HINDUSTAN ZINC
Zinc & Silver of India

Sustainability Framework

PERFORMANCE STANDARD

Standard on Acid Rock Drainage Management

Hindustan Zinc Limited

SAFE SMART SUSTAINABLE

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DATE	REVISION NUMBER	CHANGE SUMMARY
16/08/2025	v.1	Initial issue

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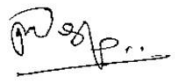
Signature	
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Confidentiality

Contents

ABBREVIATIONS

ABA	Acid Base Accounting
AP or PAG	Acid Generation Potential, (or synonym Potentially Acid Generating)
ARD or AMD	Acid Rock Drainage or Acid Mine Drainage
ARD – ML	Acid Rock Drainage and Metals Leaching
GARD	Global Acid Rock Drainage
INAP	International Network of Acid Prevention
MP	Metals Leaching
NP (or NAG)	Acid Neutralization (or Consumption) Potential (or synonym Non-Acid Generating)
NNP	Net Neutralization Potential (determined by difference of NP and AP)
NNR	Net Neutralization Ration (determined by dividing NP with AP)
PAG	Potential Acid Generating
HSE	Health, Safety and Environment
ESIA	Environmental and Social Management Plan

1. INTENT OF ACID ROCK DRAINAGE MANAGEMENT STANDARD

Acid Rock Drainage (ARD) or Acid Mine Drainage (AMD) is caused by exposure of sulphide containing minerals, mining waste rocks (overburden) and residue from mineral processing to natural oxidation with air and water in the presence of bacteria resulting in generation of dilute sulphuric acid with high concentration of leached sulphates of metals.

The conversion of sulphide containing mineral and mining waste rock in the presence of air and water is called acid generation potential (AP). The mineral and rock wastes also contain acid neutralization potential (NP) due to presence of carbonates (e.g., limestone and dolomite) which are alkaline in nature. However, in the event acid generation potential is higher than the acid neutralization potential of waste rocks, it poses serious environmental risks and impacts due to leaching of metals in the drainage water, requiring preventative and control measures during the lifecycle of mining activities and where necessary a detailed ARD Management Plan.

HZL recognizes the need for ARD management of all its mining operations. HZL aims to prevent, manage, and mitigate risks and environmental impacts associated with ARD. HZL's commitment on ARD Management is to eliminate or if complete elimination is not possible, take appropriate preventative and mitigation measures to minimize its potential adverse impact on the environment including flora and fauna and human receptors.

HZL has endorsed and committed to the implementation of HZL Environmental Policy. *In recognition of this commitment, this* Technical Standard (hereinafter referred to as 'Standard') aims to protect personnel from the ARD related issues from its mining operations including and tailing management of mineral processing, in HZL managed ongoing mining as well as new projects. ARD Management related environmental impacts shall be prevented, mitigated, and managed by making necessary modifications in the systems, controls, and subsequent processes.

Focused on the Business Unit level, this Standard is intended to keep efforts manageable and within the mining site's influence, allowing for impacts to be traced, monitored, and related actions to be implemented. For operating sites, reference shall be made to existing ARD management provisions adopted by HZL. The assessment and management of impacts of new projects shall be considered as part of the overarching environmental and social impact assessment (ESIA) process and therefore this document should be read in conjunction with the Technical Standard on Conducting ESIA to International Standards (VED/CORP/SUST/TS 8)

The HZL documents related to this technical standard including those which have need to be referred to in conjunction with this standard are listed in **Table 1.1**.

Table 1-1 Related Documents

Document Number	Document Title
MS 6	Competency, Training and Awareness
MS 4	Compliance and Other Requirements
TS 8	Technical Standard on Conducting ESIA to International Standards
MS 11	Incident Reporting, Classification and Investigation
/MS 8	Acquisitions, Divestment and Joint Venture Due Diligence Document
MS 3	New Projects, Planning Processes and Site Closure

2. TECHNICAL REQUIREMENTS

2.1. Scope and Applicability

This standard applies to all business units and managed operations engaged in mining activities, including new mine acquisitions, during exploration, prospecting, developmental, operations and post closure management.

2.1.1 Acid Rock Drainage (ARD) or Acid Mine Drainage (AMD) is caused by exposure of sulphide containing minerals, mining waste rocks (overburden) and residue from mineral processing to natural oxidation with air and water in the presence of bacteria resulting in generation of dilute sulphuric acid with high concentration of leached sulphates of metals.

2.1.2 Presence of sulphides in weathered mineral and mining waste rocks is mainly in form of sulphides (i.e., pyrites FeS2, pyrrhotite Fe7S8, sphalerites ZnS, and galena PbS, and argentite Ag2S) which with the natural oxidation in air and reaction with water (in presence of sulphur oxidizing bacteria – mainly Thiobacillus ferroxidans) results in acid generation, is called acid generation potential of the mineral and mining waste rocks.

1.3 The mineral rock wastes also contain acid neutralization (or consumption) potential due to presence of carbonates (limestone and dolomite) of calcium and magnesium which are alkaline in nature.

2.1.4 Mines having acid generation potential (AP) higher than acid neutralization potential (NP), results in acid rock drainage, while mines with higher acid neutralization potential than acid generation potential, results in neutral or slightly alkaline water drainage.

2.1.5. ARD from can be from underground mines, opencast mines pit water runoff, abandoned stockpiles, tailings impoundment, settling ponds or seepages.

2.16 ARD results in leaching of heavy metals (ARDML) and other soluble contents present in waste rocks, poses high environmental risks, and impacts and leads to potential subsurface contamination. It is important to understand, once ARD formation is initiated, it accelerates the process of acid generation potential of the mine waste rocks.

2.1.7 HZL's Commitment:

a) All HZL mining sites will identify and manage ARD throughout the life of a mine i.e., starting from exploration, prospecting, development, operations, and post closure phases of mining activities.

b) As part of ARD management, all HZL sites will conduct Acid-Base Accounting (ABA) of all active mines with Sulphide minerals.

c) All HZL mines with Sulphide ore, during the feasibility stage, shall develop appropriate **preventive management plan** to control ARD related issues across the mine lifecycle, including for closure.

d) HZL shall proceed with mining only if the ARD risk can be managed from both technical and economic perspective.

e) All mining sites will ensure regulatory compliance as part of ARD management.

f) All operating mines will ensure periodical **monitoring of all active areas of mines** including undisturbed mineral stockpiles (including sub-graded), waste rocks (overburden dumps), tailing dumps, runoff water, groundwater, and soil.

g) For any ARD related issue, if identified HZL sites and managed operations will develop ARD **corrective action plan** to ensure protection of the environment and any unlikely off-site consequences. The implementation of ARD action plan will be as per approval of the concerned regulatory agencies.

2.2. People

All persons including HZL's business partners responsible for ARD management must be competent and trained enough to prevent ARD and to manage its impact.

2.3. Process

2.3.1 As part of ARD management, all HZL sites will conduct analytical tests to assess ARD potential of their mines.

2.3.2 The process of ARD management involves steps covering characterization, prediction, prevention, treatment, monitoring and management plan & its implementation.

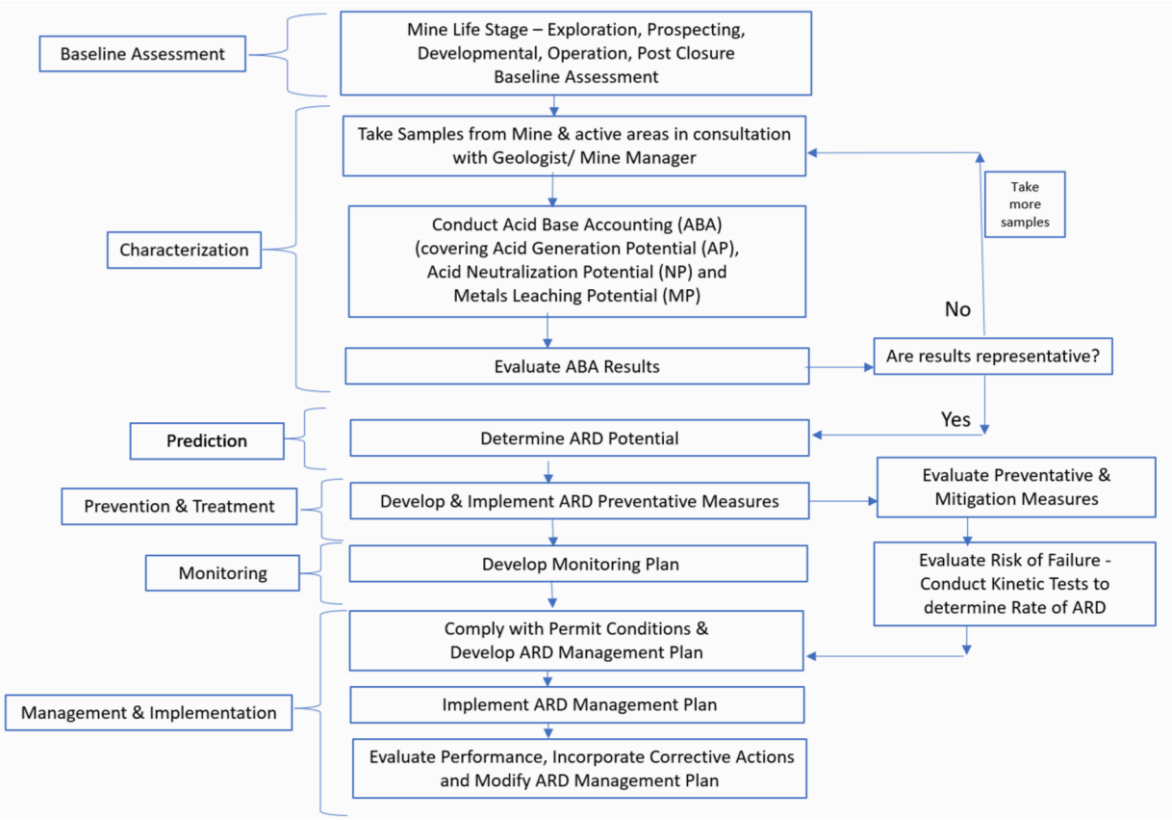
2.3.3 For characterization, there are static and kinetic analytical tests available to assess ARD potential. A static test help in assessing pH of paste, acid generating potential (AP) and acid neutralizing potential (NP) of the samples and based on difference and ratio between the two (AP & NP), ARD generation is determined for a mining activity. While kinetic tests determine rate of acid generation. Static tests are quicker and cheaper as compared to kinetic tests. However, kinetic tests are required, to confirm ARD potential.

2.3.3 The commonly adopted static test to assess ARD potential is Modified Acid-Base Accounting (ABA) of all active areas of their respective mines. Modified ABA is an analytical method to conduct analysis of key parameters including pH, ARD generation potential, acid neutralization potential and any potential resulting in metals leaching with the ARD – refer to **Appendix B** for detail.

2.3.4 For all HZL sites, it is recommended that modified ABA is conducted periodically different stages of mining activities to assess ARD potential.

2.3.5 For all HZL sites, it is recommended that potential ARD sources such as waste rock and tailings at the individual mines are reported on a periodic basis.

2.3.6 All HZL sites will follow the following process flow diagram.



2.4. Review

2.4.1 A system to annually review the identification of ARD management and the application of this standard must be implemented; and

2.4.2 Businesses are required to comply with local laws and regulations related to ARD management.

3. GOVERNANCE

3.1. Roles and Responsibilities

HZL subsidiaries, businesses, operations, and mining sites shall ensure that roles and responsibilities for implementing and complying with this Standard are allocated. Key responsibilities shall be included in job descriptions, procedures and/or other appropriate documentation. All Line Managers and their teams responsible for mining operations shall adhere to ARD management requirements of this standard. This includes ensuring that the business partners (contractors) responsible for mine operations also follow the standard. Following table provides a RACI Structure for ARD Management.

Table 1: RACI Structure for ARD Management

Activity Description	Mine Director/ Occupier	Mine Manager & Mine Agent	Head Business Planning	EHS Head	Corporate EHS
Identifying ARD potential		A/R	C	C	I
Preparation of ARD Preventative Plan	R	A/R	C	C	
ARD Periodical Monitoring	R	A/R	C	R	
Inspection/audits for implementation of Preventative measures	R	A/R	C	R	
ARD Management – action plan for corrective actions, as and when required	R	A/R	R	C/I	I

R=Responsible; expected to participate in the activity and contribute the best of his/her abilities; A=Accountable; ultimately responsible for the results; C=Consulted; contributes towards decision making; I=Informed; kept informed but need not participate in the effort; Supervisor

3.2. Compliance

Each HZL and its manged mining operation shall comply with the requirements of this standard. Performance against meeting the requirements of this Standard, shall be periodically assessed, documented and, where required, reported to HZL. The assessment of performance shall include setting and reporting on key performance indicators (KPIs) where these have been established at HZL Company, or local level. All units must comply with applicable local acts, rules, and regulations and international standards as amended from time to time.

3.3. Review

This Standard shall be periodically audited and reviewed to determine its accuracy and relevance about legislation, education, training, and technological changes. In all other circumstances, it shall be reviewed no later than 12 months since the previous review. **Appendix D** covers checklists for periodical audit and review of ARD management by HZL sites.

The record of the review should be kept until the next annual review. Review outcomes and recommendations for any upgrades to the ARD management should be communicated to all concerned.

4. MANAGEMENT SYSTEMS

4.1. Support Resources

HZL Business unit and other resources are available to assist with implementation of this standard.

4.2. Management Records

Records shall be retained in compliance with the Corporate Records and Information Management Program.

4.3. Audit Requirements

Each Business Unit should audit compliance with this standard as part of its HZL Sustainability Assurance Program or the relevant standard may be referred.

4.4. Deviation Process

Deviations must be documented, and documentation must include the relevant facts supporting the deviation decision. All deviations need to have reviewed risks by competent persons, impact assessment done, mitigation methods proposed, and duration of deviation specified. Deviations from this standard must be authorized by the Unit Head for the relevant unit after consultation with the IBU CEO.

APPENDIX A: DEFINITIONS

Term	Definition
Acid Base Accounting	It is a static analytical testing method of samples collected of mine waste rocks, tailings, and other geological materials to determine acid generation potential and acid neutralization potential of the samples. The method helps predict potential for acid generation or acid neutralization and thus determine Acid Rock Drainage potential.
Acid Generation Potential (AP)	The ability of rock or collected geological material sample to generate acid due to presence of sulfides (of various metals). Sulfides react with oxygen from air and water in the presence of microorganisms, converts to acidic sulphates. It is presented in units of kg per tonne of $CaCO_3$ by multiplying %S with 31.25.
Acid Neutralization Potential (NP)	The ability of rock or collected geological material sample to neutralize acid content due to presence of alkaline carbonates (of Calcium and Magnesium). It is presented in units of kg per tonne of CaCO3.
Acid Rock Drainage	Acid Rock Drainage (ARD) or Acid Mine Drainage (AMD) is caused by exposure of sulphide containing minerals, mining waste rocks (overburden) and residue from mineral processing to natural oxidation with air and water in the presence of bacteria (mainly *Thiobacillus ferroxidans*) resulting in generation of dilute sulphuric acid with high concentration of leached sulphates of metals. Sulphides in weathered mineral and mining waste rocks is mainly in form of sulphides i.e., pyrites FeS_2, pyrrhotite Fe_7S_8, sphalerites ZnS, and galena PbS, and argentite Ag_2S.
Metals Leaching	With reaction with acidic content, heavy metals present in waste rocks, dissolves along with other soluble contents, resulting into leaching of heavy metals into subsurface.
Net Neutralization Potential (NNP)	It is difference between NP and AP i.e., NNP = NP-AP. A sample with NNP less than 20 is considered not to have any acid generation potential.
Net Potential Ratio (NPR)	It is ratio of NP and AP i.e., NPR = NP/AP. A sample with NNP less than 20 is considered not to have any acid generation potential.

APPENDIX B: ARD MANAGEMENT

B.1.0 Characterization of Waste Rocks & Geological Materials

B.1.1. Analysis of Inorganics Sulphur and Sulphates and Metals

Collected samples of waste rocks and geological materials are to be analysed by a reputed and recognized laboratory covering for the following parameters:

a) Inorganics total concentrations and leachable concentrations of Sulphides and Sulphates

b) Metals total concentrations and leachable concentrations of

V, Cr (total), Cr^{+6}, Mn, Fe, Co, Ni, Cu, Zn, Mo, Cd, Hg, Pb, Se, As, B, and Ba.

B.2.0. Acid Rock Drainage Prediction

B.2.1. Acid Base Accounting

Modified Acid Base Accounting (ABA) is a set of simple analytical procedures for screening rocks to determine their potential to become acid producing, and can be summarised as follows:

a) Total sulphur can be used as a first level screening parameter for acid rock drainage potential. Total sulphur concentrations below 0.25% are believed to be too low to sustain acid generation,

b) Acid Potential (AP) is a measure of the potential of the rock material to produce acid. The formula for calculating AP is AP = 31.25 x %S; where S is the total sulphide concentration of the sample in weight percent, and the AP is in kilograms (kg) $CaCO_3$ equivalent per tonne sample (Usher et al., 2003). AP can also be calculated from the total S concentration, but this assumes that all sulphur is present as sulphide and can therefore overestimate the potential for acid rock drainage (some S may be present as sulphate, which is the oxidised form of S and is not acid generating),

c) Neutralising Potential (NP) is a measure of the potential of the rock material to neutralise acidity that it produces. It measures the buffering capacity present in the rock due to carbonate, alkaline earth, and base minerals. NP is expressed as kg $CaCO_3$ equivalent per tonne of sample,

d) Paste pH is a measure of the pH of the crushed sample (< 300 mm) in a slurry with distilled water and gives a rapid measure of the current geochemical condition of the sample due to the presence of weathering products on the surfaces, and ion exchange (Usher et. al., 2003). An acidic paste pH indicates the potential for a rock to be acid generating,

e) Net neutralisation potential (NNP) is calculated by subtracting the AP from the NP, i.e.,

NNP = NP – AP.
If NNP < 0 indicates that the sample has the potential to generate acid, and NNP > 0 indicates that the sample has the potential to neutralise the acid produced. NNP values between -20 and 20 are indeterminate i.e., could be acid producing or acid neutralising (Usher et. al., 2003); and

The neutralising potential ratio (NPR) is the ratio of NP to AP. NPR <1 indicates a potentially acid forming rock, and a NPR >4 indicates a non-acid forming rock. An NPR between 1 and 4 is indeterminate, and further tests would be required to establish whether there is potential for AMD.

B.2.2. Screening Criteria to Interpret ARD Potential Analysed Samples

Table 2 covers screening criteria to be adopted to interpret ARD potential for the analysed samples.

Table 2. Screening Criteria for Acid Base Accounting of Geological Materials

Parameter	Screening Criteria for ARD		
	Low Risk	Uncertain	High Risk
Paste pH	>4.5	-	<4.5
Total Sulphur (%)	<0.25	-	>0.25
AP (kg as CaCO3/tonne)			
NP (kg as CaCO3/tonne)			
NNP (kg as CaCO3/tonne)	>20	-20 to 20	<-20
NPR (NP: AP)	>4	1 to 4	<1

Note: In case NNP of samples fall in uncertain risk, while, NPR indicates low risk, and the low total sulphur and paste pH, the interpretation is to be considered as unlikely ARD potential.

It is important to note that ABA provides possibility of occurrence of ARD, however it does not provide reaction rates. It is also important to note that sampling is critical part in conducting ABA test.

B.2.3. Kinetic Tests and Use of Models

In the event of uncertainty of test results i.e., NNP ranging between -20 to 20 kg as $CaCO_3$ per tonne of rock, or to evaluate risk of failure of preventative and mitigation measures, kinetic tests are required to be conducted. Kinetic tests including use of empirical and deterministic models are intended to mimic the processes found at mining sites, usually at an accelerated rate. These tests and simulating through models are time consuming and are considerably expensive than static tests. Some of the kinetic tests include a) Humidity Cell Test, b) Soxhlet Extraction Test, c) Column Test, d) British Columbia Research Test etc. With the limitation of field conditions, there is uncertainty in model outcome.

B.3.0. Prevention and Treatment

B.3.1. Prevention

HZL sites are to ensure ARD preventative measures are in place towards controlling the formation of ARD, preferable to limit oxidation of sulphides (pyrites) at source throughout the mine life.

HZL sites to refer to permit conditions as well as *IFC EHS Guidelines for Mining, 2007* for specific mitigation measures planning.

As ARD generation is dependent on oxygen, water, sulphur oxidizing bacteria, and exposed sulphides. It is important to note that preventive measures are in place suitable to the Project design for implementation right from early stages of exploration and throughout the mine operations.

B.3.2. Treatment

While treatment refers to mitigate impacts by treating ARD. ARD treatment methods include active or passive treatment. Active method is addition of alkaline (generally lime) chemicals to neutralize acid

formed. While passive method includes acid drainage passed through sequence of pits and drain buried with anoxic limestone.

HZL sites are to ensure that for any acidic water found in the pit or sub-surface, mitigation measures by treatment should be in place with suitable method and designs to ensure compliance of the permit conditions and regulatory requirements are always on top of the priority.

B.4.0 Monitoring

All HZL sites are to adopt risk-based approach to design monitoring requirements suitable to the mining, waste rocks dumping (including low grade stockpiles storage) activities to ensure ARD management complies with the requirement of this Standard. Some of the monitoring options to be considered include the following:

a) Periodical characterization of exposed rocks, waste rocks, other geological materials (including low grade stockpile or tailing dumped onsite

b) Continuous pH monitoring system for the mine water drainage into the settling tanks and exiting from the settling tank to outside water stream.

c) Monitoring of any reclaimed waste rocks

d) Monitoring of routine samples of groundwater, surface water on daily basis for essential parameters such as pH monitoring and monthly for detailed analysis.

e) Monitoring of groundwater levels and quality of essential parameters (pH, conductivity, dissolved metals) through piezometers (to be or installed along the surround waste rocks dumps) on weekly basis and detailed quality assessment on monthly basis.

f) Monitoring of subsurface soil samples within and outside the mine property near waste rock dumps.

g) Visual inspection of appropriate functioning of non-acidic soil cap (with low permeability) and vegetation cover are in place over exposed sulphide containing waste rocks to minimize exposure by isolating reactive waste rocks from oxygen and water. Regula monitoring of effectiveness of soil cover is important.

h) Monitoring of functioning of sensors installed in waste rocks to measure temperature changes inside the heaps.

i) Monitoring of effectiveness of treatment if any of ARD in place,

j) Visual inspection of vegetation growth and signs of distressed vegetation and grass outside the mine /property site.

k) Review of the permit conditions on quarterly basis.

B.4.3. ARD Management and Implementation

All HZL sites will develop and implement ARD Management Plan. The Plan will be updated from time to time with defined responsibilities, monitoring and verification in place. Periodical audits (say quarterly) are to be resorted for effective implementation of activities planned as part of ARD management.

APPENDIX C: AUDIT CHECKLIST

Following audit checklists will be followed by all HZL Site operations as part of implementation of the ARD Management. The checklists will be reviewed and modified suiting to the site operations and updated periodically.

SN	Checklist Description	Yes/No	Remarks
A	**Baseline Assessment**		
1	Has the site onsite mineral mining, waste rock generation, ore processing facility with disposal of tailings?		
2	If yes, has the site conducted environmental impact assessment (EIA/ESIA) of its operations?		
3	Has the EIA/ESIA covered ARD related baseline and management plan?		
4	Is the site located in high rainfall area?		
5	If yes, has the site assessed hydrology of the area and conducted catchment area treatment plan study of the mine site and surrounding area?		
6	Are there agriculture activities or irrigation facilities prevailing in the area surrounding the HZL site?		
7	Are there commitments made in the EIA/ESIA for ARD control and related monitoring and management plan?		
B	**Characterization**		
8	Has the site undertaken adequate characterization of mining rock wastes (including low grade stockpiles, tailings, and other geological materials) in terms of physical and chemical properties during mining life cycle?		
9	Has the site identified on-site and off-site drainage characteristics, flow patterns and paths, human and ecological receptors (including aquatic flora and fauna) within and surrounding the mine site?		
10	Has the site provision of periodically collection of rock wastes samples analysis to determine their acid-generating potential within the area of operations?		
11	Has the site valid permits for conduct of legitimate operations onsite?		
12	If so, has the site mechanism to implement requirements of conditions of the permits?		
13	Are sulphide-bearing rocks present in the mine catchment area?		
14	Has the site undertaken Acid Base Accounting and evaluated ARD potential?		
C	**Evaluating ARD Potential**		
15	Is acid rock drainage (ARD) present onsite? Has the site evaluated the potential ARD risks?		
16	Is surface drainage from acid-generating rock able to reach streams by surface flow?		
17	Is there significant acid rock drainage impacting a natural water body, are there means to mitigate it?		
18	If yes, is there any influence or potential impact of drainage from the site?		

SN	Checklist Description	Yes/No	Remarks
19	If yes, what mitigations are in place?		
20	Has there an investigation of possible use of limestone or other acid rock drainage neutralizing mechanisms considered for ARD sites?		
21	Has the site conducted leachability potential of site dump areas?		
22	Has the site performed pathway analysis of receptors located surrounding the site operations?		
23	Has the site well established procedures in place for ARD management?		
24	Has the site quantified the waste geological materials tracking?		
25	Are there low grade and unused ore stockpiles dumped for longer period?		
26	If yes, are these considered as mining waste rock dumps?		
27	Has the site received any legal notices in recent time or in the past for any ARD related complaints against the site?		
28	Has the received any complaint from public/NGO on ARD issue from its site?		
29	If yes, has the site resolved the issue with commitments and appropriate mitigation measures in place?		
30	Has site determined any requirement of treatment of ARD need to be done?		
31	Has the site communicated to the regulatory agencies?		
32	Has the site mechanism to interact with stakeholders located in the immediate vicinity?		
D	**Monitoring**		
33	Has the site provision of periodical inspection, monitoring, and maintenance of waste rock dumps (OB dumps) with respect to their characteristics and stability?		
34	Is monitoring plan in place for environmental protection including land use, surface water, groundwater quality, soil quality and stability of structures?		
35	Has the site provided waste rock and OB dumps with toe drains and scientifically sloped?		
36	Has the site reviewed training and implementation procedures annually		
37	Has the site provided catchment water collection pond(s)?		
38	Are the catchment area collection ponds lined?		
39	Has the site provided lined drainage network to receiving water pond?		
40	Are these working effectively through the drainage network?		
41	Has the site developed scientific landfill onsite?		
42	If so, has the site taken adequate protection measures in compliance with statutory approvals?		
43	Has the onsite site reclaimed dumps?		
44	If so, is this scientifically developed with appropriate approval?		
45	Have soil cover been replaced over the re-contoured surface and immediately revegetated with appropriate species that will lead to achieving end land use and productivity objectives?		

SN	Checklist Description	Yes/No	Remarks
46	Is there a requirement for ARD water treatment as part of an ongoing basis?		
47	If yes, is there a requirement to estimate for how long and with what treatment and monitoring methods are in place?		
48	Is there stakeholders' consultation and public grievance mechanism in place?		
49	Is there a mechanism to quantify residual liabilities (e.g., monitoring, maintenance, water treatment)?		
50	Is there a requirement that monitoring data and reporting be collated in a consistent and readily transparent manner, preferably against established standards?		
F	**Performance Review**		
51	Is there a mechanism of risk-based approach to prioritize which site areas to be remediated first?		
52	Has any analysis done to assess subsurface contamination due to metals and other soluble chemicals leaching?		
53	If yes, has any liability assessment done for the subsurface contamination?		
54	Has the site procedures to validate/re-validate ARD related management plans and SOPs to improve combating ARD situation.		
55	Has the site reviewed training and ARD implementation procedures annually?		

APPENDIX E: REFERENCES

Following documents were referred to in development of this HZL Standard on Acid Rock Drainage (ARD).

1. Technical Memorandum of Gameberg International Finance Corporation (IFC) General EHS Guidelines on Occupational Health and Safety, April 30, 2007,

2. IFC EHS Guidelines for Mining, 2007

3. Global Acid Rock Drainage (GARD) Guide sponsored by International Network of Acid Prevention (INAP),

4. Acid Rock Drainage Prediction Manual MEND 1.16.1b of June 2008

5. Guidelines for Metal Leaching and Acid Rock Drainage at Mine sites in British Columbia, by William A Price and John C Errington, Ministry of Energy and Mines, August 1998