هيئة كفاءة الإنفاق والمشروعات الحكومية
Expenditure Efficiency & Projects Authority

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General Design Guideline

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1.0 PURPOSE

The purpose of this section is to provide instructions on the use of checklists, templates, deliverable lists, Guidelines, etc. (henceforth collectively referred to as Design Aids) developed for use by the Entity
For the design of all government Infrastructure Projects across the Kingdom of Saudi Arabia. The instructions presented in this section are applicable to all Design Aids developed for all Engineering disciplines. This section also carries the details of non-discipline specific Design Aids such as templates for tagging procedures, templates for technical specifications, calculation checklists, etc. applicable to all Engineering disciplines.

Details of Design Aids applicable to each engineering discipline are listed in the reference section 4.0 below.

2.0 SCOPE

The use of Design Aids, as applicable to the project scope, is mandatory on all infrastructure projects across the Kingdom of Saudi Arabia. Infrastructure projects include but are not limited to: site utilities; site development; roadway systems; industrial infrastructure development and to other types of facilities including all types of buildings. The applicability of various components of Design Aids on a project will be dependent upon the Scope of Work of the project. For every project, the Entity shall identify the components of Design Aids applicable for every engineering discipline including non-discipline specific Design Aids (included in this section) during the initial phase of design. The use of Design Aids shall be included by the Entity in the A/E's scope of services.

Design Aids are intended to cover most project types, but may not include all the design requirements of specialized large industrial projects. For these projects, the Entity shall develop required additional Design Aids for use by the A/E.

3.0 DEFINITIONS & ABBREVIATIONS

Design Aids - collective term for all checklists, templates, lists, design guidelines, discipline specific procedures and sample installation Standard Drawings that are included in this guideline.

Architect/ Engineer (A/E) - organization that undertakes studies and/ or design of projects

Entity - A Saudi Government organization which is responsible for the delivery of government funded infrastructure construction projects.

Refer to Volume 6, Chapter 2, EPM-KE0-GL-000011 (Definitions and References) for the list of general definitions and abbreviations.

4.0 REFERENCES

- EPM-KEC-GL-000002 - Civils (Site work and Roads) Design Aids
- EPM-KEA-GL-000002 - Architecture Design Aids
- EPM-KES-GL-000002 - Structural Design Aids
- EPM-KEM-GL-000002 - Mechanical Design aids
- EPM-KEE-GL-000003 - Electrical Design Aids
- EPM-KEE-GL-000004 - ELV System Design Aids
- EPM-KEC-GL-000003 - Utilities Design Aids
- EPM-KER-GL-000001 - Coastal Marine Design Aids
- EPM-KE0-GL-000001 - Environmental Guideline
- EPM-KE0-GL-000002 - Geotechnical Guideline
- EPM-KE0-GL-000012 - General Engineering Procedures
- EPM-EN0-PL-000001 - Technical Standardization Plan
- EPM-KE0-PR-000011 - Verification and Validation of Computer Programs

5.0 THIRD PARTY DESIGN REQUIREMENTS

The Third Party is a stakeholder other than the Entity, such as other interfacing Entities or governmental/regulatory agencies, including, but not limited to:

- Saudi Electricity Company (SEC)
- Saudi Private Telecom Companies (STC, Mobily)
- Ministry of Transportation (MOT)
- Ministry of Defense (MOD)
- Coast Guard, National Guard, Civil Defense, High Commission for Industrial Security (HCIS)
- Saudi Railway Company (SAR)
- Saudi Sea Ports Authority (SEAPA)
- Saudi Standards, Metrology and Quality Organization (SASO)
- The Ministry of Interior (MOI)
- National Water Company (NWC)
- Others

The design work requiring Third Party approval shall be in conformance with the standards and requirements of the relevant Third Party. However, drawing sizes, lettering, drawing numbering systems and title blocks shall conform to the EXPRO CAD standards, refer Chapter 6 of volume 6 for the details of applicable CAD standards Procedure EPM-KE0-PR-000008.

The Entity shall define the responsibility for all submissions to all Third Parties including undertaking all necessary steps such as visits to the Third Party ‘s offices, follow-up submissions, etc. to obtain Third Party approval of the Entity’s project design. Entity shall ensure that all design approvals are obtained and their design drawings are approved before preparing their construction package for bid. Refer to the Template - Third Party Design Approval (Document No EPM-KE0-TP-000010) for use by A/E to record Third Party approval of the design.

A/E shall obtain letters from Third Parties that the Third Party designs or their existing system have appropriate capacities to support the proposed development. The final letters shall be submitted no later than the 90% submittal stage.

The monthly Engineering Progress Report (EPR) from A/E’s shall contain the status of Third Party Approvals.

6.0 SAUDI ARABIAN GOODS AND SERVICES

So far as possible the Entity shall define the use of materials, supplies, goods, equipment, fabrications, crafts and services of Saudi Arabian origin for incorporation into the Design and Specifications. Refer to Volume 4 (Contracts & Tendering) for the detailed guidelines on the selection and approval of equipment/ materials suppliers.

7.0 CODES, STANDARDS AND DESIGN BASIS REPORT

The Entity shall include in the A/E’s scope of work the task of identification in the design criteria/ basis of design the codes and standards applicable on their project including treatment of any discrepancies between identified codes/ standards for every applicable design discipline. Refer to Volume 6, Chapter 5 for the guide on the selection of codes and standards and the order of precedence. The mere compliance with the Standards or declaration of deviations from the Standards does not relieve the A/E from their obligation to make sure that the work performed by the A/E is fit for the intended use and meets the generally acceptable criteria for quality and safety in addition to gaining the approval of any code deviation from the permitting authorities. The A/E is the Design Authority on the Project and as such, shall be responsible for the quality of Work and services performed by them as per the conditions of the Contract

Refer to Volume 6, Chapter 6, Project Submission Standards and Requirements (EPM-KE0-GL-000015) for the development of Design Basis Report (DBR), which shall include Codes and Standards applicable on a project.

8.0 DESIGN RISK MANAGEMENT

The Entity and the A/E shall incorporate within the design the lessons learned from similar work performed in the past by them. The Project Risk Management Plan shall include assessment and mitigation of design risks. The Entity shall provide input to the Project Risk Management process and take actions to mitigate risks identified in the risk register. Refer to Volume 13 (Risk Management) for details of risk management processes.

9.0 DESIGN CHECK, REVIEWS AND APPROVALS

The Entity shall define the requirements of its review and approval of design documents (drawings, calculations, reports, etc.) produced by the A/E.

All design documents at every stage of development shall undergo both checking and the required inter-disciplinary checking process before these are issued for formal design review or IFC. The extent of inter-disciplinary checking for each design document will be determined by the document originator depending upon the document type and the interface with other disciplines. The checker of every design document will be an independent person who will be qualified and experienced to originate the same document. In addition to the normal internal checking process, the A/E's shall use relevant check lists defined in this chapter. After the normal checking process, the A/E shall use the sample checklists given in this chapter to ensure nothing was forgotten in the document.

The A/E shall preserve all evidence of document checking, use of checklists and inter-disciplinary checks until closeout and present the evidence upon the Entity's request.

10.0 RFP - SCOPE OF WORK

The Entity shall develop the Scope of Work (SOW) document to be included in the RFP for engaging the A/E services. Similarly, the A/E shall develop, in coordination with the Entity, the SOW for the RFP for Construction/ Procurement/ Specialist Services Contracts. The contents of the SOW should be as succinct as possible leaving no room for interpretation. The A/E and the Entity shall use the SOW template included in the Procedures for the Development of Service Requisition (Document EPM-KE0-PR-000006) for the Contracts involving services. Refer to Volume 6, Chapter 3 (General Engineering Procedures) - on Procedures for the details of all General Engineering Procedures.

11.0 DESIGN LIFE OF A PROJECT

The Entity shall define in the scope of work document the design life of all permanent facilities including buildings, components and systems to ensure their structural, operational and aesthetic integrity last for a minimum of the intended life of the facilities. A/E's design shall be based on the life of the facilities as defined by the Entity. The Entity is to refer to Architectural Design Guidelines EPM-KEA-GL-000001, Section 1.11 on Facility Life Cycle for guidance.

12.0 TECHNICAL STANDARDS

Technical Standardization comprising of Standard Technical Specifications, Design Criteria and Typical Construction Detail Drawings (also referred as Standard Details) will bring about the uniformity in the design, improve safety, reduce engineering efforts and improve craft productivity. Refer to the Document EPM-EN0-PL-000001 (Technical Standardization Plan), included in Chapter 3 of Volume 6 of the National manual for Project Management (NMPM) for the procedure on the identification, development, approval and publishing of Technical Standards on Entity infrastructure projects throughout the Kingdom of Saudi Arabia.

13.0 ENERGY & WATER CONSUMPTION EFFICIENCIES

Many Infrastructure projects involve the construction of different types of buildings including housing. The buildings in general are one of the largest users of energy and water, and are a formidable polluter in terms of

greenhouse gas emissions. Therefore, an energy and water efficient building design approach has a high potential to make a valuable contribution to sustainable development.

In view of above, the Saudi Center of Energy Efficiency (SEEC) and the National Water Company (NWC) have developed guidelines/specifications for the efficient use of Electricity and Water respectively. The Saudi Standards, Metrology and Quality Organization (SASO) has updated the Saudi Building Code (SBC) in September 2018 and its other Standards and Specifications and incorporated, among other changes, the recommendations of SEEC and NWC on Electricity and Water efficiencies. In addition, the Saudi Council of Ministers has passed Resolution No. 3 dated 2/1/1438 (H) which mandates the use of District Cooling for all Government buildings exceeding specified floor area/concentration factor.

For all its projects, each Entity shall define in the A/E's Scope of Design the consideration of applicable requirements relating to Energy & Water efficiency and District Cooling, as defined in the latest Saudi codes/ standards/ Saudi Council of Ministers resolution.

Refer to EXPRO Document No. EPM-KE0-GL-000004 (Improving Energy and Water Consumption in Existing and New Building) issued as a reference design guideline for the MEP design of all Government buildings.

14.0 INSTRUCTIONS ON THE USE OF DESIGN AIDS

The purpose of Design Aids is to ensure consistent designs across Entity projects and better quality control of the design. The Entity shall include in the A/E's scope the identification and use of relevant general and discipline specific Design Aids in the performance of design scope. The Purpose and instructions on the use of all Design Aids included in this document are provided below.

14.1 Discipline Design Guidelines

The Design Guidelines, issued for each discipline for reference purposes, have been provided to address the most common engineering project design elements. They are to be used in conjunction with the requirements set forth by the applicable codes, laws and ordinances of the Project jurisdiction, recognized industry standards, good engineering practice and specific project needs. Omission of a reference in these "Design Guidelines" does not relieve the Entity's or A/E's responsibility for compliance with these requirements. The A/E is mandated to use professional judgment and ingenuity. These are general guidelines, and the A/E shall develop a project specific Basis of Design, Design Criteria and standards, that will meet the service requirements of the project with inherent qualities of safe, efficient, and economical operation. The A/E is ultimately responsible for the final design and its performance. These guidelines are not all-inclusive and the A/E remains responsible to insure that his design work complies with the contract obligations and conforms to the latest Saudi Building Code (SBC) rules, regulations, codes, standards and specifications.

The provisions of these Design Guidelines" are not intended to prohibit the use of alternative systems, methods or components. Due diligence shall be performed by the A/E to ensure the design is equivalent or superior to the prescribed elements of the guidelines. As required, the A/E shall propose modifications to the guidelines to meet specific project goals, conditions and requirements for the Entity's review and approval before proceeding with the development of a project specific Design Basis Report and Design Criteria which shall form the basis of the project design.

Refer to the discipline specific Design Guidelines, listed under reference section above, for the use by the Entities.

14.2 Discipline Deliverable Lists

Design deliverables (drawings, datasheets, calculations, specifications, material take-offs, etc.) are developed during the design phase to procure material, install, test and commission the projects. The types and number of drawings/ documents to be developed for a project will depend upon the project scope of work. The A/E's scope of work shall include development of all required design deliverables (drawings, calculations, specifications, etc.) and data such as Material Take Off (MTO), 3D Model, etc. required for the purchase of equipment and material, installation, testing and commissioning of the project facilities. The design documents shall be developed for all design stages as defined in Volume 6, Chapter 3 the Design Review Procedure (Document No. EPM-KE0-PR-000002).

Typical Deliverable lists, included in the discipline specific Design Aides, provide the Entity and A/E an aid to identify and define the design deliverables required on a project. This is an indicative list and depending upon the project SOW, the Entity and/or A/E may add/delete deliverables to suit the project. The A/E shall develop a register of all drawings/ documents required on a project during the early design phase for the Entity's approval before the commencement of detailed design. The A/E's Progress and Performance Reporting for a project will be based on the list of all deliverables.

Refer to Volume 9, Chapter 4 (Site Engineering) for the procedure on defining the as-built requirements.

14.3 Checklists

Checklists are not to be construed as a replacement of normal checking processes but an augmentation of the A/E's QC process. Checklists cover only the key elements of the design and not the complete document that is what a checker is expected to go through as a part of A/E's normal checking process. Checklists are to be used at every revision of the document development (10%, 30%, 60%, etc.). The list of design documents covered by a checklist shall be listed in it. One checklist can cover more than one similar design document such as Under Ground Fire Water Layouts for a zone or an area. One checklist shall not be used for different types of design documents such as calculations and equipment layouts. If deemed appropriate the A/E can develop additional checklists for use by their design teams.

A checklist shall be completed and signed by the originator before the document is sent to the checker. The checker shall check and tick appropriate boxes under the checker column and record comments in the bottom table of the document. If required additional comment sheets can be attached to the checklist. If a checklist covers more than one document, then the checker shall identify which specific documents their comments refer to. All comments received from the checker must be resolved with the originator, document revised (if necessary) before issue. The A/E shall retain copies of checklists in the Project Electronic Content Management System (ECMS) until the Engineering close out.

Refer to discipline sections of this chapter for discipline specific check lists. A generic Drawing Checklist, applicable to every discipline, is provided for use for those drawings that are not covered by any other discipline specific checklists, see table below for other non-discipline specific checklists included in National manual for Project Management (NMPM) :

SN	Checklist for	Document No
1	Checklist - Drawing	EPM-KE0-TP-000002
2	Checklist - Calculation	EPM-KE0-TP-000003
3	Checklist - Engineering Close Out	EPM-KE0-TP-000021
4	Checklist - Engineering Scope of Work	EPM-KE0-TP-000022

14.4 Templates

Templates are developed for use by the Entity or A/E to develop different types of project specific design documents such as Design Criteria, Specification, Tagging Procedure, etc. Templates, other than Data Sheet Templates, contain sets of instructions written in italics. The templates are designed to be editable and form the basis of a document that will be generated by the originator. The originator shall delete these instructions and replace them with project specific relevant technical contents. All main section headings as shown in the templates should stay; the originator can add or delete sub-sections under each main heading as deemed appropriate.

Details of different types of templates and the list of general (non-discipline specific) issued for use by the Entity/ A/E are provided below.

Template - Basic Engineering Design Data (BEDD)

The Basic Engineering Design Data (BEDD) document is specific to every project and is generated by the Entity and/or A/E. This project specific document shall contain site weather, survey, seismic, tidal (where required), geotechnical etc. data required for the design of the project.

Any information provided elsewhere, such as Design Criteria document, shall not be repeated in the BEDD. The Entity and/or A/E shall develop this document before the Project Design Basis Report and Design Criteria is finalized.

This template is included in the general (non-discipline specific) templates list, see table at the end of this section for the template title and document number.

Template - Tagging Procedure

Tagging of equipment, material (cables, pipes, instruments, FCU's, etc.) and Buildings (room, floor, wall, corridor etc.) is required to identify and track equipment/ components on design documents, material management (purchase, storage, issue, etc.) and identification of cables, pipes, power outlets, fixtures, etc. Tagging will also be useful for the asset management by the Entity during operation phase of the project. Tagging system may vary between different Entities depending upon types of assets, accounting system (cost codes), etc. but within an Entity same tagging procedure should be used across all projects.

The Entity shall develop and issue a tagging procedure for use on every project.

This template is included in the general (non-discipline specific) templates list, see table at the end of this section for the template title/ document number.

Templates - Datasheet

Data-sheets will be used by the A/E along with specifications to describe specific design requirements (such as dimensions, rating, design margins) if the specifications are generic and not developed for specific equipment. For example, a transformer specification may include construction, material, connection types, standards, etc. but the specific requirements for each transformer (capacity, X/R ratio, tap changes, etc.) is to be covered by its Data Sheet. The Data Sheet will include designer requirements where suppliers will be required to provide information starting at the bid stage. Once the design parameters are finalized a datasheet is to be updated with the final agreed parameters, issued for purchase and construction and it then will replace the Original Data Sheet issued with RFP.

Template - Document and Data Submittal Requirements (DDSR)

This template is developed for use by the Entity to define the data and document submittal requirements of the supplier and construction contractor, both at bid stage and after award. For the contracts involving site works, the construction contractor will also provide input in the preparation of this document. This document shall be part of the Service Requisition package. Refer to Volume 6, Chapter 3 Development of Service Requisition (EPM-KE0-PR-000006).

This template is included in the general (non-discipline specific) templates list, see table at the end of this section for the template title/ document number.

Template - Design Criteria

As described in Chapter 6, the Design Criteria shall be developed for each discipline by the Entity and/or A/E. The Design Criteria document shall refer to the applicable codes and standards, specifications, the basis of equipment and material sizing, battery limits and conditions, and details of the design software to be used for the design calculations, etc. The design criteria can be a standalone document or be a part of the Basis of Design Report. As described above, the A/E shall use discipline design guidelines to develop the design criteria.

Refer to the discipline specific sections for Design Criteria templates. Depending upon the scope of the project all the sections of these templates mayor may not be applicable. Also, additional sections may be included to completely define the design and installation requirements of a project. Depending upon the requirements/ projects the Design criteria may be provided by Entity or its development included in the scope of A/E during the early part of the design and shall be approved by the Entity before its implementation in the design / construction.

Template - Technical Specifications

The Entity shall develop its Standard Specifications and provide them to the A/E for use on their projects. These Standard Specifications will be reviewed and if required, modified to suit specific Project needs and issued as Project Specifications after the Entity's approval. The Entity may advise the A/E to produce additional specifications that are required as Standard Specifications for a Project and are not available from the Entity. The specifications shall be developed in the CSI format using an industry approved software such as Building System Design Inc. SPECLINK-e software.

This template is included in the general (non-discipline specific) templates list, see table at the end of this section for the template title/ document number.

Template - Third Part Design Approval

This template is developed for use by the Entity for obtaining confirmation of its design by the third parties having jurisdiction on their projects such as SEC, SWWC, etc., see section 5.0 above for the details.

The following is the list of General (non-discipline specific) templates:

SN	Template for	Document No
1	Basic Engineering Design Data - Template	EPM-KE0-TP-000013
2	Tagging Procedure - Template	EPM-KE0-TP-000012
3	Document and Data Submittal Requirements	EPM-KE0-TP-000008
4	Technical Specification - Template	EPM-KE0-TP-000009
5	Third Party Design Approval Template	EPM-KE0-TP-000010
6	Template - Standard Drawings	EPM-KE0-GL-000018

The CAD drawing frames and Symbols by discipline and drawing sizes are developed in AutoCAD format and available for use by the Entities.

14.5 Use of Design Automation Software

In order to achieve the consistency of deliverables and design tools across the Entity's projects and the ease of training Entity engineers in the use of design data, the Entity shall ensure that the same design software is used on all their projects. The Entity shall ensure that each design software package including its version used on a project, has undergone its internal design software validation process and is approved for use (see EPM-KE0-PR-000011 - Verification and Validation of Computer Programs). The Project Automation Plan shall be prepared by the A/E and approved by the Entity for every project and shall include a list of all design software to be used for the design.

See Attachment 8: EPM-KE0-RG-000009 - List of Commonly Used Design and Engineering Software as a starting point for selecting design and analysis software:

14.6 Typical Construction Detail Drawing (TCDD)

Use of TCDD's reduces engineering review efforts, brings design consistency across the projects and simplifies material take-off (MTO) for procurement and material management at site.

As examples, five TCCD's for each of the main engineering disciplines are included in the discipline specific sections of Chapter 7. The purpose of issuing these samples is to provide the A/E guidance on the format and contents of typical TCDD's. These samples shall not be used by the A/E on a project. The Entity/ A/E shall identify and develop all TCDDs required specific to their Projects.

Similar to the Standard Specification mentioned above, the Entity shall provide the A/E its TCDD's for use on their projects. If additional TCCDs are envisaged, the Entity shall include in the A/E's scope the task of developing the additional TCDDs for its approval before use on a Project.

15.0 CONSTRUCTABILITY & SAFETY IN DESIGN

15.1 Constructability of Design

Early engagement of Construction during the design phase will help the project optimize the construction sequence, the use of construction equipment, potential reductions in temporary support structures and create opportunities for possible use of permanent facilities (storage, water/ power, large equipment access, etc.) during the construction phase. In addition, construction can provide valuable input during design on modularization such as use of pre-cast structures (beams, manholes, piles, slabs etc.) which will provide overall cost and schedule benefits to the project. Technical Queries (TQ) and requests for design changes from construction will also reduce significantly if construction is engaged during the design phase.

The Entity shall provide construction expertise during all stages of design phases (10%, 30%, etc.) and ensure that the specific attributes related to constructability are incorporated in the design by the A/E. This can be achieved through assigning a Construction Coordinator on every project who, as a minimum, will participate in the design reviews (10%, 30%, 60%, etc.) to provide construction input. This coordinator will have previous construction experience on similar types of projects. The Construction Coordinator will guide the design teams on constructability requirements and develop the checklists to suit the scope of each project. The design will be reviewed against such checklists and comments during design reviews will be recorded in the design review report and closed before the next review cycle.

15.2 Design for safety

Design contributes to the site personnel safety not only during the O&M of the facility but also during the construction phase by making appropriate decisions during the early project execution phases. Besides O&M, all the engineers and designers on the project are required to consider the health and safety aspects of the construction and startup activities necessary to implement their designs. At an early stage in the design process, Engineering will need to consider general hazards that their designs have the potential to create, such as falls from height, working in potentially contaminated conditions, energized systems, etc. As the design develops, hazards relating to specific items will need to be considered. Once hazards have been identified, the responsible engineer will need to consider the risk from the hazard and the means by which it can be mitigated. If a design solution is not available for any identified safety hazard then this will be elevated to construction and included in the risk register to be taken up during risk assessment reviews.

Actual hazards likely to be encountered will vary depending upon systems, equipment, and structures being designed. Examples of the principal hazards to be considered include but not limited to:

- FALLS FROM HEIGHT: Typically, these are from access points, ladders, scaffolding, fragile roofs, roof edges or holes in roofs, structural steelwork, temporary work platforms and other parts of floors or surfaces.
- SLIPS AND TRIPS. Typically the selection of walking surfaces to avoid such hazards, such as diamond plate grating
- TRAPPED or CAUGHT BY SOMETHING COLLAPSING OR OVERTURNING. Typically these are buildings or structures or parts of thereof, earth or rocks (e.g., trench collapse), equipment movement (including lifting machinery), collapse of scaffolding, vehicles overturning, and items falling from temporary supports.
- STRUCK BY MOVING VEHICLE. These include bulldozers, excavators, private vehicles, road tankers, etc.
- STRUCK BY FALLING/FLYING OBJECTS. Objects falling from height, falling into excavations or from vehicles.
- CONTACT WITH MOVING MACHINERY. Conveyor belt and hoist, vehicles or plant and pedestrians.
- ENCLOSED SPACE HAZARDS. Confined space access for internal parts installation, painting and coating.
- CONTACT WITH ENERGIZED ELECTRICAL CIRCUITS. Overhead or underground lines in work area.
- EXPLOSION AND FIRE. Fire protection and building design standards will dictate permanent plant designs, but consider the temporary conditions during construction.

- EXPOSURE TO HIGH NOISE AND VIBRATION LEVELS. These can be temporary such as Steam Blows or associated with permanent plant equipment, of various tonal qualities.
- EXPOSURE TO VENTING AND RELIEF OF HIGH TEMPERATURE AND PRESSURE STEAM, WATER, AIR, AND HYDRALIC FLUIDS
- EXPOSURE TO COMBUSTIBLE AND ASPHYXIANT GASES, AND COMBUSTION EXHAUSTS
- EXPOSURE TO HAZARDOUS CHEMICALS, FIBERS, AND DUSTS

Each project will have unique design features that need be uniquely addressed by the design team. The Entity shall ensure that the A/E's design scope on the Entity's projects includes identification and mitigation of hazards during the design phase.

Refer to the document no. EPM-KCC-PR-000005 (Project Construction Constructability Procedure) in Volume 9 of National manual for Project Management (NMPM) for the guide on developing constructability checklist.

16.0 ATTACHMENTS

1. EPM-KE0-TP-000002 - Checklist - Drawing
2. EPM-KE0-TP-000003 - Checklist - Calculation
3. EPM-KE0-TP-000008 - Template - Document and Data Submittal Requirements
4. EPM-KE0-TP-000009 - Template - Technical Specifications
5. EPM-KE0-TP-000010 - Template - Third Party Design Approval
6. EPM-KE0-TP-000012 - Template - Tagging Procedure
7. EPM-KE0-TP-000013 - Template - Basic Engineering Design Data
8. EPM-KE0-RG-000009 - List of Commonly Used Design and Engineering Software

Attachment 1 - EPM-KE0-TP-000002 - Checklist - Drawing

(This checklist to be used if another specific drawing type checklist is not available)

PROJECT NAME:		DRAWING NO.		REV.					
No.	QUESTIONS	ORIGINATOR			CHECKER		
		N/A	YES	NO	N/A	YES	NO
Preparation and Checking							
01	Does the drawing comply with applicable codes, standards and regulatory requirements?	☐	☐	☐	☐	☐	☐
02	Does the drawing comply with applicable project design criteria, system or structural functional requirements, Scope Book, and Design basis documents considered?	☐	☐	☐	☐	☐	☐
03	Is the latest background used in the drawing?	☐	☐	☐	☐	☐	☐
04	Has information from the latest calculations supporting the drawing been used?	☐	☐	☐	☐	☐	☐
05	Match lines checked and are correct?						
06	Has it been reviewed for constructability?	☐	☐	☐	☐	☐	☐
07	Operability requirements considered?	☐	☐	☐	☐	☐	☐
08	Accessibility and other design provisions (including safety in design) for maintenance, repair, and in-service inspection been considered?	☐	☐	☐	☐	☐	☐
09	Has an interference check been performed and clashes resolved?	☐	☐	☐	☐	☐	☐
10	Are the references provided and correct?	☐	☐	☐	☐	☐	☐
11	Notes provide reference to applicable specifications, standard details, key design requirements such as material, paint, concrete class, etc.?						
12	On Issued for Construction drawings, have holds been placed for items with incomplete or preliminary information?	☐	☐	☐	☐	☐	☐
13	Are the battery limits for design/ supply/installation clearly marked						
Co-related Documents							
14	Have all outstanding change items such as Design/Field change notices been incorporated?	☐	☐	☐	☐	☐	☐
Coordination and Review							
15	Has appropriate interdisciplinary and intradepartmental coordination been done?	☐	☐	☐	☐	☐	☐
16	Have reviewers from other disciplines/departments evaluated items pertinent to their area and provided their comments?	☐	☐	☐	☐	☐	☐
17	If applicable, has the drawing been stamped by a registered professional engineer?	☐	☐	☐	☐	☐	☐
Administrative							
18	Is the Drawing number and template in accordance with the Project Requirements?	☐	☐	☐	☐	☐	☐
19	If revised, have revisions been clearly identified with clouds and clear statement in revision block?	☐	☐	☐	☐	☐	☐
20	Have previous revision indications been removed?	☐	☐	☐	☐	☐	☐

No.	Checker's Comments	Resolution
Originator's Name / Signature and Date:		Checker's Name / Signature and Date:

Attachment 2 - EPM-KE0-TP-000003 - Checklist - Calculation

PROJECT NAME:		CALCULATION NO.			REV.		
No.	QUESTIONS	ORIGINATOR			CHECKER		
		N/A	YES	NO	N/A	YES	NO
A.	**General**						
1	Is the calculation legible, logical and orderly fashion and uses standard calculation template in the procedure EPM-KE0-PR-000003	☐	☐	☐	☐	☐	☐
2	Table of Contents, if used, consistent with the calculation including page numbers?	☐	☐	☐	☐	☐	☐
3	Is the purpose of the calculation and intended use of the output clearly stated?	☐	☐	☐	☐	☐	☐
4	Is the coversheet properly completed, including title, calculation number (in accordance with the Entity's Document Numbering System), Discipline and Calculation Status Designator?	☐	☐	☐	☐	☐	☐
5	Are the calculation revisions clearly identified?	☐	☐	☐	☐	☐	☐
6	Do all pages of attachments and appendices include job number, calculation number, revision number, attachment/appendix number, page number (with each attachment/appendix independently paginated), and the source for the attachment and/or appendix?	☐	☐	☐	☐	☐	☐
7	Is the total number of sheets in the main body of the calculation (without any attachments or appendices) listed correctly on the calculation coversheet?	☐	☐	☐	☐	☐	☐
8	If preliminary information was used in the calculation, the calculation must state this.	☐	☐	☐	☐	☐	☐
9	If calculation is being used for Licensing or Permitting, has it been converted to "Confirmed"?	☐	☐	☐	☐	☐	☐
10	Have the initials of the originator, and checker been properly entered in the "BY" and "CHECKED" boxes on the coversheet?	☐	☐	☐	☐	☐	☐
11	When revising a calculation, have all the changes been properly indicated by use of revision bars in the right-hand margin?	☐	☐	☐	☐	☐	☐
B.	**Input Data & Assumptions**						
12	Does it list all the codes/ standards the calculation is based on and are these codes specified in the Project Design Basis or specifications?	☐	☐	☐	☐	☐	☐
13	Are the data input sources correctly used and clearly identified and retrievable (if not retrievable, to be included in the calculation)?	☐	☐	☐	☐	☐	☐
14	Are all Design Inputs "Issued for Use" or vendor document "Status 1"? If not, is the calculation issued for "Preliminary Information" which will need be Confirmed in the future.	☐	☐	☐	☐	☐	☐
15	Is there a complete list of valid and reasonable assumptions and engineering judgments stated along with supporting technical rationale?	☐	☐	☐	☐	☐	☐
C.	**Method of Analysis**						
16	Does the calculation use an accepted methodology that represents a "Standard of Practice" used in similar applications?	☐	☐	☐	☐	☐	☐
17	Is the methodology readily understood, and is it appropriate for the type of calculation, in accordance with applicable codes, standards, and local regulations?	☐	☐	☐	☐	☐	☐
18	Are the equations correct, appropriate for use, source identified, and derivation/justification provided for major equations not of common usage?	☐	☐	☐	☐	☐	☐
19	Are input and outputs in SI units?	☐	☐	☐	☐	☐	☐
D.	**Use of Analysis Software**						
20	If analysis software used, has it been identified (name and version) in the body of the calculations and approved for use by the Entity and Design Contractor's organization	☐	☐	☐	☐	☐	☐
21	Has the analysis software been verified and validated by the Design Contractor or other organization performing the analysis?	☐	☐	☐	☐	☐	☐
22	Does the computer model that has been created, adequately reflect actual (or to be modified) plant conditions (e.g., dimensional accuracy, type of model/code options used, time steps, etc.)?	☐	☐	☐	☐	☐	☐
23	If the calculation contains a large amount of input/output data that would make the checking/verification process data laborious, has a simplified means been used to show consistency and accuracy without having to verify all the data entries?	☐	☐	☐	☐	☐	☐

Attachment 3 - EPM-KE0-TP-000008 - Template - Document and Data Submittal Requirements

Document and Data Submittal Requirement (DDSR) Template

The following table indicates and identifies the minimum Document and Data Submittal Requirements (DDSR) for this Contract:

DDSR No.	Description	Submission Requirements & Schedule						
		A	B	C	D	E	F	G
		Submit Document with Proposal (Y/N)	Document Review Required Before Fabrication (Y/N)	Schedule for submittal after PO Award (See Note 1)	Copies required Electronic/Hard copies (See Note 2)	Schedule for submittal of Certified DWG'S & Data (see Note 4)	Required in O&M Manual (Y/N)	Requirement Refer to Note 5
	DOCUMENT SUBMITTALS AND SCHEDULES							
1	An electronic list of all document submittals, identified by the Item Numbers of this form with an associated Seller submittal number.							
2	Manufacturing & Delivery Schedule (applicable for MR)							
3	Progress Reports							
	Quality Assurance (AA)/ Quality Control (QC)							
4	Quality Plan							
5	Quality Assurance Program							
6	Inspection & Test Plan (ITP)							
7	Quality Assurance Program per Contract Requirements (for contract packages only)							
8	Index to certified Manufacturer's Record Book (MRB)							
9	Certified Manufacturer's Record Book (MRB)							
	Environment, Safety and Health							
10	Equipment reliability checklist							
11	Documentation to achieve noise reduction measure to obtain ___dB(A)							
	TRANSPORT AND STORAGE							
12	Bill of Material/Packing List including sub tier BOM and shipped loose component list for Shipment							

Attachment 4 - EPM-KE0-TP-000009 - Template Technical Specifications

EXPRO
هيئة كفاءة الإنفاق والمشروعات الحكومية
Expenditure Efficiency & Projects Authority

Template - Technical Specification

Table of Contents

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Expenditure Efficiency & Projects Authority

Template - Technical Specification

1.0 GENERAL

1.1 Work Included

1.2 Related Work Not Included

1.3 Service Requirements

1.4 Terminal Points

1.5 Quality Assurance

1.6 References

As appropriate this part of the specification shall contain:

1. *Definitions of terms used in this specification*
2. *Description of equipment/ material covered by the specification*
3. *Inclusions and exclusions of the equipment/ material (e.g. compressor specification may exclude air receiver vessel but interconnecting piping included)*
4. *Site Environmental conditions, quality of utilities or feed, etc.*
5. *Battery limits of supply (tie-in information with connected equipment/ systems)*
6. *Describe the requirements of manufacturer's quality management system (consistent with industry standards for the goods and services being procured)*
7. *Reference to applicable codes and standards and other specifications, requirement of third party certifications (e.g UL), etc. Provide order of precedence.*

Specification may include reference to other technical specifications (e.g. painting, cables, etc.) but the same information (available in other specification) or standards referenced should not be reproduced here.

Note: Entity to develop specifications in Construction Specification Institute (CSI) approved format using a industry standard software.

As needed additional sub-sections (x.7, x.8, …) and sub-sub-section (A, B, C, ….) can be added.

2.0 PRODUCTS

2.1 Materials

2.2 System Requirements

2.3 Controls, Instrumentation, and Electrical Requirements

2.4 Fabrication

As appropriate this part of the specification shall contain:

1. *Provide functional description of the equipment*
2. *Reference to data sheet (if produced) or provide performance data (size, flow, voltage, size, noise level, max dimensions, etc.)*
3. *Material of construction (and exclusions such as asbestos), specific requirements of components (e.g. instruments, cables, pipes, valves, etc.)*
4. *Provide electrical and control/ requirements if applicable (e.g. DCS/ PLC, Local CP, SCADA connection, etc.)*
5. *Any specific requirements with fabrication method*
6. *Design life*

The specification writer should avoid describing the method to be employed by the Contractor to reach the degree of finish required. To do so may block innovation on the part of the Contractor, restrict the use of different methods or machinery, or even relieve the Contractor of his contractual obligation for the quality of the end product.

As needed additional sub-sections (x.7, x.8, …) and sub-sub-section (A, B, C, ….) can be added.

Attachment 5 - EPM-KE0-TP-000010 - Template Third Party Design Approval

NAME OF ENTITY:	ENTITY's LETTER No.	DATE:

To : *The Address of ~~Third Party~~ having jurisdiction in Entity's Project*

Subject : *(Name of the Third Party's Design Approval for (Title of the Entity's Project/Facility)*

Reference : *Provide reference of meeting or discussion wherein the approval was deemed to be granted*

Attention : ***Name with Designation of ~~Third Party~~ person authorized to approve design documents***

Dear Sir,

This is further to various meetings/correspondence leading up to our last discussions/meetings on _____ at _____ between Mr. ABC of *(Name of the Entity)*, *(Designation)* with your Mr. DEF, *(Designation)* on the matter under subject.

Based on above we consider the following design documents as approved by *(Name of the Third Party)* unless we hear otherwise from you within five working days of issue of this letter. *(Name of the Entity)* will proceed with the purchase and construction of the *(Name of the Facility/Project)* based on these documents.

SN	Document No.	Document Title	Revision and Date	Notes
1				*Provide details of any holds/ condition of approvals under notes above.*

Thanking you for your cooperation and support to the progress of *(Name of the Project/Facility)*.

Yours Faithfully,

Attachments:

(If available include the transmittal copy of submission of documents listed above, else include copies of drawings as attachments).

Note for Entity:

1. If required, the list of documents could be sent as an attachment to the letter
2. Entity to obtain from third party the acknowledgement of receipt of this letter.

Attachment 6 - EPM-KE0-TP-000012 - Template Tagging Procedure

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Template - Tagging Procedure

1.0 PURPOSE

Entity to define the purpose for issuing its tagging procedure (e.g. to assign unique identifiers ("tags") to components. State how the tags will be used (e.g., on design documents, for material receipt at a project site, for asset management throughout the life off the building or facility, etc.). This must be used on Entity's all Projects.

2.0 SCOPE

State the scope of what is included. Define the structures, systems, and/or other components that require a unique identifier to track throughout the design, construction, procurement, commissioning, and operating phases of the building or facility. If not already stated in the project documents, the scope for assigning tags must be agreed to by the Entity.

3.0 DEFINITIONS

Definitions	Description
Add any terms that require a definition for consistent use on the left side of this table.	*Add the definition of the term on the right side of the table.*

4.0 REFERENCES

List any references and/or supporting project documents in this section. Include the document title along with the document number and revision or other unique identifier (such as published version or date). References made throughout this document may simply mention the appropriate reference section number (i.e., Reference 4.1, 4.2, 4.3, etc.) without repeating the entire referenced document title throughout the body of this tagging procedure.

5.0 RESPONSIBILITIES

Define the roles and responsibilities for assigning tag numbers. State whether the Entity will assign tags or delegate this task to the A/E (following the rules in this procedure.) Also state who will be responsible for updating the tables that will be attached to the procedure (i.e., Entity or A/E) when additions are needed to cover new items not originally anticipated at the initial issue of the procedure. Outline the process to get the Entity's approval for any changes to this procedure (including any changes to the attached tables).

6.0 PROCESS

Outline the process to be followed to define the format for tags on the project and obtain the Entity's agreement. Some sample formats are given here, but these shall be expanded as needed to conform to the specific needs of a given project. The number of characters allocated to each section of a tag number may be increased or decreased from the what is shown in the samples below for different component types (e.g., mechanical pump, structural steel, architectural door, electrical cable, etc.). Even if a recognized identification/tagging system is used, such as the Kraftwerk Kennzeichen System (KKS), the exact formats to be followed for each structure, system, and component tags shall be clearly defined; attachment tables will still be needed because of the wide variations adopted for the KKS and similar tagging methodologies.

6.1 Tag Format for System-Related Components

Define the format to be used for system-related components, such as mechanical equipment, lines, valves, ducts, and dampers; electrical equipment and cables that power mechanical components; instrumentation and controls related to system components; etc. More than one format may be required to accommodate the needs of the project for system tags.

Attachment 7 - EPM-KE0-TP-000013 - Template - Basic Engineering Design Data

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Expenditure Efficiency & Projects Authority

Template - Basic Engineering Design Data

1.0 PURPOSE

Provide the purpose of Basic Engineering Design Data document and who will produce and approve. Refer to Chapter 7.0 for the reason of developing Basic Engineering Design Data document. Write may add/ delete sections defined in this template to suit every project.

General note (applicable to all documents): Information provided in other project documents such as Scope of Work, Design Basis, Design Criteria, Geotechnical report, etc. should not be repeated in entirety in different documents (including this), only brief description and reference to other documents be provided.

2.0 FACILITY DESCRIPTION

Provide brief description of the project – capacity, key design requirements/ risks/ open issues, etc.

3.0 SITE-SPECIFIC DESIGN CRITERIA

3.1 Facility Location

Provide the location of Project including name of the local body having jurisdiction on Project site, site access roads and approximate plot boundary details.

3.2 Ambient Conditions

Define the following ambient conditions to be used as basis for the design of the Project:

Design Criteria for Outdoor Equipment	
Maximum Design Dry Bulb Temperature	*XX ^{0}C*
Coincident Wet Bulb Temperature	*XX ^{0}C*
Minimum Design Dry Bulb Temperature	*XX ^{0}C*
Design Criteria for Indoor Equipment Inside Building	
Maximum Design Dry Bulb Temperature	*XX ^{0}C*
Minimum Design Dry Bulb Temperature	*XX ^{0}C*
HVAC Design Conditions	
Maximum Outdoor Dry Bulb Temperature	*XX ^{0}C*
Coincident Wet Bulb Temperature	*XX ^{0}C*
Minimum Outdoor Dry Bulb Temperature	*XX ^{0}C*
Design Wind Speed	*Xxx kph*
Facility Conditions	
Barometric Pressure	*XX Pascal*
Elevation (define applicable Datum)	*XXX Meters above MSL*
For Indoor Facilities *(if not provided elsewhere)*	
Heated and Ventilated (Not Air-Conditioned) Design Indoor Bulk Temperature Range for Ventilation Fan Sizing Minimum Indoor Temperature (for designing heating)	 *xx^{0}C - yy^{0}C* *XX ^{0}C*
Air-Conditioned Space Indoor Design Conditions Occupied Areas Maximum Minimum Relative Humidity Un-occupied Areas Maximum Minimum	 *xx^{0}C* *xx^{0}C* *xx% ± y%* *xx^{0}C* *xx^{0}C*

3.3 Precipitation

Provide Annual average total, max 24-hour total and max 25 year 5-minute rainfall intensity: xxx mm

Attachment 8 - EPM-KE0-RG-000009 - List of Commonly Used Design and Engineering Software

SN	Design Discipline	Program Name	Program Description	Name of Software Developer
1	General	MS Access	Information Management tool for storing, referencing, reporting and analysing of data in tables	Microsoft
2	General	MS Excel	A numerical spreadsheet program that can perform calculations & includes graphing tools, pivot tables, & a macro programming language called Visual Basic for Applications.	Microsoft
3	General	MS PowerPoint	A computer slide presentation program.	Microsoft
4	General	MS Word	Use as a word processing program.	Microsoft
5	General	MicroStation	Used to create graphical or schematic 2D CAD drawings, including PFDs & P&IDs (when an intelligent program is not required).	Bentley Systems
6	General	e-SPECS	Automates the preparation of construction specifications by extracting product & material requirements direction from the Revit Building Information Model (BIM) software. Provides a platform for authoring & maintaining engineering technical specifications in the CSI format.	[illegible]
7	General	Adobe Acrobat Pro	A .pdf file viewer that can open, edit, & interact with other .pdf documents. It can view, word search, & edit .pdf documents.	Adobe
8	General	Adobe Acrobat Reader	A .pdf file viewer that can open & interact with other .pdf documents. It can view & word search .pdf documents.	-
9	General	AutoCAD	Used to create graphical or schematic 2D CAD drawings, including PFDs & P&IDs (when an intelligent program is not required).	Autodesk
10	General	Nuance PDF Converter Enterprise	Used to create, edit or convert PDF files from or to other formats with optical character recognition scanning capabilities.	Nuance
11	General	Visio	Used to create graphical flow diagram sketches & figures.	Microsoft
12	General	Raster Design	Raster Editor for AutoCAD	Autodesk, Inc.
13	General	MATHCAD	Engineering Calculations	Parametric Technology Corp.
14	General	ProjectWise	Electronic document and file management system	Bentley Systems
15	General	REVIT	3D CAD building design software specifically built for Building Information Modeling (BIM), which includes Architectural design; Mechanical, Electrical, & Plumbing (MEP) design; Structural design; & Construction modules.	[illegible]
16	General	Smart3D	3D data-centric and rule-driven Plant Design system	Hexagon
17	General	E3D	3D data-centric and rule-driven Plant Design system	Hexagon
18	General	CADWORX	3D file based Plant Design system	Hexagon
19	General	Subsurface Utility Engineering (SUE)	The software's 3D modeling capabilities allow you to automatically create 3D models from survey information, CAD artifacts, GIS, Excel spreadsheets & databases	Bentley Systems
20	General	[illegible]	Federated Model Assembly & Model Review	[illegible]
21	General	[illegible] Building Designer	Building BIM	Bentley Systems
22	Arch	[illegible]	3D Conceptual Civil Design	[illegible]
23	Arch	3DSMax	3D Modeling, Rendering, & Animation	[illegible]
24	Civil	INROADS	CivilSite & Roadway Design	Bentley Systems
25	Civil	Civil3D	A civil engineering design & documentation software that supports building information modelling, mainly	Autodesk