	PRE - QUALIFYING REQUIREMENTS

ENQUIRY NO:	
PROJECT:	NORTH KARANPURA
PACKAGE:	OIL FILLED SERVICE TRANSFORMER

CRITERIA FOR EVALUATION - FINANCIAL :

	Amount (in Rs.)
Average annual financial turnover during the last Three Financial Years should not be less than Rupees Ten Crore Eighty Lakh(s) Only	Rs.10,80,00,000.00

Notes:-

a) The bidder has to submit financial accounts (audited, if applicable comprising of Audit report, Balance Sheet, Profit & Loss A/c Statement and Notes/Schedules pertaining to Turnover/Sales/Revenue), for last three years (or from the date of incorporation, whichever is less) as on tender due date to review the above criteria. In case the incorporation of vendor is less than 3 years, average annual financial turnover shall be calculated based on available information as below:-

i) If the accounts are available for <= 1 Financial Year, the Average Annual Turnover shall be calculated based on available information divided by 1 (One).

ii) If the accounts are available for >1 but < = 2 Financial Years, the Average Annual Turnover shall be calculated based on available information divided by 2 (Two).

iii) If the accounts are available for >2 but <= 3 Financial Years, the Average Annual Turnover shall be calculated based on available information divided by 3 (Three).

b) Foreign bidder is to submit a latest report from reputed third party business rating agency like Dun & Bradstreet, Credit reform etc. in addition to the documents mentioned at point (a) above for review of above criteria.

c) Other Income shall not be considered for arriving at Annual Turnover/Sales.For evaluation purpose,turnover figure excluding taxes shall be considered.

d) For evaluation of foreign bidder, exchange rate (TT selling rate of SBI) as on scheduled date of tender opening (Part-I bid in case of two part bid) shall be considered.

1047452/2022/PS-PEM-EL

BHEL PEM-ELECTRICAL

PRE-QUALIFYING REQUIREMENTS FOR OIL FILLED SERVICE TRANSFORMER

ANNEXURE-I

PROJECT SPECIFIC CRITERIA AGAINST ENQUIRY

PROJECT: 3X660 MW NORTH KARANPURA STPP

1. Bidder/ Sub Vendor should have manufactured & supplied at least two numbers (one each at two different installations) of at least highest offered rating oil filled transformers which should have been in successful operation for a period of at least two (2) years prior to the date of Techno-Commercial bid opening (i.e. 28.11.2013).

2. Bidder/ Sub Vendor should have his own facilities for conducting all routine and type tests as per IS: 2026 (except short circuit test).

3. The transformer considered for the above (1.) should have been successfully short circuit tested.

Note: Two different installations means two different project sites or two different contracts.

Suniya 30/08/22
[Dealing Engineer]

30.08.22
[Controlling Officer]

30/8/2022
[Section Head]

2/9/22
[DH-Electrical]

1047452/2022/PS-PEM-EL

	PRE-QUALIFICATION REQUIRMENTS FOR OIL FILLED SERVICE TRANSFORMER	PE-PQ-999-302-E001
		REVISION NO. 03 DATE 29/04/2016
		SHEET NO. 1 OF 1

ITEMS : Oil filled service transformers

Range of transformers : 500 – 10000 kVA; HV wdg : 66/33/11/6.6/3.3 kV; LV wdg :11/6.6/3.3/0.415 kV

The complete range is divided into 2 categories and the vendor can be considered for evaluation for the complete range or either of the 2 categories :

Cat 1 – LV service transformers; 500-2500 kVA (LV wdg. - 415V)

Cat 2 – MV service transformers; above 2.0 MVA & upto 10 MVA (LV wdg - 3.3kV & above)

SCOPE: Supply : YES; Erection & Commissioning : NO;

1	Availability of type test certificates (including short circuit test) conducted at independent Lab or witnessed by third party for at least one design for the applicable category of transformers.
2	Vendor should be designer & manufacturer of oil filled service transformers for the applicable category.
3	In-house capability to carry out all routine and type tests as per IS (other than short circuit, degree of protection & impulse tests which can be conducted at Govt. Lab/ Govt. approved Independent lab) for the applicable category of transformers.
4	Option -1 : Performance certificates for min. 2 years of trouble free operation at minimum 2 different installations/sites for the applicable category of transformers. Performance certificate should be from end user only. OR Option-2 : Repeat orders received from two different purchasers/end users for the applicable category of transformers during last 5 years provided the gap between award of two PO's is minimum 2 years. OR Option-3 : 1 no. performance certificate (as per Option-1) and 1 no. repeat order (as per Option-2). OR Option-4 : Successful execution of a major order from BHEL-PEM for the applicable category of transformers.
5	Minimum no. of transformers supplied in the last 10 years from the date of application for registration or date of techno- commercial bid opening (as applicable): - 50 nos. in Category 1 with at least 20 nos. in range of 1000 to 2500 kVA - 20 nos. in Category 2
6	Minimum two (2) nos. purchase orders for the applicable category of transformers shall be submitted which should not be more than five(5) years old from the date of application for registration or date of techno- commercial bid opening (as applicable) for establishing continuity in business.

NOTE:
Supplier to comply to "general points of PQR" available at http://bhelpem.com/vensection/PMD/PMD.aspx
In case supplier is not OEM, the offer shall be evaluated as per point no 1 of "general points of PQR".

PREPARED BY	REVIEWED BY	APPROVED BY
Abhay 29/04/16	Goyal 29/4/16.	MKesri 29.04.16
NAME: ABHAY AGRAWAL DESIGNATION: MANAGER	NAME: RAJNISH GOYAL DESIGNATION: AGM	NAME: MEENA KESRI DESIGNATION: AGM & DH(E)

General Points of PQR

1. Offers of the JV companies/ Joint Bidders/ bidders having collaboration/ licensing agreement/ MOU/ Indian subsidiaries shall be evaluated as follows:

   a. If bidder happens to be an Indian subsidiaries of foreign OEM, then the credentials of the foreign OEM can also be considered for meeting PQR.
   b. If bidder happens to be the Joint Venture Company, then the credentials of any of JV partners can be also considered for meeting PQR.
   c. If bidder happens to bid jointly with their partner, then credentials of both the partners will be considered for meeting PQR as per distribution of the work. In all such cases, lead bidder as specified in bid documents shall be responsible for overall execution of the contract and all guarantee/ warranty.
   d. If bidder happens to be the having valid collaboration agreement/ MOU/ licensing agreement with some other company, then the credentials of collaborator/ MOU partner/ licensing company can also be considered for meeting PQR.

   Note: If bidder(s) qualifies on the basis of credentials of his principal/ JV partner/ Collaborator/ joint bidder etc., then the principal/ JV partner/ Collaborator/ MOU partner/ joint bidder shall be responsible for overall design vetting and warranty/ guarantee of the package. The scope matrix clearly defining their respective roles including design vetting, manufacturing of critical component, E&C etc. etc. and warranty/ guarantee shall be submitted along with the offer.

2. Bidder to note that the arrangement of bidding (joint bid partners/ collaborator/ MOU partner/ licensing company etc.) once offered to BHEL as a part of bidding documents cannot be changed till the execution of the project.

3. Consideration of offer shall be subject to customer's approval of bidders, if applicable.

4. Bidder to submit all supporting documents in English. If documents submitted by bidder are in language other than English, a self-attested English translated document should also be submitted.

5. Any other project specific requirement shall be as per Annexure-I and bidder shall submit relevant supporting documents.

6. Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities and capacity of the bidder/collaborators to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL.

7. After satisfactory fulfillment of all the above criteria/ requirement, offer shall be considered for further evaluation as per NIT and all the other terms of the tender.

3 X 660 MW NORTH KARANPURA STPP
AUXILIARY SERVICE TRANSFORMERS (OIL FILLED) For ACC Application
UNPRICE SCHEDULE

					Columns to be filled by Bidder { Fill only 'Quoted' / 'Not Quoted'}			
Sr. No.	**Item code**	**Item Description**	**Unit**	**Quantity**	**Unit Ex-Works Price**	**Freight**	**GST**	**TOTAL AMOUNT INCLUDING TAXES**
1.0	302-11010-A	2500KVA, 11kV/0.433kV, 3 phase, 2 winding, outdoor, ONAN, Z=13.0%, Dyn1, OFF Circuit taps ±5% in steps of 2.5% (with cable box type HV, with bus-duct type LV and with solidly grounded LVN termination)	NOS	17				
2.0	302-11303-A	EXTRA OIL (10%) IN SEALED NON RETURNABLE STANDARD DRUMS FOR 2500KVA TRANSFORMER	NOS	17				
3.0	302-11000-B	OIL FILLED SERVICE TRANSFORMER - Mandatory Spares Details as per Annexure-I	LOT	1				
4.0	302-11203-A	TYPE TEST FOR 2500KVA TRANSFORMER (Details as per Annexure-II)	LOT	1				
	Total (1 to 4)							

NOTES

1. BIDDER TO NOTE THAT THE COST OF TRANSFORMER SHALL INCLUDE THE COST OF ROUTINE TESTS AND SHALL BE CARRIED OUT ON ALL TRANSFORMERS WITHOUT ANY ADDITIONAL COST. BIDDER SHALL QUOTE ACCORDINGLY.
2. BIDDER SHALL SUPPLY 10% EXTRA OIL AS PER THE QUOTED PRICE. QUANTITY OF EXTRA OIL SHALL BE SUBJECT TO APPROVAL DURING DETAIL ENGINEERING.
3. **CHARGES FOR CARRYING OUT SHORT CIRCUIT TEST SHALL BE PAYABLE BASED ON ACTUAL INVOICE FROM DESIGNATED LABORATORIES (CPRI, BHOPAL/ CPRI, BANGLORE / ERDA, VADODARA) WITH AN ADDITIONAL LUMP SUM AMOUNT OF 5% OF EX-WORKS PRICE OF TRANSFORMER BEING TESTED TO COVER HANDLING COSTS (TRANSPORTATION, INSURANCE ETC.).
4. IN CASE TYPE TESTS ARE WAIVED, THE TYPE TEST CHARGES SHALL NOT BE PAYABLE TO THE BIDDER
5. CHARGES FOR ALL TYPE TESTS EXCEPT SHORT CIRCUIT TEST SHALL BE CONSIDERED FOR PRICE COMPARISONS PURPOSE.
6. IN CASE ANY OF THE TYPE AND SPECIAL TESTS ARE REQUIRED TO BE REPEATED (IN CASE TEST FAILS OR NOT MEETING THE GUARANTEED PARAMETERS) THE SAME SHALL BE CARRIED OUT BY THE VENDOR WITHOUT ANY COMMERCIAL / DELIVERY IMPLICATION TO BHEL.

ANNEXURE-I

3 X 660 MW NORTH KARANPURA STPP
AUXILIARY SERVICE TRANSFORMERS (OIL FILLED)-ACC Application
UNPRICE SCHEDULE (MANDATORY SPARE)

					Columns to be filled by Bidder { Fill only 'Quoted' / 'Not Quoted'}			
Sr. No.	**Item code**	**Item Description**	**Unit**	**Quantity**	**Unit Ex-Works Price**	**Freight**	**GST**	**TOTAL AMOUNT INCLUDING TAXES**
1.0		HV bushing with metal parts & gaskets	NO EACH TYPE					
a		11.0/0.433kV, 2500KVA	NO.	3				
2.0		LV bushing with metal parts & gaskets	NO EACH TYPE					
a		11.0/0.433kV, 2500KVA	NO.	3				
3.0		LV Neutral bushing with metal parts & gaskets	NO EACH TYPE					
a		11.0/0.433kV, 2500KVA	NO.	1				
4.0		WTI with contacts	NO EACH TYPE					
a		11.0/0.433kV, 2500KVA	NO. EACH TYPE	1				
5.0		OTI with contacts	NO EACH TYPE					
a		11.0/0.433kV, 2500KVA	NO. EACH TYPE	1				
6.0		Pressure relief Device	NO EACH TYPE					
a		Pressure relief Device	NO. EACH TYPE	1				
7.0		MOG	NO EACH TYPE					
a		MOG	NO. EACH TYPE	1				
8.0		Buchholz relay complete	NO EACH TYPE					
a		Buchholz relay complete	NO. EACH TYPE	1				
9.0		Set of gaskets	SET					
a		11.0/0.433kV, 2500KVA	SET	1				
10.0		Set of valves	SET					
a		11.0/0.433kV, 2500KVA	SET	1				
11.0		Air cell for conservator	NO. (AS APPLICABLE)					
a		Air cell for conservator	NO. (AS APPLICABLE)	1				
Total								

NOTES

1 1 set consists of quantities required for 1 complete transformer of each type (as applicable).

ANNEXURE-II

3 X 660 MW NORTH KARANPURA STPP
AUXILIARY SERVICE TRANSFORMERS (OIL FILLED)-ACC Application
UNPRICE SCHEDULE (TYPE TEST)

				Columns to be filled by Bidder { Fill only 'Quoted' / 'Not Quoted'}			
Sr. No.	**Description of Type Test**	**Unit**	**Quantity**	**Unit Ex-Works Price**	**Freight**	**GST**	**TOTAL AMOUNT INCLUDING TAXES**
1.0	2500kVA, 11kV/0.433kV, 3 phase, 2 winding, outdoor, ONAN, Z=13.0%, Dyn1, OFF Circuit taps ±5% in steps of 2.5% (with cable box type HV, with bus-duct type LV and with solidly grounded LVN termination)	NO.					
1.a	TANK PRESSURE TEST	NO.	1				
1 b	TANK VACUUM TEST	NO.	1				
1 c	MEASUREMENT OF ACOUSTIC NOISE LEVEL AS PER NEMA TR-1	NO.	1				
1 d	TEMPERATURE RISE TEST AT A TAP CORRESPONDING TO MAXIMUM LOSSES. (Gas Chromatography shall be conducted on oil sample taken before & immediately after temp. rise test. Gas analysis shall be as per IS: 9434 (based on IEC: 60567), results will be interpreted as per IS: 10593 (based on IEC: 60599). Result shall be recorded for future reference).	NO.	1				
1 e	LIGHTNING IMPULSE(FULL & CHOPPED WAVE) TEST ON WINDINGS (AS PER IEC 60076-3)	NO.	1				
1 f	SHORT CIRCUIT TEST (SPECIAL TEST) AS PER IEC 60076-5** (AS PER NOTE 1)	NO.	1				
Total							

NOTES

1 **CHARGES FOR CARRYING OUT SHORT CIRCUIT TEST SHALL BE PAYABLE BASED ON ACTUAL INVOICE FROM DESIGNATED LABORATORIES (CPRI, BHOPAL/ CPRI, BANGLORE / ERDA, VADODARA) WITH AN ADDITIONAL LUMP SUM AMOUNT OF 5% OF EX-WORKS PRICE OF TRANSFORMER BEING TESTED TO COVER HANDLING COSTS (TRANSPORTATION, INSURANCE ETC.).

2 IN CASE TYPE TESTS ARE WAIVED, THE TYPE TEST CHARGES SHALL NOT BE PAYABLE TO THE BIDDER

3 CHARGES FOR ALL TYPE TESTS EXCEPT SHORT CIRCUIT TEST SHALL BE CONSIDERED FOR PRICE COMPARISONS PURPOSE.

4 IN CASE ANY OF THE TYPE AND SPECIAL TESTS ARE REQUIRED TO BE REPEATED (IN CASE TEST FAILS OR NOT MEETING THE GUARANTEED PARAMETERS) THE SAME SHALL BE CARRIED OUT BY THE VENDOR WITHOUT ANY COMMERCIAL / DELIVERY IMPLICATION TO BHEL.

BHEL-PEM, NOIDA

SPECIAL CONDITIONS OF CONTRACT (SCC) REV 00

3X660MW NTPC NORTH KARANPURA STPP (EPC)

1. **Project Name**	:	**3X660MW NTPC NORTH KARANPURA STPP (EPC)**
2. **Consignee Address**	:	CONSTRUCTION MANAGER/BHEL SITE NTPC NORTH KARANPURA STPP, (3X660MW) NEAR TANDWA TOWN, DISTT. : CHATRA JHARKHAND
	Notes :	**1) Consignee address in LR should be strictly as per above.** **2) Vendor to note that to effect "Sale in Transit", BHEL shall issue "Delivery Note" to the Transporter for transferring the ownership from BHEL to the customer (NTPC). Delivery Note shall be carried by transporter along with other dispatch documents.**
3. **Buyer and Paying Authority**	:	**A) For Inter-state sales (where CST is applicable):** 1) BHEL-PEM, Noida for those packages for which PO is placed by PEM. 2) BHEL-PSER, Kolkata for those packages for which PO is placed by BHEL-PSER. **B) For Intra-state sales (where VAT is applicable):** Paying Authority shall be same as referred above. However, Buyer Authority shall be informed later. Detail requirements are enclosed as Annexure-I which are to be followed strictly.
4. **Mode of Dispatch**	:	As per GCC. For Road dispatch, it is Vendor's responsibilty to ensure availabilty of trucks well in advance for dispatch of material to meet contractual delivery requirement.
5. **Road Permit Requirement**	:	Required
6. **Transit Insurance**	:	In BHEL Scope (Policy details shall be provided **LATER**). Prior Dispatch intimation shall be issued to Insurance Company about the value of consignment, dispatch details, along with one set of documents consisting of LR / RR copy, Packing List/ Challan indicating the items dispatched (with their weights). A copy of above should be sent to the following: a) BHEL Site office (Address same as Consignee address) b) BHEL-PEM, Plot no 25, Sec 16-A, Noida 201301 **(For Supply Packages)** c) BHEL-PSER, Kolkata **(For Turnkey Packages)**
7. **BHEL-PEM TIN NO.**	:	09765702874 (To be used for PO issued by BHEL-PEM)
8. **BHEL-PSER, TIN NO.**	:	19200936019 (To be used for PO issued by BHEL-PSER, Kolkata)
9. **Unloading at Site**	:	1) **For Supply Packages:** In the scope of **BHEL** Site. (The Supplier shall furnish LR wise Gross Wt. of the consignment for the purpose of handling the consignment by BHEL Site Contractor) Please note that unloading of materials at Site sometimes may take 3-4 days. Transporters to be advised suitably before dispatch of materials in this regards. 2) **For Turnkey Package:** In the scope of **Vendor.**
10. **Storage at Site**	:	**1) For Supply Packages:** In the scope of **BHEL** Site. **2) For Turnkey Package:** In the scope of **Vendor.**
11. **Movement of Material Within Site**	:	**1) For Supply Packages:** In the scope of **BHEL** Site. **2) For Turnkey Package:** In the scope of **Vendor.**
12. **Inspection Agency**	:	Inspection of packages shall be carried out by agency as per below Inspection category of packages: 1) **Cat-I:** Inspection shall be done jointly or separately by **NTPC and BHEL .** 2) **Cat-II:** Inspection shall be done by BHEL only. 3) **Cat-III:** Certificate of Compliance shall be furnished by Vendor. Please note, for Cat I & II items BHEL reserve the right to carry inspection by themselves or through nominated third party. For Inspecting Agency for various items, vendor may refer to Quality Plan.
13. **Material Dispatch Clearance Certificate (MDCC) Issuing Agency**	:	For Cat-I item, MDCC shall be issued by NTPC and it's the responsibilty of vendor to arrange MDCC from them, and **original MDCC** shall be attached with Invoice by Vendor for claiming payment from BHEL. For Cat- II & Cat-III items, MDCC shall be issued by BHEL

14. **Dispatch Documents Required (to be furnished by** : **A) For customer billing by PEM, the supplier shall provide the following documents to BHEL-PEM in 4 sets :**

1) Copy of Vendor Invoice (Original VAT Invoice required in case of VAT).
2) Original LR
3) Copy of Packing List indicating Quantity/ Gross weight/ Net weight and NTPC approved BBU item no. wherever applicable against each item dispatched.
4) MDCC (Original NTPC MDCC, if applicable)
5) CHP issued by NTPC – Original (if applicable)
6) Insurance intimation copy
7) Test certificate/Inspection Reports- Original (for Cat II & Cat III Packages)

B) For Vendor payments documents mentioned in GCC shall be applicable. However, original money receipt for Freight payment is not required.

15. **Dispatch Markings** : Each package/Drum delivered under the Contract shall be marked by Supplier as per details listed below and such marking must be distinct and in English language.

1) Name and address of the consignee (as given in Sl. no 2)
2) Dispatched by: (Vendor name) : A/c BHEL PEM, Noida or BHEL-PSER,Kolkata as the case may be.
3) LR No
4) Package No / Total Package No eg: 1 of N, 2 of N; where N=Total no of packages in a particular consignment.
5)Type of Supply: **"Main equipment supply"/ "Mandatory Spares "/ "Commisioning Spares"** as the case may be.

Besides above, necessary packing shall bear a special marking "TOP" "BOTTOM","DO NOT TURN OVER","KEEP DRY","HANDLE WITH CARE", etc.

16. **Taxes & Duties** : a) All Bidders to note that this is a **Mega ICB Project** which qualifies for deemed export benefits & other benefits under Mega Power project policy of Government of India. Applicable documents such as **Project Authority Certificate (PAC)** will be issued. For this Project, **Zero % Custom Duty (against PAC)** shall be applicable on the Import Contents of the supplier.

b) The Bidder to indicate the Import contents if any i.e. list of the imported item, Currency of Import and Country of Import including CIF value in their offers. BHEL shall inform, the availability of CIF value for a particular package including ceiling limit, if any, in NIT.Bidder has to pass on the benefit of availing Zero % custom duty in price offered to BHEL.

c) All bidders to note being a Mega ICB Project, Excise Duty shall not be included in their prices to BHEL as per the nature of the project. PAC shall be issued to main vendor for their self-manufactured item only, to avail benefit of Nil ED. Concessional CST presently 2 % against Form 'C' & 'EI/E2' or VAT as applicable is to be considered in their quoted prices. Concessional CST/ VAT shall be considered for evaluation of offers to arrive at the L1 bidder. The benefit of Nil Excise duty and concessional CST must be passed on to BHEL in their offer.

The benefit of Nil Excise duty and concessional rate of CST must be passed on to BHEL in their offer.

VAT on intra-state dispatch shall be paid subject to conditions specified in Annexure-Entry tax:-If any, shall be payable by ultimate customer(NTPC) directly to sales tax authority. Hence the same should not be considered in the offer.

17. **Final Drawings/ Documents Submission** : Final documentation submission shall be as per GCC. Numbers of copies required to be submitted is as under:

1. As built/ Final Drawing: 8 Sets (Hard Copy)+4 Nos.(CD)
2. O&M Manuals: 6 Sets(Hard Copy)+ 4 Nos.(CD)
3. PG test Report: 6 Sets (Hard Copy)+ 4 Nos.(CD)
4. QA Documents : 4 Sets (Hard Copy)+ 4 Nos.(CD)

	Prepared by	Checked by	Reviewed by	Vetted by Finance	Approved by
Name:	**Sumit Agrawal**	**Sandeep Kumar**	**PK Gupta**	Swati Rastogi	**SB Naithani**
Designation:	Sr. Engr./PGIII	Sr. Mgr-PGIII	AGM-PGIII	Sr. AO	DH/MSX&P/PG-III
Signature:					
Date:	3/9/14	3/9/2014	3/9/14	3/09/2014	3/9/2014

vetted for taxes & duties Swati

ANNEXURE - I

BHEL-PEM, NOIDA
3X660MW NTPC NORTH KARANPURA STPP (EPC)
Requirements to be fulfilled for Intra-State Sales

In order to avail the benefit of input tax credit available to BHEL in case of VAT leviable on intra-state transaction between BHEL and vendor, & to fulfill the compliances as per requirements of applicable State's VAT law, the following modality shall be applicable:

BHEL has identified a nodal agency in each State to take care of VAT compliances in the State in which project is located. For the subject project nodal agency shall be: **Inform Later**

Nodal agency is defined as Buyer and BHEL/ PEM shall be paying agency in such cases, where VAT is applicable.

Vendors' original tax invoice for intra State transactions is one of the important documents for availing Input Tax credit. In this regard the following may be noted by all vendors for strict compliance:

1) As a general rule, a tax invoice must be original, must contain vendor's TIN No with full address, invoice no & date, product description with unit rate, quantity, value, VAT rate, VAT amount, gross value of bill, **buyer i.e. BHEL's address with TIN**, (as given above) special marking like "Original" and/or "valid for input credit"/ Buyer can take credit against this" etc. as per applicable State VAT law.
2) Please note that BHEL's address and TIN to be mentioned in vendors tax invoice shall be **principal place of business & applicable TIN of nodal agency of BHEL, as given above. In no case the vendors, invoices shall be addressed to BHEL PEM nor shall they contain PEM TIN.** However for payment purposes, the invoice must mention BHEL-PEM Noida/BHEL PSER-Kolkata, as paying authority (as applicable).
3) As original tax invoice of vendors is to be furnished to nodal unit for assessment/VAT audit purposes, another one Original invoice is required to be submitted by vendors for retaining with PEM bank payment voucher.
4) Where the supplies are made from within the same state where the project is located, the vendor has to provide VAT invoice for such supplies even if the price quoted is all inclusive.
5) Original tax invoice along with extra copy of Original Tax invoice in line with respective state VAT law shall be essential document to be submitted by vendor for claiming payment.
6) Vendor shall also furnish a certificate/statement/document as prescribed under applicable State VAT law. Please note that some of the States requires additional certificate/documents e.g. Haryana requires certificate in form C-4 in addition to original tax invoice.
7) Please note that reimbursement/payment of VAT shall be subject to furnishing of Vat compliant tax invoice and other certificate/document as per applicable State VAT law.
8) Tax invoice must show Vat rate & VAT amount separately and in no case all inclusive prices is to be shown in the tax invoice since input credit is not admissible in case VAT is not indicated separately.
9) In case vendor is unable to furnish Vat compliant tax invoice & other certificate/document, VAT shall not be reimbursed by BHEL.

3/9/14

3/09/2014.

NTPC
3 x 660 MW NORTH KARANPURA STPP

VOLUME – II

TECHNICAL SPECIFICATION FOR

OIL FILLED SERVICE TRANSFORMERS

SPECIFICATION NO : PE-TS-405-302-E001C
REV-0

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, UTTAR PRADESH, INDIA – 201301

	TECHNICAL SPECIFICATION FOR OIL FILLED SERVICE TRANSFORMERS	SPECIFICATION NO. PE-TS-405-302-E001C
		VOLUME II
		CONTENTS SHEET
	3 X 660 MW NORTH KARANPURA STPP	REVISION 0 | DATE: 25.07.2022
		SHEET 1 OF 1

CONTENTS

TOTAL NUMBER OF SHEETS: 71

	TECHNICAL SPECIFICATION FOR OIL FILLED SERVICE TRANSFORMERS	SPECIFICATION NO. PE-TS-405-302-E001C
		VOLUME II
		COMPLIANCE CERTIFICATE
	3 X 660 MW NORTH KARANPURA STPP	REVISION 0 | DATE: 25.07.2022
		SHEET 1 OF 1

COMPLIANCE CERTIFICATE

The bidder shall confirm compliance to the following by signing/ stamping this compliance certificate and furnishing same with the offer.

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same

2. There are no deviation with respect to specification other than those furnished in the 'schedule of deviations'

3. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.

4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.

5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in 'BOQ-Cum-Price schedule' of the specification shall not be considered (i.e., technical description & quantities as per the specification shall prevail).

BIDDER'S STAMP & SIGNATURE

6.00.00 **INSULATION LEVEL**

The insulation level for the transformer windings and bushings shall be as follows :

	WINDING		**BUSHING**	
Highest System Voltage	Rated Power Freq. withstand Voltage (kVrms)	Rated lightlning impulse withstand voltage (kVp)	Rated Power freq. withstand voltage (kV rms)	Rated lightling impulse withstand voltage (kVp)
0.433 KV	3	-	3	-
3.6 kV	10	40	10	40
7.2 kV	20	60	20	60
12 kV	28	75	28	75
17.5 kV	38	95	38	95
24kV	50	125	50	125
36kV	70	170	70	170
72.5 kV	140	325	140	325
145kV	275/38*	650	275	650
245 kV	395/38*	950/1050**	460	1050/1050**
420 kV	630/38*	1425/1570**	750	1550/1570***

* In case of non-uniformly insulated. **** Chopped wave BIL.**

*** Suitable for chopped wave impulse test on transformers.

SECTION ‘I’

SPECIFIC TECHNICAL REQUIREMENTS

	TECHNICAL SPECIFICATION FOR OIL FILLED SERVICE TRANSFORMERS	SPECIFICATION NO. PE-TS-405-302-E001C
		VOLUME II
		SECTION I
	3 X 660 MW NORTH KARANPURA STPP	REVISION 0 | DATE: 25.07.2022
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1.0 SCOPE OF ENQUIRY

1.1 This specification covers the design, manufacture, inspection and testing at manufacturer's works, proper packing and delivery to site of **OIL FILLED SERVICE TRANSFORMERS (Level-1 losses as per IS-1180, however the impedance value, list of tests, fittings shall be as per those mentioned in the specification & shall also comply with IS-1180)** as mentioned in different sections of this specification, complete with all accessories for efficient and trouble-free operation.

1.2 Overall dimension of Transformer shall not exceed 3900 mm (L) x 2900 mm (W), height (H) to be decided by manufacturer.

1.3 It is not the intent to specify herein all the details of design & manufacture. However, the equipment shall conform in all respect to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation.

1.4 Standard technical requirements of the oil filled service transformers are indicated in Section-II. Project specific requirements/changes are listed in Section-I.

1.5 <u>The requirements of Section-I shall prevail and govern in case of conflict between the corresponding requirements of Section-I and Section-II.</u>

2.0 BILL OF QUANTITIES:

2.1 Quantity requirements shall be as per BOQ-cum-price schedule as part of NIT.

3.0 SPECIFIC TECHNICAL REQUIREMENTS

S. No.	***Reference Clause No. of Section- II***	***Specific Requirement/ Change***
1.	1.02.01	The Clause shall be read as Terminal points are • HV bushing of transformer • HV cable gland at transformer

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2.	1.02.02	The Clause shall be read as Terminal points are • LV bushing of transformer • LV cable lugs & gland at transformer
3.	2.01.00	The Clause shall be read as The equipment shall comply with all currently applicable safety codes and statutory regulations of India as well as of the locality where the equipment is to be installed including Indian Electricity Act, Indian Electricity Rules and Bureau of Indian Standards, BEE Guideline & CEA notification.
4.	3.03.00	The Clause shall be read as Core shall be high grade non-ageing cold rolled super grain oriented silicon steel laminations of M4 grade or better quality. The core isolation shall be able to withstand a voltage of 2 kV (rms.) for 1 minute in air.
5.	3.08.00	The Clause shall be read as Main tank shall be provided with conservator tanks of adequate capacity for expansion of oil from minimum ambient to 100 deg.C. The equipment rated 7.5MVA and above shall be provided with air bag breathing through indicating type cobalt free silica gel breather with transparent enclosure. However conventional type conservator with indicating type cobalt free breather (transparent enclosure) may be offered for transformer below 7.5 MVA.
6.	3.10.00	The Clause shall be read as As per IS: 335. No external inhibitors are permitted. The oil supplied with transformers shall be new and previously unused and must conform to following while tested at supplier's premises and shall have following parameters.

S. No	Property	Permissible values
1.	Kinematic Viscosity, mm_2/s	≤ 12 at 40 °C ≤ 1800.0 at (-)30 °C

2.	Flash Point, °C	≥ 140°C
3.	Pour point, °C	≤ (-)40 °C
4.	Appearance	Clear , free from sediment and suspended matter
5.	Density kg/dm3 at 20 °C	≤ 0.895
6.	Interfacial Tension N/m at 25°C	≥ 0.04
7.	Neutralisation value, mgKOH/g	≤ 0.01
8.	Corrosive sulphur	Non Corrosive
9.	Water content mg/kg	≤ 30 in bulk supply ≤ 40 in drum supply
10.	Anti oxidants additives	Not detectable
11.	Oxidation Stability -Neutralization value, mgKOH/g -Sludge, % by mass	≤ 1.2 ≤ 0.8
12.	Breakdown voltage As delivered, kV After treatment, kV	≥ 30 ≥ 70
13.	Dissipation factor, at 90° C And 40 Hz to 60 Hz	≤ 0.005
14.	PCA content	≤1%
15.	Impulse withstand Level, kVp	≥ 145
16.	Gassing tendency at 50 Hz after 120 min, mm3/min	≤ 5

Subsequently oil samples shall be drawn at:

Sr. No.	Parameters	Before filling in main tank at site & tested for	Prior to energization at site for following properties & acceptance norms:
1.	BDV	60 kV (min)	60 kV (min)
2.	Moisture content	10 ppm (max.)	10 ppm (max.)

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7.	3.12.01	The Clause shall be read as a) Bushing shall be solid porcelain/condenser/oil communicating type. b) No arcing horns to be provided on the bushings. c) LV bushing palms shall be silver/tin plated. The bushings shall conform to the requirements of IS: 2099 and IS: 3347.
8.	3.15.00	Following point is added NGR is excluded from bidder scope of supply.
9.	3.16.00	The Clause shall be read as Bidder to provide neutral bushing CT as per details given in data sheet – A of section-I, volume-II for restricted earth fault protection or standby earth fault protection. CT Shall be of adequate rating for protection as required, WTI etc. All CTs (except WTI) shall be mounted in the turret of bushings, mounting inside the tank is not permitted. All CT terminals shall be provided as fixed type terminals on the M. Box/CCC/CMB to avoid any hazard due to loose connection leading to CT opening or any other loose connection in power circuit. In no circumstances Plug in type connectors shall be used for CT & Power connection.
10.	3.18.03	The Clause shall be read as The gaskets shall not deteriorate during the life of transformer if not opened for maintenance at site. All joints flanged or welded associated with oil shall be such that no oil leakage or sweating occurs during the life of transformer. The quality of these joints is considered established, only if the joints do not exhibit any oil leakage or sweating for a continuous period of at least 3 months during the guarantee period. In case any sweating / leakage is observed, contractor shall rectify the same & establish for a further period of 3 months of the same. If it is not established during the guaranteed period, the guaranteed period shall be extended until the performance is established.

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11.	3.22.00	The Clause shall be read as The conductors shall be of Electrolytic grade copper. All Windings of 66kV and below shall have uniform insulation. Windings are made in dust proof & conditioned atmosphere.
12.	4.01.00-4.02.00	The Clause shall be read as Transformer shall be provided with, but not restricted to following minimum fittings and accessories for satisfactory operation: a) Conservator for main tank with MOG (with low oil level alarm contact), drain valve & indicating type free Cobalt free breather with transparent enclosure (maximum height 1400 mm above rail level) etc. Aircell (for 7.5 MVA & above). b) Buccholz relay, double float type with alarm and trip contacts, along with suitable gas collecting device. c) For 2 MVA & above rating transformer/reactor, minimum two numbers of spring operated PRD (with trip contacts) with suitable discharge arrangement for oil shall be provided. For transformers below 2 MVA, diaphragm type explosion vent shall be provided. d) OTI & WTI shall be 150 mm dial type with alarm and trip contacts with max. reading pointer & resetting device. (maximum height 1500 mm above rail level) e) Top & bottom filter valves with threaded male adapters, bottom sampling valve, drain valve/sludge removal valve at the bottom most point of the tank. f) Air release plug, bushing with metal parts & gaskets, terminal connectors on bushings (as applicable) & surge arrestor (as applicable). g) Prismatic/toughened glass oil gauge for transformers. h) Bi-directional wheel & skids, M. Box, OCTC, Bushing CTs, Insulating Oil, Cooling equipment, Valve Schedule Plate. i) Cover lifting eyes, transformer lifting lugs, jacking pads, towing holes and core and winding lifting lugs, additional 4 nos. lifting lugs for bell tank cover, inspection cover, manhole, Bilingual R&D Plate, Terminal marking plates, two earthing terminals etc.

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<table>
<tr><td></td><td></td><td>j) Bolts & nuts (exposed to atmosphere) shall be galvanized steel/SS.
k) Rain hoods to be provided on Buchholz, MOG & PRD. Entry points of wires shall be suitably sealed.

The fittings listed above are only indicative and other fittings, which generally are required for satisfactory operation of the Transformers are deemed to be included.</td></tr>
<tr><td>13.</td><td>5.00.00</td><td>The Clause shall be read as

Paint shade shall be finalised to successful bidder during detail engineering as applicable. Adequate quantity of touch up paint shall also be supplied. There shall be no commercial or delivery implication to BHEL on account of paint shade, paint specification/ procedure.
<table>
<tr><th>PARTS NAME</th><th>TYPE OF PAINT</th><th>NO.OF COATS</th><th>TOTAL DFT</th></tr>
<tr><td>Inside of tank and accessories (except CCC, CMB & M Box)</td><td>Oil & heat resistant fully glossy white</td><td>One coat</td><td>Atleast 30 micron</td></tr>
<tr><td>External surface of Transformer and accessories including CCC, CMB, M Box (except coolers & radiators)</td><td>Chemical resistant epoxy zinc phosphate primer, MIO (Micaceious iron oxide) as intermediate paint followed by polyurethane finish paint (RAL 5012 Blue)</td><td>One coat each</td><td>Atleast 100 micron</td></tr>
<tr><td>External Cooler,Radiator surface</td><td>Anticorrosive primary paint followed by high quality full glossy outer finish paint (RAL 5012 Blue)</td><td>Two coats each</td><td>Atleast 100 micron</td></tr>
</table></td></tr>
</table>

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			Internal Radiator surface	Hot oil proof, low viscosity varnish and subsequent flushing with transformer oil	-	-
			Internal surface of CCC,CMB & M Box	Chemical resistant epoxy zinc phosphate primer followed by chemical and heat resistant epoxy enamel white paint	Two coats each	Not less than 100 micron
14.	6.03.00	Tests shall be performed in presence of Purchaser's representative. The bidder shall give at least fifteen (15) days advance notice of date when the tests are to be carried out. The contractor shall obtain the employer's approval for the type/ special test procedure before conducting the type/ special test. The type/ special test procedure shall clearly specify the test set–up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type/ special test(s) to be carried out				
15.	New Clause	6.07.00. In case the contractor has conducted such specified type/ special test(s) within last ten years as on the date of bid opening (i.e. 28.11.2013), he may submit during detailed engineering the type/ special test reports to the owner for waiver of conductance of such type/ special test(s). These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The owner reserves the right to waive conducting of any or all the specified type/ special test(s) under this contract. In case type/ special tests are waived, the type/ special test charges shall not be payable to the contractor. 6.08.00 Each transformer shall be completely assembled with all fittings & accessories meant for the particular transformer before offering for inspection & testing by purchaser.				

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6.09.00 **ROUTINE / TYPE/ SPECIAL TESTS ON TRANSFORMERS:**

S.N.	Routine Tests
1.	All routine test in accordance with IEC 60076 shall be carried out in all the transformers.
2.	Measurement of Voltage Ratio & phase displacement (as per IEC 60076-1)
3.	Measurement of winding resistance on all the taps (as per IEC 60076-1)
4.	Vector group and Polarity Check (as per IEC 60076-1)
5.	Magnetic Balance and Magnetising Current Test
6.	Measurement of no load current with 415 V, 50 hz AC supply
7.	Measurement of no load losses and current at 90%, 100% & 110% of rated voltage (as per IEC 60076-1)
8.	Load Loss & Short Circuit Impedance Measurement on principal & Extreme Taps
9.	IR measurement (As per IEC 60076-1)
10.	Measurement of capacitance & tan delta to determine capacitance between winding & earth.
11.	Dielectric tests shall be carried out as per IEC 60076-3.
12.	Separate Source Voltage Withstand Test (as per IEC 60076-3)
13.	Induced overvoltage test (ACSD Test)
14.	Repeat no load current/loss measurement & IR after completion of all electrical test
15.	Oil leakage test on completely assembled transformer along with unit coolers/ radiators (as per relevant clause of this sub section)
16.	Jacking test followed by D.P. test
17.	Marshalling Box/Cable box:It shall not be possible to insert a thin sheet of paper under gaskets and through enclosure joints.
18.	IR measurement on wiring of Marshalling Box.

S.N.	Type/ Speical Tests
1.	Lightning impulse(Full & Chopped Wave) test on windings (as per IEC 60076- 3)
2.	Lightning impulse test on Neutral (*)
3.	Short circuit test (special test) as per IEC 60076-5.
4.	Temperature Rise test at a tap corresponding to maximum losses. Gas Chromatography shall be

		conducted on oil sample taken before & immediately after temp. rise test. Gas analysis shall be as per IS: 9434 (based on IEC: 60567), results will be interpreted as per IS: 10593 (based on IEC: 60599). Result shall be recorded for future reference. 5. Measurement of acoustic noise level as per NEMA TR-1 (special test) 6. Tank Pressure test (As per CBIP norm) 7. Tank vacuum test (As per CBIP norm) **NOTE:-** i) All the type/ special tests & temperature rise test shall be conducted after performing Short Circuit Test. If Tank Vacuum & Pressure Test is to be carried out then it shall be conducted before SC test. ii) The power factors should not exceed 0.5% (at 20 oC). However in case of deviation from limiting values the same shall be resolved in line with IEEE Std-62. iii) (*) this test is applicable on Transformer neutral earthed thru NGR. 6.10.00 All metal blanking plates and covers which are specifically required to transport the transformer shall be considered part of the transformer. 6.11.00 **Oil leakage test on assembled transformer (Routine Test):** All tank and oil filled compartment shall be tested for oil tightness by being completely filled with oil of viscosity not greater than that of specified oil at the ambient temperature and applying pressure equal to the normal pressure plus 35 kN/m2 measured at the base of the tank. The pressure shall be maintained for a period of not less than 6(six) hours during which time no sweating shall occur.
16.	7.00.00	This clause stands deleted.
17.	Annexure-B	Annexure-B (Transformer Losses) clause stands deleted.

4.0 STANDARD QUALITY PLAN

S.No.	***Reference Clause No. of Section- II***	***Specific Requirement/ Change***
1.	ANNEXURE - A	The Clause shall be read as Follow ANNEXURE-II Standard Quality Plan of Section-I **instead of** ANNEXURE-A Standard Quality Plan of Section-II.

5.0 DOCUMENTATION

5.1 Documents required along with technical offer shall be as per Annexure-I.

5.2 Documents required after award of LOI shall be as per annexure -III.

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ANNEXURE – I

DOCUMENTS REQUIRED ALONG WITH TECHNICAL OFFER

a) The enclosed Data Sheet-B filled up completely for each rating/ type of transformers.

b) Schedule of deviations.

c) Schedule of BOQ cum price schedule. (Unpriced)

d) 10% Extra oil price schedule (Unpriced)

e) Schedule of Mandatory spares. (Unpriced)

f) Schedule of Type/ Special test. (Unpriced)

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DATA SHEET –A

11/0.433 kV
ACC SERVICE TRANSFORMER

S. No.	Description	Unit	Particulars
1.0	Quantity	No. & kVA	17 & 2500 kVA
2.0	Installation		Out Door
3.0	Type of insulating oil		Mineral
4.0	No. of phase	No(s)	03
5.0	Frequency	Hz	50
6.0	Type of cooling		ONAN
7.0	Rated Voltage		
	a) HV Winding	kV	11.0
	b) LV Winding	kV	0.433
8.0	No Load transformation ratio		11/0.433
9.0	Vector group		Dyn1
10.0	Impedance voltage at rated current and frequency	%	2500 kVA: 13%
11.0	Total range of tapping's and tapping steps		± 5% in steps of 2.5%
12.0	Type of tap changing equipment		Off-Circuit
13.0	Temperature rise		
	a) Top oil by thermometer	deg. C	40 deg. C above ambient of 50 deg.C
	b) Winding by resistance	deg. C	45 deg. C above ambient of 50 deg.C
14.0	System Highest Voltage		
	a) HV Winding	kV	12 kV
	b) LV Winding	V	415V + 10%,

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15.0	Phase Connection			
	a) HV Winding			Delta
	b) LV Winding			Star
16.0	Insulation Levels			
16.1	One-minute power frequency withstand voltage			
	a) HV Winding		kV	28
	b) LV Winding		kV	3
16.2	Impulse withstand voltage			
	a) HV Winding		kVp	75
	b) LV Winding		kVp	-
17.0	Terminal details			
	a) HV Line			Cable box (XLPE cables)
	b) HV Neutral			N.A.
	c) LV Line			Flange throat for TPN non-segregated Al Busduct
	d) LV Neutral			One neutral as part of LV busduct throat and second neutral with copper earthing bar for system earthing brought near the base of the transformer.
18.0	System Fault Level			
	a) HV Winding	kA		40 kA RMS
	b) LV Winding	kA		50 kA RMS
19.0	Method of System Earthing			
	a) HV System			NA
	b) LV System			Solidly grounded
	c) Through fault withstand time			2 Sec.
20.0	Details of Cooling Equipment			Detachable tank mounted radiators

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21.0	Provision/ accommodation of CTs LV Neutral	Core 1: 3500/1, Vk≥400V, Rct≤17Ω, Ie≤30mA at Vk/2 Core 2: 3500/1, 5VA, 5P20
22.0	Colour Shade: a) Interior (For M. Box)	Particulars shall be given to successful bidder during detail engineering. There shall be no commercial implication to BHEL on this account.
	b) Exterior	Particulars shall be given to successful bidder during detail engineering. There shall be no commercial implication to BHEL on this account.
23.0	Space/ Layout Limitation if Any	
24.1	Cable details	(Not in bidder scope of supply)
	a) HV side	
	i) Type	XLPE
	ii) Voltage Grade	12kV Unearthed
	iii) Conductor material & size	Stranded Aluminium, OD: 74±2 mm
	iv) No. of cores & runs	1R-3C 185
	b) LV side	NA
25.0	Losses	
	a) 'A' (Losses at 50% Load & 75°C)	Losses not to exceed max. losses as per Level-I of IS-1180
	ii) 'B' (Losses at 100% Load & 75°C)	- Do-
26.0	Creepage distance	25mm/kV

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DATA SHEET –B

TECHNICAL PARTICULARS

[*TO BE SUBMITTED ALOGWITH TECHNICAL OFFER*]

S. No	Description	Unit	Requirement	To be filled by bidder
1.	Rating	MVA	2.5	
2.	No Load transformation ratio	kV	11/0.433	
3.	Losses at 50% Load & 75°C (Watts)	W	As per Level-1 of IS-1180	
4.	Losses at 100% Load & 75°C (Watts)	W		
5.	Overall Dimensions	mm x mm x mm		
6.	Total weight	kg		
7.	Total oil Quantity	kg		

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DATA SHEET –C

TECHNICAL PARTICULARS

[***TO BE SUBMITTED AFTER AWARD OF CONTRACT***]

Clause No.	Item	(For AUX Transformer)		
1.00.00	Manufacturer's name and address			
1.01.00	Standard Applicable			
1.02.00	Rating (MVA)			
1.03.00	Voltage ratio			
1.04.00	Winding connection			
1.05.00	Vector group			
1.06.00	Number of phases			
1.07.00	Frequency (Hz)			
1.08.00	Type of cooling			
1.09.00	Impedance data Guaranteed positive sequence impeda nce @ 75 deg. C			
	AUX TR	**HV-LV**	-	-
(a.)	At Principal Tap			
(b.)	At Maximum Tap			
(c.)	At Minimum Tap			
1.10.00	Guaranteed max. losses in KW at 100 % rated voltage at 75 deg. C at principal tap (1)			
	Iron loss at rated voltage & frequency (2)			
	Copper loss at full load			
	(3) Guaranteed Cooler losses at 100% load			
1.11.00	HV winding DC resistance at 75 deg. C			
	(a) Principal tap			
	(b) Maximum tap			
	(c) Minimum tap			
1.12.00	LV winding DC resistance at 75 deg. C			

	(a)Number of coolers and rating as % of transformer cooling equipment	
	(b)Mounting	
	(c)Fan Motor Data	
	(i)Number per cooler/radiator Cooling requirement (indicate n o. of sp are fans also)	
	(ii) Type & make	
	(iii) Rating	
	(iv) Speed	
	(v) Locked rotor current	
	(e) Cooler/radiator details	
	(i)Overall dimensions l x b x h (mm)	
	(ii)Type of mounting	
	(iii)Weight with oil (kg)	
	(iv)Weight without oil (kg)	
1.14.00	**Thermal Data**	
	(a) Temperature rise in top oil over an ambient of 50 deg.C	
	(b) Temp erature rise in winding by resistance measurement method over a n ambient of 50deg. C.	
	(c) Thermal time constant (Hours)	
	(d) Oil temperature at cooler inlet at rated load at max temperature	

	load at max temperature	
	(f) Calculated Hot Spot Temperature (Desi gn value)	
1.15.00	Withstand time for short circuit at terminals (sec.)	
1.16.00	Over excitation withstand time (secs.) for % over excitation of	
	(i) 110%	
	(ii)125%	
	(iii)140%	
	(iv)150%	
	(v)170%	
1.17.00	Bushings	
	a) High voltage	
	(i) Manufacturer	
	(ii) Type	
	(iii) Rated current (Amps)	
	(iv) Total creepage distance (mm)	
	(v) Mounting	
	c) Low voltage	
	(i) Manufacturer	
	(ii) Type	
	(iii) Rated current (Amps)	
	(iv) Total creepage distance (mm)	
	(v) Mounting	

	e) Low voltage (N)	
	(i) Manufacturer	
	(ii) Type	
	(iii) Rated current (Amps)	
	(iv) Total creepage distance (mm)	
	(v) Mounting	
1.18.00		
	Neutral(LV)Bushing CT Parameters	
	CORE-1/2/3	
	(i) Core no.	
	(ii) Service	
	(iii) Ratio	
	(iv) Accuracy class	
	(v) Knee point voltage (V) min	
	(vi) VA Burden	
	(vii) Max. CT resistance	
	(vii) Magnetisation current (max) at Vk/2 (mA)	

	transportation	
	(i). Oil filled or N2 filled	
	(ii). Road Freight/ Rail Freight	
1.20.00	Is vacuum filling required, if so state absolute pressure (mm of Hg)	
1.21.00	Total quantity of oil (liters)	
1.23.00	Insulation level	
	HV Windings	
	(i) (a) Lightning impulse withstand voltage(kVp)	
	(b) CW Impu lse withstand volta ge (kVp)	
	(ii) Switching surge withstand voltage (kVP)	
	(iii) Power frequency withstand voltage (kV)	
	(iv) HV winding insulation (Graded/ Uniform)	

	LV Windings	
	(i) Lightning impu lse withstand vo ltage (kVp)	
	(ii) Power frequency withstand voltage (kV)	
	HV Bushings	
	(i) (a) Lightning impulse withstand voltage(kVp)	
	(b) CW Impu lse withstand volta ge (kVp)	
	(ii) Switching surge withs tand voltag e (kVP)	
	(iii) Power frequency withstand voltage (KV)	
	LV Bushings	
	(i) Lightning impu lse withstand vo ltage (kVp)	
	(ii) Power frequency withstand voltage (kV)	
	LVN Bushings	
	(i) Lightning impu lse withstand vo ltage (kVp)	
	(ii) Power frequency withstand voltage (kV)	
1.24.00	Approximate Dimensions	
	a) Tank (lxbxh) (mm)	
	b) Overall dimensions with coolers (lxbxh) (mm)	
	c) Height for un-tanking (mm)	
	d) Shipping dimensions	
	e) Dimensions of largest package(lxbxh) (mm)	

	a) Core (kg.)	
	b) Windings (kg.)(copper)	
	c) Total cellulose weight (kg)	
	d) Weight of Paper insulation (kg)	
	e) Weight of Press board, frame, barrier spacer etc (kg)	
	f) Tank and fittings (kg)	
	g) Oil (kg)	
	h) Untanking weight (heaviest piece) (kg)	
	i) Total weight (kg)	
	j) Weight of heaviest pkg. (kg)	
	k) Total shipping weight (kg)	
	l) Parts detached for transport(furnish list)	
1.26.00	Permissible overloading (% of rating and time in minutes)	
1.27.00	(a.)Clearances to tank in oil (mm)	
	(b.) Minimum clearance of HV winding to earth in oil (mm)	
	(c.) Clearance between coils & core(mm)	
	(d.) Clearance between coils (mm)	
	(e.) Clearance between neutral to ground (mm)	
1.28.00	Conservator	
	a) Total volume (Liters)	
	b) Volume between highest and lowest levels (Liters)	
1.29.00	Capacitance Values (pF)	
	b) LV to earth	
	c) HV to LV	
	d) Tap winding to earth	
1.30.00	a) Type of oil preservation	
	b) Material of diaphragm/air cell	
	c) Continuous temperature withstand/ capability of the diaphragm/air cell	

	a) Quality of oil	
	i) Moisture content (ppm)	
	ii) Max. tan-delta value	
	iii) In terfacial tension(N/m)	
	iv) Breakdown strength (kV)	
	b) Total Quantity including 5% extra (liters)	
		Before Energizing
	i) Moisture content (ppm)	
	ii) Max. tan-delta value	
	iii) In terfacial tension(N/m)	
	iv) Breakdown strength (kV)	
	b) Total Quantity including 5% extra (liters)	
	c) Oil flow inside Transformer (Directed/ Forced/ Normal)	
1.32.00	Core	
	a) Type of construction(core/shell)	
	b) Net core area (mm^2)	
	c) Core material and grade used	
	d) Type of joint between core and yoke	
	e) Thickness of stamping (mm)	
	f) Percentage silicon content (%)	
	g) Maximum flux density in core at rated frequency and at	
	i) 90% voltage (wb/m^2)	
	ii) 100% voltage (wb/m^2)	
	iii) 110% voltage (wb/m^2)	
1.33.00	Winding	
	a) Type of winding	
	i) HV	
	iii) LV	
	iv) Tap	
	b) Current density at rated load	
	i) HV (A/mm^2)	

	iii) LV (A/mm²)	
	iv) Tap	
'	c) Conductor area (mm2)	
	i) HV	
	iii) LV /LV1/LV2	
	iv) Tap	
	d) Magnetizing inrush current(Amps)	
	i) % Component of 2nd harmonic current (max & min)	
	e) No load current (Amps) at rated frequency and at	
	i) 90% voltage	
	ii) 100% voltage	
	iii) 110% voltage	
	f) Magnetising current at rated frequency and at rated voltage	
	g) Leakage reactance	
	i) HV	
	ii) MV	
	iii) LV /LV1/LV2	
	h) Resistance	
	i) HV	
	ii) MV	
	iii) LV /LV1/LV2	
	i) Air core reactance of HV winding	
1.34.00	Tank	
	a) Tank cover-Conventional/Bell Type	
	b) Approximate thickness of	
	i) Sid e (mm)	
	ii) Bottom (mm)	
	iii) Cover	
1.35.00	Vacuum withstand capability of	
	a) Main tank	
	b) Coolers and accessories	
1.36.00	Minimum draw bar pull required to move the transformer on level track(kg)	
1.37.00	Size of filter hose	
1.38.00	Fault level	

QUALITY ASSURANCE

OUT DOOR TRANSFORMER

Attributes / Characteristics / Items/Components Sub Systems	Visual & Dimensional Checks	Mechanical properties	Electrical strength	Thermal properties	Chemical Composition	Compatibility with oil	NDT / DPT / MPI / UT	Ageing Test.	Voltage Ratio, Vector Group & Polarity, Magnetic Balance Test	Make / Type / Rating / Model / TC / General Physical Inspection.	WPS & PQR	Routine Test as per relevant test	Routine Test
Tank, H.V. & L.V. Cable Box / Flange throat	Y	Y					Y						
Conservator / Radiator / Cooler / Pipes	Y	Y					Y						
Copper Conductor (IS:191)	Y	Y	Y		Y								
Insulating Material	Y	Y	Y	Y	Y	Y							
CRGO Lamination & Built Core	Y	Y	Y		Y	Y							
Bushing / Insulator (IS:2544 / 5621)	Y	Y								Y		Y	
Gasket	Y				Y	Y		Y				Y	
Transformer Oil (IS:335 / IEC296)												Y	
Off-Circuit Tap Changer	Y									Y			
Core Coil Assembly & Pre-tanking	Y								Y				
Marshalling Box	Y	Y					Y					Y	
WTI, OTI, MOG, PRD, Breather, Terminal Connector, Bucholz Relay, Globe & Gate Valve,	Y									Y			
Welding (ASME Sect-IX)	Y										Y		
Complete Transformer (IS:2026/ IEC-60076)	Y												Y

Note: 1) This is an indicative list of tests / checks. The manufacturer is to furnish a detailed Quality Plan indicating the practice and procedure along with relevant supporting documents.
2) All major Bought Out Items will be subject to NTPC approval.

ANNEXURE-II

STANDARD QUALITY PLAN

एनटीपीसी NTPC Transforming lives

ITEM (MATERIAL, CLASS, GRADE, RATING, RANGE, SIZE ETC.) :
Oil Filled Transformers (Up to 5 MVA, 33 kV Class)

STANDARD QUALITY PLAN

CONFORMING TO CODE :
NTPC TECHNICAL SPECIFICATION / IEC:60076

QP No: 0000-999-QOE-S-036, Rev No: 0
Date: 20.02.2013
Page: 1 of 8
VALID UPTO: 19.02.2016

REVIEWED BY: Banish K. Jha, H Shekhar, B D Prasad
APPROVED BY: I Gowrishankar

Sl No	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK M	QUANTUM OF CHECK C/N	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	D*	AGENCY M	AGENCY C	AGENCY N	REMARKS
1	2	3	4	5	6		7	8	9		**	10		11
1.00	**RAW MATERIAL**													
1.01	Steel Plate & Pipe	a) Thickness	Major	Measure	As per IS/ Plant Std	As per IS/ Plant Std	Mfr Plant Std./ IS:2062 /IS:1239	Mfr Plant Std./ IS:2062 /IS:1239	QC Record		P	V	V	*A) Supplier's TC for all BOIs shall be maintained by Mfr for NTPC verification.*
		b) Surafce defects	-do-	Visual	-do-	-	-do-	-do-	-do-		P	-	-	*B) Make of all BOIs & Raw Material shall be subject to NTPC acceptance and Vendor list for the same sall be submitted as annexure to project/package specific endorsement sheet.*
		c) Chemical Composition	-do-	Test	-do-	-	-do-	-do-	-do-		V	-	-	
		d) Mechanical Properties	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		e) Hydraulic Test of Pipes	-do-	-do-	-do-	-	-do-	-do-	-do-		V	V	V	
1.02	CRGO Steel	a) Make,Thickness,Finish & Gr	Major	Measure	As per IS/ Plant Std	As per IS/ Plant Std	Mfr Plant Std./ IS:3024/IS:649	Mfr Plant Std./ IS:3024/IS:649	QC Record		P	V	V	
		b) Cutting & edge burr	-do-	Test	-do-	-	-do-	-do-	-do-		P	-	-	
		c) Waviness & edge camber	-do-	-do-	-do-	-	-do-	-do-	Supplier's TC		V	-	-	
		d) Specific core loss	-do-	-do-	-do-	As per IS/ Plant Std	-do-	-do-	-do-		V	V	V	
		e) Surface resistivity/Insulation resistance of surface coating	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		f) Stacking factor	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		g) Permeability at 800A/m	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		h) Bend Test / Ductility	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
1.03	Paper Insulated Copper Conductor	a) Dimensions & tolerances (Bare & Insulated)	Major	Measure	As per IS/ Plant Std	As per IS/ Plant Std	Mfr Plant Std./ IS:13730/IEC 60554	Plant Std./ IS:13730/IEC 60554	QC Record		P	V	V	
		b) Resistivity/Conductivity	-do-	Test	-do-	-do-	-do-	-do-	Supplier's TC	√	V	V	V	
		c) Paper Covering	-do-	Measure	-do-	-	-do-	-do-	-do-		P	-	-	
		d) Voltage Test betn Strands for bundled conductor	-do-	Test	-do-	-	-do-	-do-	-do-		V	-	-	For CTC only
		e) Cu Purity	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		f) Elongation	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		g) Tensile Strength	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
1.04	Insulating Paper	a) Make,Dimensions & Type	M ajor	Measure	As per IS/ Plant Std	As per IS/ Plant Std	Mfr Plant Std./ IS:1060/IS:9335 IEC 60554	Mfr Plant Std./ IS:1060/IS:9335 IEC 60554	QC Record		P	V	V	
		b) Density & substance	-do-	-do-	-do-	-	-do-	-do-	Supplier's TC		V	-	-	
		c) Tensile Strength	-do-	Test	-do-	-	-do-	-do-	-do-		V	-	-	
		d) Elongation	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		e) Water Absorption	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		f) Moisture Content	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		g) pH Value & conductivity aqueous extract	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		h) Ash Content	-do-	Test	-do-		-do-	-do-	-do-		V	-	-	
		i) Electrical Strength in Air	-do-	-do-	-do-	As per IS/Plant Std	-do-	-do-	-do-		V	V	V	
		j) Air Permeability	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		k) Tear Index	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		l) Heat Stability	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	

LEGEND: * RECORDS, INDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
** M: Mfrr / SUB-SUPPLIER C: MAIN SUPPLIER, N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION. AS APPROPRIATE,
CHP: NTPC SHALL IDENTIFY IN COLUM "N" AS 'W'.

NTPC Transforming lives	ITEM (MATERIAL, CLASS, GRADE, RATING, RANGE, SIZE ETC.) : Oil Filled Transformers (Up to 5 MVA, 33 kV Class)	STANDARD QUALITY PLAN CONFORMING TO CODE : NTPC TECHNICAL SPECIFICATION / IEC:60076	QP No: 0000-999-QOE-S-036, Rev No: 0 Date: 20.02.2013 Page: 2 of 8 VALID UPTO: 19.02.2016	REVIEWED BY Banish K. Jha H Shekhar B D Prasad	APPROVED BY Approved Dt. I Gowrishankar

Sl No	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK M	QUANTUM OF CHECK C/N	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	D*	AGENCY M	AGENCY C	AGENCY N	REMARKS
1	2	3	4	5	6		7	8	9	D*	**	10		11
1.05	Press-Board	a) Make, Type, Dimensions	Major	Measure	As per IS/ Plant Std	As per IS/ Plant Std	Mfr Plant Std./ IS-1576	Plant Std./ IS-1576	QC Record		P	V	V	
		b) Compressibility	-do-	Test	-do-	-	-do-	-do-	Supplier's TC		V	-	-	
		c) Density	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		d) Tensile strength	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		e) pH Value/Conductivity of Water extract	-do-	-do-	-do-	As per IS/ Plant Std	-do-	-do-	-do-		P	V	V	
		f) Electrical Strength in air and oil	-do-	-do-	-do-	-do-	-do-	-do-	-do-		V	V	V	
		g) Shrinkage in air & oil	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		h) Flexibility/ Elongination	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		i) Ash content	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		j) Moisture content	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		j) Oil absorption	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		k) Cohesion between plies	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
1.06	Densified Wood	a) Dimensions & Type	Major	Measure	As per IS/ Plant Std	As per IS/ Plant Std	Mfr Plant Std./ IS:3513/IS3400- P-II	Mfr Plant Std./ IS:3513	QC Record		P	-	-	
		b) Surface finish	-do-	Visual	-do-	-do-	-do-	-do-	-do-		P	-	-	
		c) Electrical Strength in air and oil	-do-	Test	-do-	-do-	-do-	-do-	Supplier's TC		V	V	V	
		d) Oil absorption	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		e) Shrinkage in air & oil	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		f) Moisture content	-do-	Test	-do-	-	-do-	-do-	-do-		V	-	-	
		g) Compression strength	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		h) Crossbreaking strength	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		i) Tensile strength	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		j) Density	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		k) Specific gravity	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
1.07	Gasket Syntheic Rubber or Acryo Nitrile Butadine Rubber for Gasket	a) Dimensions, Grade & Type	Major	Measure	As per IS/ Plant Std	As per IS/ Plant Std	Mfr Plant Std./ IS:4253-P-I/II	Plant Std./ IS:4253-P-I/II	QC Record		P	-	-	
		b) Hardness	-do-	-do-	-do-	-do-	-do-	-do-	Supplier's TC		V	V	V	
		c) Tensile strength	-do-	Test	-do-	-	-do-	-do-	-do-		V	-	-	
		d) Compressibility	-do-	-do-	-do-	-do-	-do-	-do-	-do-		V	V	V	
		e) Recovery	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		f) Compression set	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		g) Flexibility	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		d) Ageing in air & oil	-do-	-do-	-do-	-	-do-	-do-	-do-		V	V	-	
		e) Accelerated ageing	-do-	-do-	-do-	-	-do-	-do-	-do-		V	V	-	
		f) Chloride/Sulphate conte- nt of water extract	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		g) Density	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	

LEGEND: * RECORDS, INDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
** M: Mfrr / SUB-SUPPLIER C: MAIN SUPPLIER, N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION. AS APPROPRIATE,
CHP: NTPC SHALL IDENTIFY IN COLUM "N" AS 'W'.

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REVIEWED BY	APPROVED BY
Banish K. Jha	
H Shekhar	Approved
B D Prasad	Gowrishankar

Sl No	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					M	C/N					M	C	N	
1	2	3	4	5	6		7	8	9	D*	**	10		11
1.08	Insulating Oil	a) Make, Appearance of oil	Major	Visual	As per IEC/IS	As per IEC/IS	NTPC Specification/ IEC-296/IS-335	NTPC Specification	Supplier's TC	√	V	V	V	
		b) Density,Resistivity	-do-	Test	-do-	-do-	-do-	-do-	-do-	√	V	V	V	
		c) Kinematic Viscosity	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	V	V	V	
		d) Interfacial Tension	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	V	V	V	
		e) Flash & pour point	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	V	V	V	
		f) Neutralisation value	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	V	V	V	
		g) Corrosive Sulfer Test	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	V	V	V	
		h) Water contnet	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	V	V	V	
		i) Anti Oxidants Additives	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	V	V	V	
		j) Oxidation Stability, Neuralisation Value in mgKOH/g and Sludge %	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	V	V	V	
		k) Breakdown Voltage (As delivered and after treatment)	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	V	V	V	
		l) Dissipation factor	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	V	V	V	
		m) PCA Content	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	V	V	V	
		n) Impulse withstand Level	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	V	V	V	
		o) Gassing tendency	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	V	V	V	
		q) Ageing characteristics at 115^0 C for 96 hours	-do-	-do-	-do-	-do-	IS-335-1993	IS-335-1993	-do-	√	V	V	V	*For reference only*
					-do-	-do-				√				
		r) S.K.Value	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	V	V	V	
2.00	FITTING AND ACCESSORIES													
2.01	Porcelain Busings	a) Make , Rating,Dimensions	Major	Measure	As per IS/ Plant Std	As per IS/ Plant Std	IS:2099/IS:3347/ IS:12676/NTPC Spec.	IS:2099/IS:3347/ IS:12676/NTPC Spec.	QC Record		P	-	-	
		b) Visual Defects	-do-	Visual	-do-	-	-do-	-do-	-do-		P	-	-	
		c) Routine testing	-do-	Testing	-do-	-do-	-do-	-do-	Supplier's TC	√	V	V	V	
2.02	Bucholz Relay	a) Type, Size & Make	Major	Visual	As per IS/ Plant Std	As per IS/ Plant Std	Plant Std./ IS:3637	Plant Std./ IS:3637	QC Record		P	V	V	
		b) Continuity for alarm & trip (Performance)	-do-	Test	-do-	-do-	-do-	-do-	Supplier's TC		V	V	-	
		c) Porosity Test	-do-	-do-	-do-	-do-	-do-	-do-	-do-		V	V	-	
		d) High Voltage & IR Test	-do-	-do-	-do-	-do-	-do-	-do-	-do-		V	V	-	
		e) Element Test	-do-	-do-	-do-	-do-	-do-	-do-	-do-		V	V	-	
		f) Gas Voulme Test	-do-	-do-	-do-	-do-	-do-	-do-	-do-		V	V	V	
		g) Loss of Oil & Surge Test	-do-	-do-	-do-	-do-	-do-	-do-	-do-		V	V	-	
2.03	Pressure Relief Device (if applicable)	a) Type, Size & Make	Major	Visual	10%	As per IS/ Plant Std	Mfr Plant Std./ IS:3637	Plant Std./ IS:3637	QC Record		P	V	-	
		b) Operation (Pressure & flag indication)	-do-	Test	-	-	-do-	-do-	Supplier's TC		V	-	-	
		c) Switch Contact Operation	-do-	-do-	-	-	-do-	-do-	-do-		V	-	-	
		d) HV Test	-do-	-do-	-do-	-	-do-	-do-	-do-		V	V	-	

LEGEND: * RECORDS, INDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
**** M: Mfrr / SUB-SUPPLIER C: MAIN SUPPLIER, N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION. AS APPROPRIATE,**
CHP: NTPC SHALL IDENTIFY IN COLUM "N" AS 'W'.

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REVIEWED BY: Banish K. Jha, H Shekhar, B D Prasad
APPROVED BY: T Gowrishankar

Quality Assurance Approved NTPC, Noida

Sl No	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK M	QUANTUM OF CHECK C/N	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	D*	AGENCY M	AGENCY C	AGENCY N	REMARKS
1	2	3	4	5	6		7	8	9		**	10		11
2.04	Magnetic Oil Level Gauge	a) Type, Size & Make	Major	Visual	10%	-	NTPC Spec/ Plant Std/Mfrr Drg	NTPC Spec/ Plant Std/Mfrr Drg	QC Record		P	-	-	
		b) Dial Marking	-do-	-do-	-do-		-do-	-do-	Supplier's TC		V	-	-	
		c) Switch Continuity	-do-	Test	-do-	-	-do-	-do-	-do-		V	-	-	
		d) Leak Test	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		e) HV Test	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
		f) Operational test	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
2.05	Off-Circuit Tap Changer (if applicable)	a) Dimensions, Alignment of padlocking arrangement	Major	Measure	10%	As per IS / Plant Std	Mfrr Drg. /Mfr Plant Std	Mfrr Drg. /Mfr Plant Std	QC Record		P	V	-	
		b) Physical condition	-do-	Visual	100%	-	-do-	-do-	-do-		P	-	-	
		c) Operation of Switch	-do-	Test	-do-	-	-do-	-do-	-do-		P	-	-	
		d) Insulation Resistance Test	-do-	-do-	-do-	-	-do-	-do-	Supplier's TC		V	-	-	
		e) Leak Test of Handle Stuffing Box	-do-	-do-	-do-	100%	-do-	-do-	-do-		V	V	V	
2.06	On Load Tap (if applicable)	a) Visual Check,make,type	Major	Visual	100%	-	IS: 2026/IS:8468	IS: 2026/IS:8468	QC Record		P	V	-	
		b) Dimensional check	-do-	Measure	-do-	-	-do-	-do-	-do-		P	-	-	
		c) Mechanical operation on Diverter & selector switch	-do-	verify	-do-	100%	-do-	-do-	Supplier's TC		P	V	-	
		d) HV test on auxiliary circuit	-do-	Test	-do-	-do-	-do-	-do-	-do-	√	V	V	V	
2.07	Valves (Gate/Globe/ Butterfly)	a) Dimensional check	Major	Measre	10%	-	Mfr Drg/Plant Std/ IS:778-P-I	Mfr Drg/Plant Std/ IS:778-P-I	QC Record		P	-	-	Drain and Sample Vlave should have zero leakage rate
		b) Type, Size & Make	-do-	Visual	-do-	-	-do-	-do-	-do-		P	V	-	
		c) Hydraulic/Leakage Test (for Body & Seat)	-do-	Test	As per IS/ Plant Std	As per IS/ Plant Std	IS:778-P-I	IS:778-P-I	Supplier's TC		V	V	V	
									-do-		V	-	-	
		d) Operational Test (Smooth Close & Open)	-do-	-do-	-do-	-	-do-	-do-	-do-		V	-	-	
2.08	Marshalling Kiosk & Remote Tap Control (RTCC)	a) Dimensional/Visual checks, makes of MB & mountings	Major	Visual	100%	100%	NTPC Appd Drgs	NTPC Appd Drgs	QC Record		W	W	V	At Marshalling Kiosk's mnaufactuer's works.
		b) 2 kV insulation test on auxiliary wiring	-do-	Test	-do-	-do-	-do-	Should withstand for one minute	Test Report	√	W	W	V	
		c) IP-55 Degree of protection by thin paper insertion	Major	Test	-do-	-do-	IS:13947-1993	IS:13947-1993	-do-		P	W	V	
		d) Check for paint, shade & thickness	-do-	Measure/ Test	On random basis	On random basis	NTPC Specn./ IS:101-P-IV-Sec-2	NTPC Specn./ IS:101-P-IV-Sec-2	-do-		W	W	V	
2.09	OTI & WTI	a) Type, Size & Make	Major	Visual	As per IS/ Plant Std	As per IS/ Plant Std	NTPC Specs/Apvd drgs/ Mfr Std/ IS:11222/IS:2848	NTPC Specs/Apvd drgs/ Mfr Std/ IS:11222/IS:2848	QC Record		P	V	V	
		b) HV Test	-do-	Test	-do-	-do-	-do-	-do-	Supplier's TC		V	V	-	
		c) Temperature Calibration	-do-	-do-	-do-	-do-	-do-	-do-	-do-		V	V	V	
		d) Switch setting & switch deferential	-do-	-do-	-do-	-do-	Mfr Std / IS 2848	Mfr Std / IS 2848	-do-		V	V	V	
		e) Calibration & operation of Switch	-do-	-do-	-do-	-do-	-do-	-do-	-do-		V	V	V	

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Oil Filled Transformers (Up to 5 MVA, 33 kV Class)

STANDARD QUALITY PLAN

CONFORMING TO CODE :
NTPC TECHNICAL SPECIFICATION / IEC:60076

QP No: 0000-999-QOE-S-036, Rev No: 0
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Page: 5 of 8
VALID UPTO: 19.02.2016

REVIEWED BY	APPROVED BY
Banish K. Jha	Approved
H Shekhar	
B D Prasad	I Gowrishankar

Sl No	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK M	QUANTUM OF CHECK C/N	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	D*	AGENCY M **	AGENCY C 10	AGENCY N	REMARKS 11
1	2	3	4	5	6		7	8	9					
2.10	Bushing CT	a) Make & rating	Major	Visual	100%	10%	Mfr Drg/IS:2705	Mfr Drg/IS:2705	QC Record		V	V	V	
		b) Dimensions/Visual check	Major	Measure	As per IS	-	-do-	-do-	Supplier's TC		V	-	-	
		c) Routine Test	-do-	Test	100%	100%	-do-	-do-	-do-		V	V	V	
2.11	Radiator	a) Type, Model, Rating, make	Major	Visual	100%	100%	NTPC Specs/Apvd drgs/ Mfr Std	NTPC Specs/Apvd drgs/ Mfr Std	QC Record		P	V	V	
		b) Dimensions & No. of elements	-do-	Measure	-do-	-do-	-do-	-do-	-do-		W	V	-	
		c) Paint, Shade, Finish & thickness	-do-	Visual / Measure	-do-	-do-	-do-	-do-	-do-		W	V	V	
		d) Pressure test	-do-	Test	-do-	1samp/des./lot	-do-	-do-	Supplier's TC	√	W	V	V	
		e) Adhesion Test on paint	-do-	-do-	-do-	As per IS	IS:101	IS:101	-do-		W	V	V	
2.12	Terminal Connector	a) Dimensional check	Major	Measure	10%	-	Mfrs Drg'/IS:5561	Mfrs Drg'/IS:5561	QC Record		P	-	-	
		b) Surface Finish	-do-	Visual	As per IS	-	-do-	-do-	-do-		V	-	-	
		c) Acceptance Test	-do-	Test	-do-	-	-do-	-do-	Supplier's TC		V	-	-	
2.13	Silicagel Breather	a) Type, Size, Model	Major	Visual	10%	-	Mfr Plant Std.	Mfr Plant Std.	QC Record		P	-	-	
		b) Pressure/Breathing Leakage Test	-do-	Test	-do-	-	-do-	-do-	Supplier's TC		V	-	-	
		c) Colour of Silica gel	-do-	Viusal	-do-	-	-do-	-do-	-do-		V	-	-	
3.00	IN-PROCESS													
3.01	Fabrication of Tank, Cover, Conservator and welding requirement	a) Welding Procedure Spececification	Major	Verify	100%	100%	ASME-Sec-IX	Approved WPS/ ASME-Sec-IX	QW-482		V	V	V	†-WPS approval, Welders & PQR qualification shall be done as per following :- A) Upto 2 MVA - by Transformer Mfrr B) 2-5 MVA - by Main Contractor
		b) Process Qualification Records	-do-	Test	-do-	-do-	-do-	-do-	QW-483		W	V/W†	V/W†	
		c) Welders Qualification	-do-	-do-	-do-	-do-	-do-	-do-	QW-484		W	V/W†	V/W†	
		d) Welding Electrodes	-do-	-do-	As per IS	-	As per WPS/IS:814	As per WPS/IS:814	Supplier's TC		V	-	-	
		e) Fitup for Butt weld joints of tank and cover	-do-	Visual	-do-	-	Mfr Drg/Plant Std	Mfr Drg/Plant Std	QC Record		V	-	-	
		f) Visual check on weldment	-do-	Visual	100%	-	-do-	-do-	-do-		V	-	-	
		g) Dimensional check after welding	-do-	Measure	-do-	-	-do-	-do-	-do-		V	-	-	
		h) DP Test on welded joints of load bearing member	-do-	Test	-do-	100%	Mfr Drg/Plant Std/ IS:3658	Mfr Drg/Plant Std/ IS:3658	-do-		W	V	V	
		i) Check for flatness of gasket surface	-do-	Visual	-do-	-	Mfr Drg/Plant Std	Mfr Drg/Plant Std	-do-		W	-	-	
		j) Rim flatness	-do-	Measure	10%	-	-do-	-do-	-do-		W	-	-	
		k) Surface cleaning by sand/ shot blasting	-do-	Visual	100%	100%	-do-	-do-	-do-		V	V	-	
		l) Primer coating, Paint shade, thickness inside and outside	Major	Measure	100%	10%	IS:101/ NTPC Specification	IS:101/ NTPC Specification	-do-		W	V	V	
		m) Paint adhesion test	-do-	Test	-do-	5%	IS:101	IS:101	-do-		W	V	V	
3.02	Core Stamping	a) Burr & Bow	Major	Visual	Plant Std	-	Mfr Drg/Plant Std	Mfr Drg/Plant Std	QC Record		P	-	-	
		b) Dimensional check	-do-	Measure	-do-	-	-do-	-do-	-do-		P	-	-	
3.03	Core Building	a) Dimensional check	Major	Measure	100%	-	Mfr Drg/Plant Std	Mfr Drg/Plant Std	QC Record		P	-	-	
		b) Assembly of limb insulation and limb plates	-do-	Visual	-do-	-	-do-	-do-	-do-		P	-	-	
		c) Rectangularity of core assembly	-do-	-do-	-do-	-	-do-	-do-	-do-		P	-	-	

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Sl No	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					M	C/N				D*	M	C	N	
1	2	3	4	5	6		7	8	9		**	10		11
		d) Freedom from overlaps & air gap at joints.	-do-	-do-	-do-	-	-do-	-do-	-do-		P	-	-	
		e) Core verticality	-do-	-do-	-do-	-	-do-	-do-	-do-		P	-	-	
		f) Limb & stack thikcness	-do-	-do-	-do-	-	-do-	-do-	-do-		P	-	-	
		g) Limb clamping & binding	-do-	-do-	-do-	-	-do-	-do-	-do-		P	-	-	
		h) Core Diameter	-do-	-do-	-do-	100%	-do-	-do-	-do-		P	V	V	
		i) Earthing of Core	-do-	-do-	-do-	-do-	-do-	-do-	-do-		P	V	V	
3.04	Test on core	a) Dimensional check	Major	Measure	100%	-	Mfr Drg/Plant Std	Mfr Drg/Plant Std	QC Record		P	-	-	
		b) Pre-core Loss measurement	-do-	-do-	Plant Std.	-	-do-	-do-	-do-		P	-	-	
3.05	Winding	a) Brazing procedure , PQR & Brazer qualification	Major	Review	100%	100%	Mfr Drg/Plant Std	Mfr Drg/Plant Std	QC Record		P	V	V	
		b) Conductor size	-do-	Measure	-do-	-	-do-	-do-	-do-		P	-	-	
		c) Radial Depth of winding	-do-	-do-	-do-	-	-do-	-do-	-do-		P	-	-	
		d) Anchoring & Binding	-do-	-do-	-do-	-	-do-	-do-	-do-		P	-	-	At start & finish
		e) No of turns.	-do-	-do-	-do-	-	-do-	-do-	-do-		P	-	-	
		f) Transposition & cross overs	-do-	-do-	-do-	-	-do-	-do-	-do-		P	-	-	
		g) Dimensional checks	-do-	-do-	-do-	-	-do-	-do-	-do-		P	-	-	OD, ID & axial length
		h) Insulation arrangement & alignment	Major	Measure	100%	-	-do-	-do-	-do-		P	-	-	
		i) Winding length	-do-	-do-	-do-	-	-do-	-do-	-do-		P	-	-	
		j) Brazed joints	-do-	Visual	-do-	-	-do-	-do-	-do-		P	-	-	
		e) Lead & Coil identification and marking	-do-	-do-	-do-	-	-do-	-do-	-do-		P	-	-	
		f) Free from damages	-do-	-do-	-do-	-	-do-	-do-	-do-		P	-	-	
		g) Continuity test for leads	-do-	Test	-do-	100%	-do-	-do-	-do-		P	V	V	
		h) IR Test	-do-	-do-	-do-	-do-	-do-	-do-	-do-		P	V	V	
3.06	Core coil assembly	a) Cleanliness of core	Major	Visual	100%	-	Mfr Drg/Plant Std	Mfr Drg/Plant Std	QC Record		P	-	-	
		b) Alignment of spacers /blocks	-do-	-do-	-do-	-	-do-	-do-	-do-		P	-	-	
		c) Cleaning of Core before Core Coil Assembly	-do-	-do-	-do-	-	-do-	-do-	-do-		P			
		d) Arrangement of Top & Bottom Insulation and Pressure rings.	-do-	-do-	-do-	-	-do-	-do-	-do-		P			
		e) Resting of Common Blocks on Active Part	-do-	-do-	-do-	-	-do-	-do-	-do-		P			
		f) Isoaltion Test of Core, if applicable	-do-	-do-	-do-	100%	-do-	NTPC Spec.	-do-		P	V	V	
		g) Earthing of core	-do-	-do-	-do-	100%	-do-	Mfr Drg/Plant Std	-do-		P	V	V	
3.07	Connection and tap switch assembly	a) Ratio Test on all taps	Major	Test	100%	-	Mfr Drg/Plant Std	Mfr Drg/Plant Std	QC Record		P	-	-	
		b) Lead disposition	-do-	Visual	-do-	-	-do-	-do-	-do-		P	-	-	
		c) Brazing of joints	-do-	-do-	-do-	-	-do-	-do-	-do-		P	-	-	
		d) Crimping of joints	-do-	-do-	-do-	-	-do-	-do-	-do-		P	-	-	
		e) Insulation over joints	-do-	-do-	-do-	-	-do-	-do-	-do-		P	-	-	
		f) Vector group	-do-	Test	-do-	-	-do-	-do-	-do-		P	-	-	

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REVIEWED BY: Banish K. Jha, H Shekhar, B D Prasad
APPROVED BY: Approved, T.Govindshankar

Sl No	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK M	QUANTUM OF CHECK C/N	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	D*	AGENCY M	AGENCY C	AGENCY N	REMARKS
1	2	3	4	5	6		7	8	9		**	10		11
3.08	Ovening and	a) Cleanliness of tank	Major	Visual	100%	-	Mfr Drg/Plant Std	Mfr Drg/Plant Std	QC Record		P	-	-	
		b) Drying	-do-	Physical	-do-	-	-do-	-do-			P	-	-	
		c) Check tightness of clamped blocks and measurments of winding height	-do-	Measure	-do-	-	-do-	-do-	-do-	√	P	-	-	
		d) Electrical Clearances	-do-	-do-	-do-	100%	-do-	-do-	-do-	√	P	V	V	
		e) Tightning of Coil & Spacers; Locking of tie rods & fastners	-do-	-do-	-do-	-	-do-	-do-	-do-	√	P			
		g) Check Paint shade,thickness & Adhesion	-do-	Visual/ Phys.	-do-	-	-do-	-do-	-do-	√	P	-	-	
		h) Oil filling and air release	-do-	Physical	-do-	-	-do-	-do-	-do-		P	-	-	
4.00	Type & Special Test	a) Review of Type test & Special test report												NTPC RIO to verify type test clearance from NTPC Engg for complete transformer including bushings, MB, transformer tank (eg: Pressure & Vacuum tests), terminal connector, OLTC, etc, as per specs. / LOA.
		b) Review of all previous stage of inspection as per QP	Major	Verify	100%	100%	NTPC Specs/Apvd Drg/DS	CHP Reports/ Protocols	TC / TR		V	V	V	
5.00	Routine Test	a) Dimensional check	Critical	Measure	100%	1Sample /Lot/Rating	NTPC Spec/Apvd Drgs/ DS/IS:2026 / IEC-60076	NTPC Spec/Apvd Drgs/ DS/IS:2026 / IEC-60076	QC Record	√	P	W	W	Each transformer shall be assembled with all fittings and accessories meant for the particular transformer before offering for inspection and testing by NTPC.
		b) Measurement of winding resistance of HV at normal, extreme taps & LV winding	-do-	-do-	-do-	100%	-do-	-do-	-do-	√	P	W	W	
		c) Measurement of voltage ratio at all taps, polarity & vector group	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
		d) Magnetic balance test	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
		e) Measurement of No-Load Losses & magnetising current at 90%, 100% & 110% voltage at 50 Hz.	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
		f) Measurement of No Load Current with 415 Volt/50 Hz AC Supply	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
		g) Measurement of impedance & short circuit impedance at normal & extreme taps	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
		h) Measurement of load loss	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
		i) Measurement of insulation resistance of winding	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	P	W	W	

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					M	C/N				D*	M	C	N	
1	2	3	4	5	6		7	8	9		**	10		11
		j) Dielectric Test 1) Separate source AC withstand voltage test of HV & LV	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
		2) Induced over voltage test on HV & LV terminals	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
		k) Repeat no load current/loss measurement & IR measurement after completion of dielectric tests	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
		l) Measurement of Capacitance & tan delta for winding to earth	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
		m) BDV of oil before and after dielectric test	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
		n) Jacking test on oil filled transformer followed by DP Test	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
		o) Oil Leakage test	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
		p) IP-55 Degree of protection by thin paper insertion on MB	Major	Test	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
		q) Functional/Continuity checking of wiring, IR, & HV on MB	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
		r) Functional / Continuity checking of WTI, OTI, PRV, Buchholtz Relay	-do-	-do-	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
		s) Paint, Shade, Thickness, Adhesion	Critical	-do-	Random basis	Random basis	-do-	-do-	-do-	√	P	W	W	
6.00	**PRE-DESPATCH**	a) Packing of loose items and main unit	Major	Physical	100%	-	Mfr Std/Packing List /Chalan	Mfr Std/Packing List /Chalan	QC Record	√	P	-	-	Accessories to be segregated unitwise
		b) Blanking of openings & valves after adjustment/drainage of oil	-do-	-do-	-do-	-	-do-	-do-		√	P	-	-	

LEGEND: * RECORDS, INDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.

** M: Mfrr / SUB-SUPPLIER C: MAIN SUPPLIER, N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION. AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUM "N" AS 'W'.

S.No	Description of Drgs/Docs	No of Prints	No of CD ROMs/DVDs/Portable Hard Disk
1	Drawings, Data sheets, Design calculations, Purchase specifications and other documents		
	First submission and submission with major changes		
	▪ Layout (A0&A1 sizes)	4	-
	▪ Other Drawings/Documents (A0&A1 sizes)	2	-
	▪ P&ID (All sizes)	4	-
	a) Final drawings/documents (Directly to site)	6	2
	b) "As Built" Drawing/Documents (Directly to site)	6	2
	c) Analysis reports of Equipments / piping /structures components/system employing software packages as detailed in the specifications.	2	2
2	Erection Manual (Directly to site)	4 sets	2
3	Operation & Maintenance manual i) First Submission	1 set	--
	ii) Final Submission (Directly to site)	4 sets	2
4	Plant Hand Book i) First Submission	1	1
5	Commissioning and Performance Test Procedure manual i) First Submission	1 set	--
	ii) Final Submission (Directly to site)	4 sets	2

Sl No	DWG. / DOCUMENT No.	DOCUMENT TITLE	SUBMISSION SCHEDULE
1	PE-V0-405-302-E802	SERVICE TRANSFORMER O & M MANUAL	Within one week after conduction of Type test
2	PE-V0-405-302-E147	2500KVA TRANSFORMER (11/0.433KV) LV BUS DUCT TRUNKING DRAWING	Within two weeks from the date of LOI
3	PE-V0-405-302-E149	2500KVA TRANSFORMER (11/0.433KV) L.V. BUSHING	Within two weeks from the date of LOI
4	PE-V0-405-302-E150	2500KVA TRANSFORMER (11/0.433KV) LVN BUSHING	Within two weeks from the date of LOI
5	PE-V0-405-302-E805	SERVICE TRANSFORMER TYPE TEST REPORTS	Within one week after conduction of Type test
6	PE-V0-405-302-E042	2500 KVA SERVICE TRANSFORMER (11/0.433KV) OUTLINE GENERAL ARRANGEMENT DRAWING [OGA]	Within two weeks from the date of LOI
7	PE-V0-405-302-E144	2500KVA TRANSFORMER (11/0.433KV) FOUNDATION PLAN	Within two weeks from the date of LOI
8	PE-V0-405-302-E145	2500KVA TRANSFORMER (11/0.433KV) GENERAL ARRANGEMENT OF MARSHALLING BOX	Within two weeks from the date of LOI
9	PE-V0-405-302-E151	2500KVA TRANSFORMER (11/0.433KV) VALVE SCHEDULE PLATE	Within two weeks from the date of LOI
10	PE-V0-405-302-E152	2500KVA TRANSFORMER (11/0.433KV) WIRING DIAGRAM FOR MARSHALLING BOX	Within two weeks from the date of LOI
11	PE-V0-405-302-E041	2500 KVA SERVICE TRANSFORMER (11/0.433KV) TECHNICAL DATA SHEET	Within two weeks from the date of LOI
12	PE-V0-405-302-E803	SERVICE TRANSFORMER PAINTING PROCEDURE	Within two weeks from the date of LOI
13	PE-V0-405-302-E043	2500 KVA SERVICE TRANSFORMER (11/0.433KV) RATING & DIAGRAM PLATE	Within two weeks from the date of LOI
14	PE-V0-405-302-E148	2500KVA TRANSFORMER (11/0.433KV) H.V. BUSHING	Within two weeks from the date of LOI
15	PE-V0-405-302-E146	2500KVA TRANSFORMER (11/0.433KV) HV CABLE BOX ARRANGEMENT DRAWING	Within two weeks from the date of LOI
16	PE-V0-405-302-E801	SERVICE TRANSFORMER FIELD QUALITY PLAN	Within two weeks from the date of LOI
17	PE-V0-405-302-E901	QUALITY PLAN FOR SERVICE TRANSFORMERS	Within two weeks from the date of LOI
18	PE-V0-405-302-E155	2500KVA TRANSFORMER (11/0.433KV) DESIGN CALCULATIONS FOR SHORT CIRCUIT CAPABILITY	Within two weeks from the date of LOI
19	PE-V0-405-302-E153	2500KVA TRANSFORMER (11/0.433KV) TRANSPORTATION DETAILS	Within two weeks from the date of LOI

SECTION ‘II’

STANDARD TECHNICAL SPECIFICATION

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	TITLE : STANDARD TECHNICAL SPECIFICATION FOR OIL FILLED SERVICE TRANSFORMERS	SPECIFICATION NO. PE-SS-999-302-E001
		VOLUME NO. : II
		SECTION : II
		REV NO. : 00 DATE : 30/06/2016
		SHEET : 2 of 30

1.00.00 SCOPE

1.01.00 This specification covers the design, manufacture, inspection & testing, packing at manufacturer's works and delivery to site of mineral oil filled service Transformers complete with all fittings & accessories for satisfactory operation at site.

1.02.00 **TERMINAL POINTS**

1.02.01 HV bushings with terminal connector for bus duct/ cable glands & lugs in case of cable connection.

1.02.02 LV bushings with terminal connector (3 Phase + 1 Neutral) for bus duct/ cable glands & lugs in case of cable connection.

1.02.03 For HV Earthing : (Applicable in case of star connection of HV) - neutral earth busbar brought near the base of transformer/ Cable glands & lugs in case of cable connection.

1.02.04 For LV Earthing : - neutral earth busbar brought near the base of transformer/ Cable glands & lugs in case of cable connection

1.02.05 Transformer earthing pads.

1.02.06 Terminals of marshalling box for external connection to equipment supplied by the purchaser.

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2.00.00 CODES AND STANDARDS

S.NO.	STANDARD NUMBER	STANDARD TITLE
1	IS: 2026 IEC: 60076	POWER TRANSFORMERS
2	IS:1180	OUTDOOR TYPE OIL IMMERSED DISTRIBUTION TRANSFORMERS UPTO AND INCLUDING 2500 kVA, 33kV - SPECIFICATION
2	IS:6600	GUIDE FOR LOADING OF OIL IMMERSED TRANSFORMER
3	IS: 3639	FITTINGS & ACCESSORIES FOR POWER TRANSFORMER
4	IS: 335 IEC: 60296	NEW INSULATING OILS
5	IS: 2099 IEC: 60137	Bushing for alternative voltage above 1000 volts
6	IS: 3347	Dimension for porcelain transformer bushings
7	IS: 2705 IEC: 60185	Current transformers
8	IS: 3637	Gas operated relays
9	IS:1271 IEC: 60216	Classification of insulating material for electrical machinery & apparatus in relation to their thermal stability in service
10	IS/IEC: 60529	Classification of degrees of protection provided by enclosures of electrical equipment
11	IS: 2071 IEC: 60060	Method of high voltage testing
12	IS: 5	Colours for ready mixed paints & enamels
13	NEMA, STANDARD-TR1	Noise level
14	CBIP Publication (latest edition)	Manual on transformers

2.01.00 The equipment shall comply with all currently applicable safety codes and statutory regulations of India as well as of the locality where the equipment is to be installed including Indian Electricity Act, Indian Electricity Rules and Bureau of Indian Standards.

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3.00.00 TECHICAL REQUIREMENTS

3.01.00 Technical particulars of transformers are specified in Data Sheet –A of section-I, volume-II.

3.02.00 All windings shall be fully insulated. Material of the windings shall be electrolytic grade copper, free from scales and burrs. Winding shall be uniformly insulated.

3.03.00 The core shall be constructed from high grade, non-ageing, cold rolled, grain oriented silicon steel laminations.

3.04.00 Internal design of transformer shall ensure that air is not trapped in any location.

3.05.00 Nuts, bolts and pins used inside the transformer shall be provided with lock washers & locknuts

3.06.00 **Tank**

3.06.01 Under base of tank shall be fixed type.

3.06.02 Tank shall be of welded construction & fabricated from tested quality low carbon steel of adequate thickness. Tank shields, if provided, shall not resonate at natural frequency of equipment.

3.06.03 All steel surfaces in contact with insulating oil shall be painted with two coats of heat resistant oil in soluble insulating varnish.

3.06.04 Auxiliary transformers shall have suitable bi-directional skids, however auxiliary transformers above 2 MVA shall be provided with four no. of bi-directional detachable flat rollers. Suitable locking arrangement shall be provided to prevent accidental movement of transformer.

3.06.05 At least two adequately sized inspection openings, one at the each end of the tank for easy access to bushings and earth connections & suitable manhole shall be provided.

3.06.06 The main tank body including tap-changer compartment, radiators and coolers shall be capable of withstanding full vacuum.

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	STANDARD TECHNICAL SPECIFICATION FOR	**PE-SS-999-302-E001**
	OIL FILLED SERVICE TRANSFORMERS	VOLUME NO. : **II**
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3.06.07 All tank and oil filled compartment shall be tested for oil tightness by being completely filled wit h oil of visc osity n ot greater than th at of specified oi l at the ambient temperature and a pplying pre ssure eq ual to t he normal press ure pl us 35 kN/m2 measured at the base of the tank.

3.07.00 **Tank mounting**

Tank shall also be provided with lifting lugs and minimum four jacking pads. Rollers shall be provided with holding clamp plates (04 nos), required hardware and foundation bolts etc. for each transformer.

3.08.00 **Oil preservation**

Conservator tank of adequate capacity for expansion of oil from minimum ambient to 100 deg. C sha ll be p rovided. Th e tra nsformers ra ted 6. 3MVA and above s hall b e provided with air ba g bre athing through s ilica gel br eather. For lo wer rating transformers with conventional conservator with dry air filling of the space above oil and connected to silica gel breather shall be provided.

3.09.00 **Radiators**

The radiators shall be detachable type, mounted on the tank. Each radiator shall be provided with a drain plug/valve at the bottom, an air release plug at the top, shut off valve at each point of connection to the tank.

3.10.00 **Insulating Oil**

As per IS: 335. No external inhibitors are permitted.

3.11.00 All transformers shall be suitable for cable/ busduct termination as indicated in data sheet-A of section-I, volume-II.

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3.12.00 **Bushings/ Insulators**

3.12.01 The bushings shall conform to the requirements of IS: 2099 and IS: 3347 and shall be of porcelain and above 3150A for the LV bushing Epoxy bushing shall also be acceptable.

3.12.02 For 33kV windings 36kV bushing shall be provided. For 3.3kV, 6.6kV and 11 kV windings, 17.5kV bushing shall be provided. For 415V windings, 1.1kV bushings shall be provided.

3.12.03 The porcelain shall not engage directly with hard metal and, wherever necessary, gaskets shall be interposed between the porcelain and the fitting.

3.12.04 Clamps and fittings of steel or malleable cast iron shall be galvanised.

3.12.05 Where bushing current transformer is provided, the bushing shall be mounted so that it can be removed and replaced without disturbing the current transformers. CTs shall be cast resin type & suitable for operation at ambient temperature existing at its location on the transformer.

3.12.06 Creepage distance shall be as per data sheet-A of section-I, volume-II.

3.12.07 Minimum rated current for bushings shall be as under. However, same shall comply with IS-2099 and HV/LV system fault current mentioned in Clause No. 20.00 of Datasheet A of section-I, volume-II:

1) H V Bushing for 33kV
   7.5 MVA = 250A
   5.0 MVA = 100A
   2.0 MVA = 100A

2) H V Bushing for 11kV & 6.6kV
   10.0MVA= 1000A
   8.0MVA = 1000A
   7.5MVA = 800A
   6.3MVA = 800A
   5.0MVA = 630A
   3.5MVA = 250A
   2.5 MVA = 250A

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2.0 MVA = 250A
1.6 MVA = 250A
1.0 MVA = 100A
630 kVA = 100A

2) H V Bushing for 3.3kV
2.5 MVA = 630A
2.0 MVA = 500A
1.6 MVA = 400A
1.0 MVA = 250A
630 kVA = 250A

3) L V Bushing for 11kV, 6.6kV & 3.3kV

10.0MVA= 2500A
8.0MVA = 2000A
7.5MVA = 1600A
6.3MVA = 1600A
5.0MVA = 1250A
3.5MVA= 1250A

4) L V Bushing for 433V/420V
2.5 MVA = 4000A
2.0 MVA = 4000A
1.6 MVA = 3150A
1.0 MVA = 2000A
630 kVA = 1000A

3.13.00 **Cable Box**

3.13.01 A dust tight air insulated type cable box with D.O.P. of IP: 55 shall be provided for terminating the cables directly of size and type specified in Data sheet-A of section-I, volume-II. The cable box shall also be provided with a suitable canopy. Suitable cable glands (double compression type) and lugs shall be provided for cable termination.

3.13.02 Dimensions of cable box shall be subject to purchaser's approval.

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3.13.03 Inspection cover for fixed portion of cable box shall be provided. Handles for lifting cable box shall be provided.

3.13.04 Creepage distance shall be as per data sheet-A of section-I, volume-II.

3.13.05 Provision shall be made for earthing the body of each cable box. Separate earthing pads shall be provided for this purpose, suitable for bolted connection to galvanised mild steel flat of size to be specified during contract engineering stage.

3.13.06 Gland plate for single core cable termination shall be of Aluminium.

3.13.07 Cable box(es) shall be provided with suitable air-insulated disconnecting chamber so that if required, transformer can be removed from its position without disconnecting the cables in the cable box(es). Independent supporting arrangement shall be provided for cable box(es) for this purpose. Supporting arrangement shall be supplied along with required hardware & foundation bolts etc.

3.14.00 **Busduct Termination**

If LV terminals are specified to be connected by means of a busduct, a flanged throat or equivalent connection shall be provided to suit purchaser's busducts. The winding termination shall be on outdoor type of bushing. Necessary flexibles shall be provided by purchaser to connect the bushing terminals to the busbars of the busduct. Details of bus duct shall be furnished during detail engineering stage. Degree of protection of LV busduct flange enclosure shall be IP:55.

3.15.00 **Neutral Terminals**

Two (2) nos. neutral terminals shall be provided on LV side. One neutral terminal shall be part of phase connection arrangement busduct throat/ LV cable-box (as applicable). Other neutral terminal shall be in a separate box and brought to tank bottom by means of earthing bar of 50x6 mm of copper, supported on porcelain insulators mounted on transformer tank. The neutral earthing bar brought to the tank bottom for connection to station earth shall be provided with holes and suitable connecting hardware. This earthing bar shall have fork type arrangement at the end. However neutral may be connected to NGR as per system requirement.

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3.16.00 **Neutral CT**

Bidder to provide neutral bushing CT as per details given in data sheet – A of section-I, volume-II for restricted earth fault protection or standby earth fault protection. In case neutral CT is tank mounted, CT box shall be weather proof having D.O.P. IP: 55. The Neutral CT box shall also be provided with a suitable canopy. CTs shall be cast resin type.
All CTs (except WTI) shall be mounted in the turret of bushings, mounting inside the tank is not permitted.

3.17.00 **Valves**

3.17.01 All valves upto and including 50 mm shall be of gun metal or of cast steel. Larger valves may be of gun metal or may have cast iron bodies with gun metal fittings.

3.17.02 Sampling & drain valves should have zero leakage rate.

3.18.00 **Gaskets**

3.18.01 Gasket shall be fitted with weather proof, hot oil resistant, rubberized cork.

3.18.02 If gasket is compressible, metallic stops shall be provided to prevent over compression.

3.18.03 The gaskets shall not deteriorate during the life of transformer/shunt reactor if not opened for maintenance at site. All joints flanged or welded associated with oil shall be such that no oil leakage or sweating occurs during the life of transformer.

3.19.00 **Voltage control (off circuit type)**

3.19.01 Off circuit tap-changing switch shall be three phase, hand operated, for simultaneous switching of similar taps on all the three phases by operating an external handle/ hand wheel. The position of off-circuit tap switch handle/hand wheel provided outside the transformer tank should be such as to enable an operator standing on ground to operate the same with ease. A caution plate indicating that switch shall be operated only when the transformer is de-energised shall be fitted near tap switch.

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3.19.02 Operating mechanism of tap changer shall be suitably labelled to show the direction of operation for raising secondary voltage & vice versa. Position markings shall be provided.

3.19.03 Arrangement shall be made for securing and padlocking the tap-changing switch at any working position. It shall not be possible to set and padlock in any intermediate position.

3.19.04 Tap position indicator and mechanical stops to prevent over-cranking of the mechanism shall be provided.

3.20.00 **Marshalling box**

3.20.01 Tank mounted vermin and dust proof marshalling box shall be provided to accommodate indication circuits and temperature indicators etc. and provided with proper lighting and thermostatically controlled space heaters.

3.20.02 The marshalling box shall be fabricated using sheet steel of at least 2.5mm thickness. The marshalling box shall have domed or sloping roof.

3.20.03 Marshalling box shall be complete with all internal wiring and identification ferrules, cables, conduits required for wiring between marshalling box and instruments on transformer. Wiring shall be by 1100 V grade, copper cable of size 2.5mm^2.

3.20.04 The terminal blocks shall be complete with insulating barriers and clip-on type terminals suitable for 2.5mm^2 stranded copper wire. One dummy terminal block in between each trip wire terminal shall be provided. At least 20% spare terminals shall be provided on each panel. The gasket used shall be of neoprene rubber.

3.20.05 The marshalling box shall have IP: 55 degree of protection.

3.20.06 CT terminals shall be with shorting and disconnecting facility. TB shall be stud type for all CT & power connection.

3.20.07 Wiring scheme shall be engraved in a stainless steel plate with viewable font size and the same shall be fixed inside the Marshalling Box door. Refer annexure-C for standard terminal block numbering.

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3.21.00 **Flux density**

Flux density in any part of the core & yoke on any tap position with ±10% voltage variation from voltage corresponding to the tap shall not exceed 1.9 Wb/m^2. Transformer shall also withstand following conditions due to combined voltage and frequency variations:

Continuous operation for 110% flux density
At least 1 minute operation for 125% flux density
At least 5 sec. operation for 140% flux density

3.22.00 **Winding**

For 33kV, 11kV & 3.3kVwinding, type of winding shall be continuous disc & for 433V/ 420V winding, type of winding shall be spiral type. The conductors shall be of Electrolytic grade copper.

3.23.00 **Noise & Vibration**

The design and manufacture of transformer, fittings and accessories shall be such as to reduce noise & vibration. Noise level shall not be more than as specified in NEMA Standard Publication TR-1, when measured with transformer energised at normal voltage and frequency.

3.24.00 All transformers and their accessories shall be capable of withstanding without damage any external short circuit at the terminals for duration of two seconds.

3.25.00 Maximum Transformer losses including tolerances shall be as per annexure – B, of section-I, volume-II.

3.26.00 **LOADING CAPABILITY**

Transformer shall be suitable for continuous operation at rated kVA on any tap with voltage variation of ± 10 % corresponding to voltage of the tap. Short duration overloading shall be in accordance with IS:6600 / IEC60076-7.

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4.00.00 **Fittings & accessories**

4.01.00 Transformer shall be provided with, but not restricted to following minimum fittings and accessories for satisfactory operation:

4.01.01 Conventional type conservator with drain valve and oil filling hole.

4.01.02 Magnetic oil level gauge with low-level alarm contact.

4.01.03 Prismatic & toughened glass oil level gauge.

4.01.04 Gaskets

4.01.05 Gasket protection covers.

4.01.06 Silica gel breather with oil seal.

4.01.07 Double float type Buchholz relay with alarm and trip contacts with suitable gas collecting device with two shut-off valve on both side.

4.01.08 Diaphragm type explosion vent for transformers of rating less than 2MVA

4.01.09 Pocket on tank cover for thermometer.

4.01.10 Protected type mercury in glass thermometer.

4.01.11 Dial t ype (150 mm) Oil tem perature indicator (OTI) with two sets of electrical potential- free contact rated for 2A, 220V DC, for alarm and trip purpose. The OTI shall be provide d with anti-vibration mounting. OTI sh all have m aximum reading pointer along with resett ing devic e. Fo r remote oil temperature m etering, a n independent 4-20 mA should be made available.

4.01.12 Dial type (150 mm) Winding temperature indicator (WTI) with two sets of electrical potential- free contact rated for 2A, 220V DC, for alarm and trip purpose. The WTI shall be provided with anti-vibration mounting. WTI shall have maximum reading position along with resetting devices. For remote winding temperature metering, an independent 4-20 mA should be made available.

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4.01.13 Drain Valves.

4.01.14 Sampling devices.

4.01.15 Filter valves.

4.01.16 Earthing terminals – 2 Nos.

4.01.17 Rating & Diagram plates.

4.01.18 Valve schedule plate.

4.01.19 Two sets of lifting lugs (one for transformer with oil and other for tank cover).

4.01.20 Jacking pads.

4.01.21 Skids and pulling eyes on both sides.

4.01.22 Air release devices.

4.01.23 Inspection cover.

4.01.24 Oil filling hole and cap.

4.01.25 Tank mounted marshalling box.

4.01.26 Detachable, flat, bidirectional rollers with 90 deg. swivel mechanism.

4.01.27 Clamping arrangement for rollers.

4.01.28 Ground support for cable box.

4.01.29 Neutral CT secondary box.

4.01.30 Haulage facilities.

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4.01.31 Two nos. spring operated pressure relief devices with extension pipe to bring oil to plinth level along with electrically insulated contact for alarm and tripping for transformer rating 2 MVA and above.

4.01.32 Gas collection device along with all accessories.

4.02.00 Breather shall be fitted at a height not exceeding 1.5 M.

4.03.00 Rating and diagram plate shall be fitted at a height of about 1.75 M above the ground level.

4.04.00 The WTI and OTI shall have accuracy class of $\pm$ 2 deg. C or better.

4.05.00 Rating/ Name/ Valve schedule plates shall be of white non-hygroscopic material with engraved black lettering . Such plates shall be bi-lingual (requirement will be finalised during detailed engineering) with Hindi inscription first, followed by English. Alternatively, two separate plates with Hindi & English inscription shall be provided.

5.00.00 **PAINTING**

Paint shade shall be informed to successful bidder during detail engineering as applicable for specific project. Adequate quantity of touch up paint shall also be supplied. There shall be no commercial or delivery implication to BHEL on account of paint shade, paint specification/ procedure.

6.00.00 **QUALITY ASSURANCE, TESTING & INSPECTION**

6.01.00 BHEL's Standard QP (PE-QP-999-302-E001 Rev. 0) is enclosed as per Annexure-A of section-II, volume-II for reference. In case bidder has reference QP agreed with ultimate customer, same can be submitted for specific project after award of contract for BHEL/ ultimate customer's approval. There shall be no commercial or delivery implication to BHEL on account of QP approval.

6.02.00 All materials, components and accessories of the transformers shall be procured, manufactured, inspected and tested by vendor/ sub-vendor as per approved quality plan.

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6.03.00 Tests shall be performed in presence of Purchaser's representative. The bidder shall give at least fifteen (15) days advance notice of date when the tests are to be carried out.

6.04.00 All routine and acceptance tests as per relevant standards and specification shall be carried out by the vendor/ sub-vendor on all transformers.

6.05.00 Successful bidder shall furnish List of sub-vendors/ makes of items for BHEL/ customer approval at contract stage. This shall not have any commercial implication to BHEL.

6.06.00 For acceptance of short circuit reports for tests carried out earlier on similar transformers, successful bidder shall furnish the following documents for BHEL/ BHEL's customer acceptance without any commercial/ delivery implication to BHEL

6.06.01 Calculations and design considerations to prove ability to withstand the dynamic effects of short circuit.

6.06.02 Short circuit test report of previously tested similar transformer for validation by comparison. Criteria for similarity of transformer for acceptance of Short circuit test report shall be as given in the Annexure-B of IEC-60076-5.

7.00.00 COMMISSIONING SPARES, SPECIAL TOOLS & TACKLES AND O & M SPARES

7.01.00 Commissioning spares are those, which may be required during commissioning of the equipment. Bidder to furnish list of commissioning spares along with technical offer as per annexure-IV of section-I, volume-II.

7.02.00 The bidder shall supply with the equipment, one unused complete set of all special tools & tackles required for the erection, assembly, disassembly and proper maintenance of the equipment. A list of such tools & tackles (price deemed to be included in the total bid price) shall be submitted by the bidder along with the offer as per annexure-V of section-I, volume-II.

7.03.00 O & M spares are those which are required for satisfactory & trouble free operation of equipment. List of O & M spares is enclosed as per Annexure-D of section-II, volume-II. O & M spares shall be quoted (if applicable) as per BOQ-cum-price schedule as part of NIT.

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	TITLE : STANDARD TECHNICAL SPECIFICATION FOR OIL FILLED SERVICE TRANSFORMERS	SPECIFICATION NO. PE-SS-999-302-E001
		VOLUME NO. : II
		SECTION : II
		REV NO. : 00 DATE : 30/06/2016
		SHEET : 16 of 30

8.00.00 O & M MANUALS

8.01.00 O & M manuals for the installation, operation and maintenance of transformers shall be furnished at least three months before despatch of equipment.

8.02.00 Draft manual should first be submitted for purchaser's approval. The manual should contain minimum following details:

8.02.01 General description of equipment.

8.02.02 Approved Technical Data Sheet

8.02.03 All drawings

8.02.04 Salient constructional features.

8.02.05 Technical leaflets of fittings/ important parts.

8.02.06 Type and routine test certificates.

8.02.07 Instructions to be followed on receipt of equipment at site & for storage.

8.02.08 Instructions for foundation arrangement.

8.02.09 Erection procedures and checks.

8.02.10 Pre-commissioning checks.

8.02.11 Comissioning procedures.

8.02.12 Withdrawal arrangement/ material handling instructions.

8.02.13 Operation instructions.

8.02.14 Maintenance instructions.

8.02.15 Trouble-shooting.

8.02.16 Safety instructions.

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	TITLE :	SPECIFICATION NO.
	STANDARD TECHNICAL SPECIFICATION FOR	**PE-SS-999-302-E001**
	OIL FILLED SERVICE TRANSFORMERS	VOLUME NO. : **II**
		SECTION : II
		REV NO. : **00** DATE : 30/06/2016
		SHEET : **17** of **30**

ANNEXURE - A

STANDARD QUALITY PLAN

BHEL	**QUALITY PLAN**		CUSTOMER :			PROJECT TITLE :			SPECIFICATION NO. :			
			BIDDER/ VENDOR :			STANDARD QP NO. : PE-QP-999-302-E001, REV. 0			SPECIFICATION TITLE:			
	SHEET 1 OF 10		SYSTEM			ITEM :OIL FILLED TRANSFORMER			DOC. NO. :			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**											
1.1	Mild Steel plate, MS Pipe, Channels, MS Angles	a) Thickness	Major	MEASURE	10%			QC Record.	3/2		1	
		b) Surface defects	Major	VISUAL	100%			QC Record.	3/2		2	
		c) Chemical composition	Major	TEST	-			Supplier's TC	3/2		-	
		d) Mechanical Properties	Major	TEST	-	'MANFUF. STD /	'MANFUF. STD /	Supplier's TC	3/2		2	
		e) Hydraulic test of pipes	Major	TEST	-	IS:2062 / IS:1239	IS:2062 / IS:1239	Supplier's TC	3/2		2	
1.2	CRGO Steel	a) Thickness Dimension & Finish	Major	MEASURE	10%	DRG/DATA SHEET/	DRG/DATA SHEET/	QC Record.	2		1	
		b) Grade of CRGO	Major	MEASURE	-	'MANFUF. STD /	'MANFUF. STD /	TC	3/2		2	
		c) Cutting & burr	Major	MEASURE	10%	IS:3024 / IS:649	IS:3024 / IS:649	QC Record.	2		-	
		d) Scratches, surface finish	Major	VISUAL	10%			QC Record.	3/2		-	
		e) Waviness & edge camber	Major	MEASURE	10%			QC Record.	2		1	
		f) Specific core loss	Major	TEST	-			Supplier's TC	3/2		2	
		g) Surface resistivity	Major	TEST	-			Supplier's TC	3/2		2	
		h) Stacking factor	Major	TEST	-			Supplier's TC	3/2		2	
		i) Permeability	Major	TEST	-			Supplier's TC	3/2		2	
		j) Bend test/ Ductility	Major	MEASURE	-			Supplier's TC	3/2		2	
1.3	Paper Insulated Copper Conductor	a) Dimensions	Major	MEASURE	100%	'MANFUF. STD /	'MANFUF. STD /	QC Record.	2		1	
		b) Resistivity/Conductivity	Major	TEST	10%	IS:13730-P-27/IEC	IS:13730-P-27/IEC	Supplier's TC	3/2		1	
		c) Elongation	Major	TEST	-	60554	60554	Supplier's TC	3/2		2	
		d) Tensile Strength	Major	TEST	-			Supplier's TC	3/2		2	
		e) Proof stress if applicable	Major	TEST	-			Supplier's TC	3/2		2	
		f) Insulation test between strands for bunched conductors	Major	TEST	-			Supplier's TC	3/2		2	
		g) Cu purity of CC rod	Major	TEST	-			Supplier's TC	3/2		2	
		h) Chemical composition	Major	TEST	-			Supplier's TC	3/2		2	
		i) Surface Finish	Major	VISUAL	100%	Free from sharp edge,burr,scretch, cuts etc.	Free from sharp edge,burr,scretch, cuts etc.	QC Record.	2		2	
1.4	Insulating Paper	a) Dimensions	Major	MEASURE	10%	'MANFUF. STD /	'MANFUF. STD /	QC Record.	2		1	
		b) Density & substance	Major	TEST	-	IS:9335-P-2/IS:9335-	IS:9335-P-2/IS:9335-	Supplier's TC	3/2		2	
		c) Tensile Strength	Major	TEST	-	P-III/IEC 60554	P-III/IEC 60554	Supplier's TC	3/2		2	
		d) Elongation	Major	TEST	-			Supplier's TC	3/2		2	
		e) Water absorption	Major	TEST	-			Supplier's TC	3/2		2	
		f) Moisture content	Major	TEST	-			Supplier's TC	3/2		2	
		g) pH value & conductivity aqueous extract	Major	TEST	-			Supplier's TC	3/2		2	
		h) Ash content	Major	TEST	-			Supplier's TC	3/2		2	
		i) Electrical strength	Major	TEST	-			Supplier's TC	3/2		2	
		j) Air permeability	Major	TEST	-			Supplier's TC	3/2		2	
		k)Tear index	Major	TEST	-			Supplier's TC	3/2		2	
		l) Heat stability	Major	TEST	-			Supplier's TC	3/2		2	

BHEL	**PARTICULARS**	**BIDDER/VENDOR**
	NAME	
	SIGNATURE	
	DATE	

BIDDER'S/VENDORS COMPANY SEAL

LEGEND : **1 - BHEL/ CUSTOMER** **2 - VENDOR** **3 - SUB- VENDOR** **P - PERFORM** **W - WITNESS** **V - VERIFICATION**

	QUALITY PLAN	CUSTOMER :	PROJECT TITLE :	SPECIFICATION NO. :
		BIDDER/ VENDOR :	STANDARD QP NO. : PE-QP-999-302-E001, REV. 0	SPECIFICATION TITLE:
	SHEET 2 OF 10	SYSTEM	ITEM :OIL FILLED TRANSFORMER	DOC. NO. :

SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
1.5	Insulation & Press-	a) Dimension	Major	Measure	10%	'MANFUF. STD / IS:1576	'MANFUF. STD / IS:1576	QC Record.	2		1	
	Board moulding	b) Compressibility	Major	Test	-			Supplier's TC	3/2		2	
	(stock items)	c) Density	Major	Test	-			Supplier's TC	3/2		2	
		d) Tensile strength	Major	Test	-			Supplier's TC	3/2		2	
		e) pH value/Conductivity of water extract	Major	Test	-			Supplier's TC	3/2		2	
		f) Electrical strength in air & oil	Major	Test	-			Supplier's TC	3/2		2	
		g) Shrinkage in air	Major	Test	-			Supplier's TC	3/2		2	
		h) Flexibility	Major	Test	-			Supplier's TC	3/2		2	
		i) Ash content	Major	Test	-			Supplier's TC	3/2		2	
		j) Moisture content	Major	Test	-			Supplier's TC	3/2		2	
		k) Cohesion between plies	Major	Test	-			Supplier's TC	3/2		2	
		l) Elongation	Major	Test	-			Supplier's TC	3/2		2	
		m) Oil absorption	Major	Test	-			Supplier's TC	3/2		2	
1.6	Densified wood	a) Dimension	Major	Measure	10%	'MANFUF. STD / IS:3513	'MANFUF. STD / IS:3513	QC Record.	2		1	
		b) Surface finish	Major	Visual	10%			QC Record.	2		-	
		c) Electrical strength in oil	Major	Test	-			Supplier's TC	3/2		1	
		d) Oil absorption	Major	Test	-			Supplier's TC	3/2		-	
		e) Moisture content	Major	Test	-			Supplier's TC	3/2		-	
		f) Compression strength	Major	Test	-			Supplier's TC	3/2		-	
		g) Crossbreaking strength	Major	Test	-			Supplier's TC	3/2		-	
		h) Tensile strength	Major	Test	-			Supplier's TC	3/2		-	
		i) Specific gravity/ Density	Major	Test	-			Supplier's TC	3/2		-	
1.7	Gasket(Rubber	a) Dimension	Major	Measure	10%	'MANFUF. STD / IS:4253	'MANFUF. STD / IS:4253	QC Record.	2		-	
	Bonded Cork sheet	b) Hardness	Major	Test	-			Supplier's TC	3/2		1	
	(if applicable)	c) Tensile strength	Major	Test	-			Supplier's TC	3/2		-	
		d) Compressibility	Major	Test	-			Supplier's TC	3/2		1	
		e) Recovery	Major	Test	-			Supplier's TC	3/2		-	
		f) Compression set	Major	Test	-			Supplier's TC	3/2		-	
		g) Flexibility	Major	Test	-			Supplier's TC	3/2		-	
		h) Fluid resistence test	Major	Test	-			Supplier's TC	3/2		-	
		i) Chloride/Sulphate content of water extract	Major	Test	-			Supplier's TC	3/2		-	
		j) Density	Major	Test	-			Supplier's TC	3/2		-	
1.8	Nitrile Rubber	a) Dimension	Major	MEASURE	10%	'MANFUF. STD / IS:4253	'MANFUF. STD / IS:4253	Supplier's TC	2		-	
	Cord and "0"	b) Shore Hardness	Major	Test	-			Supplier's TC	3/2		-	
	Ring	c) Tensile strength	Major	Test	-			Supplier's TC	3/2		-	
	(if applicable)	d) Elongation at break	Major	Test	-			Supplier's TC	3/2		-	
		e) Compression set	Major	Test	-			Supplier's TC	3/2		-	
		f) Accelerated Ageing in oil	Major	Test	-			Supplier's TC	3/2		-	

	PARTICULARS	BIDDER/VENDOR	
BHEL	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

BHEL	QUALITY PLAN		CUSTOMER :			PROJECT TITLE :			SPECIFICATION NO. :				
			BIDDER/ VENDOR :			STANDARD QP NO. : PE-QP-999-302-E001, REV. 0			SPECIFICATION TITLE:				
		SHEET 3 OF 10	SYSTEM			ITEM :OIL FILLED TRANSFORMER			DOC. NO. :				
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS	
1	2	3	4	5	6	7	8	9	10			11	
1.9	Insulating Oil	a) Appearance of oil	Major	Visual				Supplier's TC	3/2		2,1		
		b) Density at 29.5 deg C	Major	Test				Supplier's TC			2,1		
		c) Kinematic viscosity at 27 & 40 deg C	Major	Test				Supplier's TC			2,1		
		d) Interfacial tension at 27 deg C	Major	Test				Supplier's TC			2,1		
		e) Flash point	Major	Test				Supplier's TC			2,1		
		f) Pour point	Major	Test				Supplier's TC			2,1		
		g) Neutralization value	Major	Test				Supplier's TC			2,1		
		h) Corrosive sulphur	Major	Test				Supplier's TC			2,1		
		i) Dielectric dissipation factor	Major	Test				Supplier's TC			2,1		
		j) Specific resistance (resistivity)	Major	Test	One sample	MANUF. STD / IS:335	MANUF. STD / IS:335	Supplier's TC			2,1		
		k) Ageing characteristics after accelerated ageing	Major	Test				Supplier's TC			2,1		
		l) Oxidation stability	Major	Test				Supplier's TC			2,1		
		m) Presence of oxidation inhibitor	Major	Test				Supplier's TC			2,1		
		n) Electric strength(BDV, Tan-delta) i) As delivered ii) After treatment	Major	Test				Supplier's TC			2,1		
		o) Water content	Major	Test				Supplier's TC			2,1		
		p) S.K.value	Major	Test				Supplier's TC			2,1		
1.10	Paint &Varnish	Shelf Life	Major	VISUAL	100%	MANF.STD	MANF.STD	Supplier's TC	3/2		2,1		
2	**FITTING AND ACCESSORIES (MAKE SHALL BE AS PER ANNEXURE-1)**												
2.1	Porcelain Bushing (if applicable)	a) Dimension	Major	MEASURE	100%	IS:2099/IS:8603	IS:2099/IS:8603	QC records	2		-		
		b) Visual defects	Major	Visual	100%			QC records	2		-		
		c) routine testing	Major	Test	100%			Supplier's TC	3/2		2,1		
2.2	Condenser Bushing (if applicable)	a) Type, size & model	Major	Visual	100%	IS:2099 / IS:8603 / IEC 60137	IS:2099 / IS:8603 / IEC 60137	QC records	2		1		
		b) Dimensional check	Major	Measure	100%			QC records	2		1		
		c) Dry power frequency	Major	Test	-			Supplier's TC	3/2		2,1		
		voltage withstand test	Major	Test	-								
		d) HV Test for test tap	Major	Test	-			Supplier's TC	3/2		2,1		
		e) Tan delta & capacitance test	Major	Test	-			Supplier's TC	3/2		2,1		
		f) Nitrogen Pressure Test	Major	Test	-			Supplier's TC	3/2		2,1		
		g) Routine Test	Major	Test	-			Supplier's TC	3/2		2,1		
				PARTICULARS	BIDDER/VENDOR								
	BHEL			NAME									
				SIGNATURE									
				DATE								BIDDER'S/VENDORS COMPANY SEAL	

LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

	QUALITY PLAN	CUSTOMER :	PROJECT TITLE :	SPECIFICATION NO. :
		BIDDER/ VENDOR :	STANDARD QP NO. : PE-QP-999-302-E001, REV. 0	SPECIFICATION TITLE:
	SHEET 4 OF 10	SYSTEM	ITEM :OIL FILLED TRANSFORMER	DOC. NO. :

SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
2.3	Bucholz Relay	a) Type, size & make	Major	Visual	100%	MANFUF. STD./'	MANFUF. STD./'	QC records	2		1	
		b) Continuity for alarm &	Major	Test	-	IS:3637	IS:3637	Supplier's TC	3/2		2	
		trip (Performance)	Major	Test	-							
		c) Porosity test	Major	Test	-			Supplier's TC	3/2		2	
		d) High voltage & IR test	Major	Test	-			Supplier's TC	3/2		2	
		e) Element test	Major	Test	-			Supplier's TC	3/2		2	
		f) Gas volume test	Major	Test	-			Supplier's TC	3/2		2,1	
		g) Loss of oil & surge test	Major	Test	-			Supplier's TC	3/2		2,1	
2.4	Pressure	a) Type, size & make	Major	Visual	100%	MANFUF. STD./'	MANFUF. STD./'	QC records	2		1	
	Relief Device	b) Operation (Pressure &	Major	Test	-	IS:3637	IS:3637	Supplier's TC	3/2		2,1	
		flag indication)	Major	Test	-							
		c) HV Test	Major	Test	-			Supplier's TC	3/2		2,1	
		d) Switch contact operation	Major	Test	-			Supplier's TC	3/2		2	
2.5	Magnetic Oil	a) Type, size & make	Major	Visual	100%	MANFUF. STD'	MANFUF. STD.'	QC records	2		1	
	Lavel Gauge	b) Dial marking	Major	Visual	-			Supplier's TC	3/2		2	
	(MOG)	c) Switch continuity	Major	Test	-			Supplier's TC	3/2		2	
		d) HV test	Major	Test	-			Supplier's TC	3/2		2	
		e) Operation test	Major	Test	-			Supplier's TC	3/2		2	
2.6	Off-Circuit Tap	a) Dimensions	Major	Measure	100%	MANFUF. STD'	MANFUF. STD'	QC records	2		-	
	Changer/Switch	b) Physical condition	Major	Visual	100%			QC records	2		-	
	(if applicable)	c) operation of switch	Major	Test	-			QC records	2		-	
		d) Insulation resistance test	Major	Test	-			Supplier's TC	3/2		2	
		e) Leak test of handle stuffing box	Major	Test	-			Supplier's TC	3/2		2	
		f) Milli volt drop test	Major	Test	-			Supplier's TC	3/2		2	
2.7	On load Tap	a) Visual check	Major	Visual	100%	IS:8468/IEC 60214	IS:8468/IEC 60214	QC records	2		-	
	Changer	b) Dimensional check	Major	Measure	100%			Supplier's TC	2		-	
	(if applicable)	c) Mechanical operation on	Major	Verify	-			Supplier's TC	3/2		2	
		Diverter & Selector switch,										
		4000 switching oper. (Min)										
		d) HV test on Auxiliary circuit	Major	Test	-			Supplier's TC	3/2		2,1	
		e) Sequence test	Major	Test	-			Supplier's TC	3/2		2,1	
		f) Pressuure test of diverter	Major	Test	-			Supplier's TC	3/2		2,1	
		switch compartment with oil										
		g) Mechanical test of Tap	Major	Test	-			Supplier's TC	3/2		2,1	
		selector with motor drive										
		500 satisfactory opm(in all)										
		from one extreme position										
		to the other in air										
		h) Opm test of complete	Major	Test	-			Supplier's TC	3/2		2,1	
		tapchanger										
		i) Aux. ckt. HV test at 2 KV for 1 min.	Major	Test	-			Supplier's TC	3/2		2,1	

	PARTICULARS	BIDDER/VENDOR	
BHEL	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

	QUALITY PLAN	CUSTOMER :	PROJECT TITLE :	SPECIFICATION NO. :
		BIDDER/ VENDOR :	STANDARD QP NO. : PE-QP-999-302-E001, REV. 0	SPECIFICATION TITLE:
	SHEET 5 OF 10	SYSTEM	ITEM :OIL FILLED TRANSFORMER	DOC. NO. :

SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
2.8	Gun Metal / Cast Iron Valves Gate/globe/ Butterfly)	a) Dimensional check	Major	Measure	100%	Manf. Std./IS:778 Class 1	Manf. Std./IS:778 Class 1	QC Record	2		-	
		b) Type, size & make	Major	Visual	100%			QC Record	2		-	
		c) Leakage test(Hydraulic test	Major	Test	-			Supplier's TC	3/2		2,1	
		for Body & Seat)	Major	Test	-							
		d) Operational test (close & open)	Major	Test	-			Supplier's TC	3/2		2	
2.9	Bushing CT	a) Visual check/Dimensional check	Major	Measure/Visual test	100%	Manf. Std./IS:2705	Manf. Std./IS:2705	Supplier's TC	2		-	
		b) Routin test	Major	Test	-	Manf. Std./IS:2705	Manf. Std./IS:2705	Supplier's TC	3/2		2,1	
2.10	Marshaling box/RTCC	a) Visual check for wiring	Major	Test	100%	Drg./Manf. Std./IS:5/IS:13947	Drg./Manf. Std./IS:5/IS:13947	Supplier's TC	3/2	2	-	
		b) Dimensional check	Major	Measure/Test	100%			Supplier's TC	3/2	2	-	
		c) Check for make of components	Major	Measure/Test	100%			Supplier's TC	3/2	2	-	
		d) 2 kV insulation test on auxiliary wiring	Major	Measure/Test	100%			Supplier's TC	3/2	2	-	
		e) Check for paint, shade & thickness	Major	Measure/Test	100%			Supplier's TC	3/2	2	-	
		f) Degree of Prot. By paper insertion	Major	Measure/Test	100%			Supplier's TC	3/2	2	-	
2.11	OTI&WTI	a)Type size & make	Major	Visual	100%	Manf. Std.	Manf. Std.	QC records	2		1	
		b) HV test	Major	Test	-			Supplier's TC	3/2		2,1	
		C) Temperature calibration	Major	Test	-			Supplier's TC	3/2		2,1	
		d) Switch setting & switch deferential	Major	Test	-			Supplier's TC	3/2		2,1	
		e) Calibration & operation of switch	Major	Test	-			Supplier's TC	3/2		2,1	
2.12	Radiator	a) Type, Model, Rating	Major	Visual	100%	Drg./Manf. Std./IS:101	Drg./Manf. Std./IS:101	QC records	3/2	2	1	
		b) Dimensions & No. of elements	Major	Measure	100%			QC records	3/2	2	-	
		c) Paint shade, Finish & film thickness	Major	Measure/test	100%			QC records	3/2	2	-	
		d) Pressure test	Major	Test	100%			Supplier's TC	3/2	2	1	
		e) Adhesion test on paint	Major	Test	100%							
		f) Welding quality	Major	Visual/ DPTest	100%	Relevant code	Relevant code	Supplier's TC	3/2	2	1	
2.13	Hardware	a) Dimensional check	Major	Measure	100%	Manf. Std.	Manf. Std.	QC records	2		-	
		b) Tensile strength	Major	Test	-			Supplier's TC	3/2		-	

	PARTICULARS	BIDDER/VENDOR
BHEL	NAME	
	SIGNATURE	
	DATE	

BIDDER'S/VENDORS COMPANY SEAL

LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

	QUALITY PLAN	CUSTOMER :			PROJECT TITLE :			SPECIFICATION NO. :					
		BIDDER/ VENDOR :			STANDARD QP NO. : PE-QP-999-302-E001, REV. 0			SPECIFICATION TITLE:					
	SHEET 6 OF 10	SYSTEM			ITEM :OIL FILLED TRANSFORMER			DOC. NO. :					
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS	
1	2	3	4	5	6	7	8	9	10			11	
2.14	Oil Pump Motor set (if applicable)	a) Type, Model, Rating	Major	Visual	100%	Manf. Std.	Manf. Std.	QC records	2		-		
		b) Dimensional check	Major	Measure	100%			QC records	2		-		
		c) Hv test at 2 kV for one minute	Major	Test	-			Supplier's TC	3/2		2,1		
		d) Input power taken by pump	Major	Test	-			Supplier's TC	3/2		2,1		
		e) Performance test (I/P,O/P,DISCH, NO LOAD, Locked Rotor te)	Major	Test	-			Supplier's TC	3/2		2,1		
2.15	Cooling Fan (if applicable)	a) Type, Model, Rating	Major	Visual	100%	Approved drgs/docs/spec./ IS:2312	Approved drgs/docs/spec./ IS:2312	QC records	2		-		
		b) Dimensional check	Major	Measure	-			QC records	2		-		
		c) HV test at 2 KV for	Major	Test	-			Supplier's TC	3/2		2,1		
		one minute	Major	Test	-						-		
		d) IR test	Major	Test	-			Supplier's TC	3/2		-		
		e) Power consumption & RPM	Major	Test	-			Supplier's TC	3/2		2,1		
2.16	Roller Assembly	a)Dimensions	Major	Measure	100%	Manf. Drg./docs	Manf. Drg./docs	QC records	2		-		
		b) Mechanical & Chemical properties of Raw material used for Shaft & Roller	Major	Measure	-			Supplier's TC	3/2		2		
2.17	Terminal Connector (if applicable)	a) Dimensional check	Major	Measure	100%	Manf. Drg./docs/IS:5561	Manf. Drg./docs/IS:5561	QC records	2		-		
		b) Surface finish	Major	Visual	-			Supplier's TC	3/2		2		
		c) Acceptance test	Major	Test	-			Supplier's TC	3/2		2,1		
2.18	Air Cell for Conservator (if applicable)	a) Dimensional check	Major	Measure	100%	Manf. Drg./docs/PO	Manf. Drg./docs/PO	QC records	2		-		
		b) Surface finish	Major	Visual	100%			Supplier's TC	3/2		2		
		c) Acceptance test	Major	Test	100%			Supplier's TC	3/2		2,1		
2.19	Oil Flow Indicator (if applicable)	a) Type, Model, Rating	Major	Visual	100%	Manf. Drg./docs/Spec.	Manf. Drg./docs/Spec.	QC records	2		-		
		b) Dimensional check	Major	Measure	100%			QC records	2		-		
		c) Functional test	Major	Test	-			Supplier's TC	3/2		2,1		
2.20	Silicagel Breather	a) Type, Size, Model	Major	Visual	100%	Manf. Drg./docs/Spec.	Manf. Drg./docs/Spec.	QC records	2		-		
		b) Pressure/ Leakage test	Major	Test	-			Supplier's TC	3/2		2		
		c) Colour of silica gel	Major	Visual	-			Supplier's TC	3/2		2,1		
		PARTICULARS		**BIDDER/VENDOR**									
	BHEL	**NAME**											
		SIGNATURE											
		DATE										BIDDER'S/VENDORS COMPANY SEAL	

LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

BHEL	QUALITY PLAN		CUSTOMER :			PROJECT TITLE :			SPECIFICATION NO. :				
			BIDDER/ VENDOR :			STANDARD QP NO. : PE-QP-999-302-E001, REV. 0			SPECIFICATION TITLE:				
	SHEET 7 OF 10		SYSTEM			ITEM :OIL FILLED TRANSFORMER			DOC. NO. :				
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS	
1	2	3	4	5	6	7	8	9	10			11	
3	**IN-PROCESS**												
3.1	Fabrication of Tank, Conservator,Radiator, HV&LV CABLE BOX and welding requirement	a) Welding procedure specification	Major	Verify/Review	100%			QC Records	3/2		2		
		b) Process qualification record	Major	Verify/Review	100%			QC Records	3/2		2		
		c) Weider qualification	Major	Verify/Review	100%			QC Records	3/2		2		
		d) Welding electrodes-Me-chanical Properties	Major	Verify/Review	100%			QC Records	3/2		2		
		e) Fitup for butt weld joints of tank and cover	Major	Visual	100%			QC Records	3/2		2		
		f) Visual check on weldment & any foregin particle in the entire tank with conservator, pipes etc.and blanking of ends with bolted plates	Major	Visual	100%			QC Records	3/2		2		
		g) Dimensional check after final welding incl.foundation dimension-HV & LV cable box/ Radiator/ Cooler/ Pipes	Major	Measure	100%	Manf. Drg./stand.	Manf. Drg./stand.	QC Records	3/2		2		
		h) DP test on welded joints	Major	Test	100%			QC Records	3/2		2,1		
		i) Check for flatness gasket surface	Major	Visual	100%			QC Records	3/2		2,1		
		J) Rim flatness	Major	Measure	100%			QC Records	3/2		2,1		
		k) Surface cleaning by sand/ shot blasting	Major	Visual	100%			QC Records	3/2		2,1		
		l) Primer coating, paint shade thickness inside & outside	Major	Measure	100%			QC Records	3/2		2,1		
		m) Paint film adhesion test	Major	Test	100%			QC Records	3/2		2,1		
		n) Vacuum Test (Tank)	CR	Vacuum test	1 unit each type	Appd. Doc./BHEL	Appd. Doc./BHEL	QC formate	3/2	1			
		o) Pressure test (Tank)	CR	Pressure test	1 unit each type	SPEC./CBIP	SPEC./CBIP	QC formate	3/2	1			
3.2	Core Stamping	a) Burr & Bow	Major	Visual	100%	Manf. Drg./stand.	Manf. Drg./stand.	QC Records	2		-		
		b) Dimensional check	Major	Measure	100%			QC Records	2		-		
3.3	Core Building	a) Dimensional check	Major	Measure	100%			QC Records	2		-		
		b) Assembly of limb insulation and limb plates.	Major	Visual	100%			QC Records	2		-		
		c) Rectangularity of core assembly	Major	Visual	100%			QC Records	2		-		
		d) Freedom from overlaps & air gap at joints	Major	Visual	100%	Manf. Drg./stand.	Manf. Drg./stand.	QC Records	2		-		
		e) Leaning of cor(i.e core verticality)	Major	Visual	100%			QC Records	2		-		
		f) Limb & stack thickness	Major	Visual	100%			QC Records	2		-		
		g) Limb clamping & binding	Major	Visual	100%			QC Records	2		-		
		h) Core diameter	Major	Visual	100%			QC Records	2		1		
		i) Earthing of core	Major	Visual	100%			QC Records	2		1		

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LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

भेल BHEL	QUALITY PLAN	CUSTOMER :	PROJECT TITLE :	SPECIFICATION NO. :
		BIDDER/ VENDOR :	STANDARD QP NO. : PE-QP-999-302-E001, REV. 0	SPECIFICATION TITLE:
	SHEET 8 OF 10	SYSTEM	ITEM :OIL FILLED TRANSFORMER	DOC. NO. :

SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
3.4	Test on Core	a) Dimensional check	Major	Measure	100%	Manf. Drg./stand.	Manf. Drg./stand.	QC Records	2		-	
		b) Flux density measurement	Major	Measure	100%			QC Records	2		-	
		c) Isolation test between(core to core clamps)	Major	Test	100%			QC Records	2		-	
		d)Torque Tightness	Major	Measure	100%			QC Records	2		-	
		e) Core Insulation	Major	Electrical	100%			QC Records	2		-	
		f) Core Loss	Major	Electrical with dummy coil	100%			QC Records	2		1	
		g)Visual checks of core verticality	Major	Visual	100%			QC Records	2		-	
3.5	Winding	a) Brazing procedure & Brazer qualification	Major	Review	100%	Manf. Drg./Relevant stand.	Manf. Drg./Relevant stand.	QC Records	2		-	
		b) Conductor size.	Major	Measure	100%			QC Records	2		-	
		c) Redial depth of winding	Major	Measure	100%			QC Records	2		-	
		d) Anchoring & binding at start & finish	Major	Measure	100%			QC Records	2		-	
		e) No. of turns	Major	Measure	100%			QC Records	2		-	
		f) Transposition of cross-overs	Major	Measure	100%			QC Records	2		-	
		g) Dimensional check (0D,ID & axial length)	Major	Measure	100%			QC Records	2		-	
		h) Insulation arrangement & alignmt.	Major	Measure	100%			QC Records	2		-	
		i) Winding length	Major	Measure	100%			QC Records	2		-	
		j) Brazed joints	Major	Measure	100%			QC Records	2		-	
		k) Lead & coil identification and marking	Major	Measure	100%			QC Records	2		-	
		l) Free from damages	Major	Measure	100%			QC Records	2		-	
		m) Continuity test for leads	Major	Measure	100%			QC Records	2		-	
		n) Turn to Turn Insulation	Major	Measure	100%			QC Records	2		1	
		o) Measure. Of Resistance	Major	Measure	100%			QC Records	2		1	
3.6	Core coil assembly	a) Cleanliness of core	Major	Visual	100%	Manf. Drg./Relevant stand.	Manf. Drg./Relevant stand.	QC Records	2		-	
		b) Alignment of spacers/blocks	Major	Visual	100%			QC Records	2		-	
		c) Elect. Clearance & Insp. Of core & coil assly after completion of terminal gear	Major	Visual/measure	100%			QC Records	2		-	
		d) Check provision of core frame earthing	Major	Visual	100%			QC Records	2		-	
3.7	Connection and Tap switch assembly	a) Ratio test on all taps	Major	Test	100%	Manf. Drg./Relevant stand.	Manf. Drg./Relevant stand.	QC Records	2		1	
		b) Lead disposition.	Major	Visual	100%			QC Records	2		-	
		c) Brazing of joints	Major	Visual	100%			QC Records	2		-	
		d) Crimping of joints	Major	Visual	100%			QC Records	2		-	
		e) Insulation over joints	Major	Visual	100%			QC Records	2		-	
		f) Vector group	Major	Test	100%			QC Records	2		1	
3.8	Ovening and Tanking	a) Cleanliness of tank	Major	Visual	100%	Manf. Drg./Relevant stand.	Manf. Drg./Relevant stand.	QC Records	2		-	
		b) Drawing	Major	Physical	100%			QC Records	2		1	
		c) Check tightness of clamped blocks and measurements of winding height	Major	Measure	100%			QC Records	2		1	
		d) Electrical clearances	Major	Measure	100%			QC Records	2		1	
		e) Oil filling and air release	Major	Physical	100%			QC Records	2		-	
		f) Dryness (Tan-delta & I.R)	Major	Measure	100%			QC Records	2		-	

	PARTICULARS	BIDDER/VENDOR
BHEL	NAME	
	SIGNATURE	
	DATE	

BIDDER'S/VENDORS COMPANY SEAL

LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

BHEL	QUALITY PLAN	CUSTOMER :	PROJECT TITLE :	SPECIFICATION NO. :
		BIDDER/ VENDOR :	STANDARD QP NO. : PE-QP-999-302-E001, REV. 0	SPECIFICATION TITLE:
	SHEET 9 OF 10	SYSTEM	ITEM :OIL FILLED TRANSFORMER	DOC. NO. :

SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
4	Type & Special Test on Transformer	a)Review of type test & special test report b) Review of all previous stage of insp. As per QR prior to final testing	Major	Verify	100%	Reports			2	1	-	Type test as per enclosed annexure-1 to be conducted.
5	ROUTINE TEST Each Transformer Shall be completely assembled with all fittings and accessoriesmeant for particular transformerbefore offering for inspection & Test	a) Verification of completeness / Dimensional check	Major	Measure	100%				2	1		
		b) Measurement of Voltage Ratio at all taps,polarity & vector group verification	Major	Measure	100%				2	1		
		c) Measurement of winding resistance on HV & LV on all the Taps.	Major	Measure	100%				2	1		
		d) Vector group and polarity check	Major	Measure	100%				2	1		
		e) Magnetic balance Test	Major	Measure	100%				2	1		
		f) Induced overvoltage	Major	Measure	100%				2			
		g) Sepatate Source Voltage Withstand test	Major	Measure	100%				2	1		
		h)Measurementof capacitance & Tan delta to determine capacitance between winding & earth,	Major	Measure	100%	As per APPROVED DATA SHEET/IS:2026	As per APPROVED DATA SHEET/IS:2026	Manf. Test Records/QC Formats	2	1		
		i) Measurement of No-load losses & current at 90)%, 100% & 110% rated voltage.	Major	Measure	100%				2	1		
		j) .2 kV core Isolation (If Applicable),	Major	Measure	100%				2	1		
		k) Measurement of no load current with 415 V, 50 hZ AC supply.	Major	Measure	100%				2	1		
		l) IR & measurement of Insulation power factor & capacitance between winding and earth	Major	Measure	100%				2	1		
		m) Load loss & short circuit Impedence measurement on principal & extreme taps.	Major	Measure	100%				2	1		
		n) Repeat no load currents/loss measurement after completion of all dielectric test.	Major	Measure	100%				2	1		
		o) Test on OLTC/OCTC.	Major	Measure	100%				2	1		

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	SIGNATURE	
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BIDDER'S/VENDORS COMPANY SEAL

LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

	QUALITY PLAN		CUSTOMER :			PROJECT TITLE :			SPECIFICATION NO. :				
			BIDDER/ VENDOR :			STANDARD QP NO. : PE-QP-999-302-E001, REV. 0			SPECIFICATION TITLE:				
		SHEET 10 OF 10	SYSTEM			ITEM :OIL FILLED TRANSFORMER			DOC. NO. :				
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS	
1	2	3	4	5	6	7	8	9	10			11	
		p) Verification of oil leakage test with all fitting & accessories at normal presure plus 35KPA for 24 hours.	Major	Measure	100%	As per APPROVED DATA SHEET/IS:2026/MANF. STD.	As per APPROVED DATA SHEET/IS:2026/MANF. STD.	Manf. Test Records/QC Formats	2	1			
		q) Jacking Test followed by D.P. Test	Major	Measure	100%				2	1			
		r) Paint shade & adhession test	Major	Measure	100%				2	1			
		s) Protection on M. Box by paper insertion	Major	Measure	100%				2	1			
		t) 2 KV test on M.Box wiring & functional check for component of MB	Major	Measure	100%				2	1			
		u) Slope and alignment of Buchhoz relay	Major	visual	100%				2	1			
		v) DFT of paint	Major	Measure	100%				2	1			
6	Pre **Shipment** check &Despatch	a) Transformer- verification of final transportion.							2				
		b) Dew points measurement of N2/Dry gas tightness/ Pr reading (Only applicable for transformers dispatched with Gas Filling)							2				
		c) Packing of loose items							2				

	PARTICULARS	BIDDER/VENDOR	
BHEL	NAME		
	SIGNATURE		
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LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

	TITLE : STANDARD TECHNICAL SPECIFICATION FOR OIL FILLED SERVICE TRANSFORMERS	SPECIFICATION NO. PE-SS-999-302-E001
		VOLUME NO. : II
		SECTION : II
		REV NO. : 00 DATE : 30/06/2016
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ANNEXURE - B

TRANSFORMER LOSSES

1. The No-Load and Load losses for transformers 2.0MVA & above and voltage ratio 33kV/6.9kV, 33kV/3.5kV, 11kV/6.9kV, 11kV/3.5kV, 6.6kV/3.5kV are given below:

Ratings	Maximum No-Load losses at rated frequency and 100%voltage	Maximum Load losses at normal ratio, rated current and 75 deg. C
10.0 MVA	9.0kW	72.0kW
8.0MVA	7.5 kW	57.0kW
7.5 MVA	7.2 kW	50.0kW
6.3MVA	6.5kW	45.0kW
5.0MVA	5.5kW	36.0kW
3.5MVA	4.5kW	32.0kW
2.5 MVA	2.8kW	30.0kW
2.0MVA	2.4 kW	24.0kW

The above indicated maximum No-Load and Load losses are inclusive of permissible tolerance as per IS-2026. Further tolerance on maximum losses is not permissible.

2. Transformers of rating 2.5MVA & below and voltage ratio 33kV/433V, 11kV/433V, 6.6kV/433V, 3 .3kV/433V shall have STAR-1 as per BEE.
However, percent impedance shall be as per Data Sheet-A of section-I, volume-II of technical specification.

	TITLE :	SPECIFICATION NO.
BHEL	**STANDARD TECHNICAL SPECIFICATION FOR** **OIL FILLED SERVICE TRANSFORMERS**	**PE-SS-999-302-E001** VOLUME NO. : **II** SECTION : II REV NO. : **00** DATE : 30/06/2016 SHEET : **29** of **30**

ANNEXURE – C

Terminal No.	Description	Remarks
T-01 T-02	230V, Single Phase, 50Hz, AC Supply	
T-03 T-04	MOG (Oil Level) Alarm	
T-05 T-06	Buchholz Relay Alarm	
T-07 Dummy T-08	Buchholz Relay Trip	
T-09 T-10	PRV-1 Alarm	If applicable
T-11 Dummy T-12	PRV-1 Trip	
T-13 T-14	PRV-2 Alarm	
T-15 Dummy T-16	PRV-2 Trip	
T-17 T-18	OTI Alarm	
T-19 Dummy T-20	OTI Trip	
T-21 T-22	WTI-1 Alarm	
T-23 Dummy T-24	WTI -1 Trip	
T-25 to T-28	SPARE	If applicable
T-29 T-30	4-20 mA for OTI (DDCMIS)	If applicable
T-31 T-32	4-20 mA for OTI (SCADA)	
T-33 T-34	4-20 mA for WTI-HV (DDCMIS)	
T-35 T-36	4-20 mA for WTI-HV (SCADA)	
T-37 to T-50	SPARE	
T-51 T-52	WTI 1-CT	If applicable
T-53	CT Shorting Terminal	
T-54 T-55	WTI 2-CT	
T-56	CT Shorting Terminal	
T-57 T-58	LV Neutral CT (REF Protection)	If applicable
T-59	CT Shorting Terminal	
T-60 T-61	LV Neutral CT (E/F Protection)	
T-62	CT Shorting Terminal	
T-63 T-64	HV Neutral CT (REF Protection)	
T-65	CT Shorting Terminal	
T-66 T-67	HV U-PHASE CT	
T-68	CT Shorting Terminal	
T-69 T-70	HV V-PHASE CT	
T-71	CT Shorting Terminal	
T-72 T-73	HV W-PHASE CT	
T-74	CT Shorting Terminal	
T-75 to T-80	SPARE TBs (for CT)	

Notes:

1). The Terminals from T-01 to T-48 shall be designated as indicated in the chart for all outdoor transformers (ONAN cooling).

2). The Terminals which are not used for a particular Transformer shall be left as spare. e.g. in case there is only one WTI alarm & trip, then terminals T-25 to T-28 & T-38 to T-40 shall be left as spare terminals.

3). Provide 20% spare TBs.

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ANNEXURE – D

LIST OF O & M SPARES

S. NO.	DESCRIPTION	QTY
1	HV bushing with metal parts & gaskets	1 no. for each rating
2	LV bushing with metal parts & gaskets	1 no. for each rating
3	WTI with alarm & trip contacts	1 no.
4	OTI with alarm & trip contacts	1 no.
5	Magnetic oil level gauge	1 no.
6	Diaphragm of explosion vent	1 no.
7	Buchholz relay	1 no.
8	Silica gel charge	Three charge
9	Floats with contacts for Buchholz relay	1 set
10	Set of gaskets	2 sets
11	Set of valves (1 no. of each size & Type)	1 set
12	Set of windings for one limb in a suitable oil container (container shall be co mpletely filled with transformer oil)	1 no. of each rating & type of transformer.
13	Contact for tap changer	1 set
14	Pressure relief device for 2MVA & above transformers	1 no.
15 Hydraulic/	screw Jacks	4 no.
16	Any other item considered essential by the bidder	

Note:

1) Wherever set is indicated above, it means the total parts/ accessories required to replace the particular item for a given equipment

2) O & M spares shall be supplied along with transformers and packed separately with proper inscription.