

Part 511 – Design

Subpart B – Documentation

511.10 Scope

Design folders must be prepared for all designs within approval categories VI, VII, and VIII (see part 501 of this manual) and for all dams that have importance for reasons of public safety (see section 520.21F of this manual).

511.11 Design Folders

A. The design folder contains the design analyses, design report, construction drawings, specifications, bid schedule, performance schedule, inspection plan, and operation and maintenance plan. All notes, computations, drawings, sketches, and other data must be recorded neatly and organized in a manner that allows reproduction and incorporation in reports with a minimum of editing. Design drawings, diagrams, graphs, sketches, or other pictorial representations should be incorporated into the computation file if the size and scale permit. Designs drawn on larger sheets that cannot be folded to computation sheet size must be cited at the appropriate place in the computations by a notation that fully identifies the drawing and its file location. The design documents should be kept in a binder to keep them in order.

- (1) Design records must be kept orderly and current to allow for efficient review at any stage. They must be complete and understandable because they may be used for later actions, such as—
 - (i) Design changes required during construction.
 - (ii) Structural modification or addition during operation or maintenance.
 - (iii) Investigation of performance.
- (2) Design records must completely document the—
 - (i) Data gathered to demonstrate the physical, chemical, and biological conditions at the site.
 - (ii) Purpose and function of works designed.
 - (iii) Standards, criteria, and limitations used as design guidance.
 - (iv) Problem conditions to be considered.
 - (v) Qualitative and quantitative design analysis.

B. Design reports summarize in narrative form the design objective, data, criteria, assumptions, procedures, and decisions used in the design. Selected structure dimensions, elevations, and capacities should be used to augment the narrative, but are not to serve as a replacement.

C. Previously developed requirements established during the planning phase must be included by reference. Design reports may vary in length from a brief synopsis to an extensive review. A design report addresses the topics in the following list, as appropriate. The report contents should be commensurate with the design complexity and significance; some items listed may not be relevant, and if not, need not be included.

- (1) Summary.—A concise statement of the history and status of the design, previous reviews for disposition of applicable policy items, justification for departure from standards, receipt of waivers, etc.
- (2) Description of the Job.—A brief description of the major features, hazard classification, drainage area, storm frequencies, landscape resources, capacities, etc., must be included. Include any variance from project plans.

Title 210 – National Engineering Manual

- (3) Design Objective.—A brief, clear statement that may be a summary from a project plan. Differences identified from plans must be supported by proper approvals.
- (4) Basis for Design.—A listing of reference documents used in the design, such as handbooks, codes, reports, studies, and criteria.
- (5) General Basic Data.—Hazard analyses, seismic assessment, limiting conditions or restraints that may influence the design, construction, or facility operation.
- (6) Location and Layout.—Consideration of site configuration or landscape conditions that had an effect.
- (7) Hydrology.—The data reference, procedures, spillway operation frequency water yield, reservoir operational studies, and summary of precipitation amount and intensity.
- (8) Hydraulic Design.—A summary of the hydraulic shape and proportioning selected. Include channel stability and sediment transport considerations.
- (9) Foundations, Embankment Design, or Both.—A summary of data, site conditions, assumptions, treatments selected, and design analyses used to—
 - (i) Make seepage analyses and design control measures.
 - (ii) Make stability analyses and determine material quality and quantity.
 - (iii) Make foundation design analyses.
 - (iv) Permit planning instrumentation systems.
- (10) Structural Design.—A summary listing the assumptions, loading conditions, and design procedures.
- (11) Environmental Considerations.—Features or practices to provide for conservation of visual, biological, and surface and ground water resources that may be affected by the planned measures, both during and after construction.
- (12) Construction Drawings.—Mention of standard detail drawings or any use of previously prepared special drawings.
- (13) Specifications.—Mention of special specifications and why they were needed. Explain special conditions or the need for special provisions in the construction contract.
- (14) Bid Schedule.—Give the rationale for selection of lump sum or subsidiary items.
- (15) Cost Estimate.—The considerations used that may be affected by the season or changes in size of contract.
- (16) Construction Schedule.—Explanation of any critical starting, delay, or completion dates.
- (17) Operation and Maintenance (O&M).—Explanation of conditions in which design assumptions depend on proper O&M and significant O&M activities are anticipated (for example, grasses in the emergency spillway to protect against erosion during flow). Items identified and evaluated during the design that are planned for replacement during the evaluation period must be noted and described.
- (18) Construction Review.—A summary of those items, conditions, or features encountered during construction that require a field review by the designer, geologist, soil engineer, or other specialist to ensure that conditions anticipated during the design are verified and consistent with the design assumptions. Include the request for timely notification. Note whether a preconstruction conference is needed.
- (19) Authority.—The name (with signature) and title of the designer and approving officer must appear on the report.