

1. Scope

This standard applies to all underground mining operations managed by Vedanta businesses and specifies mandatory requirements for all existing operations, new acquisitions, shafts and adits including those developed for exploration or mine construction purposes. This standard applies to all employees and business partners. The Guidance Note inflow and inundation of liquids provides additional guidance.

The objective of the standard is to eliminate the risk of fatalities and serious incidents resulting from any activities related to inflow and inundation of liquids in underground mines across Vedanta.

Inflow refers to natural and manmade inflows into the mine of liquids such as water, backfill or others, in quantities that are managed through a process. Inundation refers to an inflow in way or in quantities that have the potential to overcome the mine's capability to manage such an inflow.

2. People

The Mine Manager is responsible to ensure that all statutory duties as outlined in the mining legislation are strictly observed. The Mine Manager shall ensure that there are appropriate standards, procedures and systems in place for the management of inflows. The Mine Manager in conjunction with Authorized Person, must ensure that:

- 2.1. The management of liquids within the mine is clearly defined and assigned to a competent person(s).
- 2.2. An annual training programme is in place to ensure that all personnel are aware of the procedures for inflows and inundation of liquids.
- 2.3. All personnel who are employed in sections associated with water, backfill or other liquids are trained in the mine SOP for inundation and have the capability to act in accordance with the procedures in the event of an inundation.
- 2.4. All personnel are aware of the Emergency Response Standard, with regards to flooding and inundation of liquids including the location & knowledge of refuge stations, secondary egresses, fresh air ways, etc.

3. Process

The processes below shall be put into place:

- 3.1. Each operation must ensure that a Hazard Identification and Risk Assessment (HIRA) system is in place to ensure that all hazards for liquid inflows and potential inundation of liquids in the mine are assessed and appropriate controls are in place to ensure safe and sustainable operations. This shall be recorded on a risk register and the Mine Manager shall review and approve the risk register annually.
- 3.2. Systems associated with water inflows, backfill and other liquid inflows shall be designed by a competent person(s), and reviewed by external expert. Each system shall have additional capacity for inflows to take consideration for highs and lows and in addition to highs associated with seasonal variations. Excess capacity of 25% shall be available to account for the variations.
- 3.3. Barriers, dams, containment berms and any other means of returning liquids are designed and approved by a chartered structural or civil engineer.
- 3.4. Inflow management systems shall be audited annually.
- 3.5. The Manager shall develop a written strategy in consultation with the Chief Surveyor, Ventilation Manager and any other relevant officials, which consider the competence of overlying material the stability of the underground workings, and any bore holes and geological features. The cautionary zone for approaching the accumulation should be indicated on survey plans.
- 3.6. Management of inflows/inundations shall at least include in the SOP:
 - 3.6.1. Mine Service Water
 - 3.6.1.1. Reticulation system not exceeding safe working specifications of pumps and pipeline
 - 3.6.1.2. Shut off valves placed at main trunk lines

- 3.6.1.3. Procedure for emergency isolation ruptured pipelines or failed pumps
- 3.6.2. Mine Dewatering
 - 3.6.2.1. Mine Emergency Water Flooding Plan
 - 3.6.2.2. Designated Flood Areas
 - 3.6.2.3. Flood Management
- 3.6.3. Backfill
 - 3.6.3.1. Mine Emergency Backfill Inundation
 - 3.6.3.2. Emergency Stoppage
- 3.6.4. Planned maintenance programmes
- 3.6.5. Pump and sump management
- 3.6.6. Back-up pumps and pipelines
- 3.6.7. Warning and alarm systems
- 3.6.8. Plans in key areas
- 3.6.9. Barricades and signage
- 3.6.10. Action to be taken by persons immediately affected by an intrush, ensuring that this is part of initial and refresher training.
- 3.6.11. Summoning adequate rescue personnel.
- 3.6.12. Evacuation of persons.
- 3.6.13. Actions to be taken to manage the problem.
- 3.7. Monitoring systems shall be developed for potential inundations, based on the risk assessment carried out in the HIRA system. Monitoring shall include visual inspections and include local and remote instrumentation and shall be linked to warning and alarm systems.
- 3.8. If an inundation hazard is suspected, cease work and clear the area; take samples from an LHD bucket away from 'damp' draw point for fines and test for moisture content; and conduct a risk assessment with the engineer in charge and the Mine Manager before recommencing work.
- 3.9. Inspections shall include at least the following activities:
 - 3.9.1. The Shift supervisor shall inspect all draw points daily for signs of mud/water accumulation.
 - 3.9.2. At least fortnightly the Technical Services Group shall assess draw point for fines and moisture content by conducting moisture content sampling of draw points.
- 3.10. Emergency back-up electrical power shall be available to ensure that inundations due to power failures are mitigated.
- 3.11. Hydrogeological and hydrology studies shall be undertaken for any mine that has identified aquifers, rivers, lakes or other sources of water in the vicinity.
- 3.12. Backfill systems, installation and management processes shall be designed by competent person(s), who have expertise in the specific type of backfill being used. The backfill section/department shall be managed by an engineer who is specifically trained in all aspects of the process.

4. Review

- 4.1. The items included in this Standard must be reviewed annually by the mining, engineering and safety departments.



Andrew Lewin
Group Head HSE & Sustainability