

SECTION-III

TECHNICAL SPECIFICATIONS FOR SUPPLY OF EHV GRADE TYPE-II TRANSFORMER OIL AGAINST TN-2557

3.01 This specification covers manufacture, testing, inspection, supply and delivery of fresh, unused and pure EHV grade insulating TYPE-II TRANSFORMER OIL. The TYPE-II TRANSFORMER OIL should be clear and transparent and free from moisture and other suspended matter which are likely to impair its properties and without any additive including oxidation inhibitor.

3.02 **QUANTITY:**

TYPE-II TRANSFORMER OIL - **500 K.Ls.**

The quantity as indicated above is approximate and may be increased or decreased to any extent at the time of finalisation of this tender enquiry.

3.03 **SPECIFICATION OF TYPE-II TRANSFORMER OIL :**

The TYPE-II TRANSFORMER OIL is for insulation and cooling of the electric transformers and switchgears of extra high voltage conforming to the Technical particulars as available at Appendix-I. The oil should also be suitable for oil circuit breakers and other electrical equipments in which oil is used as insulating medium. **The tests on TYPE-II TRANSFORMER OIL shall be conducted in accordance with the relevant methods detailed in IS:335/2018 as amended up to date or latest and as per our specification.**

The input materials for the manufacture of TYPE-II TRANSFORMER OIL viz TYPE-II TRANSFORMER OIL base stock/ TYPE-II TRANSFORMER OIL feed stock shall be from Lube Refineries of Indian Oil Corporation/ Hindustan Petroleum Corporation/ Madras Refineries or may be imported and such TOBS/ TOFS shall have viscosity of 50 Redwood second or more at 37.8 deg.c. **The supplier shall furnish the relevant documents in token of purchase of TOBS/ TOFS from the Lube Refineries or bill of lading/ entry (for imported TOBS) before affecting the supplies.**

The technical parameters of the TYPE-II TRANSFORMER OIL are available at Appendix-I.

3.04 **PACKING :**

Packing shall be done in brand new barrels on non returnable basis, generally conforming to IS-1783 (Part-I)/1993: Grade A Type-2, 200/210 litre nominal capacity barrels made from 1.25 mm nominal thickness CRCA steel sheets. Body provided with two extended rolling hoops. Finished with one coat of stowing general paint on the outside.

Both the bungs big and another small shall be provided with capsules over screw caps and provisions shall be made on the upper part of the drum in such a way that capsule can provide a seal between the drum and its concerns.

There will in addition be a provision on the capsule to apply lead seal with identification mark on the upper part of the drum in such a way that capsule can provide a seal between the drum and its corners.

There will in addition be a provision on the capsule to apply lead seal with identification mark representative of purchaser in such way that it would be impossible to tear the capsule without destroying the purchaser's leads of identification mark.

3.05 **Markings:**

Each barrel/drum shall be indelibly marked with the following:

- a) Manufacturer's name or trade mark.
- b) Quantity in litres.
- c) TYPE-II TRANSFORMER OIL .
- d) The word "Low Viscosity Type".
- e) Identification in code or otherwise to enable the date and lots of manufacture to be traced back to the factory records.
- f) ISI Certification Mark.
- g) Jaipur Vidyut Vitran Nigam Limited, Jaipur
- h) Consignees name.
- i) Sr.No. of Drum

The ISI mark on each Drum body shall be provided invariable.

The above marking shall be done with such type of ink which is customarily employed/ approved in petroleum products.

3.06 **TEST CERTIFICATE:**

The TYPE-II TRANSFORMER OIL shall invariably bear ISI certification mark for which ISI registration number shall be clearly indicated. The test certificate obtained from a recognised independent testing laboratory for TYPE-II TRANSFORMER OIL as per the IS 335/2018 with latest amendments shall be furnished along with the tender offer failing which the offer is liable to be rejected. The test certificate shall not be more than one year old. The values obtained shall not be inferior to those specified at Appendix-1 of the specification.

3.07 **INSPECTION, CHECKING & TESTING :**

Inspection, checking and testing as per IS 335/2018 (with latest amendments) and as per GTP of the purchase order of TYPE-II TRANSFORMER OIL shall be carried out before despatch. The tests for electrical characteristics shall be conducted at the manufacturers works in the presence of our Inspecting Officer. **Our inspecting officer will also provide lead seal on each drum with identification for convenience of our field staff.**

3.08 STORE CHECKING

- i) Composite samples from each lot shall be drawn from Nigam's Store in presence of firm's representative and will be sent for complete testing at CPRI, Bangalore. The testing of composite sample will also be carried out as per GTP of the Purchase Order. The firm will provide all facilities for drawing composite sample and hence presence of firm's representative for drawing sample will be mandatory. In case the sample of oil drum fails in type test at CPRI, Bangalore then for the used material, payment will be released after 15% deduction and remaining material will be lifted back by the firm. Necessary Payment will be released only after selection of Composite sample and store checking.
- ii) All charges for testing at CPRI Bangalore shall be borne by the supplier. Sampling of the oil for testing will be done in accordance with IS 6855/1972 (amended upto date).
- iii) One out of every 100 drums or part thereof from each lot (i.e. quantity received in Store(s) after inspection) will be selected for verifying tare weight of drum, total weight of drum and quantity in liters & compared with the packing details provided in the inspection report/ drum. The highest variation in percentage on negative side in respect of volume (in Liters) in CTL checking will be applicable on the sub-lot (store-wise) for release of payment. However, volume (in Litres) will not be considered more than the capacity of drum, for release of payment.
- iv) The work of composite samples selection from each lot shall be carried out by any of the ACOS to be nominated by the SE(MM-II) in presence of firm's representative and samples will be sent for complete testing at CPRI, Bangalore by the concerned ACOS. The ACOS concerned will intimate the scheduled date to the firm for composite sample selection.
- v) The facility is being developed at CTL to test the TYPE-II TRANSFORMER OIL B.D. value. Therefore, the same shall be tested at CTL.
- vi) The XEn (CTL) will intimate the scheduled date to the firm for quantity verification and necessary testing.
- vii) Any other test/s may be carried out in CTL for which testing facility is/are available in CTL.

3.09 PRICE VARIATION:

The variation in quoted price of TYPE-II TRANSFORMER OIL shall be as per Annexure-II. The base price will be one month prior to the opening of the techno-commercial bid of the tender.

- 3.10 The quantity on order can be supplied with plus/ minus half percent tolerance.

3.11 PAYMENT IN ABSENCE OF TYPE TEST REPORTS

The provision of 85% payment in absence of type test reports will be applicable only for the old manufacturers who have supplied this item to any of the State Electricity Board/ Utility and the same have been type tested as per provisions of relevant ISS.

3.12 QUALITY ASSURANCE PLAN :

- 1) The Bidder shall invariably furnish following information along with his offer, failing which the offer shall be liable for rejection. Information shall be separately given for individual type of equipment offered.
 - i) Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw material are tested, list of tests normally carried out on raw material in the presence of Supplier's representative, copies of test certificates.
 - ii) Information and copies of test certificates as in (i) above in respect of bought out items.
 - iii) List of manufacturing facilities available.
 - iv) Level of automation achieved and list of areas where manual processing exists.
 - v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.
 - vi) Special features provided in the equipment to make it maintenance free.
 - vii) The bidder should have adequate facilities to carryout accurately all required tests during manufacturing and routine/ acceptance tests as per relevant ISS/IEC standards at the final end routine/acceptance. The supplier will ensure that all testing/measuring instruments/ apparatus are calibrated at regular periodicity from reputed test house as per relevant standards and a certificate of testing authority is made available to purchaser's inspector at the time of inspection. Such calibration certificates, in any case shall not be older than one year on the date of such tests".
 - viii) List of testing instruments and apparatus along with their last date of calibration, available with the Bidder for testing of equipment specified and test plant limitation, if any, vis-a-vis the type, special, acceptance and routine tests testing during manufacture specified in the relevant standards. These limitations shall be very clearly brought out in "Schedule of Deviations".
- 2) The Supplier shall also submit the following information to the Purchaser, along with drawings/GTPs/BOM of ordered material, within 15 days of placement of order for purchaser's approval:-
 - i) Name of the raw material as well as bought out accessories and the names of sub-suppliers selected from those furnished along with the offer.
 - ii) Type test certificates of the raw material and bought out accessories.
 - iii) Quality Assurance Plan (QAP) with hold points for Purchaser's inspection. The QAP and Purchaser's hold points shall be discussed between the Purchaser and the Supplier before the QAP is finalized.

- 3) The Supplier shall submit the routine test certificates of bought out items and raw material at the time of routine/acceptance testing of the fully assembled equipment.

3.13 PURCHASING ON THE RISK & COST OF SUPPLIER, IN CASE OF NON-EXECUTION OF ORDER/ DELAY IN DELIVERY.

If at any time during the currency of the contract, the performance in whole or in part be prevented or delayed, the purchaser reserves the right to procure the material/equipment on order or part thereof from any other source at the risk and cost of the contractor/ supplier.

3.14 ADDITIONAL ORDER

Repeat orders for additional quantities, upto 50% of original ordered quantities, may be placed by the Nigam, on the same rates, terms and conditions given in the contract.

APPENDIX-I

**IMPORTANT TECHNICAL PARTICULAR OF TYPE-II TRANSFORMER OIL TO BE
SUPPLIED AGAINST TN-2557**

Sr.No.	Description	Requirement
1.	Appearance	Clear & transparent free from suspended materials or sediments
2.	Density at 29.5 Deg. C. (Max.)	0.89 g/cc.
3.	Kinematic viscosity at 27 Deg. C. (Max.)	27 cst
4.	Interfacial tension at 27 Deg. C. (Min.)	0.04 N/m
5.	Flash point pen skv marten(closed) Min.	140 Deg.C.
6.	Pour point (Max.)	(-) 6 Deg.C.
7.	Neutralisation value a) Total acidity (Max.) b) Inorganic acidity/alkalinity	0.01 mgKOH/g NIL
8.	Corrosive sulphur (In terms of classification of copper strip).	Non-Corrosive
9.	Electric strength (Break down voltage) a) New unfiltered oil (Min.) b) After filtration (Min.)	40 KV rms 60 KV rms
10.	Dielectric dissipation factor. (tan delta) at 90 Deg. C. (Max.)	0.002
11.	Specific resistance (resistivity) (In Ohm-Cm.) a) At 90 Deg.C. (Min.) b) At 27 Deg.C. (Min.)	12 100x10 12 1500x10
12.	Presence of oxidation inhibitor.	Shall not present any antioxidant additives.
13.	Water contents ppm (Max.)	30 by Weight.
14.	Oxidation stability : a) Neutralisation value after oxidation (Max.) b) Total sludge.after oxidation (Max.)	0.2 mgKOH/g 0.05 % by weight
15.	S.K. Value (Max.)	6%
16.	Ageing characteristic after accelerated aging test: a) Specific resistance (resistivity) (In Ohm-cm) j) At 27 Deg.C. (Min.) ii) At 90 Deg.C. (Min.) b) Dielectric dissipation factor (tan delta) at 90 Deg.C.(Max.). c) Total acidity (in mgKOH/g) Max. d) Total sludge (Max.)	12 2.5x10 12 0.2x10 0.15 0.05 0.05 % by weight
17.	Viscosity of TOBS/ TOFS at 37.8 Deg.C.(Min).	50 red wood second

Sr. No.	Property	Test Method	Limits (Type II Transformer Oil) as per IS 335: 2018 (Fifth revision)
A.) Function			
i)	Viscosity at 40 ⁰ C	IS 1448 (Part 25)	15 mm ^{2/5} , Max
ii)	Viscosity at 0 ⁰ C ¹⁾	IS 1448 (Part 25)	1800 mm ^{2/5} , Max
iii)	Viscosity at -30 ⁰ C ¹⁾	IS 1448 (Part 25)	-
iv)	Viscosity at -40 ⁰ C ²⁾	IS 16084	-
v)	Pour Point	IS 1448 (Part 10/Sec 2)	-10 ⁰ C, Max to be based on LCSET refer Table11) of IS
vi)	Water Content	IEC 60814	30 mg/Kg ³⁾ /40 mg/kg ⁴⁾ , Max
Vii)	Breakdown voltage	IS 6792	30 kV/70kV ⁵⁾ , Min
viii)	Density at 20 ⁰ C	IS 1448 (Part 16)	0.895 g/ml, Max
ix)	DDF at 90 ⁰ C	IS 16086	0.005, Max
x)	Particle content	IS 13236	No general requirement ¹⁰⁾
B.) Refining/stability			
xi)	Appearance	-	Clear, free from sediment and suspended matter
xii)	Acidity	IEC 62021-I	0.01 mg KOH/g, Max
xiii)	Interfacial tension	ASTM D971	No general requirement ⁶⁾
xiv)	Total sulphur content	ISO 14596 or ASTM D4294 12)	No general requirement
XV)	Corrosive Sulphur	DIN 51353	Not corrosive
xvi)	Potentially corrosive sulphur	IS 16310	Not corrosive
xvii)	DBDS	IS 16497 (Part 1)	Not detectable (<5mg/kg.)
xviii)	Inhibitors according to IS 13631/IEC 60666	IS 13631	(U) Uninhibited oil : not detectable (<0.01%)
xix)	Metal passivator additives according to IS 13631/IEC 60666	IS 13631	Not detectable (<5mg/kg.), or as agreed upon with the purchaser
xx)	Other additives		-
xxi)	2-Furfural and related compounds content	IS 15668	Not detectable (<0.05mg/kg.), for each individual compound
C.) Performance			

xxii)	Oxidation stability	IS 12422 (Method C) Test duration (1) (U) Uninhibited oil : 164 h	For oils with other antioxidant additives and metal passivator Additives.
a)	* Total acidity 9)	1.9.4 of IS 12422	1.2 mg KOH/g, Max
b)	* Sludge ⁹⁾	1.9.1 of IS 12422	0.8%, Max
c)	* DDF at 90 ⁰ C ⁹⁾	1.9.6 of IS 12422	0.500 ⁹⁾ , Max
xxiii)	Gassing tendency	IEC 60628, Method A	No general requirement ⁸⁾
Xxiv)	ECT	-	No general requirement ⁸⁾
D.) Health, Safety and Environment (HSE)			
xxv)	Flash Point	IS 1448 (Part 21)	135 ⁰ C, Min
xxvi)	PCA Content	IP 346	3% Max
xxvii)	PCB Content	IS 16082	Not detectable (<2 mg/kg)

- 1) This is the standard LCSET for a transformer oil and can be modified depending on the climatic condition of each region. Pour point should be minimum of 10⁰C below LCSET.
- 2) Standard LCSET for low temperature switchgear oil.
- 3) For bulk supply
- 4) For delivery in drums and IBC.
- 5) After laboratory treatment
- 6) Where it is used as general requirement, a limit of minimum 40 mN/m is recommended.
- 7) The supplier shall declare the generic type of all additives and their concentrations in the case of antioxidant additives.
- 8) To be agreed upon between supplier and purchaser.
- 9) At the end of oxidation stability tests.
- 10) Particle content in drums at the delivery of the oil can be agreed between supplier and customer based on a statistical reference at delivery.
- 11) A DDF of maximum 0.020 after 2 h of oxidation (see IS 12422 or IEC 61125) can be used for application in EHV instrument transformers and bushings.
- 12) In case of any dispute, ISO 14596 should be used.