MAHAVITARAN
Maharashtra State Electricity Distribution Co. Ltd.

Maharashtra State Electricity Distribution Company Limited

TECHNICAL SPECIFICATION NO. MSC /2019/ 01

TECHNICAL SPECIFICATION

FOR

NEW INSULATING OIL as per IS 335 amended 2018

FOR

Transformers

IN

MSEDCL

I N D E X

TECHNICAL SPECIFICATION NEW INSULATING OIL
SPECIFICATION NO. MSC/2019/01

1.0 Scope :

1.1 The specification covers manufacturing, sampling, testing, packing, marking and delivery of premium grade **Unused Mineral Insulating Oil (type II)** for Transformers.

1.2 This specification prescribes the requirements of new insulating oil suitable for use as an insulating and heat transfer medium.

1.3 The Unused Mineral Insulating Oils are obtained by distillation and refining of crude petroleum.

1.4 The Unused Mineral Insulating oils shall be with normal oxidation resistance.

2.0 Service Conditions:

A) The Unused Mineral Insulating oil to be supplied against this specification shall be suitable for satisfactory continuous operation of power and distribution transformers under the following tropical conditions.

2.1 Maximum ambient temperature (Degree C)	….	50
2.2 Maximum temperature in shade (Degree C)	….	45
2.3 Minimum temperature of air in shade (Degree C)	….	3.5
2.4 Relative Humidity (%)	….	10 to 100
2.5 Maximum Annual Rainfall (mm)	….	1450
2.6 Maximum Wind Pressure (Kg/Sq.)	….	150
2.7 Maximum altitude above mean sea level (meter)	….	1000
2.8 Isoceraunic level (days/year)	….	50
2.9 Seismic level (Horizontal acceleration)	….	0.3

Moderately hot and humid tropical climate conductive to rust and fungus growth.

2.10 Reference Ambient Temperature for temperature rise : 50 Deg C

B) The climatic conditions are prone to wide variations in ambient conditions and hence the Unused Mineral Insulating oil shall be of suitable for satisfactory continuous operation of power and distribution transformers.

3.0 **Reference Standards:**

3.1 Unless otherwise specified, the Unused Mineral Insulating oil to be supplied shall be conformed to Indian and International Standards amended up to date as follows:

Sr. No.	IS No.	Title
1	335/2018	New Insulating Oils - Specification (fifth revision)
2	1070 : 1992	Reagent grade water – specification (third revision)
3	1448:[P:10/sec 2]:2013	Methods of test for petroleum and its products : Part 2 Acidity (Second revision)
4	1448:[P:10]: 2013	Methods of test for petroleum and its products : Part 10 cloud point and pour point (First revision)
5	1448:[P:16]:	Methods of test for petroleum and its products: Part 21

	2014 & 1448:[P:21]: 2012	Flash Point (closed) by Pensky Martens apparatus (Third revision)
6	1448:[P:25]: 1976	Methods of test for petroleum and its products: part 25 Determination of kinematics and dynamic viscosity (First revision)
7	16084 :2013	Mineral Insulating Oils- determination of kinematics viscosity at very low temperatures.
8	1783:[Part1]: 1983	Drums, large, fixed ends: Part 1 Grade A Drums (second revision)
9	1783:[Part 2]: 1988	Drums, large, fixed ends: Part 1 Grade A Drums (third revision)
10	4759:1984	Hot-dip zinc coatings on structural steel and other allied products (second revision)
11	6103:1971	Methods of test for specific resistance (resistivity) of electrical insulating liquids
12	ASTMD 971	Methods of test for interfacial tension of oil against water by the ring method.
13	6262:1971 16086 : 2013	Method of test for power factor and dielectric constant of electrical insulating liquids. Insulating liquids – determination of the dielectric dissipation factor by measurement of the conductance and capacitance – test method.
14	6272:1971	Metal polishes (special)
15	6792:1992 6792:2017	Method for determination of electric strength of insulating oils Insulating liquids – determination of the breakdown voltage at power frequency – test method (second revision)
16	6855:2017	Method of sampling for liquid dielectric (second revision)
17	12177:1987	Methods of test for oxidative ageing of electrical insulation of petroleum oils by the open beaker method
18	12463:1988	Inhibited mineral insulating oils
19	IEC 60814/1997	Determination of water in insulating liquids and in oil-impregnated paper and press board by automatic coulometric Karl Fischer titration – Method of test

20	13631:2017	Method of test for detection and determination of antioxidant additives in insulating oils.(revision first)

3.2 In case of conflict arising out due to variations between the applicable standard and the standards specified herein the provisions of this specification should prevail.

4.0 General Technical Requirements:

The characteristics of the Unused Mineral Insulating oil when it is sampled at manufacturer's work or at the point of delivery and tested in accordance with the methods referred to in TABLE 2 of IS: 335: 2018 amended upto date.

4.1 Function :-

i) The Viscosity of Unused Mineral Insulating oil shall be **maximum 15 (mm^2/ s)** at 40 ° C as per IS 1448 [P:25]:1976.

ii) The Viscosity of Unused Mineral Insulating oil shall be **maximum 1800 (mm^2/ s)** at 0 ° C as per IS 1448 [P:25]:1976.

iii) Pour Point of the Unused Mineral Insulating oil should be minimum 10 ° C below the Lowest Cold Start Energizing Temperature (LCSET) i.e. **- 10 ° C** as per IS: 1448 [P:10. Sec 2]:1970.

iv) The Water content in the Unused Mineral Insulating oil shall be maximum **30 mg / kg** for bulk supply and **40 mg / kg** for delivery in drums as per IEC: 60814**.**

v) As per IS 6792:1992 the Breakdown voltage of Unused Mineral Insulating oil shall be as follows.

a) The Breakdown voltage of Unused Mineral Insulating oil should be minimum **30 KV (rms) at.2.5 mm gap.**

b) The Breakdown voltage of **before Laboratory treatment** should be minimum **70 KV (rms) after Laboratory treatment at 2.5 mm gap.**

vi) The Density of Unused Mineral Insulating oil shall be **maximum 0.895 g / cm^3 at 20 ° C** as per IS 1448 [P:16]:1990.

vii) As per IS: 16086 the Dielectric Dissipation Factor (DDF) of Unused Mineral Insulating oil shall be maximum **0.005** (tan δ) at 90 ° C .

viii) Particle Content in drum at delivery of the Unused Mineral Insulating oil is as per IS : 13236.

4.2 Refining / Stability :-

i) The appearance of the Unused Mineral Insulating oil shall be clear, free from sediments (impurities) and suspended matter.

ii) The Unused Mineral Insulating oil should be Neutral and free from any acidic compound. Total Acidity of Unused Mineral Insulating oil shall be maximum **0.01 mg/KOH/gm** as per IEC : 62021 – 1.

iii) Interfacial tension of the Unused Mineral Insulating oil shall be minimum 40mN / m as per ASTM D971.

iv) Total sulphur content in the Unused Mineral Insulating oil shall be maximum 0.05 % before oxidation test. as per ISO 14596 or ASTM D4294.

v) The Corrosive Sulphur in the Unused Mineral Insulating oil shall be **Non-Corrosive**. The Corrosive Sulphur in the Unused Mineral Insulating oil shall be measured as per DIN 51353.

vi) The Potential Corrosive Sulphur in the Unused Mineral Insulating oil shall be **Non-Corrosive**. The Potential Corrosive Sulphur in the Unused Mineral Insulating oil shall be measured as per IS : 16310.

vii) Dibenzyl Disulfide (DBDS) in the Unused Mineral Insulating oil should not be detectable (< 5 mg / kg) as per IS : 16497 (Part 1).

viii) The Unused Mineral Insulating oil should be uninhibited (U) as per IS : 13631 / IEC : 60666. Inhibited in the Unused Mineral Insulating oil should not be detectable (< 0.01 %) as per IS : 13631 / IEC : 60666.

ix) Metal Passivator additives in the Unused Mineral Insulating oil should not be detectable (< 5 mg / kg) as per IS : 13631 / IEC : 60666.

x) Oxidation Stability can be improved by incorporation of Antioxidant additive in the Unused Mineral Insulating oil. Oxidation Stability is measured in accordance with IS : 12422.

xi) 2- Furfural and related compound content in the Unused Mineral Insulating oil should not be detectable (< 0.05 mg / kg for each individual compound) as per IS : 15668.

4.3 Performance :-

i) Oxidation Stability can be improved by incorporation of Antioxidant additive and metal passivator additives in the Unused Mineral Insulating oil. Oxidation Stability is measured in accordance with IS : 12422 with Test Duration 164 hrs. At the end of Oxidation Stability Test following limits should be observed:

a) Total acidity : Maximum 1.2 mg KOH / gm.
b) Sludge : Maximum 0.8 %.
c) Dielectric Dissipation Factor (DDF) at 90 ° C : Maximum 0.500.

ii) Gassing Tendency is caused in equipment with high electrical field stress or special design , gasses formed when subjected to Corona Partial Discharges and shall be absorbed by the Unused Mineral Insulating oil, Gassing Tendency shall be as per IEC : 60628, Method A.

iii) Stray Gassing means production of gasses such as hydrogen, hydrocarbons carbon oxides at low temperatures (< 120° C) without thermal or electrical faults in transformer, sometimes even without operational stress. This phenomenon could result in high production of gases and a misinterpretation of Dissolved Gas Analysis (DGA) results.

iii) Electrostatic Charging Tendency (ETC) of the Unused Mineral Insulating oil is an important for certain design of HV transformer which have oil pumping rates that can give rise to the build- up of electrostatic charge. This can result in energy discharge causing transformer failure. Electrostatic Charging Tendency (ETC) can be reduced by using metal passivator additives such as Benzotriazole (BTA) and 5-methyl-1H-Benzotriazole (TTA). Electrostatic Charging Tendency (ETC)'s measurement as per CIGRE Technical Brochure 170.

4.4 Health, Safety and Environment (HSE) :-

i) Flash point of the Unused Mineral Insulating oil measured by Pensky Marten apparatus shall be **minimum 135 ° C** as per IS: 1448 [P:21]:1992.

ii) Polycyclic Aromatics (PCA) content of the Unused Mineral Insulating oil detectable by extraction with Dimethylsulfoxide (DMSO) under the condition of IP 346, shall be maximum 3 % .

iii) Polychlorinated Biphenyls (PCB) content of the Unused Mineral Insulating oil should not be detectable (< 2 mg / kg) as per IS : 16082.

5.0 ISI Certification mark for Unused Mineral Insulating oil:-

The Unused Mineral Insulating oil is to be supplied confirming to IS-335-2018 as amended upto date should bear ISI certification mark, without ISI mark insulating oil will rejected.

6.0 Packing :-

6.1 The Unused Mineral Insulating oil shall be delivered in perfectly clean steel drums of 210 liters nominal capacity conforming to Grade "A" type 2 conforming IS: 1783 (Part 1) : 1993 amended upto date. The drum shall be coated from inside with epoxy lacquer of phosphate coating or better. The inside coating of the drum shall be resistant to Unused Mineral insulating oil. The outside surface of the drum may be coated with anticorrosive primer and finish paint, for protection against atmospheric corrosion. The colour of the finishing paint shall be Navy Blue (Shade No. 106) conforming to IS:5:1994 (Colours of ready mixed paints). The drum shall be effectively sealed immediately after filling the oil to avoid ingress of moisture.

6.2 Steel Barrel:-

The Unused Mineral Insulating oil of above specification shall be supplied in standard packing of 200 liters nominal capacity, non-returnable Brand New Steel Barrels (Drums) `A' grade type-2 conforming to IS-1783 (Part-I) 1993 as amended upto date.

The Type-2 drums shall be as per Fig-2 with triple / Spiral seam (Drawings No. MSEDCL/MM-II/OIL/01 and MSEDCL/MM-II/OIL/02) with ISI marking.

7.0 Sampling :

Sampling of Unused Mineral Insulating oil shall be done in accordance with IS 6885: 1973.

8.0 Tests :

The tenderer shall submit Test reports of the offered Unused Mineral Insulating oil with the offer in electronic format (i.e. Pen Drive) and in physical format. The tests shall be carried out at laboratories accredited by National Accreditation Board for testing and Calibration Laboratories (NABL) such as CPRI/ERDA to prove the requirements specified in this specification & as per relevant standards IS:335, 2018 amended up-to-date. The tests should be carried out within 5 years prior to the date of opening of this tender. The offer without test reports from NABL laboratories is considered as non-responsive and likely to be rejected.

The successful tenderer shall get approved the test reports of Unused Mineral Insulating oil and drum from Chief Engineer (MMC), MSEDCL, Prakashgad, Bandra, Mumbai prior commencement of the supply. The Drum drawings shall be submitted to the Chief Engineer (MMC) and get approved before commencement of the supply.

9.0 Pre dispatch Inspection :

The tenderers should arrange for sample testing of Unused Mineral Insulating oil twice during the contractual period, at their cost. Tenderer's should note that no separate testing charges will be payable by the MSEDCL. Sample testing will have to be arranged as and when directed by the MSEDCL at CPRI, Bangalore/ERDA, Vadodara Laboratories.

10.0 Testing Facility :

10.1 The tenderer should have adequate testing facility for all routine and acceptance tests on Unused Mineral Insulating oil and should provide the testing arrangements and testing equipments to testing Engineer of MSEDCL. The tenderer should submit the list of testing equipments available with them with the offer.

10.2 The bidder should also supply along with his offer the pamphlets/literatures in respect of Unused Mineral Insulating oil available with them.

10.3 The bidder should not change GTP parameters of Unused Mineral Insulating oil once it offered in A/T, and Type Test Reports.

11.0 Rejection :-

Apart from rejection due to failure in testing of Unused Mineral Insulating oil to meet the specified test requirements the Unused Mineral Insulating oil shall be liable for rejection on any one of the following reasons.

i. If tests are not carried out as per clause no. 7.0 of this specification.

iv. If Drawings are not submitted with offer as per clause no. 5.2 of this specification.

v. If GTP parameters are not submitted as per clause no. 4.0 of this specification.

vi. The bidder should fill up all the details in GTP parameter list, the statement such as "as per drawings enclosed", "as per MSEDCL's requirement" "as per IS" etc. shall be considered as details are not furnished and such offers shall liable for rejection.

12.0 Quality Assurance

12.1 Names of the supplier for the raw material, list of standards accordingly to which the raw materials are tested, list of test normally carried out on raw materials in presence of bidder's representatives, copies of test certificates.

12.2 Information and copies of test certificate as in (i) above respect of bought out accessories.

12.3 List of manufacturing facilities available.

12.4 Level of automation achieved and list of areas where manual processing still exists.

12.5 List of areas in manufacturing process where stage inspection are normally carried out for quality control and details of such tests and inspections.

12.6 List of testing equipment available with the bidder for final testing of Unused Mineral Insulating oil and test plant limitation, if any, vis-à-vis the special acceptance and routine tests specified in the relevant standards and the present specification.

12.7 The successful bidder shall submit the Routine Test Certificate along with documentary evidence having paid for the excise duty for the following raw materials viz Crude Petroleum, at the time of Testing.

13.0 Qualifying Requirement:

13.1 The Tenderer must be a manufacturer of Unused Mineral Insulating oil.

13.2 The tenderer having ISO certificate for their manufacturing unit for Unused Mineral Insulating oil shall be given preference.

13.3 The bidder should have proven experience of not less than 5 years in Manufacture, supply and testing at works for offered Unused Mineral Insulating oil.

13.4 The bidder should have adequate in house testing facilities for conducting acceptance tests in accordance with relevant IS.

13.5 Bidder should have a minimum turnover of 60% of the value of the material offered in any one financial year during the previous 3 years. However, being a commercial aspect this point may be verified by mm cell.

13.6 The Bidder should furnish all the relevant documentary evidence to establish the fulfillment of the above requirement.

13.7 The bidders not meeting the requirement at clause No. 12.1 can also participate, provided they have valid ongoing collaboration with a manufacturer who has at least 10 years experience in the manufacturing and testing of offered Unused Mineral Insulating oil, which have been in satisfactory service for a period of at least seven years. In such an event the bidder shall furnish along with the bid the documentary evidence for the same and undertaking from the bidder and collaboration accepting joint and several liability for all obligations under the contract.

13.8 The bidder who does not meet the above Qualifying requirement of experience (Clause No. 12.3) may be considered for a Trial Order subject to fulfilling the following requirements along with Clause Nos. 12.1 to 12.7.

13.9 The bidder shall have the basic infrastructure for the manufacture and supply of the Unused Mineral Insulating oil offered, like machinery, technical knowledge, capacity etc.

13.10 The purchaser should be satisfied with the manufacturing, supplying and financial capacity of the bidder after inspecting the bidder's works.

13.11 Notwithstanding anything stated above, the purchaser's decision in this regard will be final.

SPECIFICATION FOR DRUMS, LARGE, FIXED ENDS

Grade "A" DRUMS

1.0 Scope :

This specification covers design, manufacturing, testing, supply Non- Returnable, New Steel Barrels (Drums) of Grade-A , Type 1 & Type 2, confirming as per IS: 1783-(Part-1) 1993 of 200 liters nominal capacity with fixed ends with the following types of construction.

a) Type-1 – Drums of steel sheets of nominal thickness 1.25 mm for body and ends, with end seam resistance welded and double seem construction.

b) Type – 2 – Drums of sheets of nominal thickness 1.25 mm for body and ends, with end seam of spiral/triple seam construction.

2.0 References :-

The following Indian standards are necessary adjuncts to this standard.

IS No.	Title
513 : 1994	Cold rolled low carbon steel sheets and sheets (Fourth revision).
1394 : 1984	Glossary of terms relating to metal containers (Third revision).
1784 : 1984	Screwed closures for drums (Second revision).
3258 : 1966	Methods of sampling of metal containers.

3.0 Terminology:

For the purpose of this standard, the definitions given in IS:1394:1984 shall apply.

4.0 Capacity :

The minimum gross capacity of the drums measured with water at ambient temperature shall be 210 litres.

5.0 Dimensions :

The drums of type 1 & type 2 construction shall have dimensions as given in Fig. 1& Fig.2. The drum drawings are attached with the specification. Drawings No. MSEDCL/MM-II/OIL/01 & MSEDCL/MM-II/OIL/02.

6.0 Material :

6.1 The material for type 1 & Type 2 drums shall be as follows –

a) Type 1- Body and ends of the drums shall be Cold Rolled Carbon Steel sheets conforming to Grade "O" or "D" or "DD" of IS: 513:1994.
b) Type 2 – Body and ends of the drums shall be Cold Rolled Carbon Steel sheets conforming to Grade "O" or "D" of IS: 513:1994.

6.2 The nominal thickness of steel sheets for body and ends of both types of drums shall be 1.25 mm.

6.3 The sheets and blanks shall be phosphatized by any of the recognized processes.

7.0 Construction:

7.1 The sheets shall be blanked and formed to shape. The blanks shall be free from cracks, dents, pitting, rust other defects.

7.2 The body shall be continuously resistance welded so as to provide air-tight joint.

7.3 Triple/Spiral seam construction for type 2 drums.
The top and bottom ends shall be seamed to the body as shown in Fig.2. The seam shall have rolled 5 layers of sheet with the sealing compound forming a core at the joint of body and end sheets. The sealing compound forming the core shall be flexible and chemically resistant to the product to be packed.

7.4 The Drums shall be provided with two rolling bends or he as expanded or rolled in the drum body, located as shown in Fig 1 & Fig. 2.

7.5 Closures :-
The drums shall be fitted with two screwed closures one of 50 mm and the other of 20 mm as desired by the purchaser. The position of the screwed closure shall be as shown in Fig 1 & Fig.2. Screwed closures shall be conforming to IS:1784:1984.

8.0 Finish :-

8.1 The drums shall be in clean condition, the inside being free from all traces of rust and foreign matter.

8.2 The inside and outside surfaces of each drums shall be treated as per Specification Cl.No.5.1 of insulating Oil.

9.0 Tests :-

9.1 Leakage Test :-

Each drum shall be tested for leakage by either of the methods:

At air pressure of 50 Kpa (0.5 Kgf/ cm^2) with the seams under water or covered with soap solution. The drums shall not show any sign of leakage or drop in the test pressure when observed for at least 10 seconds.

OR

Using special equipment fill the drum with helium, thereafter putting the drum in an air-tight chamber, creating a high vacuum in the annular space between the inner wall of the chamber and outer surface of the drum and thereafter testing for leakage in the drum by checking for presence of helium in annular space using Mass Spectrometer.

OR

Using special equipment put drum in air –tight chamber creating a high vacuum in the annular space between the inner walls of the chamber and outer surface of drum and thereafter testing for leakage in the drum by observing for any drop in the differential pressure between inside of the drum and outside of the drum.

9.2 Drop Test :-

9.2.1 Fill the drum to 98 percent of its gross capacity with water at ambient temperature and close it properly, suspend the drum with the diagonal in the vertical position and raise it to a height so that the lowest point on the drum is 1.80 mm clear off the horizontal striking test surface. The striking surface shall be horizontally plain concrete floor or a steel plate at least 40 mm thick. The drum shall be dropped in such a way that it strikes the floor at the bottom rim at its junction with the side seam. The same drum shall again be dropped so that it strikes the floor at the top rim at its junction with the side seam.

9.2.2 The drum shall be examined for any leakage of water after the test. Any leakage of water shall indicate failure of the drum in the test.

9.2.3 The drum after the test shall be subjected to air leakage test as per 8.1. The drum shall not show any sign of leakage.

9.3 Hydraulic Pressure Test :-

The drum shall be subjected to a gradually applied hydraulic pressure of 200 Kpa (2.0 kgf/cm.sq.). This pressure shall be maintained for at least 5 minutes and any leakage of water or drop in the pressure shall indicate failure of the drum in the test.

10.0 Sampling:-

10.1 Representative samples of the drums for tests regarding dimensions, capacity, construction, finish, air leakage shall be drawn as prescribed in IS:3259-1988.

10.2 One sample from each lot of 2000 drums shall be subjected to drop test as detailed in Cl.No. 9.2.1 to 9.2.3 of this specification.

10.3 One fresh sample from each lot of 2000 drums shall be selected and subjected to hydraulic pressure test as detailed in Cl. No. 9.3 of this specification.

10.4 If the sample tested above fails two more drums from the same lot shall be subjected to the same test and if any of the two samples fails again, the lot shall be deemed to have failed in the test.

11.0 Marking :-

Each drum shall be marked with the following particulars by embossing on the head with raised markings.

a) Name of the manufacturer with trademark.
b) Grade and type of the drum
c) New mineral insulating oils
d) Identification code
e) the date of manufacture
f) Quantity in litres.
g) MSEDCL
h) Work order No.

12.0 Schedules

12.1 The bidder shall fill in the following schedules which form part of the tender specification and offer. If the schedules are not submitted duly filled in with the offer, the offer shall be rejected.

Schedule `A' -Guaranteed Technical Particulars

Schedule `B' -Schedule of Tenderer's Experience.

12.2 The discrepancies between the specification and the catalogs, Literatures and indicative drawings which are subject to change, submitted as part of the offer, shall not be considered and representation in this regard will not be entertained.

12.3 The Bidder shall submit the list of orders for similar type of equipments, executed of under execution during the last three years, with full details in the schedule of Tenderer's experience (Schedule `B') to enable the purchaser to evaluate the tender.

Schedule "A"

GUARANTEED TECHNICAL PARTICULARS

New Insulating Oil in Drums for Transformers

Sr.No	GTP Parameters	
A	New Insulating Oil (Type II as per IS 335:2018)	
1	Applicable Standards for New Insulating Oil	Text
2	Specify the type of New Insulating Oil	Text
3	Specify the maximum Density of oil in g/cm3 at 20 degree Celsius as per IS 1448 [P: 16] : 1990	Text
4	Maximum Kinetic viscosity of insulating oil in mm^2/s at 40 deg. Centigrade as per IS 1448 [P:25] : 1976	Text
5	Maximum Kinetic viscosity of insulating oil in mm^2/s at 0 deg. Centigrade as per IS 1448 [P:25] : 1976	Text
6	Specify the maximum Pour Point of insulating oil in deg. centigrade as per IS: 1448 [P: 10] : 1970	Text
7	Specify maximum Water content in oil in ppm as per specification	Text
8	Specify the minimum Breakdown value of un - filtered oil in KV (rms) at 2.5 mm gap	Text
9	Specify the minimum Breakdown voltage of filtered oil in KV (rms) after laboratory treatment at 2.5 mm gap.	Text
10	Specify the maximum Dielectric Dissipation Factor (DDF)(tan delta) at 90 ºC.	Text
11	Specify minimum Interfacial tension of insulating oil in N/m ASTM D971	Text
12	Specify appearance of the unused Mineral Insulating oil	Text
13	Specify the Neutralization Value of insulating oil as per IEC:62021-1 Maximum acidity in (mg/KOH/gm)	Text
14	Specify minimum Interfacial tension of insulating oil in N/m as per ASTM D971	Text
15	Specify the total sulphur content in % as per ISO 14596 or ASTM D4294	Text
16	Specify condition of Corrosive sulphur of insulating oil	Text
17	Specify condition of potential Corrosive sulphur of unused insulating oil	Text
18	Specify the maximum value of Dibenzyl Disulfide(DBDS) in mg/kg of the unused mineral Insulating oil should not be detectable as per IS 16497(Part 1)	Text
19	Specify the maximum value of uninhibited in the unused mineral Insulating oil as per IS:13631/IEC:60666 in %	TexT
20	Specify the maximum value of Metal Passivator additives in mg/kg of the unused mineral Insulating oil should not be detectable as per IS:13631/IEC:60666	Text

21	Specify the maximum value of 2-Furural and related compounds content in mg/kg of the unused mineral Insulating oil should not be detectable as per IS:15668	Text
22	Specify maximum Dielectric dissipation factor (tan delta) of insulating oil at 90 deg. C	Text
23	Maximum Total sludge after oxidation in percent by weight	Text
24	Specify the minimum Flash Point (closed) of unused insulating oil in deg. centigrade by Pensky Marten apparatus as per IS: 1448 (P:21) : 1992	Text
25	Specify Polycyclic Aromatic Contents (PCA) of the unused mineral Insulating oil detectable by extraction with Dimetyl sulfoxide (DMSO) under the condition of IP 346	Text
26	Specify the maximum value of Polychlorinated Biphenyls(PCB) Content in mg/kg of the unused mineral Insulating oil should not be detectable as per IS 16082	Text
27	Specify percent by weight of antioxidant additives	Text
28	Gassing Tendency shall be as per IEC:60628 (Yes/No)	Text
29	Electrostatic Charging Tendency (ETC)' s measurements as per CIGRE Technical Brochure 170(Yes/No)	Text
30	Test Reports of Insulating oil submitted on soft copy with the offer(Yes/No	Text
B	**STEEL DRUM ('A ' Grade type 2)**	
31	Type and Grade of the steel Drum	Text
32	Applicable Standards for New Insulating Oil	Text
33	Nominal capacity of oil drum in liters	Text
34	New steel barrels confirms to IS-1783 as amended up to date (Yes/No)	Text
35	Dimensions of oil barrel as per drawings enclosed	Text
36	Material for oil drum	Text
37	The appearance of the new insulating oil	Text
38	Sampling shall be done as per IS 6885: 1973(Yes/No)	Text
39	Give construction details of drum	Text
40	Insulating oil bears ISI certification mark(Yes/No)	Text
41	Tenderer have adequate testing facility to carry out tests specified in the specification (Yes/No)	Text
42	List of equipments for testing submitted with the offer(Yes/No)	Text
43	List of supplier for raw material ,list of standards applied , routine tests for raw material, List of tests carried out are enclosed with offer(Yes/No) material , list of test certificates submitted on soft copy (Yes/No)	Text

44	Leakage Tests shall be carried out on each oil drums at pressure of 50 K Pa as per specification. (Yes/N	Text
45	Duration of Leakage Tests in minutes	Text
46	Method used for carrying out Leakage Tests shall on each oil drums as per specification.	Text
47	Drop Tests shall be carried out on oil drum as per specification (Yes/No)	Text
48	Hydraulic pressure test shall be carried out on oil drum as per specification (Yes/No	Text
49	Hydraulic pressure (in Kpa) used in the test for oil drum	Text
50	Marking shall be carried out on each oil drum as per of specification.(Yes/No	Text

SCHEDULE – 'B'

SCHEDULE OF TENDERER'S EXPERIENCE

Tenderer shall furnish here a list of similar orders executed/under execution by them to whom a reference may be made by company in case it is necessary.

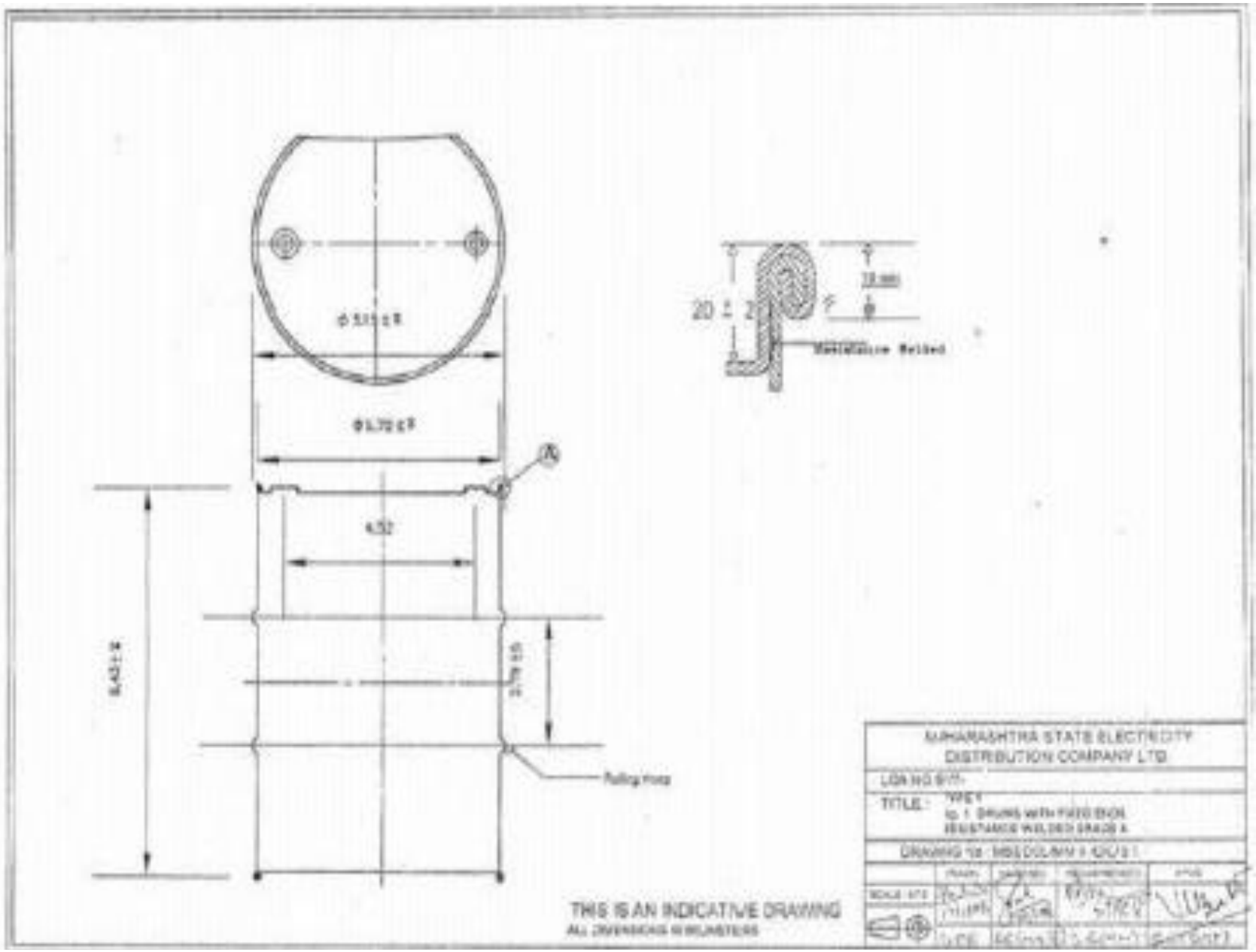
Sr. No.	Name of client & Description Order	Value of order	Period of supply and Commissioning Alongwith Size and qty.	Name and address to whom reference may be made
1	2	3	4	5

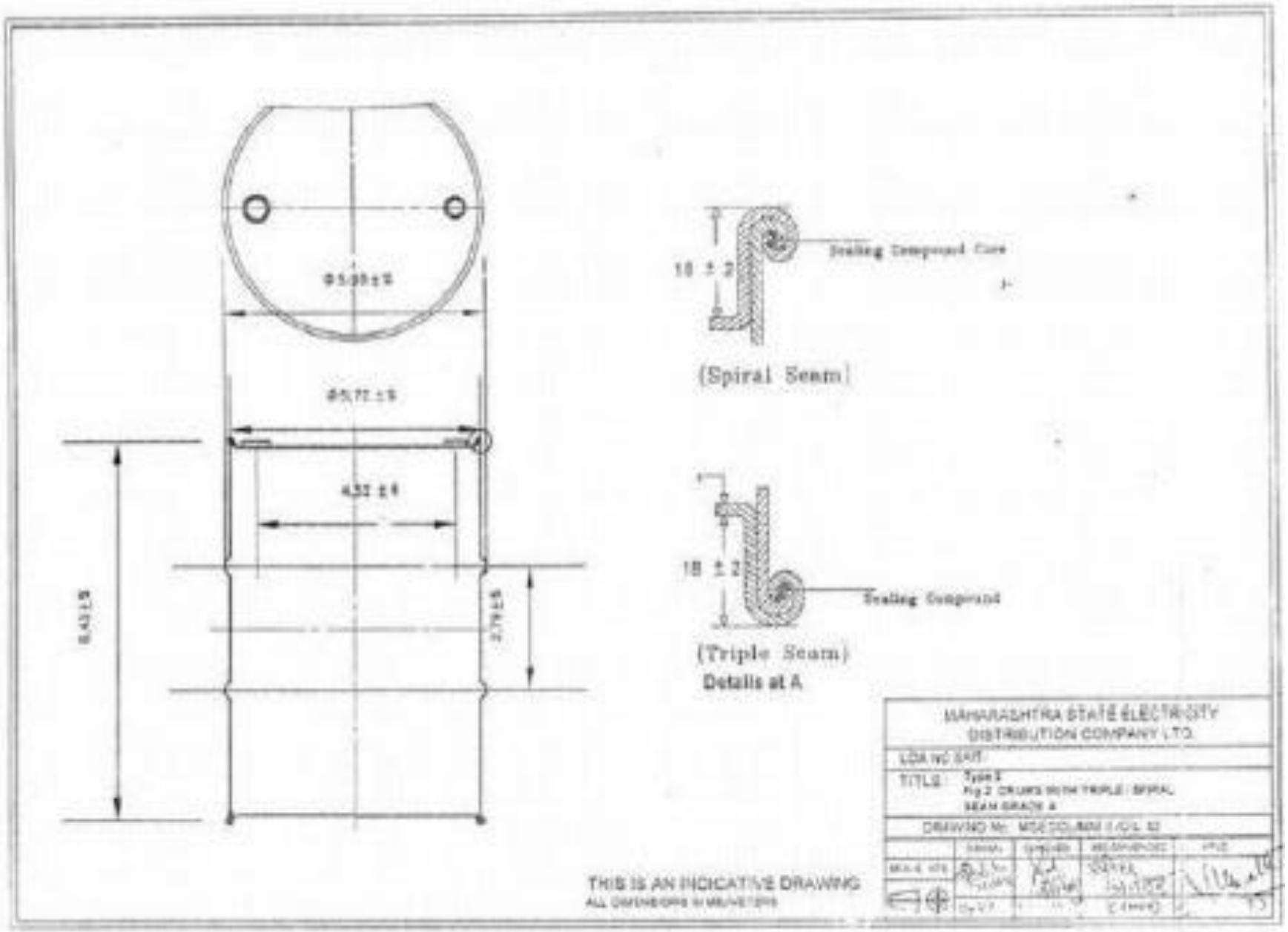
Name of Firm

Name & Signature of Tenderer

Designation

Date


MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LTD
THIS IS AN INDICATIVE DRAWING


18 ± 2
Sealing Compound Core
(Spiral Seam)
18 ± 2
Sealing Compound
(Triple Seam)
Details at A
THIS IS AN INDICATIVE DRAWING
MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LTD.
TITLE :
Type 2
SEAM GRADE A