هيئة كفاءة الإنفاق والمشروعات الحكومية
Expenditure Efficiency & Projects Authority

EXPRO National Manual for Projects Management

Volume 6, chapter 1

Engineering Introduction

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1.0 PURPOSE

The purpose of the Engineering volume of the EXPRO Projects White Book is to provide guidance to the Entities in defining and managing the technical and engineering services for their infrastructure projects.

The requirements defined in this volume along with the Saudi Arabian and International Codes and Standards, and the emphasis on the use of Saudi Arabian goods and services define the level of design detail and quality required for the Government's infrastructure projects.

Notwithstanding the provisions of this Volume, the Entity shall hold the Architect & Engineer (A/E) organizations totally responsible for the design and the preparation of the Construction/Procurement Contract Packages under their scope up to the international standards of care and due diligence. The Entity shall ensure that the A/E performs a design that is fit for the intended use and meets the scope and the acceptable criteria for quality and safety. The Entity shall assign the qualified design firms as the Design Authority for their projects and ensure that the design services performed by them are as per the conditions of the Contract.

2.0 SCOPE

The content of this Engineering Volume including the procedures, templates, checklists, guidelines, etc. shall be employed by the Entity on infrastructure projects in the Kingdom of Saudi Arabia. The requirements set out in this volume shall be employed by the Entity on all their projects whether the design is performed by the A/E, Engineering, Procurement and Construction (EPC) Contractors or Specialty Consultants.

3.0 DEFINITIONS

Term	Definitions
3D	Three dimensional
A/E Consultant (A/E)	Architectural/Engineer Consultant appointed by the EPMO to undertake the design of the project.
Entity	A Saudi Government organization which is responsible for the delivery of government funded infrastructure construction projects.
EPC	Engineering, Procurement and Construction
GES	General Engineering Service
NMPM	National Manual for Project Management
QA	Quality Assurance
QC	Quality Control
T&C	Testing & Commissioning

4.0 REFERENCES

4.1 Chapters of EXPRO Project White Book (NMPM) Volume 6

- EPM-KE0-GL-000011 - Definitions and References
- EPM-KE0-GL-000012 - General Engineering Procedures
- EPM-KE0-GL-000013 - Units of Measurement
- EPM-KE0-GL-000014 - Codes, Standards and References
- EPM-KE0-GL-000015 - Project Submission Standards and Requirements
- EPM-KE0-GL-000016 - General Design Guideline
- EPM-KE0-PR-000006 - Development of Service Requisition – Procedure
- EPM-EN0-PL-000001 - Technical Standardization plan

4.2 Other Volumes NMPM

- Volume 1 - Introduction
- Volume 2 – Project Registration
- Volume 3 – Project Initial Planning
- Volume 4 - Contracts and Tendering
- Volume 5 - Procurement
- Volume 7 - Project Controls and Reporting
- Volume 8 – Information Communication Technology (ICT)
- Volume 9 - Construction Management
- Volume 10 - Testing & Commissioning
- Volume 11- Health, Safety, Security and Environment (HSSE)
- Volume 12 - Quality
- Volume 13 - Risk Management
- Volume 14 - Document Management System
- Volume 15 - Sustainability
- Volume 16 - Handover and Closeout

5.0 RESPONSIBILITY

Based on the scope of projects the Entity shall identify from this volume the templates, guidelines, procedures, etc. applicable for use on its projects and shall ensure compliance by the A/E. The Entity shall tailor the documents for use on its projects without changing the original purpose or intent of the documents. Request for any needed augmentation in the templates, guidelines, procedures, etc., which has potential to change the intent or purpose of the original document, shall be discussed and agreed with EXPRO by the Entity before implementing the changes.

6.0 GENERAL ENGINEERING SERVICES

The Entity may hire one or more A/Es to work as General Engineering Service (GES) contractor(s) to perform various engineering/ design services tasks for the Entity including but not limited to:

- performing studies with consideration of the site conditions
- performing project site walk to familiarize with the site condition and identify interfaces
- performing preliminary calculations and establishment of rights of way
- developing project scope during initial planning phase
- developing design scope of work for Entity's major projects
- review design performed by Engineering Services contractors
- providing day to day design services as required

In addition to above the GES may be required to provide the Entity, the support for day to day miscellaneous design services as required. The Entity shall develop a work plan for the release of task orders to the General Engineering Services contractor along with the procedures for the progress measurements and reporting requirements.

As a good design practice, the Entity shall ensure that the A/E has given due consideration to, but not limited to, the following:

- Design Criteria / Design Basis Report
- Material availability
- Rapid construction (if applicable)
- Maintainability
- Energy and water conservation
- Public safety (including fire life safety) and protection of property

- Standardized components / equipment
- Acoustics control
- Corrosion protection and control
- Third party approvals
- End user document verification
- Establish Utility connections
- Reference and as-built drawings
- the protection against UV radiation

On brown field projects, following additional considerations shall be taken into account by the A/E:

- Safety plan extension/improvement
- Existing structure stability
- Phasing and construction sequence
- Conformance with existing facilities
- Establishment of power/ utility system tie-ins
- Demolition work

Entity may need the services of specialty consultants such as Fire Engineer, Acoustic Specialist, etc. to develop the basis for A/E to perform the detail design. Also, the Entity may determine the need of an independent specialty consultant to review/ check the design of specialty or critical systems designed an A/E.

In any case the Entity shall not relieve the A/E's of the obligation to ensure that the work performed by them is fit for its intended use and meets generally applicable criteria for quality and safety. Engineering is responsible for equipment and material quantities; therefore, the A/E must produce bill of quantity for each project and track it during the design progress up to the completion of the design.

7.0 SITE INVESTIGATION

To support the design of the Projects, site investigation may be required to provide input to the initial planning stage. In addition, the Entity will require detailed site investigation to support the detailed design execution phase, such investigation may include Survey, Geotechnical, Environmental, etc. These are specialty engineering services that tend to be contracted independently prior to design being performed. The Entity will select such specialty firms for a specific project or have a long-term contract to provide such services on a task basis. Refer to the document EPM-KE0-GL-000015 - Project Submission Standards and Requirements of the EXPRO Projects White Book Volume 6 for the details of site investigation requirements.

8.0 TECHNICAL STANDARDIZATION

Technical Standardization for government infrastructure projects will lead to the uniformity of design & material, improved safety, reduced engineering efforts, better construction quality & productivity and certainty of outcome. Refer to the document EPM-EN0-PL-000001: Technical Standardization Plan which defines the EXPRO plan to achieve the Technical Standardization across the projects.

Entities shall identify the lists of Technical Standards (comprising Standard Specifications, Design Criteria and Standard Details) required for the types of projects each undertakes, assess Entity's existing standards and develop lists of standards which need be developed or existing modified. Once the Technical Standards are identified and agreed, the Entity will develop a RFP for A/E's to develop technical Standards using EXPRO Projects White book templates.

9.0 STUDIES

At times the Entity will require studies to be performed for their projects such as but not limited to:

- Feasibility studies / reports
- Master planning
- Space planning
- Traffic and other site analyses

- Conceptual design
- Cost estimate / validation
- Code Analysis
- Power/ Utility Usage Projections, etc.

Such studies are generally performed by specialty A/E firms and are necessary for certain projects.

10.0 PROJECT DESIGN AND ENGINEERING SERVICES

For complex, large projects, the Entity will select A/E to perform the design of such projects. The design services scope is to include development of Construction and Installation Documents but not limited to calculations, drawings, design reports supported by studies, etc. The Entity shall define the list of design deliverables and data to be developed by the A/E for their projects, refer to Document No. EPM-KE0-GL-000016 (General Design Guideline) for the guidance on the selection of design deliverables.

Depending upon the project scope, the Entity is to provide A/E contractor the following, but not limited to, information for every Project:

- Scope of Work
- Applicable Specifications and Standard drawings
- Area Vicinity Map
- Name(s) of building(s)
- Size and type of construction (number of levels, precast, structural steel, etc.)
- General Utilization of space
- Utilities to be installed
- Any additional information useful for bidders to understand the scope (such as existing site data)
- Schedule of design development for each Project
- Contact information for project permitting (Authority Having Jurisdiction) and utility agency interface relevant to each project.

The Entity shall define the data and design documents by discipline to be produced by the A/E for each project. Besides the list of design documents/ data the Entity shall obtain from A/E the job-hour estimate with basis, required engineering staffing plan (by position) and details of any design work to be sub-contracted by the A/E.

The following is the suggested information to be obtained by the Entity from the A/E for every Project before the award of the Design Contract:

- List of design deliverables and data (such as 3D model, Material Take Off, etc.)
- Quality Assurance/Quality Control (QA/ QC) Plan
- Staffing plan based on indicative work plan provided by the entity
- The A/E’s basis of estimation of engineering job-hours
- List of sub-contractors their scope

11.0 THE A/E’S SUPPORT DURING CONSTRUCTION CONTRACT TENDER PHASE

The Entity is to define the support level (positions and duration) required from the A/E during the Construction Contract tendering/ phase.

The following are the typical engineering support activities required during Construction Contract Tender Stage:

- Responding to bidder’s technical queries
- Evaluation of bidders Technical Proposals
- Issue any revision/ addendum to the issued technical documents
- Prepare conformed Scope of Work for award

Refer to NMPM Volume 4 – Project Contracts and Tendering for the typical scope of Engineering during the Construction contract tendering process.

If feasible the Entity should obtain the engineering support during tendering phase from the same A/E that designed the project.

12.0 CONSTRUCTION SUPPORT SERVICES

The Entity is to define the A/E's scope of services during the construction phase of the project. The Entity should hire the same engineering support during construction that designed the project.

Following are some of the typical A/E support activities required during construction:

- Review and approval of Construction Contractor/ suppliers submittals
- Respond to site Technical Queries
- Attend Factory Acceptance Test (FAT)
- Provide input to the Design/ Field Change Notices as required
- Reviewing and responding to non-conformance reports
- As-built services

Refer to NMOM Volume 9 – Construction Management for the role of the Engineering during construction.

13.0 SUPPORT SERVICES DURING TESTING AND COMMISSIONING

Entity is to define the A/E's scope of services during the Testing and Commissioning phase of the project. As in the case of engineering support during tendering and construction the Entity must utilize engineering support during Testing & Commissioning (T&C) phase from the same A/E that designed the project.

The typical engineering activities during T&C phase are:

- Minor design changes required during T&C
- Response to field query such as wiring schematic drawings
- Interpretation of Code requirements, etc.

Refer to NMPM Volume 10 - Testing and commissioning for the role of the A/E during Testing and Commissioning.