GlobalTailings Review.org

GLOBAL INDUSTRY STANDARD ON TAILINGS MANAGEMENT

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ICMM International Council on Mining & Metals

UN environment programme

PRI Principles for Responsible Investment

CONTENT

PREAMBLE

The Global Industry Standard on Tailings Management (herein 'the Standard') strives to achieve the ultimate goal of zero harm to people and the environment with zero tolerance for human fatality. It requires *Operators* to take responsibility and prioritise the safety of *tailings facilities*, through all phases of a facility's *lifecycle*, including closure and post-closure. It also requires the disclosure of relevant information to support public accountability.

Issues have arisen in the development of the Standard that are difficult to translate into an auditable industry Standard for *Operators*. These issues are more appropriately addressed through national and/or state level regulatory authorities, or through multilateral agencies working with the industry. For example, it is recognised that more work needs to be done by national and/or state level regulators to develop mechanisms that enable the identification, maintenance and/or *restoration* of abandoned or 'orphaned' *facilities*.

The Standard provides a framework for safe *tailings facility* management while affording *Operators* flexibility as to how best to achieve this goal. For auditing and certification purposes, the Standard includes the Preamble, the Requirements, the Glossary and Annexes. Unless otherwise specified, the Requirements of the Standard are directed to the *Operator*. The Requirements apply to individual facilities as defined in the Glossary, and are all intended to apply and be auditable.

Conformance with the Standard does not displace the requirements of any specific national, state or local governmental statutes, laws, regulations, ordinances, or other government directives. *Operators* are expected to conform with the Requirements of the Standard not in conflict with other provisions of law.

The Standard will be supported by implementation protocols which will provide detailed guidance for certification, or assurance as applicable, and for equivalence with other standards. Many activities referenced in this Standard may be found as part of a comprehensive mine-wide *environmental and social management system*. Where credible systems for assuring these requirements are already in place (such as third party audit or verification processes), these should be recognised as equivalent to avoid duplication, to the extent reasonably practicable.

Although the Standard follows a logical sequence arranged around broad topic areas, the Requirements are not presented chronologically. The Principles are intended to summarise the Requirements that follow and are not in themselves auditable. To reduce repetition, the disclosure requirements are grouped under Principle 15. These Requirements support public accountability and protect *Operators* from the need to disclose confidential commercial or financial information.

All terms that appear in *italics* are defined in the Glossary, Annex 1.

GLOBAL INDUSTRY STANDARD ON TAILINGS MANAGEMENT

ACRONYMS

CDIV	Construction versus Design Intent Verification
DBR	Design Basis Report
DSR	Dam Safety Review
EOR	Engineer of Record
EPRP	Emergency Preparedness and Response Plan
ESMS	Environmental and Social Management System
FPIC	Free Prior and Informed Consent
GTR	Global Tailings Review
ICMM	International Council on Mining and Metals
ICOLD	International Commission on Large Dams
IFC	International Finance Corporation
ITRB	Independent Tailings Review Board
OMS	Operations, Maintenance and Surveillance
PRI	Principles for Responsible Investment
RTFE	Responsible Tailings Facility Engineer
TARP	Triggered Action Response Plan
TMS	Tailings Management System
UNEP	United Nations Environment Programme
UNGP	United Nations Guiding Principles on Business and Human Rights

AFFECTED COMMUNITIES

TOPIC I

PRINCIPLE 1 RESPECT THE RIGHTS OF *PROJECT-AFFECTED PEOPLE* AND *MEANINGFULLY ENGAGE* THEM AT ALL PHASES OF THE *TAILINGS FACILITY LIFECYCLE*, INCLUDING CLOSURE.

Requirement 1.1 Demonstrate respect for human rights in accordance with the United Nations Guiding Principles on Business and Human Rights (UNGP), conduct human rights due diligence to inform management decisions throughout the *tailings facility lifecycle* and address the human rights risks of *tailings facility credible failure scenarios*.

For existing facilities, the *Operator* can initially opt to prioritise salient human rights issues in accordance with the UNGP.

Requirement 1.2 Where a new *tailings facility* may impact the rights of indigenous or tribal peoples, including their land and resource rights and their right to self-determination, work to obtain and maintain *Free Prior and Informed Consent (FPIC)* by demonstrating conformance to international guidance and recognised *best practice* frameworks.

Requirement 1.3 Demonstrate that *project-affected people* are *meaningfully engaged* throughout the *tailings facility lifecycle* in building the *knowledge base* and in decisions that may have a bearing on public safety and the integrity of the *tailings facility*. The *Operator* shall share information to support this process.

Requirement 1.4 Establish an effective operational-level, non-judicial *grievance* mechanism that addresses complaints and *grievances* of *project-affected people* relating to the *tailings facility*, and provide remedy in accordance with the UNGP.

INTEGRATED KNOWLEDGE BASE

TOPIC II

PRINCIPLE 2 DEVELOP AND MAINTAIN AN INTERDISCIPLINARY *KNOWLEDGE BASE* TO SUPPORT SAFE *TAILINGS* MANAGEMENT THROUGHOUT THE *TAILINGS FACILITY LIFECYCLE*, INCLUDING CLOSURE.

Requirement 2.1 Develop and document knowledge about the social, environmental and local economic context of the *tailings facility*, using approaches aligned with international *best practices*. Update this knowledge at least every five years, and whenever there is a *material* change either to the *tailings facility* or to the social, environmental and local economic context. This knowledge should capture uncertainties due to climate change.

Requirement 2.2 Prepare, document and update a detailed site characterisation of the *tailings facility* site(s) that includes data on climate, geomorphology, geology, geochemistry, hydrology and hydrogeology (surface and groundwater flow and quality), geotechnical, and seismicity. The physical and chemical properties of the *tailings* shall be characterised and updated regularly to account for variability in ore properties and processing.

Requirement 2.3 Develop and document a *breach analysis* for the *tailings facility* using a methodology that considers *credible failure modes*, site conditions, and the properties of the slurry. The results of the analysis shall estimate the physical area impacted by a potential failure. When flowable materials (water and liquefiable solids) are present at *tailings facilities* with Consequence Classification of 'High', 'Very High' or 'Extreme', the results should include estimates of the physical area impacted by a potential failure, flow arrival times, depth and velocities, and depth of material deposition. Update whenever there is a *material* change either to the *tailings facility* or the physical area impacted.

Requirement 2.4 In order to identify the groups most at risk, refer to the updated *tailings facility breach analysis* to assess and document potential human exposure and vulnerability to *tailings facility credible failure scenarios*. Update the assessment whenever there is a *material* change either to the *tailings facility* or to the *knowledge base*.

PRINCIPLE 3 USE ALL ELEMENTS OF THE *KNOWLEDGE BASE* - SOCIAL, ENVIRONMENTAL, LOCAL ECONOMIC AND TECHNICAL - TO INFORM DECISIONS THROUGHOUT THE *TAILINGS FACILITY LIFECYCLE*, INCLUDING CLOSURE.

Requirement 3.1 To enhance resilience to climate change, evaluate, regularly update and use climate change knowledge throughout the *tailings facility lifecycle* in accordance with the principles of *Adaptive Management*.

Requirement 3.2 For new *tailings facilities*, the *Operator* shall use the *knowledge base* and undertake a multi-criteria *alternatives analysis* of all feasible sites, technologies and strategies for *tailings* management. The goal of this analysis shall be to: (i) select an alternative that minimises risks to people and the environment throughout the *tailings facility lifecycle*; and (ii) minimise the volume of *tailings* and water placed in external *tailings facilities*. This analysis shall be reviewed by the *Independent Tailings Review Board (ITRB)* or a *senior independent technical reviewer.*

For existing *tailings facilities*, the *Operator* shall periodically review and refine the *tailings* technologies and design, and management strategies to minimise risk and improve environmental outcomes. An exception applies to facilities that are demonstrated to be in a state of *safe closure*.

Requirement 3.3 For new *tailings* facilities, use the *knowledge base*, including uncertainties due to climate change, to assess the social, environmental and local economic impacts of the *tailings facility* and its potential failure throughout its *lifecycle*. Where *impact assessments* predict *material* acute or chronic impacts, the *Operator* shall develop, document and implement impact mitigation and management plans using the *mitigation hierarchy*.

Requirement 3.4 Update the assessment of the social, environmental and local economic impacts to reflect a *material* change either to the *tailings facility* or to the social, environmental and local economic context. If new data indicates that the impacts from the *tailings facility* have changed *materially*, including as a result of climate change knowledge or long-term impacts, the *Operator* shall update *tailings facility* management to reflect the new data using *Adaptive Management best practices*.

DESIGN, CONSTRUCTION, OPERATION AND MONITORING OF THE TAILINGS FACILITY

TOPIC III

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.

Requirement 4.1 Determine the consequence of failure classification of the *tailings facility* by assessing the downstream conditions documented in the *knowledge base* and selecting the classification corresponding to the highest Consequence Classification for each category in Annex 2, Table 1. The assessment and selection of the classification shall be based on *credible failure modes*, and shall be defensible and documented.

Requirement 4.2 With the objective of maintaining flexibility in the development of a new *tailings facility* and optimising costs while prioritising safety throughout the *tailings facility lifecycle*:

A. Develop *preliminary designs* for the *tailings facility* with external loading design criteria consistent with both the consequence of failure classification selected based on current conditions and higher Consequence Classifications (including 'Extreme').

B. Informed by the range of requirements defined by the *preliminary designs*, either:

1. Implement the design for the 'Extreme' Consequence Classification external loading criteria; or
2. Implement the design for the current Consequence Classification criteria, or a higher one, and demonstrate that the feasibility, at a proof of concept level, to upgrade to the design for the 'Extreme' classification criteria is maintained throughout the *tailings facility lifecycle*.

C. If option B.2 is implemented, review the consequence of failure classification at the time of the *Dam Safety Review (DSR)* and at least every five years, or sooner if there is a *material* change in the social, environmental and local economic context, and complete the upgrade of the *tailings facility* to the new Consequence Classification as determined by the *DSR* within three years. This review shall proceed until the *tailings facility* has been *safely closed* according to this Standard.

D. The process described above shall be reviewed by the *Independent Tailings Review Board (ITRB)* or the *senior independent technical reviewer*, as appropriate for the *tailings facility* Consequence Classification.

Subject to Requirement 4.7, Requirements 4.2.C and 4.2.D shall also apply to existing *tailings facilities*.

Requirement 4.3 The *Accountable Executive* shall take the decision to adopt a design for the current Consequence Classification criteria and to maintain flexibility to upgrade the design for the highest classification criteria later in the *tailings facility lifecycle*. This decision shall be documented.

Requirement 4.4 Select, explicitly identify and document all design criteria that are appropriate to minimise risk for all *credible failure modes* for all phases of the *tailings facility lifecycle*.

Requirement 4.5 Apply design criteria, such as factors of safety for slope stability and seepage management, that consider estimated operational properties of materials and expected performance of design elements, and quality of the implementation of risk management systems. These issues should also be appropriately accounted for in designs based on deformation analyses.

Requirement 4.6 Identify and address brittle failure modes with conservative design criteria, independent of trigger mechanisms, to minimise their impact on the performance of the *tailings facility*.

Requirement 4.7 Existing *tailings facilities* shall conform with the Requirements under Principle 4, except for those aspects where the *Engineer of Record (EOR)*, with review by the *ITRB* or a *senior independent technical reviewer*, determines that the upgrade of an existing *tailings facility* is not viable 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)*. The basis and timing for addressing the upgrade of existing *tailings facilities* shall be risk-informed and carried out as soon as reasonably practicable.

Requirement 4.8 The *EOR* shall prepare a *Design Basis Report (DBR)* that details the design assumptions and criteria, including operating constraints, and that provides the basis for the design of all phases of the *tailings facility lifecycle*. The *DBR* shall be reviewed by the *ITRB* or *senior independent technical reviewer*. The *EOR* shall update the *DBR* every time there is a *material* change in the design assumptions, design criteria, design or the *knowledge base* and confirm internal consistency among these elements.

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.

Requirement 5.1 For new *tailings facilities*, incorporate the outcome of the multi-criteria *alternatives analysis* including the use of *tailings* technologies in the design of the *tailings facility*.

For expansions to existing *tailings facilities*, investigate the potential to refine the *tailings* technologies and design approaches with the goal of minimising risks to people and the environment throughout the *tailings facility lifecycle*.

Requirement 5.2 Develop a *robust design* that considers the technical, social, environmental and local economic context, the *tailings facility* Consequence Classification, site conditions, water management, mine plant operations, *tailings* operational and construction issues, and that demonstrates the feasibility of *safe closure* of the *tailings* facility. The design should be reviewed and updated as performance and site data become available and in response to *material* changes to the *tailings facility* or its performance.

Requirement 5.3 Develop, implement and maintain a water balance model and associated water management plans for the *tailings facility*, taking into account the *knowledge base* including climate change, upstream and downstream hydrological and hydrogeological basins, the mine site, mine planning and overall operations and the integrity of the *tailings facility* throughout its *lifecycle*. The water management programme must be designed to protect against unintentional releases.

Requirement 5.4 Address all potential failure modes of the structure, its foundation, abutments, reservoir (*tailings* deposit and pond), reservoir rim and appurtenant structures to minimise risk to *ALARP*. Risk assessments must be used to inform the design.

Requirement 5.5 Develop a design for each stage of construction of the *tailings facility*, including but not limited to start-up, partial raises and interim configurations, final raise, and all closure stages.

Requirement 5.6 Design the closure phase in a manner that meets all the Requirements of the Standard with sufficient detail to demonstrate the feasibility of the closure scenario and to allow implementation of elements of the design during construction and operation as appropriate. The design should include progressive closure and *reclamation* during operations.

Requirement 5.7 For a proposed new *tailings facility* classified as 'High', 'Very High' or 'Extreme', the *Accountable Executive* shall confirm that the design satisfies *ALARP* and shall approve additional *reasonable steps* that may be taken downstream, to further reduce potential consequences to people and the environment. The *Accountable Executive* shall explain and document the decisions with respect to *ALARP* and additional consequence reduction measures.

For an existing *tailings facility* classified as 'High', 'Very High' or 'Extreme', the *Accountable Executive*, at the time of every *DSR* or at least every five years, shall confirm that the design satisfies *ALARP* and shall seek to identify and implement additional *reasonable steps* that may be taken to further reduce potential consequences to people and the environment. The *Accountable Executive* shall explain and document the decisions with respect to *ALARP* and additional consequence reduction measures, in consultation with external parties as appropriate.

Requirement 5.8 Where other measures to reduce the consequences of a *tailings facility credible failure* mode as per the *breach analysis* have been exhausted, and pre-emptive resettlement cannot be avoided, the Operator shall demonstrate conformance with international standards for *involuntary resettlement*.

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

Requirement 6.1 Build, operate, monitor and close the *tailings facility* according to the design intent at all phases of the *tailings facility lifecycle*, using qualified personnel and appropriate methodology, equipment and procedures, data acquisition methods, the *Tailings Management System (TMS)* and the overall *Environmental and Social Management System (ESMS)* for the mine and associated infrastructure.

Requirement 6.2 Manage the quality and adequacy of the construction and operation process by implementing Quality Control, Quality Assurance and *Construction vs Design Intent Verification (CDIV)*. The *Operator* shall use the *CDIV* to ensure that the design intent is implemented and is still being met if the site conditions vary from the design assumptions.

Requirement 6.3 Prepare a detailed *Construction Records Report* ('as-built' report) whenever there is a *material* change to the *tailings facility*, its infrastructure or its monitoring system. The *EOR* and the *Responsible Tailings Facility Engineer (RTFE)* shall sign this report.

Requirement 6.4 Develop, implement, review annually and update as required an *Operations, Maintenance and Surveillance (OMS) Manual* that supports effective risk management as part of the *TMS*. The *OMS Manual* should follow *best practices*, clearly provide the context and *critical controls* for safe operations, and be reviewed for effectiveness. The *RTFE* shall provide access to the *OMS Manual* and training to all levels of personnel involved in the *TMS* with support from the *EOR*.

Requirement 6.5 Implement a formal *change management system* that triggers the evaluation, review, approval and documentation of changes to design, construction, operation or monitoring during the *tailings facility lifecycle*. The *change management system* shall also include the requirement for the *EOR* to prepare a periodic *Deviance Accountability Report (DAR)*, that provides an assessment of the cumulative impact of the changes on the risk level of the as-constructed facility. The *DAR* shall provide recommendations for managing risk, if necessary, and any resulting updates to the design, *DBR*, *OMS* and the monitoring programme. The *DAR* shall be approved by the *Accountable Executive*.

Requirement 6.6 Include new and emerging technologies and approaches and use the evolving knowledge in the refinement of the design, construction and operation of the *tailings facility*.

PRINCIPLE 7 DESIGN, IMPLEMENT AND OPERATE MONITORING SYSTEMS TO MANAGE RISK AT ALL PHASES OF THE FACILITY LIFECYCLE, INCLUDING CLOSURE.

Requirement 7.1 Design, implement and operate a comprehensive and integrated performance monitoring programme for the *tailings facility* and its appurtenant structures as part of the *TMS* and for those aspects of the *ESMS* related to the *tailings facility* in accordance with the principles of *Adaptive Management*.

Requirement 7.2 Design, implement and operate a comprehensive and integrated engineering monitoring system that is appropriate for verifying design assumptions and for monitoring potential failure modes. Full implementation of the *Observational Method* shall be adopted for non-brittle failure modes. Brittle failure modes are addressed by conservative design criteria.

Requirement 7.3 Establish specific and measurable performance objectives, indicators, criteria, and performance parameters and include them in the design of the monitoring programmes that measure performance throughout the *tailings facility lifecycle*. Record and evaluate the data at appropriate frequencies. Based on the data obtained, update the monitoring programmes throughout the *tailings facility lifecycle* to confirm that they remain effective to manage risk.

Requirement 7.4 Analyse technical monitoring data at the frequency recommended by the *EOR*, and assess the performance of the *tailings facility*, clearly identifying and presenting evidence on any deviations from the expected performance and any deterioration of the performance over time. Promptly submit evidence to the *EOR* for review and update the risk assessment and design, if required. Performance outside the expected ranges shall be addressed promptly through *Trigger Action Response Plans (TARPs)* or *critical controls*.

Requirement 7.5 Report the results of each of the monitoring programmes at the frequency required to meet company and regulatory requirements and, at a minimum, on an annual basis. The *RTFE* and the *EOR* shall review and approve the technical monitoring reports.

MANAGEMENT AND GOVERNANCE

TOPIC IV

PRINCIPLE 8 ESTABLISH POLICIES, SYSTEMS AND ACCOUNTABILITIES TO SUPPORT THE SAFETY AND INTEGRITY OF THE *TAILINGS FACILITY*.

Requirement 8.1 The *Board of Directors* shall adopt and publish a policy on or commitment to the safe management of *tailings facilities*, to emergency preparedness and response, and to recovery after failure.

Requirement 8.2 Establish a *tailings governance framework* and a performance based *TMS* and ensure that the *ESMS* and other critical systems encompass relevant aspects of the *tailings facility* management.

Requirement 8.3 For roles with responsibility for *tailings facilities*, develop mechanisms such that incentive payments or performance reviews are based, at least in part, on public safety and the integrity of the *tailings facility*. These incentive payments shall reflect the degree to which public safety and the integrity of the *tailings facility* are part of the role. Long-term incentives for relevant executive managers should take *tailings* management into account.

Requirement 8.4 Appoint one or more *Accountable Executives* who is/are directly answerable to the CEO on matters related to this Standard. The *Accountable Executive(s)* shall be accountable for the safety of *tailings facilities* and for avoiding or minimising the social and environmental consequences of a *tailings facility* failure. The *Accountable Executive(s)* shall also be accountable for a programme of *tailings* management training, and for emergency preparedness and response. The *Accountable Executive(s)* must have scheduled communication with the *EOR* and regular communication with the *Board of Directors*, which can be initiated either by the *Accountable Executive(s)*, or the *Board*. The *Board of Directors* shall document how it holds the *Accountable Executive(s)* accountable.

Requirement 8.5 Appoint a site-specific *Responsible Tailings Facility Engineer (RTFE)* who is accountable for the integrity of the *tailings facility*, who liaises with the *EOR* and internal teams such as operations, planning, regulatory affairs, social performance and environment, and who has regular two-way communication with the *Accountable Executive*. The *RTFE* must be familiar with the *DBR*, the design report and the construction and performance of the *tailings facility*.

Requirement 8.6 Identify appropriate qualifications and experience requirements for all personnel who play safety-critical roles in the operation of a *tailings facility*, including, but not limited to the *RTFE*, the *EOR* and the *Accountable Executive*. Ensure that incumbents of these roles have the identified qualifications and experience, and develop succession plans for these personnel.

Requirement 8.7 For *tailings facilities* with Consequence Classification of 'Very High' or 'Extreme', appoint an *Independent Tailings Review Board (ITRB)*. For all other facilities, the *Operator* may appoint a *senior independent technical reviewer*. The *ITRB* or the reviewer shall be appointed early in the project development process, report to the *Accountable Executive* and certify in writing that they follow *best practices* for engineers in avoiding conflicts of interest.

PRINCIPLE 9 APPOINT AND EMPOWER AN *ENGINEER OF RECORD*.

Requirement 9.1 Engage an engineering firm with expertise and experience in the design and construction of *tailings facilities* of comparable complexity to provide *EOR* services for operating the *tailings facility* and for closed facilities with 'High', 'Very High' and 'Extreme' Consequence Classification, that are in the active closure phase. Require that the firm nominate 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 fulfil this role. Alternatively, the *Operator* may appoint an in-house engineer with expertise and experience in comparable facilities as the *EOR*. In this instance, the *EOR* may delegate the design to a firm ('*Designer of Record*') but shall remain thoroughly familiar with the design in discharging their responsibilities as *EOR*. Whether the *EOR* or the *DOR* is in-house or external, they must be competent and have experience appropriate to the Consequence Classification and complexity of the *tailings facility*.

Requirement 9.2 Empower the *EOR* through a written agreement that clearly describes their authority, role and responsibilities throughout the *tailings facility lifecycle*, and during change of ownership of mining properties. The written agreement must clearly describe the obligations of the *Operator* to the *EOR*, to support the effective performance of the *EOR*.

Requirement 9.3 Establish and implement a programme to manage the quality of all engineering work, the interactions between the *EOR*, the *RTFE* and the *Accountable Executive*, and their involvement in the *tailings facility lifecycle* as necessary to confirm that both the implementation of the design and the design intent are met.

Requirement 9.4 Given its potential impact on the risks associated with a *tailings facility*, the selection of the *EOR* shall be decided by the *Accountable Executive* and informed, but not decided, by procurement personnel.

Requirement 9.5 Where it becomes necessary to change the *EOR* (whether a firm or an in-house employee), develop a detailed plan for the comprehensive transfer of data, information, knowledge and experience with the construction procedures and materials.

PRINCIPLE 10 ESTABLISH AND IMPLEMENT LEVELS OF REVIEW AS PART OF A STRONG QUALITY AND RISK MANAGEMENT SYSTEM FOR ALL PHASES OF THE *TAILINGS FACILITY LIFECYCLE*, INCLUDING CLOSURE.

Requirement 10.1 Conduct and update risk assessments with a qualified multi-disciplinary team using *best practice* methodologies at a minimum every three years and more frequently whenever there is a *material* change either to the *tailings facility* or to the social, environmental and local economic context. Transmit risk assessments to the *ITRB* or *senior independent technical reviewer* for review, and address with urgency all unacceptable *tailings facility* risks.

Requirement 10.2 Conduct regular reviews of the *TMS* and of the components of the *ESMS* that refer to the *tailings facility* to assure the effectiveness of the management systems. Document and report the outcomes to the *Accountable Executive*, *Board of Directors* and *project-affected people*. The review shall be undertaken by *senior technical reviewers* with the appropriate qualifications, expertise and resources. For *tailings facilities* with 'High', 'Very High' or 'Extreme' Consequence Classification, conduct the review at least every three years.

Requirement 10.3 Conduct internal audits to verify consistent implementation of company procedures, guidelines and *corporate governance* requirements consistent with the *TMS* and aspects of the *ESMS* developed to manage *tailings facility risks*.

Requirement 10.4 The *EOR* or *senior independent technical reviewer* shall conduct *tailings facility* construction and performance reviews annually or more frequently, if required.

Requirement 10.5 Conduct an independent *DSR* at least every five years for *tailings facilities* with 'Very High' or 'Extreme' Consequence Classifications and at least every 10 years for all other *facilities*. For *tailings facilities* with complex conditions or performance, the *ITRB* may recommend more frequent *DSRs*. The *DSR* shall include technical, operational and *governance* aspects of the *tailings facility* and shall be completed according to *best practices*. The *DSR* contractor cannot conduct consecutive *DSRs* on the same *tailings facility* and shall certify in writing that they follow *best practices* for engineers in avoiding conflicts of interest.

Requirement 10.6 For *tailings facilities* with 'Very High' or 'Extreme' Consequence Classifications, the *ITRB*, reporting to the *Accountable Executive* shall provide ongoing senior independent review of the planning, siting, design, construction, operation, water and mass balance, maintenance, monitoring, performance and risk management at appropriate intervals across all phases of the *tailings facility lifecycle*. For *tailings facilities* with other Consequence Classifications, this review can be done by a *senior independent technical reviewer*.

Requirement 10.7 The amount of estimated costs for planned closure, early closure, *reclamation*, and post-closure of the *tailings facility* and its appurtenant structures shall be reviewed periodically to confirm that adequate financial capacity (including insurance, to the extent commercially reasonable) is available for such purposes throughout the *tailings facility lifecycle*, and the conclusions of the review shall be publicly disclosed annually. Disclosure may be made in audited financial statements or in public regulatory filings.

Subject to the provisions of local or national regulations on this matter, *Operators* shall use best efforts to assess and take into account the capability of an acquirer of any of its assets involving a *tailings facility* (through merger, acquisition, or other change in ownership) to maintain this Standard for the *tailings facility lifecycle*.

PRINCIPLE 11 DEVELOP AN ORGANISATIONAL CULTURE THAT PROMOTES LEARNING, COMMUNICATION AND EARLY PROBLEM RECOGNITION.

Requirement 11.1 Educate personnel who have a role in any phase of the *tailings facility lifecycle* about how their job procedures and responsibilities relate to the prevention of a failure.

Requirement 11.2 Establish mechanisms that incorporate workers' experience-based knowledge into planning, design and operations for all phases of the *tailings facility lifecycle*.

Requirement 11.3 Establish mechanisms that promote *cross-functional* collaboration to ensure effective data and knowledge sharing, communication and implementation of management measures to support public safety and the integrity of the *tailings facility*.

Requirement 11.4 Identify and implement lessons from internal incident investigations and relevant external incident reports, paying particular attention to human and organisational factors.

Requirement 11.5 Establish mechanisms that recognise, reward and protect from retaliation, employees and contractors who report problems or identify opportunities for improving *tailings facility* management. Respond in a timely manner and communicate actions taken and their outcomes.

PRINCIPLE 12 ESTABLISH A PROCESS FOR REPORTING AND ADDRESSING CONCERNS AND IMPLEMENT WHISTLEBLOWER PROTECTIONS.

Requirement 12.1 The *Accountable Executive* shall establish a formal, confidential and written process to receive, investigate and promptly address concerns from employees and contractors about possible permit violations or other matters relating to regulatory compliance, public safety, *tailings facility* integrity or the environment.

Requirement 12.2 In accordance with international *best practices* for whistleblower protection, the *Operator* shall not discharge, discriminate against, or otherwise retaliate in any way against a whistleblower who, in good faith, has reported possible permit violations or other matters relating to regulatory compliance, public safety, *tailings facility* integrity or the environment.

EMERGENCY RESPONSE AND LONG-TERM RECOVERY

TOPIC V

PRINCIPLE 13 PREPARE FOR EMERGENCY RESPONSE TO *TAILINGS FACILITY* FAILURES.

Requirement 13.1 As part of the *TMS*, use *best practices* and emergency response expertise to prepare and implement a site-specific tailings facility *Emergency Preparedness and Response Plan (EPRP)* based on *credible flow failure scenarios* and the assessment of potential consequences. Test and update the *EPRP* at all phases of the *tailings facility lifecycle* at a frequency established in the plan, or more frequently if triggered by a *material* change either to the *tailings facility* or to the social, environmental and local economic context. *Meaningfully engage* with employees and contractors to inform the *EPRP*, and co-develop community-focused emergency preparedness measures with *project-affected people*.

Requirement 13.2 Engage with *public sector agencies*, first responders, local authorities and institutions and take *reasonable* steps to assess the capability of emergency response services to address the *hazards* identified in the *tailings facility EPRP*, identify gaps in capability and use this information to support the development of a collaborative plan to improve preparedness.

Requirement 13.3 Considering community-focused measures and *public sector* capacity, the *Operator* shall take all *reasonable steps* to maintain a shared state of readiness for *tailings facility credible flow failure scenarios* by securing resources and carrying out annual training and exercises. The *Operator* shall conduct emergency response simulations at a frequency established in the *EPRP* but at least every 3 years for *tailings facilities* with potential loss of life.

Requirement 13.4 In the case of a *catastrophic tailings facility failure*, provide immediate response to save lives, supply humanitarian aid and minimise environmental harm.

PRINCIPLE 14 PREPARE FOR LONG-TERM RECOVERY IN THE EVENT OF *CATASTROPHIC FAILURE*.

Requirement 14.1 Based on *tailings facility credible flow failure scenarios* and the assessment of potential consequences, take *reasonable steps* to *meaningfully engage* with *public sector agencies* and other organisations that would participate in medium- and long-term social and environmental post-failure response strategies.

Requirement 14.2 In the event of a *catastrophic tailings facility failure*, assess social, environmental and local economic impacts as soon as possible after people are safe and short-term survival needs have been met.

Requirement 14.3 In the event of a *catastrophic tailings facility failure*, work with *public sector agencies* and other *stakeholders* to develop and implement reconstruction, *restoration* and recovery plans that address the medium- and long-term social, environmental and local economic impacts of the failure. The plans shall be disclosed if permitted by public authorities.

Requirement 14.4 In the event of a *catastrophic tailings facility failure*, enable the participation of affected people in reconstruction, *restoration* and recovery works and ongoing monitoring activities.

Requirement 14.5 Facilitate the monitoring and public reporting of post-failure outcomes that are aligned with the thresholds and indicators outlined in the reconstruction, *restoration* and recovery plans and adapt activities in response to findings and feedback.

PUBLIC DISCLOSURE AND ACCESS TO INFORMATION

TOPIC VI

PRINCIPLE 15 PUBLICLY DISCLOSE AND PROVIDE ACCESS TO INFORMATION ABOUT THE *TAILINGS FACILITY* TO SUPPORT PUBLIC ACCOUNTABILITY.

Requirement 15.1 Publish and regularly update information on the *Operator's* commitment to safe *tailings facility* management, implementation of its *tailings governance framework*, its organisation-wide policies, standards or approaches to the design, construction, monitoring and closure of *tailings facilities*.

A. For new *tailings facilities* for which the regulatory authorisation process has commenced, or that are otherwise approved by the *Operator*, the *Operator* shall publish and update, in accordance with Principle 21 of the UNGP, the following information:

   1. A plain language summary of the rationale for the basis of the design and site selected as per the multi-criteria *alternatives analysis*, *impact assessments*, and mitigation plans (Information may be obtained from the output of multiple Requirements including, but not limited to, Requirements 3.2, 3.3, 5.1, 5.3, 6.4, 6.6, 7.1 and 10.1); and
   2. The Consequence Classification. (Requirement 4.1).

B. For each existing *tailings facility* and in accordance with Principle 21 of the UNGP, the *Operator* shall publish and update at least on an annual basis, the following information:

   1. A description of the *tailings facility* (information may be obtained from the output of Requirements 5.5 and 6.4);
   2. The Consequence Classification (Requirement 4.1);
   3. A summary of risk assessment findings relevant to the *tailings facility* (Information may be obtained from the output of Requirement 10.1);
   4. A summary of *impact assessments* and of human exposure and vulnerability to *tailings facility credible flow failure scenarios* (Information may be obtained from the output of Requirements 2.4 and 3.3);
   5. A description of the design for all phases of the *tailings facility lifecycle* including the current and final height (Information may be obtained from the output of Requirement 5.5);
   6. A summary of *material* findings of annual performance reviews and *DSR*, including implementation of mitigation measures to reduce risk to *ALARP* (Information may be obtained from output of Requirements 10.4 and 10.5);
   7. A summary of *material* findings of the environmental and social monitoring programme including implementation of mitigation measures (Requirement 7.5);
   8. A summary version of the *tailings facility EPRP* for facilities that have a *credible failure mode(s)* that could lead to a flow failure event that: (i) is informed by *credible flow failure scenarios* from the *tailings facility breach analysis*; (ii) includes emergency response measures that apply

to *project affected people* as identified through the *tailings facility breach analysis* and involve cooperation with *public sector agencies*; and (iii) excludes details of emergency preparedness measures that apply to the *Operator's* assets, or confidential information (Requirements 13.1 and 13.2);

9. Dates of most recent and next independent reviews (Requirement 10.5); and
10. Annual confirmation that the *Operator* has adequate financial capacity (including insurance to the extent commercially reasonable) to cover estimated costs of planned closure, early closure, *reclamation*, and post-closure of the *tailings facility* and its appurtenant structures (Requirement 10.7).

Such disclosures shall be made directly, unless subject to limitations imposed by regulatory authorities.

C. Provide local authorities and emergency services with sufficient information derived from the *breach analysis* to enable effective disaster management planning (Information may be obtained from the output of Requirement 2.3);

Requirement 15.2 Respond in a systematic and timely manner to requests from interested and affected *stakeholders* for additional information *material* to the public safety and integrity of a *tailings facility*. When the request for information is denied, provide an explanation to the requesting *stakeholder*.

Requirement 15.3 Commit to cooperate in credible global transparency initiatives to create standardised, independent, industry-wide and publicly accessible databases, inventories or other information repositories about the safety and integrity of *tailings facilities*.

GLOSSARY

ANNEX 1

Terms shown throughout the Standard appear in italics and are explained below.

Accountable Executive — One or more executive(s) who is/are directly answerable to the CEO on matters related to this Standard, communicates with the Board of Directors, and who is accountable for the safety of tailings facilities and for minimising the social and environmental consequences of a potential tailings facility failure. The Accountable Executive(s) may delegate responsibilities but not accountability.

Adaptive Management — A structured, iterative process of robust decision-making with the aim of reducing uncertainty over time via system monitoring. It includes the implementation of mitigation and management measures that are responsive to changing conditions, including those related to climate change, and the results of monitoring throughout the tailings facility lifecycle. The approach supports alignment on decisions about the tailings facility with the changing social, environmental and economic context and enhances opportunities to develop resilience to climate change in the short and long term.

As Low As Reasonably Practicable — ALARP requires that all reasonable measures be taken with respect to 'tolerable' or acceptable risks to reduce them even further until the cost and other impacts of additional risk reduction are grossly disproportionate to the benefit.

Alternatives Analysis — An analysis that should objectively and rigorously consider all available options and sites for mine waste disposal. It should assess all aspects of each mine waste disposal alternative throughout the project life cycle (i.e. from construction through operation, closure and ultimately long-term monitoring and maintenance). The alternatives analysis should also include all aspects of the project that may contribute to the impacts associated with each potential alternative. The assessment should address environmental, technical and socio-economic aspects for each alternative throughout the project life cycle.

Best Practices — A procedure that has been shown by research and experience to produce optimal results and that is established or proposed as a standard suitable for widespread adoption.

Board of Directors — The ultimate governing body of the Operator typically elected by the shareholders of the Operator. The Board of Directors is the entity with the final decision-making authority for the Operator and holds the authority to, among other things, set the Operator's policies, objectives, and overall direction and oversee the firm's executives. As the term is used here, it encompasses any individual or entity with control over the Operator, including, for example, the owner or owners. Where the State serves as the Operator, the Board of Directors shall be understood to mean the government official with ultimate responsibility for the final decisions of the Operator.

Breach Analysis	A study that assumes a failure of the tailings facility and estimates its impact. Breach Analyses must be based on credible failure modes. The results should determine the physical area impacted by a potential failure, flow arrival times, depth and velocities, duration of flooding, and depth of material deposition. The Breach Analysis is based on scenarios which are not connected to probability of occurrence. It is primarily used to inform emergency preparedness and response planning and the consequence of failure classification. The classification is then used to inform the external loading component of the design criteria.
Catastrophic Failure	A tailings facility failure that results in material disruption to social, environmental and local economic systems. Such failures are a function of the interaction between hazard exposure, vulnerability, and the capacity of people and systems to respond. Catastrophic events typically involve numerous adverse impacts, at different scales and over different timeframes, including loss of life, damage to physical infrastructure or natural assets, and disruption to lives, livelihoods, and social order. Operators may be affected by damage to assets, disruption to operations, financial loss, or negative impact to reputation. Catastrophic failures exceed the capacity of affected people to cope using their own resources, triggering the need for outside assistance in emergency response, restoration and recovery efforts.
Change Management System	Changes in projects are inevitable during design construction and operation and must be managed to reduce negative impacts to quality and integrity of the tailings facility. The impact and consequences of changes vary according to the type and nature of changes, but most importantly according to how they are managed. Managing changes effectively is crucial to the success of a project. A change management system has the objective of disciplining and coordinating the process, and should include an evaluation of the change, a review and formal approval of the change followed by detailed documentation including drawings and, where required, changes to equipment, process, actions, flow, information, cost, schedule or personnel.
Construction versus Design Intent Verification	Intended to ensure the design intent is implemented and still being met if the site conditions vary from the design assumptions. The CDIV identifies any discrepancies between the field conditions and the design assumptions, such that the design can be adjusted to account for the actual field conditions.
Construction Records Report	Describes all aspects of the 'as-built' product, including all geometrical information, materials, laboratory and field test results, construction activities, schedule, equipment and procedures, Quality Control and Quality Assurance data, CDIV results, changes to design or any aspect of construction, non-conformances and their resolution, construction photographs, construction shift reports, and any other relevant information. Instruments and their installation details, calibration records and readings must be included in the CRR. Roles, responsibilities and personnel, including independent review should be documented. Detailed construction record drawings are fundamental.
Corporate Governance	Refers to the organisational structures and processes that a company puts in place to ensure effective management, oversight and accountability.

Credible Failure Modes / Scenarios	Refers to technically feasible failure mechanisms given the materials present in the structure and its foundation, the properties of these materials, the configuration of the structure, drainage conditions and surface water control at the facility, throughout its lifecycle. Credible failure modes can and do typically vary during the lifecycle of the facility as the conditions vary. A facility that is appropriately designed and operated considers all of these credible failure modes and includes sufficient resilience against each. Different failure modes will result in different failure scenarios. Credible catastrophic failure modes do not exist for all tailings facilities. The term 'credible failure mode' is not associated with a probability of this event occurring and having credible failure modes is not a reflection of facility safety.
Critical Controls	A control that is critical to preventing a potential undesirable event or mitigating the consequences of such an event. The absence or failure of a critical control would disproportionately increase the risk despite the existence of the other controls.
Cross-functional	A system or a practice whereby people from different areas of an organisation share information and work together effectively as a team.
Dam Safety Review	A periodic and systematic process carried out by an independent qualified review engineer to assess and evaluate the safety of a dam or system of dams (or in this case a tailings facility) against failure modes, in order to make a statement on the safety of the facility. A safe tailings facility is one that performs its intended function under both normal and unusual conditions; does not impose an unacceptable risk to people, property or environment; and meets applicable safety criteria.
Design Basis Report	Provides the basis for the design, operation, construction, monitoring and risk management of a tailings facility.
Designer of Record	A qualified professional engineer designated by the Engineer of Record to design the tailings facility in the case where the Engineer of Record is an internal professional.
Deviance Accountability Report	Provides an assessment of the cumulative impact of changes to the tailings facility on the risk level of the achieved product and defines the potential requirement for updates to the design, DBR, OMS or the monitoring programme.
Emergency Preparedness and Response Plan	A site-specific plan developed to identify hazards, assess capacity and prepare for an emergency based on tailings facility credible flow failure scenarios, and to respond if it occurs. This may be part of operation-wide emergency response planning and includes the identification of response capacity and any necessary coordination with off-site emergency responders, local communities and public sector agencies. The development of the EPRP includes a community-focused planning process to support the co-development and implementation of emergency response measures by those vulnerable to a tailings facility failure.

Engineer of Record
The qualified engineering firm responsible for confirming that the tailings facility is designed, constructed, and decommissioned with appropriate concern for integrity of the facility, and that it aligns with and meets applicable regulations, statutes, guidelines, codes, and standards. The Engineer of Record may delegate responsibility but not accountability. In some highly-regulated jurisdictions, notably Japan, the role of EOR is undertaken by the responsible regulatory authorities.

Environmental and Social Management System
A methodological approach which draws on the elements of the established process of 'Plan, Do, Check, Act', and is used to manage environmental and social risks and impacts in a structured way in the short and longer term.

An effective ESMS, appropriate to the nature and scale of the operation, promotes sound and sustainable environmental and social performance, and can also lead to improved financial outcomes. The ESMS helps companies integrate the procedures and objectives for the management of social, environmental (and, local economic) impacts into core business operations, through a set of clearly defined, repeatable processes. An ESMS is a dynamic and continuous process initiated and supported by management, and involves engagement between the Operator, its employees and contractors, project-affected people and, where appropriate, other stakeholders. The interaction of the ESMS with the TMS facilitates alignment of decisions about the tailings facility with the changing social, environmental and local economic context and reflects the fact that a tailings facility is situated within a complex and dynamic local and global environment.

Free, Prior and Informed Consent
A mechanism that safeguards the individual and collective rights of indigenous and tribal peoples, including their land and resource rights and their right to self-determination. The minimum conditions that are required to secure consent include that it is 'free' from all forms of coercion, undue influence or pressure, provided 'prior' to a decision or action being taken that affects individual and collective human rights, and offered on the basis that affected peoples are 'informed' of their rights and the impacts of decisions or actions on those rights. FPIC is considered to be an ongoing process of negotiation, subject to an initial consent. To obtain FPIC, 'consent' must be secured through an agreed process of good faith consultation and cooperation with indigenous and tribal peoples through their own representative institutions. The process should be grounded in a recognition that the indigenous or tribal peoples are customary landowners. FPIC is not only a question of process, but also of outcome, and is obtained when terms are fully respectful of land, resource and other implicated rights.

Grievance
A perceived injustice, which may be based on law, contract, explicit or implicit promises, customary practice, or general notions of fairness of aggrieved communities.

Hazard
Any substance, human activity, condition or other agent that may cause harm, loss of life, injury, health impacts, loss of integrity of natural or built structures, property damage, loss of livelihoods or services, social and economic disruption, or environmental damage.

Impact Assessment
A decision-making and management support instrument for identifying, predicting, measuring and evaluating the impact of development proposals, both prior to major decisions being made, and throughout the lifecycle of a project. While impact assessments typically focus on a single project, assessments can be scoped at the landscape level, and consider strategic implications of a change. Depending on the context, the circumstances, and the issues at hand, impact assessments may be discipline-specific, or conducted as part of an integrated set of studies. Assessments can be conducted in advance of impacts, or retrospectively.

In this context, impacts are consequences to people, built infrastructure or the natural environment caused by a tailings facility or its failure, including impacts to the human rights of workers, communities, or other rights holders and including sensitive ecological receptors and ecosystem services. Impacts can be positive or adverse, tangible or intangible, direct or indirect, acute, chronic or cumulative, and measurable quantitatively or qualitatively.

Independent Tailings Review Board
A board that provides independent technical review of the design, construction, operation, closure and management of tailings facilities. The independent reviewers are third-parties who are not, and have not been directly involved with the design or operation of the particular tailings facility. The expertise of the ITRB members shall reflect the range of issues relevant to the facility and its context and the complexity of these issues. In some highly regulated jurisdictions, notably Japan, the role of ITRB is undertaken by the responsible regulatory authorities.

Involuntary Resettlement
Resettlement can be either voluntary or involuntary, and may involve either physical or economic displacement. Involuntary resettlement occurs when project-affected people do not have the right to refuse resettlement. This includes cases where a company has the legal right to expropriate land. Voluntary resettlement occurs when resettled households have a genuine choice to move. When the voluntary nature of resettlement cannot be confirmed, resettlement should be treated as involuntary.

Knowledge Base
The sum of knowledge required to support the safe management of a tailings facility throughout its lifecycle. The knowledge base has an iterative nature and needs to be updated as the need arises and the context changes. Fundamental elements would include a detailed site characterisation and baseline knowledge of the social and environmental context. As design, construction and performance monitoring proceeds additional data are collected and required and the knowledge base evolves.

Material (adj)
Important enough to merit attention, or having an effective influence or bearing on the determination in question. For the Standard, the criteria for what is material will be defined by Operator, subject to the provisions of local regulations, and evaluated as part of any audit or external independent assessment that may be conducted on implementation.

Meaningful Engagement	A process of mutual dialogue and decision-making whereby Operators have an obligation to consult and listen to stakeholder perspectives, and integrate those perspectives into their business decisions. Meaningful engagement involves measures to overcome structural and practical barriers to the participation of diverse and vulnerable groups of people. Strategies for addressing barriers must be appropriate to the context and the stakeholders involved, and may include, for example, logistics and other support to enable participation. Preconditions to meaningful engagement include: access to material information that can be reasonably understood; a structure that enables transparent communication; and accountability for engagement processes and outcomes.
Mitigation Hierarchy	Identifies a series of essential, sequential steps that Operators must follow through the project lifecycle in order to limit negative impacts and to enhance opportunities for positive outcomes. It describes a process to anticipate and avoid adverse impacts on workers, communities and the environment from a proposed action. Where avoidance is not possible, actions must be taken to minimise, and where residual impacts remain, to compensate fairly or offset for the risks and impacts.
Observational Method	A continuous, managed, integrated, process of design, construction control, monitoring and review that enables previously defined modifications to be incorporated during or after construction as appropriate. All of these aspects must be demonstrably robust. The key element of the Observational Method is the proactive assessment at the design stage of every possible unfavourable situation that might be disclosed by the monitoring programme and the development of an action plan or mitigative measure to reduce risk in case the unfavourable situation is observed. This element forms the basis of a performance-based risk management approach. The objective is to achieve greater overall safety. See Peck, R.B. (1969) "Advantages and Limitations of the Observational Method in Applied Soil Mechanics" Geotechnique 19, No2., pp.171-187.
Operations, Maintenance and Surveillance Manual	Describes the performance indicators and criteria for risk controls and critical controls, and the ranges of performance linked to specific pre-defined management actions. An OMS manual also describes the procedures for collecting, analysing and reporting surveillance results in a manner consistent with the risk controls and critical controls and that supports effective, timely decision-making. The link between OMS activities and critical controls management underscores the fact that it is essential that OMS Manuals be developed to reflect site-specific conditions and circumstances. An OMS Manual cannot be purchased 'off-the-shelf'. To be effective, it must be tailored to the site.
Operator	An entity that singly, or jointly with other entities, exercises ultimate control of a tailings facility. This may include a corporation, partnership, owner, affiliate, subsidiary, joint venture, or other entity, including any State agency, that controls a tailings facility.

Preliminary Design	For the purpose of Requirement 4.2 of the Standard , preliminary design is a design performed to a level of detail sufficient to determine the differences between viable designs that adopt different external loading design criteria in terms of required footprints, volumes and drainage requirements.
Project-affected People	People who may experience impacts from a tailings facility. People affected by a tailings facility may include, for example, people who live nearby; people who hear, smell or see the facility; or people who might own, reside on, or use the land on which the facility is to be located or may potentially inundate.
Public Sector Agencies	All governmental agencies at the State, regional, and/or local level with some responsibility or authority for regulating mining activities that occur within or impact their jurisdictions.
Reasonable Steps	Steps taken to achieve a specific objective such that any negative impact on people, social systems, environment, local economy or costs is not out of balance with the intended benefits.
Reclamation	The process of restoring the mine site to a natural or economically useable state as provided in a reclamation plan. Reclamation results in productive and sustainable landscapes to meet a range of conditions that might allow for biodiversity conservation, recreational or agriculture uses, or various forms of economic development.
Responsible Tailings Facility Engineer	An engineer appointed by the Operator to be responsible for the tailings facility. The RTFE must be available at all times during construction, operations and closure. The RTFE has clearly defined, delegated responsibility for management of the tailings facility and has appropriate qualifications and experience compatible with the level of complexity of the tailings facility. The RTFE is responsible for the scope of work and budget requirements for the tailings facility, including risk management. The RTFE may delegate specific tasks and responsibilities for aspects of tailings management to qualified personnel but not accountability.
Restoration	The process of assisting recovery of the social, environmental and local economic systems that have been degraded, damaged or destroyed.
Robust Design	The robustness of a tailings facility design depends on each particular situation and it may be associated with various aspects including, for example, the factor of safety against each of the potential failure modes, the presence or absence of materials with brittle behaviour, the degree of brittleness of these materials, the degree of variability of the materials and the potential for thresholds of deformation that materially affect the facility performance. The degree of robustness is related to the facility maintaining its overall integrity despite less than ideal performance of one or more of its components.
Safe closure	A closed tailings facility that does not pose ongoing material risks to people or the environment which has been confirmed by an ITRB or senior independent technical reviewer and signed off by the Accountable Executive.

Senior Independent Technical Reviewer	An independent professional with in-depth knowledge and at least 15 years' experience in the specific area of the review requirements, e.g. tailings design, operations and closure, environmental and social aspects or any other specific topic of concern. The independent reviewer is a third-party who is not, and has not been directly involved with the design or operation of the particular tailings facility.
Senior Technical Reviewer	A professional who is either an in-house employee or an external party with in-depth knowledge and at least 15 years' experience in the specific area of the review requirements, e.g. tailings design, operations and closure, environmental and social aspects or any other specific topic of concern.
Stakeholder	Persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, positively or negatively. Stakeholders may include workers, trade unions, project-affected people or communities and their formal and informal representatives, national or local government authorities, politicians, religious leaders, civil society organisations and groups with special interests, the academic community, or other businesses. Different stakeholders will often have divergent views, both within and across stakeholder groupings.
Tailings	A by-product of mining, consisting of the processed rock or soil left over from the separation of the commodities of value from the rock or soil within which they occur.
Tailings Facility	A facility that is designed and managed to contain the tailings produced by the mine. Although tailings can be placed in mined-out underground mines, for the purposes of the Standard, tailings facilities refer to facilities that contain tailings in open pit mines or on the surface ('external tailings facilities'). For the purposes of the Standard, tailings facilities are higher than 2.5 m measured from the elevation of the crest to the elevation of the toe of the structure, or have a combined water and solids volume more than 30,000 m3, unless the Consequence Classification is 'High', 'Very High' or 'Extreme', in which case the structure is considered a tailings facility regardless of its size. For the purposes of this Standard, existing tailings facilities are facilities that are accepting new mine tailings on the date that the Standard takes effect or not currently accepting new mine tailings but are not in a state of safe closure. All other facilities will be treated as New for the purposes of this Standard.

Tailings Facility Lifecycle	The phases in the life of a facility, which may occur in linear or cyclical succession, consisting of: 1. Project conception, planning and design; 2. Initial construction; 3. Operation and ongoing construction (may include progressive reclamation); 4. Interim closure (including care and maintenance); 5. Closure (regrading, demolition and reclamation); 6. Post-closure (including relinquishment, reprocessing, relocation, removal)
Tailings Governance Framework	A framework that focusses on the key elements of management and governance necessary to maintain the integrity of TSFs and minimise the risk of catastrophic failures. The six key elements of this TSF governance framework are: 1. Accountability, Responsibility and Competency; 2. Planning and Resourcing; 3. Risk Management; 4. Change Management; 5. Emergency Preparedness and Response; 6. Review and Assurance.
Tailings Management System	The site-specific TMS comprises the key components for management and design of the tailings facility and is often referred to as the 'framework' that manages these components. The TMS sits at the core of the Standard and is focused on the safe operation and management of the tailings facility throughout its lifecycle (see above). The TMS follows the well-established Plan-Do-Check-Act cycle. Each Operator develops a TMS that best suits their organisation and tailings facilities. A TMS includes elements such as: establishing policies, planning, designing and establishing performance objectives, managing change, identifying and securing adequate resources (experienced and/or qualified personnel, equipment, scheduling, data, documentation and financial resources), conducting performance evaluations and risk assessments, establishing and implementing controls for risk management, auditing and reviewing for continual improvement, implementing a management system with clear accountabilities and responsibilities, preparing and implementing the OMS and EPRP. The TMS, and its various elements, must interact with other systems, such as the environmental and social management system (ESMS), the operation-wide management system, and the regulatory system. This systems interaction is fundamental to the effective implementation of the Standard.
Trigger Action Response Plan	A TARP is a tool to manage risk controls, including critical controls. TARPs provide pre-defined trigger levels for performance criteria that are based on the risk controls and critical controls of the tailings facility. The trigger levels are developed based on the performance objectives and risk management plan for the tailings facility. TARPs describe actions to be taken if trigger levels are exceeded (performance is outside the normal range), to prevent a loss of control. A range of actions is pre-defined, based on the magnitude of the exceedance of the trigger level.

CONSEQUENCE CLASSIFICATION TABLES

ANNEX 2

Table 1: Consequence Classification Matrix

Dam Failure Consequence Classification	Incremental Losses				
	Potential Population at Risk	Potential Loss of Life	Environment	Health, Social and Cultural	Infrastructure and Economics
Low	None	None expected	Minimal short-term loss or deterioration of habitat or rare and endangered species.	Minimal effects and disruption of business and livelihoods. No measurable effect on human health. No disruption of heritage, recreation, community or cultural assets.	Low economic losses: area contains limited infrastructure or services. <US$1M.
Significant	1–10	Unspecified	No significant loss or deterioration of habitat. Potential contamination of livestock/fauna water supply with no health effects. Process water low potential toxicity. Tailings not potentially acid generating and have low neutral leaching potential. Restoration possible within 1 to 5 years.	Significant disruption of business, service or social dislocation. Low likelihood of loss of regional heritage, recreation, community, or cultural assets. Low likelihood of health effects.	Losses to recreational facilities, seasonal workplaces, and infrequently used transportation routes. <US$10M.
High	10–100	Possible (1–10)	Significant loss or deterioration of critical habitat or rare and endangered species. Potential contamination of livestock/ fauna water supply with no health effects. Process water moderately toxic. Low potential for acid rock drainage or metal leaching effects of released tailings. Potential area of impact 10 km^2 – 20 km^2. Restoration possible but difficult and could take > 5 years.	500-1,000 people affected by disruption of business, services or social dislocation. Disruption of regional heritage, recreation, community or cultural assets. Potential for short term human health effects.	High economic losses affecting infrastructure, public transportation, and commercial facilities, or employment. Moderate relocation/compensation to communities. <US$100M.
Very High	100–1,000	Likely (10 – 100)	Major loss or deterioration of critical habitat or rare and endangered species. Process water highly toxic. High potential for acid rock drainage or metal leaching effects from released tailings. Potential area of impact > 20 km^2. Restoration or compensation possible but very difficult and requires a long time (5 years to 20 years).	1,000 people affected by disruption of business, services or social dislocation for more than one year. Significant loss of national heritage, community or cultural assets. Potential for significant long-term human health effects.	Very high economic losses affecting important infrastructure or services (e.g., highway, industrial facility, storage facilities, for dangerous substances), or employment. High relocation/ compensation to communities. < US$1B.
Extreme	> 1,000	Many (> 100)	Catastrophic loss of critical habitat or rare and endangered species. Process water highly toxic. Very high potential for acid rock drainage or metal leaching effects from released tailings. Potential area of impact > 20 km^2. Restoration or compensation in kind impossible or requires a very long time (> 20 years).	5,000 people affected by disruption of business, services or social dislocation for years. Significant National heritage or community facilities or cultural assets destroyed. Potential for severe and/or long- term human health effects.	Extreme economic losses affecting critical infrastructure or services, (e.g., hospital, major industrial complex, major storage facilities for dangerous substances) or employment. Very high relocation/compensation to communities and very high social readjustment costs. >US$1B.

The intention of this guidance is to provide a consistent manner to establish minimum external loading design criteria for the safe design of *tailings facilities*. Alternative guidance exists, for example, by reputable national dam associations, which, in turn, form the basis of jurisdictional regulatory requirements. These alternative guidances can be considered by the *EOR*, *RTFE* and *ITRB* or independent technical reviewer and adopted, if appropriate and approved by the *Accountable Executive*.

There is a distinction between Operations and Post-Closure (also referred to as Passive Care Closure) where Operations involves all phases of construction and operation, periods of temporary cessation of operations, and the Closure phase (transition phase into post-closure also referred to as active care closure). Post-Closure refers to permanently closed facilities that have been configured for their perpetual form/state and thereby will be subjected to the maximum time of exposure irrespective of the Consequence Classification for the facility.

Table 2: Flood Design Criteria

Consequence Classification	Flood Criteria[1] – Annual Exceedance Probability	
	Operations and Closure (Active care)	Passive-Closure (Passive Care)
Low	1/200	1/10,000
Significant	1/1,000	1/10,000
High	1/2,475	1/10,000
Very High	1/5,000	1/10,000
Extreme	1/10,000	1/10,000

The term "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 facilities and/or facilities at the Post-Closure (or Passive Care Closure) phase.

Table 3: Seismic Design Criteria

Consequence Classification	Seismic Criteria[2,3] – Annual Exceedance Probability	
	Operations and Closure (Active care)	Passive-Closure (Passive Care)
Low	1/200[2]	1/10,000[2]
Significant	1/1,000[2]	1/10,000[2]
High	1/2,475[2]	1/10,000[2]
Very High	1/5,000[2]	1/10,000[2]
Extreme	1/10,000[2]	1/10,000[2]

1. For existing *tailings facilities* the *EOR*, with review by the *ITRB* or a *senior independent technical reviewer*, may determine that the upgrade to this 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)*. The basis and timing for addressing the upgrade of existing *tailings facilities* shall be risk-informed and carried out as soon as reasonably practicable (see Requirement 4.7).

2. The selection of the design ground motion should consider the seismic setting and the reliability and applicability of the probabilistic and deterministic methods for seismic *hazard* assessment. The Maximum Credible Earthquake (MCE) is part of a deterministic approach that can govern in some areas. The method that produces the most appropriate ground motion for the facility safety should be used for the design.

3. For existing *tailings facilities* the *EOR*, with review by the *ITRB* or a *senior independent technical reviewer*, may determine that the upgrade to this 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)*. The basis and timing for addressing the upgrade of existing *tailings facilities* shall be risk-informed and carried out as soon as reasonably practicable (see Requirement 4.7).

SUMMARY TABLES

ANNEX 3

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

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 5: Summary of Key Documents mentioned in the Standard

Key Documents	Description
Design Basis Report	Details the design assumptions and criteria, including operational constraints to provide a basis for all phases of the *tailings facility lifecycle*.
Design Report	Includes among other items: documentation of the relevant aspects of *knowledge base*, the consequence classification, multi-criteria *alternatives analysis*, water balance modelling, design analyses and evaluation of their results, design of all stages of the facility including monitoring requirements, construction requirements and specifications, operational constraints and construction drawings. The Design Report typically includes constuction drawings.
Construction Records Report	Includes among other items: survey data and drawings, field reports, QC and QA reports, *CDIV* reports, changes required during construction, drilling and field test data, instrumentation installation details and calibration reports, instrumentation monitoring data, description of field procedures and equipment, photographic records (Requirements 6.2, 6.3, 6.5).
Operation, Maintenance and Surveillance Manual	Provides the context and *critical controls* for the safe operation of the *tailings facility* to support effective risk management. Includes among other items: description of the facility, (Requirements 6.4, 6.5). It includes the *Trigger Action Response Plan (TARP)*.
Deviance Accountability Report	Provides an assessment of the cumulative impact of the individual changes assessed, approved and documented in the *change management system*, on the risk level of the as-constructed *tailings facility* and provides recommendations for managing the risk, if required.
Annual Performance Report	Provides the results of the annual performance review and typically includes results of visual inspection, instrumentation monitoring and assessment. Some *Operators* may conduct internal performance reports on a more frequent basis.
Dam Safety Review Report	Provides the results of a review of the safety of a *tailings facility* covering technical, operational and governance aspects, conducted by an independent technical specialist according to established *best practices*.
Emergency Preparedness and Response Plan (EPRP)	Provides a detailed, site-specific plan developed to identify *hazards* of the *tailings facility*, assess capacity internally and externally to respond, and prepare for an emergency and to respond if it occurs.
Impact Assessments and Mitigation Plans	Assessments of the social, environmental and local economic impacts from a *tailings facility* or its failure, and the associated impact mitigation and management plans.

Table 6: Summary of Levels of Review mentioned in the Standard

Key Documents	Description
Internal Reviews	Includes reviews of company processes, procedures, guidelines and *corporate governance* requirements and systems (including *TMS*, *ESMS*) (Requirement 10.3).
EoR Review	Engineering firms typically have internal review systems for all engineering work to manage the accuracy and quality of the technical product and provide mentoring and training to staff. This is also good practice for technical work done in-house by the *Operator* (Requirement 9.3).
Annual Performance Reviews	Conducted by the *EOR* or an independent reviewer. Regular performance reviews are typically mandated in many jurisdictions, often annually or twice a year. Some *Operators* may conduct internal performance reviews more frequently. These reviews typically involve visual inspection, review of construction and operation practices and review and assessment of the instrumentation monitoring data.
Dam Safety Review (DSR)	Independent review of the safety of a *tailings facility* covering technical, operational and governance aspects, conducted by an independent technical specialist according to established *best practices*. It should be conducted at intervals based on the Consequence Classification and the complexity of its condition or performance. It is regulatory requirement in many jurisdictions.
Independent Tailings Review Board (ITRB) or Senior Technical Reviewer	Provides ongoing senior independent review of the planning, siting, design, construction, operation, maintenance, monitoring, performance, risk management at appropriate intervals across all phases of the *tailings facility lifecycle* (Requirement 8.8).

Co-convened by the International Council on Mining and Metals (ICMM), United Nations Environment Programme (UNEP) and Principles for Responsible Investment (PRI), the Global Tailings Review has established a robust, fit-for-purpose international standard for the safer management of tailings storage facilities.

GlobalTailings Review.org

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