



## Procedure

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## 1. INTRODUCTION

The design review procedure provides for the governance that prescribes a series of evaluations to determine the adequacy, correctness and adherence of designs in achieving objectives at each pre-defined phase of the design review procedure. The design review procedure is crucial for obtaining approval and acceptance for designs during the execution of the different phases in the Project Life Cycle (PLC), thereby authorizing the release to the following phase of the design review process.

Design reviews provide the necessary assurance that all previously set requirements at the end of each phase has been satisfactorily met. This ensures that a credible basis is set for the next phase in the PLC. Properly conducted design reviews will assist in avoiding re-work and will reduce the risk of adversely affecting project deliverables in terms of cost, quality, time and scope.

In order to conduct design reviews, it is essential to define end of phase baselines. These baselines will describe the requirements that need to be met for each phase/stage in the PLC in terms of designs, standards and deliverables.

## 2. SUPPORTING CLAUSES

### 2.1 SCOPE

This procedure covers the required steps for the execution of design reviews (end-of-phase and interim).

#### 2.1.1 Purpose

The purpose of this procedure is to define the essential steps that are required to ensure that a structured, systematic and consistent approach is followed when design reviews (end-of-phase and interim) are conducted.

The execution of these steps ensures that designs conform to requirements (user, technical, legislative, etc.), designs are correct (calculations, philosophy, etc.) and designs are integrated.

#### 2.1.2 Applicability

This procedure applies to all professionals delegated by the relevant Engineering Centre of Excellence to perform engineering or engineering design related work in Eskom Holdings SOC Ltd and its subsidiaries. It, however, does not apply to Nuclear environments.

### 2.2 NORMATIVE/INFORMATIVE REFERENCES

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

#### 2.2.1 Normative

- [1] [240-43327398](#): Engineering Policy
- [2] [240-46953552](#): Process Control Manual (PCM) for Plan Technical Effort
- [3] [240-43898151](#): Process Control Manual (PCM) for Perform Verification and Validation
- [4] 32-1155: Eskom PLCM Policy
- [5] [240-68604731](#): Design Base Standard
- [6] [240-53114026](#): Project Engineering Change Procedure.

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[7] [240-53114002](#): Engineering Change Management Procedure

[8] [240-51093273](#): Control Configuration Changes

### 2.2.2 Informative

[9] [240-53114190](#): Internal Audit Procedure

[10] Engineering Profession Act No. 46 of 2000

[11] IEC 61160: Design review

[12] ISO 10007: Quality Management Systems – Guidelines for configuration management

[13] ISO 9001: Quality Management Systems - Requirements

[14] SANS 15288: Systems and software engineering - Systems life cycle processes

[15] SANS 26702: Systems engineering - Application and management of the systems engineering process.

### 2.3 DEFINITIONS

Definition	Description
<b>Baseline</b>	A specification or product that has been formally reviewed and agreed upon, placed under configuration control and documentation management, and that thereafter serves as the basis for further development.
<b>Configuration</b>	Interrelated functional and physical characteristics of a product defined in product configuration information.
<b>Design Base</b>	The Design Base of an Asset is the combination of those key design outputs that define the functions, capabilities, capacities, physical sizes and dimensions (Physical Base), limits and set points, shutdown and start-up sequences, normal and out of normal operations (Operating Technical Specification) and maintenance elements (Maintenance Base), that are required for the asset to meet its required performance, reliability and availability within the limits of the external constraints.
<b>End-of-Phase Design Review</b>	End-of-Phase Design Reviews are performed to establish design Baselines and to ensure the correctness, completeness, conformance and integrity of a design. End-of-Phase reviews are performed at key milestones during a project's life cycle, normally at the end of a defined phase in the project.
<b>Interim Design Review</b>	Interim Design Reviews are performed on a day-to-day basis by a professional or team of professionals to review design documentation issued by an external Design Authority or an Eskom internal Design Engineering Practitioner.  These reviews are conducted during any phase of a project. Interim Design Reviews includes the detail review of design documentation.

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## 2.4 ABBREVIATIONS

Abbreviation	Description
BMH	Bulk Materials Handling
BOQ	Bill of Quantities
C&I	Control and Instrumentation
CAPEX	Capital Expenditure
CCCC	Central Change Control Committee
CM	Configuration Management
COE	Centre of Excellence
DMS	Document Management System
DOR	Division of Responsibility
DRC	Design Review Committee
DRT	Design Review Team
Dx	Distribution
EDWL	Engineering Design Work Lead
EIA	Environmental Impact Assessment
GA	General Arrangement
GM	General Manager
Gx	Generation
LPS	Low Pressure Services
MDL	Master Document List
P&ID	Piping and Instrumentation Diagram
PDE	Power Delivery Engineering
PDRA	Project Definition Readiness Assessment
PEIC	Production Engineering Integration Coal
PFD	Process Flow Diagram
PLC	Project Life Cycle
PLCM	Project Life Cycle Model
SED	Station Electrical Diagram
SME	Subject Matter Expert
TP	Terminal Point
Tx	Transmission

## 2.5 ROLES AND RESPONSIBILITIES

- **Design Engineer:** The role of the Design Engineer is to perform detail design within his/her field of expertise. The Design Engineer works closely with the other discipline design engineering roles in the production of an effectively integrated project design. As the registered professional, the Design Engineer is ultimately accountable for the technical integrity of the domain design work as delegated. The Design engineer shall have the required delegation to perform design from the relevant Centre of Excellence (COE) principal (manager).

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- **Lead Discipline Engineer:** The role of the Lead Discipline Engineer is to manage the technical integrity of the design and be accountable for the management of the interfaces within their specific engineering domain. In addition, the Lead Discipline Engineer coordinate the discipline specific activities for the particular package/plant/system/asset such as Protection, Telecommunications, Control, Metering, Turbine, Boiler, Bulk Materials Handling (BMH), Civil, Electrical, Control and Instrumentation (C&I), Chemical, Low Pressure Services (LPS), etc.

In addition, the Lead Engineer is accountable for the provision and establishment of all documentation required for a Design Review. The Lead Discipline Engineer is to ensure that a system of check sheets is being used in the review process and before the design review package is put together for the end of phase design review meeting he reviews and signs off on these documents.

- **Reviewers:** When Eskom acts as the Owners Engineer on a project/package/plant/system/asset, the interim reviewer(s) shall review the design documentation issued by the Design Authority to ensure that:
  - the design satisfies the stakeholder requirements (i.e. validation of design deliverables against stakeholder requirements).
  - general technical oversight is provided over the design.

When Eskom acts as the **Architect Engineer** on a project/package/plant/system/asset, the interim reviewer(s) shall review the design documentation issued by the Design Authority to ensure that:

- the design satisfies the stakeholder requirements (i.e. validation of design deliverables against stakeholder requirements);
- the design is integrated by identifying all interfaces with other packages/plant systems/assets and ensuring that these interfaces are catered for;
- foreseen technical risks are identified and addressed / challenged with the Design Authority;
- general technical oversight is provided over the design.

When Eskom acts as the **Design Authority** on a project/package/plant/system/asset, the interim reviewer(s) shall review the design documentation to ensure that:

- the design satisfies the design requirements;
  - all relevant COE design standards, procedures and guidelines have been adhered to;
  - the design is suitable and correct (calculations, philosophy, functionality, etc.);
  - best COE practices were applied;
  - the design is integrated by identifying all interfaces with other packages/plant systems/assets and ensuring that these interfaces are catered for.
- **COE Principal (Manager):** The COE manager is the ultimate engineering authority for design work and is responsible for and is the custodian of technical knowledge within their engineering domain. The COE manager ensures that his/her respective Design Review Committee/Team (DRC/DRT) is in place, properly constituted and representative of all relevant COE stakeholders as required per End-of-Phase design review and ensures implementation and compliance to this procedure.
  - **COE Senior Manager:** The COE Senior Manager is responsible and accountable for all engineering work related to their specific discipline (mechanical, civil, electrical, materials handling etc) and provides assurance for compliance of multidisciplinary work.

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- **Engineering Design Work Lead (EDWL):** EDWL is an engineering practitioner assigned by a delegated engineering person to co-ordinate the design work provided by the discipline Design Engineering roles and integrates this work into a final integrated design product. The EDWL is the custodian of the requirements set and the interface register between packages and part of his/her role is to maintain this information. The EDWL remains responsible for the integrity of the engineering product and is accountable for the overall management of interfaces and delivery of an integrated product

The EDWL ensures that all End-of-Phase Design Reviews are identified and executed as defined in this procedure.

- **Project Engineering Manager (PEM):** The PEM is accountable to plan for design reviews in conjunction with EDWL and the Project Planner. He / she shall also ensure that Design Reviews are incorporated into the relevant project's Master Schedule and programme. The PEM ensures compliance to this procedure in the project execution environment.

## **2.6 PROCESS FOR MONITORING**

This procedure will be monitored via [9] and self-assessments.

## **2.7 RELATED/SUPPORTING DOCUMENTS**

[16] [240-57934588](#) : End-of-Phase Design Review Report Template.

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### 3. DESIGN REVIEW PROCEDURE

Engineering designs are performed either “in-house” or by an external design office. In both cases design reviews need to be conducted regardless of which design authority generated the documents. Important to note that the professional accountability can either rest with:

- Eskom, when acting as designer (Eskom the design Authority) or;
- The external design office who works according to their own internal design processes.

In both these instances, the design authority remains responsible and accountable for the correctness of the design documents, irrespective of whether these documents have been reviewed by Eskom or not.

#### 3.1 OBJECTIVES OF DESIGN REVIEWS

The main objective of the design review procedure is to ensure that on an ongoing basis the plant or system being designed conforms to all requirements as defined by the various stakeholders. Particularly, the design review process is implemented to ensure that:

- the plant meets the stakeholder requirements definition (satisfies the customer needs)
- the design is correct (this includes calculations, philosophy, etc. where applicable);
- whether specified or not, that all mandatory and legislative requirements (organizational, local or national) to which a plant, component or system to which the design pertains needs to comply, have been identified, stated and verified for compliance;
- the design assumptions are accepted as being reasonable and adequate;
- plant designs will meet previous design reliability and availability or improving on conventional design reliability or availability;
- the eventual plant, component or system allows, and is equipped for, ease and speed of maintenance;
- the eventual plant, component or system allows, and is equipped for, ready access and ergonomically accommodating for normal and abnormal operating;
- adequate safety levels are met in building, operating and maintaining the plant / system;
- capital costs are optimized whilst considering all specified requirements;
- levelized life cycle costs are properly addressed throughout design lifecycle;
- the plant / system can operate safely and reliably within the specified design margins;
- components can be operated within the specified performance and stress ratings;
- all Interfaces with other plants or systems have been identified;
- all interface impacts or cross-coupling are assessed and catered for;
- all necessary design, manufacturing and installation codes and standards are used;
- design methodologies and philosophies are stated and verified as acceptable;
- supply chain considerations are included;
- designs are constructible;
- all IM requirements are identified, evaluated and appropriately addressed;

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- specific risks stemming from the design are identified and stated in the design package, to assist in the effective review;
- where plant, component or system are likely to be replaced or upgraded in future, that the design allows for this to be readily achieved;
- based on the value, criticality, etc. of the plant, component or system, that adequate protection, control, indication, alarm and condition monitoring forms part of the design;
- the reliability of the design is in keeping with the generally accepted Eskom standard of power generation or transmission installations in South Africa;
- the plant and its elements can be disposed of in a safe and economical manner.

All problem areas identified by the review panel during the design review meetings will be addressed by the designated engineering team. The engineering team should consider improvements to plant reliability, availability, design concepts, specifications, plans, schedules, costs, safety, quality, manufacturing techniques, installation procedures, operation and maintenance procedures. However, changes to previously set baselines must follow the Project Engineering Change Procedure - [240-53114026](#)

### **3.2 DESIGN REVIEW TYPES**

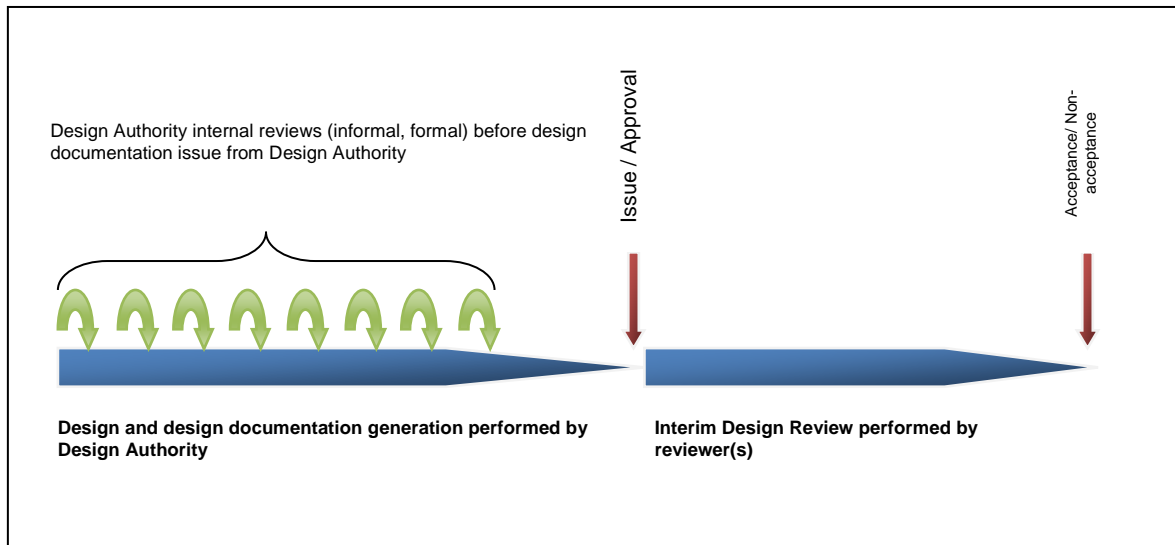
Formal reviews are carried out to approve design packages and are performed at key milestones during the project's life cycle, normally at the end of a defined phase or stage in the project. It is not practical to have formal design reviews too frequently due to the time and effort required to arrange, prepare and conduct these meetings. Hence, in addition to end-of-phase formal reviews, interim or day-to-day reviews should be held on a regular basis to support technical coordination as well as interface- and integration management. These reviews assist to avoid miscommunication, interface clashes and the development of inadequate designs. Hence, two types of design reviews are conducted during the project lifecycle:

- Interim Design Reviews; and
- End-of-Phase Design Reviews.

### **3.3 INTERIM DESIGN REVIEWS**

#### **3.3.1 Background**

Interim Design Reviews are performed on a day-to-day basis during any phase of a project by a professional or team of professionals to review design documentation issued by an external Design Authority or an Eskom internal Design Engineering Practitioner as represented in Figure 1. These reviews are conducted to accept / not accept documentation issued by the Design Authority (internal or external).



**Figure 1 : Interim Design Reviews**

Note: Only the Design Authority can approve design documentation. Interim Design Reviewers can only accept / not accept documentation issued by the Design Authority.

Typical Interim Design Review documentation includes:

- Functional and technical descriptions;
- Design drawings (SEDs, PFDs, P&IDs, General Arrangement drawings, 3D model, etc.);
- Load lists, cable schedules, logic diagrams;
- Design specifications/calculation reports;
- Design manuals and operating manuals.

After the design documentation have been approved (by the Design Authority) and accepted in the Interim Design Review it could thereafter typically be used for:

- Project sourcing;
- Construction;
- Manufacturing;
- Installation; and/or;
- Design input for interfacing system designs.

### 3.3.2 Process

#### Step 1: Distribution of design review documentation

The LDE responsible for the package/plant/system/asset shall evaluate from which parties (LDEs, SMEs, Configuration Management (CM), etc.) he/she requires comments on the design documentation. All affected parties and interfacing Centres of Excellence delegates shall be included in the interim review.

Further distribution of design documentation may occur, as required.

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**Step 2: Review of design documentation**

All identified reviewers shall perform a design review on the design documentation.

It is the responsibility of the reviewer(s) to:

- Perform the review within the specified time<sup>1</sup>;
- Prepare detailed review comments (this may include document/drawing redlines, etc.);
- Assign a review status to each reviewed document as specified in the Document Management System (DMS) - if not specified label as: accepted, accepted with comments or not-accepted.

**Step 3: Consolidation of comments**

Consolidation of comments within a COE shall occur before comments are returned to the LDE for final consolidation.

The LDE responsible for the package/plant/system/asset shall assess all received comments and consolidate as required. The LDE shall also facilitate the resolution of all clarifications and conflicting comments.

**Step 4: Finalisation of interim design review**

The LDE responsible for the package/plant/system/asset shall, after consolidation of all received comments, assign a final review status to each reviewed document.

**3.3.3 Documentation and Records Management**

All Interim Design Reviews' consolidated comments as well as the associated design review final statuses (linked to the reviewed document) shall be formally recorded on the relevant Document Management System (DMS). The LDE shall be responsible to ensure that this is recorded to ensure traceability and safekeeping. All individual reviewers shall have access to view the final assigned design review status for each design review.

**3.4 END OF PHASE DESIGN REVIEWS****3.4.1 Background**

End-of-Phase Design Reviews are performed to approve design Baselines and to ensure the completeness, conformance and integrity of a design.

End-of-Phase Design Reviews are performed as required at key milestones during the project's life cycle.

The following End-of-Phase Design Reviews are typically performed during the project life cycle, however not all specified End-of-Phase Design Reviews in Table 1 are necessarily performed during the execution of a project. The required End-of-Phase Design Reviews for a particular package/plant system/asset shall be predetermined and agreed as per the Engineering Management Plan. In the event that any End-of-Phase Design Review is not performed, approval shall be obtained from the General Manager-Engineering.

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<sup>1</sup> This time frame could be specified in the relevant contract, specified by the LDE or agreed upon as per Engineering Management Plan.

**Table 1 : End-of-Phase Design Reviews**

<i>Project Phase</i>	<i>Gate</i>	<i>Project Stage</i>	<b>End of Phase Design Review</b>	<b>Engineering Baseline</b>
<i>Pre-Project Planning</i>	<i>CRA</i>	<i>Define Need Identify Alternatives</i>	-	-
<i>Concept</i>	<i>DRA</i>		Stakeholder Requirements Review	Stakeholder Requirements Baseline
		<i>Develop Alternatives</i>	Concept Design Review	Concept Design Baseline
		<i>Select Single Solution</i>		
<i>Definition</i>	<i>ERA</i>	<i>Develop Solution</i>	Basic Design Review	Basic Design Baseline
			Pre-Enquiry Review <sup>2</sup>	Acquisition Requirements Baseline
<i>Execution</i>	<i>HOA</i>	<i>Finalise Solution</i>	Contract Award Review	Contract Award Baseline
			Design Freeze Review (Detail Design)	Design Freeze Baseline
			System Integrated Design Review (Detail Design)	Integrated Design Baseline
		<i>Implement</i>	Pre-Commissioning Review	As-Built Baseline
		<i>Commissioning and Handover</i>	Acceptance Testing Review	As-Commissioned Baseline
			Handover Review	Handover Baseline
<i>Finalisation</i>	<i>FRA</i>	<i>Close Project</i>	-	-
<i>Post Project</i>	<i>BRA</i>	<i>Realise Benefits</i>	-	-

**3.4.1.1 Stakeholder Requirements Review<sup>3</sup>**

Stakeholder Requirements Reviews are performed to analyse and agree on stakeholder expectations/requirements.

<b>End-of-Phase Design Review</b>	<b>Focus of Design Review</b>	<b>Typical Review Documentation</b>
Stakeholder Requirements Review	Establish agreed stakeholder requirements baseline by: <ul style="list-style-type: none"> <li>Analysing stakeholder expectations/requirements.</li> <li>Analysing project technical, engineering, legal, regulatory and environmental constraints.</li> <li>Analysing all technical risks.</li> <li>Defining external stakeholders.</li> <li>Confirming PDRA requirements are met.</li> <li>Identifying and resolving conflicting requirements.</li> </ul>	<ul style="list-style-type: none"> <li>Stakeholder requirements</li> </ul>

<sup>2</sup>Note: This review can also be referred to as the Works Information Review or Employers Requirements Review.

<sup>3</sup>Refer to figure 10, SANS 26702 [15] for information.

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### 3.4.1.2 Concept Design Review

Concept Design Reviews are performed to evaluate the feasibility, suitability and correctness of a proposed concept design.

End-of-Phase Design Review	Focus of Design Review	Typical Review Documentation
Concept Design Review	Establish agreed concept design baseline by: <ul style="list-style-type: none"> <li>• Verifying whether concept design(s) complies with stakeholder requirements.</li> <li>• Verifying that concept design deviations from stakeholder requirements were identified and managed by means of formal Engineering Change Management.</li> <li>• Analysing concept designs' technical feasibility and risks.</li> <li>• Analysing all technical risks taking into account plant modifications and incident investigations.</li> <li>• Assessing technology and technology maturity and market availability.</li> <li>• Estimating Capital Expenditure (CAPEX)/Lifecycle Cost</li> <li>• Defining concept design's preliminary project and system technical boundaries and interfaces.</li> <li>• Analysing proposed works scope allocation within project.</li> <li>• Confirming PDRA requirements are met</li> </ul>	<ul style="list-style-type: none"> <li>• Applicable design standards.</li> <li>• Concept design feasibility analysis.</li> <li>• Environmental Impact Assessment (EIA)</li> <li>• Concept design documentation as applicable (SEDs, PFDs, GA's, concept plant operational philosophy, etc.)</li> <li>• Stakeholder Requirements</li> <li>• Verification &amp; Validation Report</li> </ul>

### 3.4.1.3 Basic Design Review

Basic Design Reviews are performed to evaluate the suitability and correctness of basic design deliverables.

End-of-Phase Design Review	Focus of Design Review	Typical Review Documentation
Basic Design Review	Establish agreed basic design baseline by: <ul style="list-style-type: none"> <li>• Verifying whether basic design(s) complies with stakeholder requirements or previously set baseline.</li> <li>• Verifying that basic design deviations from previously set baseline were identified and managed by means of formal Engineering Change Management.</li> <li>• Analysing basic design parameters.</li> <li>• Analysing all technical risks.</li> <li>• Analysing basic design's physical and functional interface requirements.</li> <li>• Analysing lifecycle costing</li> <li>• Analysing proposed works scope allocation within project.</li> <li>• Confirming PDRA requirements are met</li> </ul>	<ul style="list-style-type: none"> <li>• Applicable design codes and standards.</li> <li>• EIA</li> <li>• Basic design documentation as applicable (P&amp;IDs, GA's, functional descriptions, design criteria, operational capability, etc.)</li> <li>• Division of Responsibility (DOR)</li> <li>• Interface register/definitions</li> <li>• Verification &amp; Validation Report</li> </ul>

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### 3.4.1.4 Pre-Enquiry Review

Pre-Enquiry Reviews are performed to ensure that technical specifications are complete, integrated and correct before market enquiry.

End-of-Phase Design Review	Focus of Design Review	Typical Review Documentation
Pre-Enquiry Review	<p>Establish agreed acquisition requirements baseline by:</p> <ul style="list-style-type: none"><li>• Verifying whether Works Information/Employers Requirements comply with previously set baseline.</li><li>• Verifying that deviations from previously set baseline were identified and managed by means of formal Engineering Change Management.</li><li>• Reviewing complete scope of supply/services/extent of work.</li><li>• Reviewing all requirements (such as system operating philosophies, performance requirements, and all particular system requirements).</li><li>• Reviewing the applicability of all specified codes, standards and procedures (internal and external).</li><li>• Reviewing technical schedules.</li><li>• Reviewing technical tender returnables.</li><li>• Reviewing referenced drawings in Works Information/Employers Requirements.</li><li>• Reviewing Bill of Quantities (BOQ) as applicable.</li><li>• Reviewing tender technical evaluation strategy.</li><li>• Reviewing all detailed system/package boundaries and interfaces.</li><li>• Reviewing the contract strategy</li><li>• Confirming PDRA requirements are met</li><li>• Reviewing that all Terminal Points and Interfaces have been correctly identified, defined and detailed</li></ul>	<ul style="list-style-type: none"><li>• Applicable design codes, standards and procedures.</li><li>• Complete Works Information/Employers Requirements package.</li><li>• Division of Responsibility (DOR)</li><li>• Interface definitions</li><li>• Technical evaluation/contract strategy.</li><li>• Technical evaluation strategy</li><li>• Verification &amp; Validation Report</li></ul>

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### 3.4.1.5 Contract Award Review

Contract Award Reviews are performed after contract award to ensure that all waivers from the Works Information/Employers Requirements during negotiations are addressed and catered for.

End-of-Phase Design Review	Focus of Design Review	Typical Review Documentation
Contract Award Review	<ul style="list-style-type: none"><li>Review awarded contract's compliance to Pre-Enquiry Works Information/Employers Requirements prior to signing of the contract.</li><li>Review changes in scope and interfaces.</li><li>Confirming PDRA requirements are met</li></ul>	<ul style="list-style-type: none"><li>Contract package Works Information/Employers Requirements (signed).</li><li>Changes to Works Information/Employers Requirements (deviation/variation protocol)</li><li>Technical Evaluation Reports</li><li>Verification and Validation Report</li></ul>

### 3.4.1.6 Design Freeze Review (Detail Design)

Design Freeze reviews can be conducted as End-of-Phase Design Reviews or as a series of Interim Design Reviews with the aim to design freeze a system or subsystem/asset in order to enable subsequent designs to progress. If applicable, contractual acceptance of contractor design documentation (P&IDs, GAs, etc.) during Interim Design Reviews are regarded as design freeze for the accepted plant/system/asset.

Typical Design Freeze reviews include:

- Process design freeze;
- Plant Layout/Arrangement design freeze;
- Equipment design freeze.
- Design freeze reviews are conducted on an as-required basis.

### 3.4.1.7 System Integrated Design Review (Detail Design)

System Integrated Design Reviews are performed to ensure that designs are fully integrated.

End-of-Phase Design Review	Focus of Design Review	Typical Review Documentation
System Integrated Design Review	<p>Establish agreed system integrated design baseline by:</p> <ul style="list-style-type: none"><li>Analysing all interfacing package/plant/system/asset's design status.</li><li>Ensuring closure of all issues regarding the integrated detail design.</li><li>Performing interfaces checks both physical and functional.</li><li>Confirming PDRA requirements are met</li></ul>	<ul style="list-style-type: none"><li>Project Package(s) Master Document Lists (MDLs)</li><li>Interface documentation (piping Terminal Points (TPs), signal lists, load lists, cable schedules, etc.)</li><li>Construction/installation methods and plans</li><li>Verification &amp; Validation Report</li></ul>

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**3.4.1.8 Pre-Commissioning Review**

End-of-Phase Design Review	Focus of Design Review	Typical Review Documentation
Pre-Commissioning Review	<p>Establish agreed As-Built Baseline by:</p> <ul style="list-style-type: none"><li>• Verifying that actual plant/asset configuration conforms to detail design.</li><li>• Verifying that design documentation set is complete</li></ul> <p>Provide assurance that system is ready for commissioning by:</p> <ul style="list-style-type: none"><li>• Reviewing all interfacing services' availability for commissioning.</li><li>• Reviewing system commissioning procedures.</li><li>• Confirming all required safety clearances are in place.</li><li>• Confirming PDRA requirements are met</li></ul>	<ul style="list-style-type: none"><li>• System commissioning procedures.</li><li>• As built drawings.</li><li>• Verification &amp; Validation Report</li></ul>

**3.4.1.9 Acceptance Testing Review**

End-of-Phase Design Review	Focus of Design Review	Typical Review Documentation
Acceptance Testing Review	<p>Establish agreed As-Commissioned Baseline by:</p> <ul style="list-style-type: none"><li>• Verify/Validate that plant/asset performance and functions meet stakeholder/technical requirements.</li><li>• Confirming PDRA requirements are met</li></ul>	<ul style="list-style-type: none"><li>• Commissioning/Acceptance Test Report</li><li>• Verification &amp; Validation Report</li></ul>

**3.4.1.10 Handover Review**

End-of-Phase Design Review	Focus of Design Review	Typical Review Documentation
Handover Review	<p>Provide assurance that a system/asset is ready for handover by:</p> <ul style="list-style-type: none"><li>• Reviewing that the technical hand-over documentation set is complete as per Stakeholder Requirements.</li><li>• Confirming PDRA requirements are met.</li></ul>	<ul style="list-style-type: none"><li>• Technical Hand-over package.</li><li>• Verification &amp; Validation Report</li></ul>

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### 3.4.2 Process

#### Step 1: Planning and Preparation

The responsible package/plant system/asset LDE shall ensure that End-of-Phase Design Reviews, as prescribed by this procedure, are scheduled as the project progresses through the project lifecycle.

The relevant End-of-Phase Design Review approver shall ensure that the Design Review Committee/Team (DRC/DRT) is properly constituted for the relevant End-of-Phase Design Review to represent all Technology stakeholders including the relevant COE Design Engineers, relevant LDEs and SMEs.

The responsible package/plant/system/asset LDE shall ensure that the following activities are performed in preparation for an End-of-Phase Design Review:

- Prepare the design review package (design review report, design review checklist<sup>4</sup>, all reference documentation);
- Schedule the relevant End-of-Phase Design Review;
- Ensure that the design review package is distributed to all review panel members as identified by the relevant COE manager at least 10 working days<sup>5</sup> before the scheduled review. All review panel members shall perform an individual review on the distributed design review package and return all comments to the responsible person within 5 working days<sup>6</sup> of the scheduled review;
- Consolidate all comments for discussion during the conduct of the End-of-Phase Design Review.

#### Step 2: Conduct End-of-Phase Design Review

The End-of-Phase design review approver shall determine if a quorum is present. In the event where no quorum is present, no End-of-Phase Design Reviews shall be conducted or authorised.

The responsible package/plant/system/asset LDE shall present the End-of-Phase design review with specific focus on the items as tabled in sections 3.4.1.1 through 3.4.1.10.

The panel members shall discuss and address all comments received during the individual reviews of step 1.

The panel members shall ensure that all items have been satisfactorily addressed in the specific End-of-Phase Design Review before approval and authorisation.

#### Step 3: Authorisation of End-of-Phase Design Review

Authorisation shall only occur should all review panel members approve the End-of-Phase design review and the necessary assurance are provided that all issues / items have been satisfactorily addressed.

End-of-Phase design review reports (See [13]) shall be approved by all review panel members and authorised by the relevant authoriser as per paragraph 3.4.3.

Should the review panel disagree on approval, the authorisation shall be escalated to the relevant Technology General Manager (GM).

The resolution of the panel shall be minuted and recorded on the relevant DMS. l;lkj

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<sup>4</sup>The End-of-Phase Design Review Checklist shall be developed by the LDE and include all checks deemed necessary. The review panel shall review the checklist for appropriateness / completeness.

<sup>5</sup>This time may differ as agreed upon and depending on the complexity of the plant/Package.

### 3.4.3 End-of-Phase Design Review Approval and Authorisation

**Table 2 : End-of-Phase Design Review Panel (Gx New Build and Refurbishment Projects)**

Scope of Design	Design Review Panel	Chair of Design Review + Approval	Authorisation
Package/plant/system/asset confined to one COE.	<ul style="list-style-type: none"> <li>Relevant Design Engineers</li> <li>Relevant LDEs</li> <li>Relevant corporate consultant<sup>6</sup></li> <li>Client Representative</li> </ul>	LDE	COE Manager <sup>7</sup>
Package/plant/system/asset involves multiple COE.	<ul style="list-style-type: none"> <li>All affected / involved Design Engineers</li> <li>All affected / involved LDE's</li> <li>Project Engineering Manager</li> <li>Relevant corporate consultant<sup>6</sup></li> <li>Client Representative</li> </ul>	EDWL	SM Plant Engineering <sup>7</sup>

**Table 3 : End-of-Phase Design Review Panel (Tx Projects)**

Scope of Design	Design Review Panel
Package/plant/system/asset confined to one COE.	<ul style="list-style-type: none"> <li><b>Approval:</b> Relevant COE DRT</li> <li><b>Authorisation:</b> PDE DRT Chairperson</li> </ul>
Package/plant/system/asset involves multiple COE.	<ul style="list-style-type: none"> <li><b>Approval:</b> All Relevant COE DRT</li> <li><b>Approval:</b> PDE DRT</li> <li><b>Authorisation:</b> PDE DRT Chairperson</li> </ul>

The Distribution design review panels will be set up by the PDE DRT. This shall include the rules for jurisdiction over projects by scope or value, and rules for escalation of technical decisions. This detail shall be included in the PDE DRT Terms of Reference.

<sup>6</sup> All designs must be signed off by the relevant corporate consultant / field expert(PEIC)

<sup>7</sup> Authorisation may be delegated.

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### 3.4.4 End-of-Phase Design Review Reports

All finalised End-of-Phase Design Review reports shall be recorded on the relevant Document Management System (DMS).

End-of-Phase Design Review reports shall typically include (see [16]):

- A summary/short description of the package/plant system/asset being reviewed;
- A summary of the scope of package/plant system/asset being reviewed;
- A reference list to all applicable review documentation;
- All issues/risks identified during the design review;
- All signatures obtained from the End-of-Phase Design Review panel (as per paragraph 3.4.3).

## 4. AUTHORISATION

This document has been seen and accepted by:

Name	Designation
D Odendaal	Senior General Manager Engineering, (Acting)
T Mathe	General Manager: Engineering Projects Management (Acting)
P Moyo	General Manager: Power Delivery
Louis Fernandez	Senior Manager: System Integration
Prudence Madiba	Senior Manager: Electrical and C&I Engineering
Vasanie Pather	Senior Manager: Chemical and Auxiliary Engineering
Galia Dudenska	Senior Manager: Civil and Structural Engineering
Dhiraj D Bhimma	Senior Manager, Production Engineering Integration Coal (PEIC)
Julian Fourie	Senior Manager: Production Engineering Integration Coal (Outside Plant)
Nad Moodley	Senior Manager Engineering (Acting) – Peaking OU
Riaan Mouton	Senior Manager Engineering, Production Engineering Integration (Peaking and Renewables)
G Bronkhorst	General Manager – Mega Projects
P Underhay	Senior Manager Capital Projects EPMO
K Pather	General Manager - Sustainability
J Naicker	Middle Manager - Business Processes
Poobie Govender	Chairman – Technical Process Governance Committee
B Maccoll	General Manager - Research
L Reddy	Middle Manager - Asset Management
M Maynard	Chief Advisor Business Processes
N Msibi	PDE
L Ndlala	Middle Manager – IM Project
A Scott	Middle Manager – Business Processes
R Stephen	General Manager – Capital Projects
C De Beer	Chief Engineer – System Integration

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## 5. REVISIONS

Date	Rev.	Compiler	Remarks
March 2007	0	P Knothe	First Issue of document (45-4)
July 2010	1	SC Engelbrecht	<ul style="list-style-type: none"> <li>Document supersedes N.PPZ 45- 4.</li> <li>Update on general content.</li> <li>Updated structure and format.</li> <li>Updated Figure 1.</li> <li>Updated conventional naming.</li> <li>Updated responsibility Matrix (Table 2 &amp; 3).</li> <li>Inclusion of section 3.5.3: System/Subsystem Design Freeze Review Process.</li> <li>Updated figure ANNEXURE A: End-of-Phase Design Reviews</li> <li>Alignment of ANNEXURE A: End of Phase Reviews with Table 1.</li> <li>Insert of 3.8: Minimum Documentation for Design Reviews</li> </ul>
November 2012	2	TA Botha SC Engelbrecht WJW Naudé	<ul style="list-style-type: none"> <li>Complete document rewrite including principles, terminology and responsibilities. Final Review by F Bosch for DM.</li> </ul>
September 2015	2.1	RA Mandavha	<ul style="list-style-type: none"> <li>Update on general content</li> <li>Reference document number updated to 240 D004FC number</li> <li>Align role of EDWL and LDE</li> <li>Final Draft for Comments Review</li> </ul>
January 2016	2.2	RA Mandavha	<ul style="list-style-type: none"> <li>Updated Final Draft after Comments Review Process</li> <li>Document approved by Eskom P&amp;P Steerco</li> </ul>
September 2016	3	RA Mandavha	<ul style="list-style-type: none"> <li>Final Document prepared for Authorisation and Publication by F Bosch for DRM</li> </ul>

## 6. DEVELOPMENT TEAM

The following people were involved in the development of this document:

- RA Mandavha
- S Jagjiwan

## 7. ACKNOWLEDGEMENTS

- None

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