A global, standard approach to tailings, finally!

Amanda Adams* from Stantec discusses the new Global Industry Standard on Tailings Management and what it means for the mining sector

Only 19 months after the January 25, 2019 tailings dam failure in Brazil, a global tailings standard has been released. During the August 5, 2020, official on-line launch of the Global Industry Standard on Tailings Management, moderator Antonia Mihaylova announced that more than 2,000 participants had joined. This number represents only a fraction of the people who contributed to the development of the Standard, and an even smaller fraction of the people and companies who will ultimately be impacted by it.

Stantec's tailings team has been anxiously anticipating the release of the Standard because it will impact both new and existing projects. Yet during the call, any discussion of the technical specifics was overshadowed by a deeply emotional presentation from the guest speaker, Angelica Amanda Andrade, Community Representative from Brumadinho. She eloquently and passionately shared how the loss of her sister and the other fatalities impacted her, her family and the entire Brumadinho community. Her testament reinforced why this Standard is so important. Her words "economic recovery is possible, life recovery isn't" were a stark reminder of why the Standard was created and what lies behind it in human terms.

What guidance is covered in the Standard?

With that perspective the Stantec tailings team took a fresh look at the Standard. One of the most impressive, and complex, aspects of the Standard is its global nature. Before now there have been country-specific standards, such as CDA, MAC and ANCOLD – all which are internationally recognised – this marks the first time that a truly global standard is available. It is divided into six topics; I: Affected Communities, II: Integrated Knowledge Base, III: Design, Construction, Operation and Monitoring of the Tailings Facility, IV: Management and Governance, V: Emergency Response and Long-Term Recovery and VI: Public Disclosure and Access to Information. There are 15 Principles contained in the Standard, with specific requirements under each Principle. Topic III contains four Principles:

- Principle 4: Develop plans and design criteria for the tailings facility to minimise risk for all phases of its lifecycle, including closure and post-closure.
- Principle 5: Develop a robust design that integrates the knowledge base and minimises the risk of failure to people and the environment for all phases of the tailings facility lifecycle, including closure and post-closure.
- Principle 6: Plan, build and operate the tailings facility to manage risk at all phases of the tailings facility lifecycle, including closure and post-closure.
- Principle 7: Design, implement and operate monitoring systems to manage risk at all phases of the facility lifecycle, including closure.

How does the Standard differ from current practice?

At first glance this is incredibly simple – just plan, design, build, operate and monitor the tailing storage facility (TSF) so risks to people and the environment are managed at all phases of the facility lifecycle. At Stantec this is common practice on our projects. There are some key differences, such as the Flood Design Criteria and Seismic Design Criteria. For the Low and Significant consequence categories the design criteria are higher than existing Canadian Dams Association (CDA) guidance. The High classification is similar. The criteria for Extreme Consequence facilities is the 1/10,000 year storm and earthquake.

For those expecting to see the Maximum Credible Earthquake (MCE) as the seismic criteria there is a footnote which says "selection of the design ground motion should consider the seismic setting and the reliability and applicability of the probabilistic and deterministic methods. The MCE is part of a deterministic approach that can govern in some areas." The Standard also explains that "Maximum Probable Precipitation" (PMP) or "Probable Maximum Flood" (PMF) are terms sometimes used to denote extreme hydrological events. The concepts of PMP and PMF are acceptable for assigning flood loading if they meet, or exceed, the requirements above for Extreme Consequence Classification. This will become very relevant for existing facilities with Very High or Extreme Consequence classification which have been designed using the PMP and MCE, and now need studies to evaluate the 1/10,000 storm to see if the design PMP is higher. Specific clarification on which areas are governed by the deterministic approach is not provided.

There is also a new requirement which states that if a classification other than Extreme is used for design, "the feasibility, at a proof of concept level, to upgrade to the design for the

'Extreme' classification criteria [must be] maintained throughout the tailings facility lifecycle." For existing facilities that do not have the ability to be upgraded to Extreme, the Engineer of Record (EOR), with review by the Internal Technical Review Board (ITRB) or a senior independent technical reviewer, if they determine that the upgrade in design criteria is not feasible or cannot be retroactively applied – "In this case, the Accountable Executive shall approve and document the implementation of measures to reduce both the probability and the consequences of a tailings facility failure in order to reduce the risk to a level as low as reasonably practicable (ALARP)." This is a protective measure for future community development near a mine. A mine site that is isolated at the start of a project may develop a substantial population downstream of the tailings dam after the project site has been selected. The successful implementation of this standard will require diligent attention, by all parties, and frequent assessment of the risks to maintain the level of transparency envisioned by the Standard.

What are the key roles described in the Standard?

Table 4 summarises the key roles and functions mentioned in the standard. Requirement 9.1 of the Standard explains that the owner should engage an engineering firm with expertise and experience in the design and construction of tailings facilities of comparable complexity. This is different from some previous debates within the industry about whether the EOR should be defined as a person or a company. The Standard defines the EOR representative as a "senior engineer, approved by the Operator, to represent the firm as the EOR, and verify that the individual has the necessary experience, skills and time to fulfill this role."

No specific requirements for engineering discipline, degree, or number of years of experience have been provided. The Standard also states that "alternatively, the Operator may appoint an in-house engineer with expertise and experience in comparable facilities as the EOR and the EOR may delegate the design to a firm ('Designer of Record')." We know that this model is common practice in some regions, such as the Alberta oil sands. It is clear that some flexibility has been built into the Standard to maintain the status-quo of some areas and regions. For example, the Standard also states that "in some highly-regulated jurisdictions, notably Japan, the role of EOR is undertaken by the responsible regulatory authorities."

Frequent reviews are a recurring theme in the Standard, and there is a requirement for Dam Safety Reviews (DSR) which may be new to some projects. A DSR must be carried out by an independent qualified review engineer to evaluate the safety of a tailings facility against failure modes, in order to make a statement of safety of the facility. The requirement states that an independent DSR must be conducted at least every five years for facilities classified as Very High or Extreme, and at least every 10 years for all other facilities. The DSR includes governance and operational aspects, as well as technical review of the facility. Additionally, the DSR contractor (not just the individual engineer, but the entire company) cannot conduct consecutive DSRs on the same facility.

These DSRs are in addition to the annual (or more frequent) reviews by the EOR, internal audits, regular reviews of the management systems (every three years for High, Very High and Extreme) and multi-disciplinary risk assessments that are done at a minimum of every three years. It will be imperative that consultants and engineering companies carefully track their previous DSRs and identify potential conflicts of interest when taking on this type of work because they must certify in writing that they "follow best practices for engineers in avoiding conflicts of interest."

What does the Standard mean for the industry?

This is an exciting time for the mining industry and the engineers and operators who contribute to the tailings practice. The bar has clearly been set high by the co-conveners of the Global Tailings Review in an effort to protect people from being impacted by the failures. The industry is doing good work and needs to do better across the board to meet the goal of zero harm. This Standard provides a great framework, it can be fit-for purpose. The industry's technical experts will be stretched thinner than ever before in order to meet the oncoming tidal wave of demand.

The Standard is available on the Global Tailings Review website: *https://globaltailingsreview.org/global-industry-standard/.*

**Amanda Adams is a Principal Tailings Engineer and Project Manager at Stantec. She is based in Denver, Colorado and can be reached at amanda.adams@stantec.com*

Key Role	Function Items listed below are either expressly requested in the Standard OR are listed against those roles which typically undertake these activities. It is understood that this may vary depending on the operation.
Responsible Tailings Facility Engineer (RTFE)	• Accountable for the integrity of the *tailings facility* (Requirement 8.5). • Responsible for liaising with *EOR*, operations, planning, regulatory affairs, social performance and environment teams (Requirement 8.5). • Responsible for implementation of the design. • Accountable for the establishment of a *change management system* (Requirement 6.5). • Responsible for the monitoring system and communication of the results to the *EOR*, including performance reviews (Requirements 7.2, 7.3). • Responsible, with the *EOR*, for the *Construction Records Report* (Requirement 6.3). • Responsible for the *OMS Manual* (Requirement 6.4).
Engineer of Record (EoR)	• Responsible for the *Design Basis Report* (Requirement 4.8). • Responsible for the design (Requirement 9.1). • Responsible for the design report. • Responsible for construction and performance reviews (Requirement 10.4). • Responsible for the *Deviance Accountability Report* (Requirement 6.5). • Responsible, with the *RTFE*, for the *Construction Records Report* (Requirement 6.3). • Support the *RTFE* on the *OMS Manual* (Requirement 6.4).
Accountable Executive	• Accountable for the safety of the *tailings facility* and for environmental and social performance (Requirements 7.1, 8.2, 8.3, 8.4). • Approval of the adopted design criteria and measures to reduce the risk of failure of existing facilities to *ALARP* (Requirements 4.3, 4.7, 5.7). • Accountable for *tailings* management training, emergency preparedness and response (Requirement 8.4). • Selection of the *RTFE* (Requirements 8.5, 8.6) and the *EOR* (Requirements 9.1 to 9.5, 8.6). • Appointment of the *ITRB* or a *senior independent technical reviewer* (Requirement 8.7). • Establishment of a process for addressing concerns (Requirement 12.1).
Independent Tailings Review Board (ITRB) or senior technical reviewer	• Review of the design, construction, risk assessments, *governance* systems and other risk management matters that can affect the *tailings facility*, ensuring that the required expertise and skill sets are involved. • Review of the adopted external loading design criteria and measures to reduce the risk of failure of existing facilities to *ALARP* (Requirements 4.2, 4.7, 5.7). • Review of the *alternatives analysis* (Requirement 3.2), design, construction, risk assessments (Requirements 10.1), governance systems and other risk management matters (Requirement 10.6) that can affect the *tailings facility*. • Review the *Design Basis Report* (Requirement 4.8). • Determine the frequency of *Dam Safety Review* (Requirement 10.5).

Table 4: Summary of Key Roles and Functions mentioned in the Standard