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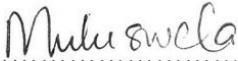
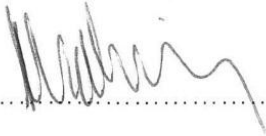
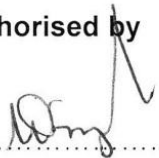
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## 1. INTRODUCTION

Eskom's Group Technology: Engineering supports Eskom's Business through the delivery of engineered solutions related to power generation and delivery asset design and engineering assurance to meet the security of continuous power supply.

Electrical power plants and network infrastructure are an asset-intensive business, with Engineering being a key component of the sustainability of the technical integrity of Eskom's assets.

Engineering have established the following:

- An Engineering Framework; independent from functions, reporting structures, technology and the business strategy
- Technical Governance, ensuring the integrity of design, operating technical specifications and maintenance baselines for sustainable plant performance
- International recognised Qualified and Competent Engineers in their relevant roles to perform and operate with industry-leading tools, i.e., processes, systems, specifications, software applications, international best practice
- Management of Engineering in a quality manner; through benchmarking business processes against the latest version of the International Standard ISO 9001.

Technology Engineering is made up of various departments that are responsible for specific engineering activities including the design life cycle, to realise electrical generation power plants and Lines. The departments are as follows: Engineering Support, Power Delivery Engineering (PDE), Generation Plant Engineering, Production Engineering Integration Coal (PEIC), Production Engineering Peaking and Project Engineering.

Technology Engineering may outsource certain Engineering services where this may be required.

## 2. SCOPE AND PURPOSE

This Quality Manual is the property of Group Technology Engineering, and serves as the framework for the Quality Management System. Although it contains some procedures, it does not document extensive detail with regards to controls at an operational level, since these documents reside with the respective departments.

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### 3. NORMATIVE REFERENCES

3.1 ISO 9001 Quality Management System Requirements

3.2 ISO 9000 Quality Management Systems Fundamentals and Vocabulary

3.3 SHEQ Policy 32-727

3.5 Eskom Documentation Management standard 32-644

3.6 Eskom's Procurement and Supply Chain Management Procedure 32-188

3.7 Project Management Definitions and Acronyms ESKASADP4

3.8 Quality Assurance Requirements for Nuclear Facility Applications ASME NQA-1

### 4. DEFINITIONS AND ABBREVIATIONS

ABBREVIATION	DESCRIPTION
ASME	American Society of Mechanical Engineers
Conformity	Fulfilment of requirement
Correction	Action to eliminate a detected nonconformity
Corrective action	Action to eliminate the cause of a detected nonconformity
Document	Information and its supporting medium
EPCM	Engineering Project Construction Management
Nonconformity	Non-fulfilment of a requirement
PCM	Process Control Manual
Preventive action	Action to eliminate the cause of a potential nonconformity or undesirable potential situation
Procedure	A specified way to carry out an activity or a process
Process	Is a set of interrelated or interacting activities which transforms inputs into outputs
Product	Defined as a result of a process
QMR	The person appointed as the Quality Management Representative who is responsible to ensure the management and execution of the QMS
QMS	Quality Management System
Quality Assurance	Part of quality management focused on providing confidence that the quality requirements will be fulfilled

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ABBREVIATION	DESCRIPTION
Quality Control	Part of quality management focused on fulfilling quality requirements
Quality objective	Something sought, or aimed for, related to quality
Quality Policy	Overall intentions and direction of an organization related to quality as formally expressed by top management
Record	Document stating results achieved or providing evidence of activities performed
SGM	Senior General Manager
Supplier Organisation	A producer, distributor, retailer or vendor of a product, or provider of a service or information
TE	Technology: Engineering
PDE	Power Delivery Engineering
PEIC	Production Engineering Integration-Coal

## 5. QUALITY MANAGEMENT SYSTEM

### 5.1 GENERAL

The Quality Management System consists of both quality control and assurance processes, to ensure customer satisfaction is achieved. The quality assurance is from processes residing within the quality department and the quality control processes are vested within the product realization processes.

The Quality Management system shall be in accordance with the requirements stipulated in the International Standard BS EN ISO 9001: 2008.

Engineering will comply with customers, statutory and regulatory requirements as applicable.

Processes are found in PCM's, Procedures, Work instructions and Forms.

External audits conducted by the relevant certification body serve as an extension of assurance to the satisfaction of the customer.

### 5.2 THE SCOPE OF THE QUALITY MANAGEMENT SYSTEM

The scope for the purpose of certification will be the processes for the design of product as required by both existing assets and new projects.

Any external support, product or service will be handled in accordance with the requirements stipulated in the purchasing procedure.

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**5.2.1 Departments certified:**

- Engineering Support
- Generation Plant Engineering
  - i. Systems Engineering
  - ii. Power Plant
  - iii. Auxiliary and Chemicals
  - iv. Electrical and Control and Instrumentations Design
  - v. Structures and Civil Design
- Power Delivery Engineering
  - i. Substation Engineering
  - ii. Lines Engineering Services
  - iii. High Voltage Plant

**5.2.2 Departments yet to be certified:**

- Power Deliver Engineering
  - i. PTM& C Engineering
  - ii. Planning and GIS
  - iii. Design Base and Operating Unit Support
  - iv. Integration
- Production Engineering Integration-Coal
- Project Engineering
- Production Engineering Integration-Peaking and Renewables

**5.2.3 Supportive Departments Involved:**

- Commercial: Purchasing
- Engineering Support: Quality Management

**5.2.4 Exclusions:**

- No exclusion from the scope

**5.3 MONITORING AND MEASUREMENT**

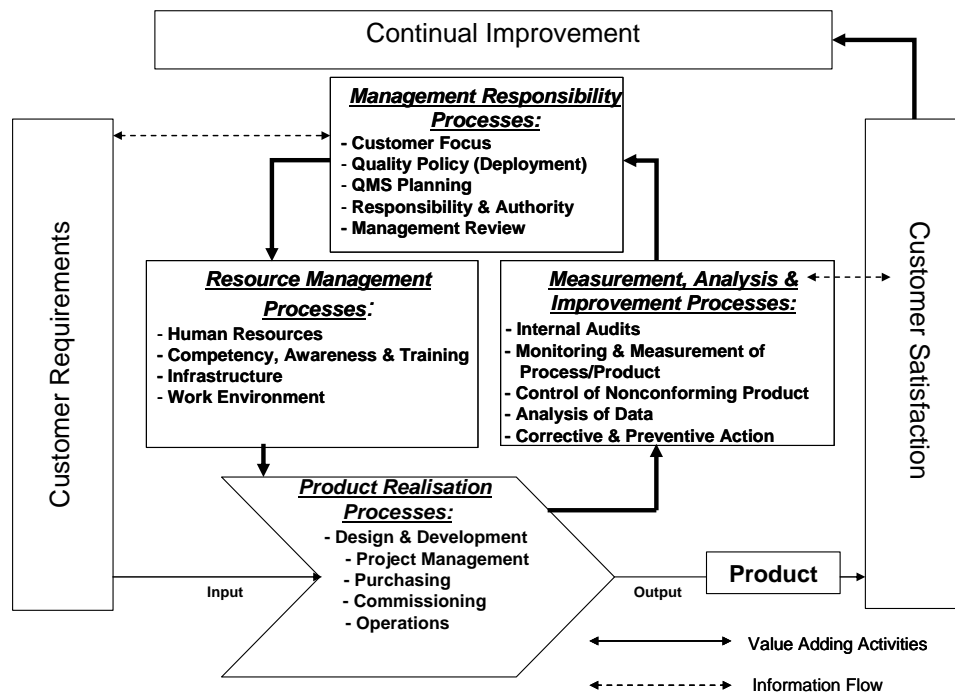
The quality control activities will be supported and monitored by the quality department through regular audits, inspections, analysis of data, and management reviews, to ensure that departments providing a support, function adequately, and provide the required resources.

The analysis of data, management reviews, quality control activities and the control of nonconforming product will also be utilized to implement continuous improvements.

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## 5.4 INTERACTION OF PROCESSES FOR THE QUALITY MANAGEMENT SYSTEM



**Figure 1: The Quality Management system**

Process Control Manuals are part of the Quality Management System and they detail the interrelationship between various processes. There are generic PCMs across all the businesses and specialised PCMs that vary for each Engineering discipline. Each business decides on the applicable PCMs in use annually with approval by the SGM. The review of compliance requirements to defined PCM's for each department in Engineering is done annually by the respective GM's and SGMs.

## 5.5 DOCUMENTS

The control of documents and records shall be in accordance with the procedures for control of documents and records.

Engineering has the following types of documents:

- Manual
- Policies
- Procedures
- Instructions
- Forms
- Drawings
- Letters
- Records
- Refer to document 32-6 for more information regarding the Definition of Eskom Documents

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The Quality Manual contains the quality policy, quality objectives and the six listed mandatory procedures. It also contains some specific instructions, guidelines for monitoring and measuring and the analysis of data in order to implement regular improvements.

PCM's, procedure, policy and work instruction documents addressing the different operational activities will be listed and or referenced in the Quality Manual as appendices were possible, and will carry their own unique identification number.

The six mandatory procedures and Quality Manual shall be maintained by the Quality Department. Care shall be taken to ensure that these documents are approved by the relevant personnel, revision status updated, and available on the applicable server for all personnel to view.

Documents of external origin, also known as external documents, will be controlled in accordance with procedure Document and Record management 240-53114186.

The procedure containing the detailed instructions for handling and controlling documents and records is referenced in this Quality Manual.

## 6. MANAGEMENT RESPONSIBILITY

### 6.1 MANAGEMENT COMMITMENT

Upon the approval of this Quality Manual, the Senior General Manager: Engineering, commits himself on behalf of the top management team to uncompromising support to the Quality Management System in order to achieve the quality objectives of Engineering.

The Senior General Manager: Engineering is also committed to conduct an annual Management Review, create and sustain a communication channel to ensure personnel conform to customer, statutory and regulatory requirements.

The Senior General Manager: Engineering shall also provide input to the SHEQ policy revisions in association with top management whenever customer requirements change or when the need arises.

### 6.2 ORGANIZATIONAL STRUCTURE OF TECHNOLOGY: ENGINEERING

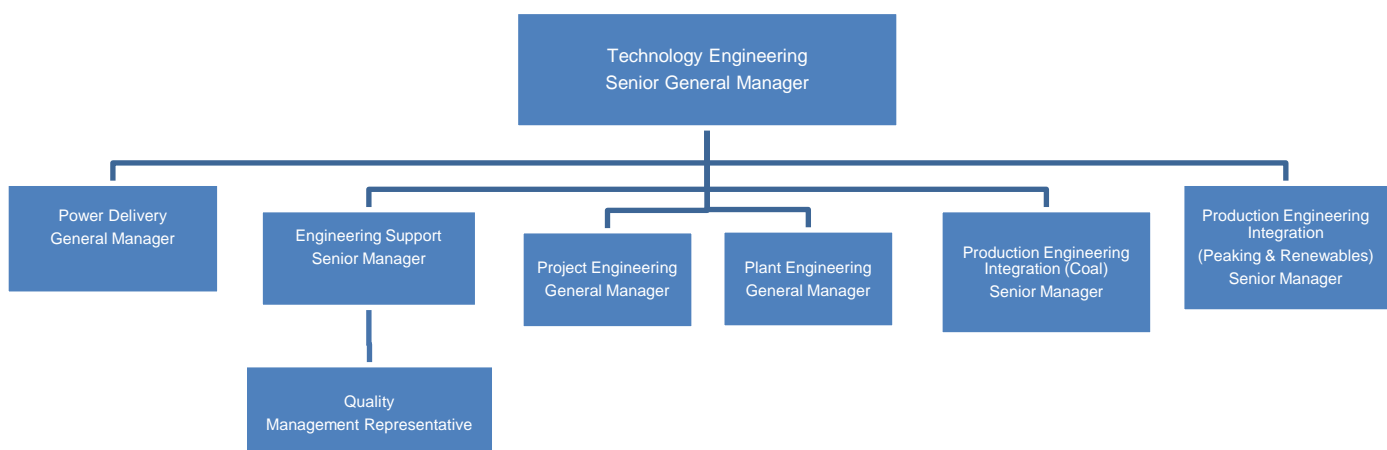


Figure 2: Structure for Technology Engineering

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### **6.3 CUSTOMER FOCUS**

Engineering in accordance with its policy shall always be focused on achieving and even exceeding customer requirements, through regular communication and review of the requirements.

Care shall be taken to ensure customer requirements for the delivery of product contain the following basic elements:

- Specification, and time of delivery is clearly stipulated in the purchase order and or contract, and that the incorporated activities are reviewed through the Design Review process
- The agreement is also scrutinized to ensure any requirements not stated by the customer, including statutory and regulatory requirements applicable to the product and or any other requirements considered necessary by Engineering, are included
- Details of the agreement are communicated to the design team
- Transportation methods
- The Design Review procedure 240-53113685 contains the instructions for addressing the requirement of the customer
- System for measuring customer feedback.

Customer satisfaction measurements will be conducted by the respective Departments and or Disciplines on an annual basis, through a questionnaire, from which the results will be analysed and discussed during the Management Review in order to ensure appropriate action is taken as part of the continuous improvement objectives. Engineering Support will facilitate annual satisfaction surveys with Engineering, collate and report on the results.

The customer satisfaction report will show measurements of the various Departments and or Disciplines;

A channel will be available for recording and dealing with customer feedback, which can be complaints or compliments.

### **6.4 CUSTOMER COMMUNICATION**

It is of paramount importance that communication with customers, especially enquiries, contracts and or any amendments of agreements, be conducted in a professional and orderly manner, and only by the designated personnel.

Customers can be both internal and external.

Complaints shall be reported to the Management Representative by the designated person utilizing the electronic system or the form where access to a computer is not available.

Letters, e-mail and or any other format of complaints received from customers shall be forwarded to the Quality Manager for processing.

All complaints shall be submitted to the Management Representative in writing using form 474-4070 that will be processed in the following manner:

- Complaints shall be registered electronically and manually, whereby a unique number running in sequence will be allocated to each complaint received.
- A letter of acknowledgment shall be sent to the customer.

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- The Management Representative shall upon receipt of the complaint, with 48 hours evaluate the severity and or possible impact, if such impact poses any severe risk, immediate action needs to be taken, prior to the investigation
- The Management Representative shall assign a person to identify a team (comprising of management and other interested parties) to investigate and resolve the complaint
  - This team will conduct a root cause analysis to determine the reason for the complaint
  - The complaint will be classified as either a nonconforming product, nonconformity of an operational activity, human error according to the form provided.
- The classification will determine the appropriate action, in case of a nonconforming product; it needs to be handled in accordance with the procedure for handling nonconforming product, or as applicable
- After addressing the complaint, a letter shall be sent to the customer, clearly stating the actions taken.
- The Management Representative will after final wrap up, evaluate the report including the possibility of recurrence, and consider if necessary to increase the frequency of auditing and or inspection in the particular area of activity.
- Records shall be kept by the Quality Department of all activities pertaining to complaints.

## **6.5 INTERNAL COMMUNICATION**

The following communication forums are used for ensuring communication takes place regarding the effectiveness of the Quality Management System:

- Regular Quality Management Meetings
- Departmental meetings
- Annual Management Reviews
- E-mail notifications
- Display of information on notice boards
- Information sessions via intranet.

## **6.6 SHEQ POLICY (32-727)**

It is with total commitment and dedication that Group Technology: Engineering supports the Eskom SHEQ Policy that complies with ISO 9001:2008, providing leadership to ensure that this policy is understood, implemented and maintained throughout Engineering, during design for both existing assets and new projects.

Group Technology: Engineering shall support the development, implementation, and maintenance of the entire electricity supply value chain so as to supply reliable and affordable electricity within a challenging business, social, natural, and political environment, without compromising future sustainability. This is in line with the corporate vision of “together building the power base for sustainable growth and development”.

Group Technology: Engineering will provide support and input to the integration of safety, health, environment, and quality requirements into activities, products, and services throughout the organisation for a sustainable electricity supply.

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This shall ensure the integration and consideration of economic development and environmental, quality, and social equity into business practices to continually improve performance and underpin development, ensuring that stakeholder requirements are met.

To demonstrate Engineering's firm commitment to safety, health, environment, and quality, we shall:

1. Establish appropriate management systems that are ISO 9001, ISO 14001, and OHSAS 18001 compliant to address related issues with a view to minimising risk, ensuring duty of care by prevention of pollution and environmental degradation and by conducting performance monitoring and measurement;
2. Comply with applicable legislative and other requirements Eskom subscribes to and, in the absence of these, set standards to meet the objectives of this policy;
3. Address the needs and expectations of our customers and stakeholders;
4. Ensure that SHEQ is an integral part of our operations and that no operating condition, or urgency of service, justifies exposing anyone to negative risks arising out of Eskom's business, causing an incident or damage to the environment;
5. Appraise our SHEQ performance with the objective of continuous improvement, in light of sustainable development, cost-effective resource use, efficient production, distribution, and use of electricity;
6. Ensure that SHEQ objectives are established and periodically reviewed to achieve sustainable performance levels;
7. Promote on- and off-the-job SHEQ for all our employees, as we believe that all occupational injuries and illnesses, fatalities, environmental incidents, and poor quality performance are preventable, and our goal for all is zero occurrence;
8. Engage stakeholders, by promoting open communication and educating, training, motivating, and developing them on requirements of SHEQ;
9. Ensure that our suppliers and service providers integrate SHEQ issues into their operations to achieve SHEQ objectives throughout our value chain;
10. Conduct Eskom business with respect and care for people and the environment and, in so doing, ensure that adequate resources are available for SHEQ management;
11. Ensure that the planning process takes into account a low carbon future and prioritising energy efficiency within and outside Eskom; and
12. Ensure that SHEQ objectives and criteria are entrenched in Eskom's procurement and investment strategies, governance, and decision-making processes for informed decision-making.

## **6.7 QUALITY OBJECTIVES**

It is the policy of Engineering to provide a service and product of high quality to meet the requirements of its customers in every respect.

The organization endeavours to achieve this through the application of the following objectives:

- To obtain and sustain the ISO 9001 certification
- To achieve more than 80% customer satisfaction

Other objectives reside with the respective Departments and or Disciplines.

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Set objectives for Engineering will be reviewed in the Management and Business Review meetings.

## **6.8 QUALITY MANAGEMENT PLANNING**

Planning in terms of operational activities is done by the different departments, contributing in achieving the engineering objectives.

Through communication, integration and interaction of processes, plans are synchronized on a regular basis using various methods of communication in order to achieve the objectives of Engineering.

Changes to the Quality Management system will be planned, managed and monitored to ensure that the integrity of the Quality Management System is continuously maintained.

Records of such plans are kept and stored by the different departments and or disciplines.

## **6.9 RESPONSIBILITY AND AUTHORITY**

All personnel have a job description, kept and maintained by the Human Resources and Discipline Manager, clearly defining their responsibilities and authority; this includes the listed key personnel.

HR shall in consultation with the Discipline Manager arrange for replacement of key personnel, both during planned absenteeism and unforeseen circumstances, in order to maintain continuity of responsibility, authority and communication.

Delegation of authority and responsibilities shall be communicated through the electronic media, of which records shall be kept.

### **6.9.1 Senior General Manager: Engineering**

The Senior General Manager: Engineering is accountable for the execution of the following tasks:

- The delivery of quality products and services offered by Engineering
- Commitment of Top Management to the effective development, implementation, maintenance and continual improvement of the QMS
- Support the Quality Policy and Objectives
- Ensure personnel establish the system, implement, maintain and review when necessary
- Communicates the importance of ensuring customer needs are known and met
- Regular Interface with outside parties on quality issues
- Provide media for internal communication
- Conduct Management Reviews
- Leads the development and implementation of the Business Plan and strategic objectives
- Ensures that all necessary resources are provided
- Is accountable for all business operations and processes
- Ensures the integrity of the system is maintained at all times, including where changes are planned or implemented
- Ensures proper infrastructure and working environment

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- Will provide infrastructure to maintain all data backups and ensure that these are kept in safekeeping
- Provide resources for the control of company records and documentation.

### **6.9.2 Senior Manager: Engineering Support**

This position has direct access to the Divisional Executive to resolve quality related issues, and is independent of business operations. The Engineering Support department provides oversight assurance that processes comply with requirements and for the effective implementation of the QMS and to identify opportunities for improvement.

The Senior Manager of Engineering Support is the defacto Quality Management Representative of Engineering unless the Senior General Manager appoints a Quality Management Representative

The Quality Management Representative is responsible for the execution of the following tasks:

1. Ensure that processes needed for the Quality Management System are established, implemented, and maintained
2. Report to top management on the performance of the Quality Management System and any need for improvement
3. Ensure the promotion of awareness of customer requirements throughout the organization, and any other activities associated with the Quality Management System
4. Effect authorized changes to the Quality Management System
5. Manage reported non-conformities and potential non-conformities
6. Communicate improvement requirements to management and other internal parties
7. Stop the Production/Design process if found to be non-conformant
8. Maintain quality records
9. Ensure training of the QMS is implemented
10. Check the adequacy of monitoring, measurement activities of product and processes and
11. Accountable for the analysis of data to facilitate continuous improvement.
12. Responsible for implementing ISO 9001: 2008 as a Quality Management System in Engineering.

### **6.9.3 General and Senior Managers**

The Department Managers are responsible for the execution of the following tasks:

- Support all activities required to maintain the QMS and sustain certification
- Provide the required resources to produce product to the satisfaction of the customers
- Track progress on all quality, safety related issues in their area.

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#### 6.9.4 Discipline Managers

The Discipline Managers are responsible for the execution of the following tasks:

1. Determine processes needed and documents where required
2. Provide evidence of commitment to the development and implementation of the quality management system and continually improving its effectiveness – records of meetings, training, etc.
3. Focus on the customer to ensure requirements are achieved and even exceeded, especially the requirements not stated, including statutory regulatory requirements. Keep records of such activities; documented changes, correspondence, minutes, etc. Conduct customer perception measurements as required.
4. Ensure all personnel are aware of the quality objectives and establish objectives for your department
5. It is of paramount importance that communication with customers, especially enquiries, contracts and or any amendments of agreements be recorded. Complaints shall be reported in accordance with the instructions stipulated in the Quality Manual
6. Ensure personnel are aware of the applicable policies; through training, toolbox sessions or workshops
7. Ensure personnel have clear defined responsibilities, are competent to do what they are charged to do. Sustain competence by providing evidence of training scheduled and completed
8. Provide adequate resources and infrastructure to personnel in order for them to conduct their respective tasks
9. Provide a work environment that is conducive for their personnel to conduct their respective duties
10. Deviations of the said regulations shall be reported to the SHEQ Manager using the designated process
11. Ensure safety, environment and quality audits and inspections are conducted in conjunction with the Safety Representatives of the work environment and report any deviation and take the required action to rectify it
12. Any monitoring and measuring equipment utilized, shall comply with the requirements for the control of monitoring and measuring equipment
13. Ensure only approved suppliers (list of approved suppliers) are used for purchasing product, and that purchased product is adequately verified. This is only for product that can adversely affect the design
14. Ensure all nonconforming product and or nonconformities in their respective departments are reported and adequately addressed in accordance with the applicable procedures
15. Ensure final design documents are adequately identified, recorded and preserved
16. Provide support to supervisor and or manager in order to maintain the SHEQ Management Systems.

#### 6.9.5 Quality Representatives

The Quality Representatives are responsible for the execution of the following tasks:

- Support the Discipline Manager in all activities required to implement and sustain the QMS

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- Train and provide guidance to personnel within your Discipline regarding the implementation and ensure everyone understands the QMS and is conversant in maintaining it
- Monitor the maintenance of the QMS and utilize Discipline/Department meetings to keep activities on track
- Ensure records are kept of all activities related to operational activities.

## **6.10 MANAGEMENT REVIEW**

Top management shall review the Quality Management System at least annually, to ensure its continuing suitability, adequacy, and effectiveness. This review shall include assessing opportunities for improvement and the need for changes to the quality management system, including the quality policy and objectives.

The Review team comprises, as a minimum, the following: -

- Senior General Manager
- HR Business Partner
- SHEQ Manager
- Management Representative
- Departmental General Managers / Senior Managers
- Finance Manager
- Any other invitees selected by the SGM

The input to management review shall include information on: -

- Results of audits,
- Customer feedback,
- Process performance and product conformity,
- Status of preventive and corrective actions,
- Follow-up actions from previous management reviews,
- Changes that could affect the Quality Management System, and
- Recommendations for improvement from various sources.

The output from the management review shall include any decisions and actions related to:

- Improvement of the effectiveness of the Quality Management System and its processes,
- Improvement of product related to customer requirements, and Resource needs
- The said actions shall be monitored by the SHEQ Manager to ensure completion thereof, and in the agreed time frame
- Records pertaining to management review activities shall be kept on the network and maintained by the SHEQ Manager.

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## 7. RESOURCE MANAGEMENT

### 7.1 PROVISION OF RESOURCES

Engineering shall determine and provide the resources needed:

- To implement and maintain the Quality Management System and continually improve its effectiveness, and
- To enhance customer satisfaction by meeting and exceeding customer requirements.

### 7.2 HUMAN RESOURCES

Personnel performing work affecting conformity to product requirements shall be competent on the basis of appropriate education, training, skills and experience.

#### 7.2.1 Competence, training and awareness

- Training can either be conducted externally or internally
- Each Department/Discipline Manager is responsible in conjunction with the Human Resource department to ensure that her/his personnel are competent and remain competent to do the work they are charged to do.

Engineering shall utilize the following systematic process to ensure personnel are competent to perform their respective duties:

- Determine criteria, as in responsibilities (Job Profiles/Job Description) for each post
- Gather and list evidence of an individual's qualifications
- Compare qualification against requirements of the position that the individual occupies
- Registration with a national or international recognised institution in the likes of the Engineering Council of South Africa (ECSA ) can be valuable evidence of competency
- Identify lack of skill and plan the required training to reach the required level of competence
- Although competency might be found adequate, future training can be scheduled to maintain the individual's competency
- Valid reasons must however be provided, substantiated with sufficient evidence of competency, when no training is scheduled for a particular year.

### 7.3 INFRASTRUCTURE

Engineering shall supply, maintain and where possible improve the infrastructure which forms part of the continuous improvement philosophy.

The maintenance of the resources and infrastructure which is of paramount importance is done through a well-structured maintenance plan.

Although the respective departments are managed separately, having their unique processes and even objectives, it all ties up in achieving the company objectives in order to satisfy the customer.

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## **7.4 WORK ENVIRONMENT**

Engineering shall provide a work environment that is conducive for personnel to conduct their respective duties.

The work environment shall comply with South African health and safety regulations.

Deviations of the said regulations shall be reported to the SHEQ Manager using the designated process.

The SHEQ Manager shall be responsible to ensure everyone is issued with protective clothing where applicable. The issue of such clothing shall be done in a controlled manner.

The SHEQ Manager shall in conjunction with the Safety Representatives ensure regular monitoring through inspections and measuring of the work environment; report any deviation and take the required action to rectify it.

The measuring equipment utilized for measuring environmental conditions shall comply with the requirements for the control of monitoring and measuring equipment.

## **8. PRODUCT REALISATION**

The product realisation processes is the term used to describe the activities that Engineering conducts to deliver the product.

### **8.1 PLANNING OF PRODUCT REALISATION**

Planning for product realisation is performed in accordance with the Design Review procedure 240-53113685 and applicable references. In planning for product realisation, Engineering shall determine at least the following:

- The objectives and requirements for the product
- The need to establish processes and documents, and to provide resources specific to the product
- Required verification, validation, monitoring, inspection and test activities specific to the product and criteria for product acceptance
- Records needed to provide evidence that the realization processes and resulting product meet requirements.

### **8.2 PROJECT QUALITY PLAN**

A Project Quality Plan shall be prepared and published by Project Management in association with the respective Engineering/Discipline Manager for projects as required. The International Standards Organization (ISO) documents 10005 and 10006 can be used as a guide.

### **8.3 CUSTOMER-RELATED PROCESSES**

#### **8.3.1 Determination of requirements related to the Product:**

- Engineering will utilize the Design Review Procedure 240-53113685 to determine the requirements related to the product
- Engineering is responsible for effective implementation of this procedure and any other associated procedure required to execute the task

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- Engineering shall also ensure that all requirements are met as agreed and or contracted to the customer including delivery and post-delivery activities, requirements not specified by the customer but necessary for intended use where known, legal and regulatory requirements and any additional requirements determined by Engineering.

### **8.3.2 Review of requirements related to the Product**

- Engineering is responsible for the review of the requirements related to the product
- The review includes ensuring the product requirements are defined and documented, contract requirements differing from those previously expressed are resolved and that Engineering has the ability to meet these defined requirements, prior to commitment by Engineering to supply a product to the customer
- Engineering ensures that records of the review of requirements and of actions taken from the review are maintained.

### **8.3.3 Design and Development**

#### **Planning**

- During the design and development planning, the following are determined which includes, the design and development stages, the review, verification and validation appropriate to each design and development stage, responsibilities and authorities for design and development, and organizational and technical interfaces
- The interfaces between different groups involved in design and development are managed to ensure effective communication and clear assignment of responsibility.

### **8.3.4 Design and Development inputs**

- Design and Development inputs are documented in the form of specifications and design information transmittals. Records of design inputs relating to product requirements are maintained. Design and Development inputs includes where appropriate, functional and performance requirements, legal and regulatory requirements, information derived from previous similar designs, and additional requirements essential for design and development
- These inputs are reviewed for adequacy, completeness, unambiguous content and to ensure that inputs are not in conflict with each other.

### **8.3.5 Design and Development outputs**

- Design outputs are provided in a form suitable for verification against design input requirements and approved, prior to release
- The approval process ensures that design and development outputs, meet the input requirements, including the assurance that customer requirements are fulfilled, provide appropriate information for purchasing, production, fabrication (constructed item) and service provision, contain or reference product acceptance criteria, and specify the characteristics of the product that are essential for its safe and proper use.

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### 8.3.6 Design and Development Review

- Systematic design and development reviews are performed at suitable planned stages, these include; the evaluation of the results of design and development to meet requirements, evaluating the risk of proceeding with follow-on design and development stages, and identification of any problems and propose necessary actions
- Participants in design and development reviews include representatives of functions and disciplines concerned with the design stages under review, as well as independent reviewers
- Records are maintained of the results of all design and development reviews performed, including required actions.

### 8.3.7 Design and Development Verification

- The verification ensures that design and development outputs have met relevant design and development input requirements. Design verification methods include design reviews, performing alternative calculations, computer analyses, safety analysis and testing. Design verification is performed by personnel who were not involved with the original design
- Records of the results of the verification, and any necessary actions are maintained.

### 8.3.8 Design and Development Validation

- Engineering ensures that design and development validation is performed in accordance with planned arrangements to ensure that the resulting product is capable of meeting the requirements of its specified application or intended use. Where practicable, validation is completed prior to delivery or implementation of the product
- Records of the results of design and development validation, and subsequent actions are maintained.

### 8.3.9 Control of Design and Development Changes

- The Engineering Change Management Procedure 240-53114002 is utilized to control changes identified, in order to review, verify, validate as appropriate, and approve before implementation
- The review of design and development changes, include an evaluation of the effects of the changes on interfaces between constituent parts and product already delivered. Verification measures for design changes are the same as those employed in the original design. Design changes are approved by the same organization or affected groups that reviewed and approved the original design
- Records of the review and development of design changes, and subsequent actions taken relevant to those changes shall be maintained in accordance with the requirements stipulated in the procedure for Document and Records management 240-53114186.

### 8.3.10 Computer Software Design and Development

Computer software used for design and development is controlled, verified, and validated in accordance with established procedures. The procedures include software acquisition processes, life-cycle management, application of standards and conventions and controls during development, operation and maintenance of computer programs.

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### 8.3.11 Process for End-Of-Phase Design Reviews

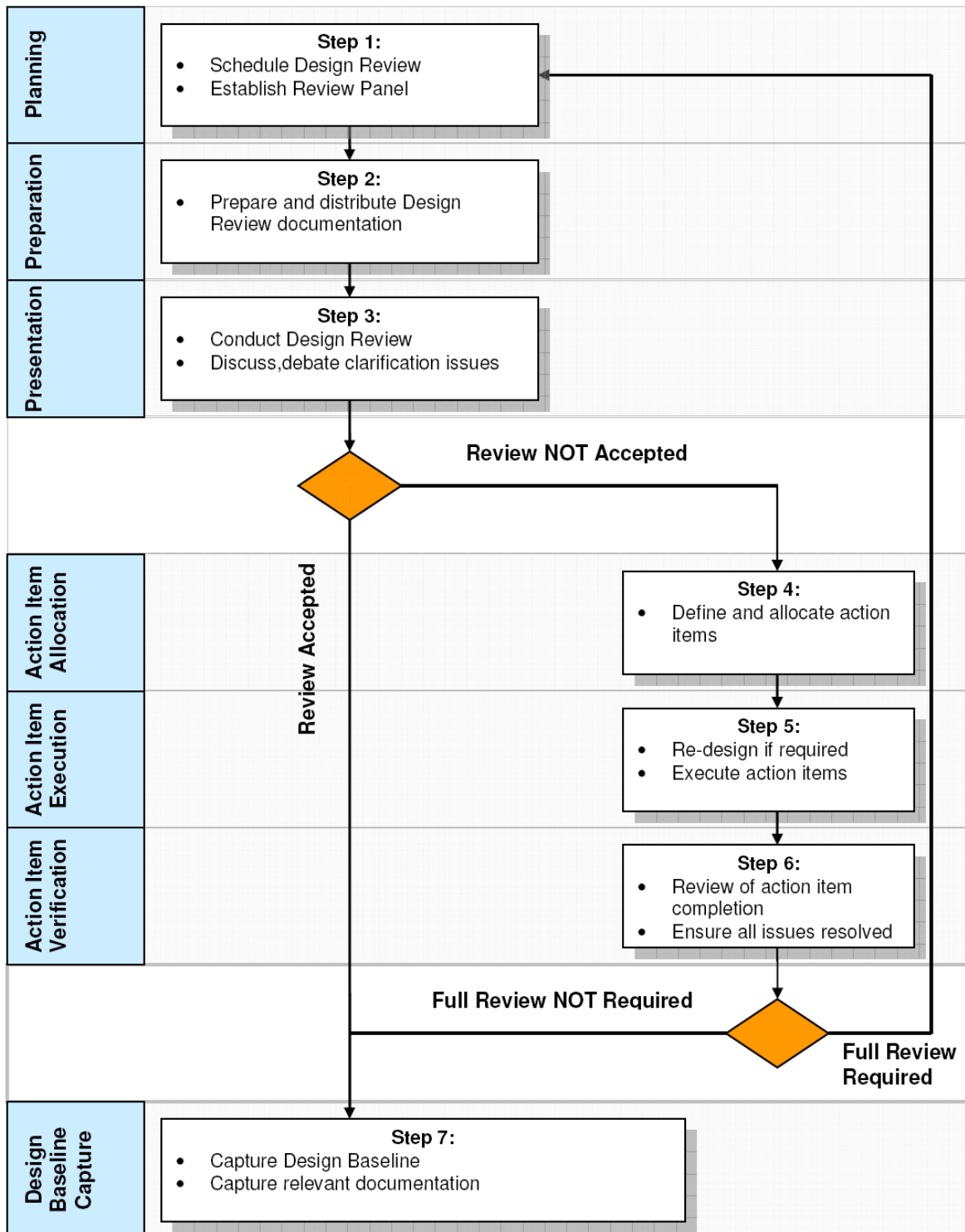


Figure 3: Detailed Flow Diagram

**Note:** Detailed flow diagrams are available in the Design Review Procedure 240-53113685

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## 8.4 PRODUCTION AND SERVICE PROVISION (CONSTRUCTION & INSTALLATION)

### 8.4.1 General

- Engineering shall have clear defined instructions embedded in the design review to ensure good quality delivery of the product
- Inspection and Test Plans (ITP) need to be approved by Engineering prior to any construction and installation as applicable
- Measurements conducted with monitoring and measuring equipment (Test Equipment) effecting product need to be traceable to national or international measuring standards
- Where significant issues are identified, the necessary communication of required changes shall be made and implemented and re sampling/Testing/inspection conducted. Where sample results are acceptable, product is released and the process initiated
- Any nonconforming product is handled in accordance with the procedure for controlling nonconforming product.

### 8.4.2 Monitoring and measurement of product

- Monitoring and measurement mechanisms shall be included during the Design Review process to ensure no defect product is delivered to the customer. If however any defect is measured, it will be controlled in accordance with the procedure for handling nonconforming product
- Records shall indicate the person(s) authorising release of the product for delivery to the customer
- Product shall not be released until the planned arrangements have not been satisfactorily completed, unless otherwise approved by a relevant authority, and where applicable by the customer.

### 8.4.3 Identification and traceability

- Any product delivered by Engineering shall be uniquely identified, and in accordance with the customer requirements
- Records shall be kept in terms of the requirements stipulated in the procedures for control of documents.

### 8.4.4 Validation of processes

Engineering shall use the Design Review process to ensure that designs have sufficient validation activities embedded to ensure product will meet customer requirements, especially where the resulting output cannot be verified by subsequent monitoring or measurement and, as a consequence, deficiencies become apparent after the product is in use.

### 8.4.5 Customer property

- Customer property provided for use or incorporation into the product or on a rental basis shall be adequately inspected and identified upon receipt
- The said property shall be received, stored and dispatched in accordance with the purchasing procedure for handling customer property.

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#### **8.4.6 Preservation of product**

Specific requirements for identification, storage, packaging and dispatch of the final product are conducted in accordance with the requirements of the respective customers and the applicable Technology Engineering instructions and procedures.

#### **8.5 PURCHASING**

The Purchasing Department is responsible for the control of all activities pertaining to purchased product; therefore they have to ensure no product of a substandard quality shall be purchased that can have an adverse effect on the product that Engineering supplies.

Engineering will however assist with verification of purchased product as required.

Purchasing will draft and keep the approved supplier list and maintain it through regular monitoring of performance in accordance with the requirements stipulated in the Purchasing Procedure 32-1034.

The said procedure needs to meet the requirement of this Standard.

#### **8.6 CONTROL OF NONCONFORMING PRODUCT**

Nonconforming product is the non-fulfilment of a specific requirement. In this context it is the final product delivered to the customer, that has been measured, and found failing to conform to the requirements as stipulated by the customer.

A systematic approach shall be taken to prevent the unintended use or delivery of such product. Action for correction (remedial action), a cause analysis needs to be conducted in order to ensure an appropriate corrective action is taken to prevent it from recurring.

Refer to the procedure 240-53114194 for detailed information regarding the Control of Nonconforming product.

### **9. MEASUREMENT, ANALYSIS AND IMPROVEMENT**

#### **9.1 GENERAL**

Monitoring and measurement of processes and product shall be conducted, as well as internal audits and the analysis of data, in order to determine the effectiveness of the Quality Management System, to demonstrate conformity of product requirements and to continually improve the effectiveness of the Quality Management System.

Customer perception measurements are addressed in paragraph 6.3.

The monitoring and measurement of product is addressed in paragraph 8.4.2.

The control of nonconforming product is addressed in paragraph 8.6.

Internal audits will be conducted in accordance with the procedure 240-53114190.

#### **9.2 INTERNAL AUDITS**

Internal audits form an integral part in determining whether the Quality Management System conforms to planned arrangements as stipulated in this manual and associated operational document(s). It also measures whether the Quality Management System is effectively implemented, and if Technology Engineering has met their objectives.

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An audit schedule is established to ensure all areas of the business, relevant supporting services as well as all elements of the ISO 9001:2008 are assessed and verified.

Refer to the applicable internal audit procedure referenced in this quality manual, for clear instructions on how to conduct internal audits.

### **9.3 MONITORING AND MEASUREMENT OF PROCESSES**

The Quality Management System comprises of management activities, provision of resources, product realisation, measurement, analysis and improvement.

The quality management processes shall be monitored and measured through internal audits, inspections, analysis of data and Management Review meetings.

The production and service provision (Design) processes will be addressed during the design review process.

### **9.4 ANALYSIS OF DATA**

The SHEQ Manager shall on behalf of Engineering and in association with all departments collect and analyse appropriate data to demonstrate the effectiveness of the Quality Management System and to evaluate where continual improvement can be made.

Information shall mainly be collected from the results of customer perception measurements, conformity of product, corrective actions, preventive actions, complaints and general audit findings.

The following are also some additional sources and methods of collecting data relating to the QMS and product conformance:

- Analysis of product and production performance
- Analysis of non-conformity records, trends and improvements relating to types of non-conformities, areas of non-conformities, product non-compliance, supplier deviations, customer complaints, etc.
- Analysis of effectiveness of maintenance actions
- Analysis of customer satisfaction reports.

The results of the abovementioned analysis will be discussed at the QMS and Management Review meetings and where the necessary continual improvement projects may be established.

### **9.5 IMPROVEMENT**

#### **9.5.1 General**

Engineering shall continually strive to improve the Quality Management system through the use of quality policy, quality objectives, audit results, analysis of data, corrective and preventive actions, and management reviews.

#### **9.5.2 Corrective Action**

A corrective action is the action to illuminate the causes of nonconformities in order to prevent recurrence. Corrective actions shall be appropriate to the effects of the nonconformities encountered.

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Nonconformities shall be handled in accordance with the procedure 240-53114192 for Corrective and Preventive action.

The description of the non-conformity, cause analysis of the non-conformity, action for correction, proposed corrective action, and completion of corrective action taken, and verification of all actions are included.

A manual system of reporting nonconformities and the associated corrective action report is available, upon failure of the electronic system.

### **9.5.3 Preventive Action**

Preventive action is to eliminate the causes of potential nonconformities in order to prevent their occurrence. Preventive actions shall be appropriate to the effects of the potential problems.

The procedure 240-53114192 for Corrective and Preventive action addresses the potential nonconformities and their causes, evaluates the need for action to prevent occurrence of potential nonconformities, determines the implementation needed, records the results of actions taken, and reviews the effectiveness of actions taken.

The said procedure also defines the activities/actions and responsibilities of personnel at Technology Engineering, regarding the reporting, registration and handling of potential nonconformities in the work place.

## **10. CONTROL OF MONITORING AND MEASURING EQUIPMENT**

### **10.1 GENERAL**

Engineering shall be equipped with all items of sampling, measurement and test equipment required for the correct performance of the services and or product provided (including sampling, preparation of test and/or calibration items, processing and analyses of test and/or calibration data).

In those cases where Engineering needs to use equipment outside its permanent control and or by suppliers it shall ensure that the requirements are clearly defined during the Design Review.

Equipment and its software used for any services provided shall be capable of achieving the accuracy required and shall comply with specifications relevant to the services concerned.

Calibration programmes shall be established for essential quantities or values of the instruments where these properties have a significant effect on the results.

Before being placed into service, equipment (including that used for sampling – if applicable) shall be calibrated or checked to establish that it meets the product specification requirements and complies with the relevant standard specifications.

Only personnel with adequate knowledge shall operate equipment. Up-to-date instructions on the use and maintenance of equipment (including any relevant manuals provided by the manufacturer of the equipment) shall be readily available for use by the appropriate personnel.

Measurements results from calibration certificates shall be traceable to either International or National measuring standards.

### **10.2 DEFINITION**

Measurement considers the determination of a quantity, magnitude or dimension (using measuring equipment e.g. a measuring tape, Voltmeter, etc.).

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### 10.3 CALIBRATION AND VERIFICATION OF TEST EQUIPMENT

The designated responsible person shall distribute the Monitoring and Measuring Equipment Inventory List to personnel within the department in which they have to collectively select what test equipment need to be calibrated or verified and at what frequency.

There after the calibration and verification schedule shall be drafted spreading the calibration equally throughout the year. When planning such schedules, the existing calibration status of equipment must always be taken in consideration, preventing any calibration from expiring.

A copy of the calibration and verification schedule shall be given to the designated responsible person who shall ensure the correct suppliers are selected and that the calibration is done at regular intervals.

Verification checks can also be conducted internally, and only by qualified personnel; using the correct equipment, with a higher accuracy than the unit under test.

### 10.4 DELIVERY AND DISPATCH OF TEST EQUIPMENT

Monitoring and Measuring Equipment shall be delivered and dispatched in accordance with the requirements stipulated in the Purchasing Procedure 32-1034

Monitoring and Measuring Equipment of high accuracy, especially electronic equipment shall only be transported in a vehicle that provides sufficient cushioning to prevent shock or vibration. Equipment shall also be strapped in such a manner preventing excessive movement during transport.

Monitoring and Measuring Equipment shall be inspected by the end user in consultation with the Quality Manager for the following, when received back from repair and calibration:

- Check for external damage
- Check that all calibration stickers and, certificates are present
- Check that all accessories associated with the instrument are brought back
- Ensure calibration certificates issued by the calibration contractor meet the requirements in terms of traceability.

### 10.5 FAULTY EQUIPMENT

When test equipment is being identified or suspected to be faulty, a fault report form "Instrument Repair/Calibration Request" must be completed by the operator, indicating what parameter of the instrument is suspect. Such report together with the instrument must then be handed over to the designated responsible person managing the test equipment within the respective department

The faulty equipment must then be labelled with a "faulty sticker" or card as depicted by the procedure for dispatch and receipt of test equipment kept and maintained by the purchasing department

Arrangements must immediately be made to get the equipment repaired. The same procedure and documents are used, as for sending equipment for calibration

The status of the equipment must always be updated and recorded on both the calibration schedule

An investigation must be conducted in order to determine whether any measurements conducted with the said instrument was incorrect, and has perhaps had an adverse effect on product quality. If this is the case a non-conformity report has to be raised, in accordance with the procedure for reporting nonconforming product.

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## 10.6 PURCHASING OF NEW EQUIPMENT

The purchasing of new equipment shall be done in accordance with the Purchasing procedure 32-1034.

## 11. AUTHORISATION

This document has been seen and accepted by:

Name	Designation
Danie Odendaal	General Manager: Generation Plant Engineering
Titus Mathe	Senior Manager: Power Plant
Vasanie Pather	Senior Manager: Auxiliary & Chemical
Galia Dudenska	Senior Manager: Civil & Hydro
Elli Lechtman	Senior Manager: Substation Engineering (Acting)
Roger Cormack	Senior Manager: HV Plant Engineering (Acting)
Riaz Vajeth	Senior Manager: Lines Engineering (Acting)
Prince Moyo	General Manager: Power Delivery (Acting)

## 12. REVISIONS

Date	Rev.	Compiler	Remarks
August 2012	0.1	Eugene Keyser	Draft Changes new Document number
September 2012	0.2	Eugene Keyser	Second updated draft
September 2012	0.3	Eugene Keyser	Updates to Template format by C Bunce, document for Comments Review
October 2012	1	Eugene Keyser	Final Rev 1 Document for Authorisation and Publication
November 2014	1.1	Innocent Muluswela	Updated document to reflect business changes for comments Review process
December 2014	1.2	Innocent Muluswela	Updated Document after Comments Review Process completed
January 2015	2	Innocent Muluswela	Final Rev 2 Document for Authorisation and Publication

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### **13. DEVELOPMENT TEAM**

The following people were involved in the development of the Rev 1 document:

- Eugene Keyser
- Larry Kloppenborg
- Denise Caripis
- Tony Martin

### **14. PROCEDURES**

The following procedures can be found on the Eskom Electronic Document Storage System known as Hyperwave:

- Corrective and Preventive Action Procedure (240-53114192)
- Internal Audit Procedure (240-53114190)
- ESKOM Document and Record Management Procedure (32-6)
- Control of Nonconforming Product Procedure (240-53114194)

### **15. FORMS**

Forms are available on Eskom Electronic Document Storage System known as Hyperwave.

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