design pressure (bar)
Switchgear (BB+DS/ES)	4.5	4.2	8.5	4.0	8.0
Voltage transformer	5.6	5.2	9.4	5.0	8.0
	4.5	4.2	8.5	4.0	8.0

Reference Drawing/Document	
Single Line Diagram for 66kV GIS (Rev.01)	TB-1-402-510-001
CT & VT parameters (Rev.02)	TB-1-402-510-024
Specification for Extra high voltage Gas insulated switchgear(Rev.0)	6-51-0066

DOCUMENT REVIEW DETAILS

1 No Comments.

2 Proceed with manufacture / fabrication as per the commented document. Revised document required.

3 Document does not conform to basic requirements as marked. Resubmit for review.

R Retained for Records. V Void.

Signature with Date 07-JAN-2019

Name of Reviewer SAI ACHUTUNI (A738)

Transmittal No

Page 4 of 27

REV.	DATE	ALTERED	CHD/APPD
03	28.11.18	Buffer compart add	BS
02	19.11.18	Customer comment	BS
01	17.10.18	Customer comment	BS
00	12.10.18	First Issue	BS

Scale NTS = HPCL + Visakh /

66kV GIS _HPCL Visakh

8DN8 switchgear

Date 28.11.2018 Drawn BS Appr. GQ Norm

66kV GIS- GAS SCHEMATICS WITH SINGLE LINE DIAGRAM WITH CT VT PARAMETERS

Siemens (1) G71770 - AF269 - S005-00 Sheet 4 - 4

PROJECT: CAPTIVE POWER PLANT (CPP) PACKAGE VISAKH REFINERY MODERNIZATION PROJECT (VRMP) JOB NO. B016

OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC: ENGINEERS INDIA LIMITED (EIL), NEW DELHI

BHARAT HEAVY ELECTRICALS LTD. TBG NOIDA

	NAME	SIGN.	DATE
DRN.	BS		17.10.18
CHD.	GQ		17.10.18
APPD.	SM		17.10.18

DEPT. PE&SD CODE 450 | UNTOL. DIMS. GR. G/M/F | SCALE NTS | WEIGHT (KG) NA | REF. TO ASSY. DRG. NA | ITEM NO. NA | NO.OF ITEMS NA

TITLE 66kV GIS- GAS SCHEMATICS WITH SINGLE LINE DIAGRAM WITH CT VT PARAMETERS

CARD CODE N.A.

CUST DRNG NO. TB-3-402-316-050

BHEL DRNG NO. TB-3-402-316-050

REV. 01

SHT. No 4 NO. OF SHT. 4 OF 4

BHEL	CAT-1
A P P R O V E D This Approval does not relieve the Vendor of his responsibilities under the contract.	
SIGNED DKS	DATE 24.12.2018
Transmission Business Engineering Management	

1. Weight of two bay combined togethor= 7T
2. The size of maixmum tranport unit=3mx3mx5m

Additional panels to be located,
1. Transducer panel
2. Dummy panel
3. Interposing panel

FOR APPROVAL

DO NOT SCALE WORKING DIMENSIONS

In accordance with the standard IEC 61936-1 chapter 3.2.1 it is obligatory for the user to comply with all requirements which concern an enclosed electrical operating area.

For ventilation of SF6 switchgear hall pay attention to IEC 61936-1, section 8.8.2 and to national valid instructions off accident preventions at SF6 switchgear.

Reference Drawing:

(1)	TB-3-402-316-050	66kV GIS- GAS SCHEMATICS WITH SINGLE LINE DIAGRAM WITH CT VT PARAMETERS
(1)	PY-DA-1-M104-1269-02	GIS BUILDING(SS-93) ARCH. PLAN AT 66KV GIS FLOOR(EL+103.60M) &CABLE CELLAR FLOOR(EL+106.00M) FOR 33kV

Scale 1:60

66kV GIS- LAYOUT DRAWING (PLAN & SECTION VIEW)

8DN8 Switchgear
66 kV

Rev.	Remarks	Date	Name
03	Customer comment	15.12.18	BS
02	Buffer comartment added	04.12.18	BS
01	Customr comment	19.11.18	BS
00	First Issue	27.10.18	BS

Date 15.12.18 | Drawn BS | Appr. SM | Norm

Siemens

(1) G71770- AE269 -V021 -00

Sheet 1-1

PROJECT: CAP VISAKH

OWNER: HINI

PMC: EP

BHARAT

DEPT. PE&SD | CODE. 450 | UNTOL. DIMS. GR. ~~C/M/F~~

TITLE 66kV GIS- LAY (PLAN & SECTI

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
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DOCUMENT REVIEW DETAILS

- No Comments
- Proceed with manufacture / fabrication as per the commented documents. Resubmission not required.
- Document does not comply with specifications as marked. Resubmission required.
- Retained for Record

Signature with Date: 05-JAN-2019
Name of Reviewer: SAI ACHUTUNI (A780)
Transmittal No.:

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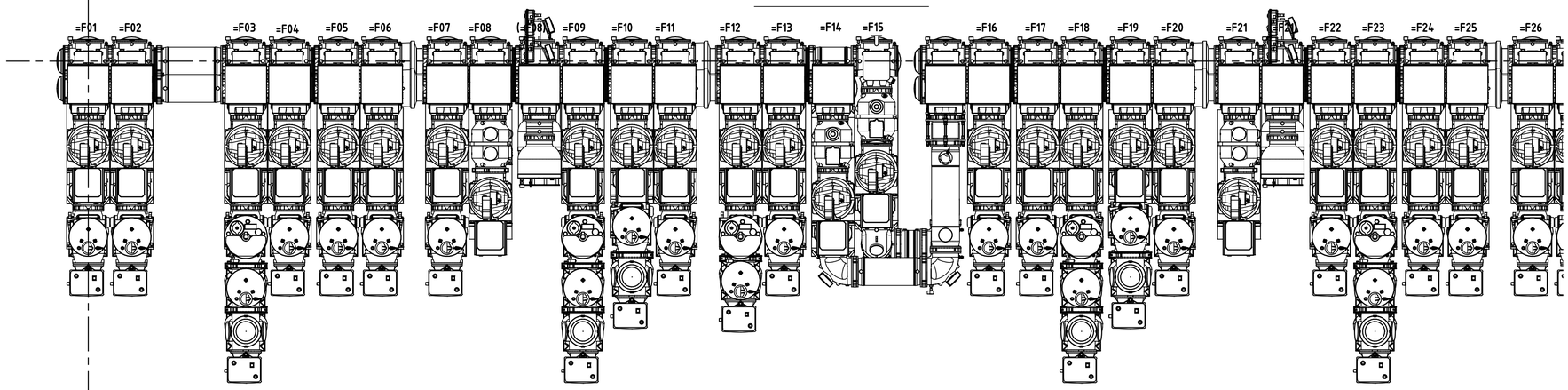
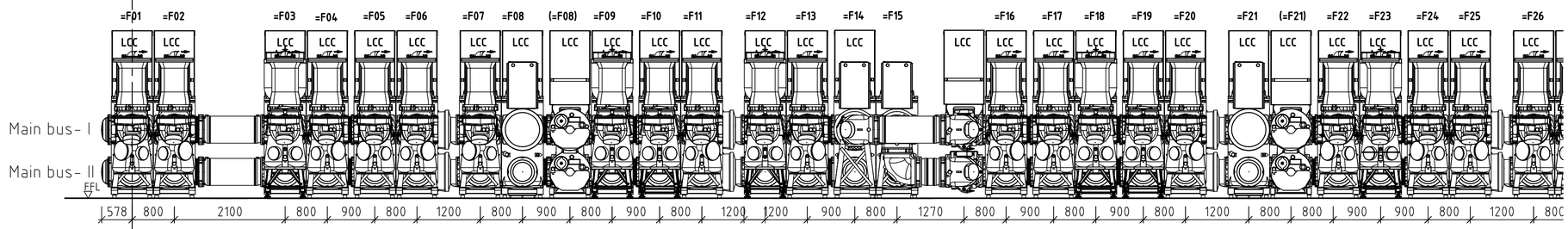
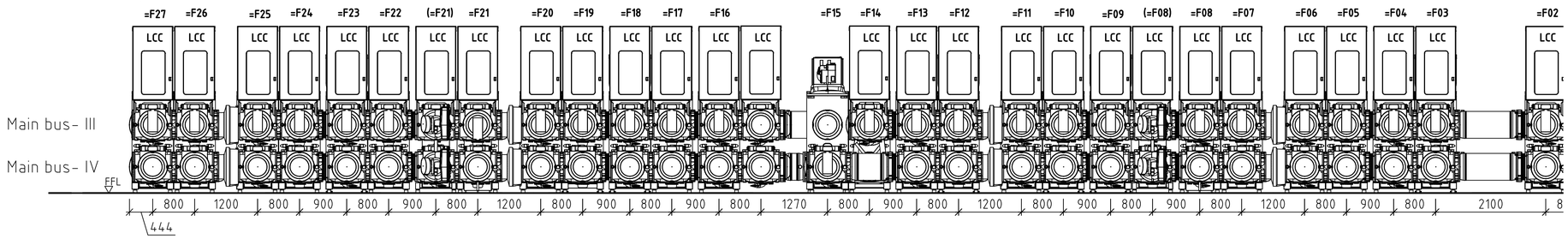
GIS - PLAN VIEW



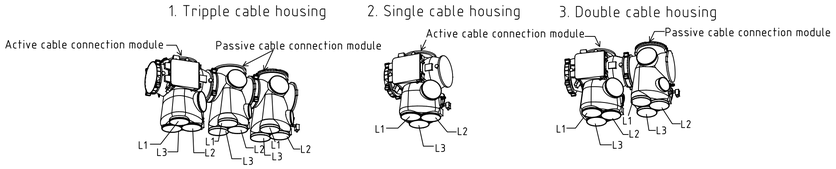
VIEW- Y-Y



VIEW- X-X



Cable sealing end Phase Allocation



Scale 1:50	=	+	/
66kV GIS- LAYOUT DRAWING (PLAN & SECTION VIEW)		8DN8 Switchgear 66 kV	

Rev.	Remarks	Date	Name
			Date 15.12.18
			Drawn BS
			Appr. SM
			Norm
03	Customer comment	15.12.18	BS
02	Buffer compartment added	04.12.18	BS
01	Customer comment	19.11.18	BS
00	First Issue	27.10.18	BS

Siemens | (1) G71770- AE269 -V021 -00 | Sheet 2-2

PROJECT: CAI VISAKH
OWNER: HINI
PMC: EI
BHARAT

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
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DEPT. PE&SD | UNTOL. DIMS. GR.
CODE. 450 | ~~C/M/F~~
TITLE 66kV GIS- LAY (PLAN & SECTI

DOCUMENT REVIEW DETAILS
No Comments
Proceed with changes noted
Comments noted document is not to be released
Document does not conform to basic requirements as marked. Resubmit for review.
Returned for Record
Signature with Date: 05-JAN-2018
Name of Reviewer: SAI ACHUTUN (A736)

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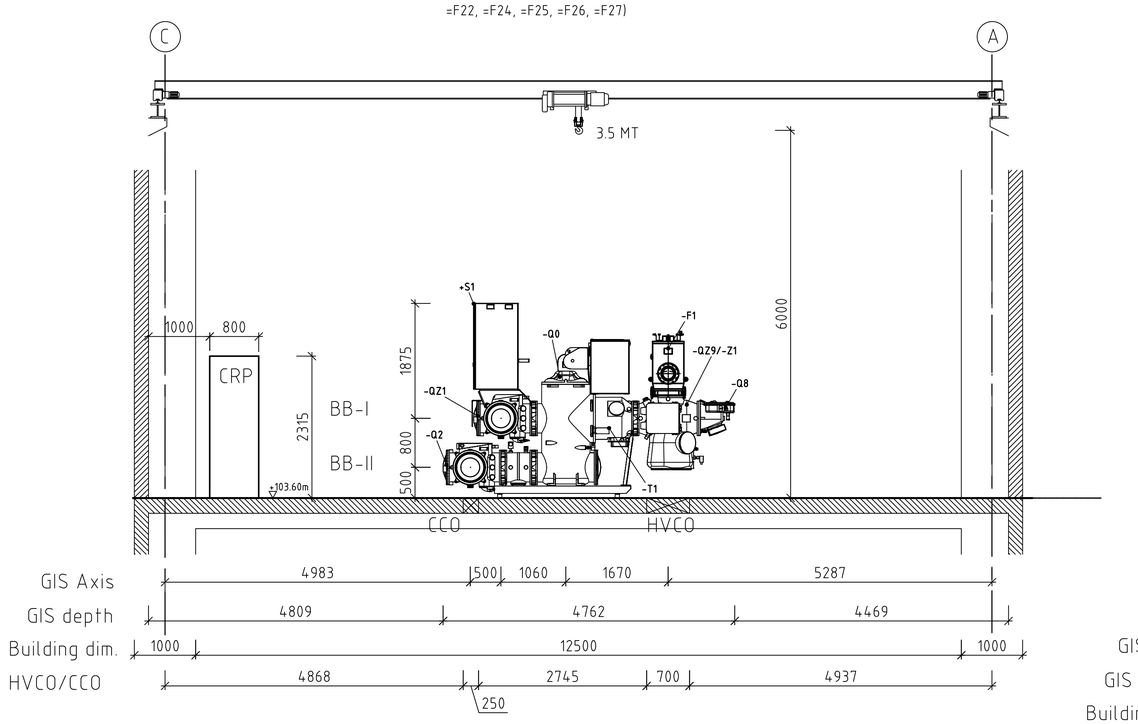
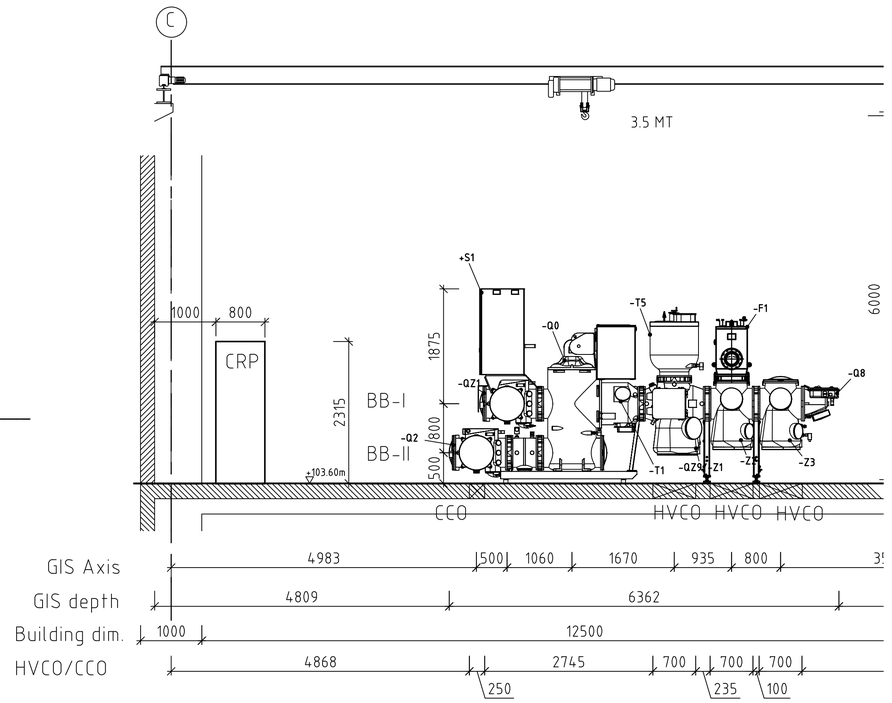
Section A-A

=F01, (=F02, =F04, =F05, =F06, =F07, =F11, =F13, =F16, =F17, =F20, =F22, =F24, =F25, =F26, =F27)



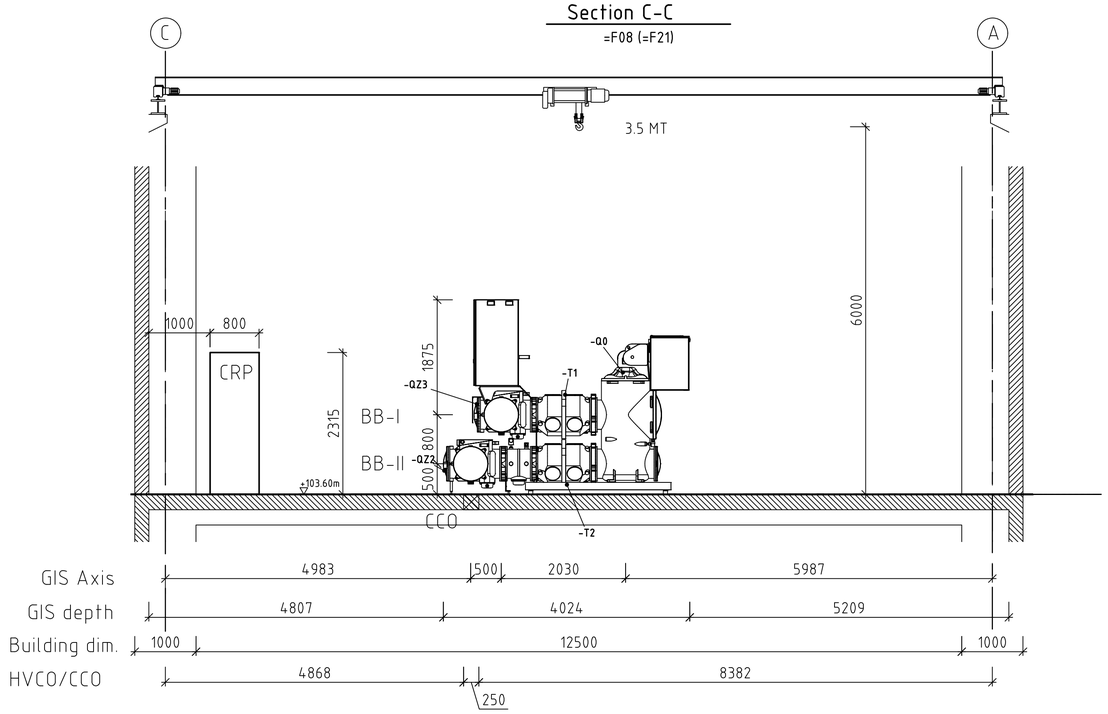
Section B-B

=F03 (=F18, =F23, =F09)



Section C-C

=F08 (=F21)



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66kV GIS- LAYOUT DRAWING (PLAN & SECTION VIEW)		8DN8 Switchgear 66 kV	

				Date	15.12.18
				Drawn	BS
				Appr.	SM
				Norm	
03	Customer comment	15.12.18	BS		
02	Buffer compartment added	04.12.18	BS		
01	Customer comment	19.11.18	BS		
00	First Issue	27.10.18	BS		
Rev.	Remarks	Date	Name		

Siemens | (1) G71770- AE269-V023 -00 | Sheet 1-4

PROJECT: CAI VISAKH

OWNER: HINI

PMC: EI

BHARAT

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
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DEPT. PE&SD | UNTOL. DIMS. CR.

CODE. 450

TITLE 66kV GIS- LAY (PLAN & SECTI

DOCUMENT REVIEW DETAILS
No Comments
Proceed with changes noted/commented document
Document does not conform to basic requirements as noted. Resubmit for review.
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Name of Reviewer: SAI ACHYUTH (A736)
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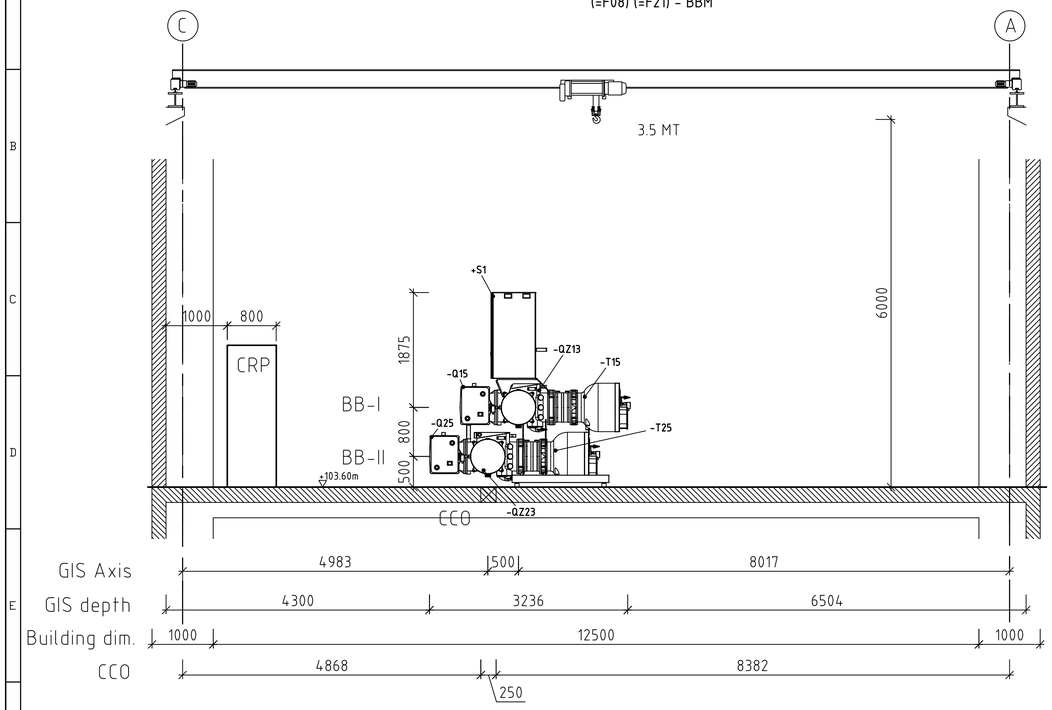
Section D-D

(=F08) (=F21) - BBM



Section E-

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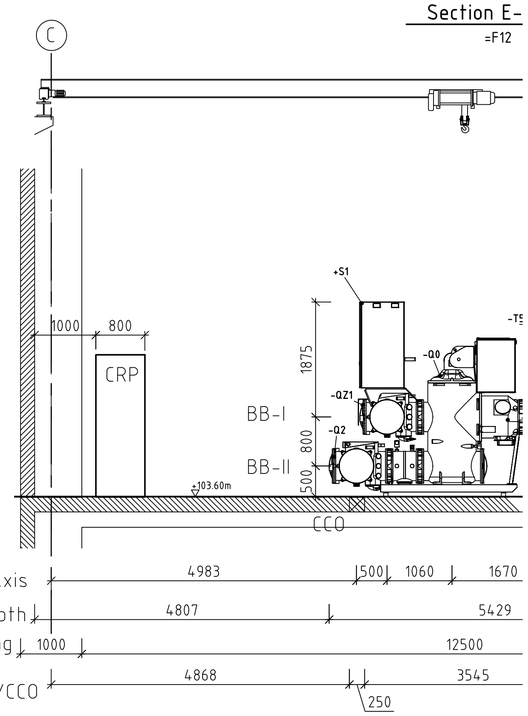
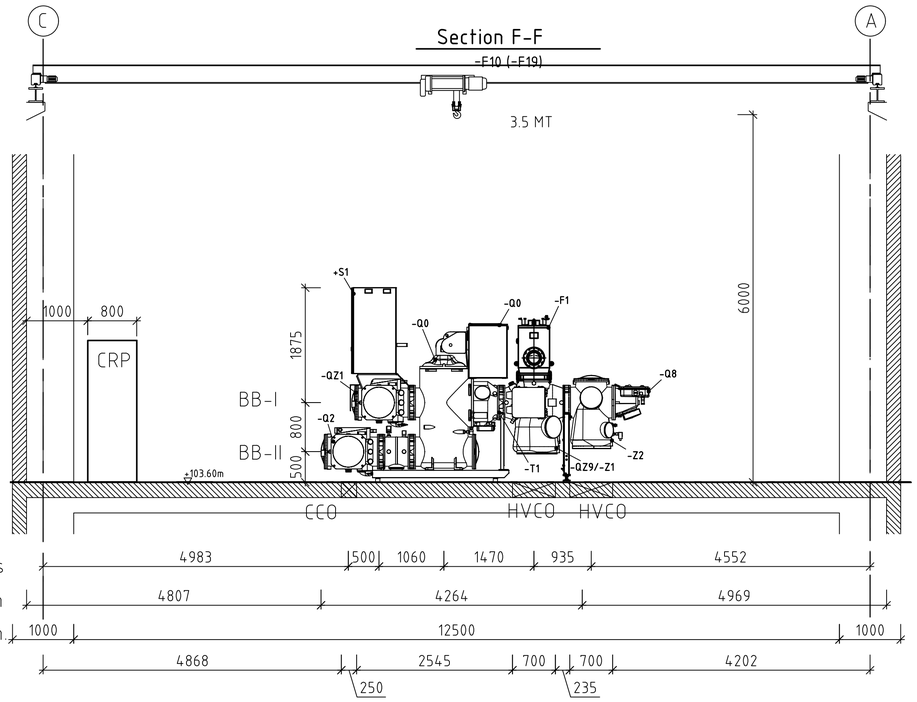


Legend

Equipment	Nomenclature	(SLD Symbol)
Circuit breaker	-Q0	
Three position swtich insulated (DS+ES)	-QZ3 -QZ4, -QZ9 -QZ11, -QZ21	
Three position switch (not insulated) (DS+ES)	QZ12,-QZ22,-QZ14 -QZ1, -QZ2, QZ13,-QZ23,-QZ24	
High speed earthing switch (insulated)	-Q8	
earthing switch (not insulated)	-Q15, -Q16 -Q25,-Q26	
Current transformer	-T1, -T2	
Voltage transformer (with Manual isolating link)	-T5/Q6	
Voltage transformer	-T15-,T25 -T16,-T26	
Surge arrester	-F1	
Cable sealing end (with isolating link)	-Z1, Z2, Z3	
Local control cubicle	+S1	
Gas permeable bushing		
Gas tight bushing		

Section F-F

-F10 (-F19)



Scale 1:50	=	+	/
66kV GIS- LAYOUT DRAWING (PLAN & SECTION VIEW)	8DN8 Switchgear 66 kV		

Rev.	Remarks	Date	Name
		Date	15.12.18
		Drawn	BS
		Appr.	SM
		Norm	
03	Customer comment	15.12.18	BS
02	Buffer compartment added	04.12.18	BS
01	Customer comment	19.11.18	BS
00	First Issue	27.10.18	BS

Siemens | (1) G71770 - AE269 -V023 -00 | Sheet 2-4

PROJECT: CAI VISAKH

OWNER: HINI

PMC: EI

BHARAT BHEL

DEPT. PE&SD | UNTOL. DIMS. GR.

CODE. 450 | ~~C/M/F~~

TITLE 66kV GIS- LAY (PLAN & SECTI

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
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ZONE			ZONE			ZONE			ZONE			ZONE			ZONE			ZONE		

DOCUMENT REVIEW DETAILS
No Comments
Proceed with changes as noted
Comments attached
Document does not conform to basic requirements as marked. Resubmit for review.
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Signature with Date: 05-JAN-2018
Name of Reviewer: SAI ACHUTUN (A736)
Transmittal No.
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Section G-G

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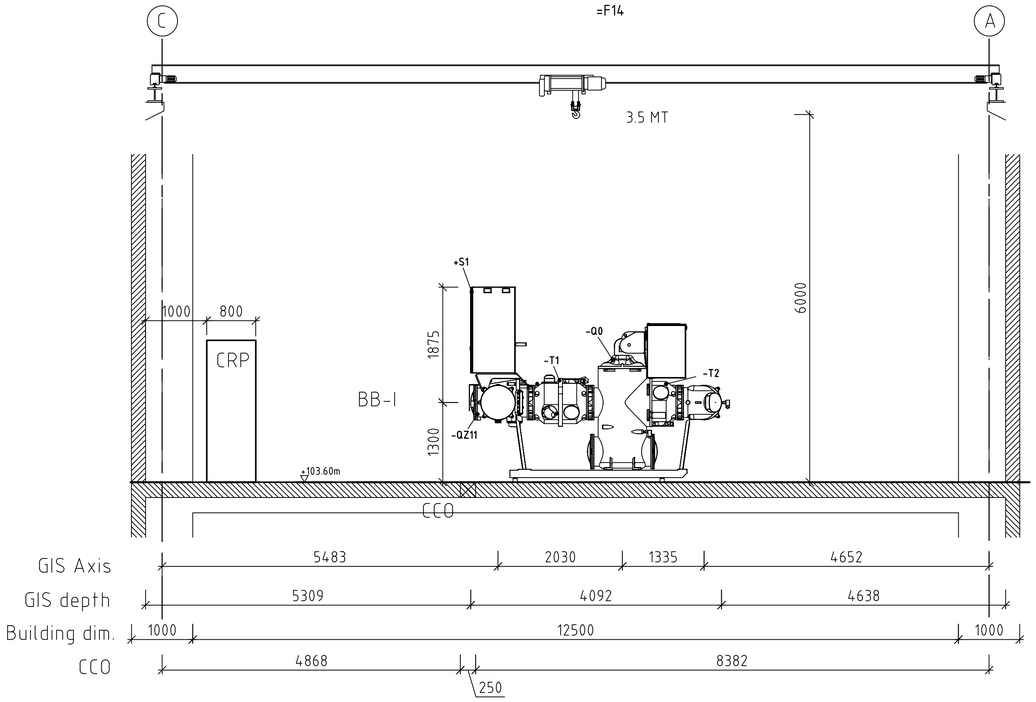

Section H-H

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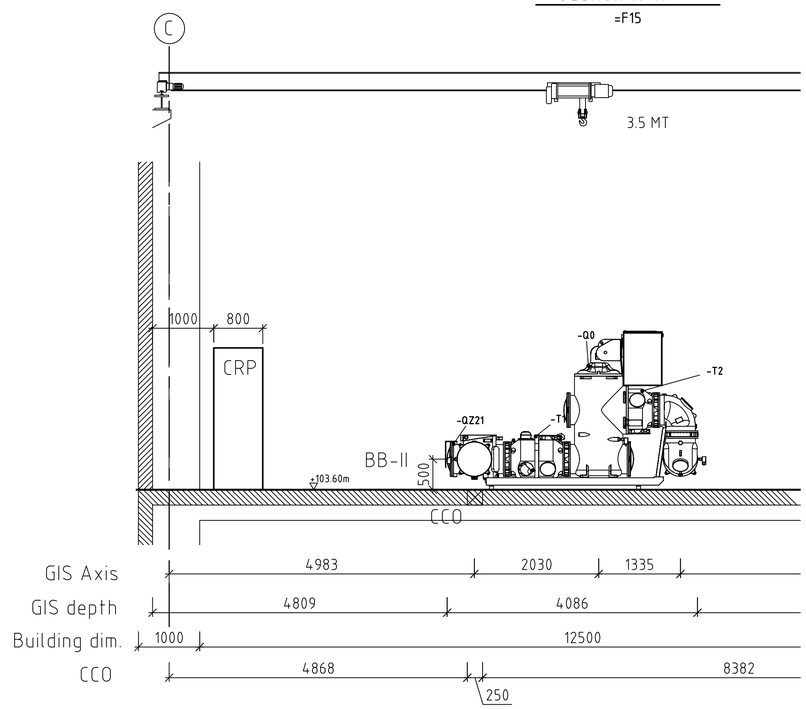

Section I-I

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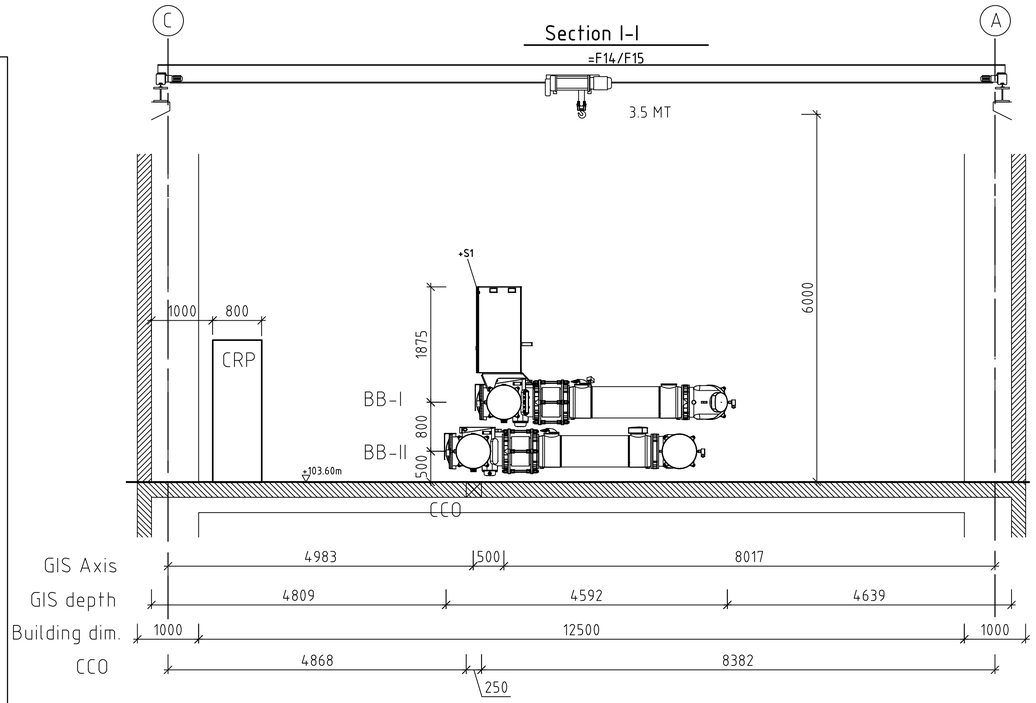

Notes :-

1.1- 'HVCO' refers 'High Voltage Cable Opening'

1.2- 'CCO' refers 'Control Cable Opening'

Scale 1:50 | = | + | /

66kV GIS- LAYOUT DRAWING (PLAN & SECTION VIEW)

8DN8 Switchgear 66 kV

Rev.	Remarks	Date	Name
03	Customer comment	15.12.18	BS
02	Buffer compartment added	04.12.18	BS
01	Customer comment	19.11.18	BS
00	First Issue	27.10.18	BS

Date 15.12.18 | Drawn BS | Appr. SM | Norm

Siemens | (1) G71770 - AE269 -V023 -00 | Sheet 3-4

PROJECT: CAP VISAKH

OWNER: HPCL HINI

PMC: EIL

BHARAT

DEPT. PE&SD | UNTOL. DIMS. GR. ~~C/M/F~~

CODE. 450

TITLE 66kV GIS- LAY (PLAN & SECTI

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
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DOCUMENT REVIEW DETAILS

No Comments
Proceed with manufacturing / fabrication as per the commented document. Revised document required for Document does not conform to basic requirements as marked. Re-submit for review.
Returned for Records
Signature with Date: 05-JAN-2019
Name of Reviewer: SAI ACHUTUNI (A736)
Transmittal No.

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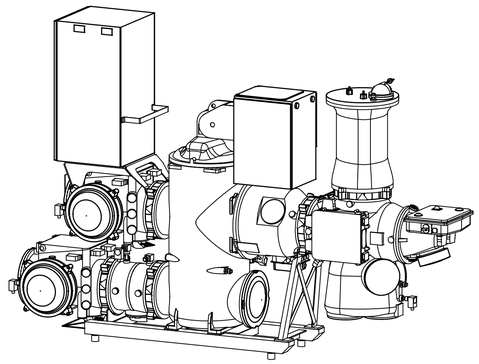
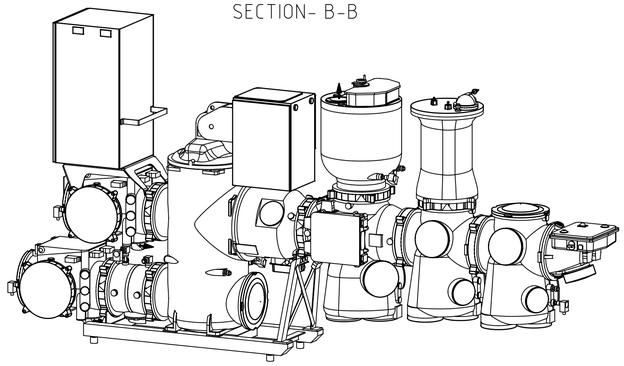
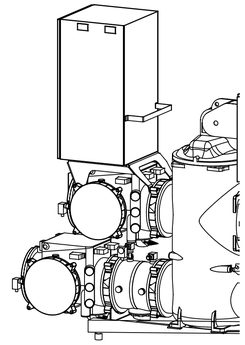
ISOMETRIC VIEWS

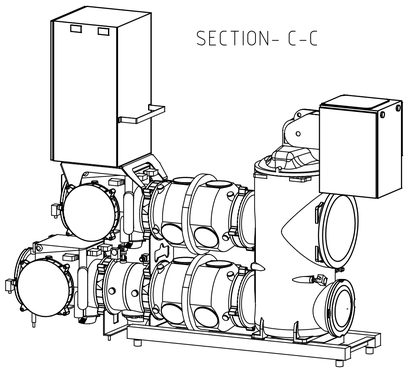
SECTION- A-A



SECTION- B-B

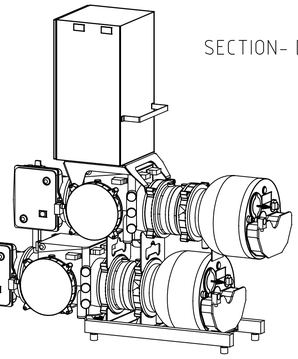


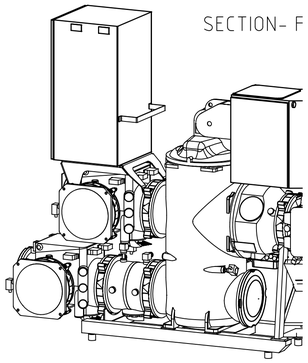




SECTION- C-C

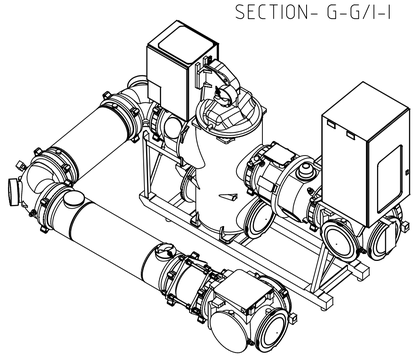
SECTION- D-D



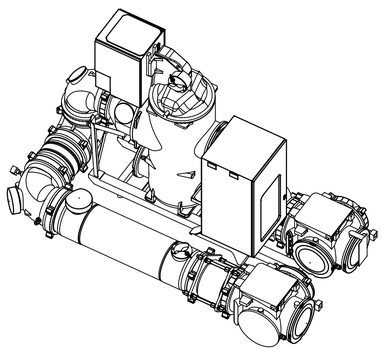


SECTION- F

SECTION- G-G/I-I



SECTION- H-H/I-I



Surge arrester model shown in ISOMETRIC view is tantative only.

Scale 1:50		=		+		/	
66kV GIS- LAYOUT DRAWING (PLAN & SECTION VIEW)				8DN8 Switchgear 66 kV			
				Date	15.12.18		
				Drawn	BS		
				Appr.	SM		
				Norm			
03	Customer comment	15.12.18	BS				
02	Buffer compartment added	04.12.18	BS				
01	Customer comment	19.11.18	BS	Siemens	(1) G71770- AE269-V023 -00		Sheet 4-4
00	First Issue	27.10.18	BS				
Rev.	Remarks	Date	Name				

PROJECT: CAI VISAKH

OWNER: HINI

PMC: EI

BHARAT

DEPT. PE&SD	UNTOL. DIMS. CR. -C/M/F-
CODE. 450	

TITLE 66kV GIS- LAY (PLAN & SECTI

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
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A.V. PCL Vishakh

DOCUMENT REVIEW DETAILS

No Comments
Proceed with changes noted
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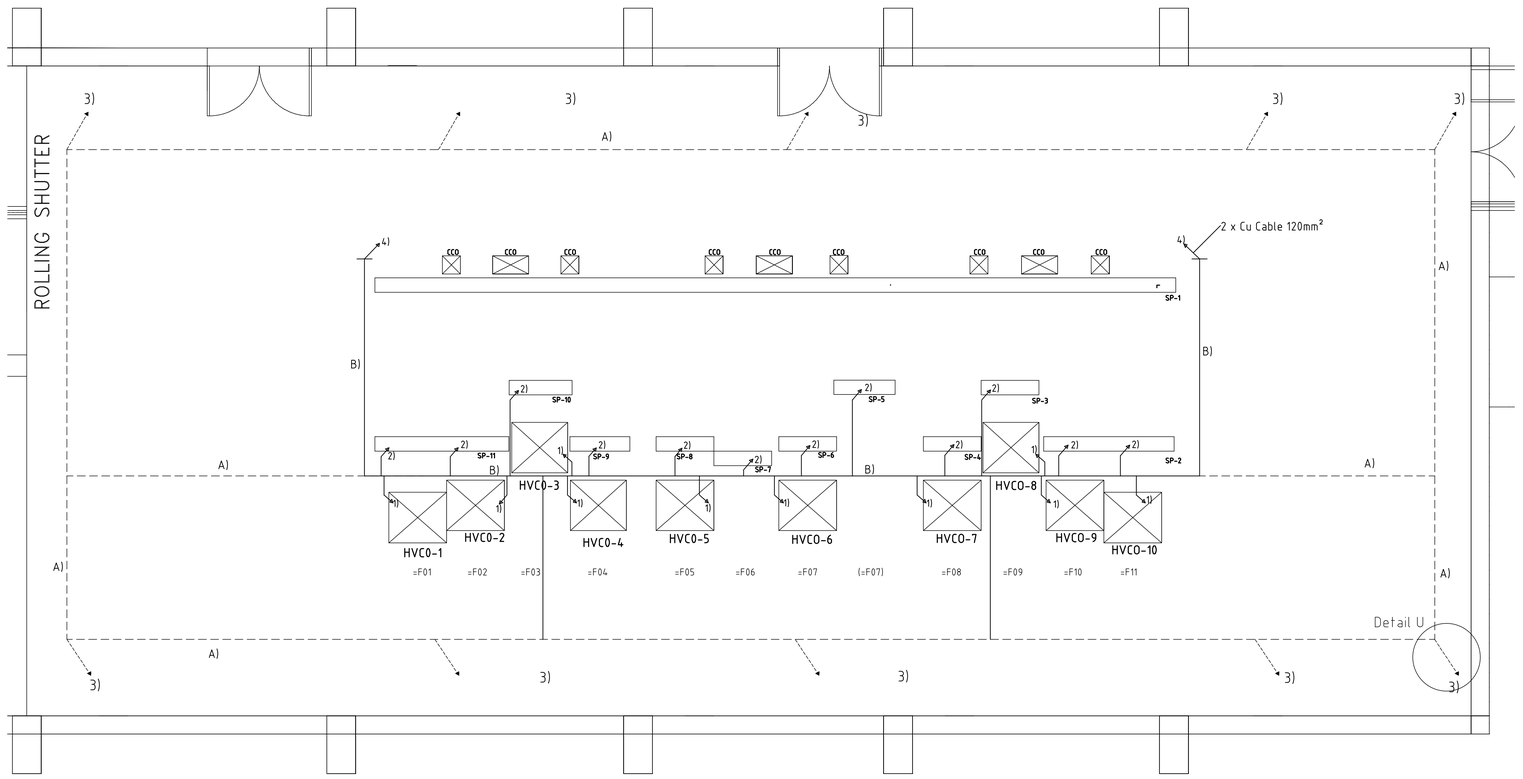
CONTENTS

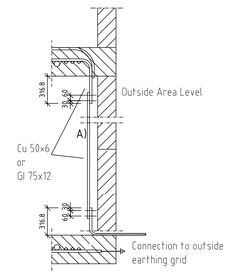
SL.NO.	DOCUMENT TITLE	DOCUMENT REF. NO.	PAGES	DATE
1.	INTERFACE FOR EARTHING & PROCEDURE/ PHILOSPHY/METHODOLOGY	(0)-G71770-AF137-P131-0 REV00	1	27.09.2016

ओएनजीसी ONGC	**ONGC Ltd.** 66kV GIS for COMBINED CYCLE CAPTIVE POWER PLANT at HAZIRA PLANT, GUJRAT
बी एच ई एल BHEL	**BHARAT HEAVY ELECTRICALS LTD.** TRANSMISSION PROJECTS DIVISION NOIDA LOA NO. MR/MM/OTP/CCPP/HAZIRA/264/2012-13/105AC12001 DTD. 31.03.2015



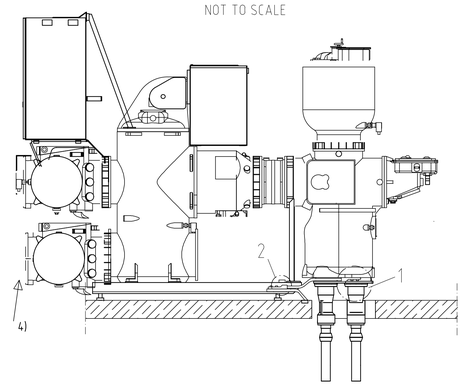
DETAIL "U"

NOT TO SCALE



SECTION VIEW

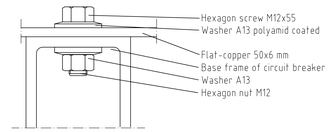
NOT TO SCALE

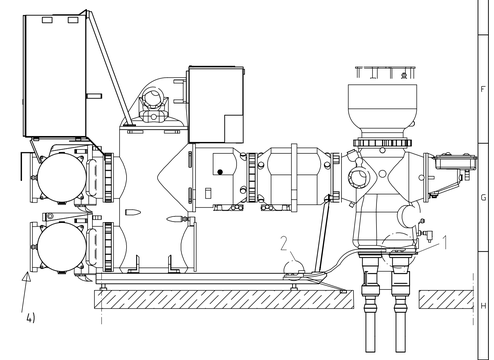


DETAIL 2)

View rotated 90°

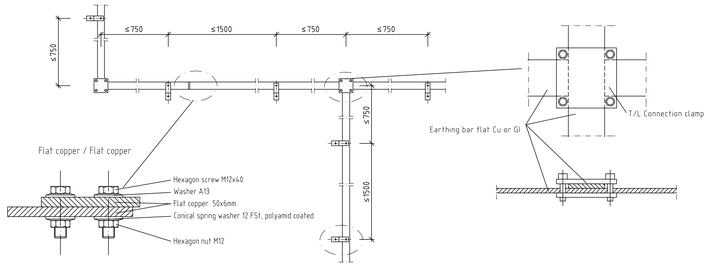
Flat Copper / Base frame of circuit breaker





REFERENCE FOR FIXING OF EARTHING BAR

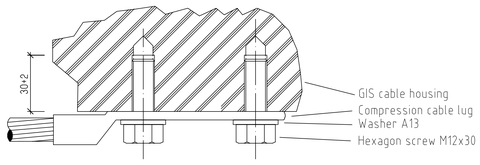
(Flat Cu 50×6 or GI 75×12)



DETAIL 1)

Connection to cable module

Stranded Copper / Earthing Point



Sr.no	Representation/ location	Material	Scope of supply
1	A) Flushed to GIS room	Flat Cu 50 x6 (or) GI 75 x 12	BHEL
2	B) Fixed on GIS room floor	Flat Cu 50 x6 (or) GI 75 x 12	BHEL
3	1) CONNECTION TO CABLE MODULE	(2 x Cu Cable 120mm²) flexi copper cable	SIEMENS
4	2) CONNECTION FROM FLAT Cu AT flushed to floor TO FLAT Cu AT GIS BASE FRAME	(2 x Cu Cable 120mm²) flexi copper cable	SIEMENS
5	3) CONNECTION TO THE OUTSIDE AND BUILDING EARTHING GRID	Flat Cu 50 x6 (or) GI 75 x 12	BHEL
6	4) CONNECTION TO BUSBAR	(2 x Cu Cable 120mm²) flexi copper cable	SIEMENS
7	Accessories for fixing the flexi copper connections		SIEMENS

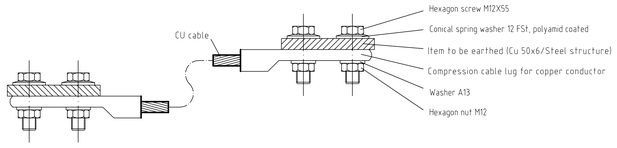
Floor openings

Note-A

Openeing for cable flat from basement to GIS floor (Size of the opening can be decided by the civil contractor, depending upon the Earth flat)

ITEM TO BE EARTHED AS PER DETAIL 1)

Stranded copper / Earthing point



Equipments to be earthed as per Detail 1)

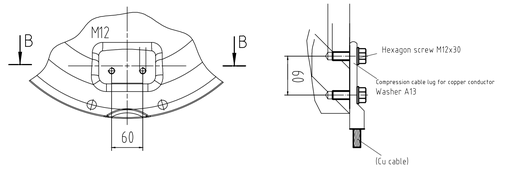
LA, through surge counter

Cable termination

DETAIL FOR 4)

Connection to Busbar

STRANDED COPPER / EARTHING POINT



THIS EARTHING PLAN ONLY SHOWS THE MEASURES FOR THE EARTHING OF THE HIGH VOLTAGE EQUIPMENT

PROPOSAL FOR EARTHING

ONLY BINDING FOR EARTHING

DO NOT SCALE WORKING DIMENSIONS

Reference Drawing:

(0)	G71770-AF137-P101	CONSTRUCTIONAL DATA FOR GIS

Rev	Remark	Date	Name
1	Items to be earthed as detail 1 added Bus bar earthing with flexible copper CB support (detail 2) with flexi copper	06/09/2016	RA
0	First issue	31/05/2016	RA

OIL AND NATURAL GAS CORPORATION LTD.
AT HAZIRA PLANT, GUJARAT.

LOA NUMBER : MR/WM/OTP/CCPP/HAZIRA/264/2012-13/105AC12001 DT.31/03/2015

EPC CONTRACTOR:
BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION PROJECTS DIVISION
PO NUMBER :275P336 PO DATE : 26/04/2016

FICHTNER
Consulting Engineers (India) Private Limited ,Bangalore.

PROJECT:-
1X51 MW COMBINED CYCLE COGENERATION CAPTIVE POWER PLANT

EQUIPMENT MANUFACTURER
SIEMENS

DRN.	CHKD	APPD	DATE
NAME RA	CHKD SM		DATE 06/09/2016

TITLE
INTERFACE FOR EARTHING & PROCEDURE/PHILOSPHY METHODOLOGY

DOC NO.: NUMBER (0)-G71770-AF137-P131-1 | SHEET: SHEET | SHEET 1 OF 1 | REV. 1

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AKZ: AF137-DMGE_Hazira

66kV GIS - SITE UNLOADING & STORAGE PROCEDURE FOR STORAGE AT SITE

TB-4-402-316-075

Project :- CAPTIVE POWER PLANT (CPP) PACKAGE VISAKH REFINERY MODERNIZATION PROJECT (VRMP) JOB NO.B016

BHEL	CAT-2
APPROVED WITH COMMENTS The Vendor can go ahead with manufacture subject to incorporating comments. This Approval does not relieve the Vendor of its responsibilities under the contract. Resubmit within 7 days.	
SIGNED DKS	DATE 30.11.2018
Transmission Business Engineering Management	

PROJECT:	CAPTIVE POWER PLANT (CPP) PACKAGE VISAKH REFINERY MODERNIZATION PROJECT (VRMP) JOB NO. B016
OWNER:	HINDUSTAN PETROLEUM CORPORATION LIMITED
PMC:	ENGINEERS INDIA LIMITED (EIL), NEW DELHI
	BHARAT HEAVY ELECTRICALS LTD. TBG NOIDA — Date:26.10.2018 — NO.OF VAR. –N.A.–
DEPT. PE&SD / CODE. 450	UNTOL. DIMS. GR. C/M/F — SCALE NA — WEIGHT (KG) NA — REF. TO ASSY. DRG. NA — ITEM NO. –N.A.– — NO.OF ITEMS –N.A.–
STORAGE PROCEDURE	CARD CODE N.A. — TB-4-402-316-075 — REV. 00
	SHT. No 0 — NO. OF SHT. 04

REV.	DATE	ALTERED	CHD/APPD	ZONE

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R Retained for Records. V Void.

Signature with Date 06-DEC-2018

Name of Reviewer SAI ACHUTUNI (A738)

Transmittal No.

Guidelines for storage & handling of GIS & its components

(EPC Scope)

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Transmittal No. _____

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1 Objective

2 Scope

3 Transport & handling of GIS & Components at site

4 Storage of goods

4.1 Storage must take place

4.2 Requirements to be met when choosing and preparing storage areas

4.3 For Highly flammable materials

4.4 The protection can be considered sufficient if

4.5 Storage of the delivery units for the installation

5 Constructional preconditions must be fulfilled before start of erection

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5.3 Side Room

5.4 Additional control Room

5.5 Additional for battery rooms

6 Do's & Don'ts

7 Annexure

7.1 Symbols on packages

7.2 Identification of the shipping

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Name of Reviewer SAI ACHUTUNI (A738)

Transmittal No.

1. Objective

This work instruction describes all storage, handling and transport of GIS bays and module after receipt of GIS bays, modules and material at site in order to be able to ensure the product quality.

Taking into account the various influences on the goods (climate conditions, duration of transport and storage, method of transport), several different types of packaging are used. The type of packaging is noted on the packing slip and subsequently described. Drawings on the packaging give information on the nature and arrangement of transport devices.

The accessory items are delivered on wooden pallets, in open crates or sturdy corrugated-cardboard boxes.

The sealed packaging surrounds the contents on all sides with a barrier layer. The quantity of drying agent contained in this barrier layer limits the relative humidity to a level of < 60%, a level which can cause no damage to the contents of the packaging for the duration of their storage life unless it is damaged & mishandled. The amount of desiccant depends on the crate surface area, the type of barrier (vapors permeability), the climatic conditions and active life in months.

2. Scope

All types of GIS products, its components, modules

3. Transport & handling of GIS & Components at site

On-site transport means the moving of packed or unpacked goods before or during erection. Various devices used for moving may include Trucks or other vehicles, Fork-lift trucks, Mobile and/or stationary cranes, Transport roller systems, specially for complete switchgear bays, Hydraulic jacks, Winches (rope winches, rack-and-pinion jacks), Rollers, Crowbars with and without rollers, Various ropes

Ensure that all tools are capable of bearing the load.

When loading and unloading heavy goods, especially if using winches, jacks and

Crowbars, etc., there is a risk of load tipping – Danger to life

- Prop up top-heavy or side-heavy loads and secure them by ropes during handling.
- Stabilize the transport vehicle with support frames or jacks during loading and unloading, in order to avoid tipping or springing of the loading platform. The brakes must always be applied.

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Transmittal No.

Heavy parts should be secured so that they cannot shift when handled.

With steel ropes, use wooden blocks to prevent them from rubbing against the cases or cutting into them.

Heed all notices. **Do not remove labels or other markings.**

4. Storage of goods

4.1 Storage must take place

In closed rooms (Indoor)

Outdoors after applying a folding box. Limited storage period for packaged goods in basic packaging. Shipping units in the basic packaging may only be stored in the open if it is certain that they are adequately protected from the elements, particularly from moisture.

4.2 Requirements to be met when choosing and preparing storage areas

Protect stored goods against moisture (flooding, runoff from melting snow and ice), dirt, destructive creatures such as rats, mice and termites, and unauthorized access.

Place crates on boles or squared timber to protect them against ground moisture and for better ventilation.

Determine the loading capacity of the area.

Arrange the storage area based on packing slip information, symbols and details on the packages.

Keep access routes free.

Stored goods should be inspected at regular intervals. After storms, heavy rain or snow, appropriate additional measures should be taken. If erection of the installation does not take place until after the intended life of the package seals, appropriate steps must be taken in good time. This may include:

Proper reconditioning of the sealed packaging.

Unpacking of goods and storage in an appropriate storage room. Where required, qualified personnel can be consulted through the appropriate Siemens office. Time-limited storage in sealed packaging that is exclusively designed for transport.

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1. Use proper equipments for unloading the GIS material from the trucks/trolleys

2. Use the guidelines (SOP) stick on the boxes to tie the slings for unloading to avoid damage to the material

3. After proper unloading, if the erection is not to be started immediately follow the below guidelines for storage of the GIS material

4. If the GIS is to be stored indoor

   a. GIS equipment should be stored indoor always in a lock and key arrangement

   b. The hall should have proper flooring and roof top with closed window (if any), and shall be kept ,

   c. Sealing all the open entries so as to avoid water, moisture, dust, destructive creatures like rats/mice and termites

   d. Do not put heavy goods on top of one other, do not overload any goods by excessive stacking

   e. The cases (boxes) should be arranged in such a way that the packing list/ box details are not torn off

5. If the GIS is to be stored outdoor in absence of indoor space below guidelines to be followed

   a. The GIS should be stored at elevated base (to avoid water ingress)

   b. The base should have enough loading capacity to bear the load of GIS bays

   c. There should be a proper roof (shed) over the elevated ground

   d. Do not put heavy goods on top of one other, do not overload any goods by excessive stacking

   e. The cases (boxes) should be arranged in such a way that the packing list/ box details are not torn off

   f. Once all the boxes are kept in the prescribed area, cover all the boxes with proper tarpaulin sealing all the open entries so as to avoid water, moisture, dust, destructive Creatures like rats/mice and termites

Store the goods carefully in accordance with the directives in the following section. Store spare parts separately. Specially preserve small components if the storage room is unable to maintain required storage conditions or if the storage time is expected to be particularly long.

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Avoid damage to modular assemblies during storage – Damage can affect subsequent operation.

- Pay attention to the carrying capacity of the floor.
- Do not place heavy goods on top of one other. Do not overload any goods by excessive stacking.
- The cases should be arranged so that the case number is clearly visible. Related parts should be stored in line with the sequence in which they are to be erected.
- Store machines with rolling-contact bearings (or assemblies containing machines) on vibration-free floors (the bearings may otherwise be damaged).

4.3 For Highly flammable materials

- Smoking is forbidden
- Observe fire prevention regulations.
- Fire engines must have unhindered access in the event of fire.
- Ensure that extinguishers are available adequately protected from adverse weather conditions.

4.4 The protection can be considered sufficient if

The requirements outlined in this section with regard to the selection of and conditions in a site for the storage of seaworthy crates are met.

The case of tents and tarpaulins, it is ensured that they are secured properly and that water cannot accumulate (such canopies must cover the goods far enough to prevent the penetration of rain driven from the side, snow etc.),

There is adequate ventilation underneath the weather protection (covers must not lay directly against the cases. Use a frame of slats or boards to ensure that there is an air gap of approx. 30 cm.)

The supply voltage to the anti-condensation heating is connected and the heating is in operation if the unpacked assembly is to be stored in the open for more than 2 weeks.

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4.5 Storage of the delivery units for the installation

Depending on the respective local conditions, the packages can be either unpacked directly at the assembly point, in a special room, or with suitable weather conditions.

Essentially, it has proven beneficial to unpack the packages directly in the switchgear hall after leveling the switchgear, if this is possible.

After this is finished the hall floor must be thoroughly cleaned before any further work can begin.

5 Constructional preconditions must be fulfilled before start of erection

5.1. General

Power supply consumed on site (AC/DC) according to common security requirements available.

First aid kit (large) existing

Necessary number of fire extinguishers

available Fire protective measures carried out

Waste disposal (container/collection) arranged

5.2 Switchgear Room

Construction work & Painting work completed

First dust absorbent coating of floor completed

Window & wall openings dustproof closed, Door openings dustproof lockable

Floor/ceiling/roof openings are covered

Lighting installation/station auxiliaries completed.

AHU's are in operating condition. (Controlled room conditions are preferred if possible) Crane ready for operation

5.3 Side rooms

Day-room available

Lavatory and washing facilities available

Office room & Workshop area available

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5.4 Additional for control rooms

4.1 Rooms are dust free

4.2 false floor ready

4.3 Cut-outs for cables correctly placed

4.4 Air conditioning ready for operation

5.5 Additional for battery rooms

5.1 Acid-resistant floor paint and/or

tiles 5.2 Protective clothing, eye shower

5.3 Ventilation in operation (final or temporary)

6. Do's & Don't's

SIEMENS	Clean room condition of GIS substation
✓ DO's	✗ DON'T' s
• GIS Hall opening must be close like window opening, door opening, roof opening and ground floor opening. • Shoes dust cleaner must be place at GIS room entry. • AHU must be in service for 24 hour. Ensure for air circulation & air changes. • Periodical check & replacing the filters. • Entry should be restricted to unauthorized personal. • GIS room should be in clean and dust free. • GIS room should be moisture free. • Ensure proper up keeping of the protection coating applied on the compensators, like avoid of damage of coating by any means like due to handling, accessing of surround area of it, falling of any substances, using the compensators for resting the feet etc.	• Entry door & any other opening to the GIS room should not remain open. • Eating food is prohibited inside the GIS room. • Don't perform any activity after opening the GIS compartment. • Use of tap water for any cleaning purpose strictly prohibited

DOCUMENT REVIEW DETAILS

1 No Comments.

2 Proceed with manufacture / fabrication as per the commented document. Revised document required.

3 Document does not conform to basic requirements as marked. Resubmit for review.

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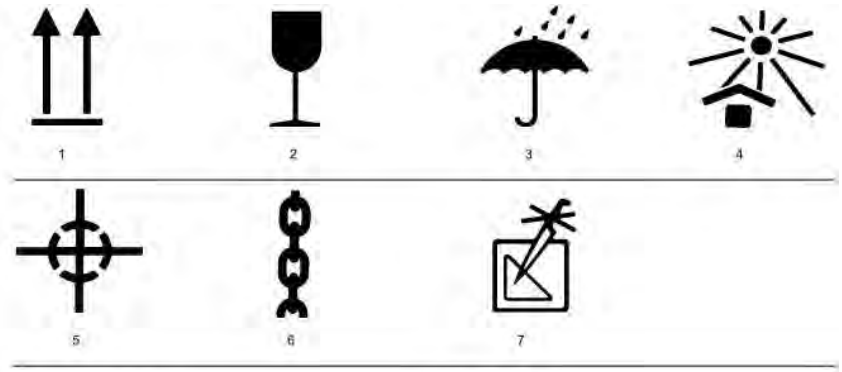
7. Annexure

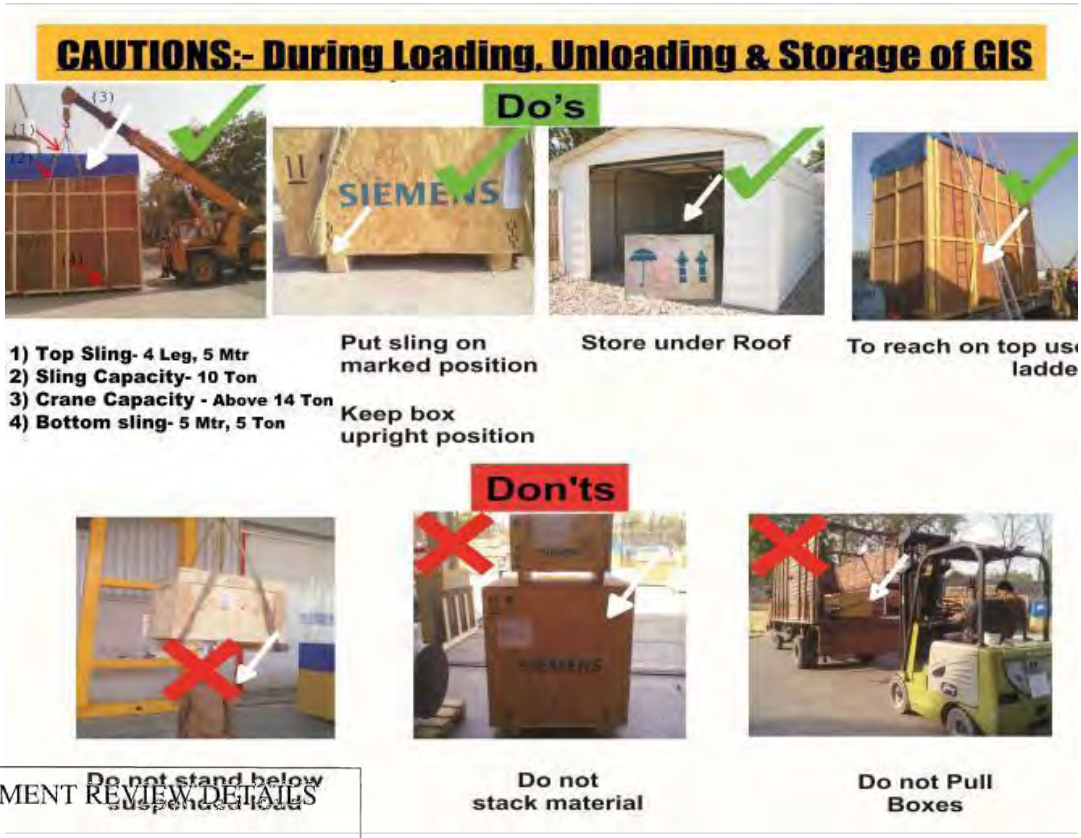
7.1 Symbols on packages

The packing crates bear symbols which give instructions for safe transport and proper storage.



1 Oben	1 This way up
2 Zerbrechliches Packgut	2 Fragile
3 Vor Nässe schützen	3 Keep dry
4 Vor Sonnenstrahlung schützen	4 Keep away from heat
5 Schwerpunkt	5 Centre of gravity
6 Anschlagpunkt	6 Point of notice
7 Dichte Verpackung	7 Sealed packing

RECOMMENDATION FOR LOADING UNLOADING AND MATERIAL HANDLING



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7.2 Identification of the shipping

In order to clearly organize the location of assembly for the switch gear, shipping assemblies are specifically labeled. These labels have been placed on the protective covers on the joints of the assembly.

13 Schaltanlagentyp
14 Kennwort
15 Werk-Nr.
16 Fabrik-Nr.
17 Position und Feldbezeichnung (aus HSA-Zeichnung und Lieferschein)
18 Charge Nr.
19 Maße und Gewicht
21 Feldbezeichnung
22 Beipackinhalt

13 Switchgear type
14 Password
15 Works no.
16 Serial no.
17 Position and bay designation (see HSA drawings and delivery note)
18 Batch no.
19 Dimensions and weight
21 Bay designation
22 Contents of accessory pack

Use the packing slip to check completeness of delivery.

The dispatch note includes the following information:

– Customer order item

– Manufacturer order item

– Contents in German and in an appropriate foreign language

– Case no.

– Gross weight

– Net weight

– Dimensions

DOCUMENT REVIEW DETAILS

Prepared by: Approved by

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Contractor shall ensure that the storage procedure provided by OEM is strictly followed.

DOCUMENT REVIEW DETAILS

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Name of Reviewer SAI ACHUTUNI (A738)

Transmittal No.

EHV CABLE DRUM LOADING & UNLOADING AT SITE

The purpose of this guide is to provide right procedure to handle the EHV Cable Drum. Cable drum has been designed in such a way that if handled properly, there will not be any damage to the product.

Inspection on Receipt/Pre-installation:

i) Check during drum loading and unloading: the cable marking against packing list to confirm the size, length, type and grade of the cable, Direction of rotation, Customer name and Address, Manufacturer name, Drums Number etc.

ii) Ensure the use of proper tools for opening the packing.

iii) Check for damages that may have occurred during transit or unloading

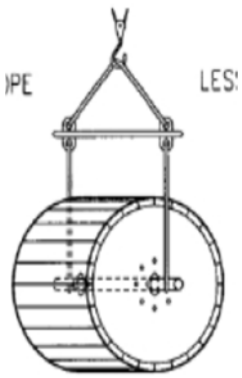
iv) Damages to be checked as: Condition of the cable drum and its packing. Lagging /PP sheet damaged/outer GI sheet, Presence of cable end seals. Sheath ruptures /Damage / Armor breakage or bent Condition of the drum/reel, If any damage found during transportation proper reporting with photographs as in condition with transporting vehicle must be done.

Loading and Unloading of the Drum and storage:

EHV Cable Drum loading and unloading should be done with proper capacity crane, shaft as shown in below pictures, good quality sling or belt, Drum should not be dropped from the vehicle or height while unloading. Drum should not strike another drum while unloading.

This arrangement is very important for Loading and unloading of cable drums at main store / site store why because it doesn't allow to press cable by pressure of slings and weight of cable drums.

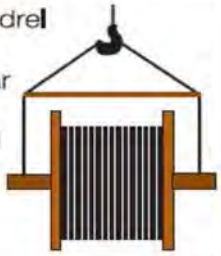
- **Storage area surface should be flat and rigid, brick /RCC. It is very important to protect cable drums from any mechanical damage/theft/water. Storage platform should be some extra height to avoid any water logged.**
- **Storage area should have boundary wall with proper lockable gate and security guard should be provided 24hrs. Proper Lighting facility must be arranged.**
- Drum should be inspected after every three months in case it is stored for long periods.



When off loading reels from a truck, lower reels carefully using a hydraulic gate, hoist or forklift truck.

Never drop reels. If reels must be rolled, roll in opposite direction of the cable wraps to keep cable from loosening on the reel.

When using a hoist, install a mandrel through the reel arbor holes and attach a sling. Use a spreader bar approximately 6 inches longer than the overall reel width placed between the sling ends just above the reel flanges.



This may lead to the bending of the reel flanges and mashing the cable.

It is always safer to use a strong and well-drained surface for storing drums. If possible, the drums should be raised from the ground by the insertion of wooden planks, etc, below and on both sides of the drums : some check pieces should be placed so as not to allow the drums to be rolled loosely and easily. Cable drums should also be stored away from the direct sun and rains.
Reason : Direct sunrays can cause deterioration due to UV rays and rain can cause damage to wooden drum, resulting drum collapse after few months.

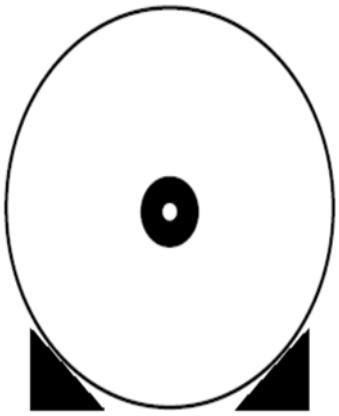
Multiple reels stacked on top of each other ("Pancake" storage) is not recommended for cable drums. The weight of the stack can total thousands of kgs. creating an enormous load on the bottom reel. Also, damage to the reel and/or cable will likely occur when the reel is flipped for transit. A concentration of stress on the reel flange may cause it to break and subsequently damage the cable.

Fasten the Drums during Transportation or Shifting at site

The drums shall be fastened to the base through the center hole or across the flanges with wires or ropes. To prevent movement of the drums, a combination of wedges / Stopper / support should be used as shown in figure.

Cable Drum should be shifted at site location when cable laying pre-activity (Cable Trench excavation, HDPE pipe cleaning) completed.

Unloading of cable drum should be done with same arrangement as shown as previous slide.



EHV Cable Laying Manual

INTRODUCTION

The purpose of this method statement is to provide the contractors with safe working practises for laying of Extra High Voltage power cables outside the substation in open trenches. Laying the power cables inside of substations will be subject of separate method statements for each substation. The brief scope of work is as follows:
The civil works (Cable trench excavation, Joint Bay construction as per approved drawing) executed by Cable laying contractor EHV Cable 66/110/132/220KV

The following methods for laying the cables may be used:

- Nose/End pulling
- Continuous bond pulling
- Driven rollers
- Caterpillar machines – pushers
- Manually assistance
- Combination of two or more above mentioned.

As the installation of every cable section differs in detail, it is not possible to lay down other than general instructions. The possible causes of damage during installation are due to: -

- Excessive and pulling tensions
- Excessive bending
- Accidental damage to the cable serving and/or metallic sheath.

REFERENCE DOCUMENTS

1) Quality Assurance Plan, 2) Work Order of sub-contractor with complete scope.

SAFETY DOCUMENTATION

- Permits to work from concern department and authority
- Clients Approved route and civil Work drawing

LIMITS OF WORK

- All works will be limited to those contained on any safety document issued and to the contents of this Method Statement. Any works outside the remits of this Method Statement will require the approval of further documentation by client. The working area will be demarked as per approved cable route drawings.

METHOD OF WORKING

- Prior to commencement of cable laying works, check for the following documents to be available on site with each site engineers:
- Valid Permits from the following authorities.
- Land Department /Local Authority /Municipality/PWD/NHAI/Railway etc as applicable
- Client (end User/Owner)
- Traffic department (If Required)
- Availability of all Approved cable route /Laying drawing.

Power Cable Installation

Permissible parameter of cable pulling

Maximum permissible pulling tension (Conductor/Pulling eye cable pulling)

- Prior to actual cable pulling, pulling tension is calculated and final pulling tension is certified less than the maximum permissible pulling tension.
- Maximum permissible pulling tension of cable is calculated by the following formula;
- Tmax. = [Conductor area (mm^2)] x 7kg/mm^2 = ...kg

Maximum permissible cable sidewall pressure

- Sidewall pressure for cables of bending part shall be applied less than 300kg/m generally as defined by the following formula,
- P=T/R[kg/m] Where, T: pulling tension at exit from bend [kg] P: sidewall pressure [kg], R: bending radius [m]

Minimum bending radius

- Normally bending radius for single core cables shall be applied more than "20 x D" during cable laying. Specified bending radius for the cable is as follows;
- **Calculation of cable pulling tension**
- Typical coefficient of friction
- Roller method (direct burial) : 0.1 ~ 0.2
- PVC/PE pipe with lubricant method : 0.15 ~ 0.3
- PVC/PE pipe without lubricant method : 0.3 ~ 0.5

Pulling direction

- Pulling direction should be decided so that the pulling tension and sidewall pressure are below the maximum allowable value during the cable pulling. One of the ends of the cable route is selected for setting of cable drum and other is for the winch according to the basic design of cable pulling. At this time the space for setting of cable drum should be considered.

Drum Delivery

- The cable drums shall be delivered to site from main store either by a purpose-built drum-trailer, or by low bed trailer and then unloaded with a crane on to the drum stand or nearby cable pulling ramp in plane and rigid surface.
- The crane shall be fit for purpose and shall have adequate capacity to lift the drum and install in the final position for installation.
- Lifting shall be via the approved lifting points on the drum and with slings of good condition. All equipment that is not in suitable condition shall be removed from site immediately.

TYPE OF PULLING:

Nose/End Pulling

- The steady maximum permissible pulling tension shall not to exceed as per calculation/GTP for the cable conductor cross section used on this contract. The permissible side wall pressure for lead sheathed copper conductor cables is not to exceed 500Kg/m. If the calculation of pulling tension and/or side wall pressure exceeds permissible values, and, where the use of manual labour is impractical, then the continuous bond or an equivalent aided method must be adopted.

- If the route includes several right-angle bends (or equivalent), the pulling tension and side wall pressure created by a nose pull, would certainly exceed these values. Therefore for these conditions a cable pusher could be used to reduce the tension and maintain the pulling tension within the limit, alternatively a bond pull may be used.
- The connection between the cable pulling eye and the wire bond, (ideally none stretching) must be made by means of a ball bearing or equally efficient swivel to permit tension to be taken, and not transferred from the wire bond, without imparting a twist to the cable, if a power winch is used a dynamometer or equivalent measuring and/or controlling device must be used.
- If the bends on the cable run are predominately located at one end of the trench, it is generally preferable to locate the drum at that end, if site conditions permit.
- In most of cases the preferred method will be to use a Cable Winch and Cable Pushers (where and if necessary).
- Generally, cable pulling by winch is common and mostly used for this type of Power Cables due to the simplicity and types of route/section lengths anticipated for this contract. The process and content will be the same for any given section. The only major consideration while pulling the power cable is to keep the pulling tension lower than the allowable pulling tension. The cable winch that is going to be used for this project is fitted with a tension limiting device, which will be used to pre-select the maximum pulling force, this will ensure that the **maximum tension on the cable will not be exceeded**.
- Should self-driven rollers need to be used, they will reduce the friction and back tension, a cable winch will be necessary to guide and pull the cable from roller to roller. The winch will take the cable through each roller position and will prevent slippage and ensure constant movement which will prevent any sheath damage. Care must be taken with the powered rollers to ensure that in case of the cable stopping then the rollers must also stop immediately with synchronise way.

- Most of the cable installation that is carried out in India is carried out by **Nose/End Pulling** method, and the operatives are more comfortable and familiar with it. Both Sterlite Power and their subcontractors are more experienced with this method of installation and have installed numerous of EHV Cable Lines.

Continuous Bond

- With this procedure the pulling force is taken by a wire bond to which the cable is tied at regular intervals and the cable is virtually carried through the route with the wire bond taking the strain. The trailer mounted re-wind storage drum for wire bond is positioned at the drum end of the trench. Skid plate and roller assemblies are positioned on the inner side of all bends in the trench and snatch blocks mounted on the opposite side of the trench with 100 mm x 50mm channel anchor blocks.

- The cable is fed into the trench by hand for a distance of 9m to 12m and then tied with untarred marlin or nylon card to the wire hawser at intervals of approx, 2m. The pull is commenced and successive ties are then applied, with the cable in motion. On the cable arriving at a point approx. 2.7m from a bend where a snatch block is fitted, the ties are removed and the cable guided round the bend or duct block, the cable is then re-tied to the bond. This is a continuous process and carried out with the cable in motion. This process is repeated until the cable reaches its final position.

- **This method of** installation is preferred where a conventional nose pulling is not possible due to the number of obstructions or excessive number of bends within the cable section.

- **On completion** of pulling one cable the wire bond may be re- wound, or alternatively two or three cables may be laid and the wire bond re-wound in one operation. This is usually carried out within the natural meal/rest breaks between the cable pulls.

List of Equipment Required for Cable Pulling Work

- Motor driven winch (5 to 10 ton capacity with load controller/load reader/recording facility)
- Cable ramp roller, Corner roller frame assembly, angular roller, triple cable roller, cable pulley,
- Cable Pulling Socks, swivel
- Metal fairleads (cable rollers).
- Hydraulic jack and drum trestle, shaft.
- A type ladder (for Height work), Pulling Tirfor equipment.
- Hard barricades,
- De-watering Pump & Pipe, Portable generator, power cutter, tool box, wooden batten/blocks, Robber sheet, MS pipe, tent materials. Scaffolding materials.
- 45-50mm MS pipe and scaffolding clamp (qty. as per site condition/requirement)
- **Manually Assisted Method**

- Conditions a rise in practice where mechanical aid means are limited or cannot be used. In such cases cables are laid satisfactorily with **manual labour** distributed along the lengths of the run. This method may also be used as an alternative, providing enough site labour is available. Care must be taken in ensuring that enough staff are available and that the efforts are co-ordinated.

Procedure of cable pulling

Inspection of cable route condition:

- Before the cable pulling work commences, the whole trench/ pit/ tunnel is to be inspected jointly by client & Contractor, and they must have been notified at least 24 hrs before.
- In case of the direct burial type trench, the thermal bedding for the cables should be installed smoothly and **any objects** as the gravel, which has fallen from the ground to the surface of bedding sand should be removed.
- Checking installation of the pipe ducts and cleaning them properly.
- Before the cable pulling work commences, the pipe ducts for road crossing, etc. are to be checked to ensure that they are correctly aligned and to be cleaned.
- The cleaning brush having suitable size for pipe ducts should be passed through the pipe ducts and removed any obstacles in the pipe
- Setting cable pulling winch and drum of cable pulling wire
- The cable pulling winch is to be fixed firmly so that it can stand against the pulling force. The anchoring and plug supporting will be considered in each place separately and will depend to the local conditions and pulling forces expected. All manufacturers' recommendations and provisions will be respected, followed and used. Kinks in the wire rope will not be allowed and must any bond must be removed from site.

- The winch is to be capable of changeable pulling speed in the range of 0~ 30 meters per minute.
- The winch shall be equipped with a tension limiter and meter in order to control the cable pulling tension. The winch will be fitted with overload cut-out and chart recorders. Chart records will be used to record the pulling tension.
- The bond drum shall be set at the appropriate position in order to roll up the wire bond easily.

Inspection of the cable surface

- Outer surface of the cable is to be inspected visually continually monitored throughout.
- Setting cable rollers / curve rollers
- Cable rollers are to be placed at suitable positions into the trench/pit/tunnel.
- The intervals of the rollers are to be kept approx. 2 meters in straight sections so that cable should not touch ground or side wall.
- In case, if there is any slope vertically or horizontally of the trench, intervals of the roller are to be kept approx. 1 meter.

The rollers shall be maintained to rotate smoothly. If the cable is planned to be pulled through the corner, the correct type of rollers should be positioned correctly to ensure easy installation with no damage to the cable. Rollers should not have any sharp edge which may cause damage of cable if rollers did not place properly.

- The bell mouths with guide rollers shall be installed at ducts in the road crossings or other service crossings.
- The key rollers will be secured by bracings supported to the trench walls.
- Setting guide rollers with supporting facilities (Sand Bag may used)
- The cable guide rollers are positioned at the appropriate locations between cable drum and trench / pit / tunnel in order to be guiding the cable from cable drum to the trench/pit/tunnel smoothly.
- Setting portable telephone/mobile/communication to team along the cable route
- After the equipment has been properly placed, the portable telephones are to be located on the drum side, leading end of the cable and the winch side. They are utilized to control the cable pulling speed and other communication.

Laying of wire bond in cable route.

- The wire bond should have four times as much safety factor as the calculated maximum value of pulling tension for the pull.
- It is important that the wire is to be handled in such a manner that it is not twisted, or kinked

Connection of the wire bond to the cable

- The factory fitted pulling eye that is fixed on the nose of the cable is connected to the bond wire by a swivel and shackles. A swivel and shackles should have the proper size for cable pulling and be in good condition, with the swivel freely rotating.

Cable Pushers

- In the sections having a number of bends, and where the cable pulling tension has been calculated as high, hydraulically operated independent cable pushers equipped with soft Vulcan-rollers shall be positioned at some of the bends. These cable pushers will give the necessary relief on the cable by removing some of the back tension on

the cable, but they will not damage the sheath in the event of the cable stalling and stopping. By pulling and pushing the cable at the same time there will be a very low level of tension on the cable. The calculation of pulling tension will determine the positions and number of the pushers, and pushing forces required.

Cable pulling

- Each pulling section will have a drawing/sketch clearly showing the positions of winch and drum and calculated pulling forces. The back tension will be controlled by either a motorized friction brake or a simple wooden brake and kept as low as possible without the coils on the drum becoming loose/touch ground.
- Cable pulling is to be started gradually. A watchman is to be located at nose of the cable, will walk along with the nose of the cable as it is being pulled.
- Positioning of pulling staff shall typically be; 2 persons to travel with cable end, drum operator and 3 persons at drum point, labours at every 20mtrs or every trench bending and sections to guide the cable along the cable route, winch operator with 2 labours at winch with conference communication each other in between the route.
- Tension the wire bond and reset the straight rollers position accordingly. Set the maximum tension on computerised recorder for automatic tripping of the winch on overload.
- **"Whistle to alert"** and start pulling. Keep the cable speed and tension in view of the under constant review and do not let it exceed the maximum value.
- Should any problems arise, the pull will be stopped immediately and not re-started until the problem has been cleared.
- Care must be taken when the cable approaches the terminating point (jointing position) at the winch side and tail end of the cable is just going off the drum. The pulling speed must be carefully regulated.
- If the cable remains on the drum when the top of the cable of reached the termination point at winch side, the pulling must be continued to make a stage where the tail end of cable is just going off the drum.
- After finishing of cable layng, take out the printer record sheet of pulling from the electronic recorder and preserve.
- Laid cable should be covered by sand bag to avoid any external damage outer sheath by falling any materials on cable, extra cable should be protected with proper care and both end sealing should be checked, if required additional sealing to be used.

Cable pulling in pipe duct

- When the cable is to be installed into a duct, the pipe duct should be checked to ensure that it is suitable for cable pulling as inner diameter, bending radius, etc. All ducts will have a mandrel passed through them prior to installation.
- Special equipment may be necessary which are different from the equipment of cable pulling for open trench may be required to ensure that the cable is installed correctly.
- Guide facilities are rollers, supports, etc. which are installed between cable drum and the pipe duct entrance into manhole on the cable drum side.
- Bell mouths with guide rollers, supports, snatch block, etc. which are installed in the duct mouth.
- Cable pulling lubricant/grease is applied around cable to reduce the friction between the cable and the ducts, this is more applicable where the ducts pipes have a change in direction, elevation or that they are of excessive length.
- Brush off remaining lubricant from cable surface on exit side of the duct.

- Any damage occurring during the installation will be informed to site in charge / cable laying supervisor immediately. No damaged areas shall be installed into ducts until on inspection has been carried out. Any serious sheath damage shall be identified with coloured tape and its location monitored to ensure that it does not land in a duct **without being repaired**.

If necessary, rags can be tied around the cable during installation to remove any small particles that are there.

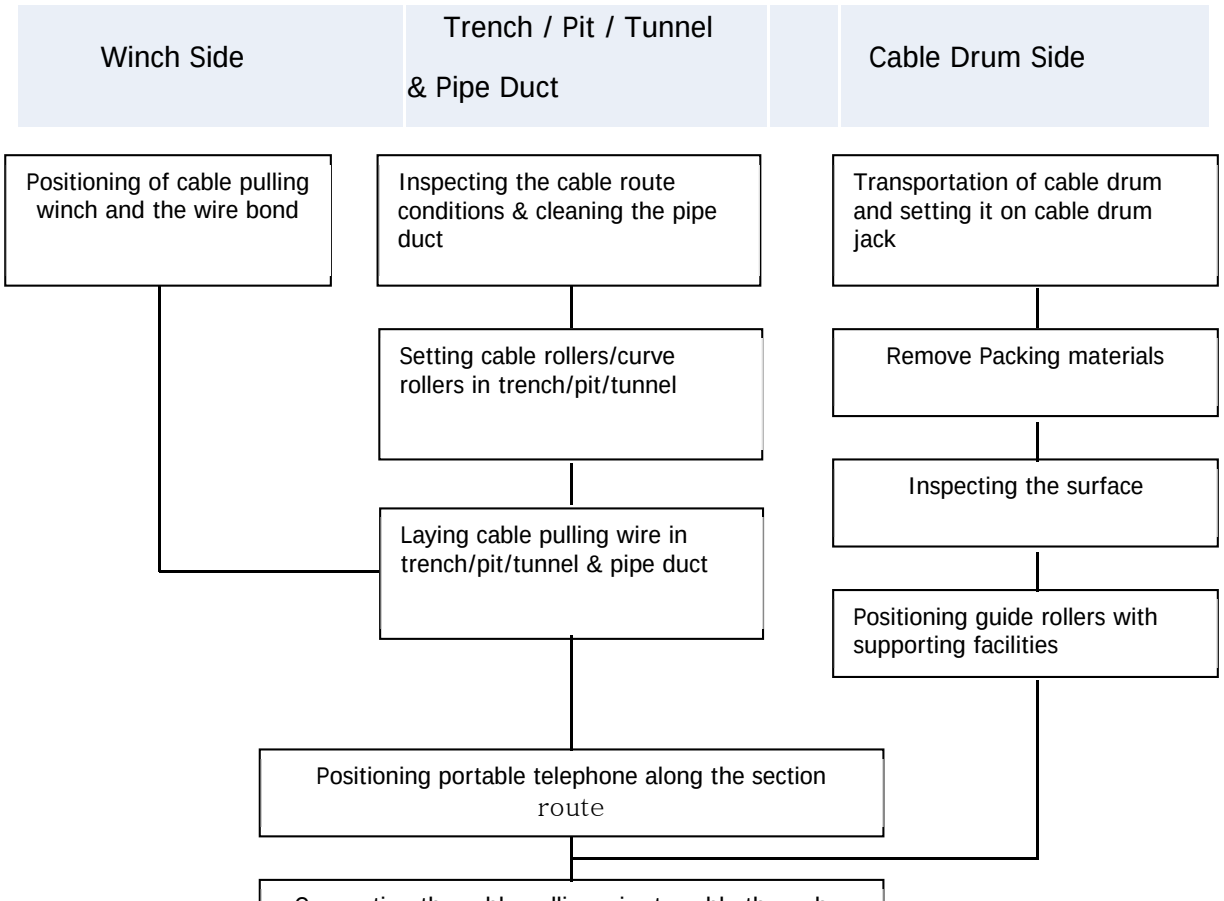
Cable pulling in Cable Tray in height**:**

Cable Laying in trestle with full safety and extra precaution to be taken such as height work, Cable laying in raiser portion will be done through rope and pully so that cable can pulled up way direction in controlled way, skilled worker should work with complete PPE.

- Rollers must be fixed in cable tray / support arrangement in trestle area.
- During cable laying work, Cable "I" always should be fixed with rope and solid support as it will not slip from rollers.
- Sufficient skilled manpower to be deployed with PPE at trestle area for cable pulling work. Proper illumination and walkway should be hazard free, hand rail must be
- Life line rope must be fixed in walk way along the cable route, safety belt must be tightening while working and cable laying work.
- If possible, cable pulling may done with the help of pulley and rope in guidance of cable rollers, adequate precaution must be taken for not to touch cable in any side surface of tray, sharp edge, supports, corners, these may damage outer sheath and lead to fail sheath integrity test.
- Ladder plan fixed typed or "A" type portable ladder may use for approaching cable trestle and cable laying route, there should not be any shortcut.

Cable Pulling Work - A flow chart

- Cable laying in trench / pit / tunnel (By Pulling Eye)
- Typical procedure for the cable laying work in trench/pit/tunnel is shown by the following scheme.



- **Cable Arrangement**

- After cable pulling all equipment will be removed and put out of the trench. Care is to be taken to avoid cable damage and labourers must not step on the cables. Cables must not be left on the installation rollers for any extended period and not left on the rollers overnight.
- Road Crossing or wherever ducts/HDPE pipe used will be sealed properly.
- Excess slack from the cables will be organized according to snaking method at both sides of the joint bay. Phase's transposition is to be done, Transposition is always located in accordance with the cross-bonding diagram
- The phase marking, after installation will be by Colour tapes (red, yellow and blue) should be wrapped around the cables for phasing, in accordance to the cross-bonding diagram.
- Cables will be then arranged in the joint bay and protected by sandbags. If required extra cable lengths may be cut and ends protected/sealed using shrinkable caps to prevent ingress of moisture.
- **Inspection and Repair of the outer sheath**
- The Contractor operator in the presence of the Engineer must carry out this test unless otherwise agreed. An Inspection Report will be used to record the test results.
- In case of any sheath fault damage to be reported to Cable laying Engineer/Sterlite Power by an appropriate method with photographs for review and approval before commencement of sheath repairs.
- **Test Requirement**
- The cable sheath shall withstand a voltage of 10KV applied between the earth and the metallic sheath for one minute. This shall be carried out on each length of cable after laying, dune sand surround and filling, installation of concrete tiles and pipes bentonite (where applicable). Test will be recorded on Site as per standard format.
- **Test Procedure**
- This testing voltage will be applied between the metallic sheath and the earth. One person must be posted at the end of the cable to warn workers in the area of the potential danger. No one shall work in the during the testing with same cable section.
- After testing the metallic sheath will be earthed / discharge and sealed properly
- **Backfilling**
- Before the backfill is placed the power cables will be inspected to confirm the spacing/dressing, no foreign materials should around the Cable except sand
- **Route Marker**

- Approved Route Markers shall be required at both ends of joint bays, locations where route changes direction, at both ends of ducts road crossing and at a maximum interval of 500m on straight runs or as instruction by Engineer in charge.
- **Clearance of Site**
- Site clearance on completion of the works and removal of material shall be to an approved position for disposal
- **EMERGENCY PROCEDURES**
- Any incidents, accidents or near misses will be recorded as per our own H&S systems and the Client will be notified immediately so that they can complete their own procedures.
- Details of the nearest Accident & Emergency department will always be given to each operative at the site induction and be available within the site staff.
- Inform emergency department of the concerned service department immediately in case of any damage to the existing services. The emergency services (nearest) contact nos. are as follows:
- Hospital / Drainage Dept. / Telecom Dept. / Building Engineering Dept. /Land Dept./ Client / Police/Fire etc.
- **PERSONNEL PROTECTIVE EQUIPMENT (PPE)**
- Safety Manual
- Hard Hat
- Safety Boots
- Hi Vis Clothing for night
- Gloves

Ear Protection / Eye Protection (where required)

PLANT AND EQUIPMENT REQUIRED AT SITE FOR CABLE LAYING WORK

- Cable pulling winch with chart recorder and overload cut-out
- Hydraulic cable pushers
- Hydraulic jack / Cable drum trailer
- Flat rollers /Corner rollers / Curve rollers
- Stand rollers of various height (Draw off rollers) / V – rollers (Guide roller)
- Cable pushers (Hydraulic)
- Bell mouths
- Fibre blowing equipment / compressor
- Swivel links / Slings
- Mandrel / Duct brush
- Water Pumps, if required

RESOURCES AVAILABILITY FOR EHV CABLE LAYING PROJECT

- Project Engineer / Site Engineer
- QA/QC Engineer & Safety Officer
- Foreman (1 No.)
- Labourers as per site condition
- Winch operator & Drum Operator
- Crane Operator & Heavy truck driver
- **PROTECTION MEASURES**
- All personnel entering the working area must understand the contents of this Method statement be signed on to it.

- All temporary signs shall be mounted on bases, which are designed to accept sand bags or a similar approved device which creates a stable base.
- Traffic safety cones with safety tapes tied across each cone shall be kept throughout each cable trench section and suitable barricades shall be erected wherever required in order to prevent any accident.
- **WASTE MANAGEMENT**
- Demobilize the equipment's and machinery from the site and surplus waste materials and any other litter if any shall be taken away from the site.
- **HOLD POINTS**
- Notify for inspection 24hrs in advance before laying of cable outside the substation.

Cable Ramp Rollers

Cable Laying and Protecting with Sand Bags after laying completion, one by one all cables, every time.

Cable Laying Dressing, Phase Marking, Sand Filling

Backfilling with Sand, RCC Slab, Soil and with Warning Tape and complete by soil

Laid cable protected by sand bag against any external damage of outer sheath

- **Points to be noted for EHV Cable Laying:**
- After Joints Bay Construction Cable laying work may be started.
- Contractor must have experience for EHV cable laying work and skilled workers.
- Contractor must have plant & machinery required for EHV cable execution projects.
- Excavation may be done as straight as possible in view of cable laying with minimum tension.

- Enough sand bags must be available at site for covering of laid cables, laid cable should not be exposed in any location, outside the trench or in JB, Cable always should be above sand bed and cover with sand bag always. Cable roller always supported by sand bag wherever required.
- Cable Ramp always to be prepared at drum side with proper angle so that cable may laid smoothly from drum to trench. Proper good working rollers only used for cable laying work.
- Barricades must be used during excavation and cable laying work.
- During Cable laying smooth speed should be maintain and pulling tension should not be more than calculated tension.
- Always we should take care for water and moisture ingrains in cable, required precaution must be taken cares and if any cut found in end cap of pulling I, must be replaced with new end cap.
- During cable pulling, cable should not touch any hard/sharp surface, which may cause of sheath fault.
- End cap must be provided in HDPE pipe, before cable pulling all HDPE pipes must be cleaned with proper ways so that no foreign materials left out inside HDPE pipe, which may cause damage of EHV cable or its sheath.
- Safety stewards must be available at site, First add box should available all time at site.

Testing & Commissioning

10KV DC Sheath Integrity Test: The Test is applied when the cable sheath can be isolated from the earth to permit the voltage to be applied to the over sheath to check the integrity of the covering. This testing is generally applied at different stage of cable system installation at specified parameter as follow:

1. When the cable is still on reel/drum, the applied voltage is 10KV for 10 seconds, if test lead is provided.
2. Once the cable is laid, dressed and tied together in trefoil contribution a test voltage of 10KV is applied for 20 second.
3. After backfilling with sand, RCC protection slab, warning tape, normal soil etc as per drawing, a test voltage 10kV applied for 1 minute on each cable. This is a formal testing should be done in present of consultant/clients and reports should be signed as witnessed for record purpose. All cables end should be sealed properly if any end found damage. Jointing & Termination: Before jointing/termination of cables in joint bay/end side, both sides cable phase checking /continuity must be done and marked properly as per drawing, all cable should be moisture/water free, if any moisture/ water found in cables then nitrogen blowing must be done for removing oisture/water. After completion of jointing (cross-bonding) and End Termination Outdoor/Indoor then pre-commissioning test must be conducted in presence of consultant and client.

Earthing System: Earthing Systems are very important for any Electrical System, so proper earthing value should come as per requirement, must be checked jointly and recorded. Cable Outer sheath Earthing pits should be done separately in all the locations where ever earthing system provided as per system requirement/drawings/SLD.

Testing & Commissioning: Sheath Integrity test for laid Cable should be done immediately, so that any major sheath faulty found, proper action may be taken. Backfilling must be done as per drawing, after backfilling again sheath integrity to be performed, all test result must be recorder and witnessed by clients. Before joining work, phase identification must be done with proper color tape or permanent marker. Once all joints and termination work completed then EHV system is ready for pre-commissioning test,

Following Test (or advice by client test) must be done as Testing & Commissioning" SOP"

1. Continuity test or Phase Checking, 2. Sheath Integrity test,

3. Insulation test, 4. Capacitive test, 5. No load Test (or Comm. Test) for 24Hrs at rated voltage.

All test result / reports must be jointly signed by consultant/clients/contractor/testing agency.

List of Equipment for Testing & Commissioning Work:

1. DC High Voltage Test Kit (0-25KV, 25mil. Amp.) + Portable DG Set.
2. Megger 5kv.
3. Insulation resistance tester / Multi meter.
4. Toolbox.

#

Sterlite Power Transmission Limited, F-1, Mira Corporate Suites,
1&2, Ishwar Nagar, Mathura Road, New Delhi – 110 065, India +91 11 4996 2200
www.sterlitepower.com

Sterlite Power

PHASE CHECKING
TEST REPORT

PROJECT	Project Name			
CABLE TYPE	.....kV .....SQmm XLPE CABLE			
ROUTE/FEEDER				
ROUTE LENGTH	km			
TEMPERATURE	°C	HUMIDUTY		%
No	PHASE	CONNECTION		TEST RESULT
1	RED	Red	Earthed	
		Yellow	Unearthed	
		Blue	Unearthed	
2	YELLOW	Red	Unearthed	
		Yellow	Earthed	
		Blue	Unearthed	
3	BLUE	Red	Unearthed	
		Yellow	Unearthed	
		Blue	Earthed	
TEST INSTRUMENT		MANUFACTURER		REMARKS

TEST	ORGANIZATION	NAME	SIGNATURE
WITNESSED BY	Client		
TEST BY	Testing Agency/Contractor		

10kV DC SHEATH INTEGRITY
TEST REPORT

PROJECT	Project Name				
CABLE TYPE	.....kV .....SQmm XLPE CABLE				
ROUTE/FEEDER					
ROUTE LENGTH	km				
TEMPERATURE	°C	HUMIDUTY			%
TEST Section	CIRCUIT	Test Voltage / Time	PHASE	LEAKAGE CURRENT	TEST RESULT
From...		10kV	Red	mA	
to	CIRCUIT 1	applied for	Yellow	mA	
.....		1 minute	Blue	mA	
TEST INSTRUMENT		MANUFACTURER		REMARKS	
Hi-pot kit / Megger					

TEST	ORGANIZATION	NAME	SIGNATURE
WITNESSED BY	Client		
TEST BY	Testing Agency/Contractor		

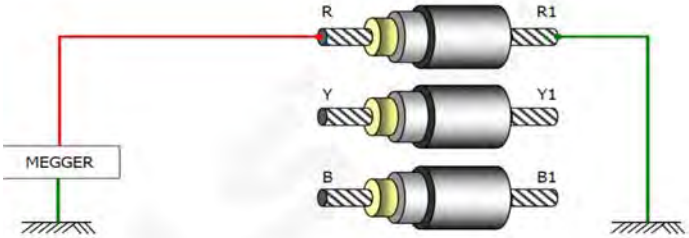


Fig. 1 Cable Phasing Test

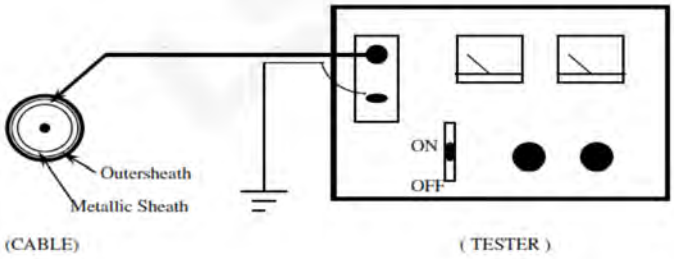


Fig. 2 10kV DC Sheath Test

INSULATION RESISTANCE
TEST REPORT

PROJECT	Project Name				
CABLE TYPE	.....kV .....SQmm XLPE CABLE				
ROUTE/FEEDER					
ROUTE LENGTH	k m				
TEMPERATURE	°C	HUMIDUTY			%
S.No.	PHASE	TEST VOLTAGE / TIME	RESISTANCE		TEST RESULT
1	RED	5kV / 1Minute	Measured	GΩ	
2	YELLOW	5kV / 1Minute	Measured	GΩ	
3	BLUE	5kV / 1Minute	Measured	GΩ	
TEST INSTRUMENT		MANUFACTURER			REMARKS

TEST	ORGANIZATION	NAME	SIGNATURE
WITNESSED BY	Client		
TEST BY	Testing Agency/Contractor		

EFFECTIVE CAPACITANCE
TEST REPORT

PROJECT	Project Name				
CABLE TYPE	.....kV .....SQmm XLPE CABLE				
ROUTE/FEEDER					
ROUTE LENGTH	km				
TEMPERATURE	°C	HUMIDUTY			%
No	PHASE	METALLIC SCREEN	SPECIFIED [μF/Km]	MEASURED TOTAL[μF]	μF/Km
1	RED	Conductor & Sheath			
2	YELLOW	Conductor & Sheath			
3	BLUE	Conductor & Sheath			
TEST INSTRUMENT		MANUFACTURER		REMARKS	

TEST	ORGANIZATION	NAME	SIGNATURE
WITNESSED BY	Client		
TEST BY	Testing Agency/Contractor		

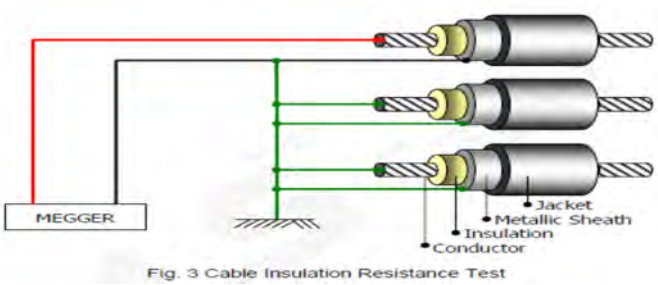


Fig. 3 Cable Insulation Resistance Test

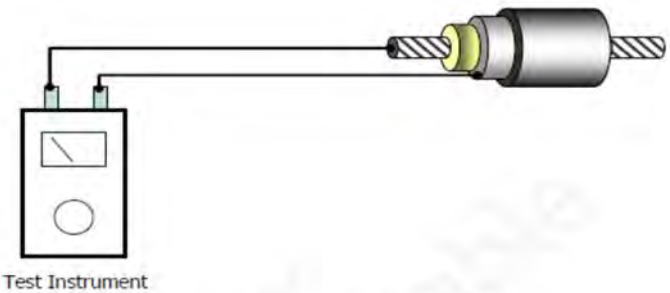


Fig. 4 Cable Capacitance Measurement

#

Commissioning Test: Before commissioning test megger must be done, Electrical Safety clearance obtained. All testing equipment's calibration certificate copy to be submitted along with test reports.

AC HIGH VOLTAGE TEST ON NO LOAD						
TEST REPORT						
PROJECT	Project Name					
CABLE TYPE	.....kV .....SQmm XLPE CABLE					
ROUTE/FEEDER						
ROUTE LENGTH		km				
TEMPERATURE		℃	HUMIDUTY		%	
Sl. No.	Phase	Test Time	Charging Current [A]	Test Result	Remark	
1	Red Phase	For 24 Hrs				
2	Yellow Phase					
3	Blue Phase					
TEST	ORGANIZATION		NAME		SIGNATURE	
WITNESSED BY	Client					
	Contractor					

No Load charging current May recorded for future references.

#

66kV XLPE Cable System- List of Special Tool & Tackles for EHV Cable Laying Work under Cable laying contractor's scope:

1. Cable Drum Stand suitable for EHV Cable Drums Jack (Hydraulic), capacity 10-15ton and Iron solid Shaft 150mm dia X 2.5 to 3 mtr, Rubber mate 2.5mX3m may use to touch ground cables below drum, wooden battens may use as drum stopper.

2. Motor driven winch machine 5 to 10 Ton capacity (prefer with load controller/load recording facility)

Ramp Rollers, HDPE pipes.

3. Cable Rollers (Aluminium) 200Nos. Suitable for EHV cable Laying Cable OD 70-200 mm, required to provide every 2/3 meter in cable laying trench / route.

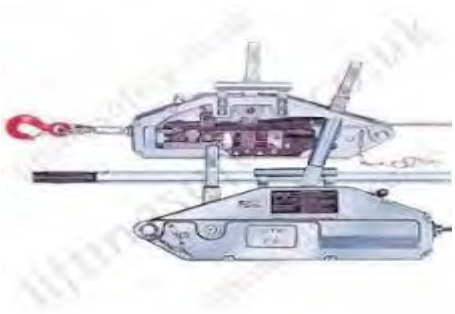
4. Bend Rollers.

5. Pulley: May used for cable lifting in raise or cable shaft

6. Cable Pulling swivel, Socks, Suitable to fixed with cable pulling ceiling

7. PP rope 20mmdia (100mtr 4 Nos.)
8. Hard Barricades to protect working area to avoid any mis happening.
9. De-watering pump (Portable, if required)
10. Portable generator 3KW
11. Power Hacksaw / cutter.

12. Pulling Tirfor equipment.



13. Drilling Machine (Hammer).

14. Complete tool box.

15. 45-50mm MS pipe and scaffolding clamp (qty. as per site condition/requirement)

List for Testing & Commissioning Equipment's (with Calibration certificate)

1. Megger 5KV
2. **DC High Voltage Test Set (0-15KV)**

3. Insulation registance tester / Multi meter**.**

4. Power Supply / Portable Generator.
5. Tester, Continuity tester.
6. Tool box.

List for Jointing & Termination Work for EHV UG Cable

1. Chain Block 1 Ton, 4 nos.

2. Chain Block 5 Ton, 2 nos.

3. Body Puller 1 set

4. Body Expansion kit 1 set

5. Stripper 1 set

6. Gas Torch Set 1set

7. Spanner Box 1 set

8. Misc. tools kit 1 set

9. Drill Machine 1 set with drill bits

10. Heater 1450 watt with controller

11. Allen key set

12. Torque rachet

13. Sprit Level

14. Measurement scale wooden

15. Vernier Callipers.

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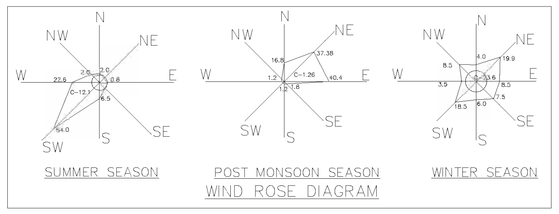
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. PY-LC-0-M104-2001-01

Annexure G-Trench layout drawings



WIND ROSE DIAGRAM

1. Cable Routing Details at Customer Area is not marked. These details are required for Route Finalization for laying of 220kV Cables.
2. Considerations for looping of 220kV Cables arrangement are also to be incorporated.

This Routing is for 220kV cabkes

1. Cable routing details are not provided.
2. Considerations for looping of 220kV Cables arrangement are also to be incorporated.

TBG Cables (220kV) Trefoils Requirement in this area are,
1. 220/66kV Grid Transformer01-01 Trefoils
2. 220/66kV Grid Transformer02-01 Trefoils
3. 220/33kV Grid Transformer01-01 Trefoils
4. 220/33kV Grid Transformer02-01 Trefoils
Total: 04 Trefoils

1. Considerations for looping of 220kV Cables arrangement are also to be incorporated.

Entry of 220kV and 66kV cables

1. Utility Transformer and GTG Transformer shall be routed through trays.
2. 66kV cables for remaining BHEL loads shall be routed through trench.

1. Considerations for looping of 220kV Cables arrangement are also to be incorporated.

1. Details for internal Cable Trench and Hanging Cable and rack assembly is not shown.
2. Considerations for looping of 220kV Cables arrangement are also to be incorporated.

TBG Cables (66kV) Trefoils Requirement in this area are,
1. 220/66kV Grid Transformer01-03 Trefoils
2. 220/66kV Grid Transformer02-03 Trefoils
Total: 06 Trefoils

CABLE ENTRY/TERMINAL POINT FOR 66kV CABLES

1. Cable Routing Details at Customer Area is not marked. These details are required for Route Finalization for laying of 66kV Cables.
2. Considerations for looping of 66kV Cables arrangement are also to be incorporated.

Routing for 66kV cables for STG Transfomer , utility & Aux transformers

1. Considerations for looping of 66kV Cables arrangement are also to be incorporated.

Refer ISO views with structure and without structure details

GTG Trannsformer routing

1. Considerations for looping of 66kV Cables arrangement are also to be incorporated.

1. Routing of cables are not shown in this area.

TBG Cables (66kV) Trefoils Requirement in this area are,
1. GTG-07 Bay Transformer-3 Trefoils
2. STG-01 Bay Transformer-1 Trefoils
3. 11kV CPP Aux. Swbd (HT-9421) Transformer-9401-1 Trefoils
4. 11kV CPP Aux. Swbd (HT-9421) Transformer-9402-1 Trefoils
5. 11kV Utility Swbd (HT-9422) Transformer-9403-2 Trefoils
6. 11kV Utility Swbd (HT-9422) Transformer-9404-2 Trefoils
Total: 10 Trefoils

NEW PIPE/CABLE RACK

CABLE TRENCH

Refer Note-24

NEW PIPE/CABLE RACK

NEW PIPE/CABLE RACK

DEPTH OF ELEVATED TRENCH =2000MM
SIZE=300 DIA PVC INSERTS.
*Customer feotmet point for 11kV cables

NOTES:
1. ALL CO-ORDINATES ARE IN METERS
2. ALL DIMENSIONS ARE IN MM
3. ALL ROADS INSIDE THE CPP BATTERY LIMIT SHALL BE SUITABLE FOR HYDRA/CRANE MOVEMENT.

PIPE RACK
EXISTING ROAD
PROPOSED ROAD
EXISTING CABLE TRENCH
CABLE TRENCH
EXISTING FENCE

LIST OF EQUIPMENTS/BUILDINGS (PRELIMINARY)

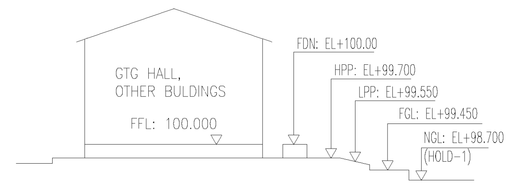
SL NO	DESCRIPTION	QTY.	SIZE (M X M)
1	GTG SHED	1	38.5x23.0
2	HRSG AREA	1	44.40X17.4
3	STG BUILDING	1	32X15
4	GT GENERATOR TRANSFORMER	1	16.3X12.8
5	ST GENERATOR TRANSFORMER	1	12.8X11.8
6A	GIS BUILDING (66KV)	1	38X13.5
6B	GIS BLDG (33KV),CONTROL ROOM	1	33X22
6C	TRANSFORMER BAY (220/ 66Kv)	1	35.6X12
6D	TRANSFORMER BAY (220/ 33Kv)	1	35.6X12
7	SWGR BLDG (SS94)	1	72X16
8	TRANSFORMER AREA (66/11/0.433) (4+6 NOS)	1	72X12.5
9	BFP AND DEAERATOR STRUCTURE	01	44X21
10A	LIQUID FUEL AREA (HSD)	01	15.1X8
10B	LIQUID FUEL AREA (NAPTHA)	01	19X8
11	GAS CONDITIONING SKID AREA	1	34.1X18
12	DG SHED	1	51.5X17.2
13	DUMP CONDENSER, COND TANK, PUMP (2 NOS)	1	16.2X10.8
14	SWAS	1	12X6
15	AIR COMPRESSOR SHED	1	11.5X7
16	CEMS FOR HRSG	1	8X6
17	CBD TANK FOR HRSG	1	DIA 1.5M
18	IBD TANK FOR HRSG	1	DIA 2.0 M
19	SPACE FOR FEED WATER CONTROL VALVE STATION FOR HRSG	1	4.5X2.0
20	PLATE HEAT EXCHANGER, PUMP	2+2	6X8
21	CONDENSATE STORAGE TANK	1	DIA 5.5X7M HT
22	GT INLET AIR FILETER	1	12 X 9
23	GT BYPASS STACK	1	DIA 3.9
24	HRSG EXHAUST STACK	1	DIA 4.5
25	LP DOSING SKIDS 2 NOS, SAFETY SHOWER	2+2	4X4
26	TRAFO OIL PIT (NEAR FD FAN)		**5(L)X3.5(B)X3(H)**
27	TRAFO OIL PIT (NEAR SS-93)		**5 (L)X3.5(B)X3(H)**
28	CAPACITOR BANKS	3+3	11.73X20.57
29	HSD, NAPHTHA DRAIN TANK	1+1	7.5X5.5
30	HSD, NAPHTHA FORWARDING PUMPS(EIL SUPPLY)	2+2	2X3.8 EACH
31	MANHOLE FOR OWS AND CRWS SYSTEM (CONT BY EIL/HPCL)	1+1	2X2 EACH
32	OWS COLLECTION PIT	1	2X2X3
33	CRWS COLLECTION PIT	1	2X2X3
34	STEAM TRAP DRAIN COLLECTION PIT	1	2X2
35	VENT SILENCER STRUCTURE	1	14.5X6

LIST OF EXISTING FACILITIES

SL NO	DESCRIPTION	QTY.	SIZE (M X M)
E1	EXISTING TRANSFORMER BAY	1	22.3 X 9.2
E2	TRANSFORMER OIL PIT	1	5.8X5.8
E3	EXISTING TRAFO BAY (GT-5,6)	1	81.1 X 12.5
E4	TRANSFORMER OIL PIT	1	6.2X4.1
E5	EXISTING SWITCH YARD	1	58.5X39
E6	EXISTING CABLE TRENCH	1	--
E7	EXISTING PIT, FIRE DV STATION	3	

LEGEND:

NGL : NATURAL GROUND LEVEL
FGL : FINISHED GROUND LEVEL
LPP : LOWEST PAVED POINT
HPP : HIGHEST PAVED POINT AND ROAD LEVEL
FDN : HALL/BUILDING/PIPERACK FOUNDATIONS LEVEL
FFL : FINISHED FLOOR LEVEL
RTL : ROAD TOP LEVEL



REFERENCE LEVELS OF FLOORS/FOUNDATIONS

CUSTOMER: HINDUSTAN PETROLEUM CORPORATION LIMITED, VISAKH REFINERY, VISHAKHAPATNAM

CONSULTANT: ENGINEERS INDIA LIMITED (EIL), NEW DELHI, EIL JOB NO : B016

PROJECT: 75 MW CAPTIVE POWER PLANT (CPP) PACKAGE (1x Fr 6Fa GTG + 1 x 185 TPH HRSG + 1 x 15 MW BPTG) FOR "VISAKH REFINERY MODERNIZATION PROJECT (VRMP)"

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	K.V	-SD-	30.03.18	
CHD.	B.N.K	-SD-	30.03.18	NA
APPD.	J.K.P	-SD-	30.03.18	

REV.	DATE	ALTERED	CHD/APPD
01	06.12.18	K.V P.S/JKP REVISED INLINE WITH CUSTOMER/CONSULTANT COMMENTS	

DEPT. PE&SD | CODE. 450 | UNTOL. DIMS. GR. | SCALE 1:350 | WEIGHT (KG) NA | REF. TO ASSY. DRG. -N.A.- | ITEM NO. -N.A.- | NO.OF ITEMS -N.A.-

TITLE: OUTDOOR AREA CABLE TRAY TRENCH LAYOUT

CARD CODE: NA

DRAWING NO. PY-LC-0-M104-2001-01-200-R01 | REV. 01

SHT. No 01 | NO. OF SHT. 02

GENERAL DIMENSIONAL LI... | SIGN. AND DATE | REF. DRG. NO. | INVENTORY NO

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GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261
INVENTORY NO | SIGN. AND DATE | REF. DRG. NO. | COMPUTER FILE NAME

TERMINAL POINT FOR 220kV CABLES

6 M ROAD (BY BHEL)

3Rx2-300 DIA PVC INSERTS.

2Rx4-300 DIA PVC INSERTS. (REFER NOTE-8)

7Rx4-200 DIA PVC INSERTS. (REFER NOTE-8)

4Rx8-300 DIA PVC INSERTS. (REFER NOTE-8)

CABLE TRAYS FOR BHEL LOADS

CABLE TRAYS FOR CUSTOMER LOADS

CABLE PULL POINT FOR DROPPING SIGNAL CABLES

EXISTING TRANSFORMER BAY 22300

9200

5800

5800

E1

E2

PLAN AT EL 100.000 M LEVEL FOR GIS & CONTROL ROOM BUILDING

SECTION – A–A

SECTION – B–B

SECTION – C–C

SECTION – D–D

SECTION – E–E

SECTION – F–F

SECTION:: G–G

SECTION – L–L

SECTION – W–W

SECTION H–H

SECTION "Y–Y"

DETAIL–'B'

SECTION "Z–Z"

SECTION:: XX–XX

SECTION – T–T

SECTION – U–U

SECTION K–K

SECTION I–I

SECTION:: J–J

SECTION – V–V

LEGEND:

– GI LADDER/PERF TYPE CABLE TRAY

CABLE TRAY IDENTIFICATION:

1 | EL. XXX.XXXM | 750

- SIZE OF CABLE TRAY
- ELEVATION OF CABLE TRAY
- SERVICE OF TRAY (1–66kV, 2–33kV, 3–11kV, HT CABLES, 4–LT CABLES, 5–CONTROL CABLES, 6–INSTRUMENT/SIGNAL CABLES)

REFERENCE DRAWING:

1. PLOT PLAN, DWG. NO. PY-LQ-0-M104-2001-01
2. OVERALL PLANT CABLE TRAY/TRENCH LAYOUT DWG. NO. PY-LC-0-M104-2001-01
3. SWGR ROOM EQUIPMENT LAYOUT (SS-93), DWG. NO. PY-LE-1-M104-2019-01
5. NOTES AND DETAILS FOR PLANT CABLE LAYING SYSTEM DWG. No. PY-DN-4-M104-8908-01

NOTES:

1. ALL DIMENSIONS ARE IN MM AND ELEVATIONS & CO-ORDINATES ARE IN METRES, UNLESS OTHERWISE SPECIFIED ELSE WHERE IN THIS DRAWING.
2. CABLE ROUTE MAY BE ADJUSTED AT SITE TO SUIT SITE CONDITIONS AND AS PER INSTRUCTION OF SITE ENGINEERS.
3. FOR INSTALLATION DETAILS REFER DOC. NO. PY-DN-4-M104-8908-01- NOTES AND DETAILS OF PLANT CABLE LAYING SYSTEM.
4. THE CABLE TRAYS SHALL BE GI LADDER TYPE AND PERFORATED CABLE TRAY.
5. ALL TRAYS SHALL BE SUPPORTED AT AN INTERVAL OF 1M FOR HORIZONTAL 1M FOR AND VERTICAL.
6. CABLE SHALL BE NEATLY ARRANGED IN THE TRAYS IN SUCH A MANNER THAT CRISS CROSSING IS AVOIDED & FINAL TAKE OFF TO THE MOTOR OR PANEL IS FACILITATED.
7. ALL POWER & CONTROL CABLES SHALL BE HAVING ALUMINIUM CABLE TAGS FOR CABLES ON TRAYS & LEAD TAGS FOR UNDER GROUND CABLES. THESE TAGS SHALL BE FIXED AS EVERY BEND. TERMINATION POINT, BRANCHING POINT FROM A GROUP OF CABLES AND AT EVERY 30 METRES IN STRAIGHT LENGTH.
8. SLEEVES SHALL BE SLANTED IN A WAY TO AVOID WATER INGRESS.

ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD
	ZONE			ZONE			ZONE			ZONE			ZONE			ZONE			ZONE		

PROJECT: CAPTIVE POWER PLANT (CPP) PACKAGE
VISAKH REFINERY MODERNIZATION PROJECT (VRMP)
JOB NO. B016

OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC: ENGINEERS INDIA LIMITED (EIL), NEW DELHI

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE
DRN.	K.VENKATESH	–SD–	24.09.18
CHD.	B.NAVEEN	–SD–	24.09.18
APPD.	J.K.PATTANAIK	–SD–	24.09.18

NO.OF VAR.

DEPT. PE&SD	UNTOL. DIMS. GR. C/M/F		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE. 450					–N.A.–	–N.A.–	–N.A.–

TITLE: CABLE CELLAR CABLE TRAY LAYOUT IN SUBSTATION BUILDING SS-93

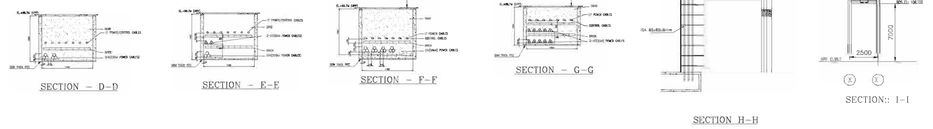
CARD CODE: N.A.

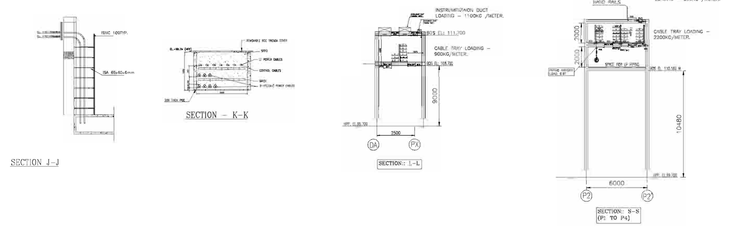
BHEL DRG NO. PY-LC-0-M104-2036-02 REV. 00

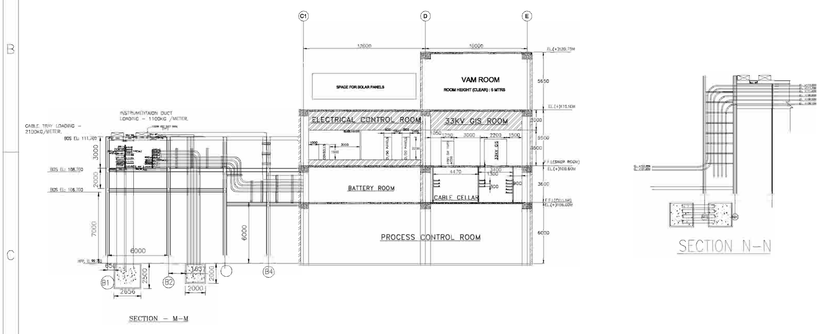
CUST DRG NO.

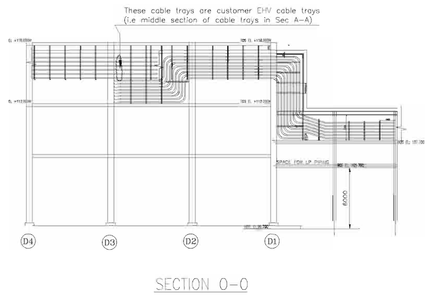
SHT. No – 1 NO. OF SHT. 2

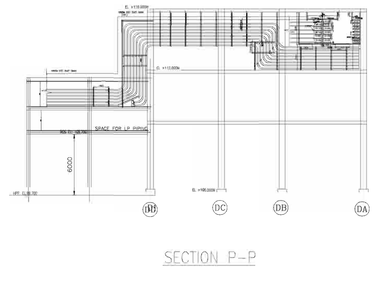
FIRST ANGLE PROJECTION
(ALL DIMENSIONS ARE IN mm)
DRG. PY-LC-0-M104-2001-01
THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY
GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261
COMPUTER FILE NAME
REF. DRG. NO.
SIGN. AND DATE
INVENTORY NO

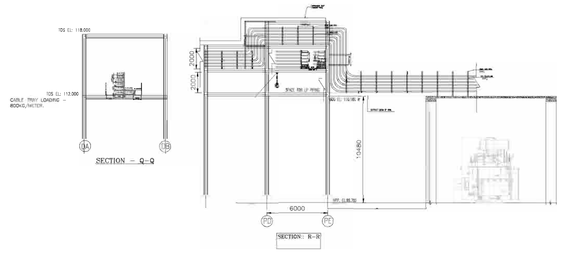


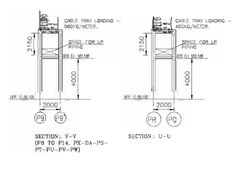


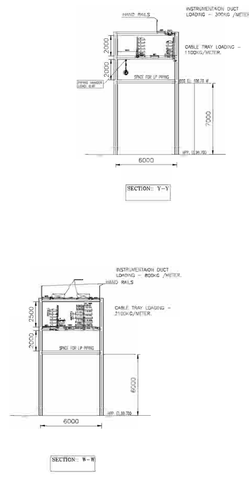


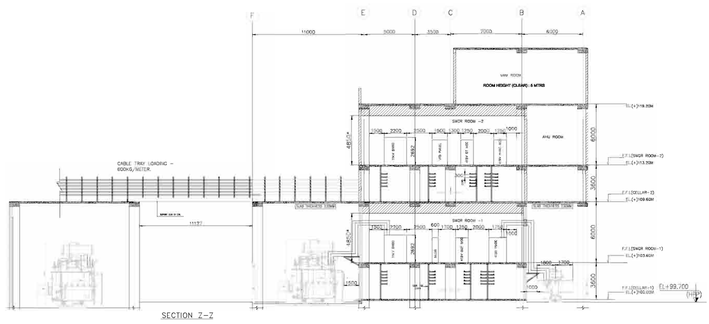


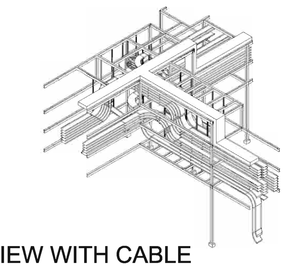




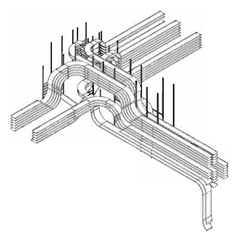




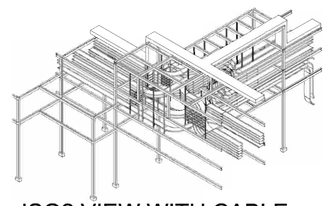




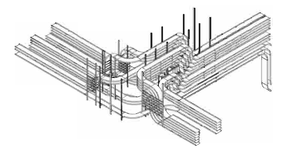
ISO1 VIEW WITH CABLE DUCT AND STRUCTURE



ISO1 VIEW WITHOUT CABLE DUCT AND STRUCTURE

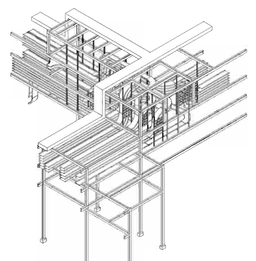


ISO2 VIEW WITH CABLE DUCT AND STRUCTURE

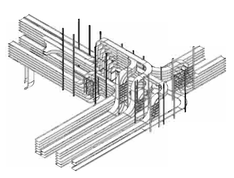


ISO2 VIEW WITHOUT CABLE DUCT AND STRUCTURE

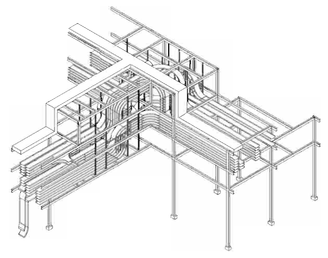
Following Cable Trefoils requirements are to be taken care by PE&SD.
A. TBG Cables (66kV) Trefoils Requirement towards SS-4 area are,
1. GTG-07 Bay Transformer-3 Trefoils
2. STG-01 Bay Transformer-1 Trefoils
3. 11kV CPP Aux. Swbd (HT-9421) Transformer-9401-1 Trefoils
4. 11kV CPP Aux. Swbd (HT-9421) Transformer-9402-1 Trefoils
5. 11kV Utility Swbd (HT-9422) Transformer-9403-2 Trefoils
6. 11kV Utility Swbd (HT-9422) Transformer-9404-2 Trefoils
Total: 10 Trefoils
B. TBG Cables (66kV) Trefoils Requirement in this area are,
1. 220/66kV Grid Transformer01-03 Trefoils
2. 220/66kV Grid Transformer02-03 Trefoils
Total: 06 Trefoils
C. TBG Cables (220kV) Trefoils Requirement in this area are,
1. 220/66kV Grid Transformer01-01 Trefoils
2. 220/66kV Grid Transformer02-01 Trefoils
3. 220/33kV Grid Transformer01-01 Trefoils
4. 220/33kV Grid Transformer02-01 Trefoils
Total: 04 Trefoils



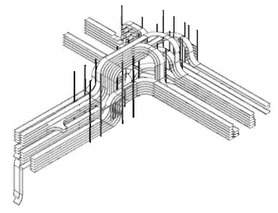
ISO3 VIEW WITH CABLE DUCT AND STRUCTURE



ISO3 VIEW WITHOUT CABLE DUCT AND STRUCTURE



ISO4 VIEW WITH CABLE DUCT AND STRUCTURE



ISO4 VIEW WITHOUT CABLE DUCT AND STRUCTURE

NOTES:

1. ALL DIMENSIONS ARE IN M AND ELEVATIONS & CO–ORDINATES ARE IN METRES, UNLESS OTHERWISE SPECIFIED ELSE WHERE IN THIS DRAWING.

2. CABLE ROUTE MAY BE ADJUSTED AT SITE TO SUIT SITE CONDITIONS AND AS PER INSTRUCTION OF SITE ENGINEERS.

3. THE CABLE TRAYS SHALL BE PREFABRICATED GI LADDER TYPE CABLE TRAYS FOR POWER CABLES, GI LADDER / PERFORATED TYPE FOR CONTROL AND FRP TYPE FOR INSTRUMENT CABLES.

4. ALL TRAYS SHALL BE SUPPORTED AT AN INTERVAL OF 1.5M FOR HORIZONTAL AND 1.0M FOR VERTICAL.

5. ALL VERTICAL CABLE TRAYS SHALL BE COVERED WITH G.I SHEET FOR PROTECTION AGAINST PHYSICAL DAMAGE TO CABLES.

6. CABLE SHALL BE NEATLY ARRANGED IN THE TRENCHES/TRAYS IN SUCH A MANNER THAT CRISS CROSSING IS AVOIDED & FINAL TAKE OFF TO THE MOTOR OR PANEL IS FACILITATED.

7. ALL POWER & CONTROL CABLES SHALL BE HAVING ALUMINIUM CABLE TAGS FOR CABLES ON TRAYS & LEAD TAGS FOR UNDER GROUND CABLES. THESE TAGS SHALL BE FIXED AS EVERY BEND, TERMINATION POINT, BRANCHING POINT FROM A GROUP OF CABLES AND AT EVERY 30 METRES IN STRAIGHT LENGTH.

8. THE EXACT HEIGHT OF OPENING IN TRENCH WALL FOR G.I./PVC PIPE FOR TAKING CABLE SHALL BE SUITABLY DECIDED AT SITE.

9. THE REMOVABLE CONCRETE COVERS SHALL BE SEALED WITH MASTIC ASPHALT FILLER/BITUMEN TO PREVENT INGRESS OF WATER/HYDROCARBONS IN CABLE TRENCH.

10. TOP OF THE TRENCH SHALL BE 100 M ABOVE FINISHED GRADE LEVEL (F.G.L.) IN CASE OF UNPAVED AREAS AND SHALL BE FLUSHED WITH FINISHED FLOOR LEVEL (F.F.L.) IN CASE OF PAVED AREAS.

11. MINIMUM GAP OF 300 M SHALL BE PROVIDED BETWEEN FA / COMUNICATION / TELEPHONE CABLES AND ALL OTHER POWER / CONTROL CABLES.

12. INSTRUMENT CABLE SHALL BE ROUTED THROUGH SIGNAL CABLE TRAY DESIGNATED AS (ST)/INSTRUMENTATION DUCT ON PIPE RACK.

13. ELEVATIONS FOR CABLE RACK WILL BE INDICATED LATER AFTER THE FINALIZATION OF PIPE RACK/CIVIL STRUCTURE DETAILS.

14. FOR PIPE RACK FOUNDATION AND WALK WAY DETAILS REFER CIVIL DRAWINGS.

15. NIL.

16. NIL.

17. ENTRY FOR WALKWAYS SHALL BE PROVIDED AT THE STRAT OF PIPE RACK AND END OF THE PIPE RACK.

18. ONE (1No) FRP CABLE TRAY WITH COVER SHALL BE PROVIDED FOR LAYING OF ECS CABLES/FO DIFFERENTIAL CABLE.

19. ALL CABLE TRENCH COVER SHALL BE PROVIDED WITH AS PER EIL SPECIFICATION (EIL STD NO. 7–51–0303, REV–4, 6–51–0099 & 6–51–0082)

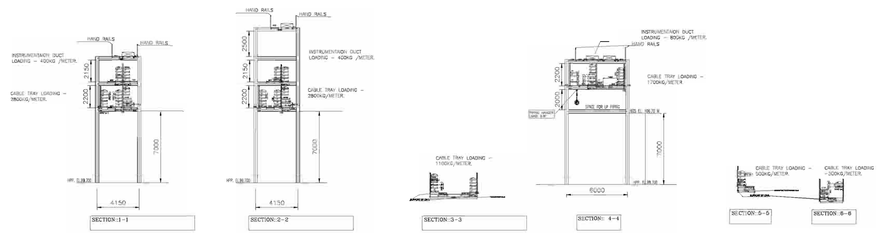
20. IN CABLE CELLAR, CABLE ENTRY PVC SLEEVES SHALL BE PROVIDED WITH WATER SEAL.

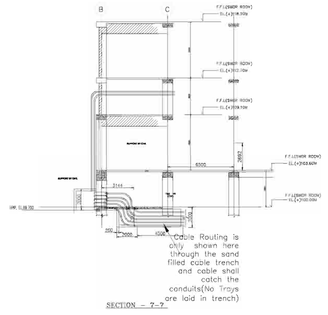
21. CABLE TRAY COVER SHALL BE PROVIDED FOR TOP MOST CABLE TRAY ON PIPE RACK.

22. INST. CABLE DUCT SHALL BE SUPPORTED CONTINUOUSLY BY ISMC 100 AND DETAILS ARE FURNISHED IN THE SECTIONAL DETAILS

23. 33kV CABLES FOR EXISTING TRANSFORMER (FEEDING SWGR–200), SWITCHGEAR–270 & 71–HV–111 BOARDS SHALL BE DROPPED DOWN AT THIS POINT TO CATCH EXISTING CABLE TRENCH FOR RESPECTIVE CABLE ROUTINGS.

24. JOINTING LOCATION OF 33kV CABLES FOR 71–HV–111 BOARDS SHALL BE DONE AT THIS LOCATION.





REV.	DATE	ALTERED	CHD/APPD
01	05.12.18	REVISED INLINE WITH CUSTOMER/CONSULTANT COMMENTS	K.V P.S/J.KP

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE
DRN.	K.V	-SD-	30.03.18
CHG.	B.N.K	-SD-	30.03.18
APPD.	J.K.P	-SD-	30.03.18

DEPT. PE&SD | CODE 450 | UNTOL. DIMS. OR +/-M+/F- | SCALE | WEIGHT (KG) | REF. TO ASSY. DRG. -N.A.- | ITEM NO. -N.A.- | NO.OF ITEMS -N.A.- | NO.OF VAR. -N.A.-

TITLE: OUTDOOR AREA CABLE TRAY TRENCH LAYOUT

CARD CODE N.A. | DRAWING NO. PY-LC-0-M104-2001-01-S00-R01 | REV. 01 | SHT. No. 02 | NO. OF SHT. 02

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

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

6–ST & 5–CT	EL. +108.300M	300 & 300
2–HT	EL. +108.000M	750
2–HT	EL. +107.700M	750

4–LT	EL. +108.300M	300
2–HT	EL. +108.000M	750
2–HT	EL. +107.700M	750

4–LT	EL. +108.300M	300
2–HT	EL. +108.000M	750
2–HT	EL. +107.700M	750
2–HT	EL. +107.400M	750
2–HT	EL. +107.100M	750

6–ST & 5–CT	EL. +108.300M	300 & 300
4–LT	EL. +108.000M	600
2–HT	EL. +107.700M	750
2–HT	EL. +107.400M	750
2–HT	EL. +107.100M	750

6 M ROAD (BY BHEL)

1. Transducer Panel,
2. Dummy Panel
3. Interposing Panel

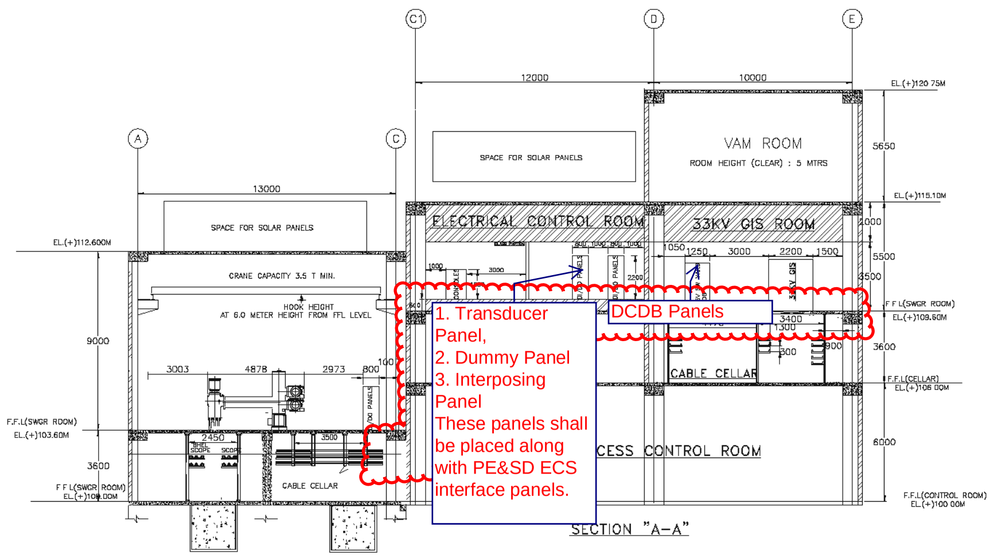
6–ST	EL. +108.300M	500
5–CT	EL. +108.000M	600
4–LT	EL. +107.700M	600
5–CT	EL. +108.300M	600
4–LT	EL. +108.000M	600
6–ST	EL. +108.300M	600
5–CT	EL. +108.000M	600
4–LT	EL. +107.700M	600

2070WX600H FALSE FLOOR OPENING BELOW 106.600M FALSE FLOOR SLAB

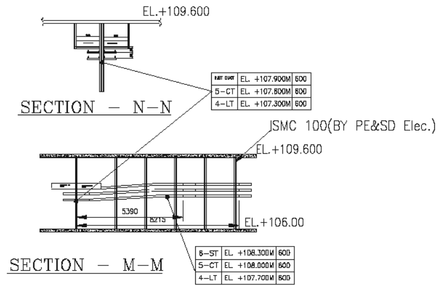
Cable Details,
AC Cables: 10 Cables
DC Cables: 70 Cables
Control Cables: 150 Cables

6 M ROAD (BY BHEL)

PLAN AT EL.109.600 M LEVEL FOR GIS & CONTROL ROOM BUILDING

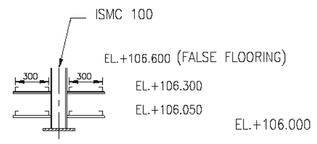


SECTION "A-A"

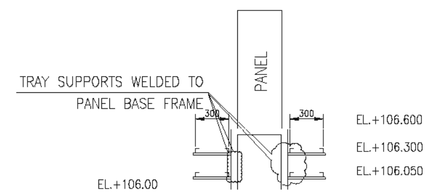


SECTION – N–N

SECTION – M–M



SECTION P–P



SECTION Q–Q

ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD
	ZONE			ZONE			ZONE			ZONE			ZONE			ZONE			ZONE			ZONE		

PROJECT: CAPTIVE POWER PLANT (CPP) PACKAGE
VISAKH REFINERY MODERNIZATION PROJECT (VRMP)
JOB NO. B016

OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC: ENGINEERS INDIA LIMITED (EIL), NEW DELHI

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	K.VENKATESH	–SD–	02.08.18	
CHD.	B.NAVEEN	–SD–	02.08.18	
APPD.	J.K.PATTANAIK	–SD–	02.08.18	

DEPT. PE&SD	UNTOL. DIMS. GR. C/M/F		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE. 450					–N.A.–	–N.A.–	–N.A.–

TITLE
CABLE CELLAR CABLE TRAY LAYOUT IN SUBSTATION BUILDING SS–93

CARD CODE N.A.

BHEL DRG NO. PY–LC–0–M104–2036–02 REV. 00

CUST DRG NO.

SHT. No – 2 NO. OF SHT. 2

DRAWING NO. : CGT3-OGA-15850Q

MINIMUM CLEARANCE IN AIR AS PER IEC 60076-3		
TERMINAL	PHASE TO PHASE	PHASE TO EARTH
HV	NA	500
IV	NA	200
LV	NA	320
HVN	NA	320
IVN	NA	320

DESCRIPTION	MASS (kG)
ACTIVE PART	79000
TANK & ACCESSORIES	62000
TOTAL OIL (88780 Lts.)	79458.1000
TRANSPORT (GAS FILLED)	110400
OVERALL	220460

APPROXIMATE DIMENSIONS OF THE TRANSFORMER		
	OVERALL	TRANSPORT
LENGTH	14873	7000
WIDTH	9252	3950
HEIGHT	9130	4300

Annexure H-220/66kV Transfomer layout drawings

:

OLERANCE ON MASS & DIMENSIONS SHALL BE ±5%, UNLESS OTHERWISE SPECIFIED.

LL DIMENSIONS ARE IN MM.

AINT SHADE:- 631 OF IS-5.

TEM NUMBER FOR FITTINGS ARE STANDARDIZED FOR OUR EASY REFERENCE AND ENCE NOT CONTINUOUS.

5. **FOR ASSEMBLY OF LOOSE FABRICATED PARTS REFER TAG IDENTIFICATION DRAWING (PART OF OPERATION & MAINTENANCE MANUALS).**

6. **IN LIST OF FITTING ITEMS MARKED '*' ARE DETACHED FROM TRANSFORMER FOR TRANSPORT PORPOSE.**

REFR. DRG. NO.	DESCRIPTION		REFERENCES	REV.	DESCRIPTION	DRAWN	CHECKED	APPROVED	STATUS
			FIRST SUBMISSION DATED		FOR CLIENT APPROVAL	Name XXX Date XX.XX.XX	Name XXX Date XX.XX.XX	Name XXX Date XX.XX.XX	

TITLE : FOUNDATION PLAN OF 80/100 MVA, INTERCONNECTING 3-PH TRANSFORMER

GE POWER AND INDUSTRIAL SOLUTIONS LTD. TRANSFORMER DIVISION VADODARA - 390024.

DRG.NO: CGT3-OGA-15850Q REV 0

OWNERS : HPCL VISAKHAPATNAM (HINDUSTAN PETROLEUM CORPORATION LIMITED)

OWNERS CONSULTANT : PTC INDIA LIMITED. (FORMERLY KNOWN AS POWER TRADING CORPORATION OF INDIA LIMITED)

PROJECT : 220/66KV HPCL S/S & KALPAKA EXTENSION PACKAGE - II

LOA REF : 17000404-HP-46004/RP DATED:12:03:2018.

TITLE : OUTLINE GENERAL ARRANGEMENT 220/66/11kV, 100/80MVA INTERCONNECTING TRANSFORMER

GE T&D INDIA LTD (FORMERLY ALSTOM T&D INDIA LTD) 19/1, 102 BUILDING, IST FLOOR, PALLAVARAM, CHENNAI - 600043 TAMILNADU (INDIA).

DRAWING NO. CGT3-OGA-15850Q

SIZE A1 | TOTAL SH | SHEET No. | REV | SCALE

This drawing and design is the property of GE and must not be copied or lent without prior permission in writing

"Nothing contained in this drawing shall be construed as basis for establishing contractual scope of works unless agreed otherwise in writing."

DRG.NO: CGT3-OGA-15850Q

IF IN DOUBT, ASK

Please furnish the height

Please furnish these dimensions

CL of Transformer / Rail

1050±50 725±50 1775±5

HV SIDE

RH SIDE

1U 1V 1W

308 527 306 827 301 826 401 448 408 213 645 528 107 309 306A 532 583 534 101 145 117 501 809 202 709 810 312 313 452 322 404 503 1700±50 601 823 822 717 505 705 RAIL GAUGE=1676 ROLLER CENTER=1736 332 707 507 660 221 803 A

306B 529 710 719 960 310 824 509 605 582 677 606 323 581 806 868 868 1736 507 PLINTH LEVEL 529 801

DETAIL A
SCALE 1:5

40 25 40 25 90 90

4 TAPPED HOLES M12

MAIN TRAFO. & COOLER BANK EARTHING PAD ITEM-507

NO	REVISION	SIGN	DATE
4			
3			
2			
1			

GEN. TOL. TSI-100

MATL.: AS SPECIFIED

SPEC.: TSI-99

THIRD ANGLE PROJECTION

SCALE:

ALL DIMNS. IN MM. UNLESS OTHERWISE SPECIFIED.

	INITIALS	NAME
ORG		SV
CHD		MQ
APPD		MQ

DATE : 16/10/2018

TITLE :

Outline General Arrangement

CG Power and Industrial Solutions Limited
(Formerly Crompton Greaves Limited)
TRANSFORMER DIVISION
MANDIDEEP, BHOPAL.

DRG.NO: CGT3-OGA-15850Q

REV 0

CGL W.O.:BE11183

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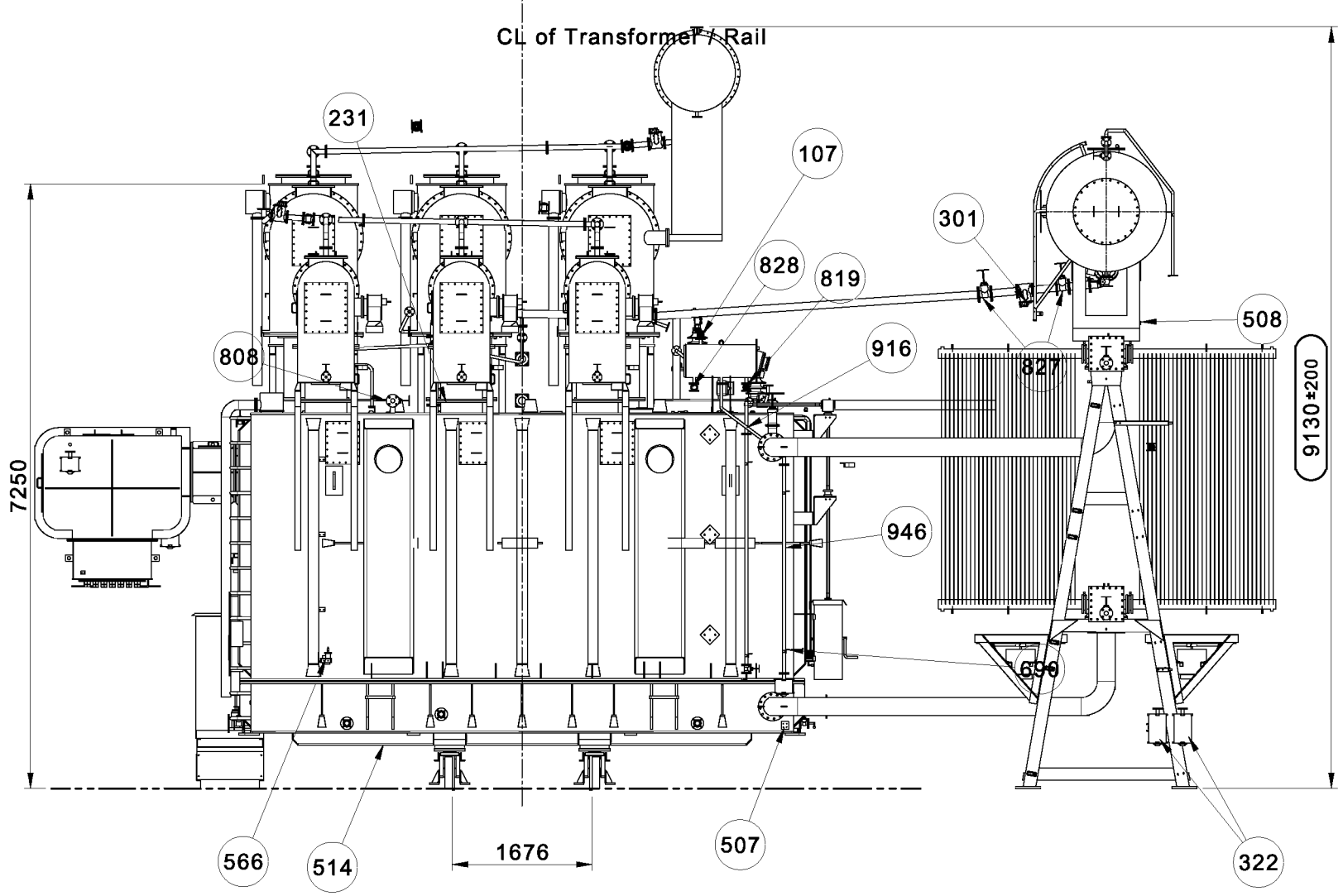
A3 297 * 420 : DIVISION – TRANSFORMER

FILE NAME:- IND_T3_A3-views-template.prt

DRG.NO: CGT3-OGA-15850Q

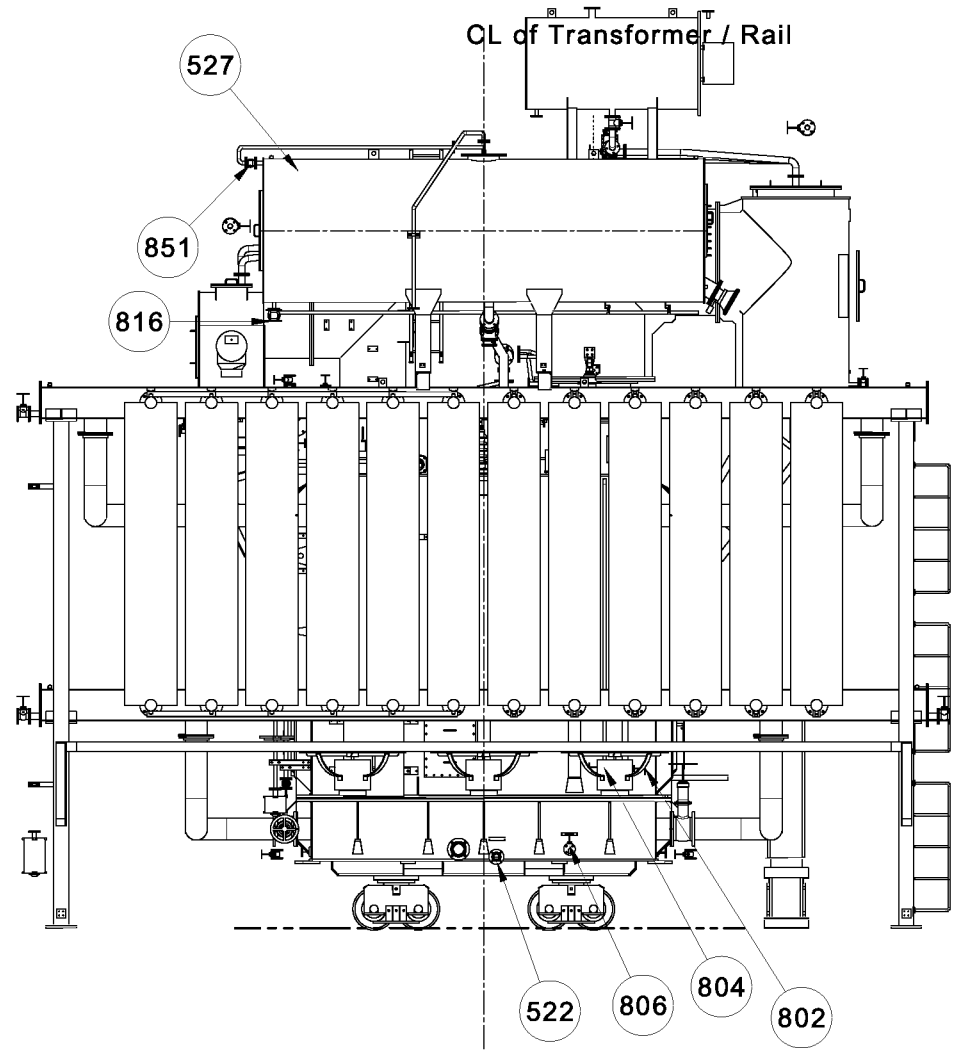
IF IN DOUBT, ASK

LV SIDE



RAIL GAUGE

LHS SIDE



4				GEN. TOL. TSI-100	MATL.: AS SPECIFIED			TITLE : Outline General Arrangement	
3				THIRD ANGLE PROJECTION					
2				SCALE:		INITIALS	NAME	CG Power and Industrial Solutions Limited (Formerly Crompton Greaves Limited) TRANSFORMER DIVISION MANDIDEEP, BHOPAL.	
1				ALL DIMNS. IN MM. UNLESS OTHERWISE SPECIFIED.	ORG		SV		
					CHD		MQ		
					APPD		MQ	DRG.NO: CGT3-OGA-15850Q	REV 0
NO		REVISION	SIGN	DATE		DATE : 16/10/2018		CGL W.O.:BE11183	

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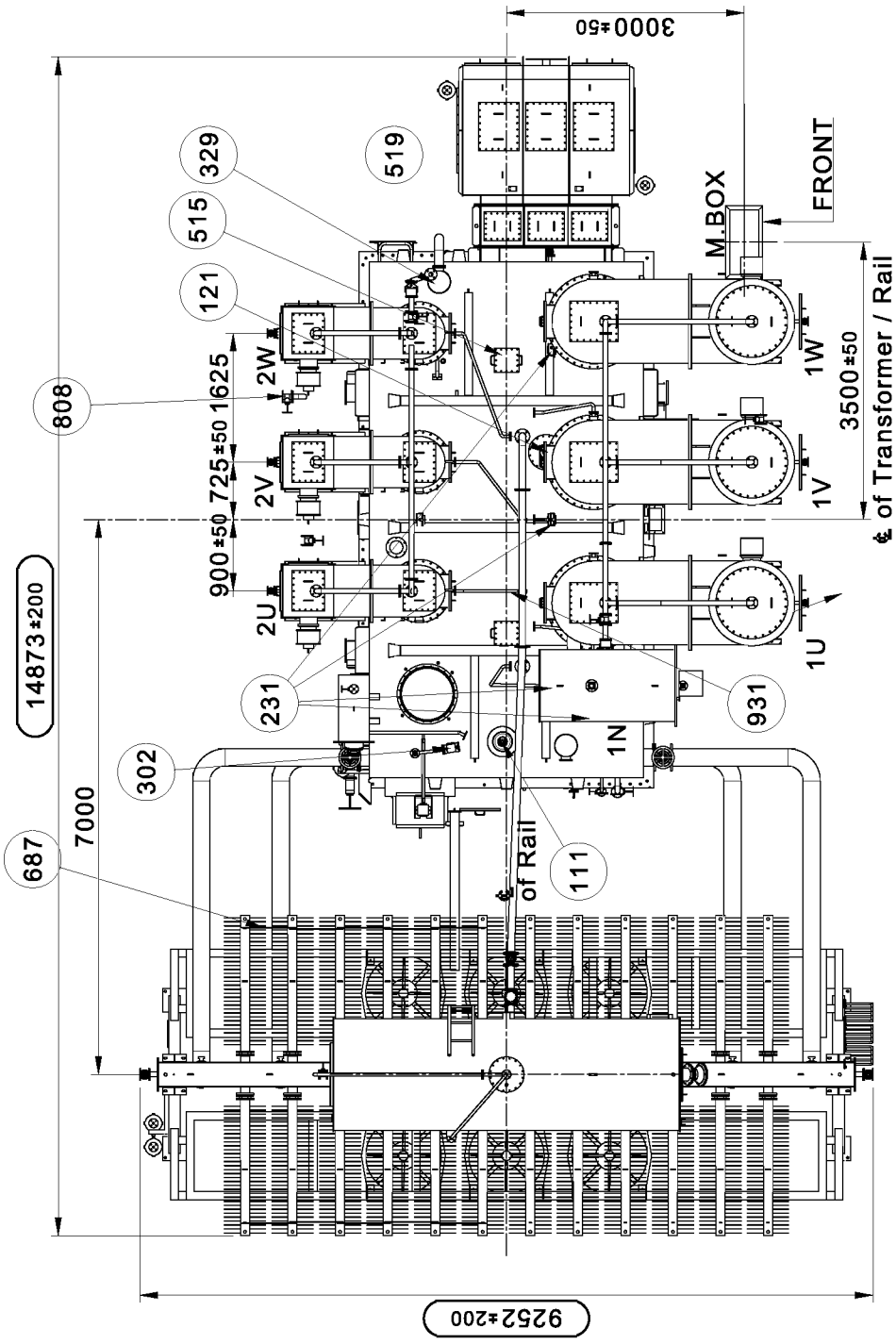


DIRECTION OF REMOVAL

NOTE:

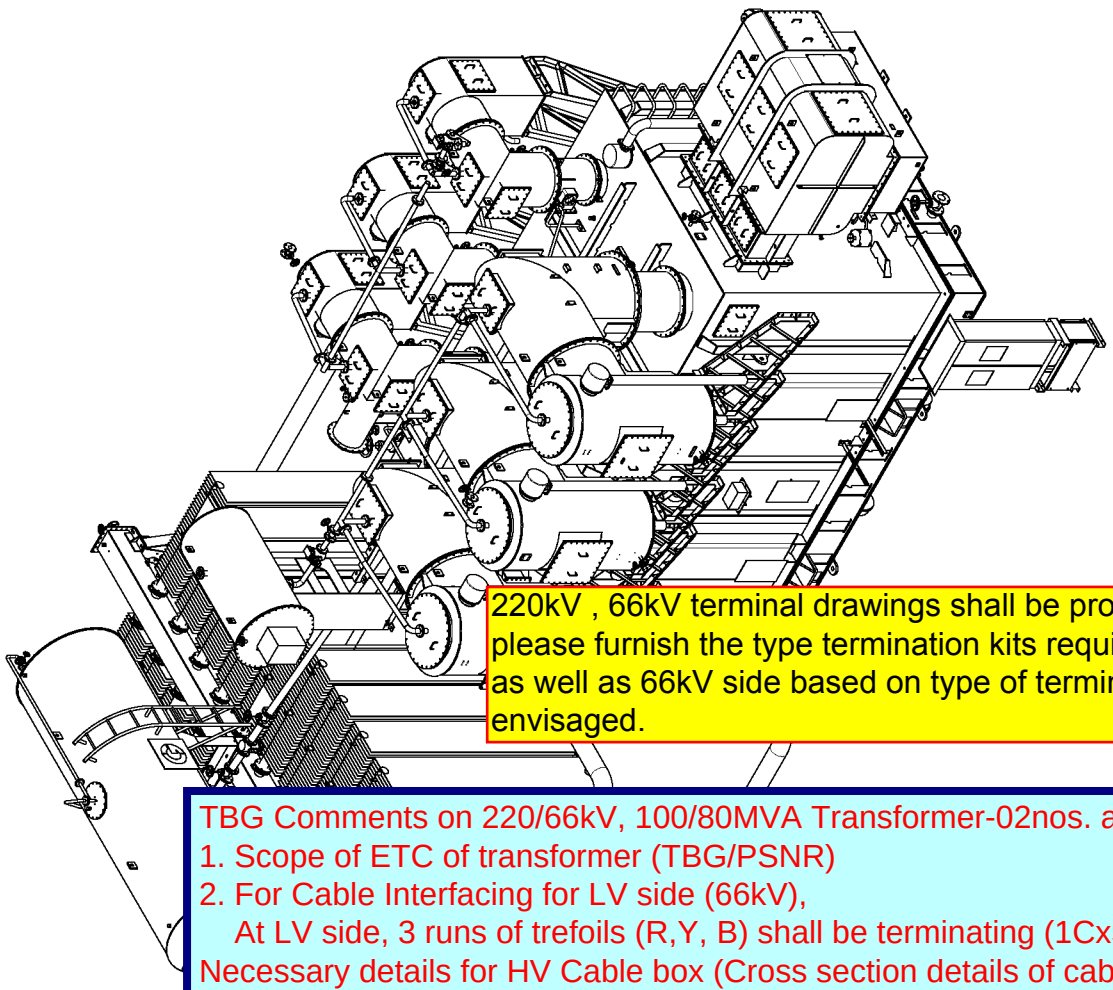
1. ALL DIMENSIONS ARE IN MILLIMETERS (mm), UNLESS SPECIFIED OTHERWISE.
2. DIMENSIONS SHOWN IN BOXES, ARE OVERALL DIMENSIONS FOR THE TRANSFORMER.
3. EXTERNAL PAINT SHADE 631 of IS 5.
4. TOLERANCE ON DIMENSIONS SHALL BE +/- 5%, UNLESS SPECIFIED OTHERWISE.
5. TOLERANCE ON WEIGHT SHALL BE +0/-5%.
6. TANK TYPE: BELL TYPE TANK.
7. TANK COVER IS HAVING SLOPE FROM LV TO HV SIDE (LV BEING HIGHER THAN HV SIDE) TO AVOID WATER LOGGING OVER COVER.
8. ALL ACCESSORIES, PIPELINES ARE SHOWN FOR GENERAL GUIDANCE ONLY AND MAY CHANGE DURING DETAILED ENGINEERING.
9. IN THE PART LIST, ITEMS FOLLOWED BY "*" ARE SHIPPED AS SEPARATE PACKAGES FOR TRANSPORT. THESE ARE NOT A PART OF THE MAIN UNIT FOR TRANSPORTATION PURPOSES.
10. IN THE PART LIST, ITEM NUMBER FOR FITTINGS ARE STANDARD FOR CG's REFERENCE NO. HENCE NOT CONTINUOUS.
11. FOR ASSEMBLY OF LOOSE FITTED PARTS, REFER TAG IDENTIFICATION / PART MARKING DRAWING, WHICH IS A PART OF OPERATION AND MAINTENANCE MANUAL.

Due to space constraint, we request vendor to reduce dimension atleast by 500mm

Due to space constraint, we request vendor to reduce dimension atleast by 500mm

Please furnish this dimnesion

Please furnish this dimnesion



220kV , 66kV terminal drawings shall be provided. Further please furnish the type termination kits required for 220kV side as well as 66kV side based on type of termination box envisaged.

TBG Comments on 220/66kV, 100/80MVA Transformer-02nos. are as follows,

1. Scope of ETC of transformer (TBG/PSNR)
2. For Cable Interfacing for LV side (66kV),
   At LV side, 3 runs of trefoils (R,Y, B) shall be terminating (1Cx500sqmm XLPE, Cu Cable). Necessary details for HV Cable box (Cross section details of cable box, type of cable box (oil filled/ air filled), necessary trench construction for accommodating extra length of cable, any specific requirement for termination kit and necessary arrangement for accommodating 3runs of trefoils) shall be furnished.
3. For Cable Interfacing for HV side (220kV)
   At HV side, 1 runs of trefoils (R,Y, B) shall be terminating (1Cx1000sqmm XLPE, Cu Cable, free issue item from customer). Necessary details for HV Cable box (Cross section details of cable box, type of cable box (oil filled/ air filled), necessary trench construction for accommodating extra length of cable, any specific requirement for termination kit and necessary arrangement for accommodating 1 runs of trefoils) shall be furnished.
4. Necessary support points shall be provided for supporting XLPE cables.
5. As per EIL specification, Heat/ cold shrinkable termination kits suitable for air filled cable box is being procured. Kindly review and confirm suitablity.

CG Power and Industrial Solutions Limited
(Formerly Crompton Greaves Limited)
TRANSFORMER DIVISION
MANDIDEEP, BHOPAL.

DRG.NO: CGT3-OGA-15850Q REV 0

CGL W.O.:BE11183

Outline General Arrangement

GEN. TOL. TSI-100	MATL.: AS SPECIFIED SPEC.: TSI-99			
THIRD ANGLE PROJECTION	SCALE:	INITIALS	DRG	SV
			CHD	MQ
	ALL DIMNS. IN MM. UNLESS OTHERWISE SPECIFIED.		APPD	MQ
			DATE	: 16/10/2018

NO	REVISION	SIGN	DATE

FILE NAME:- IND_T3_A3-views-template.prt

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CGT3-OGA-15850Q

EQUIPMENT	**100 MVA, 220 / 33 KV, 50 Hz, 3-PHASE, ONAN/ONAF COOLED GENERATOR TRANSFORMER.**
CUSTOMER	**M/s HPCL VIZAG**
PROJECT	**CAPTIVE POWER PLANT (CPP) PACKAGE VISAKH REFINERY MODERNIZATION PROJECT (VRMP)**
CONSULTANT	**M/s ENGINEERS INDIA LIMITED**
JHANSI WORK ORDER NO.	**72110A17100**
ELECTRICAL SPECIFICATION	**627130**
TRANSFORMER SL. NO.	**2048400 - 401**

S.No.	INDEX	DRAWING NO.	REVISON NO.	PAGE NO.
	DRAWINGS			
1	OGA	14580050341	00	3
2	FOUNDATION DRAWING	24580050497	00	4
3	RATING AND DIAGRAM PLATE	14581950567	00	5
4	HV CABLE BOX	24580050498	00	6
5	LV CABLE BOX	24580050499	00	8
6	ROLLERS	34580050974	00	9
7	HV BUSHING	34580050972	00	10
8	LV & LVN BUSHING	34580050973	00	11
9	HVN BUSHING	34580050973	00	12

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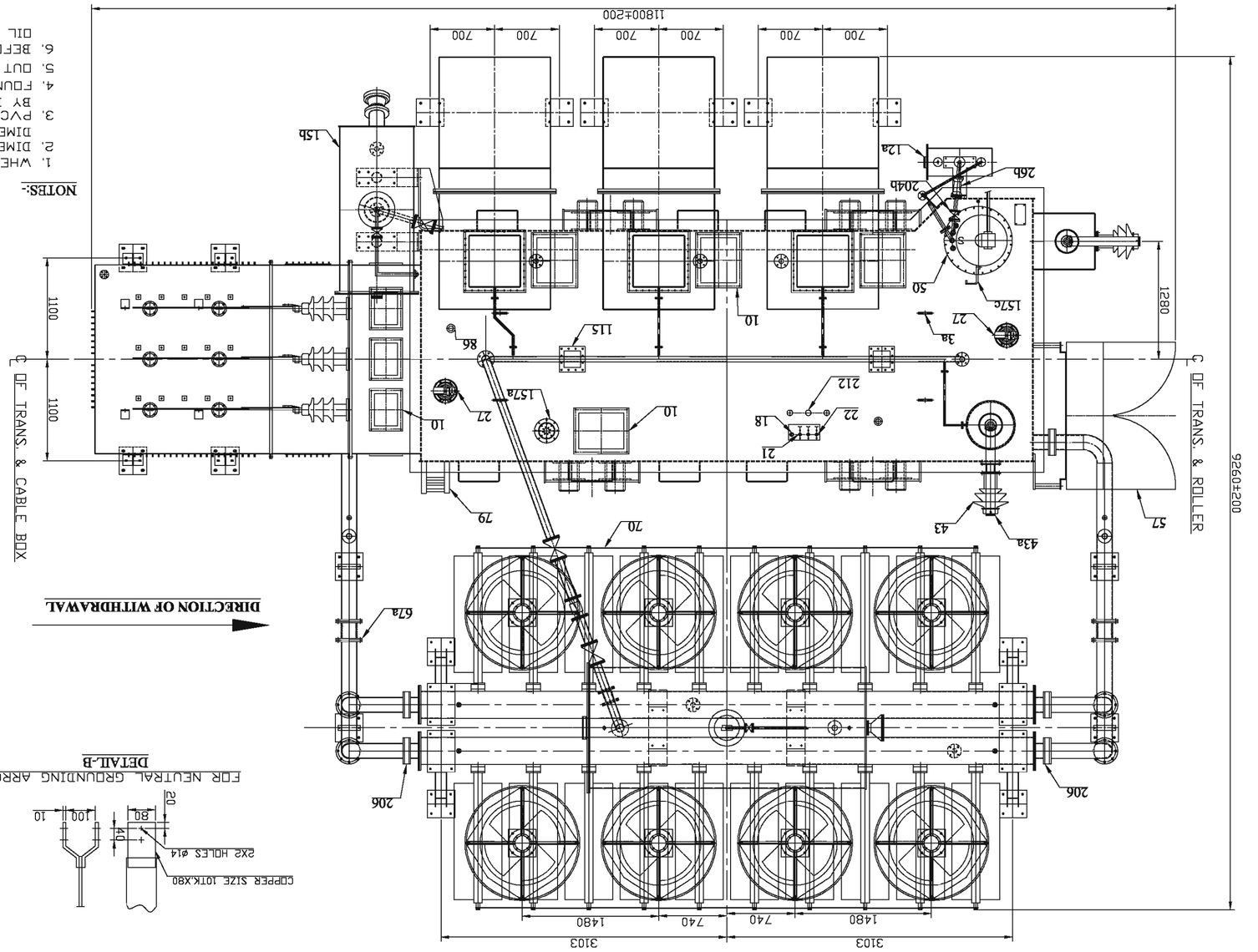
INVENTORY NO.	SIGN AND DATE	REF. DRG. NO.

ZONE	REV	DATE	ALTERED / CHECKED / APPROVED
1			
2			
3			
4			
5			
6			
7			
8			
9	00		
10			
11			
12			

NOTES:

1. WHEN REFERRING THIS DRG. STATE 100 MVA & W.O.NO. 72110A1710O
2. DIMENSIONS MARKED THUS □ ARE OVER ALL SHIPPING DIMENSIONS EXCLUSIVE OF PACKING. UPTO MARSHALLING BOX ARE SUPPLIED
3. PVC, SWA, PVC ARMOURED CABLE WIRING
4. FOUNDATION BOLTS, NUTS & WASHERS ETC. ARE SUPPLIED BY BHEL.
   BY BHEL, BUT NOT SHOWN IN THIS DRG. FOR CLARITY.
5. OUT SIDE PAINTING SHALL BE EPOXY PAINT TO SHADE RAL NO. 7031 (PU PAINT) OF 1.5/5
6. BEFORE FILLING OIL IN TRANSFORMER REFER INSTRUCTIONS GIVEN ON OIL FILLING INSTRUCTION PLATE (ITEM NO.2C) FITTED WITH THIS TRANSFORMER.



ADDITIONAL INFORMATION

W.O. 72110A1710O

STATUS OF DRAWING

U

DISTRIBUTION OF PRINTS

TYPE OF PRODUCT	OR	80/100 MVA, 220/33 KV ONAN/ONAF COOLED POWER TRFR.
NAME OF CUSTOMER/PROJECT		M/S:-HPCL VIZAG

BHARAT HEAVY ELECTRICALS LTD. JHANSI

	NAME	SIGN	DATE
DSN	PSRI		
CHD			
APP'D			

UM	TOL. DIM./M/F	SCALE	WEIGHT (KG)	REF. TO ASSY. NO.	ITEM NO	NO. OF ITEM
DEPT-IRE						

CODE-406

TITLE: OUT LINE GENERAL ARRGT.

DRAWING NO. 14580050341 REV. 00

SHT NO 1 NO OF SHT 1

SIGNATURE NOT REQUIRED AS IT IS SYSTEM GENERATED DRAWING **SIZE A4**

PRODUCT: CAPTIVE POWER PLANT (CPP) PACKAGE
VISAKH REFINERY MODERNIZATION PROJECT (VRMP)
JOB NO. R016

NAME OF CUSTOMER: HINDUSTAN PETROLEUM CORPORATION LIMITED

ENGINEERS INDIA LIMITED (EIL), NEW DELHI

TABLE OF REFERENCE DRAWINGS

SR. NO.	DESCRIPTION	DRG.NO.
01	OUT LINE GENERAL ARRANGEMENT	1 458 00 50 341
02	RATING & DIAGRAM PLATE (ENGLISH)	1 458 19 50 367
03	FOUNDATION PLAN OF TRFR.	2 458 00 50 497
04	H.V. CABLE BOX	2 458 00 50 498
05	L.V. CABLE BOX	2 458 00 50 499
06	245 KV, 1250 AMPS. H.V. BUSHING	3 458 00 50 972
07	36 KV, 3150 AMPS. L.V. & L.V.N. BUSHING	3 458 00 50 973
08	36 KV, 3150 AMPS. H.V.N. BUSHING	3 458 00 50 973
09	320 DIA TWIN ROLLER	3 458 00 50 974

APPROXIMATE WEIGHT

DESCRIPTION	WT.IN KG.
CORE & WINDINGS (INCLUDING OIL ABSORBED)	67000
TANK+FITTINGS (INCLUDING RADIATORS) + ACCESSORIES	30000
OIL IN KG.	40000
TOTAL WEIGHT	137000
SHIPPING WEIGHT (N2 GAS FILLED)	79000

TABLE OF FITTINGS

ITEM NO.	DESCRIPTION	QTY.
1	MARSHALLING BOX	01NO
2	RADIATORS	20NOS
3	FAN & MOTOR	6+2NOS
3A	FLEXIBLE JOINT (80 N.B) MAIN CONS. & CABLE BOX CONS.	02NOS
3B	FLEXIBLE JOINT (150 N.B) HEADER PIPE WORK	07NOS
4	TOP HEADERS	02NOS
5	BOTTOM HEADERS	02NOS
6	A-FRAME SUPPORT	02NOS
7	FAN SUPPORT	08NOS
7A	RADIATOR TIE BAR	32NOS
7B	LADDER WITH SAFETY FLAP	01NO.
8	OIL INLET VALVE (150NB BUTTERFLY) ON TANK	01NO.
8A	OIL OUTLET VALVE (150 NB BUTTERFLY) ON TANK	01NO.
8B	SAMPLING VALVE (15 NB) ON TANK	02NOS
8BA	SAMPLING VALVE (25NB) FOR OLTC DIVERTER SWITCH	04NOS
8C	AIR RELEASE VALVE (15 NB) ON COVER	02NOS.
8D	AIR RELEASE PLUG ON RADIATORS, HEADERS, 3/4" BSP	20+4CS
8DA	AIR RELEASE PLUGS (3/4" BSP) ON MAIN CONS. & CABLE BOX CONS.	04NOS
8DB	AIR RELEASE PLUG (3/4" BSP) ON MAIN CONS., CABLE BOX CONS. & OLTC CONS.	02NOS.
8DC	AIR RELEASE PLUG (3/4" BSP) ON CABLE BOX CONS.	02NOS.
8E	BUCHHOLZ RELEASE COCK (6 NB) WITH 6 N.B. PIPE	01NO.
10I	PRESSURE GAUGE ON MAIN CONS. & CABLE BOX CONS.	02NOS.
11S	HOLE FOR CLAMPING CORE AND COIL TO TANK COVER	02NOS.
11	OIL FILLING HOLES ON OLTC CONSERVATOR	01NO.
12	MAGNETIC OIL GAUGE (WITH LOW OIL LEVEL ALARM) MAIN CONS. & CABLE BOX CONS.	02NOS.
12A	PRISMATIC OIL GAUGE MAIN CONS. OLTC CONS & CABLE BOX CONS	02NOS.
13	DRAIN PLUG 1"BSP	02NOS.
13A	DRAIN PLUG 1/4"BSP FOR RADIATOR, HEADER & PIPE WORK	26NOS
14	DRAIN VALVE ON TANK (100 NB. B/F)	01NO.
14A	DRAIN VALVE (50 NB. B/F) ON MAIN CONS. & CABLE BOX CONS.	02NOS.
14B	DRAIN VALVE FOR OLTC CONSERVATOR (15 NB)	01NO.
14C	FILTER & DRAIN VALVE (50 NB. B/F) ON CABLE BOX CONS.	03NOS
15	OIL CONSERVATOR AIR CELL TYPE	01NO
15A	OLTC CONSERVATOR	01NO.
15B	CABLE BOX CONSERVATOR	01NO.
17	DEHYDRATING BREATHER FOR MAIN CONSERVATOR	02NOS
17A	DEHYDRATING BREATHER FOR OLTC CONSERVATOR	01NO.
17B	DEHYDRATING BREATHER FOR CABLE BOX CONSERVATOR	01NO.
18	THERMOMETER POCKETS (WITH ALCOHAL THERMOMETER) ON TANK COVER & HEADER	01+04NOS
19	JACKING LUGS	04NOS
21	SENSOR POCKET FOR WINDING TEMPERATURE INDICATOR WITH RTD	01NOS
22	SENSOR POCKET FOR WINDING TEMPERATURE INDICATOR WITH RTD	02NOS
23	FLANGED BI-DIRECTIONAL @ 320 TWIN ROLLER WITH STOPPER ARRGT.	04NOS
25	FILTER VALVE ON TANK & HEADER PIPE WORK (50 NB. B/F)	04NOS
26	BUCHHOLZ RELAY (80NB) MAIN CONS& CABLE BOX CONS.	02NOS
26A	OIL SURGE RELAY	01NO.
27	PRESSURE RELIEF VALVE	02NOS
28	END COVER FOR MAIN CONSERVATOR	01NO.
43	33 KV, POST INSULATOR FOR H.V.N & L.V.N.	06NOS
43A	HV NEUTRAL & LV NEUTRAL GROUNDING STRIPS	02NOS
44	BILINGUAL COMPANY'S MONOGRAM ON TANK & MAIN CONSERVATOR)	1+01NO
48	MOTOR DRIVING UNIT	01NO.
49	HAND OPERATING HANDLE FOR MOTOR DRIVE UNITS	01NO.
50	ON LOAD TAP CHANGER	01NO.
63	FAN & MOTOR	6+2NOS
64	RADIATORS	20NOS
57	MARSHALLING BOX	01NO
59	FLEXIBLE JOINT (80 N.B) MAIN CONS. & CABLE BOX CONS.	02NOS
67	FLEXIBLE JOINT (80 N.B) MAIN CONS. & CABLE BOX CONS.	02NOS
67A	FLEXIBLE JOINT (150 N.B) HEADER PIPE WORK	07NOS
72	A-FRAME SUPPORT	02NOS
73	TOP HEADERS	02NOS
74	BOTTOM HEADERS	02NOS
77	RADIATOR TIE BAR	32NOS
79	LADDER WITH SAFETY FLAP	01NO.
80	OIL INLET VALVE (150NB BUTTERFLY) ON TANK	01NO.
81	OIL OUTLET VALVE (150 NB BUTTERFLY) ON TANK	01NO.
85	SAMPLING VALVE (15 NB) ON TANK	02NOS
85A	SAMPLING VALVE (25NB) FOR OLTC DIVERTER SWITCH	04NOS
86	AIR RELEASE VALVE (15 NB) ON COVER	02NOS.
86A	AIR RELEASE PLUG ON RADIATORS, HEADERS, 3/4" BSP	20+4CS
86A	AIR RELEASE PLUGS (3/4" BSP) ON MAIN CONS. & CABLE BOX CONS.	04NOS
86C	AIR RELEASE PLUG (3/4" BSP) ON CABLE BOX CONS. & OLTC CONS.	02NOS.
86H	AIR RELEASE PLUG (3/4" BSP) ON CABLE BOX CONS.	02NOS.
88	BUCHHOLZ RELEASE COCK (6 NB) WITH 6 N.B. PIPE	01NO.
101	PRESSURE GAUGE ON MAIN CONS. & CABLE BOX CONS.	02NOS.
115	HOLE FOR CLAMPING CORE AND COIL TO TANK COVER	02NOS.
151	LV CABLE BOX	03NOS.
150	HV CABLE BOX	03NOS.
152	CONSERVATOR SUPPORT FOR CABLE BOX CONSERVATOR	02NOS.
157A	EARTHING CONNECTION BETWEEN CORE TO END FRAME & END FRAME TO TANK	02NOS.
157B	EARTHING CONNECTION BETWEEN TOP TANK TO TANK COVER	02NOS.
157C	EARTHING CONNECTION BETWEEN TAP CHANGER TO TANK COVER	02NOS.
164	BREATHER PIPE (15 N.B.)	02NOS.
203	RADIATOR VALVE (80 NB BUTTERFLY)	20NOS.
204	VALVE (80 NB FOR MAIN CONS., CABLE BOX CONS. & 25 NB FOR OLTC CONS)	04+04CS
204A	CONSERVATOR VALVE 25 NB FOR OLTC CONS.	01NO.
210	VALVE (15 NB) FOR BREATHER CONNECTION ON MAIN CONSERVATOR	01NO.
211	FLEXIBLE SEPERATION (AIR CELL) INSIDE MAIN CONSERVATOR	01NO.
212	OIL DRAIN VALVE FOR NIPPLES	01NO.
213	NITROGEN GAS INJECTION VALVE ON TANK	06NO.
214	NIPPLES SIGNAL BOX	01NO.

First Angle Projection
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
All dimensions in 'mm'
DRG.No. 24580050497

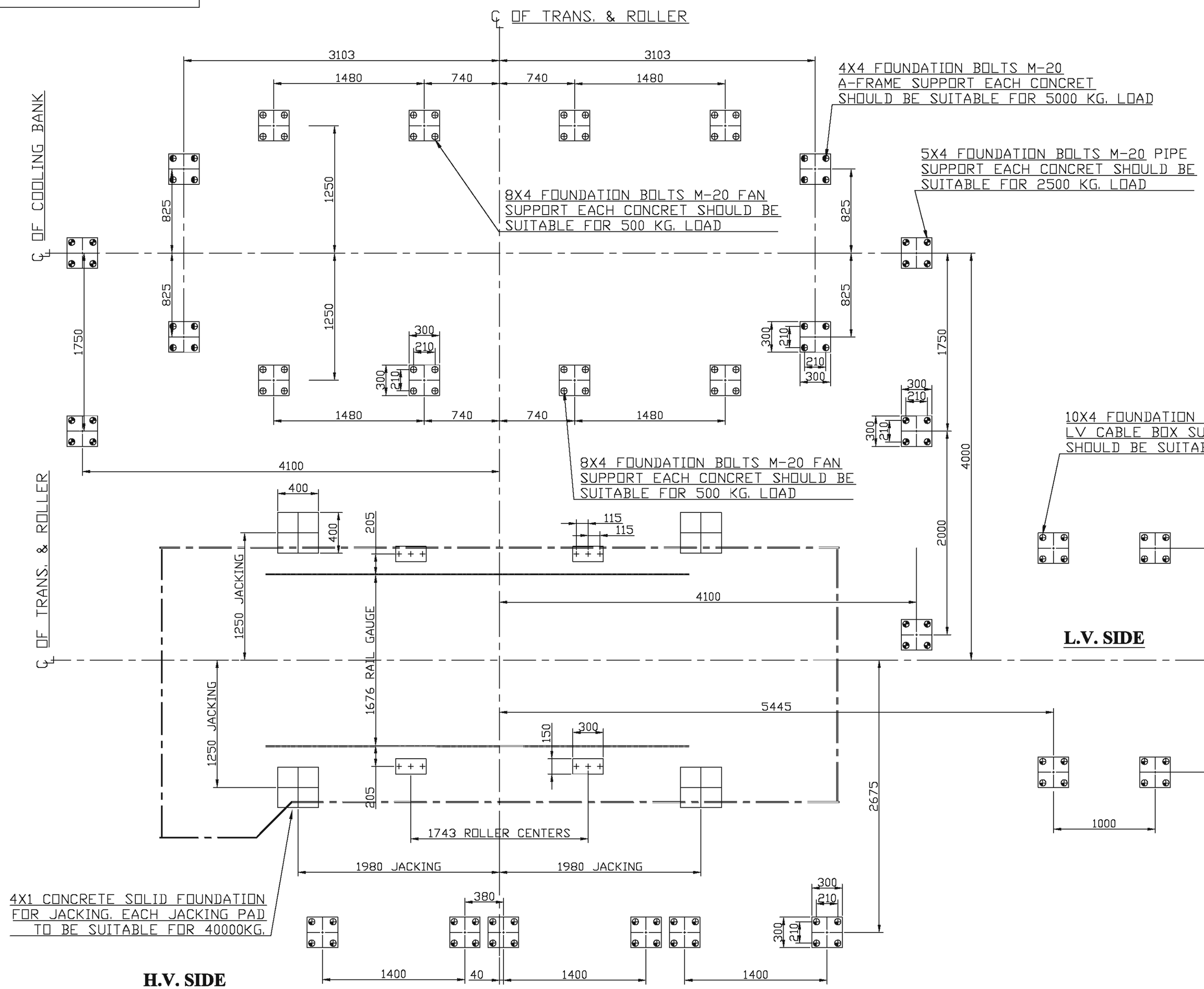
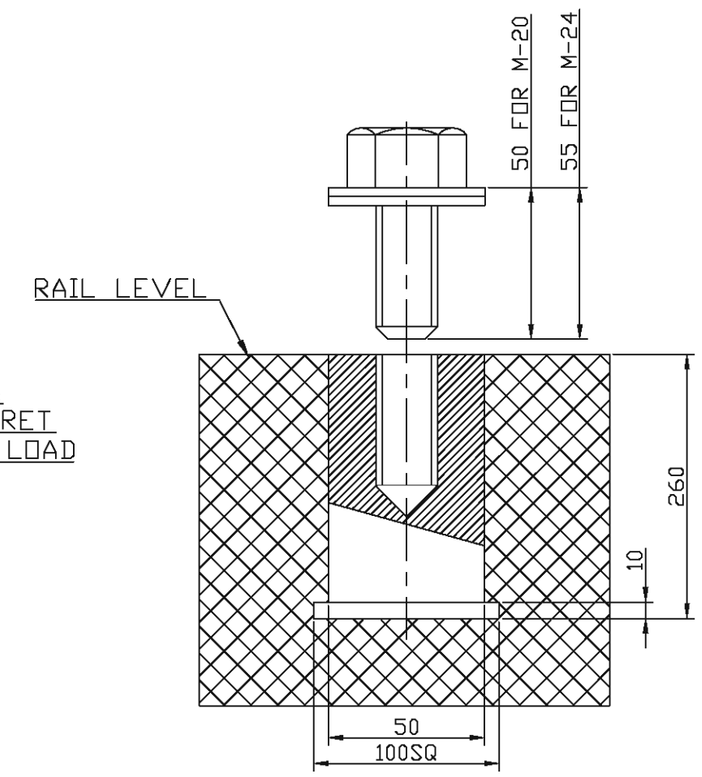


TABLE FOR BOLTS SIZE FOR VARIOUS FITTINGS			
FITTING	SIZE OF BOLTS	QTY.	SYMBOL
ROLLER STOPER SUPPORT	M-24	18	⊕
FAN SUPPORT	M-20	32	⊕
CABLE BOX SUPPORT	M-20	40	⊕
RADIATOR A-FRAME SUPPORT	M-20	16	⊕
PIPE SUPPORT	M-20	20	⊕



FOUNDATION BOLTS
(SEE TABLE FOR SIZE & QTY.)

NOTES:-

1. FOUNDATION BOLTS AND ITS HARDWARES ARE WITH IN THE SCOPE OF B.H.E.L. JHANSI SUPPLY.
2. BLOCKS SHOWN ARE OF BASE STEEL PLATE FOR PIPE SUPPORTS, HEADER SUPPORT & RADIATOR SUPPORTS etc.
3. TOP OF ALL FOUNDATION AND RAIL LEVEL ARE AT PLINTH LEVEL (SEE DETAIL-A)
4. IN DRG. STEEL PAD SIZES HAVE BEEN SHOWN .CONCRETE SIZE SHALL BE DECIDED BY CONCERNED CIVIL ENGINEERING DEPT.

PROJECT: CAPTIVE POWER PLANT (CPP) PACKAGE
VISAKH REFINERY MODERNIZATION PROJECT (VRMP)
JOB NO. B016

OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC: ENGINEERS INDIA LIMITED (EIL), NEW DELHI

ADDITIONAL INFORMATION
W.O. 72110A17100
STATUS OF DRAWING
U
DISTRIBUTION OF PRINTS

TRE	PPC	BAY 1&2	BAY 3,4&5	BAY 6&7	BAY 8	BAY 9	LMM	Other
1	1					4		0

TYPE OF PRODUCT OR 80/100 MVA, 220/33 KV ONAN/ONAF COOLED POWER TRFR.
NAME OF CUSTOMER/PROJECT M/S:-HPCL VIZAG

BHARAT HEAVY ELECTRICALS LTD, JHANSI

	NAME	SIGN	DATE
DRN	PSR1		
CHD			
APPD			

NO. OF VAR

REV	DATE	ALTERED / CHECKED / APPROVED
00		ALTERED PSR1 / CHECKED / APPROVED

DEPT-TRE
CODE-406
UN. TOL. DIM. C/M/F
SCALE --
WEIGHT (KG)
REF. TO ASSY. NO.
ITEM NO
NO. OF ITEM

TITLE: FOUNDATION PLAN FOR TRFR.

DRAWING NO. 24580050497 REV. 00
SHT NO 1 NO OF SHT 1

SIGNATURE NOT REQUIRED AS IT IS SYSTEM GENERATED DRAWING SIZE A2

REF. DRG. NO.
SIGN AND DATE
INVENTORY NO.

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INVENTORY NO.	SIGN AND DATE	REF. DRG. NO.

400

DRG.No.14581950567

First Angle Projection

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
BHARAT HEAVY ELECTRICALS LIMITED JHANSI

स्टेशन परिणामित

भारतीय मानक 2026–1977 के अनुसार
TO INDIAN STANDARD 2026-1977

STATION TRANSFORMER

शीतन प्रकार / TYPE OF COOLING	ONAF	ONAN
विधारण उ.वो. मे.वो.ए. / RATING HV (M.V.A.)	100	80
विधारण वि.वो. मे.वो.ए. / RATING LV (M.V.A.)	100	80
शून्य भार वोल्टता उ.वो. कि.वो. / NO LOAD VOLTAGE H.V. (kV)	220	
नाममात्र वोल्टता वि.वो. कि.वो. / NOMINAL VOLTAGE LV	33	
लाइन धारा उ.वो. ऐ. / LINE CURRENT H.V. (AMPS.)	262.43	209.95
लाइन धारा वि.वो. ऐ. / LINE CURRENT LV (AMPS.)	1749.55	1399.64
ताप वृद्धि तेल (सें.) / TEMPERATURE RISE OIL (°C)	45	45
ताप वृद्धि कुंडलन (सें.) / TEMPERATURE RISE WINDING (°C)	50	50
ग्राहक / CUSTOMER	M/S: HPCL, VIZAG	

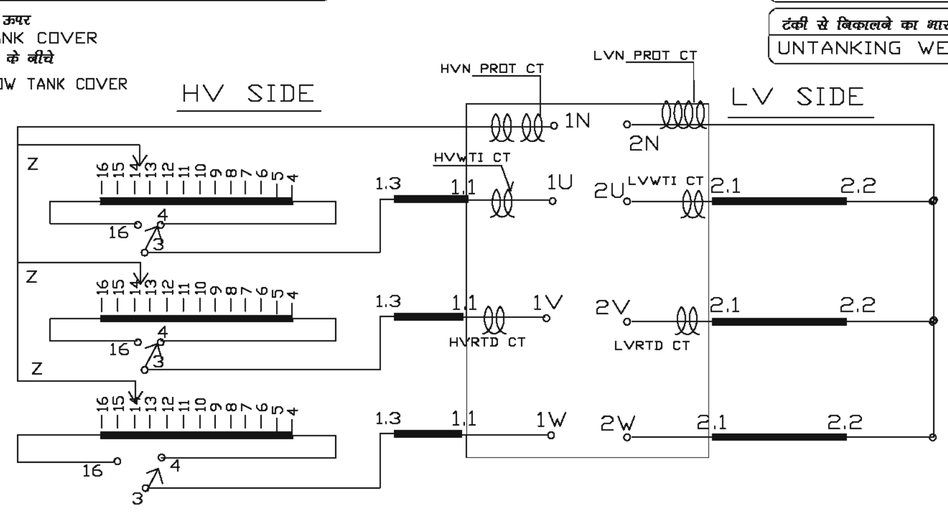
फेज / PHASE	3
आवृति हर्ट्ज / FREQUENCY (Hz)	50
संयोजन प्रतीक / CONNECTION SYMBOL	YNyn0
प्रतिबाधा % उ.वो–वि.वो / IMPEDANCE VOLT% HV-LV	12+10% TOL.
विर्माण ईकाई / MANUFACTURING UNIT	JHANSI

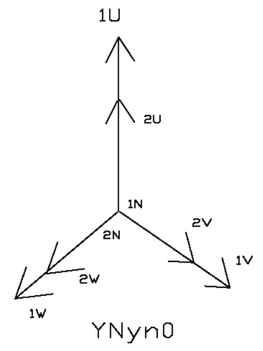
विद्युत रोधन स्तर
INSULATION LEVEL

उ.वो / H.V.	950 KVp.	395 KV rms
वि.वो. / LV	75 KVp.	28 KV rms
उ.वो.न्यूट्रल / H.V.NEUTRAL	95 KVp.	38 KV rms
वि वो न्यूट्रल / L.V.NEUTRAL	75 KVp.	28 KV rms

वैद्युत विनिर्देश संख्या / ELEC. SPEC. No.	627130
क्रमांक संख्या / S.NO.	2048400
विर्माण वर्ष / YEAR OF MANUFACTURE	2019
आरेख ड्राईंग संख्या / DIAGRAM DRAWING NO.	14581950567
प्ररुप ड्राईंग संख्या / O.G.A. DRAWING NO.	14580050341
कोड और कुंडलन कि.ग्रा. / CORE & WINDING (Kg)	67000 APPROX
तेल का भार कि.ग्रा. / WEIGHT OF OIL (Kg)	40000 APPROX
पूर्ण भार कि.ग्रा. / TOTAL WEIGHT (Kg)	137000 APPROX
तेल मात्रा लीटर / OIL QUANTITY (Litre)	45000 APPROX
परिवहन भार गैस भरा कि.ग्रा. / TRANSPORT WEIGHT GAS FILLED (Kg)	79000 APPROX
टंकी से निकालने का भार कि.ग्रा. / UNTANKING WEIGHT (Kg)	10000 APPROX

● टर्मिनल्स टंकी ढक्कन के ऊपर
TERMINALS ON TANK COVER
◎ उप टर्मिनल्स टंकी ढक्कन के नीचे
SUB TERMINALS BELOW TANK COVER





YNyn0
VECTOR GROUP

TAP VARIATION +12.5% TO −17.5% OF HV ON HV IN 24 EQUAL STEPS

TAP POSITION	LEAD JOINT	NO LOAD VOLTAGE KV	RATED CURRENT AMPS	NO LOAD VOLTAGE KV	RATED CURRENT AMPS	MEASURED %Z at 100MVA BASE
01MAX	(Z-16)(3-4)	247.50	233.27			
02	(Z-15)(3-4)	244.75	235.89			
03	(Z-14)(3-4)	242.00	238.57			
04	(Z-13)(3-4)	239.25	241.31			
05	(Z-12)(3-4)	236.50	244.12			
06	(Z-11)(3-4)	233.75	246.99			
07	(Z-10)(3-4)	231.00	249.93			
08	(Z-9)(3-4)	228.25	252.94			
09	(Z-8)(3-4)	225.50	256.03			
10	(Z-7)(3-4)	222.75	259.19			
11 NT	(Z-6)(3-4)	220.00	262.43	33.00	1749.54	
12	(Z-5)(3-4)	217.25	265.75			
13	(Z-4)(3-4) (Z-16)(3-16)	214.50	269.16			
14	(Z-15)(3-16)	211.75	272.65			
15	(Z-14)(3-16)	209.00	276.24			
16	(Z-13)(3-16)	206.25	279.92			
17	(Z-12)(3-16)	203.50	283.71			
18	(Z-11)(3-16)	200.75	287.59			
19	(Z-10)(3-16)	198.00	291.59			
20	(Z-9)(3-16)	195.25	295.69			
21	(Z-8)(3-16)	192.50	299.92			
22	(Z-7)(3-16)	189.75	304.26			
23	(Z-6)(3-16)	187.00	308.74			
24	(Z-5)(3-16)	184.25	313.35			
25MIN	(Z-4)(3-16)	181.50	318.09			

C.T.	RATIO	KNEE POINT VOLTAGE KPV	Iex @ VK/2	RESISTANCE	BURDEN	ACCURACY CLASS
LVN PROT CT-1	2000/1	>25Rct + 60V	<30	--	-	PS
LVN PROT CT-2	1000/1	---	--	--	15 VA	5P10
HVN PROT CT-1	300/1	>27Rct + 64V	<30	--	-	PS
HVN PROT CT-2	150/1	--	---	--	15VA	5P10

टिप्पणियाँ:– 1. ऊपर की सारणी में शून्य भार वोल्टता दिखलाई गई है । 2. परिणामित्र के आपेक्षित टर्मिनल स्थान लगभग यहाँ दिखाये अनुसार हैं ।
3. टंकी कोड और कुंडलन के साथ पूर्ण विवरण के लिए उपयुक्त है ।
4. कू.ता.सू.धारा परिणामित्र टर्मिनल पेटी के एवं कोड , एण्डफ्रेम एंव टंकी के बीच भू–सम्पर्क बनाने वाली श्रंखलाओं को ढक्कन हटाने से पहले अलग करें ।

NOTES:– 1) THE ABOVE TABLE GIVES VOLTAGE AT NO LOAD.
2) THE RELATIVE TERMINAL POSITIONS ON TRANSFORMER ARE APPROXIMATELY AS SHOWN
3) THE TANK IS SUITABLE FOR FULL VACUUM WITH CORE AND WINDING INSIDE .
4) CONNECTION OF CT,S TERMINAL BOARD & EARTHING CONNECTION BETWEEN CORE, END FRAME & TANK SHOULD BE REMOVED BEFORE LIFTING THE COVER.

भारत में निर्मित — MADE IN INDIA

NOTE TO SHOP:–
1. ENGRAVE MAKER'S SERIAL NO.,YEAR OF MANUFACTURE
2. % IMPEDANCE VOLTAGE ON EACH PLATE AFTER JOB IS TESTED.
2. ENGRAVED LETTERS TO BE FILLED WITH BLACK PAINT.

NOTES TO DIAGRAM PLATE MANUFACTURER
1. CONSULT ENGINEERS BEFORE ENGRAVING WEIGHTS AND OIL QUANTITIES.
2. RATING PARTICULARS TO BE ENGRAVED OR MACHINE STAMPED AND FILLED IN BLACK HAND STAMPING NOT PERMITTED.

2.LETTERING:–
I.LETTER HEIGHT FOR VARIOUS HEADINGS SHALL BE AS PER TABLE – 1.
II.BILINGUAL COMPANY'S MONOGRAM TO BE AS PER STANDARD AA 0401121 OF SIZE 60MM.

3.FINISH:–
I.PLATES ARE TO BE MANUFACTURED BY ETCHING PROCESS.
II.ALL LETTERS,DIVIDING LINES,BORDER LINES & FIGURES ETC. TO BE BLACK .
III.BACK GROUND TO BE SATIN SILVER.
4.THE SETTING OF THE DIAGRAM PLATE SHOULD BE DONE AS NEAR AS POSSIBLE TO DRAWING .
5.DRILLING IS TO BE DONE IN PLATE BEFORE ENGRAVING OR ANODISING .
6. DRAWING NO.14581950567 REV.00 W.DNO.72110A17100 TO BE PAINTED ON THE BACK OF THE PLATE .

7.PACKING:–
RATING & DIAGRAM PLATE TO BE SUITABLY PACKED IN POLYTHENE COVERS (500 MICRONS THICKNESS) TO AVOID DAMAGE DURING TRANSIT / STORING.

8.MATERIAL:–
FOR STAINLESS STEEL 16TK-SIZE AND DRILLING OF PLATE SEE DRAWING NO. 4499190010.

9.NOTES TO CUSTOMER :–
I – THE RATING & DIAGRAM PLATE IS MADE OF ANODISED STAINLESS STEEL.
II – SEE NOTE TO SHOP ALSO.
III– WEIGHTS AND OIL QUANTITIES ARE APPROXIMATE AND FINAL VALUES SHALL BE FURNISHED AFTER FINALISATION OF DESIGN.

TABLE – 1

SIZE OF THE RATING PLATE HEADING	LETTER SIZE ENGLISH
BHARAT HEAVY ELECTRICALS LIMITED JHANSI	8
MADE IN INDIA	6
NAME OF EQUIPMENT	6
RATING PARTICULARS NOMENCLATURES	4
NOTES	3

ZONE	REV	DATE	ALTERED / CHECKED / APPROVED
	00		

ADDITIONAL INFORMATION
W.O. 72110A17100
STATUS OF DRAWING
U
DISTRIBUTION OF PRINTS

TYE	PPC	INV 1&2	INV 3,4&5	INV 6&7	INV 8	INV 9	UNM	DISPATCH
1	2					4		0

TYPE OF PRODUCT OR 80/100 MVA, 220/33 KV ONAN/ONAF COOLED POWER TRFR.
NAME OF CUSTOMER/PROJECT M/S:-HPCL VIZAG

BHARAT HEAVY ELECTRICALS LTD. JHANSI

	NAME	SIGN	DATE
DRN	PSR1		
CHD			
APPD			

DEPT-TRE UNIT-C/M/F CODE-406
SCALE
WEIGHT (KGS) 1 458 00
REF. TO ASSY. NO. 50 341
ITEM NO.
NO. OF ITEM
NO. OF VAR
DRAWING NO. 14581950567
REV. 00
SHT NO 1
NO OF SHT 1

TITLE
RATING & DIAGRAM PLATE

PROJECT: CAPTIVE POWER PLANT (CPP) PACKAGE
VISAKH REFINERY MODERNIZATION PROJECT (VRMP)
JOB NO. B016

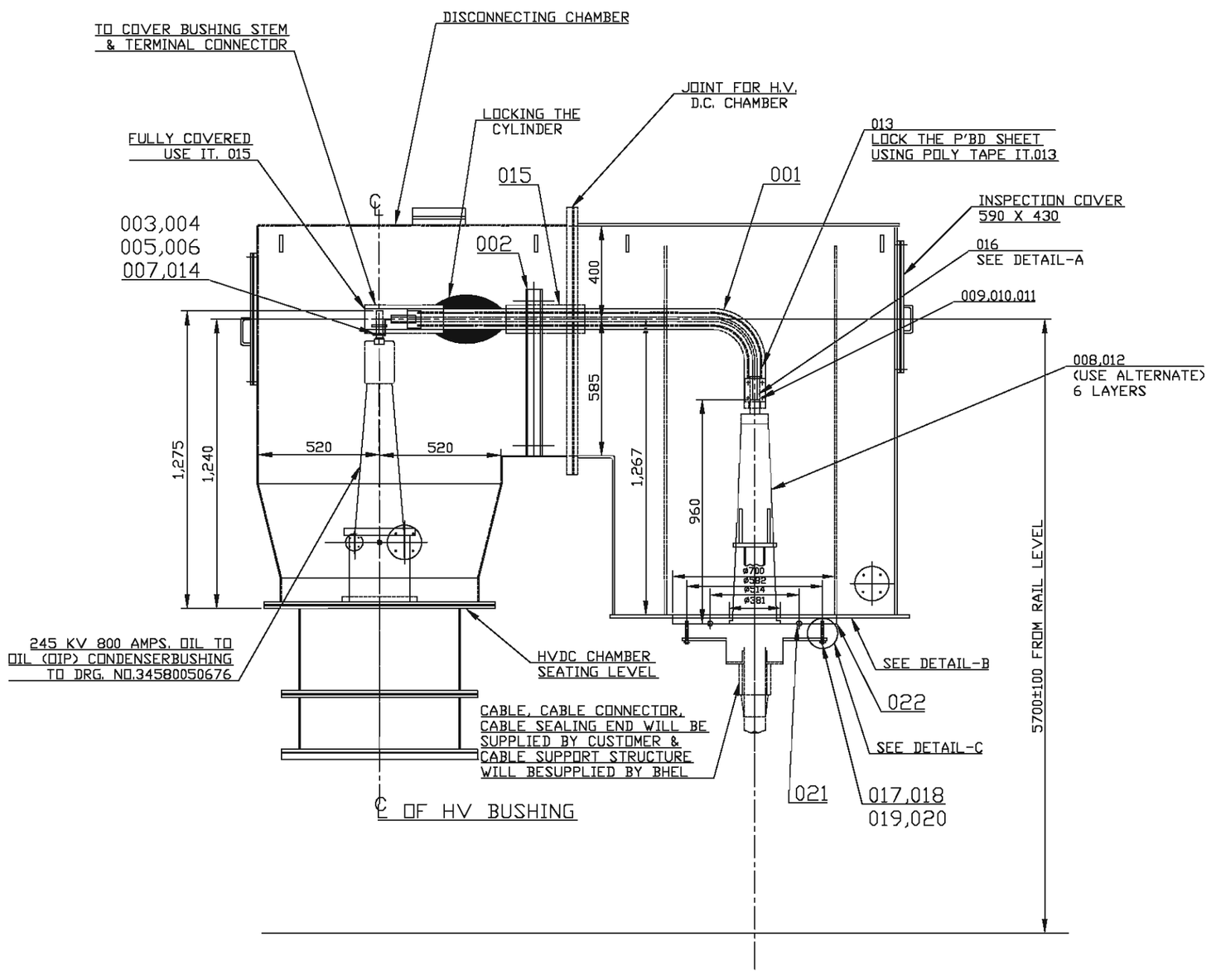
OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED
PMC: ENGINEERS INDIA LIMITED (EIL), NEW DELHI

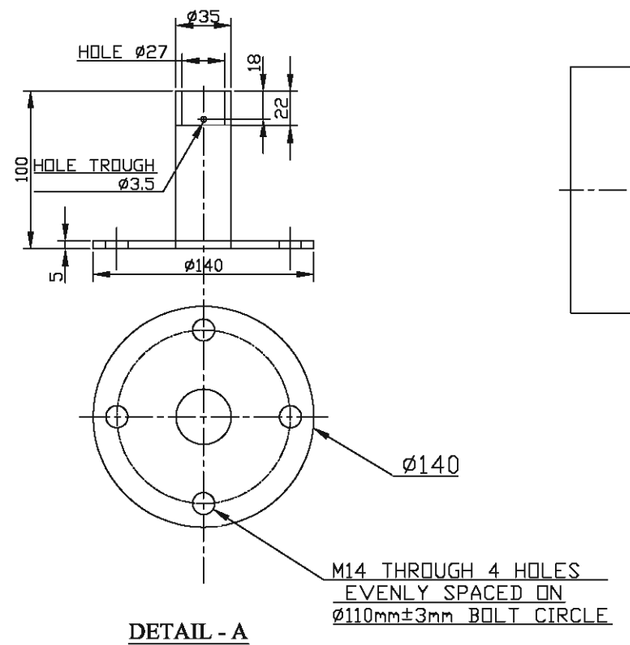
SIGNATURE NOT REQUIRED AS IT IS SYSTEM GENERATED DRAWING
SIZE A1

All dimensions in 'mm'

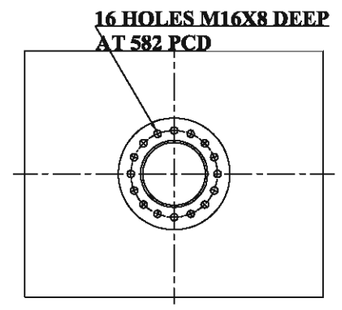
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

First Angle Projection
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
All dimensions in 'mm'
DRG.No. 24580050498



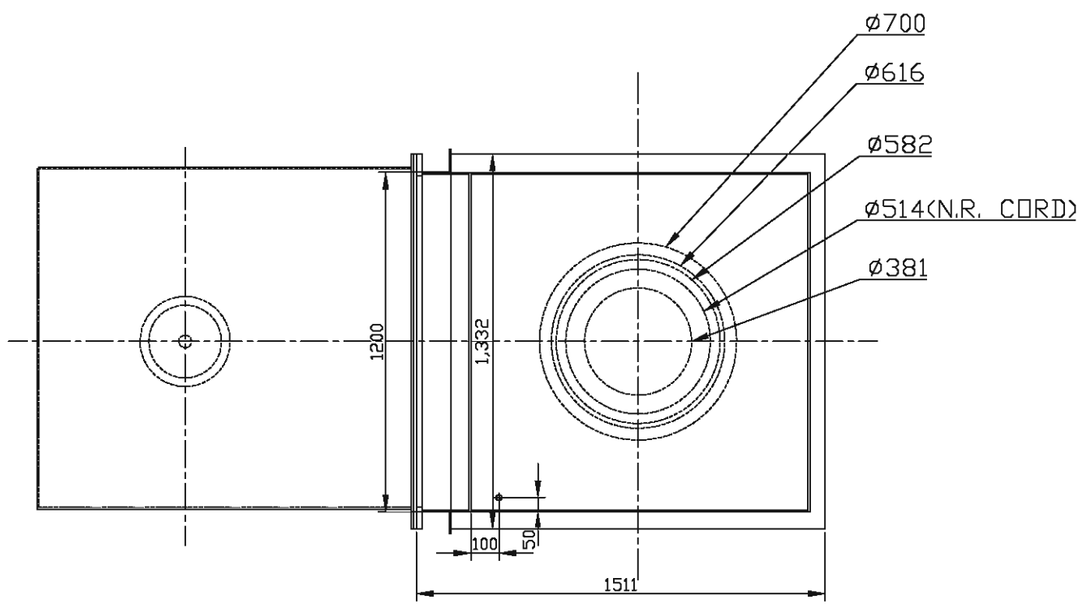


DETAIL - A

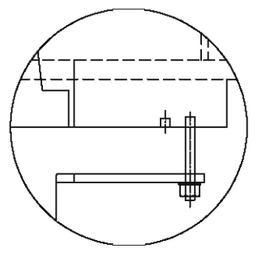


DETAIL - B

TABLE OF FITTING		
SL.NO.	DESCRIPTION	QTY.
001	LEAD ASSEMBLY	01
002	LEAD SUPPORT ASSEMBLY	01
003	BUSHING CONNECTOR	01
004	BOLT HEX M8 X 115 LG.	04
005	WASHER MCD. M8	04
006	WASHER SPRING M8	04
007	NUT HEX M8	04
008	PRESSBOARD SHEET	01
009	WASHER SPRING M12	04
010	SCREW M12 X 20	04
011	MCB WASHER M12	04
012	CORRUGATED P'BD SHEET	01
013	POLYSTER TAPE	01
014	SCREENING CAP	08
015	PRESS PAPER	01
016	CONNECTOR	01
017	STUD M16 X 125	16
018	SPRING WASHER M16	16
019	MCD WASHER M16	16
020	NUT M16	16
021	NITRILE RUBBER CORP 8ø	01
022	BUSHING MTG. FLANGE	01



CABLE BOX



DETAIL - C

NOTE:-

1. OIL QUANTITY IN EACH CABLE BOX = 3000 LITERS. APPROX. INCLUDING DISCONNECTING CHAMBER
2. CABLES, CABLE LUGS , CABLE GLANDS & CABLE TERMINATION KIT ARE NOT IN SCOPE OF B.H.E.L. JHANSI SUPPLY.
3. GASKET ARE PROVIDED TO PREVENT IN GRESS ON DUST AND MOISTURE AT ALL INSPECTION COVERS

PROJECT: CAPTIVE POWER PLANT (CPP) PACKAGE
VISAKH REFINERY MODERNIZATION PROJECT (VRMP)
JOB NO. B016

OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC: ENGINEERS INDIA LIMITED (EIL), NEW DELHI

ADDITIONAL INFORMATION
W.O. 72110A17100
STATUS OF DRAWING
U
DISTRIBUTION OF PRINTS

TRE	PPC	BAY 1&2	BAY 3,4&5	BAY 6&7	BAY 8	BAY 9	LMM	Other
1	2					4		0

TYPE OF PRODUCT OR 80/100 MVA, 220/33 KV ONAN/ONAF COOLED POWER TRFR.
NAME OF CUSTOMER/PROJECT M/S:-HPCL VIZAG

BHARAT HEAVY ELECTRICALS LTD. JHANSI

	NAME	SIGN	DATE	NO. OF VAR
DRN	PSR1			
CHD				
APPD				

REV	DATE	ALTERED	REV	DATE	ALTERED	REV	DATE	ALTERED	REV	DATE	ALTERED	REV	DATE	ALTERED PSR1
		CHECKED			CHECKED			CHECKED			CHECKED	00		CHECKED
		APPROVED			APPROVED			APPROVED			APPROVED			APPROVED
ZONE			ZONE			ZONE			ZONE			ZONE		

DEPT-TRE	UN. TOL. DIM. C/M/F	SCALE	WEIGHT (KG)	REF. TO ASSY. NO.	ITEM NO	NO. OF ITEM
CODE-406				1458 00 50 341		

TITLE: HV CABLE BOX ASSY.

DRAWING NO. 24580050498 REV. 00
SHT NO 01 NO OF SHT 02

SIGNATURE NOT REQUIRED AS IT IS SYSTEM GENERATED DRAWING SIZE A2

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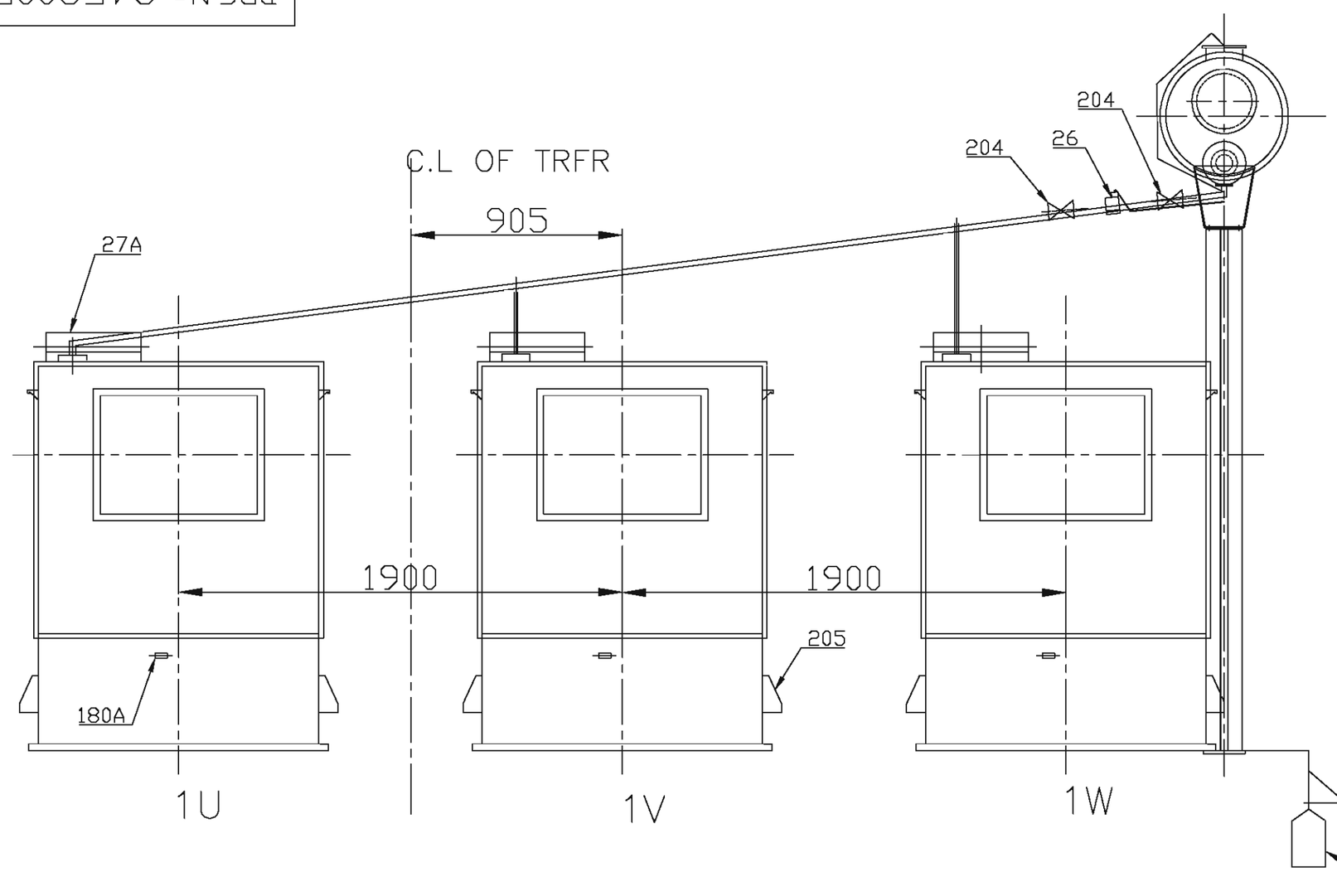
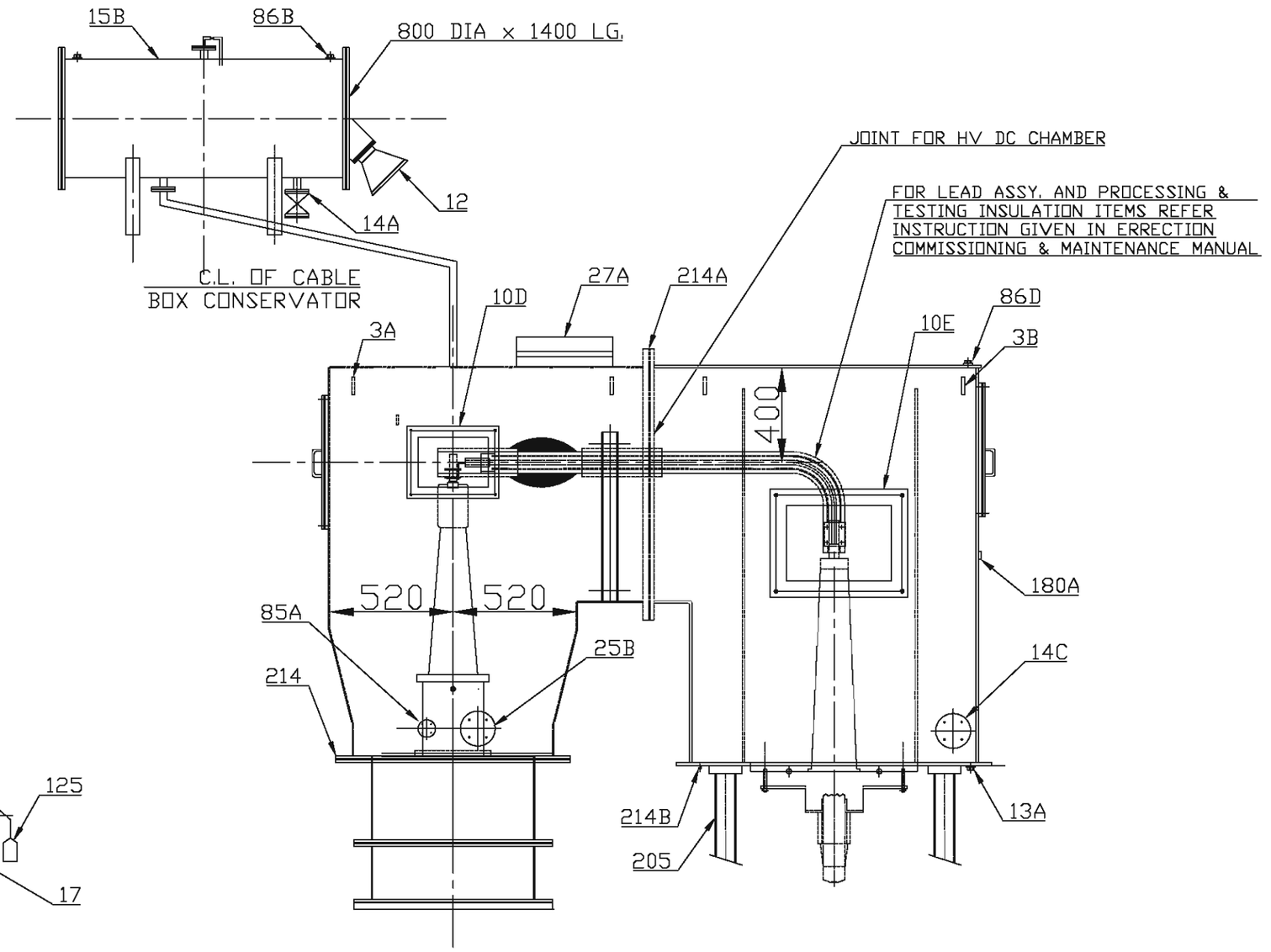
First Angle Projection
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
All dimensions in 'mm'
DRG.No. 24580050498





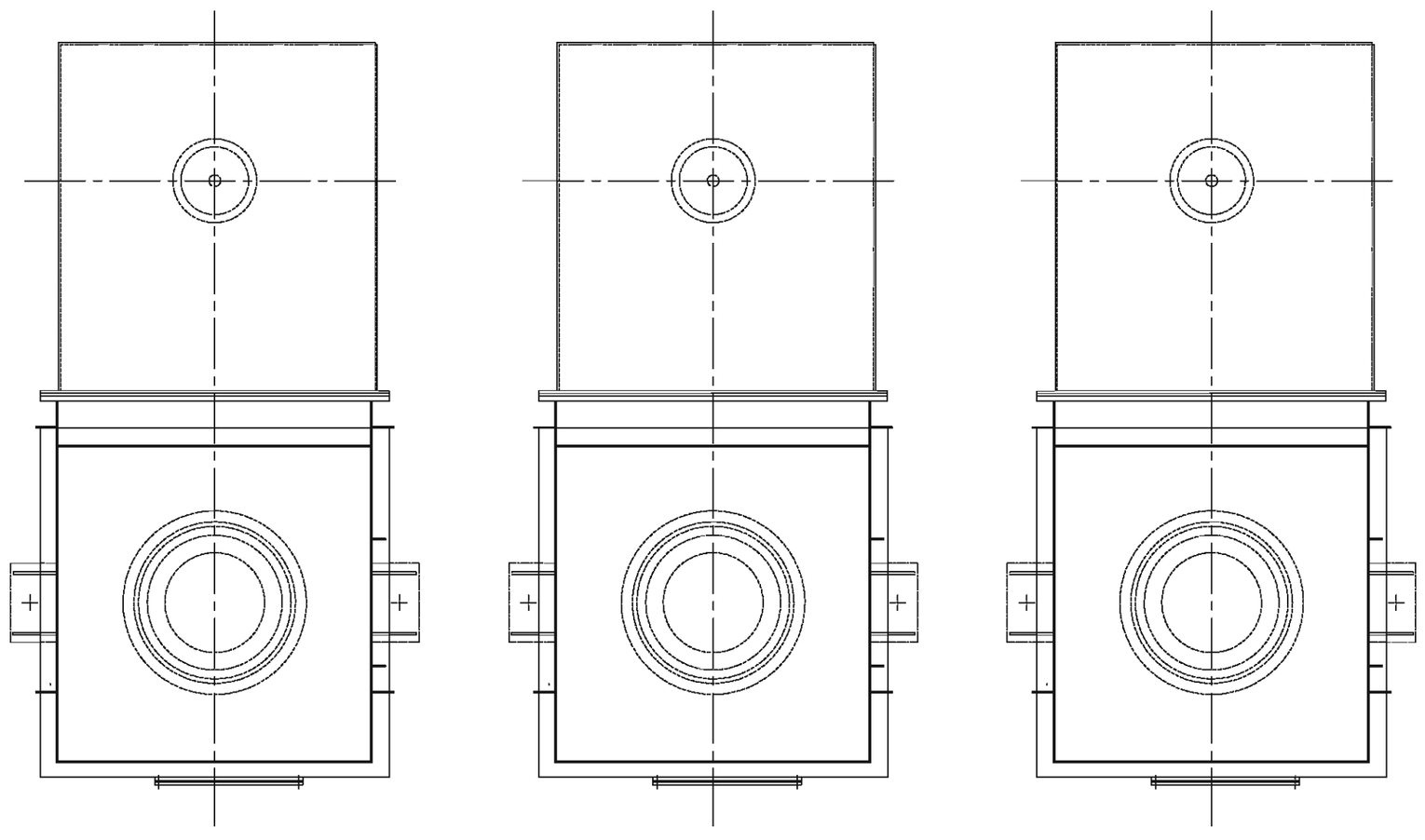


TABLE OF FITTING		
IT.NO.	DESCRIPTION	QTY.
3A	LIFTING LUG ON HV DISCONNECTIONG CHAMBER	12
3B	LIFTING LUG ON HV CABLE BOX	12
10D	INSPECTION COVER ON HV DISC CHAMBER	09
10E	INSPECTION COVER ON HV CABLE BOX.	09
12	MAGNETIC OIL GAUGE	01
13A	3/4" BSP DRAIN PLUG ON HV CABLE BOX	03
14A	DRAIN GATE VALVE (15 NB) ON CABLE BOX CONSERVATOR	01
15B	AUX. CONSERVATOR ø800 X 1400 LG.	01
17	BREATHER FOR OIL SEALING CHAMBER	01
14C	FILTER GATE VALVE 50 NB ON DISCONNECTING CHAMBER AND CABLE BOX	06
26	BUCHHOLZ RELAY (50 NB)	01
27A	PRESSURE RELEAVE VALVE	03
85A	SAMPLING VALVE (15 NB)	03
86D	AIR RELEASE PLUG 1/2" BSP	06
125	GAS COLLECTING DEVICE	01
204	ISOLATING GATE VALVE (50 NB)	02
180A	POLARITY DISC 1U, 1V, 1W	03
205	SUPPORT FOR HV CABLE BOX	04
214	EARTHING CONNECTION FOR H.V. TURRET	06
214A	EARTHING CONNECTION FOR H.V. DC CHAMBER	06
214B	EARTHING BOSS M12 FOR HV CABLE BOX.	03

CABLE BOX ARRGT.

PROJECT:	CAPTIVE POWER PLANT (CPP) PACKAGE VISAKH REFINERY MODERNIZATION PROJECT (VRMP) JOB NO. B016
OWNER:	HINDUSTAN PETROLEUM CORPORATION LIMITED
PMC:	ENGINEERS INDIA LIMITED (EIL), NEW DELHI

ADDITIONAL INFORMATION
W.O. 72110A17100
STATUS OF DRAWING
U
DISTRIBUTION OF PRINTS

TRE	PPC	BAY 1&2	BAY 3,4&5	BAY 6&7	BAY 8	BAY 9	LMM	Other
1	2					4		0

TYPE OF PRODUCT OR 80/100 MVA, 220/33 KV ONAN/ONAF COOLED POWER TRFR.
NAME OF CUSTOMER/PROJECT M/S:-HPCL VIZAG

BHARAT HEAVY ELECTRICALS LTD, JHANSI

	NAME	SIGN	DATE	
DRN	PSR1			NO. OF VAR
CHD				
APPD				

REV	DATE	ALTERED
		CHECKED
		APPROVED
00		ALTERED PSR1
		CHECKED
		APPROVED

DEPT-TRE	UN. TOL. DIM. C/M/F	SCALE	WEIGHT (KG)	REF. TO ASSY. NO.	ITEM NO	NO. OF ITEM
CODE-406				1458 00 50 341		

TITLE
HV CABLE BOX ASSY.

DRAWING NO. 24580050498 REV. 00
SHT NO 02 NO OF SHT 02

SIGNATURE NOT REQUIRED AS IT IS SYSTEM GENERATED DRAWING SIZE A2

REF. DRG. NO.
SIGN AND DATE
INVENTORY NO.

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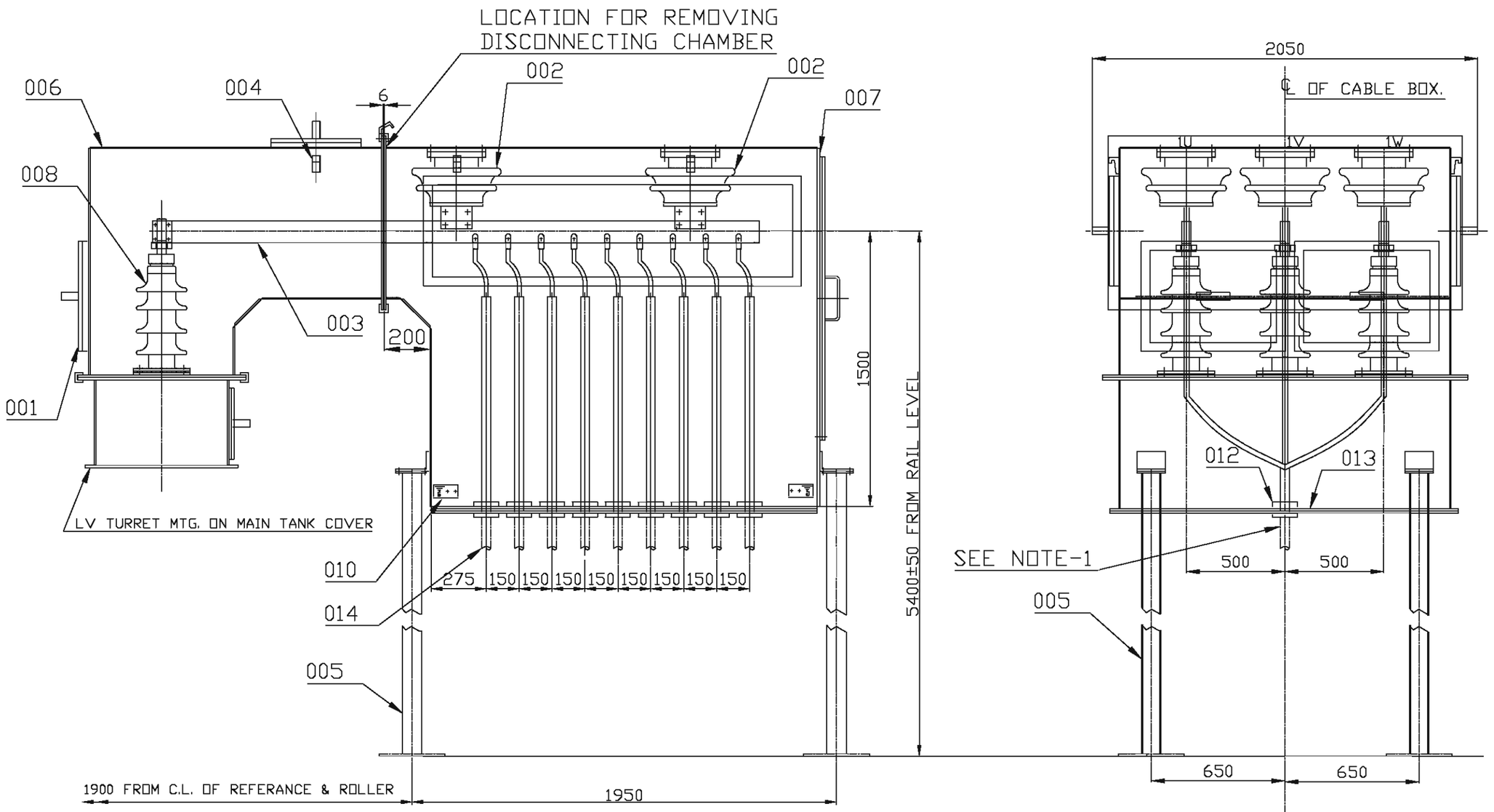
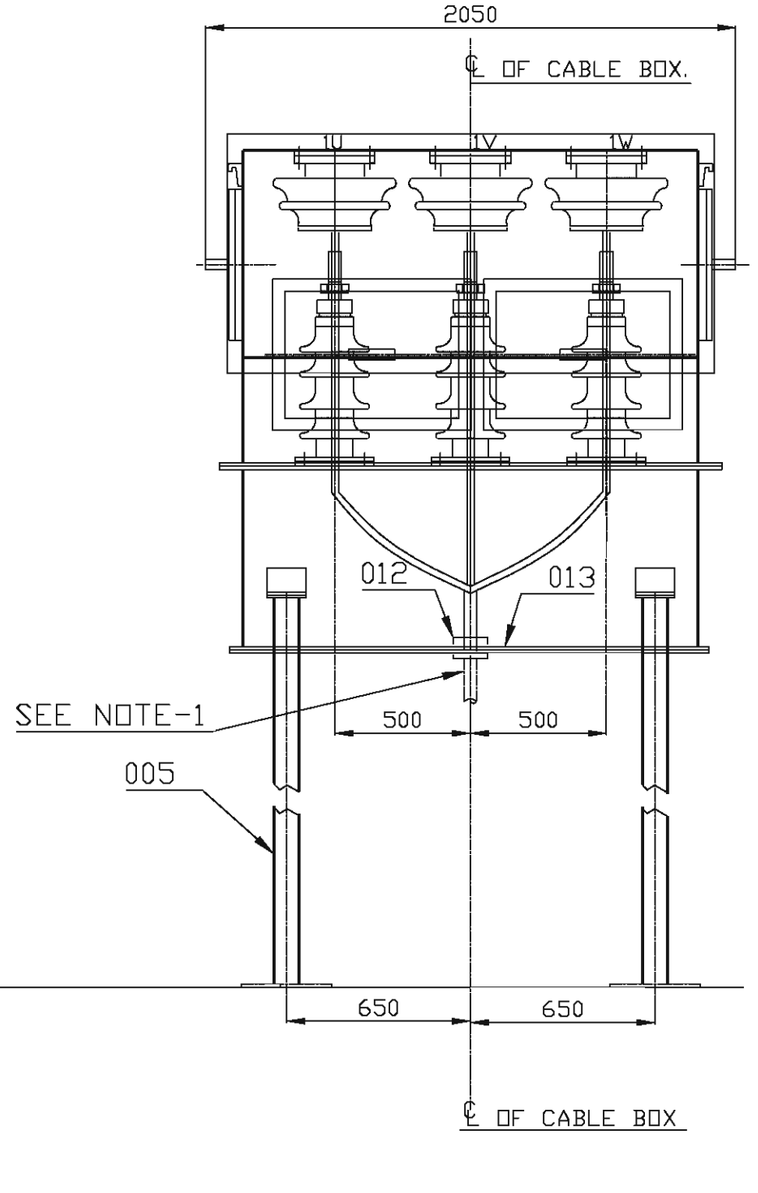
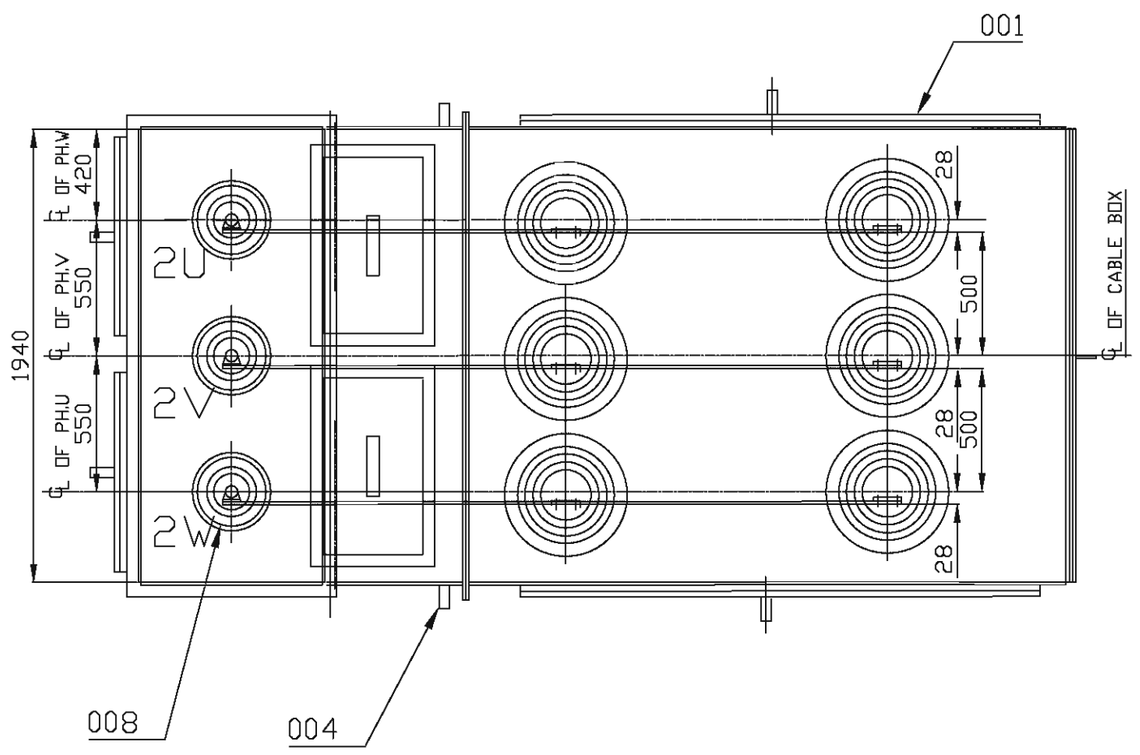
First Angle Projection
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
All dimensions in 'mm'
DRG.No. 24580050499







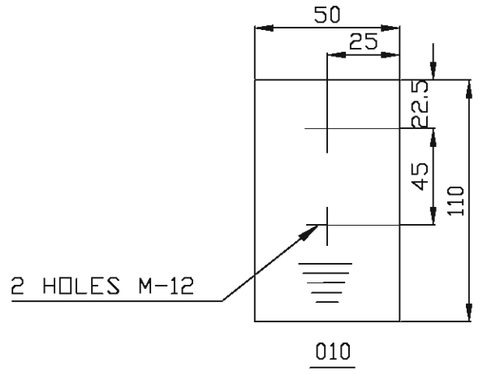


	TABLE OF FITTINGS		
	IT.NO.	DESCRIPTION	QTY.NOs.
	001	INSPECTION COVER	06
	002	POST INSULATOR 33 KV.	03+03
	003	COPPER CONNECTOR (SIZE - 12 TK X 150)	03
	004	LIFTING LUG	02+02
	005	CABLE BOX SUPPORT - 50 NB PIPE	04
	006	DISCONNECTING CHAMBER	01
	007	CABLE BOX SHELL	01
	008	BUSHING 36 KV.3150 AMPS.	03
	009	EARTHING STRIP	04
	010	EARTING TERMINAL	02
*	011	CRIMPING TERMINAL CABLE LUG	27
*	012	CABLE GLAND,	09
	013	UNDRILLED DETACHABLE GLAND PLATE -12TK. (NON-MAGNETIC MATERIAL)	01
*	014	1XC CORE 630 SQ. MM. CABLE	15

ELECTRICAL CLEARANCE IN AIR	
DESCRIPTION	MIN CLEARANCE IN MM
PHASE TO PHASE	351 MIN
PHASE TO EARTH	320 MIN

NOTES:-

* 1. CABLES, CABLE LUGS & CABLE GLANDS ARE NOT IN SCOPE OF B.H.E.L. JHANSI SUPPLY.
2. GASKET ARE PROVIDED TO PREVENT IN GRESS ON DUST AND MOISTURE AT ALL INSPECTION COVERS
3. IN ITEM 013 HOLE TO BE DONE AT SITE TO SUIT CABLE ENTRY.

REV	DATE	ALTERED / CHECKED / APPROVED	ZONE
		ALTERED / CHECKED / APPROVED	
		ALTERED / CHECKED / APPROVED	
		ALTERED / CHECKED / APPROVED	
00		ALTERED PSR1 / CHECKED / APPROVED	

ADDITIONAL INFORMATION
W.O. 72110A17100
STATUS OF DRAWING
U
DISTRIBUTION OF PRINTS

TRE	PPC	BAY 1&2	BAY 3,4&5	BAY 6&7	BAY 8	BAY 9	LMM	Other
1	2					4		0

TYPE OF PRODUCT OR 80/100 MVA, 220/33 KV ONAN/ONAF COOLED POWER TRFR.
NAME OF CUSTOMER/PROJECT M/S:-HPCL VIZAG

BHARAT HEAVY ELECTRICALS LTD. JHANSI

	NAME	SIGN	DATE	NO. OF VAR
DRN	PSR1			
CHD				
APPD				

DEPT-TRE / CODE-406 | UN. TOL. DIM. C/M/F | SCALE | WEIGHT [KG] | REF. TO ASSY. NO. 1 458 00 50 341 | ITEM NO | NO. OF ITEM

TITLE
GENERAL ARRGT. OF 36KV,3150AMP., AIR INSULATED L.V. CABLE BOX

DRAWING NO. 24580050499 | REV. 00
SHT NO 1 | NO OF SHT 1

PROJECT: CAPTIVE POWER PLANT (CPP) PACKAGE
VISAKH REFINERY MODERNIZATION PROJECT (VRMP)
JOB NO. B016
OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED
PMC: ENGINEERS INDIA LIMITED (EIL), NEW DELHI

REF. DRG. NO.
SIGN AND DATE
INVENTORY NO.
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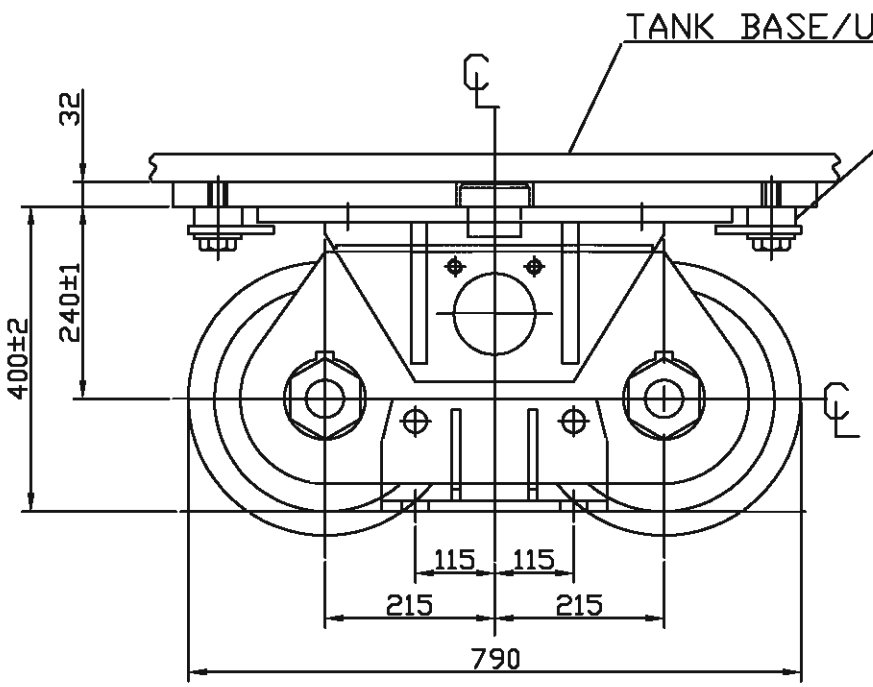
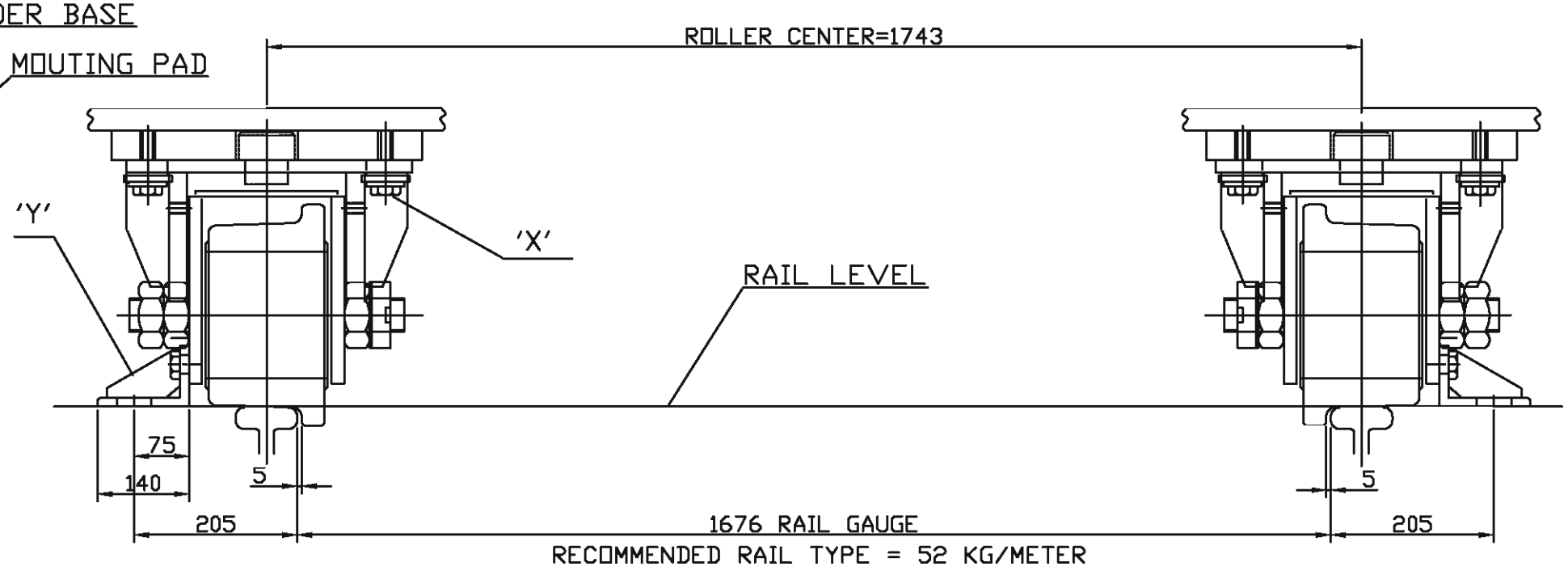
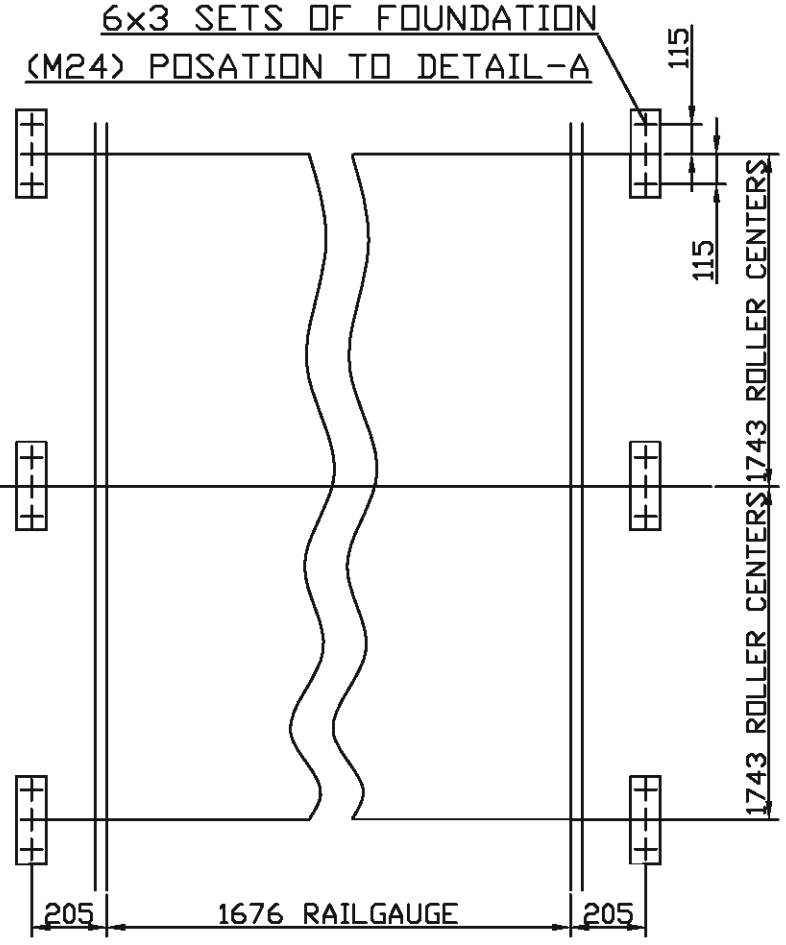
First Angle Projection
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
All dimensions in 'mm'

DRG.No. 34580050974

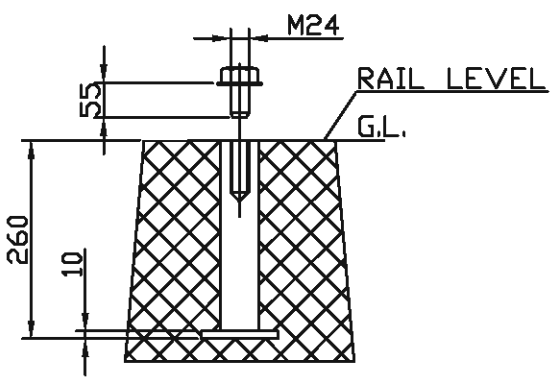




RECOMMENDED RAIL TYPE = 52 KG/METER



FOUNDATION PLAN



DETAIL - A
DETAIL OF FOUNDATION BOLT

NOTES:-

1. MAXIMUM LOAD CARRYING CAPACITY OF SINGLE ROLLER =50 TONNES
2. CHANGE THE DIRECTION OF ROLLER IN THE FOLLOWING SEQUENCE.
2.1. UNSCREW THE ITEM MARKED 'X' ALSO REMOVE THE BRACKET ITEM MARKED 'Y'.
2.2. JACK THE TRANSFORMER ON JACKING LUGS AND LIFT THE TRANSFORMER BY 30 MM MINIMUM FROM R.L.
2.3. CHANGE THE DIRECTION OF THE ROLLERS.
2.4. BRING DOWN THE TRANSFORMER & PLACE ITEM MARKED 'X' IN POSITION.
3. GREESE NIPPLES OF ROLLERS TO BE FULL OF GREESE BEFORE USE.

PROJECT: CAPTIVE POWER PLANT (CPP) PACKAGE
VISAKH REFINERY MODERNIZATION PROJECT (VRMP)
JOB NO. B016

OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC: ENGINEERS INDIA LIMITED (EIL), NEW DELHI

ADDITIONAL INFORMATION
W.O. 72110A17100
STATUS OF DRAWING
U
DISTRIBUTION OF PRINTS

TRE	PPC	BAY 1&2	BAY 3,4&5	BAY 6&7	BAY 8	BAY 9	LMM	Other
1	2					4		0

TYPE OF PRODUCT OR 80/100 MVA, 220/33 KV ONAN/ONAF COOLED POWER TRFR.
NAME OF CUSTOMER/PROJECT M/S:-HPCL VIZAG

BHARAT HEAVY ELECTRICALS LTD. JHANSI

	NAME	SIGN	DATE
DRN	PSR1		
CHD			
APPD			

NO. OF VAR

REV	DATE	ALTERED
		CHECKED
		APPROVED
ZONE		

REV	DATE	ALTERED
		CHECKED
		APPROVED
ZONE		

REV	DATE	ALTERED
00		PSR1
		CHECKED
		APPROVED
ZONE		

DEPT-TRE	UN. TOL. DIM. C/M/F	SCALE	WEIGHT [KG]	REF. TO ASSY. NO.	ITEM NO	NO. OF ITEM
CODE-406				1 458 00 50 341		

TITLE
Ø320 TWIN BI - DIRECTIONAL ROLLER

DRAWING NO. 34580050974 REV. 00

SHT NO 1 NO OF SHT 1

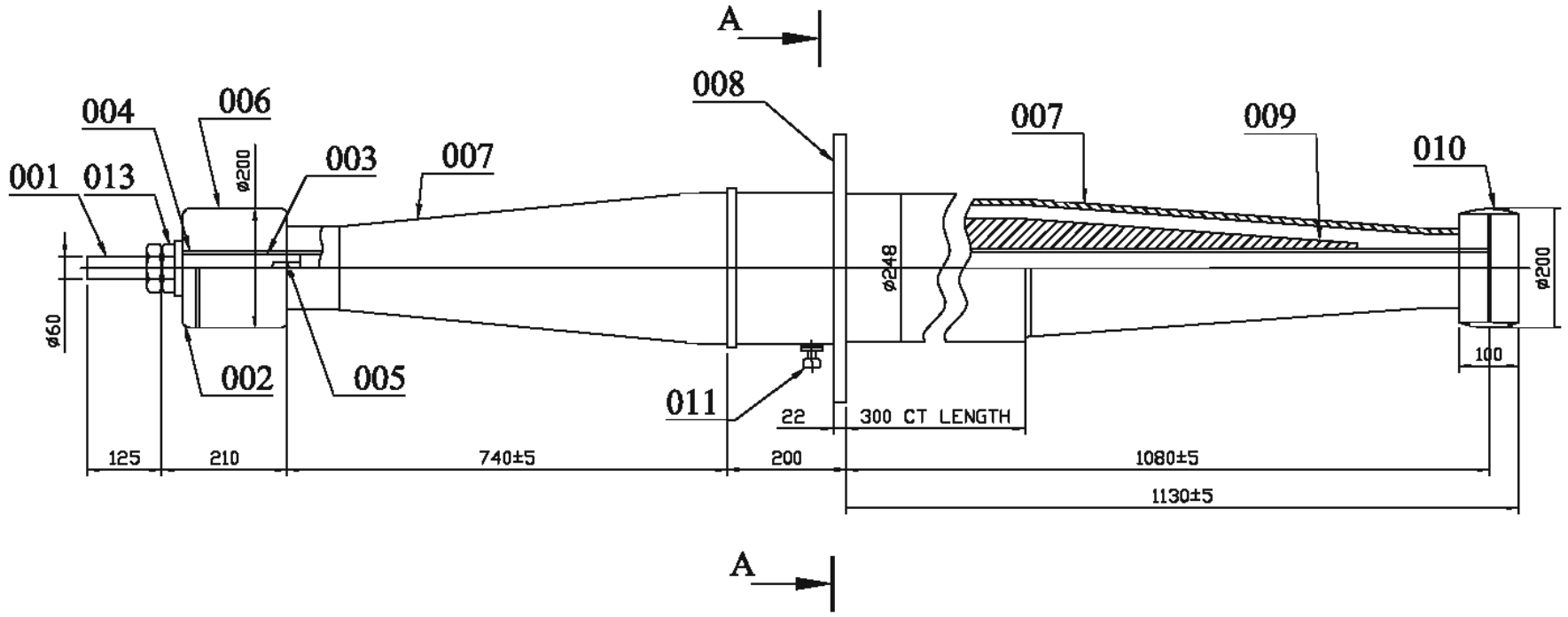
SIGNATURE NOT REQUIRED AS IT IS SYSTEM GENERATED DRAWING SIZE A3

REF. DRG. NO.
SIGN AND DATE
INVENTORY NO.

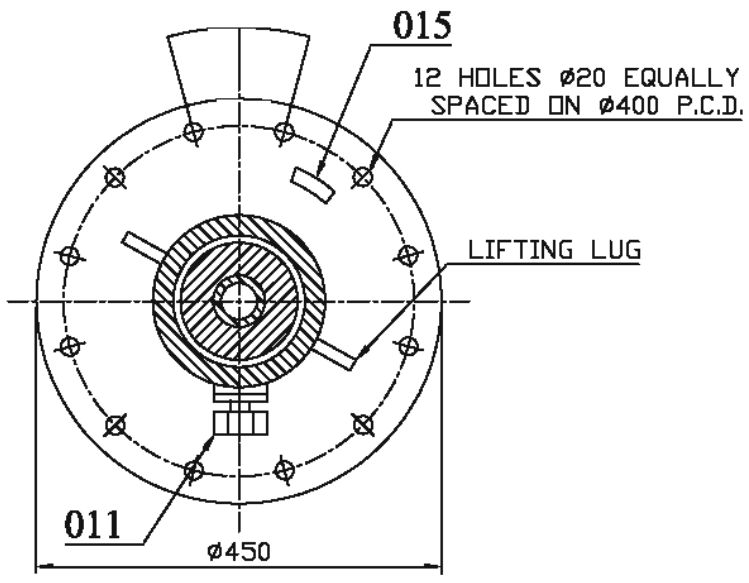
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

First Angle Projection
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
All dimensions in 'mm'

DRG.No. 34580050972



ITEM	DESCRIPTION	
001	TOP TERMINAL	BRASS
002	TOP CAP COVER	AL
003	SEAL	RUBBER
004	SEAL	RUBBER
005	CABLE THIMBLE	BRASS
006	TOP CAP	AL
007	PORCELAIN	–
008	MOUNTING FLANGE	AL
009	CONDENSER BUSHING	–
010	STRESS SHIELD	AL
011	TEST TAP FOR TAN DELTA AND CAPACITANCE TEST	ST
012	OIL FILLING PLUGE	BRASS
013	NUT	BRASS



SECTION-AA

MAKE : BHEL
QUANTITY : 3 NOS. / TRFR.

CANTILEVER WITHSTAND LOAD : AS PER LEVEL –II

TECHNICAL DETAILS

RATED VOLTAGE	245 KV
RATED CURRENT	1250 AMPS.
PHASE TO GROUND VOLTAGE	142 KV
1MIN P.F. VOLTAGE WITHSTAND	460 KV
LIGHTNING IMPULSE 1.2/50 μ SEC. FULL WAVE	1050 KVP
RATED FREQUENCY	50 HZ
STANDARD APPLICABLE	IS:2099/IEC60137
APPROX OIL QTY	9.0 LITRES
TYPE:-OUTDOOR OIL IMMERSED BUSHING APPROX.WEIGHT	133 Kg.

PROJECT: CAPTIVE POWER PLANT (CPP) PACKAGE
VISAKH REFINERY MODERNIZATION PROJECT (VRMP)
JOB NO. B016

OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC: ENGINEERS INDIA LIMITED (EIL), NEW DELHI

ADDITIONAL INFORMATION
W.O. 72110A17100

STATUS OF DRAWING
U

DISTRIBUTION OF PRINTS

TRE	PPC	BAY 1&2	BAY 3,4&5	BAY 6&7	BAY 8	BAY 9	LMM	Other
1	2					4		0

TYPE OF PRODUCT OR 80/100 MVA, 220/33 KV ONAN/ONAF COOLED POWER TRFR.

NAME OF CUSTOMER/PROJECT M/S:-HPCL VIZAG

BHARAT HEAVY ELECTRICALS LTD. JHANSI

	NAME	SIGN	DATE	NO. OF VAR
DRN	PSR1			
CHD				
APPD				

REV	DATE	ALTERED / CHECKED / APPROVED
00		ALTERED PSR1 / CHECKED / APPROVED

DEPT-TRE | CODE-406 | UN. TOL., DIM. C/M/F | SCALE | WEIGHT (KG)

REF. TO ASSY. NO. 1 458 00 50 341 | ITEM NO | NO. OF ITEM

TITLE: 245 KV 1250 AMPS OIL TO OIL HV BUSHING ASSY.

DRAWING NO. 34580050972 | REV. 00

SHT NO 1 | NO OF SHT 1

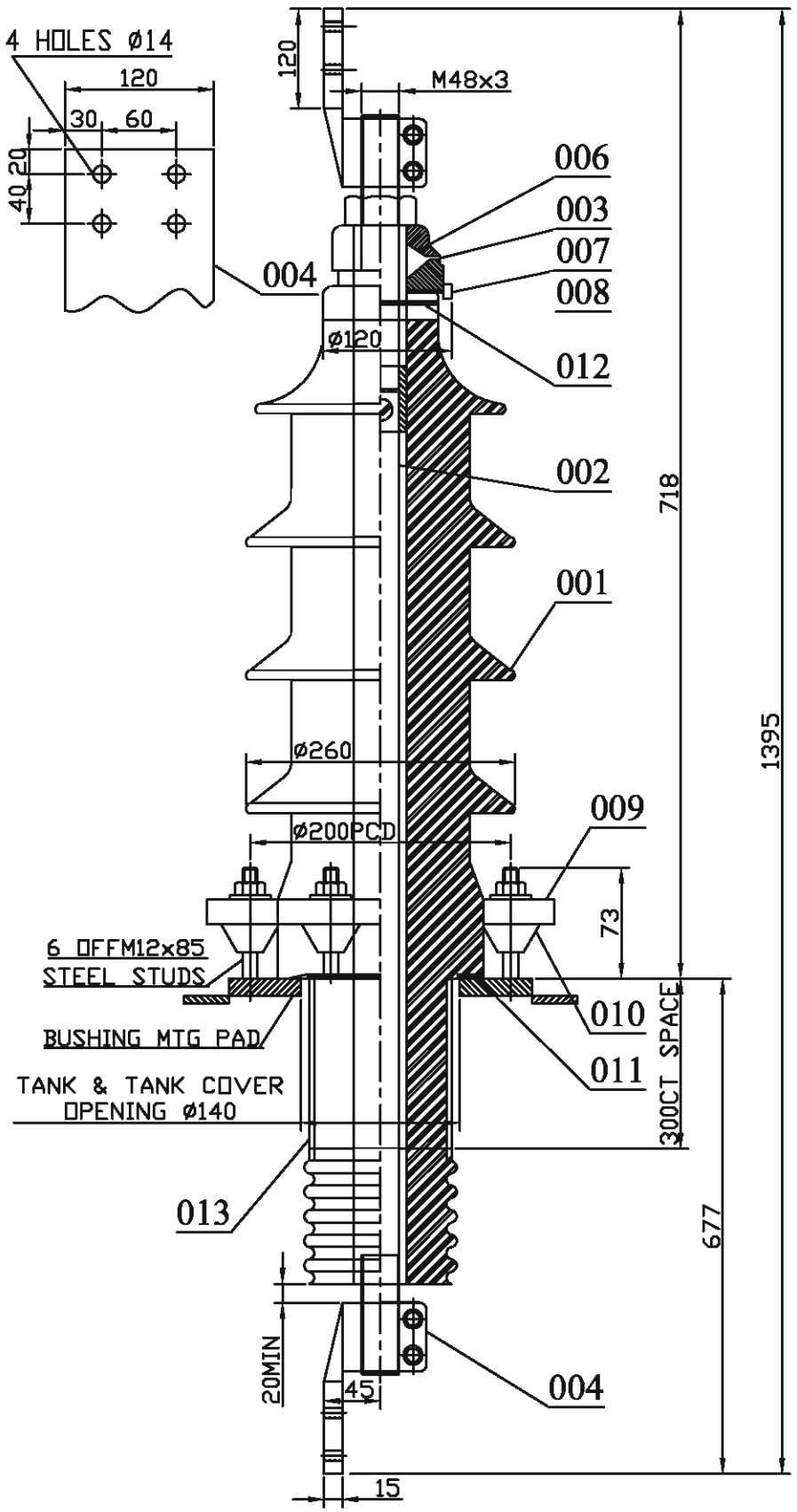
SIGNATURE NOT REQUIRED AS IT IS SYSTEM GENERATED DRAWING SIZE A3

REF. DRG. NO. | SIGN AND DATE | INVENTORY NO.

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

First Angle Projection
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
All dimensions in 'mm'

DRG.No. 34580050973



ELECTRICAL CHARACTERISTICS	
RATED VOLTAGE	36 KV
RATED CURRENT	3150 AMP
TOTAL CREEPAGE	900 mm.
ONE MINUTE DRY 50Hz WITH STSND	70 KV rms
ONE MINUTE WET 50Hz WITH STSND	70 KV rms
1.2/50 μSEC. IMPULSE WITH STAND	170 KVP

NO.	DESCRIPTION	MAT.
001	PORCELAIN INSULATOR	PORCELAIN
002	STEM	COPPER
003	CAP	BRASS
004	CONNECTING LUG	BRASS
005		
006	SEALING WASHER	NITRILE RUBBER
007	VENT PLUG	BRASS
008	GASKET RING	TEFLON
009	CLAMPING RING	AL.
010	CLAMPING MEMBER	AL. ALLOY
011	SEALING WASHER	SRBC
012	SEALING WASHER	SRBC
013	EARTHING SHIELD	COPPER

MAKE : BHEL MAKE
QUANTITY : 3 NOS. / TRFR.
CANTILEVER WITHSTAND LOAD : AS PER LEVEL -II

NOTES:-

1. REMOVE VENT PLUG IT.007 & 008 DURING FILLING OF OIL IN TANK AND TO BE REFITTED AFTER BUSHING IS FILLED WITH OIL. COMPLIANCE TO STD.IS:2099 & IS:3347

APPROX.OIL QTY. = 2.5 LITRES
APPROX.WEIGHT = 40 KG.

PROJECT: CAPTIVE POWER PLANT (CPP) PACKAGE
VISAKH REFINERY MODERNIZATION PROJECT (VRMP)
JOB NO. B016

OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC: ENGINEERS INDIA LIMITED (EIL), NEW DELHI

ADDITIONAL INFORMATION
W.O. 72110A17100
STATUS OF DRAWING
U
DISTRIBUTION OF PRINTS

TRE	PPC	BAY 1&2	BAY 3,4&5	BAY 6&7	BAY 8	BAY 9	LNM	Other
1	2					4		0

TYPE OF PRODUCT OR 80/100 MVA, 220/33 KV ONAN/ONAF COOLED POWER TRFR.
NAME OF CUSTOMER/PROJECT M/S:-HPCL VIZAG

BHARAT HEAVY ELECTRICALS LTD.
JHANSI

	NAME	SIGN	DATE	NO. OF VAR
DRN	PSR1			
CHD				
APPD				

REV	DATE	ALTERED / CHECKED / APPROVED
00		ALTERED PSR1 / CHECKED / APPROVED

ZONE

DEPT-TRE
CODE-406
UN. TOL. DIM. C/M/F
SCALE
WEIGHT [KG]
REF. TO ASSY. NO. 1 458 00 50 341
ITEM NO
NO. OF ITEM

TITLE: LV BUSHING 36KV 3150AMPS
LV,LVN & HVN BUSHING

DRAWING NO. 34580050973
REV. 00
SHT NO 1
NO OF SHT 1

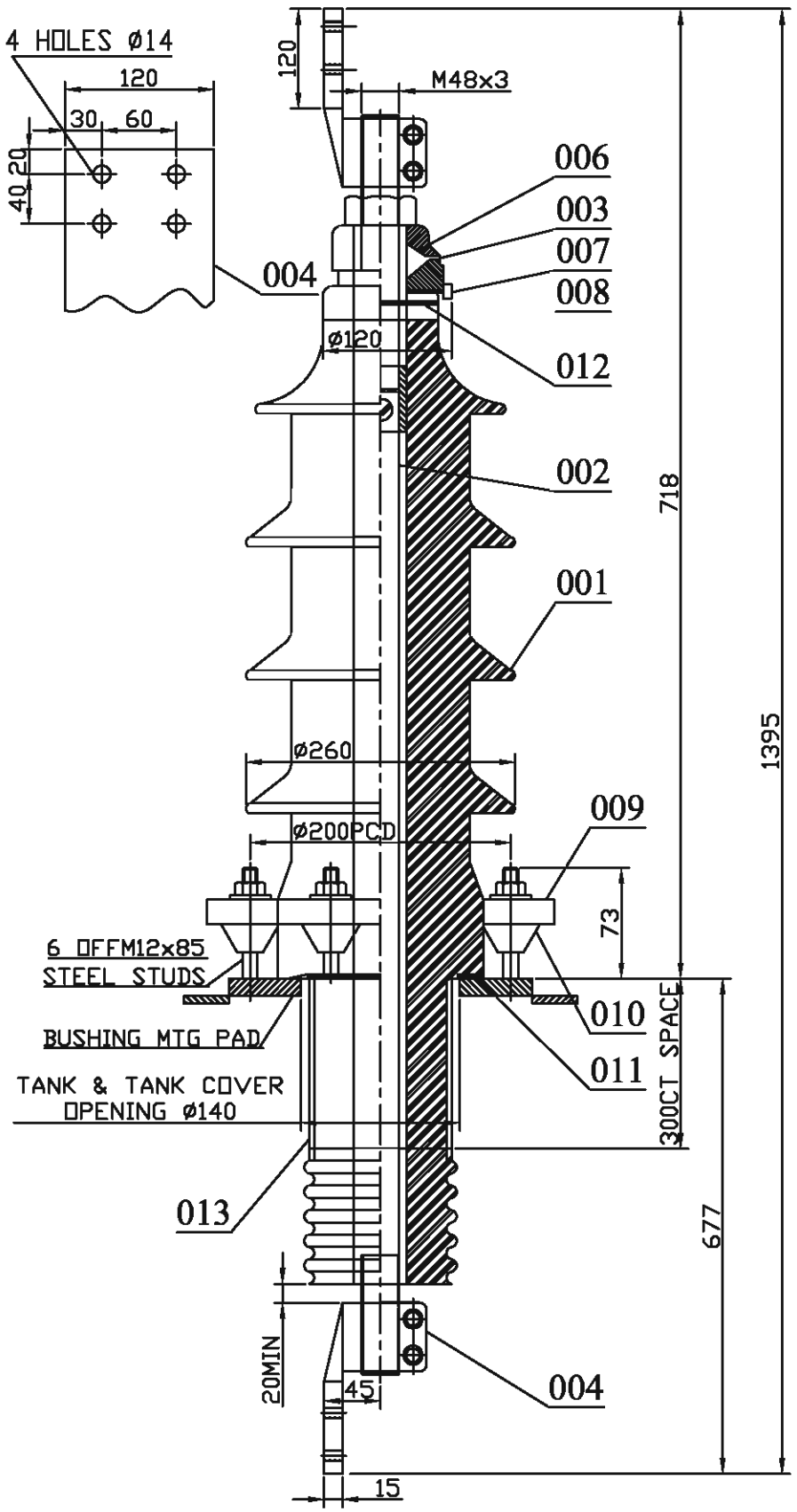
SIGNATURE NOT REQUIRED AS IT IS SYSTEM GENERATED DRAWING SIZE A3

REF. DRG. NO.
SIGN AND DATE
INVENTORY NO.

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

First Angle Projection
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
All dimensions in 'mm'

DRG.No. 34580050973



ELECTRICAL CHARACTERISTICS	
RATED VOLTAGE	36 KV
RATED CURRENT	3150 AMP
TOTAL CREEPAGE	900 mm.
ONE MINUTE DRY 50Hz WITH STSND	70 KV rms
ONE MINUTE WET 50Hz WITH STSND	70 KV rms
1.2/50 μSEC. IMPULSE WITH STAND	170 KVP

NO.	DESCRIPTION	MAT.
001	PORCELAIN INSULATOR	PORCELAIN
002	STEM	COPPER
003	CAP	BRASS
004	CONNECTING LUG	BRASS
005		
006	SEALING WASHER	NITRILE RUBBER
007	VENT PLUG	BRASS
008	GASKET RING	TEFLON
009	CLAMPING RING	AL.
010	CLAMPING MEMBER	AL. ALLOY
011	SEALING WASHER	SRBC
012	SEALING WASHER	SRBC
013	EARTHING SHIELD	COPPER

MAKE : BHEL MAKE
QUANTITY : 3 NOS. / TRFR.
CANTILEVER WITHSTAND LOAD : AS PER LEVEL -II

NOTES:-

1. REMOVE VENT PLUG IT.007 & 008 DURING FILLING OF OIL IN TANK AND TO BE REFITTED AFTER BUSHING IS FILLED WITH OIL. COMPLIANCE TO STD.IS:2099 & IS:3347

APPROX.OIL QTY. = 2.5 LITRES
APPROX.WEIGHT = 40 KG.

PROJECT: CAPTIVE POWER PLANT (CPP) PACKAGE
VISAKH REFINERY MODERNIZATION PROJECT (VRMP)
JOB NO. B016

OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC: ENGINEERS INDIA LIMITED (EIL), NEW DELHI

ADDITIONAL INFORMATION
W.O. 72110A17100
STATUS OF DRAWING
U
DISTRIBUTION OF PRINTS

TRE	PPC	BAY 1&2	BAY 3,4&5	BAY 6&7	BAY 8	BAY 9	LNM	Other
1	2					4		0

TYPE OF PRODUCT OR 80/100 MVA, 220/33 KV ONAN/ONAF COOLED POWER TRFR.
NAME OF CUSTOMER/PROJECT M/S:-HPCL VIZAG

BHARAT HEAVY ELECTRICALS LTD.
JHANSI

	NAME	SIGN	DATE	NO. OF VAR
DRN	PSR1			
CHD				
APPD				

REV	DATE	ALTERED / CHECKED / APPROVED
00		ALTERED PSR1 / CHECKED / APPROVED

ZONE

DEPT-TRE
CODE-406
UN. TOL. DIM. C/M/F
SCALE
WEIGHT [KG]
REF. TO ASSY. NO. 1 458 00 50 341
ITEM NO
NO. OF ITEM

TITLE: LV BUSHING 36KV 3150AMPS
LV,LVN & HVN BUSHING

DRAWING NO. 34580050973
REV. 00
SHT NO 1
NO OF SHT 1

SIGNATURE NOT REQUIRED AS IT IS SYSTEM GENERATED DRAWING **SIZE A3**

REF. DRG. NO.
SIGN AND DATE
INVENTORY NO.

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

SIEMENS

Annexure J-CRP Board formation

BOARD-FORMATION FOR 66kV GIS VIZAG S/S

BHEL DOC No.TB-3-402-510-073

HINDUSTAN PETROLEUM CORPORATION LIMITED

CONTRACTOR: BHEL LTD.

PROJECT: CAPTIVE POWER PLANT (CPP) PACKAGE VISAKH REFINERY MODERNIZATION PROJECT (VRMP) JOB NO. B016

SUBSTATION: 66kV GIS, VIZAG S/S

CONSULTANT: ENGINEERS INDIA LIMITED, NEW DELHI

TITLE: 66kV BOARD-FORMATION

DRAWING NO.	SCALE	SHEET	REV.
(4)G719EA-KG9215-B600	NTS		0

BHEL | CAT-1

APPROVED

This Approval does not relieve the Vendor of his responsibilities under the contract.

Transmission Business Engineering Management

DOCUMENT REVIEW DETAILS

1 No Comments.

2 Proceed with manufacture / fabrication as per the commented document. Revised document required.

3 Document does not conform to basic requirements as marked. Resubmit for review.

R Retained for Records.

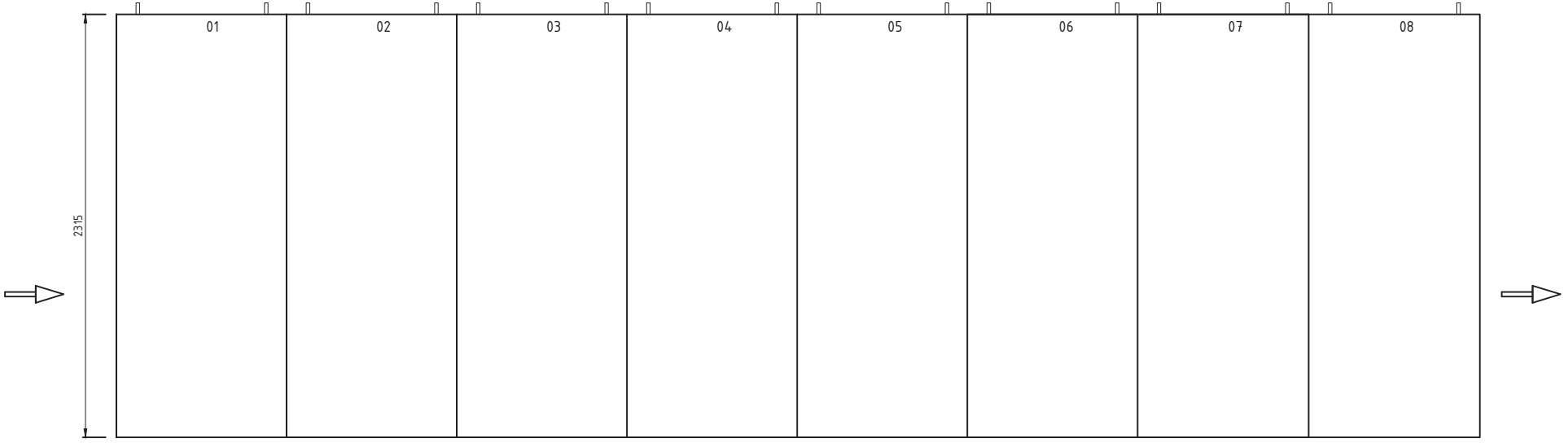
V Void.

Signature with Date 05-JAN-2019

Name of Reviewer SAI ACHUTUNI (A738)

Transmittal No.

Rev	Note	Prepared	Checked	Approved	Revision
0	06.12.18	SSK	PRT	HEM	FIRST SUBMISSION



PANEL TYPE	6 CRP-1	PANEL TYPE	6 CRP-2	PANEL TYPE	6 CRP-3	PANEL TYPE	6 CRP-4	PANEL TYPE	6 CRP-5	PANEL TYPE	6 CRP-6	PANEL TYPE	6 CRP-7	PANEL TYPE	6 CRP-8
NAME PLATE	SS-94 (CPP) TR-9401 BAY-F01	NAME PLATE	SPARE FEEDER BAY-F02	NAME PLATE	GTG-07 BAY-F03	NAME PLATE	SS-83 (CDU/VDU) TR-8301 BAY-F04	NAME PLATE	SS-84 (RUF) TR-8401 BAY-F05	NAME PLATE	SS-84 (RUF) SSTR-8403 BAY-F06	NAME PLATE	SS-82 (HCU) TR-8201 BAY-F07	NAME PLATE	BUS COUPLER-1 BAY-F08

DOCUMENT REVIEW DETAILS

1 No Comments.

2 Proceed with manufacture / fabrication as per the commented document. Revised document required.

3 Document does not conform to basic requirements as marked. Resubmit for review.

R Retained for Records. V Void.

Signature with Date **05-JAN-2019**

Name of Reviewer **SAI ACHUTUNI (A738)**

Transmittal No.

ISSUES	REMARKS	DATE

HEM	APPD	NAME	06.12.18
PRT	CHKD		
SSK	PREP		

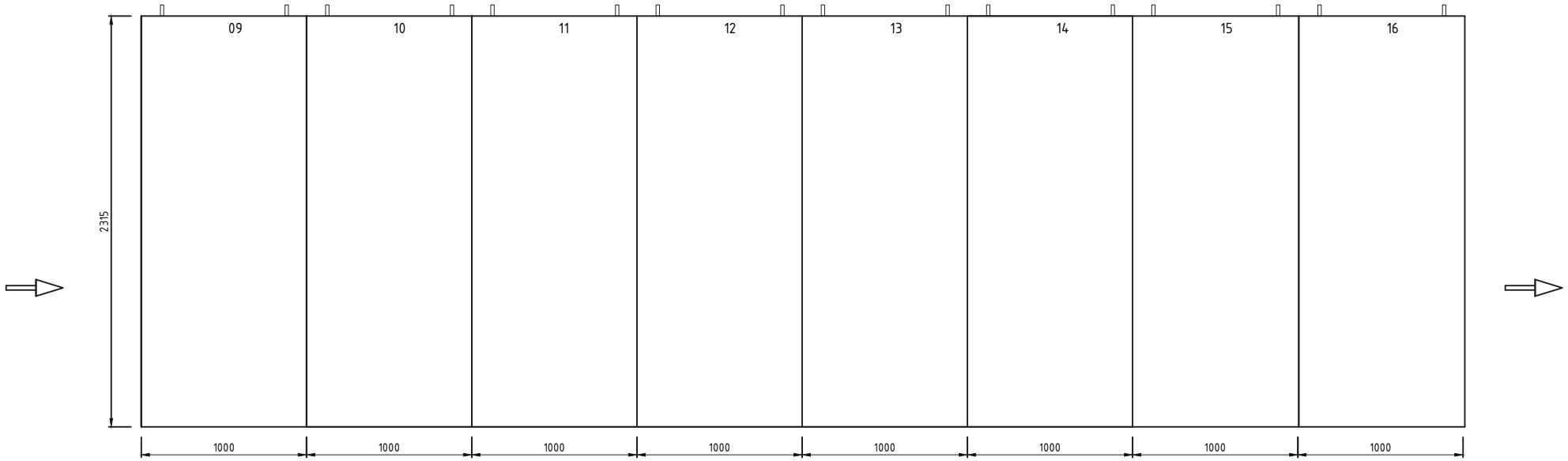
CLIENT: HINDUSTAN PETROLEUM CORPORATION LTD.
SUB. NAME: 66kV GIS, VIZAG S/S
CONTRACTOR: BHEL LTD.

SIEMENS

BOARD FORMATION-66kV

SALES REF. : 3005936184
(4)-G719EA-KG9211-B600

FILE: KG9211B600
SHT : 01
CONT: 02



PANEL TYPE	6 CRP-9	PANEL TYPE	6 CRP-10	PANEL TYPE	6 CRP-11	PANEL TYPE	6 CRP-12	PANEL TYPE	6 CRP-13	PANEL TYPE	6 CRP-14	PANEL TYPE	6 CRP-15	PANEL TYPE	6 CRP-16
NAME PLATE	FUTURE GRID TRAFO BAY-F09	NAME PLATE	SS-94 (CPP) TR-9403 BAY-F10	NAME PLATE	SS-86 (CT) TR-8601 BAY-F11	NAME PLATE	STG-01 BAY-F12	NAME PLATE	SS-90 (HGU) TR-9001 BAY-F13	NAME PLATE	BUS SECTION-1 BAY-F14	NAME PLATE	BUS SECTION-2 BAY-F15	NAME PLATE	SS-94 (CPP) TR-9402 BAY-F16

DOCUMENT REVIEW DETAILS

1 No Comments.

2 Proceed with manufacture / fabrication as per the commented document. Revised document required.

3 Document does not conform to basic requirements as marked. Resubmit for review.

R Retained for Records. V Void.

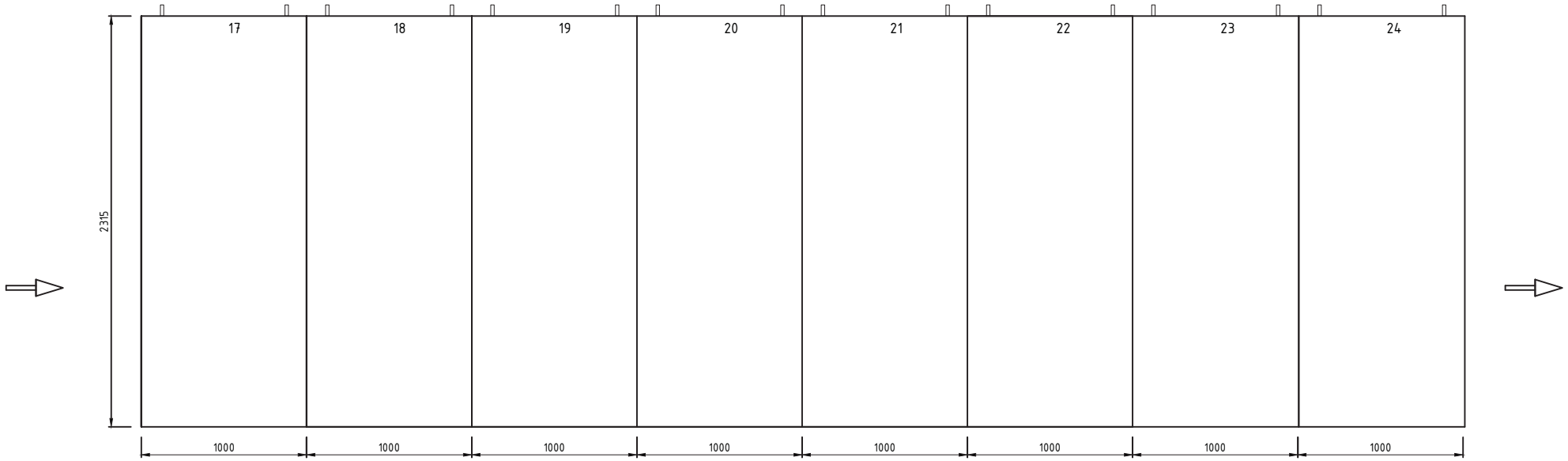
Signature with Date 05-JAN-2019

Name of Reviewer SAI ACHUTUNI (A738)

Transmittal No.

ISSUES	REMARKS	DATE

HEM	APPD	CLIENT: HINDUSTAN PETROLEUM CORPORATION LTD.	SIEMENS	BOARD FORMATION-66kV	SALES REF. : 3005936184 / FILE: KG9211B600
PRT	CHKD	SUB. NAME: 66kV GIS, VIZAG S/S			(4)-G719EA-KG9211-B600 / SHT : 02
SSK	PREP	CONTRACTOR: BHEL LTD.			CONT: 03
NAME	06.12.18				



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NAME PLATE	SS-83 (CDU/VDU) TR-8302 BAY-F17	NAME PLATE	INCOMER-1 TR-9301 BAY-F18	NAME PLATE	SS-94 (CPP) TR-9404 BAY-F19	NAME PLATE	SS-82 (HCU) TR-8202 BAY-F20	NAME PLATE	BUS COUPLER-2 BAY-F21	NAME PLATE	SS-86 (CT) TR-8602 BAY-F22	NAME PLATE	INCOMER-2 TR-9302 BAY-F23	NAME PLATE	SS-90 (HGU) TR-9002 BAY-F24

DOCUMENT REVIEW DETAILS

1 No Comments.

2 Proceed with manufacture / fabrication as per the commented document. Revised document required.

3 Document does not conform to basic requirements as marked. Resubmit for review.

R Retained for Records. V Void.

Signature with Date **05-JAN-2019**

Name of Reviewer **SAI ACHUTUNI (A738)**

Transmittal No.

ISSUES	REMARKS	DATE

HEM	APPD	CLIENT: HINDUSTAN PETROLEUM CORPORATION LTD.	SIEMENS
PRT	CHKD	SUB. NAME: 66kV GIS, VIZAG S/S	
SSK	PREP	CONTRACTOR: BHEL LTD.	
NAME	06.12.18		

BOARD FORMATION-66kV

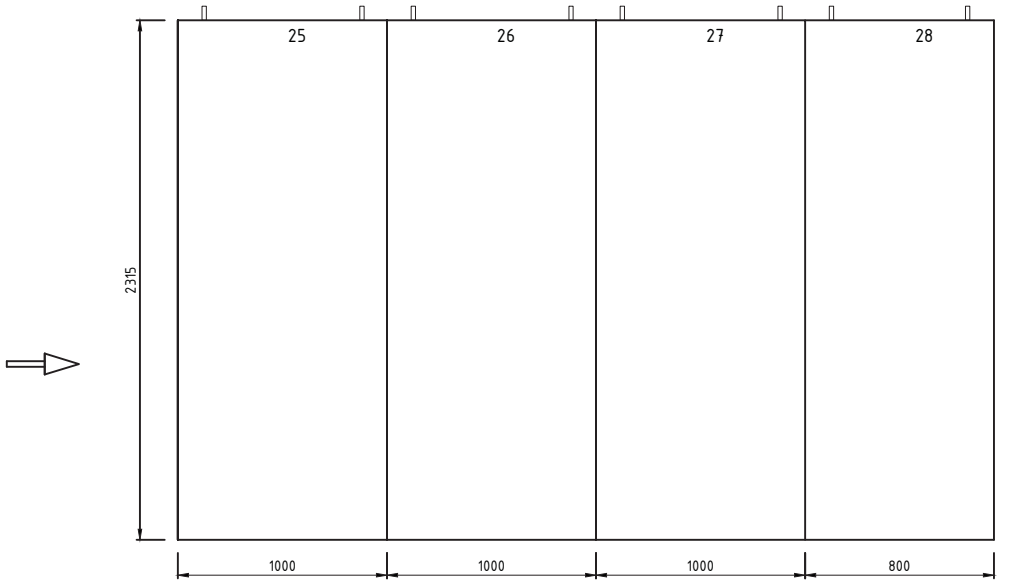
SALES REF. : 3005936184

(4)-G719EA-KG9211-B600

FILE: KG9211B600

SHT : 03

CONT: 04



PANEL TYPE	6 CRP-25	PANEL TYPE	6 CRP-26	PANEL TYPE	6 CRP-27	PANEL TYPE	6 CRP-28
NAME PLATE	SPARE FEEDER BAY-F25	NAME PLATE	SS-84 (RUF) TR-8402 BAY-F26	NAME PLATE	SS-84 (RUF) TR-8404 BAY-F27	NAME PLATE	BUSBAR PANEL

DOCUMENT REVIEW DETAILS

1 No Comments.

2 Proceed with manufacture / fabrication as per the commented document. Revised document required.

3 Document does not conform to basic requirements as marked. Resubmit for review.

R Retained for Records. V Void.

Signature with Date **05-JAN-2019**

Name of Reviewer **SAI ACHUTUNI (A738)**

Transmittal No.

ISSUES	REMARKS	DATE

HEM	APPD	CLIENT: HINDUSTAN PETROLEUM CORPORATION LTD.	SIEMENS
PRT	CHKD	SUB. NAME: 66kV GIS, VIZAG S/S	
SSK	PREP	CONTRACTOR: BHEL LTD.	
NAME	06.12.18		

BOARD FORMATION-66kV

SALES REF. : 3005936184

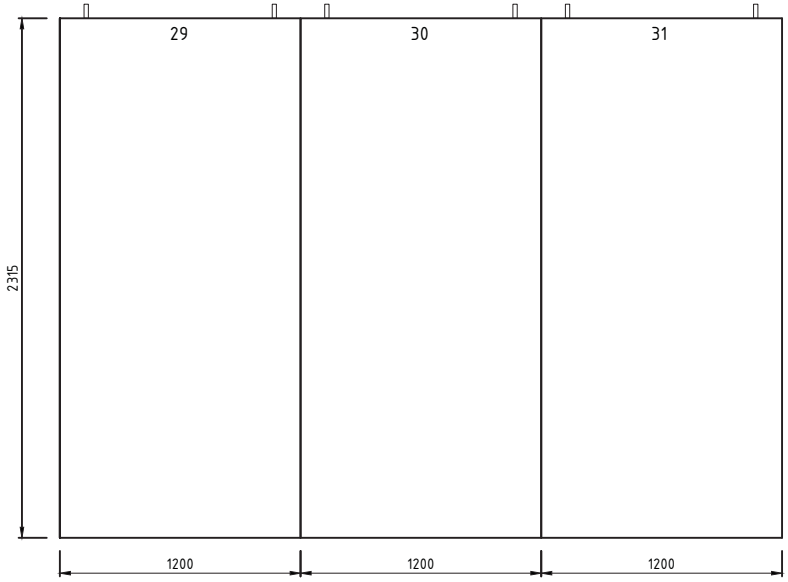
(4)-G719EA-KG9211-B600

FILE: KG9211B600

SHT : 04

CONT: 05

CONTROL ROOM



PANEL TYPE	6 CRP-29	PANEL TYPE	6 CRP-30	PANEL TYPE	6 CRP-31
NAME PLATE	TRANSDUCER PANEL BAY-6TD	NAME PLATE	DUMMY PANEL BAY-6DUMMY	NAME PLATE	INTERPOSING PANEL BAY-6INT

DOCUMENT REVIEW DETAILS

1 No Comments.

2 Proceed with manufacture / fabrication as per the commented document. Revised document required.

3 Document does not conform to basic requirements as marked. Resubmit for review.

R Retained for Records. V Void.

Signature with Date 05-JAN-2019

Name of Reviewer SAI ACHUTUNI (A738)

Transmittal No.

ISSUES	REMARKS	DATE

		HEM	APPD	CLIENT: HINDUSTAN PETROLEUM CORPORATION LTD.	SIEMENS
		PRT	CHKD	SUB. NAME: 66kV GIS, VIZAG S/S	
		SSK	PREP	CONTRACTOR: BHEL LTD.	
		NAME	06.12.18		

BOARD FORMATION-66kV

SALES REF. : 3005936184

(4)-G719EA-KG9211-B600

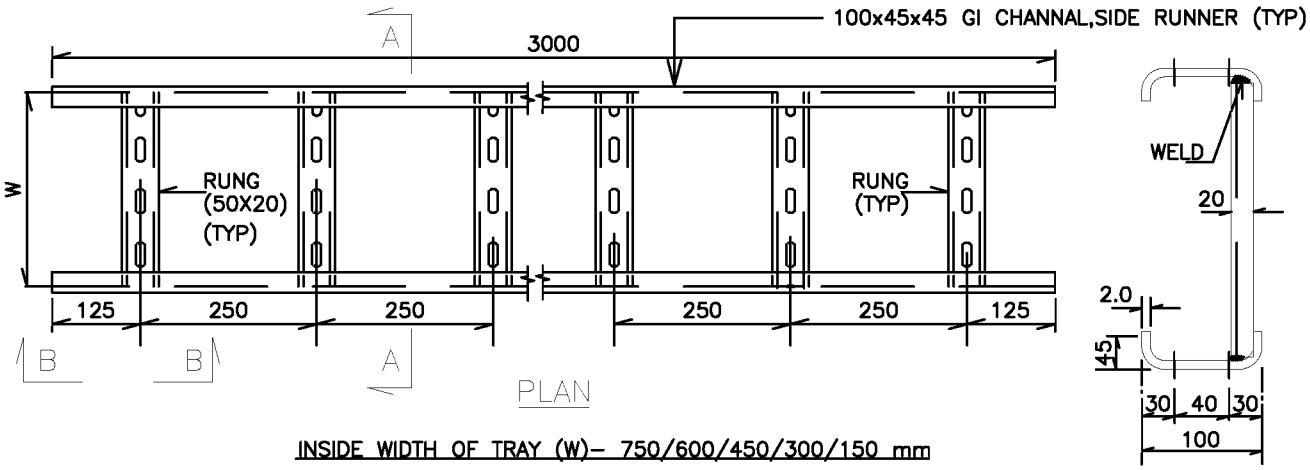
FILE: KG9211B600

SHT : 05

CONT: NIL

PLANT STANDARD
HYDERABAD

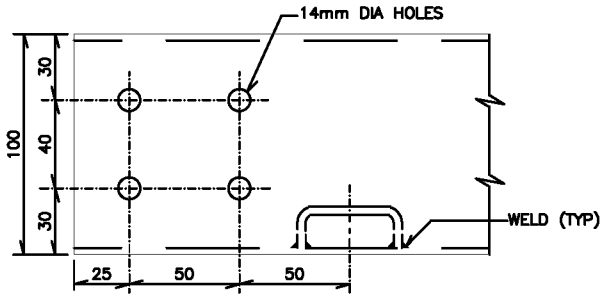
LADDER TYPE STRAIGHT RUN CABLE TRAY ALONG WITH ACCESSORIES INCLUDING COUPLER PLATES –TYPE 2 (CHANNEL TYPE)



PLAN

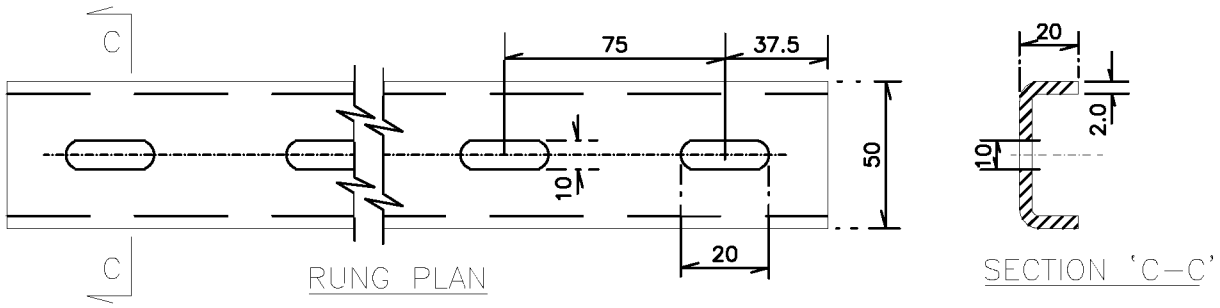
INSIDE WIDTH OF TRAY (W)– 750/600/450/300/150 mm

SECTION A–A



SECTION 'B–B'

H=100mm for 300/450/600/750mm width Tray
H=50mm for 150mm width Tray



RUNG PLAN

SECTION 'C–C'

NOTEs:

1. LADDER TYPE (CHANNEL TYPE) STRAIGHT RUN CABLE TRAY TYPE–2 INCLUDES SUPPLY OF 2 Sets OF COUPLER PLATES ALONG WITH ACCESSORIES LIKE WASHERS, NUTS AND BOLTS. DETAILS OF THE SAME IS ATTACHED IN SHEET NO. 4 OF 20
2. ALL DIMENSIONS ARE IN mm. PLEASE NOTE THAT NEGATIVE TOLERANCE IN ANY DIMENSIONED, ARE NOT ACCEPTABLE. HOWEVER A POSITIVE TOLERANCE OF +2mm CAN BE ACCEPTED.
3. MATERIAL CODES FOR VARIOUS LADDER TYPE(CHANNEL TYPE) STRAIGHT RUN CABLE TRAY TYPE2 ARE GIVEN IN THE FOLLOWING PAGE.
4. IN ORDER TO MAINTAIN PROPER EARTH CONTINUITY BOND, PAINTING ON SURFACES IN CONTACT BETWEEN COUPLER PLATES AND CABLE TRAY SHALL BE SCRAPPED AT THE TIME OF INSTALLATION.
5. THE DETAILS SHOWN IN THE DRAWING ARE TYPICAL FOR LADDER TYPE (CHANNEL TYPE) CABLE TRAYS.

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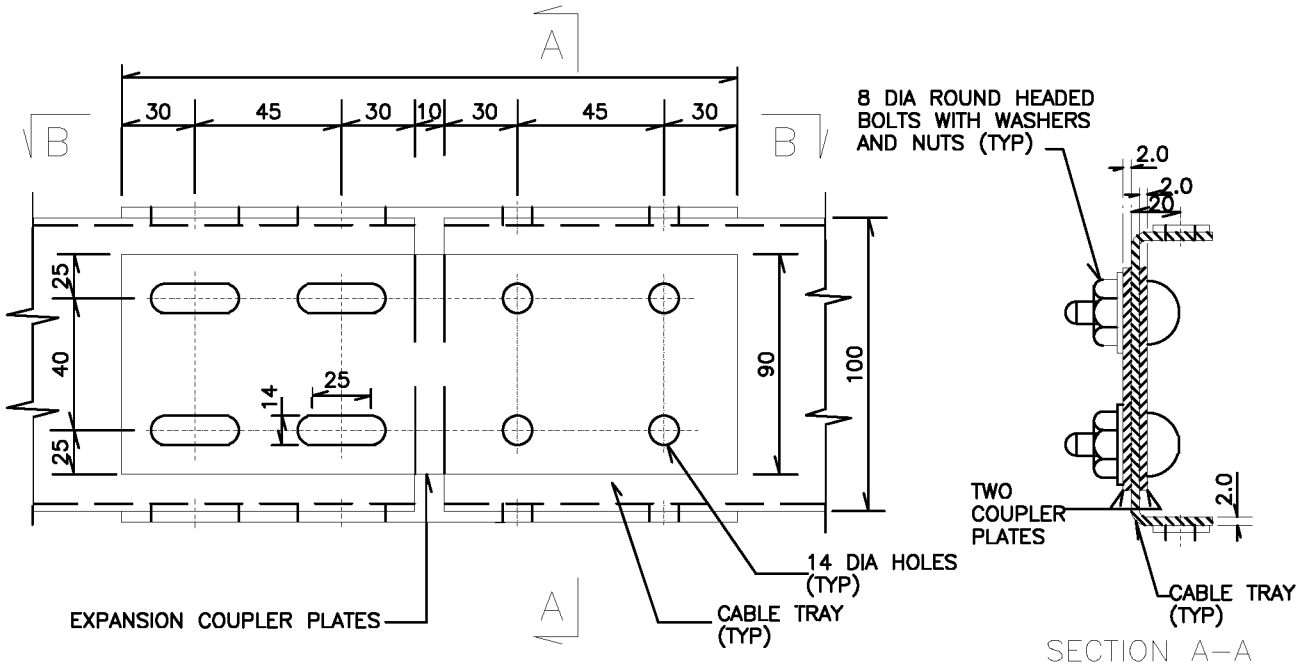
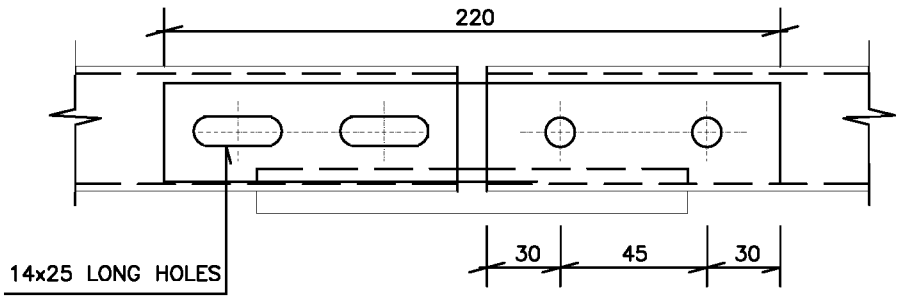
PLANT STANDARD
HYDERABAD

TYPICAL ARRANGEMENT OF COUPLER PLATE SET WITH ACCESSORIES INCLUDING FIXING DETAILS FOR LADDER TYPE (CHANNEL TYPE) CABLE TRAYS–TYPE2



SECTION A–A



SECTION B–B

NOTES

1. ALL DIMENSIONS ARE IN mm. PLEASE NOTE THAT NEGATIVE TOLERANCE IN ANY DIMENSIONED, ARE NOT ACCEPTABLE. HOWEVER A POSITIVE TOLERANCE OF +2mm CAN BE ACCEPTED.
2. MATERIAL – Min 2 mm thick M.S SHEET FOR 750/600/450/300/150 mm CABLE TRAYS.
3. IN ORDER TO MAINTAIN PROPER EARTH CONTINUITY BOND, PAINTING ON SURFACES IN CONTACT BETWEEN COUPLER PLATES AND CABLE TRAY SHALL BE SCRAPPED AT THE TIME OF INSTALLATION.
4. TWO COUPLER PLATES TO BE PROVIDED ONE EACH ON EITHER SIDE OF TRAY.
5. ONE SET OF COUPLER PLATE WITH ACCESSORIES SHALL CONSISTS 2No. OF COUPLER PLATES 8No. OF NUTS, BOLTS AND WASHERS AS SHOWN IN THE DRAWING.
6. MATERIAL CODES FOR LOOSE SUPPLY OF COUPLER PLATE WITH ACCESSORIES FOR VARIOUS TYPE OF LADDER TYPE (CHANNEL TYPE) CABLE TRAYS–TYPE2, ARE GIVEN IN THE FOLLOWING PAGE.

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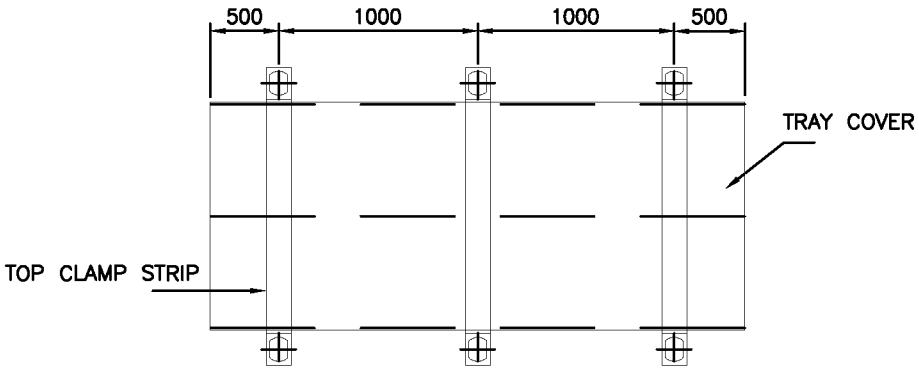
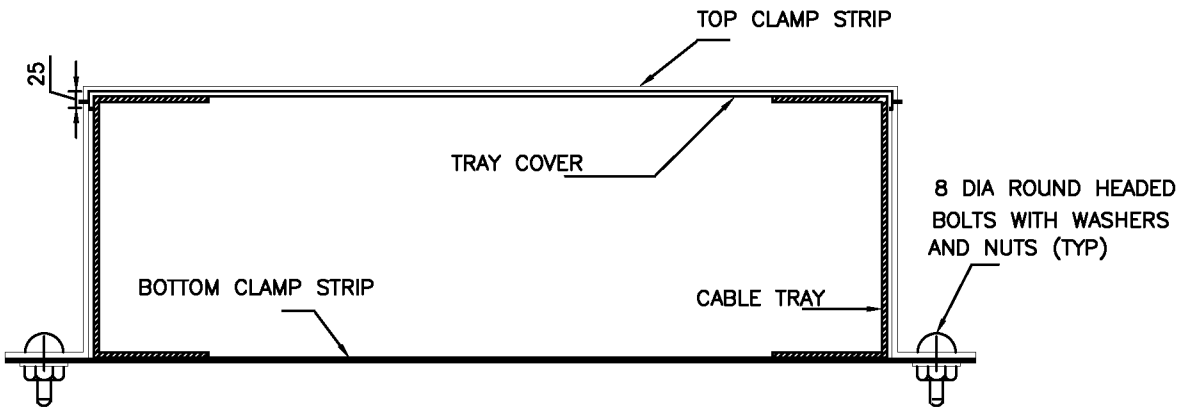
Annexure-2

PLANT STANDARD
HYDERABAD

TYPICAL ARRANGEMENT SHOWING DETAILS OF CABLE TRAYE COVER WITH ACCESSORIES FOR LADDER TYPE(CHANNEL TYPE) CABLE TRAYS–TYPE2



CABLE TRAY COVER WITH ACCESSORIES–PLAN



CABLE TRAY COVER WITH ACCESSORIES–ELEVATION

NOTES

1. CABLE TRAY COVER SHALL INCLUDE 1 No OF TRAY COVER OF 2500 mm LENGTH ALONG WITH 3Nos OF TOP CLAMP STRIP, 3Nos OF BOTTOM CLAMP STRIP AND 6Nos OF BOLTS ALONG WITH NUTS AND WASHERS.
2. ALL DIMENSIONS ARE IN mm. PLEASE NOTE THAT NEGATIVE TOLERANCE IN ANY DIMENSIONED, ARE NOT ACCEPTABLE. HOWEVER A POSITIVE TOLERANCE OF +2mm CAN BE ACCEPTED.
3. ALL THE ACCESSORIES EXCEPT NUTS AND BOLTS SHALL BE FABRICATED FROM 2mm THICK GI SHEET STEEL.
4. MATERIAL CODES FOR CABLE TRAY COVERS WITH ACCESSORIES FOR VARIOUS TYPE OF LADDER TYPE (CHANNEL TYPE) CABLE TRAYS–TYPE2, ARE GIVEN IN THE FOLLOWING PAGE.
5. IN ORDER TO MAINTAIN PROPER EARTH CONTINUITY BOND, PAINTING ON SURFACES IN CONTACT BETWEEN COUPLER PLATES AND CABLE TRAY SHALL BE SCRAPPED AT THE TIME OF INSTALLATION.
6. THE DETAILS SHOWN IN THE DRAWING ARE TYPICAL FOR LADDER TYPE (CHANNEL TYPE) CABLE TRAYS.

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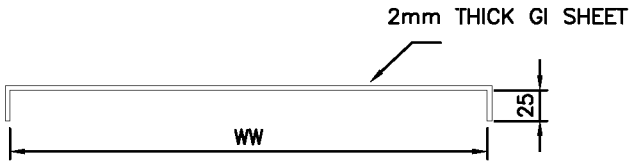
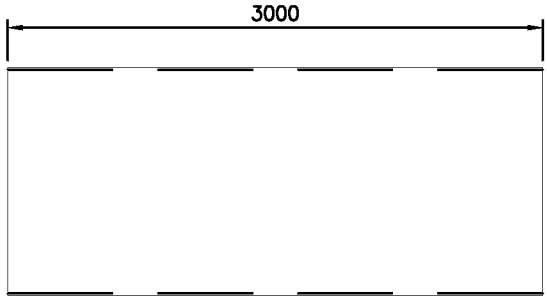
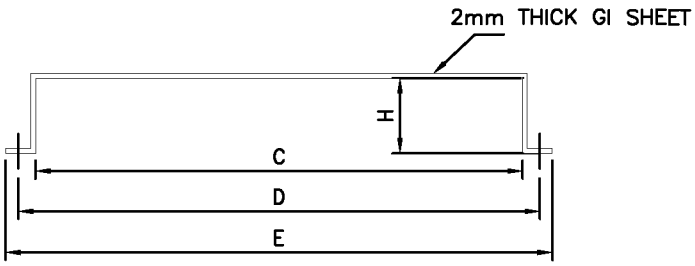
TYPICAL ARRANGEMENT FOR CABLE TRAY COVER AND ACCESSORIES FOR LADDER TYPE CABLE TRAYS–TYPE 2 (CHANNEL TYPE)



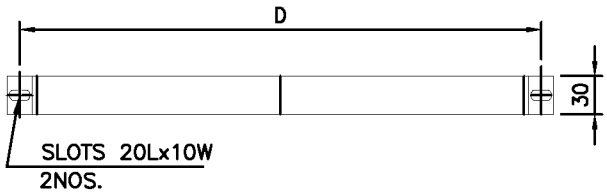
CABLE TRAY COVER–ELEVATION



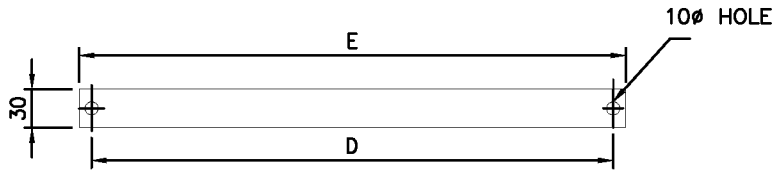
CABLE TRAY COVER–PLAN



TOP CLAMP STRIP–ELEVATION



TOP CLAMP STRIP–PLAN



BOTTOM CLAMP STRIP–ELEVATION

DESCRIPTION	WW	C	D	E	H
COVER FOR 750mm TRAY	756	760	794	824	100
COVER FOR 600mm TRAY	606	610	644	674	100
COVER FOR 450mm TRAY	456	460	494	524	100
COVER FOR 300mm TRAY	306	310	344	374	100
COVER FOR 150mm TRAY	156	160	194	224	50

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Ceilig Fixed

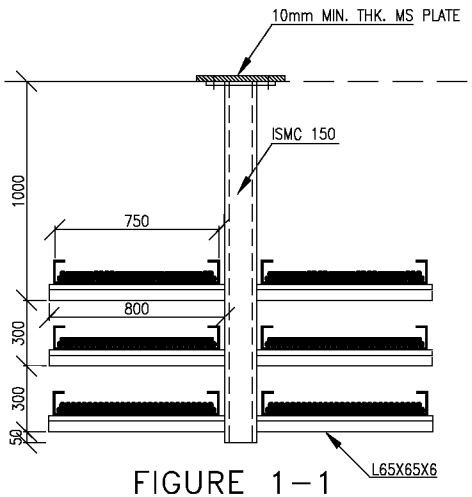


FIGURE 1–1

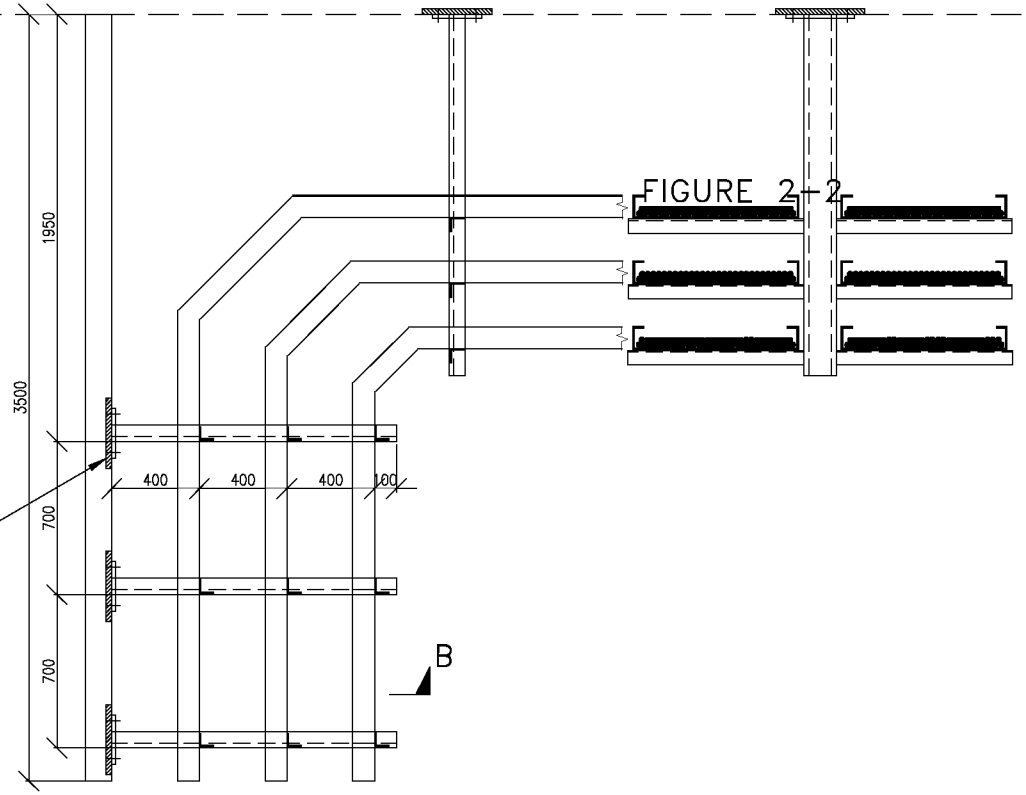
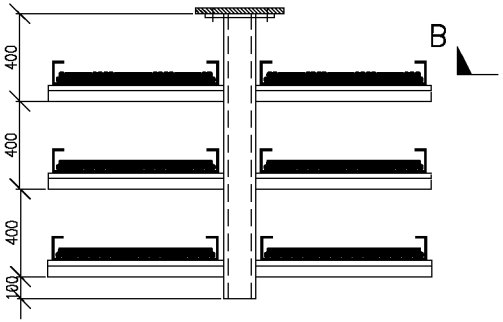
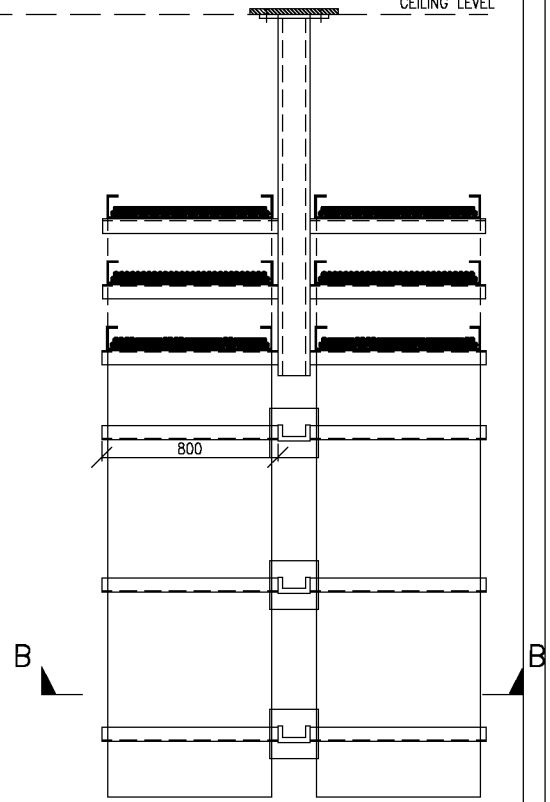


FIGURE 2–2

Wall Fixed



VIEW B–B
FIGURE 2–2



VIEW A–A

NOTE:–

1. ALL DIMENSIONS ARE IN MM.

Annexure-3

PROJECT– 66kV GIS SYSTEM, VRMP, VIZAG	ANNEXURE–1	SH.: 1 OF 2

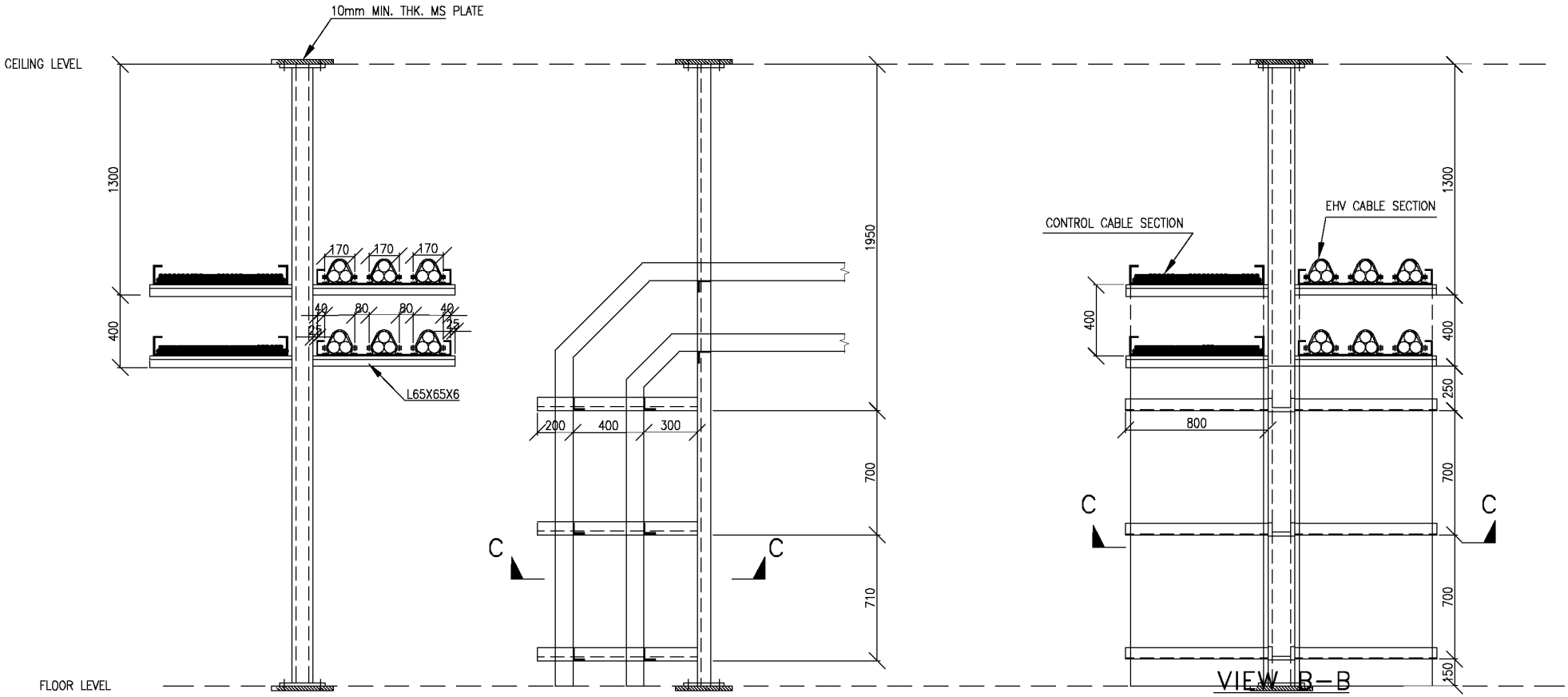


FIGURE 3–3

VIEW B–B

VIEW C–C
FIGURE 4–4

NOTE:–

1. ALL DIMENSIONS ARE IN MM.

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INVENTORY NO | REF. DRG. NO. PY-VG-4-M104-8908-01-S00-R00 | COMPUTER FILE NAME :

COVER SHEET

FOR

LADDER AND

PERFORATED TYPE

CABLE TRAY

AND

ACCESSORIES

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Limited
Ramachandrapuram, Hyderabad

PROJECT ENGINEERING & SYSTEMS DIVISION

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Dt: 12/01/2019

Naga Sathish Maduri
Design Engineer / PE & SD
B.H.E.L. Hyderabad

PROJECT: VISAKHAPATNAM PLANT

OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC: ENGINEERS INDIA LIMITED (EIL), NEW DELHI

MANUFACTURER: RATAN PROJECTS & ENGG. CO. PVT. LTD.
26, P. K. TAGORE STREET, KOLKATA - 700 006, WEST BENGAL, INDIA

P. O. NO . :- T718A00444 DATED 28.12.2018

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD
Maharatna Company

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	DKM		05.01.2019	–N.A.–
CHD.	PJ		05.01.2019	
APPD.				

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD
ZONE			ZONE			ZONE		

DEPT.	UNTOL. DIMS.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
PE&SD	GR. ~~C/M/F~~		NTS	–N.A.–	–N.A.–	–N.A.–	–N.A.–
CODE. 450							

TITLE: GI CABLE TRAY WITH ACCESSORIES

CARD CODE: N.A.

BHEL DRG NO. PY-VG-4-M104-8908-01-S00-R00 REV. 00

CUST DRG NO. ------

SHT. No 1 NO. OF SHT. 15

GEN. DIM. LIMITS , FITS , & TOLERANCES AS PER P.S :- HY0230261

DATA SHEET

1	a) Material b) Type of Tray	M.S. Sheet Confirming to IS:10748 Gr. I/II Ladder and Perforated
2	Length : Single Ladder Type Cable Tray Piece	3000
	Length : Single Perforated Type Cable Tray Piece	2500
3	Thickness of Tray	2.0 mm
4	Thickness of Coupler Plate	2.0 mm
5	Width of Tray	As per BOQ
	Runner of Ladder Type	100x45x2 mm
	Rung of Ladder Type	50x20x2 mm
6	Lip Height for Perforated Tray	100 mm for 600 mm Width 75 mm for 300 & 150 mm Width 25 mm for 50 mm Width
7	Collar for Perforated Tray	25 mm for 600, 300 & 150 mm Width
8	Finish	Hot Dip Galvanized As per IS: 2629 & IS: 4759
9	Zinc Coating Standard	As per IS: 4759
10	Tolerance	As per IS: 1852
11	Galvanization Uniformity of Zinc Coating	As per IS: 2633
12	Weight of Zinc Coating	610 gms./Sq. Mtr.
13	Thickness of Zinc Coating	86 Microns. (Minimum)
14	Purity of Zinc	Conforming to IS: 209

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Bharat Heavy Electricals Limited
Ramachandrapuram, Hyderabad

PROJECT ENGINEERING & SYSTEMS DIVISION

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Dt: 12/01/2019

VNNaga Sathish
नाग सतीश मेदुरी
Naga Sathish Maduri
Design Engineer / P.E. & SD
भा.ह.वि.लि. हैदराबाद, BHEL, HYD-32

PROJECT: VISAKHAPATNAM PLANT

OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC: ENGINEERS INDIA LIMITED (EIL), NEW DELHI

MANUFACTURER: RATAN PROJECTS & ENGG. CO. PVT. LTD.
26, P. K. TAGORE STREET, KOLKATA - 700 006, WEST BENGAL, INDIA

P. O. NO . :- T718A00444 DATED 28.12.2018

Ratan Projects & Engg. Co. Kolkata (W.B.)

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD
Maharatna Company

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	DKM		05.01.2019	–N.A.–
CHD.	PJ		05.01.2019	
APPD.				

DEPT.	UNTOL. DIMS. GR.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
PE&SD	~~C/M/F~~		NTS	–N.A.–	–N.A.–	–N.A.–	–N.A.–
CODE. 450							

TITLE: GI CABLE TRAY WITH ACCESSORIES

CARD CODE: N.A.

BHEL DRG NO. PY–VG–4–M104–8908–01–S00–R00 REV. 00

CUST DRG NO. ––––––

SHT. No 2 NO. OF SHT. 15

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD
ZONE			ZONE			ZONE		

INVENTORY NO

REF. DRG. NO. PY–VG–4–M104–8908–01–S00–R00 COMPUTER FILE NAME :

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GEN. DIM. LIMITS , FITS , & TOLERANCES AS PER P.S. :– HY0230261

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INVENTORY NO | REF. DRG. NO. PY-VG-4-M104-8908-01-S00-R00 | COMPUTER FILE NAME :

GRNERAL NOTES :–

1. THE CABLE TRAYS AND ACCESSORIES SHALL COMPLY WITH LATEST EDITION OF INDIAN STANDARDS IS : 1363, IS : 1367(PART–13), IS : 2629, IS : 5986.
2. THE CABLE TRAYS SHALL BE LADDER TYPE PREFABRICATED, HOT DIP GALVANIZED, THE LADDER TYPE TRAYS SHALL CONSIST OF SIDE RUNNERS & HORIZONTAL RUNGS.
3. THE LADDER TYPE TRAYS AND ACCESSORIES SHALL HAVE RIGID WELDED CONSTRUCTION AND SHALL BE FABRICATED OUT OF 2 mm THICK HOT ROLLED SHEET STEEL. THE RUNGS SHALL BE WELDED TO THE SIDE RUNNERS.
4. SIDE RUNNERS SHALL BE 100 x 45 mm (FOR 750/600/300 W) WITH THE FLANGES FACING INSIDE. RUNGS SHALL BE 50 x 20 mm SLOTTED CHANNEL TYPE.
5. SIDE RUNNERS, CHANNELS SHALL BE CONNECTED AT ENDS USING 4 SPLICE PLATES.
6. THE SIDE RUNNER WILL ALSO HAVE SUITABLE 10ø HOLES AT EVERY METER FOR CLEATING EARTHING STRIP.
7. HOT DIP GALVANIZING SHALL BE DONE AFTER FABRICATION AS PER IS : 2629 & IS : 4759 THE AMOUNT OF GALVANIZING SHALL BE MINIMUM 610 gm/Sq.Mtr. (86 Microns Minimum)
8. THE TYPE OF CONSTRUCTION SHALL BE SUCH AS TO FACILITATE EASY HANDLING, ASSEMBLY AND INSTALLATION AT SITE FOR THE CONSTRUCTION OF THE CABLE TRAYS. THE STANDARD STRAIGHT LENGTH OF CABLE TRAY SHALL BE 3 METERS FOR LADDER TRAY AND 2.5 METERS FOR PERFORATED TRAY.
9. SPLICE PLATE OF CABLE TRAYS SHALL BE PLACED NOT MORE THAN 750 mm FROM SUPPORT ANGLE.
10. THE WORKMANSHIP SHALL BE SUCH AS TO ENSURE EASY LAYING OF CABLES WITHOUT CAUSING DAMAGE TO CABLES. ALL SURFACES SHALL BE FREE FROM DEFECTS SUCH AS BURRS, SHARP EDGES ETC..
11. THE HARDWARE SHALL CONFORM TO THE RELEVANT INDIAN STANDARD SPECIFICATIONS AND SHALL BE ABLE TO WITHSTAND THE MAXIMUM LOADING CONDITIONS AS REQUIRED. ALL HARDWARE AND FITTINGS SHALL BE HARD CHROME, ZINC PASSIVATED OR CADMIUM PLATED. HARDWARE SHALL INCLUDE BOLTS,NUTS, WASHERS ETC.
12. CABLE TRAYS AND FITTINGS ETC. SHALL BE MANUFACTURED AS PER DRAWINGS TO BE APPROVED BY EIL IN LINE WITH DETAILS SHOWN IN DRAWINGS.
13. THE FOLLOWING TESTS FOR THE AMOUNT OF ZINC COATING SHALL BE CARRIED OUT :
    - THICKNESS OF GALVANIZED COATING BY ELCOMETER.
    - MASS OF GALVANIZED COATING BY STRIPPING TEST.
    - DETERMINATION OF UNIFORMITY OF GALVANIZED COATING.
14. CABLE TRAYS SHALL BE SUITABLE FOR A CABLE WEIGHT OF 75 Kg/M OF RUNNING LENGTH OF TRAY AND ADDITIONALLY IT SHALL ALSO BE SUITABLE FOR POINT LOAD OF 75Kg (EQUIVALENT TO WEIGHT OF A MAN WORKING ON THE CABLE TRAY).

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Bharat Heavy Electricals Limited
Ramachandrapuram, Hyderabad

PROJECT ENGINEERING & SYSTEMS DIVISION

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Dt: 12/01/2019

VVNaga Sathish
नाग सतीश वेमुरी
Naga Sathish Maduri
Design Engineer / PE & SD
भा.ह.वि.लि. हैदराबाद, BHEL, HYD-93

PROJECT: VISAKHAPATNAM PLANT

OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC: ENGINEERS INDIA LIMITED (EIL), NEW DELHI

MANUFACTURER: RATAN PROJECTS & ENGG. CO. PVT. LTD.
26, P. K. TAGORE STREET, KOLKATA - 700 006, WEST BENGAL, INDIA

P. O. NO . :- T718A00444 DATED 28.12.2018

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD
Maharatna Company

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	DKM		05.01.2019	–N.A.–
CHD.	PJ		05.01.2019	
APPD.				

REV.	DATE	ALTERED CHD/APPD	REV.	DATE	ALTERED CHD/APPD	REV.	DATE	ALTERED CHD/APPD
ZONE			ZONE			ZONE		

DEPT.	UNTOL. DIMS.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
PE&SD	GR. ~~C/M/F~~	NTS	–N.A.–	–N.A.–	–N.A.–	–N.A.–
CODE. 450						

TITLE: GI CABLE TRAY WITH ACCESSORIES

CARD CODE: N.A.

BHEL DRG NO. PY–VG–4–M104–8908–01–S00–R00 REV. 00

CUST DRG NO. ––––––

SHT. No 3 NO. OF SHT. 15

GEN. DIM. LIMITS , FITS , & TOLERANCES AS PER P.S :– HY0230261

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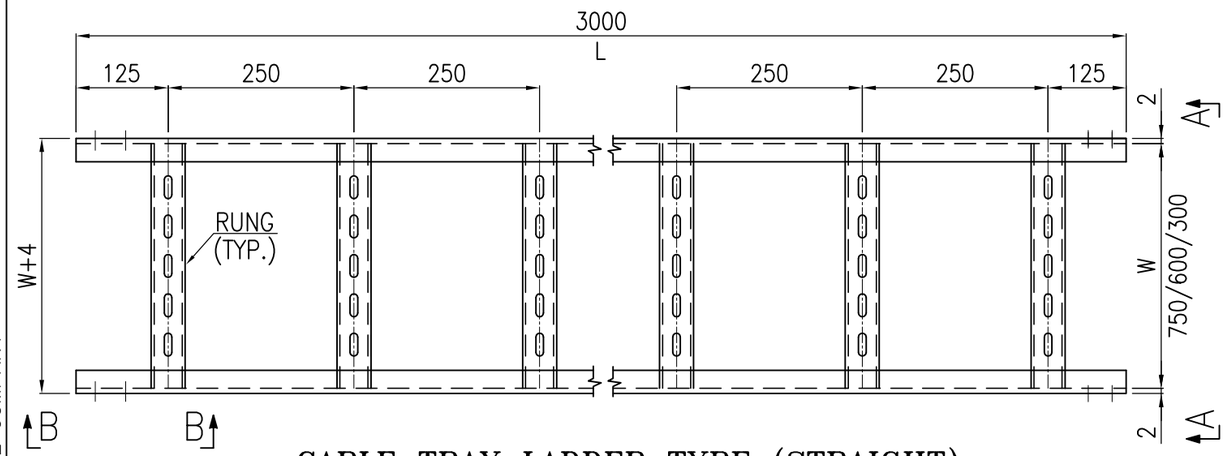
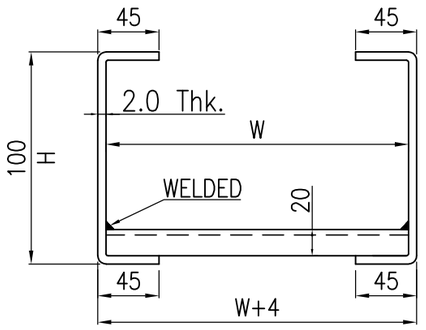
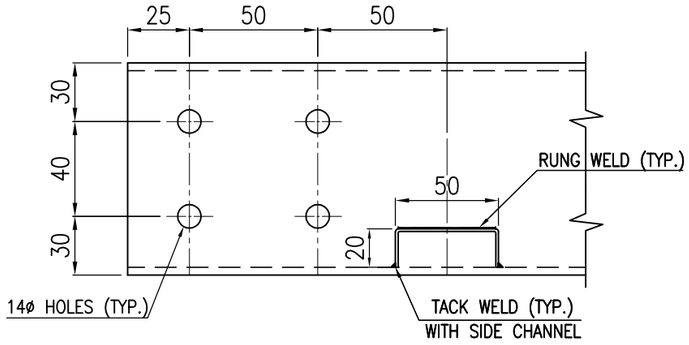
COMPUTER FILE NAME : REF. DRG. NO. PY-VG-4-M104-8908-01-S00-R00



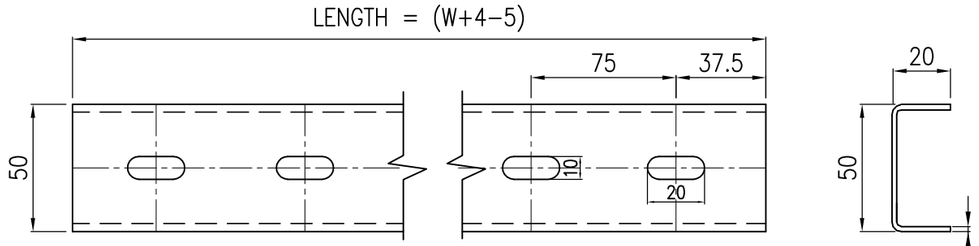
CABLE TRAY LADDER TYPE (STRAIGHT)



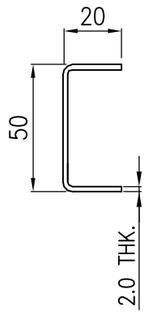
VIEW 'A-A'

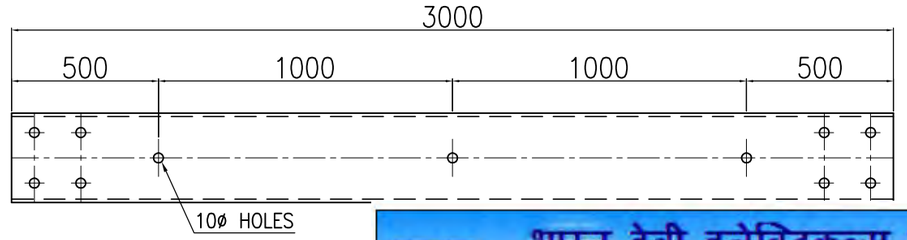


VIEW 'B-B'



DETAIL OF SLOTTED RUNG





DESCRIPTION													
PACKAGE NO.	P.O. SL. NO.	MATERIAL CODE	ITEM	W	H	L	THK.	QTY.(NOS.)	WEB COUPLER PLATE(NOS.)	FLANGE COUPLER PLATE(NOS.)	BOLT(NOS.)	NUT(NOS.)	WASHER(NOS.)
01	01-1	HY7433663010	LADDER TRAY	750	100	3000	2.0	450	1800	1800	14400	14400	14400
02	02-1	HY7433663029	LADDER TRAY	600	100	3000	2.0	450	1800	1800	14400	14400	14400
03	03-1	HY7433663045	LADDER TRAY	300	100	3000	2.0	150	600	600	4800	4800	4800
COUPLER PLATE & BOLT TOTAL									4200	4200	33600	33600	33600

NOTES :-

1. M12x20 LONG ELECTROPLATED ROUND HEAD BOLT WITH WASHERS & NUTS CONFORMING TO IS : 1363 & IS : 1367 SHALL BE USED FOR FIXING OF SPLICE PLATE
2. W - WIDTH OF CABLE TRAY (750/600/300)

REV.	DATE	ALTERED CHD/APPD	REV.	DATE	ALTERED CHD/APPD	REV.	DATE	ALTERED CHD/APPD
ZONE			ZONE			ZONE		

INVENTORY NO

PROJECT: VIS

OWNER: HINDUSTAN

PMC: ENGINEEI

MANUFACTURER: RATAN P
26, P. K. TAGO

P. O. NO . :- T718A00444

BHARAT HEAVY E
HYDERA
Maharatna Company

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Limited
Ramachandrapuram, Hyderabad

PROJECT ENGINEERING & SYSTEMS DIVISION

DESCRIPTION OF CODE :

1. APPROVED.
2. APPROVED WITH MINOR COMMENTS. RELEASED FOR MANUFACTURING SUBJECT TO INCORPORATION OF COMMENTS. RESUBMIT FOR FINAL APPROVAL.
3. REVISE AS PER BHEL COMMENTS AND RESUBMIT FOR APPROVAL.
4. RETAINED FOR INFORMATION.

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Dt: 12/01/2019

Naga Sathish Maduri
Design Engineer / PE&SD
BHEL, HYD-32

DEPT.	UNTOL. DIMS.					ITEMS
PE&SD	GR. ~~C/M/F~~		NTS	-N.A.-	-N.A.-	-N.A.-
CODE. 450						-N.A.-

TITLE: GI CABLE TRAY WITH ACCESSORIES

CARD CODE: N.A.

BHEL DRG NO. PY-VG-4-M104-8908-01-S00-R00

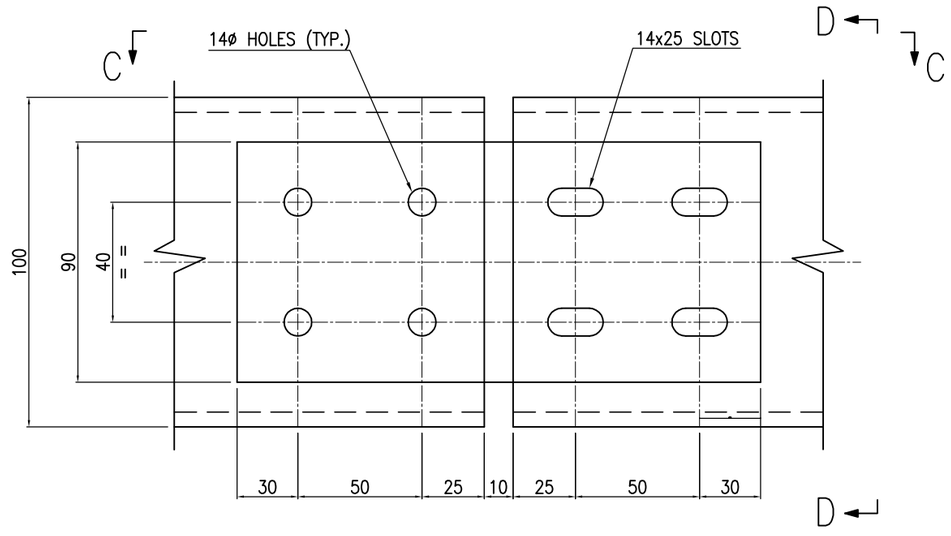
CUST DRG NO. ------

REV. 00

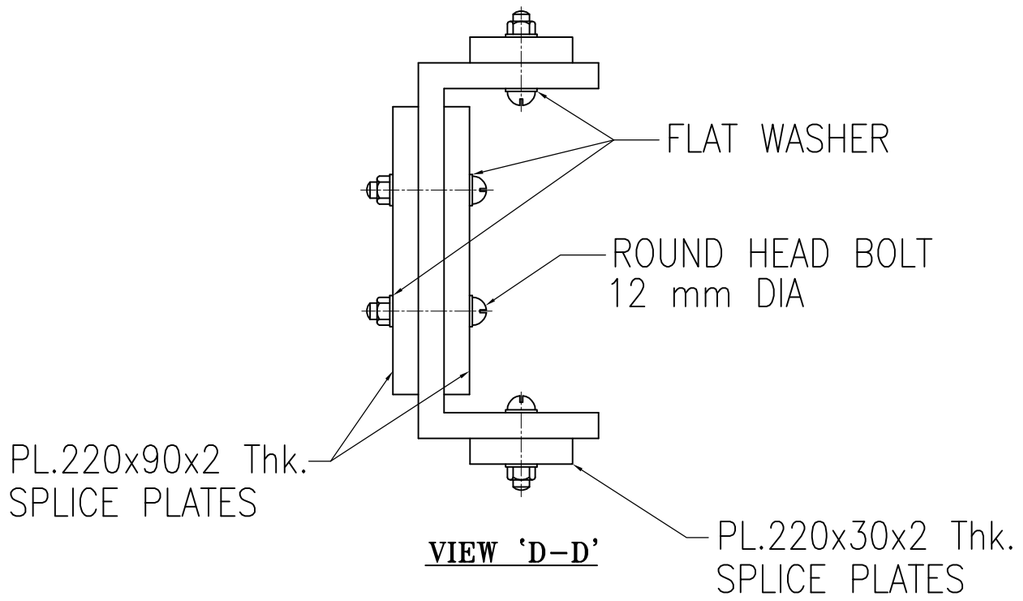
SHT. No 4 NO. OF SHT. 15

PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED.
IN ANY WAY DETRIMENTAL TO THE INTREST OF THE COMPANY

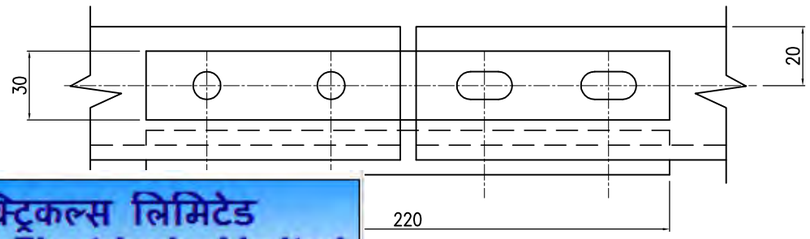
COMPUTER FILE NAME :



DETAIL OF COUPLER PLATE FOR LADDER TRAY



VIEW 'D-D'



W 'C-C'

S & NUTS CONFORMING
LICE PLATE

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Limited
Ramachandrapuram, Hyderabad

PROJECT ENGINEERING & SYSTEMS DIVISION

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Dt: 12/01/2019

Naga Sathish Maduri
Design Engineer / PE & SD
BHEL, HYD-32

LTERED	REV.	DATE	ALTERED
HD/APPD			CHD/APPD
	ZONE		

PROJECT: VISAKHAPATNAM PLANT

OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC: ENGINEERS INDIA LIMITED (EIL), NEW DELHI

MANUFACTURER: RATAN PROJECTS & ENGG. CO. PVT. LTD.
26, P. K. TAGORE STREET, KOLKATA - 700 006, WEST BENGAL, INDIA

P. O. NO . :- T718A00444 DATED 28.12.2018

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

Maharatna Company

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	DKM		05.01.2019	
CHD.	PJ		05.01.2019	-N.A.-
APPD.				

DEPT.	UNTOL. DIMS.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
PE&SD	GR. ~~C/M/F~~		NTS	-N.A.-	-N.A.-	-N.A.-	-N.A.-
CODE. 450							

TITLE: GI CABLE TRAY WITH ACCESSORIES

CARD CODE: N.A.

BHEL DRG NO. PY-VG-4-M104-8908-01-S00-R00

CUST DRG NO. ------

REV. 00

SHT. No 5 NO. OF SHT. 15

ESP-001-8A

GEN. DIM. LIMITS , FITS , & TOLERANCES AS PER P.S :- HY0230261

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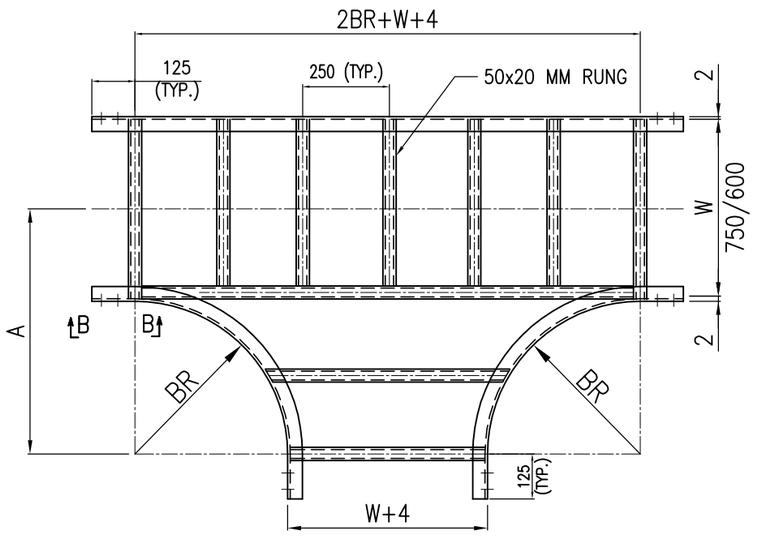
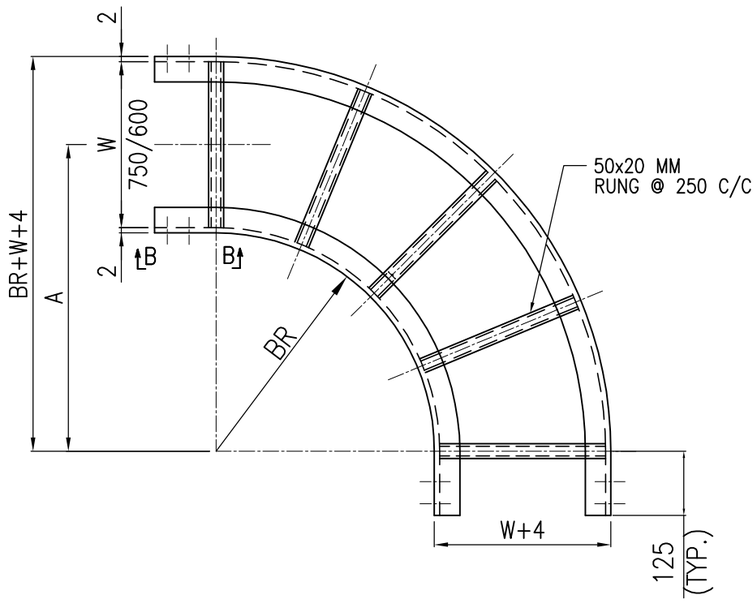
COMPUTER FILE NAME :

REF. DRG. NO. PY-VG-4-M104-8908-01-S00-R00

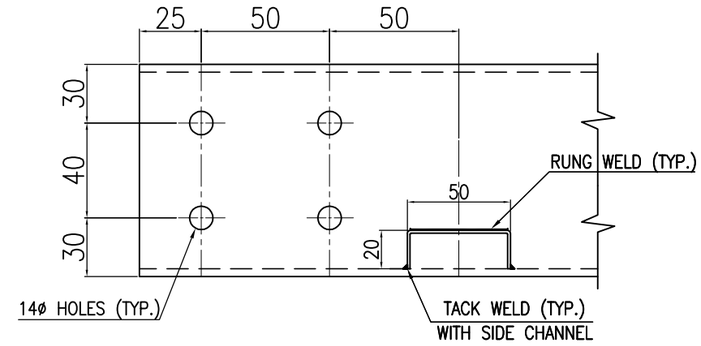
INVENTORY NO



HORIZONTAL TEE
(LADDER TYPE)



90° HORIZONTAL BEND
(LADDER TYPE)



VIEW 'B-B'

DESCRIPTION – LADDER TYPE ACCESSORIES

PACKAGE NO.	P.O. SL. NO.	MATERIAL CODE	TYPE	DEG.	W	BR	A	H	THK.	QTY.(Nos.)	WEB COUPLER PLATE(NOS.)	FLANGE COUPLER PLATE(NOS.)	BOLT(NOS.)	NUT(NOS.)	WASHER(NOS.)
01	01-2	HY7433663258	HORIZONTAL TEE	90°	750	900	1277	100	2.0	15	120	120	960	960	960
02	02-2	HY7433663223	HORIZONTAL TEE	90°	600	900	1202	100	2.0	02	16	16	128	128	128
01	01-3	HY7433663371	HORIZONTAL BEND	90°	750	900	1277	100	2.0	10	40	40	320	320	320
02	02-3	HY7433663347	HORIZONTAL BEND	90°	600	900	1202	100	2.0	25	100	100	800	800	800
COUPLER PLATE & BOLT TOTAL											584	584	2208	2208	2208

NOTES :-

1. M12x20 LONG ELECTROPLATED ROUND HEAD BOLT WITH WASHERS & NUTS CONFORMING TO IS : 1363 & IS : 1367 SHALL BE USED FOR FIXING OF SPLICE PLATE

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Limited
Ramachandrapuram, Hyderabad

PROJECT ENGINEERING & SYSTEMS DIVISION

DESCRIPTION OF CODE :

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Dt: 12/01/2019

Naga Sathish Maduri

PROJECT: VI

OWNER: HINDUST

PMC: ENGIN

MANUFACTURER: RATAN
26, P. K. TA

P. O. NO . :- T718A004

BHARAT HEA
HY[

Maharatna Company

AS PER P.S. :- HY0230261

GEN.

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD
ZONE			ZONE			ZONE		

DEPT.	UNTOL. DIMS. GR.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
PE&SD	~~C/M/F~~		NTS	-N.A.-	-N.A.-	-N.A.-	-N.A.-
CODE. 450							

TITLE: GI CABLE TRAY WITH ACCESSORIES

CARD CODE: N.A.

BHEL DRG NO. PY-VG-4-M104-8908-01-S00-R00

CUST DRG NO. ------

REV. 00

SHT. No 6 | NO. OF SHT. 15

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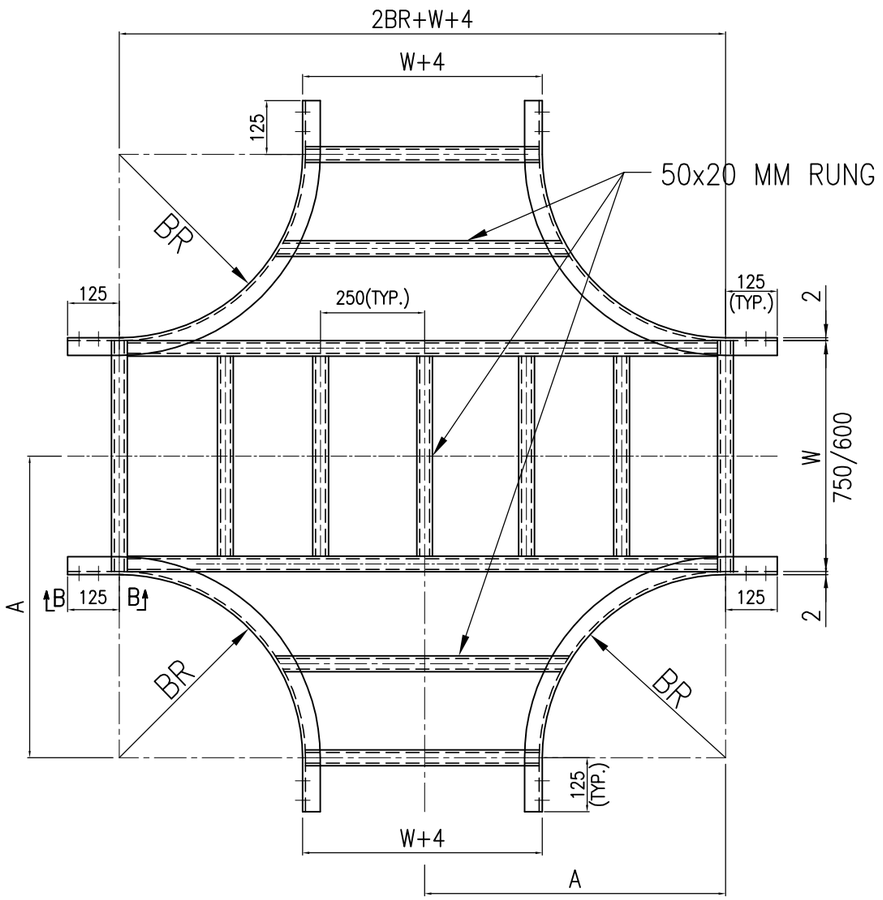
COMPUTER FILE NAME :

REF. DRG. NO. PY-VG-4-M104-8908-01-S00-R00

INVENTORY NO

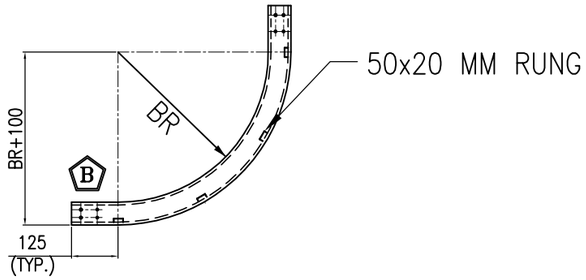


HORIZONTAL CROSS
(LADDER TYPE)

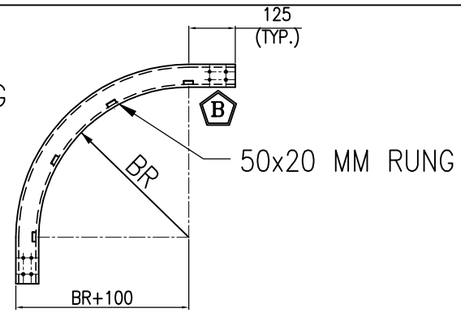
DESCRIPTION – LADDER TYPE ACCESSORIES															
PACKAGE NO.	P.O. SL NO.	MATERIAL CODE	TYPE	DEG.	W	BR	A	H	THK.	QTY.(Nos.)	WEB COUPLER PLATE(NOS.)	FLANGE COUPLER PLATE(NOS.)	BOLT(NOS.)	NUT(NOS.)	WASHER(NOS.)
01	01-4	HY7433663584	VER. OUTSIDE BEND	90°	750	900	--	100	2.0	15	60	60	480	480	480
02	02-4	HY7433663525	VER. OUTSIDE BEND	90°	600	900	--	100	2.0	10	40	40	320	320	320
01	01-5	HY7433663592	VER. INSIDE BEND	90°	750	900	--	100	2.0	15	60	60	480	480	480
02	02-5	HY7433663533	VER. INSIDE BEND	90°	600	900	--	100	2.0	20	80	80	640	640	640
01	01-6	HY7433663916	HORIZONTAL CROSS	90°	750	900	1277	100	2.0	05	40	40	320	320	320
02	02-6	HY7433663886	HORIZONTAL CROSS	90°	600	900	1202	100	2.0	02	16	16	128	128	128
COUPLER PLATE & BOLT TOTAL											296	296	2368	2368	2368

NOTES :-

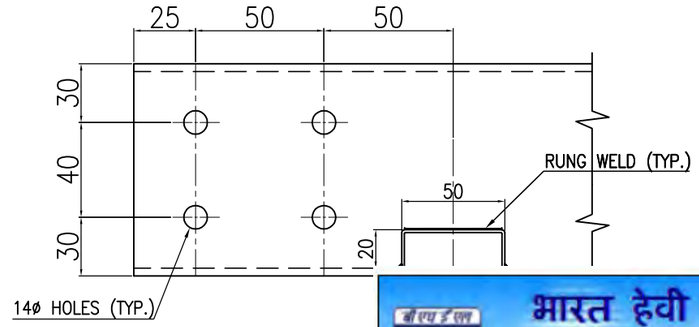
1. M12x20 LONG ELECTROPLATED ROUND HEAD BOLT WITH WASHERS & NUTS CONFORMING TO IS : 1363 & IS : 1367 SHALL BE USED FOR FIXING OF SPLICE PLATE



90° INSIDE (DN.) VERTICAL BEND
(LADDER TYPE)



90° OUTSIDE (UP) VERTICAL BEND
(LADDER TYPE)



VIEW 'B-B' /]

AS PER P.S. :- HY0230261

GEN.

PROJECT: VI

OWNER: HINDUST

PMC: ENGIN

MANUFACTURER: RATAN
26, P. K. TA

P. O. NO . :- T718A004

BHARAT HEA
HY[

Maharatna Company

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Limited
Ramachandrapuram, Hyderabad

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Dt: 12/01/2019

Naga Satish Maduri
Design Engineer / PE & SD
BHEL, HYD-32

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD
ZONE			ZONE			ZONE		

APPD.						
DEPT. PE&SD	UNTOL. DIMS. GR. C/M/F		SCALE NTS	WEIGHT (KG) -N.A.-	REF. TO ASSY. DRG. -N.A.-	ITEM NO. -N.A.-	NO.OF ITEMS -N.A.-
CODE. 450							

TITLE: GI CABLE TRAY WITH ACCESSORIES

CARD CODE N.A.

BHEL DRG NO. PY-VG-4-M104-8908-01-S00-R00

CUST DRG NO. ------

REV. 00

SHT. No 7 | NO. OF SHT. 15

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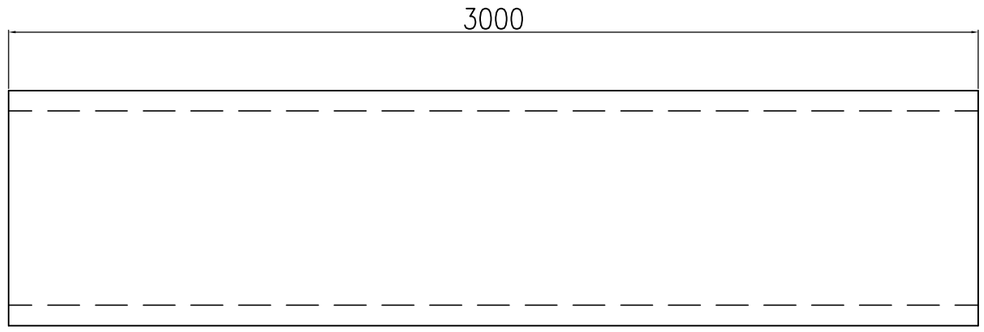
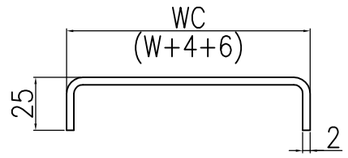
COMPUTER FILE NAME :

REF. DRG. NO. PY-VG-4-M104-8908-01-S00-R00

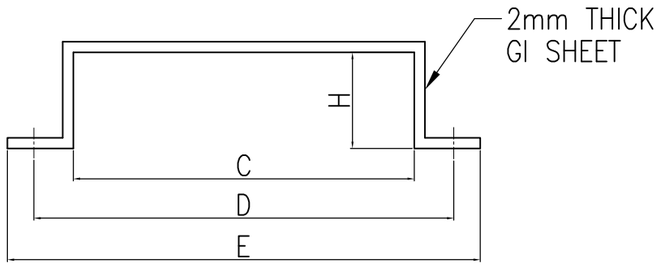
INVENTORY NO



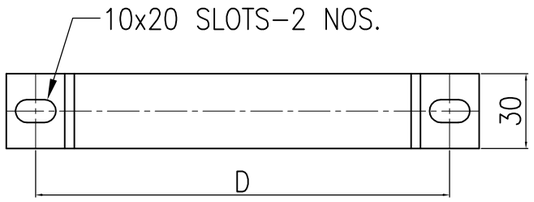
CABLE TRAY COVER-PLAN



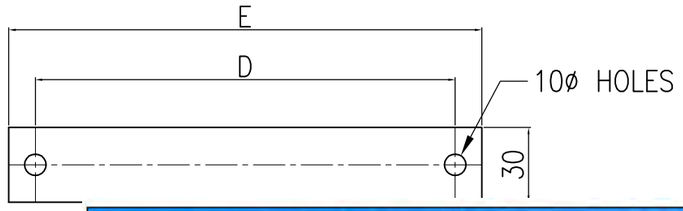
CABLE TRAY COVER-ELEVATION



TOP CLAMP STRIP-ELEVATION



TOP CLAMP STRIP-PLAN



BO

DETAIL OF COVER FOR LADDER TYPE CABLE TRAY

DESCRIPTION – COVER FOR LADDER TYPE TRAY													
PACKAGE NO.	P.O. SL NO.	MATERIAL CODE	TYPE	WC	C	D	E	H	QTY.(Nos.)	COVER CLAMP(SETS)	BOLT(NOS.)	NUT(NOS.)	WASHER(NOS.)
01	01-7	HY7433663118	COVER FOR 750mm TRAY	760	764	799	828	100	25	75	150	150	150
02	02-7	HY7433663126	COVER FOR 600mm TRAY	610	614	648	678	100	50	150	300	300	300
03	03-2	HY7433663142	COVER FOR 300mm TRAY	310	314	348	378	100	25	75	150	150	150
COVER CLAMP & BOLT TOTAL										300	600	600	600

NOTES :-

1. M8x20 LONG ELECTROPLATED ROUND HEAD BOLT WITH WASHERS & NUTS CONFORMING TO IS : 1363 & IS : 1367 SHALL BE USED FOR FIXING OF COVER CLAMP

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD
ZONE			ZONE			ZONE		

PROJECT: VI

OWNER: HINDUST

PMC: ENGIN

MANUFACTURER: RATAN
26, P. K. TA

P. O. NO. :- T718A004

BHARAT HEA
HYD

Maharatna Company

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Limited
Ramachandrapuram, Hyderabad

PROJECT ENGINEERING & SYSTEMS DIVISION

DESCRIPTION OF CODE :

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Dt: 12/01/2019

Naga Satish Maduri

APPD.

DEPT.	UNTOL. DIMS. GR.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
PE&SD	~~C/M/F~~		NTS	-N.A.-	-N.A.-	-N.A.-	-N.A.-
CODE. 450							

TITLE: GI CABLE TRAY WITH ACCESSORIES

CARD CODE: N.A.

BHEL DRG NO. PY-VG-4-M104-8908-01-S00-R00

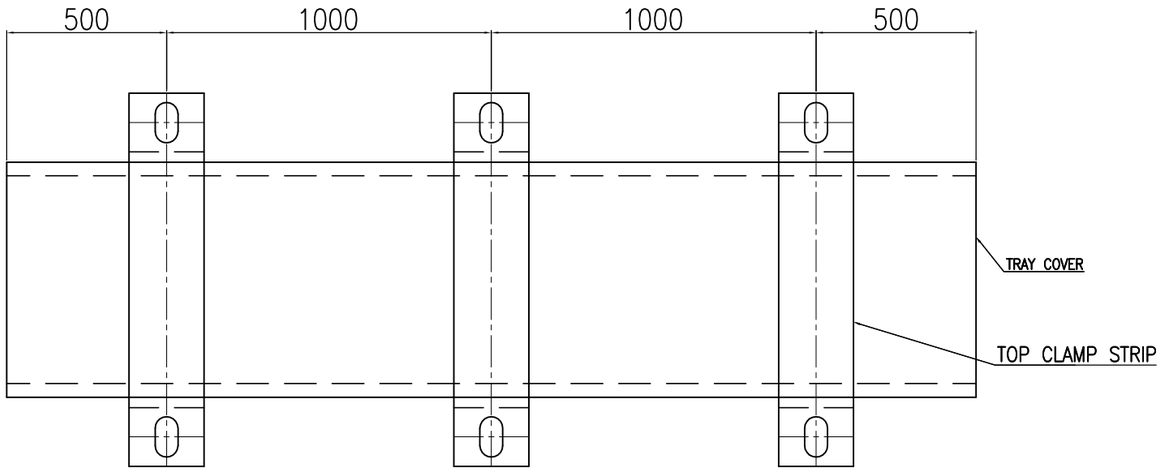
CUST DRG NO. _____

REV. 00

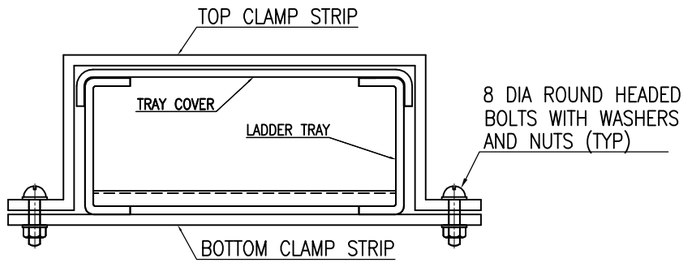
SHT. No 8 | NO. OF SHT. 15

GEN.

AS PER P.S :- HY0230261



CABLE TRAY COVER WITH ACCESSORIES–PLAN



CABLE TRAY COVER WITH ACCESSORIES–ELEVATION

COVER ASSEMBLY
FOR LADDER TYPE CABLE TRAY

NOTES :–

1. M8x20 LONG ELECTROPLATED ROUND HEAD BOLT WITH WASHERS & NUTS CONFORMING TO IS : 1363 & IS : 1367 SHALL BE USED FOR FIXING OF COVER CLAMP

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Limited
Ramachandrapuram, Hyderabad

PROJECT ENGINEERING & SYSTEMS DIVISION

DESCRIPTION OF CODE :

1. APPROVED.
2. APPROVED WITH MINOR COMMENTS. RELEASED FOR MANUFACTURING SUBJECT TO INCORPORATION OF COMMENTS. RESUBMIT FOR FINAL APPROVAL.
3. REVISE AS PER BHEL COMMENTS AND RESUBMIT FOR APPROVAL.
4. RETAINED FOR INFORMATION.

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Dt: 12/01/2019

Naga Sathish Maduri
Design Engineer/PE & SD

PROJECT: VISAKHAPATNAM PLANT

OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC: ENGINEERS INDIA LIMITED (EIL), NEW DELHI

MANUFACTURER: RATAN PROJECTS & ENGG. CO. PVT. LTD.
26, P. K. TAGORE STREET, KOLKATA - 700 006, WEST BENGAL, INDIA

P. O. NO . :- T718A00444 DATED 28.12.2018

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD
Maharatna Company

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	DKM		05.01.2019	–N.A.–
CHD.	PJ		05.01.2019	
APPD.				

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD
ZONE			ZONE			ZONE		

DEPT.	UNTOL. DIMS. GR.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
PE&SD	~~C/M/F~~	NTS	–N.A.–	–N.A.–	–N.A.–	–N.A.–
CODE. 450						

TITLE: GI CABLE TRAY WITH ACCESSORIES

CARD CODE: N.A.

BHEL DRG NO. PY–VG–4–M104–8908–01–S00–R00 REV. 00

CUST DRG NO. _____

SHT. No 9 NO. OF SHT. 15

INVENTORY NO | REF. DRG. NO. PY–VG–4–M104–8908–01–S00–R00 | COMPUTER FILE NAME :

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GEN. DIM. LIMITS , FITS , & TOLERANCES AS PER P.S. :– HY0230261

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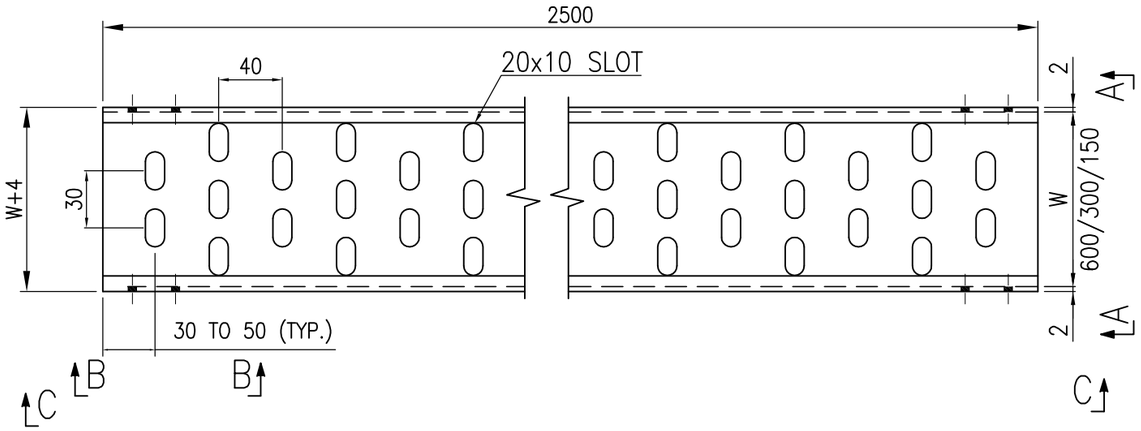
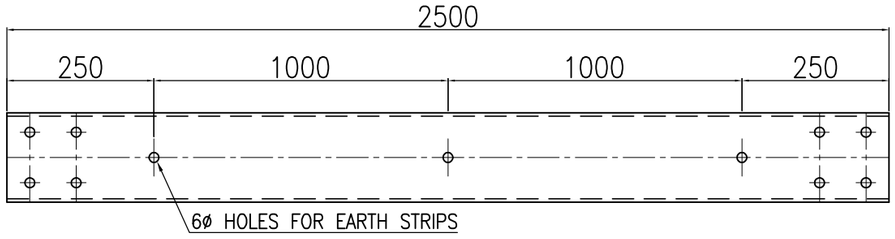
COMPUTER FILE NAME :

REF. DRG. NO. PY-VG-4-M104-8908-01-S00-R00

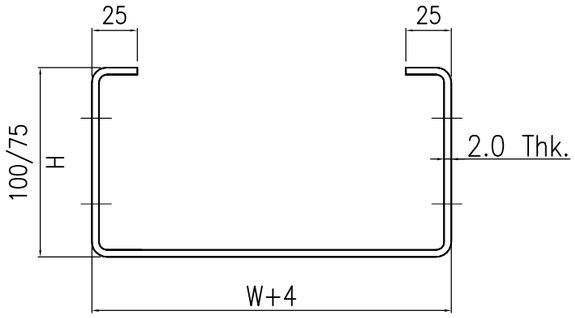
INVENTORY NO



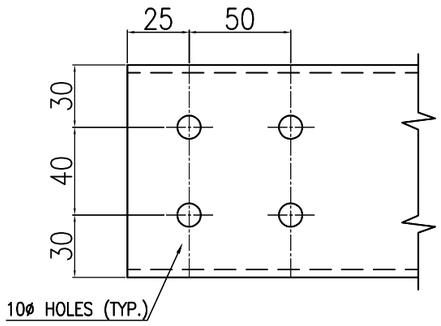
PERFORMATED TYPE CABLE TRAY – 600/300/150mm WIDTH



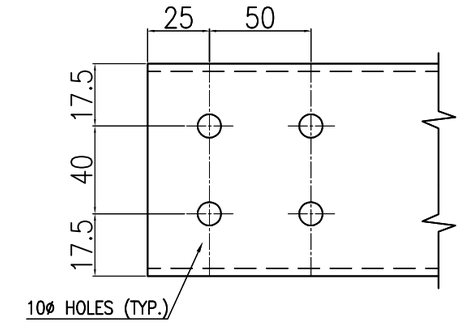
VIEW 'C–C'



VIEW 'A–A'



VIEW 'B–B' FOR 600W



DESCRIPTION												
PACKAGE NO.	P.O. SL. NO.	MATERIAL CODE	ITEM	W	H	L	THK.	QTY.(NOS.)	COUPLER PLATE(NOS.)	BOLT(NOS.)	NUT(NOS.)	WASHER(NOS.)
04	04–1	HY7433665021	PERFORATED TRAY	600	100	2500	2.0	200	800	3200	3200	3200
05	05–1	HY7433665048	PERFORATED TRAY	300	75	2500	2.0	100	400	1600	1600	1600
06	06–1	HY7433665056	PERFORATED TRAY	150	75	2500	2.0	2100	8400	33600	33600	33600
COUPLER PLATE & BOLT TOTAL									9600	38400	38400	38400

NOTES :–

1. M8x20 LONG ELECTROPLATED ROUND HEAD BOLT WITH WASHERS & NUTS CONFORMING TO IS : 1363 & IS : 1367 SHALL BE USED FOR FIXING OF SPLICE PLATE
2. W – WIDTH OF CABLE TRAY (600/300/150)

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD
ZONE			ZONE			ZONE		

PROJECT: V

OWNER: HINDUS

PMC: ENGIN

MANUFACTURER: RATAI
26, P. K. T

P. O. NO . :- T718A00

BHARAT HEA
HY

Maharatna Company

DEPT. PE&SD

CODE. 450

UNTOL. DIMS. GR. ~~C/M/F~~

Dt: 12/01/2019

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Limited
Ramachandrapuram, Hyderabad

PROJECT ENGINEERING & SYSTEMS DIVISION

DESCRIPTION OF CODE :

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Naga Sathish Maduri
Design Engineer / PE & SD
B.H.E.L. Hyd. BHEL, HYD-32

TITLE

GI CABLE TRAY WITH ACCESSORIES

CARD CODE N.A.

BHEL DRG NO. PY-VG-4-M104-8908-01-S00-R00

CUST DRG NO. ------

REV. 00

SHT. No 10 | NO. OF SHT. 15

GEN. DIMS. LIMITS, FITS, & TOLERANCES AS PER P.S. :- HY0230261

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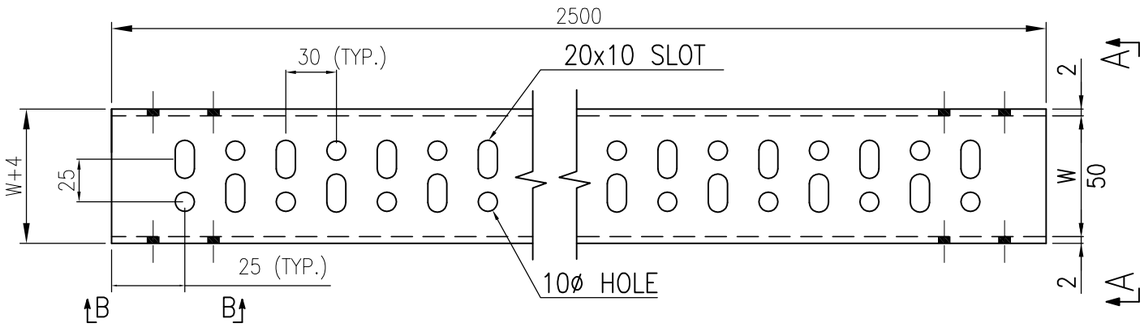
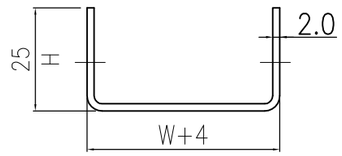
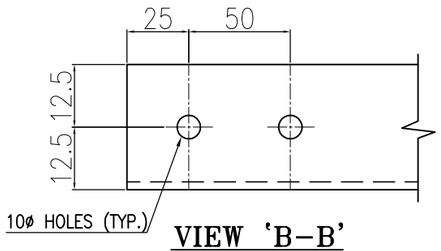
COMPUTER FILE NAME : REF. DRG. NO. PY-VG-4-M104-8908-01-S00-R00



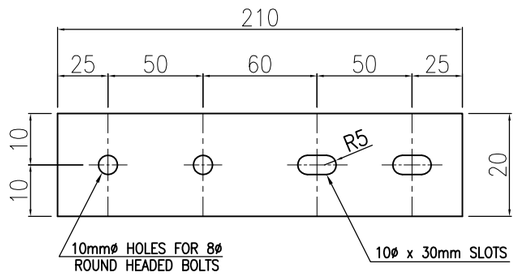
PERFORATED TYPE CABLE TRAY – 50mm WIDTH

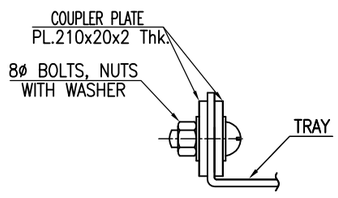


VIEW 'A–A'



VIEW 'B–B'





COUPLER PLATE DETAILS

DESCRIPTION												
PACKAGE NO.	P.O. SL. NO.	MATERIAL CODE	ITEM	W	H	L	THK.	QTY.(NOS.)	COUPLER PLATE(NOS.)	BOLT(NOS.)	NUT(NOS.)	WASHER(NOS.)
07	07–1	HY7433665064	PERFORATED TRAY	50	25	2500	2.0	250	1000	2000	2000	2000

NOTES :–

1. M8x20 LONG ELECTROPLATED ROUND HEAD BOLT WITH WASHERS & NUTS CONFORMING TO IS : 1363 & IS : 1367 SHALL BE USED FOR FIXING OF SPLICE PLATE
2. W – WIDTH OF CABLE TRAY (50)

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD
ZONE			ZONE			ZONE		

INVENTORY NO

S.:– HY0230261

GEN. DIM. LIMITS

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Limited
Ramachandrapuram, Hyderabad

PROJECT ENGINEERING & SYSTEMS DIVISION

DESCRIPTION OF CODE :

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Dt: 12/01/2019

Naga Sathish Maduri
Design Engineer/PE&SD
BHEL-HYD-33

PROJECT: VIS

OWNER: HINDUSTA

PMC: ENGINEE

MANUFACTURER: RATAN
26, P. K. TAGORE STREET, KOLKATA - 700 006, WEST BENGAL, INDIA

P. O. NO. :- T718A00444 DATED 28.12.2018

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD
Maharatna Company

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	DKM		05.01.2019	–N.A.–
CHD.	PJ		05.01.2019	
APPD.				

DEPT.	UNTOL. DIMS. GR.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
PE&SD	~~C/M/F~~		NTS	–N.A.–	–N.A.–	–N.A.–	–N.A.–
CODE. 450							

TITLE: GI CABLE TRAY WITH ACCESSORIES

CARD CODE: N.A.

BHEL DRG NO. PY–VG–4–M104–8908–01–S00–R00

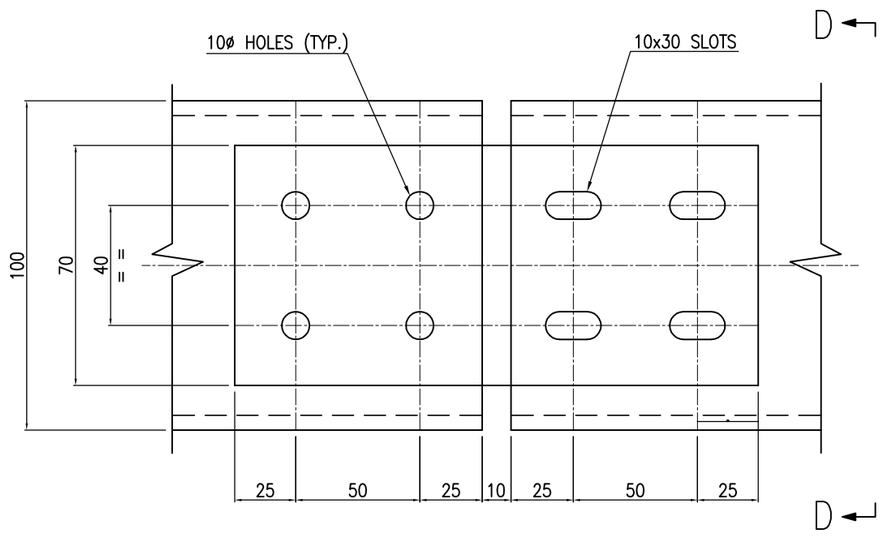
CUST DRG NO. ––––––

REV. 00

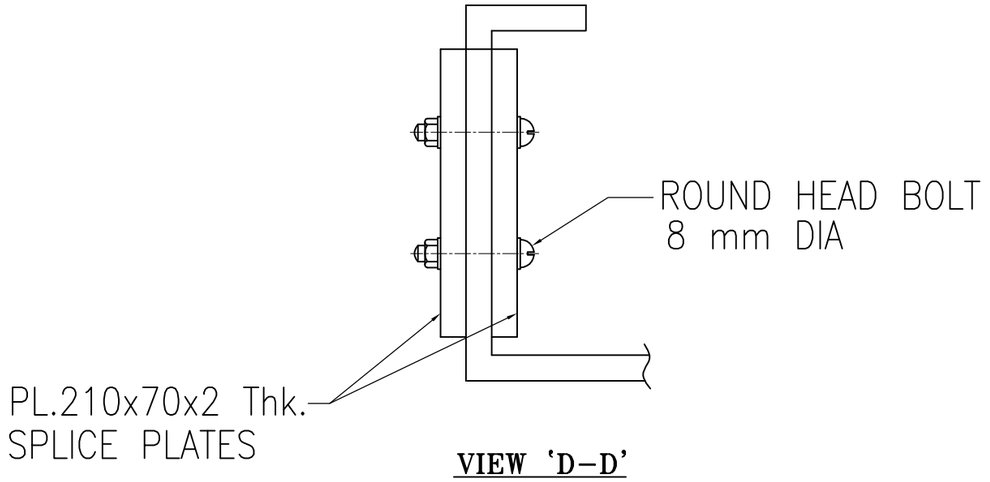
SHT. No 11 NO. OF SHT. 15

OPERTY OF BHARAT HEAVY ELECTRICALS LIMITED.
IN ANY WAY DETRIMENTAL TO THE INTREST OF THE COMPANY

IPUTER FILE NAME :



DETAIL OF COUPLER PLATE
FOR 600/450/300/150W PERFORATED TRAY



VIEW 'D-D'

GEN. DIM. LIMITS, FITS, & TOLERANCES AS PER P.S :- HY0230261

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Limited
Ramachandrapuram, Hyderabad

PROJECT ENGINEERING & SYSTEMS DIVISION

DESCRIPTION OF CODE :

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Dt: 12/01/2019

Naga Sathish Maduri
नाग सतीश मेदुरी
Design Engineer/PE&SD
भा.ह.वि.लि. हैदराबाद, BHEL-HYD-03

PROJECT: VISAKHAPATNAM PLANT

OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC: ENGINEERS INDIA LIMITED (EIL), NEW DELHI

MANUFACTURER: RATAN PROJECTS & ENGG. CO. PVT. LTD.
26, P. K. TAGORE STREET, KOLKATA - 700 006, WEST BENGAL, INDIA

P. O. NO. :- T718A00444 DATED 28.12.2018

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD
Maharatna Company

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	DKM		05.01.2019	-N.A.-
CHD.	PJ		05.01.2019	
APPD.				

ERED	REV.	DATE	ALTERED
/APPD			CHD/APPD
	ZONE		

DEPT.	UNTOL. DIMS. GR.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
PE&SD	~~C/M/F~~		NTS	-N.A.-	-N.A.-	-N.A.-	-N.A.-
CODE. 450							

TITLE: GI CABLE TRAY WITH ACCESSORIES

CARD CODE: N.A.

BHEL DRG NO. PY-VG-4-M104-8908-01-S00-R00 REV. 00

CUST DRG NO. ------

SHT. No 12 NO. OF SHT. 15

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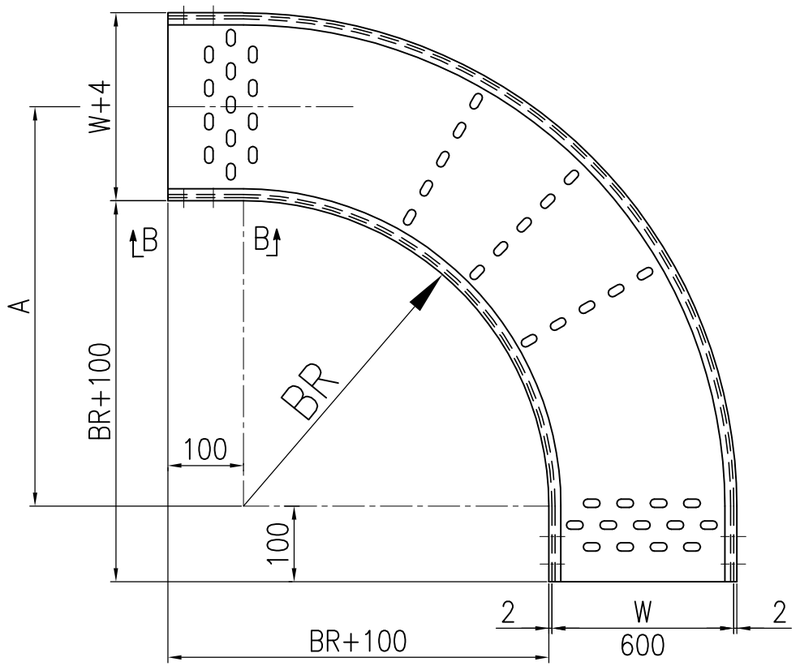
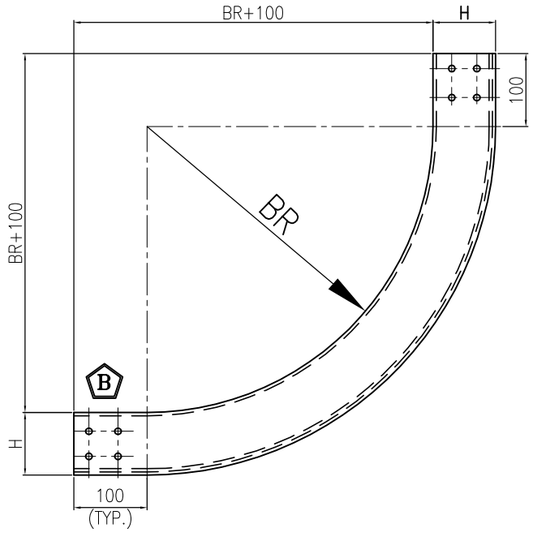
COMPUTER FILE NAME : PY-VG-4-M104-8908-01-S00-R00

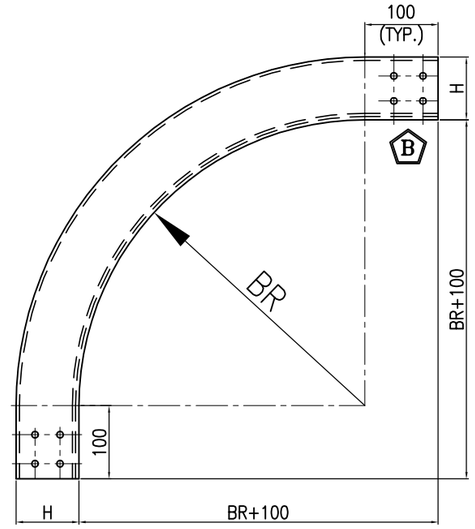
REF. DRG. NO. PY-VG-4-M104-8908-01-S00-R00



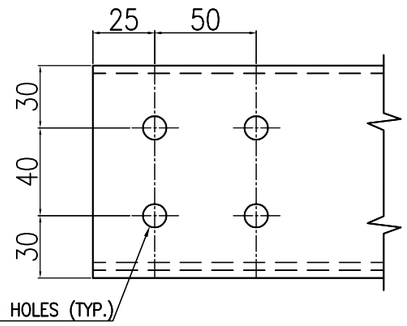
90° HORIZONTAL BEND
(PERFORATED TYPE)



90° INSIDE (DN.) VERTICAL BEND
(PERFORATED TYPE)



90° OUTSIDE (UP) VERTICAL BEND
(PERFORATED TYPE)



VIEW 'B-B' / DETAIL 'B'
FOR 600W

DESCRIPTION – PERFORATED TYPE ACCESSORIES

PACKAGE NO.	P.O. SL. NO.	MATERIAL CODE	TYPE	DEG.	W	BR	A	H	THK.	QTY.(Nos.)	COUPLER PLATE(NOS.)	BOLT(NOS.)	NUT(NOS.)	WASHER(NOS.)
04	04-2	HY7433665390	HORIZONTAL BEND	90°	600	900	1202	100	2.0	05	20	80	80	80
04	04-3	HY7433665595	VER. OUTSIDE BEND	90°	600	900	--	100	2.0	05	20	80	80	80
04	04-4	HY7433665609	VER. INSIDE BEND	90°	600	900	--	100	2.0	06	24	96	96	96
COUPLER PLATE & BOLT TOTAL											196	256	256	256

NOTES :-

1. M8x20 LONG ELECTROPLATED ROUND HEAD BOLT WITH WASHERS & NUTS CONFORMING TO IS : 1363 & IS : 1367 SHALL BE USED FOR FIXING OF SPLICE PLATE

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Limited
Ramachandrapuram, Hyderabad

PROJECT ENGINEERING & SYSTEMS DIVISION

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Dt: 12/01/2019

Naga Sathish Medur
Design Engineer / PE & SD

PROJECT: V

OWNER: HINDU

PMC: ENGI

MANUFACTURER: RATA
26, P. K.

P. O. NO. :- T718AC

BHARAT HE
H

Maharatna Company

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD
ZONE			ZONE			ZONE		

INVENTORY NO

DEPT.	UNTOL. DIMS. GR.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
PE&SD	~~C/M/F~~		NTS	-N.A.-	-N.A.-	-N.A.-	-N.A.-
CODE. 450							

CHD. APPD.

TITLE: GI CABLE TRAY WITH ACCESSORIES

CARD CODE: N.A.

BHEL DRG NO. PY-VG-4-M104-8908-01-S00-R00

CUST DRG NO. ------

REV. 00

SHT. No 13 NO. OF SHT. 15

GEN. DIM. LIMITS , FITS , & TOLERANCES AS PER P.S :- HY0230261

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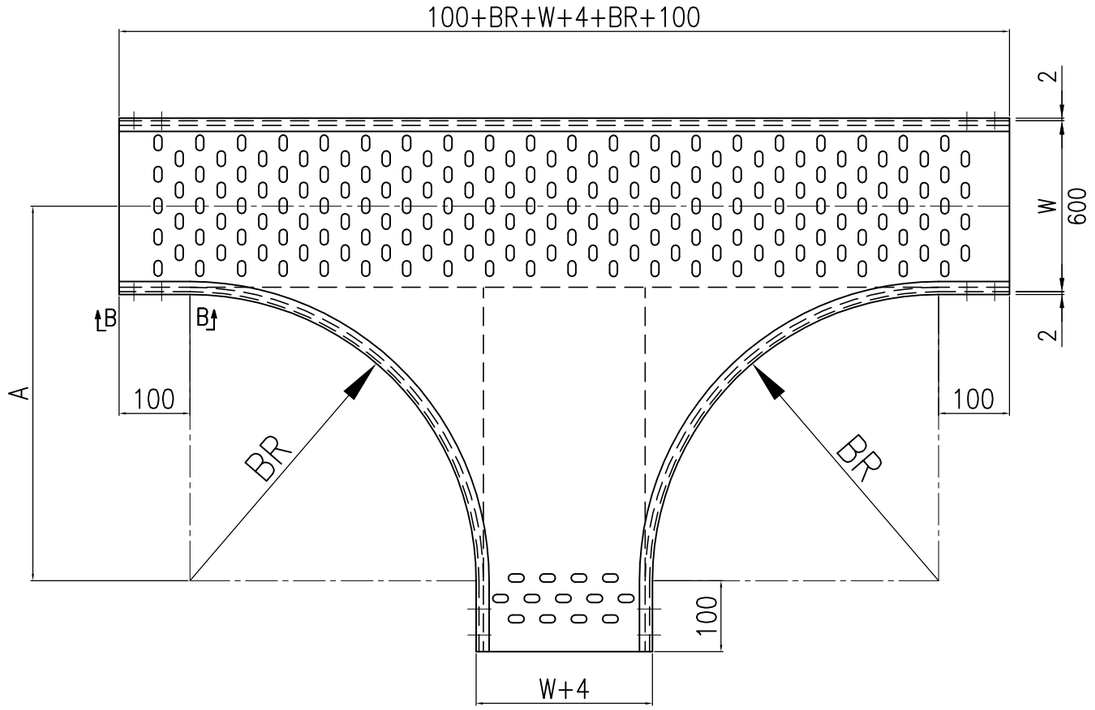
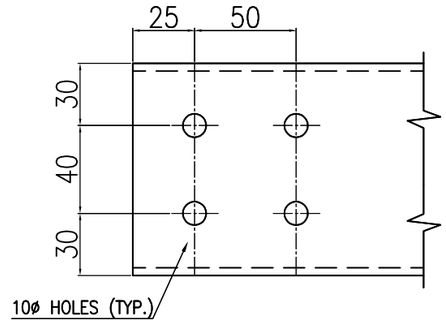
INVENTORY NO



90° HORIZONTAL TEE
(PERFORATED TYPE)



VIEW 'B-B' FOR 600W

DESCRIPTION – PERFORATED TYPE ACCESSORIES

PACKAGE NO.	P.O. SL. NO.	MATERIAL CODE	TYPE	DEG.	W	BR	A	H	THK.	QTY.(Nos.)	COUPLER PLATE(NOS.)	BOLT(NOS.)	NUT(NOS.)	WASHER(NOS.)
04	04-5	HY7433665269	HORIZONTAL TEE	90°	600	900	1202	100	2.0	03	24	96	96	96

NOTES :-

1. M8x20 LONG ELECTROPLATED ROUND HEAD BOLT WITH WASHERS & NUTS CONFORMING TO IS : 1363 & IS : 1367 SHALL BE USED FOR FIXING OF SPLICE PLATE

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD
ZONE			ZONE			ZONE		

ER P.S.:- HY0230261

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Limited
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PROJECT ENGINEERING & SYSTEMS DIVISION

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Dt: 12/01/2019

Naga Sathish Maduri
Design Engineer / P.E. & S.D.
B.H.E.L. Hyderabad-93

PROJECT: VISA

OWNER: HINDUSTAN

PMC: ENGINEE

MANUFACTURER: RATAN P
26, P. K. TAGO

P. O. NO. :- T718A00444

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD
Maharatna Company

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	DKM		05.01.2019	-N.A.-
CHD.	PJ		05.01.2019	
APPD.				

DEPT.	UNTOL. DIMS. GR.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
PE&SD	~~C/M/F~~		NTS	-N.A.-	-N.A.-	-N.A.-	-N.A.-
CODE. 450							

TITLE: GI CABLE TRAY WITH ACCESSORIES

CARD CODE: N.A.

BHEL DRG NO. PY-VG-4-M104-8908-01-S00-R00 REV. 00

CUST DRG NO. _____

SHT. No 14 NO. OF SHT. 15

GEN. DIM. L

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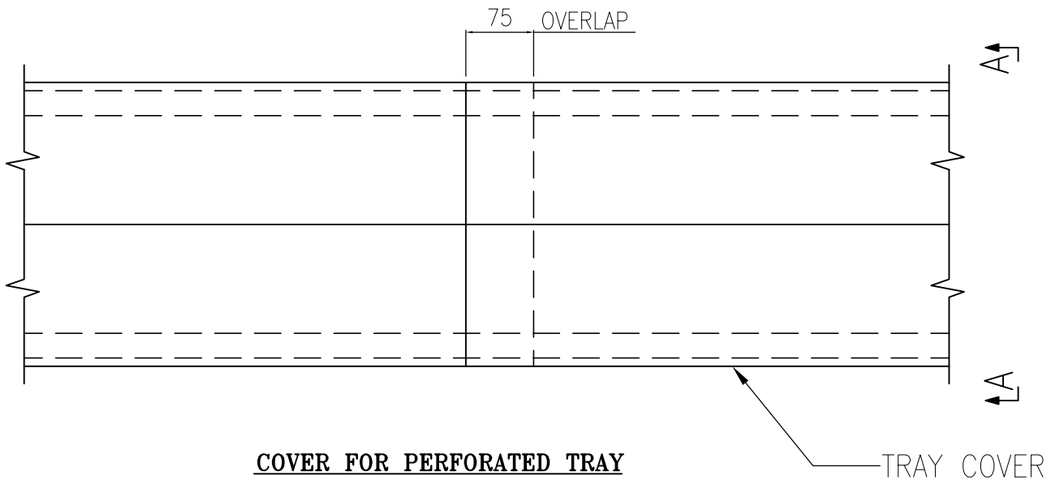
IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTREST OF THE COMPANY

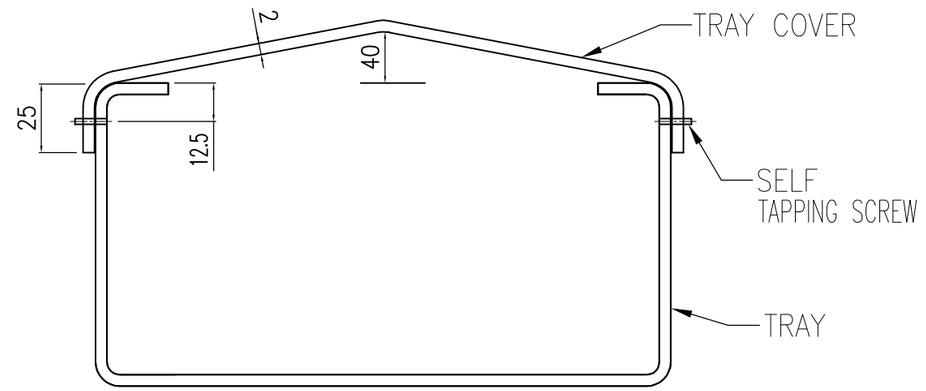
COMPUTER FILE NAME :

REF. DRG. NO. PY-VG-4-M104-8908-01-S00-R00

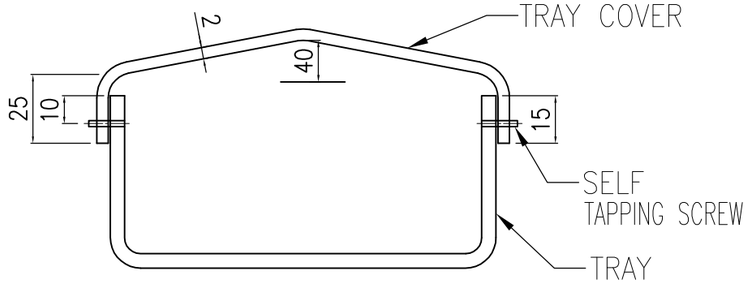
INVENTORY NO



COVER FOR PERFORATED TRAY
2500 mm LONG



VIEW 'A-A'
COVER FOR 600/300/150W PERFORATED TRAY



VIEW 'A-A'
COVER FOR 50W PERFORATED TRAY

DESCRIPTION – COVER FOR PERFORATED TYPE TRAY					
PACKAGE NO.	P.O. SL NO.	MATERIAL CODE	TYPE	QTY.(Nos.)	SELF TAPPING SCREW (Nos.)
04	04-6	HY7433665145	COVER FOR 600mm TRAY	50	200
05	05-2	HY7433665161	COVER FOR 300mm TRAY	37	148
06	06-2	HY7433665170	COVER FOR 150mm TRAY	700	2800
07	07-2	HY7433665188	COVER FOR 50mm TRAY	100	400
SELF TAPPING SCREW TOTAL					3548

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Limited
Ramachandrapuram, Hyderabad

PROJECT ENGINEERING & SYSTEMS DIVISION

DESCRIPTION OF CODE :

1. APPROVED.
2. APPROVED WITH MINOR COMMENTS. RELEASED FOR MANUFACTURING SUBJECT TO INCORPORATION OF COMMENTS. RESUBMIT FOR FINAL APPROVAL.
3. REVISE AS PER BHEL COMMENTS AND RESUBMIT FOR APPROVAL.
4. RETAINED FOR INFORMATION.

This approval does not absolve the vendor from the responsibility to comply with BHEL's specification and all applicable codes and standards. Vendor has to ensure safe and smooth operation and meet the intended performance of the equipment.

Dt: 12/01/2019

Naga Sathish Maduri
Design Engineer / PE & SD
BHEL, Hyderabad

PROJECT:

OWNER: HINDU

PMC: ENGI

MANUFACTURER: RATA
26, P. K.

P. O. NO. :- T718AC

BHARAT HI

Maharatna Company

REV.	DATE	ALTERED CHD/APPD	REV.	DATE	ALTERED CHD/APPD	REV.	DATE	ALTERED CHD/APPD
ZONE			ZONE			ZONE		

DEPT.	UNTOL. DIMS.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
PE&SD	GR. C/M/F		NTS	–N.A.–	–N.A.–	–N.A.–	–N.A.–
CODE. 450							

APPD. –N.A.–

TITLE: GI CABLE TRAY WITH ACCESSORIES

CARD CODE: N.A.

BHEL DRG NO. PY-VG-4-M104-8908-01-S00-R00

CUST DRG NO. ------

REV. 00

SHT. No 15 NO. OF SHT. 15

ESP-001-8A

GEN. DIM. LIMITS, FITS, & TOLERANCES AS PER P.S :- HY0230261