

## INTRODUCTION - Hazard and Failure Mode Analysis

The Dam Safety Review Engineer should be familiar with the 2007 CDA Technical Bulletin Number 5, “Dam Safety Analysis and Assessment”. In that bulletin, hazards are described as being either external or internal to the dam. External hazards are beyond the control of the dam owner, and originate outside the boundary of the dam and reservoir system. Internal hazards are errors and omissions in the design, operation and maintenance of the dam and water conveyance structures. A ‘failure mode’ describes how element or component failures must occur to cause loss of the system function. Please refer to Technical Bulletin Number 5 for further information

The accompanying Hazards and Failure Modes Matrix ([HFMM](#)), was created by BC Hydro for the safety analysis of their hydro electric dams. It was designed to be used for larger complex dams, but it can be used effectively for smaller dams. This matrix allows the DSR engineer to examine only the failure modes that apply to each specific dam. Analysis of failure modes for smaller dams will be reduced considerably. Please review the accompanying [instructions](#) “HAZARDS AND FAILURE MODES MATRIX (REVISION 8, 11-03-05)” before using the matrix. The accompanying Safety Analysis [Framework](#) “Fault Tree” is included to show the failure modes matrix in a different format which helps to explain the concept.

**Note:** The DSR Engineer may wish to use their own hazards and failure modes analysis process, or, create a simplified failure modes analysis using the failure modes identified in Section 3 of the “[Inspection & Maintenance of Dams](#)” guideline on the Dam Safety web site. Please note that failure due to dam management is not included in Section 3 of the *Inspection & Maintenance of Dams* guideline and it should be included with any failure modes analysis.