EXPRO National Manual for Projects Management

Volume 6, chapter 3

Design Review Procedure

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1.0 PURPOSE

The procedure defines the content and methodology for the internal and external design reviews of engineering design documents produced by the Architect & Engineer (A/E) companies. The formal design reviews, with Entity and other stakeholders shall take place at 10%, 30%, 60% and 90% of engineering design completion. In addition, a formal kick off meeting shall take place with the Entity at the commencement of engineering activities (0%).

2.0 SCOPE

This procedure is applicable for all engineering design deliverable completed by the A/E.

3.0 DEFINITIONS

Terms	Definitions
3D	Three dimensional
A/E	Architect & Engineer
BEDD	Basic Engineering Design Data
ECMS	Enterprise Content Management System
DBR	**Design Basis Report**
ENTITY	A Saudi Government organization which is responsible for the delivery of government funded infrastructure construction projects.
HSSE	Health, Safety, Security and Environment
IFA	Issued for approval. A/E will issue documents to the Entity for approval.
IFC	Issued for construction. Engineering document that is ready to be constructed.
IFD	Issued for design. Once the Entity comments are resolved and agreed, the A/E will issue documents as Issued for Design (IFD).
IFI	Issued for Information
IFR	Issued for review. This is the design review process, internal to A/E, for review of design document.
NMPM	National Manual for Project Management
QMS	Quality Management System
RFP	Request for Proposal
SME	Subject Matter Expert
VE	Value Engineering

4.0 REFERENCES

1. EPM-KE0-GL-000015 - Project Submission Standard and requirements
2. EPM-KE0-GL-000016 - General Design Guideline

5.0 PROCESS

5.1 Review Categories

During the initial stages of Engineering, the A/E will prepare a complete and detailed list of all design documents required for the project i.e. a document register for each discipline's deliverables. These lists shall include all design basis / design criteria, specifications, drawings including those extracted out of 3D model, reports, schedules, lists, studies, reports, etc.

All engineering deliverables identified in **ATTACHMENT 1** shall go through the following two reviews:

5.1.1 Internal Review

Internal reviews are undertaken by the A/E. Personnel involved in the review process shall be independent from those preparing the deliverables. The reviewing personnel shall be technically competent and possess equal or greater experience in the area of the work being performed by the originator of the deliverable under review.

5.1.2 External Review

External Reviews shall be conducted by the Entity, Construction and where required, by their Subject Matter Experts (SMEs) as well as third party stakeholders e.g. related or “interfacing” Entities, utility companies, etc.

The A/E shall submit a Design Review Package for External Review only after their Internal Reviews are completed and resulting comments fully dispositioned. The Design Review Package contents, for each review milestone, is defined in **ATTACHMENT 1** Submittal Requirements for each discipline.

All design shall be reviewed for safety (safety in design), constructability and operability by the A/E, Entity as well as their third party stakeholders.

5.2 Internal Review

The A/E shall develop and implement a Quality Management System (QMS), whereby each document is checked and reviewed by qualified personnel other than the originator.

The QMS shall define the method of checking, review, level, preparation and control of review documents, verification of review execution as well as disposition of any corrective actions. The A/E shall use the applicable design check lists as specified by the Entity.

The Entity is responsible for reviewing and approving the A/E’s QMS.

All deliverables shall be checked for completeness, accuracy, compliance with codes and standards, resolutions of interfaces and for any other detail affecting the function, quality, constructability, safety and the operability of the end product. The requirements for the necessary checks shall be clearly defined in A/E’s QMS.

Upon completion of Internal Review, the document originators shall review, align, update and issue the document to next revision. Once the update and internal signoff process is completed, A/E shall submit a Design Review Package to the Entity for approval.

The A/E shall submit all documentation in accordance with the submittal requirements of **ATTACHMENT 1**, or as specifically stated in the agreed Scope of Work associated with the design task. The required elements of submittal documents are described in **ATTACHMENT 2**

5.3 External Reviews

In addition to the A/E and Entity, external design reviewers may include one or more of the following:

- Entity’s Subject Matter Experts (SME). (Note that SME may be an integral part of the Entity’s organization OR an external specialist consultant retained for specific services).
- Other stakeholders such as:
    - “Interfacing” Entities e.g. Ministry of Housing needing to interface with the Ministry of Transport for completion of road access to the housing complex; Ministry of Housing need to interface with utility supply organization, etc.
    - Owners of adjacent buildings and or structures
    - Permit issuing authorities
    - Construction
    - Testing and Commissioning (T&C)
    - Operation and Maintenance (O&M)

The Entity shall examine the evidence of A/E’s Internal Review, complete their own review of the documents contained within the Design Review Package, consolidate review comments by their other stakeholders and return resulting comments to the A/E. Documents contained within the Design Review package may be returned by the Entity either approved with / without comments and work may proceed. The Entity may reject the documents and request the A/E to conduct the design review again. Work may not proceed. The Entity shall provide the basis of rejection. Where required, the A/E shall resubmit the document to Entity for approval.

The Entity shall coordinate distribution of documents requiring External Reviews as described below.

5.3.1 Kick Off Meeting (0% Design Review Stage)

The purpose of this review is to approve the operational roadmap prior to commencement of engineering design activities.

The A/E shall submit the initial documents(s) required by the contract to the Entity for external review. Required documents include:

1. Project Execution Plan
2. A list of all deliverables, including studies (list of deliverables should include total number of drawings for each discipline, Specification contents, etc.) – i.e. document register for each discipline.
3. The project Quality Management System (QMS) plan
4. The project Health, Safety, Security and Environment (HSSE) Plan (Design)
5. Basic Engineering Design Data (BEDD)
6. Organization structure
7. Schedule
8. Staffing Plan
9. Procedure for progress tracking and reporting
10. Automation Plan

The Entity shall review the A/E's submitted documents and either approve or return them with comments to the A/E. The A/E will resolve the comments and resubmit the initial documents review to the Entity for final approval.

Following final approval of the initial documents, the Entity shall inform the A/E to commence the project design.

A flow chart showing the various steps involved in the initial document review is provided in Figure-1.

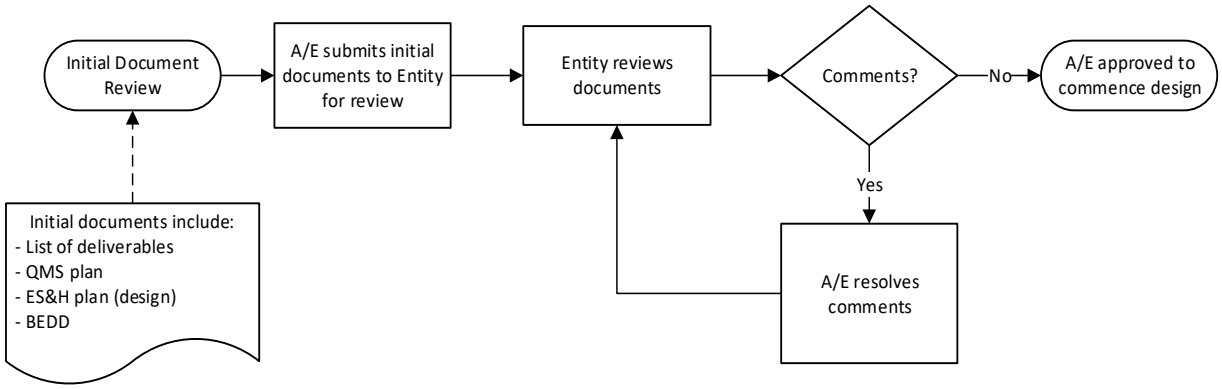

Figure-1: Initial Document Review (0% Design Review Stage)

5.3.2 Formal Design Review Stages

As the design proceeds, the following formal design review stages shall be conducted in accordance with Contract requirements.

5.3.2.1 10% Stage Design Deliverables - Refer to **ATTACHMENT 3**

5.3.2.2 30% Stage Design Deliverables - Refer to **ATTACHMENT 4**

5.3.2.3 60% Stage Design Deliverables - Refer to **ATTACHMENT 5**

5.3.2.4 90% Stage Design Deliverables - Refer to **ATTACHMENT 6**

5.4 Review Procedure

5.4.1 10% - 30% - 60% - 90% Design Review Steps

A flow chart showing the various steps involved in 10%, 30%, 60%, and 90% design reviews is provided as Figure-2 below.

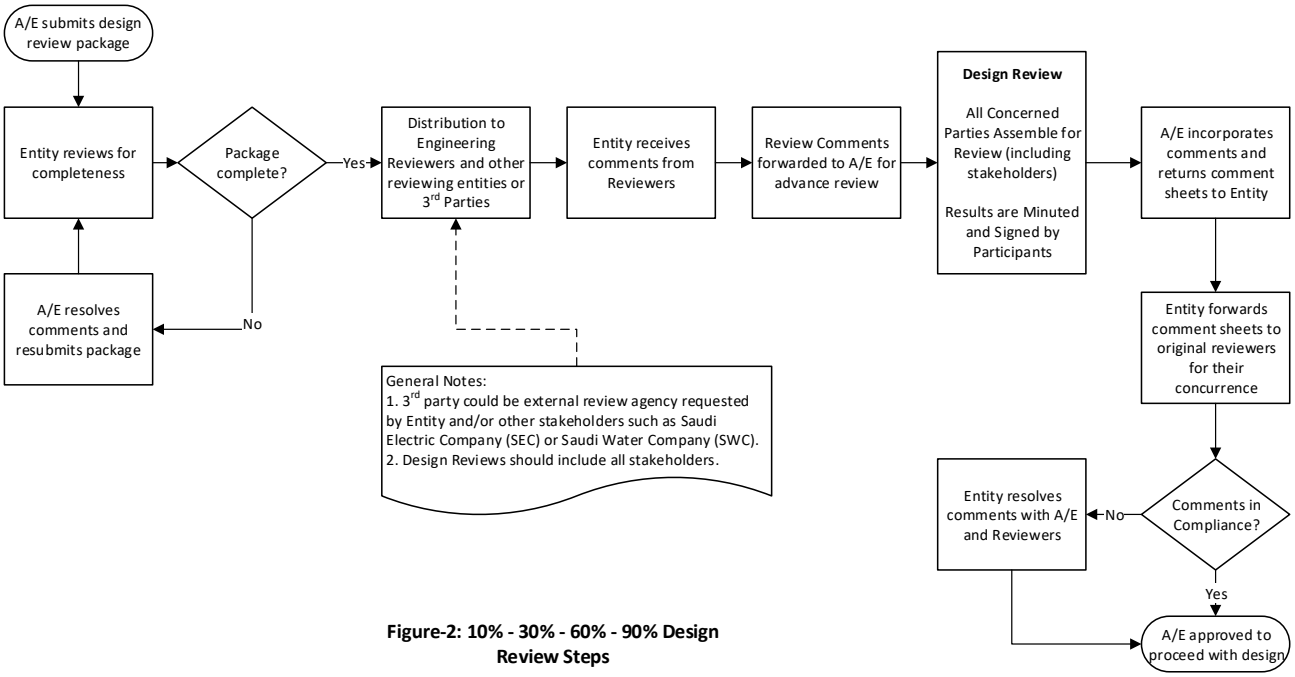

Figure-2: 10% - 30% - 60% - 90% Design Review Steps

5.5 Review Guidelines

Reviews within each Entity, Third Parties and stakeholders, shall be performed by competent, subject matter personnel.

All reviews shall follow the approved/submitted Project QMS plan.

5.5.1 10% - 30% - 60% - 90% Stage Quality Check

The minimum scope of design review includes:

- Quality: Design Review Package completeness, Quality Check and compliance with stated procedures.
- Compliance with checklists
- Review of Quantity/Cost Estimate Against Approved Budget
- Technical Review against Scope of Work, Codes and Standards
- External (“Interfacing Entities”), Interface details and disposition
- Safety, Constructability and Operability

5.5.2 Design Review Package Distribution

Generally, Design Review Packages shall be transmitted to other stakeholders in the same way as they are submitted by the A/E using Technical Package Review Release Form (**ATTACHMENT 7**). The distribution of the package may be automated through the document management system.

5.5.3 Specific Review Responsibilities

The external design reviewers will review the design package for technical completeness, accuracy, compliance with relevant codes and standards, consideration of all interfaces, constructability, etc. as well as acceptance and compatibility with other related contracts.

The A/E shall submit relevant design documents and drawings (and models if applicable) to all stakeholders and obtain all necessary approvals before issuing Issued for Construction (IFC) package.

5.5.4 Package Sponsor

The responsibility for assuring that the technical section of any engineering design contract package or other design document proceed through the required review process rests with the Entity. The Entity shall ensure that the package review proceeds expeditiously and be available to resolve any technical questions posed by the reviewers in accordance with the agreed review period.

5.5.5 Multiple Reviewers

In instances where more than one reviewer has been designated for a particular document, one copy of the entire package will be transmitted to each reviewer by the A/E. More than one copy may be sent to an Entity if parallel review within Entity is required.

5.5.6 Review Duration

The Entity shall define the review periods and return of comments prior to contract award. As a guideline, this deadline must allow a minimum of ten (10) working days for review excluding transmittal time.

5.5.7 Review Disposition

The external design reviewer will complete his review and record all comments on the Design Review Comments Form (**ATTACHMENT 8**). For quality assurance purposes and to ensure that all design comments are resolved, the reviewer shall record his comments only on the Design Review Comments Form and not on any submitted material.

The Entity will review all comments and forward them to the A/E.

Note: Completed Design Review Comments Forms are part of the final compliance report.

5.5.8 Review Disposition Meeting

The purpose of the formal design review meeting is to discuss and agree on the resolution of the comments and align all stakeholders and interfaces, etc. This meeting shall be arranged by the Entity.

A Design Review Meeting shall be conducted at each Design Review milestone 10%, 30%, 60% and 90%. All Stakeholders are to be invited to this meeting.

The A/E is required to send representatives to the review meeting with technical knowledge and management authority to reach resolution on all comments from external reviewers. Resolution of all comments shall be recorded on the Design Review Comments Form.

The Entity is responsible for maintaining evidence of compliance; i.e., resolution of the reviewer comments. If there is non-compliance with comments, documented resolution providing a closed action shall be maintained in the project Enterprise Content Management System (ECMS).

The Entity will review all comments and forward them to the A/E. A review meeting will be conducted at each stage. All Stakeholders are to be invited to the meeting to discuss and agree on the resolution of the comments.

The A/E is required to send representatives to the review meeting with sufficient technical knowledge and management authority to reach resolution on all comments from reviewers. Resolution of all comments shall be recorded on the Design Review Comments Form.

The Entity is responsible for maintaining evidence of compliance; i.e., resolution of the reviewer comments. If there is non-compliance with comments, documented resolution providing a closed action shall be maintained in the project ECMS.

The A/E shall disposition all comments resulting from the current design review before including the same documents subsequent Design Reviews.

5.6 Conflict between Reviewers

Conflicts between two or more of their external reviewers will be resolved by the Entity. If necessary, this alignment may be completed during the formal design review meetings. The A/E shall be responsible for resolving conflict between their internal engineering disciplines.

5.7 Approval Authority

Final approval of all engineering design documents covered by this Procedure rests with the Entity.

5.8 Special Requirements

Schematics and layouts of buildings and facilities, expected to be handed over to and operated by a third party, shall be transmitted to that third party for review of the appropriateness of the design with respect to the function, operation and maintenance of such buildings and facilities. Generally, the third party comments addressed to layouts and functional requirements shall be incorporated in the design.
Third parties shall be invited to relevant Design Review Meetings.

6.0 ATTACHMENTS

Attachment 1 - Submittal Requirements (Table)
Attachment 2 - Elements of Design for External Design Review
Attachment 3 - 10% Design Stage Review
Attachment 4 - 30% Design Stage Review
Attachment 5 - 60% Design Stage Review
Attachment 6 - 90% Design Stage Reviews
Attachment 7 - Technical Package - Review Release (Form)
Attachment 8 - Design Review Comments (Form)

Attachment 1 - Submittal Requirements

			GENERAL : Engineering Design Reviews				
Phase	**Type**	**Deliverable Description**	**10%**	**30%**	**60%**	**90%**	**IFC**
Contract Information	**Engineering Management**	Project Execution Plan	X	Updated as necessary throughout the contract			
		Project Operations Plan	X				
		Design Criteria	X				
		Deliverable List for each discipline (including a list of studies that may be required to support the design development process)	X				
		Automation Plan					
		Engineering Schedule					
		Engineering performance tracking plan					
		Quality Management System (QMS) Plan	X				
Design Development Activities	**Basic Engineering Design Data (BEDD)**	Environmental, Safety and Health Plans and Studies.	X	X	X	X	
		Topographical Survey Plans	X1	X	X	X	
		Land Boundary Plans	X1	X	X	X	
		Geotechnical - Site investigation reports (SI)	X1	X	X	X	
		Geotechnical - Interpretive Reports (GI)	X1	X	X	X	
		Special study reports	X1	X	X	X	
		Utility surveys reports	X1	X	X	X	
		Utility surveys and plans	X1	X	X	X	
		"As Built" documentation	X1				
		Entity design guidelines / templates / checklists	X1	Updated as required throughout the Contract.			
		Entity technical specifications	X1				
		Other information / data as specified in the contract.	X1				
	Design Basis Report (DBR) and Design Criterion	System Narratives		X	X	X	
		Roadworks		X	X	X	
		Structures		X	X	X	
		Buildings		X	X	X	
		Potable / Fire Water System		X	X	X	
		Grading		X	X	X	
		Mechanical including piping and process		X	X	X	
		Fire and Life Safety (FLS)		X	X	X	
		Electrical including telecommunications, instrumentation and controls		X	X	X	
		Risk Assessment		X	X	X	
		Design Criterion for each discipline.		X	X	X	

Notes:

X: Document Submitted by the A/ E.

X1: Information Provided by the Entity.

IFD: This revision contains estimated equipment details (dimensions, ratings, power consumption, heat dissipation, etc.) In addition, the A/E may use this revision of documents to request budget bids from up to three equipment vendors. The information from bidders including their technical solution, equipment dimension, ratings, etc. would allow the A/E to issue deliverables at Issued for Construction (IFC).

		CSA: Engineering Design Reviews			
Discipline	Deliverable Description	10%	30%	60%	90%
Geotech	Bore hole Location Plan	IFC	N/A	N/A	N/A
	Geotechnical report / Recommendations	IFR	IFA	IFD	N/A
Survey	Site survey Scope / Basis	IFC	N/A	N/A	N/A
	Site survey drawings	IFR	IFD	N/A	N/A
	3D drawing preparation	IFR	IFD	N/A	N/A
Architecture	Scope of work	IFR	IFD	N/A	N/A
	Design Criteria / Basis of Design	IFA	IFD	N/A	N/A
	Site Plan - site layout, site access, parking lot configuration, laydown area, internal roads, etc.	IFR	IFA	IFC	N/A
	Specifications	N/A	IFR	IFD	N/A
	Fire/hazard analysis	N/A	IFA	IFD	N/A
	Finish Schedule	IFR	IFR	IFA	IFC
	Furniture, Fixtures and Equipment list	N/A	IFA	IFD	N/A
	Standard details and notes	N/A	IFR	IFC	N/A
	General Arrangement Plans & Sections	N/A	IFR	IFA	IFC
	Elevated Concrete slab plan & details	N/A	IFR	IFD	IFC
	Elevation drawings	N/A	IFR	IFD	IFC
	Building Exterior Details	N/A	N/A	IFR	IFC
	3-D Model	N/A	IFR	IFC	N/A
Civil	Scope of work	N/A	IFR	IFC	N/A
	Design Basis / Design Criteria	IFA	IFD	N/A	N/A
	Site Plan	N/A	IFR	IFD	IFC
	Earthwork Specification	N/A	IFR	IFD	IFC
	Duct bank layout	N/A	N/A	IFR	IFC
	Drainage plan	N/A	N/A	IFR	IFC
	Standard details drawing	N/A	N/A	IFR	IFC
	Rough grade drawing	N/A	IFR	IFC	N/A
	Finish grade drawings	N/A	N/A	IFR	IFC
	Road layout (plan & Sections)	N/A	N/A	IFR	IFC
	3-D Model	N/A	IFR	IFA	IFC
	Demolition spec	N/A	IFR	IFD	N/A
Structural	Scope of work	N/A	IFA	IFC	N/A
	Design basis / Design Criteria	IFA	IFD	N/A	N/A
	Specifications	N/A	IFR	IFD	N/A
	Standard details and notes	N/A	Conceptual sketches / diagram	IFR	IFC
	General Arrangement Plans	N/A	Conceptual sketches / diagram	IFR	IFC
	Elevated floor plan & details	N/A	N/A	IFR	IFC
	Reinforcement drawings	N/A	N/A	IFR	IFC
	Steel detailing	N/A	N/A	IFR	IFC
	3-D Model	N/A	Block model	IFR	IFC

	MECHANICAL: Engineering Design Reviews			
Deliverable Types	**10%**	**30%**	**60%**	**90%**
Design Criteria / Design Basis	IFA	IFD	N/A	N/A
Scope of Work, General Project Specification and Particular Project Specification	N/A	IFR	IFD	N/A
Load Calculation (HVAC Software Output), Psychometric Analysis, Exhaust and Fresh Air Calculation	Preliminary	IFA	IFD	N/A
HVAC Equipment Load Calculation.	Preliminary	IFA	IFD	N/A
Mechanical Fire and Life Safety System Calculation	Preliminary	IFA	IFD	N/A
Fire Hose and Sprinkler System Calculation	Preliminary	IFA	IFD	N/A
Plumbing System Calculation	Preliminary	IFA	IFD	N/A
Clean Agent System Calculation	Preliminary	IFA	IFD	N/A
Riser Diagrams	N/A	IFR	IFA	IFC
BMS Process Instrumentation Diagrams (P&IDs), Sequence of Operation, and Data Point Schedule for Air and Water Distribution System	N/A	IFR	IFA	IFC
Fire & Life Safety System Sequence of Operation	N/A	IFR	IFA	IFC
Equipment Schedules	N/A	IFR	IFA	IFC
Mechanical Plant Room Layout Drawings	N/A	IFR	IFA	IFC
HVAC Layout Drawings	N/A	IFR	IFA	IFC
Mechanical Life Safety System Single Line Diagram	N/A	IFR	IFA	IFC
Fire Protection Layout Drawings	N/A	IFR	IFA	IFC
Plumbing Layout Drawings (Water and Drainage)	N/A	IFR	IFA	IFC
Underground (U/G) Utility Layout Drawings	N/A	IFR	IFA	IFC
HVAC Symbols, Legends, and Technical Notes	N/A	IFA	IFC	N/A
HVAC Typical Construction Detail Drawings (TCDDs)	N/A	IFR	IFC	N/A
Fire Protection Symbols and Legends	N/A	IFA	IFC	N/A
Fire Protection Typical Construction Detail Drawings (TCDDs)	N/A	IFR	IFC	N/A
Plumbing Symbols and Legends	N/A	IFA	IFC	N/A
Plumbing Typical Construction Detail Drawings (TCDDs)	N/A	IFR	IFC	N/A
Piping and Instrument Diagram(P&ID)	IFR	IFA	IFD	IFC
Control System Sequence of Operation	N/A	IFR	IFA	IFC
Fire Strategy Report	IFR	IFA	IFD	N/A
FDAS Cause and Effect Matrix	N/A	IFR	IFA	IFD

	ELECTRICAL: Engineering Design Reviews			
Deliverable Types	**10%**	**30%**	**60%**	**90%**
Design Basis / Design Criteria Document	IFA	IFD	N/A	N/A
Scope of Work/ Specifications	IFA	IFD	IFC	N/A
3-D Model	IFR	IFA	IFD	IFC
Permitting submittals	N/A	N/A	N/A	N/A
Data Sheet(s)	IFR	IFA	IFD	N/A
Bulk Quantity Takeoff / BOQ	IFI	IFI	IFI	IFI
Tagged Material Tracking / BOQ	IFI	IFI	IFI	IFI
Equipment room layout design	IFR	IFA	IFD	IFC
Electrical Equipment Plans & Installation Details	IFR	IFA	IFD	IFC
Hazardous Area Classification Drawings	IFR	IFA	IFD	IFC
Lighting & Power System Notes, Symbols & Details	IFR	IFA	IFD	IFC
Lighting and Power Panels Schedule	IFR	IFA	IFD	IFC
Lighting Plans & Fixture Schedule	IFR	IFA	IFD	IFC
The containment and Raceway Notes, Symbols & Details	N/A	IFR	N/A	IFC
The containment & Raceway Plan Sections	IFR	IFA	IFD	IFC
Single-Line Diagrams	IFR	IFA	IFD	IFC
Single Line Relay & Meter Diagrams	IFR	IFA	IFD	IFC
Schematic Diagrams	N/A	N/A	IFD	IFC
Three-Line Diagrams	N/A	N/A	IFD	IFC
Three-line Relay & Meter Diagrams	N/A	N/A	IFD	IFC
Block Diagrams	IFR	IFA	IFD	IFC
Fire Alarm & detection riser schematic	IFR	IFA	IFD	IFC
Corrosion / Cathodic Protection and stray current Monitoring - SPECIFICATION OR DRAWING	IFR	IFA	IFD	N/A
Duct bank Plan(s)	IFR	IFA	IFD	IFC
Earthing Diagram and Bonding Details	IFR	IFA	IFD	IFC
Earthing and Bonding Strategy	IFR	IFA	N/A	IFC
Electrical Heat Tracing Panel Schedule(s)	N/A	IFA	IFD	N/A
Earthing/Grounding Layout, Earthing and Bonding, Lightning Protection & Details	IFR	IFA	IFD	IFC
Earthing/Grounding and Lightning Protection Notes, Symbols & Details	IFD	IFC	N/A	N/A
Lightning Protection and Details	IFR	IFA	IFD	IFC
MCC Load List	IFR	IFA	IFD	N/A
Protection Scheme details	N/A	IFA	IFD	IFC
Protection Settings & Calculations	IFA	IFD	N/A	N/A
The containment and Raceway Notes, Symbols & Details	IFD	IFC	N/A	N/A
The containment & Raceway Plan Sections	IFR	IFA	IFD	IFC
Relay, Transducer, Meter and Transformer Setting Diagram(s) / Relay Coordination	N/A	IFA	IFD	IFC
Phasing Diagrams	IFR	N/A	IFD	IFC
Plan and Profile (Transmission Line)	IFR	IFA	IFD	IFC
Raceways and Containment Details (Plan and Section)	N/A	N/A	IFD	IFC

	Extra Low Voltage (ELV): Engineering Design Reviews			
Deliverable Types	**10%**	**30%**	**60%**	**90%**
Design Basis / Design Criteria Document	IFA	IFD	N/A	N/A
Scope of Work/ Specifications	IFI	IFA	IFC	N/A
Control System Architectural Drawing	IFR	IFA	IFD	IFC
Distributed Control System (DCS) Block Diagram	IFR	IFA	IFD	IFC
Telecommunication Room/ Main Entry room/ Control Room layout design	IFR	IFA	IFD	IFC
CCTV/Intrusion detection System/Security Surveillance System - Specification or drawings	IFR	IFA	IFD	IFC
3D Model	IFR	IFA	IFD	IFC
Material Assignment Schedule (MAS) and Contract Assignment Schedule (CAS)	IFR	IFA	IFD	N/A
Data Sheet(s)	N/A	IFA	IFD	IFC
Bulk Quantity Takeoff / BOQ	IFI	IFI	IFI	IFI
Tagged Material Tracking / BOQ	IFI	IFI	IFI	IFI
ELV System Equipment and Devices List and schedules	N/A	IFA	IFD	N/A
ELV Riser Diagrams	IFR	IFA	IFD	IFC
Structural Cabling System Layout	IFR	IFA	IFD	IFC
Access Control System Layout	IFR	IFA	IFD	IFC
Public address System Layout and schematic	IFR	IFA	IFD	IFC
Intercom System Layout	IFR	IFA	IFD	IFC
Distributed Television System layout	IFR	IFA	IFD	IFC
Master Clock System Layout	IFR	IFA	IFD	IFC
Audio/Visual System layout	IFR	IFA	IFD	IFC
Fire Alarm System Layout	IFR	IFA	IFD	IFC
Fire Alarm System Riser Diagram	IFR	IFA	IFD	IFC
Nurse Call System Layout	IFR	IFA	IFD	IFC
Underground(UG) Utility Layout	IFR	IFA	IFD	IFC
IP TV /Master Antenna TV	IFR	IFA	IFD	IFC
CCTV and IP based Surveillance	IFR	IFA	IFD	IFC
Telecom Earthing Layout	IFR	IFA	IFD	IFC
Earthing and Bonding Strategy	IFR	IFA	IFD	IFC
Cause and Effect Diagram	IFR	IFA	IFD	IFC
Control Narrative	IFR	IFA	IFD	IFC
Instrument Installation details	IFR	IFA	IFD	IFC
Instrument Interconnection Wiring Diagram	N/A	N/A	IFD	IFC
Instrument Loop Diagram	N/A	N/A	N/A	IFC
Process Flow Diagram	IFA	IFD		
ELV System standard details, symbol, legend and abbreviation	IFD	IFC		

Attachment 2 - Elements of Design for External Design Review

The development of A/E designs leading to the preparation of the construction contract packages generally includes the following elements:

1. Quality Management System (QMS) Documents
2. Basic Engineering Design Data (BEDD)
3. Environmental, Safety and Health Plan (Design)
4. Risk Assessments (Design)
5. Schematics (preliminary design of systems, buildings, and building complexes)
6. Studies (including development of final design criteria)
7. Design Basis Reports (DBR)
8. Design Criteria (if not included in DBR)
9. Request for Proposal (RFP) Package

Affected Departments will provide input to the above elements. A more detailed discussion of these elements follows:

1. QUALITY MANAGEMENT SYSTEM

QMS Documentations are is required at the beginning of engineering design and construction. All documents shall be prepared by the A/E and approved by the Entity. The required documentations includes:

a. Design Criteria outlining the applicable codes and standards (part of Design Basis Report).
b. Deliverables List
c. QMS Plan describing the quality requirements and the internal review procedures to assure the requirements are met. Refer to National Manual for Management (NMPM), Volume 12 on Quality Requirements)

2. BASIC ENGINEERING DESIGN DATA (BEDD)

The Basic Engineering Design Data (BEDD) is generally comprised of information about existing conditions, guidelines, studies, reports and other information that sets parameters and impose constraints on the design.

Refer to Chapter 7 of nmpm, Volume 6 for the template and purpose of BEDD.

The A/E is responsible for collecting all relevant engineering data (e.g., site survey, Geotech information, walk downs reports, etc.) not provided by the Entity. The A/E shall also take full responsibility for the verification of such data provided by the Entity.

3. HEALTH, SAFETY, SECURITY AND ENVIRONMENT (HSSE) PLAN

The HSSE Plan (specific to design) describes the internal procedures of the A/E to assure compliance of the design with environmental laws, regulations, and permit conditions related to waste management and environmental issues. Waste minimization and pollution prevention shall be considered in the process design, during construction as well as during operation.

The HSSE Plan will be applied to assure compliance with regulations covering a wide range of topics including, but not limited to the following:

a. Noise
b. Vibration
c. Dust
d. Asbestos
e. Site traffic access and planning
f. Air quality

g. Water quality
h. Discharge to public sewers and natural watercourses
i. Protection of endangered species
j. Protection of cultural resources and archaeological sites
k. Protection of wetlands
l. Dealing with hazardous waste

4. SCHEMATICS

The schematic phase of facility, system or building design converts the project criteria into physical layouts. During this phase of the work, the land area, floor area, space requirements, and system designs are combined with the architectural design to produce a facility that will satisfy Project requirements.

The selected schematic design, with alternates, is examined for conformance with the developed program, functional requirements, costs with respect to budget, and any schedule limitations.

5. RISK ASSESSMENTS (DESIGN)

The risk assessment of design evaluates factors that can influence schedule, cost, constructability, environmental concerns and safety issues as relate to the execution of the contract package as well as the safety, maintainability, and operability of the completed work. Risk assessments shall be prepared in matrix form with adequate descriptions of each factor, its potential impact, and recommended actions.

Risk assessment matrices are prepared by the A/E and reviewed by the Entity during the conceptual (10%) and preliminary (30%) stages of design. Agreed upon action measures from the risk assessment review are evaluated during the detailed design stages (60%-90%) for implementation and compliance.

Risk assessment is not limited to factors that have negative impacts on project variables and completed work. Factors that can positively enhance the project variables and completed works are also part of risk assessment and are to be included as part of the risk assessment.

Refer to NMPM, Volume 13 on Risk Management procedures.

6. STUDIES

The study phase of system design investigates the Project requirements covered by various criteria, policy and Work Plan data, and concludes in making recommendations for the final design criteria to be used as the basis for the preparation of contract packages.

The studies are made by the A/E's and are reviewed by the Entity. The studies result in recommendations for final design. Any study results accepted by the Entity will be incorporated into the design by the A/E.

7. DESIGN BASIS REPORTS

A Design Basis Report (DBR) shall be prepared for each operational system and infrastructure component required for a design project. Refer to Project Submission Standard and requirements (EPM-KE0-GL-000015) for details on the Design Basis Report.

8. DESIGN CRITERIA

Refer General Design Guideline (EPM-KE0-GL-000016) for details on the Design Criteria.

9. REQUEST-FOR-PROPOSAL PACKAGE

The Request-for-Proposal Package for the contract is the end-product of the design phase of the project.

Refer to NMPM, Volume 4 for contracts and tending processes.

Attachment 3 - 10% Design Stage Review

1. An external review at the 10% design stage (conceptual design) is required for large and/or complex projects in accordance with the contract. Basic submittal requirements include the following:

   - Architectural Facade / Elevations / Layout
   - Basic Engineering Design Data (BEDD)
   - Approval of Conceptual Site Layout, Site Access, parking lot configuration, etc.
   - Verification and approval of as-built information for utility interface points
   - Draft/outline and format of Design Basis Report (DBR), including Design Criteria
   - Program studies and Schematics
   - Initial Quantity/Cost Estimate (+/- 25%)

   A/E's engineering discipline documents, required at specific design review milestones, are fully detailed in **ATTACHMENT 1** above.

2. The purpose of the 10% Package Review is to accomplish one or more of the following:

   a. To submit for approval any studies, schematics, or logic diagrams required for the project design;

   b. To submit for approval any design alternatives proposed by the A/E

   c. To confirm that the A/E has the Basic Engineering Design Data (BEDD), including as-builts and utility interface points, and validated any data provided by the Entity;

   d. To approve the initial Design Basis Criteria that will govern the design;

   e. To list major procurement items and study options for procurement of long lead ones;

   f. To submit exceptional risk/constructability assessments.

3. The A/E will submit the package to the Entity for review. The Entity will review the A/E's documents for completeness and either approve or return them with comments to the A/E. The A/E will act on the comments and resubmit any affected documents of the package to the Entity.
4. The Entity will notify the Engineering Department reviewers and the Lead Discipline Engineers that the package is available and the date for comments to be returned. The Entity will determine the number of working days for review based on the complexity of the package. The review period shall not be less than two (2) nor more than (10) working days.
5. If any part of the submittal requires review by third parties, the Entity will also prepare a Technical Package-Review Release (**ATTACHMENT 7**), attach the package, and transmit it to third parties. Entity Managers will identify the required number of packages and the recipients in their respective departments. All review comments are to be returned to the Entity by the date set (see item 4 above). The Entity will forward the comments to the A/E for advance review while also arranging a meeting with the A/E and the reviewers to discuss and agree on the necessary actions to comply with the comments. The A/E will prepare Minutes of the Meeting which will be signed by the Entity and A/E, and other key participants of the meeting.
6. The A/E will incorporate the review comments in accordance with the Minutes of Meeting and return the Design Review Comments Sheet to the Entity within 10 days.
7. The Entity will receive the A/E's response to the comments and the forward them to the original reviewers for concurrence. Each reviewer will indicate on the comment sheet whether or not the A/E's response is in compliance with his comment as stated. The Entity will investigate all comments not marked in compliance and take appropriate action to resolve the discrepancies in consultation with the Lead Discipline Engineers and the cognizant representatives of the A/E.
8. Once resolution of all comments are agreed, the Entity will instruct the A/E to proceed. The Entity will retain copies of all the comments for inclusion in the compliance report.

Attachment 4 - 30% Design Stage Review

1. The 30% Package submittal and review is mandatory for all design projects unless waived by the Entity as a special case.
2. Prior to submitting the 30% package to the Entity, the A/E shall submit evidence of the internal review as specified in the Project QMS Plan. The Entity shall review the documents and either approve or return them with comments to the A/E. The A/E will act on the comments and resubmit the required documentation for review and approval. The design package shall not be submitted until the Entity approves the internal review documentation.
3. Following approval by the Entity, the A/E shall submit the design package for review. The Entity will check for completeness of the package in accordance with the contract requirements.
4. Upon receipt of the design package the Entity will prepare a Technical Package Review Release **(ATTACHMENT 7),** attach the package, and transmit it to other Entities, A/E's, or Third Parties for review. Entities will identify the required number of packages and the recipients in their respective Entities.
5. The Entity will coordinate the technical review. The Entity will notify the Engineering Department reviewers and the Lead Discipline Engineers that the package is available and the date for comments to be returned. The Entity shall allow the reviewers ten (10) working days for review. However, this deadline may be extended beyond ten (10) working days if the document concerned requires more intensive review.
6. If Value Engineering (VE) is required by current Entity standards, the Entity will provide one copy of the review package to the Value Engineering Coordinator who will arrange for a workshop to be conducted. Following the Value Engineering Workshop the Entity will review the recommendations produced by the workshop and prepare an implementation plan. The implementation plan will include justifications for any deviations from the recommendations of the VE Workshop. Once approved, the implementation plan will be forwarded to the A/E for action. A copy of the implementation plan will be retained by the Entity.
7. All review comments are to be returned to the Entity by the date set (see item 4 above). The Entity will forward the comments to the A/E for advance review while also arranging a meeting with the A/E and the reviewers to discuss and agree on the necessary actions to comply with the comments. All reviewing Entities will be invited to the meeting. The A/E will prepare Minutes of the Meeting which will be signed by the Entity, A/E, and other key participants of the meeting. If, following the review meeting, there are remaining discrepancies or conflicts in the review comments the Entity should discuss with the appropriate Lead Discipline Engineer(s) to resolve the conflict.
8. The A/E will incorporate the review comments in accordance with the Minutes of Meeting and return the comment sheets to the Entity within 15 days of receipt.
9. The Entity receives the A/E's response to the comments and forwards them to the original reviewers. Each reviewer will indicate on the Design Review Comments Form whether or not the A/E's response is in compliance with his comment as stated. The Entity will investigate all comments not marked in compliance and take appropriate action to resolve the discrepancies in consultation with the Lead Engineer(s) and the cognizant representatives of the A/E.
10. Once all comments are marked in compliance, the Entity will instruct the A/E to proceed with the design. The Entity will retain copies of all the comments for inclusion in the compliance report.

Attachment 5 - 60% Design Stage Review

1. The 60% Package submittal and review is mandatory for all design projects. The 60% Package Review is an intermediate stage review of selected material. Reasons for conducting a 60% review are:

    a. To review the status of 3rd party approvals and assess their impact on the design work;

    b. To review material affected by implementation of the Value Engineering implementation plan;

    c. To review key elements of the work to ascertain the technical quality of the design;

    d. Other reasons as determined by the Entity.

2. Depending on the nature and volume of the material to be reviewed, as well as the number of reviewers involved, the 60% review may be conducted at the site of the A/E. The Entity shall determine whether the review is to be at the A/E site.
3. The Entity is responsible for arranging the technical review and conducting the subsequent review meeting regardless of the location.
4. Following the review of the selected material the Entity shall arrange a meeting with the A/E and the reviewers to discuss and agree on the necessary actions. The Entity will prepare Minutes of the Meeting which will be signed by the Entity, A/E, and other key participants of the meeting. The Minutes of Meeting must state an objective evidence of closure for all action items.
5. If a 'hold' is placed on portions of the design work the A/E shall take necessary action(s) to meet the objective evidence of closure and resubmit as much material as necessary to demonstrate compliance therewith.
6. Once the A/E has taken all required actions necessary to remove the 'hold' on the design work, the Entity shall remove the 'hold'.
7. Once all action items stated in the 60% review Meeting Minutes have been closed in accordance with the objective evidence of closure, the Entity who will instruct the A/E to proceed. The Entity will retain copies of the review Meeting Minutes for inclusion in the compliance report.

Attachment 6 - 90% Design Stage Reviews

1. The 90% Package submittal and review is mandatory for all design projects. The package will consist of:

    a. The updated Project Operations Plan;

    b. Updates to the project Environmental, Health and Safety Plan;

    c. The Design Basis Report;

    d. Detailed calculations to support the design;

    e. Detailed drawings including arrangements, sectional details, and reinforcements;

    f. Detailed quantity/cost estimates;

    g. Evidence of approval of the design package by 3rd party stakeholders including stamped drawings and permits. Failure to obtain 3rd party approvals must be addressed in the risk assessment;

    h. Risk/Constructability Assessment;

    i. All technical specifications to be included in the RFP package; and

    j. All RFP documentation.

2. Prior to submitting the 90% package to the Entity the A/E shall submit evidence of the internal review as specified in the Project QMS Plan. The Entity shall review the documents and either approve or return them with comments to the A/E. The A/E will act on the comments and resubmit the required

documentation for review and approval. The design package shall not be submitted until the Entity approves the internal review documentation.

3. Following approval by the Entity, the A/E shall submit the design package for review. The Entity will check for completeness of the package in accordance with the contract requirements.
4. Upon receipt of the complete design package the Entity will prepare a Technical Package Review Release **(ATTACHMENT 7),** attach the package, and transmit it to other Entities, A/E's, or Third Parties for review. Entity's will identify the required number of packages and the recipients in their respective Entities. The Risk/Constructability Assessment shall be included with the review package sent to the Construction Department. Department Managers will identify the required number of packages and the recipients in their respective departments.
5. The Entity will coordinate the technical review. The Entity will notify the Engineering Department reviewers and the Lead Discipline Engineers that the package is available and the date for comments to be returned. The Entity shall allow the reviewers a minimum of ten (10) working days for review. However, this deadline may be extended beyond ten (10) working days if the package concerned requires more intensive review.
6. All review comments are to be returned to the Entity by the date set (see item 7 above). The Entity will forward the comments to the A/E for advance review while also arranging a meeting with the A/E and the reviewers to discuss and agree on the necessary actions to comply with the comments. All reviewing Departments will be invited to the Meeting. The Entity or designee will prepare Minutes of the Meeting which will be signed by the Entity and key participants of the meeting.
7. Once all comments are resolved the Entity will instruct the A/E to proceed. The Entity will retain copies of all the review Minutes of Meeting for inclusion with the compliance report.

Attachment 7 - Technical Package - Review Release (Form)

Department	Attachment No.	Signature	Comments

Note:

All comments shall be submitted by _____. Departments that do not submit any comments shall be considered as accepting the design. There will be a meeting, to be held in conference room _____ on _____ at _____, to discuss Engineering and external department comments. You are requested to attend this meeting.
(DATE) (PLACE) (DATE) (TIME)

All comments shall be submitted in Excel sheet format by using the standard form for comments, and shall be sent to the Entity Engineering Manger by the deadline. We cannot accept any comments that are submitted in other formats. If you don't already have the correct format, please contact the Entity at _____.
(PHONE)

Attachment 8 - Design Review Comments (Form)

Design Review Comment Form						
Contract No.			Reviewing Entity:			
Contract Title:			Reviewed by:			
A/E:			Date Received:	Date Reviewed:		
Review Subject:						
Documents Reviewed:						
Item No.	Document Ref. Drawing No.	Reviewer (Entity or Other Stakeholder)		A/E		Compliance Sign-Off by Entity Reviewer
		Comments	Type	Response	Status	

Status codes:
A: Reviewed - Work may proceed;
B: Reviewed with comments - Revise and resubmit. Work may proceed subject to incorporation of comments;
C: Objection - Revise and resubmit. Work may not proceed;
D: Review not required, or comment superseded