



Catalog of FEMA Dam Safety Resources

August 2006



FEMA

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US Army Corps of Engineers
Applegate Dam, Oregon

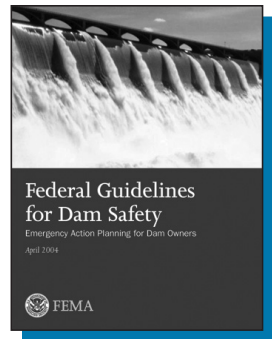
Publications

Federal Guidelines For Dam Safety

In June 1979, the *ad hoc* interagency committee on dam safety (ICODS) issued the first guidelines for federal agency dam owners (*Federal Guidelines for Dam Safety, FEMA 93*). To supplement the *Federal Guidelines for Dam Safety*, ICODS has prepared and approved federal guidelines in the areas of emergency action planning; earthquake analyses and design of dams; selecting and accommodating inflow design floods for dams; and hazard potential classification system for dams. ICODS also has published a glossary of terms to accompany the guidelines.

Federal Guidelines for Dam Safety: Emergency Action Planning for Dam Owners (FEMA 64)

There are many types of emergency events that affect dams. Whenever people live in areas that could be flooded from a dam failure, there is the potential for loss of life and damage to property. The purpose of these guidelines is to encourage thorough and consistent emergency action planning for dams to help save lives and reduce property damage. The guidelines cover basic considerations for preparing an Emergency Action Plan (EAP); the six basic elements of an EAP; and the suggested format for an EAP.



FEMA 64

The CD-ROM, FEMA 93CD, 2005, contains all of the Federal Guidelines for Dam Safety: FEMA 64; FEMA 65; FEMA 93; FEMA 94; FEMA 148; and FEMA 333.

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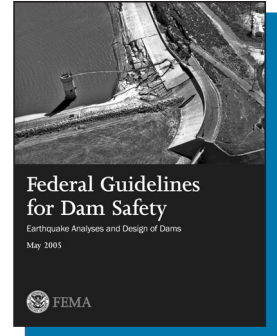
 Available in Print

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 Available in Video

Federal Guidelines for Dam Safety: Earthquake Analyses and Design of Dams (FEMA 65)

These guidelines provide the basic framework for the earthquake design and evaluation of dams. The general philosophy and principles for each part of the framework are described in sufficient detail to achieve a reasonable degree of uniform application among the federal agencies involved in the planning, design, construction, operation, maintenance, and regulation of dams. This document includes general guidelines for specifying design earthquake loadings (for design or safety evaluation) and for performing seismic analyses for the design of new dams (for evaluating the safety of existing dams or modifying existing dams). The guidelines are presented in four parts: selection of design or safety evaluation for earthquakes; characterization of ground motions; seismic analyses of the dams and foundations; and evaluation of structural adequacy for earthquake loading.



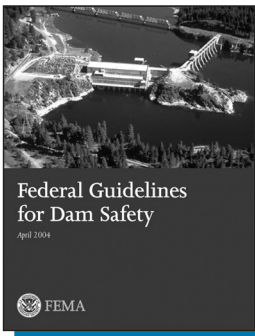
FEMA 65

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The CD-ROM, FEMA 93CD, 2005, contains all of the Federal Guidelines for Dam Safety: FEMA 64; FEMA 65; FEMA 93; FEMA 94; FEMA 148; and FEMA 333.

Federal Guidelines for Dam Safety (FEMA 93)




These guidelines encourage strict safety standards in the practices and procedures employed by federal agencies or required of dam owners regulated by the federal agencies. The guidelines provide the most complete and authoritative statement available of the desired management practices for promoting dam safety and the welfare of the public. The guidelines apply to federal practices for dams with a direct federal interest; the guidelines do not attempt to establish technical standards and are not intended to supplant or conflict with state or local government responsibilities for the safety of dams under their jurisdiction.



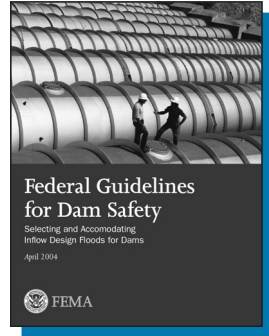
FEMA 93

The CD-ROM, FEMA 93CD, 2005, contains all of the Federal Guidelines for Dam Safety: FEMA 64; FEMA 65; FEMA 93; FEMA 94; FEMA 148; and FEMA 333.

Federal Guidelines for Dam Safety: Selecting and Accommodating Inflow Design Floods for Dams

(FEMA 94)   




These guidelines provide thorough and consistent procedures for selecting and accommodating inflow design floods (IDFs), the flood flow above which the incremental increase in water surface elevation downstream due to the failure of a dam or other water retaining structure no longer presents an unacceptable additional downstream threat. These guidelines are not intended to provide a complete manual of all procedures for estimating IDFs; the selection of procedures is dependent upon available hydrologic data and individual watershed characteristics.

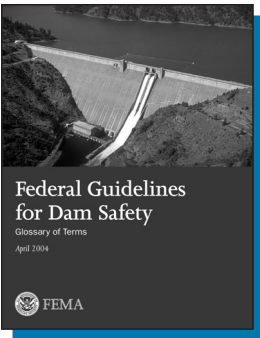


FEMA 94

The CD-ROM, FEMA 93CD, 2005, contains all of the Federal Guidelines for Dam Safety: FEMA 64; FEMA 65; FEMA 93; FEMA 94; FEMA 148; and FEMA 333.

Federal Guidelines for Dam Safety: Glossary of Terms

(FEMA 148)   



FEMA 148

This glossary provides a common terminology for dam safety for use within and among federal agencies. The terms are generic and applicable to all dams, regardless of size, owner, or location.

The CD-ROM, FEMA 93CD, 2005, contains all of the Federal Guidelines for Dam Safety: FEMA 64; FEMA 65; FEMA 93; FEMA 94; FEMA 148; and FEMA 333.

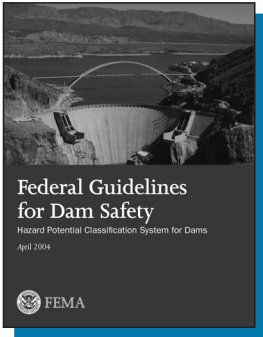
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Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams (FEMA 333)



FEMA 333

Existing hazard potential classification systems are numerous and vary within and between the federal and state sectors. These guidelines set forth a hazard potential classification system for dams that is simple, clear, concise, and adaptable to any agency's current system. The intent is to provide straightforward definitions that can be readily understood by the public and applied uniformly by all federal and state dam safety agencies. The guidelines do not establish how the system will be used, such as prescribing specific design criteria or prioritizing inspections. Those responsibilities remain with the responsible regulatory authority.

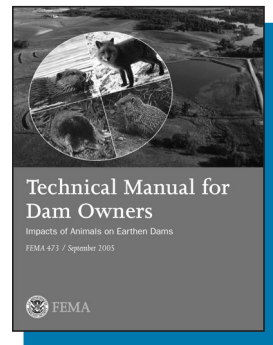
The CD-ROM, FEMA 93CD, 2005, contains all of the Federal Guidelines for Dam Safety: FEMA 64; FEMA 65; FEMA 93; FEMA 94; FEMA 148; and FEMA 333.

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Technical Manuals

Technical Manual for Dam Owners: Impacts of Animals on Earthen Dams (FEMA 473)

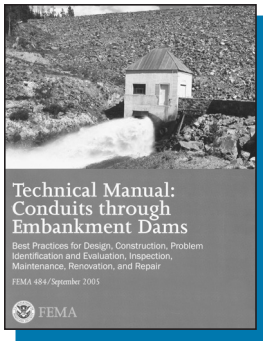
Safe dam operation includes comprehensive, state-of-practice guidance on timely inspection and observation of wildlife damages, accurate wildlife identification and mitigation, and appropriate dam design, repair, and preventive measures. This technical manual provides guidance to dam specialists, including dam owners, operators, inspectors, state dam officials, and consulting engineers, in the following areas: (1) the impacts wildlife can have on earthen dams; (2) habitat, range, description, and behavior of common nuisance wildlife to aid in the proper identification at the dam; (3) state-of-practice methods to prevent and mitigate adverse wildlife impacts on earthen dams; and (4) state-of-practice design guidance for repair and preventive design associated with nuisance wildlife intrusion.



FEMA 473

Technical Manual: Conduits through Embankment Dams (FEMA 484)

Today, tens of thousands of conduits through embankment dams in the United States are aging and deteriorating. Many of these conduits were poorly constructed and are not frequently inspected, if at all. With each passing year, deteriorating conduits pose an increasingly greater risk for developing defects that can lead to embankment dam failure. This technical manual provides procedures and guidance for “best practices” for the design, construction, problem identification and evaluation, inspection, maintenance, renovation, and repair associated with conduits through embankment dams. The technical manual is intended for use by personnel familiar with embankment dams and conduits, such as designers, inspectors, construction oversight personnel, and dam safety engineers. The technical manual includes more than 280 illustrative figures, 34 case histories, and an extensive glossary.

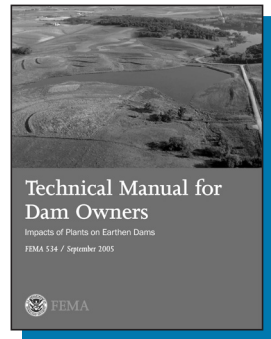


FEMA 484

The technical manual is also available in CD-ROM (FEMA 484CD) and DVD (FEMA 484DVD). The DVD format includes an extensive collection of “additional reading” references. PDF copies of these references are provided to further the user’s understanding of topics related to conduits and embankment dams.

Technical Manual for Dam Owners: Impacts of Plants on Earthen Dams (FEMA 534)

Tree and woody vegetation penetrations of earthen dams and their appurtenances can cause serious structural deterioration and distress, resulting in the failure of earthen dams. This technical manual provides the dam owner, operator, inspector, dam safety regulator, engineer, and consultant with the fundamental understanding and technical knowledge associated with the potential detrimental impacts of tree and woody vegetation growth on the safety of earthen dams. The manual also provides the user with an understanding of the methods, procedures, and benefits of maintaining a growth of desirable ground cover of vegetation on the embankments of earthen dams.



FEMA 534

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 Available in Print

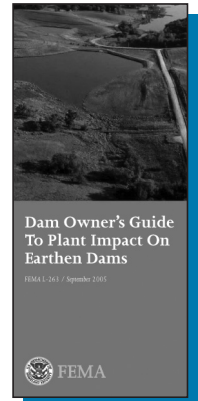
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 Available in Video

Dam Owner Guides

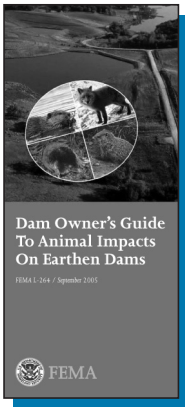
Dam Owner's Guide to Impacts of Plants on Earthen Dams (FEMA L-263)

The dam owner is the first line of defense in the appropriate maintenance and safe operation of dams. This brochure describes the dangers presented by problem vegetation on earthen embankment dams and discusses how to identify problem vegetation. A quick quiz is included for dam owners to determine whether their dam may be at risk for problems related to inappropriate vegetation.



FEMA L-263

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FEMA L-264

Dam Owner's Guide to Impacts of Animals on Earthen Dams (FEMA L-264)

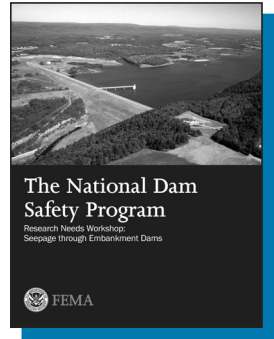
This brochure is designed to help the dam owner manage and reduce nuisance wildlife and wildlife damages at earthen dams. The brochure provides information on the types of nuisance wildlife damages, wildlife observation during routine inspections, wildlife identification, and basic damage repair.

National Dam Safety Program Research Needs Workshop Reports

Research conducted under FEMA's National Dam Safety Program addresses a cross-section of issues and needs, all in support of ultimately making dams in the United States safer. Since 1999, research funding under the National Dam Safety Program has been allocated to hold workshops in nine priority areas. The following National Dam Safety Program Research Needs Workshop reports are now available online and in CD-ROM format:

National Dam Safety Program Research Needs Workshop: Seepage through Embankment Dams (FEMA 535)

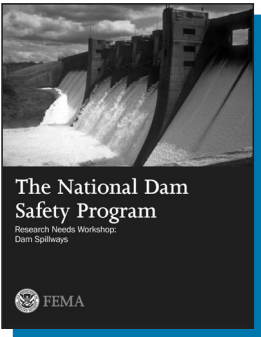
This workshop report documents expert consideration of (1) potential seepage problems and solutions associated with penetrations through embankment dams, e.g., outlet works conduits; (2) filter design criteria and observed performance; (3) inspection of dams for detection of seepage problems, failure modes associated with seepage and internal erosion, and analysis of risks associated with seepage and internal erosion; (4) investigation of seepage problems and concerns at dams, including the use of geophysical techniques, and instrumentation and measurements for evaluation of seepage performance; (5) remediation of seepage problems through cutoff, reduction of flow, and collection and control of seepage, including the use of geosynthetics; and (6) impacts of the aging of seepage control and collection system components on seepage performance.



FEMA 535

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National Dam Safety Program Research Needs Workshop: Dam Spillways (FEMA 536)



FEMA 536

This workshop report documents the state of practice concerning cost-effective techniques for the enlargement, modification, inspection, monitoring, and maintenance of dam service and emergency spillways. The report discusses dam safety research needs related to dam spillways, i.e., the short-term and long-term needs of the federal and non-federal dam safety community, and recommends a course of action to address those research needs.

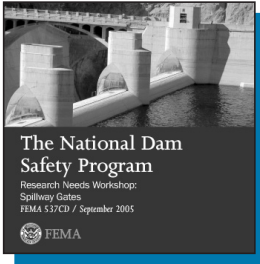
 Available Online

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National Dam Safety Program Research Needs Workshop: Spillway Gates (FEMA 537)

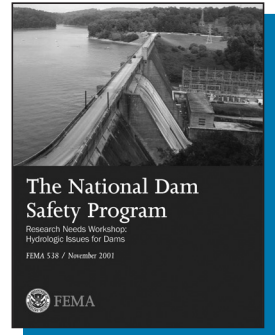


FEMA 537CD

One of the outcomes of the Folsom tainter gate failure was the recognition of the need to revisit the issues related to gate performance and safety. This workshop report documents lessons learned from the Folsom tainter gate failure and applies those lessons across the broad spectrum of spillway gates. The report provides recommendations for future action and serves as a reference for regulatory agencies as they refine their requirements in this area.

National Dam Safety Program Research Needs Workshop: Hydrologic Issues for Dams (FEMA 538)

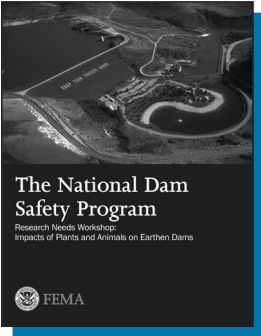
This workshop report documents expert findings in three areas: risk analysis, standards, and meteorological needs. Risk analysis focuses on items relating to uncertainty factors that influence reservoir inflow values and the computation of the Annual Exceedance Probability (AEP) of extreme floods. Standards issues include physical factors that influence the methodology for the computation of extreme floods, including the Probable Maximum Flood (PMF). Meteorological needs focus on rainfall analysis from both the standards base analysis and a risk-based analysis, including precipitation analysis, rainfall frequency analysis, and real-time storm analysis.



FEMA 538

National Dam Safety Program Research Needs Workshop: Impacts of Plants and Animals on Earthen Dams

(FEMA 540)  



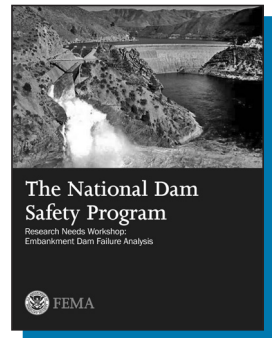
FEMA 540

Several areas for future development related to the impacts of plants and animals on earthen dams are documented in this report, including (1) the development of tools to educate dam owners and engineers on how to spot problems caused by plant and animal penetrations, how to prevent these problems from occurring, and how to mitigate or repair existing problems; (2) the analysis of tools and methods for repairing animal burrows on dams; and (3) collaboration with other groups, such as federal wildlife agencies that have research programs in place.

National Dam Safety Program Research Needs Workshop: Embankment Dam Failure Analysis (FEMA 541)

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For this workshop, 35 national and international experts participated in discussions on research and new technology related to risk assessment, embankment dam failure, and flood routing. The experts identified 14 priority areas for research, including the updating, revision, and dissemination of the historic data set/database of dam failures; development of forensic guidelines and standards for dam safety expert use when reporting dam failures or dam incidents; creation of a forensic team that would be able to collect and disseminate valuable forensic data; identification of critical parameters for different types of failure modes; and basic physical research to model different dam parameters, such as soil properties and scaling effects, with the intent to verify the ability to model actual dam failure characteristics and extend dam failure knowledge using scale models.



FEMA 541

 Available Online

 Available in Print

 Available on CD-ROM or DVD

 Available in Video

National Dam Safety Program Research Needs Workshop

Report: Outlet Works

This report addresses (1) outlet works failure modes, including failure by seepage and piping along the outlet works conduit; (2) conduit materials, selection criteria, and construction methods, including pipe material types and their advantages, disadvantages, and appropriate applications; (3) gates, valves, and controls, including types of gates and valves and their applications; (4) energy dissipaters, including stilling basins and energy dissipating valves; (5) rehabilitation of conduits, including in-place rehabilitation and replacement; and (6) outlet works inspection, including the determination of appropriate frequency; systems, methods, and techniques; and consideration of design criteria to accommodate inspection.

National Dam Safety Program Research Needs Workshop:



Risk Assessment for Dams

10

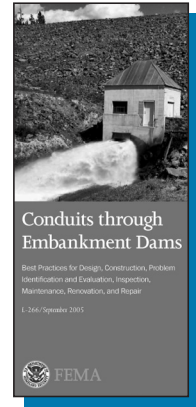
This workshop report presents the detailed discussions of federal, state, and private sector experts on the three areas of risk assessment applications for dam safety: failure modes identification (qualitative approaches); portfolio risk assessment and index prioritization approaches (prioritization and portfolio approaches); and detailed quantitative approaches. The workshop participants recognized that stakeholders will have different information needs for their dam safety decisions. As a result, information that may play an essential role in a dam owner's decision-making process may not be needed by a regulator who oversees the dam owner's decision outcomes. Because the information needs of organizations vary widely, the workshop report acknowledges that it is not feasible for a single risk assessment approach to meet the needs of all organizations.

Brochures

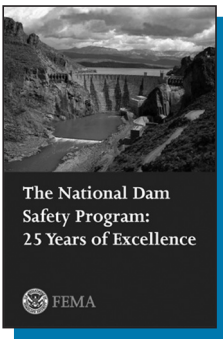
Conduits through Embankment Dams: Best Practices for Design, Construction, Identification and Evaluation, Inspection, Maintenance, Renovation, and Repair

(FEMA L-266)  

This brochure provides a summary of the information presented in FEMA 484, *Technical Manual: Conduits through Embankment Dams*, including the effects of conduits on embankment dams, internal erosion and backward piping erosion, the factors that can lead to embankment dam failure, and best practices for conduits through embankment dams.



FEMA L-266



25 Years of Excellence

The National Dam Safety Program: 25 Years of Excellence

FEMA has provided leadership of the National Dam Safety Program for over 25 years. This brochure provides the general public with an overview of FEMA's role as lead agency and the responsibilities of the federal agencies that own, regulate, operate, and maintain dams. The brochure also describes the benefits of dams, including irrigation, electric power generation, flood control, and water storage.

 Available Online

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 Available in Video

Videos and Software

Emergency Action Planning

This videotape presents the discussion of federal and state dam safety experts on the various aspects of emergency action planning for dams, including the components of an Emergency Action Plan (EAP) and how to assess whether a dam requires an EAP. An audiotape of the expert discussions is available in CD-ROM format.

Dam Seepage Monitoring System, Version 2

The Dam Seepage Monitoring System is an interactive tool designed to help owners and operators store instrument data on their personal computers and plot the data for evaluation, thereby improving the safety of their dams. Version 2 of the Dam Seepage Monitoring System software, which is available at no cost to state dam safety officials and dam owners and operators, offers improved data entry, plotting, reporting, and installation features. The new desktop version 2.0 can be downloaded from the Association of State Dam Safety Officials web site at www.damsafety.org.

Resource List

Publications

FEMA 64, Federal Guidelines for Dam Safety: Emergency Action Planning for Dam Owners. Interagency Committee on Dam Safety, 1998. Reprinted by the Federal Emergency Management Agency. Washington, D.C., 2004.

FEMA 65, Federal Guidelines for Dam Safety: Earthquake Analyses and Design of Dams. Interagency Committee on Dam Safety, 1985. Revised by the Interagency Committee on Dam Safety and reprinted by the Federal Emergency Management Agency. Washington, D.C., 2005.

FEMA 93, Federal Guidelines for Dam Safety. Interagency Committee on Dam Safety, 1979. Reprinted by the Federal Emergency Management Agency. Washington, D.C., 2004.

FEMA 94, Federal Guidelines for Dam Safety: Selecting and Accommodating Inflow Design Floods for Dams. Interagency Committee on Dam Safety, 1998. Reprinted by the Federal Emergency Management Agency. Washington, D.C., 2004.

FEMA 148, Federal Guidelines for Dam Safety: Glossary of Terms. Interagency Committee on Dam Safety, 2003. Reprinted by the Federal Emergency Management Agency. Washington, D.C., 2004.

FEMA 333, Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams. Interagency Committee on Dam Safety, 1998. Reprinted by the Federal Emergency Management Agency. Washington, D.C., 2004.

FEMA 473, Technical Manual for Dam Owners: Impacts of Animals on Earthen Dams. URS Corporation. Federal Emergency Management Agency. Washington, D.C., 2005.

FEMA 484, Technical Manual for Dam Owners: Conduits through Embankment Dams. Chuck Cooper, P.E., et al. Department of the Interior, Bureau of Reclamation. Federal Emergency Management Agency. Washington, D.C., 2005.

FEMA 534, Technical Manual for Dam Owners: Impacts of Plants on Earthen Dams. Dan Marks, P.E., Bruce Tschantz, P.E., Federal Emergency Management Agency. Washington, D.C., 2005.

FEMA 535, National Dam Safety Program Research Needs Workshop: Seepage through Embankment Dams. Association of State Dam Safety Officials and URS Greiner Woodward Clyde, October 17-19, 2000, Denver, Colorado. Federal Emergency Management Agency. Washington, D.C., 2005.

FEMA 536, National Dam Safety Program Research Needs Workshop: Dam Spillways. Department of the Interior, Bureau of Reclamation, August 26-27, 2003, Denver, Colorado. Federal Emergency Management Agency. Washington, D.C., 2005.

FEMA 537, National Dam Safety Program Research Needs Workshop: Spillway Gates. Association of State Dam Safety Officials and the Electric Power Research Institute, January 5-6, 2000, Palo Alto, California. Federal Emergency Management Agency. Washington, D.C., 2005.

FEMA 538, National Dam Safety Program Research Needs Workshop: Hydrologic Issues for Dams. U.S. Army Corps of Engineers, Hydrologic Engineering Center, November 2001, Davis, California. Federal Emergency Management Agency. Washington, D.C., 2005.

FEMA 540, National Dam Safety Program Research Needs Workshop: Impacts of Plants and Animals on Earthen Dams. Association of State Dam Safety Officials, November 30-December 2, 1999, Knoxville, Tennessee. Federal Emergency Management Agency. Washington, D.C., 2005.

FEMA 541, National Dam Safety Program Research Needs Workshop: Embankment Dam Failure Analysis. U.S. Department of Agriculture, Agricultural Research Service, June 26-28, 2001, Oklahoma City, Oklahoma. Federal Emergency Management Agency. Washington, D.C., 2005.

FEMA L-264, Dam Owner's Guide to Impacts of Animals on Earthen Dams. URS Corporation. Federal Emergency Management Agency. Washington, D.C., 2005.

FEMA L-263, Dam Owner's Guide to Impacts of Plants on Earthen Dams. Dan Marks, P.E., Bruce Tschantz, P.E. Federal Emergency Management Agency. Washington, D.C., 2005.

FEMA L-266, Conduits through Embankment Dams: Best Practices for Design, Construction, Identification and Evaluation, Inspection, Maintenance, Renovation, and Repair. Chuck Cooper, P.E., et al. Department of the Interior, Bureau of Reclamation. Federal Emergency Management Agency. Washington, D.C., 2005.

National Dam Safety Program Research Needs Workshop Report: Outlet Works. URS Corporation, May 25-27, 2004, Denver, Colorado. Federal Emergency Management Agency. Washington, D.C., 2006.

National Dam Safety Program Research Needs Workshop: Risk Assessment for Dams. Association of State Dam Safety Officials and Utah State University, March 7-9, 2000, Logan, Utah. Federal Emergency Management Agency. Washington, D.C., 2005.

The National Dam Safety Program: 25 Years of Excellence. BRI Consulting Group. Federal Emergency Management Agency. Washington, D.C., 2004.

Videos and Software

Emergency Action Planning. Federal Emergency Management Agency. Washington, D.C., 1999.

Dam Seepage Monitoring System, Version 2. URS Corporation. Federal Emergency Management Agency. Washington, D.C., 2005.

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