

	Procedure	Generation Engineering
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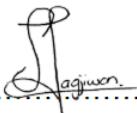



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1. INTRODUCTION

The control and execution of engineering changes on projects is critical in ensuring sustainable performance. All engineering changes must be correctly prepared, motivated, reviewed, approved, authorized, controlled, and recorded before they can be implemented.

This procedure defines a standardised process for all Generation projects to be followed when conducting an engineering change to an established baseline design. It must be noted that the Engineering Change Management procedure (240-5314002) is used when a change is to be made on physical plant assets. This procedure Project Engineering Change Management (240-53114026) is used on baselines created through the design review procedure on documentation. The aim of a well-managed engineering change process is to ensure that the design integrity of the plant remains intact (240-5314002) and that the design baseline is maintained (240-53114026).

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Appendix A clarifies the relationship between these procedures.

2. SUPPORTING CLAUSES

2.1 SCOPE

The need for an engineering change on a new build and/or refurbishment project must be captured through an approved application system and follow due process for resolution. This procedure provides for the registration of all Change Requests (CRs) and for reporting on the status of all CR's that impact the engineering baseline while the actual engineering work is processed. As stipulated in the Engineering Change Management Procedure, the approach shall provide assurance that the systematic evaluation of proposed solutions adhere to project, regulatory, client, safety, health, environment, and quality standards requirements.

2.1.1 Purpose

The purpose of this procedure is to ensure that the Generation Design Baselines shall be managed in such a way as to enable sustainable achievement of Generation's business goals, by controlling engineering changes during the execution of a project. The procedure must be applied to ensure that an effective process for controlling and managing changes to the baseline is performed in a controlled manner. Any proposed changes shall be traced, thereby demonstrating compliance with auditable traceability.

2.1.2 Applicability

This procedure shall apply to all personnel involved in engineering changes executed by or on behalf of Generation (excluding Generation Nuclear) during the creation of an asset to be owned by Generation.

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] 240-53113685: Design Review Procedure
- [3] 32-1155: Eskom PLCM Policy
- [4] 240-53113704: Design Base Standard
- [5] 240-42366126: Process Control Manual (PCM) – Control Change on the Project
- [6] 240-46693733: Process Control Manual (PCM) – Manage Technical Queries
- [7] 240-51093273: Process Control Manual (PCM) – Control Configuration Changes
- [8] 240-44271204: Process Control Manual (PCM) – Manage Engineering Delivery

2.2.2 Informative

- [9] 240-53665024: Engineering Quality Manual
- [10] 240-53114190: Internal Audit Procedure

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2.3 DEFINITIONS

Approve	The functional responsible person determines if the document is fit for purpose and approves the document content and therefore takes responsibility and accountability for the document content.
Asset/Plant	Machinery, property, buildings, vehicles and other items and related systems that have a distinct and quantifiable business function or service.
Authorise	The document authoriser authorises the release and application of the document and is accountable for document implementation.
Design Authority	A professionally registered engineer, or team of appropriately registered built environment professional including engineers, appointed and tasked to provide a detail design
Established Baseline Design	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.
Engineering Change	Any permanent or temporary change, deletion or addition to any system, equipment, structure including permanent changes to operating/protection/control set points, software and technical documentation which will result in any deviation from original or existing System Structure of Component (SSC) design and/or specification or established baseline. This includes the replacement of SSC's with equivalent components of a different make or type.
Project Engineering Change	Changes to documentation baselines that require a technical review, an update of the baseline and a re-signoff to establish a new baseline.
Engineering Change Classification	The categorisation of a modification depending on the level to which it affects safety, the environment, reliability, availability, and costs.
Engineering Change Management	Engineering Change Management ensures all engineering changes are correctly prepared, motivated, reviewed, approved, controlled and recorded.
Engineering Change Prioritisation	Selection criteria, as part of the Engineering Change process that will guide the engineer and the approval design review committee on the priority of the engineering change into different levels.
Change Request	The entire document package containing the Engineering Change Proposal, feasibility study, design package, reviewers report, implementation plan, works information, commissioning procedures and the execution schedule. These documents will bear the approval signatures relevant to the engineering change classification and those signatures required for authorisation prior to implementation and Return to Service of the affected Plant.
Engineering Change Notice	The outcome from the Engineering Change Notice (ECN) Process used by the Design Authority to issue a proposed revision to a frozen document. An ECN contains the motivation for the changes required as well as the impact of the proposed changes.
Engineering Response	Formal communications that do not require a change in design documentation.
Field Change Notice	The outcome from the Field Change Notice (FCN) Process that is used by the Design Authority during construction and commissioning, to mark up the design documentation by means of red marks on to documentation to reflect the proposed changes that are required. As built documentation indicating updates from the red marks is submitted through an ECN process.

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Engineering Change Requestor	The engineering change requestor can be any stakeholder (engineering or non-engineering) on the project. This includes any engineering change request originating from engineering, contractors, project management or construction, etc.
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2.4 ABBREVIATIONS

Abbreviation	Description
CC	Change Co-ordinator
DA	Design Authority
DMO	Document Management Officer
DMS	Document Management System
ECN	Engineering Change Notification
ECP	Engineering Change Proposal
ECR	Engineering Change Request
EDWL	Engineering Design Work Lead
FCN	Field Change Notification
KKS or AKZ	Kraftwerk Kennzeichen System or Alagen Kennzeichnungs System
LDE	Lead Discipline Engineer
LOSS	Limit of Supply and Services
PCCB	Project Change Control Board
PCR	Project Change Request
PM	Project Manager
RFD	Request for Design
SM	Senior Manager
SoW	Scope of Work
SRD	Stakeholder Requirements Definition
SSC	System Structure or Component

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2.5 ROLES AND RESPONSIBILITIES

Role	Responsibility
Change Coordinator (CC)	The person(s) in charge of managing the permanent or temporary configuration to structures, systems, components, or technical content of prescriptive or descriptive documentation that form part of the design and/or asset base and updating in the relevant document management system to reflect the latest status of an ECN/PCR.
Lead Discipline Engineer (LDE)	The LDE shall ensure that the engineering change request is relevant, reviewed and fit for purpose to be implemented on the relevant plant area(s). The LDE shall verify that the engineering change impact assessment team is duly constituted of all affected stakeholders and Engineering Discipline representatives. The LDE is responsible for ensuring the correctness of the engineering change request.
Engineering Change Requestor	The engineering change requestor has the responsibility to ensure that the engineering change and relevant documentation is based on accurate and correct information and that the proposed change will, or has the potential, to improve / sustain plant performance, safety, investment protection, operability and / or supports the plant life cycle. The engineering change requestor also has the responsibility to register the request on the project change register with the relevant Change Co-ordinator.
Project Engineering Change Design Review Panel	<p>A committee/individual appointed by the Project Engineering Manager. Their responsibilities include:</p> <ul style="list-style-type: none"> • Authorising the proposed Level 1 and Level 2 engineering changes. • Authorising the engineering change based on the principles, use of technologies and alignment to the process and procedure. • Confirming the engineering change impact (change classification, environmental assessment, risk ranking, priority, and technical content, etc.). • Performing change level classifications; and • Assesses the impact on the project (cost, risk, plan and schedule, contracts, resource management, etc.). <p>The responsibilities of the committee could be delegated to one person in certain instances. This committee is usually constituted by all stakeholders who are appointed on the specific project. This committee is not to be confused with the role of the Site Change Control Committee.</p>
Impact Assessment Team Leader	<p>An appropriate and qualified Project Engineer, who has the training, technical qualification and expert knowledge of the plant or systems affected by the engineering change. The impact assessment team leader shall be selected by the EDWL/LDE, and his/her function is to:</p> <ul style="list-style-type: none"> • define the impact assessment team. • lead the impact assessment; and • compile the engineering change report.
Impact Assessment Team	The impact assessment team is defined by the impact assessment team leader. The impact assessment team shall consist of all affected

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Role	Responsibility
	stakeholders and Engineering Disciplines representatives. Each member of the impact assessment team shall provide input (technical, financial, safety etc).
Engineering Design Work Lead (EDWL)	EDWL is an engineering practitioner assigned by a delegated engineering Manager 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/projects 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):	Ensures compliance to this procedure in the project environment. The project engineering manager accepts the engineering change for implementation in the project based on comments and recommendation from the project engineering change design review panel.
Project Manager	Ensures compliance to this procedure in the project environment. The project manager ensures that the engineering change is implemented based on engineering approved ECR and the Project Change Control Board comments.

2.6 PROCESS FOR MONITORING

This procedure will be monitored via Internal Audit Procedure [10], 240-53665024: Engineering Quality Manual Engineering Quality Manual [9] and self-assessments.

2.7 RELATED/SUPPORTING DOCUMENTS

- [11] ISO 15288: Systems and software engineering - Systems life cycle processes.
- [12] N.PPZ 45-5 Superseded by this document.
- [13] 240-70976432 Engineering Change Proposal Template
- [14] 240 – 113413666 Technical Query Template
- [15] 240 – 113412907 Engineering Response Template
- [16] 240 – 113413789 Engineering Change Request Template
- [17] 240 – 113413710 Impact Assessment Template

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3. PROJECT ENGINEERING CHANGE PROCEDURE

3.1 OBJECTIVES

The objectives are:

1. Ensure the effective management of all engineering changes to maintain the integrity of the Design Base over the full lifecycle of the project and to reduce business risk.
2. Ensure a consistent approach is used for the classification and prioritisation of all engineering changes.
3. Ensure the process/procedure and tools used for design engineering changes and change management across all plant is standardised.

3.2 CHANGE REQUEST PRINCIPLES

3.2.1 Engineering change level classification and change review panel members.

A change request (CR) is a proposed change to an established baseline(s). CRs are classified by the EDWL, LDE, or any person delegated to do so, according to their potential impact on affected systems or disciplines, health and safety, regulation, project timelines and cost. The ECR level classification, criteria and relevant project engineering change design review panel members are shown in the table below:

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Table 1: ECR level classification, criteria and change review panel members.

Level	Criteria	Project Engineering Change Design Review Panel Members	Chair of Engineering Change Design Review + Approval	Authorisation
1	<ul style="list-style-type: none"> ▪ Proposed change affects any of: <ul style="list-style-type: none"> – Compliance to SRD or the agreed baseline document e.g., SOW – Health and safety – Time or cost greater than 5% on overall project. – Regulatory compliance – Compliance to Eskom standards and specifications ▪ or avoidance of major equipment damage ▪ or prevention of production loss 	<ul style="list-style-type: none"> ▪ All affected Design Engineers ▪ All affected / involved LDE's¹ ▪ Project Engineering Manager ▪ Client Representative² 	EDWL	Power Station Engineering Manager or PEM if appointed ³
2	<ul style="list-style-type: none"> ▪ Proposed change affects multiple systems or engineering disciplines. ▪ or impact on: <ul style="list-style-type: none"> – Plant reliability – Availability – Environmental – Operations 	<ul style="list-style-type: none"> ▪ All affected Design Engineers ▪ All affected / involved LDE's. ▪ Project Engineering Manager 	EDWL	Power Station Engineering Manager or PEM if appointed ³
3	<ul style="list-style-type: none"> ▪ Proposed change affects one plant system or engineering discipline. ▪ and has no impact on: <ul style="list-style-type: none"> – Safety – Operations – Environment – Plant reliability 	<ul style="list-style-type: none"> ▪ Relevant Design Engineers ▪ Relevant LDE 	EDWL	Power Station Engineering Manager or PEM if appointed ³

¹ Note that all LDEs must be ECSA professionally registered or work under supervision as per the LDE appointment letter and must comply to MEA requirements.

² Where a dispute arises between engineering and the client regarding adherence to Stakeholder Requirements, Power Station Technical Plant Manager (where applicable) or Power Station General Manager may approve the project Stakeholder Requirements deviation, refer to section 3.2.9.

³ Authorisation may be delegated.

3.2.2 Engineering Change Classification

For all changes identified that impact engineering and affect the baseline, the Impact Assessment Team shall also assess if additional design work (no part of the existing scope) is required. Where additional design work is required, this shall be facilitated through the Engineering Change Proposal process prior to the Design Authority performing any engineering change. For changes that impact engineering and affect the baseline but does not require any additional design work shall be facilitated using ECN/FCN processes. Depending on the complexity and the final response classification, the Impact Assessment Team shall decide on the appropriate route. Table 2 below outlines the selection criterion for selecting the right response for all CRs. The Design Authority shall be responsible for responding to all requests which are classified as technical queries.

Table 2: Project Engineering Change Management Selection Criterion

Classification	Summary	Complexity
ER	Used to respond to queries that does not affect design baseline.	-
ECP	Used for the change of complex systems, major design deficiencies, missing scope, alignment of SRD, or alternative design concepts.	Complex and Specialist work Black Line Drawings
FCN	Used to mark-up changes to design documentation. Typically used during construction and commissioning to "redline" design documentation in order to reflect changes. As built documentation to then be submitted with transmittal referencing the changes that were approved via the FCN	Simple Redline Drawings
ECN	Used for the revision of frozen design documentation. Typically used to reflect the "as built" or "as commissioned" state using the FCN's and marked up documentation from the field. The ECN is also used to propose a change for review and approval by the Project Change Design Review Panel.	Complex work Black line Drawings

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All changes should be classified in terms of the reason for change:

- **Design Document Error or Omission** – The Design Authority erred during the design process and requires a correction to the approved design to make it functional and/or safe.
- **Value Engineering** – Although the current design is fully functional and safe, by performing a change to the design as proposed, certain saving in time and/or costs may be achieved that will exceed the additional design costs and time incurred.
- **Design Improvement** – Although the current design is fully functional and safe, in the professional opinion of the Design Authority Representative a change is required to cater for specific conditions not envisaged as part of the original design.
- **Workaround** – A temporary physical plant, equipment, or component, etc. or electronic attributes (setting, logic, etc.) that is fulfilling the function of the part, or whole of the design during the commissioning stages of the project but is not intended to be handed over as part of the final design, thus the workaround will be decommissioned and removed before handover.
- **Construction Integration** – During the construction of the design it is found that certain changes must be made to make the overall (cross package/cross designer) design functional and/or safe.
- **NCR Incorporation** – A concession is evaluated and incorporated into the overall design, changing the design base, and making the construction compliant. If the construction concession acceptance is for a specific component only, without changing the design base, the drawings are not updated, and the concession is reflected on the quality records only.
- **Other** – This may include items such as excavation permits, temporary construction works etc.

3.2.3 Engineering Change Impact Assessment

The impact assessment team led by impact assessment team leader (LDE or any delegated engineer) shall:

- Review and confirm the engineering change level classification.
- Review the engineering change and determine the relevant criteria needed to be taken into consideration in evaluating the acceptability of the proposed change.
- Identify and review all documentation affected by the proposed engineering change.
- Identify all affected plant KKS or any plant codification.
- Identify all affected package/project baselines.
- Analyse the engineering change for impact on:
 - Technical
 - Financial
 - Safety
 - Environmental
 - Operating
 - Schedule
 - Information management
- Perform trade-off analysis on the affected systems and propose alternative solutions, if appropriate.

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- If applicable, develop / update the suggested scope of work (SoW), LOSS diagrams, drawings and terminal points for engineering change implementation.
- Produce a signed impact assessment as a record of issues considered and decisions made.

Once an impact assessment is conducted, the impact assessment team leader shall compile an engineering change report (FCN, ECN, RFD, ECP).

3.2.4 Project Engineering Change Design Review Panel

The project engineering change design review panel members shall:

- Ensure that all affected stakeholders are represented, and scopes fully covered.
- Perform an assurance check on the engineering change process followed.
- Review the completeness / make-up of the impact assessment team.
- Review the engineering change.
- Review if due process has been followed in covering all interfaces, changes have been adequately motivated and engineering standards and statutory requirements have been complied with.
- Jointly agree, led by the EDWL, or delegated individual, on an engineering change status classification. Should the panel disagree, the project engineering manager shall, depending on the risk, make the final decision.

The project engineering change design review panel chairperson shall ensure that:

- Record is kept of decisions and comments from the review panel.
- Record of all panel members acceptance is kept.
- Sign the engineering change report with the relevant status classification.
- Ensure that the change package is complete and submitted to the Project Engineering Change Design Review Panel committee.

3.2.5 Engineering change report

The engineering change report (as developed by impact assessment team leader) shall include the following:

1. Engineering change introduction (description / background)
2. Affected engineering baseline(s)
3. Detailed analysis on potential impacts with respect to:
 - technical
 - financial
 - safety
 - environmental
 - operating
 - risk
 - timing, and
 - information management.
4. List of impact assessment team members
5. Engineering change check sheet
6. Affected documentation/drawings.
7. Lessons learnt and
8. Recommendations / Proposals.

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3.2.6 Change Request Status

An engineering change will at any time be assigned one of the following statuses:

Table 3: Engineering Change Statuses

Status	Description
Authorised	Engineering change authorised by the Power Station Engineering Manager/Project Engineering Manager (where appointed for specific project). Engineering change shall be implemented.
Authorised with Comments	Engineering change authorised by the Power Station Engineering Manager/Project Engineering Manager subject to the inclusion of panel and committee comments. No engineering change re-presentation to change review panel required.
Cancelled	Engineering change cancelled prior to review by change review panel.
Open	Engineering change registered. Engineering change to be presented to change review panel.
Rejected	Engineering change rejected by change review panel. Engineering change shall not be implemented. The engineering change can also be rejected by the LDE before it is required to be reviewed by the Project Engineering Change Design Review Panel
Rework	Engineering change requires rework. After completion of rework, engineering change to be reviewed by the change review panel and re-presented to the relevant committee

3.2.7 Configuration Management

Configuration management activities shall be performed throughout the lifecycle of a project to record and report the status of all proposed engineering changes. An engineering change register per project shall be maintained throughout the lifecycle of the project. The register shall, as a minimum, include the following:

- Unique change identifier
- Change title.
- Status
- Originator.
- Responsible LDE
- Level classification
- Change registration date.
- Actual change panel review date.

Configuration management activities shall adhere to Configuration Management Systems to ensure traceable, auditable information regarding the status of proposed changes as well as the implementation status of approved changes.

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3.2.8 Document and Records Management

All relevant engineering change documentation, reports, panel acceptance and minutes of meetings shall be managed and regularly recorded on the relevant project DMS.

3.2.9 Dispute Resolution

When a dispute arises within the PECM process, the right authorities will have to settle and resolve the dispute in a manner that is properly controlled, transparent and fair. The table below prescribes the correct dispute resolution bodies that shall settle and resolve any dispute that may arise within the project depending which stakeholders are involved in the dispute.

Table 4: Dispute Resolution Board

<i>Affected Stakeholders</i>								<i>Dispute resolution stakeholders</i>
<i>CLIENT</i>		<i>LDE</i>	<i>EDWL</i>	<i>PEM</i>	<i>PEC Design Review Panel</i>	<i>Contract Manager</i>	<i>PCCB</i>	
		X(x2)						EDWL
X				X				Power Station Engineering Manager
		X			X			PEM
			X		X			PEM
					X	X		PM and PEM
					X		X	Power Station General Manager and Project Manager (Director)

A dispute between two or more LDEs will be resolved by the EDWL. Any ruling/decision taking by the dispute resolution board shall be final and not subjected to any further appeals except for the ruling/decision take by the EDWL and Project Engineering Manager. These can be escalated to the Power Station Engineering Manager, Project Manager (Director) and Power Station General Manager.

3.3 PROJECT ENGINEERING CHANGE MANAGEMENT PROCESS

Figure 1 below outlines the high-level project engineering change management process to be followed when performing an engineering change on a project. This process shall be used to manage and control technical queries and all engineering changes that affects the integrity of the design baseline from any Design Authority, be it the Design Authority is Generation or otherwise. As depicted, the project engineering change management process is divided in two phases, and these are explained in detail in the section that follows.

3.3.1 Change Request Phase

In line with the project requirements, all change requests shall be formally initiated through a single point of entry for the project where all queries are registered. Any stakeholder on the project can submit a query/change request and this shall be captured in a register. However, all queries that are technical in nature must be discussed by the Originator, PEM and the LDE (and/or the EDWL) together with the Design Authority Representative and a resolution on the way forward should be discussed before any query is formalised. The purpose for the discussion is to ensure the following:

- The problem or opportunity is correctly identified.
- Possible solutions are discussed; and
- A decision is made on recommendations for resolution or not.

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The resolution from the discussion shall be an agreed problem statement and a way forward on how to address the problem. The way forward shall also include selecting the right avenue for addressing that query. If the problem was not resolved /clarified during the discussion, the Originator shall initiate an Engineering Change or Technical Query (TQ). All TQ's shall be formally submitted following the TQ Process outlined in section 3.3.1.2 below.

3.3.1.2 Change Request Process

Once a TQ is registered and captured on the project change register, the Project Engineer's shall perform a high-level assessment to ensure the completeness of the TQ. All TQ's shall be validated by the Project Engineer, thus TQ's that are not justified as complete shall be deemed as invalid and these shall be closed out and the query originator notified. Where the query is deemed valid and complete, the TQ shall be accepted. Accepting the TQ does not mean that it shall subsequently be approved. It is an indication that it is sufficiently justified to be given further consideration.

Once the TQ is accepted, the Project Manager's Representative shall evaluate if the TQ requires engineering input. All TQ's that requires engineering input are therefore classified as technical queries and shall be forwarded to the relevant LDE for resolution. However, the Project Manager's Representative shall respond and close out all other queries that do not require any engineering input. All valid TQ that do not impact engineering shall follow the project management processes, however engineering shall form part of the core team and provide input to the query where possible.

Where a valid TQ impacts engineering, a further assessment shall be done by the LDE together with an impact assessment team to assess whether the TQ resolution would impact the design baseline. The LDE shall ensure that the Impact Assessment Team comprise of all affected stakeholders which may include Engineers, Project managers, Construction Supervisors, Contractor Representative and Design Authority Representative, etc. All TQ that impact engineering but do not affect the design baseline shall be dealt with using the Engineering Response (ER) process as they are classified as requiring only a technical response.

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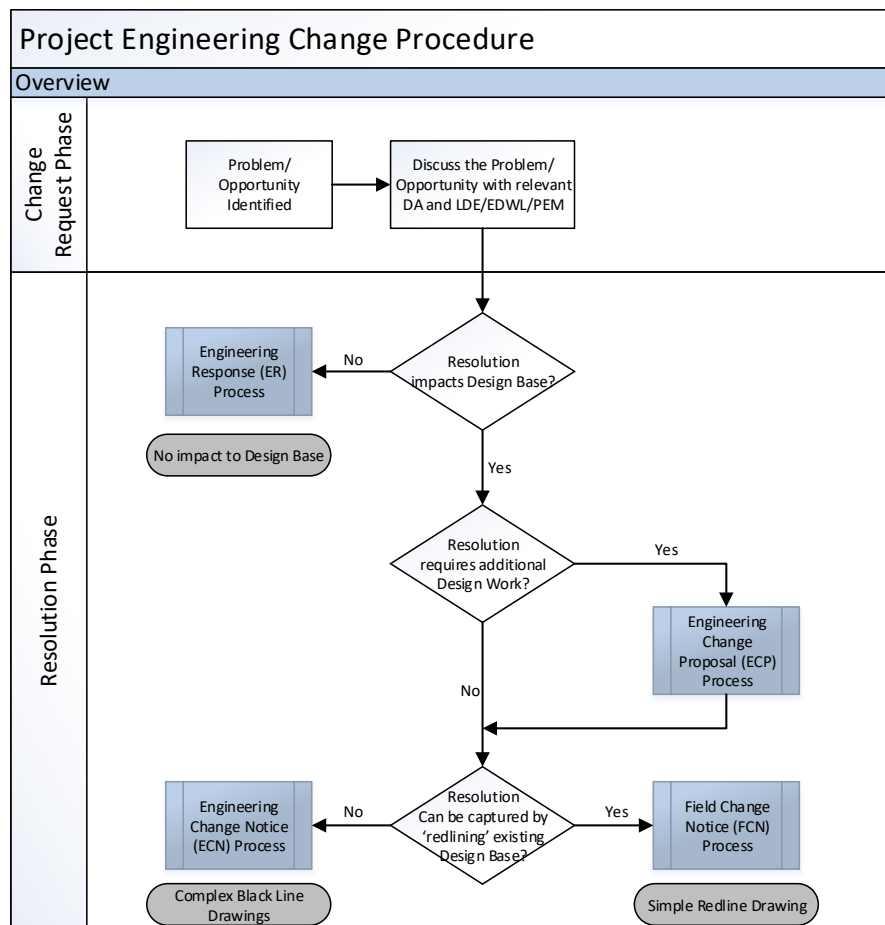


Figure 1: PECM Overview

3.3.2 Resolution Phase

3.3.2.1 ER Process

The Engineering Response (ER) process is defined in Figure 2. Where the response to a TQ or Design Request does not entail changing or updating the design baseline, an ER shall be used to communicate all technical responses that were discussed and agreed by the Impact Assessment Team outlines a process on how ER shall be executed. An ER shall be issued by the Design Authority using the correct ER template [15].

After the Impact Assessment Team has discussed and agreed that the resolution to a TQ does not have any impact on the design, the TQ shall be formally submitted to the Design Authority through the relevant Project Manager. Upon receiving a formal TQ, the Design Authority (or representative) shall produce the required response on the ER template and submit it formally for review and authorisation.

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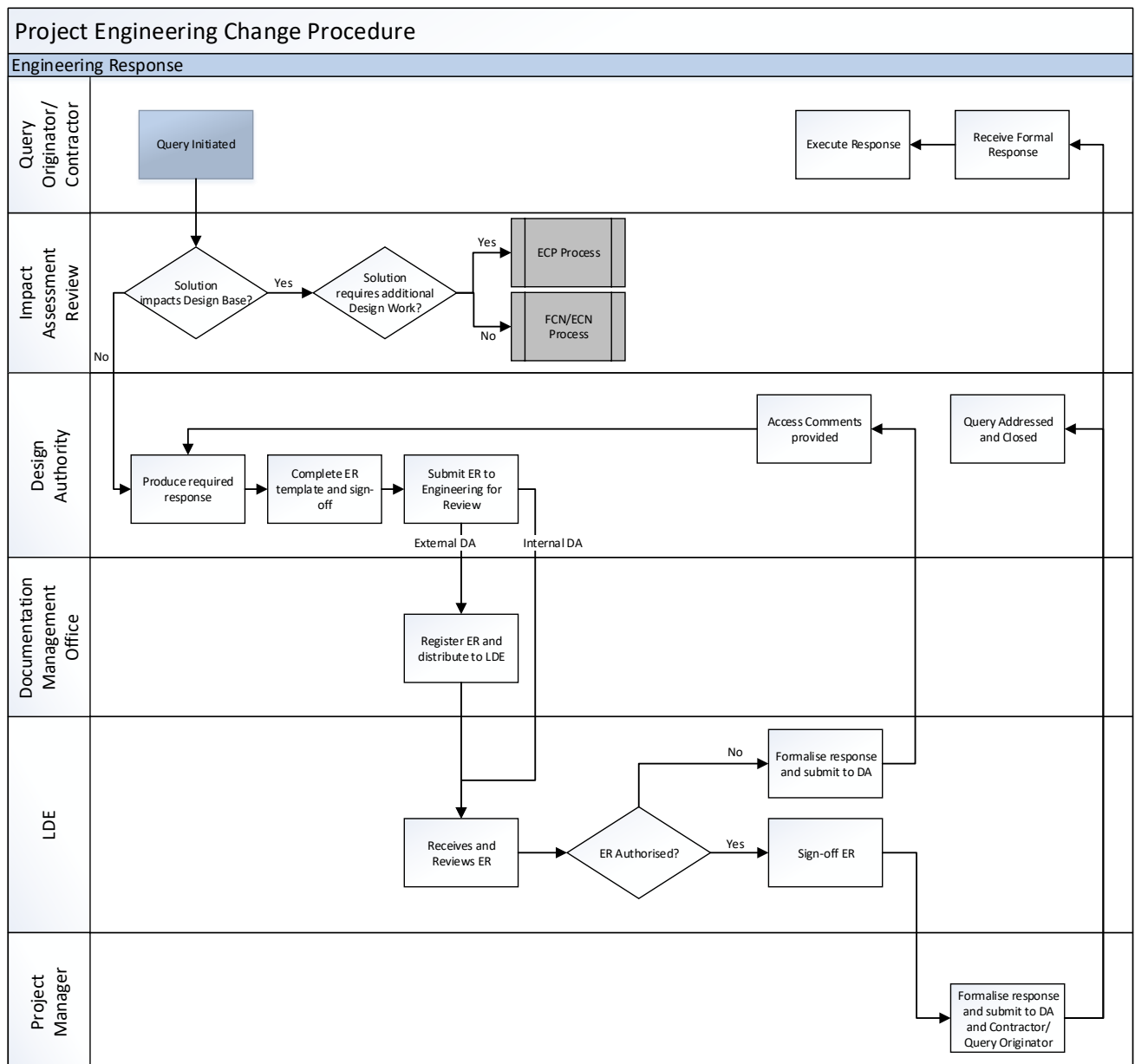


Figure 2: Engineering Response Process

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All ERs shall be received through the Project Manager's Representative for processing and before they are distributed to the relevant LDE for review. The LDE shall review the ER before signing it for final authorisation. The review shall ensure that the correct parties reviewed and authorised the response by confirming that it does not impact on the overall integration of the plant and the design base.

All authorised ERs shall be processed by the Project Manager's Representative. All ERs shall be registered, loaded on approved DMS and distributed to the affected parties as per the distribution list on the ER. All approved ERs shall be formally communicated to both the Design Authority and the Constructor through their respective Project Manager's Representatives. However, if an ER has been rejected the response shall only be communicated to the Design Authority for correction and resubmission. For all approved ER's, the Query Originator shall, upon receipt of the ER, execute the response immediately.

3.3.2.2 Engineering Change Proposal Process

The design request process provides a formal way in which all requests for designs may be raised to the relevant Design Authority. All design requests shall be discussed and properly identified before they are issued using the correct template (ECP - [13]). The process for executing a design request is outlined in Figure 3

Before any design request is executed, the LDE shall ensure that the Impact Assessment Team which shall consist of all affected stakeholders is appointed as per 474-34 and a proper impact assessment shall be conducted using the correct template. The team shall perform an impact assessment on the design and construction, considering the time and costs impact before any design request is sent to a Design Authority for consideration.

Completed design requests shall be submitted to the Project Engineering Design Review Panel for authorisation. The review panel shall review all design requests to ensure that the correct stakeholders reviewed the request and that the impacts assessed is acceptable before authorisation. However, if a design request must be rejected the response shall be communicated to the relevant LDE for correction and resubmission. Only the EDWL or person authorised to do so can authorise a design request.

All authorised Design requests shall be submitted to the Project Manager's Representative for DA before they are distributed to the DMO for processing. The Project Manager's Representative shall instruct the DMO to issue the design request formally, through a transmittal note, to the Design Authority.

Upon receipt of a design request, the Design Authority shall evaluate the request and respond accordingly using the type of response stipulated by the impact assessment team on the design request. The Impact Assessment Team can stipulate either of the engineering change process to the design authority. However, should the Design Authority decide not to consider the design request, an ER template shall be used to respond.

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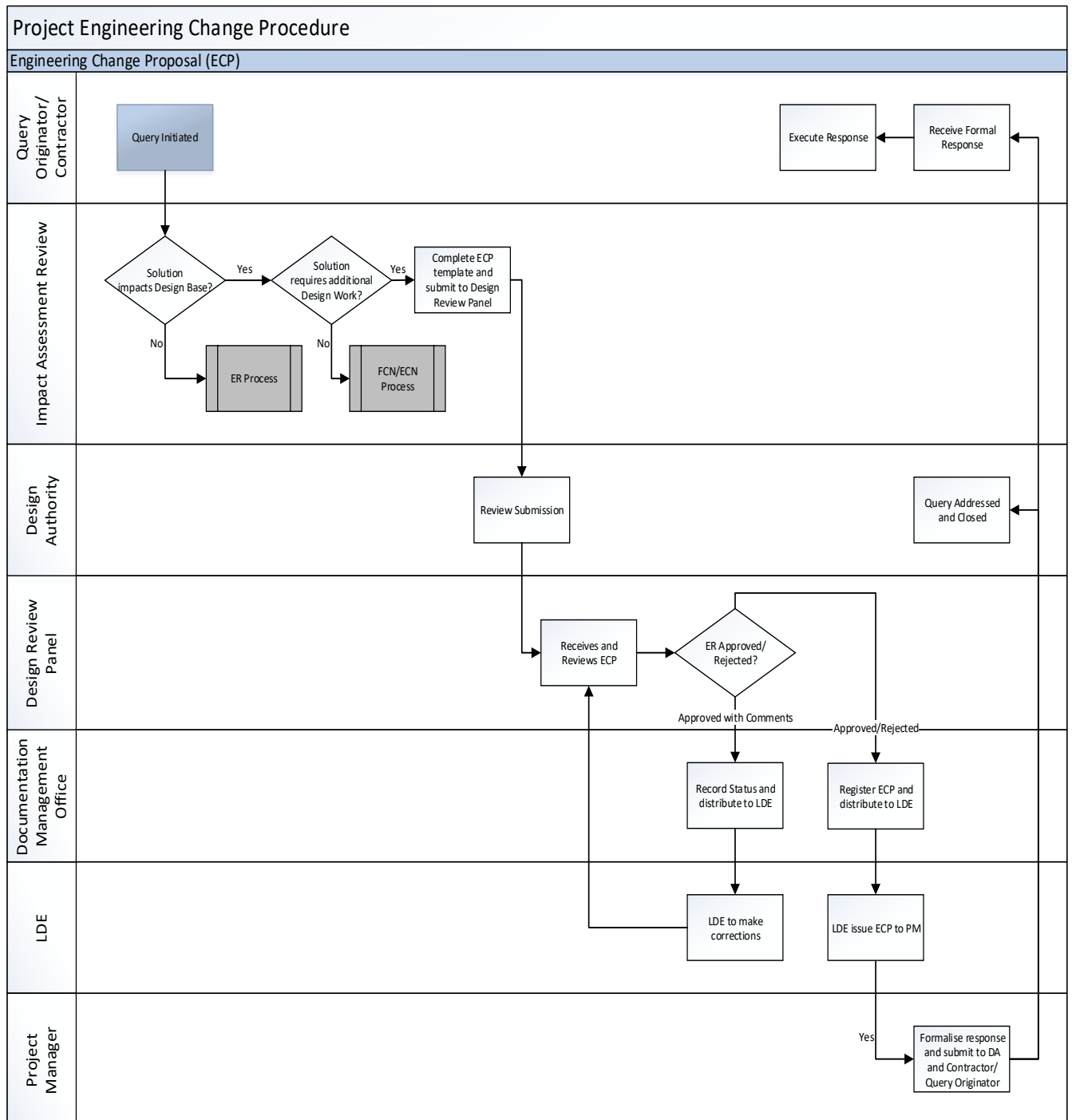


Figure 3: Engineering Change Proposal (ECP) Process

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3.3.2.3 FCN/ECN Process

Figure 4 below outline the process that must be followed for all responses that affect the design base. Following the guidelines shown in Table 3, the Impact Assessment Team shall assess whether an FCN or ECN can be used to respond to the TQ. For any of these responses, it is the responsibility of Design Authority to produce designs of a high-quality standard and should be error free. If the Design Authority becomes aware of any errors (including lack of information), the Design Authority shall correct these errors using the applicable ECR process following the guidelines in Table 3.

After the Impact Assessment Team has discussed and agreed on resolution to a TQ, the TQ shall be formally submitted to the Design Authority through the Project Manager's Representative. Upon receiving the formal TQ, the Design Authority (or representative) shall produce the required response as per the discussion from the impact assessment using the correct template and outlining the problem, the solution as well as the expected impact on the design and construction. For FCN's, the Design Authority shall identify the design documents affected and mark up the changes in red using the latest authorised documentation. For ECN's, the Design Authority shall identify and revise all the design documents and clearly indicate the changes in the revision blocks.

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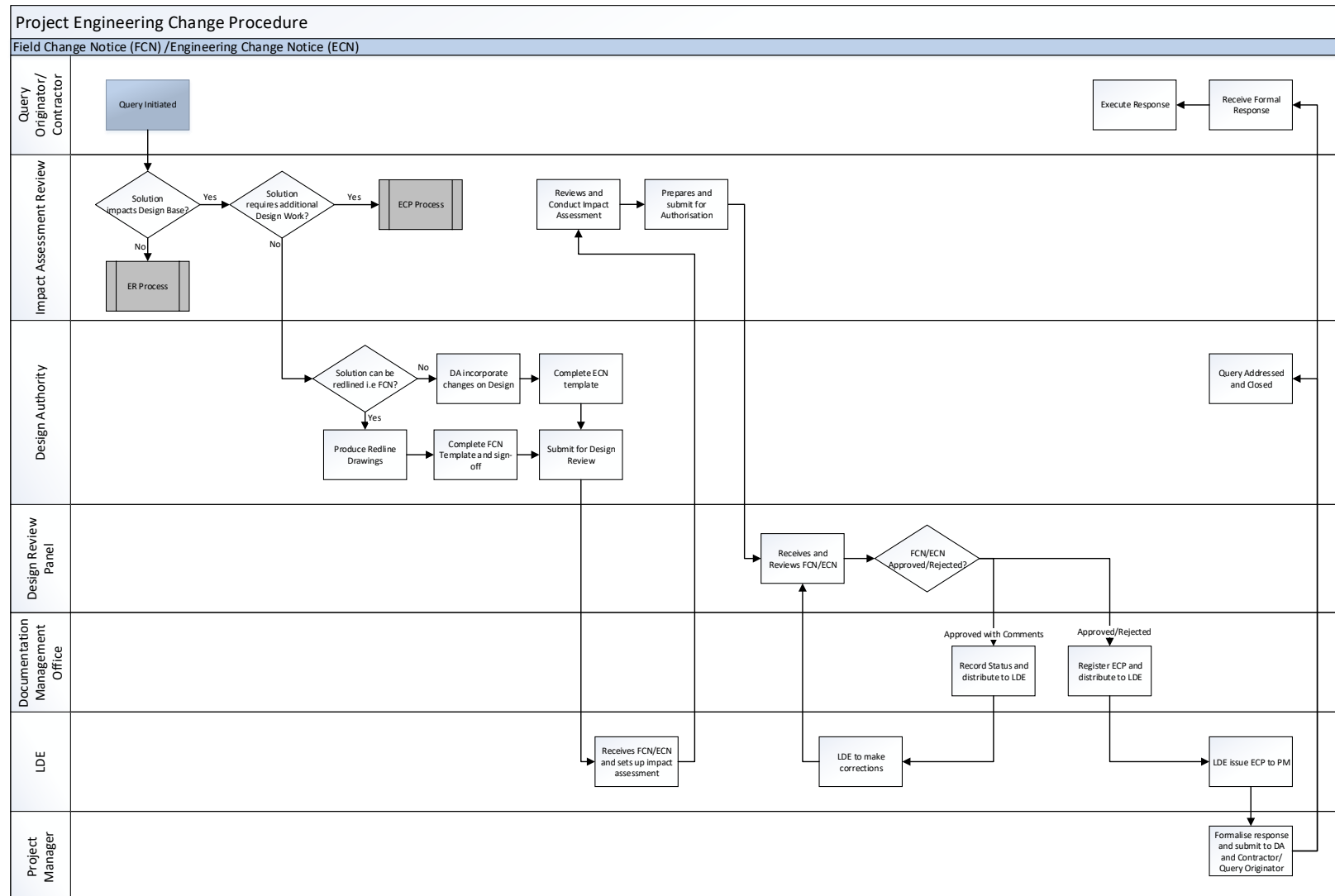


Figure 4: FCN/ECN Process

All completed ECR's shall be formally submitted back to Engineering for review and final approval through the relevant Project Manager's Representative. The relevant LDE shall review the ECR documentation assessing the descriptions, classification and thereafter ensure an assessment team is appointed. The Impact Assessment Team shall conduct an impact assessment using the correct template. Completed ECR's shall be submitted to the Project Engineering Design Review Panel for authorisation. The review panel shall review all ECR's to ensure that the correct stakeholders were involved and that the impacts assessed is acceptable before authorisation. However, if an ECR has to be rejected the response shall be communicated to the relevant LDE/Design Authority for correction and resubmission. Only the EDWL or a person authorised to do so can authorise an ECR.

For All ECR's that have been rejected, the response shall only be communicated to the Design Authority through the Project Manager's Representative for correction and resubmission (only if the LDE cannot make the necessary correction for resubmission). The Design Authority shall consider the comments provided by Project Engineering Design Review Panel when resubmitting the revised ECR.

All authorised ECR's shall be submitted to the Project Manager's Representative for DA before they are distributed to the DMO for processing. The Project Manager's Representative shall instruct the DMO to issue the ECR formally, through a transmittal note, to the Design Authority as well as any affected stakeholders. It must be noted that before the Project Manager's Representative instruct the DMO to issue the ECR formally, the necessary project authorisation may be required from the PCCB as outlined in sections 3.3.3 and 3.3.4 below.

Where in ECR was facilitated through an FCN and is now authorised, the Design Authority shall automatically incorporate the redlined changes and update the design documentation. All incorporated changes and updates to design documentation shall be review by Project Engineering Design Review Panels following the normal design review process.

All other affected stakeholders shall execute the ECR immediately upon receipt. The implementation status of an ECR shall be reviewed in the subsequent formal design review of all affected projects. This means that the LDE must demonstrate that the approved change has been implemented. All approved designs baseline shall be sent to projects for construction implementation.

3.3.3 Project ECR Authorisation

Having received the approved ECR from engineering, the information obtained from the ECR, and the change requestor shall be used to define the scope of the engineering change and an impact assessment shall be conducted on the following:

- Cost management.
- Risk management.
- Planning and scheduling.
- Project quality management.
- Project integrated resource management; and
- Project contract management.

The impact assessment shall cover all aspects that were not covered by the engineering impact assessment which engineering does not have the mandate to do so. Once the impact assessment is conducted, the project manager shall consolidate the individual assessments obtained into a single proposal using the appropriate template.

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Before submitting the report, the project manager shall ensure that the scope of work required to implement the assessed scope of the change as per received feedback of assessment is properly determined. The compiled change proposal report shall be submitted to the Project Change Control Board for acknowledgement and comments. Where the proposal requires rework, the scope of work for the change shall be updated accordingly and as well as the change proposal report. The change proposal shall then be submitted to the Project Change Control Board (PCCB) for acceptance.

All change proposals that are accepted without comments from the Project Change Control Committee shall be deemed an authorised change request. For all authorised change request where designs shall be required, the Project Manager's Representative shall initiate the ECR design implementation with the relevant LDE. For ECR that already contains an engineering approved revised design baseline, the baselines shall be deemed as sent to projects for implementation.

3.3.4 Project ECR Rejection and Comments

If the PCCB does not approve an authorised Engineering ECR, the matter may be raised with the relevant dispute resolution stakeholders as outlined in section 3.2.9.

Where comments are made by the PCCB, a notification shall be sent to engineering for consideration; the ECR shall be revised to include comments from the PCCB and presented again to the Project Engineering Change Design Review Panel before resubmitting the revised ECR to the Project Manager's Representative. If engineering does not agree with the inclusion of the comments made by the PCCB, this shall be regarded as rejecting the comments and the matter shall be raised with the relevant dispute resolution stakeholders as outlined in section 3.2.9 for resolution. Any recommendation that is made by the dispute resolution stakeholders shall be implemented.

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4. AUTHORISATION

This document has been seen and accepted by:

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5. REVISIONS

Date	Rev.	Compiler	Remarks
March 2007	0	P Knothe	First Issue of document
March 2008	0	P Knothe	Second Issue of document
March 2011	1	SC Engelbrecht AJ van Staden	Revision of original document N.PPZ 45-5. Updated: <ul style="list-style-type: none"> • General document layout • Roles + responsibilities, • Engineering change principles • Engineering change process
December 2012	2	RA Mandavha	The following updates were made: <ul style="list-style-type: none"> • Update on general content. • Updated structure and format. • Updated Figure 1. • Updated conventional naming (align to B2B). • Updated Document Template
January 2016	2.1	RA Mandavha	The following updates were made: <ul style="list-style-type: none"> • Update on general content. • Reference document number updated to 240 D004FC number. • Align role of EDWL and LDE Final Draft for Comments Review
January 2016	2.2	RA Mandavha	Updated Final Draft for Comments Review Process
September 2016	3	RA Mandavha	Final Rev 3 for Authorisation and Publication prepared by F. Bosch for DRM
November 2023	3.1	J Van Tonder	Amendments to document based on relinking and re-structuring. The documents have also been separated per business unit and thus reverted to revision 1.
Jan 2024	3.2	S. Jagjiwan	Updating the process flow as well as the flow of the document.
March 2024	3.3	S. Jagjiwan	Final Draft Document after Comments Review Process
March 2024	3.4	S. Jagjiwan	Additional updates completed
April 2024	3.5	S. Jagjiwan	Final Daft after Additional updates were Approved
April 2024	4	S. Jagjiwan	Final Rev 4 Document for Authorisation and Publication

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6. DEVELOPMENT TEAM

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- Yuvir Gokul
- Shamita Jagjiwan
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7. ACKNOWLEDGEMENTS

None

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APPENDIX A

The figure below shows the link between ECM procedure which manages changes to the design base (physical plant/asset). The design review procedure that establishes the baselines throughout the project and PLCM phases. The PECM procedure that manages changes to the baseline across the lifecycle of the project (PLCM)

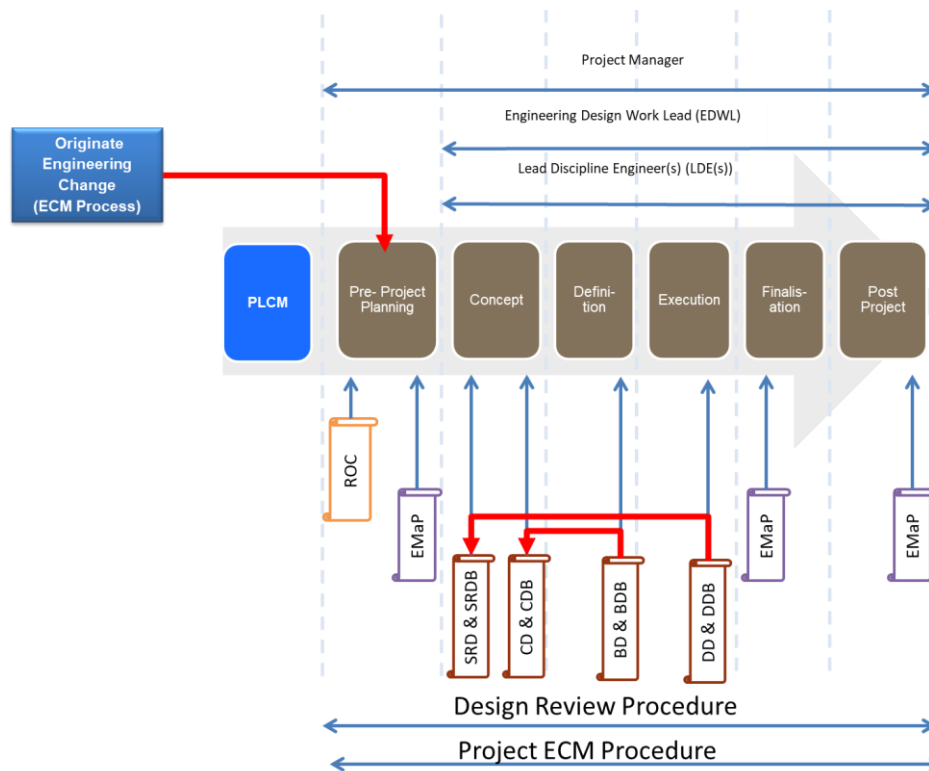


Figure 5: Link between ECM, PECM and Design Review procedure

The section below clarifies the process for the management of engineering changes at the before and after handover at a New Build that is between the project construction and handover to Generation once completed.

1. BEFORE ASSET HANDOVER

Note: Deals with changes to assets within the project environment that could potentially impact assets handed over to Gx.

The following principles are applicable 'Before Asset Handover':

- The authority for approval and implementation of changes for all plant, before handover to Generation (Gx) will be the Project team using Project Engineering Change Management (PECM). All changes will be considered by the Project Change Committee for approval.
- The affected Gx representative shall be informed of changes that need to be implemented on both systems handed over and systems not handed over to Gx.

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- c. Changes will be communicated to Gx in the form of an Engineering Change Notice (ECN), Field Change Notice (FCN) or an Engineering Change Proposal (ECP). Where the impact is to assets after handover, the Gx system engineer will submit these documents to Site Change Control Committee (SCCC) for consideration, the SCCC can advise if additional supporting documentation is to be compiled by the Gx system engineer i.e. Required Operational Capability (ROC), evaluation report etc.

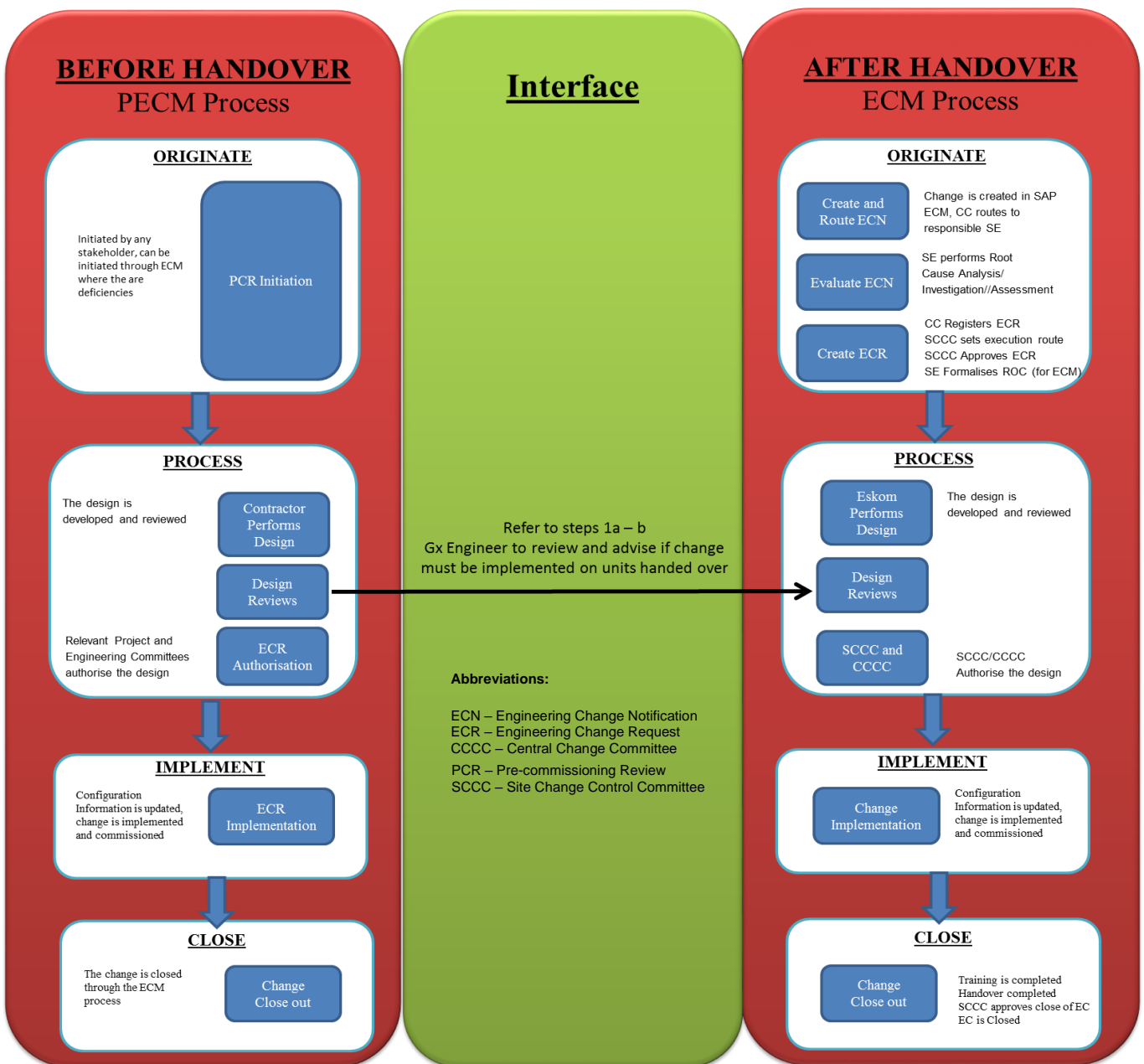


Figure 6: Interface between ECM and PECM Process (change initiated through PECM Process)

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2. AFTER ASSET HANDOVER

Note: Deals with changes to assets handed over to Gx that could potentially impact assets not handed over to Gx i.e. non-commercial assets.

The following principles are applicable 'After Project Handover':

- a. Where any stakeholder identifies and requests changes on plant after handover, such changes shall be recorded by Gx system engineer on the SAP Engineering Change Management (ECM) system and considered by the Gx Site Change Control Committee (SCCC) for approval. Should the change be deemed a design defect, the request will be submitted via email (with supporting information) to Project Team (Project EDWL, Lead Discipline Engineer and System Engineer) for consideration. It must be noted that associated processes such as Issue Management, Defects Management processes etc. must also be followed (where applicable).
- b. The representative of the Project Team i.e. Project EDWL and Lead Discipline Engineer (LDE) must be informed of all changes that are implemented on plant already handed over.
- c. All design defect requests will be reviewed by the Project EDWL and LDE. Typically changes that relate to contractual obligations, lessons learnt to be transferred to remaining assets, optimisation etc. will be considered for implementation through the PECM process. The Gx engineer will form part of the impact assessment team.
- d. All new change requests/designs etc. will be managed/implemented through the ECM process.
- e. The SCCC chairperson is requested to consider adhoc sittings for urgent submissions from Project Team for implementation on handed over assets.

To provide clarity after project handover, the following provides further detail on the recommended steps that should be followed:

4.1 Create and Route Notification (ECN)

- i. An Engineering Change Notification (ECN) will need to be raised
 - Changes initiated by the Project Team after handover will be communicated to Gx in the form of an Engineering Change Notice (ECN), Field Change Notice (FCN) or an Engineering Change Proposal (ECP). The Gx Engineer is to sign Impact assessment from the Project Team.
 - The Gx Engineer is to raise the ECN on SAP ECM.
- ii. The Change Coordinator (CC) routes the change to the relevant Gx System Engineer (SE).

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4.2 Evaluate Change

- iii. He/she will need to evaluate the change by performing a Root Cause Analysis/ Investigation/Assessment of the change. The evaluation will be completed by Gx to determine whether the change is warranted, the Project Team relevant engineer is required to sign off on the evaluation/Root Cause Analysis.
- iv. If the evaluation deems the change as a design defect, the Project EDWL and relevant LDE will need to determine the applicability to the project prior to submission to the SCCC.
- If the change is supported by the Project Team (LDE/ Project EDWL) within Project Engineering:
 - The execution route for changes recommended to the SCCC will be the PECM process.
 - The Gx Change Coordinator (CC) will inform the Project system engineer to initiate the PECM process.
 - These requests will be registered by the Project system engineer on the change register and managed via the PECM process for consideration and implementation.
 - The change request will be closed out via the PECM process upon completion.
 - The Project system engineer will advise the CC, the Gx Plant EDWL and the Gx System Engineer via email when the change has been closed (with supporting documentation). The Gx Engineer will complete the Close Engineering Change Form Engineering Change Final Configuration Control Sheet, the Project Team will support where required.
 - The close out of the change is noted in the ECM process and the SCCC then approves close of the change. (Full package is stored as part of the PECM and referenced in ECM).
 - If the change is not supported by the Project Team (LDE/Project EDWL) within Project Engineering:
 - The Gx System Engineer will arrange a meeting with all stakeholders (Gx and Project). This deciding committee will include the following persons as a minimum:
 - ❖ Gx Discipline Engineering Managers (as required)
 - ❖ Gx Plant EDWL
 - ❖ Project LDE's (as required)
 - ❖ Project EDWL
 - ❖ Project Team and Gx System Engineers (as required)
 - If this committee agrees i.e. change is not supported then the execution route for the changes recommended to the SCCC will be via the ECM process alternatively the change will be managed via the PECM process.
 - ❖ All changes made to the design base by Gx should be redlined and communicated to the Project Team (EDWL/LDE). Gx will need to update the as-builts when they receive unless

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the Project Team is able to provide the updates to the contractor prior to their submission of the final as-builts.

- v. Should there be no resolution (dispute) by the deciding committee, the relevant stakeholders will escalate to the Gx Engineering Manager and Project Engineering Manager. Thereafter, if there is still no resolution it will be escalated through the process defined in the Engineering Issue Management and Escalation Work Instruction.
- vi. The Gx system engineer will submit this document to Site Change Control Committee (SCCC) for consideration, the SCCC can advise if additional supporting documentation is to be compiled by the Gx system engineer i.e. Required Operational Capability (ROC), evaluation report etc.

4.3 Authorise Change

- vii. The SCCC will review the evaluation and select the applicable execution route for the project based on the recommendations. This decision/execution route via PECM must be supported by both Projects and Gx in order for the project to proceed.
- viii. An Engineering Change Request (within SAPECM) will then be created once the SCCC has approved the Engineering Change Request (ECR).
- ix. The ECM or PECM process is followed until completion of the change.

Where the execution route is via PECM, the interface between the ECM and PECM process is shown in the Figure 6 below.

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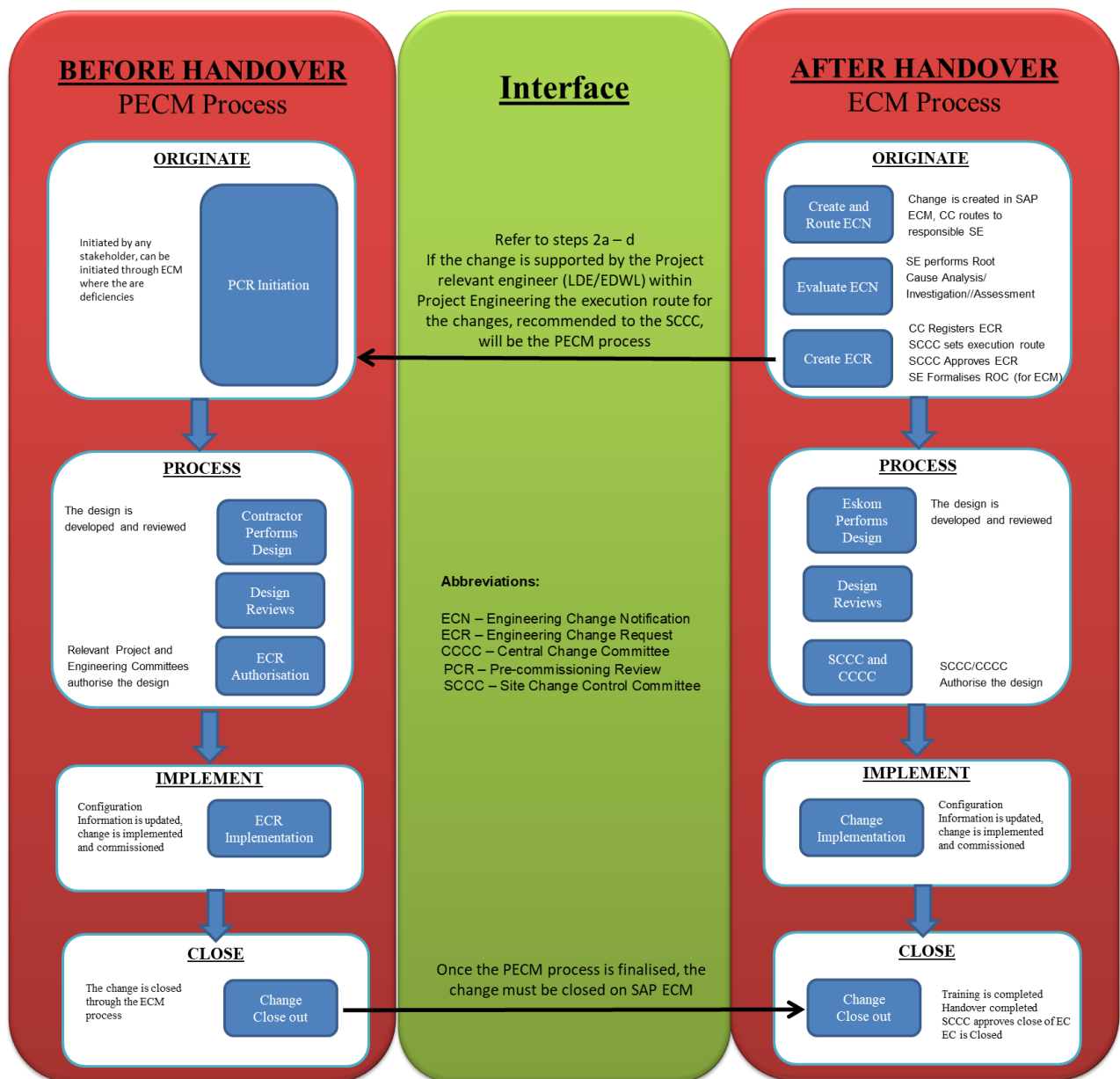


Figure 7: Interface between the ECM and PECM Process (change initiated through ECM Process)

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