Comments on State of Practice to Reduce Tailings Dam Risks

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DESIGN OF "SAFE" DAMS

- The principles of dam design have not substantially changed in the last 50 years – however:
  - On the "plus" side, we have: better site investigation tools, lab testing, modeling, instrumentation, increased knowledge of tailings properties and behaviour, and integration of environmental design with TSF design
  - On the "negative" side, we have: more tailings dams than trained engineers and scientists, increased reliance on data and models and less reliance on good judgement and critical thinking compartmentalization of specialities
    - Simple models help the designer shape their thought process: e.g. ARD loading estimates, water balance, river modeling, dam breach assessment
    - Design of TSFs requires integration and application of many technical and environmental areas, often particular to the setting , material available and storage requirements

WHY DO TAILING DAMS FAIL?

- Most failures are due to poor design – Too many designers do not know "what they don't know"
  - Poor unsupported logic – what is the evidence for the "story" design?
  - Use of poor data to support "models" and reliance on these models– not enough reality check with simple models

TAILINGS TECHNOLOGIES

- Conventional, High Density Thickened and Dewatered
- High density thickened
  - recovers about 10% more water in the process plant, versus at the dam, tailings slopes are a bit steeper
  - In situ tailings density is similar to conventional, tailings – they are still loose and potential liquefiable
  - Similar challenges as conventional for ARD management
- Filtered tailings:
  - Opportunities: Consequence of potential failure significantly reduced, water management mainly focused on surface water, closure can be easier
  - Challenges: not practical for large tonnage deposits in mountainous winter/wet settings; energy use for filter presses and transport; compaction of outer shells required for stability, ARD management still required

HOW TO MAKE TAILINGS DAMS SAFER

- Dams “fail” by: foundation weakness, dam structure deficiencies, overtopping, natural hazards, environmental release
- Continuous safety improvements: increase knowledge base of foundation, dam designs for tailings (not water dams),
- Simple robust designs with redundancy in the critical components
- Application of current best design practices