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ANNEXURE TO INDENT-CUM-ENQUIRY	340604011	DTD: 24-11-20
DESCRIPTION OF EQUIPMENT	NITROGEN INJECTION BASED FIRE PROTECTION AND EXTINGUISHING SYSTEM FOR 275 MVA, 420 KV, 1-PH GEN. TRANSFORMER	
WORK ORDER NO.	69001-A-512-01	
CUSTOMER	M/s MAHAGENCO, Bhusawal	

SPECIFICATION FOR NITROGEN INJECTION BASED FIRE PREVENTION AND EXTINGUISHING SYSTEM



1.0 General:-

Nitrogen Injection, drain and Stir Method type fire prevention and extinguishing system along with all associated fitting and control equipments. The system is required for 4 nos. 275 MVA, 420 kV Generator Transformer as per OGA drawing no. 34920000001 (4 sheets) having total oil capacity of 63000 liters approximately in each transformer.

The bidder shall furnish full details of the fire extinguishing system offered. The system offered shall comply with the following requirements:

2.0 Details Of Prevention/Extinguishing System:-

- A. The fire protection/prevention system shall work on the oil drain, Nitrogen Inject and Stir method. The system shall operate correctly during fire on transformer due to internal or external factors, including fire due to bursting of transformer bushing. Fire detectors (bulb type or linear heat detector type) provided on the transformer top cover / body shall take minimum time for detection of fire and initiate the fire protection system. The Bidder shall give complete details of the system and also arrange to demonstrate the operation of the fire fighting system, if desired by the Purchaser.
- B. The system may have its own power supply unit for operation during A/C failure condition. Alternatively, systems suitable for operation on station DC aux. supply (220V/110V DC) may be offered. The system shall operate in 'Auto'/'Remote Electrical'/'Local Manual' modes. Provision shall be available to keep the system "OUT", which is necessary for preventing any mal-operation during transformer maintenance.
- C. The fire fighting system shall be compatible to be hooked on to the station SCADA/ fire alarm system. Systems using micro processor/micro-controller will be given preference.
- D. The fire fighting system should have its own temperature sensors to detect all types of fires.

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						CKD	S SACHDEVA		26.6.20
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On detection of fire (by the sensors) and receipt of positive feedback signal regarding "Master trip relay operated" the system shall start operation, initially draining out top level oil in the main tank and simultaneously closing the valve in the conservator line and then start nitrogen injection into the transformer tank.

- E. The system shall have built-in on line testing facility, which will be operatable without affecting the functioning of the transformer.
- F. On initiation of the fire extinguishing system on detection of fire, if the circuit breakers fail to trip/trip-relay fails to operate, suitable audible alarm should be sounded so as to call the attention of the operator to trip the breakers manually, and simultaneously initiating the oil drain and nitrogen injection system. The manual operating system shall be used only in case the automatic system fails to operate and hence the arrangement for manual operation shall be provided in a box and shall be accessible only after breaking the glass cover on this box.

The Bidder shall confirm whether it is advisable to initiate the "oil drain and nitrogen injection" manually even when the transformer is not electrically isolated due to stuck breaker problem.

- G. The system shall preferably have built-in facility for monitoring/display of the following:
- i. Oil temperature.
 - ii. Tank pressure.
 - iii. Healthiness of all sensors.
 - iv. 'Open'/'Close' status of valves.
- H. Provision shall be available for annunciation (alongwith audible alarm) of the following:
- i. Increase in temperature of oil/tank pressure beyond the set limit.
 - ii. Detection of fire due to external causes.
 - iii. Low nitrogen pressure.
 - iv. System initiated (automatic)
 - v. Automatic operation failed.
 - vi. Control cable faulty.
- I. All valves used in the system shall preferably be stainless steel ball type together with flanges. By-pass valves along with electrical limit switches shall be provided wherever required. The connecting cables shall be Fire Retardant Low Smoke (FRLS) armoured cables. Cables passing along the top of the transformer shall be Fire Survival (FS) type.

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- J. Fire extinction cubicle shall be of robust design/construction and shall accommodate the Nitrogen gas cylinder of adequate capacity and associated accessories like, regulators, stainless steel tubings, etc. The cubicle shall have a degree of protection not less than IP-56.
- K. The remote control panel, to be mounted inside the control room shall accommodate the necessary control unit operating switches, push buttons, etc., as also the display unit and alarm annunciation unit.
- L. The Bidder shall furnish the complete details including bill of materials of the fire extinguishing/fire prevention system offered. The list of all accessories including FRLS & Fire Survival cables, pipes, valves, sensors, control cubicle, Nitrogen gas cylinder, etc shall be listed out and furnished in the offer.
- M. The Bidder/manufacturer shall ensure that the fire protection/prevention system offered is fool-proof and reliable.
- N. Fire Protection System should be capable of working on Automatic Mode, Remote Electrical mode and Local manual mode.
- O. The Fire Fighting Scheme for the power transformer should have authentic certification regarding performance issued by any standard approved laboratory.
- P. The manufacturers of such scheme should have past experience and should submit the list of such scheme supplied and commissioned.
- Q. System shall be compatible to fit with generator transformer in case of replacement of spare GT.
- R. Nitrogen release scheme shall be designed in such way that the nitrogen gas shall not enter the energized transformer in case of passing/leakage of valve.

S. Technical Particulars-

Fire extinction period from commencement of nitrogen injection	30sec(max)
Total time duration to bring oil temperature below flash point	30 minutes (Max)
Fire detector's (quartz bulb) heat sensing temperature	141 deg.C
Transformer Conservator Isolation valve setting for normal operation (Valve should not close) to ensure no obstacle for transformer breathing	40 l/min

DWI/TCB/TRE/010

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Transformer conservator isolation valve setting for operation during abnormal flow of oil due to rupture/explosion of tank or bursting of bushing/oil drain during system operation	60 l/min (Minimum)
Capacity of nitrogen cylinder	10 m ³ gas at pressure of 150 kg/cm ² up to 60000 liters oil capacity of transformer/ transformer and 20m ³ gas at pressure of 150 kg/cm ² above 60000 liters of oil capacity of transformer/tractor tank
Power supply for control box	220V DC
For fire extinguishing cubicle for lighting	220V DC

3.0 Specification of UG tank:-

A. OIL Container:-

- i) Capacity of tank shall be of 20% excluding free board as per requirement of the total oil capacity of the largest transformer.
- ii) Tank shall be of cylindrical shape and made of minimum 5 mm thick MS sheet.
- iii) Cylinder shall be placed with horizontal axis below ground level with adequate supporting frame of angles and channels at bottom and clamp on sides. The bottom frame shall be fixed firmly with bolts grouted in ground with cement concrete 1:2:4 (1 cement: 2 Coarse sand: 4 graded stone aggregate).
- iv) Tank shall have
 - a) 700mm dia air tight manhole cover with gasket.
 - b) Drainage/suction valve.
 - c) Lifting hooks of suitable strength.
 - d) Air vent pipe with through silica gel breather.
 - e) One no. drain/suction pipe DN 50 NB on topmost circular surface of tank.
 - f) One no. drain pipe DN 150 NB on vertical flat surface of tank and
 - g) All other accessories for functional requirement of tank.

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- v) Outside surface of tank shall be painted with black anti corrosive bitumastic paint (two or more coats on new work) and also oil resistive paint as per requirement.

B. Chamber for OIL tank below GL :-

- i) Chamber shall be of rectangular in size having minimum 50 CM clearance on sides and top of the MS tank.
- ii) Bottom slab of the tank shall be minimum 125 mm thick RCC 1:1:5:3 (1 cement: 1.5 coarse sand : 3 grade stone aggregate of 20 mm of nominal size) having reinforcement 12 mm dia @ 175 center to center both ways (TMT bars confirming to relevant IS codes).
- iii) Cement shall confirm OPC 43 grade.
- iv) Water proofing compound @ 1 kg./bag cement as per CPWD specification shall be mixed with the cement in RCC and plaster work.
- v) Side walls of the chamber shall be brick masonry in cement mortar. (1 cement: 4 Coarse sand) with bricks confirming to class designation 75 thickness of wall shall be given below.
 - a. From GL to 500mm below GL -230mm.
 - b. From 500 mm below GL to 1250 mm below GL -345 mm.
 - c. From 1250 mm below GL to 2000 mm below GL -4 60 mm.
- vi) Complete inside face and outer surface up to 300 mm below of GL of wall shall be plastered with 15 mm thick cement mortar 1:4 (1 cement : 4 fine sand) having neat cement punning on top of the plaster.
- vii) Top of brick wall shall have 100mm thick coping in cement concrete 1:2:4 (1 cement : 2 Coarse sand : 4 graded stone aggregate 20 mm nominal size.)
- viii) Space between wall and MS tank including bottom gap and top of tank shall be filled with dry Jamuna sand after fixing of tank in chamber and on top of Jamuna sand gap shall be plugged with cement concrete 1:2:4 (1 cement: 2 coarse sand : 4 graded stone aggregate) having minimum 125 mm thickness.
- ix) For 700 mm dia. of manhole of tank, round MS sheet of 700 mm dia., 5mm thick and length as per requirement to be provided as attachment with tank.

4.0 Conservator Isolation Valve:

Conservator isolation valve which shall be flow sensitive and shut off when the flow in the pipe is more than the flow expected in the permissible normal operating conditions. It shall be provided with physical position indicator along with remote alarm indication. This valve shall be provided

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with locking arrangement for normal position and oil filling/filtration position. Conservator isolation valve should not obstruct oil surge from transformer tank towards Conservator and in normal working of Transformers should allow flow of oil in both directions.

5.0 Scope of Supply & Work:

The supplier shall be responsible for the design of the complete NIFPS system and shall submit the drawings and design calculations for the number of fire detectors, pipe sizing of drain pipe and Nitrogen injection pipe, Nitrogen cylinder capacity, number of injection points etc. and get approval from Purchaser.

- a) The scope of supply of the NIFPS system also includes complete earthwork (i.e. excavation, backfilling etc.), civil work with civil material for the entire open/ buried piping for the fire protection system, construction of safety wall (if any), construction of oil pits with provision of oil storage tank of MS and pipe supports for open/ buried, entrenched and over ground piping at MAHAGENCO, Bhusawal, site. The system design shall also conform to TAC/NFPA norms.
- b) All necessary power and control cables etc. for NIFPS shall be in the scope of supply. The distance of control room from Generator Transformer to be considered as 500 meters approx. for cabling purpose.
- c) Any other item or accessories which are not indicated above but are considered necessary / essential for satisfactory operation of NIFPS shall be deemed to have been included in the accepted price without any extra cost to the purchaser, irrespective of whether these are specifically indicated here or not.

6.0 Erection, Installation, Commissioning & Demonstration:

Erection, commissioning and demonstration of the complete NIFPS system at site is in the scope of supply. The supplier shall also provide training to customer's engineers at MAHAGENCO, Bhusawal site on intimation by BHEL for operation and maintenance of the equipment and shall obtain certificate from customer regarding impart of training. All the expenses i.e. travelling, lodging, boarding, engineer expenses etc. for product commissioning & demonstration at MAHAGENCO, Bhusawal site are in supplier's scope. For this, supplier should quote the charges separately, if any, in the offer.

7.0 Inspection, Testing & Dispatch:

After receipt of purchase order from BHEL, the supplier shall furnish detailed drawings and quality assurance plan (QAP) for approval from ultimate customer MAHAGENCO, Bhusawal. It will be sole responsibility of the supplier to get the approval of drawings and QAP before execution of the order.

The supplier shall furnish a list of all fittings and components in the dispatch details giving description and quantity of each item (Quantity of each item shall be mentioned). All items shall be properly packed in wooden boxes so as to avoid scratches/damage in transit. The system shall be dispatched only after clear material inspection dispatch clearance.

NOTE: Bidder To Submit The Duly Filled Checklist (Annexure-A) along with Other Bidding Documents.

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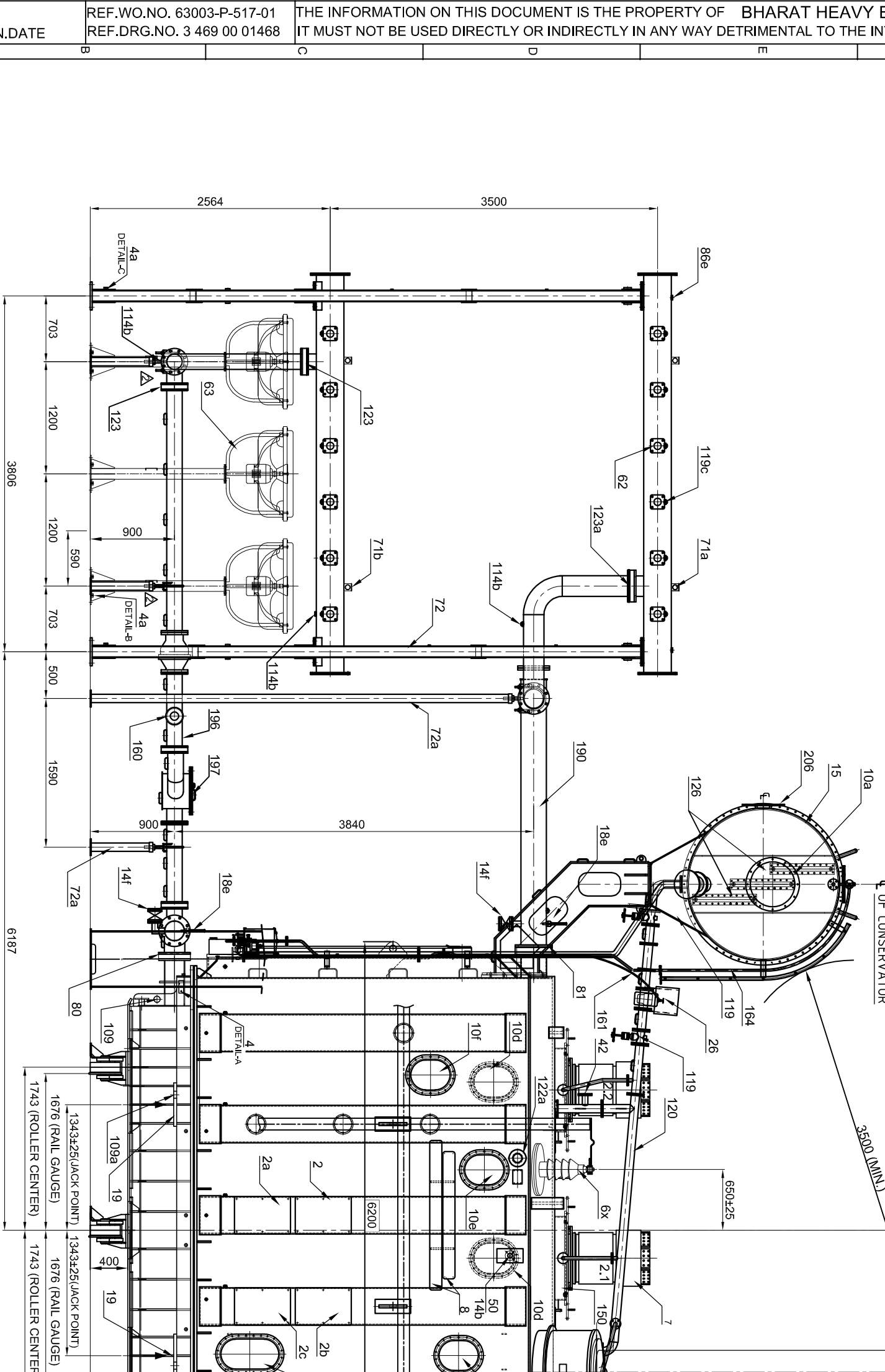
FORM NO. TRE-2003A

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Annexure - A
Compliance Check List

	Compliance to Requirement	Yes/ No	Deviation, if any
1.	GENERAL (Cl. 1.0)		
2.	DETAILS OF PREVENTION/ EXTINGUISHING SYSTEM (Cl. 2.0 to 2.3)		
3.	TECHNICAL PARTICULARS (Cl. 3.0)		
4.	SCOPE OF SUPPLY & WORK (Cl. 4.0)		
5.	ERECTION, INSTALLATION, COMMISSIONING & DEMONSTRATION (Cl. 5.0)		
6.	INSPECTION, TESTING & DISPATCH (Cl. 6.0)		

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MIN. AIR CLEARANCES		A					
		HV - EARTH	3500 mm				
		NEUTRAL - EARTH	320 mm				
		LV - EARTH	320 mm				



DEVELOPMENT CONSULTANT PVT. LTD.
Reviewed only for general conformance with contract drawings and specifications; Contractor to be responsible for any error and for fulfilment of details requirements of contract documents.

CODE:- **1 (ONE)** DATE:- **21.09.2020**

DISTRIBUTED BY:- **SALONI BELNEKAR**

1	Approved	4	For information only
2	Approved Subject to compliance to comments. Proceed with manufacturing/construction. Revised document required to be submitted after incorporating the comments.	V	Null and Void (Not applicable)
3	Not Approved. Resubmission required		

SEE COVERING LETTER

LETTER REF.NO.:- 18V06-E-LOT-BHEL-0225

REF.WO.NO. 63003-P-517-01
REF.DRG.NO. 3 469 00 01468

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


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SIGN.DATE

NOTE: 1. THE ONLINE DGA SHALL BE MOUNTED ON THE VALVE (ITEM NO.-14a) AND ALSO SUPPORTED BY THE SUPPORT STRUCTURE PROVIDED ON THE TANK WALL.
2. ORIENTATION OF COOLER CONTROL CABINET (CCC) TO SUIT THE SITE.

A	REV	DATE	ALT.	REV	DATE	ALT.	REV	DATE	ALT.	RAKESH	REV	DATE	ALT.	RAKESH
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	APPD.			APPD.										
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DRAWING/DOCUMENT NO		BP-DG-415-301-0001	
W/O.- 68001-A-512-01		STATUS OF DRAWING "PR"	
DISTRIBUTION OF PRINTS		TRE-1, TRM-3	
ADDITIONAL INFORMATION		PO. NO.	
DG/BSL U-6/2011/T-1/BTG+BOP EPC		CONTRACT/SUPPLY/0054 DATED: 07/01/2018	

TYPE OF PRODUCT		4 X 275 MVA, 21/420/ 3 KV, 1-PH, ONAN/ONAF/OPAF, GENERATOR TRANSFORMER						
PROJECT		1 X 660 MW BHUSAWAL UNIT-6						
		OWNER		MSPGCL				
		OWNER'S CONSULTANT		DEVELOPMENT CONSULTANTS PVT. LTD. CONSULTING ENGINEERS VASHI, NAVI MUMBAI				
		भारत हेवी इलेक्ट्रिकल्स लिमिटेड, भोपाल						
DEPT	CODE	WEIGHT(kg)	SCALE		CHD.	NAME	SIGN	DATE
TRE	406	-----	COMP.SCALE:1:1		DRN.	RAKESH		26.03.19
					LK			01.04.19
				APPD.	LK/SS			01.04.19
TITLE:- OUTLINE GENERAL ARRANGEMENT				DRG. NO	3 469 00 02077		REV.	
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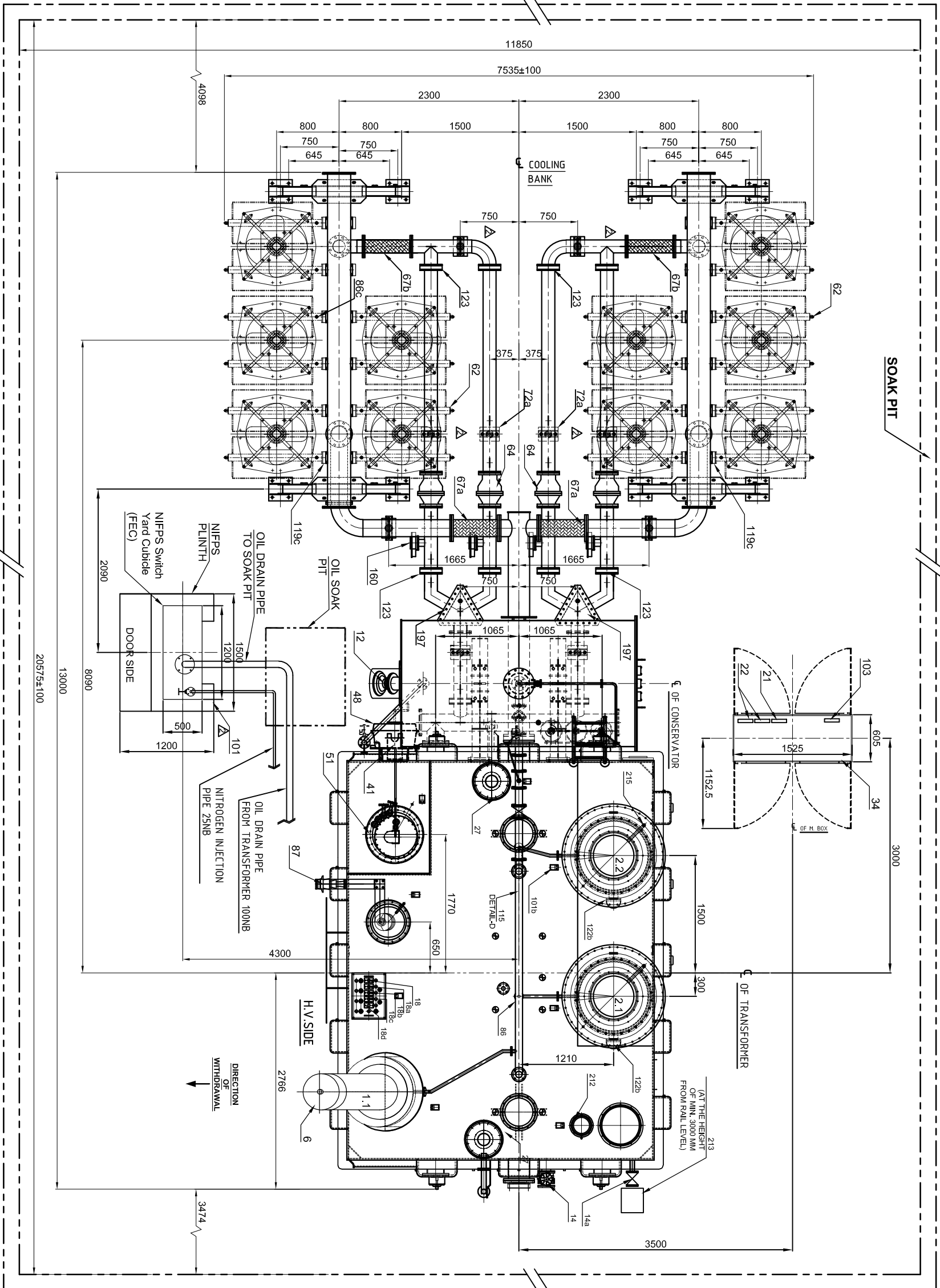
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INVENTORY NO.

SIGN. DATE

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STATUS OF DRAWING "FR"	DISTRIBUTION OF PRINTS
TRE-1, TRM-3	TRE-1, TRM-3

OWNER	CONSULTANT	DEVELOPMENT CONSULTANTS PVT. LTD. CONSULTING ENGINEERS VASHI
MSPGCL	NAVIMOMBAY	

TYPE OF PRODUCT	PROJECT	1 X 660 MW BHUSAWAL UNIT-6
OWNER	CONSULTANT	DEVELOPMENT CONSULTANTS PVT. LTD. CONSULTING ENGINEERS VASHI
MSPGCL	NAVIMOMBAY	

DRG. NO.	3 469 00 02077	REV.	02
SHEET	02	OF	03

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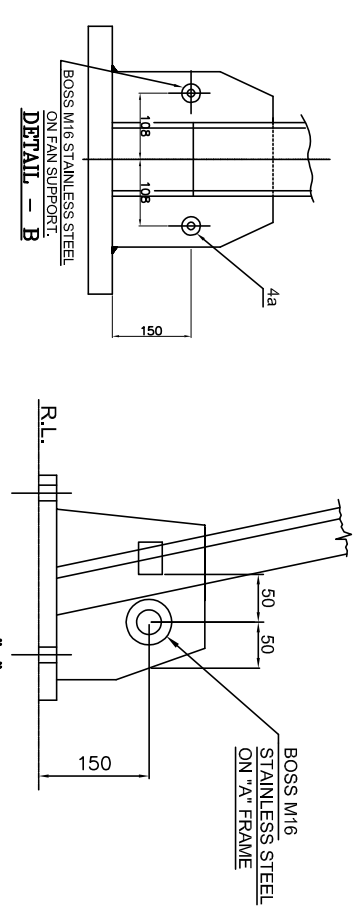
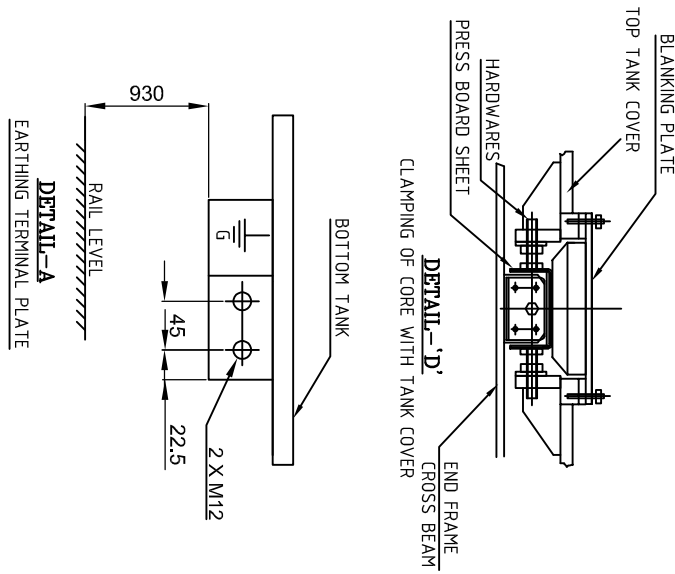
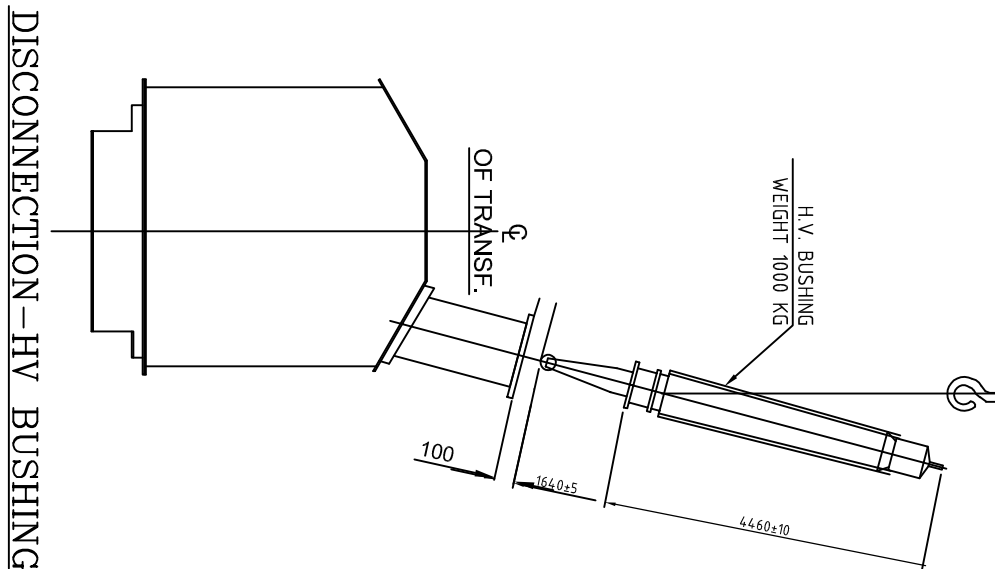
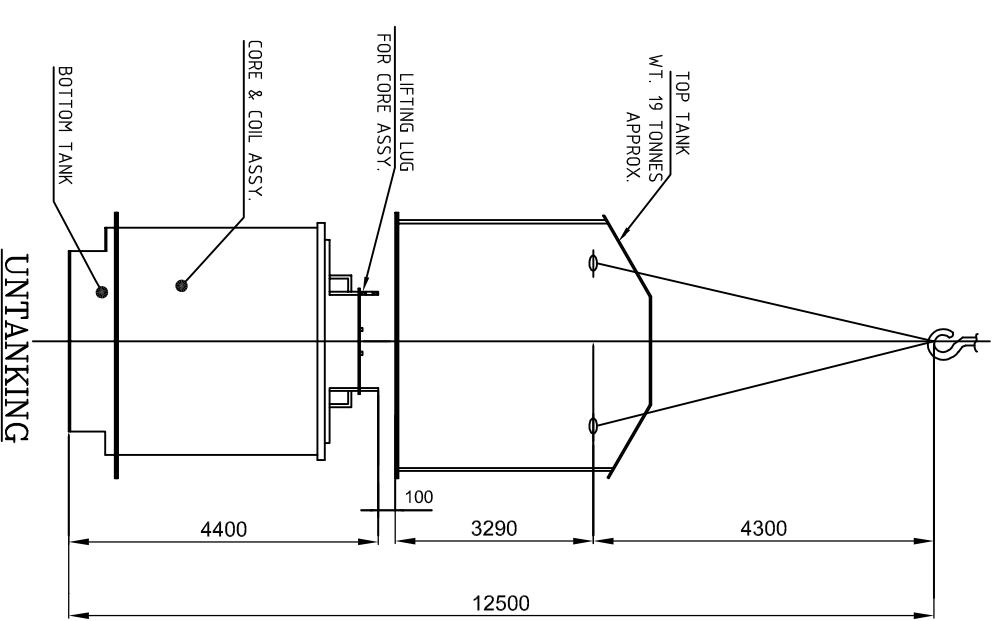
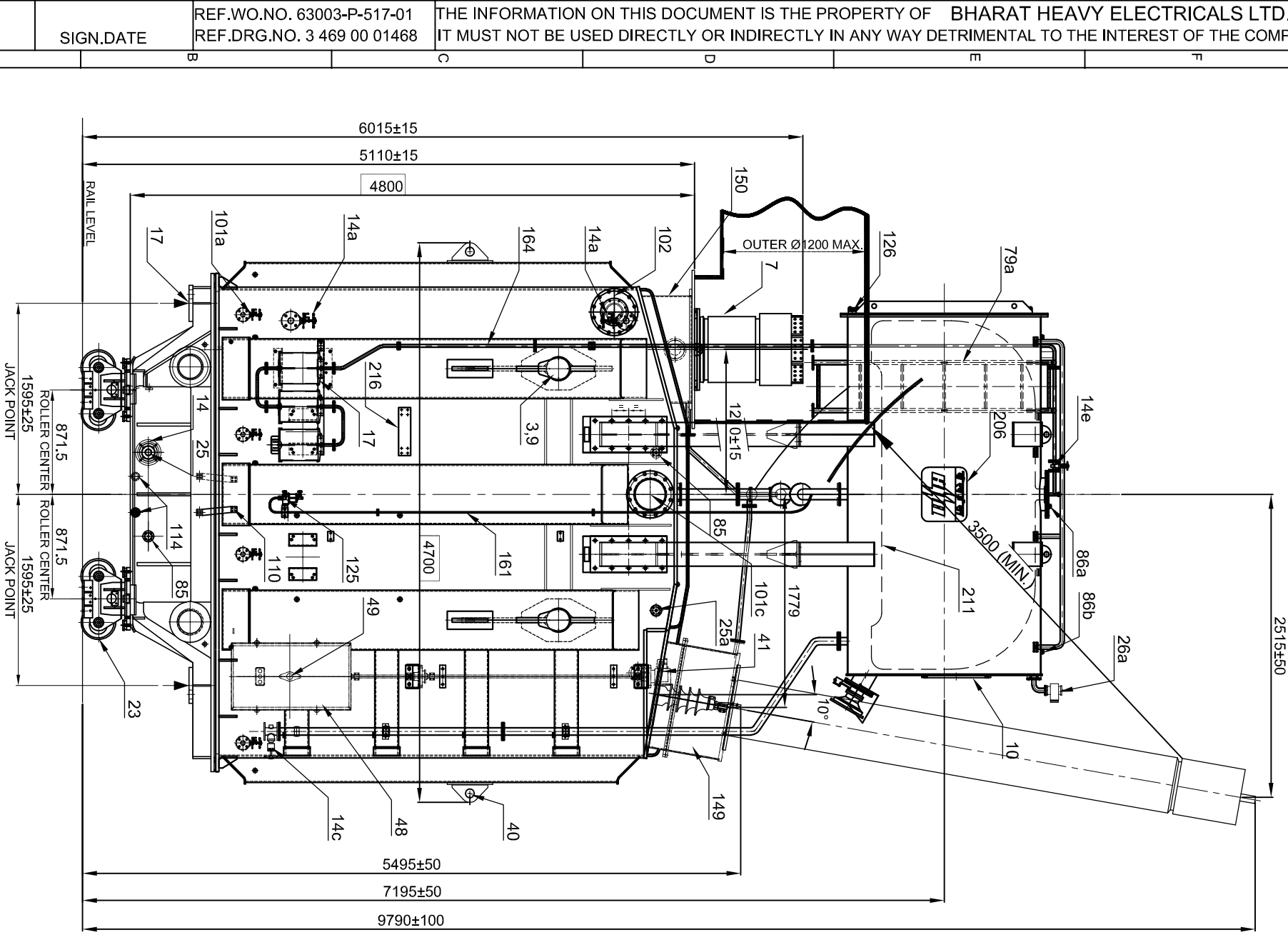
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NOTE:-
1. FOR NOTES, REFERENCE DRAWINGS, DETAILS OF WEIGHT & OIL QUANTITIES AND PART LIST, REFER DRG. NO. 34520001016.

INVENTORY NO.											
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REV	DATE	ALT.		REV	DATE	ALT.		REV	DATE	ALT.	
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