REGULATORY APPROACHES FOR THE 21st CENTURY

How Government Regulations Interface with Voluntary Initiatives to Improve the Environmental Performance of the Mining Sector

Toronto, Canada
13-15 March 2002

SUMMARY REPORT
WORKSHOP REPORT
This report contains the outcome of an International Workshop on ‘How Government Regulations Interface with Voluntary Initiatives to Improve the Environmental Performance of the Mining Sector’, held in Toronto, Canada, 13 – 15 March 2002. The report is available at UNEP’s MRF website:
http://www.mineralresourcesforum.org

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Preface

Following the January 2000 Baia Mare cyanide tailings accident, the United Nations Environment Programme’s (UNEP) accident prevention initiatives expanded to include the idea of a mine regulators network. The first international workshop of mining regulators took place in Perth, Australia, in October 2000.

‘Mining is a global activity and it is remarkable that there has not been a regular forum for exchange amongst governments.’

(UNEP Executive Director Klaus Töpfer in a letter to Australian Minister for Environment and Heritage, Senator Hill, Nov 2000)

Jointly hosted by the Government of Australia and UNEP, participants from seventeen countries shared experiences and discussed actions to improve environmental safety in mining. Officials from developing countries said they found it particularly timely and suggested follow-up Workshops to address safer tailings management; regulating a diverse industry; and, enhancing implementation and skills.

This second Workshop, held in association with the World Mines Ministries Forum (WMMF), followed on from another of UNEP’s responses to the Baia Mare accident, namely launching a multistakeholder process to develop an International Cyanide Management Code for the Manufacture, Transport and Use of Cyanide in Gold Mining. Initiated by UNEP and the former International Council on Metals and the Environment (ICME), developed with the financial support of the gold mining industry by an international multistakeholder committee over thirteen months. The Code was launched at a WMMF luncheon, 14 March 2002. It served as the focus for discussing how, with the growing number of voluntary industry codes in the world today, can voluntary initiatives be incorporated into government procedures.

The use of government resources to monitor industry’s compliance with regulations, and increasing public concern about environmental stewardship makes the interface between voluntary codes and regulatory standards an important topic for discussion. Fundamentally, how can government policy and regulations complement, use and take advantage of these initiatives?

UNEP hopes that these Regulators Workshops will become self-sustaining annual or biannual events so that shared experiences will be mutually beneficial to governments and be complementary to industry’s own efforts to make mining a safer and more sustainable industry.

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1 The Workshop Summary Report ‘Accident Prevention in Mining: Environmental Regulation For Accident Prevention – Tailings and Chemicals Management’ is available on UNEP’s MRF-Environment at www.mineralresourcesforum.org
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About the Workshop

This year’s Regulators Workshop was one of six themes highlighted at the WMMF because of their importance to sustainable mineral development practices in the 21st century. The six WMMF themes were:

i. Mining and People, convened by the World Bank
ii. Creating a Positive Investment Climate, convened by Aird & Berlis LLP and McMillan Binch (Toronto, Canada)
iii. The Role of Geoscience in Attracting Investment, convened by Natural Resources Canada
iv. Governance Issues in the Mining Sector/Mining Minerals Sustainable Development Project, convened by the International Institute for Environment and Sustainable Development
v. Sustainable Development: The Road to Johannesburg Summit 2002, convened by Natural Resources Canada, and
vi. Mine Regulators Workshop, convened by UNEP.

WMMF followed the Prospectors and Developers Association of Canada (PDAC) Convention and Trade Show, the world’s largest annual mineral-related convention which attracts some 7000 delegates from some 70 countries, providing an opportunity for mineral producing jurisdictions from around the world to discuss the opportunities and challenges facing the industry and regulators in an increasingly competitive environment.

This worldwide forum provides unique opportunities to network with representatives from jurisdictions where mining represents the historic foundation of their existence, as well as those whose potential mineral wealth could fuel future economic growth and enhance social health. Stakeholders interested in policy issues affecting the international mining industry participated in discussions about the regulation and sustainability of the world’s mining industry.
Overview of the Workshop, the Issues and the Future

The Workshop discussed the interface of voluntary initiatives with government regulation amongst regulatory officials, experts and NGO’s from 9 countries to share the strengths and weaknesses of initiatives in their countries as a back-drop to better understanding how to take advantage of the new international Cyanide Management Code for the gold mining industry.

There were, unfortunately, logistical complications associated with this Workshop. Because the Regulators Workshop was one of six parallel sessions, including one on the World Summit on Sustainable Development (WSSD)\(^3\) with Dr. Emil Salim\(^4\), participants to WMMF had to choose amongst important topics. The proximity to the World Summit and that fact that minerals and metals were referenced in several key sections of that text for the first time, it was understandable that participants wanted to know more about the Summit at the expense of participating in other discussions. While there are benefits in linking the Regulators Workshop with other minerals and metals events, parallel sessions should be avoided in the future.

Key issues from the Workshop included:

1. Regulation in the twenty-first century will take advantage of voluntary initiatives ensuring that standards of practice are specific, measurable, actionable/achievable/accountable, reportable and timely and transparent – that is, SMART.
2. It is not important who takes the lead in launching voluntary initiatives – what is important is that development is credible and transparent, focusing on verifiable performance-based results.
3. The international community is seeing the 2\(^{nd}\) generation of voluntary initiatives and policy development. While the first generation of environmental policies were simpler, new ones have stronger performance targets and are more internally consistent.
4. While industry is striving for continuous improvement (even if the fundamental reason is cost reduction), governments have the responsibility to lead, drive and ensure environmentally and socially responsible development.
5. Company research programs are sometimes driven by pending regulations.\(^5\)
6. Codes can offer guidance to governments in the development of national regulations. They can also assist financial institutions as their implementation can often be a proxy for good management.
7. There should be no conflict between voluntary codes and government regulations. Companies are expected to always comply with the law although where codes and standards are more stringent, best practice now demands that these be followed.
8. Implementation guidelines to Codes can be a way of transferring knowledge and best practice from large to smaller companies.
9. One of the growing problems around the world relates to the lack of qualified personnel in both industry and government. Many governments have aging inspectors; industry has aging engineers. Mining has a severe image problem; it is seen as an OLD industry; not very stable and not progressive. Because few people want to become mining engineers, this is not a good industry to deregulate at this time.

\(^3\) Scheduled from 27 August – 4 September 2002 in Johannesburg, South Africa 
\(^4\) The Chair of the Commission for Sustainable Development, responsible for the WSSD preparatory process \(^5\) Patrick Finlay gave an example where Environment Canada’s Mine Effluent Guidelines were going to require non-toxic effluent. Mining companies were notified. Placer Dome’s research department found such a non-toxic effluent. A potential policy dispute became a technological challenge that was met.
KEY NOTE ADDRESS: Summary

The key note address on “SMART Regulatory Approaches for the 21st Century: public sector interface with private sector initiatives” was given by Mr. Gavin Murray, Director of Environment and Social Development, International Finance Corporation, who pointed out that while the public/private roles were different, there was a shared objective of improved environmental performance.

The roles of both regulatory agencies and of industry are evolving and, in fact, these roles are converging (Figure 1).

This menu of policy options that includes voluntary initiatives (V I’s) shows increasing sophistication between a totally hands-off approach to one where there is strong intervention.

The above spectrum (or continuum) of policy interventions includes the following elements6.

A. Hands-off Approach
   • Safeguards only
   • Guarding against misleading claims, e.g. DETR’s Green Claims Code
   • General awareness-raising
   • Raising public awareness about VIs without direct support for individual schemes

B. Enabling Framework
   • Work to ensure supportive international environmental framework
   • Improving the legal regime, securing buy-in particularly from developing countries, promoting mutual recognition or harmonization
   • Highlighting and advising on best practice
   • Providing advice and highlighting best practice, e.g. DFID support for Resource Centre for Socially Responsible Business; DTI’s support for PWBLF’s INSIGHT scheme

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6 Source: ‘Rights of Exchange’ – Performance and Innovation Unit, Cabinet Office, UK in Mr Murray’s presentation.
• Standard-setting
  • Government participation in defining voluntary standards, e.g. EU eco-labelling scheme, DTI’s participation in SIGMA scheme with BSI

• Providing grants or loans
  • Support via grants or loans, e.g., DFID funding for the ETI

• Leading by example:
  • Such as through government procurement

C. Strong Intervention
• Mandatory reporting
  • Requiring companies to report on performance in relation to SHE outcome and/or label their products, e.g. EU Energy label

• Requiring adherence to process guidelines in VIs
  • Government requires adherence to process guidelines, e.g., requiring independent verification of codes

• Signaling VIs to be used as evidence of compliance with general statutory obligations
  • e.g., voluntary codes used to demonstrate compliance with health and safety guidelines

• Threatening alternative measurements
  • Government threatens more binding measures if participation in a VI is not forthcoming

• Direct financial incentives to adapt specific standards
  • Government provides tax and other financial incentives for participation (including withholding privileges, export credits, participation in trade missions)

However, the growing convergence of public governance and private sector initiatives is regarded differently by different parties. The validity and effectiveness of voluntary initiatives, when initiated by industry, are seen to lack consistency in application, lack transparency and lack accountability. They are also viewed as being preemptive to more formal regulation. From industry’s point of view, they are seen as creating competitive advantage by enabling market differentiation. Industry leaders also view voluntary initiatives as reflecting their commitment to corporate social responsibility which, in turn, is being driven by civil society, consumers and investors.

Voluntary initiatives can also be initiated by international organizations such as the World Bank Group (WBG) and United Nations organizations because of their ability to convene governments, industries and civil society in multistakeholder dialogue; their ability and expertise to deal with transboundary and global issues; their ability to resource and sponsor voluntary international initiatives; and, their ability to provide independent credibility which, in turn, reinforces voluntary international initiatives as a standard of choice.

The International Finance Corporation (IFC) is a member of the WBG supported by 175 shareholder countries. Its aim is to promote sustainable private sector investments through: loan and equity financing; mobilizing capital in international financial markets; and provides technical assistance to governments and businesses.
The WBG’s environmental and sustainability interventions are based on its Safeguard Policies, Disclosure Policy and Environmental Guidelines\(^7\). Although these originally were intended as internal guidance to staff to assist them in investment projects decisions, they have become more widely used both inside and outside The Bank. Over time, these policies have gained recognition as *norms* that assist developing countries and countries with economies in transition to develop their regulatory agency. International standards can also be used by industries where national regulatory frameworks are weak or non-existent. Their application by IFC is now mandatory as standards to control project behavior and improve performance. Compliance with WBG standards is seen as a minimum requirement with the next evolutionary step being to “push” and “pull” industries to go beyond minimum compliance with guidelines and standards towards full sustainability through the promotion of best practice, articulation of the business case and voluntary disclosure as drivers for improved industry performance.

Moving towards this next phase, IFC has developed a Sustainability Framework with four performance levels, as shown below:

<table>
<thead>
<tr>
<th>Performance Level</th>
<th>Developmental Benefits</th>
</tr>
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<tbody>
<tr>
<td><strong>Level 1</strong></td>
<td>Complies with IFC and national minimum standards</td>
</tr>
<tr>
<td></td>
<td>• The economic activity conducted by the project or company is in accordance with accepted national and IFC standards for mitigating potential environmental or social harm stemming from the activity</td>
</tr>
<tr>
<td><strong>Level 2</strong>: Added environmental, social, or corporate governance value</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Handling of environmental/social issues materially exceeds minimum standards</td>
</tr>
<tr>
<td></td>
<td>• In so doing, the project or company creates local or global benefits in terms of reduced waste, emissions, or use of natural resources of its economic activity or helps spread the benefits accruing from its economic activity to the local community or to groups which often fail to benefit from such activity.</td>
</tr>
<tr>
<td></td>
<td>• Corporate governance practices are good enough to affect positively views of investors about investing in the country.</td>
</tr>
<tr>
<td><strong>Level 3</strong>: High performance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Handling of environmental and social issues materially exceeds WBG minimum standards. Formulation of practices or other steps enable good practices on environmental, social and corporate governance issues to leverage change broadly with in a region, a sector or a supply chain.</td>
</tr>
<tr>
<td></td>
<td>• Economic activity beyond the firm is influenced in the direction of improved resource intensity and inclusion of new beneficiaries.</td>
</tr>
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<td></td>
<td>• Corporate governance attributes of the project are sufficiently advanced so that a demonstration effect is possible.</td>
</tr>
<tr>
<td><strong>Level 4</strong>: Leadership</td>
<td></td>
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<tr>
<td></td>
<td>• Company is actively engaged on many fronts in the dissemination of best practice.</td>
</tr>
<tr>
<td></td>
<td>• Economic activity well beyond the firm is influenced in the direction of improved resource intensity and inclusion of new beneficiaries.</td>
</tr>
<tr>
<td></td>
<td>• Firm is seen as a global corporate governance leader with wide influence.</td>
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</table>

Finally, and to lay the groundwork for the discussion, Gavin Murray articulated seven challenges which lie ahead.

i. Credibility - how credible are the public and private sectors in their ability to implement voluntary initiatives?

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\(^{7}\) Pollution Prevention and Abatement Handbook
ii. Benefits – are there mutual benefits for implementing voluntary international initiatives for both industry and government regulatory agencies?
iii. Performance – what are the incentives to enhance performance to provide recognition?
iv. Verification – how can performance be independently verified?
v. Reporting – is there a common monitoring and reporting framework?
vi. Information sharing – who will be responsible for collecting and disseminating best practice? and
vii. Results - what will be the explicit alignment to ensure improved industry performance and disclosure?

WORKSHOP THEMES:

While the launch of the new International Cyanide Management Code for the Manufacture, Transport and Use of Cyanide in the Production of Gold was the focus of this Workshop, the discussions were structured around:

i. understanding the lessons learnt from well established voluntary initiatives – the ARET challenge developed in Canada by an environmental non-government organization\(^8\) in 1991
ii. learning about the new Cyanide Code, its standards of practice and guidance for implementation, and
iii. understanding how voluntary codes are seen by governments in different regions of the world and how they interface with government regulatory systems.

This Summary Report provides an overview of key points. Readers are encouraged to consult the Mineral Resources Forum website\(^9\) where all presentations are listed because of the excellent detail given in the presentations.

Theme 1: Leveraging voluntary initiatives to benefit the environment: Lessons learnt from Canada’s Accelerated Reduction and Elimination of Toxics (ARET) Initiative - Patrick Finlay, Environment Canada

Voluntary initiatives are only one, albeit important tool in the environmental management toolbox that includes regulations, economic instruments, non-regulatory standards, the polluter pays principle, responsible corporate conduct and varying capacities for governance by jurisdictions and corporations.

The ARET Program\(^10\), now in its second phase, is a voluntary, non-regulatory programme targeting 117 toxic substances and aims at virtual elimination of 30 persistent, bioaccumulative and toxic (PBT) substances and the reduction of another 87 toxic substances to levels insufficient to cause harm\(^11\).

The five-year ARET Challenge program (1995-2000) initiated by an NGO was overseen by a multistakeholder committee involving industry, federal and provincial governments, and

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\(^8\) The New Directions Group
\(^9\) www.mineralresourcesforum.org
\(^10\) Details are available on Environment Canada’s website at: www.ec.gc.ca/aret in both English and French
\(^11\) Relevant to the mining and minerals industry are targeted reductions in: arsenic; cadmium; chromium; cobalt copper; cyanides; hydrogen sulphide; lead; mercury; nickel; silver and zinc. Information is available for Mining Association of Canada companies at: www.mining.ca

Although ARET was initially launched ahead of government regulations, the strengths included the facts that the initiative focussed industry’s attention on Environment Canada’s toxics management programs and fostered industry-government relationships. The Challenge targets were met ahead of time except for the PBT substances which were reduced only by 61%, not the ARET 90% target. However, ARET may not have been the only factor contributing to reductions as companies knew that regulations were pending. Technological changes from pyrometallurgical to hydrometallurgical processes resulted in reduced emissions of mercury. The Acid Rain program which required cuts to sulphur dioxide emissions also resulted in other reductions relevant to ARET. However, the evaluations laid the groundwork for improved design of ARET 2 which includes a new government policy of establishing Environmental Performance Agreements (EPA’s).\textsuperscript{12}

The Policy criteria for EPA’s include:

- senior level commitment from participants
- establishment of clear objectives and measurable results
- clearly defined roles and responsibilities
- provision for public consultation
- requirement for public reporting
- verification of results
- incentives and consequences (i.e. the regulatory backstop), and
- incorporating continual improvement.

While some have raised concerns about the globalization of environmental performance standards, and while countries need to be sensitive to avoid creating non-tariff barriers to trade, positive features include ensuring that there are no pollution havens. Voluntary environmental standards also provide an opportunity for leadership by industry and governments at all levels.

Finally, during the discussion, there was consensus that voluntary initiatives encourage industry leaders although a regulatory framework is required to capture the ‘free-riders’ and laggards. Environmental performance standards will continue to be required although these standards must be credible, verifiable and reportable. The development of these standards needs to be done in an inclusive and transparent manner. These standards will be implemented if adopted voluntarily by industry, required by financial institutions; and regulated by governments.

\textsuperscript{12} Similar programs exist in other countries like the 33/50 Program and Pollution Prevention/P2 in the U.S.
Theme 2: International Cyanide Management Code for The Manufacture and Use of Cyanide in the Production of Gold – Harold Barnes

Mr. Harold Barnes, Chair of the multistakeholder Steering Committee that developed the Cyanide Management Code explained the new Code, its Standards of Practice and the inclusion of Implementation Guidelines (see Annex 3).

Gold is produced by both large and small producers (Figure 2), throughout the world (Figure 3), and in both developing and developed nations (Figure 4) as many operations use a cyanidation process.

Cyanide has been involved in a number of high-profile accidents, including the 30 January 2000 cyanide tailings spill in Baia Mare, Romania when 100,000 cubic metres of liquid and suspended waste including some 50 -100 tonnes of cyanide contaminated four river systems in Europe. This incident resulted in UNEP and ICME co-hosting a Workshop
to look at cyanide management in mining. Participants unanimously confirmed the importance of developing such a cyanide Code of Practice to drive improved performance in mining through high standards of technology, management and control, and to provide the public with the confidence that their expectations for the industry are being addressed.

Over the following 13 months, UNEP and ICME formed a multi-stakeholder Steering Committee from the gold mining industry, governments, labour, NGO’s, cyanide producers, financial institutions and academia developing an international Code for large, medium and small gold producers around the world. The purpose of the Code is to assist the global gold mining industry in improving cyanide management, thereby reducing risks to workers, communities and the environment from the use of cyanide in gold mining, and reducing community concerns about its use.

The Code, covering all aspects of management, but not engineering, is made up of principles and standards of practice for each of: production; transportation; handling and storage; use; decommissioning; worker safety; emergency response; training; and, public consultation and disclosure. The Code addresses: management plans, procedures and demonstrated capabilities; response plans, resources and testing; storage facilities and water balance; containment measures; cyanide concentration limits; education and training; stakeholder dialogue and public reporting; groundwater and surface water protection; and, employee and public health and safety. Also needed are communications plans, internal verification procedures, process monitoring and response, third party audits and reporting of results and, decommissioning of mine site facilities where cyanide is/has been present.

Other issues such as the design requirements for tailings dams, final reclamation and closure of the mine, financial surety instruments, other minerals and metals of concern (arsenic, heavy metals, mercury) and site requirements, while important, are not contained in the Code either because they are being dealt with elsewhere or reflect issues that need to be dealt with in a separate manner, but not as part of a Cyanide Code.

However, development is only phase one. Now work is required to implement the Code around the world. The administrative organization needs to be established with a volunteer Board of Directors. Auditors need to be accredited. Appeal procedures need to be developed and mine sites need to be audited for compliance.

Mr. Barnes indicated that the May 2000 UNEP-ICME Workshop was ‘the first time that a group from the mining industry met to develop a Code on environmental issues on a global basis’. Secondly, it is the first time that an industry code has been developed by a multi-stakeholder committee. And thirdly, results have been achieved in a timely fashion demonstrating what can be done when there is a clear objective, a specific timeframe and commitment to meaningful results.

However, the challenge now is to implement the Code. Positive results are expected because the Code is performance based; because mine sites will be certified through third party audits; and because these audits will be repeated at a maximum of every three years. Regulators should discuss the degree of implementation, and its strengths and weaknesses in future years.

13 The Workshop was held in Paris in May 2000, information on which is on UNEP’s MRF at www.mineralresourcesforum.org
Theme 3: How Voluntary Codes Interface with Regulatory Systems – viewpoints from Africa, Australia, Latin America and Civil Society

South Africa
With the focus at this meeting on the new international Cyanide Management Code, Ms. Mavis Hermanus, Chief Inspector of Mines for South Africa talked about regulatory mechanisms in South Africa under the Mine Health and Safety Act (1996).

The fundamental principles of regulation are its tripartite development (government, labour and industry), the importance of risk assessment, enabling legislation, and the importance to promote, advise and enforce, balancing performance based standards with guidance.

The rule making process passes through nine stages:

i. needs are identified and assessed
ii. a Department of Minerals and Energy project team is established
iii. scoping documents are prepared
iv. draft regulatory instruments are prepared
v. tripartite task groups are established
vi. Mining Regulations Advisory Committee, responsible for regulatory changes and draft legislation reviews material
vii. Mine Health Safety Council, responsible for overall policy and regulation, research agenda, coordination and promotion of occupational health and safety is consulted
viii. Ministerial approval is given, and
ix. Publication of the rule making occurs, in 8 languages, clearly understandable by all.

Subsequent to and aligned with the International Cyanide Management Code, the Chamber of Mines of South Africa developed, through a multistakeholder committee, more specific implementation guidelines for South Africa. The Guidelines were designed around the best practice principles and included operational expertise and the application of best management technology. Every gold mining operation in South Africa was visited during the development of the guidelines and, upon completion, every operation, regardless of whether they were members of the Chamber or not, was sent a copy of the South African Code and signed a delivery notice that it had been received. Chamber members have been encouraged to ‘mentor’ smaller operations in their area to ensure that the principles and standards of practice are applied throughout the country and cyanide accidents negatively impact all operations.

Interesting to note is that South Africa has a mechanism to convert voluntary industry Guidelines through a tripartite review, into government regulations giving them the force of law. The entire process is inclusive, open, and transparent, benefiting everyone. Some view this as a progressive option whereas others are concerned.

15 The Committee included representatives from the mining industry, government, NGOs, cyanide suppliers and labour.
Australia

Dr. Lynton Jaques presented the Australian government’s views on the interrelationship of voluntary initiatives and regulations. The fundamental issue is not whether or not governments have regulations in place; it is the degree to which regulations are being effectively implemented and this is the area where governments often rely on the expertise of industry to ensure that environmental standards are being met.

For communities, the legislative equation is based on trust and control – the higher the level of trust, the lower the level of control necessary to enforce regulation. This means that the community, through government, sets the acceptable standards of industry behaviour, through legislation and through regulation. Government sets the rules. Industry abides by the rules by implementing the regulation. This is more than compliance – it is a partnership between government and industry to achieve best practice. However, when this effective marriage of interests fails, the results can be disastrous.

Although in countries like Australia (and Canada and the United States of America), mining played a critical economic role in the past in the economy, today’s mining companies can no longer assume that they will be given access to community resources solely on the basis of the economic return they provide governments. Sustainable development and the triple bottom line must be more than clichés and industry is recognizing that it must demonstrate responsiveness to community concerns and to environmentally sound management if it genuinely expects a “social license” to operate.

Under the Australian constitution, the prime responsibility for environmental and occupational safety and health rests with the State and Territorial governments. Australia’s Corporation Law now requires company directors to include information about environmental management in the company’s financial reports. This trend towards greater accountability goes beyond compliance with the legislation – it is results based and geared towards best practice.

As of 2000, the Minerals Council of Australia (MCA) requires that all Council members be signatories of the Australian Minerals Industry Code for Environmental Management which requires signatories to adopt environmental standards in their overseas operations that are no less environmentally sound than Australian legal requirement. This is one case where a voluntary arrangement is succeeding where a mandatory arrangement (i.e. legal extraterritoriality) would not be successful.

Three other Australian examples of effective voluntary initiatives include:

- The MCA released a Strategic Framework for Mine Closure in 2000 identifying principles to be followed in any mine closure plan over the whole life of a mine. This Framework is used by the mining industry to develop site specific closure plans and by government regulators to assess the expected effectiveness of site closure plans.

- The Best Practice Environmental Management (BPEM) in mining modules, developed by Environment Australia in consultation with industry experts and professionals in related fields over a number of years is a source of best industry practice, in Australia as well as elsewhere.\(^\text{16}\)

\(^{16}\) These modules are available on Environment Australia’s website: www.ea.gov.au/industry/sustainable/mining
• The Greenhouse Challenge, (since 1995) has been a very effective initiative in reducing greenhouse gases and in improving the capacity of industry and the Government to identify, monitor and manage greenhouse gas emissions.

Argentina

Many changes occurred in Argentina during the 1990’s including a new economic framework, a new Mining policy and a new institutional legal framework for mining investors that includes legal security, fiscal stability, environmental regulations, access to land for exploration, and the modernizing and strengthening of public institutions for mining. These laws are important as in 2001, small and medium enterprises represented 46% of the mining sector.

Voluntary codes of practice are regarded by the government as supplementary to regulations. They are considered as a means of updating regulations to incorporate best practice. They are seen as important to transfer knowledge and experience from large companies to smaller ones. However, voluntary initiatives may not be sufficient so governments need to introduce into their regulations the principles and standards used in voluntary codes.

Environmental Community Perspective – Glenda Ferris

At the start of the Workshop, organizers were asked if an NGO perspective could be offered with specific reference and experience related to civil society’s involvement with the Eskay Creek mine in British Columbia, Canada.

Tailings from the Eskay Creek mine were deposited into a natural lake (but one without fish). This method of tailings disposal was chosen to prevent acid rock drainage problems but, there are other metals issues to consider.

Key points raised were:
• Although the federal government requires an environmental effects monitoring program, this will not be required once the mine is closed; this is a regulatory gap.
• Environmental and social impacts are site specific which makes it difficult to address all points but, it is important that the partnership approach of government, the mining company and the community continue.
• Both voluntary initiatives and government regulations are needed. Voluntary initiatives reflect best practices of the better companies but government regulation is required to deal with ‘free-riders’.
• Voluntary codes can address the internal footprint of a mining operation to ensure that the footprint is as minimal as is possible.
• The ecosystem model provides a good approach to dealing with the variety of activities and toxic material at a mine site.
• Mines should be seen as permanent waste management facilities and addressed as such.
• Mines are a permanent alteration of the landscape.
• Regulations, not Codes, are required to address security issues including post-closure issues.
• Mine closure plans must be periodically reviewed, updated, verified and ratified.

17 The Eskay Creek mine is now owned by Barrick after its merger with Homestake in December 2001.
18 This particular point concerning ‘free riders’ was made numerous times.
Discussion, Options, Training and Future Directions

The discussion throughout the day was wide ranging. Key points are reflected below.

The two principle examples, Canada’s ARET Challenge Program and the Cyanide Code focussed the discussion on who should take the lead in initiating voluntary codes – NGOs, as was the case for ARET, or an international intergovernmental organisation like UNEP who partnered with an industry association, the former ICME, to launch the Cyanide Code, which, in turn, was used by a national industry association, the South African Chamber of Mines to develop greater specificity for the management of cyanide in South Africa? At the end of the day it does not matter who leads. It does matter however, how voluntary codes and standards are developed. Development must be credible, transparent and involve all affected parties.

The Cyanide Code is an example where both substance and process issues are addressed in the quest to improve performance, and where the South African effort is providing more detailed guidance targeted to their specific environmental and social realities. Training is critical for all parties, company site personnel, auditors and government regulators. While not the main objective, the Code offers guidance that is useful to governments in developing national regulations.

In a discussion about financial institutions and stock markets, Patrick Finlay pointed out that one of the reasons DOFASCO was one of the companies in an ethical fund whereas, STELCO was not, was DOFASCO’s performance Agreement with Environment Canada. Some voiced the view that increasing the awareness of codes, standards, guidelines and best practices with financial institutions and security institutions would be valuable in raising the environmental and social practices of mining companies because compliance with best practice could positively impact the stock price and return to shareholders.

Participants questioned whether implementation of voluntary codes could put companies in conflict with government regulatory authorities. It was pointed out that companies must always comply with the law. However, where codes and standards are more stringent than local laws, best practice now demands that the more stringent standards be met which would mean going beyond what was legally required.

It was also pointed out that while there are tremendous gains to be made through multistakeholder partnerships of government, industry and civil society, there are areas where governments must make the final decision as governments have a fiduciary responsibility to respect.

Training and capacity building workshops are important and all have a role to play. The World Bank Group is involved in different capacity building initiatives in different countries. Australia offers different workshops and short courses to countries in their region.

Terminology relating to regulations, codes of practice, standards and best practice guidelines can be confusing and so it is important to clearly understand the requirements of each jurisdiction. In South Africa
- regulations provide the general overview;

19 DOFASCO and STELCO are two large steel producers, both located in Ontario, Canada.
20 The example of mine closure was given by Ms Hermanus
- codes are more site specific (e.g. coal mining, hard rock mining) although some codes of practice can be mandatory;
- guidelines are the 3rd level providing more guidance although many guidelines are too difficult for small and artisanal miners.

Guidelines and codes are an important mechanism for improved performance when governments do not have the resources to inspect.

Regional networks exist – CAMMA\textsuperscript{21} (Mining Ministries of the Americas) and MERCOSUR (Mercado Común del Sur)\textsuperscript{22} in Latin America; SADC \textsuperscript{23} (Southern African Development Community) in Southern Africa; GEMEED \textsuperscript{24} (Expert Group on Minerals and Energy, Exploration and Development) in Asia Pacific. These regional networks which often reflect a common language and similar cultures also provide the opportunity to address mining issues of mutual concern.

One of the growing problems around the world relates to the lack of qualified personnel in both industry and government. Many governments have aging inspectors and industry has aging engineers. Mining has a severe image problem; it is seen as an OLD industry; not very stable and not progressive. This image problem must be addressed, as lack of young qualified entrants into the mining industry is producing widespread concern at a time when there is a trend towards deregulation. There is a loss of knowledge, expertise and institutional memory in governments which is heightening concerns everywhere.

\textsuperscript{21} www.camma.org
\textsuperscript{22} www.rau.edu.uy/mercosur
\textsuperscript{23} www.sadc.int
\textsuperscript{24} www.gemeed.org
APPENDICES

APPENDIX 1       AGENDA
APPENDIX 2       LIST OF ACRONYMS
APPENDIX 3       INTERNATIONAL CYANIDE MANAGEMENT CODE
APPENDIX 1

AGENDA

SMART Regulatory Approaches for the 21st Century
OR
How government regulations interface with voluntary initiatives to improve the environmental performance of the mining sector

Thursday, March 14, 2002

8:30 a.m.
Opening Plenary of the World Mines Ministries Forum
The World Mines Ministries Forum will be officially opened. Invited key-note speakers will address each of the six programme areas. The Mine Regulators Workshop is the sixth discussion theme. The keynote presentation will be given by Mr. Gavin Murray, Director, Environment and Social Development, International Finance Corporation.

11:45-1:15
Launch of the new International Cyanide Management Code for the Manufacture, Transport and Use of Cyanide in the Production of Gold – this will take place at the lunch.

Friday, March 15, 2002 - 8:30 a.m. - 12:30 p.m.
Mine Regulators Workshop
Chair and Moderator: Mr. Gavin Murray, IFC

All sessions are intended to be interactive, starting with a presentation and then questions and discussion

8:30-9:15 Leveraging voluntary initiatives to benefit the environment: Lessons Learnt from the Accelerated Reduction and Elimination of Toxics (ARET) Initiative
Patrick Finlay, Chief, Minerals and Metals Division, Environment Canada

9:15-10:15 Presentation of the new International Cyanide Management Code for the Manufacture, Transport and Use of cyanide in the Production of Gold
Harold Barnes, Vice President, Homestake and Chair of Multistakeholder Code Steering Committee

10:15-10:30 Coffee

10:30-12:30 Panel Discussion - Viewpoints on how Voluntary Codes interface with Regulatory Systems

1. Africa Perspective – Mavis Hermanus, Government of South Africa
2. Australian Perspective – Dr. Lynton Jaques,
3. Latin American Perspective – Roberto Sarudiansky, Government of Argentina
12:30-14:00 Lunch and WMMF Plenary
- Information on location of WMMF for 2004
- Summary Remarks from Workshop Convenors
  
  Sponsored by the Ontario Ministry of Northern Development and Mines

14:15-17:00 Government Regulators (governments only meeting) – Round Table Discussion

  Chair: Wanda Hoskin (UNEP)

  - Strategic Options – how best to use voluntary initiatives
  - What related training is needed (e.g. of government inspectors)?
  - What regional or international support is needed to facilitate implementation of the cyanide code in individual countries?
  - Future Directions for the international network of government regulators.
  - Discussion of next meeting
# APPENDIX 2

## LIST OF ACRONYMS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>ARET</td>
<td>Accelerated Reduction and Elimination of Toxics</td>
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<tr>
<td>BPEM</td>
<td>Best Practice Environmental Management in Mining</td>
</tr>
<tr>
<td>CAMMA</td>
<td>Mining Ministries of the Americas</td>
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<tr>
<td>DETR</td>
<td>U.K. Department of the Environment, Transport and the Regions</td>
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<tr>
<td>DFID</td>
<td>U.K. Department for International Development</td>
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<tr>
<td>DTI</td>
<td>U.K. Department of Trade and Industry</td>
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<tr>
<td>EPA</td>
<td>Environmental Performance Agreement</td>
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<tr>
<td>GEMEED</td>
<td>Expert Group on Minerals and Energy, Exploration and Development</td>
</tr>
<tr>
<td>ICME</td>
<td>International Council on Metals and the Environment</td>
</tr>
<tr>
<td>MCA</td>
<td>Minerals Council of Australia</td>
</tr>
<tr>
<td>MERCOSUR</td>
<td>Mercado Común del Sur (The Common Market of the Southern Cone)</td>
</tr>
<tr>
<td>MRF</td>
<td>Mineral Resources Forum</td>
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<tr>
<td>NGO</td>
<td>Non Governmental Organisation</td>
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<tr>
<td>PBT</td>
<td>Persistent bioaccumulative and toxic</td>
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<tr>
<td>PDAC</td>
<td>Prospectors and Developers Association of Canada</td>
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<tr>
<td>SADC</td>
<td>Southern African Development Community</td>
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<tr>
<td>SHE</td>
<td>Safety, health and environment</td>
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<tr>
<td>V I</td>
<td>Voluntary initiatives</td>
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<td>WBG</td>
<td>The World Bank Group</td>
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<td>WSSD</td>
<td>World Summit on Sustainable Development</td>
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APPENDIX 3

INTERNATIONAL CYANIDE MANAGEMENT INSTITUTE

www.cyanidecode.org

International Cyanide Management Code

For The Manufacture, Transport and Use Of Cyanide in the Production of Gold

May 2002
BACKGROUND

For over a century, cyanide has been the primary reagent used by the mining industry for the production of gold. It is a hazardous chemical that requires careful management. Since no other commercially viable and environmentally sound alternatives currently exist, gold mines will continue to use cyanide.

In January 2000, the accidental release of large amounts of cyanide solutions and tailings from the Aurul mine in Romania resulted in significant pollution of the receiving river system. This incident dramatically increased the consciousness of governments, international organizations, industry and the public of the environmental hazards associated with the use of cyanide in the gold mining industry.

To address concerns about cyanide use and management, a two-day multi-stakeholder workshop was held in May 2000 to consider development of a voluntary industry code of practice for the use of cyanide in mining. Workshop participants determined that a voluntary code, implemented industry-wide, could improve the management of cyanide.

The International Cyanide Management Code For The Manufacture, Transport and Use of Cyanide in the Production of Gold (“the Code”) were developed as this voluntary industry code. The Code was prepared under the direction of a multi-stakeholder Steering Committee, whose members were chosen by the United Nations Environment Programme and the International Council on Metals and the Environment. The Committee, consisting of participants from the gold mining industry, governments, non-governmental organizations, labor, cyanide producers and financial institutions, worked cooperatively toward the common goal articulated in the Code’s Mission Statement:

To assist the global gold mining industry in improving cyanide management, thereby minimizing risks to workers, communities and the environment from the use of cyanide in gold mining, and reducing community concerns about its use.

The objectives of the Code as identified by the Committee are:

- To protect workers, communities and the environment from adverse effects of cyanide.
- To improve cyanide management.
- To be used by large and small gold mining companies, cyanide manufacturers and transporters.
- To serve as a form of assurance for interested parties including regulators, financiers, communities and non-governmental organizations.
- To be applied internationally, in both developed and developing countries.
- To be credible and verifiable.
- To be dynamic over time.

The Code encourages improvement on an industry-wide basis by aggressively promoting participation in the Code, and by requiring signatories to the Code to take appropriate action to manage cyanide responsibly. The public, workers, industry and the environment will derive their
greatest benefits if operations using cyanide to extract gold adopt the Code and upgrade their practices as required to meet the Code.

**SCOPE**

The Code is a gold mining industry voluntary code, intended to complement an operation’s existing regulatory requirements. Compliance with the rules, regulations and laws of the applicable political jurisdiction is necessary; this Code is not intended to contravene such laws.

The Code focuses exclusively on the safe management of cyanide and cyanidation mill tailings and leach solutions. It addresses production, transport, storage, and use of cyanide and the decommissioning of cyanide facilities. It includes requirements related to financial assurance, accident prevention, emergency response, training, public reporting, stakeholder involvement and verification procedures.

It does not address all safety or environmental activities that may be present at gold mining operations such as the design and construction of tailings impoundments or long-term closure and rehabilitation of mining operations.

The term “cyanide” used throughout the Code generically refers to the cyanide ion, hydrogen cyanide, as well as salts and complexes of cyanide with a variety of metals in solids and solutions. It must be noted that the risks posed by the various forms of cyanide are dependent on the specific species and concentration. Information regarding the different chemical forms of cyanide is found at [www.cyanidecode.org/library/cyanide facts/cyanide chemistry](http://www.cyanidecode.org/library/cyanide facts/cyanide chemistry).

**CODE IMPLEMENTATION**

The Code is comprised of two major elements. The Principles broadly state commitments that signatories make to manage cyanide in a responsible manner. Standards of Practice follow each Principle, identifying the performance goals and objectives that must be met to comply with the Principle. Operations are certified as being in compliance with the Code upon an independent third-party audit verifying that they meet the Standards of Practice.

For implementation guidance, visit [www.cyanidecode.org/thecode/implementationresources](http://www.cyanidecode.org/thecode/implementationresources)

The programs and procedures identified by the Code’s Principles and Standards of Practice for the management of cyanide can be developed separately from other programs, or they can be integrated into a site’s overall safety, health and environmental management programs. Since operations typically do not have direct control over all phases of cyanide production, transport or handling, gold mines will need to require that other entities involved in these activities commit to and demonstrate that they adhere to the Code’s Principles and meet its Standards of Practice for these activities.
This Code, the implementation guidance, mine operators guide, and other documents or information sources referenced at www.cyanidecode.org are believed to be reliable and were prepared in good faith from information reasonably available to the drafters. However, no guarantee is made as to the accuracy or completeness of any of these other documents or information sources. The implementation guidance, mine operators guide, and the additional documents and references are not intended to be part of the Code.

No guarantee is made in connection with the application of the Code, the additional documents available or the referenced materials to prevent hazards, accidents, incidents, or injury to employees and/or members of the public at any specific site where gold is extracted from ore by the cyanidation process.

Compliance with this Code is not intended to and does not replace, contravene or otherwise alter the requirements of any specific national, state or local governmental statutes, laws, regulations, ordinances, or other requirements regarding the matters included herein.

Compliance with this Code is entirely voluntary and is neither intended nor does it create, establish, or recognize any legally enforceable obligations or rights on the part of its signatories, supporters or any other parties.

**PRINCIPLES AND STANDARDS OF PRACTICE**

1. **PRODUCTION** Encourage responsible cyanide manufacturing by purchasing from manufacturers who operate in a safe and environmentally protective manner.

   **Standard of Practice**
   
   1.1 Purchase cyanide from manufacturers employing appropriate practices and procedures to limit exposure of their workforce to cyanide and to prevent releases of cyanide to the environment.

2. **TRANSPORTATION** Protect communities and the environment during cyanide transport.

   **Standards of Practice**
   
   2.1 Establish clear lines of responsibility for safety, security, release prevention, training and emergency response in written agreements with producers, distributors and transporters.
   
   2.2 Require that cyanide transporters implement appropriate emergency response plans and capabilities, and employ adequate measures for cyanide management.
3. HANDLING AND STORAGE  
Protect workers and the environment during cyanide handling and storage.

Standards of Practice

3.1 Design and construct unloading, storage and mixing facilities consistent with sound, accepted engineering practices and quality control and quality assurance procedures, spill prevention and spill containment measures.

3.2 Operate unloading, storage and mixing facilities using inspections, preventive maintenance and contingency plans to prevent or contain releases and control and respond to worker exposures.

4. OPERATIONS  
Manage cyanide process solutions and waste streams to protect human health and the environment.

Standards of Practice

4.1 Implement management and operating systems designed to protect human health and the environment including contingency planning and inspection and preventive maintenance procedures.

4.2 Introduce management and operating systems to minimize cyanide use, thereby limiting concentrations of cyanide in mill tailings.

4.3 Implement a comprehensive water management program to protect against unintentional releases.

4.4 Implement measures to protect birds, other wildlife and livestock from adverse effects of cyanide process solutions.

4.5 Implement measures to protect fish and wildlife from direct and indirect discharges of cyanide process solutions to surface water.

4.6 Implement measures designed to manage seepage from cyanide facilities to protect the beneficial uses of ground water.

4.7 Provide spill prevention or containment measures for process tanks and pipelines.

4.8 Implement quality control/quality assurance procedures to confirm that cyanide facilities are constructed according to accepted engineering standards and specifications.

4.9 Implement monitoring programs to evaluate the effects of cyanide use on wildlife, surface and ground water quality.

5. DECOMMISSIONING  
Protect communities and the environment from cyanide through development and implementation of decommissioning plans for cyanide facilities.
### Standards of Practice

**5.1** Plan and implement procedures for effective decommissioning of cyanide facilities to protect human health, wildlife and livestock.

**5.2** Establish an assurance mechanism capable of fully funding cyanide-related decommissioning activities.

### 6. WORKER SAFETY

**Protect workers’ health and safety from exposure to cyanide.**

**Standards of Practice**

**6.1** Identify potential cyanide exposure scenarios and take measures as necessary to eliminate, reduce and control them.

**6.2** Operate and monitor cyanide facilities to protect worker health and safety and periodically evaluate the effectiveness of health and safety measures.

**6.3** Develop and implement emergency response plans and procedures to respond to worker exposure to cyanide.

### 7. EMERGENCY RESPONSE

**Protect communities and the environment through the development of emergency response strategies and capabilities.**

**Standards of Practice**

**7.1** Prepare detailed emergency response plans for potential cyanide releases.

**7.2** Involve site personnel and stakeholders in the planning process.

**7.3** Designate appropriate personnel and commit necessary equipment and resources for emergency response.

**7.4** Develop procedures for internal and external emergency notification and reporting.

**7.5** Incorporate into response plans monitoring elements and remediation measures that account for the additional hazards of using cyanide treatment chemicals.

**7.6** Periodically evaluate response procedures and capabilities and revise them as needed.

### 8. TRAINING

**Train workers and emergency response personnel to manage cyanide in a safe and environmentally protective manner.**

**Standards of Practice**

**8.1** Train workers to understand the hazards associated with cyanide use.

**8.2** Train appropriate personnel to operate the facility according to systems and procedures that protect human health, the community and the environment.

**8.3** Train appropriate workers and personnel to respond to worker exposures and environmental releases of cyanide.
9. **DIALOGUE**  
Engage in public consultation and disclosure.

**Standards of Practice**

9.1 Provide stakeholders the opportunity to communicate issues of concern.
9.2 Initiate dialogue describing cyanide management procedures and responsively address identified concerns.
9.3 Make appropriate operational and environmental information regarding cyanide available to stakeholders.

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**CODE MANAGEMENT**

**Administration**

The International Cyanide Management Institute (“The Institute”) is a non-profit corporation established to administer the Code through a multi-stakeholder Board of Directors consisting of representatives of the gold mining industry and participants from other stakeholder groups. For additional information on the Institute, see: [www.cyanidecode.org/theinstitute](http://www.cyanidecode.org/theinstitute).

The Institute’s primary responsibilities are to:

- Promote adoption of and compliance with the Code, and to monitor its effectiveness and implementation within the world gold mining industry.
- Develop funding sources and support for Institute activities.
- Work with governments, NGOs, financial interests and others to foster widespread adoption and support of the Code.
- Identify technical or administrative problems or deficiencies that may exist with Code implementation, and
- Determine when and how the Code should be revised and updated.

**Code Signatories and Supporters**

Companies with either single or multiple operations can become signatories to the Code; the signature of an owner or corporate officer of the operating company is required. By becoming a signatory, a company commits to follow the Code’s Principles and implement its Standards of Practice. Code signatories’ operations will be audited to verify their operation’s compliance with the Code.

A signatory is not required to have all operations certified. When becoming a signatory, a company must specify which of its operations it intends on having certified. A company that does not have these operations audited within 3 years of signing the Code will lose its signatory status. See: [www.cyanidecode.org/signatories&certifiedoperations](http://www.cyanidecode.org/signatories&certifiedoperations).
Cyanide producers, transporters, and other companies or individuals not currently or directly engaged in production of gold by cyanidation can demonstrate their support of the Code’s objectives by conducting audits and where appropriate becoming Code Supporters.

**Code Verification and Certification**

Audits are conducted every three years by independent, third-party professionals who meet the Institute’s criteria for auditors. Auditors evaluate an operation to determine if its management of cyanide achieves the Code’s Principles and Standards of Practice; the Code’s Verification Protocol contains the criteria for all audits. Operations must make all relevant data available to the auditors, including the complete findings of their most recent independent Code Verification, in order to be considered for certification.

During an initial verification audit, an operation’s compliance at the time of the audit will be evaluated. Subsequent re-verification audits will also evaluate compliance during the period between the preceding and current audits.

Upon completion of the audit, the auditor must review the findings with the operation to ensure that the audit is factually accurate and make any necessary changes. The auditor must submit a detailed “Audit Findings Report” addressing the criteria in the Verification Protocol and a “Summary Audit Report” that includes the conclusion regarding the operation’s compliance with the Code to the signatory, the operation and to the Institute. The operation is certified as complying with the Code if the auditor concludes that it is in full compliance with the Code’s Principles and Standards of Practice. The detailed “Audit Findings Report” is the confidential property of the operation. The “Summary Audit Report” of certified operations will be made available to the public on the Code website. The operation may submit its comments regarding the Summary Audit Report to the Institute, which will be posted along with the Summary Audit Report on the Institute’s website.

Operations that are in substantial compliance with the Code are conditionally certified, subject to the successful implementation of an Action Plan. Substantial compliance means that the operation has made a good-faith effort to comply with the Code and that the deficiencies identified by the auditor can be readily corrected and do not present an immediate or substantial risk to employee or community health or the environment. Operations that are in substantial compliance with a Standard of Practice must develop and implement an Action Plan to correct the deficiencies identified by the verification audit. The operation may request that the auditor review the Action Plan or assist in its development so that there is agreement that its implementation will bring the operation into full compliance. The Action Plan must include a time period mutually agreed to with the auditor, but in no case longer than one year, to bring the operation into full compliance with the Code. The Auditor must submit the Action Plan to the Institute along with the Audit Findings Report and Summary Audit Report.

The operation must provide evidence to the auditor demonstrating that it has implemented the Action Plan as specified and in the agreed-upon time frame. In some cases, it may be necessary for the auditor to re-evaluate the operation to confirm that the Action Plan has been implemented. Upon receipt of the documentation that the Action Plan has been fully
implemented, the auditor must provide a copy of the documentation to the Institute along with a statement verifying that the operation is in full compliance with the Code.

All operations certified as in compliance with the Code will be identified on the Code website, www.cyanidecode.org/signatories&certifiedoperations. Each certified operation’s Summary Audit Report will be posted and operations with conditional certification will have their Summary Audit Report and their Action Plan posted.

An operation cannot be certified if the auditor concludes that it is neither in full compliance nor in substantial compliance with any one of the Standards of Practice. An operation that is not certified based on its initial verification audit can be verified and certified once it has brought its management programs and procedures into compliance with the Code. Its signatory parent company remains a signatory during this process.

An operation that is not yet active but that is sufficiently advanced in its planning and design phases can request conditional certification based on an auditor’s review of its site plans and proposed operating procedures. An on-site audit is required within one year of the operation’s first production of gold by cyanidation to confirm that the operation has been constructed and is being operated in compliance with the Code.

An operation or an individual cyanide facility at an operation is no longer subject to certification after decommissioning of the cyanide facilities.

**Certification Maintenance**

In order to maintain certification, an operation must meet all of the following conditions:

- The auditor has concluded that it is either in full compliance or substantial compliance with the Code.
- An operation in substantial compliance has submitted an Action Plan to correct its deficiencies and has demonstrated that it has fully implemented the Action Plan in the agreed-upon time.
- There is no verified evidence that the operation is not in compliance with the Code.
- An operation has had a verification audit within three years.
- An operation has had a verification audit within two years of a change in ownership, defined as a change of the controlling interest of the operating company.

**Auditor Criteria and Review Process**

The Institute will develop specific criteria for Code Verification auditors and will implement procedures for review of auditor credentials. Criteria will include requisite levels of experience with cyanidation operations and in conducting environmental, health or safety audits, membership in a self-regulating professional auditing association and lack of conflicts of interest with operation to be audited.
**Dispute Resolution**

The Institute will develop and implement fair and equitable procedures for resolution of disputes regarding auditor credentials and certification and/or de-certification of operations. The procedures will provide due process to all parties that may be affected by these decisions.

**Information Availability**

The Code and related information and code management documentation are available via the Internet at www.cyanidecode.org. The website is intended to promote an understanding of the issues involved in cyanide management and to provide a forum for enhanced communication within and between the various stakeholder groups with interest in these issues. The site is the repository for Code certification and verification information.

**ACKNOWLEDGEMENTS**

This project was underwritten by a group of gold companies and cyanide producers from around the world. The Gold Institute was instrumental in organizing this financial and technical support and provided the administrative and logistical support necessary to successfully complete the project; his effort represents the first time that an industry has worked with other stakeholders to develop an international voluntary industry Code of Practice.

The individuals listed below participated in the process. Participation by these individuals does not necessarily represent an endorsement of the Code by their respective organizations.

**Steering Committee**
Harold Barnes (Chairman)\(^1\) Homestake Mining Company, United States
Stephen Bailey International Finance Corporation, United States
Julio Bonelli Government of Peru
Gordon Drake, Ph.D\(^2\) WMC Resources, Ltd., Australia
John den Dryver\(^3\) Normandy Mining Limited, Australia
Bill Faust Eldorado Gold Company, Canada
Fred Fox\(^4\) Kennecott Minerals Company, United States
John Gammon, Ph.D. Government of Ontario, Canada
Steven Hunt United Steelworkers of America, Canada
Juergen Loroesch, Ph.D. Degussa, Germany
Basie Maree AngloGold Company, South Africa
Glenn Miller, Ph.D. University of Nevada, Reno, United States
Anthony O’Neill WMC Resources, Ltd., Australia
Michael Rae World Wide Fund For Nature, Australia
Stan Szymanski International Council of Chemical Associations, United States
Stephan Theben\(^5\) European Commission, Spain
Federico Villasenor\(^6\) Minas Luismin, Mexico
Juergen Wettig European Commission, Belgium

\(^1\) Elected Chairman by the Steering Committee
\(^2\) Substituted for Anthony O’Neill at Washington and Vancouver Meetings
\(^3\) Substituted for Anthony O’Neill at Santiago Meeting
\(^4\) Replaced Bill Faust on Committee after Napa Meeting
\(^5\) Added to Steering Committee at Vancouver Meeting
\(^6\) Substituted for Juergen Wettig at Washington, Vancouver and Santiago Meetings
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Ashanti Goldfields Company, Ghana Kinross Gold Corp., Canada
Australian Gold Council, Australia Lihir Management Corp., Papua New Guinea
Australian Gold Reagents, Australia Mining Project Investors, Australia
Barrick Gold Corp., Canada Newmont Gold Company, United States
Degussa, Germany Normandy Mining, Australia
Dupont, United States Placer Dome, Inc., Canada
Glamis Gold, Ltd., United States South African Chamber of Mines, South Africa
Gold Fields Limited, South Africa Rio Tinto, United Kingdom
The Gold Institute, United States WMC, Australia
INTERNATIONAL CYANIDE MANAGEMENT INSTITUTE

www.cyanidecode.org

Implementation Guidance for the International Cyanide Management Code

May 2002
INTRODUCTION

Signatories of the International Cyanide Management Code commit to follow the Code’s Principles and Standards in the use of cyanide. The Standards of Practice listed under each Principle in the Code set performance goals and objectives that an operation must achieve in order to be certified as in compliance with the Code.

The specific means of implementing the Code described in this guidance document are not mandatory in order for an operation to become certified as Code compliant. An operation can achieve certification if it is able to demonstrate that its methods achieve the performance goal as stated in the Standard of Practice.

This Document can be a useful tool for all stakeholders in that it describes an acceptable method that achieves the performance goals set by the Standards of Practice.

This implementation guidance, the Code, the mine operators guide, and other documents available or information sources referenced at www.cyanidecode.org are believed to be reliable and were prepared in good faith from information reasonably available to the drafters. However, no guarantee is made as to the accuracy or completeness of any of these other documents or information sources. The implementation guidance, mine operators guide, and the additional documents and references are not intended to be part of the Code.

No guarantee is made in connection with the application of the Code, the additional documents available or the referenced materials to prevent hazards, accidents, incidents, or injury to employees and/or members of the public at any specific site where gold is extracted from ore by the cyanidation process.

Compliance with this Code is not intended to and does not replace, contravene or otherwise alter the requirements of any specific national, state or local governmental statutes, laws, regulations, ordinances, or other requirements regarding the matters included herein.

Compliance with this Code is entirely voluntary and is neither intended nor does it create, establish, or recognize any legally enforceable obligations or rights on the part of its signatories, supporters or any other parties.
1. PRODUCTION  
Encourage responsible cyanide manufacturing by purchasing from manufacturers who operate in a safe and environmentally protective manner.

Standard of Practice 1.1
Purchase cyanide from manufacturers employing appropriate practices and procedures to limit exposure of their workforce to cyanide and to prevent releases of cyanide to the environment.

Guidance
Many cyanide manufacturers are members of the International Council of Chemical Associations’ Responsible Care® Program, which promotes the adoption of Codes of Practice to limit workforce exposures to cyanide and to prevent, control and respond to environmental releases of cyanide. Most cyanide manufacturers pay great attention to product stewardship and employ management systems, procedures and practices to achieve these goals. Code signatories can play a significant role by encouraging cyanide producers to act responsibly and purchase cyanide from manufacturers who commit to follow safe and environmentally sound production procedures and provide an independent third party audit as required by the Code.

Gold mining operators should require in all cyanide purchase agreements that the cyanide producer initially provides a report from an independent third party auditor of its cyanide production facilities. This report should confirm that the producer:
1. Utilizes programs to limit worker exposure to safe levels of cyanide,
2. Has the ability to prevent, control and respond to releases of cyanide to the environment,
3. Uses sound and accepted engineering practices for design and construction of cyanide production facilities,
4. Prepares and implements a worker health and safety plan,
5. Utilizes a training program for employees handling cyanide, and
6. Has in place an emergency response plan that has been developed with input from the community.

A company’s primary purchasing arrangements for cyanide can be interrupted by production or transportation problems beyond its control, and it may occasionally be necessary to purchase cyanide from alternate sources for a limited time to ensure continued gold production. Operations should include the same requirements in all contracts developed with secondary cyanide distributors and producers.

The contract with an independent distributor of cyanide should require the distributor to provide the results of an independent third-party audit of the cyanide production facilities. The distributor of the cyanide sold should also demonstrate that programs, practices and procedures to limit worker exposure to cyanide, and to prevent, control and respond to releases of cyanide to the environment are in place at its facilities. A certification or chain-of-custody documentation stating that the cyanide delivered to an operation was indeed produced by the stated manufacturer must also be provided.

For additional information, see [www.cyanidecode.org/auditing&verification](http://www.cyanidecode.org/auditing&verification)
2. TRANSPORTATION  Protect communities and the environment during cyanide transport.

Standard of Practice 2.1
Establish clear lines of responsibility for safety, security, release prevention, training and emergency response in written agreements with producers, distributors and transporters.

Guidance
Operations should establish written agreements with cyanide producers, distributors and transporters, designating the specific responsibilities for each aspect of cyanide transport. The following items should be addressed (as appropriate for the manner of transport):

- Packaging as required by, and labeling in languages necessary to identify the material in the governmental jurisdiction/s the shipment passes through,
- Storage prior to shipment,
- Evaluation and selection of routes to reduce risks, including community involvement,
- Storage and security at ports of entry,
- Interim loading, storage and unloading during shipment,
- Transport to the operation,
- Unloading at the operation,
- Safety and maintenance of the means of transportation (e.g., aircraft, vessels, vehicles, trains, etc.) throughout transport,
- Task and safety training for transporters and handlers throughout transport,
- Security throughout transport,
- Emergency response throughout transport.

For international shipments, packaging and labeling should conform to Recommendations for the Transport of Dangerous Goods (a.k.a. the Orange Book), published by the United Nations Economic and Social Council’s Committee of Experts on Transport of Dangerous Goods.

The written agreement should also specify that the designated responsibilities extend to any subcontractors used by the producer, distributor, transporter or the operation for transportation-related activities.

Standard of Practice 2.2
Require that cyanide transporters implement appropriate emergency response plans and capabilities, and employ adequate measures for cyanide management.

Guidance
Although it may not have direct control over the cyanide transport process, a mining operation is expected to make reasonable efforts to insure that the transporter, and any subcontractors involved in cyanide transport, make health, safety and environmental considerations a priority while transporting cyanide to the mine.
Operations should require in their transport contracts for cyanide that the transporter implement the procedures discussed below to minimize the potential for releases and exposures during cyanide transport and provide an independent third party audit verifying implementation of these procedures:

1. Transporters should prepare an Emergency Response Plan addressing the applicable elements discussed under Principle 7, Emergency Response, and have in all vehicles the appropriate emergency response equipment, including cyanide-specific personal protective equipment. Transport personnel should be trained and given periodic refresher training in the use of this equipment and in implementing the Emergency Response Plan, as discussed under Principle 8, Training, and Standard of Practice 8.3.

2. Warning signs must be posted alerting workers that cyanide is present, and prohibiting smoking, open flames, and eating and drinking. It should also be specifically stated that cyanide-specific personal protective equipment must be worn, and that security measures such as lockouts on valves, and fenced/locked storage of solids should be provided at any trans-shipping depots or interim storage sites. Storage of both solid and liquid cyanide should be separated by berms or other appropriate methods to prevent mixing with incompatible materials such as acids, strong oxidizers and explosives. Contact with low- and neutral-pH water should be prevented. Spill containment capacity and clean-up materials appropriate for the type and amount of cyanide stored should be readily available.

3. In selecting routes, transporters should evaluate the risks of alternative transport methods and routes and identify options as necessary to minimize risks. High-risk portions of the selected route should be identified and evaluated. Input from communities and other stakeholders, as well as applicable governmental transportation-related and emergency response agencies should be solicited and considered as necessary in the selection of routes and development of measures to prevent and respond to releases during cyanide transport. Use of convoys and/or escorts may be considered when transport routes present safety or security concerns.

4. Emergency communication capability should be adequate for timely communication with potentially impacted communities, governments and designated emergency response teams, using means such as satellite or mobile telephones or radio. A back-up communications system should be considered where available. Global positioning systems, procedures for periodic communications between transport vehicles and the transporter or purchaser, or other methods should be used to track the progress of cyanide shipments.

5. Overseas shipments should be in compliance with the requirements of the “Dangerous Goods Code of the International Maritime Organization.” Shipment of cyanide by aircraft should comply with the “Technical Instructions for the Transport of Dangerous Goods by Air” of the International Civil Aviation Organization. For shipment by truck, transporters should implement a road safety program that includes, but is not limited to, vehicle and tire inspections, preventive maintenance, limitations on drivers and hours, tie-down
procedures for solids, and procedures by which transportation can be suspended if severe weather conditions are encountered. Transporters should retain records to document that these activities were conducted.

1. Inventory controls and/or chain of custody documentation should be required to identify the loss of any cyanide material during transport.

For additional information, see:

- Cyanide Transportation Audit Protocol, www.cyanidecode.org/auditing&verification
- Principles for Storage, Handling and Distribution of Alkali Cyanides; Cyanides Sector Group, European Chemical Industry Council (CEFIC), May 2000, Revision 1.
- International Maritime Organization, Dangerous Goods Code.

3. HANDLING AND STORAGE  Protect workers and the environment during cyanide handling and storage.

**Standard of Practice 3.1**
Design and construct unloading, storage and mixing facilities consistent with sound, accepted engineering practices, quality control and quality assurance procedures, spill prevention and spill containment measures.

**Guidance**
To the extent feasible, unloading and storage areas for liquid and solid cyanide should be located away from people and surface waters. The potential for releases to surface water and/or human exposure associated with the storage location should be evaluated, and the operation should implement precautions as needed to prevent or minimize these potentials. Protective measures may include automatic sensors and alarms for hydrogen cyanide gas, enhanced or additional containment structures, and specific emergency procedures for notification, evacuation, response and remediation. Additionally many cyanide manufacturers have guidelines for the design, construction and operation of unloading and storage facilities that may be helpful in the implementation of this practice.

Unloading of liquid cyanide should be done on a concrete surface to prevent leakage from contacting the environment. Systems and procedures should be in place to address potential recovery of released solution, remediation of any contaminated soil, and possible failures of the tank trucks as necessary to protect surface and ground water. A method to prevent the overfilling
of cyanide storage tanks (other than by direct observation and manual gauging rod) should be provided, such as an automatic level indicator, high-level alarm, or integrated tank and tanker valve-shutdown device.

Storage areas for cyanide should be well ventilated to prevent the build-up of hydrogen cyanide gas. Measures such as storage under a roof and off the ground or in secure containers should be in place to minimize the potential for contact of cyanide with water. Cyanide should be stored within a secure location where public access is prohibited, such as the fenced boundary of the operation/plant or within a separate fenced and locked area. Cyanide should not be stored with acids, strong oxidizers, explosives, foods, animal feeds, tobacco products, or any other incompatible materials. Berms, bunds, walls or other barriers that will prevent mixing can be used.

Cyanide storage and mixing tanks should be located on a concrete surface to prevent seepage to the subsurface. Secondary containment should be employed to contain any releases from the tanks, and for any precipitation that may come in contact with the cyanide. Allowances must also be made for the recovery and return to the cyanidation process or proper disposal of any contaminated water or cyanide leakages.

Secondary containments used for this purpose should be constructed of concrete, asphalt, plastic or other materials that are demonstrated to provide a competent barrier. Containments, which may include multiple containments connected by piping, should be sized to hold a volume of leakage greater than that of the largest tank, any piping that drains back into the containment, and should have additional capacity for the design storm event. Procedures should be implemented to prevent discharge to the environment of any process solution or precipitation contaminated with cyanide that is collected in a secondary containment area.

Operations should employ quality control and quality assurance procedures in the construction of foundations, storage and mixing tanks, solution handling facilities and containments to ensure that design objectives have been achieved. Records should be retained documenting that these procedures have been followed.

Cyanide storage and mixing tanks and related pipelines should be constructed of or coated with materials compatible with cyanide and high pH conditions. Tanks and pipelines should be clearly identified as containing cyanide, and the direction of flow should be indicated on pipelines. This should be accomplished by using labels, tags, signs or other clearly legible markings. Some jurisdictions also have standardized color-codes for cyanide tanks and pipes containing cyanide.

*Standard of Practice 3.2:*
Operate unloading, storage and mixing facilities using inspections, preventive maintenance and contingency plans to prevent or contain releases and control and respond to worker exposures.

*Guidance*
The unloading, storage and mixing of cyanide at an operation involves concentrated solutions of cyanide and solid cyanide salts and therefore presents the potential for worker exposure and environmental releases involving potentially toxic concentrations of cyanide. Employing
appropriate practices and procedures during these activities is critical to protect worker health and safety, prevent releases, and effectively respond to any exposures or releases.

Operations should develop and implement a written set of procedures designed to prevent or control exposures and releases during cyanide unloading, storage and mixing activities. These procedures may be in the form of an operating manual, standard operating procedures, checklists, signs, training documents, or other written formats as long as they address the elements discussed below, as appropriate for the site and its unloading, storage and mixing activities.

The procedures should include instructions for operating all valves and couplings, and requirements for use of personal protective equipment. Procedures for handling solid cyanide should include measures to insure that containers are neither ruptured nor punctured, and describe limits on stacking containers. Mixing procedures should include techniques to minimize the evolution of hydrogen cyanide gas, prevent loss of solid cyanide, and insure the handling and disposal of empty cyanide containers consistent with the Code.

Operations should develop contingency procedures for responding to releases and worker exposure that may occur during the unloading, mixing and storage of cyanide. These plans should address the issues identified under Principle 6, Worker Safety and Principle 7, Emergency Response, and may be incorporated into the operation’s overall Emergency Response Plan.

At least two individuals also should be present when unloading liquid cyanide so that one can be available for immediate response in the event of an exposure. These individuals, who may be from the operation or the transport company, should be trained in the unloading procedures used at that site as well as in the applicable procedures for emergency response to worker and community exposure and environmental release. Remote video monitoring can be used in lieu of the second “observer” during the unloading of liquid cyanide.

At least two individuals should also be present when mixing cyanide with water unless an automated system is used or a remote video monitoring system is used. The cyanide manufacturer’s recommended procedures for mixing or similar site-specific procedures should be followed closely to minimize the possibility of worker exposure. The pH of the mix water should be sufficiently high to minimize the evolution of hydrogen cyanide gas. The exact pH required at a given operation will depend on the concentration of cyanide in solution, the water chemistry, and the engineered controls built into the mixing system.

Cyanide-specific first aid and emergency response equipment should be readily available for use at unloading, storage and mixing locations, including high-pH water for decontamination of exposed workers, oxygen, resuscitator and appropriate personal protective equipment. An antidote for cyanide poisoning must also be available. However, while any trained individual can administer oxygen and/or amyl nitrite, only certified medical personnel may administer intravenous antidotes. A means of communication or notification, such as a radio, telephone or alarm system, should also be available to summon help in the event of an exposure. Workers involved with unloading, storage and mixing should be trained in the use of emergency rescue equipment and in the first aid procedures for responding to cyanide exposures as discussed in Principle 8, Training.
Spill neutralization and clean-up equipment should also be readily available at unloading, storage and mixing locations. This may include water for cleaning up spills of liquid cyanide, shovels for cleaning up spills of solid cyanide, and chemicals to treat or neutralize cyanide and cyanide-contaminated soils, as well as cyanide-specific personal protective equipment. See the Guidance for Standard of Practice 7.5 regarding treatment of cyanide. Personnel engaged in unloading, storage and mixing activities should be trained in the operation’s procedures to respond to cyanide spills, including notifications, clean up and detoxification.

Storage areas, pipelines, pumps, valves and tanks should be inspected regularly for evidence of leakage, presence of solution in secondary containments and integrity of the containment. Deficiencies should be noted and records retained documenting the inspection and the implementation of necessary corrective measures.

Empty cyanide containers should not be reused on or off the mine site for any purpose other than holding cyanide. Prior to disposal or re-use, cyanide drums should be rinsed three times with high-pH water to remove cyanide residue. All rinse water should either be added to the cyanidation process or assumed to contain cyanide and disposed of in an environmentally sound manner. The rinsed drum may then be crushed and placed in a landfill. Plastic bags and liners should also be triple-rinsed prior to disposal. Wooden crates are difficult to effectively decontaminate; it should be assumed that they have come in contact with cyanide and they should be burned or otherwise disposed of in an environmentally sound manner. Cyanide containers that are specifically meant for return to the vendor for reuse may not require internal rinsing, but any cyanide residue on the outside of the container should be washed off and managed consistent with the Code, and the container should be securely closed for shipment.

For additional information, see:
- Principles on Cyanide Management for Gold Mining, Chamber of Mines of South Africa, June 2001
- Best Practice Environmental Management In Mining, Cyanide Management; Environment Australia, June 1998
- Principles for Storage, Handling and Distribution of Alkali Cyanides; Cyanides Sector Group, European Chemical Industry Council (CEFIC), December 1997
- Technical Guide for the Environmental Management of Cyanide in Mining, British Columbia Technical and Research Committee on Reclamation, Cyanide Subcommittee, December 1995
- Cyanide Management Principles, Department of Minerals and Energy, Western Australia, July 1992
- The cyanide manufacturer’s guidelines and government regulations where they have been established.

4. OPERATIONS: Manage cyanide process solutions and waste streams to protect human health and the environment.
Standard of Practice 4.1
Implement management and operating systems designed to protect human health and the environment including contingency planning and inspection and preventive maintenance procedures.

Guidance
Written management systems, including operating plans and procedures, are the link between a site’s design and its operation. On a daily basis, these systems provide a method to insure operational parameters are consistent with design criteria and assumptions. Although formalized plans are suggested, the Code does not require an operation to compile its cyanide-specific procedures into specified formats or documents or that the necessary cyanide management procedures be documented separately from an operation’s other operating, training or environmental plans and procedures. Procedures may be in the form of manuals, standard operating procedures, checklists, signs, training materials or other forms, and may be separate for cyanide management or included with other documentation, as long as they demonstrate the operation’s understanding of managing cyanide in a manner that prevents or controls releases to the environment and exposures to workers and the community.

Operating plans or procedures should be developed and implemented for both new and existing facilities such as leach plants, heap leach operations, tailings impoundments, cyanide treatment, regeneration and disposal systems for the use, management and disposal of cyanide and cyanide-containing solutions.

The plans or procedures should describe the standard practices necessary for the safe and environmentally sound operation of the facility and the specific measures needed for compliance with the Code, such as inspections and maintenance activities, and identify the assumptions and parameters on which the facility design was based. They should also identify any applicable regulatory requirements necessary to prevent or control cyanide releases and exposures, examples of which include the freeboard required for safe pond and impoundment operation and cyanide concentrations in tailings on which the facility’s wildlife protection measures or permit limits are based.

The management system should also include procedures to identify when the initial design and operating practices at the site have or will be changed, and require a change in cyanide management practices. For example, the initial design of a facility may have been based on disposal of tailings with a sufficiently low Weak Acid Dissolvable (WAD) cyanide concentration, making no additional wildlife protection measures necessary. But if the mine encounters ore with a high copper content, the increased cyanide concentrations required for efficient leaching may result in a tailings solution that is harmful to birds. Therefore, a change in procedure would be warranted to prevent the exposure of birds to a tailings solution that may have a toxic concentration of cyanide. For example the procedure may require the blending of ore types, or the use of a cyanide destruction or regeneration plant, to address this issue.
Management systems and operating plans or procedures should also include contingencies for situations where there is an upset in a facility’s water balance, when inspections or monitoring identifies a problem, and when a temporary closure or cessation of operations may be necessary. Prior planning for these situations allows rapid responses and minimizes risks of cyanide exposures and releases.

Various programs and guidelines can be useful as models for development of environmental management systems. The International Standards Organization’s ISO 14000, British Standards BS 7750, European Community's Eco-Management & Audit Scheme (EMAS) and the Organization for Economic Cooperation and Development’s (OECD) Guidelines for Multinational Enterprises, V. Environment all provide frameworks an operation can use as a basis for its cyanide management system. However, the Code does not require the use of any single approach to environmental management nor accepts such systems in lieu of the development and implementation of the plans and procedures identified in the Code.

Facilities should be inspected on an established frequency to insure that they function within design parameters. Although specific inspection needs will depend on the facilities at a given site and the degree of automated instrumentation, some visual inspections are typically necessary at most sites. Tanks holding process solutions should be inspected for structural integrity and signs of corrosion and leakage. Secondary containments should be inspected for their integrity, the presence of fluids, and their available capacity to insure that drains are closed and, if necessary, locked, to prevent accidental releases to the environment. Leak detection and collection systems at leach pads and ponds should be inspected as required in the design documents. Pipelines, pumps and valves should be inspected for deterioration and leakage. Ponds and impoundments should be inspected for the parameters identified as critical in design documents to their containment of cyanide and solutions, maintenance of the water balance (such as available freeboard) and the integrity of structures for diversion of surface water and runoff.

Facility inspections should be documented on inspection forms, in log books or by other means, and should include the date of the inspection, the name of the inspector, and any observed deficiencies. The nature and date of corrective actions also should be documented.

Preventive maintenance programs should be implemented and their activities documented to insure that equipment and devices necessary for cyanide management function continuously. Pumps, pipelines, treatment, and destruction/regeneration equipment are examples of equipment that should be regularly maintained so that failures do not result in worker exposures or releases to the environment.

Operations should have a source of emergency power for pumps and other equipment to prevent unintentional cyanide releases and worker exposure when their primary power supply is interrupted. Back-up power generating equipment should be maintained and tested to insure its viability and reserves.

Standard of Practice 4.2
Introduce management and operating systems to minimize cyanide use, thereby limiting concentrations of cyanide in mill tailings.
Guidance

Limiting cyanide use to the greatest extent practicable has environmental and economic benefits because reducing the concentration of cyanide lowers the risk of potential seepage, harmful exposures to wildlife, and minimizing the amount of cyanide that must be transported to the site lowers the potential of transport-related releases.

While facilities must use the amount of cyanide determined to be metallurgically necessary for efficient precious metal extraction, operations should use bottle roll or other test procedures to determine the optimal amount of cyanide, and should reevaluate and adjust addition rates as necessary when changes in ore type or processing plant practices occur. Operations should also evaluate various control strategies for cyanide additions, such as periodic sampling and automated systems to optimize efficiency, to reduce cyanide concentrations in mill tailings and/or recycled solutions, and then implement the chosen strategy.

Standard of Practice 4.3:
Implement a comprehensive water management program to protect against unintentional releases.

Guidance

The proper management of process solution and storm water is central to the prevention of releases from tailings impoundments and solution ponds. A comprehensive water balance should be developed in order to define the necessary parameters for design and operation of these facilities. Inspection and monitoring to maintain the water balance should become part of the facility’s operating procedures, thus preventing an over-accumulation of water that can result in overtopping, unplanned discharge into the environment, and the potential structural failure of the facility.

The water balance should be probabilistic in nature, taking into account the uncertainty and variability inherent in the prediction of precipitation patterns. This entails considering precipitation and evaporation ranges, extremes and seasonal variations, as well as average conditions. Although a water balance must be developed on a site-specific basis, a number of basic factors must be considered in all cases.

The rates at which solutions are applied to leach pads and tailings are deposited into storage facilities are critical design parameters for sizing facilities. Once set (unless other engineering changes are made) these rates will limit the amount of tailings that can safely be discharged to an impoundment and the volume of leach solution that can be circulated through a leach operation.

Facility design must be based on a storm duration and return interval that provides a sufficient degree of probability that overtopping of the pond or impoundment can be prevented. Since precipitation falling on the facility and evaporation from it may represent a significant input and loss of water to the system, these rates should be evaluated on a regular (typically monthly) basis to account for seasonal variations in weather patterns. The selection of events and their
recurrence interval should be based on the anticipated period of operations, rainfall distribution patterns, the relative safety, health and environmental risks at the site, applicable regulatory requirements and an adequate margin of safety. Examples include but are not limited to designs for containment of a 100-year, 24-hour event (the most precipitation anticipated to fall during a 24-hour period once every 100 years) and a 50-year, 72-hour event (the most precipitation anticipated to fall during a 72-hour period once every 50 years). The quality of existing data is also a factor, and conservative assumptions or adjustments may need to be considered when long-term data are not available or where the only data available do not represent actual site conditions.

The amount of precipitation entering a pond or impoundment resulting from surface run-on from the upgradient watershed must be considered in the water balance. While the design storm event used to calculate inflow from upgradient will be at least the same as that used for precipitation falling directly on the facility, it may be necessary to increase the anticipated volume of precipitation if the watershed includes significantly higher terrain, to account for infiltration into the ground and run-off entering the facility.

In regions receiving precipitation as snow or ice, an “inventory” of precipitation may accumulate for weeks or months during freezing conditions and be released as a single inflow during a thaw. The potential for such an occurrence must be considered in areas experiencing such conditions.

For leach ponds, the water balance should also include an evaluation of the amount of solution that can drain from the heap to a pond before pumping capacity can be restored. Site-specific parameters, such as the height and porosity of the heap, should be considered along with the design storm event and other potential failure scenarios such as pipe failure. A 48-hour period is used by some jurisdictions for drain-down calculations.

The water balance must also take into account various solution losses in addition to evaporation. These include the capacity of decant, drainage and recycling systems used to return solution to the process, seepage to the subsurface as authorized by the applicable jurisdiction, and whether the facility is allowed to discharge solution to surface water. Where pumps and other equipment will be used to remove solution from ponds and impoundments, the water balance must account for potential power outages or equipment failures, and the availability of back-up equipment and power.

Where discharge to surface water is allowed and deemed necessary to accommodate site design and climatic conditions, the capacity of cyanide treatment, destruction or regeneration systems must be considered in the water balance. Further, the on-line availability of these systems, and the implications of their failure or maintenance downtime, must be factored into the water balance and facility storage capacity.

Other aspects of facility design may have direct consequences on how the water balance must be determined, and these factors must be included when calculating the amount of water that can be stored in the impoundment. For example, the analysis of dam stability or potential seepage of a tailings impoundment may be based on an assumed phreatic surface within the dam.
Ponds and impoundments must be designed to maintain an adequate freeboard between the crest of the pond or impoundment and the maximum design level of solution determined to be necessary from water balance calculations. Heights of 0.5-1.0 meters are examples of freeboard requirements that are typically found in many regulations and guidance documents as a safety factor and to account for potential wave action in tailings storage facilities. Greater freeboard may be necessary in leach ponds since their surface areas are generally much smaller than those of tailings storage facilities, and they fill more rapidly during increased precipitation.

Operation of a rain gauge is necessary unless daily precipitation data is available from another nearby source that is representative of site conditions. Precipitation data should be compared with the assumptions used for facility design, and operating practices should be reviewed and revised as necessary to account for actual measured precipitation.

**Standard of Practice 4.4:**
Implement measures to protect birds, other wildlife and livestock from adverse effects of cyanide process solutions.

**Guidance**
Process solutions impounded in a Tailing Storage Facility (TSF), leaching facilities and solution ponds can attract birds, wildlife and livestock. A concentration of 50 mg/l WAD cyanide or lower in solution is typically viewed as being protective of most wildlife and livestock mortality other than aquatic organisms. Where birds, wildlife or livestock have access to water impounded in TSFs, leaching facilities or solution ponds, operations should implement measures to limit the concentration of WAD cyanide to a maximum of 50 mg/l. Various treatment methods are available to reduce cyanide concentrations in mill effluents to achieve this concentration.

Measures to restrict access by wildlife and livestock should be instituted for all open waters where WAD cyanide exceeds 50 mg/l. These measures include fencing, filling in leach solution collection and transport ditches with gravel, and covering or netting water in ditches, ponds and impoundments. Hazing techniques such as use of air cannons are not effective in most cases. Fencing is also appropriate in most cases to prevent unauthorized access and potential exposure to humans.

Solution application methods for leach operations should be designed and operated to avoid significant ponding on the heap surface and limit overspray of solution off the heap liner. This should prevent contact with birds and other wildlife and potential contamination of surrounding soil, surface water and ground water. Ponding on a heap leach facility may indicate saturated conditions at depth in the heap that could lead to structural failure and release of process solution to the environment.

**Standard of Practice 4.5:**
Implement measures to protect fish and wildlife from direct and indirect discharges of cyanide process solution to surface water.
Guidance

Process solutions may be discharged directly or indirectly to surface waters. A typical direct discharge would be a permitted discharge of tailings water to a stream, while an indirect discharge could be seepage from a tailings storage facility that flows on the surface or through the subsurface and enters a stream. Direct discharges to surface water may be necessary in regions where precipitation exceeds evaporation. Operations should implement measures to protect against and manage indirect discharges so that cyanide concentrations are not harmful to fish and wildlife in these surface waters.

Discharges to surface waters should not exceed 0.5 mg/l WAD cyanide nor result in a concentration of free cyanide in excess of 0.022 mg/l within the receiving surface water body, and downstream of any mixing zone approved by the applicable jurisdiction. The 0.022 mg/l Guideline is from the United States Environmental Protection Agency’s National Water Quality Criteria for Cyanide, and represents a concentration to which a freshwater aquatic community can be briefly exposed without resulting in an unacceptable effect.

The lower quantification limit (LQL) for free cyanide analysis achievable by most laboratories is 1 mg/l. (See: www.cyanidecode.org/library/cyanidefacts/samplingandanalyticalmethods) If the analytical laboratory cannot achieve accurate compliance with the 0.022 mg/l, the operation may demonstrate compliance by determining the free cyanide concentration in the discharge and calculating the resulting concentration after dilution in the mixing zone (if applicable). In the event that the free cyanide concentration of the discharge is below the analytical limit of quantification, the operation should determine the WAD cyanide concentration in the discharge, assume that all WAD cyanide is free cyanide, and calculate the resulting concentration after dilution in the mixing zone (if applicable). Operations may also apply biotoxicity testing using species and techniques accepted by the applicable jurisdiction.

Free cyanide levels of 0.022 mg/l may not be appropriate in all cases, as the sensitivity of aquatic life to cyanide varies with the species present and the characteristics of the receiving water. It will usually be necessary to treat or regenerate cyanide prior to its discharge in order to achieve 0.022 mg/l free cyanide downstream of the mixing zone. Many jurisdictions have their own specific numerical standards for surface water discharges or surface water quality, or may limit cyanide species other than free cyanide.

Treatment may be passive (allowing sufficient residence time in an impoundment for natural processes to reduce cyanide concentrations or use of wetlands) or active (utilizing any of the various available technologies to oxidize cyanide or to regenerate hydrogen cyanide for reuse in production). It should be noted that some treatment methods could increase the concentration of cyanide degradation products (such as cyanate, ammonia and nitrate) in the discharge. These substances can themselves be harmful to fish and wildlife. Although control of these substances is not covered by the Code, operations utilizing such treatment systems should evaluate the effects of cyanide degradation products on exposed fish and wildlife and take measures necessary for their protection.

Monitoring surface water quality in both the up- and down gradients of a cyanide facility can determine if an indirect discharge is causing harmful concentrations of cyanide in the surface
water. In such a case, the discharge should be stopped either as soon as possible or intercepted and collected. The water balance and design parameters of a tailings storage facility should be reviewed to determine if the seep is from improper water management. Seepage that cannot be stopped should be collected in trenches, ponds or wells, and either returned to the production process or, if permitted, treated as necessary and discharged.

**Standard of Practice 4.6:**
Implement measures designed to manage seepage from cyanide facilities to protect the beneficial uses of ground water.

**Guidance**
Measures designed to manage seepage of leaching and tailings solutions should be incorporated into the design and construction of facilities to protect the existing beneficial uses of ground water, and/or the beneficial uses designated by the applicable jurisdiction. Where the beneficial use of ground water has been adversely impacted, mine operations should implement remedial measures to protect against further degradation and restore beneficial uses at the applicable monitoring location or point/s of compliance.

For leach pads and leach solution ponds, this typically requires lining with a minimum of one synthetic membrane, such as high- or low-density polyethylene, HDPE or LDPE, placed on a prepared and compacted earthen liner. These and other liner systems, such as two synthetic membranes, can be designed and constructed with leak detection and recovery systems between the liners where significant hydraulic head (i.e., a solution pond or the internal solution collection trenches of a heap leach pad) allows for periodic monitoring for leakage.

Verification of protection of the beneficial uses of groundwater is based on data, and not on the use of a particular technology. There are a number of techniques for limiting and controlling seepage from tailings storage facilities; these are identified for informational purposes only, and are not intended as verifiable elements of the Code:

- Limiting the hydraulic head by maintaining a small pond area will reduce the force driving solution into the subsurface. The earthen floor of an impoundment can be compacted in its natural condition, or by adding clay materials to form a liner.
- Deposition methods can be used to promote tailings compaction and reduce their permeability.
- Dam designs are available to promote drainage to a collection system rather than to the subsurface, and cut-off trenches can be used to intercept and collect shallow seepage before it can impact ground water.
- Remedial actions such as pump-back systems also can be used to manage subsurface flows and prevent existing ground water plumes from reaching potential receptors and interfering with the beneficial uses of ground water.

The need for and nature of seepage control measures is highly dependent on site-specific hydrogeological conditions. Such systems should therefore be factored into the initial design of a tailings storage facility and be incorporated into the facility’s operating plan to protect the designated beneficial uses of ground water. Any measures to restrict or control seepage from
Tailings storage facilities must be integrated into overall facility design, as they are directly related to the overall stability of the engineered structures.

Information on design and construction of tailings storage facilities (TSFs) can be found in Bulletins # 74, 97, 98, 101, 102, 104, 106 and 121 published by the International Commission On Large Dams, ICOLD, as well as in documents developed by many political jurisdictions.

Where mill tailings are used as underground backfill, the operation should determine the cyanide concentrations in the liquid phase and evaluate the risks to worker safety and ground water quality. Where potential exists for worker exposure to hydrogen cyanide gas, or for the release of cyanide to ground water, treatments to chemically convert, remove available cyanide, or to complex it in forms that do not present risks to worker health or the beneficial uses of the ground water or other appropriate actions should be implemented.

**Standard of Practice 4.7:**
Provide spill prevention or containment measures for process tanks and pipelines.

**Guidance**
Tanks holding process solutions such as leaching vessels, CIL and CIP tanks and cyanide tanks associated with cyanide regeneration activities should be located on concrete or material impermeable to seepage of spilled solution. Secondary containment should be provided for potential failure of cyanide process solution tanks, with provisions for recovery of released solution or remediation of any contaminated soil as necessary to protect surface and ground water. Containments should be sized to hold a volume greater than that of the largest tank within the containment, any piping that drains back into the containment, and have additional capacity for the design storm event.

Spill prevention or containment measures should also be provided for process solution pipelines. Examples include secondary containment ditches, differential pressure sensing with alarms and/or automatic shutoff systems, and preventive maintenance programs with pipe thickness measurements. While a program of regular visual inspections should also be conducted, visual inspections alone are not typically sufficient unless the inspections are conducted at a frequency that can identify and prevent significant releases. If a risk exists for a release of process solution from a pipeline to adversely effect surface water, such as where pipes cross streams, operations should evaluate the need for special protection such as double-walled piping.

Cyanide process tanks and pipelines should be constructed or coated with materials that are compatible with cyanide and high pH conditions. Tanks and pipelines should be clearly identified as containing cyanide. The direction of flow should be indicated on pipelines. Labels, tags, signs or other clearly legible markings can accomplish this. Some jurisdictions also have standardized color-codes for cyanide tanks and pipes containing cyanide.

**Standard of Practice 4.8:**
Implement quality control/quality assurance procedures to confirm that cyanide facilities are constructed according to accepted engineering standards and specifications.
Facilities for the management of cyanide should be constructed according to accepted engineering standards and specifications. Quality control and quality assurance programs should be implemented during construction of new facilities and modifications to existing facilities to insure structural integrity and the ability to safely contain process solutions and solids. Qualified personnel should review facility construction and document that the facility has been built as proposed and approved.

Existing facilities may not have been subject to quality control and assurance programs when originally constructed. If no records exist, to insure that the facility can operate consistent with the Code’s Principles and Standards of Practice the facility must be inspected by appropriately qualified personnel and a report issued documenting the results.

The quality control and quality assurance program should address the suitability of the construction materials and the adequacy of soil compaction for earthworks such as tank foundations and earthen liners for leach facilities. Quality control and quality assurance procedures are also necessary for installation of synthetic membrane liners used in ponds and leach pads, for pipes, pipe fittings, for welds and bolts on cyanide storage and process tanks, and for any other equipment containing cyanide. Records should be retained to document that the specific quality control and quality assurance procedures have been followed.

Oversight by qualified personnel of all phases of construction and testing, and well-defined procedures for approval of changes to original design or construction techniques are also important aspects of quality control and quality assurance programs. The previously referenced ICOLD documents, as well as guidance documents developed by many individual countries and jurisdictions, provide information on quality control and quality assurance programs for construction of tailings dams and impoundments. In particular, the suitability of construction materials and the degree of compaction necessary for natural materials are of critical importance in most tailings storage facility designs. Other parameters may also be significant depending on the design.

Standard of Practice 4.9:
Implement monitoring programs to evaluate the effects of cyanide use on wildlife, surface and ground water quality.

Guidance
Monitoring programs play a key role in release prevention and identification and provide a basis for effective worker training. Sites should develop written standard procedures for monitoring activities; conduct the activities in a uniform and consistent manner to insure good quality.

Operations should monitor cyanide in discharges to surface water, and in the surface and ground water upgradient and down gradient of the site to determine the effectiveness of the current management systems and take any necessary corrective actions. Sampling and analytical protocols should be developed by appropriately qualified personnel and should specify to the extent practical how and where samples should be taken, sample preservation techniques, chain
of custody procedures and cyanide species to be determined. Sampling conditions and procedures should be documented on standardized written forms, in logbooks or by other means.

Monitoring should be conducted at intervals adequate to characterize the medium being monitored and to identify changes in a timely manner. Timing may vary from site to site, depending on the amount of existing data, the stability of the parameters, and the rate of ground water movement. Discharges to surface waters are typically monitored daily, while surface water monitoring may be weekly or monthly. Ground water monitoring may be monthly, quarterly or longer. Monitoring for wildlife mortality is normally part of a daily inspection of cyanide facilities.

For additional information see:
- Principles on Cyanide Management for Gold Mining, Chamber of Mines of South Africa, June 2001
- Water Quality Protection Principles No. 1-11; Department of Minerals and Energy, Western Australia, May 2000
- Bird Usage Patterns on Northern Territory Mining Water Tailings and their Management to Reduce Mortalities; David Donato; January 1999
- Principles on the Safe Design and Operating Standards for Tailings Storage; Department of Minerals and Energy; Western Australia; October 1999
- Best Practice Environmental Management In Mining, Cyanide Management; Environment Australia, June 1998
- Best Practice Environmental Management In Mining, Water Management; Environment Australia, June 1998
- Principles on the Development of an Operating Manual for Tailings Storage; Department of Minerals and Energy; Western Australia; October 1998
- Best Practice Principles: Reducing Impacts of Tailings Storage Facilities on Avian Wildlife in the Northern Territory of Australia; Northern Territory Department of Mines and Energy; October 1998
- Environmental Management Systems-General Principles on principles, systems and supporting techniques; International Organization for Standardization, 1996
- Principles for Environmental Protection; The Engineering Design, Operation and Closure of Metalliferous, Diamond and Coal Residue Deposits; Volume 1/1979; Chamber of Mines of South Africa; March 1996
- Technical Guide for the Environmental Management of Cyanide in Mining, British Columbia Technical and Research Committee on Reclamation, Cyanide Subcommittee, December 1995
5. DECOMMISSIONING

Protect communities and the environment from cyanide through development and implementation of decommissioning plans for cyanide facilities.

**Standard of Practice 5.1:**
Plan and implement procedures for effective decommissioning of cyanide facilities to protect human health, wildlife and livestock.

**Guidance**
Prior to the start of new operations, the steps necessary to decommission the cyanide facility should be determined so that the facility can be closed in a manner that prevents adverse impacts to people, wildlife or the environment.

Issues related to cyanide are only one component of a site’s overall decommissioning and closure strategy. An operation may incorporate procedures to address decommissioning of cyanide facilities in its overall site closure plan, or it may develop separate procedures for decommissioning and closing. The chosen strategy should address issues such as disposal of cyanide reagents, decontamination of equipment, rinsing of heaps and activities to prepare tailings storage facilities for closure, removal of water from pond surfaces or reduction of the cyanide concentration to a level protective of human health and wildlife, and the installation of any equipment necessary for long-term protection of ground and/or surface water quality during the facility’s closure period. The plan should also include implementation schedules for each activity. The decommissioning strategy should be routinely reviewed and revised during the life of the operation to address changes in facilities or the development of new decommissioning technologies.

**Standard of Practice 5.2**
Establish an assurance mechanism capable of fully funding cyanide related decommissioning activities.

**Guidance**
A mining operation should develop an estimate of the cost to fully fund the cyanide-related decommissioning measures identified in its plan for site decommissioning or closure; the estimate should be based on the current cost for a third party to implement the identified decommissioning measures. Those plans should be reviewed and updated at least every five years or when revisions are made that affect cyanide-related decommissioning activities.

An operation will be considered compliant with this Standard of Practice if it has met the financial assurance requirements imposed by the applicable political jurisdiction in an amount sufficient to cover its decommissioning costs as identified above.

In situations where there is no jurisdictional requirement for financial assurance for site decommissioning, an operation should establish an assurance mechanism capable of covering the
costs of its cyanide-related decommissioning activities. One option is the establishment of a financial instrument, such as a bond, letter of credit or insurance in the amount estimated to be necessary for cyanide-related decommissioning activities. If the operation uses self-insurance or self-guarantee as its financial assurance, it must provide a statement by a qualified financial auditor that it has sufficient financial strength to fulfill this obligation as demonstrated by an accepted financial evaluation methodology such as those described in the U.S. Code of Federal Regulations at 40 CFR 264.143(f), 30 CFR 800.23, 10 CFR 30, Appendix A, or at Sections 13 through 20 of Ontario Regulations 240/00, Mineral Development and Closure, under Part VII of the Ontario Mining Act.

For additional information see:
- Best Practice Environmental Management In Mining, Rehabilitation and Revegetation; Environment Australia, June 1998
- Principles for Environmental Protection; The Engineering Design, Operation and Closure of Metalliferous, Diamond and Coal Residue Deposits; Volume 1/1979; Chamber of Mines of South Africa; March 1996

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6. WORKER SAFETY  Protect workers’ health and safety from exposure to cyanide.

**Standard of Practice 6.1**
Identify potential exposure scenarios and take measures as necessary to eliminate, reduce and control them.

**Guidance**
Job functions and tasks should be evaluated to determine possible exposure scenarios and pathways. Process changes or engineering controls should be developed and implemented to eliminate these exposures and reduce or control them when they cannot be eliminated.

Operations should then develop and document procedures for performing cyanide-related tasks such as unloading, mixing, plant operations, entry into confined spaces, and equipment decontamination in a manner that minimizes worker exposures. These procedures should also address, where appropriate, the use of cyanide-specific personal protective equipment such as respirators, eye protection, protective gloves, coveralls or suits, pre-work inspections, emergency response, cyanide monitoring, communication and documentation. Personnel involved in cyanide management should be trained to handle cyanide in a manner that protects their safety and their co-workers’ safety. Training should also include the proper use of equipment for personal protection, emergency rescue, and cyanide first aid.

Operations should also implement procedures to review any future proposed process or operational changes or modifications for their potential impact on worker health and safety, and necessary worker protection measures.
The workforce is a valuable source of information regarding where and how potential exposures can occur and how they can be managed. Worker input through safety meetings, suggestion boxes, or other methods should be factored into the development and evaluation of health and safety procedures.

**Standard of Practice 6.2**
Operate and monitor cyanide facilities to protect worker health and safety and periodically evaluate the effectiveness of health and safety measures.

**Guidance**
The pH of a solution containing cyanide significantly affects the amount of evolved hydrogen cyanide and the potential for workers to be exposed to toxic concentrations of hydrogen cyanide gas. In aqueous solution, the cyanide ion hydrolyzes to form hydrogen cyanide. At a pH of 9.3 - 9.5, the cyanide ion, and hydrogen cyanide are at equilibrium. Higher pH conditions result in greater concentrations of the cyanide ion. At a pH of 10.0, 88% will be in the form of the cyanide ion and when the pH is increased to 11.0, more than 99% will be in the ionic form. Below a pH of 9.3 - 9.5, hydrogen cyanide will be the predominant form of cyanide. While aqueous hydrogen cyanide is soluble in water, it volatilizes rapidly under the temperature and pressure conditions typically found in gold cyanidation operations. Therefore, maintaining process solutions at a sufficiently high pH is necessary to effectively prevent evolution of significant amounts of hydrogen cyanide gas. However, in high saline water or when processing certain ore types, solution chemistry limits how high the pH can be adjusted. Operations should evaluate their solutions to determine the appropriate pH for limiting the evolution of hydrogen cyanide gas, and develop operating procedures and controls to reduce risks to its workforce.

Process changes and engineering or administrative controls should be used to limit worker exposure to hydrogen cyanide gas and sodium and potassium cyanide pursuant to the American Conference of Governmental Industrial Hygienists (ACGIH) Ceiling Limit Value of 4.7 parts per million (5 mg/m$^3$) as cyanide. Where the potential exists for significant worker exposure to hydrogen cyanide gas or sodium or potassium cyanide dust, the operation should monitor hydrogen cyanide concentrations with ambient and/or personal monitoring devices (either automatic or manual, passive or active) and evaluate the results to confirm that controls are adequate. Cyanide-specific personal protective equipment must be required in any areas and for any activities where process and engineering or administrative controls are not practicable or effective in limiting worker exposures to 5 mg/m$^3$.

Cyanide monitoring equipment should be maintained, tested and calibrated as directed by the manufacturer, and records should be retained for at least one year. The need to monitor for hydrogen cyanide gas is increased in facilities where the solution chemistry is such that maintenance of a high pH in process solutions is difficult.

Warning signs should be placed where cyanide is used and should alert workers that cyanide is present, that smoking, open flames, eating and drinking are not allowed and that the necessary cyanide-specific personal protective equipment must be worn.
Showers, low-pressure eye wash stations and dry powder or non-acidic sodium bicarbonate fire extinguishers should be located at strategic locations throughout the operation where cyanide is present. This equipment should be maintained, inspected, and tested on a regular basis, and records should be retained.

Tanks and piping containing cyanide should be identified by color code, signs, labels, tags, decals or other means to alert workers of their contents. The direction of cyanide flow in pipes should also be labeled, marked or otherwise designated.

Material Safety Data Sheets (MSDS), first aid procedures and any other informational materials on cyanide safety should be written in the language of the workforce and should be available in areas where cyanide is managed.

All exposure incidents should be investigated and evaluated to determine if the operation’s programs and procedures to protect worker health and safety, and to respond to cyanide exposures are adequate or if changes are necessary.

Standard of Practice 6.3
Develop and implement emergency response plans and procedures to respond to worker exposure to cyanide.

Guidance
Although every effort must be made to eliminate risks to workers from exposure to cyanide, operations must nonetheless be prepared for such exposures with effective response procedures and trained personnel. Cyanide first aid equipment including medical oxygen and a resuscitator must be on hand and inspected regularly to insure it is available when needed.

Antidotes for cyanide poisoning should be available at an operation. Preferred and permissible antidotes vary from country to country, and their selection at each operation must take local requirements into account. Intravenous antidotes such as sodium nitrite, sodium thiosulfate, cobalt edetate (Kelocyanor), and 4-dimethylaminophenol (DMAP) must only be administered by certified medical personnel. The antidote amyl nitrite is inhaled, and can be administered by trained non-medical personnel. However, all antidotes can themselves be harmful depending on the dose and the patient’s overall health, and must be administered with great care and an understanding of the patient’s pre-existing medical condition. Antidotes must be stored, tested and replaced as directed by their manufacturers’ schedules.

Specific emergency response procedures should be developed to respond to cyanide exposure. Most cyanide producers have prepared detailed response procedures that can be adopted and implemented at mining operations. In general, procedures for responding to inhalation of cyanide gas or skin contact with liquid or gaseous cyanide should include the following elements:

1. Activate alarm or call for help to notify the appropriate site personnel (through alarms, radio, and telephone) so that medical assistance is available as soon as possible.
2. Call for assistance before responding to the emergency (“buddy-system”). Never try to rescue a cyanide victim on your own.
3. The responder must put on the personal protective equipment necessary to safely enter the area and come in contact with the exposed individual.

4. If possible, the responder must move the exposed individual to a safe area away from continued exposure. If removing the exposed individual from the area is not possible, the responder must attempt to prevent further exposure to the victim or seek assistance in moving the victim from the area of exposure.

5. All contaminated clothing must be removed from the exposed individual, and the exposed individual should be decontaminated by washing with water. Safety shower and eye wash station using low-pressure water are recommended.

6. Oxygen must be administered, and medical help must be sought. Where authorized by the applicable jurisdiction, treatment with amyl nitrite is recommended along with oxygen. A resuscitator should be used if the exposed individual is not breathing.

Medical opinions and accepted procedures vary with regard to first aid when ingestion of cyanide is suspected. In general, response to such exposure should include the following elements:

1) Notify the appropriate site personnel and put on personal protective equipment.

2) The exposed individual, when conscious, should spit or be made to vomit, and the mouth should be rinsed with water.

3) Continue with decontamination and administration of oxygen and amyl nitrite if permitted, or if the exposed individual is not breathing, a resuscitator should be used.

4) If the exposed individual is not conscious, or has impaired consciousness, treat with oxygen and amyl nitrite, if permitted.

Workers who may be called upon to respond to cyanide exposures must be trained in the operation’s response procedures and should take part in routine drills to test and improve their response skills.

Operations must develop their own on-site capabilities to provide first aid and medical assistance to workers exposed to cyanide. This is especially important in remote areas where qualified medical personnel may be hours away. Where qualified off site medical facilities are locally available, the operation should develop procedures to transport exposed workers. Formalized arrangements should be made with local hospitals, clinics, etc. so providers are aware of the potential need to treat patients for cyanide exposure prior to incident. The medical facility should have qualified staff, equipment and expertise to be able to respond effectively. The operation may need to assist local medical providers with training and equipment to enhance its capabilities.

Mock emergency drills based on likely release/exposure scenarios should be conducted periodically to test response procedures. Lessons learned from the drills should be incorporated into response planning and other procedures.

For additional information see:

- Principles on Cyanide Management for Gold Mining, Chamber of Mines of South Africa, June 2001
7. EMERGENCY RESPONSE

Protect communities and the environment through the development of emergency response strategies and capabilities.

Standard of Practice 7.1

Prepare detailed emergency response plans for potential cyanide releases.

Guidance

An Emergency Response Plan should be developed to address potential releases of cyanide requiring response. Although the Emergency Response Plan need not be specific to cyanide, these procedures should be formalized in a single document so that all necessary information is readily available. Operations should evaluate cyanide handling and management to determine how and where potential releases may occur and the potential impacts of such releases. The assessment may use a formal failure mode and effects methodology such as a Hazard and Operability Study (HAZOP), or a less formal process. In any case, it should consider the following failure scenarios appropriate for the nature of the operation’s cyanide management activities and the site-specific environment, including weather conditions and anticipated seismic events:

- Catastrophic release of hydrogen cyanide gas from cyanide storage, process or regeneration facilities,
- Transportation accidents (for transporters or an operator who has assumed responsibility for any elements of transport under Standard of Practice 2.1),
- Releases during unloading and mixing,
- Releases during fires and explosions,
- Pipe, valve and tank ruptures,
- Overtopping of ponds and impoundments,
- Power outages and pump failures,
- Uncontrolled seepage,
- Failure of cyanide treatment, destruction or recovery systems,
- Failure of tailings impoundments, heap leach and other cyanide facilities.

Plans for transportation-related emergencies should consider the transportation route, the physical and chemical form of the cyanide, method of transport (e.g., rail, truck), the condition of the road or railway, and the design of the transport vehicle (e.g., single or double walled, top or bottom unloading).

The Plan should describe specific response actions, as appropriate for the emergency situations. These include clearing personnel and potentially affected communities from the area of exposure, notifying operational management and response personnel, use of cyanide antidotes and first aid measures, controlling releases at their source, containment of releases, assessment of the release and mitigation, procedures to examine the cause of the release, and implementation of measures to prevent its reoccurrence.
Due to its remote location, a mining operation may be the closest emergency responder in the event of a cyanide emergency at another mine or during cyanide transport. Although not an auditable Code requirement, it is a good practice for operations to enter into mutual aid agreements with other mines or entities located nearby or on its cyanide transport routes.

**Standard of Practice 7.2**

Involve site personnel and stakeholders in the planning process.

**Guidance**

The workforce and off-site stakeholders, including potentially affected communities, should be included in the emergency response planning process. The workforce can provide significant input in the identification of potential failure and release scenarios and response capabilities. Potentially affected communities should be made aware of the nature of the risks associated with cyanide and should be consulted regarding communication and response actions. It is especially important that the operation involve communities when the community has a role in the response action, such as when an evacuation may be necessary. The community may be involved directly through contact with potentially affected individuals or groups, or by contact with community leaders or representatives, depending on the nature of failure and effects scenarios.

Local response agencies such as outside responders and medical facilities in the community may be able to assist in a cyanide-related emergency. Their input should be solicited as appropriate to their capabilities and potential role in response actions.

Regular consultation or communication with the local community or its representatives should also be conducted as necessary to assure that the Plan addresses current conditions and risks.

**Standard of Practice 7.3**

Designate appropriate personnel and commit necessary equipment and resources for emergency response.

**Guidance**

The following actions and procedures should be implemented:

- Primary and alternate emergency response coordinators should be designated.
- The coordinator should have explicit authority to commit the resources necessary to implement the Plan.
- Emergency response teams should be identified and appropriately trained and prepared.
- The Emergency Response Plan should include call-out procedures and 24-hour contact information for the coordinators and response team members.
- The duties and responsibilities of the coordinators and team members should be specified.

The Plan should identify all emergency response equipment available during transport of cyanide along transportation routes and/or on-site, including personal protective equipment. Procedures should be included to inspect this equipment regularly so that it will be available when required.
The Plan should describe the functions and responsibilities of outside responders, such as medical facilities and include necessary contact information. The operation should confirm that all outside entities included in the Emergency Response Plan are aware of their involvement and are included as necessary in mock drills or implementation exercises conducted by the operation.

*Standard of Practice 7.4*
Develop procedures for internal and external emergency notification and reporting.

*Guidance*
The Plan should include procedures with up-to-date contact information for notifying management, regulatory agencies, community leaders, outside response providers and medical facilities of an emergency. Procedures and contact information should be included for notifying potentially affected communities of the incident and/or response measures and for communication with the media. Communities may have responsibility for their own protection in terms of evacuations or avoidance of contaminated water. If appropriate, a back-up contingency communication system should be considered.

*Standard of Practice 7.5*
Incorporate into response plans monitoring elements and remediation measures that account for the additional hazards of using cyanide treatment chemicals.

*Guidance*
The Plan should describe specific remediation measures including procedures for the recovery or treatment of solutions or solids, decontamination of soils or other contaminated media and management and/or disposal of spill clean-up debris. Where a cyanide release could contaminate sources of drinking water, the Plan should provide for an alternate drinking water supply.

The two major chemical treatment methods used to remediate cyanide in the environment are oxidation (using chemicals such as sodium hypochlorite and hydrogen peroxide or biological treatment) and complexation (using ferrous sulfate). Although both can be effective in reducing the impacts of cyanide released onto the land, it must be recognized that there are no safe and effective options to treat cyanide once it has entered natural surface waters such as streams and lakes.

Sodium hypochlorite and ferrous sulfate must never be used to treat cyanide that has been released into natural surface water bodies. Both of these chemicals are toxic to aquatic life. Treatment with sodium hypochlorite can produce cyanogen chloride (CICN), which is hazardous to humans and aquatic life. Moreover, these chemicals have very limited effectiveness in treating cyanide at the pH of natural surface waters. Their utility is further reduced by the practical difficulty of adding them to surface water in a manner that allows for adequate contact and mixing with a cyanide plume, especially in a flowing stream or river. Although hydrogen peroxide is a less toxic and persistent oxidant than sodium hypochlorite, it is also harmful to aquatic life and its effectiveness is similarly limited by the lack of a means to mix it with the cyanide.
Given the recognized adverse impacts to aquatic life and the limited effectiveness of using sodium hypochlorite, hydrogen peroxide and ferrous sulfate to treat cyanide released to surface waters, it is difficult to identify any situation where such a procedure would be acceptable. However, use of these chemicals may be appropriate in a sufficiently well defined and controlled situation where three conditions are met:

- First, there must be a method to introduce the chemical into the water that ensures adequate mixing with a cyanide plume.
- Second, effective treatment of the cyanide must be demonstrated at the pH of the surface water.
- Third, the inevitable adverse impacts to aquatic life must have been considered and determined to be necessary in order to prevent human mortality. This implies that the technique has been fully evaluated prior to its use rather than done as an ad hoc response to an emergency. However, it must be recognized under Standard of Practice 7.4, an operation should develop an emergency notification procedure capable of providing sufficient warning to potentially affected individuals and communities to prevent contact with or ingestion of contaminated surface water.

Both sodium hypochlorite and ferrous sulfate can be used to treat releases of cyanide to land. Ferrous sulfate binds cyanide in an insoluble complex but does not chemically convert it to a less toxic substance. The complex formed is susceptible to photodecomposition and can release cyanide back to the environment if it is not properly managed. Application of hypochlorite to neutralize a cyanide spill on land will oxidize the cyanide to the less toxic cyanate, which breaks down to ammonia and carbon dioxide. Hypochlorite and ferrous sulfate both must be used carefully to avoid their introduction into aquatic systems, and soil contaminated with these chemicals should be excavated and disposed of in compliance with the Code and applicable requirements (i.e., with mill tailings or on a leach pad). Biological treatment of contaminated soil is also possible but is much slower than chemical treatment.

The Plan should also address the potential need for environmental monitoring to identify the extent and effects of a release and mitigation. Sampling methodologies and parameters should be established in the Plan for a rapid evaluation of the consequences of the release. Where practical, possible sampling locations should be established.

Although it may not be possible to detail all remediation and monitoring actions in advance of an actual release, the Plan should include sufficient information to provide a basis for decision-making during an emergency.

**Standard of Practice 7.6**
Periodically evaluate response procedures and capabilities and revise them as needed.

**Guidance**
The Emergency Response Plan should include provisions for reviewing and evaluating its adequacy on a regular basis. Mock emergency drills reflecting the most likely incidents identified through the failure mode analysis should also be periodically used to test and evaluate the adequacy of the Plan. Drills can simulate a full-scale emergency situation or selectively isolate some aspect of the Plan. Including the potentially affected community in a simulation can...
enhance the benefits of the exercise, by creating a more realistic event, testing the public’s response, and allowing participants to become familiar with operations and response personnel.

The Plan also should be evaluated after any emergency requiring implementation. When a review or simulation has identified deficiencies, the Plan should be revised as soon as possible to insure its proper functioning.

For additional information see:
- Awareness and Preparedness for Emergencies at Local Level for Mining (APELL for Mining); United Nations Environmental Programme, Technical Report No.41 May 2001
- Principles for Dealing with Distribution Incidents Involving Alkali Cyanides; European Chemical Industry Council (CEFIC) Cyanide Sector Group, October 2000
- APELL Annotated Bibliography, United Nations Environmental Programme, Technical Report No.21, 1994
- Integrated Contingency Plan Outline, U. S. Federal Register, 61 FR 28649

8. TRAINING  Train workers and emergency response personnel to manage cyanide in a safe and environmentally protective manner.

Standard of Practice 8.1
Train workers to understand the hazards associated with cyanide use.

Guidance
All personnel who may encounter cyanide must be trained on its inherent hazards. This training should include recognition of cyanide materials at the operation, information regarding the health effects of cyanide, symptoms of cyanide exposure, and procedures to follow in the event of exposure. Material Safety Data Sheets or other informational materials written in the language of the workforce are useful for this purpose. Retraining should be conducted periodically, and records of training should be retained.

Standard of Practice 8.2
Train appropriate personnel to operate the facility according to systems and procedures that protect human health, the community and the environment.

Guidance
Health, safety and environmental components are intrinsic to task training and should be considered part of each worker's responsibility. Each job position involving cyanide management should be evaluated to identify how the required tasks can be accomplished with minimum risk to worker health and safety and in a manner that prevents unplanned cyanide releases. The training elements necessary for each job should be identified in training materials. Personnel in these positions, including personnel involved in unloading and storage of cyanide, plant operators, tailings storage facility operators, maintenance personnel and the environmental and
management staff should be trained in the procedures, as appropriate to their job functions. Training should be provided by appropriately qualified personnel, and may include outside trainers for specialized areas such as environmental regulatory programs, and the operation's own staff.

Training must be provided prior to employees working with cyanide. Refresher training should be conducted regularly to insure that employees continue to perform their jobs in a safe and environmentally protective manner. Testing or observation to insure that employees conduct their activities in compliance with cyanide operating procedures should be used to evaluate the effectiveness of all training.

Records documenting employee training should be retained throughout an individual's employment, and should include the names of the employee and the trainer, the date of training, the topics covered, and if the employee demonstrated an understanding of the training materials.

**Standard of Practice 8.3**

Train appropriate workers and personnel to respond to worker exposures and environmental releases of cyanide.

**Guidance**

All personnel involved in cyanide management should be trained in emergency cyanide release procedures, including notification of the appropriate site personnel, insuring worker safety, and stopping or containing the release.

Site personnel who may be called upon to respond to worker exposure to cyanide must be trained in decontamination and first aid procedures. This training should include the procedure for notifying appropriate site personnel and stress that the responder must first insure his own protection through use of cyanide-specific personal protective equipment.

Personnel acting as Emergency Response Coordinators and members of the Emergency Response Team should receive specialized training. Responders must be thoroughly familiar with the procedures included in the Emergency Response Plan, including the use of response equipment. Communities, local responders and medical providers included in the operation’s Emergency Response Plan should be made familiar with the Plan and their responsibilities.

Records should be retained documenting all training on responses to cyanide exposures and releases, including the names of the employee and the trainer, date of training, topics covered, and how the employee demonstrated an understanding of the training materials. Refresher training should be conducted regularly.

Emergency drills simulating worker exposures and environmental releases are important training tools; these drills should be conducted periodically to provide hands-on training for the workers involved. Drills should be evaluated from a training perspective to determine if personnel have the knowledge and skills required for effective response, and training procedures should be revised if deficiencies are identified.
For additional information see:
- Principles on Cyanide Management for Gold Mining, Chamber of Mines of South Africa, June 2001
- Best Practice Environmental Management In Mining, Planning a Workforce Environmental Awareness Training Program; Environment Australia, June 1998

9. DIALOGUE  Engage in public consultation and disclosure.

Standard of Practice 9.1
Provide stakeholders the opportunity to communicate issues of concern.

Guidance
Operations should provide the opportunity for stakeholders to communicate issues of concern. In order for the communication to be meaningful and productive, the frequency and format for this input should be appropriate for the issues discussed and the nature of the concern. Methods to foster public input include open public meetings, creation of citizens’ advisory panels and site tours for interested parties. Opportunities for public input are also available during the development and review of environmental assessments, or reviews of permits and licenses required by applicable jurisdictions.

Standard of Practice 9.2
Initiate dialogue describing cyanide management procedures and responsively address identified concerns.

Guidance
Operations should create opportunities to engage concerned stakeholders and address their issues in a direct and responsive manner. Information regarding the operation’s practices and procedures should be available to demonstrate that cyanide is managed responsibly and that the operation takes measures to improve cyanide management when deficiencies arise. Some of this dialogue may occur as part of a jurisdiction’s environmental review, permitting or licensing process.

Standard of Practice 9.3
Make appropriate operational and environmental information regarding cyanide management available to stakeholders.

Guidance
It is important that stakeholders understand how mine operations manage cyanide to protect human health and safety and the environment. Operations should develop written descriptions of cyanide management activities in appropriate local languages, and make these descriptions available to communities and stakeholders. This information can be disseminated through brochures, newsletters or other educational materials at the operation or at locations in local communities, at public forums or meetings, libraries, local government offices, on websites, or...
through other means. Where a significant percentage of the local populations are illiterate, operations should provide information through presentations or direct, regular consultations with community leaders.

Operations should also make available information on confirmed releases or exposures involving: a) incidents of cyanide exposure resulting in hospitalization or fatality; b) incidents where releases off the mine site required response or remediation; c) incidents where a release on or off the mine site results in significant adverse effects to health or the environment; d) incidents where a release on or off the mine site required reporting under applicable regulations; and e) releases that caused exceedances of applicable limits for cyanide. This information can be included in a company’s Annual Report, its Health, Safety and Environmental report, its verification audit report, posted on a company website, reported as part of applicable governmental reporting requirements, or through other means.

For additional information see:

About the UNEP Division of Technology, Industry and Economics

The mission of the UNEP Division of Technology, Industry and Economics is to help decision-makers in government, local authorities, and industry develop and adopt policies and practices that:

- are cleaner and safer;
- make efficient use of natural resources;
- ensure adequate management of chemicals;
- incorporate environmental costs;
- reduce pollution and risks for humans and the environment.

The UNEP Division of Technology, Industry and Economics (UNEP DTIE), with the Division Office in Paris, is composed of one centre and five branches:

/ The International Environmental Technology Centre (Osaka), which promotes the adoption and use of environmentally sound technologies with a focus on the environmental management of cities and freshwater basins, in developing countries and countries in transition.

/ Production and Consumption (Paris), which fosters the development of cleaner and safer production and consumption patterns that lead to increased efficiency in the use of natural resources and reductions in pollution.

/ Chemicals (Geneva), which promotes sustainable development by catalysing global actions and building national capacities for the sound management of chemicals and the improvement of chemical safety world-wide, with a priority on Persistent Organic Pollutants (POPs) and Prior Informed Consent (PIC, jointly with FAO).

/ Energy and OzonAction (Paris), which supports the phase-out of ozone depleting substances in developing countries and countries with economies in transition, and promotes good management practices and use of energy, with a focus on atmospheric impacts. The UNEP/RISØ Collaborating Centre on Energy and Environment supports the work of the Branch.

/ Economics and Trade (Geneva), which promotes the use and application of assessment and incentive tools for environmental policy and helps improve the understanding of linkages between trade and environment and the role of financial institutions in promoting sustainable development.

/ Coordination of Regional Activities Branch (Paris), which coordinates regional delivery of UNEP DTIE's activities and ensures coordination of DTIE's activities funded by the Global Environment Facility (GEF).

UNEP DTIE activities focus on raising awareness, improving the transfer of information, building capacity, fostering technology cooperation, partnerships and transfer, improving understanding of environmental impacts of trade issues, promoting integration of environmental considerations into economic policies, and catalysing global chemical safety.

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