

Works Information

The *works* includes design, detailed engineering, design review, manufacturing, testing (at *Contractor's* works), shipping , local transport, offloading, installation and assembly, oil filling, testing, commissioning and supply of fully functional power transformers as stipulated in the purchase order

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1. DESCRIPTION OF THE WORKS

The *works* includes design, detailed engineering, design review, manufacturing, testing (at *Contractor's* works), shipping, local transport, offloading, installation and assembly, oil filling, testing, commissioning and supply of fully functional power transformers as stipulated in the purchase order. The *works* is done strictly in accordance with:

1. The *Employer's* Specification 240-68973110, Specification for Power Transformers rated for 1.25 MVA and above with a highest voltage of 2.2kV and above, including documents listed in the Normative references
2. All accompanying commercial annexures and documents, and
3. Agreed test and inspection plan.

The *Employer* will ensure maintenance and operations are in accordance with manufacturer's instruction.

All bushing types, tap changers and accessories are as confirmed to the *Employer* within signed A & B Schedules.

The *Contractor* provides all engineering services, materials, tools, transport and labour necessary to provide the *works* for fully completed installation and commissioning.

The *works* includes the entire power transformer auxiliary equipment normally supplied with a new transformer including but not limited to conservator tank, breathers, HV and MV Bushings, Radiators and Fans, Tap Changer, Protection equipment, Instrumentation, Valves, controls and marshalling kiosks. These are elaborated on in the specification document - 240-68973110.

The *works* operates effectively for at least 40 years. (Expected design life).

2. WORK TO BE PERFORMED BY THE *CONTRACTOR* FOR THE *WORKS*

2.1 SCOPE OF WORK

2.1.1 *Contractors* Design Responsibilities

The *Contractor* performs the design and detailed engineering with drawings of the *works* and affected power transformer auxiliary equipment as detailed in the specification and accompanying schedules “A&B” for each unit.

The scope of supply includes but is not limited to the following:

- a) All windings,
- b) Tank and supporting structures,
- c) Core,
- d) Bushings ,
- e) Tap changer (on-load and/ off- circuit),
- f) Radiators, Fans (including motors) and cooling equipment,
- g) Protection equipment, such as PRV, Buchholz relays, etc
- h) Digital temperature Indicators, and mechanical WTI & OTI
- i) Bagged Conservator tank, (where applicable),
- j) Cabling to the Marshalling interface box from each transformer component,
- k) Kiosks , panels
- l) On-line Dissolved Gas Monitors (where applicable),
- m) Corrosion Protection painting,
- n) Dehydrating Breathers,
- o) Insulating Oil
- p) Transformer Fast Depressurisation and Fire Prevention Equipment (where applicable)

The *Employer* requires that all the individual units of the same SAP Number to be such that they are interchangeable with each other. This is also applicable to all the major components used for each individual unit of the *Works*, such as fans, bushings, oil pumps etc.

The *Contractor* shall, after the initial completion of the electrical and mechanical design, perform a design review with the *Employer* present before closure of the design detail. The *Contractor* must also provide outline drawings, design details and supporting documents of the *works*, to the *Employers Project Manager* within 6 weeks of the order placement, prior to ordering of any materials.

The *Contractor* provides the finalized outline drawings of the *works* to the *Project Manager* before closure of the detail design.

2.1.2 Manufacturing and Testing

During manufacturing, *the Employer*, reserves the right, at any time, to perform any product or equipment inspections as long as prior notice is given to the *Contractor*.

The *employer* reserves the right for its representatives to attend and witness the factory acceptance testing. The *Employer's Project Manager* must be notified 12 weeks before the intended test date.

2.1.3 Transport, Delivery , Off-loading and Installation

The *Contractor* is responsible for the transport of the transformer from the factory to the *Employer's* applicable Strategic Store, and for the commissioning and installation, of the transformer at the store. Transformers are to be delivered and off-loaded to the applicable store in accordance with A&B Schedules as stated in the Purchase Orders. On completion of the installation and commissioning, the transformer must be handed over to the *Employer* with all relevant test results and signed certificates.

In accordance with 240-68973110, a minimum of 2 impact recorders are to be fitted to the transformer before being loaded for transport at the factory. One impact recorder will be mounted inside the transformer tank, on the active part and the other recorder on the outside on the wall, of the transformer tank.

The recorder is only stopped or removed once the transformer is in its final position at the applicable store, witnessed by the *Employers'* representative and signed by both parties. One continuous record of horizontal, vertical and longitudinal shock and vibration is recorded starting at the commencement of lifting in the factory ex works and ending after final placement at the various sub-stations. The impact recorders remain the property of the *Contractor*.

All bushings must be transported with shock/impact indicators per the bushing specification 240-56062799.

The *Contractor* must provide information by means of completing the B schedule for the allowable "G" Force for the units in question, and indicate the tolerances applicable to this value.

The *Employer* requires results of the impact recorders at the following points to be included in the inspection and test plan:

- Loading at the factory
- After loading onto vehicle
- After off-loading on to plinth

In addition, Sweep Frequency Response Analysis tests (SFRA) and insulation resistance is done on all the windings prior to the transformer being loaded in the factory. The SFRA will be performed on the highest tap position, which in the case of Eskom Distribution transformers is tap position = 1. The SFRA and insulation resistance tests must be repeated at the once the transformer is in position at the applicable store. If the transformer is being supplied from abroad, the SFRA and insulation resistance tests must be repeated once on the ship and before offloading at the harbour. SFRA is aimed at the early detection of winding movement during the transportation of the transformer as well as to provide a baseline for future condition monitoring of the windings.

The *Contractor* must submit the results of the SFRA tests, insulation resistance and the, transport vibration and shock monitoring results, to the *Employer's Project Manager* and illustrates that no damage or movement of the windings has taken place during the transport process.

Dry-air pressure indication must be provided and must be readable from ground level.

Any information from checks performed by the *Contractor*, on the impact recorder and the dry-air system, during any transportation phases will be handed to the *Employer* for assessment, prior to the handing over of the unit.

Whenever plant is dispatched ex works, the *Contractor* must notify the *Project Manager* at least 6 weeks in advance of the proposed transport dates, giving the relevant dates of the total transport, a description of the plant, the packing list, the mass, and any other information deemed necessary for identification.

2.1.3 Testing and Commissioning

The Contractor is responsible for the comprehensive installation of the transformer, including all the auxiliary plant necessary for the proper operation of the transformer such as, but not limited to, the bushings, tap changer, conservator tank, radiators, marshalling kiosk, buchholz relay, etc,

The *Contractor* must perform all the necessary testing and inspections on the plant to ensure safe commissioning of the *works*, and must ensure that all the tests listed in 240-68973110 are performed and the results properly documented.

The *Contractor* must maintain a safe and clean condition working environment for the duration of the *Contract* whilst at Eskom Strategic Stores.

2.2 QUALITY ASSURANCE AND QUALITY CONTROL

2.2.1 Reviews

Design review meetings are scheduled to ensure that there is a common understanding of the specific requirements and the applicable standards. These review meetings are structured as detailed in 240-68973110, and is scheduled by the *Contractor* at least 12 weeks before the design review meeting. This period will be 6 weeks for the design reviews for local factories.

The design review meeting will be held at the manufacturer's works or as otherwise specified.

The *Contractor* minutes all-important information during the design review process and ensures that all outstanding actions are addressed and agreed upon by all parties before manufacturing starts.

2.2.2 Quality

Power transformers are to be manufactured in accordance with a quality assurance management system complying with the latest ISO 9001 and ISO 14001 standards, and must be accepted by the *Employer*. The *Employer* reserves the right to conduct surveillance and periodic inspections at the *Contractor's* works during the manufacturing phase. The *Contractor* submits his Process Quality Plans (PQPs) to the *Employer* for acceptance 6 weeks after the Purchase Order date, and includes all witness and hold points. Draft copies are submitted and discussed during the design review phase.

The Contractor compiles PQPs to cover the following processes:

- Manufacturing (includes the design stages and all processes during manufacturing, up to and including testing). This quality documentation must be agreed to by not later than the design freeze date.
- Transport ex-works from factory up to the final position at the applicable store. This quality documentation must be agreed to by not later than one (1) month prior to FAT date.
- Assembly and commissioning at site. This quality documentation must be agreed to by not later than FAT date.

The PQPs must include and provide for the following:

- Details of the process and reference to the project
- Acceptance by the Employer
- A list of signatures (and reference to the owner) which will be used to complete all the steps for the process. This is necessary for identification of the relevant Authority for signing off certain steps or tasks in the process.
- Hold Points and Witness Points as required by various steps in the processes.

- Reference to certificates or any important documentation e.g acceptance criteria for inspection points or tests.
- The main process is broken down into individual tasks or steps, to a point as to reflect logical building blocks necessary to complete the main process.
- For each step/task there must be place for signature (with date of signature) of a relevant Authority (Supervisor, Inspector etc.).

2.2.3 Factory Testing

The scope is detailed in the A&B schedules, the standard 240-68973110 and the acceptance criteria shall be in accordance with the relevant and latest IEC standard as per date of the order.

The *Employer* reserves the right to be present during any or all of tests. The *Contractor* shall inform the *Employer* of the testing date 12 weeks in advance.

The *Employer's Project Manager* only releases a power transformer for despatch when all tests have been successfully completed, and all the necessary quality documentation completed. The *Employer's Project Manager* must give the instruction for the despatch within 48 hours from successful test.

2.3 MISCELLANEOUS

2.3.1 Tools

The *Contractor* provides any special tools or keys, if any, that are required for maintenance or affecting adjustments. Excluded are special tools required for long-term tap changer maintenance.

2.3.2 Blanking Plates

The *Contractor* supplies the transformers with all the blanking plates, which should be kept as the property of the *Employer*. The blanking plates must be painted to the same specification as the transformer tank.

2.3.3 Recommended Spares List

The *Contractor* supplies a list of recommended spares for the *works* for the transformer after final design. This list includes item descriptions, reference numbers quantity recommended, prices, and guaranteed supply period. The *Contractor* also details the recommended routine maintenance required to maintain maximum availability. Where possible, the local supply of plant and material must be indicated.

2.3.4 Summary table of documentation

The *Contractor* supplies the following minimum documentation:

DOCUMENT NAME	COPIES REQUIRED	WHEN TO SUBMIT	REFER TO SECTION
QA Manual	2	Ex-works + 2 weeks	2.2.2
Operating & Maintenance Manual (Training)	2	Before commissioning of the <i>Works</i>	2.4
Operating & Maintenance Manual	5	Ex-works + 2 weeks	240-68973110 and 240-60725684
Soft copy of above	1	Ex-works + 2 weeks	

2.4 TRAINING

The *Contractor* shall provide training to the *Employer*. The training shall be given at different levels

Site staff - It is the responsibility of the Contractor to provide training to the Employer's personnel in the operation and maintenance of the works. The Contractor provides a list of recommended training activities including duration and location.

The Contractor provides two (2) Master Training Manuals and an electronic media like video is accepted. Each person trained receives his/her own individual copy of the training manual, which allows him/her to make notes in the manual during the training sessions. The Project Manager will provide the number of Employer's personnel to be trained up to a maximum of 15 people and duration up to two days.

Training is given to the following site staff

- Store people for units being delivered and erected for storage
- Site staff responsible for maintenance for units being installed and commissioned at the Employer's premises.

Training must be completed before the hand-over of the works. The Contractor shall submit proof of training conducted as part of the handing over documents.

Engineering staff: The training for engineers shall be arranged on ad-hoc basis and this shall be in line with the design, manufacturing, testing, and life management of transformers. The *Contractor* shall bring proposal to the *Employer* for acceptance. During each contract review, the OEM shall produce the records of the training done.

2.5 WARRANTY

The warranty is only applicable provided that the transformer has been installed by, or has been under the supervision of an engineer/technician approved by the respective factory. The preparation for storage, or moving to required destination after storage, must be supervised by the manufacturer's supervisor or an engineer / technician approved by the respective manufacturer.

In the case where the site is not ready for installation and commissioning, the *Employer* will be responsible for the unit until the site is ready. The *Employer* has to adhere to the storage procedure of the *Contractor*. In all other circumstances provided the *Employer* had handed the unit back to the *Contractor*, the *Contractor* remains responsible for handling and storage of items.

The equipment is handled and maintained in compliance with the manufacturer's instructions and the equipment is not exposed to the conditions other than those defined by provisions of the Contract.

Normal wear and tear, inadequate maintenance, conditions of Force Majeure and any other damage that cannot be considered as *Contractor's* fault are not covered by warranty.

2.6 SCHEDULES A & B

2.6.1 Schedule A: Specific requirements by the *Employer's*.

2.6.2 Schedule B: Guarantees and technical particulars of equipment offered by the *Contractor*. The *Contractor* guarantees the values entered in Schedule B.

SCHEDULE A&B takes precedence over all other specifications.

3. ACCOUNTABILITY FOR THE WORKS INSTALLATION

3.1 SITE WORK

The *Employer* performs the following specific tasks at the strategic store:

- a) Bonding of the transformer bushings to ground using the appropriate materials.
- b) Earthing of the transformer tank.
- c) Cabling from Marshalling interface box.
- d) Connection of the tap changer heater to the relevant supply
- e) Provision of unobstructed access to site in order to ensure completion of the works.

The *Contractor* is responsible for all cabling from the transformer and its components to the marshalling interface box as well as the supply and installation of all components necessary for the completion the *works*.

3.2 SITE SERVICES

The *Employer* will provide all relevant information pertaining to the site.

4 PROGRAM

The *Contractor* submits a first program to the *Employer* for acceptance within six weeks of the Purchase Order date.

The program contains all activities, durations, resource details, start date and completion date and relevant milestone dates.

The program is submitted utilising MS Projects format.

5 COMPLETION

5.1 SECTIONAL COMPLETION

The following phases of work are to be completed for sectional completion for the transformer

5.1.1 Design freeze

- Design review has been completed
- The design in totality according to the *Works Information*
- Single line, general arrangement and detail drawings
- All new plant interfaces
- Commissioning / re-commissioning procedures
- Quality Assurance plans
- Inspection and test plans
- Manufacturing PQP's

5.1.2 Installation

- Signed clearance and test certificates
- One set of red lined (as-built) drawings available
- Completed PQPs
- Training manuals available
- Personnel fully trained
- Operating and maintenance manuals delivered
- No defects and installation according to *Works Information*
- Oil samples taken before and after installation of the *works*

5.1.3 Unit completion

- No outstanding defects.
- All documentation as required in Section 2.3.4 delivered.
- All Quality Control documentation signed off, with no outstanding issues to address.

5.2 WORK PROVIDED BY THE CONTRACTOR BY THE COMPLETION DATE

The following *works* are provided by the *Contractor* in accordance with the *Works Information*:

- a. Design
- b. Supply whole of the *works*
- c. Deliver whole of the *works*
- d. Removal of all debris, tools and equipment used during erection of the *works*.
- e. Corrosion protection on whole of the *works*
- f. Installation and Commissioning of the *Works*
- g. Operating and Maintenance Manuals
- h. *Employer* Staff Training and Training Manuals
- i. "As Built" Drawings for whole of the *works*
- j. All the Quality Documentation signed off with no outstanding actions to be resolved

6. QUALITY MANAGEMENT

The *Contractor* demonstrates compliance to the applicable Quality documents as referenced in the specifications.

The *Contractor* authorises all documents submitted as demonstration of compliance to the quality requirements of the contract.

Before Plant is placed in service the *Contractor* is to certify that it is in safe condition.

7. LABOUR

All staff whether, permanent, non-permanent, part-time, sub-contracted, and labour only supply, is the *Contractor's* responsibility in terms of supervision and control.

8 RESTRICTIONS APPLICABLE TO THE CONTRACTOR

8.1 DETAILS OF OTHER CONTRACTORS

The *Contractor* could be interfacing with the following Contractors

- The *Employer's* Protection and Metering department (PT&M)
- The *Employer's* maintenance departments
- Any other

9 ENTITLEMENT TO SITE MATERIALS

All Plant and Material that are removed remains the property of the *Employer*. It is important to note that the *Contractor* stores the removed Plant and Material at a dedicated area.

10 ACCOUNTS AND RECORDS

10.1 THE FOLLOWING INFORMATION MUST BE AVAILABLE ON THE INVOICE:

- The registered name of the company
- The VAT registration number
- The *Employer's* Contract & Purchase Order number
- The invoice sequence number
- The *Employer's* VAT registration number
- Contractor statement reflecting all payments and status

11 DRAWINGS

Applicable drawings for this contract are contained in the Annexures.

Additional drawings required to supply the works can be applied for by the *Contractor*.

All new drawings become the property of the *Employer*.

All drawings provided by the *Contractor* must adhere to 240-68973110.

12 SPECIFICATIONS AND SPECIAL REQUIREMENTS

12.1 Specifications

The following standards and those listed in the annexure; contain provisions that, through reference in text, constitute requirements of this document, including reference documents referred to in these standards. The revision as at the date of *Contract* placement is applicable. The *Contractor* is responsible for obtaining the latest revision of these documents.

12.2 Special requirements

12.2.1 Transportation requirements and limitations

The transport limitations are reflected in the drawings and additional information provided in Annexure B.

12.2.2 Notification Time

For local factories, the *Contractor* will inform the *Employer* 6 weeks prior to F.A.T's. For factories outside the borders of South Africa, the *Contractor* will inform the *Employer* 12 weeks prior to F.A.T's.

12.2.3 Factory Performance Figures

The *Contractor* must provide the *Employer* with the factory performance figures every 6 months. The annual performance figures must have been audited by an independent body. The *Contractor* must inform the *Employer* of any deviations from the quoted Factory failure rates or on time delivery rate.

13 ANNEXURES:

Annexure A

Documentation, Configuration Management, and Drawings