Design And Construction Guidelines For Dams

Course Number: ST-02-310

PDH: 10

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Chapter 1. Introduction to the Guidelines

Introduction

This course describes the design and construction requirements for the construction of a proposed dam or the reconstruction, modification, enlargement, rehabilitation, alteration, or repair of an existing dam in Texas. These design and construction requirements include the submission, review, and approval of engineering plans and specifications, inspections, reports, and records.

The course delineates the full extent of a submittal package that would provide the information necessary for the TCEQ to conduct an adequate review of a proposed construction project. Though the guidelines are rather explicit, the engineer may submit alternate designs or utilize unconventional practices if they can be adequately demonstrated to be safe and effective.

These guidelines may be revised and republished at any time. Therefore, when you are preparing a submittal package for a proposed dam construction project, you should specify which version of these guidelines you are using.

This course supplement the Texas Administrative Code, Title 30, Part 1, Chapter 299, “Dams and Reservoirs.”

Professional Responsibility and Duty

If you are a licensed professional engineer or working under the guidance of one, this course is for you. We assume that you are familiar with the processes discussed in this course, as well as with the standard engineering software used for stability (including erosion stability) analyses. In Texas, the design and quality assurance of dam construction projects is considered to be a facet of the practice of engineering and, as such, subject to the Texas Engineering Practice Act, as amended.

Applicability

The course described in this document apply to all dams under the jurisdiction of the TCEQ Dam Safety Program. Some dams may also need to meet the requirements of other agencies, such as the U.S. Department of Agriculture’s Natural Resources Conservation Service (NRCS) or the U.S. Army Corps of Engineers (USACE).

Definitions

Many of the words and terms used throughout this course are defined in the glossary, “Dam Safety Terms.” According to 30 TAC 299.1(a), dams fall under the jurisdiction of the TCEQ Dam Safety Program if they meet one or more of the following four criteria:

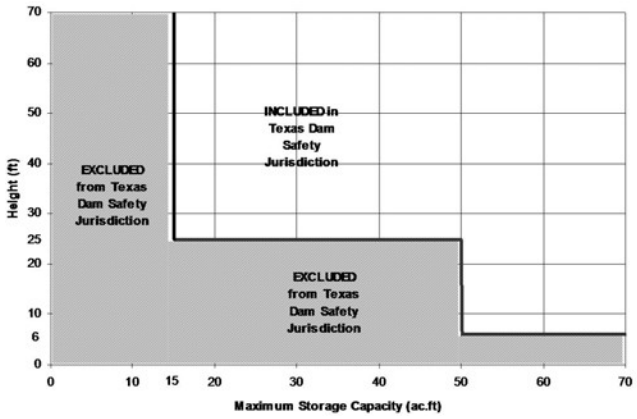
[they] have a height greater than or equal to 25 feet and a maximum storage capacity greater than or equal to 15 acre- feet; [they] have a height greater than 6 feet and a maximum storage capacity greater than or equal to 50 acre-feet; [they] are a high- or significant-hazard dam as defined in §299.14 (relating

to Hazard Classification Criteria), regardless of height or maximum storage capacity; or [they] are used as a pumped storage or terminal storage facility.

Acknowledgements

This course is based substantially on the work of many agencies and individuals that have contributed greatly to the design and construction of dams in the United States. These agencies and individuals are credited in the Bibliography, at the end of this course.

Figure 1.1. Definition of a Jurisdictional Dam



Chapter 2. Submitting Construction Plans and Specifications

Introduction

All engineering plans and specifications, inspections, reports, and records for the construction of a proposed dam or the reconstruction, modification, enlargement, rehabilitation, alteration, or repair of an existing dam in Texas must be prepared by, or under the direct supervision of, a professional engineer (licensed in the State of Texas) with direct responsibility for the analysis of the dam. All applicable proposed construction projects—as defined in 30 TAC 299.21, “Applicability”—must fulfill all construction requirements, including the submission of the engineering plans and specifications to the TCEQ Dam Safety Program, and their review and approval by the program. Any submittal packages for proposed construction projects that you send to us, the TCEQ, for review and approval must sufficiently document the technical basis for the proposed design(s). Furthermore, this documentation must include the methods used, the key assumptions, and the results and conclusions of any investigations and/or diagnostic work conducted prior to and during the design process.

You should supply the required information regardless of whether the analysis is a stand- alone review of an existing dam, or supports the design of a proposed new dam or the modification of an existing one. If you are proposing the major rehabilitation of a large dam, you should meet with us before you develop construction plans. Our requirements as to the preparation of hydrologic and hydraulic analyses, as well as any related breach analyses, are outlined in our most current version of the *Hydrologic and Hydraulic Guidelines for Dams in Texas* (GI-364), which you can find online at www.tceq.state.tx.us/goto/dams. Two other TCEQ publications that are referred to in these guidelines are also fundamental: *Guidelines for Operation and Maintenance of Dams in Texas* (GI-357) and *Dam Removal Guidelines* (GI-358) These publications are also available at the above Web address.

Minimum Requirements for Submission

Construction Plans and Specifications

The principal element of the submittal package is the final set of signed and sealed construction plans and specifications.

Supplemental Information

In addition to the construction plans and specifications, you should also include the following supplemental information in the submittal package, depending on the nature of the project. The supplemental reports that you include in the submittal package must address the requirements and/or considerations outlined in the remaining chapters of these guidelines. The TCEQ forms mentioned below are included in the Appendix. A Submittal Package Checklist is also included in the Appendix, to help you make sure your submittal package is complete.

The submittal package you send in to the TCEQ Dam Safety Program only has to contain one copy of each of the required documents, as delineated below. These documents will be retained in TCEQ records after the construction plans and specifications are approved. If you or the owner need additional approved copies of the construction plans and specifications for your own records or for distribution, the number of additional copies you want should be included in the submittal package.

New Dam or Major Modification Project

A major modification is one that will change the hydraulic or structural design or capabilities of the dam.

- Information Sheet: Proposed New Construction, Modification, Repair, Alteration, or Removal of a Dam (Form TCEQ-20345)

- Hydrologic and Hydraulic (H&H) Evaluation Summary (Form TCEQ-20346)

- Design Report – to assess and report the proper size and hazard classification of the dam, as well as any applicable Federal Emergency Management Agency (FEMA) floodplain issues or requirements

- Geotechnical Report – including stability analyses, if applicable

- Hydrologic and Hydraulic Analyses – if applicable

- Breach Analyses (with inundation mapping) – if applicable; for a dam designed to handle less water than that generated by its required design flood

- Quality Control Plan

- Closure Plan

- Plan for Addressing Possible Emergencies

- Instrumentation and Monitoring Plan – if applicable

- Supplemental Engineering Plans – if applicable, according to 30 TAC 299.22(d)(2) Additionally, in the case of a large, high- hazard existing dam, the TCEQ Dam Safety Program may require the dam owner to obtain the service of an independent team of professional engineers or other dam experts during the evaluation and design of modifications. This requirement would only apply to dams that have unique or unusually complicated technical issues related to the design of dam safety improvements. In such a case, the owner would retain a team of two or three independent experts to assist you, the owner's engineer, in the evaluation, design, construction, modification, or operation of the dam. You would have to submit the team members' names, along with their qualifications, to our Dam Safety Program. The Dam Safety Program will provide the dam owner with names of qualified engineers, if needed.

Major Repair Project

A major repair is one that will NOT change the hydraulic or structural design or capabilities of the dam, but whose scope goes beyond normal maintenance, as defined by our *Guidelines for Operation and Maintenance of Dams in Texas*.

- Information Sheet: Proposed New Construction, Modification, Repair, Alteration, or Removal of a Dam (Form TCEQ-20345)

- Design Report

- Geotechnical Report
- Quality Control Plan
- Plan for Addressing Possible Emergencies
- Supplemental Engineering Plans – if applicable, according to 30 TAC 299.22(d)(2)

Removal or Permanent Breach Project

- Information Sheet: Proposed New Construction, Modification, Repair, Alteration, or Removal of a Dam (Form TCEQ-20345)
- Design Report – to address all considerations outlined in the TCEQ's *Dam Removal Guidelines*
- Hydraulic Analysis – if applicable; for permanent breach projects, for which you need to demonstrate that the proposed breach size(s) can handle at least the peak inflow from the dam's design flood without overtopping the dam

Emergency Repair Project

An emergency repair does NOT require approval prior to commencement, according to 30 TAC 299.45, "Emergency Repair." The dam owner must undertake emergency repairs under the supervision of a professional engineer and implement the emergency action plan as soon as possible after the emergency is discovered and evaluated. The dam owner must notify the TCEQ Dam Safety Program coordinator by telephone, e- mail, or fax of the action being taken as soon as the emergency situation allows, but no more than 12 hours after the emergency is discovered and evaluated. The dam owner must have a professional engineer develop plans for permanent repairs as soon as the emergency is over. You, the engineer, must submit the plans for review and approval in accordance with these guidelines.

Content of Construction Plans and Specifications

The construction plans submitted to the TCEQ Dam Safety Program for review and approval must be 22 x 34 inches in size. (The plans may be reduced to 11 x 17 inches, as long as all details are still clearly legible and you included an accurate scale.) The submittal package must also satisfy all the other requirements outlined in 30 TAC 299.22, "Review and Approval of Construction Plans and Specifications."

Construction Plans for Proposed Dams

Purchase this course to see the remainder of the technical materials.