SOUTHERN COMPANY

DAM SAFETY INITIATIVES

CEATI PROJECT

DAM SAFETY INSPECTION PROCEDURES, GUIDANCE AND TRAINING FOR PLANT OPERATORS

Hugh Armitage – Southern Company

Annual Dam Safety Training

Southern Company Safety Procedure for Dams and Dikes mandates:

- *Development and maintenance of a dam safety training program for plant personnel;*

- *Training is required on an annual basis and includes:*
- *Instructor led classroom training;*
- *On-the-job training in the field with a Dam Safety Engineer; and*
- *Video based training for new or temporary employees*

- *Classroom training consisting of:*
- *Technical presentations using power point presentations supplemented by other training materials.*

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"Opportunities for Improvement"

1. *Continued education of plant personnel to fully understand the need for and benefits of a comprehensive and consolidated Dam Safety Program.*

2. *Dam Safety Inspection Checklist improvements – continuity, consistency.*

3. *Flexibility of training – In-class, field and online.*

4. *Engage, promote and foster ownership mentality of company assets.*

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INNOVATION THROUGH COLLABORATION

CEATI INTERNATIONAL

Dam Safety for Plant Operators – Training Materials

Contractor:

HDR Corporation
Toronto, Ontario, Canada

HDR

Dam Safety for Plant Operators

Purpose and Need

- Plant operators are often a dam owner's first line of defense against a developing dam failure condition.
- Plant operators typically obtain dam safety training on the job.
- There is an increased need for formal dam safety training as a component of succession planning and Owners' Dam Safety Programs.

Dam Safety for Plant Operators

Dam Safety Training Challenges Faced by Dam Owners

- Training often developed and delivered by engineers for non-engineering audiences.
- Creating training presentations from scratch is time consuming and labor intensive.
- Overwhelming amount of references from which to draw training material.
- Common need for a modular training approach, so that training can be matched to individuals' dam safety responsibilities, and flexibility of training administration.

Dam Safety for Plant Operators

Overview of Training Materials

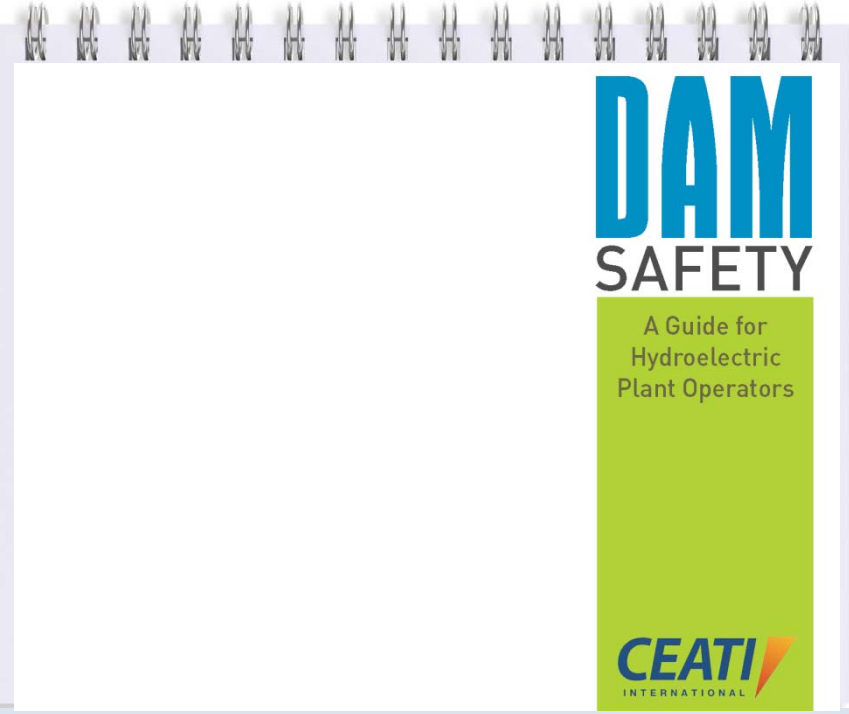
- Annotated Bibliography
- Guidance Document
- Training Presentations
- Facilitator Guide & Files
- Inspection Checklists
- eLearning Modules

Dam Safety for Plant Operators

Training Materials

Guidance Document

- 4 Sections
  1) Dam Basics
  2) Dam Failure
  3) Dam Safety Surveillance and Monitoring
  4) Mitigating Dam Failure and Flood Emergencies
- Serves as a training resource and continued reference
- Visually appealing, efficient magazine format



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CEATI Report No. T112700-0227

Prepared for:
CEATI International
Dam Safety Interest Group

Prepared by:
HDR Engineering, Inc.

Sponsored by:
BC Hydro, Brookfield Renewable Energy Group, Eugene Water & Electric Board, FirstEnergy, Grant County Public Utility District, NB Power, Newfoundland Labrador Hydro, Pacific Gas & Electric, SaskPower, SHEM, Southern Company, Tacoma Power, TVA, TransAlta

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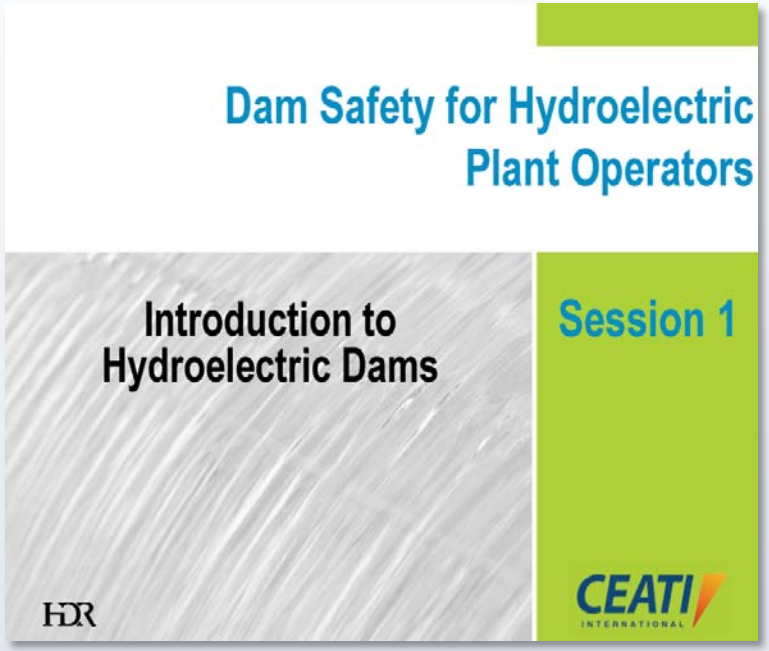
U.S. Bureau of Reclamation's Minidoka Dam, Snake River, Idaho

Dam Safety for Plant Operators

Training Materials

- **5 Powerpoint Training Sessions**
  1) Introduction to Hydroelectric and other Dams
  2) Surveillance and Monitoring to Prevent Dam Failure
  3) Instrumentation for Monitoring Dam Safety
  4) Field Inspection Exercise
  5) Mitigation of Dam Failure and Flood Emergencies
- **Customizable time frame (½ to 2-day) & training needs of specific personnel**



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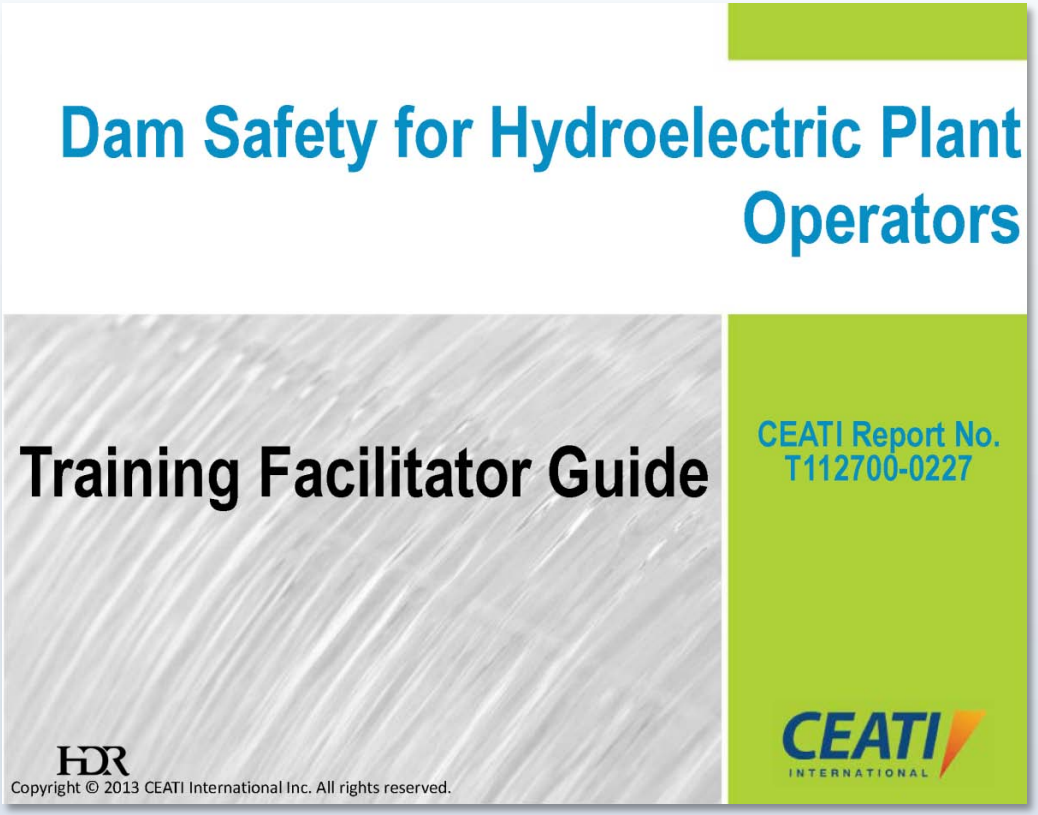
Training Materials

Facilitator Guide & Files

- Outline of Training content (syllabus)
- Directions and tips for delivery
  - Facilitator qualifications
  - Instructions for modifying the PowerPoint presentations
  - Guidelines for conducting Field Inspection Exercise



Dam Safety for Plant Operators

Training Materials

Facilitator Guide & Files

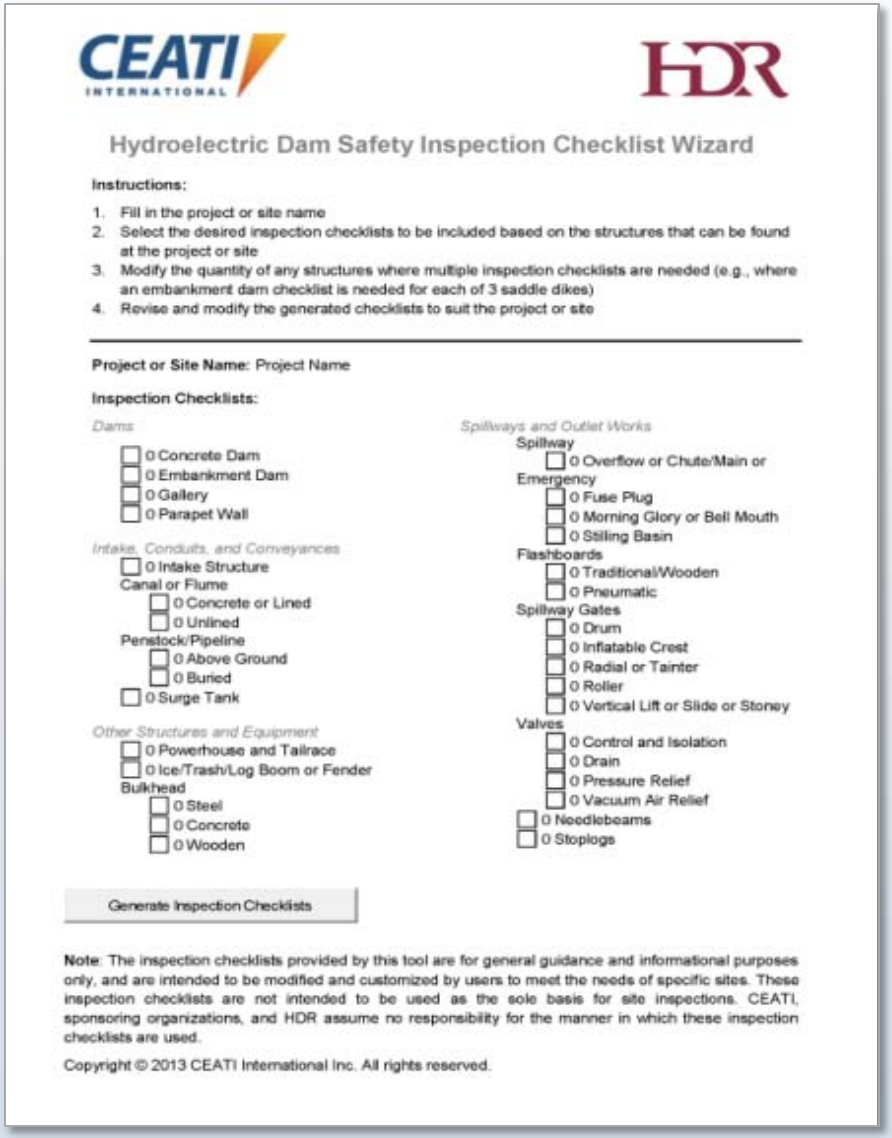
- **Speaker's Notes**
  - Talking points
  - Suggested questions and activities to increase audience participation
  - Indicates when additional materials are recommended for use (e.g., hand-outs or flip chart)
  - Timing guides

Dam Safety for Plant Operators

Training Materials

Inspection Checklists

- Stand-alone set of checklists for major structures commonly found at hydroelectric projects
- Provided in Word format for customization
- The *Hydroelectric Dam Safety Inspection Checklist Wizard* facilitates compilation of checklists relevant to a specific project



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Hydroelectric Dam Safety Inspection Checklist Wizard

Instructions:

1. Fill in the project or site name
2. Select the desired inspection checklists to be included based on the structures that can be found at the project or site
3. Modify the quantity of any structures where multiple inspection checklists are needed (e.g., where an embankment dam checklist is needed for each of 3 saddle dikes)
4. Revise and modify the generated checklists to suit the project or site

Project or Site Name: Project Name

Inspection Checklists:

Dams

- ☐ 0 Concrete Dam
- ☐ 0 Embankment Dam
- ☐ 0 Gallery
- ☐ 0 Parapet Wall

Intake, Conduits, and Conveyances

- ☐ 0 Intake Structure
- Canal or Flume
  - ☐ 0 Concrete or Lined
  - ☐ 0 Unlined
- Penstock/Pipeline
  - ☐ 0 Above Ground
  - ☐ 0 Buried
- ☐ 0 Surge Tank

Other Structures and Equipment

- ☐ 0 Powerhouse and Tailrace
- ☐ 0 Ice/Trash/Log Boom or Fender
- Bulkhead
  - ☐ 0 Steel
  - ☐ 0 Concrete
  - ☐ 0 Wooden

Spillways and Outlet Works

- Spillway
  - ☐ 0 Overflow or Chute/Main or Emergency
  - ☐ 0 Fuse Plug
  - ☐ 0 Morning Glory or Bell Mouth
  - ☐ 0 Stilling Basin
- Flashboards
  - ☐ 0 Traditional/Wooden
  - ☐ 0 Pneumatic
- Spillway Gates
  - ☐ 0 Drum
  - ☐ 0 Inflatable Crest
  - ☐ 0 Radial or Tainter
  - ☐ 0 Roller
  - ☐ 0 Vertical Lift or Slide or Stoney
- Valves
  - ☐ 0 Control and Isolation
  - ☐ 0 Drain
  - ☐ 0 Pressure Relief
  - ☐ 0 Vacuum Air Relief
- ☐ 0 Needlebeams
- ☐ 0 Stoplogs

Generate Inspection Checklists

Note: The inspection checklists provided by this tool are for general guidance and informational purposes only, and are intended to be modified and customized by users to meet the needs of specific sites. These inspection checklists are not intended to be used as the sole basis for site inspections. CEATI, sponsoring organizations, and HDR assume no responsibility for the manner in which these inspection checklists are used.

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Inspection Information			
Inspector Name:		Location:	
Date:		Time:	
Field Conditions			
Weather:	Temperature:	Rain last 24 Hours	☐Yes ☐ No
Headpond Elev.:	Tailwater Elev.:	Snowmelt On-going?	☐Yes ☐ No

Powerhouse and Tailrace					
1. Powerhouse					
Seepage/leakage		Cracking?			
Along interface with dam?	☐Yes ☐ No	Generator floor?		☐Yes ☐ No	
Along interface with intake?	☐Yes ☐ No	Turbine floor?		☐Yes ☐ No	
Along interior/exterior walls?	☐Yes ☐ No	At concrete columns?		☐Yes ☐ No	
At penstocks entry?	☐Yes ☐ No	Near overhead crane?		☐Yes ☐ No	
Concrete deterioration/spalling/erosion along waterline of draft tube piers?	☐Yes ☐ No	Interior/exterior substructure walls?		☐Yes ☐ No	
Cracking/spalling on powerhouse superstructure walls?	☐Yes ☐ No	Significant cracks:			
Windows secured and protected?	☐Yes ☐ No	Length		Width	
Increased flow/plugging/accumulation of sediment at drainage collection systems?	☐Yes ☐ No	Length		Width	
Safe load limits for floors signed?	☐Yes ☐ No	Length		Width	
Comments:					
2. Tailrace					
Erosion/displacement of tailrace side slopes?	☐Yes ☐ No	Signs of seepage through upstream/downstream training walls?		☐Yes ☐ No	
Displaced, missing, or damaged slope protection?	☐Yes ☐ No	Signs of rock falls?		☐Yes ☐ No	
Vegetation that compromises inspection?	☐Yes ☐ No	Signs of deterioration/cracking/erosion/spalling/ displacement of the training walls?		☐Yes ☐ No	
Does vegetation need to be removed?	☐Yes ☐ No	Draft tube bulkheads available?		☐Yes ☐ No	
Build-up of debris?	☐Yes ☐ No	Draft tube bulkheads in good condition?		☐Yes ☐ No	
Unusual wave patterns?	☐Yes ☐ No	Hoisting equipment in good condition?		☐Yes ☐ No	
Comments:					
3. Other Site-Specific Concerns					
4. New Deficiencies					
Description:					
Photographs attached? ☐ Yes ☐No					
Sketch: (include dimension and distances to reference points)					

Dam Safety for Plant Operators

Training Materials

eLearning Module 1

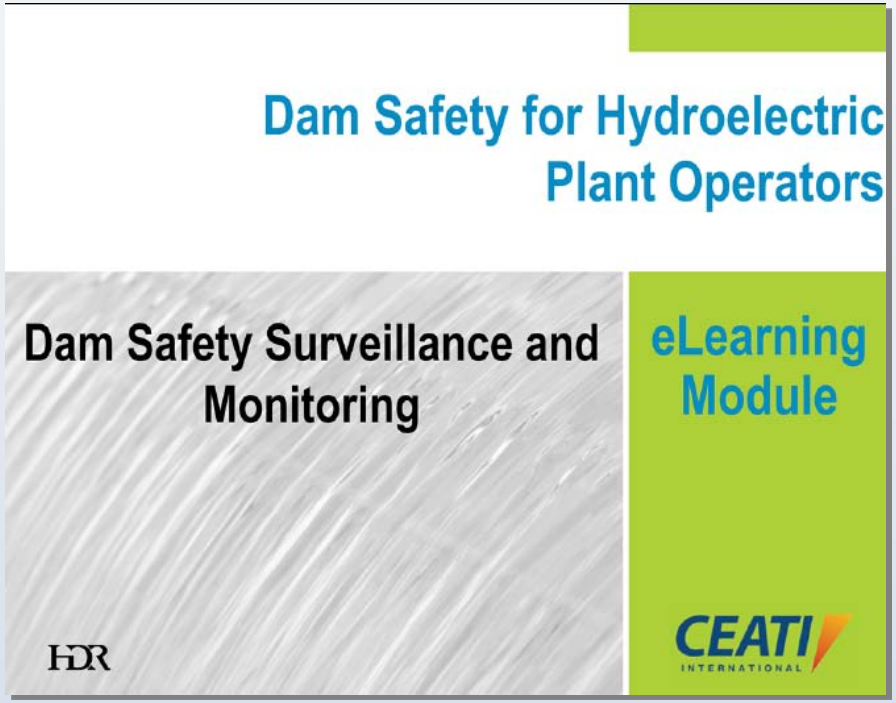
- Self-guided, narrated (closed-captioned) 45-minute training
- Run from CD or can be hosted on Owner's own website
- Alternative delivery method (high level overview) or periodic dam safety refresher for Training Sessions 1, 2, and 5

Dam Safety for Plant Operators

Training Materials

eLearning Modules 2 and 3

- Focused on major failure modes and surveillance and monitoring for concrete and earth dams
  - **eLearning Module 2**: To be used in conjunction with Module 1 to provide high level overview of in-person Training Sessions
  - **eLearning Module 3**: Intended to complement other Training Materials and provide interactive, supplemental learning experience for plant operators



Dam Safety for Plant Operators

Use of the Training Materials

- Training Materials that are broadly applicable to all hydroelectric and other projects and Owners;
- Owners should customize the Training Materials and make them their own;
- Effective training program requires full support of Owner's management team; and
- Flexible delivery methods and schedule, potentially including combination of in-person classroom and field training and eLearning Modules

"Opportunities for Improvement"

1. *Continued education of plant personnel to fully understand the need for and benefits of a comprehensive and consolidated Dam Safety Program.*

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