NEW MURABBA

Mukaab District Asset Design

Design Management Plan

MKB-HKR-DES-PLN-000001

HKR ARCHITECTS

Design Management Plan

MKB-HKR-DES-PLN-000001

Document History

Revision code	Description of changes	Purpose of issue	Date

Design Team Lead

HKR Architects

Document Approval

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Design Management Plan

Mukaab District Stages 3B to 3D Asset Design

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1 Purpose

The purpose of this Design Management Plan (DMP) for Mukaab Distrcit stage 3B to 3D Asset Design is to provide the framework in which The PMC and Design Consultants (DC) can understand the Project structure, organization, communication and protocols of the Project and its execution.
It is important to note that nothing in this document shall override, modify, or otherwise affect the Contract with The PMC and HKR. Plan needs to be read in conjunction with other Project Plans and documents pertaining to the scope and Project, and it needs to be understood that this DMP does not supersede or substitute other requirements and information. Its intent and purpose are to explain how the design is managed. The readers of this DMP are assumed to be well versed in the Project and its design elements.

1.1 Objective

The objective is to define the processes relating to Design Management across Mukaab Distrcit stage 3B to 3D Asset Design. The DMP provides guidance on the plans, procedures, forms, and documentation requirements to be followed to manage design activities to a level suitable for permitting, procurement, constructing and operating the assets.
The processes of Value Management, Sustainability Management, and management of submissions to Approving Authorities, Agencies and Utilities are also to be addressed as part of the process of design management.

1.2 Order Of Precedence

Any values identified in this Plan, such as financial or time, are illustrative only and the Project specific Consultancy Services Agreement and / or Contract shall take precedence, and these will be identified in the associated Project Management Plan.

1.3 Plan Control and Distribution

The DMP is intended to be an evolving document with additional contents being added when necessary. Approved amendments shall be updated by The PMC, approved by the Employer, and subsequently communicated to all parties where necessary. Circulation of the Plan and subsequent updates shall be controlled, monitored, and maintained by The PMC.

1.4 Terms and Abbreviations

Term	Definition
BIM	Buildings Information Management
BoQ	Bill of Quantities
CRS	Comments Resolution Sheet
MC	Main Consultant
DMP	Design Management Plan
HSE	Health, Safety and Environment
BoD	Basis of Design
PMC / PMCM	Project Management Consultant / Project Management Construction Management Consultant
PRC	MKB Procedure
SoW	Scope of Work
Asset	Refers to the required physical buildings or infrastructure such as residential, business facilities, commercial and retail facilities, media centre, recreation, entertainment and sports facilities, marinas, hospital, medical clinics, religious facilities, school, library, fire stations, roads / streets / bridges, infrastructure system, and utility networks. It also relates to components of building and structures that need to be tracked and managed.
Asset Brief	Prepared by the proponent or specific MKB sector, providing a high-level description and requirements for the development of an asset within the MKB region. It is prepared according to *MKB-NEN-PRC-004 Initial Asset Brief Procedure*, at Stage 2C prior to the appointment of the "Designer" and represents an agreement between all Project stakeholders.
Basis of Design (BoD)	A document that records the major thought processes and assumptions behind design decisions made to meet the Employer's Requirements.
Comments Resolution Sheet (CRS)	To capture and record the design review via The PMC / PMCM, contractors and designers. For external review the comments resolution sheet (CRS) shall be as per DMP and as per *MKB-NEN-PRC-030*. For internal review (MKB to MKB), the MKB internal CRS shall be used.
Departments	Different entities and divisions constituting the MKB organization, which may include the Project Department, Operations Department, Proponent / Sponsor, Urban Department, Environment Department, Loss Prevention and Fire Safety Department, etc.
Design Brief	Expands on Asset Briefs and outlines the technical requirements in greater detail such that design activities can be performed.

Term	Definition
Designer / Engineering Consultant / Architect Engineer (A/E)	Master Planners, design Consultants, engineering consultant, contractor's designers and any other entity involved in providing design Submittals to MKB.
Developer	Owner of an individual plot.
Employer's Requirements	MKB`s complete performance and functional requirements specified in the designers and contractors' contract and as per MKB documents.
Stage Review	A formal design gate process to be conducted in accordance with MKB procedure MKB-NEN-PRC-021 for the life cycle stages. The review outcome can be Rejected, Resubmitted, Approved with Comments or Approved. The Design Management Plan will focus on Stage 3 and its sub-gates and outcome may be Rejected, Resubmitted and Accepted with Comments. The Design Management Plan runs in parallel to the procedure No. *MKB-NEN-PRC-021* whose requirements are mandatory.
Project	Refers to the development and delivery of a MKB Asset or a group of MKB Assets.
Stage 3A	Concept design (30% design).
Stage 3B	Developed design (60% design).
Stage 3C	Detailed design (90% design).
Stage 3D	Tendering Stage and Issue for Construction Drawings (100% Final Design and corresponding IFC).
Third Party	Organisation other than the MKB, PMC / PMCM and Designer. Third party entities will primarily contain ICE and ISA.
Works	Refers to the development and delivery of a MKB Asset or a group of MKB assets. Works encompass all associated engineering, services, procurement, construction (including temporary and permanent), installation, pre- commissioning, commissioning, and performance tests that are essential to accomplish the required Asset.

2 Project introduction

2.1 MKB Background

Located in northwest Saudi Arabia at a key crossroads of global trade, MKB is “The city of the future”, where the greatest minds and best talents are empowered to embody pioneering ideas.
MKB includes regions, towns, ports, commercial and manufacturing hubs, enterprise zones, research, and innovation centres. It is the home and workplace for people from around the world, and comprises mixed-use communities, research centres, sports venues, entertainment venues and tourists’ destinations. MKB introduces a new model for Urban sustainability and sets new standards for community health and environmental protection. Furthermore, MKB adopts an effective and productive use of technology.
MKB’s ambition is to implement a Modular Construction Methodology when required, due to its short, medium and long-term benefits. It incorporates the latest developments in the MMC industry, drives new approaches and adopts the latest technologies in the field.

2.2 MUKAAB DISTRCIT Background & Vision

MUKAAB DISTRCIT forms an integral part of MKB’s Regional Land Use Plan. It is geographically situated between the Red Sea and the backdrop of the Shar Mountains.

Above: MUKAAB DISTRCIT Location within MKB

MUKAAB DISTRCIT will be the first development in MKB. It is positioned to be a hub for innovation and a sustainable environment for living and working. It provides key industrial processes and facilities for MKB, KSA and the rest of the region. In essence, MUKAAB DISTRCIT is the catalyst for economic growth and diversity in MKB and the Kingdom, and contributes to redefining the world’s approach to sustainable industrial development.

MUKAAB DISTRCIT, the “Industrial City of the Future”, is strategically positioned to contribute to the success of MKB. It adopts the latest state of the art technologies in construction, industrial manufacturing, supply chain, logistics, smart cities, and sustainability to serve its purposes.

Above: MUKAAB DISTRCIT Detailed Masterplan
MUKAAB DISTRCIT Key Strategic Pillars

2.3 Mukaab Distrcit Overview

The Mukaab Distrcit Residential Units embody the essence of community and harmonious coexistence with the environment, reflecting MKB's vision as the ultimate destination for modern living. These assets are complemented by adjacent commercial office spaces designed for project administration personnel and private enterprises, as well as retail outlets catering to essential services for the residents.
The residential units within Mukaab Distrcit serve as valuable assets within the broader MUKAAB DISTRCIT region, aspiring to achieve global recognition as a pioneering model for the future of both living and working. This Village, spanning across the MUKAAB DISTRCIT island, is dedicated to creating a vibrant mixed-use development with the central goal of fostering a diverse and thriving community.

Above: Mukaab Distrcit Plan

Mukaab Distrcit will provide the essence of community living that portrays MKB aspirations as the 'place to live in'. It includes commercial and retail spaces accommodating the essential services for the residents. The goal is to nurture a sense of community centred around facilities assets, school, sports hubs, clinic, and hospitality assets.

2.4 Asset Summary

2.5 Employer

The Employer is responsible for:

- Define the Project brief and objectives that fully satisfy MKB's overall vision and requirements.
- Communicate these requirements to the Delivery team for each of the Project's components.
- Provide direction, reviews and approvals on the services performed by The PMC & DC.

2.6 Design Consultant (DC)

- Responsible for the overall management, supervision, and coordination of the delivery of their Services including the works of other subconsultants.
- Shall not procure sub-consultants or external personnel until MKB's approval has been granted.
- Shall coordinate with the Employers appointed subconsultants and procured Vendors. This responsibility extends into HKR's design and the full coordination with the MUKAAB DISTRCIT Masterplan and infrastructure teams.
- Responsible for preparing the Basis of Design (BoD) and design development, ensuring Employer's Requirements are met and in compliance with relevant codes.
- Shall allocate sufficient resources to meet the deliverables as per the agreed work programme.

- Responsible to design to budget and to ensure that their design evolves within the set budget through:
    - Validating the existing cost plan
    - Developing the cost estimate at each stage to ensure full tracking and compliance.
- Shall ensure each design submission is accompanied by a Buildings Information Model (BIM) developed to the level specified in the MKB Technical procedures and in accordance with the BIM Execution Plan (BEP).

2.7 HKR Design Management Team

HKR undertakes regular internal reviews, by technically competent personnel, independent of those preparing the deliverables. After the internal review is completed, HKR shall submit a design review package on Aconex for external review.

HKR is responsible for to self-certifying the design. HKR performs systematic reviews in accordance with this Design Management Plan. These requirements are applied HKR's integrated team of subconsultants, specialists and specialist designers, and assured by checking and approval by the designer.

All design documents will be signed by the designer competent persons at each of the three quality stages

Authorization levels are defined as:

Prepared – by a competent person who produces the design document, checking their own work complies with codes and standards governing that work.

Checked – by a competent person able to undertake a formal detailed check of design methods, codes and standards, deliverables, calculations, drawings and specifications produced by another member of the Design Team. This role is undertaken by a competent person of the same discipline, not the Preparer, but can be a member of the same team.

Approved – by a competent person able to undertake a review of the design output after detail checking has taken place to validate that the design is consistent with the project requirements. Although integration is considered at every stage, this level of sign-off is specifically intended as the final confirmation that interdisciplinary checks have been carried out.

2.7.1 Design team Organogram

2.8 PMC

The PMC shall:

- Be accountable for the overall design management, issued by HKR for stages; 3A – 3D.
- Ensure a collaborative approach is implemented.
- Fully support the timely completion of planned design activities / deliverables in accordance with the design brief, standards, and codes
- Manage the design review process with all relevant stakeholders to the agreed work program following a design stage submission by HKR.
- Produce a biweekly design report (to be issued to the Employer) in collaboration HKR which includes but is not limited to:
    - Summary of all design drawings, specifications, reports
    - Any changes and / or revisions to design deliverables (drawings, 3D Renders, models, reports, calculations...) for the stage
    - Any deviations from the standards and potential risks, issues, and key actions / decisions.
- Following the design review process, ensure that:
    - The next design stage deliverables are agreed.
    - Any decisions made during the review of the previous stage are incorporated.
- Escalate any potential design risk and / or issues that are beyond The PMC's control to the notice of the Employer.

2.9 PMC Design Management Team

Senior Design Manager

- Monitor the quality and progress of the discipline for each Project.
- Establish standard and procedures manuals for the discipline.
- Responsible for overall managerial and technical direction of the discipline.
- Ensure that new employees receive orientation on company policies and procedures.
- Actively participate in and promote the Quality Improvement Program.
- Perform other associated responsibilities as may be appropriate.
- Ensure technical reviews and design engineering are compliant with controls to maintain and improve high quality deliverables.
- Ensure that Project plans are in place to result in better-planned Projects and improved Project team understanding of milestones, budget, and deliverables.
- Target meeting or exceeding Employer expectations
- Where non-compliance exists, ensure implementation of corrective action(s).
- Provide direct input to proposals, strategic plans, and client presentations.

Senior Discipline Engineer

- Monitor productivity and technical proficiency of assigned personnel.
- Help to define discipline design organization and participation on a Project, including SoW, design criteria, schedules, standards, and procedures.
- Determines staffing requirements for the defined scope and schedule.
- Supervise the review of Project drawings and design calculations.
- Promote technical excellence on the Project, including furthering the Quality Improvement Process.
- Ensure that discipline design work is coordinated with Project staff and engineers from other disciplines by maintaining clear and frequent communications.
- Ensure that adequate checking is performed in accordance with discipline checking policy and procedures.

2.10 PMC Design Management Team

The Design Management will be led by **The PMC Corporation** for the Mukaab Distrcit stage 3b to 3C Asset Design.

2.11 Responsibility Assignment Matrix

Task / Activity Description		Employer	PMC	Design Consultants	Contractor
1.	Prepare Design Management Plan	**C/I**	**A/C**	**R**	**R**
2.	Review Design Management Plan	**C**	**A/R**	**I**	**I**
3.	Approve Design Management Plan	**R/A**	**C/I**	**I**	**I**
4.	Prepare and maintain Design Schedule	**C/I**	**A**	**R**	**R**
5.	Prepare Design Deliverables	**I**	**C**	**R**	**R**
6.	Review Design Deliverables	**C**	**A/R**	**I**	**I**
7.	Design Stage Approval	**R/A**	**C/I**	**I**	**I**
8.	Value Management	**C/I**	**A/R**	**R**	**R**
9.	Coordinate with all RelevantAuthorities	**C/I**	**A/C**	**R**	**R**

Above: Table- PACI Matrix

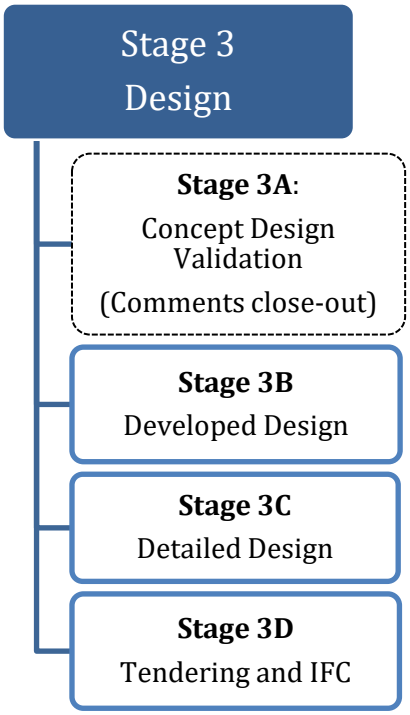
R- Responsible	People or stakeholders who do the work. They must complete the task or objective or make the decision.
A – Accountable	Person or stakeholder who is the “owner” of the work. He or she must sign off or approve when the task, objective or decision is complete. This person must make sure that responsibilities are assigned in the matrix for all related activities.
C - Consulted	People or stakeholders who need to give input before the work can be done and signed-off on. These people are 'in the loop" and active participants.
I – Informed	People or stakeholders who need to be kept 'in the picture". They need updates on progress or decisions, but they do not need to be formally consulted, nor do they contribute directly to the task or decision. This is also the allocation where a formal notification is required under an Agreement or Contract.

Note: The Responsibility Matrix shall be used as guidance only and under no circumstances does it override the contract agreements.

3 Design Management Processes and Procedures

3.1 PMC Deliverables

HKR will be appointed to provide design services as required by the selected procurement and Project delivery strategies. This DMP is mandated for all entities involved in the delivery of Stage 3 Design to MKB. This DMP will be implemented and adhered to during Stage 3B to 3D.



Above: Design Sequence in 3 Stages

3.2 Design Inputs

Preconditions for commencing the design stage included:

- Design briefs are based on the initial asset brief provided by MKB.
- Established standards baseline, plans, procedures, and processes.
- Saudi statutory laws and regulations
- Interface requirements for both internal and external stakeholders
- Employer's Requirements
- Agreed deliverables for the stage and any Work in Progress (WIP) submissions.
- Agreed work programme.

3.3 Design Deliverables

HKR shall submit the deliverables, including drawings, BIM, calculations, and reports, in accordance with the obligations of their Consultancy Service Agreement and MKB Procedure PRC 005.
Outputs from HKR scope of services include but are not limited to:

- Basis of Design (BoD)
- Design drawings and 3D Renders
- Design calculations
- Design reports/presentations
- Building Information Models (BIMs)
- Bills of Quantities (BoQs) / updated cost plans
- Building Permits and Statutory Authority consents
- Tender stage documents
- Contract stage documents

The level of detail provided at each stage shall increase with additional design information included and greater coordination accuracy as the design life cycle progresses.

Design deliverables shall be developed to provide a greater level of detail as the design progresses through its life cycle, with the objectives being:

- Improved cost and time certainty
- Reduced constructability risk (avoiding transfer into construction phase)
- Enhanced safety in design
- Obtain an informed approval of a design stage by the Employer, or as required by statutory authorities.

The outputs of the design stage are also used to inform other discipline outputs such as cost estimates and the construction schedule.

3.3.1 Stage Deliverables

Detailed information on HKR stage deliverables can be found in the stage deliverables procedure MKB-NEN-PRC-005, and HKR's Design Services Agreement: Mukaab Distrcit 3B – 3D Asset Design, Contract number: 4800000652. The table below is a summary extracted from MKB-NEN-PRC-005.

<table>
<tr><th colspan="4">Appendix A (excerpt) Roadmap for Design Deliverables</th></tr>
<tr><td></td><td>Stage 3B: Developed Design</td><td>Stage 3C: Detailed Design</td><td>Stage 3D: Tendering Stage and IFC</td></tr>
<tr><td>Core Objective</td><td>Preparing developed design including coordinated drawings, developed specifications, developed capital cost estimate and lifecycle cost</td><td>Preparing detailed design including coordinated drawings, specifications, capital cost estimate and lifecycle cost</td><td>Tendering services for the selection of construction contractor and compiling IFC documents for signature</td></tr>
<tr><td rowspan="5">Master Planning & Engineering Deliverables</td><td colspan="2">Book 1 - Main Report describing the project components and the briefing the deliverables</td><td rowspan="5">IFC Drawings</td></tr>
<tr><td colspan="2">Book 2 – Data Collection Results compiles and describes the relevant data collected and their analysis, the gap analysis and the assumptions adopted</td></tr>
<tr><td>Book 3 – Design Development describing design criteria, design of various components, and all design notes</td><td>Book 3 – Design Development describing design criteria, design of the various components, and all design notes</td></tr>
<tr><td>Book 4 – Drawings to be provided at the Design Development stage,</td><td>Book 4 – Drawings to be provided at the Design Development stage,</td></tr>
<tr><td>Book 5 – Specifications. This could be optional at this stage and could be limited to outline specifications</td><td>Book 5 – Specifications</td></tr>
<tr><td>Commercial Report and Tender Documents</td><td>Commercial Report (Preliminary Cost Concept Estimates & Project Risks and Mitigations)
Draft Tender documents</td><td>Commercial Report (Detailed Cost Estimates, Final Bill of Quantities & Project Risks and Mitigations) Tender documents</td><td>Final Price Estimate (Pre-Tender Estimate) based on Final bill of Quantities and Post Tender Clarifications, Contract Documents</td></tr>
</table>

HKR will produce key deliverables which will outline how they intend to achieve each design stage and meet the Employer's requirements. HKR is responsible for the production of the design documents and to ensure that the design at each stage complies with:

- Asset brief
- Design brief
- Contractual requirements
- All applicable laws, codes, and standards.
- Brand Guidelines
- Plot Sheet
- Guardianship during construction
- Responding to RFI's during construction

Parson's role is to:

- Ensure that the deliverables are produced and agreed.
- Monitor the design through the stage.
- Manage the review process.
- Ensure that the design conforms with the Project and Employer's requirements.

A formal review of phase deliverables will be carried out by The PMC at the end of each design stage with an approval recommendation made to Employer.

On receipt of the Employer's approval, HKR may formally commence the subsequent design stage. While the overall design process shall generally follow the above sequence, it may be necessary for certain aspects or disciplines of a design to be developed in advance of others, due to procurement or early construction works activities, which could result in the need for a partial design stage approval.

3.3.2 Deliverables Tracking

HKR deliverables will be tracked through various processes, including but not limited to:

a. Weekly progress meetings with PMC
b. Fortnightly progress reporting to PMC
c. Weekly progress meetings between HKR and subconsultants
d. Fortnightly progress reporting from subconsultants to HKR
e. Internal trackers
f. Compliance checklists
g. Programme reporting (primavera/schedule)
h. Weighted deliverables sheet

3.3.3 Design Reporting

HKR shall include the status of each deliverable within their Weekly progress meeting to allow The PMC to monitor, report and manage the design progress.
A comprehensive schedule of overall deliverables shall be defined at the commencement of the design stage with progress measured using an agreed methodology and included within the project specific Project Management and Design Management Plans.
HKR and PMC shall organize design workshops to ensure that:

- The design is progressing as per the agreed deliverables and agreed work programme.
- All risks and issues are captured and mitigated wherever possible before the subsequent design stage.

3.3.4 Programme (Design Schedule) Reporting

Refer to HKR's basis of schedule MKB-HKR-ARC-PRG-000001 for further information.
See appendix 1 for current baseline schedule.

3.3.5 Document Control

Design outputs including review of CRS, drawings, schedules, specifications, and reports shall be issued and managed in ACONEX. PMC and design consultant shall adhere to the requirements of MKB-NEN-PRC-030, MKB-NEN-PRC-010 and MKB-NEN-PRC-008.

3.3.5.1 Risk Register Workshops

As required by the project risk management process, risk register workshops shall be organized by The PMC and designers during the various design phases to ensure design risks are captured and, where possible, mitigated before the subsequent stages in the process. Even if the design risk is closed out, the information will be captured for future reference.
Any residual risks will be tracked to ensure that actions detailed in the risk register are completed. Evidence will be provided to demonstrate compliance.
The process for managing risk is based on the following hierarchy:

1. Eliminating hazards.
2. Reducing risks from remaining hazards.
3. Communication of residual risks with notes on drawings.
4. The risk registers are to be used throughout the design, construction, T&C and Handover phases for.
5. Design drawings.
6. Health, safety, and environment (HSE) information/notes.
7. The risk will be reported and communicated under the following headings:
8. Construction Activities risks.
9. Demolition or de-commissioning risks.

Based on best practice the PMC and HKR shall identify design elements and materials which are either to be avoided because they are judged to represent significant risk to construction personnel, facilities users and the environment.

3.3.5.2 Design Change Control

MKB Projects and Proponents will be responsible for technical review and approval of any design changes. The PMC and HKR will be responsible for ensuring that any design change is cascaded to MKB Projects and Proponents on ACONEX. The PMC and HKR will apply change control process using an engineering change management procedure, which will be applied as follows:

1. Identification of a change, which may be either an engineering "Change Proposal" or a Requirements "Technical Change Request".
2. Evaluation of the technical consequences of the change, particularly on system safety and operations.
3. Authorised to progress the change.
4. Implementation of the change and verification (if approved).

New changes identified in the design documentation or within external documentation (e.g., interface requirements), will be categorized in terms of complexity, resources, cost and scheduling. The change will subsequently be evaluated to identify any consequence and:

- Technical merits of the proposed change.
- Risks associated with the change.
- Potential impact on contractual requirements, scope split between Project entities, schedule, and costs (if design costs).

The implementation of a change will be done according to an agreed action plan and protocol which must list all impacted documents to be reviewed. The action plan will be followed until all impacted documents have been reviewed, revised as needed and re-submitted.

3.3.5.3 Request For Information

Design related Request for Information (RFI) will be utilised to facilitate formal communication between PMC, designers and Projects. RFIs compilation and transmission shall be done via ACONEX.
Each RFI must include at least the following information:

1. Data raised.
2. Raised by.
3. Project number, element of works, location, drawing or specification number and revision.
4. Detail of query.
5. Party to answer query.
6. Date response required by.

3.3.6 Stakeholder Management & Engagement

HKR will coordinate with relevant MKB entities and Stakeholders and will conduct a thorough assessment and promptly communicate any project requirements that could potentially affect costs or timelines to MKB.

HKR will work closely with MKB to identify and define the roles and responsibilities of all project stakeholders, including the NIC Village Project Lead, Residential Workstream Lead, as well as various other Workstream Leads such as those for Retail, Asset Management, Projects, Design, Delivery, and Sectors. This collaborative effort ensures a well-coordinated and efficient project management process.

HKR will maintain effective coordination with MKB entities by actively participating in meetings, conducting necessary workshops, and promptly addressing queries and comments. This collaborative approach ensures that communication channels remain open and responsive throughout the project's lifecycle.

3.3.7 Interfaces With Other Projects

As the project scope of work is limited the plot boundary of each residential asset, the main consideration for the project is principally with the masterplanning element of the island the respective infrastructure aspects. This includes, but is not limited to the following interfaces:

- Surface and Storm Water Network
- Pneumatic Waste System
- Waste Water Network
- Mineral Water Network
- Renewable Water Network
- Potable Water Network
- District Cooling Network
- Power Network
- Roads retaining structures
- Grading and levelling
- Geotechnical & Topography
- Masterplan Landscape
- Masterplan Logistics & transport
- Masterplan Sustainability
- Digital Intervention.

3.4 Design Coordination

HKR is responsible for the coordination of the design deliverables and The PMC shall provide support as necessary.

- The PMC shall ensure Stakeholder and authorities having jurisdiction (AHJ) approvals for design procurement and construction activities are coordinated.
- The PMC is **not** responsible for overall design coordination.

3.5 Design Tools

The tools that will be employed to produce the design such as simulation and modelling will be detailed by the design consultant as part of their pre/post contract BIM Execution Plan (BEP) submission and is subject to MKB`s approval.

Solutions will need to be agreed between MKB and HKR, where applicable, to develop a design over and above the standard tools.

ACONEX will be used as the project engineering environment to archive and transmit engineering documentation, drawings and models as per MKB protocols. Additionally, all submitted documentation will be hosted in ACONEX to retain, issue and control project records and submissions.

Project documentation is required to be stored and controlled within the ACONEX. Documentation control requirements will be as stated in the MKB Documentation Plan. The numerous (not an exhaustive list) software tools to be deployed are as follows:

- ACONEX
- Micro-station v8.1 and AutoCAD 2014 for drafting.
- REVIT Architectural, Structural and MEP.
- Bentley Rail Track.
- Autodesk Civil3D for civil site works, highways and utilities.
- MKB Common Design Environmental (CDE) shall be used for Design Collaboration.

Commonly used structural engineering and analysis software.

3.6 Compliance

In order to demonstrate compliance with MKB-NEN_PRC-005 and the RFP requirements for each stage and discipline, HKR have implemented the use of compliance checklists. These are completed prior to each stage cycle submission by each of HKR's discipline leads and verified and signed off by HKR directors and Quality manager.

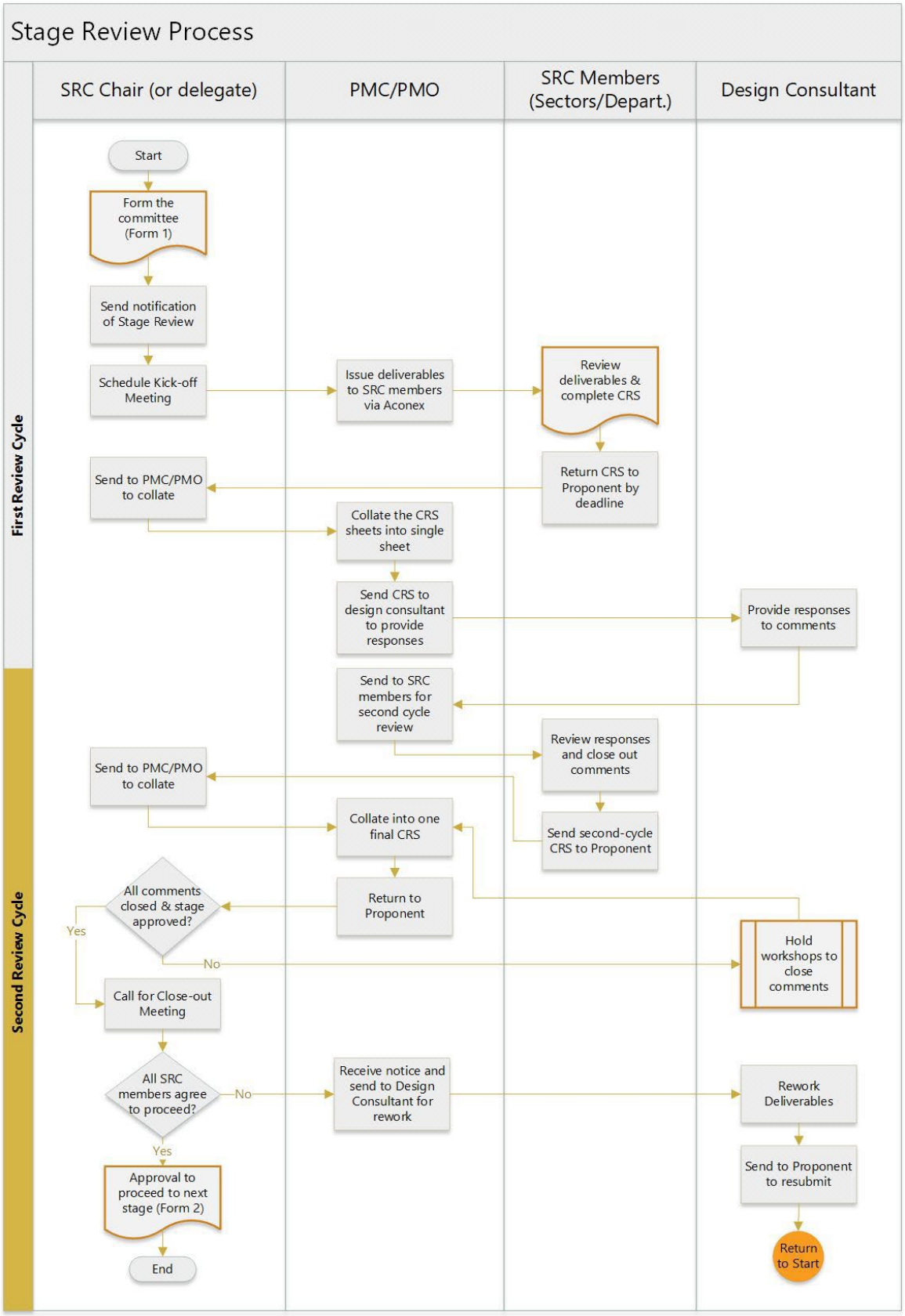
Compliance with building codes and regulations are addressed within the submission books for each individual discipline.

3.7 Design Technical Submission

HKR submissions will be in line with stage deliverables procedure MKB-NEN-PRC-005, and HKR's Design Services Agreement: Mukaab Distrcit 3B – 3D Asset Design, Contract number: 4800000652.

3.8 Design Review Process

The flowchart below shows the various steps involved in Stage 3B, Stage 3C, and Stage 3D design reviews.



Above: Stage 3B-3C-3D Design Review Steps

The design team will conduct the design review during the design and construction phases within the guidelines established by MKB and will adhere strictly to the Mandatory Documents and other Contract requirements as the basis for the design including but not limited to MKB-NPR-PRO-100_05.00 Design Review Procedure and as follows:

3.8.1 Safety in Design Procedure

Managing the safety in Design Aspects will be according to MKB procedure ref. MKB-NEN-PRC-006_01.00 to ensure that Operational, Safety & Health (OSH) criteria are taken into consideration during the various design phases.

The PMC Engineering Manager will ensure that Design Risk Assessment DRA sessions are conducted during the design stages. PMC responsibility during the Construction supervision includes:

- Overseeing the transition between design and construction ensuring that the information captured on the DRA is adequately transferred to construction and it is included in the baseline for the Risk Assessment.
- Lead the Contractor hand-over meeting of the project design OSH risk register ensuring the proper attendance of Design Consultant and Contractor's Representative.

The below figure 6 describes the Safety in Design process which include Pre-design information, DRA (Design Risk Assessment), Design OSH (Occupational, Safety and Health) register.

Safety in Design Process

- Pre-Design Information: The Design Consultant shall ensure the receipt of all the pre-design information. If the Information was not provided The PMC will ensure that the Design Consultant has included in his scope of work the OSH studies required to complete the Pre-design information ensuring that all risks that can be anticipated are considered at Concept Design (Stage 3A) in MKB's Plan of Work.
- Design Risk Assessment: DRA will be initiated at the Concept design (Stage 3A). The identification and management of hazards and adverse effects of activities is a vital part of OSH management to ensure adherence to MKB's vision. The DRA shall be aligned with MKB-OSH-GF–MSU 2 (Risk Management).
- The DRA is developed from actions raised in design Occupational Safety and Health reviews, these reviews commonly called HIRA (Hazard Identification and Risk Assessment) are attended by everyone connected to the design of the Asset. HIRA studies shall be undertaken at the various design stages, including Master plan stage.

- Design OSH Register: During the Concept Design Stage, the Design Consultant shall review the complexity of the assets being designed and request to MKB any additional specialist OSH studies that are required to underpin the design. The requirement for such specialist OSH studies may be identified during the HIRA process. However, additional specific OSH studies will also be determined during the development of project documentation and deliverables.
- Upon completion of the detailed design, a copy of the design OSH risk register shall be transmitted internally by the Design Consultant to MKB and potential contractors for construction, as part of the tendering and contract documentation, as there will typically be some outstanding OSH issues for the contractor to mitigate further.
- As soon as a Contractor has been appointed a hand-over meeting will be conducted to transfer the Design OSH Risk Register to the Contractor with the attendance of Senior staff representatives of Design Consultant, Contractor and appointed Construction/Supervision Consultant who will convene and lead the meeting.
- Contractor shall implement the information captured in the DRA and include it in the baseline of the Asset Risk register, assessing the risk for the construction stage and reduce the risk to ALARP level

The PMC team will be guided by the Hazard checklist provided in section 7.4 of MKB procedure no. MKB_NEN-PRC-006

3.9 Design Scoring

It is vital to segregate the Design Review (DR) and Stage Review (SR). These are two different MKB attributes, and the design review outcomes and design scoring will enable MKB to conduct successful SR. The minimum design review scope for all assets will be as per MKB's Stage Deliverables Procedure MKB-NEN-PRC-005, Scope of Works, and as per the requirements of the Initial Asset Brief MKB-NEN-PRC-004. Post-technical review, design maturity will be subject to this document's quantitative design scoring approach.

This will be implemented and conducted by PTD/PTS/PMC in addition to the requirements of MKB-NEN-PRC-021 and should not be mixed with formal SR. Five major design scoring attributes will be gauged quantitatively before any design package is released for a formal SR. Please refer to Table 6. These five main design scoring attributes will cover various design maturity aspects. Please refer to Appendix 4 for detailed subsets of the design scoring attributes and scoring criteria.

The total available design score for Stages 3A and 3B will be 105, and for Stages 3C and 3D, the total available score will 115. Please note the total score available is a baseline and can be adjusted to suit the requirements of a specific asset. At 3A and 3B, a 70% score is expected to initiate a design scoring pass, whereas, for 3C, a minimum score of 90% must be achieved. For Stage 3D, a score of 100% must be achieved. Evidence of design scoring will be maintained in EDMS.

Design Scoring Requirements	3A DR Score	3B DR Score	3C DR Score	3D DR Score
Design Review General Requirements	Score at 3A 30% Design	Score at 3B 60% Design	Score at 3C 90%	Score at 3D 100% (IFC)
Design Review Safety Requirements	Score at 3A 30% Design	Score at 3B 60% Design	Score at 3C 90%	Score at 3D 100% (IFC)
Design Review Interfaces Requirements	Score at 3A 30% Design	Score at 3B 60% Design	Score at 3C 90%	Score at 3D 100% (IFC)
Design Review Action Planning Requirements	Score at 3A 30% Design	Score at 3B 60% Design	Score at 3C 90%	Score at 3D 100% (IFC)
Design Review Documentation Requirements	Score at 3A 30% Design	Score at 3B 60% Design	Score at 3C 90%	Score at 3D 100% (IFC)
Design Review Score	X	X	X	X
Total Score Available	105	105	115	115
Design Scoring Percentage	Y	Y	Y	Y
Minimum Pass Criteria	70%	70%	90%	100%
Design Scoring Outcome	Pass or Fail	Pass or Fail	Pass or Fail	Pass or Fail

Table above: Design Scoring Requirements.

3.10 Stage Review and Approval

The Stage Review and Approval Procedure is detailed in NEOPM Procedure MKB-NEN-PRC-021_01 and associated forms and Templates.

All relevant parties shall comply with the processes and procedures outlined in the aforesaid documents. As The SRP will result in a Go/No-Go decision to the next Stage or Interim Stage.

The outcome of this exercise will also yield a review & approval report to be issued to the consultants and/or contractors for consideration and incorporation of requirements and comments, if any.

Figure above: Stage review and Approval Flowchart

3.11 Cost Plan Management

Refer to separate cost plan, and MKB-NPR-PLN-002 for cost management procedures.

MKB-NPR-PLN-002 describes the concept and implementation of Cost Management in the context of project controls. It highlights that Cost Management involves the effective management and control of project costs by establishing and following specific plans and procedures. These plans and procedures are designed not just to report costs, but to actively manage and forecast them accurately. The Cost Management Plan is part of a broader set of Project Controls and Commercial Plans and Procedures, which outline the minimum requirements and processes that MKB Projects must follow regarding Project Controls and Commercial activities.

3.11.1 Commercial Deliverables

During the design stages (Stages 3A to 3C), the Cost Consultant will prepare detailed cost estimates as required by MKB-NCC-PRC-001 and provide a formal cost estimate report. The Cost Consultant will use stage financial reports to monitor cost changes against any revisions to previously "approved" stage cost estimates.

At Stage 3D, before issuing the Request for Proposal and after completing the Final Bill of Quantities based on exact measurements from the final design drawings, the Cost Consultant will prepare the Final Price Estimate (Pre-tender Estimate) by pricing all unit rates and amend the Bill of Quantities to account for Tender and Post-Tender Clarifications.

The Final Price Estimate shall exclude the following unless specifically requested by the client:

1. Design / Consultant Fees (unless the completion of the design is to be carried out by the Contractor, in which case the Preliminaries shall take account of the Contractor design fees)
2. Developer Costs
3. Direct Employer Costs
4. Contingency
5. Inflation

The Cost Consultant will prepare a Final Price Estimate based on the Final Bill of Quantities, using rates from the Cost Consultant's Cost Database and/or unit rates based on local market pricing data from similar projects within the last three years. The Cost Consultant will label the soft copy as "Confidential" and send it to the MKB Proponent, who will issue it to the MKB Estimation Division and/or Procurement before receiving the tender returns. The Cost Consultant will use the Final Price Estimate to compare with the tender returns, analysing their rates and overall pricing. This comparison will form the basis of a

Tender Evaluation Report, which will be sent to MKB's Proponent and then to the MKB Estimation Division for final approval before awarding the tender.

In addition to the Final Price Estimate, if there is a variance from the earlier Stage 3C Cost Estimate, an updated Cost Estimate Report will be issued, along with a financial report to reconcile the variance. If the scope of work is divided into packages for tendering and contracting purposes, the Consultant will describe the packages and reconcile the package budgets with the overall cost estimate. At this stage, constructability of the project should be considered, and the Consultant should account for any special logistical requirements, including a narrative statement in the Basis of Estimate.

3.12 Value Management Overview

Value management is a tool used to assist the decision-making process and is an integral part of the Project Team's processes. Value management exercises are to be carried out in coordination with HKR / Contractor to investigate opportunities of cost, time, maintenance, and operational savings. Such savings may arise from major or minor changes in the design and specified materials or performance requirements. Consideration of operational needs such as the functionality, circulation, and flow of the program are also to be considered. The resulting findings shall be recommended to the Employer by The PMC for final decisions.

Value Engineering is also used as a planning and design tool. It assists the design to "start off on the right foot" and when used as a design tool it can be invaluable in avoiding the pitfalls of overrunning the budgets at the start of the Project.

3.12.1 Value Engineering (VE) – Philosophy and Approach

VE is the systematic application of recognized techniques to review designs, products, or services and to identify and achieve improvements that will result in completed facilities that provide the established program functions at the lowest possible life cycle cost. Any modifications resulting from the VE process must be consistent with requirements for performance, maintainability, quality, HSE and community impacts.

HKR shall assist The PMC in carrying out a VE program of reviews for the scope of its delivery during each design stage. The PMC will organize VE workshops and invite HKR and other relevant stakeholders. Workshop findings and recommendations shall be reported to The PMC and Employer in an agreed format.

HKR shall liaise with The PMC and provide any necessary comparative exercises, which shall include, but is not limited to:

- Measurement and production of quantities

- Estimates for alternative methods of construction for portions of the BoQ.

HKR may be required at any time by the Employer (or may of its own volition) to submit a written proposal which will, if adopted:

a. Reduce the cost to the Employer of executing, maintaining, or operating the Project.
b. Improve the efficiency or value to the Employer of the completed Project.
c. Accelerate completion.
d. Otherwise, be of benefit to the Employer.

3.12.2 Value Engineering – Design

VE Workshops will be held during the design stages. The PMC shall chair the VE workshops and undertake a leadership role including producing value engineering reports and recommendations. The workshops will be attended by HKR, Employer, and other key stakeholders.

- All members of the workshops are expected to contribute to the management of value in the design.
- The PMC is responsible for co-coordinating the costing and presentation of suggestions offering value to the Project and judged to be feasible.
- All suggestions that are judged technically equal and feasible by the Contractor and which offer better value, will be presented to the Employer for final review and further instruction.
- The PMC will state the effect upon the design and schedule as part of the submittal process.
- No alternative schemes will be progressed further in the absence of the Employer's final approval of the Value Engineering Proposal (VEP).

3.12.3 Value Engineering Studies

For some critical elements, formal value engineering procedures may be carried out by small teams who have not been directly involved in the design development. Where appropriate, The PMC shall assign responsibility for further study and development of alternate solutions for elements. The development of alternate solutions shall include comparative cost estimates.

Each element that progresses to the status of a study and development of alternate solutions shall be documented as a VE action and shall include:

a. A statement of the problem or issue
b. The alternate solutions considered.
c. The comparative estimates, including life cycle cost, where appropriate
d. A record of the acceptance, or rejection, of the VEP, with a discussion of the reasons for the action taken.

3.13 Environment

The MKB Environment will assess the overall environmental design quality for compliance with the applicable level of performance during Design Gates as per the Employer's Requirements and MKB`s

Stage Review and Approval Procedure MKB-NEN-PRC-021. NEV will be informed for the following items during Stage 3.

a. Materials data sheets employed in design for carbon foot printing exercise within MKB.
b. Environmental related design submissions. Sustainability related LEED submissions from designers, contractors, and PMC to ensure that the MKB`s assets remain compliant to MKB Environmental requirements.
c. Environmental related documents including strategic environmental assessment and environmental impact assessment reports.

3.14 Integration

3.14.1 Health, Safety, and Environment (HSE) in Design

HKR shall take HSE considerations into account in the design and shall mitigate any foreseeable hazards that may arise from the design. If it is not reasonably practicable to eliminate the risk completely, then HKR shall take measures to control the risk.
HKR's comprehensive arrangements for HSE in design shall be transparent and demonstrated to The PMC. A Risk Register HSE Assessment will be part of the design process and integrated into meetings between parties in the design group.
The HSE Management Plan and the Hazard Risk Management Plan shall be implemented by HKR

3.14.2 Risk

HKR shall comply with The PMC risk and opportunity guidelines, and with the Risk Management Plan.

HKR, in coordination with The PMC, must prepare a Risk Management Plan that will identify and evaluate risks that may affect the delivery of the design on time, on budget and in accordance with the Project Brief. The plan shall recommend treatment / mitigation strategies, and record, monitor, and report on risk management throughout the Project to The PMC. The plan shall also consider technical and quality risks when undertaking coordination between HKR and other approving authorities, agencies, and utilities.

HKR and PMC shall organize risk workshops to ensure that:

- The design is progressing as per the agreed deliverables and agreed work programme.
- All risks and issues are captured and mitigated wherever possible before the subsequent design stage.

The PMC shall establish a Permit and No Objection Certificate (NOC) schedule linked to design to include all governmental authorities for all stages of the design and construction, testing, commissioning, and handover of the Project.

HKR shall establish the NOCs required and confirm same to The PMC.

HKR is responsible for obtaining No Objection Certificates prior to submission and approval by respective AHJ, which shall be identified in the Project Management and Design Management Plans for each Project. HKR shall lead a liaison team for the approvals process and assign a single point of contact for all authorities. The PMC, in consultation with HKR, shall monitor the approval of all relevant AHJ approvals and requirements, and report any matters of interest to the Employer. The PMC will collect all consents, permits, NOCs and licenses from HKR, and submit them to the Employer.

3.14.3 Quality Management

The Project Quality Plan serves as a comprehensive guide tailored to the project's unique needs. It comprises three main components:

- Project Definition, offering a concise overview of key project details for effective communication;
- Services and Project Team, outlining the roles and scope of services for each team member
- and Project Processes, detailing operational procedures and deviations from standard protocols.

The Project Quality Manager takes charge of planning, implementing, and auditing the plan, ensuring its alignment with project objectives. As the project progresses and new information arises, the plan will be continuously updated to reflect changes and evolving requirements. Flexibility is key, allowing for adjustments and additions as needed throughout the project lifecycle.

Please refer to the project quality plan for further details:
MKB-HKR-DES-PLN-000002.

3.14.4 BIM/ Information Management

The Information Management Execution Plan (hereinafter referred to as ‘BEP’) presents the minimum content for BIM & GIS Planning. The BEP respects the same structure as the Information Requirements & BIM & GIS Procedure of MKB to facilitate its use by the supply chain.

The BEP presents an agreed, unified approach for delivering the BIM & GIS Information Requirements as outlined in the Information Requirements and BIM & GIS Procedure of MKB (hereinafter referred to as ‘PRC-009’). In conjunction with that document and the documents and annexes referenced therein, this BEP and its appendices form the complete source of information concerning BIM & GIS on the Project.

- The BEP is binding on all Delivery Team Members responsible for authoring and assuring the quality of Information Models and any associated data. All Delivery Team Members shall comply with the PRC-009 and the BEP in its entirety.
- A thorough understanding of the Employer Information Requirements and BIM & GIS Procedure of MKB is a prerequisite to using the BEP.
- The BEP shall be the only BIM plan used by the Delivery Team Members. All relevant organizational standards and methods of working shall be incorporated into the BEP.
- The BEP is a 'live' document and shall be kept up to date with agreed amendments that reflect changes to the Project, the Delivery/Operation Team Members, MKB BIM & GIS requirements, and any other project environment.
- This BEP responds to the current Delivery Teams scope to complete Stage 3B to Stage 3D of the MKB Mukaab Distrcit – Residential Assets project.
- The BEP is a progressive document and will be developed and reviewed at each stage as the project scope progresses through each stage.

For further information, please refer to the Information Management Execution Plan:
MKB-HKR-BIM-PLN-000001

4 Referenced Documents

- Mukaab Distrcit 3B – 3D Asset Design, Contract number: 4800000652
- MKB-NCC-PRC-001_ Cost Estimation Procedure
- MKB-NPR-PLN-002_ Cost Estimation Performance Measurement Procedure
- MKB-NEN-PRC-005_02 Stage Deliverables Procedures
- MKB-NPR-PLN-101_ Rev 05.00 Design Management Plan
- MKB-NPR-PRO-100_ Rev 05.00 Design Review Procedure
- MKB-NEN-PRC-020_ Asset Naming Conventions Procedure
- MKB-NEN-PRC-021_01.00 - Gate Review and Approval Procedure
- MKB-NEN-PRC-030_ Project Document Numbering and Revisions Procedure
- MKB-NEN-PRC-010_ Drawing and Drafting Procedure
- MKB-NEN-PRC-008_ MKB Document Numbering and Revision Procedure

5 PRC-005 List of Key Procedures

Document no.	Document title
MKB-NCC-PRC-001	Cost Estimation Procedure
MKB-NCC-PRC-002	Cost Estimation Performance Measurement Procedure
MKB-NEN-PRC-001	Geotechnical Investigation Procedure
MKB-NEN-PRC-002	Topographic Survey Procedure
MKB-NEN-PRC-003	Business Case Procedure
MKB-NEN-PRC-004	Initial Asset Brief Procedure
MKB-NEN-PRC-006	Safety in Design Procedure
MKB-NEN-PRC-007	Value Management Procedure
MKB-NEN-PRC-008	MKB Document Numbering and Revision Procedure
MKB-NEN-PRC-009	BIM & GIS Procedure
MKB-NEN-PRC-010	Drawing and Drafting Procedure
MKB-NEN-PRC-011	Site Specific Seismic Hazard Study Procedure
MKB-NEN-PRC-012	Hydrological Study Procedure
MKB-NEN-PRC-013	Traffic Study Procedure
MKB-NEN-PRC-020	Asset Naming Conventions Procedure
MKB-NEN-PRC-021	Stage Review and Approval Procedure
MKB-NEN-PRC-022	Handing Over Procedure
MKB-NEN-PRC-029	MKB Plan of Work
MKB-NEN-PRC-030	Project Document Numbering and Revisions Procedure
MKB-NEN-SCH-002	Schedule Q – Quality Requirements for Contractors
MKB-NEN-SCH-005	List of Technical Codes and Standards
MKB-NEN-SCH-006	List of Definitions and Abbreviations
MKB-NEV-PRC-016	Regenerative Development
MKB-NEV-PRC-501	Interim Sustainability Requirements Procedure
MKB-NLF-PRC-002	Fire Safety Approvals Procedure
MKB-NSE-PRC-001	Security Standard Procedure