



Roles and Accountabilities for Dam Safety Management in Alberta

Alberta Chamber of Resources

Dam Integrity Advisory Committee, Engineer of Record Subcommittee

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BACKGROUND

Dam owners, regulators and industry organizations have increasingly sought clarity on the roles and responsibilities needed for the safe design, construction and operation of dams within the mining, hydroelectric, water supply, flood control and irrigation industries.

This white paper outlines the basic roles and responsibilities necessary for the safe management of dams in Alberta. It is intended to be a flexible framework, adaptable to the size and structure of an organization.

A robust dam safety program is founded on accountability for dam safety that rests at the Owner's Senior Executive and Board of Directors levels, and clearly defined responsibilities for managers and technical professionals. The dam safety roles from the operations staff up to the Accountable Executive should be formally declared and the responsibility acknowledged by the individuals in those roles.

Two tables are provided in this paper which show examples of how this framework could be applied to a large organization with significant internal management and technical resources, or a smaller organization that combines several roles.

DAM SAFETY ORGANIZATIONAL STRUCTURE - BASIC REQUIREMENTS

The roles listed below must be fulfilled in order to safely and effectively manage the design, construction, operation and closure/decommissioning of dams. Organizations may use different titles, and combine or split roles as necessary to fit the organizational size, scope and technical capability. However, an organization with a robust dam safety program will have all of these roles addressed in some manner within their organizational structure, or delegated to external consultants/contractors.

In some cases, alternative titles may be used based on the operational phase of the dam (construction vs. operation) or the organizational structure. Some alternative titles are listed in parentheses. The roles and functions should be documented within an Owner's Dam Safety Management System or Policy document.

Each party must formally acknowledge their role and accountability/responsibility.

Each role must be fulfilled by an individual, not a company or department.

Accountable Executive

- Designated by the Board of Directors.
- Has overall financial control, and assigns budgetary authority and responsibility for dam safety management.
- Accountable for the management structure and ultimately the dam safety.

Operations Manager (Construction Manager/Project Manager)

- Has overall responsibility, with delegated budget authority and resource control for the safe construction and operation of the dams.
- Delegated authority to execute construction and maintenance in accordance with the design specifications, and for safe operation of the dams.
- Implements the components of the Operations, Maintenance and Surveillance (OMS) program that relate to the Operations group.
- Communicates with the DSRE where technical input to the dam OMS is required.

Dam Safety Responsible Engineer (DSRE) – (Chief Dam Safety Engineer)

- Coordinates and provides oversight of the design, construction quality assurance, and overall management of the dam safety system.
- Given authority and resources to protect dam safety by the Accountable Executive, Operations and/or Mine Manager.
- Reports to the Accountable Executive regarding the status and performance of the dam(s).
- Identifies the scope and budget requirements for dam safety work.
- Verifies implementation of the OMS.
- Maintains the succession plan for the EOR.
- Implements and manages an Independent Review Board, where required by regulation or the Owner's policy.
- Determines appropriate risk mitigation strategies as part of the overall dam safety management program.

Engineer of Record (EOR)

- On behalf of the Owner, provides technical direction for the safety of one or more dams.
- Assesses the dam conformance with design, construction specifications, operational plans, regulations and standards.
- Confirms that maintenance of the dam is carried out as per design requirements and OMS procedures.

Engineer of Record (EOR) ‘Continued’

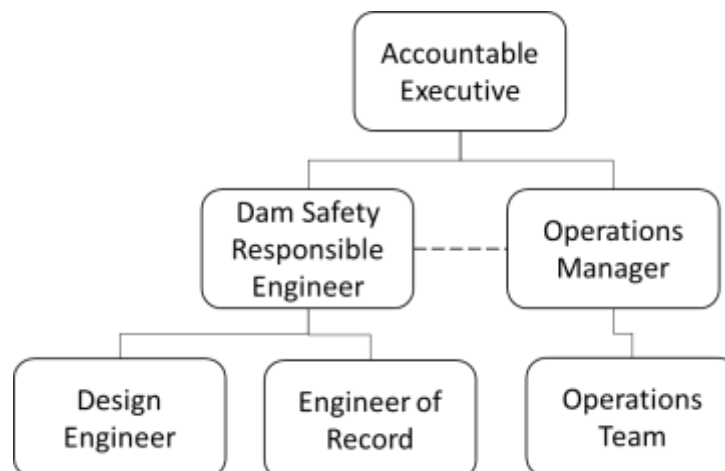
- Implements the surveillance program. Assesses the performance against the QPOs, reviews and interprets construction and instrumentation performance data, and recommends changes to the design or operation to maintain the safety of the dam and compliance with regulations, guidelines and standards.
- Reports any deficiencies to the DSRE.
- Assesses risk associated with dam safety and communicates risk to the DSRE and DE. Provides recommendations to and supports the DSRE and DE in development of risk mitigation strategies.
- Maintains and submits construction quality, performance and dam safety documentation.
- Typically reports to the DSRE.

Design Engineer (DE)

- Engineer responsible for the most recent overall design of the dam.
- Prepares design reports and construction drawings.
- Sets Quantifiable Performance Objectives (QPOs) for the dam. Supports the EOR and DSRE to assess performance data and verify that the dam is functioning consistent with the design intent.
- Must be sufficiently familiar with previous designs, and operational and performance history so that the current design meets the regulations and safety standards.

An example organizational structure with these roles is shown in the figure below. Ideally, the DSRE reports on the safety of the dams directly to the Accountable Executive, and the DSRE coordinates the work of the DE and EOR. The Operations Manager is responsible for the construction and safe operation, and also reports to the Accountable Executive.

DAM SAFETY ACCOUNTABILITIES AND EXAMPLE ORGANIZATIONAL STRUCTURE



COMMENTARY

The Owner of the dam, as represented by the Accountable Executive, is accountable for the safety of the dam. Responsibility for the dam safety management is delegated to the DSRE, and responsibility for the construction, maintenance and operation of the dam in accordance with the design and operating limitations is delegated to the Operations Manager.

The Accountable Executive position must be clearly identified within the Owner's organization. The Operations Manager and DSRE roles are typically within the Owner's organization, but may be delegated to a consultant/contractor for small organizations. The EOR and DE roles may be consultants or employees of the Owner.

It is important that the Operations Manager and DSRE have the authority and resources to protect dam safety.

The EOR does not, in most organizations, have direct control over the construction and operation of the dam; that rests with the Operations Manager who has organizational and budgetary control. Close coordination is required between the Operations Manager and DSRE/EOR, so that the operations and technical groups are each fully informed and work collaboratively to manage the risks.

The qualifications and experience of the DE and EOR must be commensurate with the risk and complexity of the dam. A typical minimum requirement is a relevant professional undergraduate and/or graduate degree, and 10 years of relevant experience in the design, construction, performance evaluation and/or operation of dams. Additional experience is needed for responsibility for high risk or complex structures. Significant engineering judgment and discretion is required in these roles.

The DSRE, EOR and DE must be registered Professional Engineers in Alberta.

Particular attention needs to be paid to transfer of responsibility from a DE/EOR at the design and construction phase to the EOR during the operational phase, or between EORs during any phase of the life of the dam, to ensure that the new EOR has sufficient information to understand the design and be able to assess the safety of the structure. The accountability to coordinate between the DE and EOR, and for transfer of EOR responsibilities, lies with the DSRE.

EXAMPLE RASCI TABLES

Definitions

Abbreviation	Role	Description
R	Responsible	Person doing the work to achieve the task. Others may be delegated to assist.
A	Accountable	Person ultimately answerable for the correct and thorough completion of the task, and the one who delegates the work to those responsible.
S	Support	Allocates resources to the responsible person. Helps the responsible person complete the task.
C	Consult	Those whose options are sought, typically subject matter experts; two-way communication with the responsible person.
I	Inform	Informed of the progress, status and when task is complete; one-way communication.

The RASCI tables below follow the principle that only one person can be Accountable for a task. In some cases there is more than one person shown with Responsibility, where each person has responsibility for their area of the organization. For example, both the Operations Manager and DSRE may have responsibility for ensuring that qualified people undertake work, within their respective areas of authority.

TABLE 1: LARGE ORGANIZATION, MULTIPLE DAMS, SOPHISTICATED INTERNAL RESOURCES

	Organizational Group				
	Organizational Accountability	Operational Control	Technical Responsibility		
	Example Roles				
	Accountable Executive (Corporate Owner)	Operations Manager	Dam Safety Responsible Engineer (DSRE)	Engineer of Record (EOR)	Design Engineer (DE)
Organizational					
Set dam safety policy	A	I	R	C	I
Develop and maintain the dam safety management system	A	I	R	C	I
Implement the dam safety management system	A	S	R	S	
Coordinate departments with dam safety roles	A		R	S	
Ensure qualified people undertake work	A	R	R	S	S
Provide technical oversight to manage dam safety risks			A	R	
Commission and implement an Independent Review Board	A	S	R	S	
Investigation and Design					
Site investigation using qualified people and appropriate methods		I	A	C	R
Prepare design report and construction drawings		I	A	S	R
Document design basis, QPOs and expected performance		C	A	C	R
Construction					
Provide resources to construct in accordance with design using appropriate materials and methods	A	R	C	C	I
Verify construction conformance with design		A	I	R	S
Maintain construction and performance records		R	A	R	S
Operations and Maintenance					
Develop and maintain operations procedures and limits		C	A	C	R

	Organizational Group				
	Organizational Accountability	Operational Control	Technical Responsibility		
	Example Roles				
	Accountable Executive (Corporate Owner)	Operations Manager	Dam Safety Responsible Engineer (DSRE)	Engineer of Record (EOR)	Design Engineer (DE)
Operate and maintain dam safely in accordance with specifications, regulation and license, to meet QPOs	A	R	S	S	
Surveillance and Reporting					
Develop and maintain surveillance procedures		I	A	C	R
Conduct surveillance and assess dam performance including monitoring QPOs		S	A	R	C
Report on Dam Safety Inspections		S	A	R	I
Prepare and submit regulatory compliance reports	A	I	R	S	I
Report dam safety occurrences to Regulator	A	S	R	S	
Respond to occurrences, investigate and correct issues		A	C	R	C
Emergency Preparedness and Response					
Assess and control public safety and access risks	A	R	S	S	
Prepare dam breach and inundation maps			A	R	S
Prepare, distribute and maintain Emergency Preparedness Plans (EPPs)		A	S	R	
Prepare and test Emergency Response Plans (ERPs) with stakeholders	A	R	S	S	
Decommissioning and Closure					
Prepare decommissioning and closure plan	A	R	C	C	S
Obtain regulatory approval for decommissioning and closure plan	A	R	S	S	
Risk, Documentation and Review					
Perform dam safety risks analysis	A	S	C	R	
Maintain design, construction, operations, maintenance and surveillance records	A	S	C	R	
Conduct Dam Safety Reviews (DSRs)	A	S	C	R	
Address DSR and Review Board recommendations	A	S	C	R	

TABLE 2: SMALL ORGANIZATION, FEW DAMS, LIMITED INTERNAL RESOURCES

In this example, the DSRE, EOR and DE roles are combined within an external consultant.

	Organizational Group		
	Organizational Accountability	Operational Control	Technical Responsibility
	Example Roles		
	Accountable Executive (Corporate Owner)	Operations Manager	Engineer of Record (EOR)
Organizational			
Set dam safety policy	A		R
Develop and maintain the dam safety management system	A	S	R
Implement the dam safety management system	A	R	C
Coordinate departments with dam safety roles	R		I
Ensure qualified people undertake work	R		I
Provide technical oversight to manage dam safety risks	A		R
Commission and implement an Independent Review Board	A	S	R
Investigation and Design			
Site investigation using qualified people and appropriate methods	A		R
Prepare design report and construction drawings	A		R
Document design basis, QPOs and expected performance	A	C	R
Construction			
Provide resources to construct in accordance with design using appropriate materials and methods	A		R
Verify construction conformance with design	A		R
Maintain construction and performance records	R		
Operations and Maintenance			
Develop and maintain operations procedures and limits	A	C	R
Operate and maintain dam safely in accordance with specifications, regulation and license, to meet QPOs	A	R	C

	Organizational Group		
	Organizational Accountability	Operational Control	Technical Responsibility
	Example Roles		
	Accountable Executive (Corporate Owner)	Operations Manager	Engineer of Record (EOR)
Surveillance and Reporting			
Develop and maintain surveillance procedures	A		R
Conduct surveillance and assess dam performance including monitoring QPOs	A	S	R
Report on Dam Safety Inspections	A	S	R
Prepare and submit regulatory compliance reports	A	I	R
Report dam safety occurrences to Regulator	R		I
Respond to occurrences, investigate and correct issues	A	S	R
Emergency Preparedness and Response			
Assess and control public safety and access risks	A	S	R
Prepare dam breach and inundation maps	A		R
Prepare, distribute and maintain Emergency Preparedness Plans (EPPs)	A	R	C
Prepare and test Emergency Response Plans (ERPs) with stakeholders	A	R	C
Decommissioning and Closure			
Prepare decommissioning and closure plan	A	S	R
Obtain regulatory approval for decommissioning and closure plan	A	R	C
Risk, Documentation and Review			
Perform dam safety risks analysis	A	S	R
Maintain design, construction, operations, maintenance and surveillance records	A	R	C
Conduct Dam Safety Reviews (DSRs)	A	R	C
Act on DSR (and Review Board, if present) recommendations	A	R	C