ALBERTA DAM SAFETY GUIDELINES
And GUIDANCE DOCUMENTS
2016 UPDATE
Documents updated include:

- Inspection and Maintenance of Small Dams (previous version 1998)
- Operations, Maintenance and Surveillance Manual (previous version 2005)
- Emergency Preparedness and Response Plans (previous version 2003)
- Dam Safety Guidelines (previous version 1999)

The more significant changes are made in the “Dam Safety Guidelines”, which will be highlighted today.
OVER-ARCHING THEME

Improve dam safety regulatory system, incorporating learnings from Mt. Polley and findings from recent Auditor General Report
Main Objectives:

- Define the administrative basis of the Alberta Dam Safety Framework
- Outline minimum information required to obtain various authorizations, including associated application and review processes
- Provide consistent template for the design, construction and operation of dams in Alberta while maintaining flexibility to account for the fact that every dam is unique
- Highlight important design aspects of dams that are unique to Alberta or otherwise merit specific attention
- Provide guidance on preparation and implementation of EPP/ERP, OMS Manuals, and dam safety inspections

- **Provide a forum for, and encourage communication and cooperation between dam owners, dam designers and Alberta dam safety regulators to work together in:**
  - Designing, constructing, repairing, modifying, operating, decommissioning and closing dams in Alberta
  - Implementing more effective risk assessment / management and communications protocols
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**Highlights of Key Updates**

### Engineer of Record (EOR):

- P.Eng. in good standing with APEGA and have appropriate qualifications
- May be an in-house engineer of the dam owner or an engineer from a consulting engineering firm
- Depending on project size and complexity, additional Specialty Professional Engineers could include:
  - Design Engineer of Record
  - Construction Engineer of Record
  - Dam Safety Engineer
  - Others (e.g. mechanical, structural, etc.)

However, the EOR has overarching professional accountability for safety of dam and is the coordinating professional.
Highlights of Key Updates

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3. Frequency of Safety Assessments
   3.1 Assessments
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**A. OMS, EPP and ERP Requirements**

<table>
<thead>
<tr>
<th>Consequence Classification of Dam</th>
<th>Plans and Operations Manuals</th>
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<tbody>
<tr>
<td>EPP</td>
<td>ERP/FAP</td>
</tr>
<tr>
<td>Extreme/ Very High/ High</td>
<td>Yes</td>
</tr>
<tr>
<td>Significant</td>
<td>Generally required, amount of details are decided on a case by case basis based on potential environmental and economic losses</td>
</tr>
<tr>
<td>Low</td>
<td>Not required in general, however may be required due to potential environmental and economic losses</td>
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**EPP = Emergency Preparedness Plan**
**ERP = Emergency Response Plan**
**FAP = Flood Action Plan (is generally part of ERP)**
**OMS = Operations, Maintenance & Surveillance**

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**B. Frequency of Safety Assessments and Evaluations**

<table>
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<tr>
<th>Consequence Classification of Dams</th>
<th>Assessments</th>
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<td></td>
<td>Inspections/ Investigations</td>
<td>DSRs</td>
<td>APRs</td>
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<td>Extreme/ Very High/ High</td>
<td>Regular, ongoing by dam owners and operators</td>
<td>Every 5 years</td>
<td>All dams under construction or rehabilitation.</td>
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<tr>
<td>High</td>
<td>In case a critical dam safety deficiency is found</td>
<td>Every 7 years</td>
<td>All dams with Critical Dam Safety deficiency².</td>
</tr>
<tr>
<td>Significant</td>
<td>Not Required¹</td>
<td>Every 10 years</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>Not Required¹</td>
<td>Not required in general, however may be required in case of critical dam safety deficiencies/construction/rehabilitation</td>
<td></td>
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¹ Alberta Dam Safety team performs audit inspections approximately every 10 years, for low consequence dams that are owned by farmers and are included in the Alberta Small Dam Owner Program.
² Critical Dam Safety deficiency means a deficiency that needs immediate attention.

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**Dam Safety Management Documents and Frequency of Safety Assessments are based on Consequence Classification of dam and/or potential risks**

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2.2.1 Regulatory Framework
2.2.2 Key Regulatory Requirements
2.3 Basis of Dam Safety Regulatory Jurisdiction

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Alberta Government

April 11, 2016
Consequence Classification:

- Adapts framework of the 5 level classification per 2007 CDA Dam Safety Guidelines
- Recognizes 3 levels of dam breach inundation studies depending on project circumstances: “preliminary”, “qualitative” and “semi-quantitative”
- Should take into consideration:
  - Consequences to the owner’s operations
  - Effects of liquefied solids being entrained in the outflow when conducting dam breach analyses
  - The applicable phase of a closed facility (i.e. Transition Phase, Closure – Active Care Phase or Closure – Passive Care Phase)

Definition of “Dam” and Guidance on Consequence Classifications Expanded

“Regulated Dam” – meets one or more of the following:

1. Minimum 30,000 m³ storage capacity and minimum 2.5 m in height
2. If a breach occurs, its contents can flow beyond the dam even if there is no visible water on the surface of pond interior
3. Is classified as significant, high, very high or extreme consequence, irrespective of the dam height and storage capacity
External technical resources to support review of applications by Alberta Dam Safety

In the event Alberta Dam Safety does not have the resources available to conduct a timely review, or is lacking in internal expertise, the applicant shall provide the necessary resources to assist Dam Safety complete the review.

- The resources provided shall have the required qualifications and be acceptable to Dam Safety
- Early notification of pending application submittal is suggested
Personnel:
- Names and qualifications of key personnel are required – Responsible Person, EOR (and other specialty professional engineers as appropriate)

Design:
- For High, Very High and Extreme Consequence dams, need to define:
  - Quantitative Performance Objectives (QPO’s)
- For High, Very High and Extreme Consequence dams, need to define future performance evaluations as:
  - Performance = the difference between the measured behavior and the expected behavior

Construction and Operations:
- Documented verification that “QPO’s” are achieved and “performance’ is satisfactory (per definition in preceding bullet)
Stability

- Does not specify minimum factors of safety
- References the 2007 CDA Guidelines for guidance on factor of safety, but emphasizes that its selection must consider other influencing factors, such as:
  - Consequence of failure
  - Uncertainty in material properties & subsurface conditions
  - Variable construction and operating conditions
  - Comprehensive site investigations and geotechnical monitoring
  - Soil response (contractive/dilative) and its variation with confining stress and stress level, including potential for brittle failure
  - Time-dependent, deformation-dependent and stress-path-dependent processes that may affect the critical material properties
  - Strain-incompatibility of different materials
  - Implementation of an effective risk management system (e.g. Observational Method)

- Clarifies use of the pseudo-static method of analyses and selection of seismic coefficient
Highlights of Key Updates

• Suggested Table of Contents for DSR and APR reports is included

• A distinction is made between “deficiency” and “non-conformance”:
  – Deficiency: a dam safety deficiency may be considered as an unacceptable dam performance condition that has been confirmed based on best applicable practices and criteria, or regulatory requirements
  – Non-conformance: a non-conformance may be defined as a failure to establish or to follow appropriate policies, procedures, operating instructions, maintenance requirements, or surveillance plans. A non-conformance, however, is not an indication of unacceptable dam performance

“Standardized” reporting of Dam Safety Reviews and Annual Performance Reviews, for overall consistency regarding regulatory reporting
An “incident” that should be reported is defined as follows:

• The satisfactory or unsatisfactory performance of a dam during an extreme loading period caused by extreme seismic or hydrologic event

• The uncontrolled release of stored contents from a dam due to improper operation, overtopping, excessive seepage, piping, etc., regardless of whether downstream flooding occurs

• Indications of stress in structural features or appurtenant works that could potentially affect dam integrity

• Severe deterioration or erosion of structural elements

• Modifications or repairs to the dam required to satisfy regulatory requirements or other deficiencies that may be identified in the dam or original design basis

• Events that lead to non-compliance with regulatory approvals and conditions

Outlines types of “incidents” that requires reporting to Alberta Dam Safety, and the minimum information that should be included in the incident report

Minimum information to be provided:

• A chronology of events before, during, and after the incident

• A description of the satisfactory or unsatisfactory performance of the dam, reservoir, and related appurtenances during the incident, including photographs and a detailed description of any damage caused by the incident to the dam or appurtenances

• A description of the effects of the incident on downstream interests

• Actions taken by the dam owner, dam operator, or emergency response agencies during and after the incident

• Activities following the incident, including a description of repairs, or plans for future work or operating changes resulting from the incident

• Estimate of the economic and social impacts of the incident to the dam owner and other affected interests
Highlights of Key Updates

Complete guidance is beyond the scope, but suggests reference be made to applicable documents for guidance, such as for example:

- Oil Sands Tailings Committee Technical Guidance Document “De-licensing of Oil Sands Tailings Dams” dated March 2014. (Note: the terminologies in this document still need to be revised to make it consistent with the regulatory framework)
- Mining Association Of Canada “A Guide to the Management of Tailings Facilities”.