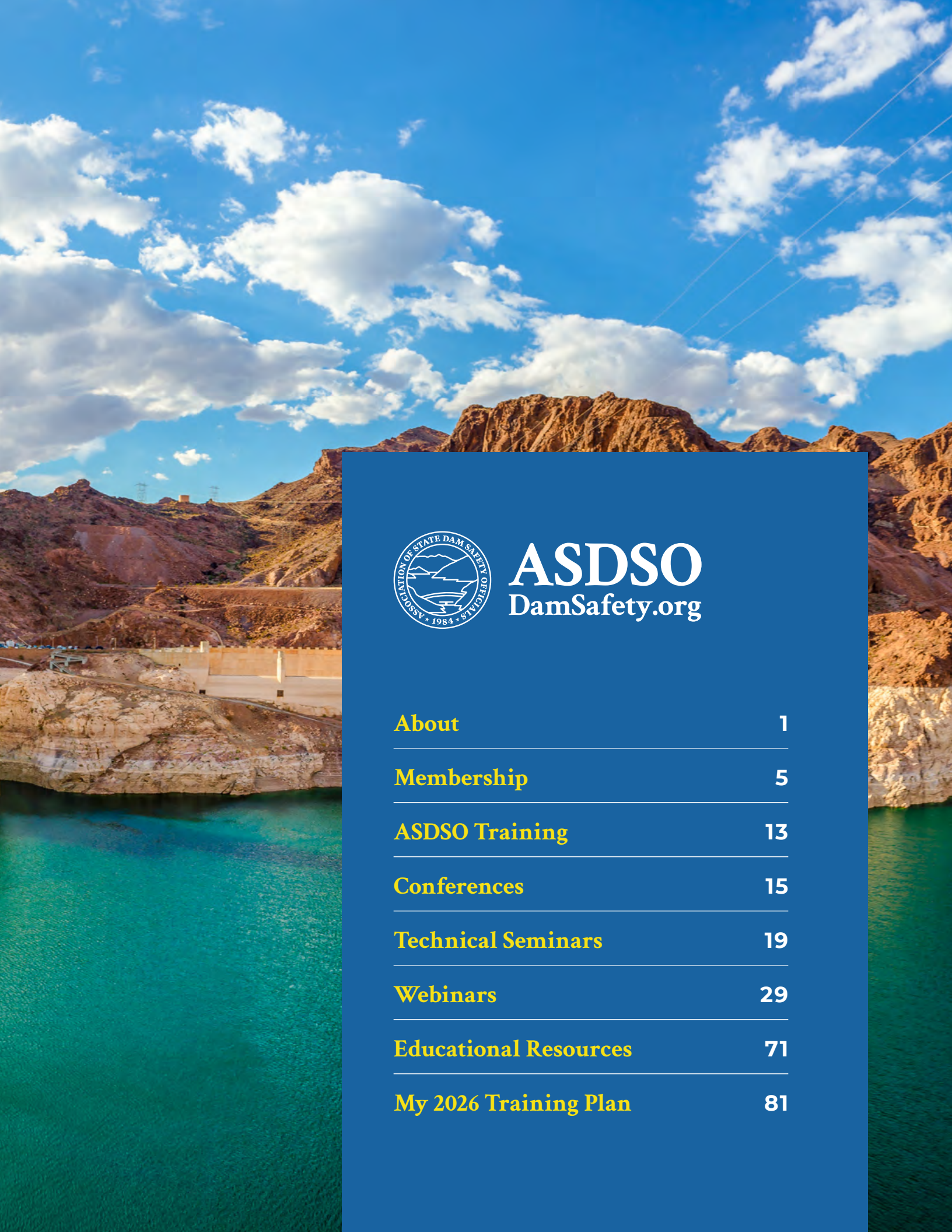
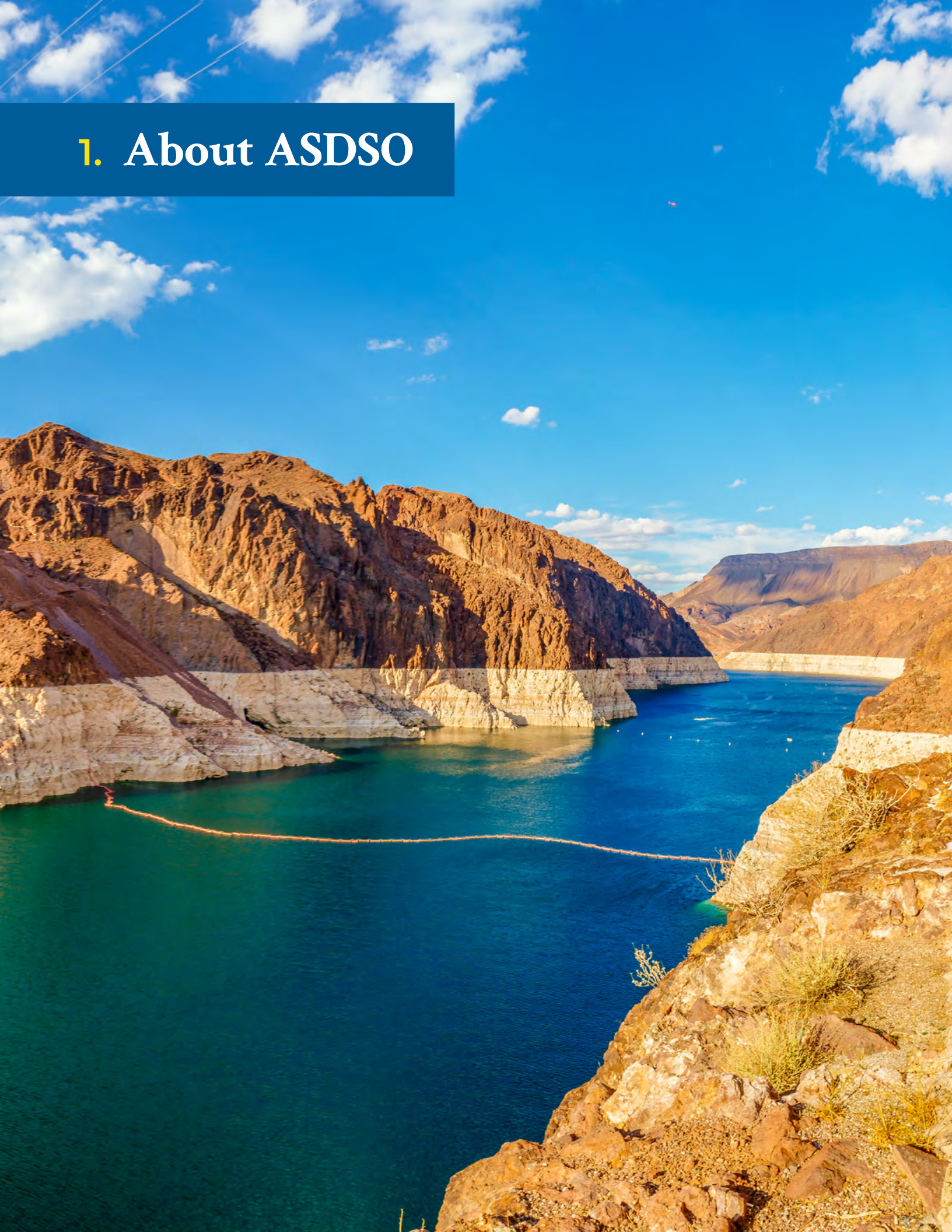
ASDSO
DamSafety.org

2026 Training & Education Catalog



ASDSO
DamSafety.org

1. About ASDSO



Join Us In Our Mission

ASDSO is the leading national non-profit association dedicated to dam and levee safety. ASDSO was created in 1983 in response to an urgent need for establishing and strengthening state dam safety programs and improving interstate communication about dam safety.

ASDSO works side-by-side with its members to build a unified community of dam and levee safety experts, recognized as leaders in their field; through the creation of industry standards and best practices; advocacy of legislative policy matters that impact the dam and levee safety community; educational opportunities to help members build upon their knowledge of core foundational topic areas, as well as the latest technology and practical trends impacting the profession; education of the general public on issues of concern for dam and levee safety professionals; and, support for future growth in the profession through outreach to students in grades K-12 and collegiate institutions to showcase the benefits of a career in dam and levee safety.

Becoming a part of the ASDSO community is a way to join with others to work toward advancing technology, standards, and the profession for a future where all dams are safe.

VISION: A future where all dams are safe.

MISSION: Improve the condition and safety of dams and lower the risk of dam failures through education, support for state dam safety programs, and fostering a unified dam safety community.

What Does ASDSO Do to Improve Dam Safety?

SUPPORT

state dam safety programs.

EDUCATE

dam owners and operators.

DEVELOP

a cohesive and engaged community committed to the ASDSO mission.

INCREASE

public awareness of the role of dams in society, the risks they present, and the importance of dam safety and preparedness.

ADVOCATE

for laws, policies, and government programs that serve to improve the safety of dams and reduce the risk to the public.

ADVANCE

and expand the technical expertise of dam and levee safety practitioners.

STRENGTHEN

and support a coordinated effort to improve the safety of dams and levees.

PROMOTE

innovative approaches to funding dam rehabilitation at the state and federal level.

2. Membership

Who Should Join ASDSO?

- STATE OR FEDERAL DAM SAFETY OFFICIALS
- CIVIL, GEOTECHNICAL, ENVIRONMENTAL, AND STRUCTURAL ENGINEERS
- SCIENTISTS AND TECHNICIANS
- DAM OWNERS AND OPERATORS
- SERVICE AND PRODUCT SUPPLIERS
- ENGINEERING CONSULTANTS
- ACADEMIC PROFESSORS AND RESEARCHERS
- STUDENTS
- HYDROLOGISTS/GEOLOGISTS
- EMERGENCY MANAGEMENT PROFESSIONALS
- FLOODPLAIN PROFESSIONALS
- ANYONE WITH A CONCERN FOR DAM AND LEVEE SAFETY ISSUES


DAM SAFETY
DENVER, COLORADO
SEPTEMBER 22-26, 2024
COLLIER

What can you gain by becoming an ASDSO member?

EXPAND YOUR KNOWLEDGE AND PROFESSIONAL EDUCATION

- ✓ Receive discounted access to ASDSO's robust training program, including conferences, technical classroom courses, and webinars. New memberships include a complimentary On-Demand webinar to help you get started.
- ✓ Gain free access to an enormous amount of resource information through ASDSO's Dam Safety Resource Database. This includes all past and current ASDSO conference papers and journal articles.
- ✓ Receive a subscription to the ASDSO's digital membership newsletter.
- ✓ Receive a subscription to the quarterly *Journal of Dam Safety*.
- ✓ Gain access to all of the Dam Safety Toolbox website features, including ability to edit and create pages.

GROW YOUR CAREER

- ✓ Complete professional development though paper publication and presentation forums.
- ✓ Increase career knowledge and opportunities from relationships with peers and mentors.
- ✓ Discover opportunities to volunteer for ASDSO task groups, interest groups, and committees.

FORM A PROFESSIONAL COMMUNITY

- ✓ Join *Collaborate*, ASDSO's professional networking site, and connect with nearly 3,000 professionals through shared interests and advice.
- ✓ Build relationships with members in different sectors of the community, including owners, regulators, educators, and more.
- ✓ Discover opportunities to join or start interest groups.

BUILD A SAFER FUTURE

- ✓ Support knowledge sharing between different state dam safety programs, federal regulators, designers, and owners.
- ✓ Assist in developing outreach and best practice materials, including videos, guides, handouts, and webpages.
- ✓ Measure success by requesting a Peer Review of your dam safety program.
- ✓ Advocate for legislation and policies that strengthen national and state dam safety programs.

Through membership dues, you support ASDSO projects that directly give back and support the community at large.

Membership Information

The failure of dams and the great destruction and loss of life failures often cause, is a matter of deep concern to the members of the Association of State Dam Safety Officials (ASDSO). ASDSO serves state dam safety programs and the broader dam safety community, which includes federal dam safety professionals, dam owners and operators, engineering consultants, emergency managers, manufacturers, suppliers, academia, contractors, and others interested in improving dam safety. If you are interested in a world where all dams are safe, invest in the future of dam safety today by becoming a member of ASDSO.

» **Learn more today at DamSafety.org/JoinASDSO**

Membership Categories

INDIVIDUAL MEMBERSHIPS

Individual memberships provide membership benefits directly to the individual, including discounts on ASDSO training and conferences.

Individual memberships are non-transferable and due annually.

JOIN NOW

Individual Standard
$116

Individual dam owners, self-employed consultants, university personnel, and other individuals whose company is not an ASDSO member. Individual members who are employees of a company with an Organizational membership shall receive a 50% discount off the Individual Standard membership.

Individual Government
$58

Open to all state, local, or federal government officials interested in dam safety.

Retired
$58

Anyone who has been a member of ASDSO for 5 years or more, is fully retired from active employment, and is 55 years of age or older, or permanently disabled is eligible.

Student
FREE

Student member status shall be granted to an applicant enrolled at least part-time and not employed as a full-time professional. Student membership may be maintained only while actively enrolled in school, but for no more than five years.

ORGANIZATIONAL MEMBERSHIPS

These membership categories are for companies or individuals working for companies in the private sector. Individual members who are employees of a company with an Organizational membership shall receive a 50% discount off the individual standard membership. All Organizational members qualify for exhibit, sponsorship, and advertising discounts.

Organizational memberships are renewed on an annual basis.

JOIN NOW

Organizational Standard
$420

One contact person is designated for each company membership, and company employees may join at a reduced employee rate (up to 12 per company membership).

Organizational Sustaining Member
$3,100

Any member may add visibility and value to their existing membership and assist in advancing ASDSO's goals. Sustaining members receive substantially higher discounts on exhibit, sponsorship, and advertising opportunities, as well as premier visibility on DamSafety.org and other ASDSO events and publications.

Agency Sustaining Member
$3,100

Any governmental agency may add visibility and value to their existing membership and assist in advancing ASDSO's goals. Sustaining members receive substantially higher discounts on exhibit, sponsorship, and advertising opportunities, as well as premier visibility on DamSafety.org and other ASDSO events and publications.


DAM SAFETY
DENVER, COLORADO
SEPTEMBER 22-26, 2024

3. ASDSO Training

ASDSO Training Overview

A ROADMAP FOR EDUCATING THOSE WORKING IN THE DAM SAFETY ENGINEERING COMMUNITY

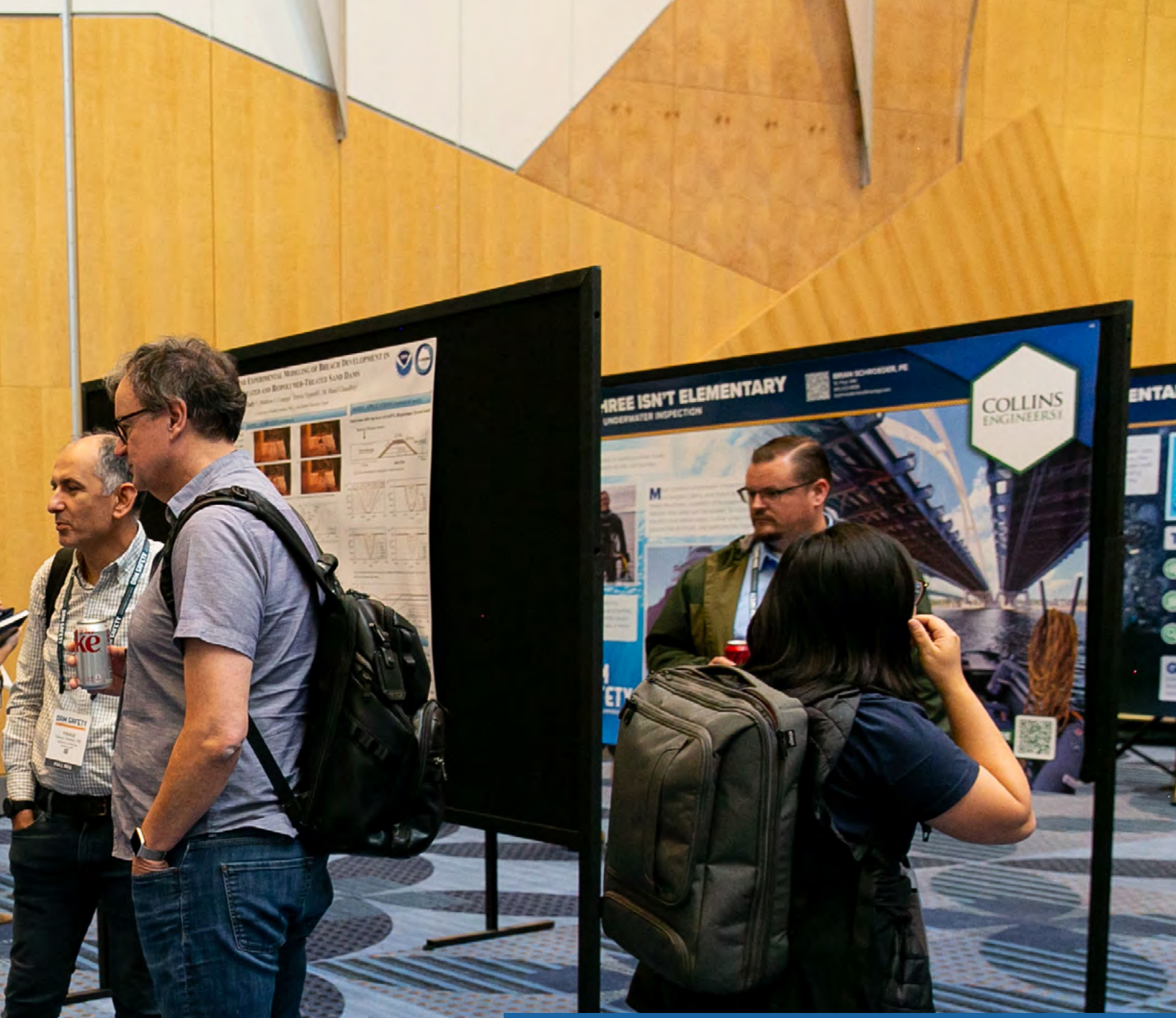
ASDSO offers a robust training program that is comprised of Conferences, Technical Classroom Courses, and Webinars. The ASDSO Training Calendar is guided by a committee of dam and levee safety professionals. ASDSO training opportunities provide dam and levee safety professionals with the opportunity to expand their professional knowledge through a wide range of opportunities geared for all levels of experience.

» **For additional details visit DamSafety.org/Training-Overview**

4. Conferences

DAM SAFETY CONFERENCE PROCEEDINGS

Want to read past conference papers? The annual Dam Safety National Conference proceedings are available to all ASDSO members for download in the ASDSO Resource Database.



Conferences at a Glance

May 18-21, 2026 • Buffalo, NY

Northeast Regional Conference

August 30-Sept. 3, 2026 • Raleigh, NC

Dam Safety 2026

☑ MY TRAINING PLAN

Click the "Save to My Training Plan" button to automatically save to your Training Plan in the back of the catalog.

Dam Safety 2026

August 30-Sept. 3, 2026

Raleigh Convention Center
Raleigh, NC

The annual Dam Safety national conference is held each September. Dam Safety is the leading conference in the United States dedicated to dam safety issues and knowledge transfer. Dam Safety brings together over 1,100 dam and levee safety professionals with over 100 exhibitors and sponsors for a week of networking, education, and policy discussions.

» **For additional details visit DamSafety.org/DS26**

Save to My Training Plan

Northeast Regional Conference

May 18-21, 2026

Buffalo Convention Center
Buffalo, NY

ASDSO regional conferences offer attendees the perfect opportunity to network with colleagues from across the region and learn from others who are working to keep dams safe. While the conference is geared towards dam safety engineers and dam owners /operators in the western states, many topics are applicable to dam and levee safety professionals from across the country.

» **For additional details visit DamSafety.org/NE26**

Save to My Training Plan

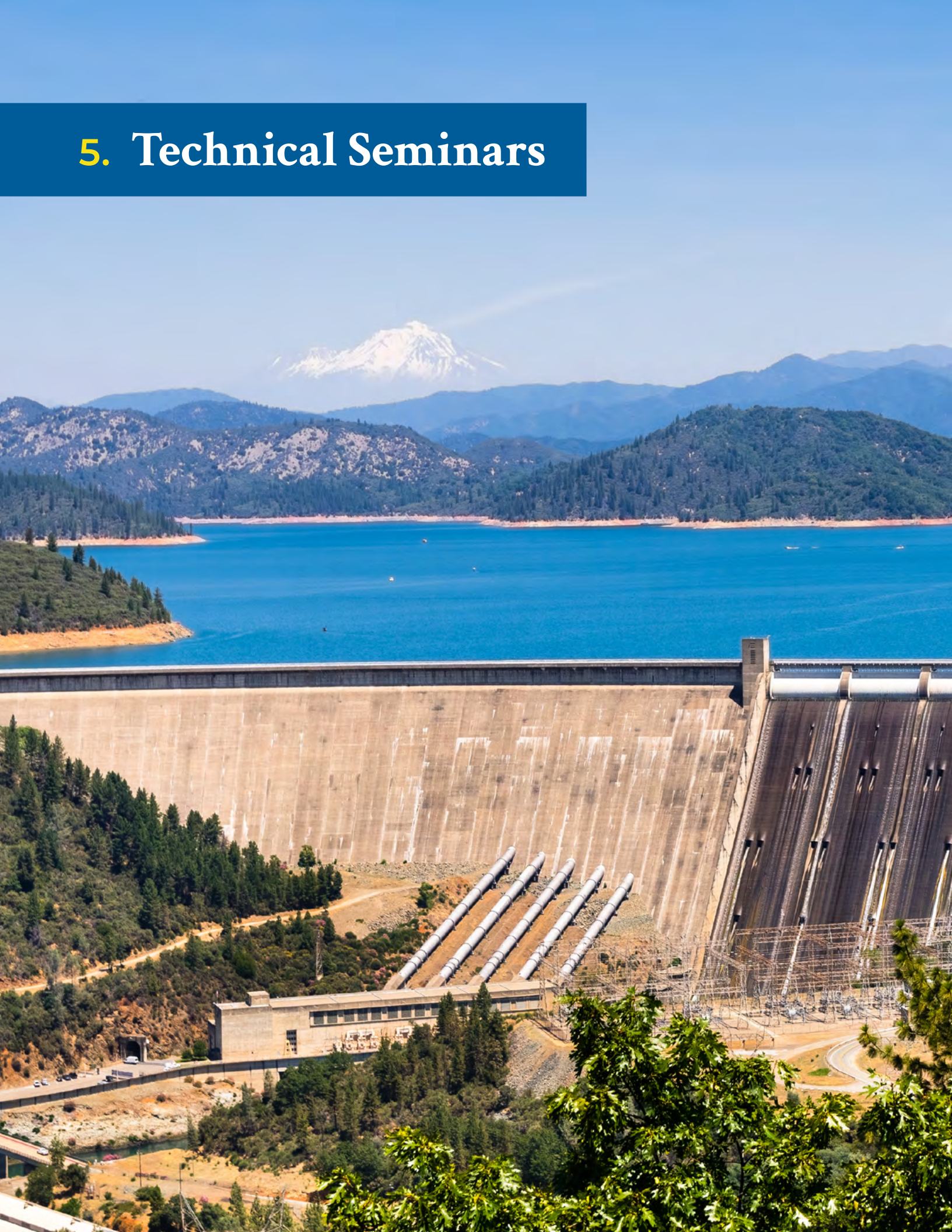
ON-DEMAND

Dam Safety 2025

If you were not able to join us in Cleveland for Dam Safety 2025, you can still enjoy all of the high-quality educational content including the general session, all concurrent sessions, and the poster-lightning talks through Dam Safety On-Demand. Plus, all Dam Safety 2025 conference attendees receive Dam Safety On-Demand as part of their registration.

» **Learn more following the conference at DamSafety.org/DS25**

5. Technical Seminars



2026 Technical Seminar Calendar

January 20-23, 2026 • Virtual

Inspection and Assessment of Dams

February 24-27, 2026 • Virtual

HEC-RAS

April 7-9, 2026 • Virtual

Dam Construction Inspection

May 26-29, 2026 • Virtual

Basic Soil Mechanics Related to Earth Dams

June 16-18, 2026 • Virtual

HEC-RAS 2D

August 4-7, 2026 • Virtual

Improving Emergency Operations for Dam and Levee Failures and Incidents

September 21-24, 2026 • Virtual

Inspection and Assessment of Dams

November 3-6, 2026 • Virtual

Seepage Through Earth Dams

Technical Seminar Details

ASDSO Technical Seminars are held throughout the year and provide a multiple-day deep dive into their respective subjects.

The following listing is a comprehensive look at all current ASDSO Technical Seminars. Please note that not all seminars are on the 2026 calendar but could have a future offering.

CLICK THE CHECKMARK BUTTON TO ADD A COURSE TO MY TRAINING PLAN.

R | INFO

CLICK THE "R" OR "INFO" BUTTONS BELOW EACH LISTING TO REGISTER OR TO LEARN MORE ABOUT A COURSE.

Basic Soil Mechanics Related to Earth Dams

OBJECTIVE

The objective of this course will be to provide a comprehensive presentation of the significant principles and concepts of soil mechanics to the participants. The material will be presented with emphasis on the basic soil mechanics principles prerequisite to further study for design or rehabilitation of earth embankment dams. This is a basic level course intended as an introduction for those with minimal to moderate knowledge or experience in the application of soil mechanics principles to earth dam design, operation, and rehabilitation. This course is a good prerequisite to the more advanced ASDSO seminars on: Stability Analysis of Embankment Dams, Seepage Through Earth Dams.

KEY TAKE-AWAYS

- The significant basic concepts and principles of soil mechanics prerequisite to further courses. related to the use of soil mechanics principles for earth embankment design and rehabilitation.
- The theory of consolidation related to embankment dam engineering.
- The concepts of soil shear strength related to embankment dam engineering.
- The concepts of lateral earth pressure needed for hydraulic structure applications.
- A basic understanding of phreatic surface, embankment permeability, and drainage systems.
- Appropriate field investigation techniques needed to evaluate foundation conditions for design and rehabilitation of embankment dams.
- Appropriate field and insitu testing procedures for existing or new embankment dams.

PDHS 23

Dam Construction Inspection

OBJECTIVE

This course serves as an introduction and guidance on construction oversight and inspections associated with the construction or modification of a dam and appurtenant structures.

KEY TAKE-AWAYS

- Organization, communication, and the roles, responsibilities, and authority of project team members.
- Emergency operations for dam and levee failures and incidents.
- Importance of dam construction documentation and record-keeping.
- Understanding design limitations and dealing with unexpected conditions during construction.
- Construction observation and inspection considerations for dam construction.
- Good and bad construction examples, things to watch for, and dealing with things that go wrong.

PDHS 15

Dam Design, Plans and Technical Specifications Review

OBJECTIVE

This course will be an interactive seminar that provides a well-blended mixture of lecture presentations covering various design disciplines along with several strategically designed hands-on exercises that provide interaction among participants. The exercises will be developed to include review of documents for a dam rehabilitation project to provide experience to both the novice and experienced dam safety engineer with design review. This course has been developed to provide attendees with a broader background on dam design and specific experience and resources that can be used following the seminar.

KEY TAKE-AWAYS

- Dam design, state of the practice.
- Standards and guidelines review.
- Design documents.
- Civil 3-D design to 2-D plan development.
- Incorporating Potential Failure Modes Analysis (PFMA) in the design process.
- Plans/Drawing review.
- Specification development and review.
- Design details and construction specifications to achieve constructability and meet quality control requirements of the design.

PDHS 14

INFO

Earthquake Engineering for Embankment Dams

OBJECTIVE

The objective of this course is to provide instruction on the general subject of earthquake engineering of embankment dams. The course will begin with a historical perspective on dam performance during earthquakes and an overview of basic concepts about earthquakes. The course will then progressively address more specialized subjects including a) evaluation of seismic hazard and characterization of earthquake motions for dam design, b) field investigation methods and characterization of materials for seismic analysis, c) methods for analysis of dynamic response and seismic stability of dams, d) procedures for instrumentation and post-earthquake inspection, e) considerations pertinent to risk analysis, and f) defensive design measures. The lectures will include presentation of case histories pertinent to some of the subjects covered in the course.

KEY TAKE-AWAYS

- Understanding of the basic aspects of earthquake engineering of embankment dams.
- Primary lessons from the seismic performance of embankment dams during past earthquakes.
- Familiarity with inputs required to perform a seismic hazard analysis and how the results are used in seismic safety assessments of dams.
- Understanding of the basic elements of dynamic response and seismic stability analysis of embankment dams.
- Introduction to risk analysis concepts for embankments including potential failure mode analysis and likelihood and consequence assessment.
- Familiarity with primary aspects of defensive design measures for seismic loads.

PDHS 17

INFO

Fundamentals of Reinforced Concrete

OBJECTIVE

This course is intended as an introductory course for persons who have at least one course in reinforced concrete design. The course will provide a thorough overview of the fundamentals of specifying the fresh and hardened properties of concrete mixes; the review of applicable codes for concrete hydraulic structures; the design philosophy and methodology of reinforced concrete hydraulic structures; and issues associated with the construction process. The course will include actual design examples of frequently used hydraulic structures utilizing current design codes and guidelines that are focused on reducing cracking, limiting deflections, increasing durability, and decreasing permeability.

KEY TAKE-AWAYS

- Understand what influences the fresh and hardened properties of reinforced concrete.
- Learn the design codes and loadings unique to the design of hydraulic structures.
- Learn how to design a durable hydraulic structure that is resistant to degradation, undermining, and destabilizing uplift pressures.
- Be able to review concrete design reports, specifications and drawings of non-complex structures for errors and omissions.
- Review construction means and methods affecting the performance of hydraulic structures.

PDHS 15

INFO

HEC-HMS

OBJECTIVE

Participants will gain practical knowledge of methods for simulation of runoff from storm rainfall. The methods covered relate to the processing of historical and hypothetical (design-storm) rainfall data; estimation of losses (infiltration); transformation of rainfall excess to direct runoff with unit hydrographs; routing of flood waves; calibration of model parameters; and modeling of runoff from watersheds. Experience will be gained in applying the methods with the program Hydrologic Modeling System (HEC-HMS). Where possible, applications will emphasize hydrologic computations for dam safety.

KEY TAKE-AWAYS

- Methods to simulate runoff from storm rainfall.
- Estimating hydrologic abstractions and transforming excess rainfall using unit hydrograph theory.
- Evaluating dam and reservoir performance during flood events.
- Running the HMS model on several real-world problems.
- Estimating uncertainty in modeling runoff.

PDHS 22

INFO

HEC-RAS

OBJECTIVE

This course is an introduction to HEC-RAS with applications to dam safety. The introduction course provides a hands-on opportunity to use the program and resolve specific questions. The objective of this course is to review the basic principles of open channel hydraulics as they relate to the natural stream environment with application to dam safety. Bridges, culverts, and in-line structures will be discussed and both steady and unsteady flow modeling will be explored.

By the end of the participant will be able to apply these six objectives and have a comfort level in developing and analyzing a hydraulic model for typical open channel flow applications. The participants should have an undergraduate engineering degree.

KEY TAKE-AWAYS

- Understand the basics of water surface profile computations.
- Create 1D HEC-RAS models.
- Incorporate bridges, culverts, and in-line structures.
- Apply principles of open channel flow to dams and dam failures.
- Extract and analyze output.
- Obtain an understanding of 1D unsteady flow modeling with HEC-RAS.

PDHS 23

HEC-RAS 2D

OBJECTIVE

This is an interactive seminar focused on the application and benefit of two-dimensional flow capabilities of HEC-RAS, specific to the dam safety industry. The course will maintain a balance between lecture-style presentations on model theory and hands-on workshop sessions for examples of model applications. Topics will include applications and benefits of HEC-RAS 2D modeling; RAS Mapper and terrain preparation; running 2D models including dam, levee, and breach modeling; viewing results with RAS Mapper; troubleshooting and model review. The course will also cover new features released with recent updates to HEC-RAS, such as spatial precipitation and infiltration; 2D bridge hydraulics; improvements to RAS Mapper; and more. The course will utilize the most recent version of the HEC-RAS software available at that time.

It is recommended that attendees have some HEC-RAS 1D unsteady experience. ASDSO's HEC-RAS Course is a recommended prerequisite. It is recommended that attendees have some HEC-RAS 1D unsteady experience.

KEY TAKE-AWAYS

- Understand when and where to use HEC-RAS 2D.
- Develop necessary input/terrain data for HEC-RAS 2D.
- Create and run a HEC-RAS 2D model.
- Troubleshoot and review a HEC-RAS 2D model.
- Utilize HEC-RAS 2D for various dam safety applications.

PDHS 21

Improving Emergency Operations for Dam and Levee Failures and Incidents

OBJECTIVE

This is an interactive course designed to help participants learn about key tools that will help improve emergency preparedness and enhance communication during dam and levee failures and incidents. Participants will gain a better understanding of the emergency action planning process, including evacuation planning and emergency response methods.

KEY TAKE-AWAYS

- Learn how to improve the integrated operations between dam owners, emergency planners, first responders, and dam engineers.
- Understand the basic potential failure modes for dams and levees.
- Understand the basics of integrated operations under the Incident Command System.
- Understand the basic elements of an emergency action plan for dams and levees.
- Understand how to effectively prepare, test, and improve emergency action plans.
- Learn how to improve communications during dam and levee incidents.
- Understand how to improve evacuation planning.
- Learn about new technologies that can help improve your emergency response.

PDHS 21

Inspection and Assessment of Dams

OBJECTIVE

The seminar provides comprehensive instruction in inspection and evaluation techniques for dams. The principles, concepts, and procedures taught will be readily adaptable to any organization conducting dam inspections and evaluating their compliance with current design standards. Participants learn about a variety of dam types and their appurtenances, the function of typical dam features, and common dam failure modes and the conditions that can lead to these failure modes. Actual dam failure cases will be presented. Public safety, security, and liability will also be discussed along with approaches to responding to dam incidents.

KEY TAKE-AWAYS

- Historical perspective of dam construction methods for various dam types.
- Common failure modes associated with various dam types.
- Understanding of standards for maintaining dams.
- Techniques for performing a comprehensive dam inspection.
- Awareness of emerging issues related to inspection and assessment of dams.

PDHS 18

January 20-23, 2026

September 21-24, 2026

Seepage Through Earth Dams

OBJECTIVE

This introductory course is designed to be a participatory, interactive workshop, which will cover the basic elements required to understand and evaluate seepage-related issues for earth dams. The first day begins with providing an understanding of why seepage mechanisms in earth dams are important to dam safety. Information on seepage mechanics, including permeability and erodibility will then be presented. The conclusion of the first day and beginning of the second day will focus on the basic principles and characteristics of seepage related to embankment dams, various modes of seepage, and computational methods for evaluating seepage. The conclusion of the second day and beginning of the third day will focus on methods of investigating, controlling, and remediating dam seepage. Discussions on various case studies will conclude the third day. Hands-on exercises will represent real-world, practical applications pertinent to the attendees. The final half day will include a hands-on, introductory session of the SEEP/W computer program to demonstrate computational analysis of hypothetical seepage scenarios for an embankment dam.

KEY TAKE-AWAYS

- Why understanding seepage mechanisms in earth dams is important to dam safety.
- Principles and characteristics of seepage related to embankment dams, including review of potential seepage-related failure modes and their common initiators or triggers.
- Computational methods for evaluating seepage.
- Understanding theory, application, and design of filters.
- Methods of investigating, monitoring, controlling, and remediating seepage problems in existing dams using case histories and hands-on exercises to enforce understanding of practical applications.

PDHS 15

Spillway Erodibility Investigation & Analysis

OBJECTIVE

This hands-on seminar offers an in-depth understanding of earthen spillway design and erosion issues critical for engineers and professionals across the dam safety community. The seminar includes engaging sessions that delve into the mechanics and dynamics of spillway erosion, fostering a comprehensive grasp of analysis, investigation, and mitigation strategies. Participants will benefit from expert-led discussions, interactive presentations, and case study reviews covering key topics such as understanding erosion mechanisms, determining critical erodibility parameters, conducting a field evaluation, O&M considerations, and analyzing earthen spillways with a variety of tools, like the NRCS WinDAM C software. Additionally, the course features hands-on activities and real-world scenarios to allow participants to immediately apply their skills during the course in a collaborative learning environment.

KEY TAKE-AWAYS

- Understand relevant factors associated with soil and rock erosion mechanisms.
- Learn about contributing features that lead to unlined spillway erodibility failure modes.
- Understand considerations for earth spillway design, operation, and maintenance, as well as erosion mitigation strategies.
- Learn about the application of erodibility analysis tools such as the NRCS WinDAM C software, including the development of key erodibility parameters.

PDHS 21

Stability Analysis of Embankment Dams

OBJECTIVE

This course provides broad coverage of stability analysis for embankment dams. Topics addressed in the course include soil stress-strain behavior, shear strength selection, field and laboratory testing methods, slope stability analysis methods, slope stability analysis loading cases, seepage as related to stability analysis, and stability rehabilitation methods. The course includes several exercises to reinforce the information presented in lectures, as well as two optional evening sessions providing opportunities for hands-on experience with a commonly used slope stability computer program.

KEY TAKE-AWAYS

- An understanding of the importance of slope stability in dam safety, and the basic theoretical principles supporting slope stability analysis methods.
- An understanding of the significance of adequate subsurface characterization and shear strength property selection.
- An understanding of soil stress-strain behavior and its relationship to shear strength.
- An understanding of how to select shear strength parameters from field and laboratory data.
- An understanding of slope stability rehabilitation measures.

PDHS 18

INFO

6. Webinars

LIVE WEBINAR SERIES

Join ASDSO every month for our live webinar series.

2026 Webinar Calendar

January 13

Precision Matters: Surveying Fundamentals for Dam Safety

February 10

Public Safety & Security at Dams: Two Sides of the Same Coin

March 10

The 2019 Spencer Dam Failure: An Extreme Case of Dams in Cold Regions

April 14

Recent Advances in Rock Scour Technology: Time Rate of Scour and More

May 12

Shear Strength of Clay/Clay Shales and Methods of Stability Analysis for Embankment Dams

June 9

AI and ML for Civil Engineering: Intro and Need-to-Knows with a HEC-RAS Example

July 14

Hang in There: Rope Access for Dam Safety Inspections

August 11

The Regulatory Playbook: Finding Success in the Dam Safety Review Process

September 8

Developing Filter Gradation Specifications from Current Guidance

October 13

Precision Blasting Near Dams: Engineering Safety Into Every Shot

November 10

Voids Beneath Spillway Slabs: Evaluation, Interim, and Long-term Risk Reduction Considerations

December 8

Introduction to Risk Analysis and How Inspection & Assessment Informs the Results

2026 Webinar Details

ASDSO offers live webinars each year. All webinars are selected by the ASDSO Training Committee. Live webinars provide the valuable opportunity for real-time interaction with the instructors, who can answer questions through the live chat feature. In addition, individuals who register for the live broadcast may also access the On-Demand version of the webinar following the live broadcast. Live webinars also allow registered participants to complete the quiz at the end and receive the PDH credit.

INTERESTED IN PRESENTING AN ASDSO WEBINAR?

Use the **ASDSO Webinar Application** to submit a webinar topic to be reviewed by the Training Committee.

R **CLICK THE "R" BUTTON BELOW EACH LISTING TO REGISTER FOR A WEBINAR.**

CLICK THE CHECKMARK BUTTON TO ADD A WEBINAR TO MY TRAINING PLAN.

January 13

Precision Matters: Surveying Fundamentals for Dam Safety

INSTRUCTOR Aimee Corn, P.E., GFT Infrastructure, Inc.

DESCRIPTION

Accurate and reliable survey data are essential to effective dam safety management. Whether assessing structural integrity, monitoring deformation, or supporting emergency action planning, sound survey practices provide the foundation for defensible engineering decisions.

This webinar offers a high-level overview of surveying principles, methods, and technologies as applied to dam safety programs. Drawing from industry standards and U.S. Army Corps of Engineers manuals (EM 1110-1-1002 and EM 1110-2-1009), this webinar will introduce best practices in survey planning, control networks, accuracy requirements, equipment selection, and data quality assurance.

Participants will explore the "why" behind common survey strategies, for example, the importance of seasonal monitoring of arch dams or consistent practices across an inventory of dams. Real-world examples will illustrate how well-executed surveys support inspections, instrumentation data, interpretation, and risk assessments, particularly under increased regulatory requirements (i.e., increased FERC Part 12 requirements).

This training is ideal for dam safety engineers, surveyors, and technical staff who want to strengthen their understanding of modern surveying fundamentals and their critical role in dam safety.

KEY TAKE-AWAYS

- Explain how accurate and defensible survey data support dam inspections, deformation monitoring, and risk assessments.
- Identify best practices and quality control measures that minimize survey errors and improve data reliability.
- Interpret guidance from USACE EM 1110-1-1002 and EM 1110-2-1009 relevant to dam safety surveying.
- Describe typical structural behaviors of different dam types and how these influence survey frequency and approach.
- Evaluate elements of a reliable dam surveying program and recognize opportunities for improvement.

PDHS 2

MEMBER RATE $99

NON-MEMBER $130

February 10

Public Safety & Security at Dams: Two Sides of the Same Coin

INSTRUCTOR William Foos, CPP, PSP, Paul Schweiger, P.E., GFT Infrastructure, Inc.

DESCRIPTION

Recent trends show that the likelihood of experiencing injuries and fatalities at dams is far greater than experiencing injuries and fatalities from dam failures, and this likelihood is increasing. Similarly, the need to increase security at dams to address terrorist threats, control public access, and protect the resource from harm is increasing. In response to these increasing risks, dam owners are developing public safety and security plans.

Fortunately, public safety and site security are not mutually exclusive. A joint approach to evaluating and addressing both concerns can maximize the return on a dam owner's investment. Solutions to address security can also be used for public safety. The steps and information needed to assess the risks associated with public safety and site security are also similar. Solutions to address both issues emphasize the need to provide public warnings, limiting public access to features that create dangerous conditions and/or are critical to the mission of the dam, and effectively monitoring unauthorized activity around the dam.

This webinar presents concepts from the authors' experiences on an approach to conducting dam site assessments and preparing public safety and security plans for dams. An approach is presented for conducting a common site assessment that can be used to simultaneously evaluate security and public safety. Additionally, examples of mitigating strategies that could be used to increase site security and minimize the risks associated with injury, accidental death, property damage, and related litigation are shown.

KEY TAKE-AWAYS

- Become aware of the changing public safety and security trends at dams.
- Understand how public safety and security at dams can be assessed.
- Become aware of mitigating strategies that could be used to minimize the risks associated with injury, accidental death, property damage, and related litigation.
- Available resources.

PDHS 2

MEMBER RATE $99

NON-MEMBER $130

March 10

The 2019 Spencer Dam Failure: An Extreme Case of Dams in Cold Regions

INSTRUCTOR Mark Baker, P.E., DamCrest Consulting

DESCRIPTION This webinar will describe the physical processes and human factors that contributed to the failure of Nebraska's Spencer Dam in a 2019 ice run. There was one fatality. Due to cold and ice, dams in cold regions can experience loadings that are not applicable to dams in warm regions, including ice runs, gate ice-up, gate clogging, and frozen operating equipment. This webinar will expand the knowledge of people who work on dams in cold regions.

KEY TAKE-AWAYS

- Identify unusual loadings on dams.
- Learn about dams in cold regions.
- Understand Spencer Dam failure and its investigation.
- View selected cases of the regulator's connection to dam incidents.
- Understand the importance of a dam's history.
- Learn about downstream hazard classification and why people don't evacuate.

PDHS 2

MEMBER RATE $99

NON-MEMBER $130

April 14

Recent Advances in Rock Scour Technology: Time Rate of Scour and More

INSTRUCTORS George Annandale, George W. Annandale, Inc., Mike George, BGC Engineering

DESCRIPTION The erodibility of rock foundations, spillways, and other hydraulic conveyance structures remains a critical factor in the integrity and safe operation of dams worldwide. This short course presents recent advancements in rock scour science and engineering, with a focus on predictive methodologies that incorporate both geologic and hydraulic controls. Emphasis is placed on the evaluation of time-dependent scour processes and the integration of high-resolution monitoring data to enhance site-specific assessments.

Participants will be introduced to real-world case studies where rock scour has impacted dam safety, followed by a technical overview of scour mechanisms, including the influence of lithologic variability, structural discontinuities, and flow dynamics. The course will demonstrate practical tools and methods for quantifying scour potential, including the application of computational fluid dynamics (CFD) modeling to simulate hydraulic conditions and inform erosion predictions.

Attendees will gain insight into how these tools can be applied to support risk-informed decision-making, particularly in the classification and management of potential failure modes (PFMs) related to scour. The course is designed to equip dam owners, engineers, and risk analysts with the knowledge and capabilities to implement robust scour assessments and improve dam safety outcomes.

- Recognize rock scour as a significant dam safety concern requiring quantitative evaluation.
- Apply modern techniques to estimate the time-rate of scour in rock foundations and appurtenant structures.
- Utilize high-resolution remote sensing and monitoring data to enhance the accuracy of scour assessments.
- Understand the fundamental geologic and hydraulic drivers that govern rock scour processes.
- Conduct rock scour analyses using demonstrated methodologies and case-based examples.

PDHS 2

MEMBER RATE $99

NON-MEMBER $130

May 12

Shear Strength of Clay/Clay Shales and Methods of Stability Analysis for Embankment Dams

INSTRUCTOR Keith A. Ferguson, P.E., D.GE, D.WRE, HDR Engineering, Inc.

DESCRIPTION A historical timeline will be presented that describes significant stability-related failure case histories and how various technologies have been developed for characterizing the shear strength of soils (primarily clays and clay shales), as well as methods for performing stability analyses of embankment dams. The history of soil characterization technology, including shear strength, began in the 1800s but accelerated in the early to mid-1900s through the late 1980s. Each critical milestone in the evolution of soil characterization and stability analysis technology will be identified along with key published references for the audience to review after the webinar. Case histories to be reviewed (briefly) include Fort Peck Dam, MT (abutment clay shale contribution to construction static liquefaction) and the Mt. Polly Tailing Dam, Canada (stability failure resulting from shear strength failure of foundation clays under the impoundment).

KEY TAKE-AWAYS

- Learn about the key failure case histories involving stability failures of clayey embankment dams and dam foundations.
- Describe key technical advances in characterizing the properties of clays and clay shales.
- Describe and select appropriate shear strength models for clay and clay shale materials.
- Describe the alternative methods for assessing the stability of embankment slopes and select an appropriate method for an embankment dam stability evaluation.
- Review description and implementation of a Heuristic (Process Flow Diagram) for assessing the stability of an embankment (dam or levee).

PDHS 2
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June 9

AI and ML for Civil Engineering: Intro and Need-to-Knows with a HEC-RAS Example

INSTRUCTOR Matthew Garica, GFT Infrastructure, Inc.

DESCRIPTION A significant knowledge gap is emerging between the rapidly evolving capabilities of Artificial Intelligence (AI) and Machine Learning (ML) and the general engineering workforce, both in terms of terminology and technical expertise. This course is designed to bridge that gap, offering an introductory overview that connects these new powerful tools with the technical understanding of the engineers who will review and oversee such efforts in the coming years. The course will address both ethical and technical challenges, along with clarifying common misconceptions regarding the capabilities of these advanced tools within the engineering community. The content will aim to be broadly applicable across the engineering community and will provide some detailed examples, including the automation of HEC-RAS 2D workflows. By the end of this course, participants will have a foundational understanding of how coding, ML, and AI can be ethically and responsibly applied in the engineering field to support informed implementation and review moving forward.

KEY TAKE-AWAYS

- Gain a high-level technical understanding of AI, ML, and data science.
- Comprehend the general benefits and risks associated with implementing AI and automation.
- Establish connections between common engineering knowledge and a technical-level understanding of AI, facilitating further education after this course.
- Explore multiple ways in which ML, AI, and coding can be effectively integrated into engineering workflows.
- Develop a basic understanding of implementing these tools, illustrated by an example of automation using HEC-RAS 2D.

PDHS 2
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July 14

Hang in There: Rope Access for Dam Safety Inspections

INSTRUCTORS Joshua Paquet, Michelle Karlen, GFT Infrastructure, Inc.

DESCRIPTION This webinar presents the application of rope access techniques for inspection of dams and hydraulic appurtenances, including confined conduits, spillway structures, radial gates, and canal linings. Topics include SPRAT-certified access methods, integration of nondestructive testing at height, confined space entry protocols, digital defect documentation, and coordination with dam safety programs. Case studies will highlight structural assessments performed in constrained environments where conventional access methods are impractical, with a focus on data quality, regulatory compliance, and support of future operations and maintenance.

KEY TAKE-AWAYS

- Understand the fundamentals of rope access systems, including SPRAT certification, safety protocols, and equipment, and how they apply to dam safety inspections.
- Learn how to plan and execute rope access inspections in confined and high-elevation environments such as penstocks, radial gates, spillway monoliths, and canals.
- Gain insight into how rope access inspections integrate with nondestructive testing (NDT), digital documentation tools, and confined space entry protocols.
- Evaluate real-world case studies where rope access enabled cost-effective, high-quality data collection in locations not accessible by traditional inspection methods.
- Identify how rope access inspections support regulatory compliance, improve O&M decision-making, and enhance safety outcomes for dam owners and operators.

PDHS 2
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August 11

The Regulatory Playbook: Finding Success in the Dam Safety Review Process

INSTRUCTORS Matthew Marquis, P.E., Ohio Department of Natural Resources, Anthony M. Nokovich, P.E., Pennsylvania American Water Company, Chad Davis, P.E., HDR Engineering, Inc.

DESCRIPTION This webinar provides a practical guide to understanding and participating in dam safety focused regulatory reviews with confidence. Participants will gain insight into the distinct roles involved in the process, providing clarity in responsibilities and expectations. The webinar will provide strategies to locate and interpret relevant regulations, including state-specific guidance. Attendees will also learn the key elements of complete submittals and strategies for responding to regulatory comment letters. Through expert insights and real-world examples, this webinar equips professionals with the tools needed to navigate regulatory challenges effectively, minimize delays, and achieve compliance.

KEY TAKE-AWAYS

- Understand roles and responsibilities in the regulatory review process
- Discover where to find and understand state regulations and state-specific guidance
- Identify common types of engineering submittals and the key elements required for a complete submittal
- Learn how to be productive in responding to a comment letter
- Be prepared to ask yourself “is it defensible?”

PDHS 2
MEMBER RATE $99
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September 8

Developing Filter Gradation Specifications from Current Guidance

INSTRUCTOR John W. France, P.E., JWF Consulting, LLC..

DESCRIPTION

The current guidance on aggregate soil filter gradations is based on research conducted by the U.S. Department of Agriculture in the 1980s. Subsequently, various federal agencies (Natural Resources Conservation Service, Bureau of Reclamation, U.S. Army Corps of Engineers, and FEMA) published step-by-step guidance for aggregate filter gradation design based on that research. The resulting guidelines represent a great advance in filter gradation design, but not all practitioners understand the reasons for the various steps in the process and the latitude available in translating the results of the process into project specifications. This situation can result in the specification of filter gradations that are hard to find or are excessively expensive.

This webinar will 1) briefly review the history of aggregate soil filter gradation criteria, 2) explain the purposes of the various steps in the current guidelines, 3) illustrate with examples the latitude available to designers in developing project specifications from the results of the step-by-step guideline calculations, and 4) explain how some of the steps in the calculations may need to be modified for the coarser zones in multi-stage filter drain systems.

- An understanding of the history of aggregate soil filter gradation criteria.
- An understanding of the desired characteristics of an aggregate soil filter.
- An understanding of the purposes of the various control points determined in the current step-by-step procedures for establishing aggregate filter gradation requirements.
- An understanding of the latitude available to a designer in developing an aggregate filter gradation specification using the control points.
- An understanding of adjustments to the calculation procedures that may be needed for multi-stage filter/drain systems.

PDHS 2

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October 13

Precision Blasting Near Dams: Engineering Safety Into Every Shot

INSTRUCTOR Dr. Anthony Konya, DetX

DESCRIPTION

Blasting near dams demands more than technical expertise—it requires precision, foresight, and an uncompromising commitment to structural safety. This webinar is designed for dam operators, engineers, and infrastructure contractors who face the challenges of rock excavation in high-risk environments. This webinar will dive into the proven techniques and critical safeguards that enable successful blasting near sensitive water infrastructure.

KEY TAKE-AWAYS

- Learn how to design and execute blasts near critical infrastructure without compromising structural integrity.
- Understand advanced vibration control techniques and monitoring best practices.
- Learn engineering and administrative safeguards required for high-risk blasting environments.
- Understand how to evaluate and hire qualified blasting contractors for dam projects.
- Identify the role of the blasting contractor's project management team in ensuring safe, on-time execution.

PDHS 2

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November 10

Voids Beneath Spillway Slabs: Evaluation, Interim, and Long-term Risk Reduction Considerations

INSTRUCTOR Bill Dressel, P.E., Barr Engineering Company

DESCRIPTION This webinar will introduce lessons learned related to voids beneath spillway slabs. Case histories will be presented, highlighting different detection, monitoring, interim, and long-term repair techniques. The development and subsequent evaluation of potential failure modes associated with voids beneath spillways will be presented along with a discussion of different interim risk reduction and long-term repair considerations and alternatives. Case histories will include various state and private owner examples.

KEY TAKE-AWAYS

- Gain an awareness of Potential Failure Modes (PFMs) associated with voids underneath spillways and learn how to use analysis results to assess these PFMs.
- Become more familiar with different field exploration approaches and non-destructive techniques for detecting and monitoring voids using case histories to illustrate key principles.
- Recognize the advantages and limitations of various monitoring methods.
- Learn about the evaluation of different interim and long-term repair alternatives.
- Understand the complexity and coordination required when evaluating interim risk reduction measures.
- Broaden knowledge regarding the theory, application, and design of defensive measures

PDHS 2
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December 8

Introduction to Risk Analysis and How Inspection & Assessment Informs the Results

INSTRUCTOR Dean B. Durkee, PhD, P.E., GE, GFT Infrastructure, Inc.

DESCRIPTION This webinar is intended for individuals who are responsible for performing inspections on dams. The goal is to provide a connection between what can be observed in a field inspection and how dams fail, with particular focus on the risk analysis and how inspections inform the process.

- Risk analysis and how it is used as part of dam safety risk management.
- Definition of potential failure modes.
- Examples of specific dam failure case histories.
- How inspections have or could have reduced the likelihood of failure.
- Examples of potential failure modes and how observations during inspections help inform us of the risk of failure.

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ALPHABETICAL LISTING

Webinars below are listed in alphabetical order. Please note, instructors are listed with the organization to which they belonged during the presentation of the webinar.

3-D Effects on Estimation of Gradients, Seepage Flows and Evaluation of Internal Erosion Potential Failure Modes

INSTRUCTOR Keith A. Ferguson, P.E., National Practice Leader, Dams and Hydraulic Structures, HDR Engineering, Inc.

OBJECTIVE This webinar will present the results of 2D and 3D numerical evaluations of seepage conditions around a developing piping defect. An updated model similar to the first 3D numerical model performed at the University of Florida beginning in about 1980 (Townsend, 1981) will be presented to illustrate the importance of 3D influences on estimated seepage gradients, seepage flows and the evaluation of potential internal erosion potential failure modes. The updated numerical models were developed using the computer code SVFlux. One of the benefits of this program is an automatic remeshing routine that provides for more accurate estimation of seepage gradients in areas of seepage concentration such as at a discharge defect (influence on initiation processes), or as a pipe continues (progresses) in an upstream direction toward the reservoir or water source. A simplified method of estimating 3D influences on gradients and flow quantities will be presented that will allow practitioners to evaluate several different shapes and sizes of dam and levees.

Advances in Geologic Data Collection and 3D Geologic Modeling for Site Characterization and Safety Studies for Dams and Levees

INSTRUCTORS Robert P. Cannon, P.G., Gary D. Rogers, P.G., Frederic Snider, P.G., and Guy-Justin Nuyda, GISP, Schnabel Engineering

OBJECTIVE This course will address a variety of geologic issues in dam and levee design and safety engineering, with emphasis on the application of 3D geologic modeling and other technologies to enhance communication between the project geoscientists and the project engineers, regulators, and other stakeholders.

AI and ML for Civil Engineering: Intro and Need-to-Knows with a HEC-RAS Example

INSTRUCTOR Matthew Garica, GFT Infrastructure, Inc.

OBJECTIVE A significant knowledge gap is emerging between the rapidly evolving capabilities of Artificial Intelligence (AI) and Machine Learning (ML) and the general engineering workforce, both in terms of terminology and technical expertise. This course is designed to bridge that gap, offering an introductory overview that connects these new powerful tools with the technical understanding of the engineers who will review and oversee such efforts in the coming years. The course will address both ethical and technical challenges, along with clarifying common misconceptions regarding the capabilities of these advanced tools within the engineering community. The content will aim to be broadly applicable across the engineering community and will provide some detailed examples, including the automation of HEC-RAS 2D workflows. By the end of this course, participants will have a foundational understanding of how coding, ML, and AI can be ethically and responsibly applied in the engineering field to support informed implementation and review moving forward.

Analysis of Concrete Arch Dams

INSTRUCTOR Guy S. Lund, P.E., Gannett Fleming, Inc.

OBJECTIVE The purpose of this course is to provide a brief introduction into the science of concrete arch dams. The review will touch on design methods used in the past, but primarily focus on the methods used in the current state of the practice. A historical review of construction techniques will be discussed, and how that relates to evaluations and the physical behavior of the structures. The basic loads and loading conditions used for analysis will be explained, as well of techniques that can be used to validate analysis models.

A Perfect Storm of Flawed Judgments and Decisions

INSTRUCTOR Robert A. Kline, Jr, P.E., Gannett Fleming, Inc.

OBJECTIVE Through various venues such as ASDSO's DamFailures.org website, many in the dam engineering community today know the basic story of the Bayless Dam failure that occurred over 100 years ago in the small town of Austin in north-central Pennsylvania. The dam failed on September 30, 1911, resulting in the loss of 78 lives. In the immediate wake of this disaster, investigations to identify the contributing factors to this concrete dam failure were hastily prepared to quickly appease the public with answers. Limitations in the technological advancement of dam engineering at the time further prevented a comprehensive understanding of the failure's contributing factors.

Despite technological shortcomings, perhaps the most troubling aspect of this event is the fact that the disaster could have easily been prevented if warning signs had been correctly interpreted and there had not been a cascading series of flawed judgments and decisions over a span of more than two years. It also illustrates why effective dam safety regulatory programs are so important. This webinar will revisit the lessons learned from both a physical and human factors perspective in hopes of providing a sobering reminder of how immature technology coupled with one or more unchecked flawed judgments and decisions, made by people who lack adequate technical expertise, can result in catastrophic consequences. Given that newsworthy dam failures have recently occurred which also likely involved flawed judgments and decisions, and which were preventable, it is evident that the profession still needs to learn from history to prevent future dam failures.

Application of 2D Hydraulic Modeling for Dam and Levee Safety

INSTRUCTORS Amanda J. Hess, P.E., CFM, and Benjamin P. Israel-Devadason, P.E., CFM, Gannett Fleming, Inc.

OBJECTIVE Recent improvements in the computational capacity of computers and in the availability of high-quality terrain data have allowed 2D hydraulic models to become highly valuable tools in dam and levee safety analyses. Today, there are several free and commercially available 2D models on the market. This webinar will provide a background on 2D hydraulic modeling theory, identify steps to set up a 2D model, describe important specifications for 2D models, and summarize features available in 2D models.

Applications of 2D models for dam and levee safety will be highlighted.

Application of PFMA in Dam Safety

INSTRUCTOR Douglas D. Boyer, P.E., CEG, Federal Energy Regulatory Commission

OBJECTIVE Failure mode evaluation, or what is now more commonly referred to as potential failure mode analysis (PFMA) for dam safety, has become routine practice for many in the profession. The process became more formally organized by the US Bureau of Reclamation in the early to mid-1990's and gained wider industry exposure in the early 2000's through the publication of FERC's Engineering Guidelines, Chapter 14 – Dam Safety Performance Monitoring Program. The PFMA process systematically identifies, describes, and evaluates ways a dam and its appurtenances could fail under all postulated loading conditions. However, a PFMA is much more than an exercise to evaluate and document potential failure modes for a dam. At its fullest extent, a PFMA is a valuable tool which can be used to guide and inform dam safety personnel on where to focus dam safety observations and inspections, where to strategically perform an investigation or install instruments to monitor dam performance, and can be used as a first step in a risk analysis. The process and results of the PFMA can also help to identify and prioritize O&M deficiencies, identify the need for improved operational processes, and pinpoint training needs. PFMAs can benefit dam owners and regulators by providing a better understanding and appreciation of potential structural and operational weaknesses and operating procedures. Finally, they may also be used to better inform downstream emergency management personnel of the hazards posed by the dam, while also providing a better understanding of effective evacuation protocols.

Application of Risk Principles within State Dam Safety Programs

INSTRUCTOR Greg Richards, P.E., CFM, Gannett Fleming, Inc.

OBJECTIVE The application of risk-informed decision-making to dam safety in the United States has been considered since the 1960s. However, it wasn't until the mid-1990s that risk-informed processes and criteria were seriously applied to dam safety by both the Bureau of Reclamation and U.S. Army Corps of Engineers. Since that time, many other federal agencies have adopted risk-informed processes and Federal Guidelines for Dam Safety Risk Management has been published. Within state dam safety agencies, however, the adoption of risk-informed decision-making has lagged. There are many likely reasons for this delay including limited resources, difficulty in updating regulations, lack of technical training, and in some cases skepticism of engineers and regulators in adopting a new approach to dam safety. At present, most state dam safety programs still follow a prescriptive, standards-based approach for dam design criteria.

Contrary to this trend, there have been several states (including Colorado, Washington, Montana, and New Mexico in particular) that have applied or are in the process of developing simplified risk-informed processes to dam safety. These vary from using risk information to define regulatory Inflow Design Flood criteria to facilitating potential failure mode screenings and risk assessment workshops for individual dams. Simplifications have allowed regulators and dam owners with limited resources to take advantage of risk information in making dam safety decisions. This webinar will discuss the history of risk-informed processes in the United States, provide an overview of risk-informed decision-making processes that are currently being applied within state dam safety programs, and highlight several recent risk initiatives that these states are pursuing. The perspectives of current dam safety officials from these states regarding the challenges and opportunities posed by risk analysis will also be shared.

Automated Instrumentation and Early Warning Systems for the Monitoring of Dams

INSTRUCTOR Lee Mauney, P.E., CFM, HDR Engineering, Inc.

OBJECTIVE Timely warning and rapid response have proven to be critical in reducing consequences during dam and levee safety incidents. The detection of abnormal, hazardous, and/or threatening conditions is the first step in issuing a more timely and effective warning. Early Warning Systems can provide real-time information on the health of a dam, conditions during incidents, and advanced warning to evacuate ahead of dam failure flooding.

An Early Warning System is an Automated Data-Acquisition System (ADAS) equipped to transmit and process data to include early warning notification features and programmed to operate without the need for human intervention. The system may include various types of sensors, including reservoir/tailwater level monitoring, stream gauges, geotechnical/structural instruments, and weather measurements; however, a successful Early Warning System program encompasses much more than just instrumentation and offers numerous potential benefits for a dam/levee safety program.

Best Management Practices for Waterstop Selection, Installation, and Inspection

INSTRUCTORS Joseph Kudritz, P.E., and Brian Afek, P.E., Michael Baker International, Inc.

OBJECTIVE This course is intended to provide guidance on the proper selection and installation of waterstops for hydraulic structures. This course will discuss the various types and applications of waterstops and discuss the necessary design constraints such as site constraints, joint types, head pressures, and concrete clearances and cover. The course will emphasize the need for thorough structure detailing to ensure proper clearances and placement location are specified. The use of 3-dimensional modeling techniques will be discussed as a visualization technique to better detail complex joints. Most deficiencies regarding waterstops occur with the installation of the waterstops. Therefore, this course will highlight proper and improper installation placements and welding techniques. The course will discuss the benefits of using manufacturer welded unions, having properly trained waterstop installers, input from the waterstop manufacturer, and having trained inspectors.

Best Practices for Dam Safety Warning Signs

INSTRUCTORS Diana Castro, Atkins and Preston Wilson, FEMA

OBJECTIVE FEMA's Dam Safety Warning Signs Best Practices is a compilation of existing leading practices from industry leaders to provide nationwide guidelines for consistent signage to improve public safety around dams. Through this webinar, attendees will learn about the importance of dam safety signage, how to assess the risks at dams that can be addressed by safety signage, and several best practices for materials, messaging, and maintenance for dam safety signage.

Best Practices in Floodplain Management Associated With Dam Safety Management and Dam Rehabilitation

INSTRUCTORS John Wolfhope, P.E., Freese and Nichols, Sam Crampton, P.E., CFM, Dewberry

OBJECTIVE This webinar provides an overview of the history, recent trends, and best practices in floodplain management as relates to dam safety management, with a special focus on dam rehabilitation and FEMA's High Hazard Potential Dam (HHPD) Rehabilitation Grant Program.

Concrete Construction – Issues and Remedies

INSTRUCTORS Mike Zusi, P.E., and Henrik Forsling, P.E., AECOM

OBJECTIVE Spillways and outlet works are critical structures to the operation of a dam, and each of these features has its own unique design details and construction requirements. Even the best and most experienced contractors don't always get it right.

This webinar will focus on the most commonly encountered construction defects for each of the respective structures and how to address them. The presenters will begin with an introduction of key design features to provide design basis and context for potential remedies. They will then present detailed examples of defects and challenges often encountered in hydraulic structure construction. The presenters will further discuss proactive measures that can be taken to reduce the occurrence of these construction defects and to mitigate the effects thereof. Finally, the presenters will discuss how to identify defects, understand their root causes, assess their criticality, and present the current best practices of typical remedies and repairs.

Concrete Repair and Maintenance for Dams

INSTRUCTOR Kurt F. von Fay, Bureau of Reclamation (Retired)

OBJECTIVE This course will provide an overview of the best methods and materials for concrete repair and maintenance. It will include a description of a systematic process to follow to achieve best results and will include information from recent industry wide research efforts to ensure long lasting durable repairs. Attendees will learn how to conduct a thorough condition assessment, the most common types of concrete damage, how to select the correct material for repair, proper substrate preparation, and how to repair leaks and cracks.

Construction Quality Control / Information Data Systems for Dam Rehabilitation

INSTRUCTOR Conrad Ginther, Andrew Higgins, Jamey Rosen, Geosyntec Consultants

OBJECTIVE We live in an information age. A huge variety of digital tools and methods are in use to assure quality in dam construction. These tools can be leveraged to verify compliance with specifications, excavation limits, production rates, construction limits, structure size, geotechnical instrumentation trends, and generate as-built records much more efficiently than manually compiled and analyzed data. This webinar will look at the use of digital tools in managing the enormous amount of data generated by a project. As a result, construction quality and compliance with design intent can be ascertained in real time and inform decisions that must be made in a timely manner to minimize delays and project impacts. Tools for automated record keeping and as-built drawings will be explained along with data management both during the project and at construction's end.

Cracking and Hydraulic Fracturing in Embankment Dams and Levees

INSTRUCTOR Deborah J. Miller, Ph.D., P.E., Miller Geotechnical Consultants

OBJECTIVE Cracks are likely to develop in most embankment dams and levees, and not just in those that are poorly constructed. This course will present some of the common conditions that can lead to adverse geostatic stress conditions, cracking, and hydraulic fracturing in embankments. Case histories are used to illustrate various crack-forming mechanisms and potential failure modes associated with embankment cracking. The need for caution when considering drilling in the core of a dam is discussed. The course will review practical design measures that can be implemented to defend against internal erosion that is associated with the inevitable formation of cracks in dams and levees.

Current Trends in the Seismic Analysis of Embankment Dams

INSTRUCTOR Lelio Mejia, Ph.D., P.E., G.E., Geosyntec Consultants Inc.

OBJECTIVE Earthquakes represent a significant hazard to dams in many parts of the United States and the world and are a key consideration in the safe design and construction of dams. A key aspect of earthquake risk mitigation for dams is reliable seismic analysis of the expected performance of dams under earthquake loads. Significant advances have been made by the dam engineering profession in the seismic analysis of dams over the past several years. This webinar will provide an overview of the fundamentals of seismic analysis of embankment dams and discuss current trends in the analysis of seismic stability and deformations. The webinar will provide dam engineers and dam safety officials with basic knowledge of seismic analysis of embankment dams and an overview of recent developments in analysis methodologies for the seismic safety evaluation of such dams. Topics to be covered include lessons from observed performance during past earthquakes, selection of appropriate analysis procedures, evaluation of soil behavior and strength, and procedures for analysis of seismic stability and deformations. Key concepts will be presented for each topic with application examples of selected concepts in practice.

Customization and Utilization of Dam Operation and Maintenance Manuals

INSTRUCTORS Kristin Ray, and Scott Arends P.E., CFM, Hazen and Sawyer

OBJECTIVE This webinar will provide participants with information on the preparation and utilization of operation and maintenance (O&M) manuals for dams of varying type and size. It will serve as an update to and expansion upon ASDSO's 2014 webinar, "Developing Operations and Maintenance Manuals for Dams." The webinar will briefly review the importance of routine O&M in a dam safety program as well as the key elements of a comprehensive dam O&M manual. Current federal and state guidelines, including templates for developing O&M manuals, will be presented. The use of these resources for customizing O&M manuals and enhancing O&M programs for various dam types will be conveyed through both traditional and multimedia examples.

Dam Construction Quality Control – Do's, Dont's and Lessons Learned

INSTRUCTOR Randall P. Bass, P.E., Schnabel Engineering

OBJECTIVE The implementation of a successful dam design is predicated on the construction contractor using acceptable construction means and methods when performing the work and the quality control staff performing timely and through inspections. There are many critical work items associated with dam construction which, if not performed correctly, will lead to poor performance, reduced service life, and contribute to potential failure modes. This webinar will present some proper and improper construction techniques that are often encountered during dam construction that are crucial to a successful project including, engineered fill placement, internal drains systems, reinforced concrete structures, RCC placement, control of water, and foundation preparation. Participants of this webinar will gain greater knowledge of acceptable construction practices, understand the consequences of out of spec work, and better understand how to evaluate the inspect critical work tasks during dam construction.

Dam Overtopping Protection Systems - Part I

INSTRUCTOR Tom Hepler, Schnabel Engineering

OBJECTIVE This is the first of a two-part series on overtopping protection systems for embankment and concrete dams. Many dams today have insufficient spillway capacity and may be overtopped during large floods below the regulatory requirement. In recent years, dam overtopping protection has become increasingly popular to provide additional flood release capacity when more conventional methods such as increasing spillway discharge capacity or reservoir storage are cost prohibitive or impractical. This course will present many of the overtopping protection systems currently in use, describing for each their range of design applications, construction considerations, and potential limitations and risks. Using FEMA's 2014 Technical Manual: Overtopping Protection for Dams as a guide, the two most commonly used systems today, roller-compacted concrete (RCC), and articulating concrete blocks (ACB) will first be presented, followed by various reinforced concrete, turf, and rockfill alternatives for embankment dams. The course will conclude with special applications for concrete dams. Part 2 explores the performance of various systems in hydraulic model studies.

Dam Overtopping Protection Systems - Part II

INSTRUCTOR Christopher Thornton, Ph.D., Colorado State University

OBJECTIVE This is the second of a two-part series on overtopping protection systems for embankment and concrete dams. Many dams today have insufficient spillway capacity and may be overtopped during large floods below the regulatory requirement. In recent years, dam overtopping protection has become increasingly popular to provide additional flood release capacity when more conventional methods such as increasing spillway discharge capacity or reservoir storage are cost prohibitive or impractical. This course will present the process of evaluating protections systems for use in spillway applications. A summary of determining appropriate project hydraulic conditions will be followed by a brief history of prototype research conducted on multiple types of protecting technologies. Results of these tests will be presented in support of design methodologies where new methods for determining project FOS and numerically evaluating hydraulic jump system performance will be recommended. Procedures outlined in NRCS NEH Part 628 Chapter 54, "Articulated Concrete Block Armored Spillways" will be presented to show a standardized evaluation approach whereby permitting evaluation of multiple protection system technologies. The presentation will conclude with an example of a design application.

Dam Safety with 3D Weirs

INSTRUCTORS Brian Crookston, Ph.D., P.E., and Greg Paxson, P.E., Schnabel Engineering

OBJECTIVE Inadequate spillway capacity, significant hydrologic loadings on embankments and structures, and operation and maintenance are common dam safety issues, instigating the need for risk-reduction measures and/or rehabilitation. 3D weirs, or weirs with a crest length greater than the spillway width, are a particularly efficient approach to reduce these concerns. These weirs are also commonly used in new dams and may be useful as levee spillways. In some cases, these structures may be an alternative to gated spillways, which require operation and maintenance and can cause downstream flooding from misoperation or failure. Examples of 3D weirs include: arced or curved weirs, box-inlet drop spillways, labyrinth and piano-key weirs, and labyrinth fuse gates. Because of their hydraulic performance and site-adaptive geometries, these types of weirs are of increasing interest to those involved in dam safety, including practitioners, researchers, regulators, and dam owners. However, these spillways have complex hydraulic behaviors and can be challenging to develop efficient designs.

Delhi Dam – A Compound Failure

INSTRUCTORS William R. Fiedler, HDR; and Wayne King, Federal Energy Regulatory Commission

OBJECTIVE This webinar will focus on the Delhi Dam failure case history. Delhi Dam failed on July 24, 2010 during a record storm. The failure was a result of a number of factors all contributing to the ultimate failure. The review of the dam failure by a forensic team allowed for a good understanding of the mechanisms that lead to failure. Analyses were performed, which provided valuable insights into the weight of the contributions from the key factors. This webinar will describe in detail the history of Delhi Dam prior to the failure, a chronology of events leading to dam failure, studies and analysis performed as part of the forensic team efforts, and the findings and recommendations from the forensic team report.

Design of Siphon Systems

INSTRUCTORS Robert A. Kline, Jr., P.E., and Andrzej Kulik, P.E., Gannett Fleming, Inc.

OBJECTIVE Since at least the time of the ancient Egyptians, siphons have been a useful tool to transport fluids in conduits by arranging the conduit in an inverted "U" and relying on gravity to eliminate the need for a pump. In the United States, siphons have been used as spillways and outlet works at dams. This webinar reviews the best applications for siphons at dams; design procedures and considerations; misconceptions regarding how they function; real-life examples in use; and the best methods to construct and operate a siphon.

Designing Slope Protection for Dams and Levees

INSTRUCTOR J. Richard Weggel, Ph.D., P.E., D.CE, Drexel University

OBJECTIVE Slopes on the upstream side of dams are subject to wind-generated waves. Likewise, levees along riverbanks experience wind waves, boat wakes and current forces. This webinar will describe how winds produce waves in reservoirs and other enclosed bodies of water. Wave heights and periods resulting from winds blowing across the water surface will be calculated as a function of wind speed, duration, water depth and fetch distance. Wakes produced by various vessels traveling at different speeds and distances from a levee and/or dam will be quantified. Wind set up in reservoirs will be calculated. Runup and the potential for wave overtopping of slopes will be calculated for various slopes and types of slope protection. Rubble revetments, rip-rap revetments, and other types of slope protection will be described, and design methods presented.

Detecting, Monitoring, and Repairing Voids Beneath Spillway Slabs

INSTRUCTORS Bill Dressel, P.E., Barr Engineering, Patrick Maier, P.E., Tyler Sporisky, Bureau of Reclamation

OBJECTIVE This webinar will introduce lessons learned related to voids beneath spillway slabs. Case histories will be presented highlighting different detection, monitoring, and repair techniques. The development and subsequent evaluation of potential failure modes associated with voids beneath spillways will be presented along with a discussion of different interim risk reduction and long-term repair alternatives. Case histories will include the Bureau of Reclamation's Hyrum Dam, Merritt Dam, and Vallecito Dam spillways.

Developing Operations and Maintenance Manuals for Dams

INSTRUCTOR Steve Jamieson, P.E., W.W. Wheeler and Associates, Inc.

OBJECTIVE This webinar will provide participants with information on the importance of preparing operations and maintenance (O&M) manuals for dams. It will include an overview of some of the key federal agency and state requirements and formats for dam O&M manuals. Operations and maintenance guidelines will be presented for both embankment and concrete dams and key dam appurtenances, such as spillways and outlet works. Many examples will be provided that illustrate the key elements of a comprehensive dam O&M manual including: O&M responsibilities, routine and periodic inspections, instrumentation and monitoring, dam operations, maintenance guidelines, interaction with emergency actions, and interaction with risk assessments.

Drilling Plans and Hazard Evaluations for Dams and Levees

INSTRUCTOR Doug Boyer, Federal Energy Regulatory Commission

OBJECTIVE Drilling into, in close proximity to, or through dams, levees, and their foundations may pose significant risk to the structures. Damage created by hydraulic fracturing and other means during the drilling process (use of inappropriate drilling methods), improper in-situ sampling techniques, and/or unacceptable methods of completing (backfilling) borings can open seepage paths that could create conditions conducive to internal erosion (piping) and ultimately dam failure. This webinar will provide an overview of existing guidance for drilling in and near embankment dams and their foundations. Of special emphasis will be the identification and assessment of drilling hazards for the prevention of damage to the embankment, structures, and their foundations from hydraulic fracturing, heave, erosion, filter/drain contamination, or other mechanisms during drilling-related activities. The webinar will also describe the typical requirements of a site drilling plan for any exploration drilling, instrument installation, or remediation drilling (including grouting) work to occur on an embankment dam, in proximity of the dam in which the drilling methods could pose a risk to the dam, or the dam's foundation and abutments.

Drone Technology Integrated into Dam Safety Inspections and Evaluations

INSTRUCTORS Jay Halligan and Greg Daviero, Ph.D., P.E., Schnabel Engineering

OBJECTIVE During recent years the use of unmanned aerial vehicles (UAVs) or drone technology for the inspection and monitoring of dams and levees has increased. This rate of integration is, in part, due to FAA regulation revisions and the advantages regarding personnel safety, flexibility, speed and volume of data acquisition, and cost. This webinar presents an overview of drones and how this technology can be incorporated into dam safety inspections and evaluations. Although drones are a cost-effective and efficient contribution to inspections, there are regulatory requirements for use and challenges with data acquisition—things to know before you fly. These include various flight rules, authorizations, accuracy requirements, flight strategies and site conditions, shadowing, and handling and processing large amounts of geospatial data. This webinar presents insights into these challenges and common pitfalls to encourage the appropriate use and application of this emerging technology. This webinar also highlights the advantages of drone technology, why it is well suited to dam and levee safety applications, and how it can complement and provide new approaches to observe and inspect dams and levees. Included is a selection of recent site inspections that incorporated drone technology to successfully gather information and allow an inspection team to more safely and efficiently observe areas that are not accessible or difficult to access.

Earthquake Hazards, Ground Motions and Dynamic Response

INSTRUCTORS Lelio H. Mejia, Ph.D., P.E., G.E., AECOM; and William A. Fraser, CA Division of Safety of Dams (Retired)

OBJECTIVE Earthquakes represent a hazard to dams in many parts of the United States and therefore are of interest to design engineers and dam safety officials. The hazard from earthquakes includes strong shaking, fault rupture displacements, reservoir seiche and earthquake-induced landslides, all potentially damaging to dams and reservoirs. This webinar will discuss the physics and geology of the earthquake process and the methods used to identify seismic hazards in the field such as identifying geologic indicators of past earthquakes. The factors that control the earthquake ground motion at a site and the approaches used to predict ground motions for engineering analysis will be discussed. The intensity measures most commonly used to describe ground motions will be discussed along with the use and modification of motions for engineering analyses of dams. Finally, methods used to predict the dynamic response of embankment dams and their soil foundations to earthquake motions will be presented.

Easy and Quick Determination of the PMF from the PMP Using Free Tools

INSTRUCTORS Nicholas Agnoli, P.E., Applied Weather Associates

OBJECTIVE This webinar will provide training on using the PMP to generate the PMF, including a walk-through of the rapidly evolving US Army Corps of Engineers HEC-HMS and HEC-RAS modeling processes to transform rain into runoff. The methodology was updated in 2023-2024 based on major software improvements and is cutting-edge. This webinar will include both theory and case study examples. This is Part II of a webinar by Bill Kappel related to the development of PMP and its application for dam safety, *Probable Maximum Precipitation: What Is It, How Is It Calculated, and How Do I Apply It?*

Emergency Action Plan Basics

INSTRUCTOR John W. France, P.E., D.GE, D.WRE, AECOM

OBJECTIVE This webinar is intended to introduce emergency action plans (EAPs) for dam safety emergency planners, dam owners, dam regulators, and consultants. The webinar will include information that will be useful to participants in developing new EAPs and improving the effectiveness of existing EAPs. The agenda is structured to answer the following key questions: Why are EAPs important? What are the important components of an effective EAP? How do EAPs relate to other aspects of emergency planning? How do you develop, update, and test an EAP?

Empirical Estimates of Permeability for Earth Dam Projects

INSTRUCTOR Danny K. McCook, P.E., McCook Geotechnical Engineering, PLLC

OBJECTIVE This webinar provides a thorough discussion of the range of permeability likely in natural and recompacted embankment soils. Empirical correlations and charts are provided that can assist in the evaluation of design report assumptions and models used for seepage analyses. Various empirical techniques such as the Kozeny-Carman equation, Chapuis's equation, the Slichter method, and others will be discussed. Examples and illustrated problems will be provided. The importance of anisotropy will also be discussed.

Evaluation and Maintenance of Piezometers, Relief Wells, and Drains in Dams and Levees

INSTRUCTORS Charles N. Easton, P.E., and Russell Glenn Springer, P.E., Freese and Nichols, Inc.

OBJECTIVE Many dams and levees have embankment drains, structure underdrains, and relief wells to control seepage through and beneath the dam and piezometers to monitor the performance of these features. Dam and levee owners, managers, and maintenance staff may be uncertain about the function of these features and what maintenance is required. This webinar will summarize seepage principles and terminology in layman's terms and describe the purposes and function of relief wells, drains, and piezometers. Examples will be shown of the types of deterioration and damage that can occur. Procedures for evaluating monitoring data and inspecting, testing, and repairing drainage features and piezometers will be presented. Experienced professional guidance is needed to avoid damage, but much of the work can be performed by the local maintenance personnel using common equipment and home-built tools.

Evaluation of Seepage Related Potential Failure Modes (PFMA's) in Embankments with Emphasis on Outlet Penetrations

INSTRUCTOR Keith A. Ferguson, P.E., HDR Engineering, Inc.

OBJECTIVE Evaluation of potential seepage failure modes in embankment dams and in particular around outlet works penetrations is a very important aspect of dam safety evaluations. Assessing potential seepage failure modes typically requires designing and evaluating investigation and instrumentation programs, and a variety of engineering analyses. Experience has shown that adverse seepage and piping conditions can develop and remain difficult to detect until the potential failure mode is in an advanced stage of the continuation phase of the development process. In this webinar, a framework will be presented for identifying, investigating, analyzing, and evaluating potential failure modes around outlet penetrations. Case histories will be used to illustrate the challenges associated with these assessments. Results of engineering seepage and stress analyses will be presented to better understand potential failure mode development mechanisms including the potential for cracking and hydraulic fracturing.

Event Tree Principles and Applications for Dam Safety Risk Assessment

INSTRUCTOR David S. Bowles, Ph.D., P.E., P.H., D.WRE, F.ASCE, RAC Engineers and Economists, LLC

OBJECTIVE Event tree analysis is commonly used in dam safety risk analysis. Event trees are tools used to aid in understanding, analyzing, and communicating dam safety risks and for informing dam safety decisions. Like all other tools they are imperfect, and their potential value depends on the skills of their user. Event trees can be used to obtain quantitative estimates of the probability of dam failure and its associated consequences. This can be done for an existing dam or for structural or to compare non-structural risk reduction alternatives. Event trees can also serve as qualitative or diagrammatic representations of failure modes and their consequences. This webinar will summarize the principles of event trees and their application in dam safety risk assessment. It will include discussion of the construction of event trees, the calculations associated with event tree analysis and various type of post processing such as tolerable risk evaluation, which is important in support of dam safety decisions.

Exploring Dam Breach Parameters: Observed and Modeled

INSTRUCTOR Amanda J. Hess, P.E., CFM, Gannett Fleming, Inc.

OBJECTIVE Dam breach modeling is commonly used to classify the hazard potential of a dam, establish the inflow design flood and other design criteria of a dam, and plan for emergency response in the event of an incident or failure. Dam breach analyses are also an essential component of risk analyses. The results of a dam breach analysis can be very sensitive to the assumed dam breach parameters of breach size, shape, and timing.

In dam breach modeling, estimates of dam breach parameters are frequently based on observed dam failures, either based on direct comparison or based on empirical relationships derived from the population of dam failures. This webinar will review the methods available to estimate breach parameters and provide comparisons to historical dam breaches and research data. Uncertainty and sensitivity will be discussed.

Extreme Precipitation and Dam Safety in a Changing Climate

INSTRUCTORS Charles N. Thompson, P.E., New Mexico Office of the State Engineer; Mark Perry, P.E., State of Colorado; Jeff Lukas, Lukas Climate Research and Consulting, LLC; Kelly Mahoney, National Oceanic and Atmospheric Administration, Physical Sciences Laboratory

OBJECTIVE Essential to dam design and dam safety is the reliable assessment of hydrometeorological hazards such as extreme precipitation events and associated flooding. The traditional methods for assessing these hazards, such as estimation of Probable Maximum Precipitation, assume stationarity in risk over time and into the future. However, the climate at global, national, and local scales has become clearly non-stationary in recent decades, and there is increasing evidence that climate change is affecting key aspects of extreme events and storm environments. The best available science indicates that these changes and their overall impacts on extreme precipitation will become even larger over the next several decades.

In this webinar, we will first review the physical mechanisms that govern extreme precipitation events, the state of the science on the observed and expected changes in these mechanisms, and the overall effects on extreme precipitation events in the U.S. Then, we will describe how key federal agencies and others in the dam safety community have responded to these risks from a changing climate by reconsidering traditional practices, conducting pilot studies, and issuing new guidance. We will conclude by outlining potential pathways for dam safety programs and dam owners to incorporate climate-change risk into regulation and practice, highlighting recent experience in the states of Colorado and New Mexico.

Facilitating Low-Head Dam Removals and Improving Aquatic Resource Restoration Outcomes

INSTRUCTOR Jeffrey Hartranft, Josh Fair, PA Department of Environmental Protection

OBJECTIVE Many low-head dams no longer serve their original purpose and their existence often poses a public safety risk and continues to have negative impacts on aquatic resources. This webinar will focus on effective strategies for low head dam removal and aquatic resource restoration in Pennsylvania over the last two decades, which may also facilitate dam removals in other states. Topics will include applied principles of aquatic ecosystem restoration and technical aspects of restoration planning, design, and implementation for

low head dam removals. More in-depth topics on recent regulatory program adaptations and interpretations for current and future low head dam removal and aquatic resource restoration efforts will be presented. Case studies will present low head dam removal monitoring results and recent scientific and technical advances that are being applied to current aquatic resource restoration efforts. Technical aspects that apply to geologic, engineering, environmental, hydrologic, geomorphic, and many aquatic resource restoration disciplines, particularly stream and wetland-focused disciplines, will be included. Lastly, funding opportunities will be discussed with an emphasis on regulatory compliance through mitigation banking, in-lieu fee, and water quality obligations.

Field Investigations for New and Existing Dams

INSTRUCTOR Ray E. Martin, Ph.D., P.E., D.GE., REM, LLC

OBJECTIVE The purpose of the webinar is to provide an overview of the process required to developing field investigation programs for design of new dams or rehabilitation of existing dams. The presentation will include the four phases that are typical of field investigations for new and existing dams. The presentation will highlight the important aspects of each phase from planning to execution, including defining their goals. Phases discussed include site reconnaissance, geologic study, preliminary field investigation, and final field investigation.

Filter Design History and a One-Step Design Process

INSTRUCTORS James R. Talbot, P.E., Consulting Engineer; and Danny K. McCook, P.E., McCook Geotechnical Engineering, PLLC

OBJECTIVE The webinar consists of two basic parts – a history of filter design practice (including theoretical design considerations) and a step-by-step design process with criterion for the design of a critical filter for one example soil type. The primary topics covered in the first part of the webinar include early filter designs that address only interparticle seepage and piping, the historical research performed by Sherard et al to develop critical filters for soils with defects (cracks, etc.) in the soil, and the basis for regrading soils that contain considerable coarse-grained particles (gravels). The primary topics covered in the second part of the webinar include a simplified, step-by-step process for designing filters that will comply with most agency design criteria; and a step-by-step detailed example of a filter design for one of the four base soil categories. This step-by-step process is related to the most common agency design criteria and steps, including those of the USACE, Reclamation, and the NRCS.

Filters and Drainage Systems for Embankments Dams

INSTRUCTORS John W. France, P.E., D.GE, D.WRE, JWF Consulting LLC.; and Jennifer L. Williams, P.E., AECOM

OBJECTIVE This webinar will review the design and construction of filters and drains for embankment dams. Specific topics covered will include principles of filters and drains, locations and configurations of filters and drains in embankment dams (for both new dams and dam rehabilitations), design guidelines for filters and drains, evaluations of filters and drains in existing embankment dams, and practical considerations for design and construction of filters and drains.

Findings of the Independent Forensic Investigation of the Failures of Edenville and Sanford Dams, Michigan

INSTRUCTOR John W. France, P.E., D.GE, D.WRE, JWF Consulting, LLC

OBJECTIVE This webinar will summarize the findings of the Independent Forensic Team (IFT) tasked with investigating the May 19, 2020 failures of the Edenville and Sanford Dams in Michigan. The chronology of events leading up to the dam failures will be detailed. The likely physical mechanisms for the failures will be described, along with the range of potential mechanisms considered by the IFT. Contributing factors to the failures, including human and organizational factors will be discussed. Emergency actions that included the evacuation of up to 10,000 people will also be discussed. Finally, lessons to be learned from the failures will be reviewed.

Findings of the Oroville Dam Spillway Forensic Investigation

INSTRUCTOR John W. France, P.E., D.GE, D.WRE, JWF Consulting, LLC

OBJECTIVE At a height of 770 feet, Oroville Dam is the tallest dam in the United States. On February 7, 2017, a section of the concrete chute slab of the service spillway at Oroville Dam failed during spillway discharge. Several days later, as the California Department of Water Resources was evaluating and managing discharges through the damaged service spillway during a large rainfall event, the emergency spillway activated for the first time in the project's history. The emergency spillway flow resulted in significant erosion of the hillside below the crest structure, leading to concern for the integrity of the emergency spillway and the evacuation of nearly 190,000 downstream residents. The Federal Energy Regulatory Commission mandated a forensic evaluation of the failure of the service spillway chute and the damage to emergency spillway. This webinar will present the findings of the six-person Independent Forensic Team, including discussions of physical factors, human / organization factors, and lessons to be learned from the incident.

Foundation Cutoff Walls for Dams and Levees

INSTRUCTOR Dr. Donald A. Bruce, Geosystems, L.P.

OBJECTIVE During the last 10 years, there have been unparalleled levels of activity in dam and levee foundation remediation. This has been triggered mainly by the U.S. Army Corps of Engineers' evaluation of their dam and levee portfolio following the disastrous flooding of New Orleans and surrounding areas in 2005. Remedial diaphragms walls have been in installed in dams in the US since 1975 when Wolf Creek Dam, in Kentucky, was repaired for the first time. Since then, there are approximately 30 case histories that can be reviewed, up to the present day. This webinar reviews the different methods used to create foundation cutoff walls by methods other than grouting alone. A distinction is drawn between Category 1 walls (which are "excavate and replace") and Category 2 walls (which are "mixed in place").

Foundation Preparation and Treatment for Dam Construction

INSTRUCTOR John W. France, P.E., D.GE, D.WRE, JWF Consulting, LLC

OBJECTIVE This webinar will address a wide range of foundation preparation and treatment methods applicable to construction of new dams, rehabilitation of existing dams, and enlargement of existing dams. Topics to be covered include: treatment of surface rock exposures in dam foundations, rock grouting, treatment of foundation soils, foundation seepage barrier walls and upstream blankets, and foundation seepage collection and control methods.

Fundamentals of Concrete Construction Inspections for Dams and Appurtenant Structures

INSTRUCTORS Mike Zusi and Henrik Forsling, AECOM

OBJECTIVE This webinar will review field inspection of concrete structures for dams, water conveyances, and levees. Specific topics to be covered will include foundation preparation, reinforcing steel inspection, embedded items, formwork, concrete joints, waterstop installation, and concrete mixes and placement.

Getting Ahead of the Storm: Building Capacity to Respond to Large-Scale Weather-Related Dam Impacts

INSTRUCTORS Jill C. Steward, M.E.M., P.E., John M. McCain, P.E., SC Department of Environmental Services

OBJECTIVE This webinar will discuss the lessons and expertise gained from rebuilding a state dam safety program from state dam safety program officials and emergency managers almost 10 years after a historic rainfall event that had impacts statewide and caused the failure of 50 state-regulated dams.

Guidelines for Assigning Erodibility Parameters to Soil Horizons for SITES Analyses

INSTRUCTOR Danny K. McCook, P.E., McCook Geotechnical Engineering, PLLC

OBJECTIVE The SITES computer program provides engineers with a tool for predicting the formation and progression of a headcut in an auxiliary spillway during a design storm. The predicted performance given by SITES includes the extent and speed of development of a headcut that may develop in the auxiliary spillway. The predicted erosion in the spillway depends on (1) the duration and quantity of design flow through the spillway during the design storm (design hydrograph), and (2) the erodibility parameters of the soil and bedrock horizons in the spillway model. The erodibility factors used in SITES are the headcut erodibility index Kh and the detachment rate coefficient, kd. This webinar provides guidance primarily on selection of Kh and kd parameters for soils. Soils are vastly more erodible than bedrock and the erosion potential of soil horizons is extremely important in the predicted performance of any spillway that is not situated solely on bedrock. The webinar does not provide specific training on the actual use of the computer program SITES. The training in the webinar is confined to guidance related to the selection of the two erodibility factors for soil. Bedrock is not explicitly included in the webinar training, but some of the same principles in selecting the Kh and kd parameters for soils also apply to bedrock materials. Information is extracted from NRCS publications on the SITES program as well as supplemental guidance developed by the webinar trainer, Mr. McCook.

HEC-RAS 2D Modeling

INSTRUCTORS Arthur C. Miller, Ph.D., D.WRE, AECOM; and Amanda J. Hess, P.E., CFM, Gannett Fleming, Inc.

OBJECTIVE With the release of HEC-RAS 5.0 (and newer versions), the Hydrologic Engineering Center (HEC) added the ability to perform two-dimensional (2D) hydrodynamic routing to the HEC-RAS computer model. This webinar will provide an overview of the new HEC-RAS 2D tools and solution processes and the basic capabilities of the HEC-RAS 2D model. The 2D flow modeling can be accomplished by adding 2D flow area element. This is similar to adding a storage area in a 1D unsteady flow model. The flow area is developed by adding a 2D polygon, developing the computational mesh, and linking the 2D flow area either to a 1D model element or directly connecting boundary conditions to the 2D flow area. Each of these steps will be discussed. Guidelines on when to use 2D flow modeling and an example problem of developing a simple computational mesh and running the model will also be covered.

How to Communicate Effectively in Any Situation

INSTRUCTOR Leonard S. Greenberger, Potomac Communications Group, Inc.

OBJECTIVE ASDSO members are called upon to communicate in many different situations — in presentations to colleagues, testimony before regulatory bodies and legislative committees, and interviews with reporters. Whatever the circumstances, best practices can help to ensure that communication is as effective as possible. Specific learning objectives include gaining a better understanding of effective media communications and presentation skills, best practices in the art of communication, and skills and techniques that can raise trust and credibility in order to communicate more effectively in tough situations.

How to Conduct a Successful PFMA – Lessons Learned from Past Successes and Failures

INSTRUCTOR Douglas D. Boyer, P.E., CEG, Federal Energy Regulatory Commission

OBJECTIVE Potential failure modes analysis (PFMA) was first used in dam safety over twenty years ago. Although thousands of PFMA workshops have been conducted since it was first introduced, the use and application of PFMAs is still mostly limited to larger federal agencies and occasionally by others on larger projects. PFMA is a tool and a framework to evaluate dam and levee safety. It has fundamentally changed the way many now approach assessing and solving dam and levee safety issues. It's the first question asked by some prior to deciding if actions or expenditures are warranted –

"So what's the potential failure mode?" The PFMA process has evolved over the years with new twists, ideas, and improvements to the process. Still, improvements are needed, some of which have been pointed out in the Oroville Spillway Independent Forensic Team Report. Preparation, process, and team composition remain key factors in the success or failure of a PFMA. This webinar will provide examples (both good and bad) and some suggested guidance.

How to Make Your Emergency Action Plan More Effective

INSTRUCTORS Steve Jamieson, P.E., W.W. Wheeler and Associates, Inc.; Bill McCormick, P.E., Colorado Dam Safety Branch; and Kerry Kimble, CO Division of Homeland Security and Emergency Management

OBJECTIVE In the last forty years, dam safety professionals have recognized the importance of preparing emergency actions plans (EAPs) as an effective tool to minimize the consequences of dam failures. In the last 15 years, the National Incident Management System (NIMS) was established, and the Incident Command System (ICS) has become a more important emergency response tool. As a result, EAP formats, procedures for testing dam EAPs, and training personnel have evolved to meet the needs and capabilities of the emergency management and emergency response community. In recent years, we have learned some valuable lessons about the effectiveness of EAPs as part of an efficient emergency response from recent large storm events in the United States. This webinar will provide a brief overview of the evolution of emergency response and EAPs for dams and discuss key elements and formats for dam EAPs as well as some thoughts on the future of more effective and simplified EAP formats. We will provide some tools to improve decision making, preventative actions, and communications during dam incidents and emergencies. We will also provide an overview of some of the latest inundation mapping tools and techniques. The differences between EAPs for dams and levees will also be highlighted. The webinar will conclude with an EAP effectiveness checklist that will highlight dam owner, consultant, state dam safety program, and emergency management and response perspectives.

Human Factors in Dam Failure and Safety

INSTRUCTOR Irfan Alvi, P.E., Alvi Associates, Inc.

OBJECTIVE Dam failures typically result from interactions of human and physical factors which extend over years or decades. Understandably, engineers and others involved with dams normally focus on the physical factors. However, because physical systems such as dams are subject to physical laws and do not make 'mistakes,' it may be asserted that dam failures (and incidents) are fundamentally due to human factors. The other side of this coin is that dam safety must then also be fundamentally due to human factors. Human factors which are primary drivers of failure include (a) tradeoffs associated with non-safety goals (e.g., reducing costs, meeting tight schedules, and political pressures), (b) inherent human fallibility and limitations (e.g., incomplete information, inaccurate models, and cognitive biases), and (c) cognitive effects of having to deal with complexity (e.g., counterintuitive system behavior). These drivers of failure in turn result in various types of human errors (e.g., mistakes, slips, and lapses) and inadequate risk management (e.g., risk ignorance, complacency, or overconfidence). Conversely, human factors which contribute to safety include (a) organizational 'safety culture,' with a corresponding humble and vigilant attitude with regard to preventing failure, and (b) numerous best practices related to general design features of dams, organizational and professional practices, and addressing warning signs. From the perspective of this framework, failures generally result when the human factors contributing to safety are not sufficient to outweigh those contributing to failure (i.e., demand exceeds capacity). This webinar will provide a framework for engineers, contractors, owners, regulators, inspectors, maintenance staff, and others involved with dams to systematically think about the human factors which contribute to dam failure and safety, and will include detailed discussion of several of these factors. Use of the framework will also be illustrated by its application to case studies of dam failures, as well as a case study where failure was prevented by vigilant implementation of best practices.

Human Factors in the Edenville Dam Failure

INSTRUCTOR Irfan Alvi, P.E., Alvi Associates, Inc.

OBJECTIVE On May 19, 2020, Edenville Dam, located in central Michigan, suddenly failed when its lake reached a historically high level, despite the dam not overtopping. When Edenville Dam failed, the resulting breach flow resulted in overtopping failure of the downstream Sanford Dam, and necessitated evacuation of about 11,000 people. While the resulting property damage was estimated to be more than $200 million, the evacuation was successful in preventing serious injuries and loss of life. This webinar will serve as a "Part 2" continuation of a prior ASDSO webinar, "Findings of the Independent Forensic Investigation of the Failures of Edenville and Sanford Dams, Michigan," which presented an overview of the findings by the five-person Independent Forensic Team. This webinar will expand on the discussion of human factors contributing to these dam failures, beginning with the design and construction of the projects, and continuing through the decision-making during the emergency response.

Human Factors in the Oroville Dam Spillway Incident

INSTRUCTOR Irfan Alvi, P.E., Alvi Associates, Inc.

OBJECTIVE Oroville Dam is the tallest dam in the United States. On February 7, 2017, a section of the concrete chute slab of the service spillway failed during spillway discharge, and several days later the emergency spillway was activated for the first time in the half-century history of the dam, resulting in rapid and severe erosion of the hillside below the emergency spillway weir, and prompting precautionary evacuation of nearly 190,000 downstream residents. The Federal Energy Regulatory Commission mandated a forensic investigation of the incident. This webinar will serve as a "Part 2" continuation of a prior ASDSO webinar, "Findings of the Oroville Dam Spillway Forensic Investigation," which presented an overview of the findings by the six-person Independent Forensic Team. It will also expand on the discussion of human, organizational, and industry factors contributing to the incident, beginning with the design of the project and continuing until the decision-making during the incident response.

Hydraulic Design of Labyrinth Weirs

INSTRUCTORS Blake Tullis, Utah State University; and Brian Crookston, Ph.D., P.E., Schnabel Engineering

OBJECTIVE Labyrinth weirs are widely used in spillway rehabilitation to upgrade existing dams to meet updated spillway design flood criteria. In addition to increasing discharge capacity, these weirs are also well suited to regulating upstream pool elevations for flood control or at intake structures. The hydraulic design of a labyrinth spillway requires the consideration of complex flow characteristics and optimization of multiple geometric parameters in an iterative process. In addition to maximizing hydraulic performance, other considerations must be considered (e.g., site characteristics, construction costs, and operational objectives and requirements) when designing a labyrinth weir control structure. During the past 10 years, considerable research has been performed at Utah State University on the hydraulics of labyrinth weirs. This webinar presents the application of the resulting design methodology, information, and guidance used to develop effective labyrinth spillway designs. Technical components include the influence of labyrinth weir geometry (sidewall angle and crest shape) on discharge efficiency, in-channel and reservoir-specific labyrinth weir applications, nappe interference, nappe behaviors, tailwater submergence effects, staged labyrinth weir hydraulics, high headwater ratios, downstream residual energy, generalized spillway construction costs, and a comparison between labyrinth spillways and a similar spillway type, the piano key weir.

Hydraulic Tour of Standard NRCS Inlet Risers

INSTRUCTORS Dhan Gautam, Ph.D., P.E., Karl Visser, P.E., Hong Wang, Ph.D.,P.E., USDA-NRCS

OBJECTIVE This webinar will describe USDA-NRCS riser inlets for watershed dams. USDA-ARS research on various riser configurations informed the current standard NRCS riser design. Other NRCS inlet risers exist for specific design situations.

Maintenance concerns for continued optimum riser performance will be discussed. Finally, this webinar will explore how NRCS criteria protects earth spillways by requiring separation between the riser crest and auxiliary spillway crest.

Hydraulics 101: Intro to Hydraulics for Dam Safety

INSTRUCTOR Arthur C. Miller, Ph.D., D.WRE, AECOM

OBJECTIVE This webinar stresses the fundamentals of hydraulics and its application to dam safety. The presentation will include four short sessions: (1) Fluid Flow, (2) Uniform Flow in Open Channels, (3) Specific Energy, and (4) Water Surface Profile.

Precedes the webinar Hydraulics 201.

Hydraulics 201 for Dam Safety

INSTRUCTOR Arthur C. Miller, Ph.D., D.WRE, AECOM

OBJECTIVE This webinar will have four one-half hour sessions and will begin with a brief review of the Hydraulics 101 lectures. Uniform flow, specific energy, and gradually varied flow will be covered in the first session. Hydraulic modeling and water surface profile computations will be covered in the second session, and geometric data requirements will be addressed in the third session. The final session will concentrate on the development of the Hydrologic Engineering Center's River Analysis System computer model (HEC-RAS).

Hydrologic Hazards – Estimating Probabilities of Extreme Floods

INSTRUCTOR Dr. John F. England, Jr., U.S. Army Corps of Engineers

OBJECTIVE Hydrologic hazard curves are critical flood loading inputs for dam and levee safety risk assessments. Over the past decade, some federal agencies have developed and applied new tools and data sets to estimate hydrologic hazard curves, which are graphs of peak flows, volume, or reservoir stages versus Annual Exceedance Probability (AEP). Hydrologic hazard curves provide a full probability distribution for the flood hazard, covering the range of extreme flood probabilities with uncertainty with AEPs typically to 1/100,000, and relevant for assessing hydrologic failure modes. Streamflow-based statistical methods and Monte-Carlo rainfall-runoff methods are the main approaches used to estimate hydrologic hazards. This webinar provides an overview and background on current data and methods used in estimating hydrologic hazard curves for dam and levee safety. Participants will gain an understanding of: hydrologic hazard curves for dam and levee safety risk analysis, extreme storm, flood, and paleoflood data sets for hydrologic hazard curves; hydrologic hazard methods currently in use by USACE and other federal agencies for dam safety risk analysis; the philosophy and approach used to integrate meteorology, flood hydrology and paleoflood hydrology to estimate hydrologic hazard curves with uncertainty; and ongoing activities and future directions in estimating hydrologic hazard curves.

Hydrology 101 for Dam Safety

INSTRUCTOR Arthur C. Miller, Ph.D., D.WRE, AECOM

OBJECTIVE The webinar stresses the fundamentals of hydrology and is an introduction to the Hydrologic Processes. The class will stress the importance the fundamentals and its application to dam safety.

Precedes the course Hydrology 201.

Hydrology 201 for Dam Safety

INSTRUCTOR Arthur C. Miller, Ph.D., D.WRE, AECOM

OBJECTIVE The Hydrology 201 webinar consists of four one-half hour segments. The first segment is a brief review of Hydrology 101 emphasizing some of the important hydrologic issues. The second segment will concentrate on the NRCS procedures to determine the loss rate function and the dimensionless unit hydrograph as it is utilized to transform excess rainfall into runoff. Different methods of determining time of concentration and lag time will be covered in this session. The third segment will be a brief introduction to the US Army Corps of Engineers Hydrologic Center's computer model HEC-HMS, and the last segment will be an application of the NRCS procedures to a small watershed utilizing the HEC-HMS model.

Improving the Dam Safety Design Review Process

INSTRUCTORS Jeremy Franz, CO Division of Water Resources; Michele Lemieux, MT Department of Natural Resources and Conservation; and Greg Paxson, Schnabel Engineering LLC

OBJECTIVE This webinar will include a discussion of common challenges with the design review process for dam safety projects and present strategies to improve the efficiency and effectiveness of the process, with a focus on early and regular engagement of the owner, regulator, and designer.

Inlet and Outlet Hydraulics for Spillways and Outlet Structures

INSTRUCTOR Arthur C. Miller, Ph.D., P.E., AECOM

OBJECTIVE This webinar will begin with an overview of hydraulic grade lines and head losses associated with outlet structures and spillways for dams. The hydraulic structure must be designed to carry the planned flow for the expected head and tailwater conditions. Selection of the most appropriate hydraulic outlet structure depends upon the design discharge and the controlled head where the controlled head is the change in water surface elevation that will occur as discharge passes through the structure. It is important that the inlet be sized adequately to supply water to the spillway. The outlet conditions also affect the head-discharge relationship. The outlet must be sized properly so that the tailwater is deep enough to assist in energy dissipation, but not be located so that a tailwater floods out the structure (submerged tailwater condition). The concept of hydraulic control factors that can impact the location of the control will be covered in detail. This will include approach losses, entrance losses due to geometry, trash racks, and obstructions that impact inlet control computations. A few examples will be covered so that the participants will understand the concepts of inlet and outlet control.

Inspection and Assessment of Spillways

INSTRUCTOR Paul G. Schweiger, P.E., Gannett Fleming, Inc.

OBJECTIVE The February 2017 incident involving both the principal and auxiliary spillways of Oroville Dam in California brought considerable attention to potential failure modes associated with both structural and unlined spillways. Based on the lessons learned from this event and the subsequent findings of forensic investigations, many dam owners initiated their own spillway assessments.

The goal of this webinar is to provide information to help engineers inspect and assess spillways. It will explain the different types of spillways, discuss their performance requirements, and provide a general historical evolution of typical spillway construction features with an emphasis on common vulnerabilities of older spillways and best practices and defensive measures for modern spillways. Deficiencies and weaknesses in historic spillway designs and how the integrity of spillways can change over time will be highlighted. Checklists to help practitioners identify potential physical factors that can contribute to the failure of structural and unlined spillways will be presented. Recommendations and warning signs for inspectors are discussed.

Instrumentation in Dams – Selection and Installation

INSTRUCTORS Christopher Bailey, P.E., Robert Saber, P.E., and Matt Buche, P.G., Gannett Fleming, Inc.

OBJECTIVE The safe operation of dams and appurtenant structures is paramount to the communities they serve. Instrumentation is an important tool of a comprehensive dam safety and performance monitoring program that can detect changes that might otherwise be missed by visual surveillance. The objectives of this course are to provide the participants with a general understanding of dam

performance monitoring and its purpose; instrumentation and measurement tools, including emerging sensor and monitoring technologies; recommended sensor installation methods and lessons learned; data acquisition system technologies and solutions; planning a dam instrumentation and monitoring program; and instrumentation selection considerations demonstrated through case studies.

Internal Drainage Systems for Embankment Dams

INSTRUCTOR James R. Talbot, P.E., Consulting Engineer

OBJECTIVE This webinar covers the use of sand and gravel filter/drainage systems in embankment dams to protect against excessive seepage pressures, internal erosion in cracks or other anomalies, and piping. Excessive seepage pressures can affect embankment stability related to slope sloughing or failure, and piping from progressive removal of soil forming a tunnel feature in or under the embankment. Many seepage issues in dams involve the development of concentrated leaks that start in cracks or other anomalies associated with foundation and abutment features or penetrations through the embankment. Filter/drainage systems must be properly designed and located to provide safety and function against these potential problems. Drain dimensions and outlet configuration are important considerations that will be covered.

Internal Erosion – Applying Erosion Mechanics From ICOLD Bulletin 164 In Internal Erosion Failure Mode Analyses

INSTRUCTORS John W. France, P.E., D.GE, D.WRE, JWF Consulting, LLC; and Rodney Bridle, Dam Safety Ltd.

OBJECTIVE Internal erosion causes about half of all failures of water-retaining earth embankment dams. Similar statistics apply to levees. Internal erosion occurs when the hydraulic loads imposed by water seeping through the pores or flowing through cracks and openings in the soils in embankments and their foundations generate erosive forces sufficient to overcome the resistance to erosion of those soils. The knowledge of internal erosion processes has advanced significantly over the past two decades. The two volumes of ICOLD Bulletin 164 (ICOLD 2017, ICOLD, 2016) reflect the results of a group of international experts to collect information from experience, case histories, and research to provide guidance on internal erosion for engineers in dams and levees. The accumulation of knowledge led to the definition and understanding of the mechanics of the four modes of internal erosion. This understanding of internal erosion mechanics makes it possible for engineers to estimate the hydraulic load that will likely cause internal erosion to failure. The mechanics of the modes of internal erosion (mechanisms) can be combined with the internal erosion pathways through embankments and their foundations to developed detailed descriptions of potential failure modes (PFMs). If desired, these detailed PFM descriptions can be used in quantitative risk analyses. This webinar will include discussion of all the concepts described above, with reference to how the Bulletin provides a reference to the application of these concepts in dam safety evaluations and risk analyses.

Intro to Cavitation in Chutes and Spillways

INSTRUCTOR Henry T. Falvey, Henry T. Falvey & Associates, Inc., Dr. Ing. Honorary Diplomate WRE

OBJECTIVE The course is intended to give the participants an understanding of cavitation on chutes and spillways. The course will be introduced with a video of a case study that illustrates some of the fundamentals of cavitation and an explanation of why cavitation causes damage. Following the video, a PowerPoint presentation will discuss the beneficial effects of aeration on preventing damage due to cavitation. The participants will be guided to an Excel program that reproduces all the Fortran programs given in EM 42. The spreadsheet can be used to analyze chutes and spillways for their hydraulic and cavitation performance, design aerators, determine the best vertical alignment to minimize cavitation inception, and analyze the cavitation damage potential of historic data.

Intro to Post-Tensioned Anchors for Dams

INSTRUCTOR Dr. Donald A. Bruce, Geosystems, L.P.

OBJECTIVE The course will describe the evolution of prestressed rock anchor technology as applied for over 50 years to dams in North America. This evolution will be presented through an analysis of the successive phases of the PTI "Recommendations" documents, which constitute the referenceable standard of care. Special attention will be paid to issues associated with long-term performance and the so called "Legacy Anchors."

Intro to Tailings Dam and Coal Ash Impoundment Design, Construction and Monitoring: What Can Go Wrong and Right?

INSTRUCTORS Richard R. Davidson, P.E., and Christina J. Winckler, P.E., AECOM

OBJECTIVE A large difference between water storage dams versus tailings dams and coal ash impoundments is that these industrial structures are always under construction. This provides the opportunity to optimize design and construction but places an emphasis on ongoing evaluation and monitoring. This course provides an overview of the unique construction and design components of these facilities. This course will examine several recent failures that have plagued the industry but provide valuable lessons for the future.

Introduction to Addressing Inadequate Conveyance Capacity at Dams

INSTRUCTOR Paul G. Schweiger, P.E., Gannett Fleming, Inc.

OBJECTIVE The most common deficiency at dams in North America is inadequate spillway capacity. Inadequate spillway capacity can result in overtopping of a dam during flood events. This is especially a concern for embankment dams where overtopping of the dam embankment can cause breaching of the dam and uncontrolled release of the impounded water. This failure mode accounts for more than 40 percent of recent dam failures. A broad overview of the many approaches, including state-of-the-art technologies, to effectively modify existing dams to meet current spillway capacity requirements will be presented. The various approaches will be illustrated with photographs from recently modified dams and case studies.

Introduction to Armoring Embankment Dams and Earth-Cut Spillways with ACBs

INSTRUCTORS Paul G. Schweiger, P.E., Gannett Fleming, Inc.; and Christopher I. Thornton, Ph.D., P.E., Colorado State University

OBJECTIVE Over the past 23 years, numerous embankment dams and earth-cut spillways in the United States have been armored with Articulating Concrete Blocks (ACBs) to provide overtopping protection and extend the life of the structures. With the current focus on evaluating and rehabilitating dams throughout the United States to pass increased design flows, the use of this construction technology has become popular. As a result, some ACB manufacturers have made significant investments in research and development of their concrete block systems to evaluate and improve their performance for use on embankment dams and earth-cut spillways, provide design data for designers, and develop more economical embankment armoring solutions. In addition to established ACB manufacturers, researchers from Colorado State University, Bureau of Reclamation, and U.S. Army Corps of Engineers have

designed, tested, and patented ACB systems for use on embankment dams, spillways, and channels. Several dams and spillways armored with ACBs have been overtopped and performed satisfactorily with overtopping flow depths and 26 velocities approaching 4 feet and 30 feet per second, respectively. Over the same period, at least one known ACB overtopping application has failed. Much has been learned about what works and what does not work. This webinar will be presented in two parts. In Part 1, Dr. Chris Thornton will focus on ACB theory and will provide a brief history of the origins of ACB systems, discuss their development, and summarize the physical model investigations that have been completed to date to assess the performance and stability of various ACB systems. Dr. Thornton will also present the latest approach for analyzing and interpreting the test data for use in design applications. In Part 2, Paul Schweiger will focus on ACB applications and provide a summary of the first applications of ACBs for dam embankment overtopping and spillway armoring, present performance information on ACB dam armoring projects that have experienced overtopping flows, and discuss lessons learned from these and other projects. The purpose of this webinar is to provide practitioners with an introduction to the application of ACBs for use in armoring embankment dams and spillways.

Introduction to Computational Fluid Dynamics (CFD) Modeling for Dam and Levee Safety

INSTRUCTORS Benjamin Israel-Devadason, Gannett Fleming, Bryan Heiner, U.S. Bureau of Reclamation

OBJECTIVE This webinar aims to provide an introduction to CFD modeling by focusing on the history of CFD modeling, fundamentals of CFD modeling, critical components of a CFD modeling, application of CFD models for dam and levee safety, benefits of CFD modeling, how to setup a CFD model – A step-by-step guide, the role of the Modeler in CFD modeling, and why not CFD modeling?

Introduction to Concrete Gravity Dams

INSTRUCTOR Robert A. Kline, Jr., P.E., Gannett Fleming, Inc.

OBJECTIVE With the development in Europe in the later 1800s of a rational method for evaluating structural stability combined with practical experience, U.S. engineers gained greater confidence in increasing the structural height and loadings on masonry dams, as they were known then. This led to record setting heights in the U.S. for several gravity dams built for water supply purposes for major U.S. cities. As records were being set, a few dramatic concrete gravity dam failures occurred which sparked wide debate concerning whether rational methods adequately accounted for various destabilizing external forces acting on a gravity dam. Many practicing engineers agreed that although estimates and likely ranges can be assigned to these forces, for some, exact values are indeterminate. Recognition was also given to the variable nature of material strength properties. This led to the adoption of the use of safety factors to better account for the indeterminate and variable nature of such factors. Since many U.S. gravity dams in service today were constructed decades ago while design practices were still evolving, historical background for design and construction practices will be presented to provide today's practitioners with a better understanding of potential vulnerabilities in these structures. Select noteworthy gravity dam failures will be presented as well with an emphasis on lessons learned from these failures.

Introduction to Dam Decommissioning

INSTRUCTOR Paul G. Schweiger, P.E., Gannett Fleming, Inc.

OBJECTIVE As dams deteriorate, or as their purpose and benefits diminish, there may come a time when the appropriate action is to decommission the dam. For some dams, this can be a very simple, rapid and inexpensive undertaking. For other dams, it can be a very complex and costly process, requiring years to accomplish. The purpose of this webinar is to provide an overview of recent trends in dam decommissioning in the United States with an emphasis on the engineering and design aspects of dam decommissioning. Distinctions will be made between decommissioning run-of-the-river dams versus traditional storage dams, high and significant hazard dams versus low hazard dams, concrete and masonry dams versus embankment dams, and large dams versus small dams. Reservoir sediment issues and management strategies will also be presented and discussed. The webinar will include many examples of decommissioned dams and provide participants with key references and best practice documents for dam decommissioning.

Introduction to Earth Spillway Design and Evaluation

INSTRUCTOR Darrel M. Temple, P.E., D.WRE, USDA - ARS (Retired)

OBJECTIVE This webinar provides an introductory discussion of the processes governing earth and vegetated earth spillway design and performance. Topics include the history of vegetated earth spillway use by the USDA and associated design criteria, the concept of stability and integrity design, the importance of maintenance, and the erosion processes quantified in the SITES program. Examples from USDA NRCS experience and USDA ARS research will be used to illustrate the erosion processes discussed. There are no education or experience prerequisites for this webinar. Knowledge and/or experience in the area of dam engineering or hydraulics would be beneficial.

Introduction to Embankment Dams

INSTRUCTOR John W. France, P.E., D.GE, D.WRE, President, JWF Consulting, LLC

OBJECTIVE The overwhelming majority of dams in the world, and in the U.S., are embankment dams. This webinar is intended as an overview of embankment dams, to serve as an introduction for those relatively new to dam safety and a refresher for the more experienced practitioner. The webinar will begin with a review of the history of embankment dams from antiquity to today and comments on today's inventory of dams. Types of embankment dams and embankment dam failure modes will then be reviewed, followed by discussions of design and construction considerations. Finally, approaches to the evaluation of existing embankment dams and common maintenance concerns will be described. After the webinar, attendees will have an overall understanding of the universe of embankment dams, how they are intended to work, problems that can develop, and design, construction, and maintenance approaches to address those problems. Although the webinar is focused on dams, many of the concepts, failure modes, and design, construction, and maintenance issues may be applicable to earthen levees.

Introduction to Computational Fluid Dynamics (CFD) modeling for Dam and Levee Safety

INSTRUCTORS Benjamin Israel-Devadason, Gannett Fleming, Inc.; Bryan Heiner, U.S. Bureau of Reclamation

OBJECTIVE This webinar aims to provide an introduction to CFD modeling by focusing on the history of CFD modeling, fundamentals of CFD modeling, critical components of a CFD modeling, application of CFD models for dam and levee safety, benefits of CFD modeling, how to setup a CFD model - A step-by-step guide, the role of the Modeler in CFD modeling, and why not CFD modeling?

Introduction to Grouting for Dams

INSTRUCTORS Trent L. Dreese, P.E., David B. Wilson, P.E., and Daniel P. Stare, P.E., Gannett Fleming, Inc.

OBJECTIVE This webinar is intended to introduce dam foundation grouting for dam regulators, owners, and consultants. Topics covered will include determining the need and applicability of grouting, types of foundation grouting, an explanation of the grouting process including common variations in grouting techniques, grout mixes, and recent advancements in grouting technology. The information presented will be illustrated using case studies of grouting for new dams and for dam remediation projects. There are no specific education or experience perquisites for this webinar, although some knowledge/experience of dam design would be beneficial.

Introduction to Hydrologic Modeling Using Geospatial Information

INSTRUCTORS Arthur C. Miller, Ph.D., D.WRE, AECOM; Amanda J. Hess, P.E., CFM, and Chris D. Krebs, P.E., CFM, GISP, Gannett Fleming, Inc.

OBJECTIVE The field of hydrology experienced its most dramatic period of development from the late 19th century to the mid-20th century. While the theory and equations used to estimate watershed runoff have remained relatively unchanged since that time, the availability of Geographic Information Systems (GIS) software and geospatial data has modernized the methods used to evaluate watershed characteristics and develop input parameters. Today's hydrologic engineer should understand the advantages and disadvantages of using geospatial data to support hydrologic analysis, recognize the type of spatial data that is available and needed for such analysis, and be aware of the steps required for building a hydrologic model based on geospatial data.

Introduction to Nature-Like Fishways for Dams

INSTRUCTOR Dr. Luther Aadland, MN Department of Natural Resources

OBJECTIVE Dam-related problems include blockage of fish migrations, drowning hazards, failure hazards, reservoir sedimentation, habitat loss, and tailwater erosion. Some environmental problems can only be addressed through dam removal while other issues, where removal is not a viable option, can be remediated by dam modification and nature-like fish passage. Traditional fish passage projects have typically focused solely on passage of single or few large game species. As the name implies, nature-like fishways emulate natural river geometry. Nature-like fish passage includes full width dam modifications that have been applied to address dam and levee stability issues, eliminate dangerous hydraulic undertows, provide spawning habitat, provide recreational boating, grade control or sediment stabilization in dam removal and river restoration, and pass the full spectrum of native fish species. These broad benefits have drawn a diversity of funding from federal, state, and local sources. This course will introduce nature-like fishway types, design principles, applications, case examples, and associated benefits.

Introduction to Public Safety Risk Evaluation and Treatment for Dams and Levees

INSTRUCTOR John D. Cattanach, P.Eng., Civil Engineer, (Retired)

OBJECTIVE This webinar is designed to provide dam and levee owners, and their specialist consultants, an introduction to a comprehensive program to assess and reduce public safety risk around dams, levees, and powerhouses. In 2011 the Canadian Dam Association, an association similar in nature to the ASDSO, published Guidelines for Public Safety Around Dams. Dam owners across Canada are embracing these guidelines and are assessing and reducing public safety risk in a comprehensive and consistent manner. More people die in accidents around dam sites than from structural failures of these dams. In this webinar the participants will be shown examples of the hazards posed to the public by the presence and operations of dams and levees and will be reminded of the owner's responsibility for managing these public safety risks. The participants will be made aware of a comprehensive methodology to identify and classify these risks, including the steps necessary to reduce them. Examples will be provided of where public safety (and security) risks can be reduced to acceptable levels through a series of control measures.

Introduction to Spillway Gates

INSTRUCTORS Matt Moses, P.E., and Janis Murphy, P.E., Freese and Nichols, Inc.

OBJECTIVE This course will introduce spillway gates, including an overview of different types of spillway gates. The key components of a gate condition assessment will be discussed. This course will cover how gate modeling has changed over time and the major items that have influenced the current design code. Typical gate repairs and issues, both normal and unique, identified with the inspection of spillway gates will be covered. Finally, removing gates from service and/or alternatives will be touched upon.

Intrusive Activities in Dams and Levees – Are They Worth Creating a Flaw?

INSTRUCTORS Thomas Terry, P.E., P.G., USACE Institute for Water Resources, Risk Management Center

OBJECTIVE The U.S. Army Corps of Engineers has updated its regulation ER 1110-1-1807, Drilling and Invasive Activities at Dams and Levees, and related guidance based on what has been observed and learned during the last nine years of reviewing drilling program plans. This webinar will describe the update, which includes expansion to cover invasive activities for all dam and levee structures such as concrete dams and flood walls. The webinar also presents a different way to think about the risks related to drilling and invasive activities related to dams and levees, along with a short primer on hydraulic fracturing calculations related to fluids in borings. The processes and concepts presented are applicable to all dams and levees.

Judgment and Decision-Making in Dam Engineering

INSTRUCTOR Irfan A. Alvi, P.E., Alvi Associates, Inc.

OBJECTIVE Dam engineering is about dams but is done by and for people. As a result, in order to achieve dam safety, we need to understand not just dams, but also the people involved in designing, constructing, operating, maintaining, and benefitting from them. Social scientists have been studying people scientifically for more than a century, and we are now at a point historically where the social sciences have generated valuable insights into human thought and behavior. The aim of this webinar is to describe key socio-psychological insights and apply them to the practice of dam engineering, with an emphasis on judgment and decision-making. We will find that judgment and decision-making are influenced by aspects such as subconscious and conscious cognition, perception, attention, memory, modes of reasoning, self-concept, use of heuristics, cognitive biases, emotions, group influences and interactions, and culture, all of which contribute to both human capability and human fallibility. This webinar will use examples from dam engineering practice and conclude with evidence-based suggestions for how we can improve our judgment and decision-making at both individual and group levels.

Latest Trends in Roller-Compacted Concrete (RCC) Spillways and Overtopping Protection

INSTRUCTORS Joshua Gilman, P.E., Portland Cement Association and Randall Bass, P.E., Schnabel Engineering, LLC

OBJECTIVE This course will provide the latest details in design trends, mix designs, control sections, and construction means and methods for roller-compacted concrete (RCC) spillways and overtopping protection. With projects now over 40 years in service, it is clear which design criteria should be used to construct RCC hydraulic structures with long-term durability in extreme weather environments. This course will present what has been learned, along with today's design trends, and will also look at other applications of RCC for hydraulic structures including support of CVC spillways and channel protection.

Lawn Lake Dam: Pre-Failure Comprehensive Dam Safety Evaluation and Post Failure Impacts

INSTRUCTORS Mark E. Baker, P.E., National Park Service; and Bill McCormick, P.E., Colorado Dam Safety Branch

OBJECTIVE Lawn Lake Dam, located in Rocky Mountain National Park, failed suddenly and catastrophically on a sunny day in July 1982, and resulted in over $30 million dollars in damage and the loss of 3 lives. This webinar will explore the history of the dam, construction features responsible for the failure, the failure event and emergency response, the long legal process to assign liability for the failure, and the overall impacts to the Town of Estes Park and its citizens, the Colorado Dam Safety Branch, and the National Park Service.

Legal Responsibilities of Dam Owners, Operators, and Regulators

INSTRUCTOR Denis Binder, Chapman University

OBJECTIVE This webinar will address the legal responsibilities in: owning and operating a dam under normal conditions, during a flood, or in cases of a breach; devising, testing, and updating emergency action and business continuity plans; and maintaining the dam to minimize the chances of failure and tragedy. Compliance with statutory and administrative minimums may not be sufficient to forestall liability. Liability can be especially perilous to private inspectors if the dam fails.

Lessons Learned Regarding Seismic Deformation Analyses of Embankment Dams from Re-Evaluation of the Upper and Lower San Fernando Dams Performance Case Histories

INSTRUCTORS Raymond Seed, P.E., Ph.D., University of California, Berkeley; and Khaled Chowdhury, U.S. Army Corps of Engineers and University of California Berkeley

OBJECTIVE Analyses of expected seismic performance of earthen dams subject to potential liquefaction hazard are routinely performed for high hazard dams. The State of Practice has increasingly evolved from simplified methods to the use of fully coupled seismic pore pressure generation and nonlinear seismic deformation analyses (NDA) using either finite difference or finite element analysis frameworks. To evaluate the accuracy and reliability of these NDA methods, the Upper and Lower San Fernando Dams field performance case histories from the 1971 San Fernando earthquake were re-analyzed in these current studies by means of fully nonlinear seismic deformation analyses, using (1) a suite of four analytical models, (2) a suite of three cyclic pore pressure generation relationships, and (3) a suite of three post-liquefaction residual strength relationships. The results of these analyses have shown that a successful implementation of non-linear deformation analyses would involve (1) how cyclic pore pressure generation and liquefaction triggering is accounted for in different constitutive modeling approaches, (2) treatment of critical state and dilatant behaviors in soils during shaking, (3) evaluation and implementation of post-liquefaction residual strength (Sr), (4) modeling of potential strain softening of the non-liquefiable (e.g. clayey) soil layers, (5) continuation of the analyses through post-shaking conditions, (6) dealing with numerical difficulties associated with very large embankment displacements within the continuum analysis framework, and (7) suitable engineering assessment and interpretation of the analytical results. Failure to suitably accomplish any of these can result in potentially misleading and/or potentially unconservative findings. When these are suitably accomplished, seismic deformation analyses were found to be capable of producing excellent engineering insights and a good basis for engineering decision-making and/or mitigation design.

Low-Head Dams: Mitigating Danger and Liability

INSTRUCTOR Rollin H. Hotchkiss, Brigham Young University, Paul Schweiger, Gannett Fleming, Inc., Karl Kingery, Hydrometrics, Inc., Dr. Andrew Earles, Wright Water Engineers, Inc.

OBJECTIVE This course will introduce the attendees to the thousands of low-head dams in the country by describing their purpose, operation, and non-jurisdictional nature – that is, apart from national, state, and local dam safety programs. Dangerous countercurrents that can form at low-head dams, responsible for approximately 1,000 drownings, will be explained and illustrated. Legal case histories involving drownings will be examined and the best strategies to mitigate dangerous currents and liability will be shared.

Low-Level Conduits – What Can Go Wrong, How to Inspect, How to Repair?

INSTRUCTOR Joseph S. Monroe, P.E., Schnabel Engineering, LLC

OBJECTIVE This course will provide an overview of commonly observed issues associated with the most common type of spillway for relatively small dams (riser and low-level conduit). Importantly, the presentation will summarize methods to evaluate the condition of existing conduits and present common methods to repair and/or replace conduits. At the completion of the course, the participants should be able to identify common issues with low-level conduits, to include inlets and outlets, and have probable courses of action to address the identified issues.

Managing Increased Dam Safety Risk During Reconstruction

INSTRUCTORS Jennifer L. Williams, P.E., AECOM; and Del Shannon, P.E., Barnard Construction Company, Inc.

OBJECTIVE Dams are inherently vulnerable during rehabilitation construction due to risks such as a weakened/reduced cross section of the structure or reduced flood passage capacity. Successful management of the risks salient to dam construction requires proactive identification, planning, and mitigation by all parties. This 2-hour webinar will examine typical risk categorization with a focus on dam safety during construction, the risk identification and evaluation process, and risk management strategies. These include design and construction mitigation measures, risk allocation and transfer, appropriate levels of investigation and monitoring, and emergency response planning. The discussion will draw from case histories and lessons learned considering perspectives from the design engineer, contractor, owner, and regulator.

Michigan Failures/Pandemic – Impacts to the ASDSO Peer Review Process

INSTRUCTORS William B. Bingham; Robert H. Dalton, P.E., Veenstra & Kimm, Inc.; Dr. Dennis R. Dickey; Kenneth E. Smith, IN Department of Natural Resources; Luke Trumble, MI Department of Environment

OBJECTIVE On May 19, 2020, failures of the Edenville and Sanford Dams in Michigan left a lasting impact, not only on the city of Midland, MI, and other localities, but also on the dam safety community writ large. Shortly after the failures, an ASDSO Peer Review was requested and conducted. This webinar will discuss various aspects of the peer review process – what is reviewed, why those items are reviewed, how that information is used in the preparation of the initial presentation to the agency, and the preparation of the written report. Lessons learned from the Michigan review will be highlighted. Since the report was submitted, the state of Michigan took many actions based on the recommendations in the report. These actions will be discussed, and the state agency will comment on the overall experience of the review process and the interaction with the review team.

Modeling Tailings Dam Failures with 2-Phase Flow

INSTRUCTORS Jimmy O'Brien, Ph.D., P.E., Karen O'Brien, MSc., Noemi Gonzalez Ramirez, Ph.D., P.E., RIADA Engineering, Corp

OBJECTIVE This webinar will focus on the following:

- Failure modes of a tailing dam.
- Discussion of recent tailings dam failures.
- Use of Tailings Dam Tool and regression equations to estimate volume releases.
- Simulate tailings dam breach including tailings material and water volume using a two-phase flow model.
- Predict downstream mudflow inundation.
- Simulate mudflow – fluid exchange with scour and deposition, downstream tributary inflow and mudflow into lakes and reservoirs.
- Predict sediment routing by size fraction, and mudflow cessation and re-mobilization.
- Set up a project using QGIS and the FLO-2D model. Application of the Tailings Dam Tool.
- Mudflow Hazard Mapping.

Natural Resources Conservation Service Dam Design and Dam Safety Resources: Policy, Procedures, and Tools

INSTRUCTOR Steve Durgin, P.E., USDA-NRCS

OBJECTIVE This webinar will provide an overview of multiple dam design and dam safety resources available from the Natural Resources Conservation Service (NRCS). The overview will include a presentation on the NRCS history of building dams and dam safety. The policy presentation will focus on key dam design and dam safety elements in the NRCS General Manual, the National Engineering Manual, and NRCS directives process. The presentation on NRCS design and dam safety procedures will highlight various NRCS Conservation Practice Standards, NRCS National Engineering Handbook chapters, and several NRCS Technical Releases. The presentation on tools will include overviews and applications of NRCS computer software such as TR20, TR20, SITES, WinDam, and DamWatch.

Piezometric Data Evaluation for Seepage Characterization of Levees and Earth Dams

INSTRUCTOR Rick Olsen, PhD, PE , TrustDirt.com

OBJECTIVE The webinar will show how to evaluate the time series of piezometric data for dams and levees. Theory tells us that piezometers should respond in relationship to river/reservoir levels (in a linear rate) – but it never does. Seepage computer models cannot reproduce the rate change of piezometers with reservoir/river changes. Engineers call it flat, or aggressive, response. This webinar will provide numerous tools for trying to understand real-time piezometer response at different locations in a dam.

Pitfalls in Quality Control Processes for Compacted Earth Fill

INSTRUCTOR Danny K. McCook, P.E., McCook Geotechnical Engineering, PLLC

OBJECTIVE Quality control activities are important during the construction of an earth dam. The quality control program is intended to ensure that the compacted fill meets or exceeds all the specifications for the earth fill in the construction contract. The two primary specifications involve the degree of compaction and the acceptable range of water content for each zone in the compacted fill. This webinar provides guidance on common pitfalls in the quality control process. The most common pitfalls covered in the webinar are: 1. Failure to obtain and employ a correction factor that considers the difference between the water content measured with the nuclear density gage and the correct oven dry water content, 2. Failure to correctly determine a reference density test to which the field density test can be compared to obtain the correct degree of compaction for a test, and 3. Failure to consider correctly the presence of oversize rock or gravel particles at a test site. The common pitfalls are related to the ASTM specifications where applicable. While designed for quality control involved in the construction of earth dams, the same principles apply equally to the construction of any earth fill where construction specifications include degree of compaction and water content requirements.

PMP and the History of HMRs

INSTRUCTOR Edward M. Tomlinson, Ph.D., Atmospheric Science Consultants, LLC

OBJECTIVE Probable Maximum Precipitation (PMP) is used to compute the Probable Maximum Flood (PMF) that in turn is used by federal and state regulators to evaluate the safety of dams. The concept of an upper limit for precipitation was presented in the 1940's with procedures for determining PMP values developed by the Weather Bureau (now the National Weather Service), the US Army Corps of Engineers, and the Bureau of Reclamation. The definition of PMP will be presented and discussed along with how theoretical values for PMP are determined. A brief historical review of Hydrometeorological Reports (HMRs) along with discussions on the evolution of PMP determination procedures in the current HMRs from HMR 49 to HMR 59 will be provided. A summary of the steps followed will be presented along with examples of the procedures used. Lastly, the differences between generalized and site-specific PMP will be discussed. Questions related to the HMRs and site-specific PMP studies will be addressed.

Potential Failure Mode Analysis as a Dam Safety Tool Part I: Introduction to PFMA

INSTRUCTOR Douglas D. Boyer, P.E., CEG, Federal Energy Regulatory Commission

OBJECTIVE Failure mode evaluation or what now is more commonly referred to as potential failure mode analysis (PFMA) for dam safety has become routine practice for many in the profession. The process became more formally organized by the US Bureau of Reclamation in the early to mid-1990's and gained wider industry exposure in the early 2000's through the publication of FERC's Engineering Guidelines, Chapter 14 – Dam Safety Performance Monitoring Program. The PFMA process systematically identifies, describes, and evaluates ways a dam and its appurtenances could fail under all postulated loading conditions. However, a PFMA is much more than an exercise to evaluate and document potential failure modes for a dam. At its fullest extent, a PFMA is a valuable tool which can be used to guide and inform dam safety personnel on where to focus dam safety observations and inspections, where to strategically perform an investigation or install instruments to monitor dam performance, and can be used as a first step in a risk analysis. The process and results of the PFMA can also help to identify and prioritize O&M deficiencies, identify the need for improved operational processes, and pinpoint training needs. PFMAs can benefit dam owners and regulators by providing a better understanding and appreciation of potential structural and operational weaknesses and operating procedures. Finally, they may also be used to better inform downstream emergency management personnel of the hazards posed by the dam, while also providing a better understanding of effective evacuation protocols. This training webinar is being taught in two parts. Part I – Introduction to PFMA is an introductory "how to" session for folks who are not familiar with PFMAs or who have never done a PFMA. It will cover the basics of what a PFMA is, how it is typically structured, what information is required, who should be present, how to 'brainstorm' and evaluate PFMs, and what information from the PFMA session should be captured and documented in a report. Examples will be provided, both good and not so good, of potential failure mode sessions and reports. Part II – Application of PFMA in Dam Safety focuses on what to do with the results of a PFMA. Examples are provided of how the results of a PFMA can be integrated into everyday dam safety processes and can be used to inform and improve dam safety activities and decision-making.

Practical Applications of Trash Racks and Anti-Vortex Devices

INSTRUCTORS Dustin Mortensen, P.E., Chris Stoner, Freese and Nichols, Inc.

OBJECTIVE This webinar will cover the effects of vortices, debris, and other issues on spillway hydraulics. Air entering the spillway through a vortex reduces the spillway discharge and increases debris management. Various drop inlet spillway designs developed over the years will be reviewed with the effects of the changes on trash management and vortex formation. Real-world hydraulic performance of trash racks and intakes when subjected to debris, beaver activity, ice, and other environmental challenges will be discussed. The applicability of Section 316(B) of the Clean Water Act for intake and trash rack design will also be discussed.

Preventing Fatalities in Confined Spaces at Dams

INSTRUCTORS Paul Schweiger, P.E., Joseph Bell, Gannett Fleming, Inc.

OBJECTIVE Most dams have facilities that include permit-required confined spaces. These spaces can include towers, risers, galleries, manholes, vaults, conduits, instrument enclosures, tunnels, adits, drainage systems, etc., that are often unmarked and possess several unique hazards to dam inspectors, operators, and trespassers that are not intuitively obvious without confined space training. Unfortunately, several dam inspectors, contractors, and operators have recently lost their lives while working in and around confined spaces at dams. In addition to the tragic loss of life, the dam owners and others responsible for conducting work at these dams were subject to significant litigation and payment of fines. In almost all cases, the experience drastically changed the policies and practices of these dam owners and organizations, including the implementation of mandatory training of their staff, clearly marking confined spaces as hazardous areas, and restricting access to these spaces.

The professionals tasked with designing, inspecting, or working in or around confined spaces at dams should have training to help them identify permit-required confined spaces and to know how they need to be treated. Before performing a manned inspection of a permit-required confined space at a dam, a confined space entry plan should be developed that includes advanced notifications, assigned inspection team responsibilities, use of special equipment, and following well-established confined space entry protocols.

The purpose of this webinar is to provide dam safety professionals an introduction into permit-required confined spaces at dams and the challenges and special requirements that these spaces entail. The importance of this topic will be reinforced using case histories at dams that included loss of life and near-tragedies. Factors to be considered before entering a confined space will be discussed along with recommendations for training personnel, needed equipment, and the preparation of a confined entry plan. These and other lessons learned will be shared to serve as a helpful resource for dam safety professionals.

Probable Maximum Precipitation: What Is It, How Is It Calculated, and How Do I Apply It?

INSTRUCTORS Bill Kappel, Applied Weather Associates

OBJECTIVE This webinar will provide detailed discussions related to the development of Probable Maximum Precipitation and its application for dam safety. Detailed information will be provided regarding the history of PMP development and its use in dam safety design, the current standard of practice for calculating PMP estimates, the uncertainties and subjective aspects of PMP, how deterministically derived PMP depths relate to risk analyses, and where climate change factors into PMP estimates and dam design. Specific examples will be provided of site-specific and statewide PMP studies that demonstrate the calculation process from start to finish and include examples of the results that are used as input for Probable Maximum Flood (PMF) development. This will include discussions on how the PMP depths have changed through time and how to address differences across study domain, as well as trends in PMP depths, future expectations, and how to address situations where PMP information has been updated versus locations that have not been updated. The examples will include an explanation on the proper selection of the magnitude, spatial, and temporal distribution of a major precipitation event. Discussion on the future development of PMP and potential federal involvement will also be provided. Note: A companion webinar is planned that will provide training on the use of the PMP to generate the PMF, including a walk through the rapidly evolving Army Corps' HEC-HMS and HEC-RAS modeling processes to transform rain into the runoff.

Putting Public Safety First – The Oroville Dam Spillways Emergency Recovery

INSTRUCTORS Ted Craddock, P.E., California Department of Water Resources; Steve Verigin, P.E., G.E., GEI Consultants, Inc.; and Paul Schweiger, P.E., Gannett Fleming, Inc.

OBJECTIVE Starting in May 2017, DWR and its construction contractors began repairing and rebuilding Oroville's main and emergency spillways. By November 1, 2018, the main spillway was successfully reconstructed, meeting DWR's public safety construction

milestone. Work on the emergency spillway was completed soon afterwards. More than 1,000 people worked more than 2 million hours to rebuild the Oroville spillways to ensure the safety of downstream communities. This webinar will provide an orientation to Oroville Dam and the State Water Control Project, discuss the February 2017 incident and present the immediate recovery response, as well as the permanent modifications made to the main spillway and the Emergency Spillway.

Quality Assurance and Field Inspection for Dam Construction Projects

INSTRUCTOR Joe Freeland, P.E., USDA-NRCS

OBJECTIVE Quality control on projects for the construction or rehabilitation of dams is the responsibility of the construction contractor. Contractors have control of the site during construction and are responsible for understanding and complying with the requirements of the contract documents. It would be remiss on the part of the owner however, to solely rely on the contractor for this task. To verify contract compliance, construction of complex and potentially hazardous projects demands a high level of independent observation, oversight, and quality assurance measures by the owner or his designated engineer. Quality assurance measures are also often monitored by state and federal regulators. This webinar presents an introduction to the construction inspection/quality assurance process employed for new dam and dam rehabilitation projects to ensure that they are constructed as designed and to verify that the contractor complies with the terms and conditions of the contract. It will look at important items to inspect during construction and discuss the roles and responsibilities of the inspector. The construction inspection/quality assurance process presented will be of interest to dam owners, design engineers, state and federal regulators, and contractors.

Rainfall and Dam Safety – From PMP to the 100-Year Storm

INSTRUCTORS Bill D. Kappel and Douglas M. Hultstrand, Applied Weather Associates

OBJECTIVE Understanding how extreme storms and their precipitation are analyzed is critically important for dam design and dam safety. This webinar will detail the background of PMP and storm analysis starting with the earliest work completed by the US Weather Bureau (now National Weather Service) and continuing through current statewide and site-specific PMP work. Data and methods used to quantify rainfall spatially, temporally, and in magnitude will be discussed. Information on how these data are applied to create return frequencies of rainfall data and the limitations of such values will be discussed. Details on recent advances, such as the use of NEXRAD weather radar and GIS, will be discussed in relation to storm analysis and PMP development, and comparison will be provided against legacy documents such as Technical Paper 40, NOAA Atlas 2, and NOAA Atlas 14. Specific storm examples, which are important for dam safety design, will be discussed in detail. This will include information about the reliability of the original rainfall analyses and how that affects dam design and safety. Information related to the storms and their relationship to both return frequencies and climate change will be provided. The intent of this webinar is to provide non-meteorologists, hydrologists, engineers, and others involved in dam safety and design an understanding on the background of storm analysis, how they are used in PMP development, and how those data are used for precipitation frequency analysis. The attendee should come away with an understanding of the uncertainty and sensitivity involved in the PMP process, which will allow the users to apply the data and make more informed decisions both in the design of structures reliant on rainfall information and regulators to make more informed decisions regarding dam safety.

Reexamination of the 2004 Failure of Big Bay Dam, Mississippi

INSTRUCTOR Keith A. Ferguson, P.E., DWRE, HDR Engineering, Inc.

OBJECTIVE This webinar will review the 2004 failure of Big Bay Dam. A potential failure modes framework was used to make the forensic root-cause assessment based on data and information provided by the state of Mississippi. A detailed timeline of the failure obtained through review of court proceedings will be presented including the appearance of a number of distress indicators, the seriousness of which were not recognized and acted upon by the owner and the owner engineer. Of particular interest is the influence of piping and erosion of highly erodible fine sandy silt and silty fine sand through open defects in the outlet works conduit. The full failure mode likely developed through a series of backward erosion initiation/continuation cycles that began under the upstream slope of the dam and moved toward the downstream end of the conduit over a period of about thirteen years. The rapidity of the final steps in the failure mode development leading to breach of the dam are quite stunning and serve to reinforce the importance of detecting and mitigating seepage distress in embankments as early as possible in the development process and prior to later stages of continuation/progression when adequate time or intervention methods are not available to stop the failure process. A generalized risk analysis event tree of the failure mode will be presented and described.

Rehabilitation of Concrete Dams

INSTRUCTOR Robert A. Kline, Jr., P.E., Gannett Fleming, Inc.

OBJECTIVE This webinar is the third and final course in the series on concrete gravity dams. The first webinar entitled “Introduction to Concrete Gravity Dams” (July 2012) presented information regarding the types of gravity dams, historic design, and construction practices, as well as lessons learned from noteworthy gravity dam failures. The second webinar in this series entitled, “Stability Evaluations for Concrete Dams” (Oct. 2013) presented information regarding potential failure modes, material properties, loading cases, federal agency criteria, and stability analysis methods. This webinar will start with a brief recap of these first two webinars and then present successful methods for improving the structural stability of existing concrete gravity dams. These methods can consist of either structure or foundation improvements or a combination of both. Relevant design details in applying these methods will also be covered. Since most concrete gravity dams built in the United States pre-date modern design methods, many still require stability improvements. This webinar is meant to help dam owners, regulators, and designers better understand the options available for such improvements and best practices in applying them.

Rehabilitation of NRCS Watershed Structures – a Consultant’s Perspective

INSTRUCTORS Tyler Coats, P.E. and J.R. Collins P.E., Schnabel Engineering

OBJECTIVE This course will focus on the history, process, and technical requirements of the National Watershed Rehabilitation Program and, more specifically, a review of key technical requirements associated with the design and investigation of dams and spillways following Natural Resource Conservation Service (NRCS) guidance for rehabilitation of those structures. The typical alternatives considered to correct deficiencies will be presented.

Relearning How to Look at Piezometric Data for Seepage Evaluation

INSTRUCTORS Richard S. Olsen, Ph.D. P.E., Geotechnical Consultant

OBJECTIVE This webinar will start with the most basic seepage concepts and finalize on actual evaluation of piezometric data for earth dams and levees. Simple basic seepage ideas using high graphic illustrations will be the means to teach all concepts in this webinar. Also, numerous difficult concepts will be fully explained using high graphic simple illustrations. For example, this course will also provide unique insight into how seepage changes with simple geologic layer variations. A procedure for evaluating time based piezometric data versus reservoir data will be presented and it represents the only comprehensive method — the conventional procedure is to plot the data and then just look at it. This course also provides concepts for observing the potential for backward erosion using actual piezometric data. New procedures and standards for data presentation of field based piezometric data versus reservoir level will also be shown.

Responding to Dam Emergencies

INSTRUCTOR Paul Schweiger, P.E., Greg Richards, P.E., Gannett Fleming, Inc.

OBJECTIVE Many dam failures have been averted by dam owners and engineers taking quick and effective action to intervene and stop an active dam failure from progressing. The focus of this webinar is to present the most common failure modes at dams and provide information on actions that can be taken to prevent or delay each failure mode. Case studies will be used to show examples of successful interventions. Actions that could potentially do harm and make conditions worse will also be discussed. The seminar will conclude with an overview of the new "Dam Intervention Toolbox" and how this interactive resource can be used as a companion to an Emergency Action Plan to help dam owners be better prepared to respond to a dam emergency.

Review of 1938 Construction Slide at Fort Peck Dam

INSTRUCTOR Keith A. Ferguson, P.E., HDR Engineering, Inc.; and Laila M. Berre, P.E., US Army Corps of Engineers

OBJECTIVE This webinar will review the 1938 construction failure of the upstream slope of Fort Peck Dam, Montana. The failure began at about 1:15 PM on September 22, 1938 as the construction work progressed to within 20 feet of the final dam crest elevation. One hundred eighty men were working in the area. Thirty-four men were injured. Eight men lost their lives, six of whom were never found and are buried somewhere in the dam.

This webinar will be presented in two parts. The first part will cover the background of the project through the reconstruction of dam in the area where the slide occurred and the early performance of the dam following first filling of the reservoir. Part II explores the broader technology and human factors that influenced the design and post failure investigation, including the controversies that the expanded Board of Consultants encountered in preparing a report on the cause of failure and in reviewing the redesign of the portion of the dam that failed. This part begins with a discussion of the differences of opinions about technical matters that were revealed in the project literature. It presents a summary of the state of the practice at the time of design and construction, and briefly traces technology advances during the next 40 years following the slide. This includes a discussion of evolution of technology related to the shear strength of shales, and the liquefaction of sands.

Risk Assessment Basics for an Individual Dam

INSTRUCTOR David S. Bowles, Ph.D., P.E., P.H., D.WRE, F.ASCE, RAC Engineers and Economists, LLC

OBJECTIVE There is a growing recognition of the value of using risk assessment as a supplement to traditional engineering approaches to dam safety decision making. This is referred to as a risk-informed approach in which decision-making utilizes information obtained from a risk assessment along with other factors, including good engineering practice. Thus, a risk assessment is not the sole basis for a decision, but rather it provides a systematic way of identifying what is important and where uncertainties exist. Risk assessment can also be valuable for justifying the extent and type of risk reduction and the phasing of risk-reduction measures. This webinar will provide an explanation of the steps involved in performing a risk assessment for an individual dam and how the resulting insights and risk estimates can improve decision-making. Examples will be provided for evaluating an existing dam and for selecting between risk-reduction alternatives.

Risk Assessment for Levee Projects

INSTRUCTOR Scott Shewbridge, Ph.D., P.E., P.G., U.S. Army Corps of Engineers

OBJECTIVE The USACE has been conducting economic risk analyses for evaluating benefit cost ratios for levee projects since the 1960s. With a new focus on life safety, these same analytical techniques are now being used to evaluate priorities for infrastructure investments and required design reliability to achieve various goals, including National Economic Development and life safety risk reduction. This webinar will look at how the USACE is integrating traditional probabilistic levee fragility assessments, as described in ETL 1110-2-556 (Risk-Based Analysis in Geotechnical Engineering for Support of Planning Studies, 1999), with event-tree based system-response / fragility curve development process described in the joint USBR/USACE Best Practices in Dam and Levee Risk Analysis (2015) to evaluate levee system risk and risk reduction alternatives.

Risk Communication for Dams

INSTRUCTOR Kellie Mullen, Senior Vice President/Communications Coach & Trainer

OBJECTIVE Communication is important in all aspects of dam safety within an organization, with the public, and with the specific owners or stakeholders of a project. Risk communication and stakeholder participation should ensure that (1) responsible and impacted stakeholders will be partners and be afforded the opportunity to participate in decisions that impact them, and (2) communications regarding potential inundation hazard, consequences, and shared solutions will be open, transparent, and understandable. A focus on communicating the benefits and risks associated with dams to stakeholders and the public can help increase awareness of potential dam safety issues and help all parties gain a greater understanding of how dams impact their community. This creates an understanding of risk and dam safety issues important for those with varying degrees of connections to the dam; these diverse groups have a variety of backgrounds, experience, and sophistication.

Rock Grouting Principles for New and Remedial Dam Projects

INSTRUCTORS Dr. Donald A. Bruce, Geosystems, LP.

OBJECTIVE This webinar reviews the principles of rock grouting for new and remedial dam projects. Since the mid-1990s, there have been significant developments in rock grouting technology. Although these advances have been largely driven by the challenges

of remedial grouting projects – and in particular those in karstic terrains – the developments are being implemented in foundation treatments for new dams also. This webinar reviews contemporary approaches to design, construction, QA/QC, and verification. These apply to both blanket and curtain grouting applications.

Rock Scour Assessment for Dams, Spillways and other Water Conveyance Structures

INSTRUCTORS Dr. George Annandale, George William Annandale, Inc., Dr. Michael F. George, BGC Engineering Inc.

OBJECTIVE Erodibility of dam foundations, spillways and other water conveyance structures is a critical issue for the safe operation of dams world-wide. The February 2017 events at the Oroville spillways that resulted in the evacuation of nearly 200,000 downstream residents were a recent reminder of the need for meaningful quantification of scour. The course will offer examples of rock scour events impacting the safety of dams as well as provide an overview of scour mechanisms including discussion of key geologic controls and hydraulic drivers of the scouring process. Methods that can be reliably used to predict and assess such scour will be demonstrated, which include the Erodibility Index Method, a semi-empirical approach, and a more physics-based approach utilizing Block Theory. Both methods analyze the engineering properties of the rock mass and quantify the erosive capacity of flowing water based on principles of hydraulic engineering. These methods will be explained and their use illustrated by example. Finally, incorporation of high-resolution remote sensing tools in scour applications will be explored.

Seepage Monitoring and Analysis of Embankment Dams

INSTRUCTOR Mark W. Pabst, P.E., Geotechnical Engineering

OBJECTIVE Some amount of seepage passes through and under all embankment dams. The collection, monitoring, and analysis of seepage is crucial in the successful execution of any dam safety program and is helpful in deciding if it is expected ambient seepage or indicative of a more serious condition. Seepage collection methods typically include toe drains, blanket drains, and relief wells. Monitoring schemes can be grouped into several categories, including pressure, flow, temperature, and chemistry. Commonly used methods to collect data for each of these categories are piezometers, transducers (pressure), weirs, flumes (flow), thermocouples (temperature), and stiff diagrams (chemistry). Upon collecting data from these methods, one then conducts an analysis to determine if the performance meets 'design intent' 36 or if it indicates the dam is in distress and repair is required. Since all dams and their foundations are different, there is no standard methodology for analysis and these studies tend to be 'investigative' in nature. This course will provide a background on collection methods including layout, access, and sediment collection techniques for toe drains and maintenance concerns associated with relief wells. Additionally, an overview of monitoring methods and instruments will be made, including typical presentation methods. Finally, an overview of analysis methodologies will be presented, as well as two case histories.

Seepage Rehabilitation for Embankment Dams

INSTRUCTORS John W. France, P.E., D.GE, D.WRE, JWF Consulting, LLC; and Jennifer L. Williams, P.E., AECOM

OBJECTIVE This webinar will review the current state of the practice for rehabilitation of embankment dams to address seepage issues. Seepage rehabilitation measures can generally be grouped into two categories: seepage reduction / limitation measures and seepage collection measures. Seepage reduction / limitation measures include such features as foundation grout curtains, low permeability blankets, and seepage barrier walls. These measures are intended to reduce or limit the amount of seepage that occurs through, beneath, and around a dam. Seepage collection measures include such features as blanket drains, toe drains, chimney filters / drains, and relief wells. These measures are intended to collect seepage which occurs in a manner that maintains stability of the dam and prevents internal erosion. All these measures will be reviewed along with discussion of their appropriate applications. Case studies and examples will be used to highlight the applications of the various methods.

Seismic Stability Evaluation of Earth Dams

INSTRUCTORS Lelio H. Mejia, Ph.D., P.E., G.E., AECOM; and Richard J. Armstrong, Ph.D., P.E., California Division of Safety of Dams

OBJECTIVE Earthquakes represent a hazard to dams in many parts of the United States and therefore are of interest to design engineers and dam safety officials. Evaluation of the seismic stability of these dams to future anticipated earthquakes require an understanding of seismic hazards, site exploration methods, soil behavior under seismic loading, and seismic stability analysis techniques. This webinar will cover the fundamentals of these topics to provide design engineers and dam safety officials with basic knowledge to help in the analysis and review of seismic analyses of earth dams. Topics covered include: examples of seismic performance of embankment dams, selection of applicable evaluation procedures, liquefaction evaluation, cyclic softening evaluation, soil strength, and seismic stability analysis. Key concepts to understand will be presented for each topic with examples to demonstrate the application of these concepts to practice.

Site Investigation and Parameter Development for Seismic Deformation Analyses of Embankment

INSTRUCTORS Khaled Chowdhury, Ph.D, P.E.,G.E., US Army Corps of Engineers and Raymond Seed, Ph.D, University of California at Berkeley

OBJECTIVE Seismic analyses of foundation soils and earth structures such as embankment dams, levees, and structural fills, as well as soil-structure interaction issues associated with buildings and bridges, lifelines, and port and harbor facilities, are used to reliably predict expected seismic performance and depend on a number of important factors. Over the past several decades, significant advancements have occurred in seismic hazard assessment and approaches, protocols, and computing capabilities for analysis and numerical modeling. However, in the absence of suitable site characterization and parameter development, modern seismic analyses, including seismic deformation analyses, could result in incomplete and/or potentially dangerously misleading assessments regarding the expected seismic performance of an embankment dam or other critical infrastructure during an earthquake. This webinar will focus on important aspects of site investigations and parameter development for seismic deformations analyses.

Sliplining Low-Level Conduits

INSTRUCTORS J. Tyler Coats, P.E. and Joseph S. Monroe, P.E., Schnabel Engineering, LLC

OBJECTIVE This webinar will focus on planning, investigation, design, and construction considerations associated with the abandonment of low-level conduits through earthen embankment dams. In addition, the course will include planning, investigation, design, and construction considerations for the sliplining of low-level conduits. Methods for evaluating and diagnosing the condition of existing conduits will be discussed. The course will include a review of technical guidance developed by FEMA, including FEMA 484 – Technical Manual: Conduits through Embankment Dams and FEMA 675 – Technical Manual Plastic Pipe Used in Embankment Dams. Best practices associated with selecting and installing the appropriate carrier pipe and grout, as well as case studies of projects where de-sign guidance has been applied will be presented.

Slope Stability Modeling for Embankment Dams: Planning, Interpreting, and Reporting Results

INSTRUCTORS Kevin Ritter and Harry C. Donaghy, AECOM

OBJECTIVE Slope stability analyses can be used to evaluate the performance of an existing dam, design a new dam, or design a dam safety modification. But, like all models, the output is only as good as the input. This webinar will discuss how to effectively plan for and implement slope stability analyses such that the result meets the objective.

Specialty Construction Techniques for Foundation Improvement and Seepage Reduction

INSTRUCTOR Dr. Donald A. Bruce, Geosystems, LP

OBJECTIVE This course reviews the applicability of the wide range of specialty geotechnical construction techniques used in rock and soil foundations under dams and levees. These techniques are employed to provide seepage reduction and improve soils susceptible to seismicity or are otherwise too weak to sustain embankment rebuilding projects. The world of grouting alone is very wide, ranging from rock fissure and void grouting to permeation and compaction grouting in soils. The Deep Mixing Methods (DMM) are similarly diverse and are used to form cut-offs and shear panels for both seismic and static improvements. So-called "positive" cut-off walls are constructed by several methods, including the use of clamshells, hydromills, and secant piling. Each of these techniques is described, illustrated by major U.S. dam and levee remediation case histories.

Spillway Conduits – More Than Just a Pipe Through the Dam

INSTRUCTOR Joseph S. Monroe, P.E., Schnabel

OBJECTIVE Low-level conduits (pipes) through the base of a dam are the most common spillway for small earthen embankment structures. However, the discontinuity caused by the presence of the conduit creates numerous issues that must be addressed during the design and construction of the low-level pipe. This short course will present general design and construction-related issues that dam engineers and owners should be aware of when considering a low-level conduit in their earthen embankment structure. Seepage control, structural integrity, and material life expectancy will be discussed. In addition, the course will also discuss issues that occur after the impoundment is filled, items that need to be observed/monitored, and possible remedial actions once a deficiency is documented.

Spillway Gates and Dewatering Systems - Lessons Learned and Practical Solutions

INSTRUCTORS Mathew Moses, P.E., and Layne Bukhair, P.E., Freese and Nichols, Inc.

OBJECTIVE This webinar will cover lessons learned in gate rehabilitation projects and issues associated with deciding between a rehabilitation project and a gate replacement project. Dewatering options for a spillway gate rehabilitation project will be discussed.

Many times, the extent of the rehabilitation issues is unknown until the gate has been dewatered and the seals and coatings have been removed. Rehabilitation can range from relatively straightforward seal replacement and recoating to more complicated member strengthening or cutout/replacement and trunnion anchorage strengthening, and these efforts will be discussed. Other items to be discussed include seal hardware, installation and adjustment, procedures for testing the gate for leakage, field inspections, and commissioning following a rehabilitation project.

Stability Evaluations of Concrete Dams

INSTRUCTORS Robert A. Kline, Jr., P.E., and Guy S. Lund, P.E., Gannett Fleming, Inc.

OBJECTIVE Historically, concrete dam analysis focused much of the attention on material property assumptions, which has been and continues to be important. But more recently, the focus is primarily on the modes of failure experienced by these types of dams. This webinar will present a more in-depth review of stability evaluation methods for concrete dams; the basics of which was first presented in the previous webinar entitled, "Introduction to Concrete Gravity Dams." Other topics consist of: concrete dam construction and potential failure modes, material properties, loading cases, current federal agency criteria, stability analysis methods, simple gravity method, and finite element methods. The purpose of this webinar is to familiarize practitioners with the current state-of-the-practice in evaluating the stability of concrete dams. This webinar will begin with a brief overview of the origins of rational design methods previously presented in "Introduction to Concrete Gravity Dams." Other topics consist of: concrete dam construction and potential failure modes, material properties, loading cases, current federal agency criteria, stability analysis methods, simple gravity method, and finite element methods. The purpose of this webinar is to familiarize practitioners with the current state-of-the-practice in evaluating the stability of concrete dams.

Stepped Chute Spillway Design for Embankment Dams

INSTRUCTOR Sherry L. Hunt, Ph.D., USDA-ARS

OBJECTIVE Changing demographics in the vicinity of dams has led to hazard creep in a number of dams worldwide. Many of these dams now have insufficient spillway capacity as a result of these changes in hazard classification from low to significant or high hazard. Stepped chutes applied to the embankment dams offer an advantage by providing increased spillway capacity. This webinar provides an overview on stepped chute research conducted at the USDA-Agricultural Research Service (ARS) Hydraulic Engineering Research Unit in Stillwater, OK. Scientists have developed relationships and compared them to those available in literature for the design of stepped chutes applied to embankment dams.

Stream Management for Dam Construction

INSTRUCTOR Daniel (Dan) Johnson, Daniel Johnson Consultants, Inc.

OBJECTIVE Rehabilitation of dams may involve access to the upstream side of the dam. Under such conditions, management of the river to keep the upstream area dry for construction activities is required. Cofferdams are typically used to capture river discharges and route to the bypass. Cofferdam design typically involves agreed upon criteria that is a balance between performance and cost, requiring an evaluation of risk specific to a site. Many cofferdams have failed by breaching during construction of dam projects, mainly by having the design flood exceeded. This webinar will present approaches to stream management including design approaches, assignment of risks, and separation and/or sharing of responsibilities.

Strength Selection for Static Slope Stability Analysis

INSTRUCTORS Christina J. Winckler, P.E., AECOM, John W. France, P.E., D.GE, D.WRE, JWF Consulting, LLC

OBJECTIVE This webinar will provide practical guidance on the selection of soil shear strength parameters for static slope stability analysis. Topics covered include stress-strain behaviors of cohesionless and cohesive soils and their relationships to strength selection, drained and undrained strengths and their application in stability analysis, the differences between effective stress and total stress analysis methods, loading cases for stability analysis and appropriate strength selection for each case, and methods for selection of strength parameters from field and laboratory data.

Structural Condition Assessment of Dam Facilities with Non-Destructive Evaluation Methods

INSTRUCTOR Larry D. Olson, P.E., Olson Engineering

OBJECTIVE The webinar will discuss the basics of various non-destructive evaluation (NDE) methods and their applications for investigating dam, spillway and conduit conditions such as freeze-thaw cracking, void, seepage, corrosion of reinforcing, anchor bolts, strength/moduli, and stability. Guidance will be provided as to which NDE methods are useful for diagnosing various conditions of concrete, masonry, earthen, and steel materials. The webinar will highlight the important aspects of each phase from planning of NDE investigations and the basics of the NDE methods in terms of testing and analysis.

Terminal Structures and Energy Dissipation at Outlet Works and Spillways

INSTRUCTOR K. Warren Frizell, Research Hydraulic Engineer

OBJECTIVE Effective energy dissipation of flows from outlet works and spillways is an extremely important component in dam safety. Undersized or ineffective structures can lead to damage and failure, possibly endangering the dam or the flow channel and properties downstream. Generalized design criteria for many different types of energy dissipaters and/ or stilling basins exist from several different government agencies, both federal and state (including many state dam safety offices). This webinar will introduce the problem of why energy dissipation is necessary, a review of the many types of structures and their application, specialized designs, typical operations and problems, and where to find more information.

Teton Dam – The Failure That Changed an Industry

INSTRUCTORS Richard Lee, P.G., Quantum Geophysics a Division of Gannett Fleming, Inc.; and Scott Burch, P.E., Gannett Fleming, Inc.

OBJECTIVE While there have been many notable dam failures throughout the past century, the failure of Teton Dam in 1976 led to significant changes at the Bureau of Reclamation, in the federal government, and in the dam engineering industry. This course will provide information about the dam, the failure, ensuing investigations, and the changes that were implemented in the years that followed.

The 1979 Machhu Dam Disaster: Social Origins and Social Consequences

INSTRUCTOR Mark E. Baker, P.E., National Park Service

OBJECTIVE In this webinar, Utpal Sandesara and Tom Wooten will discuss their book, No One Had a Tongue to Speak: The Untold Story of One of History's Deadliest Floods. The course will cover the social causes and social consequences of the 1979 failure of the Machhu Dam-II in Gujarat, India. The flood wiped out dozens of villages and the industrial city of Morbi, killing at least 5,000 people. The course will cover the technical causes of the dam failure, the managerial problems that allowed design flaws to go unchecked, and the many ways the flood upended lives in the Machhu River Valley.

The Fontenelle Dam Incident 1965

INSTRUCTOR Daniel (Dan) Johnson, Daniel Johnson Consultants, Inc.

OBJECTIVE Fontenelle Dam incident was, arguably, the largest dam incident in US history that did not result in failure. A large leak developed in Bureau of Reclamation's new dam and quickly eroded a very large cavity on the downstream slope. It was only through large-scale and prompt intervention that the dam was saved. In the decades following the incident, few people – even at Reclamation – knew that it had occurred. Starting in 2010, the author located an extensive dam incident technical report, a first-person incident narrative, two moving picture color films, hundreds of photos, a post-incident geology report, design/construction data, original correspondence, and dozens of news articles. In 2011, he interviewed the 91-year-old man who led the response from the scene 46 years previously. From this extensive research we now have not only a compelling day-by-day visual account of the incident, but an in-depth understanding of the complex, and well-advanced failure mechanisms that nearly breached the dam. Webinar attendees will learn about incident response techniques, incident monitoring, marshaling of equipment/materials, dealing with the press, dam/ abutment interface, need for proper foundation treatment, seepage erosion, sinkhole development, seepage control, and investigative techniques. But most importantly, attendees will learn not to be complacent with past success and to be diligent in the important work of designing and repairing dams.

The History of Dam Safety Governance in the US Including Risk Analysis

INSTRUCTOR Keith A. Ferguson, P.E., HDR Engineering, Inc..

OBJECTIVE This webinar will review the history of dam safety governance development in the US from 1876 to present day. The governance development timeline will place key failures and incidents into perspective and show how such events triggered state and federal laws and the development of risk analysis methods and best practices that form a key cornerstone of dam safety practice in the US today. A key discussion during the webinar will be the concentration of dam failures that occurred in the 1970's that led to the development of federal guidelines for dam safety, as well as the founding of ASDSO. Key failures, including Lower San Fernando Dam, Teton Dam, and Kelly Barnes Lake Dam, which resulted in almost 600 fatalities and over $1B in damages, will be discussed.

The origins of risk analysis related to dams and dam safety trace back to the mid-1960's. The initial vision for risk that was presented as part of the 2nd Terzaghi lecture (delivered by Arthur Casagrande in 1965) will start our exploration of the risk analysis and risk assessment timeline embedded within the overall US dam safety governance system. The provision for risk analysis that was embedded within the first federal guidelines for dam safety and the Reclamation Safety of Dams Act of 1978 (PL 95-578) will be discussed, along with how risk analyses emerged within various federal agencies (USBR, USACE, TVA, and the FERC) and the expanding role of risk within state dam safety programs.

The History of Seepage Technology Development

INSTRUCTOR Keith A. Ferguson, P.E.,D.GE,D.WRE, HDR Engineering, Inc.

OBJECTIVE A historical timeline will be presented that describes the significant seepage-related failure case histories and how various technology developed for seepage analyses and evaluations, including potential failure modes. The history of seepage technology begins in the 1800's but accelerates in the early 1900's and through the late 1980's. Each critical milestone in the evolution of seepage technology will be identified along with key published references for the audience to perform self-learning after the webinar. Case histories to be reviewed (briefly) at the webinar include Baldwin Hills, CA (1963), Bila Disna, CZ (1918 seepage along outlet conduit), Apishapa Dam, CO (1923 cracking failure), Big Bay Dam (2004 – failure along outlet conduit), and Teton Dam, ID (1976 - internal erosion failure at dam/foundation contact). Other case histories noted on the timeline will be highlighted relative to the technology existing at the time of failure.

The Practical Use of Geophysics to Assess Dam and Levee Safety

INSTRUCTORS Richard Lee, P.G., Principal Geophysicist and President of Quantum Geophysics a Division of Gannett Fleming, Inc.; and Scott Burch, P.E., Southeast Dams & Hydraulics Practice Leader, Gannett Fleming, Inc.

OBJECTIVE The webinar consists of two sessions. Session 1 is an overview of geophysical methods applicable to dams and levees, theory behind the methodologies, and the strengths and limitations of each method. This session will also cover what additional investigations, such as drilling, are necessary to calibrate the geophysical data in order to provide a holistic evaluation of the subsurface conditions and how these conditions can affect dam and levee safety. Session 2 will be an in-depth case study of how a particular geophysical method, MASW (Multi-Channel Assessment of Surface Waves) was used to assess subsurface conditions and potential levee safety concerns for the East Coast Protection Levee System in South Florida.

The South Fork Dam Breach and Johnstown Flood of 1889: A Civil and Dam Engineering History of the USA's Deadliest Dam Failure

INSTRUCTOR Michael D. Bennett, P.E., Gannett Fleming, Inc.

OBJECTIVE The 1889 breach of the South Fork Dam, which caused the infamous "Johnstown Flood," remains the deadliest dam failure in US history. The Commonwealth of Pennsylvania built the dam in the mid-1800s as part of a cross-state transportation network, and the dam's design and construction met the contemporary standard of care. However, decades of neglect left the dam in disrepair until a group of Pittsburgh tycoons hastily rebuilt it during the Gilded Age to create an exclusive lakeside resort. The elites' repairs were shoddy, but they ignored warnings of disaster. Then, on May 31st, 1889, the dam breached due to overtopping following a 2 percent annual probability (50-year storm) rainstorm. The resulting tsunami-like flood wave inundated the steelmaking community of Johnstown and killed roughly 2,500 people. Outrage over the disaster was widespread, but the well-connected tycoons warded off legal and financial consequences, even compromising ASCE's investigation of the failure. Civil engineering, dam safety, and engineering ethics have all undergone major positive changes since 1889. Yet, the South Fork Dam story stands as a stark reminder to civil engineers, particularly dam engineers and dam safety professionals, of their duties and responsibilities.

The State of the Practice and Future of Dam Breach Modeling

INSTRUCTOR Amanda J. Hess, P.E., CFM, Gannett Fleming, Inc.

OBJECTIVE This course will survey dam breach analysis methods currently in use. Differences in methodology, analysis steps, assumptions, and results will be described. Specifically, the course will focus on hydrologic routing of dam breach flood waves, 1D hydraulic routing, and 2D hydraulic routing. Features of popular software will be summarized and the future of dam breach modeling will be discussed based on current trends.

The Use of Void Ratio (e) in Earth Dams

INSTRUCTOR Ronaldo Luna, P.E., Ph.D, BC.GE, Luna Consulting, LLC

OBJECTIVE Void ratio (e) is a term used extensively in soil mechanics. It is a fundamental ratio that quantifies the changes in volume taking place in a soil mass. Earthen dams are constructed with soils that hold back water over a long period of time, even though they are made of pervious materials. The embankment and foundation soils may differ in composition and density. This webinar will introduce void ratio (e) and its use in assessing the performance of an earth dam throughout investigation, design, and construction. Other soil mechanics concepts discussed as they relate to void ratio are relative density, proctor compaction, permeability, consolidation, and shear strength.

Tolerable Risk Guidelines for Dams: How Safe is Safe Enough?

INSTRUCTOR David S. Bowles, Ph.D., P.E., P.H., D.WRE, F.ASCE, RAC Engineers and Economists, LLC

OBJECTIVE Tolerable risk guidelines are used to guide the process of evaluating whether dam safety risks are low enough. They provide a means of relating dam safety risks to other risks to which people are exposed as a result of technological hazards. While these guidelines should not be used as the only basis for dam safety decisions, they can play a useful role in making the case for a decision. This webinar will provide both examples of practical applications of USACE and Reclamation tolerable risk guidelines and a summary of the principles that underlie the basis for tolerable risk guidelines. The examples will be for existing dams and for the evaluation of risk reduction alternatives. They will be based on almost 20 years of experience with applying tolerable risk guidelines in several countries in support of real-world dam safety decisions. Variations in dam safety tolerable risk guidelines in several countries will be discussed. Implementation issues such as considering uncertainty in risk estimates and practical ways to build legal defensibility through considering if risks have been reduced as low as reasonably practicable will be discussed. In addition, examples of tolerable risk guidelines will be provided from other fields such as environmental protection, nuclear safety, transportation safety, and land-use planning.

Tools for Designing and Assessing Spillways

INSTRUCTOR Greg Richards, P.E., CFM, Seth Thompson, P.E., SPRATI, Gannett Fleming Inc., Brian Crookston, Ph.D, P.E., UT State University/Water Research Laboratory

OBJECTIVE Spillways are complex hydraulic structures with materials and geometries that are often tailored to unique site conditions. As such, the analysis associated with the design and assessment of spillways needs to be commensurate with the complexity of the structure and the risk posed by the structure. Some of the complex hydraulic issues often considered at spillways include approach conditions, control section performance, discharge capacity, submergence, cross waves, training wall heights, cavitation potential, joint stagnation pressures, erosion/rock scour, and energy dissipation. Tools to address these issues range from empirical methods to various types of models. Deciding which method of analysis to use is key to having a successful project that efficiently meets the intended performance criteria.

This webinar will discuss in detail these issues related to spillway hydraulics and provide an overview and comparison of available design and analysis tools including empirical methods, numerical models, and physical models. The applicability of computational fluid dynamics (CFD) and/or physical models as well as the data requirements, costs, and schedule requirements associated with each will also be discussed. Example projects will be used throughout.

Triaxial Lab Testing for Earth Dams

INSTRUCTOR Ronaldo Luna, PE, PhD, D.GE, Luna Consulting LLC

OBJECTIVE The triaxial test is the premier laboratory test to evaluate shear strength conditions for earthen embankment dams. This test is common practice in geotechnical engineering but requires a good understanding of the different laboratory steps and procedures. This webinar will present concepts of the triaxial test as it applies to embankment dams. Different stages of a triaxial test such as specimen preparation, saturation, consolidation, and shearing will be discussed in detail.

The different types of tests available (UU, CU, CD) for the different loading conditions during the life of an earthen dam will also be discussed. The application of different triaxial tests for different situations will be explained for practical situations in the field.

Understanding and Managing Plant and Animal Intrusions in Embankment Dams and Levees

INSTRUCTOR Gregory Zamensky, P.E., Black & Veatch Corporation

OBJECTIVE Plant and animal intrusions represent a common but often overlooked threat to the long-term safety of embankment dams throughout the U.S. In fact, these hazards have been attributed to dam failures and near dam failures in the past. Proper identification, treatment, and long-term management of these dangers are important to the overall health of embankment dams. This webinar will provide engineers, owners, and dam safety officials with an understanding of these concepts to help everyone participate in the safety of embankment dams. This webinar will cover both plant and animal intrusions in embankment dams. Topics covered include: the identification and diagnosis of problematic situations; typical treatment methods; and strategies for preventing problems in the future.

Understanding and Managing Plant and Animal Intrusions in Embankment Dams and Levees – Part II

INSTRUCTOR Leslie F. Harder, Jr., Ph.D., P.E., G.E, HDR Engineering, Inc.

OBJECTIVE This two-hour webinar builds upon a previous webinar given in 2015 and highlights the results of recent research and policies developed with respect to plant and animal intrusions into dam and levee embankments. Intrusions by plants and animals into water-retaining embankments have long been of concern for potentially degrading the integrity of these structures. Concerns have ranged from the potential for increased seepage and concentrated leak erosion to reducing the overall embankment cross-section due to tree blowovers. However, successfully managing such intrusions has often been difficult. Recent research provides improved insight on the relative risks of such intrusions as well as where they might be expected and potential mitigation methods for them. The guidance provided in this webinar continues to support the removal of all woody vegetation from embankment dams, particularly those embankment dams that commonly retain water. However, more nuanced approaches are outlined for the management of woody vegetation on levees. Specific remediation measures are discussed for both plant and animal intrusions together with their likely success.

Understanding Static Liquefaction

INSTRUCTOR John W. France

OBJECTIVE Static liquefaction is the brittle loss of strength in loose, saturated, nonplastic or low plasticity soil under monotonic loading (i.e., static rather than dynamic). Research has conclusively demonstrated that, if static liquefaction is triggered, loose nonplastic soils can mobilize undrained shear strengths significantly less than the strengths associated with conventional drained effective stress strength parameters.

Although static liquefaction has been studied for decades, it remains a phenomenon not well-understood in the dam safety community, and it is rarely evaluated for water storage dams. In the mining industry, the risks of static liquefaction for tailings impoundments have become more wide-ly recognized, particularly after static liquefaction was cited as a likely root cause for the Brumadi-nho Dam failure in 2019. More recently static liquefaction was cited as the cause of the May 2020 failure of Edenville Dam, MI – a hydroelectric dam. It is not widely known that static liquefaction was previously cited as the root cause for failures of multiple water storage dams including: Wachu-sett Dam (1907), Calaveras Dam (1918), and Fort Peck Dam (1938). Static liquefaction is a particular-ly dangerous potential failure mode because it can occur very quickly with little or no warning signs.

This webinar will include discussion of the principles and mechanisms of static liquefaction, case histories of static liquefaction, methods for investigation and analysis of static liquefaction potential, and thoughts on how this potential failure mode can be addressed by the dam safety industry.

Underwater Installation of Geomembranes

INSTRUCTOR John Wilkes, P.E., CARPI USA

OBJECTIVE Rehabilitation of dams with geomembranes has stopped seepage in more than 200 dams worldwide. In the 1990s, the US Army Corps of Engineers recognized that geomembranes could arrest seepage in many structures but many structures in the U.S. could not be dewatered for installation. Subsequently, a 2-phase design and testing program with the US Army Corps of Engineers adapted geomembrane system details for underwater installation. The first underwater installation occurred in 1997 at Lost Creek dam in California, stopping the seepage through the dam for the first time in 70 years. The Lost Creek project is still in service after almost 20 years without any maintenance. Subsequent underwater installations around the world have all been successful to stop seepage, including installations exceeding more than 100,000 sq. feet installed underwater. These underwater installations have relied on using compression fittings to join geomembrane panels together underwater. The underwater applications of geomembrane have also been adapted to cover joints and cracks on dams. These applications have been done in the USA, Canada, Italy, Greece, and Laos. For dams, the water typically has no substantial flow. About 10 years ago, the issue of repairing levees and canals became more important around the world and many of these structures cannot be dewatered. After years of research and development, a geomembrane system for placing geomembrane panels underwater in flowing water during operation has been developed. This advancement required the development of a special watertight zipper. Then additional testing was done to develop a complete system and deployment procedure for these geomembrane panels. This system has now gone from testing into implementation phase and promises to provide a mechanism to fix leaking structures underwater even in flowing water. The first test installations have been done on canals in Italy and Egypt. The webinar will discuss the testing and installations along with results of geomembrane systems installed underwater.

Uplift and Drainage for Concrete Dams and Spillways

INSTRUCTORS William R. Fiedler, HDR; and Gregg A. Scott, Scott Consulting, LLC

OBJECTIVE This course will discuss the impact of uplift on concrete dams and spillways, the benefits of drainage, the design of drainage systems, and the evaluation of drainage systems. Case histories related to drainage issues at concrete dams and spillways will also be presented. Potential failure modes and considerations for risk analyses will be discussed. Some of the topics that will be presented include: 3D seepage effects on uplift, effects of grouting on pressure reduction, failed waterstops and cracks in concrete, using piezometric measurements to evaluate drainage and uplift, filters for drains, drain cleaning, and the design and evaluation of supplemental drainage.

Use of Remote Sensing in Dam Safety – Including Drones

INSTRUCTORS Chris Krebs, P.E., GISP, CFM, and Daniel Hunter, GISP, Gannett Fleming Inc.

OBJECTIVE This course presents current technologies and discusses the application of them to the dams community. It focuses heavily on the integration of drone technology at dam sites but also on several other technologies, including but not limited to 360-degree cameras, mobile data collection, GNSS, and cloud computing resources. Attendees will take away a greater understanding of what technology can do for them and how they can implement each the next time they are in the field.

Use of Underwater Remote Systems in Dam Safety

INSTRUCTOR Mark Stepanek, Pro-ROV Services, LLC

OBJECTIVE This course will include specifications on various pieces of equipment, both on the high and lower end of pricing, including benefits and shortcomings used during underwater inspections and surveys. These will range from ROV, AUV, wheeled and tracked crawlers, to different types of survey lasers and sonars (including deployment methods). We will cover the various types of hydrographic, LiDAR and photogrammetric survey methodologies and equipment, including single and multibeam bathymetric sonars, sidescan, sub-bottom and pipe profiling sonars, as well as magnetometers. Emphasis will be on how resultant datasets can be combined to form a complete multi-layer geo-referenced 3D deliverable for the client from the 10,000-foot level to sub-centimeter level. A large number of equipment, data, and deliverables will be shown, along with approximate costing for equipment, time expected on type of projects, and post processing.

Using Instrumentation for Dam Safety Monitoring

INSTRUCTOR Barry K. Myers, P.E., Engineered Monitoring Solutions

OBJECTIVE It is widely accepted that monitoring programs are important for dam safety. Monitoring programs provide the information necessary to understanding the on-going performance of the dam, as well as the ability to detect a change in this performance, which can be critical in identifying the need to take actions to avoid the consequences of a dam failure. Monitoring programs generally consist of visual observations and measurements of specific parameters used by trained personnel to evaluate how the dam is performing, and to detect conditions of concern that may indicate a developing failure mode. The methods of making the physical measurements vary from manual instrument readings to automated data acquisition systems. The best approach will depend upon the monitoring needs. On-going evaluation of the monitoring results is also very important for a successful monitoring program. The key is to manage the data and present the results in a manner that is convenient and understandable for the reviewer. This includes a comparison of the measured or observed results with the expected performance for the dam. There are many tools that are currently available to assist with the measurement, collection, management, presentation, and evaluation of the monitoring results. The most appropriate tool will depend upon the needs of the users. The objectives of this course are to provide the participants with a general understanding of 1) how instrumentation and data collection/management tools can be used to improve a dam safety monitoring program, 2) the tools that are currently available and how to apply them, 3) how to use a system design approach to successfully implement a monitoring system, and 4) guidance for installing, operating, and maintaining a monitoring system.

Waterproofing Systems for Dams

INSTRUCTORS John Wilkes, P.E., and Martha Monserrate, P.E., CARPI USA

OBJECTIVE The first geomembranes were installed on dams in 1959 in Italy and British Columbia: both systems were covered. In the 1970's geomembranes began to be installed on dams exposed. In the next 20 years exposed geomembrane systems would be installed on more than 2 dozen dams, primarily in Europe. The first exposed geomembrane system on a dam in the United States was installed in 1997. The United States now has the largest installed base of exposed geomembrane systems on dams in the world and the overall world inventory has quadrupled in the last 20 years to more than 100 dams worldwide. This webinar gives an overview of the 2010 ICOLD Bulletin 135, "Geomembrane Sealing Systems for Dams" focusing on the evolving technology of exposed geomembrane sealing systems. The webinar begins with a summary of the materials, testing, and aging of geomembranes; different loads and physical considerations; and examples of installations on fill, gravity, masonry, and RCC dams, along with special applications on dam cracks/joints and underwater installations. The webinar will conclude with QC considerations for the geomembrane sealing systems along with guidance on technical and contractual specifications. The agenda will closely follow the ICOLD Bulletin 135 content.

What Can I Really Expect to Get Out of a Semi-Quantitative Risk Analyses (SQRA)?

INSTRUCTOR Doug Boyer, RIDM Branch, Federal Energy Regulatory Commission

OBJECTIVE Dam and levee safety risk analyses have been gaining more and more attention over the last few years. Risk analysis training, in general, and SQRA training, in particular, is becoming more available. Recently FERC published draft SQRA guidelines for public comment indicating a proposed expansion by that agency into using risk tools. Other federal agencies with dam and levee safety programs are also expanding the use of SQRAs in their programs as are a handful of state dam safety agencies. The growth of the use of SQRAs as a dam and levee safety tool is expected to continue to increase in the coming years.

Why Embankments Crack and How to Fix Them

INSTRUCTOR Benjamin C. Doerge, USDA-NRCS

OBJECTIVE This course is based on 50 years of NRCS experience with investigating and remediating cracked earth embankments. The presentation consists of two main sections, covering 1) the nature of soil cracking and the associated internal erosion failure modes; and 2) how to remediate cracked earth embankments. In the first section, general information is presented on which soils are most susceptible to cracking and which pose the greatest risk for failure by internal erosion. The most common causes of cracking are identified, along with descriptions of the associated cracking mechanisms and patterns. In the second section, the two main approaches to repairing cracked embankments are presented: the "cutoff" approach and the "filter" approach. Real life examples of each are presented. The use of geotextiles in repairing cracked embankments is discussed, including several case histories and an analytical procedure to design geotextiles to span open cracks. Finally, the issue of cracking of granular filters is discussed in terms of its incidence, risk, and prevention.

Why People Die During Flood Events and Options for Reducing Future Flood Fatalities

INSTRUCTOR Jason T. Needham, USACE

OBJECTIVE This webinar will describe what we know about why people die during flood events and opportunities to reduce flood fatalities during future events. Results from analysis of over 100 location-specific fatalities will be provided to lay the foundation for understanding what leads to life loss during dam breach, levee breach, coastal, and riverine flood events. This webinar will describe a modern approach for estimating potential loss of life from flooding and show how emergency management activities can be used to reduce it.

WinDAM – Overtopping and Internal Erosion for Earthen Embankments

INSTRUCTORS Karl Visser and Jon Fripp, USDA-NRCS

WinDAM software estimates the erosion and breach outflows from overtopping flows and internal erosion flows affecting earthen embankments. This webinar will provide an overview of the WinDAM model and the various inputs needed. The webinar will also cover output from WinDAM. The webinar will target users and designers more than researchers.

Webinars by Category

CONSTRUCTION

- Concrete Construction - Issues and Remedies
- Construction Quality Control Information Data Systems for Dam Rehabilitation
- Dam Construction Quality Control Dos, Dont's and Lessons Learned
- Designing Slope Protection for Dams and Levees
- Foundation Preparation and Treatment for Dam Construction
- Fundamentals of Concrete Construction Inspections for Dams and Appurtenant Structures
- Improving the Dam Safety Design Review Process
- Intro to Tailings Dam and Coal Ash Impoundment Design, Construction and Monitoring What Can Go Wrong and Right?
- Introduction to Dam Decommissioning
- Managing Increased Dam Safety Risk During Reconstruction
- Quality Assurance and Field Inspection for Dam Construction Projects
- Rock Grouting Principles for New and Remedial Dam Projects
- Spillway Gates and Dewatering Systems - Lessons Learned and Practical Solutions
- Stream Management for Dam Construction
- The History of Dam Safety Governance in the US Including Risk Analysis
- The Practical Use of Geophysics to Assess Dam and Levee Safety
- The South Fork Dam Breach and Johnstown Flood of 1889 A Civil and Dam Engineering History of the USA's Deadliest Dam Failure
- Use of Remote Sensing in Dam Safety-Including Drones
- Waterproofing Systems for Dams

DAM SAFETY PROGRAM MANAGEMENT

- Application of Risk Principles within State Dam Safety Programs
- Customization and Utilization of Dam Operation and Maintenance Manuals
- Developing Operations and Maintenance Manuals for Dams
- Emergency Action Plan Basics
- Getting Ahead of the Storm: Building Capacity to Respond to Large-Scale Weather-Related Dam Impacts
- How to Communicate Effectively in Any Situation
- How to Conduct a Successful PFMA - Lessons Learned from Past Successes and Failures
- Human Factors in Dam Failure and Safety
- Human Factors in the Oroville Dam Spillway Incident
- Improving the Dam Safety Design Review Process
- Intro to Tailings Dam and Coal Ash Impoundment Design, Construction and Monitoring: What Can Go Wrong and Right?
- Introduction to Dam Decommissioning
- Introduction to Public Safety Risk Evaluation and Treatment for Dams and Levees
- Judgment and Decision-Making in Dam Engineering
- Legal Responsibilities of Dam Owners, Operators, and Regulators
- Lessons Learned Regarding Seismic Deformation Analyses of Embankment Dams from Re-Evaluation of the Upper and Lower San Fernando Dams Performance Case Histories
- Low-head Dams: Mitigating Danger and Liability
- Michigan Failures/Pandemic – Impacts to the ASDSO Peer Review Process
- Natural Resources Conservation Service Dam Design and Dam Safety Resources: Policy, Procedures, and Tools

- Risk Assessment for Levee Projects
- Site Investigation and Parameter Development for Seismic Deformation Analyses of Embankment Dams and Levees
- Teton Dam – The Failure That Changed an Industry
- Understanding and Managing Plant & Animal Intrusions in Embankment Dams and Levees
- Understanding and Managing Plant and Animal Intrusions in Embankment Dams and Levees – II
- Using Instrumentation for Dam Safety Monitoring
- What Can I Really Expect to Get Out of a Semi-Quantitative Risk Analyses (SQRA)?

EMERGENCY MANAGEMENT

- A Perfect Storm of Flawed Judgments and Decisions
- Automated Instrumentation and Early Warning Systems for the Monitoring of Dams
- Designing Spillways to Mitigate Failure Modes
- Emergency Action Plan Basics
- Exploring Dam Breach Parameters, Observed and Modeled
- Findings of the Independent Forensic Investigation of the Failures of Edenville and Sanford Dams, Michigan
- Getting Ahead of the Storm: Building Capacity to Respond to Large-Scale Weather-Related Dam Impacts
- How to Make Your Emergency Action Plan More Effective
- Human Factors in the Edenville Dam Failure
- Hydraulic Tour of Standard NRCS Inlet Risers
- Judgment and Decision-Making in Dam Engineering
- Lawn Lake Dam: Pre-Failure Comprehensive Dam Safety Evaluation and Post Failure Impacts
- Lessons Learned Regarding Seismic Deformation Analyses of Embankment Dams from Re-Evaluation of the Upper and Lower San Fernando Dams Performance Case Histories
- Putting Public Safety First – The Oroville Dam Spillways Emergency Recovery
- Responding to Dam Emergencies
- Rock Grouting Principles for New and Remedial Dam Projects
- Teton Dam – The Failure That Changed an Industry
- The 1979 Machhu Dam Disaster: Social Origins and Social Consequences
- The State of the Practice and Future of Dam Breach Modeling
- Why People Die During Flood Events and Options for Reducing Future Flood Fatalities
- WinDAM - Overtopping and Internal Erosion for Earthen Embankments

ENVIRONMENTAL

- Extreme Precipitation and Dam Safety in a Changing Climate
- Facilitating Low-Head Dam Removals and Improving Aquatic Resource Restoration Outcomes
- Introduction to Dam Decommissioning
- Introduction to Nature-Like Fishways for Dams

FAILURES, INCIDENTS, & INVESTIGATIONS

- A Perfect Storm of Flawed Judgments and Decisions
- Automated Instrumentation and Early Warning Systems for the Monitoring of Dams
- Concrete Construction - Issues and Remedies
- Concrete Repair and Maintenance for Dams
- Current Trends in the Seismic Analysis of Embankment Dams
- Dam Overtopping Protection Systems Part 2
- Delhi Dam – A Compound Failure
- Designing Spillways to Mitigate Failure Modes
- Detecting, Monitoring, and Repairing Voids Beneath Spillway Slabs
- Drone Technology Integrated into Dam Safety Inspections and Evaluations
- Evaluation and Maintenance of Piezometers, Relief Wells, and Drains in Dams and Levees
- Exploring Dam Breach Parameters, Observed and Modeled
- Findings of the Independent Forensic Investigation of the Failures of Edenville and Sanford Dams, Michigan
- Findings of the Oroville Dam Spillway Forensic Investigation
- Human Factors in Dam Failure and Safety
- Human Factors in the Edenville Dam Failure
- Human Factors in the Oroville Dam Spillway Incident
- Judgment and Decision-Making in Dam Engineering
- Key Features of Effective Emergency Action Plans for Dams
- Lawn Lake Dam: Pre-Failure Comprehensive Dam Safety Evaluation and Post Failure Impacts
- Lessons Learned Regarding Seismic Deformation Analyses of Embankment Dams from Re-Evaluation of the Upper and Lower San Fernando Dams Performance Case Histories
- Low-Level Conduits – What Can Go Wrong, How to Inspect, How to Repair?
- Potential Failure Mode Analysis as a Dam Safety Tool Part I: Introduction to PFMA
- Preventing Fatalities in Confined Spaces at Dams
- Putting Public Safety First – The Oroville Dam Spillways Emergency Recovery
- Reexamination of the 2004 Failure of Big Bay Dam, Mississippi
- Relearning How to Look at Piezometric Data for Seepage Evaluation
- Responding to Dam Emergencies
- Review of 1938 Construction Slide at Fort Peck Dam
- Rock Scour Assessment for Dams, Spillways and other Water Conveyance Structures
- Site Investigation and Parameter Development for Seismic Deformation Analyses of Embankment Dams and Levees
- Stability Evaluations of Concrete Dams
- Teton Dam – The Failure That Changed an Industry
- The 1979 Machhu Dam Disaster: Social Origins and Social Consequences
- The Fontenelle Dam Incident 1965
- The History of Seepage Technology Development
- The South Fork Dam Breach and Johnstown Flood of 1889: A Civil and Dam Engineering History of the USA's Deadliest Dam Failure
- The Use of Void Ratio (e) in Earth Dams
- Triaxial Lab Testing for Earth Dams
- Understanding Static Liquefaction
- Uplift and Drainage for Concrete Dams and Spillways
- WinDAM - Overtopping and Internal Erosion for Earthen Embankments

GEOTECHNICAL & GEOLOGY

- 3-D Effects on Estimation of Gradients, Seepage Flows and Evaluation of Internal Erosion Potential Failure Modes
- A Perfect Storm of Flawed Judgments and Decisions
- Advances in Geologic Data Collection and 3D Geologic Modeling for Site Characterization and Safety Studies for Dams and Levees
- Cracking and Hydraulic Fracturing in Embankment Dams and Levees
- Current Trends in the Seismic Analysis of Embankment Dams
- Delhi Dam – A Compound Failure
- Detecting, Monitoring, and Repairing Voids Beneath Spillway Slabs
- Drilling Plans and Hazard Evaluations for Dams and Levees
- Earthquake Hazards, Ground Motions and Dynamic Response
- Empirical Estimates of Permeability for Earth Dam Projects
- Evaluation of Seepage Related Potential Failure Modes (PFM's) in Embankments with Emphasis on Outlet Penetrations
- Field Investigations for New and Existing Dams
- Filter Design History and a One-Step Design Process
- Filters and Drainage Systems for Embankment Dams
- Findings of the Independent Forensic Investigation of the Failures of Edenville and Sanford Dams, Michigan
- Foundation Cutoff Walls for Dams and Levees
- Foundation Preparation and Treatment for Dam Construction
- Guidelines for Assigning Erodibility Parameters to Soil Horizons for SITES analyses
- Human Factors in the Edenville Dam Failure
- Human Factors in the Oroville Dam Spillway Incident
- Instrumentation in Dams – Selection and Installation
- Internal Drainage Systems for Embankment Dams

- Internal Erosion – Applying Erosion Mechanics From ICOLD Bulletin 164 In Internal Erosion Failure Mode Analyses
- Intro to Post-Tensioned Anchors for Dams
- Intro to Tailings Dam and Coal Ash Impoundment Design, Construction and Monitoring: What Can Go Wrong and Right?
- Introduction to Embankment Dams
- Introduction to Grouting for Dams
- Intrusive Activities in Dams and Levees – Are They Worth the Risk of Creating a Flaw?
- Lawn Lake Dam: Pre-Failure Comprehensive Dam Safety Evaluation and Post Failure Impacts
- Lessons Learned Regarding Seismic Deformation Analyses of Embankment Dams from Re-Evaluation of the Upper and Lower San Fernando Dams Performance Case Histories
- Pitfalls in Quality Control Processes for Compacted Earth Fill
- Rehabilitation of NRCS Watershed Structures – A Consultant's Perspective
- Relearning How to Look at Piezometric Data for Seepage Evaluation
- Risk Assessment for Levee Projects
- Rock Grouting Principles for New and Remedial Dam Projects
- Rock Scour Assessment for Dams, Spillways and other Water Conveyance Structures
- Seepage Monitoring and Analysis of Embankment Dams
- Seepage Rehabilitation for Embankment Dams
- Site Investigation and Parameter Development for Seismic Deformation Analyses of Embankment Dams and Levees
- Sliplining Low-Level Conduits
- Slope Stability Modeling for Embankment Dams: Planning, Interpreting, and Reporting Results
- Specialty Construction Techniques for Foundation Improvement and Seepage Reduction
- Strength Selection for Static Slope Stability Analysis
- Teton Dam – The Failure That Changed an Industry
- The Fontenelle Dam Incident 1965
- The History of Seepage Technology Development
- The Practical Use of Geophysics to Assess Dam and Levee Safety
- The South Fork Dam Breach and Johnstown Flood of 1889: A Civil and Dam Engineering History of the USA's Deadliest Dam Failure
- The Use of Void Ratio (e) in Earth Dams
- Time History Evaluation of Piezometers for Seepage Characterization of Levees and Earth Dams
- Triaxial Lab Testing for Earth Dams
- Understanding Static Liquefaction
- Uplift and Drainage for Concrete Dams and Spillways
- Use of Underwater Remote Systems in Dam Safety
- Using Instrumentation for Dam Safety Monitoring
- Why Embankments Crack and How to Fix Them

HYDRAULICS

- Dam Overtopping Protection Systems Part 1
- Dam Overtopping Protection Systems Part 2
- Delhi Dam – A Compound Failure
- Design of Siphon Systems
- Designing Spillways to Mitigate Failure Modes
- Detecting, Monitoring, and Repairing Voids Beneath Spillway Slabs
- Exploring Dam Breach Parameters, Observed and Modeled
- Findings of the Independent Forensic Investigation of the Failures of Edenville and Sanford Dams, Michigan
- Findings of the Oroville Dam Spillway Forensic Investigation
- HEC-RAS 2D Modeling
- Human Factors in the Edenville Dam Failure
- Human Factors in the Oroville Dam Spillway Incident
- Hydraulic Tour of Standard NRCS Inlet Risers
- Hydraulics 101: Intro to Hydraulics for Dam Safety
- Hydraulics 201 for Dam Safety
- Inlet and Outlet Hydraulics for Spillways and Outlet Structures
- Intro to Cavitation in Chutes and Spillways
- Intro to the Application of 2D Hydraulic Modeling for Dam and Levee Safety
- Introduction to Computational Fluid Dynamics (CFD) modeling for Dam and Levee Safety
- Latest Trends in Roller-Compacted Concrete (RCC) Spillways and Overtopping Protection
- Low-head Dams: Mitigating Danger and Liability
- Modeling Tailings Dam Failures with 2-Phase Flow
- Practical Applications of Trash Racks and Anti-Vortex Devices
- Rehabilitation of NRCS Watershed Structures – A Consultant's Perspective
- Rock Scour Assessment for Dams, Spillways and other Water Conveyance Structures
- Sliplining Low-Level Conduits
- Stream Management for Dam Construction
- The History of Dam Safety Governance in the US Including Risk Analysis
- The State of the Practice and Future of Dam Breach Modeling
- Tools for Designing and Assessing Spillways
- Uplift and Drainage for Concrete Dams and Spillways
- WinDAM - Overtopping and Internal Erosion for Earthen Embankments

HYDROLOGY

- Dam Overtopping Protection Systems Part 2
- Delhi Dam – A Compound Failure
- Extreme Precipitation and Dam Safety in a Changing Climate
- Findings of the Independent Forensic Investigation of the Failures of Edenville and Sanford Dams, Michigan
- Findings of the Oroville Dam Spillway Forensic Investigation
- Getting Ahead of the Storm: Building Capacity to Respond to Large-Scale Weather-Related Dam Impacts
- Human Factors in the Edenville Dam Failure
- Hydraulic Tour of Standard NRCS Inlet Risers
- Hydrologic Hazards – Estimating Probabilities of Extreme Floods
- Hydrology 101 for Dam Safety
- Hydrology 201 for Dam Safety
- Inlet and Outlet Hydraulics for Spillways and Outlet Structures
- Introduction to Hydrologic Modeling Using Geospatial Information
- Modeling Tailings Dam Failures with 2-Phase Flow
- PMP and the History of HMRs
- Probable Maximum Precipitation, What is it, How is it Calculated, and How do I apply it?
- Rainfall and Dam Safety-From PMP to the 100-Year Storm
- Rehabilitation of NRCS Watershed Structures – A Consultant's Perspective
- Stream Management for Dam Construction
- The History of Dam Safety Governance in the US Including Risk Analysis
- The State of the Practice and Future of Dam Breach Modeling
- Use of Underwater Remote Systems in Dam Safety

INSPECTIONS

- Application of Risk Principles within State Dam Safety Programs
- Automated Instrumentation and Early Warning Systems for the Monitoring of Dams
- Best Management Practices for Waterstop Selection, Installation, and Inspection
- Best Practices for Dam Safety Warning Signs
- Concrete Construction - Issues and Remedies
- Concrete Repair and Maintenance for Dams
- Customization and Utilization of Dam Operation and Maintenance Manuals
- Designing Spillways to Mitigate Failure Modes
- Drone Technology Integrated into Dam Safety Inspections and Evaluations
- Evaluation and Maintenance of Piezometers, Relief Wells, and Drains in Dams and Levees
- Findings of the Oroville Dam Spillway Forensic Investigation
- Fundamentals of Concrete Construction Inspections for Dams and Appurtenant Structures
- Human Factors in Dam Failure and Safety

- Inlet and Outlet Hydraulics for Spillways and Outlet Structures
- Inspection and Assessment of Spillways
- Introduction to Spillway Gates
- Judgment and Decision-Making in Dam Engineering
- Lessons Learned Regarding Seismic Deformation Analyses of Embankment Dams from Re-Evaluation of the Upper and Lower San Fernando Dams Performance Case Histories
- Michigan Failures/Pandemic – Impacts to the ASDSO Peer Review Process
- Practical Applications of Trash Racks and Anti-Vortex Devices
- Preventing Fatalities in Confined Spaces at Dams
- Spillway Gates and Dewatering Systems - Lessons Learned and Practical Solutions
- Structural Condition Assessment of Dam Facilities with Non-Destructive Evaluation Methods
- Understanding and Managing Plant & Animal Intrusions in Embankment Dams and Levees
- Understanding and Managing Plant and Animal Intrusions in Embankment Dams and Levees – II
- Use of Remote Sensing in Dam Safety-Including Drones
- Use of Underwater Remote Systems in Dam Safety
- Using Instrumentation for Dam Safety Monitoring

PUBLIC SAFETY

- A Perfect Storm of Flawed Judgments and Decisions
- Best Practices for Dam Safety Warning Signs
- Dam Overtopping Protection Systems Part 1
- Dam Overtopping Protection Systems Part 2
- Designing Spillways to Mitigate Failure Modes
- Drilling Plans and Hazard Evaluations for Dams and Levees
- Drone Technology Integrated into Dam Safety Inspections and Evaluations
- Easy and Quick Determination of the PMF from the PMP Using Free Tools
- How to Conduct a Successful PFMA - Lessons Learned from Past Successes and Failures
- Inlet and Outlet Hydraulics for Spillways and Outlet Structures
- Instrumentation in Dams – Selection and Installation
- Intro to Post-Tensioned Anchors for Dams
- Introduction to Nature-Like Fishways for Dams
- Introduction to Public Safety Risk Evaluation and Treatment for Dams and Levees
- Introduction to Spillway Gates
- Intrusive Activities in Dams and Levees – Are They Worth the Risk of Creating a Flaw?
- Key Features of Effective Emergency Action Plans for Dams
- Low-head Dams: Mitigating Danger and Liability
- Low-Level Conduits – What Can Go Wrong, How to Inspect, How to Repair?
- Practical Applications of Trash Racks and Anti-Vortex Devices
- Preventing Fatalities in Confined Spaces at Dams
- Relearning How to Look at Piezometric Data for Seepage Evaluation
- Responding to Dam Emergencies
- Risk Communication for Dams
- Rock Grouting Principles for New and Remedial Dam Projects
- Site Investigation and Parameter Development for Seismic Deformation Analyses of Embankment Dams and Levees
- Slope Stability Modeling for Embankment Dams: Planning, Interpreting, and Reporting Results
- Specialty Construction Techniques for Foundation Improvement and Seepage Reduction
- Spillway Gates and Dewatering Systems - Lessons Learned and Practical Solutions
- Teton Dam – The Failure That Changed an Industry
- The Use of Void Ratio (e) in Earth Dams
- Triaxial Lab Testing for Earth Dams
- Use of Remote Sensing in Dam Safety-Including Drones
- Use of Underwater Remote Systems in Dam Safety

REHABILITATION AND REMEDIATION

- Best Management Practices for Waterstop Selection, Installation, and Inspection
- Best Practices in Floodplain Management Associated With Dam Safety Management and Dam Rehabilitation
- Concrete Construction - Issues and Remedies
- Concrete Repair and Maintenance for Dams
- Construction Quality Control Information Data Systems for Dam Rehabilitation
- Dam Overtopping Protection Systems Part 1
- Dam Overtopping Protection Systems Part 2
- Design of Siphon Systems
- Designing Spillways to Mitigate Failure Modes
- Evaluation and Maintenance of Piezometers, Relief Wells, and Drains in Dams and Levees
- Filters and Drainage Systems for Embankment Dams
- Foundation Cutoff Walls for Dams and Levees
- Fundamentals of Concrete Construction Inspections for Dams and Appurtenant Structures
- Guidelines for Assigning Erodibility Parameters to Soil Horizons for SITES analyses
- Hydraulic Tour of Standard NRCS Inlet Risers
- Improving the Dam Safety Design Review Process
- Inlet and Outlet Hydraulics for Spillways and Outlet Structures
- Intro to Post-Tensioned Anchors for Dams
- Introduction to Addressing Inadequate Conveyance Capacity at Dams
- Introduction to Armoring Embankment Dams and Earth-Cut Spillways with ACBs
- Introduction to Computational Fluid Dynamics (CFD) modeling for Dam and Levee Safety
- Introduction to Embankment Dams
- Introduction to Spillway Gates
- Latest Trends in Roller-Compacted Concrete (RCC) Spillways and Overtopping Protection
- Lessons Learned Regarding Seismic Deformation Analyses of Embankment Dams from Re-Evaluation of the Upper and Lower San Fernando Dams Performance Case Histories
- Managing Increased Dam Safety Risk During Reconstruction
- Natural Resources Conservation Service Dam Design and Dam Safety Resources: Policy, Procedures, and Tools
- Putting Public Safety First – The Oroville Dam Spillways Emergency Recovery
- Rehabilitation of Concrete Dams
- Rehabilitation of NRCS Watershed Structures – A Consultant's Perspective
- Rock Grouting Principles for New and Remedial Dam Projects
- Rock Scour Assessment for Dams, Spillways and other Water Conveyance Structures
- Seepage Rehabilitation for Embankment Dams
- Sliplining Low-Level Conduits
- Specialty Construction Techniques for Foundation Improvement and Seepage Reduction
- Spillway Gates and Dewatering Systems - Lessons Learned and Practical Solutions
- Stepped Chute Spillway Design for Embankment Dams
- Stream Management for Dam Construction
- The 1979 Machhu Dam Disaster: Social Origins and Social Consequences
- The History of Dam Safety Governance in the US Including Risk Analysis
- The Use of Void Ratio (e) in Earth Dams
- Tools for Designing and Assessing Spillways
- Triaxial Lab Testing for Earth Dams
- Understanding and Managing Plant & Animal Intrusions in Embankment Dams and Levees
- Understanding and Managing Plant and Animal Intrusions in Embankment Dams and Levees – II
- Underwater Installation of Geomembranes
- Use of Underwater Remote Systems in Dam Safety
- Waterproofing Systems for Dams
- Why Embankments Crack and How to Fix Them

REMOVAL/DECOMMISSIONING

- Best Practices in Floodplain Management Associated With Dam Safety Management and Dam Rehabilitation
- Facilitating Low-Head Dam Removals and Improving Aquatic Resource Restoration Outcomes
- Concrete Repair and Maintenance for Dams
- Introduction to Nature-Like Fishways for Dams
- Introduction to Dam Decommissioning

RISK MANAGEMENT

- Application of PFMA in Dam Safety
- Application of Risk Principles within State Dam Safety Programs
- Automated Instrumentation and Early Warning Systems for the Monitoring of Dams
- Dam Overtopping Protection Systems Part 1
- Designing Spillways to Mitigate Failure Modes
- Easy and Quick Determination of the PMF from the PMP Using Free Tools
- Event Tree Principles and Applications for Dam Safety Risk Assessment
- Extreme Precipitation and Dam Safety in a Changing Climate
- Getting Ahead of the Storm: Building Capacity to Respond to Large-Scale Weather-Related Dam Impacts
- How to Conduct a Successful PFMA - Lessons Learned from Past Successes and Failures
- Human Factors in Dam Failure and Safety
- Internal Erosion – Applying Erosion Mechanics From ICOLD Bulletin 164 In Internal Erosion Failure Mode Analyses
- Introduction to Computational Fluid Dynamics (CFD) modeling for Dam and Levee Safety
- Intrusive Activities in Dams and Levees – Are They Worth the Risk of Creating a Flaw?
- Judgment and Decision-Making in Dam Engineering
- Lawn Lake Dam: Pre-Failure Comprehensive Dam Safety Evaluation and Post Failure Impacts
- Lessons Learned Regarding Seismic Deformation Analyses of Embankment Dams from Re-Evaluation of the Upper and Lower San Fernando Dams Performance Case Histories
- Potential Failure Mode Analysis as a Dam Safety Tool Part I: Introduction to PFMA
- Probable Maximum Precipitation, What is it, How is it Calculated, and How do I apply it?
- Risk Assessment Basics for an Individual Dam
- Risk Assessment for Levee Projects
- Risk Communication for Dams
- Rock Scour Assessment for Dams, Spillways and other Water Conveyance Structures
- Site Investigation and Parameter Development for Seismic Deformation Analyses of Embankment Dams and Levees
- Stream Management for Dam Construction
- The 1979 Machhu Dam Disaster: Social Origins and Social Consequences
- The History of Dam Safety Governance in the US Including Risk Analysis
- The History of Seepage Technology Development
- The State of the Practice and Future of Dam Breach Modeling
- Time History Evaluation of Piezometers for Seepage Characterization of Levees and Earth Dams
- Tolerable Risk Guidelines for Dams: How Safe is Safe Enough
- What Can I Really Expect to Get Out of a Semi-Quantitative Risk Analyses (SQRA)?
- Why People Die During Flood Events and Options for Reducing Future Flood Fatalities
- WinDAM - Overtopping and Internal Erosion for Earthen Embankments

SECURITY

- Rock Scour Assessment for Dams, Spillways and other Water Conveyance Structures

SEISMIC

- Analysis of Concrete Arch Dams
- Current Trends in the Seismic Analysis of Embankment Dams
- Earthquake Hazards, Ground Motions and Dynamic Response
- Lessons Learned Regarding Seismic Deformation Analyses of Embankment Dams from Re-Evaluation of the Upper and Lower San Fernando Dams Performance Case Histories
- Seismic Stability Evaluation of Earth Dams
- Site Investigation and Parameter Development for Seismic Deformation Analyses of Embankment Dams and Levees
- Specialty Construction Techniques for Foundation Improvement and Seepage Reduction
- Use of Underwater Remote Systems in Dam Safety

STRUCTURAL

- A Perfect Storm of Flawed Judgments and Decisions
- Analysis of Concrete Arch Dams
- Best Management Practices for Waterstop Selection, Installation, and Inspection
- Concrete Construction - Issues and Remedies
- Dam Overtopping Protection Systems Part 1
- Dam Safety with 3D Weirs
- Delhi Dam – A Compound Failure
- Designing Spillways to Mitigate Failure Modes
- Drone Technology Integrated into Dam Safety Inspections and Evaluations
- Filter Design History and a One-Step Design Process
- Findings of the Oroville Dam Spillway Forensic Investigation
- Foundation Cutoff Walls for Dams and Levees
- Fundamentals of Concrete Construction Inspections for Dams and Appurtenant Structures
- Human Factors in the Oroville Dam Spillway Incident
- Hydraulic Design of Labyrinth Weirs
- Hydraulic Tour of Standard NRCS Inlet Risers
- Introduction to Armoring Embankment Dams and Earth-Cut Spillways with ACBs
- Introduction to Concrete Gravity Dams
- Introduction to Earth Spillway Design and Evaluation
- Introduction to Grouting for Dams
- Introduction to Spillway Gates
- Latest Trends in Roller-Compacted Concrete (RCC) Spillways and Overtopping Protection
- Low-Level Conduits – What Can Go Wrong, How to Inspect, How to Repair?
- Reexamination of the 2004 Failure of Big Bay Dam, Mississippi
- Rehabilitation of Concrete Dams
- Rehabilitation of NRCS Watershed Structures – A Consultant's Perspective
- Sliplining Low-Level Conduits
- Spillway Conduits - More Than Just a Pipe Through the Dam
- Spillway Gates and Dewatering Systems - Lessons Learned and Practical Solutions
- Stability Evaluations of Concrete Dams
- Stepped Chute Spillway Design for Embankment Dams
- Structural Condition Assessment of Dam Facilities with Non-Destructive Evaluation Methods
- Terminal Structures and Energy Dissipation at Outlet Works and Spillways
- Uplift and Drainage for Concrete Dams and Spillways
- Use of Remote Sensing in Dam Safety-Including Drones
- Use of Underwater Remote Systems in Dam Safety

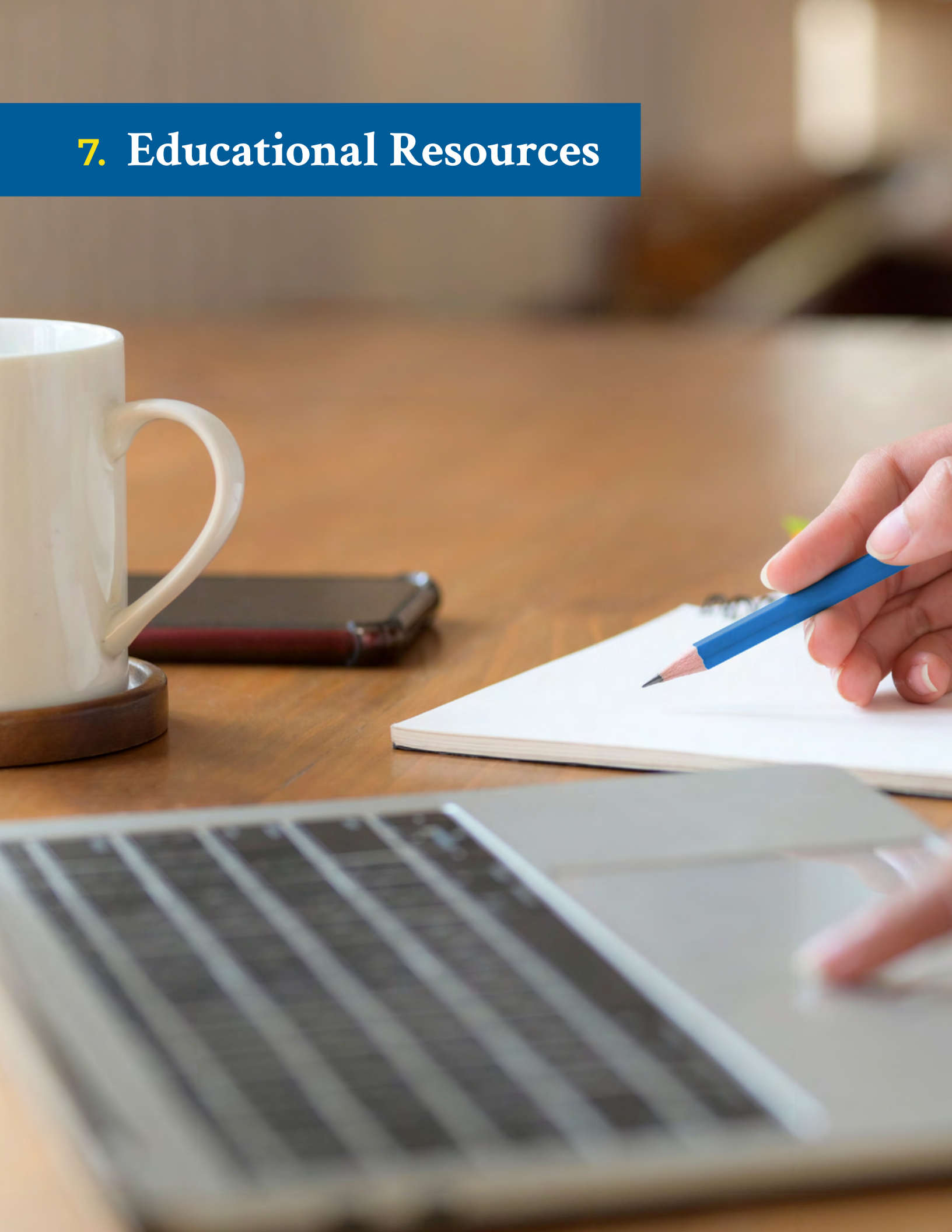
SURVEILLANCE & MONITORING

- Automated Instrumentation and Early Warning Systems for the Monitoring of Dams
- Concrete Repair and Maintenance for Dams
- Customization and Utilization of Dam Operation and Maintenance Manuals
- Designing Spillways to Mitigate Failure Modes
- Drone Technology Integrated into Dam Safety Inspections and Evaluations
- Evaluation and Maintenance of Piezometers, Relief Wells, and Drains in Dams and Levees
- How to Conduct a Successful PFMA - Lessons Learned from Past Successes and Failures
- Human Factors in Dam Failure and Safety
- Inlet and Outlet Hydraulics for Spillways and Outlet Structures
- Instrumentation in Dams – Selection and Installation
- Intro to Tailings Dam and Coal Ash Impoundment Design, Construction and Monitoring: What Can Go Wrong and Right?
- Lawn Lake Dam: Pre-Failure Comprehensive Dam Safety Evaluation and Post Failure Impacts
- Low-Level Conduits – What Can Go Wrong, How to Inspect, How to Repair?
- Managing Increased Dam Safety Risk During Reconstruction
- Relearning How to Look at Piezometric Data for Seepage Evaluation
- Seepage Monitoring and Analysis of Embankment Dams
- Uplift and Drainage for Concrete Dams and Spillways
- Use of Remote Sensing in Dam Safety-Including Drones
- Use of Underwater Remote Systems in Dam Safety
- Using Instrumentation for Dam Safety Monitoring

TAILINGS & OTHER INDUSTRIAL DAMS

- Intro to Tailings Dam and Coal Ash Impoundment Design, Construction and Monitoring: What Can Go Wrong and Right?
- Lessons Learned Regarding Seismic Deformation Analyses of Embankment Dams from Re-Evaluation of the Upper and Lower San Fernando Dams Performance Case Histories
- Modeling Tailings Dam Failures with 2-Phase Flow
- Probable Maximum Precipitation, What is it, How is it Calculated, and How do I apply it?
- Relearning How to Look at Piezometric Data for Seepage Evaluation
- Site Investigation and Parameter Development for Seismic Deformation Analyses of Embankment Dams and Levees
- The Use of Void Ratio (e) in Earth Dams
- Triaxial Lab Testing for Earth Dams
- Understanding Static Liquefaction

7. Educational Resources



Dam Safety Toolbox

Through the Dam Safety Toolbox website, professionals can quickly build their knowledge of dam safety basics by accessing guidelines, recommendations, and other resources curated by industry leaders. The website is improved year-round with new and updated content thanks to a collaborative volunteer effort. Users can explore hundreds of already existing pages on dam safety fundamentals, management, and technical topics.

We Need Your Help to Grow the Website!

Those ready to share their expertise will also find the website useful. By logging in with an ASDSO membership account, the website's wiki-based editing system can be utilized to expand the website into additional knowledge areas. Users can create new interconnected topic pages or improve existing content directly through the website. ASDSO's team of moderators and subject matter experts routinely reviews these new edits for inclusion on the live site.

» **Visit DamToolbox.org to Start Exploring or Learn How to Contribute**

Want to learn more about the Dam Safety Toolbox? A free one-hour webinar is available on ASDSO's YouTube channel that provides an overview of existing content, making edits, and the moderation process.

Public Safety at Dams Resources

Each year, dozens of lives are lost at dams on America's waterways. People are often unaware of the dangers, or they underestimate their risk of falling victim to them. It may be a case of a simple lack of knowledge, reckless behaviors, lack of warning, or just being in the wrong place at the wrong time. Regardless of the cause or intention, outings on waterways can end in tragedy.

ASDSO provides information and resources that can be used internally or disseminated to the general public to assist in the promotion of safety at dams.

» **Visit Damsafety.org/Public-Safety**

Resources for Dam Owners & Operators

To make accessing guidance information easier for dam owners and operators, ASDSO has developed numerous educational resources. Resources were also designed to be useful for state dam safety officials and others with owner outreach programs. You can access educational videos, workshops, handouts, guidance documents, and other useful resources on ASDSO's Dam Owner Outreach webpage.

» **Visit DamSafety.org/DamOwners**

DAM OWNERSHIP FACT SHEETS

The Dam Ownership Fact Sheet Booklet contains guidance on more than 20 specific issues that dam owners face. All fact sheets are free to download, printer-friendly, and can be used alone or as part of the full booklet.

DAM OWNER ACADEMY VIDEOS

The Dam Owner Academy is a series of videos to educate and inform owners on all aspects of operating and maintaining a dam safely. Each video concisely presents one topic related to safely operating and maintaining a dam. Videos are free, about 10 minutes each, and feature Grady Hillhouse as the host.

Available Videos:

- Dams 101
- Dam Inspections
- Spillways & Outlet Works
- Operation and Maintenance Plans
- Emergency Planning
- Extreme Rainfall Events
- Hiring an Experienced and Qualified Dam Engineer
- Rehabilitation Projects
- Plants & Animals on Dams
- Seepage, Slope Stability & Seismic Issues
- Learning from Dam Failures
- Concrete Problems & Repairs
- Removing a Dam
- Public Safety Around Dams
- Dam Safety 3.0

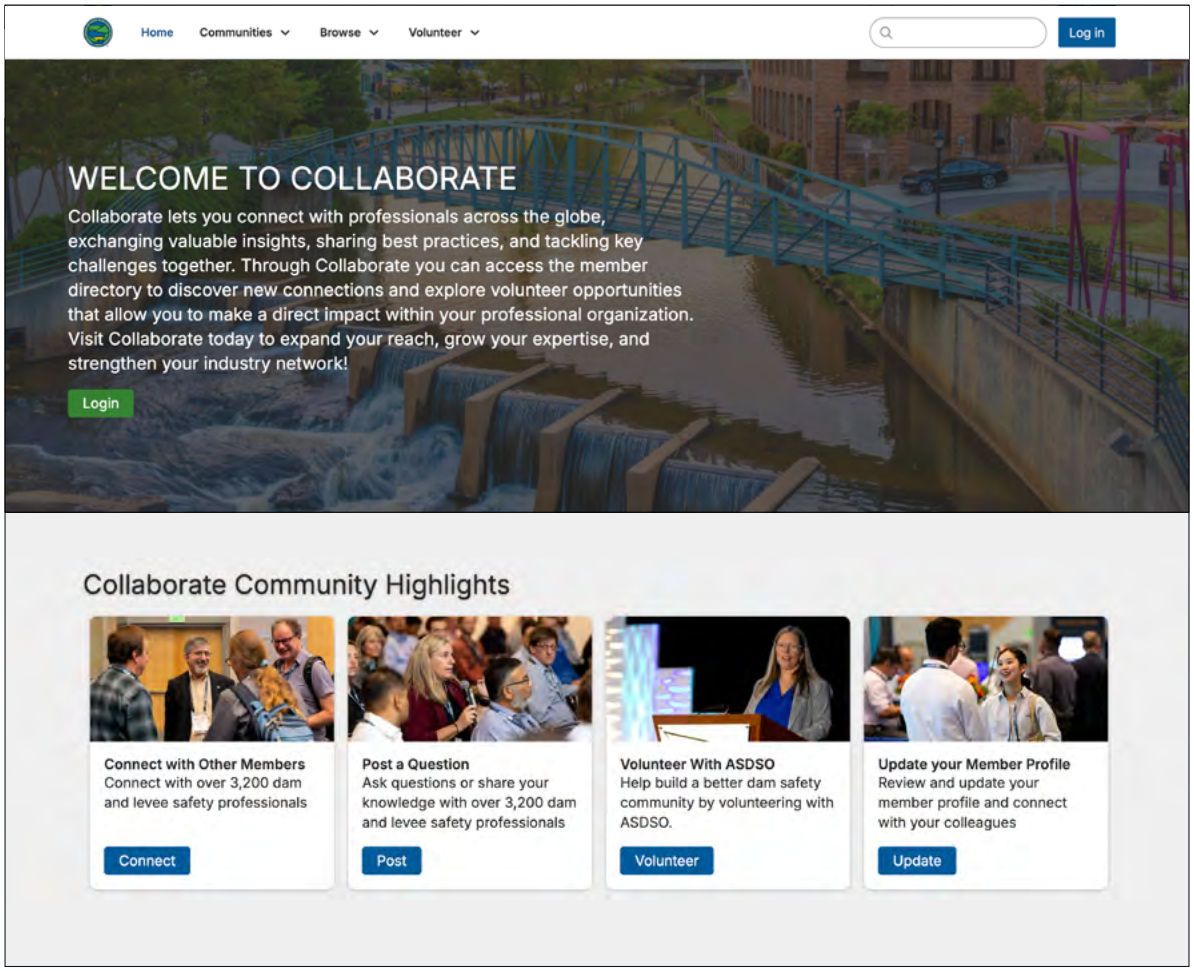
Search ASDSO on YouTube for the full Dam Owner Academy Series

ASDSO Collaborate

ASDSO Collaborate is an online networking community for dam safety professionals. The site provides an opportunity to connect with nearly 3,500 professionals across the country through sharing ideas, discussing challenges, posting questions, and searching for ASDSO volunteer opportunities. News from the ASDSO Board of Directors, staff, and committee leaders is also often shared through Collaborate.

Each ASDSO member can create a professional profile and easily search for other members on the site. Members can also start a broad conversation through joining 'communities' specific to them and their interests, such as those for committees, regions, key topics, or an 'all member' community.

» **Visit Collaborate.DamSafety.org**



Dam Incident Database

The Dam Safety Incident Database is a searchable, online collection of more than 1000 records of failure and non-failure incidents. Each record has basic information on the dam safety incident such as incident date, type, driver, and mechanism. There is also information on downstream consequences such as evacuations, deaths, damages, etc. as available.

Most of the incident records have been collected from state programs following the year in which they occurred. Some states have been able to provide historic incident information and ASDSO will continue to obtain as much information, both current and historic, as possible. The database is not considered comprehensive of all dam safety incidents, both historic and current, and reflects only the data that ASDSO has been able to collect. Much of the identifying information on specific dams is obtained from the National Inventory of Dams.

» **Visit DamSafety.org/Incidents**

Dam Safety Resource Database

ASDSO's Dam Safety Resource Database contains more than 10,000 entries referencing dam safety publications. These entries cover a wide variety of dam safety topics, including technical and non-technical areas, history, best practices, regulations, news, and more. The entries also represent a variety of sources, including federal and state departments, professional societies, research groups, industry news outlets, international organizations, and universities.

All ASDSO conference papers and *Journal of Dam Safety* articles are included as entries. ASDSO members have free, unlimited access to full ASDSO papers through the resource database.

» **Visit DamSafety.org/Resource/Search**

Lessons Learned from Dam Failures and Incidents Website, DamFailures.org

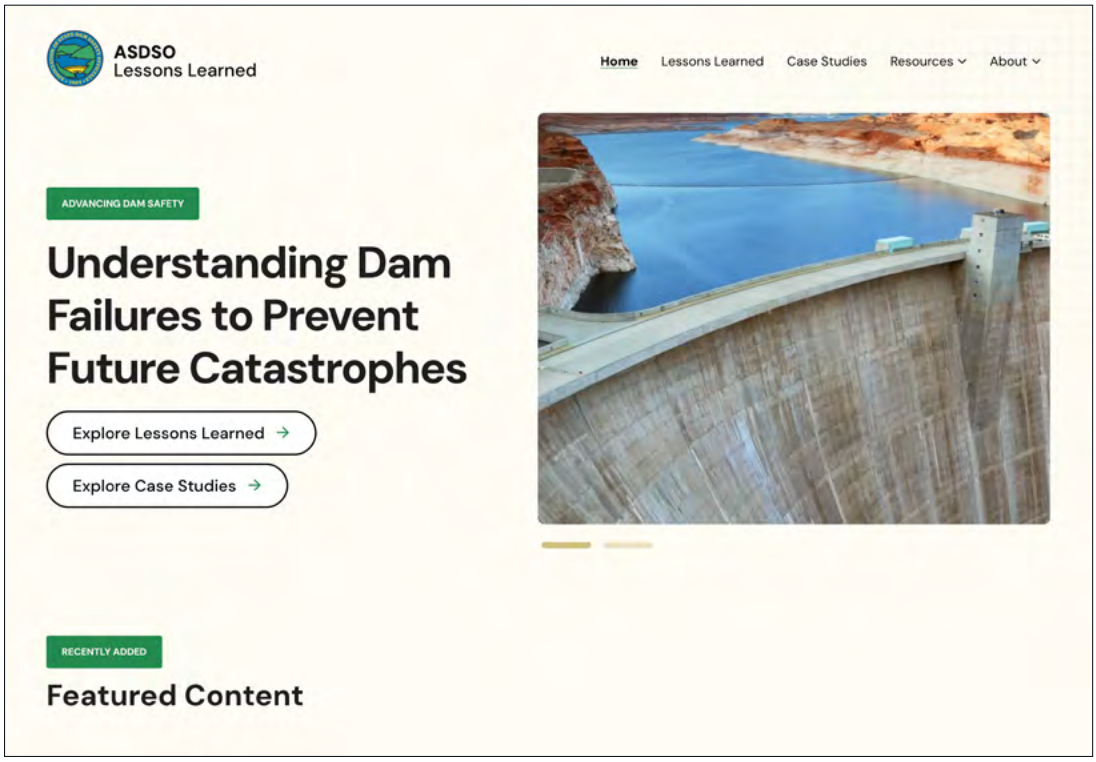
ASDSO's Dam Failures website, DamFailures.org, provides educational information relating to dam failures and incidents in an innovative, user-friendly manner to assist owners and practitioners with critical design and operational decisions.

The website presents links to individual case studies and 'lessons learned' pages that summarize historical dam incidents and failures and the valuable information gleaned from them. Each page contains a background and description, photographs, videos, best practices, and other resources related to the case study or lessons learned being addressed. The contents of this website encompass a range of failure modes, dam types, and dam safety topics, including best practices regarding engineering and design practices, human factors, emergency planning and response, operation and maintenance, and regulatory issues.

As of 2025, the website has more than 65 case studies and nearly 40 lessons learned from dam failures to explore. Additional content is in development for 2026.

» **Visit DamFailures.org**

NEW LOOK! The Website is now even more user-friendly!

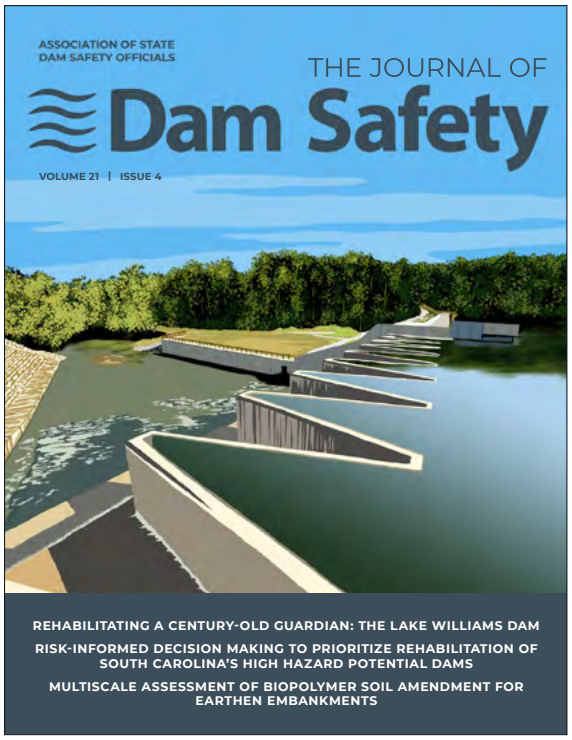


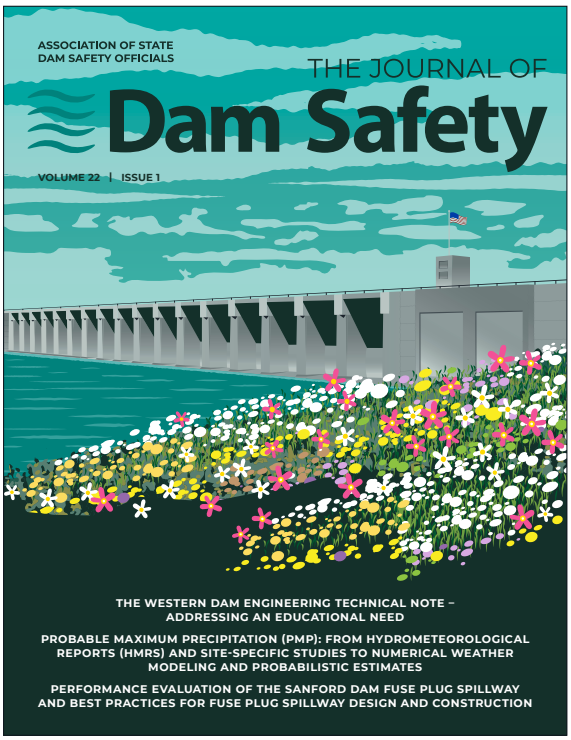
Journal of Dam Safety

The Journal of Dam Safety is a quarterly members-only publication dedicated to increasing the technical expertise of engineers, owners, operators, and others involved in dam safety. A primary goal is to promote consistency in technical and regulatory approaches to dam safety with examples from various geographic regions, multiple types of dams, and from a variety of perspectives. Articles are selected to share valuable information, lessons learned, and promote new technologies that can benefit the dam safety community. The journal is also a valuable source for industry news, organizational updates, and upcoming events.

ASDSO members may view all past journal articles by browsing our Resource Database!

» **Visit DamSafety.org/JDS**





State Dam Safety Programs & Topics

Using ASDSO's state maps page, you can easily access state-specific dam safety details, including contact information for ASDSO state representatives and state statutes and regulations.

Pages also include individual **State Performance Reports**. The 2024 State Performance Reports include data on condition ratings, state staffing, state budgeting, EAP completion, a comparison to the national benchmark, and more. State Performance Reports are useful to educate the public, media, and other stakeholders on specific state regulatory programs and the dams they regulate.

» **Visit DamSafety.org/States**

Cost of Rehabilitating Dams in the U.S. Report

In 2025, ASDSO updated *The Cost of Rehabilitating Dams in the U.S.* report. In this update, **ASDSO estimated that the total cost to rehabilitate the nation's non-federal dams is $165.2 billion. The cost to rehabilitate just the most critical dams was estimated at $37.4 billion**, a cost that continues to rise as maintenance, repair, and rehabilitation are delayed.

ASDSO developed this report to inform national and state policy decisions and provide the public and the media with a high-level understanding of the national dam rehabilitation need in terms of estimated costs.

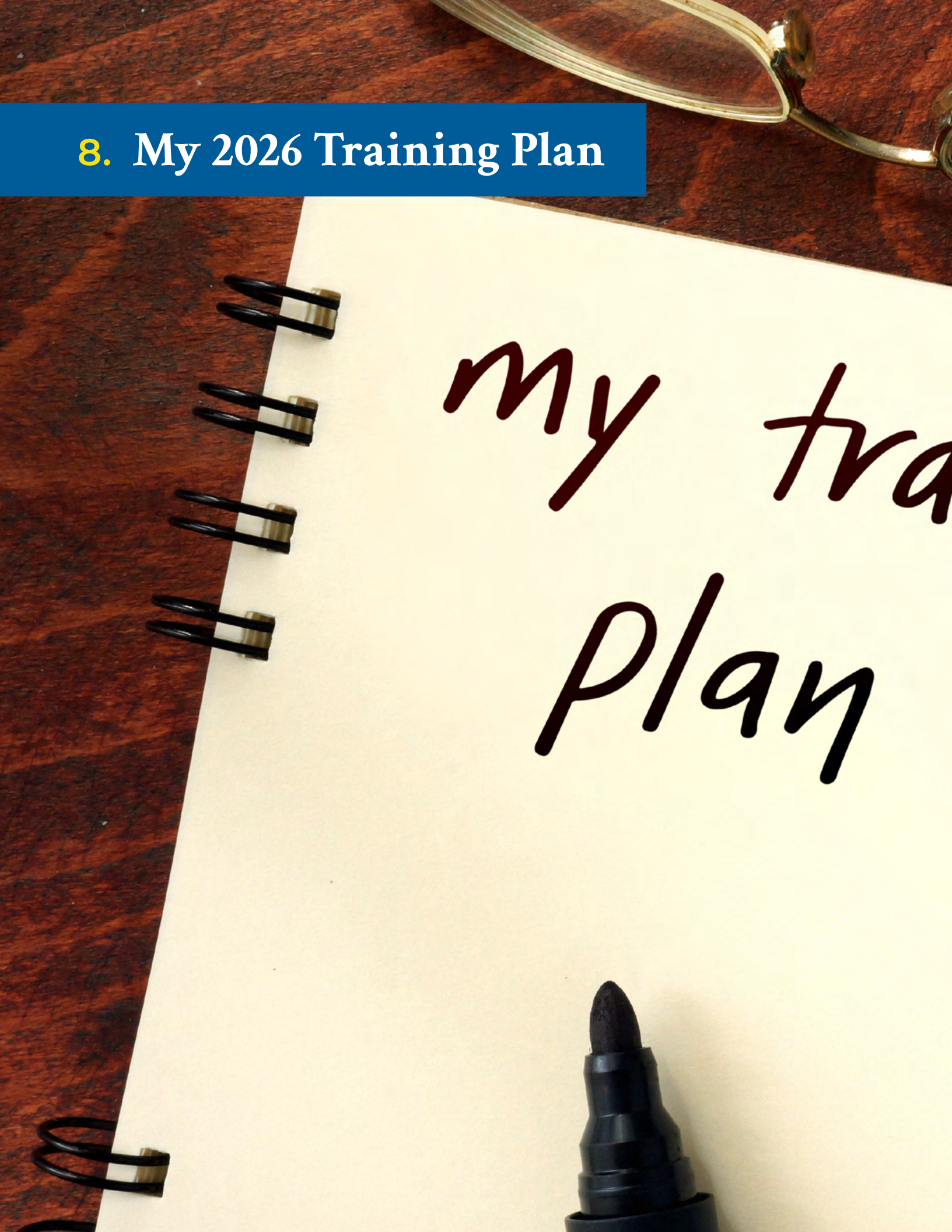
» **Visit DamSafety.org/CostofRehab**

Monthly Podcast, "A Dam Conversation With..."

ASDSO's podcast, "A Dam Conversation With…", was launched in September 2024 on all major podcasting platforms. Each episode features an interview with an industry leader who shares insights on career development, lessons learned, and industry history. As of 2025, twelve episodes are already available!

Listen now on:
Apple →
Spotify →
Amazon →

8. My 2026 Training Plan



Create your customized 2026 Training Calendar

The following pages will allow you to create your very own 2026 Training Plan. Simply mark the conferences, webinars, and seminars you want to attend, including the On-Demand Webinars needed to round out your training needs. Then, visit **DamSafety.org** and register for the courses you have selected.

Create your customized 2026 Training Calendar

CONFERENCES

- [ ] **Northeast Regional Conference**
  Buffalo, NY · May 18-21
- [ ] **Dam Safety 2026**
  Raleigh, NC · August 30-September 3, 2026

TECHNICAL SEMINARS

- [ ] **Inspection and Assessment of Dams**
  January 20-23, 2026 · Virtual
- [ ] **HEC-RAS**
  February 24-27, 2026 · Virtual
- [ ] **Dam Construction Inspection**
  April 7-9, 2026 · Virtual
- [ ] **Basic Soil Mechanics Related to Earth Dams**
  May 26-29, 2026
- [ ] **HEC-RAS 2D**
  June 16-18, 2026 · Virtual
- [ ] **Improving Emergency Operations for Dam and Levee Failures and Incidents**
  August 4-7, 2026 · Virtual
- [ ] **Inspection and Assessment of Dams**
  September 21-24, 2026 · Virtual
- [ ] **Seepage Through Earth Dams**
  November 3-6, 2026 · Virtual

WEBINARS

- [ ] **Precision Matters: Surveying Fundamentals for Dam Safety**
  January 13, 2026
- [ ] **Public Safety & Security at Dams: Two Sides of the Same Coin**
  February 10, 2026
- [ ] **The 2019 Spencer Dam Failure: An Extreme Case of Dams in Cold Regions**
  March 10, 2026
- [ ] **Recent Advances in Rock Scour Technology: Time Rate of Scour and More**
  April 14, 2026
- [ ] **Shear Strength of Clay/Clay Shales and Methods of Stability Analysis for Embankment Dams**
  May 12, 2026
- [ ] **AI and ML for Civil Engineering: Intro and Need-to-Knows with a HEC-RAS Example**
  June 9, 2026

- [ ] **Hang in There: Rope Access for Dam Safety Inspections**
  July 14, 2026
- [ ] **The Regulatory Playbook: Finding Success in the Dam Safety Review Process**
  August 11, 2026
- [ ] **Developing Filter Gradation Specifications from Current Guidance**
  September 8, 2026
- [ ] **Precision Blasting Near Dams: Engineering Safety Into Every Shot**
  October 13, 2026
- [ ] **Voids Beneath Spillway Slabs: Evaluation, Interim, and Long-term Risk Reduction Considerations**
  November 10, 2026
- [ ] **Introduction to Risk Analysis and How Inspection & Assessment Informs the Results**
  December 8, 2026

ON-DEMAND WEBINARS

- [ ] **3-D Effects on Estimation of Gradients, Seepage Flows and Evaluation of Internal Erosion Potential Failure Modes**
- [ ] **Advances in Geologic Data Collection and 3D Geologic Modeling for Site Characterization and Safety Studies for Dams and Levees**
- [ ] **AI and ML for Civil Engineering: Intro and Need-to-Knows with a HEC-RAS Example**
- [ ] **Analysis of Concrete Arch Dams**
- [ ] **A Perfect Storm of Flawed Judgments and Decisions**
- [ ] **Application of 2D Hydraulic Modeling for Dam and Levee Safety**
- [ ] **Application of PFMA in Dam Safety**
- [ ] **Application of Risk Principles within State Dam Safety Programs**
- [ ] **Automated Instrumentation and Early Warning Systems for the Monitoring of Dams**
- [ ] **Best Management Practices for Waterstop Selection, Installation, and Inspection**
- [ ] **Best Practices for Dam Safety Warning Signs**
- [ ] **Best Practices in Floodplain Management Associated With Dam Safety Management and Dam Rehabilitation**
- [ ] **Concrete Construction – Issues and Remedies**
- [ ] **Concrete Repair and Maintenance for Dams**
- [ ] **Construction Quality Control / Information Data Systems for Dam Rehabilitation**
- [ ] **Cracking and Hydraulic Fracturing in Embankment Dams and Levees**
- [ ] **Current Trends in the Seismic Analysis of Embankment Dams**
- [ ] **Customization and Utilization of Dam Operation and Maintenance Manuals**

- [ ] Dam Construction Quality Control – Do's, Dont's and Lessons Learned
- [ ] Dam Overtopping Protection Systems - Part I
- [ ] Dam Overtopping Protection Systems - Part II
- [ ] Dam Safety with 3D Weirs
- [ ] Delhi Dam – A Compound Failure
- [ ] Design of Siphon Systems
- [ ] Designing Slope Protection for Dams and Levees
- [ ] Detecting, Monitoring, and Repairing Voids Beneath Spillway Slabs
- [ ] Developing Operations and Maintenance Manuals for Dams
- [ ] Drilling Plans and Hazard Evaluations for Dams and Levees
- [ ] Drone Technology Integrated into Dam Safety Inspections and Evaluations
- [ ] Earthquake Hazards, Ground Motions and Dynamic Response
- [ ] Easy and Quick Determination of the PMF from the PMP Using Free Tools
- [ ] Emergency Action Plan Basics
- [ ] Empirical Estimates of Permeability for Earth Dam Projects
- [ ] Evaluation and Maintenance of Piezometers, Relief Wells, and Drains in Dams and Levees
- [ ] Evaluation of Seepage Related Potential Failure Modes (PFMA's) in Embankments with Emphasis on Outlet Penetrations
- [ ] Event Tree Principles and Applications for Dam Safety Risk Assessment
- [ ] Exploring Dam Breach Parameters: Observed and Modeled
- [ ] Extreme Precipitation and Dam Safety in a Changing Climate
- [ ] Facilitating Low-Head Dam Removals and Improving Aquatic Resource Restoration Outcomes
- [ ] Field Investigations for New and Existing Dams
- [ ] Filter Design History and a One-Step Design Process
- [ ] Filters and Drainage Systems for Embankments Dams
- [ ] Findings of the Independent Forensic Investigation of the Failures of Edenville and Sanford Dams, Michigan
- [ ] Findings of the Oroville Dam Spillway Forensic Investigation
- [ ] Foundation Cutoff Walls for Dams and Levees
- [ ] Foundation Preparation and Treatment for Dam Construction

- [ ] **Fundamentals of Concrete Construction Inspections for Dams and Appurtenant Structures**
- [ ] **Getting Ahead of the Storm: Building Capacity to Respond to Large-Scale Weather-Related Dam Impacts**
- [ ] **Guidelines for Assigning Erodibility Parameters to Soil Horizons for SITES Analyses**
- [ ] **HEC-RAS 2D Modeling**
- [ ] **How to Communicate Effectively in Any Situation**
- [ ] **How to Conduct a Successful PFMA – Lessons Learned from Past Successes and Failures**
- [ ] **How to Make Your Emergency Action Plan More Effective**
- [ ] **Human Factors in Dam Failure and Safety**
- [ ] **Human Factors in the Edenville Dam Failure**
- [ ] **Human Factors in the Oroville Dam Spillway Incident**
- [ ] **Hydraulic Design of Labyrinth Weirs**
- [ ] **Hydraulic Tour of Standard NRCS Inlet Risers**
- [ ] **Hydraulics 101: Intro to Hydraulics for Dam Safety**
- [ ] **Hydraulics 201 for Dam Safety**
- [ ] **Hydrologic Hazards – Estimating Probabilities of Extreme Floods**
- [ ] **Hydrology 101 for Dam Safety**
- [ ] **Hydrology 201 for Dam Safety**
- [ ] **Improving the Dam Safety Design Review Process**
- [ ] **Inlet and Outlet Hydraulics for Spillways and Outlet Structures**
- [ ] **Inspection and Assessment of Spillways**
- [ ] **Instrumentation in Dams – Selection and Installation**
- [ ] **Internal Drainage Systems for Embankment Dams**
- [ ] **Internal Erosion – Applying Erosion Mechanics From ICOLD Bulletin 164 In Internal Erosion Failure Mode Analyses**
- [ ] **Intro to Cavitation in Chutes and Spillways**
- [ ] **Intro to Post-Tensioned Anchors for Dams**
- [ ] **Intro to Tailings Dam and Coal Ash Impoundment Design, Construction and Monitoring: What Can Go Wrong and Right?**
- [ ] **Introduction to Addressing Inadequate Conveyance Capacity at Dams**
- [ ] **Introduction to Armoring Embankment Dams and Earth-Cut Spillways with ACBs**

- [ ] Introduction to Computational Fluid Dynamics (CFD) modeling for Dam and Levee Safety
- [ ] Introduction to Concrete Gravity Dams
- [ ] Introduction to Dam Decommissioning
- [ ] Introduction to Earth Spillway Design and Evaluation
- [ ] Introduction to Embankment Dams
- [ ] Introduction to Grouting for Dams
- [ ] Introduction to Hydrologic Modeling Using Geospatial Information
- [ ] Introduction to Nature-Like Fishways for Dams
- [ ] Introduction to Public Safety Risk Evaluation and Treatment for Dams and Levees
- [ ] Introduction to Spillway Gates
- [ ] Intrusive Activities in Dams and Levees – Are They Worth Creating a Flaw?
- [ ] Judgment and Decision-Making in Dam Engineering
- [ ] Latest Trends in Roller-Compacted Concrete (RCC) Spillways and Overtopping Protection
- [ ] Lawn Lake Dam: Pre-Failure Comprehensive Dam Safety Evaluation and Post Failure Impacts
- [ ] Legal Responsibilities of Dam Owners, Operators, and Regulators
- [ ] Lessons Learned Regarding Seismic Deformation Analyses of Embankment Dams from Re-Evaluation of the Upper and Lower San Fernando Dams Performance Case Histories
- [ ] Low-Level Conduits – What Can Go Wrong, How to Inspect, How to Repair?
- [ ] Low-Head Dams: Mitigating Danger and Liability
- [ ] Managing Increased Dam Safety Risk During Reconstruction
- [ ] Michigan Failures/Pandemic – Impacts to the ASDSO Peer Review Process
- [ ] Modeling Tailings Dam Failures with 2-Phase Flow
- [ ] Natural Resources Conservation Service Dam Design and Dam Safety Resources: Policy, Procedures, and Tools
- [ ] Piezometric Data Evaluation for Seepage Characterization of Levees and Earth Dams
- [ ] Pitfalls in Quality Control Processes for Compacted Earth Fill
- [ ] PMP and the History of HMRs
- [ ] Potential Failure Mode Analysis as a Dam Safety Tool Part I: Introduction to PFMA
- [ ] Practical Applications of Trash Racks and Anti-Vortex Devices
- [ ] Preventing Fatalities in Confined Spaces at Dams

- [ ] **Probable Maximum Precipitation: What Is It, How Is It Calculated, and How Do I Apply It?**
- [ ] **Putting Public Safety First – The Oroville Dam Spillways Emergency Recovery**
- [ ] **Quality Assurance and Field Inspection for Dam Construction Projects**
- [ ] **Rainfall and Dam Safety – From PMP to the 100-Year Storm**
- [ ] **Reexamination of the 2004 Failure of Big Bay Dam, Mississippi**
- [ ] **Rehabilitation of Concrete Dams**
- [ ] **Rehabilitation of NRCS Watershed Structures – A Consultant's Perspective**
- [ ] **Relearning How to Look at Piezometric Data for Seepage Evaluation**
- [ ] **Responding to Dam Emergencies**
- [ ] **Review of the 1938 Construction Slide at Fort Peck Dam**
- [ ] **Risk Assessment Basics for an Individual Dam**
- [ ] **Risk Assessment for Levee Projects**
- [ ] **Risk Communication for Dams**
- [ ] **Rock Grouting Principles for New and Remedial Dam Projects**
- [ ] **Rock Scour Assessment for Dams, Spillways and other Water Conveyance Structures**
- [ ] **Seepage Monitoring and Analysis of Embankment Dams**
- [ ] **Seepage Rehabilitation for Embankment Dams**
- [ ] **Seismic Stability Evaluation of Earth Dams**
- [ ] **Site Investigation and Parameter Development for Seismic Deformation Analyses of Embankment**
- [ ] **Sliplining Low-Level Conduits**
- [ ] **Slope Stability Modeling for Embankment Dams: Planning, Interpreting, and Reporting Results**
- [ ] **Specialty Construction Techniques for Foundation Improvement and Seepage Reduction**
- [ ] **Spillway Conduits – More Than Just a Pipe Through the Dam**
- [ ] **Spillway Gates and Dewatering Systems - Lessons Learned and Practical Solutions**
- [ ] **Stability Evaluations of Concrete Dams**
- [ ] **Stepped Chute Spillway Design for Embankment Dams**
- [ ] **Stream Management for Dam Construction**
- [ ] **Strength Selection for Static Slope Stability Analysis**
- [ ] **Structural Condition Assessment of Dam Facilities with Non-Destructive Evaluation Methods**

- [ ] Terminal Structures and Energy Dissipation at Outlet Works and Spillways
- [ ] Teton Dam – The Failure That Changed an Industry
- [ ] The 1979 Machhu Dam Disaster: Social Origins and Social Consequences
- [ ] The Fontenelle Dam Incident 1965
- [ ] The History of Dam Safety Governance in the US Including Risk Analysis
- [ ] The History of Seepage Technology Development
- [ ] The Practical Use of Geophysics to Assess Dam and Levee Safety
- [ ] The South Fork Dam Breach and Johnstown Flood of 1889: A Civil and Dam Engineering History of the USA's Deadliest Dam Failure
- [ ] The State of the Practice and Future of Dam Breach Modeling
- [ ] The Use of Void Ratio (e) in Earth Dams
- [ ] Tolerable Risk Guidelines for Dams: How Safe is Safe Enough?
- [ ] Tools for Designing and Assessing Spillways
- [ ] Triaxial Lab Testing for Earth Dams
- [ ] Understanding and Managing Plant and Animal Intrusions in Embankment Dams and Levees
- [ ] Understanding and Managing Plant and Animal Intrusions in Embankment Dams and Levees – Part II
- [ ] Understanding Static Liquefaction
- [ ] Underwater Installation of Geomembranes
- [ ] Uplift and Drainage for Concrete Dams and Spillways
- [ ] Use of Remote Sensing in Dam Safety – Including Drones
- [ ] Use of Underwater Remote Systems in Dam Safety
- [ ] Using Instrumentation for Dam Safety Monitoring
- [ ] Waterproofing Systems for Dams
- [ ] What Can I Really Expect to Get Out of a Semi-Quantitative Risk Analyses (SQRA)?
- [ ] Why Embankments Crack and How to Fix Them
- [ ] Why People Die During Flood Events and Options for Reducing Future Flood Fatalities
- [ ] WinDAM – Overtopping and Internal Erosion for Earthen Embankments

Notes

ASDSO 2026 Training & Conference Calendar

January 13 — **Precision Matters: Surveying Fundamentals for Dam Safety**
Webinar

January 20-23 — **Inspection and Assessment of Dams**
Technical Seminar · Virtual

February 10 — **Public Safety & Security at Dams: Two Sides of the Same Coin**
Webinar

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Conference · Buffalo, NY

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Webinar

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Conference · Raleigh, NC

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