



**Bharat Heavy Electricals Limited, Bhopal**  
**Transformer Engineering Department**

Tender Enquiry No. E-021-406-04

Dated : 22.12.2021

To,

**SUBJECT: TENDER ENQUIRY “TO CONDUCT SHORT CIRCUIT TEST ON 1 No. 92 MVA, 15.75/(400/V3) KV, 1-PHASE, GENERATOR TRANSFORMER”.**

Dear Sir,

We are manufacturing 92 MVA, 15.75/(400/V3) KV, 1-phase, Generator Transformer for M/s SAPDC, Nepal for Arun III HEP Project in which short circuit test is to be conducted.

We invite your quotation for “Conducting Short Circuit Test” on the above-mentioned transformer at your test lab.

**A. SCOPE OF WORK**

1. The scope of test is as per attached Annexure -A
2. Technical specification is as per attached Annexure-B

**B. GENERAL TERMS & CONDITIONS OF ENQUIRY**

1. Offer shall be sent through courier having 2 different envelopes put in 1 outer envelope as mentioned below:
  - **First Part** – It must contain only the technical offer and commercial terms and conditions (but without price i.e. unpriced offer). If price is indicated in this part, then offer is liable to be rejected.
  - **Second Part** – It must contain the actual price and price breakup (i.e. price bid), Total Price must be indicated in figures and words both and in case any ambiguity between the figures and words, words shall prevail.
  - Both these parts shall be duly signed by authorized representative of the bidder.
2. BHEL expects that the bidder must respond to the enquiry. Regret letter, for not participating in the tender will be submitted where the bidder is unable to submit offer. Repeated lack of response on the part of vendor may lead to his deletion from BHEL's approved vendor list.



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#### **3. Pricing Terms**

Prices once quoted shall remain firm within the validity or any extension thereof for placement of order, till complete execution of the order, without any escalation / increase for any reason, whatsoever, unless specifically provided for in the Enquiry & PO.

#### **4. Terms of Payment**

Payment shall be released by BHEL normally within 90 days by electronic-pay mode on submission of invoice for the work after completion of work.

#### **5. Taxes and Duties**

All taxes/bank charges as per statutory requirement in the country of bidder shall be borne by the bidder. Income tax as applicable shall be deducted during final settlement of bill. TDS will be deducted from contractors Bill both under Income Tax Act and GST Act.

Necessary tax deduction at source from supplier's bill will be made as per statutory requirements. Tax if applicable shall be paid extra. Any new tax introduced in future shall be considered as applicable. Any loss of tax credit to BHEL due to the reason attributable to the contractor will be recovered from them along with interest

- a) Wherever bidders are required to supply services at project site Party has to submit GST registration no. of the State in which project site is located along with copy of registration certificate at the time of submission of Bid. In case the same is not available at the time of submission of bid, the contractor has to give an undertaking that the same will be arranged before award of work order
- b) HSN Code/SAC, rate of tax under GST and applicable GST (IGST/CGST/SGST/UTGST) and GSTIN shall be clearly mentioned by the Bidder
- c) GST portion of the invoice shall be released only upon:-
  1. All invoices raised by contractors/vendors must be GST compliant Tax invoices as per GST invoice rules.
  2. Contractor declaring such invoice in his GSTR-1 or any modified return as notified by government
  3. Receipt of goods/services and Tax Invoice by BHEL and
  4. Confirmation of payment of GST thereon by contractor on GSTN portal
  5. Alternatively, Contractor has to submit BG of appropriate value which shall be valid at least one month after the confirmation of date of payment of GST by contractor on GSTN portal and receipt of Tax invoice and receipt of services, whichever is later. Contractor has to give an undertaking in this regard



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6. Contractor has to give an undertaking to BHEL that they have declared invoice in his return and paying GST within timeline prescribed for availing ITC by BHEL

- d) Payment to Contractor for GST portion will be released only after completion of above activity and on availment of ITC by BHEL
- e) In case GST credit is delayed/denied to BHEL due to non/delayed receipt of services/goods and/or tax invoice or expiry of the timeline prescribed in GST Law for availing such ITC, or any other reasons not attributable to BHEL, GST amount shall be recoverable from the contractor along with interest levied/ leviable on BHEL
- f) Tax Deduction at source (TDS) as per extant provisions of the Income Tax Act and GST Act shall be deducted from supplier/contractor bill.

6. The offer shall be evaluated on the basis of total delivered cost of entire package to BHEL (including all the activities starting from sending transformer from BHEL works & receiving back transformer to BHEL works & completion of all activities related to Short Circuit at BHEL works till certification) which shall include foreign currency conversion rate on the date of technical bid opening.

7. In case of any deviation, the same may be clearly mentioned in the offer and checklist to be filled in by the bidder.

#### **8. Variation of orders**

No variation to the Engineering Order is permitted unless authorized in writing and signed by or on behalf of purchase executive, BHEL Bhopal.

#### **9. Secrecy Clause**

Bidder should not divulge any technical document/ information of BHEL to any third party without prior written permission of BHEL. Further no publications/ patent to be taken from above work without prior written permission of BHEL.

#### **10. Arbitration:**

Any disputes arising out at any stage of execution of the work to be mutually discussed and settled. Any Arbitration shall be conducted in accordance with the provisions of the Indian Arbitration and Reconciliation Act, 1996 with latest amendments.

The arbitration proceedings shall be held in Bhopal.



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#### **11. Right of rejection/Non-placement of PO:**

BHEL reserves the right to accept the offers in part or in full, cancel the Tender Enquiry or short close the contract without assigning any reason.

#### **12. THE BHEL CONCILIATION SCHEME:**

The Parties agree that if at any time (whether before, during or after the arbitral or judicial proceedings), any Disputes (which term shall mean and include any dispute, difference, question or disagreement arising in connection with construction, meaning, operation, effect, interpretation or breach of the agreement, contract or the Memorandum of Understanding (delete whichever is inapplicable), which the Parties are unable to settle mutually), arise inter-se the Parties, the same may, be referred by either party to Conciliation to be conducted through Independent Experts Committee to be appointed by competent authority of BHEL from the BHEL Panel of Conciliators.

##### **Notes:**

- (i) No serving or a retired employee of BHEL/Administrative Ministry of BHEL shall be included in the BHEL Panel of Conciliators.
- (ii) Any other person(s) can be appointed as Conciliator(s) who is/are mutually agreeable to both the parties from outside the BHEL Panel of Conciliators.

The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof and as provided in BRIEF PROCEDURE FOR CONDUCT OF CONCILIATION PROCEEDINGS.

#### **13. OVERWRITING IN THE PRICE BID**

Bid should be free from correction, overwriting, using corrective fluid etc. Any interlineation, cutting erasure or overwriting shall be valid only if they are attested under full signature(s) of person(s) signing the bid else bid shall be liable for the rejection.

#### **14. DISCREPANCY IN WORDS & FIGURES - QUOTED IN THE PRICE BID**

- (a) If, in the price structure quoted for the required goods! services! works, there is discrepancy between the unit price and the total price (which is obtained by multiplying the unit price by the quantity), the unit price shall prevail and the total price corrected accordingly, unless in the opinion of the purchaser there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price corrected accordingly.
- (b) If there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and



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- (c) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject of (a) and (b) above.
- (d) If there is such discrepancy in an offer, the same shall be conveyed to the bidder with target date upto which the bidder has to send his acceptance on the above lines and if the bidder does not agree to the decision of the purchaser, the bid is liable to be ignored.

#### **15. EVALUATION IN CASE OF MORE THAN ONE L-1 BIDDER**

In the course of evaluation, if more than one bidder happens to occupy L-1 status, effective L-1 will be decided by soliciting discounts from the respective L-1 bidders. In case more than one bidder happens to occupy the L1 status even after soliciting discounts, the L-1 bidder shall be decided by a toss / draw of lots, in the presence of the respective L-1 bidder(s) or their representative(s)

Ranking will be done accordingly. BHEL's decision in such situations shall be final and binding.

#### **16. RISK AND COST**

If the work is not executed or partly executed within the agreed execution period, BHEL reserves the right to cancel the order and get the executed from alternate source(s) at the Risk and Cost of Contractor. In such an even, it shall be obligatory on the part of contractor to make good any loss suffered by BHEL.

#### **17. FORCE MAJEURE**

"Notwithstanding anything contained in the contract, neither BHEL nor the Contractor shall be held responsible for total or partial non-execution of any of the contractual obligations, should the obligation become unreasonably onerous or impossible due to occurrence of a 'Force Majeure' which directly affects the obligations to be performed by the BHEL or the contractor; Such events include war, military operations of any nature, blockages, revolutions, insurrections, riots, civil commotions, insurgency, sabotage, acts of public enemy, fires, explosion, epidemics, quarantine restrictions, floods, earthquake, or acts of God, restrictions by Govt. authorities; over which the BHEL or the contractor has no control.

The party claiming to be affected by force majeure shall notify the other party in writing without delay, within two weeks from the occurrence of such situation and on the cessation thereof.

Extension of time sought by the contractor along with supporting evidence and so granted by BHEL for the work affected, if any, shall not be construed as waiver in



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respect of remaining execution. Rescheduling of execution on account of force majeure conditions, if so agreed by BHEL, will not entail the contractor to claim any increase in the price on whatsoever account.

Notwithstanding above provisions, BHEL shall reserve the right to cancel the Contract, wholly or partly, in order to meet the overall project schedule and make alternative arrangements. If deemed necessary, BHEL may takeover partly processed work at a mutually agreed price”

#### **18. INTEGRITY PACT**

Bidder shall submit integrity pact duly signed by its authorized signatory (Format for the same is attached).

#### **19. MSME BENEFIT APPLICABILITY**

Bidder shall submit the all the necessary registration certificates in case of applicability of MSME benefits.

#### **20. DECLARATION REQUIRED BY FOREIGN BIDDERS**

Foreign bidders to submit declaration of Permanent Establishment and business connection (PEBC) for remittances purpose. Declaration to be submitted in formats either in Annexure A or B whichever is applicable as per their transaction entered into with BHEL. In the absence of certificates from the bidders, withholding tax at applicable rates along with surcharge and cess will be recovered at the time of remittance to the bidder.

Foreign bidders to submit Tax Residency Certificate (TRC) & Form 10F (for obtaining DTAA benefits) as per Annexure C in respect of services. The TRC (tax residency certificate) is to be issued by the authorities of the government of bidder's country. If the informative part of the format (other than residency) is not furnished by the authorities, the same may be furnished by the bidder as a declaration.”

#### **21. PRICE BID FORMAT**

Bidders to submit the price bid in given price bid format.

#### **C. ADDRESS FOR SENDING OFFERS**

1. Offer may be sent in sealed envelope to following address:

In Charge,  
Works Contract (GREEN BOX),  
MM Tender Room  
BHEL Administrative Building, GF  
BHEL Piplani, Bhopal (India) 462022



**Bharat Heavy Electricals Limited, Bhopal**  
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Before tender due date 14 Jan 2022 ( FRIDAY ) & time 11am, clearly super scribing the Tender Enquiry No. & Subject on the top of envelope.

2. The quotation thus received shall be opened on the same day i.e. 14 Jan 2022 at 2 pm.

Thanking you.

A handwritten signature in blue ink, appearing to read 'Jitendra Singh'.

(Jitendra Singh)  
Dy. Manager (TRE)  
BHEL, BHOPAL, INDIA



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**CHECKLIST FOR SCOPE OF WORK (Annexure-A)**

Note: Bidder shall fill in the following details and no column should be left blank

1	Name & address of the bidder Fax / Email address		
2	Name & designation of the official of the tenderer to whom all the references shall be made.		
3	Bidder's proposal No. & date		
		YES	NO
4	SI. No. 1		
	SI. No. 1.1		
	SI. No. 1.2		
	SI. No. 1.3		
	SI. No. 1.4		
	SI. No. 1.5		
5	SI. No. 2		
6	SI. No. 3		
7	SI. No. 4		
	SI. No. 4.1		
	SI. No. 4.2		
	SI. No. 4.3		
	SI. No. 4.4		
	SI. No. 4.5		
	SI. No. 4.6		
	SI. No. 4.6.1		
	SI. No. 4.6.2		
	SI. No. 4.6.3		
	SI. No. 4.6.4		
	SI. No. 4.7		
	SI. No. 4.7.1		
	SI. No. 4.7.2		
	SI. No. 4.7.3		
	SI. No. 4.7.4		
	SI. No. 4.7.5		
	SI. No. 4.7.6		
	SI. No. 4.7.7		
	SI. No. 4.7.8		
	SI. No. 4.7.9		
	SI. No. 4.7.10		
	SI. No. 4.7.11		
	SI. No. 4.8		
	SI. No. 4.9		
8	SI. No. 5.0		
9	SI. No. 6.0		
10	SI. No. 7.0		
11	SI. No. 8.0		
12	SI. No. 9.0		
13	SI. No. 10.0		
14	SI. No. 11.0		
15	SI. No. 12.0		
16	SI. No. 13.0		



**Bharat Heavy Electricals Limited, Bhopal**  
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**CHECKLIST FOR GENERAL TERMS & CONDITIONS OF ENQUIRY**

Note: Bidder shall fill in the following details and no column should be left blank

1	Name & address of the bidder Fax / Email address		
2	Name & designation of the official of the tenderer to whom all the references shall be made		
3	Bidder's proposal No. & date		
		YES	NO
4	Sl. No. 3		
5	Sl. No. 4		
6	Sl. No. 5		
7	Sl. No. 6		
8	Sl. No. 7		
9	Sl. No. 8		
10	Sl. No. 9		
11	Sl. No. 10		
12	Sl. No. 11		
13	Sl. No. 12		
14	Sl. No. 13		
15	Sl. No. 14		
16	Sl. No. 15		
17	Sl. No. 16		
18	Sl. No. 17		
19	Sl. No. 18		
20	Sl. No. 19		
21	Sl. No. 20		
22	Sl. No. 21		

## **PRICE BID FORMAT**

Tender Enquiry No.: E-021-406-04

Rating of Transformer: 92 MVA, (400/ $\sqrt{3}$ )/15.75 kV, 1 Ph. Generator Transformer

Name of Test: Dynamic Short Circuit Test

<b>S. No.</b>	<b>Description</b>	<b>Charges (In INR) (In Figures)</b>	<b>Charges (In INR) (In Words)</b>
1	SC Test Charges		
2	Inspection Charges		
3	Other charges if any		

**BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL**  
**TRANSFORMER ENGINEERING DEPARTMENT**

**ANNEXURE - A**

FORM NO: TRE-2003A

Sht. 1 of 3 sheets

**ANNEXURE TO INDENT CUM ENQUIRY: - E-021-406-04**

DTD.: - **22 Dec 2021**

DESCRIPTION OF EQUIPMENT:      SHORT CIRCUIT TEST ON 92 MVA, 15.75/(400/V3) KV, 1-PHASE  
 GENERATOR TRANSFORMER

WORK ORDER NO.                    :      **68012-X-512-01**

CUSTOMER                        :      M/s SAPDC for Arun III Project

**SPECIFICATION OF SHORT CIRCUIT TESTING OF TRANSFORMER**

1.	This specification calls for short circuit testing of power transformer as per IEC 60076-5 having technical particulars as per Annexure-B (2 sheets) & with following condition:
1.1	Transformer shall be tested for short circuit between HV-LV pair by applying shot on HV terminal with LV terminal pre-shorted.
1.2	Total number of test shots (excluding calibration shots) shall be 3, in which one shot shall be applied at maximum tap position, one at normal tap position and one at minimum tap position.
1.3	Duration of each shot shall be 0.25 seconds.
1.4	The values of the HV peak short-circuit current shall be calculated based on tested impedance values at maximum, minimum & principal tapping & HV system impedance corresponding to 50 kA system fault level. The calculated peak value of current shall be based on X/R ratio of transformer and is 2.55 times the symmetrical current as per IEC 60076-5. The tolerance on the current shall be as per IEC 60076-5. Final value of short-circuit currents will be furnished after routine testing at works prior to S.C test.
1.5	Also note that after each shot, a demagnetizing shot is to be applied to demagnetize the core, if applicable.
2.	Transformers shall be assembled to our OGA Drg. no. 34520001107 enclosed herewith. However, OFWF coolers & associated fittings shall not be assembled during this test.
3.	Bidder to submit complete procedure for testing along with the offer including values of currents.
4.	<p><b>Scope of work:</b>                      Bidder to cover the following in their scope of work &amp; if necessary in collaboration with other agencies for part of work normally not performed by them.</p>
4.1	Unloading of transformer at nearest sea-port (if applicable).
4.2	Transportation up to test laboratory.
4.3	Transportation up to test bed.
4.4	Arranging crane, crane operator etc. for mounting bushings, turrets, pipework, conservator & other fittings. Charges for the same are to be quoted by bidder on per hour or per day basis specifying constraints, limitations if any. Number of working hours considered in a day with time applicable. Additional charges (if any) for providing above facilities after normal working hours & on weekly off days to be clearly spelt out. This facility shall also be required after Short Circuit testing for dismantling the fittings.

**BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL**  
**TRANSFORMER ENGINEERING DEPARTMENT**

FORM NO: TRE-2003A

Sht 2 of 3 sheets

ANNEXURE TO INDENT-CUM-ENQUIRY - **E-021-406-04**

WORK ORDER NO. : **68012-X-512-01**

4.5	Arranging of processed oil as per IEC 60296 suitable for filling in Transformer tank. The oil should specifically comply the following requirements in addition to IEC: BDV $\geq$ 70 kV, ppm $\leq$ 5, Tan delta at 90°C: 0.002 (max.) Total oil quantity required shall be 26000 Liters (approx.) The offer should also include charges for disposal/ processing in case oil parameter exceeds the limit of IEC: 60296 after completion of test. ( if outside India)
4.6	Arranging vacuum pump, oil filtration plant etc. for processing of transformer (if outside India). The processing of transformer shall include the following activities:
4.6.1	Vacuum pulling & holding vacuum for 72 hours approx.
4.6.2	Oil filling under vacuum at the rate of 3500-4500 LPH.
4.6.3	Oil circulation for 45 hours approx. (Approx. 3 complete circulation of oil) The above process shall be continuous without any break & therefore may include weekly-off days depending on the day the process is started. Bidder to furnish the charges of complete processing on lump sum basis. Bidder is also required to quote charges for additional working hours on per hour basis if the above process could not be completed in the mentioned duration due to oil parameters after circulation not meeting the desired parameters.
4.6.4	Draining of oil after completion of test.
4.7	Performance of Short Circuit Test including all activities (as listed below). Separate charges for each activity to be quoted. (If breakup cost is not given, and if repetition of these tests are required then it shall be considered that the cost of same has been built-in the Short Circuit test charges)
4.7.1	Measurement of capacitance and tan $\delta$ of windings and HV bushing.
4.7.2	DGA before and after short circuit test.
4.7.3	Measurement of turn ratio at all taps (HV/LV) before & after S.C. test.
4.7.4	Measurement of winding resistance of HV winding at max, min & rated taps & full winding of LV before & after S.C. test.
4.7.5	Measurement of insulation resistance between HV/LV+E, LV/HV+E & HV+LV/E.
4.7.6	Measurement of Magnetizing current at low voltage.
4.7.8	Measurement of oil parameters e.g. BDV, PPM, Resistivity & Tan Delta (shall be conducted 3 times).
4.7.9	SFRA Test before & after S.C. test.
4.7.10	Transportation unto nearest seaport & loading on ship. (If applicable)
4.7.11	Inspector charges for carrying out inspection at works.
4.8	Submission of test report in 2 copies, which shall include all the tests (S.C. test, low voltage test, inspection report etc. along with calibration certificate of testing equipment). After successful completion of test & inspection of the transformer at our works, test certificate declaring the successful passing of S.C. test to be furnished.

**BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL**  
**TRANSFORMER ENGINEERING DEPARTMENT**

FORM NO: TRE-2003A

Sht 3 of 3 sheets

ANNEXURE TO INDENT-CUM-ENQUIRY - **E-021-406-04**

WORK ORDER NO. : **68012-X-512-01**

4.9	Time sheet for each activity on hour/per day basis shall be prepared & duly signed by lab or its collaborator & BHEL. This shall be furnished along with invoice at the time of final settlement of bills.
5.0	Short circuit test shall be continued till the following conditions are met – (i) Variation of Short Circuit reactance is within 2% after each shot & (ii) Current and Voltage wave shapes are sustained for entire test cycle of 0.25 second.
6.0	Any other observations during Short Circuit testing i.e. PRD, wave shape, DGA etc. shall be dealt with as per the provisions laid down in IEC 60076-5 without interrupting the test schedule.
7.0	Termination of Short Circuit test to be mutually agreed between Testing laboratory and BHEL.
8.0	All the test and measuring instruments employed in the Short Circuit Testing should have been calibrated and calibration certificates made available to BHEL or its end customer whenever required.
9.0	Bidder may also quote the other miscellaneous charges required for satisfactory completion of testing e.g. assembly hall, photograph, N2 cylinder & custom clearance.
10.0	The bidder to confirm that in case of unforeseen circumstances like accident, transportation delay etc. the scheduled test dates may have to be cancelled/deferred.
11.0	Bidder should allow test witness by purchaser's representatives.
12.0	Bidder to furnish complete techno-commercial offer and a specific point wise response to each of the clauses of this indent. Any offer not responding to any of the clauses may be ignored without any explanation.
13.0	Our staff will be at test laboratory for assembly, dismantling, witnessing of test etc. of the transformer. Suitable office accommodation to be provided for them during their stay.

**ANNEXURE 'B'**

**TECHNICAL PARAMETERS**

<b><u>SL. NO.</u></b>	<b><u>ITEM</u></b>	<b><u>DETAILS</u></b>
1.	Type of cooling	OFWF Unit Cooler
2.	Continuous rating (MVA)	
	(a) HV	92
	(b) LV	92
3.	Rated Voltage (KV)	
	(a) HV at principal tap	400/V3
	(b) LV	15.75
4.	Rated frequency (Hz)	50
5.	No. of Phases	1
6.	Connections	
	(a) HV	STAR (after 3 Ph bank formation)
	(b) LV	Delta (after 3 Ph bank formation)
7.	Connection symbol	YNd11 (after 3 Ph bank formation)
8.	Line current at rated no load voltage and on principal tap (Amps).	
	(a) HV	379.40
	(b) LV	2841.27
9.	Terminal arrangement:	
	(a) HV side	OIL-AIR BUSHINGS
	(b) LV side	OIL-AIR BUSHINGS
	(c) Neutral	OIL-AIR BUSHING
10.	Test voltage for HV/LV windings	
	(a) Lightning impulse withstand test voltage (kVp)	
	HV	1300(FW), 1425(CW)
	LV	95(FW), 105 (CW)
	HVN	170
	(b) Switching Impulse (kVp) HV	1050
	(c) Power frequency withstand test voltage HV(1-min.)	630 kVrms
	(d) Separate source on HV/LV (KV rms)	70/28
11.	Type of Tap changer	Off Circuit
12.	Tap Changer on winding	HV winding

13. Tapping's on **HV winding** for regulations:

(a) Step voltage & steps	2.5%
(b) Plus and minus range of variation	+2.5% to -7.5%

14. Positive sequence impedance on 92 MVA base at rated current and frequency at 75°C winding temperature :

	Normal Tap (Tap 2)		Maximum Tap (Tap 1)		Minimum Tap (Tap 5)	
	Guaranteed	Calculated	Guaranteed	Calculated	Guaranteed	Calculated
HV-LV	14.5% $\pm$ 7.5% Tol.	15.2% $\pm$ 2% Tol.	14% approx.	14.42% $\pm$ 2% Tol.	18% approx.	17.95% $\pm$ 2% Tol.

15. Apparent fault level (MVA)  
HV (50 kA for 1 sec) (Um = 420 kV) 36373.1

16. Category II

17. Approximate mass with oil (kg) 110600

18. Approximate volume of oil (L) 26000

19. Un-tanking weight (kg) 8900

20. Approximate shipping dimensions (L x W x H) (mm) 4100 x 3600 x 3850 mm

21. Approximate height with bushings (From rail level) (mm) 6300 (approx.) with Oil to Air bushing

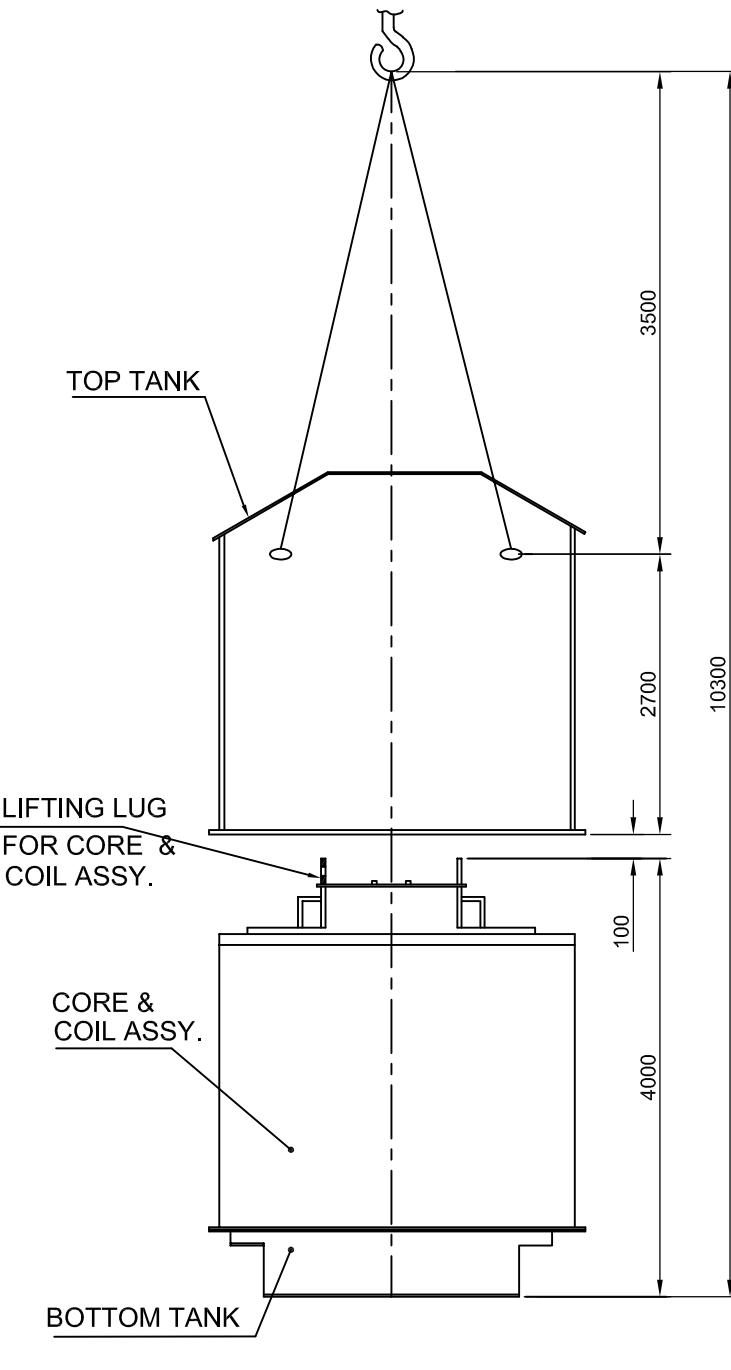
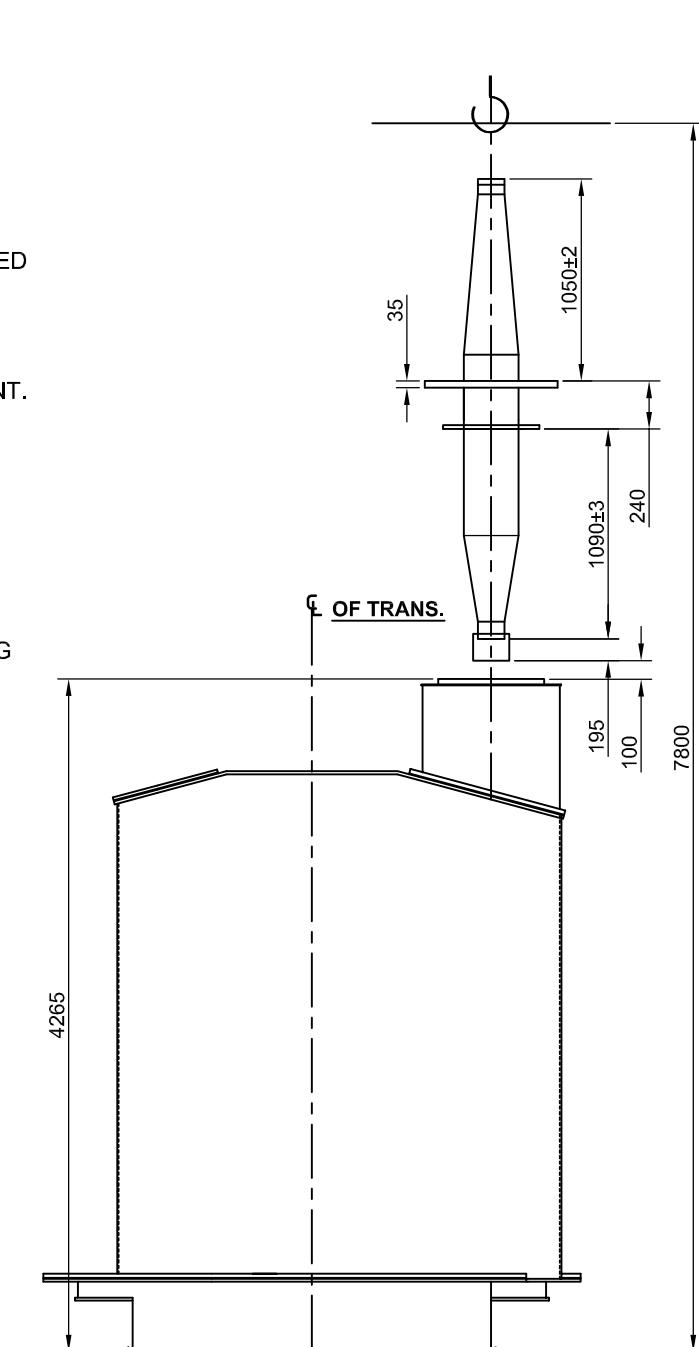
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	DRG. NO. 3452 00 01107									

**NOTES:-**

1. DIMENSIONS SHOWN THUS  ARE OVERALL SHIPPING DIMENSIONS.
2. WIRING FROM INSTRUMENTS, CTS, ETC. NOT SHOWN FOR CLARITY.
3. TRANSFORMER OIL SHALL BE SUPPLIED CONFIRMING TO IEC 60296.
4. THE DESIGN FEATURES SHOWN ON THIS DRAWING. (GENERALLY IN LINE WITH IS-2026/IEC 60076 & AGREED CUSTOMER SPECIFICATION) MEET THE STATUTORY, REGULATORY & SAFETY REQUIREMENTS WITH RESPECT TO EARTHING ARRANGEMENT & DANGER LABLES AND CLEARANCES IN AIR, PROVISIONS FOR PRESSURE RELIEF DEVICE GAS FILLED ACTUATED RELAY & ANTI EARTHQUAKE CLAMPING ARRANGEMENT.
5. FOR DRAWINGS, DETAILS OF WEIGHTS & OIL QUANTITIES REFER O.G.A. PART LIST DRG. 34520001108
6. ALL STEEL PARTS EXPOSED TO ATMOSPHERE SHALL BE PAINTED WITH 631 OF IS 5.
7. SHIPPING DIMENSIONS 4100 (LENGTH) X 3600 (WIDTH) X 3850 (HEIGHT).
8. TOLERANCE SHOWN FOR DIMENSION FROM RAIL TO TOP OF HV BUSHING IS OUR MANUFACTURING TOLERANCE, HOWEVER EFFORT SHALL BE MADE TO MINIMIZE THE TOLERANCE.
9. CENTRE OF GRAVITY OF THE TRANSFORMER SHALL BE MARKED PERMANENTLY AT TWO PLACES DURING TRANSPORTATION.
10. BUSHING CONNECTION POINTS CAN BE ACCESSED THROUGH INSPECTION COVER.
11. PROVISION OF MOUNTING OF ONLINE DGA HAS BEEN SHOWN AS GROUND AND TANK MOUNTED. FINAL MOUNTING SHALL BE DECIDED BASED ON SUPPLIER'S RECOMMENDATION / SITE REQUIREMENT.
12. FOR CRITICAL DIMENSIONS, TOLERANCES ARE INDICATED IN THE DRAWING. FOR OTHER DIMENSION, GENERAL TOLERANCE MAY BE TREATED AS  $\pm 2\%$  EXCEPT DIMENSION RELATED TO FOUNDATION PLAN.

**NOTES:-**

1. MAJOR INTERFAIR DRAWINGS ARE :
  1. HV BUSHING : 3 452 00 01110
  2. LV BUSHING : 3 452 00 01111
  3. BUSDUCT MOUNTING FLANGE : 3 452 00 01115
2. ALL THE MAJOR INTERFACE WITH THE DRAWINGS AS PER NOTE-1 HAVE BEEN CHECKED AND FOUND IN ORDER.



AIR CLEARANCE

	H.V.	L.V.	NEUTRAL
LINE TO EARTH	N.A.	230	320
PHASE TO PHASE	N.A.	330	N.A.

SJVN Arun-3 Power Development Company Pvt. Ltd.		
एसजीवीएन अरुण-३ पावर हेल्परप्रॅट कम्पनी प्रा. लि. (एसजीवीएनके पूर्ण सामिल भागों का भागी) (A wholly owned company of SJVN) १०० मीलाट प्रॅग्न-३ जलविद्युत प्रायोजन ९०० MW Arun-3 Hydro Electric Project Reg. No.: 11180869970 SAPDC		
Recommended by Consultant	To be Issued to Contractor	
	Category: APPROVAL	
Status: Approved Dated: 23.07.2020		
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Reviewed <input type="checkbox"/> Recommended <input type="checkbox"/> Approved		

DISMANTLING OF HV BUSHING

REKESH



Rakesh

REKESH



Rakesh

ADDITIONAL INFORMATION	WO:-68012-X-512-01	PROJECT	ARUN-3 HYDRO ELECTRIC PROJECT, NEPAL (4X225MW)
STATUS OF DRAWING	"U"	CUSTOMER	SJVN ARUN-3 POWER DEVELOPMENT COMPANY PVT.LTD.(SAPDC LTD)
DISTRIBUTION OF PRINTS	TRE-1, TRM-3	CONSULTANT	SJVN LTD. (A JOINT VENTURE OF GOVT OF INDIA AND GOVT OF HP)
TYPE OF PRODUCT	92 MVA, 420KV, 1-PHASE, GENERATOR TRANSFORMER	DRG. NO.	3 452 00 01107

REV	DATE	ALT.		REV	DATE	ALT.	REKESH	REKESH	भारत हेवी इलेक्ट्रिकल्स लिमिटेड भोपाल	NAME	SIGN	DATE
H	CKD.	APPD.		02	13.07.20	ALT.	REKESH	REKESH	BHARAT HEAVY ELECTRICALS LTD. BHOPAL	DRN.	NSR/RM	02/01/20
			CKD.									
ZONE	ZONE	ZONE	ZONE	ZONE	ZONE	ZONE	ZONE	ZONE	DEPT	CODE	SCALE	WEIGHT(kg)
									TRE	406	COMP.SCALE-1:1	-----
									TITLE	OUTLINE GENERAL ARRGT.		
									DRG. NO.	3 452 00 01107	REV.	02
									SHEET	01 OF 04		

Rakesh

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BHARAT HEAVY ELECTRICALS LTD.

**एसजीवीएन अरुण-३ पावर हेल्परप्रोजेक्ट कम्पनी प्रा. लि.**  
**SJVN Arun-3 Power Development Company Pvt. Ltd.**  
 (एसजीवीएनको पूर्ण सामिक्षण भागको कम्पनी)  
 (A wholly owned company of SJVN)  
 १०० वार्किंग अरुण-३, जनविहान अराधाना  
**900 MW Arun-3 Hydro Electric Project**  
 Regd. No. 111508869079

Recommended by Consultant	To be Issued to Contractor		
	Category: <b><u>APPROVAL</u></b>		
	Status: <b><u>Approved</u></b>	Dated: 23.07.20	
	<i>Brarwad</i>	<i>Waran</i>	<i>Sharma</i>
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Reviewed	Recommended	Approved

TERMINAL MARKING		
1.1	-	HV
2.1, 2.2	-	LV 
1.2	-	HVN 

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**SJVN Arun-3 Power Development Company Pvt. Ltd.**  
 (एसजीवन अरुण-३ पावर डेवलपमेंट कंपनी प्रा. लि.)  
 (A wholly owned company of SJVN)  
 १०० मेगावाट अरुण-३ जलविद्युत आपातका  
 900 MW Arun-3 Hydro Electric Project  
 Regd. No.: 11190689070

ADDITIONAL INFORMATION		WO:-68012-X-512-01		PROJECT		ARUN-3 HYDRO ELECTRIC PROJECT, NEPAL (4X225MW)						
STATUS OF DRAWING		"U"		 RAKESH	CUSTOMER		SJVN ARUN-3 POWER DEVELOPMENT COMPANY PVT.LTD.(SAPDC LTD)					
					 SJVN	CONSULTANT	SJVN LTD. (A JOINT VENTURE OF GOVT OF INDIA AND GOVT OF HP)					
DISTRIBUTION OF PRINTS		TRE-1, TRM-3		TYPE OF PRODUCT		92 MVA, 420KV, 1-PHASE, GENERATOR TRANSFORMER						
SL No .	REV	DATE	ALT.	RAKESH		भारत हेवी इलेक्ट्रिकल्स लिमिटेड भोपाल BHARAT HEAVY ELECTRICALS LTD. BHOPAL		NAME	SIGN	DATE		
01	08.06.20	CKD.	LKJS			DEPT	CODE		SCALE	WEIGHT(kg)		
		APPD.	LKJS		TRE	406		COMP.SCALE-1:1	-----	APPD.	LKJS	
AL & & & &	ZONE	REVISED AS PER CUSTOMER COMMENTS.				TITLE OUTLINE GENERAL ARRGT. (ELEVATION VIEW)				DRG. NO	3 452 00 01107	REV.
										SHEET	02 OF 04	02

*Rakesh* 201 202 203 204 205 206 207 208





REF.DRG.NO. 3452 00 01108

BHARAT HEAVY ELECTRICALS LTD.  
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THE COMPANY. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DEDIMENTAL TO THE INTEREST OF THE COMPANY.

## REFERENCE DRAWINGS

DESCRIPTION	DRAWING NO.
OUTLINE GENERAL ARRANGEMENT	3 452 00 01107
O.G.A PART LIST	3 452 00 01108
FOUNDATION PLAN	3 452 00 01109
VALVE SCHEDULE PLATE	3 452 00 01117
RATING & DIAGRAM PLATE	3 452 00 01116
HV AND LV BUS DUCT MOUNTING FLANGE	3 452 00 01115
LOADING GAUGE DIAGRAM	3 452 00 01114
Ø320 TWIN BI-DIRECTIONAL ROLLERS	3 452 00 01113
420 KV, 1250 AMPS, OIL SF6 H.V. BUSHING	3 452 00 01110
24 KV 10000 AMPS. PORCELAIN LV BUSHING	3 452 00 01111
36 KV, 2000 AMPS, NEUTRAL BUSHING	3 452 00 01112
36 KV, 2000 AMPS, NEUTRAL BUSHING	3 452 00 01112
OIL FLOW DIAGRAM PLATE	3 452 00 01203
WATER FLOW DIAGRAM PLATE	3 452 00 01204
NEUTRAL FORMATION & GROUNDING	1 452 00 00122
DIAGRAM OF COOLER CONTROL GEAR	3 452 62 00343
DIAGRAM OF COMMON KIOSK	3 452 62 00345
GENERAL ARRGT. OF COOLER CONTROL CABINET	3 452 62 00344
GENERAL ARRANGEMENT OF COMMON KIOSK	3 452 62 00346

## APPROXIMATE OIL CAPACITIES

DESCRIPTION	LITERS
OIL IN TANK AND TURRETS	24000
OIL IN CONSERVATOR, COOLERS & P/W	2000
TOTAL OIL QTY.	26000

## APPROXIMATE WEIGHT

DESCRIPTION	WT. IN KG.
WEIGHT OF CORE & WINDING ASSY.	64000
TANK AND FITTINGS	24000
BUSHINGS	
MARSHALLING BOX TANK MOUNTED	
CONSERVATOR WITH SUPPORT	
COOLER ASSY. + P/W + PUMP ETC.	
TOTAL OIL	22600
TOTAL WEIGHT INCLUDING OIL	110600
SHIPPING WEIGHT OF TRANSFORMER (GAS FILLED)	74800
UNTANKING WEIGHT	8900

## NOTES:-

1. WEIGHTS ARE TENTATIVE.
2. MAKE OF THE ITEM SHALL BE AS PER BHEL VENDOR LIST.



## To be Issued to Contractor

Category: APPROVAL

Status: Approved Dated: 23.07.2020

Approved

Consultant:- SJVN LTD.

Recommended for Approval on 20.07.2020

SUB GROUP	SECTIONAL HEAD	HOD
Checked	Reviewed	On leave

## TABLE OF FITTINGS

ITEM NO.	DESCRIPTION	QTY.	ZONE
10b	INSPECTION COVER FOR CONSERVATOR	1	404-B
12a	MAGNETIC OIL GAUGE WITH LOW & HIGH OIL LEVEL ALARM ( 5A, 240VAC )	1	404-B
12b	PRISMATIC OIL GAUGE ( 0.25A, 240AC )	1	401-B
14a	50 NB GATE VALVE FOR MAIN CONS. FOR DRAINAGE/FILTER	1	404-F
14b	50 NB GATE VALVE FOR VACCUMING	1	404-A
15	CONSERVATOR Ø1300 X 2000 LG.	1	403-A
17	DEHYDRATING BREATHER FOR CONS. (SILICA GEL TYPE)	1	406-E
26	BUCHHOLZ RELAY (80 NB) WITH RAIN HOOD	1	205-B
51a	EQUILISING PIPE	1	303-C
79a	LADDER FOR CONSERVATOR	1	401-A
86	AIR RELEASE PLUG (1/4" BSP) ON MAIN CONSERVATOR FOR AIRCELL	1	402-A
86a	AIR RELEASE PLUG (3/4" BSP) ON MAIN CONSERVATOR	2	405-A
119a	ISOLATING 80 NB GATE VALVE FOR BUCHHOLZ RELAY	2	205-B
120	MAIN CONSERVATOR 80NB PIPE SET	1	204-B
125	GAS COLLECTING DEVICE	1	406-F
133	15 NB GATE VALVE FOR BREATHER CONNECTION TO MAIN CONSERVATOR	1	402-A
153	CONSERVATOR SUPPORT	2	402-B
161	BUCHHOLZ RELAY GAS RELEASE PIPE 6 NB	1	304-C
164	BREATHER PIPE 15 N.B. FOR MAIN CONSERVATOR	1	205-A
206	MONOGRAM (ALUMINIUM)	1	402-B
211	ATMOSEAL ARRGT.(AIRCELL) INSIDE CONSERVATOR	1	404-B
16c	3/4" BSP AIR RELEASE PLUG ON COOLER PIPE WORK	2	407-B
16d	3/4" AIR RELEASE VALVE ON COOLER	2	408-C
18e	THERMOMETERS ON COOLER PIPE WORK	5	407-B
25b	50 NB FILTER/DRAIN GATE VALVE ON OIL PIPE WORK.	3	407-B
62	ODWF COOLERS	2	407-D
64	OIL PUMP AND MOTOR	2	407-A
67	100 NB FLEXIBLE HOSE PIPE	4	407-C
69	WATER OUTLET PIPE 80 NB (QTY. IN SET)	2	407-E
71	COOLER SUPPORT	4	408-C
72	EARTHING TERMINAL PAD FOR COOLER	2	408-C
84a	WATER INLET 80 NB GATE VALVE	2	407-E
84b	WATER OUTLET 80 NB GATE VALVE	2	407-E
86b	3/4" BSP AIR RELEASE PLUG ON REFLUX VALVE	2	407-B
101	OIL PRESSURE GAUGE	4	406-C
101a	WATER PRESSURE GAUGE	2	407-E
114a	ON COOLER 1/4" DRAIN PLUG	2	407-D
131	100 NB ISOLATING BUTTER FLY VALVE FOR COOLER PIPework	4	206-C
131b	100 NB ISOLATING BUTTER FLY VALVE FOR PUMP & MOTOR	2	407-D
132	100 NB INTERLINKING BUTTER FLY VALVE FOR COOLERS	1	407-B
159	WATER FLOW INDICATOR	2	408-E
160	OIL FLOW INDICATOR	2	407-C
200	100 NB NON RETURN REFLUX VALVE	2	407-B
227	WATER INLET PIPE 80 NB.	2	407-E
229	SET OF OIL PIPE 100 NB (FOR BOTH COOLER)	1	408-B
232	WATER LEAKAGE DETECTOR	2	408-B
6	H.V. BUSHING	1	204-B
6x	H.V. NEUTRAL BUSHING	1	403-C
7	L.V. BUSHING	2	406-B
122	CT TERMINAL BOX FOR H.V. NEUTRAL	1	205-D
122a	CT TERMINAL BOX FOR L.V.	1	304-C
122b	CT TERMINAL BOX PROVISION FOR L.V.	1	304-C
149	L.V. TURRET	2	406-C
150	H.V. TURRET	1	203-C
180	TERMINAL MARKING PLATE	4	203-C

## TABLE OF FITTINGS

ITEM NO.	DESCRIPTION	QTY.	ZONE
2	RATING AND DIAGRAM PLATE	1	403-E
2a	DO'S & DON'TS PLATE	1	203-E
2b	VALVE SCHEDULE PLATE	1	403-D
2c	OIL FLOW & WATER FLOW DIAGRAM PLATE	1	403-E
3	LIFTING BOLLARDS	4	203-D
4	EARTHING TERMINALS	2	203-E
8	NAME PLATE HINDI AND ENGLISH	2	203-D
9	INSTRUCTION PLATE FOR LIFTING (ON LIFTING BOLLARD)	4	402-D
10	INSPECTION COVER ON TANK (HV SIDE WALL)	3	203-D
10a	INSPECTION COVER ON TANK COVER	1	302-B
10c	INSPECTION COVER ON LV TURRET	2	406-C
14	100 NB GATE VALVE FOR DRAINGE AT BOTTOM	1	402-F
16	1/2" BSP AIR RELEASE PLUG ON TOP TANK	1	303-C
18	POCKET FOR OIL TEMPERATURE INDICATOR	1	303-D
18a	POCKET FOR WINDING TEMPERATURE INDICATOR	2	304-D
18b	ORDINARY THERMOMETER WITH POCKET	1	304-D
18c	POCKET WITH RTD-WTI	2	304-D
18d	POCKET WITH RTD-OTI	1	303-D
19	JACKING PAD (SUITABLE FOR TOTAL WEIGHT WITH OIL)	4	203-F
21	OIL TEMPERATURE INDICATOR (150 mm DIAL)	1	204-E
22	WINDING TEMP. INDICATOR (150 mm DIAL)	2	205-E
23	320 DIA TWIN BI-DIRECTIONAL ROLLERS	4	203-F
24	SKIDS	1	203-F
25	50 NB FILTER GATE VALVE FOR BOTTOM TANK	1	406-F
25a	50 NB FILTER GATE VALVE FOR TOP TANK	1	402-C
27	PRESSURE RELIEF DEVICE	2	302-C
34	COOLER CONTROL CABINET	1	304-E
40	ANCHORING LUGS	4	203-D
79	LADDER WITH LOCKING DEVICE	1	302-B
80	OIL INLET BUTTER FLY VALVE 100 NB	2	205-F
81	OIL OUTLET BUTTER FLY VALVE 100 NB	2	205-C
109	HAULAGE LUG 50 DIA. LONGITUDINAL	4	203-F
109a	HAULAGE LUG 50 DIA. TRANSVERSAL	4	205-F
110	TOP TANK AND BOTTOM TANK SHORTING LINK	2	402-E
114	DRAIN PLUG BOTTOM TANK (1" BSP)	2	402-F
115	END FRAME TO COVER LOCKING ARRGT	2	303-C
116	COOLER CONTROL CABINET SUPPORT ASSEMBLY	2	303-E
130a	PAD FOR SUDDEN PRESSURE RELAY	1	203-D
131a	40 N.B. GATE VALVE FOR SUDDEN PRESSURE RELAY	1	203-D
212	EARTHING TERMINAL BOX (CORE, END FREAM, TANK)	1	303-B
216	FEED THROUGH PLATE OF OPTICAL FIBRE TEMP. MONITORING SYSTEM	1	403-D
224	SAMPLING VALVE 15 NB (1-ON TOP TANK & 1-ON BOTTOM TANK)	2	405-C
225	50 NB GATE VALVE FOR VACUUM PULLING	1	303-C
230	50 NB GATE VALVE FOR ONLINE DGA SYSTEM	2	403-E
231	ONLINE DGA SYSTEM	1	306-F
41	BEVEL GEAR BOX	1	403-C
48	OFF CIRCUIT TAP SWITCH DRIVING UNIT	1	403-E
49	OFF CIRCUIT TAP SWITCH DRIVING HANDLE	1	