Engineering Project Procedures

## **Table of Contents**

## **Page No:**

## **Project Procedures 2**

## **Design Procedures 3**

## **Design Quality Control 4**

## **Document Control 7**

## **Note 1**: This Engineering Project Procedures document is a Template originally produced for a Contractor’s Design Manager in the management of the designer.

## It must be edited to provide the required documentation for Design-Build (D-B) or Integrated Project Development (IPD) projects where the designer works for the Contractor.

**Note 2:** If this template is being utilized to produce a Design Work Method, only a portion should be utilized. The problem is that this Engineering Project Procedures covers the full extent of a designer’s work. You need to assess and write a WM within the context of the WM fitting as a process into the full Quality Plan (assignment #3).

Suggestion: Go through this document and identify which parts are describing the Work Method, and what portions of this document shall become the Quality Plan.

## **ENGINEERING PROJECT PROCEDURES**

## 1.0 Project Procedures

### **1.1 Purpose and Scope**

* 1. **Project Description**

This project example comprises design development, detailed design and construction of the elevated guideway and associated work for the Transit Project.

* 1. **Scope of Work**
  2. **Project Organization**

1.4.1 Sub-consultants

#### Table 1. Engineering Responsibility Matrix

|  |  |  |
| --- | --- | --- |
| **Discipline/Area** | **Work Included** | **Company** |
|  |  | **Responsible** |
| General |  |  |
|  | Interface with Engineering Staff |  |
|  | Engineering Sub-consultant coordination |  |
|  | Pier Layout |  |
|  |  |  |
|  | Engineering Quality Assurance |  |
|  |  |  |
| Structural Design | Foundations, columns, superstructure |  |
|  |  |  |
| Geotechnical | Data acquisition, interpretation |  |
|  | Geotechnical design |  |
|  |  |  |
| Civil Design | Survey |  |
|  | Alignment design |  |
|  | Utility re-location |  |
|  | Guideway drainage |  |
|  | Roadway relocation design |  |
|  | Traffic Management |  |
|  |  |  |
| Electrical | Electrical design |  |
|  |  |  |

* + 1. Independent Review Engineer

As necessary, independent engineers from outside consulting firms (or internal, but independent of work on the project to date) will provide specialist input and carry out independent reviews of selected areas of the design.

* 1. **Project Schedule**

**Table 2. Key Dates**

|  |  |  |
| --- | --- | --- |
| **Milestone events:** |  |  |

* 1. **Project Implementation.**
     1. Communications procedure
  2. **Status Reporting**
  3. **Association of Professional Engineers of British Columbia**

In BC, See their relatively new requirements for Quality - https://www.apeg.bc.ca/Resources/Professional-Practice/Quality-Management-Guidelines

## APEGBC Quality Management Guidelines

These quality management guidelines are directed at APEGBC professionals and provide guidance on the respective requirements under the quality management related provisions in the *Act* and Bylaws.

|  |
| --- |
| * [Use of the APEGBC Seal >](https://www.apeg.bc.ca/APEGBC/media/APEGBC/Guidelines-Quality%20Management/APEGBC-QMG-Use-of-APEGBC-Seal.pdf) |
| * [Retention of Project Documentation >](https://www.apeg.bc.ca/APEGBC/media/APEGBC/Guidelines-Quality%20Management/APEGBC-QMG-Retention-of-Project-Documentation.pdf) |
| * [Documented Checks of Engineering and Geoscience Work >](https://www.apeg.bc.ca/APEGBC/media/APEGBC/Guidelines-Quality%20Management/APEGBC-QMG-Documented-Checks-of-Engineering-Geoscience-Work.pdf) |
| * [Documented Independent Review of Structural Designs >](https://www.apeg.bc.ca/APEGBC/media/APEGBC/Guidelines-Quality%20Management/APEGBC-QMG-Documented-Independent-Review-of-Structural-Designs.pdf) |
| * [Direct Supervision >](https://www.apeg.bc.ca/APEGBC/media/APEGBC/Guidelines-Quality%20Management/APEGBC-QMG-Direct-Supervision.pdf) |
| * [Documented Field Reviews During Implementation or Construction](https://www.apeg.bc.ca/APEGBC/media/APEGBC/Guidelines-Quality%20Management/APEGBC-QMG-Documented-Field-Reviews-During-Implementation-or-Construction.pdf) |

1. **Design Procedures**

**2.1 Design Criteria**

The following documents collectively form the majority of the project design criteria:

* Design Manual,
* Standard Specifications,
* Special Provisions,.

The most recent editions of the referenced Codes and Standards will be used unless otherwise stated in the above documents.

**2.2 Drawing Standards**

* 1. **Drawing Numbers**
  2. **Drawing Certification**

All drawings, which are Issued for Construction (IFC) will be sealed by a Professional Engineer or by other professionals such as Architects, registered in the province of British Columbia. Revisions after IFC will also be sealed and a “Seal Record Text Box” containing the following information will be added to the CADD file:

* Sealed and signed by
* Date
* Revision
* Issue
  1. **Drawing Issues and Revisions**
* preliminary drawing revisions will be sequentially lettered starting with the letter ‘A’;
* issue for construction drawing revisions will be sequentially numbered starting with the number ‘0’.

1. **Design Quality Control**
   1. **Responsibilities**

With respect to quality, the responsibility and authority of the various members of the design team are explained below.

**3.1.1. Project Director**

**3.1.2. Design Manager**

* + 1. **Quality Manager**

The Quality manager is directly responsible for ensuring that the Quality Assurance Program and Procedures are produced, and distributed; that training is provided where appropriate, and that the system is followed by all of the design team. He carries out periodic internal and external Audits and manages the resulting non-conformances and Corrective Action requirements.

* + 1. **Design Discipline Lead Engineers**

All Design Discipline Lead Engineers will attempt to provide quality and minimize the generation of defects in their designs by:

1. producing a set of design quality procedures
2. providing an organization chart to identify lines of responsibility
3. a flow chart to identify the flow of information and activities that are the components of the design quality systems
4. continuously monitoring the work carried out by their staff. They will ensure that all Design Outputs are checked in accordance with the appropriate procedures and that they are verified against Design Inputs prior to issue. They will also identify training needs and visibly support the quality process.
   * 1. **All staff**

All design staff will ensure that they are aware of the quality requirements for their own tasks and that they understand and expedite the quality process.

**Self-Checking** is typically a requirement for any and all working in the Engineering Design environment. It is typically implied but it is the experience and view of the author that it should be explicit and mandatory.

* 1. **Design Calculations** 
     1. **Self Check**

[To be developed by the practitioner]

* + 1. **Computerized Calculations (Calibration that they are accurate)**

###### All computer calculations should contain both input and output and should be in a format that is easily understood without detailed knowledge of the program. Special attention shall apply to the verification of computerized calculations. Precise verification of input data and spot checks of results through hand calculations is required. Graphical plots should be used whenever possible to verify the consistency of results.

All computations shall be verified by the \_\_\_\_\_\_\_\_\_\_\_ and the Engineer of Record prior to the Final Design Submittal.

Temporary, or incomplete, calculations shall be stamped “Preliminary”.

* 1. **Design Review**

Prior to submission of the drawings, senior engineers who are not involved in the design process will carry out an internal design review. The reviews will be carried out by one of the following methods

* Design review meeting (with minutes of attendees and results)
* Issue documents for review and comment (with tracking of comments and inclusion – or not)
* Create a central review set of documents
  1. **Design Verification (Checking)**

Discipline Lead engineers will ensure that prior to approval as Certified for Construction, all Design Outputs are checked for accuracy and completeness of technical information.

A staff member who is independent of the design is designated as the checker.

The checker will make a “checkprint” and check the following:

* design concept
* supporting design calculations
* design layouts and details
* presentation and format

A drawing specific checklist will be used where applicable. All accepted information will be marked in yellow and all incorrect or information requiring revision will be marked in red. Items for discussion will be noted with black pencil. The “checkprint” will be initialed and dated.

The checker will review significant changes with the designer and resolve any differences. The checking process will be repeated after revisions have been made.

The checker signs the original drawing to indicate that checking was done.

The checkprints shall be retained to verify that the checking process is rigorously followed.

Methods of Verification may be such as:

* Independent check against Design Input
* Design Review
* Alternate calculations
* Check against previously verified documents

The Lead Engineer signs the drawing to indicate that verification was done

* 1. **Software Verification**

Design staff who are using automated design software are responsible for the accuracy and appropriateness of their design calculations. The results of software calculations will be verified by either

* Carrying out the normal independent checking and verification process on the individual calculation , or
* Verifying the computer software by comparing it to other verified software programs
  1. **Review by General Contactor [Design Build scenario]**

### Drawings and Specifications will be submitted to \_\_\_ at 30%, 60% and 90% status for review in accordance with Quality Management Procedure No 205, Document Review prior to submission to the Owner.

The Drawing Review document will facilitate both the request for review (from the design Department) and the return of comments from the Construction Staff.

Document Clarification Request (DCRs) can also be utilized by the field staff to request clarification on any aspect of design. DCRs can be responded to by the Design Department, by the Design Consultant or by the Work Methods Department at the discretion of the Design Department.

1. **Document Control**
   1. **Document Control**

The function of the Document Control includes the following.

* centralization and maintenance of the Project Files
* maintenance of incoming and outgoing correspondence logs for the Central Files, and assigning of all outgoing serial numbers for contractual correspondence with the Owner;
* receipt and distribution of all project related and administrative correspondence
* Document Control (DC) will provide the service of reproducing, binding and distributing monthly progress reports submitted to the client and will execute other reproduction projects as required
* the DC will make project wide distribution various Central File documents as required and requested by project staff .

* 1. **Drawing Control**

Drawing Control will receive, log and control distribution of all plans and specifications for the Project.

The Drawing Control Function will include the issuance, receipt and controlled distribution of all contract documents (plans and specifications) and the maintenance of the project Office Plan Room: Drawing Control shall be responsible to ensure that all contract documents in the Project Office Plan Room contain the latest information including all revisions and changes.

* 1. **Drawing Issue and Revision Control**

All revisions will be recorded in accordance with section xxx of the Design Manual??.

Issue of drawings will be in accordance with Quality Management Procedure No 203?? “Control of Permanent Design Drawings and Specifications”

* 1. **Logs and Transmittal Records**

Records of receipt and transmittal of drawings will be kept in accordance with Quality Management procedures No 203?? “ Control of Permanent Design Drawings and Specifications” and No 206 “Transmittal Procedure”

* 1. **Document Distribution**

Distribution of drawings will be in accordance with Quality Management Procedure No 203 “Control of Permanent Design Drawings and Specifications” (see Appendix D).

* 1. **Approval Signatures**

Drawings will be issued for construction only at the direction of the Owner as is required by section xxx of the Design Manual??.

All drawings, which are ready to be issued “Issued for Construction” will have the following approval signatures and seals in the following sequence:

* Designer; ensures that the design meets the design criteria and that the project procedures were followed.
* Drafter; confirms that the drawing was produced in accordance with the Drawing Standards and any other applicable procedures.
* Checker; confirms that the drawing was checked in accordance with the checking procedure.
* Permit to Practice Seal; by responsible Professional Engineer as in section 2.3 above.
* Approval; by designers (Engineer of Record).
* Owner approval; to confirm approval for issue.
  1. **Project Files**

All project files will be filed in a comprehensive manner to allow quick access to information by all staff members involved in the project.

At the Contractor project office, the central file system will be utilized for all engineering and design related matters. However, a parallel hard-copy only filing system will be maintained under the direction of the Design Manager to allow faster access to design information.

* 1. **Record Drawings**

Record drawings will be produced as received in Section xxx of the Design Manual

**4.9 Archiving**

Files, which are to be retained for archiving at the end of the project, will be identified in the Project File Index

1. Other elements to be considered:

Review the elements required for the Assignment #1 Work Method and see if there are elements there that can or must be applied to this assignment.

Seriously consider:

Definitions and Acronyms

Responsibilities and Authorities

**SUBMITTALS**

**SPECIFICATIONS**

Project Organization Charts

**Flow Chart**

**Check list(s)**

**Inspection and Test Plan**