

Hazard Identification and Risk Assessment (HIRA)

Mining Mineral Resources S.A.S

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Objective

The purpose of this Hazard Identification and Risk Assessment (HIRA) document is to systematically identify potential hazards in mining and processing activities, assess associated risks, and propose control measures to mitigate them. The document aligns with international safety, quality, and environmental standards, ensuring compliance and sustainability. The document shall be reviewed **annually** or upon significant process changes.

Risk Assessment Methodology

The assessment follows a structured approach:

1. **Hazard Identification:** Identifying all potential hazards across operations.
2. **Risk Evaluation:** Assessing likelihood (L) and severity (S) to determine risk rating (RR).
3. **Risk Control:** Implementing measures to mitigate risks based on priority.
4. **Residual Risk Assessment:** Evaluating risk after controls are in place.

Risk Rating Scale:

Likelihood (L)	Severity (S)	Risk Rating (RR)	Risk Level
Rare (1)	Insignificant (1)	1-6	Low Risk
Unlikely (2)	Minor (2)	7-12	Moderate Risk
Possible (3)	Moderate (3)	13-25	High Risk
Likely (4)	Major (4)		
Almost Certain (5)	Catastrophic (5)		

Risk Assessment Table

Process/Activity	Hazard	L	S	RR	Impact	Control Measures	ISO Standards
Mining (Tin, Tantalum, Tungsten)	Rockfalls, equipment failure	4	4	16	Injury, equipment damage	Install geotechnical monitoring (e.g., slope stability radar), use fall protection gear, routine equipment maintenance	ISO 45001:2018, ISO 9001:2015
	Dust inhalation (silica, arsenic)	4	4	16	Respiratory diseases	Install dust extraction, provide PPE, conduct periodic medical checkups, monitor air quality	ISO 14001:2015, ISO 45001:2018
	Manual lifting, repetitive tasks	2	3	6	Musculoskeletal disorders	Use lifting aids, job rotation, ergonomic training	ISO 45001:2018, ISO 9001:2015
Ore Processing (Crushing, Grinding, Separation)	High noise levels, vibration	4	4	16	Hearing loss, vibration syndrome	Install machine guarding, ear protection, noise assessments	ISO 45001:2018, ISO 9001:2015
	Chemical exposure (cyanide, acids)	4	4	16	Poisoning, environmental harm	Use spill containment, PPE, toxicological monitoring	ISO 14001:2015, ISO 45001:2018
	Extreme heat exposure	4	3	12	Heat stress, burns	Cooling systems, proper ventilation, scheduled breaks	ISO 45001:2018, ISO 9001:2015
Smelting/Refining	Molten metal exposure, fire risk	5	5	25	Burns, fatalities	Fire-resistant PPE, fire suppression systems, emergency response drills	ISO 45001:2018, ISO 9001:2015
	Toxic fumes (SO ₂ , CO)	4	4	16	Respiratory issues	Ventilation, gas detectors, periodic toxic exposure medical assessments	ISO 14001:2015, ISO 45001:2018
Transportation & Logistics	Vehicle accidents	4	4	16	Injury, damage	Safety training, vehicle maintenance, fatigue management protocols	ISO 45001:2018
	Heavy lifting injuries	2	3	6	Back pain, strains	Use forklifts, training on lifting techniques	ISO 45001:2018, ISO 9001:2015
Waste Management	Tailings contamination	4	4	16	Environmental damage	Controlled disposal, environmental monitoring, recycling or waste-to-energy integration	ISO 14001:2015, ISO 45001:2018
	Chemical residue exposure	3	4	12	Chronic health issues	Health surveillance, safe waste handling	ISO 14001:2015, ISO 45001:2018
Administrative Work	Poor ergonomics, eye strain	2	2	4	Discomfort, musculoskeletal issues	Ergonomic setups, screen breaks	ISO 45001:2018
	Work stress, mental health risks	3	3	9	Burnout, reduced productivity	Stress management programs, employee support	ISO 45001:2018

Key Control Measures and Safety Practices

- Personal Protective Equipment (PPE)
 - Mandatory use for mining, processing, and smelting activities.
 - Includes hard hats, respirators, protective clothing, and fire-resistant gear.
 - PPE inspections must be conducted **before each shift** with documented replacements.
- Training and Competency
 - Safety training for all employees, customized per job role.
 - Emergency drills (fire, spill response, first-aid) conducted **quarterly**.
 - Routine health monitoring for high-risk employees.

- Health and Safety Inspections
 - Daily machinery checks.
 - Environmental and air quality assessments **every six months**.
 - Workplace audits for compliance.
- Emergency & Incident Management
 - Incident reporting must occur **within 24 hours** of an event.
 - Response times defined: fire (5 minutes), chemical spills (10 minutes), major accidents (30 minutes).
 - Safety equipment (fire extinguishers, spill kits) must be **accessible at all workstations**.

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Revision Summary:

- Introduced structured document review frequency.
- Expanded risk validation and emergency response protocols.
- Added geotechnical monitoring details and medical checkups.
- Enhanced PPE, training, and environmental compliance standards.
- Defined response times for incidents.

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