

Reference:

Loren R. Anderson. 2554. เอกสารประกอบการอบรม "การวิเคราะห์เพื่อออกแบบและประเมินความปลอดภัยเขื่อน", ระหว่างวันที่ 5,7 และ 8 เมษายน 2554, จัดโดย ศูนย์วิจัยและพัฒนาวิศวกรรมปฐพีและฐานราก มหาวิทยาลัยเกษตรศาสตร์ ร่วมกับ Thai Geotechnical Society (TGS), ณ โรงแรมมิราเคิล แกรนด์ คอนเวนชั่น, กรุงเทพฯ.

Typical Steps in a Dam Safety Risk Assessments

RAC Engineers & Economists

The overall approach to a Baseline dam safety risk assessment (RA) can be summarized by the following list of activities but they can vary according to specific project requirements:

- 1) Preparatory activities:
 - a) Agree on objectives, desired technical and other types of outcomes and decision criteria with client/regulator
 - b) Form RA Team: team leader, facilitator, core engineering team members and supporting team members
 - c) Collect pertinent data for review including plans and specifications, construction photos, construction documents, dam safety issue and periodic inspection reports, geology and geotechnical reports, emergency action plans, analysis reports, etc.
 - d) Conduct a survey (questionnaire) of field personnel concerning dam safety issues
 - e) Review of available information
- 2) RA Team Meeting 1: Potential Failure Modes Analysis (PFMA), Engineering Assessment and Design of Risk Assessment:
 - a) Review agreed objectives and decision criteria
 - b) Review the RA process
 - c) Review flood and earthquake loadings and identify the need for additional work to define load-frequency relationships for the RA
 - d) Review available information (detailed review before Team meeting)
 - e) Perform Engineering Assessment against standards/accepted good practice
 - f) Identify Potential Failure Modes (PFMs)
 - g) Classify PFMs as credible/non-credible and significant/non-significant for current RA
 - h) Formulate event trees risk models
 - i) Identify approach to SRP estimation and possible supporting analyses
 - j) Out brief to client management/regulator
- 3) Supporting analyses needed to inform the estimation of a) system response probabilities (SRPs) (the extent of these vary at the discretion of the client with advice from the RA Team):
 - a) Develop flood and earthquake loadings
 - i) Probable Maximum Flood determinations if needed
 - ii) Develop seismic hazard curves if necessary
 - iii) Develop peak stage flood frequency relationships
 - iv) Modify flood frequency relationships for spillway blocking, gate failure to open cases as needed
 - b) Develop various reservoir relationships
 - i) Develop overtopping stage-discharge relationships for existing dams with and without spillway blocking and gate failure to open cases as needed
 - ii) Account for performance of downstream dams in relation to discharges from and failure of upstream dams
 - iii) Develop stage-duration relationships
 - c) Supporting analyses for estimation of system response probabilities (e.g. stability analyses, seismic stability analyses)
 - d) Spillway gate reliability estimates as needed

- 4) RA Team Meeting 2: System Response Probability Estimation
 - a) Review and revise Engineering Assessment Ratings
 - b) Review and revise Potential Failure Modes
 - c) Review any additional available information
 - d) Estimate SRPs with team input/expert elicitation
 - e) Estimate breach parameters for each PFM
 - f) Estimate detection time and other factors affecting warning times for each PFM
 - g) Identify any additional supporting analyses to be conducted
 - h) Out brief to client management/regulator
- 5) Supporting analyses (the extent of these vary at the discretion of the client with advice from the RA Team):
 - a) Perform dam break modeling and inundation mapping
 - i) Develop flood routing cross sections
 - ii) Perform dam break studies for Flood and sunny day failure and No-failure cases for the main dams and other dam sections, including cascade failure cases)
 - b) Other supporting analyses as needed
- 6) Consequences estimation:
 - a) Life loss
 - b) Economic losses
 - c) Other as determined through discussion with the client with input from the RA Team
- 7) Risk assessment calculations and post-processing
 - a) Develop risk models
 - b) Conduct existing dams risk analysis
 - c) Evaluate existing dams against tolerable risk guidelines and other factors agreed with client
- 8) Draft final report
- 9) RA Team Meeting 3: Development of Findings and Recommendations
 - a) Presentation of RA details and results
 - b) Development of findings and recommendations by RA Team including the case for or against conducting a risk assessment of risk reduction measures
 - c) Out brief to client management/regulator
- 10) Finalize final report