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Audrey Hackett
Global Tailings Review – Stakeholder Engagement

Thank you for the opportunity to review and comment on the draft Standard, which is an important step towards improved safety of tailings storage facilities. We support the overall intent and application of the draft Standard. Further, we commend the Panel for the preparation of a comprehensive, high-value document in a very short timeframe.

We understand the Panel is aware that the draft Standard includes minor errors and inconsistencies and it is a work in progress as noted by Dr. Oberle at the feedback session in Perth, Western Australia on 9 December 2019. Therefore, we intend not to provide a list of specific, technical comments. Instead, we have identified and presented solutions to two overarching issues that would lead to an increased likelihood of catastrophic failures of large tailings facilities.

Our primary concern is the already limited technical resources existent in the global tailings industry, which the Standard would indirectly reallocate. This relocation will a have wider, deleterious impact on tailings storage facility (TSF) safety which may not be initially apparent. Our second concern is the ability for the draft Standard, as presented, to be verifiable and auditable.

Impact of resources reallocation

Due to the maturing nature of the global tailings industry and other market pressures, there are insufficient resources to meet the roles nominated by the draft Standard for the design, review and management of TSFs. The draft Standard places further stress on the resource pool by appearing to indicate that Operators seek the most skilled and experienced individuals for the roles nominated by the draft Standard, regardless of the potential consequences posed by TSF. Further, the draft Standard presents an arguably onerous fall-back position that all TSFs should be assigned an Extreme consequence category unless proven otherwise.

Most TSFs would have the “potential for impactful flow failure” given certain failure conditions, which would automatically result in an Extreme consequence rating under the draft Standard, irrespective of the true consequences of the TSF failure. The limited technical resource pool with the suitable capabilities to manage an Extreme consequence TSF would then be distributed across more facilities, many with lower true consequences of failure. A sudden increase in the demand for these resources, as required by the draft Standard, would exacerbate this issue.

In the best-case scenario, this resource reallocation and spreading would be equal across the increased number of Extreme consequence TSFs. However, in practice this resource reallocation would be uneven. Larger, more resourced Operators will have the capacity to attract the individuals in the industry who are truly suitably qualified and skilled to fulfil roles prescribed in the draft Standard including EoRs, ITRBs, Designers of Record and Senior Technical Reviewers. This will force the smaller Operators and non-ICMM members to engage the less capable resources from the depleted resource pool for their TSFs, which may include TSFs with an Extreme consequence category.

Invariably, there will be personnel vastly lacking the required experience and capabilities managing true Extreme consequence TSFs. In either case, **the result of the draft Standard application will be a net increase in overall risk of TSF failures globally**.

Additionally, the larger Operators may divest projects with true Extreme consequence TSFs to a smaller organisation and non-ICMM members with a less mature safety management to limit their risk exposure. This will further elevate the overall risk of TSF failures globally.

When Standard is not a standard

The formal definition of a “standard” from the International Organization for Standardization (ISO) is “*a document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context.”*

All standards must be precise, consistent and unambiguous such that compliance with the implemented standard is verifiable and auditable through objectively measured data and processes. The draft Standard includes an Implementation section, however, the implementation requirements are only outlined in generic terms and we understand the Panel is not going to be involved in the implementation phase.

Numerous requirements in the draft Standard use unquantifiable or subjective terms and measures such as “the fullest extent possible”, “conservative design criteria”, “best practices”, “robust design” and others. Although some of these terms are included in the glossary, the definitions are lacking clarity and compliance against these requirements cannot be objectively measured or verified.

Besides the internal issues within the ICMM community, the inability to objectively verify compliance with the Standard will have severe legal implications. For example, proving that the design was “robust” or sufficient actions were taken to limit the facility failure to “the fullest extent possible” would be problematic, if not impossible.

The requirements of the draft Standard will form part of contracts between ICMM members and contractors (including consultants). Hence, even if the adoption of the Standard by the ICMM member was voluntary, the compliance with the Standard will become a contractual obligation for the other party.

Furthermore, elements of the draft Standard are inconsistent and contradictory. There are many references to reducing or minimizing risks, however the term “risk” itself is not defined except for Major Hazard Risk definition, which in itself is a confusing term. The terms “consequence”, “risk” and “hazard” are used interchangeably, even though they have prescribed, exact and different definitions.

An example of a contradiction in the draft Standard is use of the “fall-back” Extreme consequence classification in conjunction with assignment of consequence classification based on the incremental losses described in the consequence category matrix. The losses described in the matrix are typically the result of a “flow failure”. However, the Standard requires that where there is “potential for impactful flow failure” an Extreme consequence classification be assigned as a fall-back position. This contradiction inadvertently eliminates the allocation of lower than Extreme consequence classifications for a vast majority of TSFs.

Due to lack of precision, inconsistencies and contradictions, the **draft Standard does not fulfil the requirements of a standard** and compliance with the Standard’s requirements is not verifiable or auditable.

Our suggestions

We fully support the intent and key principles of the presented Standard, in particular the use of a consequence-based framework to scale the design loading requirements for all TSFs. We believe that the Panel can extend the consequence-based framework to scale the required personnel experience and capabilities to avoid the undesirable outcomes outlined in this letter. This can be further extended to cover all aspects of TSF management, including TSF safety documentation requirements as suggested in the attached paper.

Under the system described in the paper, all TSFs will still require the defined roles to be appointed in some form, however, the required capabilities for these roles would be scaled based on the consequence classification of the TSF. Attached is an example of a personnel / requirements matrix for consideration.

The scaling of capability requirements would help reduce the resourcing shortage that the tailings industry will face moving forward and which the Standard will indirectly exacerbate.

Also enclosed is a similar matrix that defines the minimum requirements for TSF safety documentation that should be expected for all TSF. Similar to the roles, the requirements for the documents are scaled based on the TSF consequence classification. This matrix would replace a number of specific actions included in the draft Standard, further streamlining the document.

The minimum required personnel capability matrix and the minimum required documentation matrix would be clear, coherent and include quantifiable measures for what is expected with regards to personnel and documentation. The Standard would then comply with the minimum requirements for a standard: clarity, consistency and auditability.

To truly align with a consequence-based framework, we suggest the fall-back Extreme classification of TSFs be maintained for TSFs where the consequences of failure are unclear or for which the consequence classification has not been assessed and assigned.

The draft Standard is silent on the topic of seepage from tailings storage facilities. Seepage may have and have already had, in several cases, a devastating impact on the society and the environment. Seepage of a harmful leachate can be considered as a failure (defined as an uncontrolled release of tailings and water). Therefore, we believe the Standard should include the topic of seepage management.

As passionate and dedicated members of the tailings community, we offer our support and commendation to the Panel for the preparation of the draft Standard, and anticipate the completion of the Standard and the planning for its implementation.

Jiri Herza M.Sc, M.Eng, PhD Candidate

Member of ICOLD committee on Tailings and Waste Lagoons
Member of the working group for new ICOLD Tailings Safety Management Bulletin

Michael Ashley, BEng (Civil & Construction) (Hons)
Member of the Institution of Engineers Australia

James Thorp, BEng (Hons)

Ryan Singh, BEng (Civil), BCom

EXAMPLE CONSEQUENCE BASED MATRICES

Consequence-based matrix for the minimum requirements of an Engineer of Record (**example only**). A minimum requirements matrix will be required for each Nominated Role

Consequence Classification	Minimum Education	Minimum Experience	Minimum Affiliations
Low & Significant	Bachelor degree in Civil or Geotechnical Engineering (or equivalent)	5 years – TSF (appropriate to the height and type)	Member of relevant professional organisation (Engineers Australia, ICE, etc.)
High & Very High	Bachelor degree in Civil or Geotechnical Engineering (or equivalent)	10 years – TSF (appropriate to the height and type)	Member of relevant professional organisation (Engineers Australia, ICE, etc.)
Extreme	Masters degree in Civil or Geotechnical Engineering (or equivalent)**	15 years inter-national – Dams (appropriate to the height and type) across all key areas*	Member of relevant professional organisation (Engineers Australia, ICE, etc.) and industry organisation such as ANCOLD, ICOLD, BDS et. **

*Expert team assembled with minimum 3 persons to provide required experience across all key areas,
**For at least one member of the Expert Team

EXAMPLE TSF MANAGEMENT & DESIGN DOCUMENTATION BASED MATRICES

Consequence-based matrix for the minimum requirements of a Design Criteria document (**example only**). A minimum requirements matrix will be required for each required TSF management and design document

Consequence Classification	Geotechnical Inputs	Geotechnical Inputs	Stability Assessment
Low & Significant	Marked up regional geological map and cross section of the dam and its foundations.	Typical values confirmed by field and laboratory testing.	Simplified limit equilibrium assessment for drained and undrained conditions.
High & Very High	2D geological/geotechnical model of the site.	Stress-strain characteristics of materials taking part in dam stability. Periodically verified by field and laboratory tests.	Stress-strain analysis taking into account generation and dissipation of pore water pressures.
Extreme	3D geological/ geotechnical model of the site.	Stress-strain characteristics of materials taking part in dam stability. Periodically verified by field and laboratory tests.	Fully calibrated stress-strain analysis taking into account generation and dissipation of pore water pressures *

* For dams with contractive elements, it should be assumed that a trigger could exist for an undrained failure event