وزارة الكهرباء والماء والطاقة المتجددة
Ministry of Electricity & Water & Renewable Energy
State of Kuwait | دولـــة الكويـت

قطاع شبكات التوزيع الكهربائية

كراسة الأسس والمعايير لتأهيل مصانع محولات توزيع كهربائية مغمورة بالزيت جهد 0.433/11 ك.ف.

PRE-QUALIFICATION OF MANUFACTURERS FOR THE MANUFACTURE OF OIL IMMERSED DISTRIBUTION TRANSFORMERS

(CONSERVATOR TYPE & HERMETICALLY SEALED TYPE)

تمهيد

ترغب وزارة الكهرباء والماء والطاقة المتجددة في تأهيل المصـــانع لتصـــميم محولات التوزيع الكهربـائيـة الزيتيـة 11/0.433 ك.ف وذلـك عبر اعتمـاد الوزارة للتصاميم الهندسية التصنيعية للمنتج وفق المواصفات الفنية المذكورة في الكراســة وتقديم المصـنع للمخططات الهندسـية وكافة المتطلبات المذكورة في المسـتندات الواجب تقديمها والمذكورة في اشـتراطات الكراسـة ، على ان يقدم المصنع ما يثبت قدرته التصنيعية لاعتماده كمصنع وذلك من خلال تقديم شـــهادات الفحص النوعي والتقارير الفنية لتلك الاختبارات كما هو مذكور في كراسة التأهيل.

1. أسس ومعايير المتطلبات المالية :

1) أن تكون الميزانية العمومية لآخر ثلاث سنوات مالية منفصلة مدعمة بتقرير مدقق الحسابات للشركة / للمصنع عن كل سنة مالية متضمنة بيان المركز المالي وقائمة الدخل على أن يكون مكتب التدقيق معتمد من قبل وزارة التجارة والصناعة وذلك للشركات / المصانع (المحلية).
2) على الشركات الأجنبية/ المصانع الأجنبية تقديم المستندات المالية على أن تكون معتمدة من مكتب تدقيق في بلد الشركة / المصنع وموثقة من السفارة الكويتية في بلد المنشأ والخارجية الكويتية بدولة الكويت.
3) أن تكون الشركة المحلية /الاجنبية و المصنع المحلي / الأجنبي قد حققت أرباحاً في كل سنة عن آخر ثلاث سنوات مالية.
4) إذا لم يتحقق شرط الربح في السنة من الثلاث سنوات المذكورة في البند ثالثا أعلاه، فإن على الشركة المحلية والمصانع المحلية تقديم كتاب البنك يبدي استعداده لمنحها تسهيلات بنكية.

2. أسس ومعايير المتطلبات القانونية :

– كتاب من الشركة / المصنع يطلب من خلاله التأهيل مع كافة المرفقات والمستندات (المالية والقانونية والفنية) والتعهد بأن كافة المستندات والمرفقات صحيحة وخالية من التدليس.

2.1. المستندات القانونية المطلوبة للشركات / المصانع المحلية:

– صورة من عقد تأسيس الشركة / المصنع.
– صورة شهادة غرفة التجارة والصناعة بالكويت لهذه السنة.
– صورة السجل التجاري للشركة / المصنع
– صورة شهادة تسجيل لدى الجهاز المركزي للمناقصات العامة وتكون سارية.
– صورة شهادة نسبة العمالة الوطنية وتكون سارية.
– صورة رخصة الشركة / المصنع لدى وزارة التجارة والصناعة وتكون سارية .
– مستخرج وزارة التجارة والصناعة لمن له حق الادراة بالشركة / المصنع.
– براءة ذمة من قطاع خدمات العملاء من الوزارة.
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2.2. المستندات القانونية المطلوبة للشركات والمصانع الأجنبية (مع الوكيل المحلي / مستقل بذاته:

2.2.1. في حال مستقل بذاته يتم تقديم:

- الكيان القانوني للشركة الأجنبية / للمصنع الأجنبي معتمد من الجهات الرسمية في بلد المنشأ، ومن ثم إعتمادها من السفارة الكويتية أيضاً في بلد المنشأ والخارجية الكويتية بدولة الكويت وترجمتها إلى اللغة العربية من مكتب ترجمة معتمد داخل دولة الكويت.

2.2.2. في حال وجود وكيل محلي يتم التقديم:

- إتفاقية الوكالة بين الشركة الأجنبية / المصنع الأجنبي والوكيل المحلي معتمد من الجهات الرسمية في بلد المنشأ (الدولة الأجنبية) ومن ثم اعتمادها من السفارة الكويتية في بلد المنشأ واعتماد الاتفاقية من الجهات الرسمية في دولة الكويت (وزارة العدل / وزارة الخارجية) وترجمتها إلى اللغة العربية من مكتب ترجمة معتمد داخل دول الكويت.
- شهادة قيد الوكالة صادرة من وزارة التجارة والصناعة بين الشركة الأجنبية / المصنع الأجنبي والوكيل المحلي تكون سارية المفعول.
- كافة المستندات القانونية المطلوبة للشركات المحلية في حال تأهيل شركة أجنبية / مصنع أجنبي مع وكيل محلي لها داخل دولة الكويت.

3. المستندات الفنية الواجب تقديمها :

1)تقديم شهادات الفحص النوعي type test والتقارير الخاصة بها (مشابهة أو مماثلة لأي جهد من الجهود بين جهد 11 ك.ف. إلى جهد 33 ك.ف. بغض النظر عن أية اشتراطات فنية مذكورة في المواصفات الفنية للكراسة) على جميع أجزاء المحول بالكامل تبين قيام المصنع بعمل الاختبارات النوعية بنجاح لمحولات التوزيع الكهربائية الزيتية في مختبرات عالمية محايدة التالية:

(ANY MEMBER OF STL LIAISON - ASTA, CESI, CPRI, ESEF, JSTC, KEMA, KERI, PEHLA, SATS, STLNA, VEIKI OR, ZKU) OR (ANY INTERNATIONAL REPUTED ELECTRICAL TESTING ACCREDITATION AUTHORITY HAS CERTIFICATE ISO/IEC 17025- THE LABORATORY SHALL BE ACCREDITED WITH THE INTERNATIONAL STANDARD ISO/IEC 17025 BY AN SELF ACCREDITED IN ACCREDITATION BODY THAT IS IT ACCORDANCE WITH ISO/IEC 17011, EITHER THROUGH THE GCC ACCREDITATION CENTER OR THROUGH THE INTERNATIONAL LABORATORY ACCREDITATION COOPERATION (ILAC).) (TYPE .TEST IN FACTORY IS NOT ACCEPTED)

2) تقديم المخططات القياسية (Fully dimensional drawings) للمعدة مع ذكر تفاصيل تبين جميع أجزاءها.
3) يجب على المصنّع الإلتزام بمواصفات و شروط وزارة الكهرباء و الماء المذكورة في كراسة التأهيل.
4) يجب على المصنع استيفاء و استكمال جميع الجداول الفنية و البيانات المطلوبة والمستندات الفنية في كراسة التأهيل بالكامل دون نقصان مع توفير جميع المستندات الفنية المطلوبة و يحق للوزارة طلب أي نسخة أصلية للتأكد من مطابقتها لنسخ المستندات المرفقة.

4. المستندات الفنية للاسترشاد في الدراسة الفنية (في حالة توفرها):

1) تقديم كتالوجات تبين مراحل تصنيع المعدة المراد تأهيلها و نبذة من تاريخ المصنع و مكانه وتفاصيل المواد الأولية المكونة للمادة.
2) تقديم معلومات عن الخبرة السابقة للمصنّع في مجال التأهيل مع ذكر عدد و قيمة الأعمال المنفذة و الجاري تنفيذها وتقديم شهادات موثقة من العملاء تثبت كفاءة المصنع في تصنيع المواد و أن يكون مدون بها رقم العقد و إسم المشروع و قيمتها المالية و مدة التوريد و بداية التعاقد وانتهاء التنفيذ.

5. تعليمات عامة:

1) جميع الوثائق و المستندات المقدمة من المصانع (خارج دولة الكويت) يجب أن تكون مصدقة و موثقة من جهات الإختصاص و من سفارة دولة الكويت في بلد المنشأ لإثبات صحتها و سريان مفعولها.
2) يجب أن تكون جميع المستندات و البيانات المقدمة من قبل المصانع واضحة ومتسلسلة.

ملاحظة: يتم تقديم شهادات اختبار النوع (type test certificate) لمحولات التوزيع الكهربائية الزيتية 11/0.433 ك.ف في مناقصات قطاع شبكات التوزيع الكهربائية وذلك عند تقديم العطاء في المناقصة على ان تكون هذه الشهادات صادرة من المختبرات التالية:

[ANY MEMBER OF STL LIAISON - ASTA, CESI, CPRI, ESEF, JSTC, KEMA, KERI, PEHLA, SATS, STLNA, VEIKI OR, ZKU] OR [ANY INTERNATIONAL REPUTED ELECTRICAL TESTING ACCREDITATION AUTHORITY HAS CERTIFICATE ISO/IEC THE LABORATORY SHALL BE ACCREDITED WITH 17025- THE INTERNATIONAL STANDARD ISO/IEC 17025 BY AN ACCREDITATION BODY THAT IS IT SELF ACCREDITED IN ACCORDANCE WITH ISO/IEC 17011, EITHER THROUGH THE GCC ACCREDITATION CENTER OR THROUGH THE INTERNATIONAL LABORATORY ACCREDITATION COOPERATION (ILAC)].

والتي تبين اجتيازه لكافة الاختبارات المنصوص عليها في معايير اللجنة الكهروتقنية الدولية (IEC) حسب مواصفات الوزارة المستخدمة في الشبكة الكهربائية في دولة الكويت مع تقديم الكتالوجات الفنية الخاصة بمحولات التوزيع الكهربائية الزيتية 11/0.433 ك.ف

دولـة الـكويـت

STATE OF KUWAIT

Ministry of Electricity, Water, and Renewable Energy

وزارة الـكـهـربـاء والـمـاء والطاقة المتجددة

TECHNICAL SPECIFICATIONS OF EQUIPMENT

OIL IMMERSED DISTRIBUTION TRANSFORMERS

1. GENERAL:

1.1 MINISTRY SYSTEM:

The equipment covered by this specification is for extending the ministry existing distribution system and shall be suitable in all respects for connection to the existing system, characteristics of which are:-

System voltage	: 11 KV	415 volts
System Highest Voltage	: 12KV	457 volts.
Frequency	: 50 Hz	50 Hz.
Neutral Point	: Solidly earthed or through Low Resistance	Solidly earthed.
Maximum fault level	: 31.5KA	50 KA
Maximum fault duration	: 1.25 sec.	0.5 seconds.

1.1 CLIMATIC CONDITIONS:

THE EQUIPMENT IS FOR CONTINUOUS SERVICES IN KUWAIT AND THE CLIMATIC CONDITIONS UNDER WHICH IT WILL OPERATE ARE TO BE CONSIDERED THROUGHOUT THE DESIGN.

Climatic conditions in Kuwait are rigorous and the Summer season during which the equipment will function under continuous maximum load condition is long and shall be considered to fall during the period starting from 15th of April till 15th of November. The remainder of the year shall be considered as winter season since Autumn and Spring seasons are very short in Kuwait.

THE FOLLOWING ARE PREVAILING ATMOSPHERIC CONDITIONS BASED ON THE LATEST RECORDS:

Ambient temperature in shade	:	Maximum 55 Degrees C (summer day)
Ambient temperature in shade	:	Minimum – 6 Degree C (winter
night) Maximum sun radiation temperature as measured with a black bulb thermometer	:	85 Degrees C.
Average maximum ambient temp.	:	45 Degrees C.

Periods of high humidity are common and a humidity of 100% has been recorded at 30 degrees centigrade. However, high temperature is normally accompanied with low humidity. Violent sand and dust storms occur with wind speeds up to 120 km/hour (Gust 160 km/hour), and even on comparatively still days, fine dust is carried in suspension in atmosphere. The average rainfall is of the order of 15 cms., but this may be concentrated in 2 or 3 severe downpours.

The equipment required under these specifications shall give continuous and trouble-free service under the arduous conditions mentioned above.

1.2 STANDARD SPECIFICATIONS:

A) All materials and equipment shall comply as a minimum with:

i) The latest relevant recommendations of the International Electro-Technical Commission (I.E.C) if available.

ii) If (i) above is not available, with the latest relevant British Standard Specifications (B.S.S).

This applies to quality of material and testing … etc... If standard as mentioned above contradict with this specification then the requirements of this specification shall apply.

A) Manufacturers who manufactures equipment based on standards other than those mentioned under item "A" above must confirm that such standards meet the requirements under "A" as a minimum and must also prove this this by type test certificate.

B) What is mentioned under item, "A" and "B" above applies to wherever B.S.S. is mentioned in the different clauses of this specification.

2. TECHNICAL SPECIFICATIONS:

2.1 OIL IMMERSED DISTRIBUTION TRANSFORMER, CONSERVATOR TYPE:

1.1 TYPE:

Three phase, oil immersed naturally cooled, core type power distribution transformer.

The transformer shall be in accordance with the International Electrotechnical Commission No. 60076 or with the latest British Standard Specification No. BSEN 60076 and BSS. 6435 or equivalent except where stated otherwise.

1.2 INSTALLATION:

The transformer will be installed outdoor and may be exposed to direct sun rays and thus shall be capable of carrying their full rated current under Kuwait's worst temperature conditions as specified.

1.3 NORMAL RATING:

The normal rating shall be the maximum continuous rating under the worst temperature conditions encountered in Kuwait (see climatic conditions).

Manufacturers shall state in the schedule the equivalent British Standard specification or the International Electro Technical Commission rating for the transformer.

The Kuwait continuous rating should not be more than 80% of the IEC Recommendations / British Standard specifications continuous rating.

1.4 VOLTAGE RATIO:

The normal voltage ratio of the transformers at normal tapping and no load shall be 11/0.433 KV.

1.5 DUTY UNDER FAULT CONDITIONS:

The transformers shall be capable of sustaining a three phase symmetrical short circuit current on the L.V. side with a fault power being maintained on the H.V. side and without damage to the transformer for a period of **three seconds** (at tap position 3).

1.6 IMPEDANCE VOLTAGE:

The impedance voltage at normal rating and voltage, and at 75 degree C shall be 6 % and stated in the schedules.

1.7 TEMPERATURE RISE:

The transformers shall be capable of carrying its full normal rated current continuously under the

worst temperature conditions encountered in Kuwait, and at any tapping, without the temperature rise of oil in the hottest region exceeding **35** degree C measured by the thermometer and of winding not exceeding **45** degree C as measured by resistance. **Any transformer exceeding the above temperature rise limits will be rejected.**

1.8 CONNECTION & RATIO:

The transformers are to be wound to International Electrotechnical commission No. 60076 vector symbol Dyn11 with normal voltage ratio on normal tapping at no load.

1.9 COOLING:

Cooling of the transformers shall be natural circulation of oil through the banks of plain external cooling tubes or radiators suitably arranged. Due note being taken of the site conditions. **Transformers with corrugated tanks or cooling fins will be rejected. The radiators shall physically be separate from the tank and shall not form integral part of the tank.**

1.10 CORE:

The core shall be constructed of the best quality low loss, high permeability cold rolled, grain oriented electrical steel laminations. **The flux density in any part of the core shall not exceed 1.6 TESLA at normal voltage and frequency.** The completed core shall be provided with lifting eyes to facilitate its removal from transformer tank and prevent movement during transport and/or service. Such fixing arrangement of the transformer core must be adequate and strong enough to withstand the forces due to external short circuits.

1.11 WINDING AND INSULATION LEVEL:

The maximum current density in both H.V. and L.V. windings shall not exceed 265 amperes per square centimeter as per the requirement of clause 2.1.7. All windings shall be made from high conductivity electrolytic copper conductors of best quality and shall be fully insulated to British Standard

Specification No. BS EN 60076 and for a system highest voltage of 12 KV. The insulation shall be class “A” to British Standard specification No. 2757. The insulation level should be 75 KV as per IEC 60076-3

The HV/LV winding shall be (CU.-CU.) and can be (wire / foil / sheet)

1.12 OFF CIRCUIT TAPPING:

Off circuit tapping shall be provided on the center (both electrical and mechanical) of the H.V. windings. There shall be five tappings and arranged as follows:

Normal Voltage: ± 2.5% ± 5%

The transformer shall be capable of operation at its rated KVA without injury on any tapping and any applied voltage which does not vary from the voltage for which the tapping is rated by more than 5%.

Tap changer switch shall be located on the side of the transformer tank and tap changer switch located on the top side of the tank will not be accepted. Minimum current rating of the tap changer shall be 150 amps.

A stainless steel engraved caution plate of adequate thickness and dimensions stating that the tap switch to be operated only when the transformer is disconnected from both H.V. and L.V. Sides shall be fitted near the tap switch handle.

1.13 TANKS:

The tank shall be constructed of mild steel of suitable sections with the necessary reinforcing section and the whole shall be welded and fitted with bilateral rails.

Suitable lifting lugs must be provided to enable the transformer to be lifted by means of an overhead crane and slings. Suitable lugs shall be provided on tank cover to facilitate its removal.

The tank shall be fitted with an oil-drain valve, and also a sampling drain valve which should be at 30 cms above the ground level. The tank shall be provided with 2 suitably located earthing studs. The whole of the tank and fittings shall be sand blasted inside and outside to remove all scale and rust before painting. All transformers shall be fitted with jacking lugs located at a suitable height from ground level.

The thickness of the side walls, top, and bottom of the tank shall not be less than 5 (five) mm.

1.14 CONSERVATOR:

Conservator vessel shall be provided for mounting on the top of the tank. The conservator shall be of ample capacity for containing sufficient oil to allow for the transformer working over the maximum permissible temperature range. Connections will be between the highest point of the main tank and the conservator through common integrated safety device shall project four centimeters above the bottom of the conservator in order to allow a dump of collection of moisture or sludge. Vent pipes shall be provided as required to prevent the trapping of air or gas in sealing ends, bushings or filling cap and drain valve.

1.15 BREATHER:

1 Kg silica-gel breather with replaceable elements shall be provided and connected by means of galvanized iron pipes to the conservator vessel. Oil or ball valve seals shall be provided to prevent the circulation of air except under correct working conditions. A suitable observation window shall be provided in the breather.

Breather having glass covers shall be provided with wire mesh or cages for protection, which can be easily removed. The glass cover of the breather should be of good quality glass to withstand the weather conditions of Kuwait.

1.16 COMMON INTEGRATED SAFETY DEVICE (CISD) :

The common integrated safety device shall be used for transformer protection by detecting oil level, discharge of gas (between 100cm³ and 200cm³), tank pressure (response time less than 5 ms), and temperature. The device shall be able to send trip signal to a circuit breaker of transformer and shall also send signal to the switchgear room for alarm annunciation of the device locally and provision to connect for tele-signaling remotely via DMS. The device shall provide the ability to test all sensors (gas, pressure, and temperature) mechanically on site after installation.

Alternatively, double float Buchholz protection device may be used in addition of using the contacts of the thermometer and the pressure relief valve which are fixed on the transformer. The Buchholz device shall be provided with suitable valves on both sides of the device to facilitate easy service, and shall also incorporate a test cock for testing purpose. The Buchholz device shall be from acknowledged international manufacturer and already used in MEW primary substations for a period of at least 3 years.

1.17 PRESSURE RELIEF VALVE:

3'inch T-type that evacuates any overpressure of oil and gas found in the oil tanks. The main objective to operate in a very short period of time by evacuating the pressure increase. The preset spring loaded device shall operate if pressure exceed 0.42kg/cm2 and reset to the normal position as soon as the pressure decreases below the above mentioned value. The ejected oil and gas shall be directed towards a safe area. The device should have an integral mechanical operation indicator with manual reset and two N.O contacts. The device shall be accompanied by test certificates with values of operating pressure.

1.18 THERMOMETER:

A dial type thermometer protected by a wire mesh or cage with 2 normally open contacts shall be fitted to the tank of transformer to read directly oil temperature in the hottest region of the transformer.

A red mark should be engraved on the dial to indicate the maximum permissible oil temperature.

1.19 OIL VALVES:

High grade gun metal oil valves provided with engraved coloured indication to show whether in the open or closed position and with pad-locking devices to prevent an inadvertent operation shall be fitted as follows:

- Main tank drain valve.
- Sampling drain valve.
- Conservator to main tank valve through CISD Device/ Buchholz relay
- Conservator drain valve

1.20 OIL LEVEL GAUGE:

An oil level gauge of an approved type shall be mounted at the end of the conservator vessel, particular care being taken that the oil is easily observed when partially obscured by dust as may

be expected under operating conditions.

The gauge shall have three markings indicating the level at 20° C and lower and upper markings corresponding to the lower and the higher temperature for which the transformer is required to operate on site.

1.21 GASKETS:

All gaskets used for making oil-tight joints shall conform to ASTM F104-03 and B.S.S. 3063/1965 as applicable, taking into account Kuwait's temperature conditions. A sample of gasket material together with test report should be submitted to the Purchaser for approval. The material used for gasket shall be cork-rubber and shall have very good resistance to transformer oil.

1.22 RATING AND TERMINAL MARKING PLATES:

Substantial brass or stainless steel diagram and rating plate in accordance with International Electro- technical Commission No. 60076 and British Standard Specification No. 171 shall be fixed to each transformer giving full detailed information

The plates shall be of adequate thickness and the marking shall be engraved therein to a 0.5 mm depth. The background being filled in black. Full details of rating plate shall be submitted for approval. Also two Nos. substantial brass or stainless steel plates 200 x 150 mm. with the transformer (circuit) No. engraved and coloured are to be fixed on the transformer at two different places.

1.23 NUTS AND BOLTS:

All nuts and bolts shall be high tensile zinc coated steel alloy and locked in position with the exception of those external to the transformer.

1.24 CONSTRUCTION DETAILS:

The overall construction and assembly of the transformers shall be robust and shall be rendered suitable for the arduous weather and load conditions under which these transformers will operate. Due to limited space available at our substations, the maximum overall dimensions of the transformer shall be in the range of 2.60 M (height) x 2.50 M (length) x 2 M (width) with maximum tolerance of (+5%).

1.25 CABLE BOXES:

The transformers shall be provided with bolt-on type cable end boxes on both high and low voltage sides. The gland plates at the bottom of the H.V and L.V cable end boxes shall be completely removable from the outside, and shall be with condensation socket. Suitable steel brackets complete with cleats and clamps of non-magnetic metal (wooden clamps of any kind will not be acceptable) to support both high and low voltage cables, shall be provided. The bottom of the cable glands of cable end boxes shall not be less than 600 mm. above the base of the transformer. The boxes shall be vertically mounted and arranged for bottom entry of cable and as follows:

A) H.V. SIDE (11 KV) CABLE END BOX :

The H.V. cable end box shall be provided with H.V. bushing suitable for heat shrinkable cable terminations. The transformer cable end box on the high voltage shall comply with the requirements of B.S 6435 and shall be suitable to receive 3x185 sq. mm./ 3x300 sq. mm AL or CU /SC/XLPE/SC /SWA/PVC 11 KV cable. Copper cable lugs suitable for the BICC – UK or CEMBRE – Italy crimping tools. The cable gland is to be connected to the main transformer earthing point through 5x30 mm. tinned copper strip and shall be complete with a heat shrinkable sleeve.
11 KV cable end box shall be designed to fit with compression type cable gland to BS6121 pt.1, type C 90 made of brass and copper bonding strip of 5 x 30 mm. for earth connection to the main earth of the transformer.

The box shall be designed with ample dimensions to facilitate jointing and allow crossing of cores without damage to insulation but the distance from the cable crutch to the transformer terminal bushing shall not be less than 570 mm as specified in B.S.S. 6435, table 2. The cable end box shall be air insulated type.

The HV terminals of the transformers are to be marked clearly outside and inside cable end box. Identification of the phases using stickers is not acceptable. The phasing order shall be ("R-Y-B" / "A- B-C").

B) L.V. SIDE (0.433 KV) CABLE END BOX

The L.V. box shall be designed with ample dimensions to render easy connection of cable. The distance between bushing terminals and the bottom of the cable end box shall not be less than 350 mm. The bottom plate shall be of non-magnetic material.

L.V. cable end boxes shall be air insulated type and shall generally conform to B.S. 2562.

L.V bushing shall be mono block type.

The LV terminals of the transformers are to be marked clearly outside and inside cable end box, Identification of the phases using stickers is not acceptable. The phasing order shall be ("b-y-r-n" / "c-b- a-n")

The cable end box shall be suitable to receive seven (2 per phase & 1 for neutral) single cores 630 sq.mm., seven (2 per phase & 1 for neutral) single cores 800 sq.mm. and eleven (3 per phase & 2 for neutral) single cores 800 sq.mm. stranded CU/XLPE/PVC cables, respectively for 1000, 1250 and 1600 KVA transformers.

1.26 TRANSFORMER OIL:

The transformer shall be dispatched with the tank filled with an approved make of insulating oil.

The insulating oil shall be virgin Napthenic base, confirmed to IEC-60296 latest edition while tested at supplier's premises. The contractor shall furnish test certificates from the supplier against the acceptable norms as mentioned in IEC-60296 latest edition, prior to dispatch of oil from refinery to site. Under no circumstances, poor quality oil shall be filled into the transformer and only thereafter be brought up to the specified parameters by circulation within the transformer.

2.2 OIL IMMERSED DISTRIBUTION TRANSFORMER, HERMETICALLY SEALED TYPE:

The hermetically sealed type oil immersed distribution transformer shall be same as specified above for the conservator type except as follows.

2.2.1 TANKS:

1. Transformer tank shall be cooling fins / corrugated tank type and made of mild steel material.

2. All fins or corrugations that are welded to the tank shall be externally welded.

3. Top cover shall be totally sealed without bolts. The cover shall be in such a design and construction as to prevent the ingress of moisture and accumulation of rain water.

4. Tank shall be tested at different stages to ensure that there is no leakage. The criterion of testing shall be as under:

   a) Penetrant shall be applied on all welding joints and then the joints shall be tested for any leakage by UV (Ultra Violet) rays.

   b) Assembly oil pressure test to be conducted as per clause 3 (E).

2.2.2 OIL VALVES:

High grade gun metal oil valves provided with engraved coloured indication to show whether in the open or closed position and with pad-locking devices to prevent an inadvertent operation.

The drain valves shall be fitted with plug or cover plate and having oil tight joint. The valve shall comply with BS 5154 (Series 'B').

2.2.3 OIL LEVEL INDICATOR:

The device to be vertically mounted for showing oil level in the transformer with N.O. read contacts, the device to be fixed into the filling pipe on the transformer cover with sealing gasket**.**

2.2.4 CONSTRUCTION DETAILS:

The overall construction and assembly of the transformer shall be robust and shall be rendered suitable for the arduous weather and load conditions under which these transformers will operate. The overall dimensions of the 1000 KVA transformer shall not exceed of 2.50 M (height) x 2.25 M (length) x 1.85 M (width) and the same for 1250 KVA & 1600 KVA transformers shall not exceed 2.5 M (height) x2.40 M (length) x 1.85 M (width).

3. TYPE TESTS ON EQUIPMENT:

The oil immersed distribution transformers [match or similar for any voltage between (11 KV to 33 KV) irrespective to any technical parameters stipulated in PQ document] shall undergo type tests as stipulated in the relevant IEC/BS, which shall be carried out in full compliance with the standard [as clause 1. general (MINISTRY SYSTEM, CLIMATIC CONDITIONS, STANDARD SPECIFICATION] from an independent acknowledged international testing laboratory (Type test certificates issued from independent acknowledged international testing laboratory (ANY MEMBER OF STL LIAISON - ASTA, CESI, CPRI, ESEF, JSTC, KEMA, KERI, PEHLA, SATS, STLNA, VEIKI or, ZKU)) or (any international reputed electrical testing accreditation authority has certificate ISO/IEC 17025-The laboratory shall be accredited with the international standard ISO/IEC 17025 by an Accreditation Body that is itself accredited in accordance with ISO/IEC 17011, either through the GCC Accreditation Center or through the International Laboratory Accreditation Cooperation (ILAC)). (type test in factory is not accepted).

The following type tests shall be carried out on transformers of both types:-

A) Dynamic ability to withstand Short Circuit Test on one transformer as per IEC 60076-5

B) The transformer shall be capable of sustaining a three phase symmetrical short circuit current on the LV side with the fault power being maintained on the HV side and without damage to the transformer for a period of three (3) seconds. This is to be verified by testing, and not by calculations. So, in addition to the above mentioned test No. (3.A) The transformer is to be tested for three shots short circuit test for a current duration of (3) seconds on tap position No.3.

   The percentage change in the transformer reactance before and after the short circuit withstand test is to be mentioned in the Test Certificate, and should be in accordance with the IEC No. 60076-5

C) Temperature rise tests on one transformer in accordance with British Standard Specification No. 171 for :

   I. Continuous maximum rating under Kuwait conditions (the test shall be done under the actual ambient temperature of 55º DEGREE CENTIGRADE).

   II. Equivalent to B.S.S Continuous maximum rating.

D) Impulse voltage withstand test on one transformer. The test shall be applied on each H.V. winding and shall be in accordance with IEC 60076-3

The following additional test shall be carried out on transformers of hermetically sealed type only:-

E) After oil filling in completely assembled transformers, pressure shall be applied 1.25 times normal operating pressure and internal pressure shall be observed for at least 6 hours. If there

is no pressure drop during this period of 6 hours, then the tank can be assumed leak proof.

4. DATA TO BE SUBMITTED:

The manufacturer of the transformer shall submit the following technical data for the pre-qualification study.

1. All the technical schedules filled correctly and fully.

2. General layout drawing to Scale and in A-1 sized sheets showing front elevation, side elevation and plan elevation with all the fittings and major dimensions for each size of transformers.

3. General layout drawing to Scale and in A-1 sized sheets showing construction details as required in clause (2.1.24 & 2.2.4: "Construction Details") of the specification, for each type and size of transformers.

4. General layout of tap-changer showing constructional details for each size of transformers.

5. General layout of H.V. & L.V. cable end boxes with all fittings and major dimensions for each size of transformers.

6. Detailed drawings showing core & winding construction, insulation etc. for each size of the transformers.

7. Separate drawing for each component (Conservator, H.V & L.V glands plate for cable boxes, Skids, Earthing details, Pressure relief valve , Breather, Thermometer, Radiator, L.V & H.V Cable clamps, Common integrated safety device, Inter-trip relays (Three elements), Rating plate, All drain valves, Oil level indicator, H.V bushing & L.V Monoblock)

8. Type test certificate along with complete type test reports for the transformers as clause (3) (TYPE TESTS ON EQUIPMENT)

9. Other documents as specified in different clauses of the specification

SCHEDULE "A"
TECHNICAL SCHEDULE & GUARANTEED PARTICULARS FOR
OIL IMMERSED DISTRIBUTION TRANSFORMERS (CONSERVATOR TYPE)

Sl. No.	Details of Transformer	Unit	Particulars		
1.	Continuous rating under Kuwait conditions	KVA	1000	1250	1600
2.	Equivalent IEC/BSS continuous rating	KVA			
3.	Normal voltage ratio at normal taping.				
4.	Maximum temperature rise at normal rating:				
5.	Primary winding: a) Shape of copper conductor b) Cross-sectional area of copper conductor c) Type of winding (*)	Sq.mm			
6.	Secondary winding: a) Shape of copper conductor. b) Cross-sectional area of copper conductor c) Type of winding (*)	Sq.mm			
7.	Iron loss at normal volt & frequency on normal tapping.	KW			
8.	Copper loss at normal full load and 75 degree C.	KW			
9.	Magnetizing current (normal volts) approx.	% F.L.C.			
10.	Impedance voltage at normal tapping and frequency and at 75 degree C. and normal rating.	%			
11.	Regulation at 1.0 P.F.	%			
12.	Regulation at 0.8 P.F.	%			
13.	Efficiency at 125% load at 0.8 P.F. Efficiency at 100% load at 0.8 P.F. Efficiency at 75% load at 0.8 P.F. Efficiency at 50% load at 0.8 P.F.	% % % %			
14.	Watts loss per Kg. of iron at 1.6 TESLA	Watts			
15.	Watts loss per kg of copper at rated load	Watts			

* To be clearly indicated foil/sheet or wire type winding.

SIGNED : .....
(MANUFACTURER)

NAME : .....

ADDRESS : .....

SIGNED : .....
(LOCAL AGENT)
(if applicable)

NAME : .....

ADDRESS : .....

DATE : / /20 DATE : / /20

SCHEDULE "A" (CONT'D…)
TECHNICAL SCHEDULE & GUARANTEED PARTICULARS FOR
OIL IMMERSED DISTRIBUTION TRANSFORMERS (CONSERVATOR TYPE)

Sl. No.	Details of Transformer	Unit	Particulars		
16.	Maximum flux density in core	TESLA			
17.	Maximum flux density in yoke	TESLA			
18.	Maximum current density in primary winding	Amps/sq.m			
19.	Maximum current density in secondary winding	Amps/sq.m m			
20.	Number of tappings: Tapping arrangement: a) Increasing ratio b) Decreasing ratio c) Size of step	 % % %			
21.	Weights: a) Core and winding b) Complete transformer including oil c) Complete transformer excluding oil d) Transformer as shipped e) Quantity of oil approx. (excluding conservator) f) Quantity of oil approx. (including conservator) g) Grade of oil (with ref. To BSS)	 M/tons M/tons M/tons M/tons Litres Litres			
22.	Overall Dimensions: a) Height b) Length c) Width	 m m m			

SIGNED : SIGNED :

(MANUFACTURER) **(LOCAL AGENT) (if applicable)**

NAME : NAME :

ADDRESS : .....

DATE : / /**20**

ADDRESS : .....

DATE : / /**20**

SCHEDULE "A" (CONT'D…)

TECHNICAL SCHEDULE & GUARANTEED PARTICULARS FOR OIL IMMERSED DISTRIBUTION TRANSFORMERS (CONSERVATOR TYPE)

Sl. No.	Details of Transformer	Unit	Particulars		
23.	Thickness of transformer tank: a) Side walls b) Bottom c) Top	 m m m m m m			
24.	Type of common integrated safety device	One			

SIGNED : .....

(MANUFACTURER)

NAME :

ADDRESS : .....

DATE : / /**20**

SIGNED : .....

(LOCAL AGENT)
(if applicable)

NAME :

ADDRESS : .....

DATE : / /**20**

SCHEDULE "B"

TECHNICAL SCHEDULE & GUARANTEED PARTICULARS FOR

OIL IMMERSED DISTRIBUTION TRANSFORMERS (HERMETICALLY SEALED)

Sl. No.	Details of Transformer	Unit	Particulars		
1.	Continuous rating under Kuwait conditions	KVA	1000	1250	1600
2.	Equivalent IEC/BSS continuous rating	KVA			
3.	Normal voltage ratio at normal taping.				
4.	Maximum temperature rise at normal rating:				
5.	Primary winding: a) Shape of copper conductor b) Cross-sectional area of copper conductor c) Type of winding (*)	 Sq.mm			
6.	Secondary winding: a) Shape of copper conductor. b) Cross-sectional area of copper conductor c) Type of winding (*)	 Sq.mm			
7.	Iron loss at normal volt & frequency on normal tapping.	KW			
8.	Copper loss at normal full load and 75 degree C.	KW			
9.	Magnetizing current (normal volts) approx.	% F.L.C.			
10.	Impedance voltage at normal tapping and frequency and at 75 degree C. and normal rating.	%			
11.	Regulation at 1.0 P.F.	%			
12.	Regulation at 0.8 P.F.	%			
13.	Efficiency at 125% load at 0.8 P.F. Efficiency at 100% load at 0.8 P.F. Efficiency at 75% load at 0.8 P.F. Efficiency at 50% load at 0.8 P.F.	% % % %			
14.	Watts loss per Kg. of iron at 1.6 TESLA	Watts			
15.	Watts loss per kg of copper at rated load	Watts			

* To be clearly indicated foil/sheet or wire type winding.

SIGNED : ..... SIGNED : .....

(MANUFACTURER) **(LOCAL AGENT) (if applicable)**

NAME : ..... NAME : .....

ADDRESS : .....

ADDRESS : .....

DATE : / /**20**

DATE : / /**20**

SCHEDULE "B" (CONT'D…)

TECHNICAL SCHEDULE & GUARANTEED PARTICULARS FOR

OIL IMMERSED DISTRIBUTION TRANSFORMERS (HERMETICALLY SEALED)

Sl. No.	Details of Transformer	Unit	Particulars		
16.	Maximum flux density in core	TESLA			
17.	Maximum flux density in yoke	TESLA			
18.	Maximum current density in primary winding	Amps/sq.m			
19.	Maximum current density in secondary winding	Amps/sq.m m			
20.	Number of tappings: Tapping arrangement: a) Increasing ratio b) Decreasing ratio c) Size of step	 % % %			
21.	Weights: h) Core and winding i) Complete transformer including oil j) Complete transformer excluding oil k) Transformer as shipped l) Quantity of oil approx. (excluding conservator) m) Quantity of oil approx. (including conservator) n) Grade of oil (with ref. To BSS)	 M/tons M/tons M/tons M/tons Litres Litres			
22.	Overall Dimensions: c) Height d) Length c) Width	 m m m			

SIGNED : .....

(MANUFACTURER)

NAME : .....

ADDRESS : .....

SIGNED : .....

(LOCAL AGENT)
(if applicable)

NAME : .....

ADDRESS : .....

DATE : / /20

DATE : / /20

SCHEDULE "B" (CONT'D…)

TECHNICAL SCHEDULE & GUARANTEED PARTICULARS FOR

OIL IMMERSED DISTRIBUTION TRANSFORMERS (HERMETICALLY SEALED)

Sl. No.	Details of Transformer	Unit	Particulars		
23.	Thickness of transformer tank:				
	c) Side walls	mm			
	d) Bottom	mm			
	c) Top	mm			
24.	Type of common integrated safety device	One			

SIGNED : (MANUFACTURER)

NAME :

ADDRESS :

DATE : / /20

SIGNED : (LOCAL AGENT) (if applicable)

NAME :

ADDRESS :

DATE : / /20