CAPITAL DEVELOPMENT

Design Quality Plan

(Attachment to the UTA Quality Management Plan QMP)

April 2012

Revision History

Revision #	Date	Prepared By:	Approved By	Date

Table of Contents

Section 1—General and Administrative

1.0 Procedure Format

Purpose

The purpose is a concise statement of the reasons for issuing the procedure.

Scope

Generally identifies the conditions under which the procedure is applied within the UTA Capital Development Department. This section also contains statements relative to the extent of treatment or coverage provided by the procedure.

Background or Introduction (Optional)

This section may be included to provide extended background or explanatory information to assist in the understanding and implementation of the procedure.

Responsibilities

This section defines the responsibilities of the individuals (by job title) or department that implement the procedure. Specific responsibilities are delineated to the level necessary in order to avoid ambiguity.

Procedure

This section describes the approved method used by employees to uniformly achieve the intent of the procedure. All forms and figures used shall be included in this section. Procedures should be clear and complete so that inadvertent violation of any requirement is avoided.

Exceptions (Optional)

This section describes the process under which waivers, or deviations from the procedure, may be requested, reviewed, and approved.

Reference (Optional)

This section, when used, is a listing of documents to amplify or identify other interfacing procedures.

Forms (Optional)

This section, when used, lists the titles and numbers of all forms necessary to implement the procedure.

Figures (Optional)

Figures may be included, when necessary, for effective implementation of the procedure. Figures may be in the form of tables or other supporting descriptive information necessary to enlarge on the requirements or use of the procedure.

1.1 Preparation and Revision of Design Quality Procedures

Purpose

To define the method, format, and approval requirements related to the preparation and revision of a project's design quality procedures (DQP) document.

Scope

Design quality procedures provide a standard method or basis for the performance of quality control and assurance activities for UTA design projects.

To provide optimum effectiveness, procedure preparation must be coordinated with the project manager and staff so that their review and comments can be considered before the procedure is finalized.

A project's design quality procedures document is dynamic and changes will be issued as the program requires refinement or adaptation.

Responsibilities

The project manager is responsible for identifying those activities that require a DQP and defining the scope and content, along with preparation and distribution of each procedure, as applicable.

Individuals within the design organizations, assigned responsibility for the preparation of design quality procedures, are to follow the format established in procedure 1.0, Procedure Format.

While the UTA quality manager is responsible for preparation, coordination, maintenance, and initial approval of the DQP, the project manager may be called upon to initiate or review the procedures.

Procedure

Preparation of a DQP generally follows the outline delineated in procedure 1.0, Procedure Format. The outline may be adjusted when necessary; i.e., if all the sections delineated are not needed, only those that are applicable should be used.

1. Design quality procedures are produced with the header shown on this procedure.
2. The initial number of each procedure indicates the general subject area, as follows:

   Section 1 - General and Administrative

   Section 2 - Project Management

   Section 3 - Planning and Design
3. Procedures are in effect on the "issued" date shown, providing the procedure has an "approved" signature.
4. When a revision is issued to a previously approved procedure, the original issue date continues to be shown and the effective date indicates the activation date of the latest revision. The footer of each page notes the revision date; i.e., October 2006 Revision, January 2007 Revision, etc.

   The revised text is highlighted to show the manual holder exactly where the procedure has changed.

5. All design quality procedures are approved by the UTA quality manager. Revisions to procedures follow the same general review pattern as original procedures. Revision to a procedure requires approval by the UTA quality manager.

1.2 Terms and Definitions

Purpose

To provide standard definitions for specialized terms used in design quality procedures.

Scope

This procedure defines specific quality control/quality assurance or related UTA terms that are not adequately defined in common dictionaries.

Responsibilities

All employees using these *Design Quality Procedures* are responsible for applying the definitions herein to the terms used in the procedures.

Procedure

For an alphabetized listing of terms and their accepted definitions, for use with the procedures, see appendix A of the *Quality Management Plan*.

1.3 Documentation Control

Purpose

To define the processes and responsibility for coding, filing, and distributing quality records, design documents, and project standards.

Scope

This procedure is applicable to both technical and administrative documents, along with contractually required submissions and review comments on said submissions.

Responsibilities

The project manager is responsible for ensuring that document control procedures are implemented. The recipients of correspondence or transmittals are responsible for delivering the document to the administrative assistant to be logged, processed, and filed.

Procedures

Please refer to the UTA Capital Development *Document Control Procedures* manual. The latest version of the manual is available in SIRE document management system, under "Document Control Retention", located in CDC084 General and Administrative.

1.4 Quality Records

Purpose

To provide a system to ensure that all quality records are identified, collected, indexed, accessible, filed, stored, and discarded.

Scope

This procedure applies to all quality records identified by UTA.

Responsibilities

It is the responsibility of each individual within the project team to ensure that the quality records which they generate are legible and complete.

The project manager is responsible for establishing and issuing written requirements for the control and maintenance of the quality records. The project manager is also responsible for compiling and maintaining project quality records.

The project manager is responsible for control of and access to quality records for a given package until the completion of the QA review. The quality records are then transferred to document control.

Procedure

Identification and Maintenance

Each task manager has a procedure or work instruction identifying all quality records that are generated within the group.

All quality records are legible, dated, and identifiable to the project, person, or event to which they pertain.

All quality records are indexed, filed, and stored to facilitate easy access in accordance with the written requirements of the project manager.

Access to quality records is controlled to ensure the integrity of the records while permitting access to those who need the records.

Storage and Maintenance

All quality records are hard copies, with signatures, and are stored in facilities that provide a suitable environment to prevent damage, deterioration, and loss.

Retention and Disposition

Quality records are retained for the period of time defined in UTA's retention policy for all design project documents. Any quality record not identified in the policy is retained until at least the closeout of the project.

The latest version of the UTA Capital Development retention policy is available in SIRE document management system under "Document Control Retention" in CDC084 General and Administrative.

Section 2—Project Management

2.1 Preparation and Maintenance of the Project Management Plan

Purpose

To define the method, format, and approach, associated with the preparation and maintenance of the project management plan (PMP), for guidance of the project staff in the management and performance of the project. FTA requirements for preparation of PMP should be considered.

Scope

A PMP is required for any major project ($10 million or more) in accordance with this procedure or when required by FTA, UTA management, or any other authority.

Background

The project management plan is developed to combine all elements of the project into a strategic plan for the successful completion of the project. It is a communication tool for distribution to the project team so that each member is clear on his or her contribution, when it is due, and how it interfaces with other project elements.

This document is, in effect, a process model that clearly describes what UTA wants, how to achieve these goals, and the resources that are to be devoted to the project.

Responsibilities

Responsibility for preparation of the project management plan rests with the project manager. The PMP must establish the project parameters for all disciplines involved in design and must reflect UTA's contractual requirements and contract limitations.

The PMP must be approved by the project manager and the UTA Quality Department prior to distribution.

Procedure

The project management plan is divided into five major sections dealing with the project work program, project organization and control, budget and cost control, schedule control, and safety.

1. **Plan Format** - The PMP will follow the format shown in Figure 2.1-1.
2. **Reproduction of the Plan** - The PMP is reproduced on single-sided pages by photocopy method. It is bound in a loose-leaf binder with each subsection begun on a new page for easy substitution or addition of pages when revisions are necessary.
3. **Distribution of the Plan** - The initial and subsequent issues of the project management plan are distributed by the project manager to the following:
    - Project manager of each consultant
    - Project director
    - Design manager of each consultant
    - Quality assurance manager

    The project manager is responsible for maintaining a master distribution list and controlled distribution of the plan.

4. **Revisions to the Plan** - The plan must be a dynamic document that conveys the lessons of experience on the job and provides the direction needed to complete the project successfully.
5. **Documentation of Revisions** - As revisions or amendments to the PMP are distributed, they are accompanied by a transmittal slip listing the current and all previous revisions by revision sequence number, the revision date, and the pages revised or added by that revision as follows:

Revision No	Date	Pages Revised
1	05-03-06	3-4 added
		7-1, 7-2

——(figure 2.1-1 starts on the next page)——

Figure 2.1-1: Planning and Design Plan Format

1.0 Project Work Program

1.1 Project Description

Clearly define the type of project, scope, and limits. Include the description for procurement strategy and any special requirement.

Describe special physical, technical, timing, or other conditions affecting the design.

Include schematic location plans and/or other graphics that will help to visually define the project scope.

1.2 Work Program

Outline the major tasks and subtasks of the project, and define their interdependency and relationships to other tasks.

Prepare detailed lists of information required, that is to be provided by others to each discipline, office, and consultants, in order to complete those tasks or work phases for which they are responsible.

NOTE: Cost and time restraints associated with information requirements and task completions should be identified. Also, the expected source of the information should be clearly noted.

State the approach to be taken on each task; including, where applicable, software to be utilized and/or modified, analysis to be performed, etc.

List those tasks that will require peer review or the services of a technical advisory specialist not yet assigned to the project team.

1.3 Applicable Standards

List all standard documents, design, other applicable criteria, and standard codes required that will be used to evaluate the project deliverables.

1.4 Contract Deliverables

A list of all deliverables, together with descriptions, quantity to be delivered, and the scheduled date, should be included in the plan.

Descriptions of deliverables should include engineering scales, printing method, estimated number of pages or sheets, type of reproducible if applicable, and other information required to clearly establish production time and cost, along with where the printing or art work is to be done.

The methods of shipping and lead time for shipment of deliverables are to be identified.

2.0 Project Organization and Control

2.1 Project Organization

Define the composition of the team and organizational structure for the project. Use organization charts to show relationships.

Describe the supervisory and technical lead, support and review responsibilities for each applicable task. Clearly define a job description for each member of the project staff.

Identify the peer reviewers and technical advisory specialists who will provide advice and review of tasks requiring input beyond the experience of the project team.

2.2 Client Interface

Identify key project team members by name, job title, mailing address (office location if different), and phone number.

Describe the organizational interfaces among UTA, consultants, agencies, and local jurisdictions.

Describe responsibility for, and intended format and schedule of, progress reports and key presentations to UTA.

List the set of services to be provided by the consultant and the services to be provided by UTA; e.g., office space, LAN, WAN, software, automobiles, office equipment, etc.

2.3 Subcontract Administration

List sub-consultants to consultant, their project manager, office addresses, telephone numbers, the location where the work is being performed, and briefly describe their scope of work.

Identify the consultant's person responsible for development of the work program and coordination, review and acceptance of the work of each sub-consultant.

State each sub-consultant responsibility for staffing, the type of contract-specific deliverables, quality management system to be utilized, and their responsibilities for the checking and review of their deliverables.

2.4 Project Administration

Clearly define procedures for receipt and distribution of project information, including correspondence logging, internal/external distribution, and handling of decisions and direction documents.

Define the project numbering system and the work breakdown structure (WBS) numbers to be used for various tasks, disciplines, offices, etc.

Designate responsibilities for maintenance of project files and define other document control procedures. This should be put together with DQP 1.4 Quality Records in mind, project document retention, and a complete filing index should be created to serve as a storage inventory.

Describe all other project procedures that may differ from, or may not be covered by, the UTA administrative or the quality assurance procedures.

3.0 Budget and Cost Control

3.1 Cost Control System

Describe how the UTA cost control systems are to be applied to the project.

Identify the invoicing procedures for the project.

Identify the billing limitations for the project.

3.2 Budget

Define total project limitations and assumptions by task, criteria, and contracts upon which estimates of person-hours and project budgets were based.

Summarize person-hours by major task.

3.3 Variations and Changes

Identify contract provisions with regard to processing and payment for changes in the work program.

Amendments or changes to contracts should be addressed as to the approvals or formalities necessary to make the change.

Changes to the base contract, such as phases of funding and annual funding through supplemental agreements or transferring of funds from one phase of the program, should be addressed.

4.0 Schedule Control

4.1 Project Time Schedule

Establish a project time schedule that coincides with the work program that meets UTA requirements.

Any time limitations and penalties in the contract should be clearly indicated and strategies to meet tight completion dates should be clearly stated for each deliverable.

4.2 Schedule of Project Deliverables

A clear and concise schedule must be prepared that indicates submission of project deliverables, internal reviews, major internal meetings, project status reports, and all other major milestones in achieving the project goals.

—— (end of figure 2.1-1)——

2.2 Quality Program for Consultants and Sub-Consultants

Purpose

To establish the requirements for quality control of design documents prepared by consultant and its sub-consultants.

Scope

This procedure applies to all technical consultants retained and sub-consultants to provide UTA with project services such as surveys, investigation, testing, analyses, and/or design and services during construction.

Background

UTA requires of its consultants a professional level of diligence and care, in performance of the scope of services, equal to that expected of its own staff. Contracted planning, design, and construction-related services must comply with the quality program, including all applicable provisions of the DQP and documentation requirements. QA reviews of design submittals and formal audits of the quality process at the consultant's premises will document the consultant's compliance with the quality program.

All prospective consultants and their sub-consultants should be made aware of the quality control requirement at the time they are contacted for their services.

Responsibilities

The consultant's design manager has the responsibility of ensuring that his/her and any sub-consultant's staff gain familiarity with the project's quality program and procedures through continuous liaison with the design quality assurance organization.

The design quality manager is responsible for conducting QA/QC training classes during the early stages of the project that the consultant or sub-consultant's design staff may attend. In addition, copies of the approved DQP are distributed to all sub-consultants for their guidance.

The UTA quality manager is responsible for assessing the consultant's understanding of the program through formal QA audits.

Procedure

1. Consultants and sub-consultants are to be advised of the intent of this procedure prior to their preparation of a work program and budget.
2. The consultant or sub-consultant is to be provided with the DQP and invited to attend quality indoctrination sessions conducted by UTA quality manager.
3. The consultant or sub-consultant follows the procedures along with the rest of the design team.
4. Compliance with the program is assessed during QA audits by the UTA quality manager.

2.3 Quality Control and Validation of Computer Software

Purpose

To prescribe the method and documentation required before computer software may be used for performing design calculations or other manipulations for the project.

Scope

The requirements for validation of software apply to any purchased, contracted, or locally prepared software, which is to be used for design or calculations. UTA has provided a record-keeping system so that once the verification process is complete, it need not be duplicated for identical design applications.

Responsibilities

The design quality manager audits implementation of this procedure and provides guidance when its application is questioned.

Project managers are to immediately identify the software to be used and assess the availability of validation documentation for that software. When documentation for a particular application does not exist, appropriate assignments must be made to fulfill the requirements of this procedure.

Project managers review the available validation documentation to assure themselves of the similarity of the application and the software parameters.

Procedure

1. When it is determined that a first time usage of software or a new application is required for engineering calculations, the software or software application is to be validated and documented as follows:
   - A hand calculation with the same formulation or a parallel technique must be documented and checked in accordance with DQP 3.1.

     NOTE: In order to provide effective and efficient validation, checked calculations from a previous project or the input and output from a validated program may be substituted for original hand calculations.
   - The same input and assumptions utilized in the hand calculations are formatted and input in to the computer to check the software. Computer input is to be checked in accordance with DQP 3.4.
   - The output of the computer is compared to the results of the hand calculation with each corresponding answer annotated as equivalent values. Differences which are not obviously accountable to rounding are to be explained on the output sheet.
   - Complete documentation of the validation, to include fully checked calculations, checked computer input, printout of program when available, annotated output printout and a brief description of the processes followed are to be maintained in the office file.
2. This software quality control procedure, when performed by any consultant or sub-consultant employee, will become an acceptable project-wide validation.
3. Commercially available programs that come with validation documentation are acceptable if project personnel review the documentation and sign off, attesting that it conforms to the standards set forth herein.

4. Sub-consultants to consultants who utilize software in the performance of their contracted planning and design work will be held to standards similar to those set forth herein.

References

DQP 3.1 Checking of Calculations

DQP 3.4 Checking of Input to Computer Programs

2.4 Use of Senior Staff Specialists as Technical Advisors

Purpose

This procedure establishes situations under which senior staff with special expertise should be assigned, along with their functions, during execution of the project.

Scope

At the proposal stage, those tasks or groups of tasks that involve unusual or intricate procedures and planning or design techniques are identified. Adequate budget is to be assigned for senior specialists, or special outside consultants, to serve as technical advisors during the conceptual phase of the project and to follow up on the results of those tasks during the design development phase and before submission of preliminary or final documents to UTA.

Ultimate responsibility for the quality of the work rests with the project manager. Technical advisors must therefore answer to the project manager.

Responsibilities

The project manager has overall responsibility for coordination of technical and design review activities.

The project manager should take steps to ensure cooperation of task managers and other UTA staff responsible for work elements or tasks for which technical advisory services are required.

The task manager schedules the technical advisory service for that task, design element, or other activity, pertaining to the assigned area of responsibility, so as to not adversely affect delivery schedules.

The technical advisor gives the project manager timely written assessments necessary to allow completion of design documents or other deliverables.

It is the responsibility of the project manager and task managers to take appropriate action to carry out the directions of the technical advisors, even in their absence from the project office.

Procedure

1. The most qualified senior staff member with expertise in the type of design or element of work in question should be selected to serve as technical advisor at the project's inception if it was not done at the proposal stage.
2. The project manager establishes the work program and schedule of activities for the technical advisor.
3. The technical advisor consults with, and gives direction to, the project manager responsible for the task in question in the development and analyses of design alternatives and design and construction techniques.
4. The technical advisor reviews study results or designs during the course of the project to ensure that concepts are sound, that directions are being properly interpreted and carried out, and that the study or design, as presented to UTA, conforms to requirements and the current state-of-the-art. The technical advisor provides direction and follow-up on the following:
    - Procedures, standards, design guides, and design criteria established by project staff and UTA.
    - Concept drawings, design details, artists' renderings, and models defining the basis of design.

- Design analyses, sketches, and calculations.
- Studies and reports dealing with value engineering, constructability, technical facility, and alternatives analyses.
- Technical sections of specifications.

5. If conflicts occur, the problem is resolved between the technical advisor and the project manager.

Section 3—Planning and Design

3.1 Checking of Calculations

Purpose

To provide guidelines for preparation and checking of engineering calculations.

Scope

This procedure applies to all hand calculations which are the basis for study, construction, or procurement documents provided to UTA.

Computerized calculations are to be checked in accordance with DQP 3.4 after the software is validated per DQP 2.3.

Introduction

All calculations are to be done on standard UTA or consultant calculation sheets. All information is to be printed, title boxes filled in completely, initials used in the sign-off blocks, pages numbered, sketches used as required to clarify the calculations, and all assumptions, references, units, and conclusions are to be clearly stated.

The originals and check prints of all hand calculations are to be indexed and stored in three-ring binders by the project manager, or a designee, until filed with document control.

Responsibilities

Project Manager	Assures that the personnel assigned to the project are capable of performing the analysis or calculations required. Assures that the original calculations and check calculations are assembled, indexed, maintained, and stored in an orderly fashion.
Designers (Originators)	Use standard UTA or consultant's calculation sheets. Present all calculations in a neat and logical manner which is conducive to checking. Provide the calculations to the checker in a timely fashion. The originator is also the back-checker and may also act as the verifier.
Checker	Thoroughly checks the calculations starting with assumptions, mandated parameters, references, given values and formulas, omissions, and correctness of arithmetic. The checker is responsible for asking questions of the designer in areas that are not clear or seeking technical advice if unsure of any particular element of the calculation.

Procedure

1. When a calculation or series of calculations have been completed, the originator makes a photocopy of the original and provides it to the checker for checking.
2. The checker checks each component of the calculations and highlights in yellow all portions checked as correct. Information identified as incorrect is lined through and corrected in red. Comments by the checker should be made on the check print in black ink. When the calculation has been completely checked, the checker signs and dates the "checked by" block on the check print copy of the calculation sheet.

3. The originator back-checks the checker's marks on the check print. To document the back-checking process, the originator:

   - Check-marks in **green** each of the checker's red-marked changes if in agreement and adds in **green**, with the concurrence of the checker, any additional changes not picked up by the checker.
   - Crosses out in **green** each of the checker's red-marked changes that both the originator and the checker agree should not be changed. The back-checker should not obliterate the checker's marks.

     NOTE: The back-checker and checker should resolve differences encountered during the checking process so they are not repeated over and over again. If resolution cannot be achieved by the two individuals, the project manager should be consulted to resolve the differences.

   Following back-checking, the originator changes the original set of calculations to reflect the agreed-to corrections.

1. The checker examines the original calculation sheets to verify that the agreed-to corrections have been made. Each correction verified as made to the original is circled on the check print in **green**. When all corrections are verified, the checker signs and dates the "checked by" block on the original calculation sheet.
2. The original calculations and check prints are then sent to the project manager to be indexed, stored in three-ring binders, and placed in the project files.

   NOTE: An alternate way to check calculations is to prepare an independent calculation and compare the results to the originals. DQP 3.1.1 provides for this type of checking. This alternate method is especially applicable to structural design of major structures.

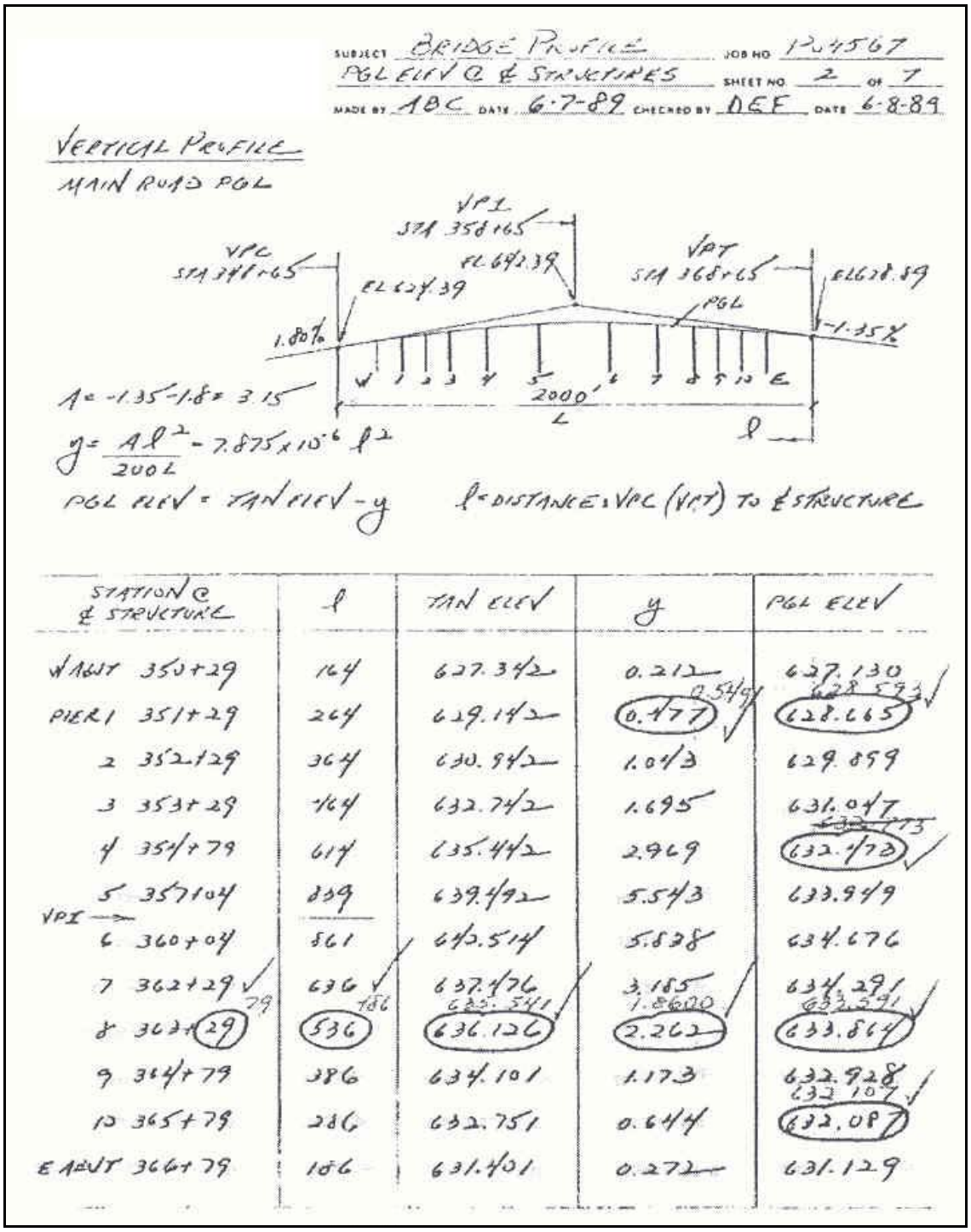
Reference

DQP 2.3	Quality Control and Validation of Computer Software
DQP 3.1.1	Checking of Calculations Utilizing the Independent Analysis Method
DQP 3.4	Checking of Input to Computer Programs

Figure

Figure 3.1-1 Sample Calculation Check Print (See next page)

FIGURE 3.1-1: Sample Calculation Check Print



SUBJECT BRIDGE PROFILE JOB NO 124567
PGL ELEV @ ℄ STRUCTURES SHEET NO 2 OF 7
MADE BY ABC DATE 6-7-89 CHECKED BY DEF DATE 6-8-89

VERTICAL PROFILE
MAIN ROAD PGL

$A = -1.35 - 1.8 = 3.15$

$y = \frac{A\ell^2}{200L} - 7.875 \times 10^{-6}\ell^2$

PGL ELEV = TAN ELEV − y ℓ = DISTANCE VPC (VPT) TO ℄ STRUCTURE

STATION @ ℄ STRUCTURE	ℓ	TAN ELEV	y	PGL ELEV
W ABUT 350+29	164	627.342	0.212	627.130
PIER 1 351+29	264	629.142	0.577 (0.549)	628.565
2 352+29	364	630.942	1.043	629.899
3 353+29	464	632.742	1.695	631.047
4 354+79	614	635.442	2.969	632.473
5 357+04	839	639.492	5.543	633.949
VPI → 6 360+04	861	643.514	5.838	634.676
7 362+29	636 (186)	637.476 (633.541)	3.185 (1.8600)	634.291 (633.591)
8 363+29	536	636.126	2.262	633.864
9 364+79	386	634.101	1.173	632.928
10 365+79	286	632.751	0.644	632.107
E ABUT 366+79	186	631.401	0.272	631.129

3.1.1 Checking of Calculations Using the Independent Analysis Method

Purpose

To provide standards and procedures for an independent design check of structural design calculations and drawings.

Scope

This procedure applies to the structural design of all major structures constructed within UTA interchange areas as part of the UTA development project, and other major structures as may be selected by the structures project manager. Major structures include bridges and box culverts or tunnels with total lengths as measured along the roadway centerline greater than 20 feet, retaining walls with both a total length greater than 100 feet and a maximum exposed height greater than 5 feet, and parking structures. Checking of MSE walls shall be the responsibility of the MSE wall vendor. Independent design check involves the complete verification of all design elements and details to ensure structural integrity, constructability, and all project standards and criteria have been satisfied. It also includes the checking of drawings that depict the elements of design for the structure. This check results in two complete sets of design calculations, i.e., the original set of calculations and the independent design set of calculations.

Computerized calculations may be used provided that the software is validated per DQP 2.3.

Checking of components may be accomplished by comparison with similar designs, provided that sufficient documentation exists and it can be produced for audit that similar designs have been checked according to design quality procedures.

Responsibilities

Project Manager	Assures that the personnel assigned to the project are capable of performing the analysis or calculations required. Assures that the independent design check is performed.
Designer (Originator)	Presents all calculations in a neat and logical manner. Performs corrections or redesign as agreed with the checker.
Checker	The checker will be an experienced structural engineer, currently licensed as a professional engineer. The checker may be a member of the design team, but must not have been involved in the design of the structure being checked. The checker shall personally make independent engineering calculations for all elements of the structure as shown on the completed drawings. These calculations shall not be assigned to another person. The checker is responsible for asking questions and resolving discrepancies and deficiencies with the designer, or seeking technical advice if unsure of any particular element of the calculations.
Back-Checker (Designer)	Confirms corrections made by the checker.
Verifier (Checker)	Confirms that the back-checked corrections have been accurately made on the drawings.

Procedure

1. When a project reaches a stage of completion where checking can begin, the originator shall assemble the following material:

   - Design criteria and memoranda as established by the client
   - A clear, unmarked set of plans with a numbered and dated check print stamp on each sheet
   - Draft special provisions

   The originator signs or initials the check print stamp on each print. Then all materials are delivered to the checker.

2. The checker reviews the general plans and typical sections for any obvious omissions, conflicts, or incompatible structural framing. A constructability review of the configuration and details shall be made.

3. The checker checks the design criteria and general notes for conformance with the client's requirements.

4. The checker completely recalculates the geometric layout. Use of computer programs is recommended as long as the program has been validated according to DQP 2.3. These calculations shall be documented in the same manner as original calculations to indicate that checks were made.

   NOTE: Structural design check calculations are not started until items 2 through 4 are completed. Any discrepancies must be resolved with the originator. If revisions are necessary, the originator will revise the design and details before the checker proceeds.

5. The checker produces a set of independent calculations for a computer analysis of the structure.

6. The drawings are checked in accordance with DQP 3.2. The special provisions and payment items (if submitted) are checked for conflicts and omissions. The checker produces an independent set of quantity calculations.

7. If discrepancies are found, the following steps apply:

   a. The checker notifies the originator that a possible discrepancy exists.

   b. The originator checks the checker's calculations governing the discrepancy, following the primary yellow line checking procedures in this DQP and signs off as having done so on the calculation sheets.

   c. A statement of resolution, initialed and dated by both the originator and checker, is placed with or on the checker's calculations.

   d. If revisions are necessary, the originator revises the design and details before the checker proceeds further. The checker performs a yellow line check of the revision and signs off those calculation sheets as the checker.

References

DQP 2.3	Quality Control and Validation of Computer Software
DQP 3.2	Checking of Drawings

3.2 Checking of Drawings

Purpose

To provide a uniform, orderly, efficient method for checking drawings before they are released for use as procurement or construction contract documents.

Scope

The checking of drawings, like any other checking, requires a minimum of two individuals: a checker/verifier, and an originator/back-checker.

Timely checking of drawings is important for efficient performance. A drawing used as a base by several disciplines should be checked and corrected before further additions are made to eliminate the need to check and correct the same items on subsequent drawings.

Responsibilities

The project manager is responsible to see that this procedure is implemented on all project drawings and that the check prints are stored for QA audit.

The originator of the work on a document has the primary responsibility for accuracy and adequacy. It is not intended that the originator rely upon the checking system to complete the drawing.

The originator of each document is responsible for making the check print, stamping and dating it, following that check print through the checking process, and obtaining the required sign-offs. The originator also functions as back-checker and may also be the verifier.

The checker is responsible for checking the drawings, independent of the originator. The checker may also function as the verifier.

The back-checker (originator) reviews the checker's comments and supervises the corrections to the drawings.

The verifier confirms that the corrections are made on the drawings.

Procedures

1. Initiating the Checking Process

As the drawings are completed in final format and deemed ready for checking, the originator signs or initials the title block of the drawings, makes a check print copy of each sheet, and stamps it with the check print stamp (figure 3.2-1). The Check prints are then passed to the checker.

2. Checking

The checker checks the drawings for technical adequacy and conformance to any applicable standards and format, and performs specific accuracy checks required for that type of drawing. Checking activity is recorded directly on the check print. The checker is responsible for ascertaining that the drawing is consistent with the corresponding checked calculations, and signs off on the stamp under "Drawing Checked Against Calculations and Calculation Check Confirmed". To document the checking process, the checker highlights in yellow on the check print each part that is found to be correct. Information found to be incorrect is lined through and corrected in red on the check print.

NOTE: Red or yellow should not be used to note comments or instructions. These colors are reserved for the checking process. Comments or instructions should be written in black ink.

The checker signs and dates the check print stamp upon completion of the checking. in the case where no corrections, additions or deletions are found, there is no need for back-checking or further signatures on the check print stamp.

3. Back-Checking

The originator (acting as back-checker) reviews the checker's marks on the check print.

To document the back-checking process, the originator:

- Check-marks in **green** each of the checker's red-marked changes if in agreement that the original should be changed, and adds in green, with the concurrence of the checker, any additional changes not picked up by the checker.
- Crosses out in **green** each of the checker's red-marked changes that both the originator and the checker agree should not be changed. The back-checker should not obliterate the checker's marks.

NOTE: The back-checker and checker should resolve differences encountered during the checking process so they are not repeated over and over again. If resolution cannot be achieved by the two individuals, the appropriate project manager or higher supervisor should be consulted to resolve the differences.

- Signs and dates the check print stamp.

4. Correcting the Drawing Original

Correction of the drawing original should be supervised by (or drafted by) either the originator or checker, since both know exactly what needs to be done.

- When making the corrections to the drawing original, the engineer, draftsperson, or CADD operator circles in blue each correction on the check print as incorporated.
- The person correcting the drawing signs and dates the "corrected" block on the check print stamp. A new drawing original is printed and given to the verifier, along with the check print.

5. Verifying the Corrected Check Print

The verifier compares the check print with the new drawing original to affirm that the agreed-to corrections have been incorporated without error.

- If the corrections are not made or are erroneous, the check print, with penciled instructions, is returned to the corrector.
- The verifier circles in green each blue-circled item that had been incorporated correctly on the original drawing.
- The verifier signs and dates the check print stamp, as applicable.
- After the corrections have been verified, the checker initials on the "checked by" line in the title block of the drawing original.

6. Disposition of the Checked Drawing

The completed original (or CADD file) is put under the control of the project manager in order to prevent further changes in the drawing that could invalidate the checking which has been done.

The project manager releases the checked drawing to other disciplines to use as a baseline for their input, or to UTA.

NOTE: When there is a change to a checked drawing, a new check print must be made to check the area that has been changed. The check print is stamped and labeled check print 2, 3, 4, etc., as applicable, and attached to the previous check prints. The checking follows the same procedure as that of the original check print, except that only the portions that changed are marked up as having been checked.

Figures

Figure 3.2-1: Check Print Stamp

Figure 3.2-2: Sample Check Print Process

Figure 3.2—1: Check Print Stamp

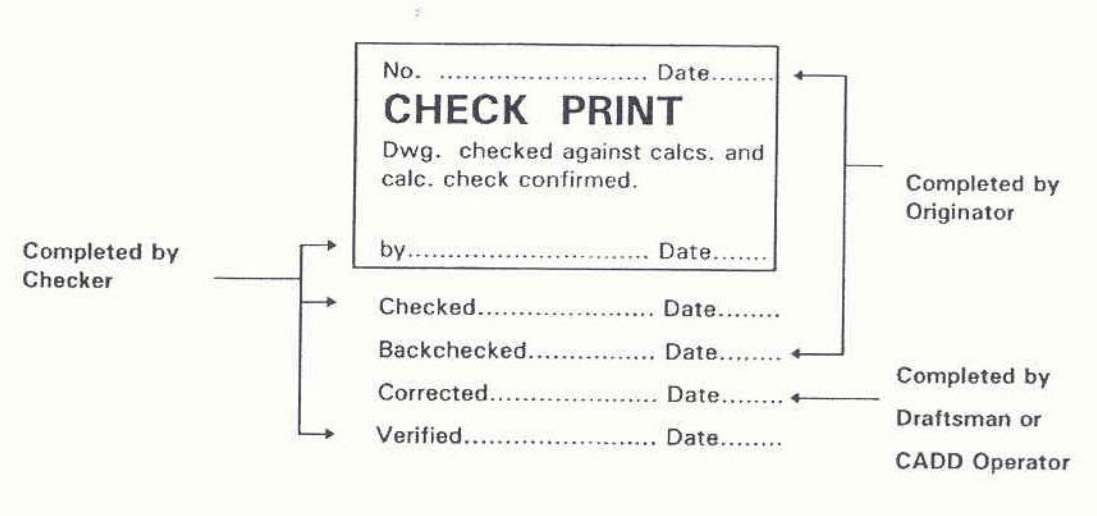
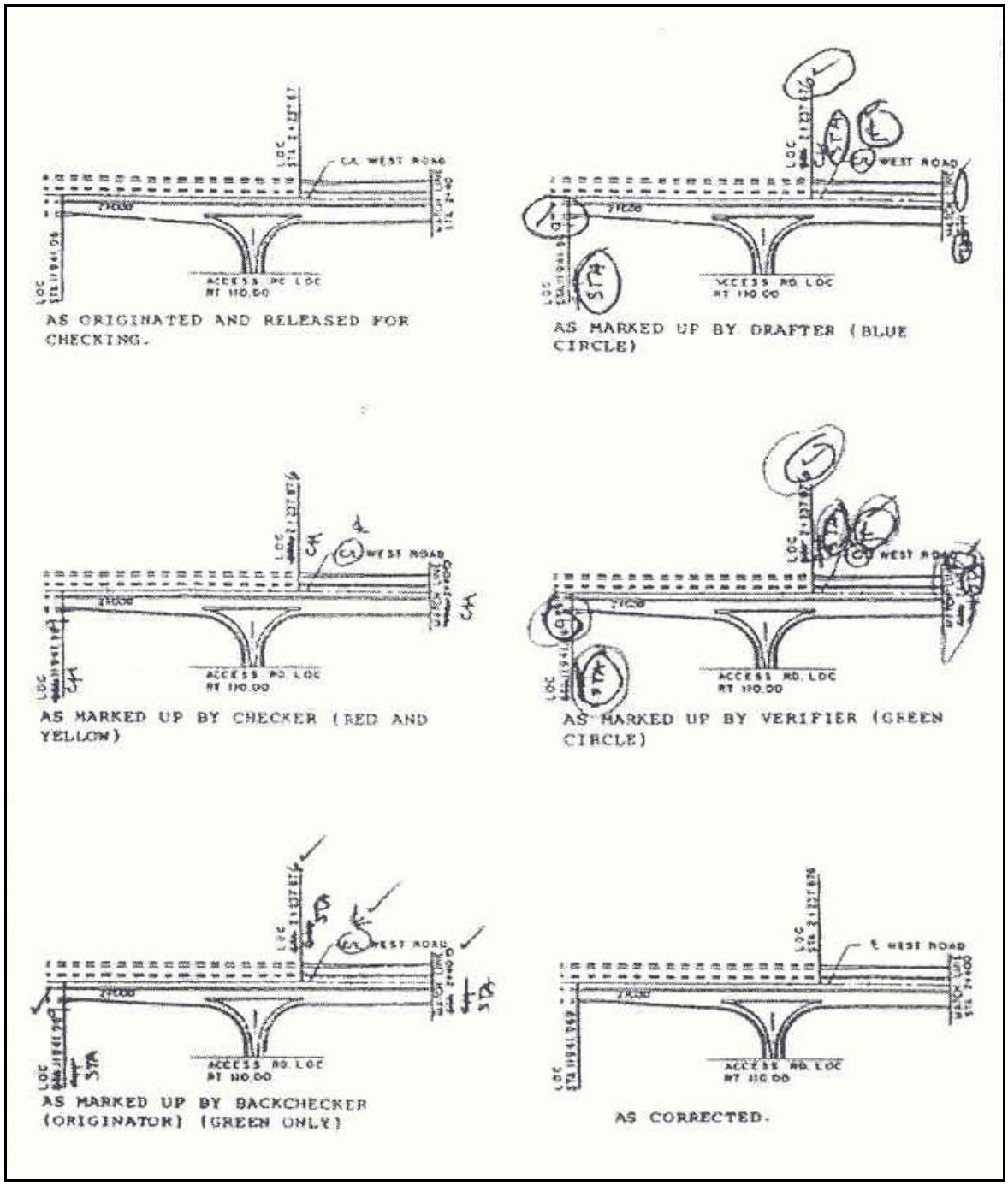


Figure 3.2—2: Sample Check Print Process



3.3 Checking of Specifications, Cost Estimates, and Contract Documents

Purpose

To provide guidelines for the checking of specifications, cost estimates, and contract documents.

Scope

This procedure applies to all specifications provided to a client for construction or procurement.

For special provisions with input from two or more disciplines, the document should go through a review process involving the contributing disciplines, as described in DQP 3.8, Design Coordination Review (DCR) and Technical Coordination Review (TCR) of Interim Submissions, or DQP 3.5 Review of Studies or Report-Type Documents.

Background

Checking and review of design documents are conducted to assure that the engineering for the project is sound. This procedure supplements design in order to assure that work is adequately specified, the current contract documents are utilized and properly completed, and the cost estimate of the work to be performed provides the client with adequate budgetary guidelines.

Responsibilities

The project manager is responsible for implementing this procedure on the project on an on-going routine basis.

The originator of the work has the primary responsibility for accuracy and adequacy. It is not intended that the originator rely upon the checking system to find and correct mistakes.

The originator is responsible for making the check print, following that check print through the checking process, and obtaining the required sign-offs.

The checker is responsible for checking the documents, independent of the originator.

Procedure

1. Check of Contract Documents (General Conditions)

The originator provides a completed copy of the documents to the checker with the check print stamp on the reverse side of the first page and the originator's input highlighted in yellow.

- The checker verifies that the current or proper issue of the client's documents has been utilized and the information inputted by the originator is accurate for the project. Corrections are noted in red. After completing the check, the appropriate line on the check print stamp is signed and dated.
- The originator back-checks and oversees the incorporation of the changes into the original document.
- The checker or originator verifies that the typed-in changes are correct and signs and dates the verified block on the check print.

2. Check of Specifications (Special Provisions)

The originator provides to the checker a complete copy of the specifications with a check print stamp on the reverse side of the first page.

- The checker reviews the specifications for applicability and clarity. Each page is marked through, indicating that it was reviewed; corrections are annotated in red and the sheet tabbed for easy location. Upon completion of the checking, the checker signs and dates the check print stamp.
- The originator back-checks the corrections and check-marks it in green if in agreement. If not in agreement, the originator confers with the checker. If both agree that the correction should not be made, the originator crosses out in green the red marks. Upon completion of the back-check, the originator has the agreed-to corrections incorporated into the specifications, and signs and dates the check print stamp.
- Either the originator or checker verifies that the corrections have been typed into the original document and signs as the verifier on the check print stamp.

NOTE: The individual that performs the corrections on the document is not allowed to also sign as the verifier, indicating that all the agreed corrections are properly incorporated in the document.

3. Checking of Cost Estimates

The originator provides a copy of the final estimate, the quantity take-off computations, and the source data for unit pricing and item numbering to the checker, with the check print stamp on the back of the first page of the estimate.

NOTE: The procedure for checking quantity take-off computations is the same as that used for calculations. (See DQP 3.1) Unit prices, if not furnished by UTA, must have UTA review during the design.

- The checker compares the total quantity for each item on the estimate sheet against the computation sheet, marking the estimate sheet in yellow if correct and red if a correction is needed. Unit prices, item numbers, extensions, and totals are checked in the same fashion for cost estimates that are computerized. DQP 2.3, Quality Control and Validation of Computer Software, and DQP 3.4, Checking of Input to Computer Programs, apply.
- The cost estimate shall also be cross-checked against the summary of quantity sheet of the drawings, if one exists.
- The originator back-checks the corrections and, if in agreement, has the changes made and verifies the changes if they are made by a third party.

Exceptions

If for some extenuating circumstance documents must be sent to UTA before this procedure has been fully implemented, the following will apply:

- The project manager must notify UTA that the documents have not been checked and explain the reasons.
- The documents must be stamped, “Unchecked. For Information Only”. If unchecked documents are to be submitted to the client for bidding purposes, they should be stamped “For Bidding Purposes Only—Not To Be Used For Construction.”

UTA should be notified in the transmittal letter that the checking process has not been completed.

Exceptions to the procedural documentation of the check prints can be given only by the design quality manager.

References

DQP 2.3 Quality Control and Validation of Computer Software

DQP 3.1 Checking of Calculations

DQP 3.4 Checking of Input to Computer Programs

Figure

Figure 3.2.1: Check Print Stamp (applicable for this procedure)

3.4 Checking of Input to Computer Programs

Purpose

To provide for systematic checking of computerized design calculations to minimize the possibility of input errors.

Scope

This procedure is to be utilized for checking both non-local (batch) input and local keyed input to software programs.

Responsibilities

The project managers are responsible for the implementation of this procedure and for the project drawings and check prints that are stored for QA review.

The designer (originator) provides the input/output documents and other associated data to the checkers in a timely and complete manner so that the checking can be quick and thorough.

The checker thoroughly checks the input parameters and all assumptions, references and mandated values. In the case of interactive CADD input, the checker thoroughly checks graphical output by measurement or visual verification to ensure that the desired results have been achieved.

Procedure

1. When any computer program is run for design, the input and output must be printed out at the same time. When completed, the originator provides the checker with a complete copy of the input and output, with a check print stamp on the reverse side of the first page. The originator numbers and dates the check print.
2. The input for the PC or CADD is yellow-line checked and signed off by the checker. Corrections are noted in red.
3. Non-local input is documented, copied and yellow-line checked on the appropriate forms prior to forwarding for batch processing. After processing and running the program, the printout of the input is verified (compared to the original check print) using a green pencil to indicate each item is correct.
4. The originator back-checks the corrections and either reruns the program or calculates and pens in the correct values in the output, as appropriate. The checker verifies the corrections and initials off on the corrections.
5. If the program is rerun, a new, complete, yellow-lined checking of the input must be generated, signed and dated by either the checker or originator.
6. All check prints of input must be kept with the output in a loose leaf binder with the other project calculations.

Reference

DQP 2.3 Quality Control and Validation of Computer Software

Figure

Figure 3.2-1 Check Print stamp

3.5 Review of Studies or Report-Type Documents

Purpose

To provide guidelines for review of documents other than engineering drawings and calculations.

Scope

This procedure applies to all studies, reports, technical memoranda, instruction manuals or procedures, letters, proposals, cost estimates, and contract documents.

Background

This review procedure requires that a minimum of one person examine any document before it is issued.

Responsibilities

Project managers designate the reviewers and their scope of review.

The originator, or document coordinator, develops or collates the document, ensures the drawings, tables, and calculations have been checked in accordance with applicable procedures, and initiates the process.

Engineers/technical specialists carry out the review in accordance with their designated scope, document their comments on the review print, and sign and date the review print stamp (figure 3.5-1).

Procedure

1. After the document has been created, the originator spell-checks the document, and prepares it for review.
2. If the document is of such a nature that a review print is necessary:
    a. The originator reproduces the document for a review print, applies the review print stamp to the first page of the review print, and forwards it to the project manager.
    b. In the space allotted in the review print stamp, the project manager lists the reviewers and their review responsibility for the document. One additional individual is listed to perform the editorial review.
    c. Reviewers are assigned a color for their comments so that each reviewer's mark-up is easily differentiated.
    d. Each reviewer is to review the document with regard to his or her responsible area, conformance with project criteria and requirements, professional policies, and content. They are also to review those parts of the document that interface with their discipline to assure that there are no conflicts.
    e. The editorial reviewer is responsible for assuring uniform format, proper sentence structure, proper syntax, and spelling.

NOTE: It is recommended that only one document review print be circulated for each review to minimize duplication or conflicting comments. However, when time constraints or distance considerations dictate, more than one document may be used.

f. The project manager, upon receipt of the completed review print, must evaluate each of the review comments and determine its disposition. In case of disagreement or conflict between reviewers, the originator and the reviewers are consulted.

g. When the corrections are made, the project manager verifies the dispositions made on the document and signs off on the review print.

3. If a review can be performed electronically:

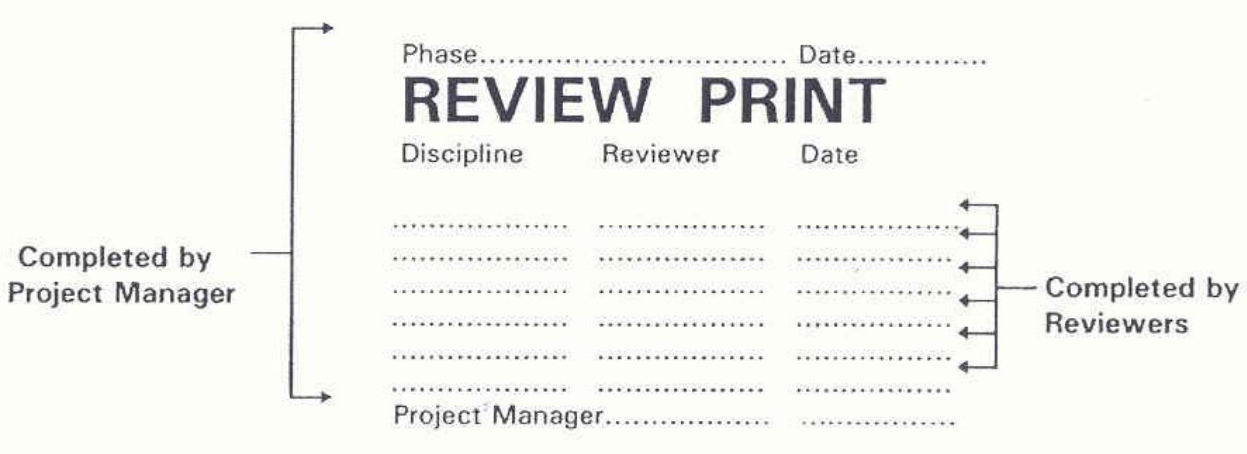
   a. The project manager determines and identifies who should review the document.

   b. The reviewer electronically highlights the comments or changes in the electronic file. The highlighting can be in color or reverse imaging. This file must then be clearly identified as a QA review file with the reviewers identified. The file must be archived for audit as would any paper copy of a review print.

   c. The completed review print, along with any check prints of drawings or calculations, is kept in the office files under the control of the project manager for QA review.

References

Figure 3.5—1: Review Print Stamp



3.6 Design Coordination Review (DCR) and Technical Coordination Review (TCR) Of Interim Submissions

Purpose

To establish the sequence and responsibilities for the multi-discipline review of documents, including a DCR and TCR.

Scope

This procedure applies to all design reports, drawings, and specifications that involve more than one discipline or which require technical scrutiny, as determined by the project manager.

The DCR is a review to coordinate design responsibility and design details between and within disciplines. The DCR is conducted at the conclusion of preliminary design and again prior to the conclusion of final design. The project manager reviews the documents regarding interferences, compatibility between design disciplines, completeness, and prudent engineering practices. Review comments are recorded directly on the review document.

The TCR is a review to examine the suitability of the design, consistency with standards and client requirements, and sound engineering practices. If deemed necessary by the project manager, based upon the scope and complexity of the design, a TCR is conducted by a group of senior engineers possessing recognized expertise in their respective design discipline. Review comments are recorded directly on the review document or on the review comment summary and resolution (RCSR) form. (See figure 3.6-1).

Responsibilities

The project manager is responsible for overall implementation of this procedure, selection of packages to receive a TCR and approval of TCR reviewers.

The project manager is responsible for selecting DCR and TCR reviewers, assembling the DCR and TCR package, distributing the packages, collecting and consolidating review comments, resolving comments and their final disposition, and ensuring that the comments are addressed and incorporated in the documents.

Reviewers assigned to perform a DCR or TCR are responsible for completing the review in accordance with this procedure to ensure that interferences or potential problems with design or construction are identified.

Procedure

1. Initiation of the Review by the Project Manager

- Prepares a review copy set, stamping “Review Print” on the front page of each document set and identifying the set as “DCR” or “TCR”.
- Fills in the phase and date areas of the stamp. Lists in the space provided the disciplines or individuals that are to participate in the review.
- Forwards the review set to the reviewers.

2. Review

The designated reviewers thoroughly review the documents with respect to their areas of responsibility or expertise.

- Unless using the RCSR form, each reviewer should make notations directly on the review print in different colored pencil or ink so that comments from each reviewer are identifiable.
- Comments on specifications or design reports should have pages paper-clipped or tabbed for easy identification.
- The reviewer signs and dates the review print stamp or RCSR form after annotating comments to be resolved, and returns it to the project manager.

3. Comment Resolution

The project manager responsible for the document or package then:

- Examines the comments of the reviewers and consults with the disciplines to resolve conflicting comments.
- Addresses each comment on the review print by annotating a response and the action to be taken.
- Signs and dates the review print stamp, and supervises the updating of the document.
- The document is then sent through the normal checking procedures in accordance with DQP 3.2, DQP 3.3, and/or DQP 3.5.

References

DQP 3.1	Checking of Calculations
DQP 3.2	Checking of Drawings
DQP 3.3	Checking of Specifications
DQP 3.5	Review of Studies or Report-Type Documents.

Figures

Figure 3.2-1	Check Print Stamp
Figure 3.5-1	Review Print Stamp
Figure 3.6-1	Review Comment Summary and Resolution Form

Figure 3.6—1: Review Comment Summary and Resolution Form

UTA **REVIEW COMMENT SUMMARY AND RESOLUTION SHEET**				**CODE** 1. Accept Comment - Correct, Add, Clarify 2. Delete Comment 3. Clarify or discuss 4. Resolution of comment in next phase of design		
Submittal: (Circle One)	Adv Prelim Design Review Final Review	Designer:	Date:			
Package/Document:	Organization	Reviewer:				
Control No.	***Dwg. No. Page No.**	**Comments** M - Mandatory A - Advisory O - Observation	**# Code**	**# Response**	**## Final Disposition**	
					Code	Date

"If no comment, write "NO COMMENT" Page __ of __	Signature of Reviewer:	Organization Sign-off: Date:

*Indicate Drawing No. or Page No. or use "G" for General Comment.	# To be filled out by Project Manager or Designee ## To be determined at Review Meeting or in subsequent meeting/ discussion

Review Comment Summary and Resolution Form

3.7 Constructibility Review (CR) of Documents

Purpose

To establish the sequence and responsibilities for the constructability review of documents.

Scope

This procedure applies to all drawings and specifications submitted for design review that, based upon the scope and complexity of the design, may benefit from a constructability review (CR). This review is conducted, as necessary, at the conclusion of preliminary design and prior to the completion of final design.

The constructability review is applied to a design drawing or specifications to coordinate and review construction issues and their impact on the design details. Engineers or contractors with wide experience in construction review the document regarding adequacy of information, tolerances, site access and restrictions, economics of design and materials, availability of materials, construction equipment and required labor, survey verification, consistency with design objectives and environmental mitigation, maintainability features, interferences, conflicts between construction disciplines, completeness, and prudent construction practices. Review comments are recorded on the document itself and summarized on the review comment summary and resolution (RCSR) forms.

Responsibilities

The project manager is responsible for assembling and forwarding the document to the reviewers, collecting and consolidating review comments, conducting a comment resolution meeting, recording comment resolution and final disposition, and ensuring necessary changes are incorporated or addressed in the design document. A designee may be assigned the responsibility of assembling and distributing the review documents, and collecting and consolidating review comments.

Reviewers assigned to perform a constructability review are responsible for completing the review of the design package, in accordance with this procedure, through written comments. Reviewers attend the comment resolution meeting.

Procedure

1. Initiation of the Review by the Responsible Project Manager

- Coordinates with the reviewers to establish the number of copies required for review.
- Prepares a review copy set, stamping “Review Print” on the front page of each document set and identifying the set as “CR”.
- Distributes, or otherwise makes conveniently available, review documents to the reviewers along with copies of the review comment summary and resolution sheet (RCSR) and a schedule for the constructability review and comment resolution meeting.

2. Review

- Each designated reviewer thoroughly reviews the document with respect to his/her responsibilities.
- The reviewer records comments directly on document and affixes his/her initials and date on the review print stamp.

- The reviewer summarizes his/her comments on the review comment summary and resolution sheet form. The comments should be consecutively numbered and should reference the drawing or page number relative to the comment. In the title block area of each form, the reviewer inserts his/her name, the date of the review, document number reviewed, form page number, and total pages of comment forms.
- In accordance with the established review schedule, the reviewer returns the review prints and completed RCSR forms to the responsible project manager.
- The project manager collates or consolidates all comments into a single set and reviews each comment, and after conferring with the original designers and others, as appropriate, enters a response to the comment and assigns the appropriate "code", (as they are defined on the RCSR form), in the column immediately to the left of the response. When all comments have been addressed and in accordance with the established review schedule, the entire comment set is reproduced and provided to all reviewers.

3. Comment Resolution Meeting

The original designers and the reviewers attend the comment resolution meeting. At the meeting chaired by the project manager, all review comments will be discussed.

- Once resolved, the chair will record the final disposition code for the comment and the date on the RCSR form.
- Comments which cannot be resolved shall be brought to the attention of the task manager by the project manager.

4. Incorporating Comments in Design

The project manager assigns each comment for incorporation a control number and redistributes a copy of the RCSR comments along with the marked up review print to the appropriate designer to incorporate the comment in the design.

The corrected document is sent through the normal checking procedures in accordance with DQP 3.2 or DQP 3.3.

References

DQP 3.2 Checking of Drawings

DOP 3.3 Checking of Specifications

Figures

Figure 3.2-1 Check Print Stamp

Figure 3.5-1 Review Print Stamp

Figure 3.6-1 Review Comment Summary and Resolution Form

3.8 Formal Review of Documents By UTA and Other Entities

Purpose

To establish the process and sequence for the formal review of construction plans and specifications by UTA and other entities having local jurisdiction, including state and local governments and agencies, utility companies, and others.

Scope

This procedure applies to all drawings and specifications submitted for formal review. The formal review process is fashioned to solicit, review, and resolve comments and concerns from UTA, and other local jurisdictions, throughout the design process. This review is conducted at the conclusion of preliminary design and final design phases, and after final revisions. Review comments will be recorded on review comment summary and resolution (RCSR) forms except as noted otherwise. All plans and specifications must have passed a quality assurance review prior to being submitted for formal review.

Responsibilities

The project manager is responsible for overall implementation of this procedure, maintaining a list of contacts within the local jurisdictions, developing and maintaining a list of required approvals for each formal review package, coordinating the review by the local jurisdictions, and acquiring final acceptance of the construction package elements within their jurisdictional control.

The project manager is also responsible for the internal aspects of the formal review, including assembling and distributing the review package, collecting and consolidating review comments, assigning appropriate project managers to review and develop responses to comments, conducting the comment resolution meeting, resolving comments and their final disposition, and ensuring necessary changes are incorporated or addressed in the design packages. A designee may be assigned the responsibility of assembling the review packages, distributing the packages, collecting and consolidating review comments, and conducting the comment resolution meeting.

Project managers, or designees, review and address comments, develop and evaluate alternatives, formulate responses, attend the comment resolution meeting, discuss comments and responses, and incorporate any necessary modifications in the design.

Procedure

This procedure applies to all documents submitted for formal review.

1. Initiation of the Review by the Project Manager

- Coordinates with the project manager to establish a list of reviewers and schedule for the review process.
- Assembles and distributes documents to the reviewers, along with copies of the review comment summary and resolution sheet (RCSR), with instructions on how to fill out and use the RCSR sheets, and the schedule for the review.

2. Review of Comments

- The project manager receives, assembles, organizes, and distributes to the proper project managers the comments received from reviewers.

- Unless it is agreed by UTA and the project manager that a review meeting is not necessary, the project manager establishes the time and place for the comment resolution meeting based on the complexity of comments received and the time required to formulate responses. The project manager coordinates the meeting with the reviewers.
- The project manager reviews and assigns an appropriate senior engineer to investigate the comment. After investigating and conferring with the original designers and others, (as appropriate), the senior engineer formulates and enters a response to the comment and assigns the appropriate "code" (as defined on the RCSR form) in the column immediately to the left of the response. When all comments have been addressed, the RCSR sheets are returned to the project manager.
- The project manager reviews the response to each comment. If not in agreement with the comment, the project manager confers with the project engineer regarding alternate courses of action.
- When all comments have been satisfactorily addressed, the project manager, (or designee), collates and organizes all RCSR sheets, then reproduces and distributes the set to all reviewers.

3. Comment Resolution Meeting

The project manager chairs the meeting. The order in which comments are reviewed should be organized by discipline, location, feature, etc., and pre-arranged with the reviewers so as to minimize attendance time by reviewers.

- Each comment is reviewed and thoroughly discussed in an attempt to resolve.
- Comments which cannot be resolved shall not be coded for final disposition, and shall be referred to the project manager.
- The final disposition of each resolved comment shall be recorded by the project manager. Codes for resolved comments are limited to "Accept", "Delete", or "Resolve in next phase".

4. Incorporating Comments in Design

The project manager assigns each comment for incorporation a control number and redistributes a copy of the RCSR comments to the proper project manager for incorporating in the design. The project manager assigns the appropriate designer to incorporate the comment.

- For each sheet requiring modification, a copy is made and the check print stamp is affixed, the phase and date are noted, and the "Formal Review" stamp is applied.
- Changes will be marked in red on the check print; notes to designers regarding issues requiring further design will be made in black ink.
- All modifications will be annotated with "Per RCSR xxxxx", where "xxxxx" represents the RCSR number of the comment.
- Once all comments on the sheet have been satisfactorily addressed, the designer fills in his/her name, and date on the check print stamp.
- The corrected document is sent through the normal checking procedures in accordance with DQP 3.2, DQP 3.3, and/or DQP 3.5.

References

DQP 3.2 Checking of Drawings

DQP 3.3 Checking of Specifications

Figures

3.9 Project Management Review of Documents

Purpose

To establish the sequence and responsibility for the final review of documents developed to be used for construction or procurement.

Scope

This procedure applies to the final review of design documents to be released or issued for construction.

For studies, reports, or other non-construction/procurement-type documents, DQP 3.5 Review of Studies or Report-Type Documents, shall apply.

Background

The project management review is a two-step procedure involving successively higher levels of responsibility: the project managers and the task manager.

The review process applies only to complete document sets that have been checked and are to be submitted as a finalized document. Draft copies and sketches not in final format are never to be used for reviewing purposes.

Ultimate responsibility for the quality of all documents produced by a project team rests with the project manager. It is mandatory, therefore, that the project manager ensures all final documents conform to UTA standards, contract requirements, applicable laws, codes and regulations, and to the functional and technical objectives of the project.

The project management review culminates in final approval of documents for submission to UTA.

Through examination of check prints, review prints, sign-off stamps, and discussion with project staff, the reviewers must assure that proper interface between disciplines has produced a final set of integrated documents that are free of incongruities. For example, the review must determine if compatibility of documents exists between:

- Civil, trackwork, structural, drainage, electrical, mechanical, and architectural drawings.
- Drawings and technical specifications.
- Drawings and quantity take-offs.
- General conditions, special conditions, and related documents.

The project manager is fully responsible for implementation of this procedure, whether the review is conducted directly by the project Manager or by designated representatives.

The reviewers must determine if the designs meet required design criteria, all applicable standards, and reflect good engineering practices.

The project managers are responsible for compiling the review set of documents, incorporating review comments, and updating the originals.

Procedure

The document originals are stored in limited access files until such time when all other work has been completed and an integrated complete document set can be printed for review.

1. The project manager concerned obtains a set of prints completed from the checked, corrected, and verified originals, then stamps the cover sheet with the "Review Print" stamp and forwards the documents to the first designated reviewer.
2. The project managers then review the set of documents for compatibility with the respective requirements for the project and for technical accuracy. He/she annotates the documents with comments, and signs and dates the sign-off stamp on the line designated on the review print stamp. Different colors are used so that each reviewer's comments are readily recognizable.
3. The originator reviews the plans to assure they have incorporated the latest design standards, client directions, and review comments. This review shall also verify the uniformity of approach between disciplines and engineers. He/she annotates the documents with comments, and signs and dates the review print stamp.
4. The project manager reviews the review prints for compatibility with project functional and technical requirements; and for adherence to policies, contractual requirements, and inclusion of client comments. The Project Manager:
    - Calls upon the assistance of the engineers who have directed the work of each discipline in carrying out the review.
    - Resolves all review comments with the project manager responsible for the document.
    - Returns review prints to the appropriate project manager for changes and corrections necessary as a result of the review.
    - Reviews the updated document originals with the project manager to assure that the changes and corrections have been correctly incorporated.
    - Signs and dates the sign-off stamp in the space designated for the project manager and sends the review prints for inclusion in the project files.
    - Assembles final sealed and signed document originals into sets of contract documents, or other appropriate formats for reproduction and submission.

Reference

DQP 3.2 Checking of Drawings

DQP 3.5 Review of Study or Report-Type Documents

Figure

Figure 3.5-1 Review Print Stamp (applicable for this procedure)

3.10 Quality Audits Of Planning and Design Functions

Purpose

To describe the methods, define the requirements, and establish the responsibilities related to the conduct of quality audits of planning and design functions.

Scope

This procedure applies to all planning and design related functions of UTA and its consultants. Audits are performed by the quality manager to assess the design team's compliance with the project's quality program as described in the *Design Quality Procedures* (DQP). The procedure also provides for coordination and follow-up of audit findings and recommended corrective actions.

The performance of audits in support of the DQP includes the following:

- Design group audits to determine the compliance of project managers and their design teams to the DQP.
- Consultant office audits to determine the compliance of the consultant's design staff to the program.
- QA review of design submittal packages to assess the design team's conformance with the quality procedures in producing the documents.

Responsibilities

The quality manager is responsible for scheduling and performing quality assurance audits to ascertain that the quality program is adequate, objective, and effectively implemented. The quality manager is to conduct the group or office audits in a professional and objective manner and, consistent with the planned audit objectives, minimize interruptions to normal work flow of the organization being audited. The quality manager is to ensure that audit evaluations and findings are valid and supported by specific written requirements of the *Design Quality Procedures*, the project management plan, and other applicable policies and procedures.

The manager of each audited design group or office is responsible for ensuring a receptive and cooperative response to the auditor by personnel in their group and providing timely access, during the performance of the audit, to pertinent facilities and documents.

All project staff members should be familiar with their quality control responsibilities and the checklist items for the audit.

Procedure for Design Group and Sub-Consultant Audits

1. Audit activities are planned, documented, and conducted in a manner to ensure adequate review of the *Design Quality Procedures* requirements.
2. A pre-planned, documented audit schedule is developed quarterly on the basis of the schedule of design activities.
3. Regularly scheduled audits are supplemented with unscheduled audits when the quality manager suspects that a serious quality control problem exists and the quality of a project may be in jeopardy.
4. The quality manager does not have direct responsibility for performing the activities being audited.
5. The audits may include, but are not limited to, the evaluation of work performed, study/design activities, checking and review documentation, and other quality control functions.

6. Audit checklists are developed and utilized during audits to ensure objectivity and continuity of audits. Form 3.10-1 maybe used for the audit checklist.
7. At the completion of the audit, and prior to finalizing the audit report, the auditor conducts an exit interview with the responsible management of the audited project office to resolve any questions and establish mutual understanding regarding audit findings and proposed corrective actions.
8. Audit activities, including resolution of deficiencies, are documented and retained as quality records in order to provide the means for the quality manager to monitor the overall quality audit program. In addition, copies of audit reports are provided to the audited organization, the principal-in-charge, and the project manager. Form 3.10-2 is used to document audit findings and corrective actions.
9. Deficient areas are re-audited, or otherwise verified, subsequent to completion of corrective action, to ascertain that corrective measures have been implemented and are effective, before the audit is closed.

Figures

Figure 3.10-1 Quality Audit Checklist Form

Figure 3.10-2 Quality Audit Finding Form

Figure 3.10-1: Quality Audit Checklist

AUDITED AREA:		DATE(S) OF AUDIT:	
AUDITOR:		AUDIT:	
AUDIT ITEM	REFERENCE	METHOD OF VERIFICATION	CONFORMS
			YES / NO

Figure 3.10-2l: Quality Audit Finding

AUDITED AREA:	AUDIT NO.:	FINDING NO.
AUDITOR:	CHECKLIST ITEM NO:	
DATE(S) OF AUDIT:	REFERENCE:	
REQUIREMENT:		
FINDING: FINDING ACKNOWLEDGED BY: _____ DATE: _____		
RECOMMENDED CORRECTIVE ACTION:		
SCHEDULED COMPLETION DATE:	CORRECTIVE ACTION RESPONSIBILITY ASSIGNED TO:	
ROOT CAUSE:		
CORRECTIVE ACTION TAKEN: CORRECTIVE ACTION COMPLETED DATE: _____ SIGNATURE: _____		
CORRECTIVE ACTION VERIFIED BY: _____ DATE: _____ (AUDITOR) COMMENTS:		

3.11 Documentation and Transmission of Design Directives and Revisions

Purpose

To describe the design control measures to be taken to assure that all design directives are properly conveyed between disciplines of the consultant and its sub-consultants that are responsible for portions of a design, or whose design work may be affected by the originating design group.

Scope

This procedure applies to all project elements where a change in design requirements, criteria, or procedure has occurred or needs to occur. Design directives shall include supporting information as necessary, such as drawings, instructions, special provisions, schedules, or details.

Background

Proper documentation and communication are essential to assure continuous and complete control and verification of design configuration. Design directives shall be established for each work item or segment, identified by number and date of issue.

Design directives and instructions affecting design should not be issued verbally. In situations where it is necessary to issue verbal instructions, they shall later be documented by formal memorandum (e-mail). A separate series of memoranda (e-mail) may be established to convey these corrections or revisions to existing conditions and shall be attached to the design directive as supporting documentation.

If a series of design directives are instituted for the project, these should be incorporated into the project notebook, as appropriate.

During the course of the project management review of documents before submission to UTA (See DQP 3.9), all staff shall refer to design directives and design revisions, issued during the course of the project, to assure that all such directives and revisions have been properly taken into account during design development.

Responsibilities

Project managers are responsible for implementation of this procedure for their discipline areas on a routine basis. Design control within the responsible disciplines and coordination of that control resides with the project manager.

Procedure

1. Project managers over their discipline areas are responsible for originating design directives. They prepare the design directive form (figure 3.11-1), describing the nature and purpose of the directive and describing the material being transmitted. Any supporting documentation is attached and the directive forwarded to the project manager.
2. Upon review and approval of the directive, the project manager signs the form and returns it to the originator.
3. The originator sends copies of the design directive to the project manager, consultant, and design managers.
4. Project managers are responsible for distributing the directive to their design staff and consultants.

5. The project manager keeps all original design directives along with supporting documentation, sending copies to document control. These are dated, distinctly identifiable, sequentially numbered, and kept in a three-ring binder.
6. Engineers, who during the course of their design create a parameter with which other disciplines must interface, will prepare the documentation necessary for the project manager to issue a design directive.

Figure

Figure 3.11-1 Sample Design Directive (see next page)

Figure 3.11-1: Sample Design Directive

UTAH TRANSIT AUTHORITY

DESIGN DIRECTIVE NO. 07
PROJECT _____

Job 646061

Design Directive File

February 1, 2005

SUBJECT:

Ogden Interchange Profiles

DESCRIPTION:

Transmitted herewith are prints showing final computed profiles and backup computations for Ogden Interchange with Crosstown Expressway originated by A.O. Millex, project Civil Engineer.

1. N-S track
   (Drawing CHP 72)

2. E-W roadways on Crosstown Expressway
   (Drawing CHP 73)

PURPOSE:

These profiles supersede those shown on Drawings CHP 8 through 10 of the April 15th preliminary plan submission, and should be used in development of all final structure and track elevations, drainage features and other design elements.

Signed _____
Project Manager

ACKNOWLEDGEMENT:

Please sign and return one copy of this directive to Deputy Design Manager and retain one copy for your design directive file.

Signed _____
Discipline Task Manager

Date _____

3.12 Quality Control of CADD-Produced Documents

Purpose

To establish the methods to be utilized for the generation of designs and design documents.

Scope

Design Quality Procedures DQP 3.1, Checking of Calculations; DQP 3.2, Checking of Drawings; and DQP 3.4, Checking of Input for Computer Programs are the primary means to be used in the checking of design documents and calculations.

This procedure has been developed to define and control the basic interfaces between CADD operators, project management, and designers in order to prepare timely, cost-effective, and quality design documents.

Responsibilities

The CADD coordinator provides for procurement, maintenance, and training for all CADD hardware and software.

The project manager provides to the CADD operators the detailed information on the makeup of the final drawings and names of designers who will be supplying the design data or using CADD workstations for design.

The CADD operator maintains detailed definitive logs on the files and reference files and what is contained on each level, both in hard copy logs and in the system.

The designer provides to the CADD operator the design data required to accurately input into the CADD system, as well as hard copies of backup calculations for all elements of the design, and initiates the checking processes for designs under his/her direction.

Procedure

1. When it has been determined that the CADD system will be utilized for a design, the project manager notifies the CADD coordinator as to what final drawings will be generated.

   The CADD coordinator and CADD operator list how the system files will be created and what will be on each designated level in the file.

   - File names that are used should reflect the nature of their contents.
   - Reference files should be utilized, as opposed to the copying of existing data. All contract drawings should be referenced from design files.
   - Seed files or libraries of standard features and details may be added but no changes should be made to an existing approved standard.

2. As referenced files are base lined, they may be plotted as strip maps and the yellow line checking performed at this level. On the subsequent contract drawings, these areas need not be rechecked.
3. The designer develops the design calculations utilizing the CADD or other systems and provides this input and plotting instructions to the CADD operator for the detailing necessary for document preparation.

   In the cases where the CADD system is utilized for design measurement of feature placement, hard copies of backup calculations must be created by the designer before the design is submitted for client review.

4. All CADD-produced prints will have produced on them automatically the date, time, and files/levels printed.
5. At a point where individual drawings are complete, check prints are made and the final checking process started. From this point on, changes or additions to the design are carefully logged in to assure that new check prints are issued to the checker.

References

DQP 3.1 Checking of Calculations

DQP 3.2 Checking of Drawings

DQP 3.4 Checking of Input to Computer Programs

3.13 Implementation of Corrective and Preventive Action

Purpose

This procedure establishes the process for implementing corrective and preventive action.

Scope

This procedure is used within the UTA team for resolution of all corrective and preventive actions. The corrective and preventive action process (CAP) is an investigative process used to determine the root cause of problems or potential problems identified by the audit finding.

Responsibilities

The quality manager is responsible for designating the CAP assignee, for assuring that all CAPs have been completed, and for ensuring that the corrective and preventive action is effective. The CAP assignee is responsible for conducting the investigation to determine the root cause, to define the corrective or preventive action plan, and to assist in determining its effectiveness.

The quality manager is responsible for approving and implementing the corrective and preventive action plan.

Procedure

1. The CAP process can be initiated by any employee or manager. A CAP results from:
   - Significant or repetitive non-conformances
   - Internal and external audit findings
   - Management review of the quality system
2. The quality manager performs an analysis and evaluates the CAP and determines the severity, priority, and impact to the department/section.
3. The quality manager assigns a control number to the CAP and identifies who is best suited as CAP assignee.
4. The CAP assignee is responsible for determining the root cause, developing the corrective and preventive action plan, and determining the implementation time schedule. The corrective or preventive action plan should address any immediate needs that may be required to limit damage or liability associated with the CAP. In order to complete this assignment, the CAP assignee:
   - Collects data and/or samples as appropriate
   - Documents results of the root cause analysis
   - Identifies action needed to avoid and prevent future incidents
   - Identifies any needed system changes
   - Determines the expected results
   - Determines timing and responsibilities for implementation

   NOTE: Root cause for preventive action is identified through analysis of work operations, processes, internal or external audits, UTA input (complaints or other feedback), statistics related to processes, and product and quality records.

5. The CAP assignee submits the suggested corrective and preventive action plan to the quality manager for review, and submittal to the appropriate task manager for implementation.
6. Once accepted, the appropriate task manager ensures that the corrective or preventive action plan is implemented.
7. The quality manager and assignee are responsible for verifying the effectiveness of the corrective or preventive action. Once verified through collection of documented objective evidence, it is noted on the CAP and the CAP is closed. The quality manager submits a copy of the CAP to the design manager and originator.
8. The quality manager will review the CAP documentation, determine its relevance to other departments or sections, and issue copies to those departments where appropriate.

   The quality manager summarizes all corrective and preventive actions and submits the summary to the senior management team for the management review.

Figure

Figure 3.13-1 Corrective and Preventive Action Process (CAP) Form

Figure 3.13-1: Corrective (And Preventive) Action Process (CAP)

To be completed by the design quality manager.

CAP Control No.	CAP Title:
CAP Assignee Name:	Project Manager

To be completed by the Originator:

Originator Name:	Originator Location
Submittal Date:	
Area(s) Involved:	
Problem Description:	

To be completed by the CAP Assignee:

Cause:
Corrective Action Plan:

To be completed by the Design Quality Coordinator and Assignee:

Verification of Effectiveness:

This CAP is closed and no further action is necessary.

cc: CAP Assignee
Project Manager
Document Control

Design Quality Coordinator

Date:

3.14 Design Changes during Construction

Purpose

To establish the scope, responsibilities and procedures for processing request for revision (RFR) of design during construction.

Scope

Construction contracts often require changes to the original design of the project. Changes in site conditions, corrections to the original design, value engineering proposals, and alternate construction method/material proposals from the subcontractors are situations which would require modifications to the original documents.

Any deviation from project requirements shall be formally processed for UTA concurrence, in the same manner as design submittals.

Responsibilities

The project manager, under the direction of the task manager, is responsible for the processing of all RFRs to make any design changes to construction documents, including the coordination, preparation, and forwarding of all RFRs to identified recipients. The project manager shall facilitate the review of RFRs with UTA and with representatives of outside agencies should the scope of that particular RFR impact construction elements under their jurisdiction.

The design staff will be responsible for making the design change. Design changes will undergo design quality control processing similar to that of the original design.

Procedures

1. Each RFR shall be initiated by the issuance of an RFR notice by the contractor, providing the base information of the revisions requested. The project manager shall register the RFR on the RFR log, which will serve as the tracking mechanism through the final release of the RFR for construction.
2. The scope of the RFR shall be thoroughly analyzed to confirm the circumstances described in the RFR notice. The project manager shall enlist additional information from field personnel, as necessary, to clearly define the scope and detail of the revisions required, as well as to identify the schedule for RFR resolution.
3. The project manager shall update the RFR log regularly to provide the current status of each RFR.
4. All design changes to plans, specifications, calculations, and reports shall be stamped, signed, and dated by a licensed professional engineer. All design work shall conform to the checking procedures governing design, as identified in other sections of this DQP. The design quality manager shall sign off that the design change has been audited for compliance with the DQP and has passed.
5. All drawings and documents modified under each RFR shall be uniquely identified from the original design. The revision box on the drawing shall include a sequential number corresponding to the number of the change on that particular sheet. The description for each change shall include the corresponding RFR number and a brief description of what is being revised. Each element being revised within the body of the drawing shall be clouded and identified by the revision number within a triangle and shall remain a part of the drawing's information.

Figures

Figure 3.14-1: Request for Revision

Request for Revision (RFR) Notice

Sheet ___of___

Utah Transit Authority **Project Name**	**Design Discipline**	**Construction Package**
Contractor Name:		**RFR #** **Date:**
SCOPE OF WORK MODIFICATION (Describe the scope, circumstances, and location of the work)		
JUSTIFICATION		
RIGHT-OF-WAY IMPACTS		
TIME CONSTRAINT		
JURISDICTIONS IMPACTED/ ACCEPTANCE		
DRAWINGS/ DOCUMENTS		
REQUESTED BY:		
UTA APPROVAL:		

Figure 3.14-2: Request for Revision (RFR) Log

				Revised Drawing		
RFR Number	**Construction Package**	**Discipline**	**Notice Date**	**Target Date**	**Actual Date**	**Description**

3.15 Responses to Field Inquiries

Purpose

To provide a uniform and documented process to deal with requests for information (RFI) or clarifications required by contractors or fabricators.

Scope

This procedure includes the interface between construction management and the design engineer.

Responsibilities

The project manager must give prompt attention to field inquiries, and document by memorandum or in a project diary the analysis and resolution. The processing of field inquiries is to be done in accordance with the construction services scope of the contract.

Procedures

The contractor contacts the project manager prior to sending the document requesting information or clarification of design.

1. If the project manager's response is immediate, a phone conversation memorandum is generated by the contractor with a copy to the project manager.
2. Should the telephone conversation not result in an immediate response, the field inquiry is forwarded along with any clarifying or supporting documentation that the project manager may have requested. The contractor may mail, fax, or hand-deliver the inquiry in a manner consistent with the annotated suspense date.
3. The project manager takes all immediate actions; i.e., lines up personnel to handle the inquiry, contacts consultants, reviews the contract plans and specifications, or contacts materials suppliers as necessary to meet the agreed-upon deadlines.
4. The project manager makes a full investigation of the inquiry, including a field inspection, when the inquiry involves changed conditions. The project manager documents the method and details of the complete analysis of the inquiry for the project files. The response, however, should be brief and to the point and need not outline the complete background. Sketches needed to clarify text should be attached to the response.
5. The project manager logs in and stamps "Received" on the inquiry upon receipt, and dates and signs the response.
6. The project manager notifies the contractor by telephone of the response before returning it, in order to eliminate any possibility of misinterpretation or dispute.