

Works Information

THE DESIGN, DETAILED ENGINEERING, MANUFACTURE, TESTING (AT *CONTRACTOR'S WORKS*), SUPPLY, DELIVERY AT POINT(DAP), INSTALLATION, AND COLD COMMISSIONING OF A RANGE OF COMPLETE FULLY FUNCTIONAL POWER TRANSFORMERS AND SHUNT REACTORS AT VARIOUS SITES INCLUDING STORAGE SITES

(TRANSMISSION UNITS)

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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 off-loading, , installation and assembly, oil-filling, testing, and commissioning a range of complete fully functional power transformers and shunt reactors at various sites (including storage sites).

- The *works* is done strictly in accordance with the *Employer's* Specifications: Document number 240-68973110 - , Specification for Power Transformers rated for 1.25MVA and above and with highest voltage of 2.2kV or above, and,
- Document number 240-60725684 Specification for oil immersed HV and EHV power reactors, and
- All documents referenced in the Normative references of both specifications which must be complied with, and
- All accompanying commercial annexures and documents
- Agreed Inspection and Test Plan.
- The *Employer* will ensure maintenance and operations are in accordance with manufacturer's instruction.

The *Contractor* provides all engineering services, material, tools, transport and labour necessary to provide the *works* for installation, testing 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 LV Bushings, Radiators and Fans, Tap Changer, Protection equipment, Instrumentation, Valves, controls and marshalling kiosks. These are elaborated on in the specification documents.

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. Contractor's Design and Design Review 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 signed schedule "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)
- f) Radiators, Fans and cooling equipment
- g) Protection equipment related to the transformer, such as PRD,
- h) Buchholz relays, etc.
- i) Temperature Indicators,

- j) Bagged Conservator tank,
- k) Cabling – transformer components to marshalling kiosk only.
- l) Kiosks , panels
- m) On-line Dissolved Gas monitors, where applicable.
- n) Corrosion Protection painting
- o) On-line Drying Systems, where applicable.
- p) Transformer Fast Depressurisation and Fire Prevention equipment, where applicable
- q) Insulating Oil

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 detail design, and provide outline drawings, design details, and supporting documents, of the works to the *Project Manager* within 6 (six) weeks of order placement, prior to ordering 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. Contractor's Manufacturing and Testing Responsibilities

The *Employer's* participation in the design review and the factory acceptance testing in no way absolves the *Contractor* of any of his contractual obligations.

During Manufacturing, the *Employer*, reserves the right at any time to perform any product or equipment inspections, after giving prior notice to the *Contractor*.

The *Employer*, reserves the right for its representative to attend and witness the Factory Acceptance Testing, and the *Project Manager* must be notified at the latest 12 (twelve) weeks before the intended test date.

2.1.3. Transportation, Delivery, and Off-loading

The *Contractor* notifies the *Project Manager* at least six (6) weeks in advance of the proposed despatch date from factory. Giving the relevant dates of FOB (where applicable) or final delivery date with description of the plant, the packing list, the mass, and any other information deemed necessary for identification.

The *Contractor* is responsible for total transport from the foreign factory up to DAP (Delivered at Place). Transformers must be handed over to the *Employer* on completion with all relevant tests and signed certificates after installation and assembly.

A minimum of 2 impact recorders are fitted to all transformers before being loaded for transport at the factory. One impact recorder will be mounted inside

the transformer tank, on the active part on the middle limb mark and the other recorder on the outside of the transformer tank. Under no circumstances will the *Employer* open the transformer to take any readings from the impact recorder inside the transformer. The transformer will only be opened with agreement of the *Contractor* and when a representative of the *Contractor* is present for the purpose of taking impact recorder readings.

The recorder is only stopped or removed once the transformer is finally positioned at the various locations per individual orders. One continuous record of horizontal, vertical and longitudinal shock and vibration is recorded starting at the commencement of lifting in the factory after completion of the HV test and ending after final placement at the various locations mentioned per individual orders.

Final impact recorder downloads will be done by Contractor once the transformer is in its final position and included in the final PQP.

The *Contractor* is to conduct various tests as specified in the specifications 240-6897110 and 240-607256684 and their normative references the applicable tests at the various hold points.

The *Contractor* must place the transformer on its final position on the plinth and is also responsible for supplying Malthoid.

The impact recorders remain the property of the *Contractor*.

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

The SFRA and insulation resistance measurement tests must be performed at the following critical points, where applicable

- At factory in a dry state in a transport condition before dispatch. For transformers, they shall be tested in the tap position where all the winding turns are in the circuit.
- At OEM Port before *FOB* for shipping.
- At RSA port of discharge
- At site before installation.
- At final position

These will be further done at any point and time when an incident like bumping or any condition presenting abnormal impact on the tank body and/or active part is experienced.

The test results shall be immediately communicated to the *Employer's* Project Manager. The test report from each point shall be made available to the *Employer's* Project Manager before the unit arrived to the next point of testing. This is required as an early confirmation that the unit did not sustain any damage during the covered transportation segment(s)

These tests are 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.

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

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.

2.1.4. Installation and Commissioning

The *Employer* shall make available the space for storage of components as reasonably close as possible to the bay of installation.

The *Employer* is to ensure that the plinth is level and the *Contractor* shall satisfy himself that the plinth is adequate for the intended transformer installation.

Installation must be comprehensive and include 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, pumps, marshalling kiosk, buchholz relays, etc.

The bund walls are removed and re-instated by the *Employer*.

The *Contractor* maintains a safe and clean condition working environment for the duration of the *Contract* whilst at site and is bound by Eskom safety rules at that site

The erection of temporary bund walls for oil storage is to be at the *Contractor's* discretion provided that it complies with the current environmental legislation.

The oil storage in iso-tanks and the oil tests are as per Eskom's test requirements as per A&B Schedule and including Oil specification 240 - 75661431

Employer's Dry air machine specification must be adhered to.

2.1.5. Handing Over

The *Contractor* will hand over the transformer with signed certificates and all ITP's (Manufacturing, Transport, Installation and testing) at place of final installation or storage after completion.

2.2. QUALITY ASSURANCE AND QUALITY CONTROL

2.2.1 Reviews

Design review meeting is to be scheduled in consultation with the Project Manager at the factory after completion of electrical design to ensure that there is a common understanding of the specific requirements and the applicable standards.

The review meeting is structured as detailed in 240-68973110, taking place at the *Contractor's* factory and is scheduled by the *Contractor's Project Manager* at least 12 (twelve) weeks before the design review meeting. This period shall be 6 weeks for design review meetings with factories located within South Africa.

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

The *Contractor* ensures that the *Employer's Project Manager* is furnished with a copy of the design review minutes within two (2) weeks from date of the meeting.

In the event of a Scope Change with a cost implication during design review stage, the *Eskom Project Manager* must be notified by the *Contractor's Project Manager* immediately to obtain a mandate to approve within the *reply period* as stated in the contract.

All data/information/drawings provided for design purpose will be treated as confidential and will only be used for the purpose of executing this contract. None of this information will be handed to a third party, including *Employer's* employees who are not directly involved in the design review responsibility and/or process. All parties concerned must sign a non-disclosure and confidentiality form.

2.2.2 Quality

The power transformer is manufactured in accordance with a quality assurance management system complying with the latest ISO 9001 and ISO 14001 standards, which 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 PQP's to the *Project Manager* for acceptance 6 weeks after the Contract Date, and includes all witness and hold points. Draft copies are submitted and discussed during the design review phase.

The *Contractor* compiles Process Quality Plans (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 (until final position)
- 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 Process Quality Plan (PQP) 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 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 standards 240-68973110 and 240-60725684 plus 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 (twelve) weeks in advance.

The *Project Manager* only releases power transformers and shunt reactors for despatch when all tests have been successfully completed.

The *Employer's Project Manager* must give instruction for release 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	

2.3 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 handover of the works. The Contractor shall submit proof of training conducted as part of the handing over documents. The contractor must issue a certificate to each individual who was trained with a summary of the competencies covered.

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.

2.4 Warranty

The manufacturer must warrant the transformer free of defects provided the installation is carried out by the *Contractor*, or under the supervision of an personnel approved by the factory. The Warranty for design defects must be applicable under any circumstances.

The same applies to transformers going into storage, with a further pre-requisition, that the preparation for storage, or moving to required destination after storage, is supervised by manufacturer's supervisor.

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.

2.5 SCHEDULES A & B

2.5.1 Schedule A: Specific requirements by the *Employer*.

2.5.2 Schedule B: Guarantees and technical particulars of equipment offered by the *Contractor*.

The *Contractor* guarantees the values entered in Schedule B

Schedules A & B take precedence over all other specifications.

3. ACCOUNTABILITY FOR THE WORKS INSTALLATION

3.1 INSTALLATION WORK

The *Employer* performs the following specific tasks.

- a. *Employer* will be responsible for the connection of the LV cables (not LV bushing terminals) to the rest of the plant, such as those to the Protection Scheme. This is true also for the connection of the droppers on the HV and MV terminals
- b. *Employer* to provide complete transformer plinth access 45 days prior to the final completion date.
- c. The *Contractor* provides scaffolding where applicable or required
- d. The *Contractor* provides cranes where applicable or required.
- e. The *Employer* supplies and installs the earthing for the transformer
- f. The *Contractor* supplies everything else for completing the *works*.

4 PROGRAMME

The *Contractor* submits a programme (up to Completion of the *Works*) to the *Project Manager* for acceptance within four weeks of the Purchase Order Date.

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

The programme is submitted utilising MS Projects and in pdf format.

5 COMPLETION

5.1 SECTIONAL COMPLETION

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

5.1.1 Design freeze

- Design review has been completed
- Minutes of the design review meeting submitted to the *Project Manager* with all action items signed off and agreed to by all parties.
- The design in totality is according to the *Employer's* specification requirements, including mechanical design review.
- Single line, general arrangement and outline and schematic drawings are available and approved
- Manufacturing PQP's are in place and signed off for acceptance

5.1.2 DAP

Handover to *Employer* with signed documentation if applicable

5.1.3 Installation

- Signed clearance and test certificates
- One set of red lined (as-built) drawings available
- Completed PQP's

- Training manuals available
- Personnel fully trained as per item 2.4 above
- Operating and maintenance manuals delivered
- No operational defects after installation according to the *Works Information* and the hand over check sheet has been filled and signed off by the HV Engineering Specialist
- Oil samples taken before and after installation of the *works* and the same have been approved by HV Engineering

5.1.3 Unit completion

- No outstanding defects.
- Unit on load or in storage for 2 weeks continuously with no visible abnormalities surfacing.
- 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. Shipping, Transport and Offloading on to final position
- d. Erection, Installation, Testing, Commissioning and Handover at site
- e. Removal of all debris, tools and equipment used during erection of the *works*
- f. Corrosion protection on whole of the *works* at site before handover
- g. Provision and Handover of Operating and Maintenance Manuals
- f. *Employer* Staff Training on site and Training Manuals
- g. "As Built" Drawings for whole of the *works*
- h. 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.

The *Contractor's* supervisor shall be on site at all times seeing to it that all the workers under his supervision work properly and safely.

8 RESTRICTIONS APPLICABLE TO THE CONTRACTOR

8.1 DETAILS OF OTHER CONTRACTORS

The *Contractor* could be interfacing and co-operating with the following Contractors

- The *Employer's* Protection, Telecommunications, Metering and Control departments (PTM&C)
- 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. This area is approximately 100m away from the working 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 / Order* number
 - The invoice sequence number
 - Supporting documentation
 - The *Employer's* VAT registration number
- Contractor statement reflecting all payments and status

11 DRAWINGS

Applicable drawings for this contract are described in the specifications.

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

All new drawings become the property of the *Employer* for maintenance and service purposes.

All drawings provided by the *Contractor* must adhere to 240-68973110 and 240-60725684.

12 SPECIFICATIONS AND SPECIAL REQUIREMENTS

12.1 Specifications and Standards

The main specifications in the *Works* are 20-68973110 for power transformers and 240-60725684 for shunt reactors. All the documents and standards referenced in the two documents, together with the all the accompanying Commercial Annexures are valid and part of the two documents. The revisions as at the date of contract placement is applicable. The *Contractor* is responsible for obtaining the latest revisions of these documents.

12.2 Special requirements

12.2.1 Transportation requirements and limitations

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

12.2.2 Notification Time

The *Contractor* will inform the *Employer* twelve (12) weeks prior to Factory Acceptance, HV test and factory visits including those for design review meetings. This period is 6 weeks for the factories within the borders of South Africa.

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.

12.2.4 Internal Inspections

The *Contractor* must inform the *Employer* 7 (seven) days prior to any site tests and/or inspections. The internal inspections indicated in the ITPs are compulsory.

13 ANNEXURES:

Annexure A

Specification documents and the Schedules A&B

Annexure B

Additional information for transportation requirement and limitations

Annexure C

Documentation, Configuration Management, and Drawings

Document and content signed and accepted by:

	Name:	Designation:	Signature:	Date:
Supplier				
Eskom:				