

Chapter 4: Developing a Safety Program

4.0 Objectives

The pressing issue of dam failure points up the need for a safety program. You, the owner, should base your program on an evaluation of your dam's structural and operational safety to identify problems and recommend either remedial repairs, operational restrictions and modifications, or further analyses and studies to determine solutions. Components of a safety program address the spectrum of possible actions to be taken over the short and long term:

- assessing the condition of the dam and its components
- conducting preliminary and detailed inspections
- identifying repairs and continuing maintenance needs
- establishing periodic and continuous monitoring capabilities over the long-term
- establishing an emergency action plan to help minimize adverse impacts should the dam fail
- establishing operations procedures which recognize dam failure hazards and risks
- documenting the safety program so that the information established is available at times of need and can be readily updated

Develop your safety program in phases, beginning with collection and review of existing information, proceeding to detailed inspections and analyses, and culminating with formal documentation.

You can accomplish much of the preliminary work personally, with the assistance of state and local agencies. However, depending upon the number and seriousness of problems identified by the initial assessment, you may require the professional assistance of qualified engineers and contractors.

4.1 Guidelines for Assessing Existing Conditions

The guidelines for assessing existing conditions involve a sequence of steps that will enable you, the owner, to secure the information you will need to determine whether subsequent detailed investigations, repairs, and maintenance are required. The steps include:

- reviewing existing data
- visiting the site
- inspecting the dam
- assessing significance of observed conditions
- deciding what to do next

Reviewing Existing Data. First (and crucially), collect and review available information on the dam—its design, construction, and operation. A first requirement is a good map of the site. Maps of the watershed and the downstream channel reaches are also valuable. Review the design of the dam and its appurtenant structures to assess its actual performance compared to that intended.

Also review engineering records originating during construction to verify that structures were constructed as designed. Collect records of subsequent construction modifications, as well as operation records that document the performance of the dam and reservoir. Review any previous emergency action plan to determine if it is up-to-date and workable. Incorporate all these records into a notebook or file; they are most important in establishing a safety program and serve as the basis for its supporting documentation. (For help with the development of such documentation, refer to Chapters 5 through 10.) Perhaps no records exist. In that case, a detailed examination of the structure is appropriate.

Visiting the Dam Site. Next, visit the site. Undoubtedly you know it well and have visited it many times, but in this visit there are particular things for you to look for. Take a fresh look at the dam structure and its surroundings from in view of their potential hazard.

Inspecting the Dam. Also, take a detailed and systematic look at all components of the dam and reservoir system. The description of the site's components in Chapter 2 should aid this inspection. (The descriptions are general, so bear in mind that dams and their components come in various shapes and sizes and differ greatly in detail). Features to inspect include:

- access roads and highways
- upstream slope
- crest
- downstream slope

- left and right abutments
- spillways
- outlets
- drains
- reservoir area (exposed and submerged)
- area immediately downstream of the dam
- downstream areas for change in hazard classification

Look for obvious deterioration, cracks and slumps, and boiling seepage and not-so-obvious internal corrosion and weathering, settlement, and foundation-rock deterioration and dissolution. A dam can look stable and still be susceptible to failure from gradual deterioration of its internal structure. Regular and very detailed inspections (Chapter 5) and follow-up monitoring (Chapter 6) and maintenance (Chapter 7) are needed to ensure maximum safety.

Assessing Significance of Observed Conditions. Chapter 5 presents detailed information on conducting inspections and assessing the significance of conditions

you observe. Typically, eroded areas, seepage, slides, and outflow draw the most attention.

Deciding What to Do Next. Your dam safety program is now off to a good start, with. Available information on design and construction of the dam and later structural modifications provides perspective on its existing condition relative to that intended. If no documentation exists, then development of equivalent detail should be a first priority. Assistance with inspection and documentation assistance is available from several sources, including the TCEQ, the state agency responsible for dam safety. Professional engineering consultants can also perform detailed inspections, testing, and analyses, and create documentation (Chapter 10).

4.2 Procedural Guidelines—A Source Book

This chapter provides an overview of how to establish a safety program.

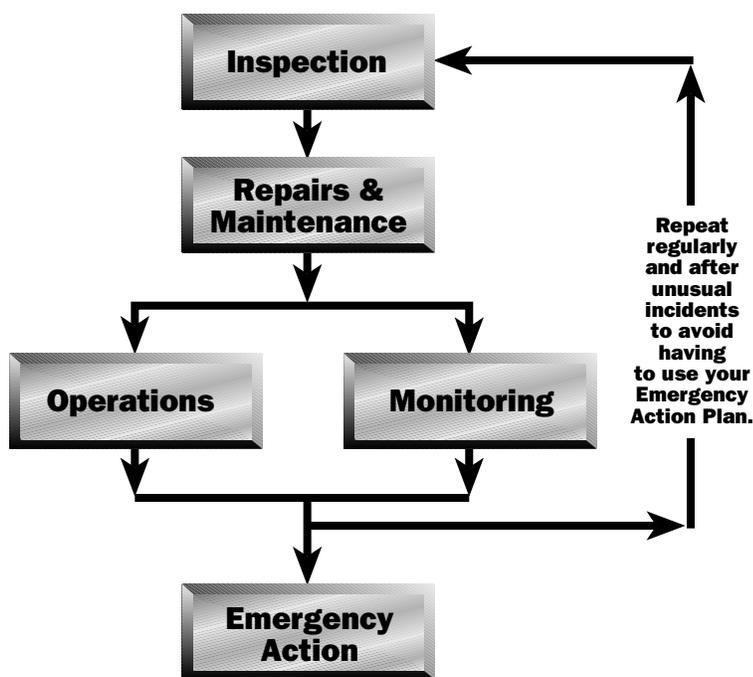
Subsequent chapters detail technical and procedural steps of the program components. They include:

- detailed inspection guidelines (Chapter 5)
- monitoring and instrumentation guidelines (Chapter 6)
- maintenance guidelines (Chapter 7)
- emergency action guidelines (Chapter 8)
- operations guidelines (Chapter 9)

These program components can be visualized as a sequence of initial and continuing activities to insure dam safety (Figure 4.1).

Again, the program of inspection for both the initial and continuing safety evaluations establishes the condition of the dam and provides the base of information necessary for specific actions involving repair, operation, maintenance, and monitoring. The flowchart illustrates the cyclical nature of the program and the need for continuing vigilance. Emergency action can, it is hoped, be avoided, but a well-thought-out plan of action (Chapter 8) in case of imminent or actual failure can greatly reduce damage and loss of life.

Figure 4.1
Procedural Guidelines for a Dam-Safety Program



4.3 Documenting the Safety Program

It is important to document a safety program in order to make the best use of reliable information about the dam. The procedural guidelines that follow can serve as an outline or table of contents for a safety program report. The operations plan (Chapter 9) presents a detailed outline of the information that should be included in the documentation. The chapters that follow suggest forms for inspections, monitoring, etc., which can be used to record information. It is helpful to maintain all the material in a single notebook or file that is easily assessable so that it can be updated and available when needed. Store duplicate copies at a different location.