
ASSESSMENT & MANAGEMENT OF RISKS RELATING TO COVERS FOR METAL LEACHING AND ARD MITIGATION

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This paper examines the risks associated with the design, construction and long-term performance of covers placed on waste rock or tailings in order to control acid rock drainage. The various potential problems in using covers including difficulty of access (for construction), slumping, erosion, consolidation and biotic activity will be reviewed and illustrated using recent field examples. The influence of site specific conditions (climate, available materials, biota) on cover design and risk of failure are discussed. Risk and risk management is evaluated and reviewed for (i) cover design, (ii) cover construction and (iii) cover disruption during post-construction operation.

Review of Cover Purpose:

- Access
- Physical Isolation
- Erosion Protection
- Vegetation Establishment
- Oxygen (oxidation) Control
- Infiltration (leaching) Control

Suitability of Cover Types:

	Water	Simple	Complex	Depends on
Access	Boat only	✓	✓	Tailings strength
Isolation	✓	✓	✓	Depth, Biota
Erosion	✓	✓	✓	Climate, Slope & Mat
Vegetation	NA	✓	✓	Climate
Oxygen	✓	x	?	Barometric pumping!
Infiltration	x	?	✓	Climate dependant

✓ can be achieved

? may be achieved

x difficult to achieve

Time Dependency of Risk

During Design:

- Access on very soft slimes
- Slimes consolidation
- Erosion protection
- Biotic intrusion
- Partial saturation (oxygen and infiltration flux)
- Barometric pumping

During Construction:

- Access on soft slimes
- Access on steep slopes

Time Dependency of Risk

Long Term Durability:

- Weathering
 - wastes effecting strength
 - rip-rap
 - geosynthetics
- Perpetual forces:
 - wind & water erosion
 - frost action
 - desiccation
 - biota
- Extreme events

Potential Problems		Tailings			Waste Rock		
		Risk in Design	Risk during Construction	Long-term Risk of Disruption	Risk in Design	Risk during Construction	Long-term Risk of Disruption
Access		✓✓	✓✓			✓✓	
Slumping						✓✓	✓✓
Erosion	Sheet Channel			✓ ✓✓			
Consolidation		✓✓		✓			✓
Biota		✓✓		✓✓	✓✓		✓✓
Infiltration		✓		✓	✓		✓
Oxygen Flux		✓		✓	✓✓		✓✓

Considerations to Manage Risk

1. Materials

- Maximize use of natural, durable materials
- Minimize use of geosynthetics which deteriorate
- Rip-rap control of erosion in dry climates

2. Climate

In dry climates:

- consider evaporative cover designs
- increase use of rip-rap for erosion protection
- provide for sedimentation control

In wet climates:

- consider infiltration cover designs
- consider water covers

Managing Risk

3. Biota

- Beaver (beaver control or wide channels)
- Burrowing animals (bio-intrusion layers)
- Ants & insects (bio-intrusion layers)
- Anthropogenic activity (institutional control)
- Roots (control vegetation species)

4. Monitoring & Maintenance

- Erosion
- Settlement
- Sedimentation (& Glaciation)
- Biotic factors
 - Fauna
 - Flora
 - Man