31 POWER DISTRIBUTION TRANSFORMERS

31.1 GENERAL

31.1.1 Scope

1 This Part specifies the requirements for Power Distribution Transformers.

31.1.2 Description

1 Power Distribution Transformers shall be provided as specified.

31.1.3 References

1 Power Distribution Transformers shall be provided in accordance with QGEWC latest specifications, and the International Standards referred to here below: Power Distribution transformers shall be submitted for QGEWC approval.

BS 2562 .....Specification for Cable Boxes for Transformers and Reactors.

BS 3692.....ISO Metric Precision Hexagonal Bolts, Screws and Nuts.

BS 381C .....Specification for Colours for Identification, Coding, and Special Purposes, (BS 381C SET:)

BS 4190.....ISO metric black hexagon bolts, screws and nuts. Specification.

BS 6435.....Specifications for Unfilled Enclosures for the Dry Termination of HV Cables for Transformers and Reactors.

BS 7079.....General introduction to standards for preparation of steel substrates before application of paints and related products

ISO 8501 .....Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness

ISO 8503------.....Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates

BS Code of Practice 1010.

EN 60076 .....Power transformer.

IEC 60076 .....Method of Measurement of Transformer and Reactor Sound Levels.

ISO 12944 .....Paints and varnishes — Corrosion protection of steel structures by protective paint systems —

ISO 14713 .....Zinc coatings — Guidelines and recommendations for the protection against corrosion of iron and steel in structures

ISO 1461 .....Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods.

IEC 60076- IEC 60078----Power Transformers

ESI Standard 98-1.

IEC 296/BS 148 .....Insulating Oil for Transformers and Switchgear.(IEC-296 Specification for unused mineral insulating oils for transformers and switchgear; IEC 60296 Fluids for electrotechnical applications . Mineral insulating oils for electrical equipment)

IEC-354 .....Loading guide for oil-immersed power transformers; (IEC-60076-7 Power transformers - Part 7: Loading guide for mineral-oil-immersed power transformers)

IEC 529/BS 5420 ..... Specification for Degrees of protection Provided by Enclosures; (IEC 529 Degrees of Protection Provided by Enclosures (IP Code); IEC 60529 Degrees of protection provided by enclosures (IP Code))

IEC 726 .....Cast risen transformers; (IEC 726 Dry-Type Power Transformers; IEC 60076-11 Power transformers - Part 11: Dry-type transformers)

QGEWC (KAHRAMAA) latest requirements for Power distribution transformers.

31.1.4 Submissions

1 Tender information and drawings shall be submitted to QGEWC (KAHRAMAA) through the supervising consultant. Submissions shall be in accordance with the requirements of the latest QGEWC specifications.

2 The following documents to be submitted to QGEWC (KAHRAMAA) for approval:

(a) Product data and catalogue for each product specified, detailed description of construction, including dimensioned plans, sections, and elevations. Show minimum clearances and installed devices and features, weight and bearing forces, incoming and outgoing terminals and provisions for feeder terminations.

(b) Wiring diagrams of transformers and accessory components, differentiating between manufacturer-installed and field-installed wiring and cabling.

(c) Type tests, Routine Tests and Special Tests are to include measurement of noise level, winding resistance, voltage ratio, check of polarity/vector group, impedance voltage, load loss, no-load loss, no-load current, induced overvoltage withstand test and separate source voltage withstand test.

(d) Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of relevant completed projects with project names and addresses, and names and addresses of the respective Engineers and Government.

(e) Shop and construction drawings including foundation details, grouting holes, base frames and installation details. All civil works are to be approved by END, Civil Section (EWD).

(f) Operation and maintenance data for materials and products.

(g) Undertaking form signed by the Supervisory consultant, supplier, manufacturer in original form.

(h) Spare parts list

(i) KAHRAMAA/QGEWC Scheme number and Building Permit number.

(j) Any additional information as required by QGEWC.

(k) It is the Contractor responsibility to provide al QGEWC/KAHRAMAA requirements in time in order to obtain the approval in time.

31.2 PRODUCTS

31.2.1 General

1 The Contractor shall supply, install, test and commission Power Distribution Transformers as specified.

2 The transformers shall be ONAN outdoor, mineral oil filled, in compliance with QGEWC latest standards.

3 The Contractor shall be responsible for obtaining the latest version of QGEWC specification for Power Distribution Transformers and shall be responsible for obtaining QGEWC approval.

4 The product selected and proposed shall include manufacturer's instructions that indicate application conditions and limitations of use stipulated by the product testing agency specified under Regulatory Requirements.

5 The Contractor shall provide full technical details of the proposed transformers together with a copy of all relevant standards for review and comment by the Engineer, prior to submission to QGEWC for approval.

31.3 INSTALLATION

31.3.1 General

1 Comply with QGEWC electrical safety codes and the manufacturer's written installation instructions.

2 A contractor who is currently approved by QGEWC must carry out installation. The written approval of QGEWC for the contractor to carry out the work must be forwarded to the Engineer, and be acknowledged by him, before any installation work commences.

3 Equipment Bases: ensure that concrete bases and foundations provided for installation of equipment are constructed in accordance with approved shop and construction drawings and equipment manufacturer’s drawings and that holes for fixings bolts and provisions for passage of cables etc. are provided as required.

4 Cable Trenches: ensure that trench construction and covers provided for installation of power and control cables are in accordance with approved shop and construction drawings.

5 Cabling and Wiring: install cables, wires, raceways, supports, cable ends and termination fittings in accordance with the appropriate sections of the Specification and/or as shown on the Drawings. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

31.3.2 Earthing

1 Earth transformers shall be in accordance with Part 22.

31.4 QUALITY CONTROL AND TEST PROCEDURES

31.4.1 General

1 The manufacturer shall provide proof of a stringent Quality Control (QC) Plan or Inspection Test Plan (ITP). In particular the main equipment manufacturing stages sanctioned by appropriate tests such as: incoming components inspection, discrete sub-assembly tests and complete functional checks on the final product. Final inspection and calibration operations shall be documented in a report drawn up by the supplier's Quality Inspection department.

2 The Assembly shall not leave the manufacturer's works until the works test sheets have been duly approved and stamped by the Engineer and written permission is obtained for their dispatch to site.

3 Installer Qualifications: Engage an experienced Installer (approved by QGEWC) of high voltage electrical distribution equipment to perform the installation specified in this Section.

4 Standards: Comply with IEC 76, 354, 726 - Power Transformers and IEC 296 - Insulating Oil.

31.4.2 DELIVERY, STORAGE AND HANDLING

1 Spare Parts: provide spare parts as recommended by the manufacturer, for one year maintenance as expected under local conditions, and to allow for emergency replacement due to accidental breakage or failure.

2 Spare Parts for Oil Filled Transformers are to include, but are not limited to, one set of 11 kV bushings, drain plug, fragile parts which are subject to external damage and suitable quantity of make-up insulating oil.

3 Tools and Instruments: provide tools and instruments required for normal routine inspection, testing, operation and maintenance, recommended by the manufacturer.

31.4.3 Testing and Commissioning

1 Transformer to be tested in accordance with QGEWC requirements.

2 Schedule tests and provide notification at least one week in advance of test commencement.

3 Report: Submit a written report of observations and tests. Report defective materials and workmanship.

4 Tests: Include the following minimum inspections and tests according to the manufacturer's instructions. For test method and data correction factors, conform to applicable Standards.

(a) Inspect accessible components for cleanliness, mechanical, and electrical integrity, for presence of damage or deterioration, and to ensure removal of temporary shipping bracing. Do not proceed with tests until deficiencies are corrected.

(b) Inspect bolted electrical connections for tightness according to manufacturer's published torque values or, where not available, those of applicable Standards.

(c) Insulation Resistance: Perform megohmmeter test of primary and secondary winding-to-winding and winding-to-ground according to the following:

WINDING RATING (VOLTS)	MINIMUM TEST VOLTS (d.c.)	MINIMUM INSULATION RESISTANCE (MEGOHMS) FOR LIQUID FILLED
601 – 5.000	2.500	1.000
5.000 – 35.000	5.000	5.000

(i) Duration of Each Test : 10 minutes.

(ii) Temperature Correction : correct results for test temperature, deviation from 20 C standards.

(d) Turns Ratio: Measure between windings at each tap setting. Measured ratios deviating more than 0.5 per cent from the calculated ratio or the measured ratio for adjacent coil are not acceptable.

(e) Winding Resistance: Measure for winding at nominal tap setting. Measured resistance deviating more than 1 per cent from that of adjacent winding is not acceptable.

5 Test Failures: Compare test results with specified performance or manufacturer's data. Correct deficiencies identified by tests and retest. Verify that transformers meet specified requirements.

31.4.4 Final Adjustments

1 After completing installation and cleaning, touch up scratches and mars on finish to match original finish.

2 Adjust transformer taps to provide optimum voltage conditions at utilization equipment throughout the normal operating cycle of the facility. Record voltages and tap settings to submit with test results.

31.4.5 General

1 Environmental conditions shall be as specified in Section 1 Part 1 and/or QGEWC specifications as applicable.

END OF PART