NEOM نيوم

ENGINEERING PROCEDURES

DESIGN MANAGEMENT PLAN

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CONTENTS

1 EXECUTIVE SUMMARY 5
2 PURPOSE 6
3 DEFINITIONS 6
4 ABBREVIATIONS 8
5 REFERENCE DOCUMENTS 9
6 DESIGN MANAGEMENT STRUCTURE ROLES & RESPONSIBILITES 10
6.1 Design Consultant/Designer 12
6.2 Project Management Consultant (PMC/PMCM) 14
6.3 NEOM Project Delivery Team (PDT) 17
6.4 NEOM Projects Architecture & Style (PAS) 17
6.5 NEOM Engineering and Technical services Department (ETSD) 18
6.6 NEOM Project Technical Service (PTS) 19
6.7 NEOM Regional & Asset Proponent 19
6.8 NEOM Operations Department 20
6.9 NEOM Environment (NEV) 20
6.10 NEOM Urban Planning (UP) 20
7 DESIGN REVIEW AND DESIGN GATES SCOPE 22
7.1 CODES AND STANDARDS 25
7.2 Design Inputs 25
8 DESIGN MANAGEMENT PROCESSES AND PROCEDURES 26
8.1 Design Strategy and Approval Methodology 26
8.2 Structure and key resources of Design Consultant and PMC 28
8.3 Project Quality Control Plan 28
8.4 Auditing 28
8.5 Design Tools 29
8.6 Interface Management 29
8.7 Engineering Deliverables List (EDL) 30
8.8 Design Reviews 31
8.9 Design Review Process and Approval 32
8.9.1 Safety in Design 32
8.9.2 Design Checks 33
8.9.3 Independent Design Checks 34
9 DOCUMENT CONTROL 35
9.1 Risk Register Workshops 35
9.2 Design Change Control 35
10 REQUEST FOR INFORMATION 36
11 PROJECT DEPARTMENT DESIGN MATURITY DASHBOARD & DESIGN KPI 36

12 CONTINUING IMPROVEMENT 43

13 APPENDICES 43

APPENDIX 1 NEOM STAGE GATES FOR ALL PHASES- DESIGN STAGE GATE NOMENCLATURE FOR BUILDING AND INFRASTRUCTURE ASSETS 44

APPENDIX 2 NEOM DESIGN REVIEW PROCESS FLOW CHART AND DESIGN REVIEW CODING CLASSIFICATION 48

APPENDIX 3 NEOM DESIGN REVIEW COMMENTS RESOLUTION SHEET (CRS) TO BE USED FOR DESIGN REVIEW BY PMC 50

APPENDIX 4 NEOM DESIGN GATES FOR STAGE 3 52

List of Tables

Table 1: Table of Definitions 6
Table 2: Table of Abbreviations 8
Table 3: Table of References 9
Table 4: Design Management RACI Matrix 21
Table 5: Table of Design Management RACI Matrix Definitions 22
Table 6: Design Objectives & Corresponding Design Gates 23
Table 7: Design Stage Objectives 24
Table 8: Table of PMCM & Designer's Key Deliverable Documents 28
Table 9: Table of NEOM EDL 31
Table 10: Design Review Codes 37
Table 11: Typical SOS for Design Disciplines 38

List of Figures

Figure 1: Depiction of NEOM's Stage 3 with Substages 5
Figure 2: NEOM Organization and Design Management Team 11
Figure 3: Responsibility Matrix for NEOM Plan of Works 12
Figure 4: NEOM Program Stages 26
Figure 5: Hierarchy & Nomenclature of Design Maturity Dashboard 40
Figure 6: Design Maturity Dashboard of a Typical Asset 41

1 EXECUTIVE SUMMARY

This Design Management Plan (DMP) is mandated on all entities involved in the provision of Stage 3 Design to NEOM. This DMP will be implemented and adhered to during all distinct design stages of Stage 3. Please refer to figure 1 for NEOM`s Stage 3 components.

This will cater to all NEOM assets including buildings & infrastructure assets. It establishes the governing framework including policies, procedures and expectations within which the design activities will be defined, planned, managed, executed, monitored controlled, reported and completed.

The DMP sets the responsibilities that will be followed to meet the requirements of the contract during all the stages. It has been developed to provide appropriate guidance to all those involved in the development and review of the design and assist in achieving a collaborative and integrated approach across NEOM wide design activities.

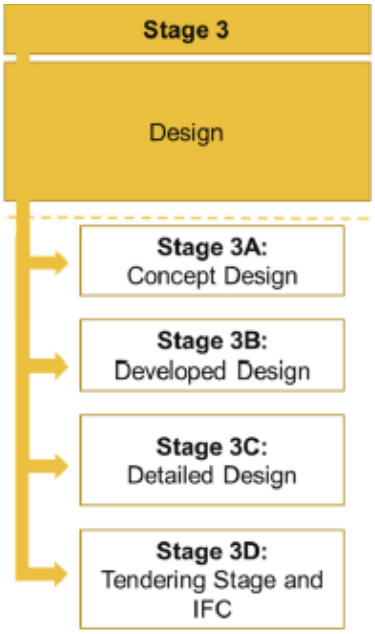


Figure 1: Depiction of NEOM's Stage 3 with Substages

Intended Audience:

This document is intended to be used by the following participants:

- NEOM region & sectors.
- PMC/PMCM.
- Executive program manager.
- Design & engineering consultants.
- Specialist consultants.
- Selected contractors.
- Internal stakeholders.
- Design and build consortiums.

- Contractors.

2 PURPOSE

The purpose of the Design Management Plan (DMP) is to outline the processes, procedures, roles and responsibilities to be followed by PMC, PMCM, contractors and design consultants.

The DMP is a working reference system to be used by PMC/PMCM, contractors and design consultants. enabling them to understand the design management systems and quickly locate design criteria and control data. It concerns all design activities associated with permanent and temporary works of NEOM's program. The DMP will be updated as part of periodic reviews and when required due to updates in procedures or scope.

3 DEFINITIONS

Table 1: Table of Definitions

Term	Definition
Asset	Refers to the required physical buildings or infrastructure such as residential, business facilities, commercial & retail facilities, media center, recreation, entertainment & sports facilities, marinas, hospital, medical clinics, religious facilities, school, library, fire stations, roads/streets/bridges, infrastructure system, and utility networks. Also, it relates to components of buildings and structures that need to be tracked and managed.
Asset Brief	Prepared by the proponent or specific NEOM sector, providing a high-level description and requirements for the development of an asset within the NEOM region. It is prepared according to NEOM-NEN-PRC-004 Initial Asset Brief Procedure, at Stage 2C prior to the appointment of the "Designer" and represent an agreement between all project stakeholders.
BOD	Basis of design is a document that records the major thought processes and assumptions behind design decisions made to meet the Employer's Requirements.
Comments Resolution Sheet	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 NEOM-NEN-PRC-030.For internal review (NEOM to NEOM), the NEOM internal CRS shall be used.
Departments	Different entities and divisions constituting NEOM organization, which may include the Project Department, Operations Department, Proponent/Sponsor, Urban Department, Environment Department, Loss Prevention and Fire Safety Department, etc.
Design & Build	Under Design & Build route, post design Stage 3A the appointed D&B contractor will be responsible for the development of remaining design stages, construction, testing and commissioning phases. Under this mode of procurement, the D&B contractor will be fully liable for design and will adhere to this plan.
Design Brief	Design Brief expand on Asset Briefs and outline the technical requirements in greater detail such that design activities can be performed.
Design Execution Centre	Designer offices with specific design activity for the NEOM project.
Design Memorandum	This document is sometime called the Basis of Design (BoD). It is produced by the designer. It details the Employers Requirements, design criteria, basis, codes and standards used, methodology, environmental conditions, etc. that designer intends to deploy in fully designing the requirements for the Asset.
Design Stages	Refers to NEOM`s distinct design stages i.e. Stage 3A,3B,3C and 3D
Design Work Packages	Discrete design work packages within the Work Streams aligned with procurement and construction plans.

Design-Bid-Build	Design activities follow all substages of Stage 3. Contractor is appointed post Stage 3D/IFC. Under this procurement, the designer carries fully liability for the design.
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 NEOM.
EDMS	Electronic Document Management System. ACONEX will be used for NEOM.
Employer's Requirements	NEOM`s complete performance and functional requirements specified in the designers and contractors' contract and as per NEOM documents.
Stage Review Process	A formal design gate process to be conducted in accordance with NEOM procedure NEOM-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. NEOM-NEN-PRC-021 whose requirements are mandatory.
Independent Checking Engineer (ICE)	Not to be confused with Independent Design Reviewer. An independent qualified entity/engineer that performs independent analysis, calculations and design to review compliance to Employer`s Requirements during design and construction stages. The ICE, if required, will always be appointed by NEOM. The ICE will provide a monthly report to NEOM highlighting any discrepancies and non-compliances from defined requirements, processes and procedures.
Independent Design Reviewer	Any independent design entity/architect/engineer that performs independent assessment (may include detailed calculations & detailed analysis) of a design package for any Work Stream. This includes independent analysis of reports, calculations and all other design documents as defined by CG 300 Technical Approval of Highway Structures.
Independent Safety Assessor (ISA)	Company employed by the Contractors/NEOM responsible for issuing the safety reports to the Employer so that the Authority in charge of authorizing the commercial revenue service of specific asset can grant a Permit to Operate.
KOM	A formal process marking the commencement of project activity. Typically, during the kick-off meeting major items of scope of work are reviewed to ensure alignment. These items reviewed may include review of SoW, deliverable list, schedule, KPIs, etc.
Lesson Learned	These record project success which we would look to continue doing. In addition, Lesson Learned also record challenges and difficulties faced, the root cause of these and the recommendation for alternative approach.
NEOM Design Manager	NEOM representative from PDT/PTS who leads a NEOM`s design review team. The NEOM technical teams are responsible for delivering design reviews and making recommendations on technical engineering issues.
NEOM Document Control (DC)	Personnel responsible for logging and inputting project data into the database, for distribution to specific project staff on the project. They are also responsible for archiving project data for future retrieval.
NEOM Plan of Work (NPOW)	The Plan of Work is a matrix presenting a structured approach for the delivery of an asset across its lifecycle stages. It includes the main objectives of each of the stages and the key criteria and deliverables pertaining to each of the stages as a guidance.
NEOM Representative	Appointed Project Management Consultant, Supervision Consultant, other Consultants or NEOM Departments.
Project	Refers to the development and delivery of a NEOM Asset or a group of NEOM 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/3rd Party	Organisation other than the NEOM, PMC/PMCM and Designer. 3rd Party entities will primarily contain ICE and ISA.
Works	Refers to the development and delivery of a NEOM Asset or a group of NEOM 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.

4 ABBREVIATIONS

Table 2: Table of Abbreviations

Abbreviation	Description
A/E	Master Planners, Design Consultants, Engineering Consultant, Contractor's Designers and any other entity involved in providing Design Submittals to NEOM.
BIM	Buildings Information Management
CRS	Comments Resolution Sheet
EDMS	Electronic Document Management Systems
EDL	Engineering Deliverable List
ETSD	Engineering and Technical Services Department
GDCD	General Directorate of Civil Défense
GIS	Geographical Information Systems
IAB	Initial Asset Brief
ISG	Interim Stage Gate
MEP	Mechanical, Electrical and Plumbing
NEV	NEOM Environmental Department
PTS	Projects Technical Services
PAS	Projects Architecture & Style
PDT	Project Delivery Team
PDDMD	Project Department Design Maturity Dashboard
PMC/ PMCM	Project Management Consultant/ Project Management Construction Management Consultant
PRC	NEOM Procedure
QA/QC	Quality Assurance / Quality Control
RFI	Request for Information
SCH	Schedule
SRC	Stage Review Committee

SOS	Status of Submissions
SoW	Scope of Work

5 REFERENCE DOCUMENTS

NEOM`s design documents, listed below in table 3, are not included in this document. They are kept in the project files and their application to this document is by reference only.

These documents were developed specifically for the core competent areas of the NEOM`s design stages and shall be used and adhered to during all design activities. These documents are reviewed and updated on periodic bases. Other NEOM design documents are under development and will be incorporated in future updates.

Table 3: Table of References

Document Name	Document Numbering
Geotechnical Investigation Procedure	NEOM-NEN-PRC-001
Topographic Survey Procedure	NEOM-NEN-PRC-002
Fire Safety Approvals Procedure	NEOM-NLF-PRC-002
Quality Requirement for Contractors	NEOM-NEN-SCH-002
Initial Asset Brief Procedure	NEOM-NEN-PRC-004
Stage Deliverables Procedure	NEOM-NEN-PRC-005
List of Technical Codes and Standards	NEOM-NEN-SCH-005
Safety in Design Procedure	NEOM-NEN-PRC-006
Value Engineering Procedure	NEOM-NEN-PRC-007
NEOM Document Numbering and Revision Procedure	NEOM-NEN-PRC-008
BIM & GIS Procedure	NEOM-NEN-PRC-009
Drawing and Drafting Procedure	NEOM-NEN-PRC-010
Site Specific Seismic Hazards Study Procedure	NEOM-NEN-PRC-011
Hydrological Study Procedure	NEOM-NEN-PRC-012

Document Name	Document Numbering
Traffic Study Procedure	NEOM-NEN-PRC-013
Management and Application of NEOM Standards & Codes Procedure	NEOM-NEN-PRC-014
Asset Naming Conventions Procedure	NEOM-NEN-PRC-020
Stage Review and Approval Procedure	NEOM-NEN-PRC-021
Handing Over Procedure	NEOM-NEN-PRC-022
NEOM Plan of Work	NEOM-NEN-PRC-029
Document Numbering and Revision Procedure	NEOM-NEN-PRC-030
Deviation Request Procedure	NEOM-NEN-PRC-051
Design Review Procedure	NEOM-NPR-PRO-100

6 DESIGN MANAGEMENT STRUCTURE ROLES & RESPONSIBILITES

The overall design team is divided into distinct teams and people, each with specific design team responsibility for a program of work. A bespoke Design Management Plan must be prepared for every specific NEOM region at the beginning of design phase by the appointed designer, contractor and PMC. Any such plans shall be fully aligned with this document.

The design management team's overarching goal is to streamline and simplify the design process. This plan will be updated when required when there are changes in procedures or scope.

Typically, the design management project structure is summarized as per Figure 2.

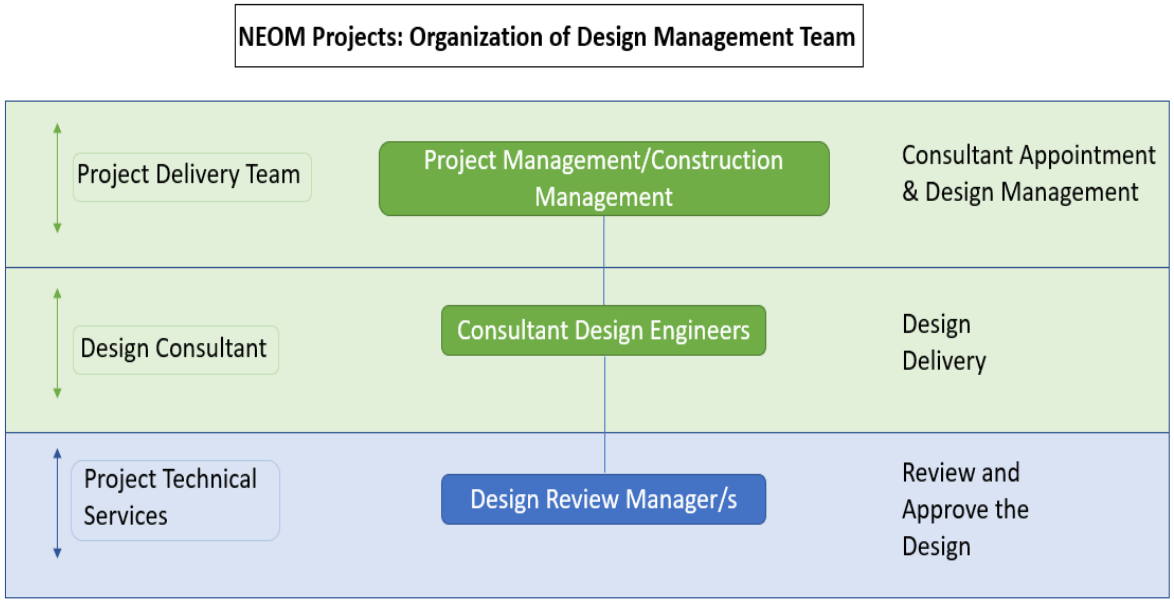


Figure 2: NEOM Organization and Design Management Team

The roles and responsibilities of other NEOM`s departments shall be as per the NEOM-NEN-PRC-021 and has been depicted in Figure 3.

Roles & Responsibilities of NEOM Departments During NEOM Plan of Works Stages

NEOM PLAN OF WORK RACI: 1 - Regional (R.R.)

RACI CHART FOR NEOM ASSETS / FACILITIES WITHIN A REGION

General Notes	
	The RACI chart is a baseline for NEOM building and infrastructure assets from NEOM CEO perspective.
	For any changes of this standard RACI Chart, a deviation shall be requested to relevant Regional Proponent, related stakeholders and ETSD. The approved version shall be communicated to all the stakeholders.

NEOM Departments/Sectors / NEOM Plan of Work Stages	Departments & Sectors					Compliance & Governance			Corporate Support
	Regional Proponent[1]	Asset Proponent (Sector/ Department)[1]	Urban Planning	Projects	Related Sectors/ Departments[4]	ETSD	Environment	Legal	Procurement
Stage 1 - Strategic Definition									
Strategic Definition & Regional Strategy	A & R	C	C	I	C	C	C	I	I
Stage 2 - Master Planning & Asset Brief									
Stage 2A : Concept Masterplan	A	C	R	C	C	C	C		
Stage 2B: Detailed Masterplan	A	C	R	C	C	C	C		
Stage 2C: Initial Asset brief	A	R	C	C	C	C	C		
Stage 3 - Design									
Sub-stage 3A: Concept Design (30% Engineering)	A[3]	C[3]	C	R	C	C	C		I
Sub-stage 3B: Developed Design (60% Engineering)	A[3]	C[3]	C	R	C	C	C		
Sub-stage 3C: Detailed Design (90% Engineering)	A[3]	C[3]	C	R	C	C	C	I	
Sub-stage 3D: Tendering & IFC (100% Engineering)	A[3]	C[3]	I	R	I	C	C	C	C
Stage 4 - Construction, Handover & Close-out									
Stage 4A: Mobilization & Construction	A[3]	C[3]		R	I	I	C		
Stage 4B: Testing & Commissioning, Handover and close-out	A[3]	C[3]		R	I	C	C	I	I
Stage 5 - Operation & Maintenance									
Operation & Maintenance	A[3]	R	I	I	I	C	C	I	I

R	Responsible	Stakeholders who **execute** the work. They must complete the task or objective and make the decisions.
A	Accountable	Stakeholder who is the "owner" of the work. Shall be **ultimately accountable** for the overall development to get the work completed. This representative must make sure that responsibilities are assigned in the matrix for all related activities.
C	Consulted	Stakeholders who need to be **engaged** during the development, who review the deliverables and are part of **final approval and sign-off**. These stakeholders are active participants.
I	Informed	Stakeholders who need to be **aware and informed** during the development. Need to be aware on progress or decisions, but not to be part of the approval.

Foot Notes:	
	(1) A NEOM representative who is accountable for his/her region is Regional Proponent and a NEOM representative who is accountable for Sector or individual assets is Asset Proponent.
	(2) The operation of Asset / Facility is the Asset Proponent Responsibility.
	(3) From Stage (3A) to Stage 5, Asset proponent shall be accountable to the regional Leader (Head) for actual development of their individual asset. Regional Proponent shall be ultimately accountable for overall Region and integration aspects of all individual assets in the region.
	(4) All other related Sectors / Departments (Design & Construction, Security, Energy, etc.) shall be included in the review (Consulted) as applicable.

NEOM PLAN OF WORK RACI: 2 - Assets (R.A.)

RACI CHART FOR NEOM STANDALONE ASSETS OUTSIDE THE REGION

General Notes	
	The RACI chart is a baseline for NEOM building and infrastructure assets from NEOM CEO perspective.
	For any changes of this standard RACI Chart, a deviation shall be requested to relevant Regional Proponent, related stakeholders and ETSD. The approved version shall be communicated to all the stakeholders.

NEOM Departments/Sectors / NEOM Plan of Work Stages	Departments & Sectors					Compliance & Governance			Corporate Support
	Regional Proponent[1]	Asset Proponent (Sector/ Department) [1]	Urban Planning	Projects	Related Sectors/ Departments [3]	ETSD	Environment	Legal	Procurement
Stage 1 - Strategic Definition									
Strategic Definition & Regional Strategy	C[6]	A & R	C	I	C	C	C	I	I
Stage 2 - Master Planning & Asset Brief									
Stage 2A : Concept Masterplan (Regional Concept Masterplan[4])	C	A	R	C	C	C	C		
Stage 2B: Detailed Masterplan (Regional Detailed Masterplan[4])	C	A	R	C	C	C	C		
Stage 2C: Initial Asset brief	C	A & R	C	C	C	C	C		
Stage 3 - Design									
Sub-stage 3A: Concept Design (30% Engineering)	I	A	C	R	C	C	C		I
Sub-stage 3B: Developed Design (60% Engineering)	I	A	C	R	C	C	C		
Sub-stage 3C: Detailed Design (90% Engineering)	I	A	C	R	C	C	C	I	
Sub-stage 3D: Tendering & IFC (100% Engineering)	I	A	I	R	I	C	C	C	C
Stage 4 - Construction, Handover & Close-out									
Stage 4A: Mobilization & Construction	I	A		R	I	I	C		
Stage 4B: Testing & Commissioning, Handover and close-out	I	A		R	I	C	C	I	I
Stage 5 - Operation & Maintenance									
Operation & Maintenance	I	A & R	I	I	I	C	C	I	I

Foot Notes:	(1) A NEOM representative who is accountable for his/her region is Regional Proponent and a NEOM representative who is accountable for Sector or individual assets is Asset Proponent.
	(2) The operation of Asset / Facility is the Asset Proponent Responsibility.
	(3) From Stage (3A) to Stage 5, Asset proponent shall be accountable to the regional Leader (Head) for actual development of their individual asset. Regional Proponent shall be ultimately accountable for overall Region and integration aspects of all individual assets in the region.
	(4) All other related Sectors / Departments (Design & Construction, Security, Energy, etc.) shall be included in the review (Consulted) as applicable.
	(5) The related Regional Proponents that will be served or impacted by the asset or facility shall be consulted.

R	Responsible	Stakeholders who **execute** the work. They must complete the task or objective and make the decisions.
A	Accountable	Stakeholder who is the "owner" of the work. Shall be **ultimately accountable** for the overall development to get the work completed. This representative must make sure that responsibilities are assigned in the matrix for all related activities.
C	Consulted	Stakeholders who need to be **engaged** during the development, who review the deliverables and are part of **final approval and sign-off**. These stakeholders are active participants.
I	Informed	Stakeholders who need to be **aware and informed** during the development. Need to be aware on progress or decisions, but not to be part of the approval.

Figure 3: Global Base line Responsibility Matrixes for NEOM Plan of Works for Regional Assets and Assets Outside the region.

6.1 Design Consultant/Designer

The design consultant is responsible for the preparing the BOD and design development. The design consultant is responsible for design of the assets, including the day-to-day management of the design, monitoring and updating the work programme, allocation of staff resources, and reporting to achieve project objectives. Each design submission will be accompanied by a BIM model developed to the level specified in NEOM's Technical Procedure reference NEOM-NEN-PRC-009 (GIS & BIM Procedure) at the end of each design stage.

Refer to BIM requirements as outlined in the NEOM BIM & GIS Procedures (NEOM-NEN-PRC-009), including the following:

The tools and software to be used for design, simulation and modelling (including: Building Information Modelling) will be detailed by the design consultant as part of their Pre/Post Contract BIM Execution Plan (BEP) submission and is subject to NEOM`s approval.

Solutions will need to be agreed between NEOM and the appointed design delivery consultant, where applicable in order to develop a design, over and above the standard tools deployed by the Project.

Design consultants and contractors are responsible to establish their own Common Data Environment (CDE) to manage their internal (Work In Progress) design collaboration with their sub-consultants and sub- contractors. This can be Autodesk BIM360, Bentley Project Wise or similar – subject to NEOM approval.

ACONEX* will be used as the official project engineering environment to transmit and archive engineering documentation, drawings and models as per NEOM-NEN-GGD-001. Additionally, all submitted documentation will be hosted in ACONEX* as the Electronic Database Management System (EDMS) to retain, issue and control project records and submissions.

Project documentation is required to be stored and controlled within the EDMS. Documentation control requirements will be as stated in the NEOM Documentation Plan.

The list of software tools to be deployed are as follows:

- ACONEX* – NEOM EDMS.
- Bentley OpenRail for rail design.
- Autodesk Civil 3D for civil site works, highways and utilities.
- Autodesk Revit for buildings design.

Additional and/or alternative BIM software can be proposed by the design consultants and Contractors in their Pre/Post Contract BIM Execution Plan (BEP) - subject to NEOM approval.

*Subject to change; as NEOM are in the process of deploying our NEOM digital delivery platform (Dassault 3DEXPERIENCE) that would act as our NEOM common data environment (NEOM Projects CDE), and will be used to host and share all engineering and BIM data.

In addition, at the submission of each stage, designers shall submit a presentation highlighting stage finding, compliance with the scope of work and compliance with NEOM requirements. The design consultant`s team is the primary point of contact for design delivery and is responsible for:

a. The project staff within the design delivery team.

b. The planning and monitoring of projects.

c. Reviewing all incoming project documents and circulating to appropriate staff.

d. The satisfactory delivery of each project in terms of scope, time, quality, risk, safety, design risk assessments and procurement of sub-consultants.

e. Liaising with NEOM`s stakeholders to obtain statutory approvals, as necessary.

f. Co-ordinating all designers' staff to deliver the project within the programmed time.

g. Attending meetings when requested.

h. Establishing and maintaining the document control procedures.

i. Maintaining the work scope change procedure.

j. Approval of design drawings, specifications and bills of quantity for issue.

k. Answer RFI's from the contractor that require technical interpretation of the design.

The design consultant authority does not include procurement of sub-consultants/external personnel. Proposals are to be forwarded to the NEOM for approval. The design delivery team shall comprise several design managers, project engineers, discipline lead, BIM coordinators, scheduler and project controls staff as per asset requirement.

The contractual liability for the design always remains with the designer. PMC/PMCM shall fully support designer for the timely completion of their planned design activities by expediting response to RFI, timely review of design deliverables and coordination with NEOM sectors for attendance at critical meetings.

6.2 Project Management Consultant (PMC/PMCM)

General:

The PMC/PMCM will manage the design process and review all the design issued by the designers for all of NEOM design stages 3A-3D. This will be achieved, by assessing the overall design quality and consistency and undertaking a review to verify the design is in compliance with the relevant codes and standards and the Employer`s Requirements with the required level of performance as stated in the Employer's Requirements.

PMC/PMCM are responsible for monitoring the design (Civil works & Systems) activities using collaborative techniques for tracking staffing and mobilization plans, completion of deliverables in accordance with agreed schedules, quality, completeness, and compliance with contractual requirements. The PMC/PMCM design review team will participate in the Requirements Management Process.

The PMC/PMCM, designers and contractors will work together to organize, clarify and prioritize project requirements for input into the requirements management software system selected for the project. Requirements management software system selected for the project. should provide major advantages for managing requirements across an organization:

-Fully configurable.

-Direct access for each Subsystem to the requirements database.

-Enabling of parallel work and multi-user access.

-Automatic excel import/export function.

-Establishing of a history record.

-Possibility to freeze and document baselines.

-Web based.

-Self generated dashboard.

-Self updated reports and figures.

PMC/PMCM shall fully support the timely completion of planned design activities and own the compliance review of design. PMC/PMCM shall manage stakeholders and obtain external approvals to NEOM (ministry of transport requirement, municipality approvals, etc.). The roles and responsibilities of the PMC/PMCM with respect to design and engineering services throughout the project include, but are not limited to, the following:

a. Ensure the total design process conforms with the applicable project standards.

b. Provide the agreed deliverables in accordance with the design briefs.

c. Participate in the design review process, review for constructability, ensure compliance with all conditions of approval, provide information for cost management purposes.

d. Develop the design according to the decisions agreed at the design review meetings in accordance with the designer guidelines, which are prepared and updated from time to time.

e. Facilitate the interface and relationships between designers and the rest of project delivery team.

f. Manage and facilitate third party participation in the design process, and review of design deliverables.

g. Review and check compliance with required standards and codes, the NEOM`s design verification and quality assurance procedures, and those of the respective design organization.

h. Assure that design files and execution records are in accordance with the applicable document control procedures.

i. Inform and advise on all design issues which may impact on the project execution and assessment of risk.

j. Process As-built drawing information expeditiously to avoid project Handover delay.

k. Assess D&B designers and their relevant experience.

l. Assess the ICE, ISA and their relevant experience.

m. Review the project scope and schedule.

n. Review the design criteria, standards, and regulations to be adopted for the project.

o. Review dilapidation survey.

p. Support requirements management process.

q. Track design progress.

r. Perform design reviews.

s. Review change management proposals.

t. Review design documentation.

u. Track design safety assurance.

v. Reviews documents submitted by the D&B ISA.

w. Respond to RFIs.

x. Review and comment on records and minutes prepared by the designers and contractors.

y. Assist the designers and contractors in interfacing with authorities when obtaining NOCs.

z. Coordinate with risk management process.

During Design:

a. Manage the design review process.

b. Review design submittal schedule.

c. Review drafting standards.

d. Oversight of design workshops.

e. Support QA/QC in reviewing design quality process.

f. Review design input data.

g. Review proposed exceptions, deviations and substitutions.

h. Review configuration and document control process.

i. Upon completion of any design stage, the designer and PMC will produce a design report for NEOM. The reports should summarize all key design related assumptions, BOD and will also summarize the following design attributes.

1. Total no: of design workflows/transmittal (Including Summary of all design drawings).
2. Total no: of design CRS.
3. Design CRS codes for all design disciplines.
4. Record of any design changes and revisions to final design drawings.

5. Any departures from standards, if any.

During Construction:

a. Review method statements and temporary works drawings.

b. Review shop drawings.

c. Review material submittals.

d. Periodic instrumentation reports. Instrumentation reports will be reviewed jointly with the PMCM construction team for compliance with design requirements and assumptions.

e. Post construction the PMCM will support to establish process and systems for managing warranty issues during the defect's liability periods.

f. Ensure contractors follow construction safety rules, requirements and practices during construction.

During Testing and Commissioning:

a. Review testing and commission plans and procedures.

b. Support construction team for witnessing field testing.

c. Support construction team for reviewing as-built drawings and test reports.

d. Review archiving process.

System Assurance Documents

The PMC design managers will review design submittals issued by the designer and contractors as part of system assurance activities. Initial conceptual safety assurance documents will be reviewed in an early project stage.

The system assurance documents impact multiple disciplines and will be reviewed during design and construction for compliance and consistency. Design packages will also be reviewed for consistency with the system assurance documentation.

The submittals to be reviewed include:

a. System validation plan including the performance verification matrix and related documentation.

b. Climatic robustness management plan and related documentation system safety Plan and related safety analysis and related documentation.

c. RAM plan and related documentation.

d. Operation and maintenance plan and related documentation.

The designer and contractors are expected to use requirements management software to demonstrate compliance with performance and functional requirements. The PMC design manager will review the implementation of the system and resulting documentation.

6.3 NEOM Project Delivery Team (PDT)

The NEOM Project Delivery Team (PDT) is responsible for overall design management of the consultants and the PMC/PMCM to the required level of performance as per Employer's Requirements, NEOM`s Design Stages Deliverable Procedure NEOM-NEN-PRC-005 and NEOM`s Stage Review & Approval Procedure NEOM-NEN-PRC-021.

The NEOM Project Delivery Team in conjunction with NEOM Project Technical Services teams shall act as the responsible entity to conduct design stage gates for stages 3 & 4 as per NEOM`s Stage Review & Approval Procedure NEOM-NEN-PRC-021.

Dedicated representatives from PTS will be allocated under each PDT region to ensure that the Stage 2C is developed and delivered by the sectors in accordance with NEOM-NEN- PRC-004 and to conduct the technical review and approval of Stage 3 deliverables.

6.4 NEOM Projects Architecture & Style (PAS)

The NEOM Projects Architecture & Style team is an integral part of the PDT and provides Architectural quality design guardianship to ensure that the Architecture & Style Guidelines generated from the Detailed Masterplans and reviewed by PAS are integrated within the Assets design. Their key role includes the following:

During Design:

a. Point of contact with the architectural firms in terms of architecture design (aesthetics, qualitative) aspects.

b. Provide oversight of the Architectural design quality for Asset designs (Stage 3A) against the Architecture & Style Guidelines derived from Detailed Masterplan of each Region.

c. Upon conclusion of the Architecture Asset review process, Stage 3A 'Stage Gate' provide asset validation of Architectural design quality.

d. Provide oversight of the Architectural design quality for Asset designs during Stages 3B, 3C and 3D against the Architecture & Style Guidelines.

e. Prepare and issue Architecture design matrix for each asset design in accordance with Architecture & Style Guidelines generated from the Detailed Masterplan of each Region.

f. Assists consultants during the procurement process or the architectural design processes to ensure the design quality and the coherence with the Architecture & Style Guidelines.

g. Maintain regular meetings with the consultant to ensure the architecture design is developing in line with the Architecture & Style Guidelines.

h. Participates in meetings with the PDT/PTS design managers, consultants, engineers, architects and other specialists, to ensure compatibility of design solutions with building systems while ensuring the quality of the architectural design and alignment with the Architecture & Style Guidelines.

i. Elaborates the minutes of the meetings in architectural design matters.

j. Support architectural design decision making role during value engineering at all stages of the project.

k. Review and validate each of the design stage deliverables, for the following design packages:

- Architecture design.
- Interior design.
- Façade aesthetics (without Engineering).
- Signage & wayfinding.
- Materials & mock-up aesthetic approval.
- Landscape.

6.5 NEOM Engineering and Technical services Department (ETSD)

The NEOM ETSD will assess the overall design quality & consistency for compliance with the applicable level of performance during Stage Reviews as per the Employer's Requirements and NEOM`s Stage Review and Approval Procedure NEOM-NEN-PRC-021.

The following criteria represent key considerations for ETSD. Additional considerations will apply, depending on the subject matter.

a. Performs compliance checks during all design gates.

b. Reviews and approves design derogations which impact the BOD and track changes as well.

c. Audits the design to ensure its being designed as per the NEOM requirements.

d. Informed during the design reviews and different types of safety risk assessments to ensure it is in compliance with required standards.

e. Conduct inspections and audits for construction sites.

f. Support in witnessing fire life safety systems testing and commissioning and functions including cost estimation, quality and facility planning.

6.6 NEOM Project Technical Service (PTS)

NEOM PTS provides an integral technical support service to the Project Delivery Team. The roles and responsibilities of PTS with respect to design and engineering services throughout the project include, but are not limited to, the following:

a. Technical review of the initial asset brief.

b. Provides technical support on BOD.

c. Overall compliance review and issue comments during 3A-3D via CRS as per Appendix 3.

d. Conduct quantitative design stage gates 3A-3D as per Appendix 4.

e. Provision of technical support for approval of design changes 3A-3D.

f. Approves the design for NEOM and issue No Objection for the design.

g. Appointment and management of independent design checks.

h. Review of BIM deliverables.

PTS will be responsible for technical review of the Initial Asset Brief (IAB) and may also support the Asset`s proponent during design stage gate 1 and 2. PTS will undertake the technical review at each stage gate as per the Stage review and approval procedure NEOM-NEN-PRC-021.

Once the design is completed, NEOM PTS are responsible to approve the design and issue the No Objection via signing the CRS. PTS alongside PDT will also manage and conduct design stage gates during stage 3 as per the Stage review and approval procedure NEOM-NEN-PRC-021.

6.7 NEOM Regional & Asset Proponent

A NEOM representative who is accountable for his/her region is regional proponent and a NEOM representative who is accountable for sector or individual assets is asset proponent. The NEOM regional proponent is a NEOM entity, or a developer designated by NEOM to accept custody for planning, designing, constructing or managing and operating a particular asset or a group of assets. For NEOM assets within a region, the regional proponent is ultimately accountable for all NEOM Plan of Work Stages (NPOW) 1-5. For assets outside the identified regions asset proponents/sector is ultimately accountable for all NPOW stages.

For Stage 3 Asset proponent shall be accountable to the regional Leader (Head) for actual development of their individual asset. Regional Proponent shall be accountable for overall Region and integration aspects of all individual assets in the region.The NEOM regional proponent is accountable for the Initial Asset Brief (IAB) document and securing the approval of relevant stakeholders as per NEOM-NEN-PRC-004. The IAB prepared at Stage 2C is a prerequisite to initiating Stage 3 (Design).

The roles and responsibilities of the regional proponent with respect to Stage 3 will be as per following:

a. Review if the Asset objectives have been achieved.

b. Review conformance of asset needs with stakeholders.

c. Review the functional requirements and compliance to design brief.

d. Review compliance to the asset`s business case.

e. Review compliance with asset`s summary sheet.

f. Review compliance with signed IAB approval form.

6.8 NEOM Operations Department

The NEOM`s operation teams will be responsible for day-to-day operations, overall health & safety, delivery, and management of routine, reactive, and planned maintenance works to ensure that the NEOM`s assets remain fit for its design purpose.

In order to effectively plan, manage, and implement the operational expenditure (OPEX) regime of NEOM Assets they will be responsible for reviewing the following items during Stage 3.

a. Reviews the design specifications.

b. Reviews the materials data sheets employed in design.

c. Reviews any design and construction impact on OPEX activities.

d. Reviews the ease of maintenance of assets during the OPEX phase.

e. Reviews design components (civil Works & systems) to establish time to first maintenance to plan an effective OPEX regime.

f. Reviews the completeness of relevant design data and BIM required for planning OPEX activities.

6.9 NEOM Environment (NEV)

The NEOM 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 NEOM`s Stage Review and Approval Procedure NEOM-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 NEOM.

b. Environmental related design submissions. Sustainability related LEED submissions from designers, contractors and PMC to ensure that the NEOM`s assets remain compliant to NEOM Environmental requirements.

c. Environmental related documents including strategic environmental assessment and environmental impact assessment reports.

6.10 NEOM Urban Planning (UP)

The NEOM urban department will assess the overall urban design quality for compliance with the applicable level of performance during design gates as per the NEOM`s Stage Review and Approval Procedure NEOM-NEN-PRC-021. During stage 3, urban will be informed of urban related design submissions and documents to ensure that the NEOM`s assets remain compliant to NEOM urban requirements outlined in NEOM-NEN-PRC-005.

Roles & Responsibilities of NEOM Departments During NEOM Stage 3 Design & Tendering

Please note that's this is a bespoke RACI within Stage 3 and should not be mixed with the RACI as per figure 3.

Table 4: Design Management RACI Matrix

Design Stage Activities	Designer	PMCM/ ICE/ISA	NEOM PDT	NEOM PAS	NEOM PTS	NEOM ETSD	NEOM Regional Proponent	NEOM Asset Proponent	NEOM NEV	NEOM UP
Technical Review of Initial Asset Brief (2C)	I	R	A	R*	R	R	C	C	I	I
Design Management during 3A-3D	C	R	A/R	C	C	I	C	C	I	I
Architectural Management (Aesthetical Attributes)	C	R	A	R	C	I	C	C	I	I
Technical Review Basis of Design during 3A-3D	R	R	A	R*	R	I	C	C	I	I
Technical review & Resolution of Designers /PMCM/Contractor Comments via CRS	R	R	A	R*	R	I	C	C	I	I
Compliance Check Per NEOM Gate Approval Procedure.	R	R	A	C	R	R	C	C	R	I
Issuance of No Objection Via CRS	I	I	C	C	A/R	I	C	C	I	I
Resolution of Stakeholder`s Design Interfaces	C	R	R	C	C	I	A	R	I	I
Technical Review of Design Change/ RFI	R	R	R	C	A/R	I	C	C	I	I
Engineering Support Framework	R	C	C	C	A/R	I	I	I	I	I

Table 5: Table of Design Management RACI Matrix Definitions

RACI Matrix	***Definitions***
Responsible	People or stakeholders who do the work. They must complete the task or objective or make the decision. Several people can be jointly Responsible.
Responsible*	Refers to the Architectural Aesthetics.
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.
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.
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.

7 Design Review and Design Gates Scope

Minimum design review scope for all assets will be as per NEOM`s Stage Deliverables Procedure NEOM-NEN-PRC-005 and as per the requirements of the Initial Asset Brief NEOM-NEN-PRC-004. Design maturity will be subject to design stage reviews as per NEOM`s Stage Review Approval Procedure NEOM-NEN-PRC-021 and the quantitative design gate approach as per this document. This DMP outlines the specific design gate requirements during Stage 3 and the gate Pass/Fail criteria for NEOM design stages. This will be implemented and conducted by PTS in addition to the requirements of NEOM -NEN-PRC-021.

It is extremely important to segregate the design review and design gates (Stage Review). These are **two different** attributes, and the outcomes of design review will enable NEOM to conduct the design gates. There will be 5 major design gate attributes which will be gauged quantitatively.

Please refer to Table 6. These 5 main design gate attributes will cover a wide range of design maturity aspects. Please refer to Appendix 4 for detailed subsets of the design gate attributes and scoring criteria.

The total available gate 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.

It is expected that at 3A and 3B a 70% score will initiate a design gate pass whereas for 3C a minimum pass core of 90% must be achieved. For Stage 3D a pass core of 100% must be achieved. Please see Appendix 1 and 4 for NEOM stage gates and scoring criteria.

Evidence of design stage-gate review will be maintained in ACONEX.

Table 6: Design Objectives & Corresponding Design Gates

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

Table 7: Design Stage Objectives

Stage 3: Design & Tendering			
Sub-Stages	**Design Stage Objectives**	**Gates Code**	**Gate Acronym**
Sub-stage 3A: Concept Design	Preparing concept design for selected option. This includes concept, outline specifications, preliminary capital cost estimate and lifecycle cost.	Stage Review 3A	SR 3A
Sub-stage 3B: Developed Design	Preparing developed design including coordinated drawings, developed specifications, developed capital cost estimate and lifecycle cost.	Stage Review 3B	SR 3B
Sub-stage 3C: Detailed Design	Preparing detailed design including coordinated drawings, detailed specifications, detailed capital cost estimate and lifecycle cost.	Stage Review 3C	SR 3C
Sub-stage 3D: Tendering Stage and IFC	Tendering services for the selection of the Contractor and compiling IFC documents for signature.	Stage Review 3D	SR 3D

This plan applies to activities undertaken by the EPM/PMC and designers/engineering consultants to ensure that the design complies with the assets Brief, design brief, contractual requirements, all applicable laws, codes and standards including but not limited to the followings:

- Asset`s functional requirements.
- Asset`s performance specifications.
- Asset`s operations and maintenance criteria.
- Asset`s design criteria, codes and standards.
- Asset`s technical specifications.
- Asset`s interface specifications.
- Asset`s safety rules and procedures.
- Asset`s environmental values and protection requirements.
- Asset`s testing and Commissioning specifications.

The designers and their respective design teams are responsible for the production of the design documents. The PMC's role is to manage the design review process and to review the design product for conformance with the project requirements.

The designer will produce design submissions which will be reviewed by the appointed EPM/PMC and then submitted for approval to NEOM.

The PMC shall review (Qualitatively & Quantitatively) all design deliverables during every design stage and will submit to NEOM PTS for approval. Some design activities will mandate review of ICE and ISA. In such cases, the design submission will evolve as an integrated submission endorsed by the ICE and the ISA before they are issued to NEOM. Design submissions where a 3RD party check will be invoked will be decided by NEOM and the relevant PMC/designer.

7.1 CODES AND STANDARDS

Designs shall be undertaken in accordance with the applicable standards as per document No. NEOM-NEN-SHC-005. Additional codes, industry guidelines, job specifications shall apply where specifically requested for the project.

However, designers are expected to be at the forefront of their respective fields and propose the use of best available and innovative technologies, techniques, methodologies and propose codes and standards that envelop this ethos and represent the designer's creativity without limitation and challenging the requirements of NEOM-NEN-SCH-005.

Any proposed new code and standard shall be submitted for ETSD review and approval. Application for deviation from the BOD, specified codes and standards must follow NEOM-NEN-PRC-014 Management and Application of NEOM Standards and Codes Procedure.

In case of conflict among the codes or standards or among them and the applicable local Saudi codes or regulations of governmental authorities, the designer/contractor shall explicitly raise the conflict and proposed mitigation measures for ETSD review and approval.

In all NEOM projects and developments, the designer or contractor shall duly satisfy the stipulations of local Saudi codes and standards in addition to all regulations and specifications of governmental authorities and agencies to be complemented by the list of international codes and standards. With respect to any conflicts between the requirements in the Saudi Building Code (SBC) and those in the particular project selected codes and standards, the most stringent requirement shall be applicable, unless otherwise approved by NEOM.

DESIGN PROCESS

The design process establishes a systematic methodology for fully identifying requirements during the concept stage and achieving those with the final design.

7.2 Design Inputs

The design inputs consist of:

- Requirements as stated in the design briefs. Design briefs are based on the asset briefs developed by the proponent and developed further jointly with NEOM sector leads, NEOM projects and engineering consultants.
- Standards baseline, plans, procedures and processes.
- Saudi statutory laws and regulations.
- Interface requirements both internally between the main work packages; and externally with existing utilities and external stakeholder as per section 8.6.

The set of design inputs will form the baseline for the verification and validation of design output at the various development stages to determine whether the final design meets the requirements.

Validation is the confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use have been fulfilled, “Build the right product” approach.

Verification is the confirmation by examination and provision of objective evidence that then specified requirements have to be realized, “Build the product right” approach.

8 DESIGN MANAGEMENT PROCESSES AND PROCEDURES

8.1 Design Strategy and Approval Methodology

As per Figure 4, the NEOM program is broken out into several different stages. The design of assets is developed through Stage 1-3 and then constructed during Stage 4.

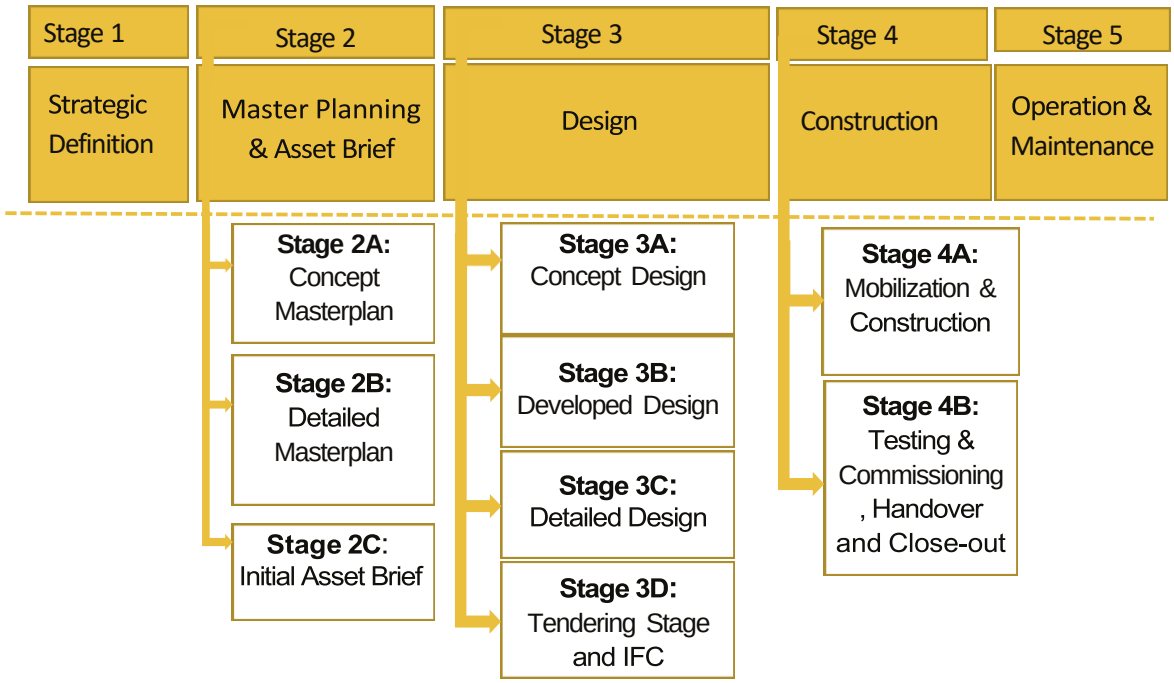


Figure 4: NEOM Program Stages

It describes what designers are to submit at each design stage:

- Stage 1 – Strategic definition.
- Stage 2 – Master planning & asset Brief.
- Stage 3 – Design.
- Stage 4 & Stage 5 – (subject of different procedures).

  As for the design and consultancy engineering Services are related (i.e., Stage 1 to 3) the following objectives are identified for each stage:

- Stage 1 – Strategic Definition
  Project visioning, identifying assets and preparing related strategic brief, business case and high-level feasibility study. Developing regional structural plan addressing large-scale development vision.

- Stage 2A – Structure Plans & Concept Master Plan
  Confirming master plan and developing pre-concept structure plan and concept master plan. Process includes validating economics and infrastructure criteria.

- Stage 2B – Detailed Master Plan, Infrastructure Master Plan
  Developing schematic and detailed master plan addressing landscaping, infrastructure and environmental requirements. Identifying asset objectives, and key requirements as part of an initial asset brief.

- Stage 2C – Asset Brief
  Developing asset objectives and aspirations, producing asset business case and feasibility study, and developing the Initial Asset Brief.

- Stage 3A – Concept Design
  Preparing concept options followed by concept design for selected option. This includes concept, outline specifications, preliminary capital cost estimate and lifecycle cost.

- Stage 3B – Developed Design
  Preparing developed design including coordinated drawings, developed specifications, developed capital cost estimate and lifecycle cost.

- Stage 3C – Detailed Design
  Preparing detailed design including coordinated drawings, detailed specifications, detailed capital cost estimate and lifecycle cost.

- Stage 3D – Tendering Stage and IFC
  Undertaking tendering services for the selection of the Contractor and compiling IFC documents for signature.

  The PMC, PMCM, contractors and designers will produce key deliverables as per table 8 which will outline how they achieve NEOM`s requirements. It will be the responsibility of the PMC/PMCM to ensure that the designers produce these documents in a timely manner and that they are in sync with PMC/PMCM documents.

Table 8: Table of PMCM & Designer's Key Deliverable Documents

No:	Key Deliverable Documents	PMCM	Designer
1	Project Execution Plan	✓	✓
2	Project Management Plan	✓	✓
3	Design Schedule	✓	✓
4	Design Review Plan	✓	✓
5	Design Management Plan	✓	✓
6	Work Packages	✓	✓
7	Work Breakdown Structure	✓	✓
8	Master Schedule	✓	✓
9	Employer requirement management plan	✓	✓
10	System validation and verification plan	✓	✓
11	Engineering design assurance gate procedure	✓	✓
12	Design quality control plan	✓	✓
13	Reliability, availability, maintainability and safety management plan [RAMS].	✓	✓
14	Project Quality Plan (PQP).	✓	✓

8.2 Structure and key resources of Design Consultant and PMC

The designer and PMC/PMCM team must be divided into distinct teams, each with a design manager responsible for a programme of work allocated by the project design director. Each team from PMC/PMCM and designer must include senior engineers from the various disciplines, with a dedicated design manager being a formal representative.

8.3 Project Quality Control Plan

The designer and PMC team must have a dedicated quality control plan to be followed in order to ensure that the design activities are kept within the quality requirements. All such plans will be reviewed and approved by ETSD and PTS and will be subject to periodic audits.

8.4 Auditing

Internal audits will be undertaken to monitor compliance with this procedure and to be assessed for suitability, relevance and effectiveness. This will include ETSD & PTS auditing appointed PMC/PMCM, contractor and designers. A copy of the audit report will be kept electronically on EDMS. External audits may also be requested.

8.5 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 NEOM`s approval.

Solutions will need to be agreed between NEOM and the appointed design delivery consultant, 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 NEOM-NEN-GGD-001. Additionally, all submitted documentation will be hosted in ACONEX as the Electronic Database Management System (EDMS) to retain, issue and control project records and submissions.

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

1. ACONEX – EDMS.
2. Micro-station v8.1 and AutoCAD 2014 for drafting.
3. REVIT Architectural, Structural and MEP.
4. Bentley Rail Track.
5. Autodesk Civil3D for civil site works, highways and utilities.
6. NEOM Common Design Environmental (CDE) shall be used for Design Collaboration.
7. Commonly used structural engineering and analysis software.

8.6 Interface Management

The PMC/PMCM, contractors and the designers shall develop their dedicated Interface management plans to capture the design details between interface design partners, including within work package designers, and between third party contractors. Responsibility of managing the Interfaces falls with the PMC/PMCM. All interfaces and design inputs and outputs from interfacing leaders and partners need to be managed during design phase. The main categories of interfaces include the following:

- Internal Interfaces between the main work packages.
- External interfaces with the other projects.
- External interfaces with local authorities and third parties, including:
    1. Ministry of Transport (MoT).
    2. Local Municipalities.
    3. Saudi Telecommunication Company (STC) and other similar service providers.
    4. Existing services and utilities.

5. Aramco gas pipelines.
6. Saudi Electric Company.
7. Regional Water and Sewerage Authority.
8. Regional Saline Water Conversion Entity.
9. Mobile Operations (STC, Mobily, Zain).
10. Ministry of Defence (MODA).
11. General Directorate of Civil Defence (GDCD).
12. Others (as identified).

The appointed design consultant and PMC/PMCM shall submit their third-party certification plan for review and approval by NEOM during design development. This plan shall include details for the third-party checking engineer for certification of GDCD Fire Safety requirements as per NEOM-NLF-PRC-002 Fire Safety Approvals Procedure.

The PMC/PMCM and designer`s interface manager will:

1. Prepare and update their interface management plans, identifying the scope, definition, process, governance, responsibilities, templates, and tools.
2. Produce a master project interface matrix and outline boundary definition.
3. Establish communications and define meeting/working protocols with external interface leaders and partners.
4. Coordinate interface definition and agreement activities.
5. Facilitate and record interface agreements and related evidence.
6. Conduct interface progress reviews as a part of the design management process.

8.7 Engineering Deliverables List (EDL)

The minimum engineering deliverables for every distinct design stage will be as per NEOM-NEN-PRC-005. These have been summarised in table 9. It will be the responsibility of the PMC/PMCM, contractors and designers to ensure that these minimum deliverables are produced accordingly.

Table 9: Table of NEOM EDL

NEOM Distinct Design Stages Numbering	Stage 3A	Stage 3B	Stage 3C	Stage 3D
NEOM Distinct Design Stages Description	**Concept Design**	**Developed Design**	**Detailed Design**	**Tendering Stage and IFC**
Core Objective	Preparing concept design for selected option. This includes concept, outline specifications, preliminary capital cost estimate and lifecycle cost.	Preparing developed design including coordinated drawings, developed specifications, developed capital cost estimate and lifecycle cost.	Preparing detailed design including coordinated drawings, specifications, capital cost estimate and lifecycle cost.	Tendering services for the selection of construction contractor and compiling IFC documents for signature.
Engineering Deliverables as per NEOM-NEN-PRC-005	Main Report describing the project components and the briefing the deliverables	Main Report describing the project components and the briefing the deliverables for developed design stage	Main Report describing the project components and the briefing the deliverables	IFC Drawings
	Data Collection Results compiles and describes the relevant data collected and their analysis, the gap analysis and the assumptions adopted	Data Collection Results compiles and describes the relevant data collected and their analysis, the gap analysis and the assumptions adopted	Data Collection Results compiles and describes the relevant data collected and their analysis, the gap analysis and the assumptions adopted	
	Concept Design illustrating design criteria, options assessed, comparative analysis, recommended option and description of the components, for both buildings and infrastructure	Design Development for Developed stage describing design criteria, design of various components, for both buildings and infrastructure, and all design notes	Design Development for Detailed Design describing design criteria, design of the various components, for both buildings and infrastructure, and all design notes	
	Drawings to be provided at the concept stage.	Drawings to be provided at the Design Development stage, for both Building assets and Infrastructure systems.	Drawings to be provided at the Design Development stage, for both Building assets and Infrastructure systems.	
	Specifications. Only for Design Build Project.	Specifications. This could be optional at this stage and could be limited to outline specifications.	Specifications.	

8.8 Design Reviews

The Design review will be as per NEOM`s design review procedure document NEOM-NPR-PRO-100. Any design review codes shall be allocated as per table 10. It will be the responsibility of the designer and consultants to self-certify their design. The designer will have to perform systematic reviews of its design in accordance with their Design Management Plan. These requirements will be applied to the

designer's dub-designers, suppliers or specialist designers (where relevant) All design documents will be signed by the designer competent persons at each of the three quality stages - Prepare, Check and Approve.

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.

Following the self-certification compliance review the PMC will undertake a full compliance review of detailed design prior to NEOM acceptance/No Objection.

8.9 Design Review Process and Approval

Any design documentation shall be produced and transmitted in ACONEX and the review of documents will be registered in ACONEX using the ACONEX workflow features and as per NEOM-NEN-PRC-030.

NEOM PDT is responsible for the overall design management of all design stages. During Stage 3, the NEOM PTS is the authority having jurisdiction for approval of all design documents via providing a No Objection on comments resolution sheets as per Appendix 2 & 3.

8.9.1 Safety in Design

Safety of assets can be mostly influenced at their design phase and designing for safety therefore is an important consideration in any design. The appointed PMC and designers will outline all engineering safety management requirements and process as per applicable standards within their region specific safety management plans.

The applicable Safety in Design procedure NEOM-NEN-PRC-006 included the mandatory minimum requirement that must be complied during the design process. This document is an operative baseline whose compliance shall be adhered by Designer and PMC consultant.

Designing for safety requires risks to be identified, assessed and controlled. In controlling risk, whereby unacceptable risks are eliminated, and unavoidable risks are either managed to a level that the residual risk is either negligible or is reduced to as low as reasonably practicable (ALARP).

The design safety management process is an iterative process conducted at each stage of the design development. It is an integral part of the Reliability, Availability, Maintenance and Safety (RAMS) analysis that is carried out for every design phase.

Every project will be required to comply with the NEOM requirements and standards as applicable to their scope of design:

a. Provide all necessary liaison and coordination Safety Management and for the purposes of system safety in design.

b. Ensure the appropriate design reviews are performed and design certification is achieved, and that adequate information on system safety in design is provided with all supplied information.
c. Review design submissions.

8.9.1.1 Design Performance

The performance of the Design Team will be monitored against the following principal factors:

a. Quality – Internal quality audits. Internal quality audits will be conducted by ETSD and PTS.
b. Cost – Performance against target hours.
c. Time – Performance against design schedule.

The PMC and designer are responsible for providing information for inclusion in the monthly report. This must capture detailed progress against programme, planned work activities, changes in schedules and costs according to the complexity of the asset. Reporting frequency will be subject to PDT/PTS requirements and must be agreed with PDT and PTS.

The performance of design progress will be measured by PMC and designer using conventional progress reporting tools. An overall percentage complete using earned value techniques is not acceptable on its own and any such reports shall also identify and tracks progress against engineering deliverables asset by asset and discipline by discipline. Design progress will also be tracked against the BIM Model and deliverables, as needed. Design progress reports must be communicated and shared with PTS/PDT in each design stage.

8.9.2 Design Checks

8.9.2.1 Compliance Checks

Compliance check of the detailed design is undertaken by the PMC or other nominated independent consultant other than the design consultant.

Designs are checked against the specified code and standard as per NEOM-NEN-SCH-005_01.00 List of Technical Codes and Standards and any other codes and standards utilised to meet the design requirements. Please note that this list is not exhaustive. All design shall be checked down to calculation and working assumptions, wind, seismic parameters and factors of safety.

Fire life safety design compliance will be carried out as per NEOM-NLF-PRC-002 Fire Safety Approval and subject matter experts registered and authorised in KSA will need to approve design for compliance.

Compliance modelling will be required to demonstrate compliance to required code and standard for identified areas of design for full design, together with innovative products, nominated by the compliance officer.

The PMC will confirm design compliance in a documented register of design information prior to IFC (issued for construction) release.

8.9.2.2 Constructability Review

Designer and PMC shall ensure that the early input of construction methodology guidance and comments enter into the design process to ensure that the design is optimised for safe and efficient construction and to highlight any specific issues that will be required to be taken into account in the final

design. This is to ensure that any required construction input is provided through the design lifecycle and ensuring that constructability reviews are conducted as necessary through the design process.

According to the Design Stage Deliverable Procedure NEOM-NEN-PRC-005 the submission of a constructability report is requested at Stage 3A, 3B and 3C.

8.9.2.3 Value Engineering

Part of Design Management Plan is to define a process for the identification and development of value engineering opportunities in the design development in accordance with the applicable Value Engineering procedure NEOM-NEN-PRC-007.

8.9.3 Independent Design Checks

As an effective method of engineering risk management, NEOM will adopt the principles of independent design checking for complex civil structures (temporary & permanent) as per the UK highway structures & bridges general information CG 300 technical approval of highway structures.

This is to ensure a design where the risk of failure is assessed to be as low as reasonably practicable (ALARP). Originally developed for bridge structures the approach has also been applied to tunnelling and underground structures. The process now addresses:

1. Highly demanding or large tunnels and underground structures, caverns and shafts, etc.
2. Innovative, complex or unusual structures.
3. Highly demanding structures which lead to long span or highly skewed bridges.
4. Very large structures with high public occupancy.
5. The categories of design check adopted for NEOM project follow the UK classification and are defined as follows:
6. Category 0 - structures are small minor constructions and do not require formal technical approval but should nevertheless be independently checked within the design team.
7. Category I - structures include bridges with spans less than 20m and other relatively small constructions. These require formal technical approval and an independent check of the design by an engineer who may be part of the design team.
8. Category II - covers all structures which do not fall into any of the other categories. Their design will be checked by an engineer or team of engineers who must be independent of the design team.
9. Category III - covers complex structures requiring relatively sophisticated analysis or those with spans greater than 50m, high skew angles, high redundancy, suspension systems, steel orthotropic decks, moving bridges, large underground caverns and tunnels, etc. These require an independent design check by an engineer or team of engineers. It is particularly important in this case that the checker possess the necessary expertise and experience suited to the type of structure in question.

9 DOCUMENT CONTROL

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

9.1 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. Railway operational risks.
10. Railway maintenance risks - including cleaning.
11. Demolition or de-commissioning risks.

Based on best practice the PMC and designer 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.

9.2 Design Change Control

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

a. Identification of a change, which may be either an engineering “Change Proposal” or a Requirements “Technical Change Request”.
b. Evaluation of the technical consequences of the change, particularly on system safety and operations.
c. Authorised to progress the change.
d. 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.

10 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.

11 Project Department Design Maturity Dashboard & Design KPI

Introduction & Objective:

The Project Department Design Maturity Dashboard (PDDMD) will serve as a design benchmarking tool for NEOM Projects. It will allow the NEOM leadership to view a user-friendly graphical representation of the design progress at any distinct design stage of the contract. The main purpose of these design dashboards is to implement an effective, user-friendly, and a lean design management tool which graphically quantifies the design progress and is not sensitive to the earned value approach.

Please see figure 6 for a typical PDDMD of an Asset.

Common Issue with Giga Projects:

Major civil engineering programs international and nationally have lacked a one-stop-shop tool that would enable readership to view precise and comprehensive design maturity & progress for any asset during any design stage. Due to the wide purview of the NEOM projects, the high volume of design submittals expected, numerous entities' (PMC/designers/ICE/ISA) involvement in the review process, various technical complexities of NEOM project and various design stages, it will be crucial to quantify the true status of design.

Recommend Solution:

Design teams (Designers) & design review teams (PMC) shall produce a live status of submission (SOS) for their design disciplines. Please see table 11 &12 where SOS for typical disciplines have been depicted as an example. The PMC and designers will develop this as per the disciplines involved and

this illustration is for guidance only. Each SOS will include a detailed breakdown of the design submissions. This will cater for all NEOM distinct design stages.

The review codes allocated in ACONEX via the Comments Resolution Sheet (CRS) will be the basis for this data. Please refer to Appendix 3 for the NEOM design review CRS template which shall be used by the appointed PMC.

The individual discipline wise SOS indicates what constitutes a complete design, for a specific discipline for any given section of the project. The data from these SOS will then be merged into one parent sheet (PDDMD) and converted into a graph. Please see figure 5 & 6 for the nomenclature and a typical

PDDMD. The graph indicates all the design submissions required on X-axis and progress status on Y-axis. This shall be submitted to NEOM via the PMC/designer on monthly basis and will be part of their design reporting deliverables.

Benefits:

NEOM PDDMD will act as an **Eye- in- the-sky** for projects department and will provide effective design controls. It will also reinforce other sectors, programs, and business units within NEOM via following:

1. Supports the project controls team to cross-check accuracy of WBS and schedules.
2. Supports document controls teams. Allows cross-check on ACONEX submissions.
3. Supports contract team for invoicing. Codes will be linked to payments certificates and invoicing.
4. Supports the construction team for accuracy of drawings and precise fabrication of approved design.
5. A well-informed team that can capture synergies on time.
6. A one-stop-shop tool that enables NEOM Projects to view precise and comprehensive design status at any stage of the contract.

Table 10: Design Review Codes

Equivalent Code for CRS	NEOM or PMC Review Outcome	Application
A	Work May Proceed	Used in workflow
B	Incorporate Comments - Proceed	Used in workflow
C	Revise & Resubmit – Do not Proceed	Used in workflow
D	Rejected	Used in workflow
UR	Under Review	Automatically assigned when a document is put in a workflow
E	Review Not Required - Proceed	Used in workflow

Table 11: Typical SOS for Design Disciplines

Architectural Design SOS

Architectural Design Submission via ACONEX	Asset 1					Asset 2					Asset 3				
	30%	60%	90%	100%	IFC	30%	60%	90%	100%	IFC	30%	60%	90%	100%	IFC
	3A	3B	3C	3D	IFC	3A	3B	3C	3D	IFC	3A	3B	3C	3D	IFC
Floor Plan	C	C	B	B	A	C	C	B	B	A	C	C	B	B	A
Elevation	C	C	B	B	A	C	C	B	B	A	C	C	B	B	A
Section	C	C	B	B	A	D	C	B	B	A	C	C	B	B	A
Enlarged Drawing	C	C	B	B	A	C	C	B	B	A	C	C	B	B	A
Vertical Circulation	C	C	D	B	A	C	C	B	B	A	C	C	C	B	B
Schedule of Finish	C	C	B	B	A	C	C	C	B	B	C	C	C	B	B
Schedule of Door/Window	B	B	B	B	A	B	C	C	B	B	B	C	C	B	B
Reflected Ceiling Plan	B	B	B	D	A	B	C	C	B	B	B	C	C	B	B
Life Safety Plan	B	B	B	B	A	B	C	C	B	B	B	C	B	B	B
3D Rendering	B	B	B	B	A	B	C	C	B	A	B	C	B	B	B
Design Basis Report	B	B	B	B	A	B	C	C	B	A	B	B	B	B	A
Specifications	B	B	B	B	B	B	C	B	B	B	B	B	B	B	C

Structural Design SOS

Structural Design Submissions via ACONEX	Asset 1					Asset 2					Asset 3				
	30%	60%	90%	100%	IFC	30%	60%	90%	100%	IFC	30%	60%	90%	100%	IFC
	3A	3B	3C	3D	IFC	3A	3B	3C	3D	IFC	3A	3B	3C	3D	IFC
Concrete Structure (Complete Station)	B	C	B	C	A	D	C	B	C	A	B	B	A	A	A
Concrete Foundation and 1st Lift of walls	B	C	B	C	A	B	C	B	C	A	B	B	A	A	A
Concrete Platform Slab and Internal Walls	B	D	B	C	A	B	C	B	C	A	B	B	A	A	A
Concrete Passageway	B	B	B	B	A	B	A	B	A	A	B	B	A	A	A
Concrete Superstructure (Entry Boxes)	B	B	B	B	A	B	A	B	A	A	B	B	A	A	A
Steel Structure (Platform Box)	B	B	B	C	A	B	A	B	C	A	B	B	A	A	A
Canopy	B	B	B	C	A	B	B	B	B	A	B	B	A	A	A

Electrical Design SOS

Electrical Design Submissions via Aconex	Asset 1					Asset 2					Asset 3				
	30%	60%	90%	100%	IFC	30%	60%	90%	100%	IFC	30%	60%	90%	100%	IFC
	3A	3B	3C	3D	IFC	3A	3B	3C	3D	IFC	3A	3B	3C	3D	IFC
Lighting	C	C	C	B	A	C	B	B	C	B	B	C	B	B	B
electrical SLD	C	C	C	B	A	A	B	B	B	B	B	C	B	B	B
fire alarm	C	C	C	B	A	A	B	B	B	B	B	C	B	B	B
BMS	C	B	C	B	A	A	C	C	B	B	C	C	B	B	B
Earthing &lightning protect.	C	B	C	C	C	A	B	B	B	D	A	B	C	B	B
Cable Containments / Small Power	C	C	C	C	B	A	B	B	B	B	A	C	B	B	B

Roads Design SOS

Roads Design Submission via ACONEX	Asset 1					Asset 2					Asset 3				
	30%	60%	90%	100%	IFC	30%	60%	90%	100%	IFC	30%	60%	90%	100%	IFC
	3A	3B	3C	3D	IFC	3A	3B	3C	3D	IFC	3A	3B	3C	3D	IFC
Geometrics	B	B	B	B	A	B	B	B	B	A	B	B	B	B	A
Pavement	B	B	B	B	A	B	B	B	B	A	B	B	B	B	A
Streetlighting	B	B	B	B	A	B	B	B	B	A	B	B	B	B	A
Signage	B	B	B	B	A	B	B	B	B	A	B	B	B	B	A

Utilites Design SOS

Utilites Design Submissions Via ACONEX	Asset 1					Asset 2					Asset 3				
	30%	60%	90%	100%	IFC	30%	60%	90%	100%	IFC	30%	60%	90%	100%	IFC
	3A	3B	3C	3D	IFC	3A	3B	3C	3D	IFC	3A	3B	3C	3D	IFC
Station Drainage Design	B	C	B	C	A	B	B	B	B	B	C	B	B	B	A
New Utilities Design	B	C	B	B	A	B	B	C	B	B	B	C	B	B	A
Permit Application of Utilities Diversion	B	B	B	C	A	B	C	C	B	B	B	B	B	B	A
Permit Application for New Permanent Utilities	B	B	C	C	A	B	C	C	B	A	B	B	B	B	A

Mechanical Design SOS															
Mechanical Design Submission via Aconex	**Asset 1**					**Asset 2**					**Asset 3**				
	30%	60%	90%	100%	IFC	30%	60%	90%	100%	IFC	30%	60%	90%	100%	IFC
	3A	3B	3C	3D	IFC	3A	3B	3C	3D	IFC	3A	3B	3C	3D	IFC
HVAC	C	B	C	B	A	C	C	C	B	C	C	C	B	B	A
Fire Protection	C	B	C	B	A	C	C	C	B	C	C	C	B	B	A
Plumbing	C	B	C	B	A	C	C	C	A	C	C	C	B	B	A
CMEP	C	B	B	B	A	B	B	B	A	B	B	B	B	B	A
Escalator	C	B	B	B	B	B	B	B	B	B	B	B	B	B	A

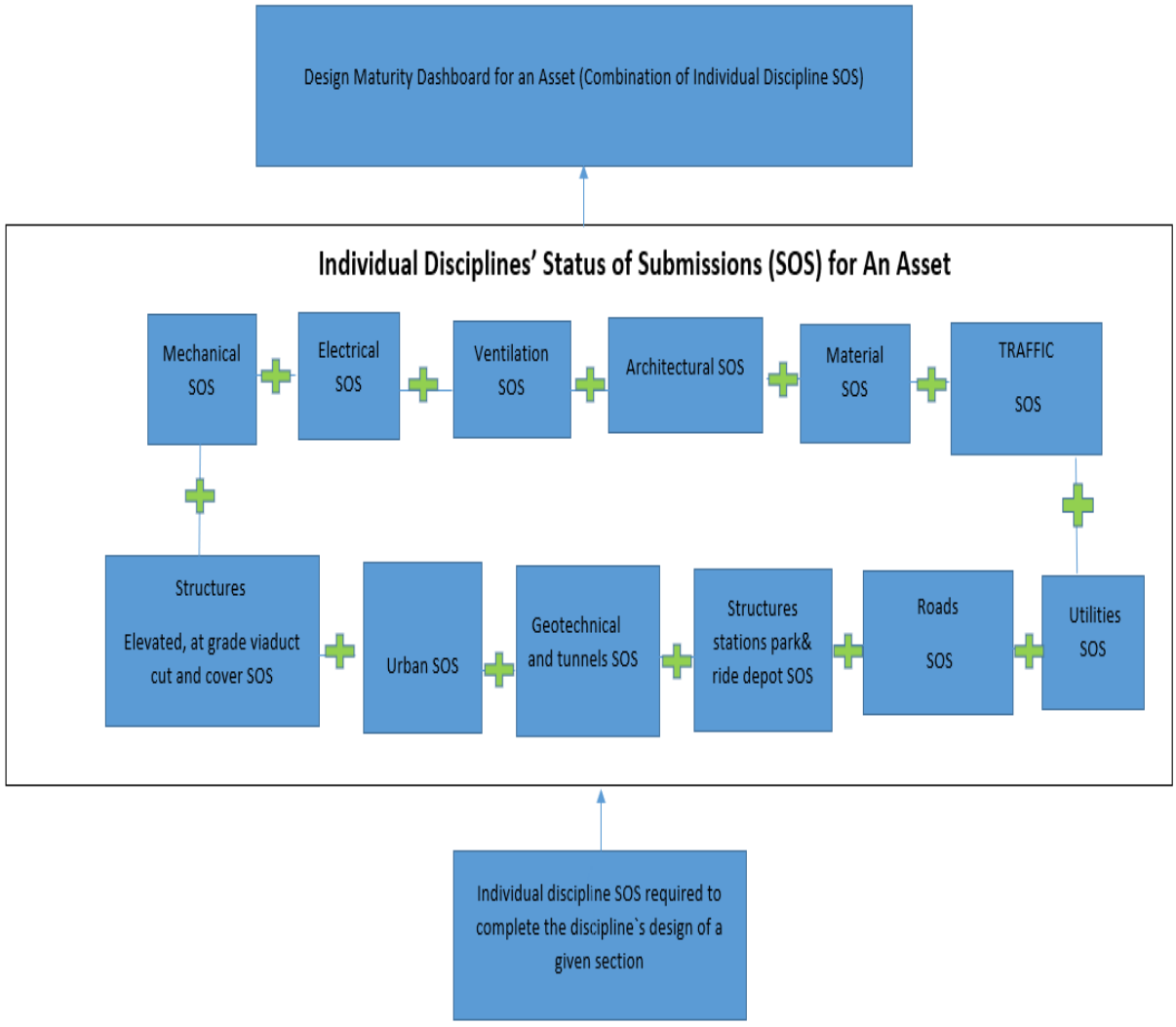


Figure 5: Hierarchy & Nomenclature of Design Maturity Dashboard

Design Discipline	Design Submittals	Design Stage	NEOM Design Stage	Design Code Status
Architectural	Architecture Drawings	30%	3A	B
	People Flow	30%	3A	C
	LEED Report	90%	3C	B
	Accessibility/Inclusive Design	90%	3C	B
	Roof and Facades Drawings	60%	3C	B
Utilities	Drainage Drawings	100%	3D	B
	Irrigation Drawings	90%	3C	B
	Street Lighting Utility	90%	3C	B
	Diversion	90%	3C	UR
	Permit Application for New Permanent Utilities	90%	3C	UR
Stuctutral	Foundation	100%	3D	B
	Superstructure	100%	3D	C
Mechanical	Mechanical	100%	3D	B
	Fire protection	90%	3D	B
	Plumbing	100%	3D	B
	CMEP	60%	3B	C
Electrical	Lighting	100%	3D	B
	Fire alarm	100%	3D	B
	BMS	100%	3D	B
	Earthing & lightning protection	100%	3D	B
	Cable Containments	100%	3D	B
Geotechnical	Enabling Works	90%	3C	A
	GIR	90%	3C	B
	Excavation	100%	3D	A
Roads	Roadway design	90%	3C	B
Urban	Urban Design Concept Report	30%	3A	B
	Landscape Mater Plan	30%	3A	B
	Hardscape Plans	60%	3B	C
	Street and landscape Lighting	60%	3B	B
	Irrigation	30%	3A	B
	Signage and way finding plans	30%	3A	B

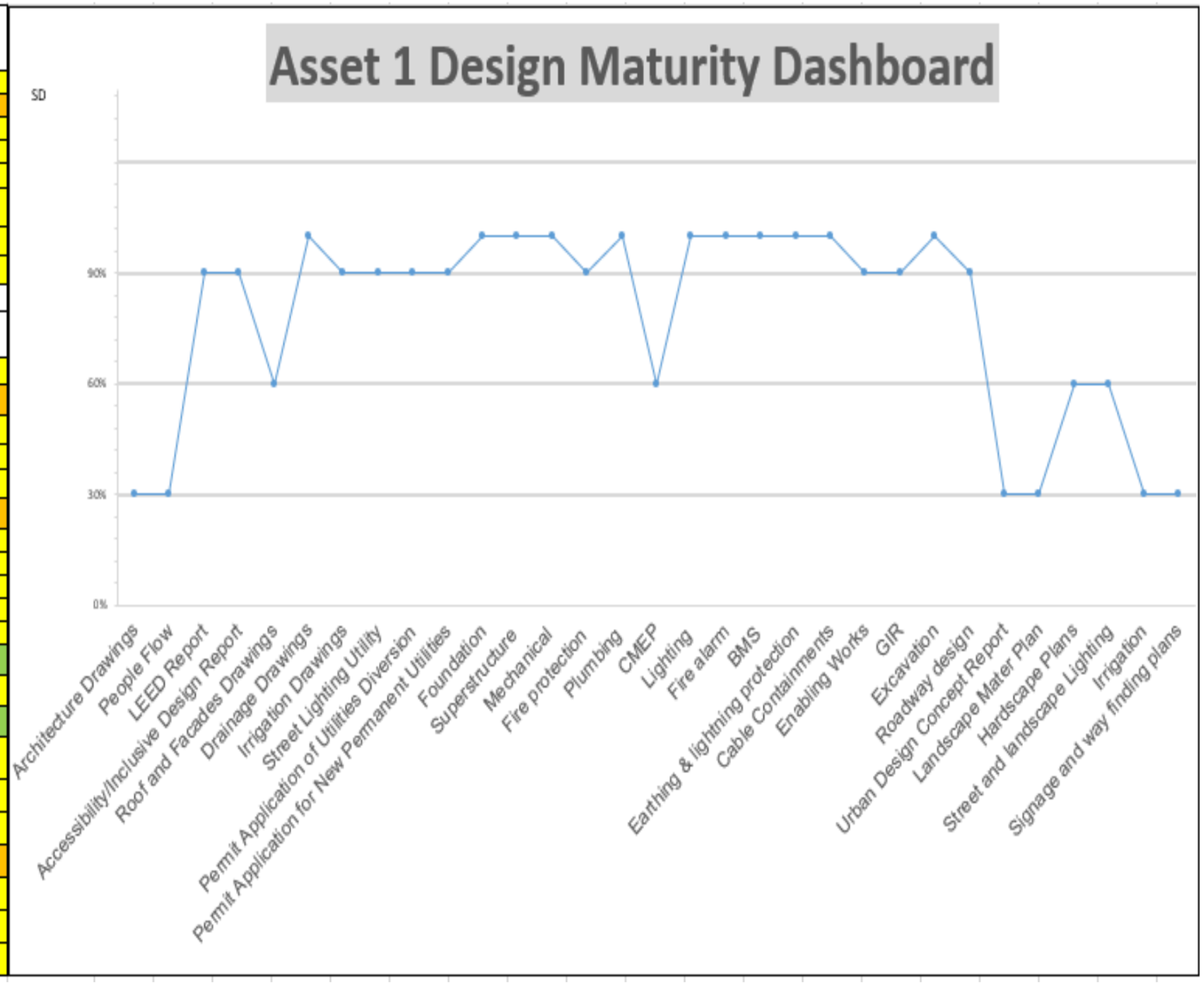


Figure 6: Design Maturity Dashboard of a Typical Asset

Design KPI:

Monitoring of following design KPIs will be performed via the document control system (Aconex), through progress reporting by the designers and through PMC. This list is not exhaustive and will be subject to periodic review of NEOM PTS.

KPIs for Design Work-In-Progress

To be provided by the EC and PMC:

- Total number of Gates reviews carried out by PMC and EC and percentage of successful gates reviews.
- Total number of drawings/specifications/calculations transmitted to ICE and reviewed by ICE (as per ICE reports).

KPIs for Design Submittals

- Percentage of Comment Resolution Sheets (CRS) coded as per NEOM-NEN-PRC-030.

Equivalent Code for CRS	NEOM or PMC Review Outcome	Application
A	Work May Proceed	Used in workflow
B	Incorporate Comments – Proceed	Used in workflow
C	Revise & Resubmit – Do not Proceed	Used in workflow
D	Rejected	Used in workflow
UR	Under Review	Automatically assigned when a document is put in a workflow
E	Review Not Required – Proceed	Used in workflow

- Percentage of submittals subject to repeated revise and resubmit cycles.
- Number of Materials Approvals Requests and specification received and their status.

KPIs for Design Review Process

- Average duration of reviews for first submittals (CRS).
- Average duration of reviews for next submittals (CRS).
- Average response time for RFIs related to design.

12 Continuing Improvement

Design managers from the PMC across the entire program will meet quarterly to evaluate the effectiveness of the design process. Subjects to be discussed will include issues, lessons learned and best practices with respect to:

- Resources.
- Effectiveness of progress monitoring.
- Efficiency and effectiveness of reviews.
- Communications and interface management.
- Coordination of the designs with construction management, configuration management, requirements management, safety management, risk management, etc.
- Coordination with external stakeholders, including utility companies.
- Changes in project scope.
- Changes in project schedule.

The meeting schedule will be coordinated by the PMC. The participants will include senior managers from PDT, PTS, design managers and team leaders from all PMC. Additional members of the project execution team may be included by invitation. In general, consistent meeting attendance by the senior design managers in each entity is desired.

Findings and recommendations from these design steering committee meetings will be documented, and a list of action items with due dates will be issued. Action items will be tracked by the PMC teams.

13 Appendices

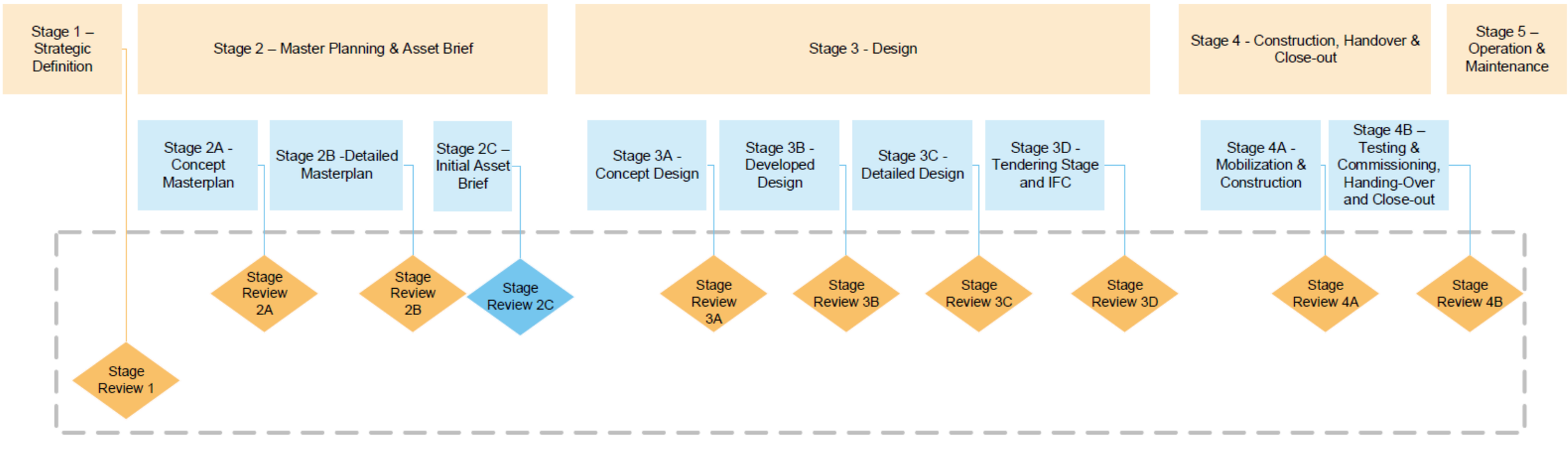
Appendix 1 NEOM Stage Gates for All phases- Design Stage Gate Nomenclature for Building and Infrastructure Assets.

Appendix 2 NEOM Design Review Process Flow Chart and Design Review Coding Classification.

Appendix 3 NEOM Design Review Comments Resolution Sheet (CRS) to be used for Design Review by PMC

Appendix 4 NEOM Design Gates for Stage 3.

Appendix 1 NEOM Stage Gates for All phases- Design Stage Gate Nomenclature for Building and Infrastructure Assets



Legend:

Stage Review

Stage Review and approval by SRC (Except those requiring final approval by Stage Approval Committee, NEOM Board or CEO)

Stage 2C

For Stage 2C, the Initial Asset brief is prepared by asset proponent. No role of Stage Review Committee is envisaged.

Design-Bid-Build Route Stage Gates for Building & Infrastructure Assets as per PRC-021

NEOM Plan of Work Stage	Minimum No: of Technical Disciplines as Per PRC-005	Gate Requirements As per PRC-021
Stage 1	**AS PER APPENDIX B: STAGE-1 STRATEGIC DEFINITION**	**Stage Review 1**
Stage 2A	**AS PER APPENDIX C: STAGE-2A CONCEPT MASTER PLAN**	**Stage Review 2A**
Stage 2B	**AS PER APPENDIX D: STAGE-2B DETAILED MASTER PLAN**	**Stage Review 2B**
Stage 2C	**IAB Form as per PRC-004**	**Stage Review 2C**
Design-Bid-Build Route		
RFP to Appoint Designers		
Designer Appointed and Develops 3A/3B/3C and 3D		
Stage 3A 30% Design	**AS PER APPENDIX E: STAGE 3A-CONCEPT DESIGN OF BUILDING ASSETS** **AS PER SAPPENDIX F: STAGE-3A CONCEPT DESIGN OF INFRASTRUCTURE ASSETS**	**Stage Review 3A**
Stage 3B 60% Design	**AS PER APPENDIX G: STAGE-3B DEVELOPED DESIGN OF BUILDING ASSETS** **AS PER APPENDIX H: STAGE-3B DEVELOPED DESIGN OF INFRASTRUCTURE ASSETS**	**Stage Review 3B**
Stage 3C 90% Design	**AS PER APPENDIX I: STAGE-3C DETAILED DESIGN OF BUILDING ASSETS** **AS PER APPENDIX J: STAGE-3C DETAILED DESIGN OF INFRASTRUCTURE ASSETS**	**Stage Review 3C**
Stage 3D 100% Design	**AS PER APPENDIX K: STAGE-3D TENDERING STAGE AND IFC**	**Stage Review 3D**
Appointed Principal Construction Contractor Post 3D		
Stage 4A Mobilization & Construction	**AS PER APPENDIX L: STAGE-4A MOBILIZATION & CONSTRUCTION**	**Stage Review 4A**
Stage 4B Testing & Commissioning Handover and Closeout	**APPENDIX M: STAGE-4B TESTING & COMMISSIONING, HANDOVER AND CLOSE-OUT**	**Stage Review 4B**
Appointment O&M Operators/NEOM Operations Team		
Stage 5	Deliverables as per NEOM requirements	As per NEOM requirements

Design & Build Route Stage Gates for Building & Infrastructure Assets as per PRC-021

NEOM Plan of Work Stages	Base line Deliverables/Minimum No: of Disciplines as Per PRC-005	Gate Requirements As per PRC-021
Stage 1	**AS PER APPENDIX B: STAGE-1 STRATEGIC DEFINITION**	**Stage Review 1**
Stage 2A	**AS PER APPENDIX C: STAGE-2A CONCEPT MASTER PLAN**	**Stage Review 2A**
Stage 2B	**AS PER APPENDIX D: STAGE-2B DETAILED MASTER PLAN**	**Stage Review 2B**
Stage 2C	**IAB FORM AS PER NEOM-NEN-PRC-004**	**Stage Review 2C**
Design & Build Route		
RFP to Appoint Designer for 3A (30%) Development		
Stage 3A 30% Design	**AS PER APPENDIX E: STAGE 3A-CONCEPT DESIGN OF BUILDING ASSETS** **AS PER SAPPENDIX F: STAGE-3A CONCEPT DESIGN OF INFRASTRUCTURE ASSETS**	**Stage Review 3A**
Appoint Design & Build (DB) Contractor Based upon 30% Design		
Stage 3B 60% Design	**AS PER APPENDIX G: STAGE-3B DEVELOPED DESIGN OF BUILDING ASSETS** **AS PER APPENDIX H: STAGE-3B DEVELOPED DESIGN OF INFRASTRUCTURE ASSETS**	**Stage Review 3B**
Stage 3C 90% Design	**AS PER APPENDIX I: STAGE-3C DETAILED DESIGN OF BUILDING ASSETS** **AS PER APPENDIX J: STAGE-3C DETAILED DESIGN OF INFRASTRUCTURE ASSETS**	**Stage Review 3C**
Stage 3D 100% Design & IFC	**AS PER APPENDIX K: STAGE-3D TENDERING STAGE AND IFC**	**Stage Review 3D**
DB Commences Construction		
Stage 4A Mobilization & Construction	**AS PER APPENDIX L: STAGE-4A MOBILIZATION & CONSTRUCTION**	**Stage Review 4A**
Stage 4B Testing & Commissioning Handover and Closeout	**APPENDIX M: STAGE-4B TESTING & COMMISSIONING, HANDOVER AND CLOSE-OUT**	**Stage Review 4B**
Appointment of O&M Operators/NEOM Operations Team		
Stage 5	**DELIVERABLES AS PER NEOM REQUIREMENTS**	As per NEOM requirements

Appendix 2 NEOM Design Review Process Flow Chart and Design Review Coding Classification

Design Review Process Flow Chart & Design Codes for Review

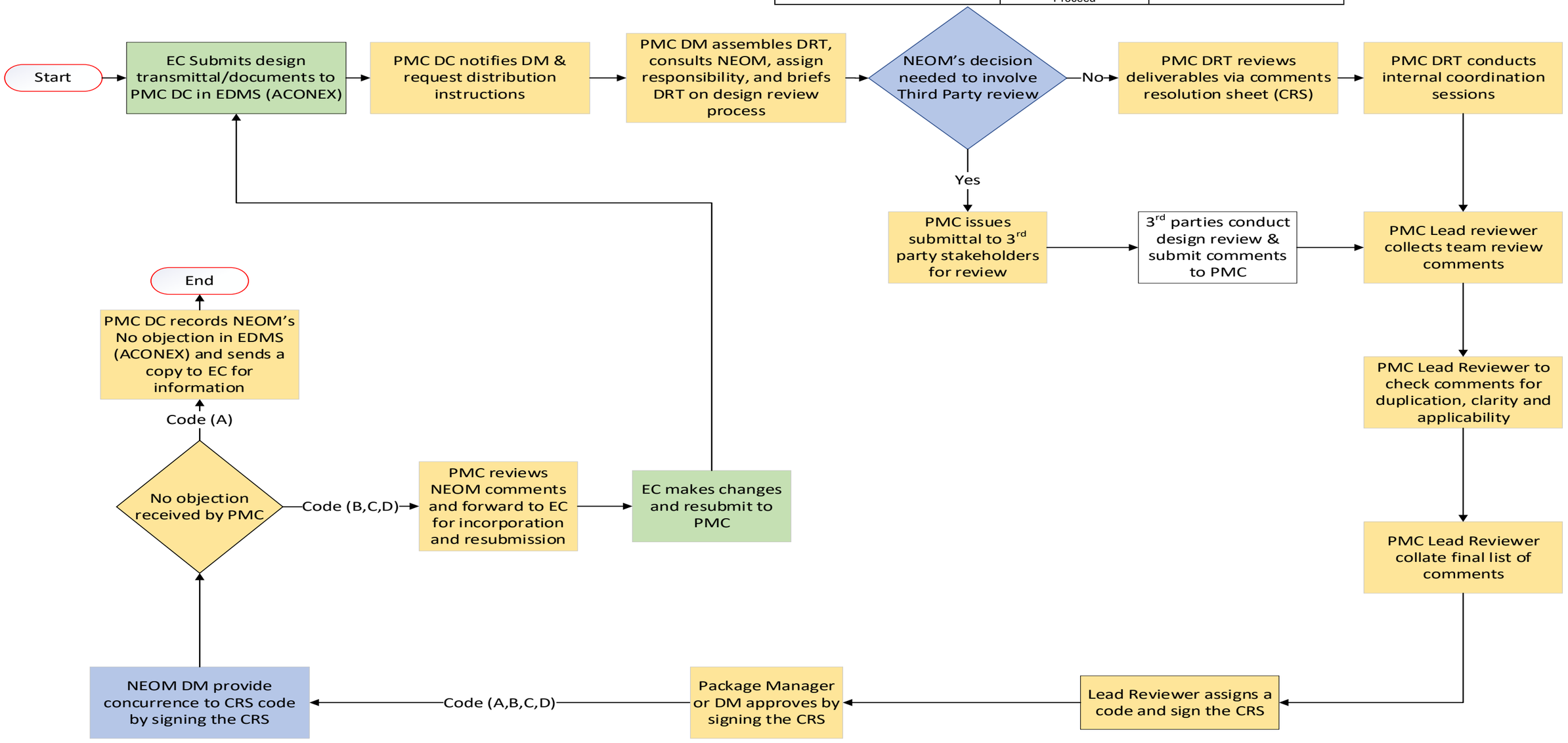
Design Review Process

- NEOM
- PMC
- EC (Designer)

Equivalent Code for Design Review CRS	PRC-30 Review Outcome	Application
A	Work May Proceed	Used in workflow
B	Incorporate Comments - Proceed	Used in workflow
C	Revise & Resubmit – Work May Proceed	Used in workflow
D	Rejected	Used in Workflow
UR	Under Review	Automatically assigned when a document is put in a workflow
E	Review Not Required - Proceed	Used in workflow

Abbreviations

PMC = Project Management Consultant
EC = Engineering/ Design Consultant
ISA = Independent Safety Assessor
DC = Document Control
ICE = Independent Checking Engineer
DM = Design Manager
DRT – Design Review Team
EDMS – Electronic Document Management System
NO= No Objection via CRS



Appendix 3 NEOM Design Review Comments Resolution Sheet (CRS) to be used for Design Review by PMC

Design Review Comments Resolution Sheet (CRS)

NEOM COMMENTS RESOLUTION SHEET

REVIEWED DOCUMENT DATA			CRS DATA		
Transmittal / Document Ref.	Insert ACONEX Transmittal Number e.g *BEC-TRANSMIT-000146*	**CRS Identification:**	**Insert CRS Number here (XXX-XXX-XXX-XXX-XXX-XXX-XXX)**	**Revision:**	**A**
Transmittal / Document Title	Insert ACONEX Transmittal Title e.g *NEOM Comments on EPM Report on NEOM's Impact Assessment Report*	**Status Code:**	**Work May Proceed**		**A**
Document Type	Insert Precisely the type of document e.g. *Drawings/Design Calculations/Reports etc.*	**CRS Prepared by:**	Name of Lead Author or Authors (Multiple Individuals) who reviews the content of submission and fill in comments and allocate codes		
Discipline(s) involved	Name of the specific Disciplines and specific part e.g. *Structural , Mechanical, Architectural*	**PMC/Design Reviewer CRS Reviewed by:**	Name of IPMC ndividual (Single Person) who reviews the **overall** CRS comments and codes allocated by Lead Author/s		
		PMC/Design Reviewer CRS Approved by:	Name of PMC Individual (Single Person) who **Approves** the CRS.	Sign	
			Mr. XX - Position = xxx	Date	
Location	Insert Precise location within NEOM e.g. Viaduct Section Bridge No: XXX (Line)	**NEOM No Objection / CRS Approved by:**	Name of NEOM Individual (Single Person) who **Approves** the CRS.	Sign	
Transmittal received date by NEOM	Insert precise date when NEOM received the Transmittal within ACONEX		Mr. XX - Position = xxx	Date	

Disclaimer : Permission to proceed shall not constitute acceptance or approval of design details, calculations, analyses, test methods or materials developed or selected by the Contractor and shall not relieve the Contractor from full compliance with Contractual obligations and NEOM requirements

Status Codes: All codes must be as per NEOM Documents NEOM-NPR-PLN-101 (Design Management Plan) & N E O M - N E N - P R C - 030 (Project Document Numbering and Revision Procedure)
A = Work may proceed , B = Incorporate Comments - Proceed , C = Revise & Resubmit - Do not Proceed , D= Rejected, E = Review not required - Proceed

No.	Doc/Section/ Page	NEOM`s Design Reviewer/PMC Comments	Comments made by	Initial Status	NEOM`s Designer Response	Responded By	Revised Status
Relevant Discipline No:1							
1				C			B
2				A			A
3				B			A
Relevant Discipline No:2							
1				B			A
2				B			A
Relevant Discipline No:3							
1				A			A
2				C			A
3				A			A

Appendix 4 NEOM Design Gates for Stage 3

Design Gates Score Sheet (Scores shown as a sample only)

ID	**Design Gate General Requirements**	Score at 3A 30% Design	Score at 3B 60% Design	Score at 3C 90%	Score at 3D 100% (IFC)	Scoring guidelines 3A 30 % Gate	Scoring guidelines 3B 60% Gate	Scoring guidelines 3C 90% Gate	Scoring guidelines 3D 100% Gate
1	Can the designer/contractor demonstrate that all employer requirements for this module have been transferred to their requirement management software so as to allow 100% verification of requirements?	1	3	5	5	1 = Cannot demonstrate 3 = Can partially demonstrate through some examples shown on screen 5 = Can demonstrate via written evidence	1 = Cannot demonstrate 3 = Can partially demonstrate through some examples shown on screen 5 = Can demonstrate via written evidence	1 = Cannot demonstrate 3 = Can partially demonstrate through some examples shown on screen 5 = Can demonstrate via written evidence	
2	Can the designer/contractor demonstrate that any skipped design stages (NPOW 3A/3B/3C/3D) for this module are recorded and any such exemptions are formally approved by NEOM?	3	5	5	5	1 = Cannot demonstrate 3 = Can partially demonstrate through some examples shown on screen 5 = Can demonstrate via written evidence	1 = Cannot demonstrate 3 = Can partially demonstrate through some examples shown on screen 5 = Can demonstrate via written evidence	1 = Cannot demonstrate 3 = Can partially demonstrate through some examples shown on screen 5 = Can demonstrate via written evidence	
3	Can the designer/contractor demonstrate that Civil Defense has no objection for this module?	--	--	5	5	N/A	N/A	1 = Cannot demonstrate 3 = Can partially demonstrate through some examples shown on screen 5 = Can demonstrate via written evidence	1 = Cannot demonstrate 3 = Can partially demonstrate through some examples shown on screen 5 = Can demonstrate via written evidence
4	Can the designer/contractor demonstrate that NEOM-Independent Safety Advisor (ISA) have endorsed this design module, if applicable?	3	5	5	5	1 = Cannot demonstrate 3 = Can partially demonstrate through some examples shown on screen 5 = Can demonstrate via written evidence	1 = Cannot demonstrate 3 = Can partially demonstrate through some examples shown on screen 5 = Can demonstrate via written evidence	1 = Cannot demonstrate 3 = Can partially demonstrate through some examples shown on screen 5 = Can demonstrate via written evidence	1 = Cannot demonstrate 3 = Can partially demonstrate through some examples shown on screen 5 = Can demonstrate via written evidence

5	Can the designer/contractor demonstrate that designer/contractor-ISA have endorsed this design module, if applicable?	5	5	5	5	1 = Cannot demonstrate 3 = Can partially demonstrate through some examples shown on screen 5 = Can demonstrate via written evidence	1 = Cannot demonstrate 3 = Can partially demonstrate through some examples shown on screen 5 = Can demonstrate via written evidence	1 = Cannot demonstrate that module has been assessed 3 = Can demonstrate that module is under assessment 5 = Can demonstrate that findings have been raised	1 = Cannot demonstrate that findings have been closed 3 = Can demonstrate findings are partially closed 5 = Can demonstrate that all findings have been closed
6	Can the contractor demonstrate that derived safety requirements from the safety hazard analysis have been captured in their requirement management software and adequately addressed through verification & validation evidence?	5	5	5	5	1 = Cannot demonstrate 3 = Can partially demonstrate that derived requirements exist and some are in Requirement Management Software 5 = Can demonstrate and show all derived requirements are in Requirement Management Software	1 = Cannot demonstrate 3 = Can partially demonstrate that derived requirements exist and some are in Requirement Management Software 5 = Can demonstrate and show all derived requirements are in Requirement Management Software	1 = Cannot demonstrate 3 = Can partially demonstrate that derived requirements exist and some are in Requirement Management Software 5 = Can demonstrate and show all derived requirements are in Requirement Management Software	
7	For this module, are all columns in contractor/designer requirement management software up to date including Design Document Reference fully populated?	5	5	5	5	1 = > 80% 3 = 80% <> 89% 5 = ≥ 90%	1 = > 80% 3 = 80% <> 89% 5 = ≥ 90%	1 = > 80% 3 = 80% <> 89% 5 = ≥ 90%	1 = < 90% 3 = 91% <> 95% 5 = > 96%
8	For this module, what percentage of requirements are identified by designer/contractor as compliant?	5	5	5	5	1 = > 80% 3 = 80% <> 89% 5 = ≥ 90%	1 = > 80% 3 = 80% <> 89% 5 = ≥ 90%	1 = > 80% 3 = 80% <> 89% 5 = ≥ 90%	1 = <90% 3 = 91%<>95% 5 = > 96%
9	For this module, what percentage of requirements are identified by designer/contractor as non-compliant?	1	5	5	5	1 = >11% 3 = 7%<>10% 5 = 0%<>6%	1 = >11% 3 = 7%<>10% 5 = 0%<>6%	1 = >11% 3 = 7%<>10% 5 = 0%<>6%	1 = >11% 3 = 5%<>10% 5 = 0%<>4%
10	For this module, what percentage of requirements are identified by designer/contractor as under discussion (i.e., requirements related to unresolved issues)?	1	5	5	5	1 = >11% 3 = 7%<>10% 5 = 0%<>6%	1 = >11% 3 = 7%<>10% 5 = 0%<>6%	1 = >11% 3 = 7%<>10% 5 = 0%<>6%	1 = >11% 3 = 5%<>10% 5 = 0%<>4%
11	Does the designer`s/contractor`s claim of compliance match the design reviewer/PMC claim of compliance? If not, can the contractor/designer provide a written action plan to eliminate this discrepancy?	5	5	5	5	1 = > 80% 3 = 80% <> 89% 5 = ≥ 90%	1 = > 80% 3 = 80% <> 89% 5 = ≥ 90%	1 = > 80% 3 = 80% <> 89% 5 = ≥ 90%	1 = <95% 3 = 96% <> 98% 5 = >98%

Design Gates Score Sheet (Scores shown as a sample only)

ID	Design Gate Safety Requirements	Score at 3A 30% Design	Score at 3B 60% Design	Score at 3C 90%	Score at 3D 100% (IFC)	Scoring guidelines 3A 30 % Gate	Scoring guidelines 3B 60% Gate	Scoring guidelines 3C 90% Gate	Scoring guidelines 3D 100% Gate
12	What percentage of safety related requirements are identified by designer/contractor as compliant?	1	3	5	5	1 = >89% 3 = 90% <> 94% 5 = ≥ 90%	1 = >89% 3 = 90% <> 94% 5 = ≥ 90%	1 = >89% 3 = 90% <> 94% 5 = ≥ 90%	1 = > 95% 3 = 96%<>99% 5 = 100%
13	Is the compliance evidence complete and comprehensive, referencing all applicable documents, drawings, or other?	5	5	5	5	1 = >89% 3 = 90% <> 94% 5 = ≥ 90%	1 = >89% 3 = 90% <> 94% 5 = ≥ 90%	1 = >89% 3 = 90% <> 94% 5 = ≥ 90%	1 = < 90% 3 = 91% <> 95% 5 = > 96%
14	For non-compliant or under discussion safety related requirements is there a confirmed and dated written action plan to close including proper documentation?	1	3	5	5	1 = >89% 3 = 90% <> 94% 5 = ≥ 90%	1 = >89% 3 = 90% <> 94% 5 = ≥ 90%	1 = No action plan available 3 = Action plan available 5 = No non-compliant or under discussion safety related requirements.	
ID	**Design Gate Interfaces Requirements**	Score at 3A 30% Design	Score at 3B 60% Design	Score at 3C 90%	Score at 3D 100% (IFC)	Scoring guidelines 3A 30 % Gate	Scoring guidelines 3B 60% Gate	Scoring guidelines 3C 90% Gate	Scoring guidelines 3D 100% Gate
15	Can the designer/contractor identify all Interface Control Forms (ICF) relevant to this module?	3	5	5	5	1 = Cannot demonstrate 3 = Can partially demonstrate through some examples shown on screen 5 = Can demonstrate via written evidence	1 = Cannot demonstrate 3 = Can partially demonstrate 5 = Can demonstrate via written evidence	1 = Cannot demonstrate 3 = Can partially demonstrate 5 = Can demonstrate via Written evidence	
16	Can the designer/contractor demonstrate the resolution of ICF's through the design stages?	3	5	5	5	1 = <80% Resolved 3 = 80%<>89% Resolved 5 = >90% Resolved	1 = <80% Resolved 3 = 80%<>89% Resolved 5 = >90% Resolved	1 = <80% Resolved 3 = 80%<>89% Resolved 5 = >90% Resolved	1 = <90% Resolved 3 = 90%<>99% Resolved 5 = 100% Resolved
17	Is there evidence of dependencies on other sub-systems via the ICF process?	3	5	5	5	1 = Cannot demonstrate 3 = Can partially demonstrate through some examples shown on screen 5 = Can demonstrate via written evidence	1 = Cannot demonstrate 3 = Can partially demonstrate through some examples shown on screen 5 = Can demonstrate via written evidence	1 = Cannot demonstrate 3 = Can partially demonstrate through some examples shown on screen 5 = Can demonstrate via written evidence	

Design Gates Score Sheet (Scores shown as a sample only)

ID	**Design Gate Action Planning Requirements**	Score at 3A 30% Design	Score at 3B 60% Design	Score at 3C 90%	Score at 3D 100% (IFC)	Scoring guidelines 3A 30 % Gate	Scoring guidelines 3B 60% Gate	Scoring guidelines 3C 90% Gate	Scoring guidelines 3D 100% Gate
18	Can the designer/contractor identify all requirements that are non-Compliant and demonstrate a dated, documented and practical action plan for close-out?	3	3	5	5	1 = Cannot demonstrate 3 = Can partially demonstrate 5 = Can demonstrate	1 = Cannot demonstrate 3 = Can partially demonstrate 5 = Can demonstrate	1 = Cannot demonstrate 3 = Can partially demonstrate 5 = Can demonstrate	
19	Can the designer/contractor identify all requirements that are under discussion and demonstrate a dated, documented and practical action plan for close-out?	3	5	5	5	1 = Cannot demonstrate 3 = Can partially demonstrate 5 = Can demonstrate	1 = Cannot demonstrate 3 = Can partially demonstrate 5 = Can demonstrate	1 = Cannot demonstrate 3 = Can partially demonstrate 5 = Can demonstrate	
20	Can the designer/contractor identify all detailed design submission documents that are not-currently code 'A' and demonstrate a dated, document and practical action plan for close-out?	3	5	3	5	1 = Cannot demonstrate 3 = Can partially demonstrate 5 = Can demonstrate	1 = Cannot demonstrate 3 = Can partially demonstrate 5 = Can demonstrate	1 = Cannot demonstrate 3 = Can partially demonstrate 5 = Can demonstrate	
ID	**Design Gate Documentation Requirements**	Score at 3A 30% Design	Score at 3B 60% Design	Score at 3C 90%	Score at 3D 100% (IFC)	Scoring guidelines 3A 30 % Gate	Scoring guidelines 3B 60% Gate	Scoring guidelines 3C 90% Gate	Scoring guidelines 3D 100% Gate
21	Design submission`s codes (CRS Codes for this module)	3	5	1	5	1 = Some submissions are Code D 3 = Some submissions are Code C 5 = All submissions are Code B or A	1 = Some submissions are Code D 3 = Some submissions are Code C 5 = All submissions are Code B or A	1 = Some submissions are Code D 3 = Some submissions are Code C 5 = All submissions are Code B or A	1 = Some submissions are Code C 3 = Some submissions are Code B 5 = All submissions are Code A
22	Can the designer/contractor demonstrate that all non-compliances applicable to this module have been submitted as Technical Change Requests (TCR)?	5	5	3	5	1 = Cannot demonstrate 3 = Can partially demonstrate 5 = Can demonstrate	1 = Cannot demonstrate 3 = Can partially demonstrate 5 = Can demonstrate	1 = Cannot demonstrate 3 = Can partially demonstrate 5 = Can demonstrate	
23	Are all approved TCR's for this module reflected in the Requirement management database?	5	5	3	5	1 = Cannot demonstrate 3 = Can partially demonstrate 5 = Can demonstrate	1 = Cannot demonstrate 3 = Can partially demonstrate 5 = Can demonstrate	1 = Cannot demonstrate 3 = Can partially demonstrate 5 = Can demonstrate	
	Design Gate Score	72	102	105	115	72	102	105	115
	Total Score Available	105	105	115	115	105	105	115	115
	Design Gate Percentage	68.57	97.14	91.30	100.00	68.57	97.14	91.30	100.00
	Minimum Gate Pass Criteria	70%	70%	90%	100%	70%	70%	90%	100%
	Gate Outcome	Fail	Pass	Pass	Pass	Fail	Pass	Pass	Pass