



# ***INTERNATIONAL CYANIDE MANAGEMENT INSTITUTE***

## ***Auditor Guidance for Use of the Gold Mining Operations Verification Protocol***

[www.cyanidecode.org](http://www.cyanidecode.org)

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## Introduction

This guidance is issued by the International Cyanide Management Institute (ICMI) to assist gold mining operations in understanding their obligations in implementing the International Cyanide Management Code, and to aid Code auditors in their evaluation of Code compliance.

Compliance is evaluated against the Code's Principles and Standards of Practice. The Code's Implementation Guidance document identifies measures that are typically used to meet the Principles and Standards of Practice, and the questions in the Verification Protocol for Gold Mining Operations are based on these measures. In most cases, these measures have been intentionally described in broad terms to allow their flexible implementation at operations with varying site-specific environmental, social and regulatory circumstances. Determining the exact way these measures should be implemented at any given operation, and how an auditor is to evaluate them for compliance with the Code, can require interpretation and use of professional judgment. This Interpretive Guidance discusses such situations and advises operations and auditors on the factors to be considered when making these judgments.

Additionally, operations may implement alternatives to the measures identified in the Implementation Guidance and still meet the Principles and Standards of Practice. This Guidance document identifies some of these alternatives. Further, it places each one of the Verification Protocol question in the appropriate context so that operations and auditors can better understand their intent and expectation of performance and evaluate any alternative measures taken by an operation to meet a Standard of Practice.

## General Guidance

1. Use of the Protocol: ICMI has prepared the Verification Protocol to address each Standard of Practice and to evaluate and document an operation's compliance with the Code. It is suitable for use as the audit questionnaire, and the completed Protocol becomes the Detailed Audit Findings Report that is submitted to the operation and to ICMI. However, use of the Protocol itself is not mandatory, and an auditor can develop his own audit questionnaire and/or submit the Detailed Audit Findings Report in an alternative format as long as the submittal to ICMI clearly addresses each question raised in the Protocol in a responsive manner.
2. Scope: The Scope of the Code is quite specific. It addresses the management of cyanide used in gold mining. It does not address any other potential health, safety or environmental issues that gold mining may present, such as acid rock drainage or post-mining land use. It does not address impacts of elements found in the ore, such as mercury, even if the use of cyanide increases their mobility in the environment or availability to potential receptors. The Code does not address the oxidation or degradation products of cyanide such as cyanate and thiocyanate.

There also are two uses of cyanide at gold mines that presently are not evaluated under the Verification Protocol. Management of cyanide used in laboratories is not addressed because of the relatively minor amounts used and the controlled laboratory setting in which it is used.

Management of cyanide in gold refining is not included because of the great economic value of the gold-rich solutions handled in refining and the resulting highly controlled management of cyanide solutions in refineries.

Also, it should be noted that the Code is not an engineering document. That is, it is not intended as an engineering guide that mandates specific engineering solutions to potential cyanide management issues. This means that Code auditors are not expected to conduct engineering-level evaluations of cyanide facilities or question professional engineers assumptions, calculations and designs.

While the Code's requirements stand alone, operations are always expected to comply with applicable laws, regulations, permits and other governmental approvals. However, auditing of the Code is based solely on compliance with the Code and its related documents. It is therefore possible that an operation can be in full compliance with the Code but still be in violation of the requirements of its applicable jurisdiction, or be fully compliant with its permits and governmental requirements but out of compliance with the Code. The Code was structured in this manner so that the auditor would not need to be an expert in the locally-applicable regulatory setting, and not be required to make findings involving legal interpretations.

3. Nature of Responses: Detailed written responses to each Protocol question are necessary. Since the completed Verification Protocol becomes the Detailed Audit Report, answers to each question must be of sufficient detail to provide a clear justification for the resulting audit finding. A simple "yes" or "no" or "not applicable" answer is not adequate. In response to each question, the auditor must describe the evidence that supports the finding. What evidence demonstrates that the operation is in full compliance? What deficiency results in only substantial compliance? Why is a question "not applicable"? Data to support a finding, such as the cyanide concentration in open waters or discharged to a stream, should also be provided, where applicable.

Auditors are not prohibited from including recommendations or suggestions for further improvement that may not be necessary for compliance with the Code. However, auditors are requested to clearly identify these as additional measures and explain, as necessary, why they are not required for Code compliance.

4. Evidence: As with any formal audit, various types of evidence are necessary to support the findings. These include documents reviewed by the auditor, the auditor's direct observations in the field, and interviews with appropriate personnel. In many cases, the most appropriate personnel for interviews are those in the field doing the job, as these are the individuals with first-hand knowledge of what is actually done at the operation. While a supervisor will know what a procedure calls for or what is supposed to be done, this may not be what is actually done in the field. Auditors should ask the same questions to several employees in order to confirm, for example, how a written procedure actually is being implemented. It is also important to record the names of each person interviewed in the detailed audit notes. Useful evidence may also be found in inspection reports of applicable regulatory agencies.

The nature of the supporting evidence should be identified in each response so that this information is available in the Detailed Audit Findings Report. The response should also identify the basis for any representative sampling of records, inspection reports or other documentation. For example, what records were reviewed in determining whether or not an inspection program was implemented?

5. Implementation Guidance and Alternative Measures: The Verification Protocol questions are based on the measures identified in the Implementation Guidance as typically necessary for Code compliance, but variations and alternatives are also acceptable if they are demonstrated to achieve a Standard of Practice. Therefore, an operation can still be in full compliance with a Standard of Practice even if the auditor answers “no” to one or more of the audit questions under that Standard. In order to evaluate these alternative compliance measures, the auditor must be familiar with the Implementation Guidance.

The Implementation Guidance places each Protocol question in the appropriate context, and helps the auditor to understand the intent and expectation of performance for the Standard of Practice. In doing so, it allows the auditor to better evaluate any alternate measures taken by an operation to meet a Standard of Practice. Full and complete answers to Protocol questions are extremely important when alternative measures are used to meet a Standard of Practice because in these cases, the operation has not implemented the measure identified in a question. The auditor must describe how and why the alternate measure meets the Standard.

Site-specific conditions and local regulatory requirements may legitimately affect how an operation chooses to meet a given Standard of Practice, and these must also be identified in the responses to the Protocol questions. However, since compliance with local regulations is separate from Code compliance, the auditor should avoid justifying a finding based only on such compliance and instead describe substantively how or why compliance with a local regulation ensures compliance with the Code.

6. Management Plans and Procedures: Operations are expected to develop and implement a number of written management systems or procedures to comply with the Code. These include standard operating practices, water balance and process solution management procedures, worker health and safety programs, training information, emergency response procedures, and monitoring programs.

The Code does not mandate any specific form or format for these systems, plans and procedures. Formalized manuals, standard operating procedures, checklists, signs, work orders, training materials, or other forms all can be acceptable if they accomplish the goal of the Standard of Practice. Moreover, none of these documents need be limited solely to issues involving cyanide management. However they are structured, an operation’s management systems and procedures should demonstrate that the operation understands the practices necessary to manage cyanide in a manner that prevents and controls releases and exposures.

The auditor must determine whether the necessary plan, procedure or system is in place, whether it addresses the elements identified in the Verification Protocol, and whether there is evidence that the plan, procedure or system is being implemented.

While the auditor must determine if the operation's plans, procedures and systems can reasonably be expected to meet the performance goals of the Standards of Practice based on available evidence, he is neither expected nor advised to conduct an exhaustive analysis of every plan, procedure and management system to confirm every assumption and calculation. Obviously, if an assumption or calculation that may have a significant bearing on the operation's ability to comply with the Code appears to be questionable, it should be further investigated. For example, if the design precipitation event used in an operation's water balance seems to be significantly lower than expected, the auditor should follow up to determine if the value is appropriate. But the auditor should not substitute his own judgment for that of another professional when the impact of the difference will not adversely affect the ability of the plan, procedure or management system to meet the Standard of Practice.

The intent of third-party auditing of the Code is not to have the auditor judge each decision made by the operation's design engineers or planners, but to ensure that the operations' design, construction and operation are based on the reasonable assumptions and calculations of competent professionals. The question of when to accept what is presented to the auditor, and when it is necessary to dig deeper into an issue is intrinsic to every audit of every kind. The auditor's professional judgment is especially important in this regard during Code audits.

7. Design, Construction and Quality Assurance/Quality Control Documentation: In a number of cases, the Verification Protocol calls for documentation of an operation's design, construction and/or quality assurance/quality control (QA/QC) programs. As with the auditor's review of the operation's plans, procedures and management systems, review of these documents should not become an exercise in identifying arguable points, alternative approaches or minor deficiencies that do not affect the operation's compliance with the Code. For example, the point of reviewing QA/QC records for liner construction is to confirm that such a program was undertaken, that it used a standard approach in terms of frequency and type of testing, and that the documentation concluded that the liner installation met accepted quality standards.

In many cases, and especially at older operations, these records may not be available, either because no QA/QC program was conducted or because the original reports and as-built certifications cannot be located. In such cases, the operation can substitute a report by an appropriately qualified person substantiating that the facility can continue to be safely operated within established parameters that are consistent with the Code's Principles and Standards of Practice. A specific discussion of the nature of this review is included in question 5 under Standard of Practice 4.8.

8. Risk Assessments and Code Compliance: The degree of risk from management of cyanide varies from site to site. While risk assessments can play a significant role in determining the specific measures needed at a given operation, cyanide presents an intrinsic risk that is the starting point for compliance with the Code. This intrinsic risk, as well as the perception of risk in the minds of the public and other stakeholders, is the reason the Code exists.

To a large extent, the measures recommended in the Implementation Guidance and echoed in the Verification Protocol are predicated on this intrinsic risk. In almost all cases, implementation of these measures is appropriate and necessary regardless of the nature of the site-specific risk at a given operation. For example, it is difficult to imagine any situation where controls such as secondary containments for reagent cyanide tanks or identifying signage on a tank containing cyanide solution would not be appropriate, based on intrinsic risks to health and the environment from release of and exposure to cyanide. Using a risk assessment to determine that such measures are simply unnecessary at a given site is generally not compatible with the intent of the Code, and may even suggest that the operation lacks a commitment to the most basic measures for protection of its workers or stewardship of its hazardous materials.

This is not to say that risks are equal at every site and therefore all operations require identical management practices. However, in developing the Code, a conscious decision was made to avoid basing all cyanide management measures on an operation's own risk assessments or that of an auditor. This was done both because of substantive and programmatic concerns.

By their nature, risk assessments can be very subjective because risk is relative and different individuals have different views on the significance of a given risk. Risk assessments can be very subjective because they require many assumptions to be made regarding various release and exposure scenarios. The perception of risk can be affected by cultural biases and regional perspectives.

Having consistent implementation and auditing of the Code at operations around the globe will be difficult enough given the degree of auditor judgment necessary to account for varying site-specific conditions. Requiring different auditors in different regions and continents to evaluate numerous risk assessments at each operation would make it nearly impossible to expect uniform decisions regarding Code compliance.

Given these difficulties in applying risk assessments as the basic determinant of compliance, the Code takes the approach of accepting the intrinsic risks posed by use of cyanide and assuming that a pre-defined set of management practices will usually be necessary and appropriate in most situations. However, relative risk can be used in determining the specific nature of various controls that are necessary at an operation. It then becomes incumbent on that operation to justify its choices to the auditor's satisfaction.

9. Consideration of Risk in the Application of Implementation Guidance: While Code compliance cannot be solely dependent of the outcome of site-specific risk assessments, it is recognized that the level of risk present at an operation will affect how that operation implements the Code. The Code is designed to allow a consideration of risk through the flexibility built into the Implementation Guidance and carried through in the Verification Protocol. While a cursory review of the Implementation Guidance may suggest that it is highly prescriptive, there is actually a significant degree of flexibility in many of its recommendations.

For example, the Implementation Guidance calls for some type of signage to identify the presence of cyanide in tanks and pipelines. However, the Implementation Guidance does not mandate specific wording to be used, the size of lettering, or the frequency and location of signs along a pipeline. The operation will consider risk in implementing this measure, as should the auditor in evaluating it. For example, signage within a mill building where access is restricted and all personnel are trained in the management of cyanide solutions may be different from that along an exterior heap leach solution pipeline or in other locations where untrained personnel may have access. Similarly, a pipe carrying leaching solution that is labeled as “barren solution” may be appropriate and acceptable if located such that the only personnel in the area are those trained to understand that “barren solution” contains cyanide. However, the same label on a pipe located where the public may have access would not be sufficiently descriptive to alert untrained individuals of its potential danger.

Another example would be in the implementation of this same labeling provision for pipes and tanks with low concentration cyanide solutions. Many operations reclaim tailings water for reuse in their milling operations, or otherwise manage solutions containing less than 10 or 15 mg/l cyanide. In these cases, the operations could determine that the risk to worker health and safety posed by these solutions does not require individual labeling of each pipe and tank. The operation may propose to achieve the applicable Standard of Practice, which is to protect worker health and safety, by putting signs only on the outside of the mill building identifying that cyanide may be present in all tanks and pipes. Auditors should not expect that all such decisions will be supported by formal risk assessment. Rather, the auditor should recognize that site-specific factors including risk are appropriate for consideration as an operation implements the recommended protective measures, and evaluate these measures accordingly.

These and other examples where the measures described in the Implementation Guidance and identified in the Verification Protocol can be applied flexibly with consideration of site-specific risks are discussed further under individual Protocol questions. In nearly all cases, however, some management measures will be necessary to address the intrinsic risk presented by use of cyanide regardless of site-specific risk that may exist at an operation. This is consistent with the Code’s intent to promote the best practice for management of cyanide.

10. Consideration of Risk in Alternative Measures for Compliance: Another area where consideration of site-specific risk would be legitimate relates to the use of alternative management measures that are not identified in the Implementation Guidance. For example, under Standard of Practice 3.2, the Implementation Guidance states the following: “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.” However, once connections are made, the delivery truck driver can move to a safe distance and thereby reduce the risk of being exposed to a release while the solution transfers to the operation’s storage tank. An operation’s procedure for unloading may therefore require the presence of an observer only when connections are made and then broken after the delivery is complete. This alternative to the measure identified in the Implementation Guidance can be justified based on an

assessment of the level of risk present when the driver can observe the delivery from the same location as would the observer.

**11. Potential Audit Findings:** Auditors make separate findings for each Standard of Practice. These individual findings determine the overall finding for the operation and its certification status.

The Verification Protocol does not have a numerical score. Compliance with the Code and its Standards of Practice is a “Pass/Fail” situation, but there are two passing categories: full compliance and substantial compliance.

Full compliance with any individual Standard of Practice means just what it says; there are no exceptions to compliance with any Verification Protocol questions under that Standard of Practice. A finding of full compliance with a Standard of Practice can be made if there are affirmative answers to all applicable Verification Protocol questions under that Standard, or if the operation has implemented alternatives to the measures identified in the audit questions that achieve the Standard of Practice.

An operation can be in substantial compliance with a Standard of Practice if it is not in full compliance (that is, if there are one or more negative answers to Verification Protocol questions and no alternate measures that achieve the Standard of Practice). However, three criteria must be satisfied for an auditor to make a finding of substantial compliance.

First, the operation must have made a good-faith effort to comply. This means that the operation has made a reasonable attempt to manage cyanide in a manner consistent with the Standard of Practice rather than simply ignoring a particular aspect of Code. As an example, having most but not all of the necessary operating plans could be viewed as a good-faith effort as opposed to having no plans at all. However, using an Emergency Response Plan developed for another operation without changing the facility name or other site-specific information may not constitute a good-faith effort. The auditor will need to exercise considerable professional judgment in determining whether or not the operation has made a good faith effort to comply.

Second, in order for a finding of substantial compliance to be made, the deficiency must be readily correctable. The concept of “readily correctable” implies that the deficiency can be brought into full compliance within one year, which is the time limit for implementation of a Corrective Action Plan. This determination also may require a considerable degree professional judgment on the part of the auditor.

Third, there can be no immediate or substantial risk to health, safety or environment from a situation found in substantial compliance. For example, on the one hand, many deficiencies related to paperwork or documentation would not pose an immediate or substantial risk to health, safety or environment, and if the other two criteria are met, these types of deficiencies can often result in a finding of substantial compliance. On the other hand, a finding of substantial compliance may not be appropriate in a situation where cyanide antidote is out-of-date or stored beyond the temperature range marked on the box, as the lack of an effective

antidote could present an immediate and substantial risk to worker health. This decision also may require significant professional judgment.

An operation may not be fully compliant with any of the Protocol questions under a given Standard of Practice, but can still be found in substantial compliance with that Standard of Practice if it met the three criteria discussed above for each of the questions. It should also be recognized that a facility can be found in full compliance even if the auditor has identified some deficiency. For example, one or two missing inspection reports out of three years of monthly documentation could be viewed as an isolated situation and the operation could still be found in full compliance. It is also possible for an operation to be in full compliance if, for example, its data showed an isolated and minor exceedance of the recommended limit of 50 mg/l WAD cyanide in its tailings impoundment, if the operation could document that this was an upset condition and/or show that it had revised its operating procedures to prevent its reoccurrence.

Generally speaking, although the auditor must use his professional judgment to evaluate site-specific circumstances, a finding of full compliance can more easily be supported when a situation involves an isolated problem rather than a programmatic deficiency, where the issue involves paperwork or retention of records rather than on-the-ground non-compliance, or when a problem that may have occurred early in a three-year audit cycle has not reoccurred.

An operation that is neither in full nor substantial compliance with a Standard of Practice is in non-compliance. It could be that no good-faith effort was made to comply, that the deficiency is not readily correctable, or that the deficiency presents an immediate or substantial risk to health, safety or environment.

As an auditor makes his findings, he must keep in mind that any deficiency that drops the operation from full to substantial compliance, or from substantial to non-compliance for a given Standard of Practice should only be applied to a single Standard of Practice. The Protocol questions have been drafted to be as narrow as possible, and they should be read and applied carefully so there is no overlap which results in the same deficiency being counted against an operation under more than one Standard.

**12. Certification Decision:** The auditor can determine the certification status of the operation once he has made findings with respect to each individual Standard of Practice. For this decision, the lowest individual finding for any Standard of Practice prevails as the overall audit finding.

An operation can be found in full compliance with the Code only if all Standards of Practice are found in full compliance. Operations in full compliance are certified as such under the Code.

An operation is in substantial compliance with the Code if any Standard of Practice is found in substantial compliance and none are in non-compliance. These operations are conditionally certified subject to their implementing a Corrective Action Plan and coming into full compliance.

An operation is in non-compliance with Code if it is found in non-compliance with any Standard of Practice.

ICMI does not make a separate decision regarding an operation's certification. ICMI certifies an operation when an Audit Report which has been accepted by ICMI finds the operation in full or substantial compliance. ICMI has no independent means of determining whether or not an operation complies with the Code, and it therefore relies entirely on the findings of the certified professional auditor. The auditors will have observed the operation in its entirety and should evaluate what they observe within the context of the operation as a whole. While the guidance provided in this document is intended to assist auditors around the world to see things from a similar perspective and reach consistent findings given the same set of facts, the professional auditors and technical experts conducting verification audits must use their own professional and expert judgment to reach their own independent conclusions.

13. Submission of Audit Reports and ICMI Completeness Review: Lead auditors must submit the following documents to ICMI within 90 days of the completion of the site inspection portion of the audit: Detailed Audit Findings Report; Summary Audit Report; Auditor Credentials Form; Corrective Action Plan (for operations found in substantial compliance with the Code); and a letter from the owner or authorized representative of the audited operation granting the ICMI permission to post the Summary Audit Report and Corrective Action Plan (if required) on the Code Website. This letter, as well as the lead auditor's signature on the Auditor Credentials Form must be certified by notarization or its equivalent.

Upon receipt of the required information, ICMI will conduct a review of the submitted documentation for "completeness." This review is intended to ensure that all necessary information has been provided. It does not address the substantive issues of Code compliance.

ICMI's "completeness review" of the Detailed Audit Findings Report is intended to determine that all relevant questions have been answered and that sufficient details are provided in support of the auditor's findings. The Summary Audit Report is reviewed to ensure that it accurately represents the results of the Detailed Audit Findings Report, and includes sufficient information to demonstrate the basis for each finding. The Auditor Credentials Form is also reviewed to confirm that the auditors met ICMI criteria at the time of the audit and that the required information and attestation is available for public review. The Corrective Action Plan, if required, is reviewed to confirm that it covers all deficiencies that resulted in findings of substantial compliance. ICMI also confirms that the Reports are accompanied by a letter from the audited facility authorizing ICMI to post the Summary Audit Report (and Corrective Action Plan, if required) on its website.

If the documentation is complete, ICMI will inform the auditor and operation and post the Summary Audit Report, Auditor Credentials Form, and, if required, the Corrective Action Plan on its web site. If the documentation is incomplete, ICMI will advise the auditor and

operation of the deficiencies and request that revised documentation be submitted within 30 days. ICMI will not approve an incomplete audit report.

## Gold Mining Auditor Guidance

**1. PRODUCTION:**                   **Encourage responsible cyanide manufacturing by purchasing from manufacturers that 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.

1. Does the operation's contract with all cyanide manufacturer(s) or distributor(s) require either that a) the cyanide be produced at a facility that has been certified as being in compliance with the Code or b) the manufacturer(s) provide the results of an independent third party audit of the cyanide production activities?

The auditor should review the operation's contract for purchase of cyanide to verify that it requires that the cyanide be produced at facility that either is certified under the Code or, as an alternative, has been audited and shown to be in compliance with the Code. The alternative demonstration is addressed in more detail in questions 3 and 4 below.

While the Code expectation is that compliance with the Code should be required in the gold mine's contract for purchase of cyanide, however, a mine can still be in full compliance as long as it does, in fact, purchase its cyanide from a producer that is either certified or otherwise found to fully comply with the Code, as noted in the guidance to the following question.

2. Is the cyanide purchased by the gold mine manufactured at a facility or facilities certified as being in compliance with the Code? If so, questions 3 and 4 under this Standard of Practice do not apply.

If the cyanide is produced at a facility that is certified under the Code, then no further evidence is needed. The auditor should be able to compare the operation's purchase agreement with the listing of certified cyanide production facilities on the ICMI web site to confirm that the cyanide was, in fact, produced by a certified operation. This is the key question, and if answered affirmatively, then the gold mine can be found in compliance with this Standard of Practice regardless of the answer to the first question.

If the cyanide production facility is fully certified, a finding of full compliance with Standard of Practice 1.1 can be made and the auditor does not need to go through the other questions under this Standard of Practice.

If the cyanide production facility was found in substantial compliance during its Code Verification Audit and was certified conditionally, then the gold mining company would be in substantial compliance with this Standard of Practice, and assuming that it is not in non-compliance with other Standards of Practice, it must develop a Corrective Action Plan to

bring this (and other Standards of Practice found in substantial compliance) into full compliance.

The mining operation's Corrective Action Plan could include such measures as:

- periodic monitoring of the status of the cyanide producer in becoming fully certified (that is, monitoring the producer's implementation of its own Corrective Action Plan); and
- investigating alternate arrangements for purchase of cyanide from a producer that is fully certified or one that has made the necessary demonstration of responsible cyanide management.

However, if the production facility is not certified either fully or conditionally, then the auditor must continue to the next question.

It is possible that during the three-year period between certification audits, a certified gold mining operation's supply of cyanide manufactured by a certified producer may be disrupted. The mine is not expected to cease operations if it cannot immediately contract with another certified cyanide producer (or one that has otherwise demonstrated its responsible management of cyanide as described below in questions 3 and 4), nor is it necessarily in non-compliance with the Code. In such a case, the auditor's finding depends on the nature of the disruption and the mine's response. The auditor should consider the following factors when determining whether the gold mining operation was in full, substantial or non-compliance with Standards of Practice 1.1 during the preceding three-year audit cycle:

- What caused the disruption in the supply from the certified producer?
- How did the mine operator respond when its certified supply was disrupted?
- Did the mine operator re-establish a certified cyanide supply as soon as reasonably practical?

In general, full or substantial compliance could be indicated when a) the disruption was due to forces beyond the mine's control, b) the mine made a good-faith effort to purchase cyanide from another certified supplier (or one that has otherwise demonstrated its responsible management of cyanide as described below in questions 3 and 4), but was unable to do so, and/or c) the mine re-established its certified supply in a reasonable period of time. Substantial or non-compliance may result when a) the mine elected to use a non-certified producer due to the higher cost of certified cyanide production, b) the mine used up a large stockpile of certified cyanide before it sought an alternate certified supply, and was then forced to use non-certified vendors because it had not made arrangements to receive certified cyanide in a timely manner, and/or c) when the mine continued to use a non-certified producer for a prolonged period even though a certified producer was available. The auditor's decision is highly dependent on site-specific circumstances, and should be well supported in the Detailed Audit Findings Report and Summary Audit Report. Mining operations that experience such disruptions should document their circumstances and responses to provide the auditor with a basis for his finding.

3. Does the gold mining operation have a copy of an audit of the cyanide production facility or facilities demonstrating that it implements programs, practices and procedures consistent with ICMI's Cyanide Production Audit Protocol?

If the production facility is not certified, the gold mining operation must be able to present to the auditor a copy of an audit report signed by the lead auditor of the cyanide production facility. This report must conclude that producer "implements programs, practices and procedures consistent with ICMI's Cyanide Production Audit Protocol" or similar language indicating full or substantial compliance. However, since the production facility is not seeking certification, it is not required to submit a Detailed Audit Findings Report, as would be required for certification. ICMI requests, but does not require, that production auditors submit their results to the gold mine using the ICMI Production Summary Audit Report Form.

If the producer was found to be substantially compliant, the report also must include a statement identifying the deficiencies and a plan to correct them and achieve full compliance by a specified date which can be no later than one year after its audit. The producer must also commit to present the necessary evidence of full compliance to the auditor by the specified date and have the auditor provide the gold mine with a statement confirming that the necessary measures have been implemented and that the producer is fully compliant with the Code. If this and the following question are answered affirmatively, the operation must be found in compliance with this Standard of Practice regardless of the response to the first question. Any review of a non-certification audit for items not specifically identified in this Standard of Practice (e.g., for completeness or substantive issues) is not within the gold mine auditor's purview.

The gold mining operation would be in non-compliance with this Standard of Practice and therefore with the Code if:

- no such audit report or auditor's statement is available;
- if the report or statement indicates that the cyanide production facility did not implement programs, practices and procedures that are fully or substantially consistent with ICMI's Cyanide Production Verification Protocol;
- if found to be substantially compliant, the report did not a) identify the producer's deficiencies, b) include a plan to correct them within one year, c) commit to demonstrate that it has done so to the auditor's satisfaction, and d) commit to provide the auditor's statement to that effect to the gold mine; or
- if the production audit did not employ ICMI's Production Verification Protocol or equivalent.

If the cyanide production facility was found in substantial compliance during its non-certification audit, then the gold mining company would be in substantial compliance with this Standard of Practice, and assuming that it is not in non-compliance with other Standards of Practice, the mine must develop a Corrective Action Plan to bring this (and other Standards of Practice found in substantial compliance) into full compliance.

4. Was the audit(s) conducted within the past three years by an independent third-party meeting the qualifications established by ICMI?

The cyanide producer's audit report or statement of results must demonstrate that the audit was conducted by auditor(s) meeting ICMI criteria. Additionally, the audit of the production facility must have been conducted within the 3 years prior to the gold mining audit. The date reported for the audit is considered to be acceptable evidence; it is not necessary for the auditor to independently verify the date of the audit through other means.

The auditor is also expected to check that the lead auditor of the production facility meets ICMI's auditor criteria. His initial check would be to determine if the lead auditor's certifying organization is included on ICMI's list of acceptable organizations in the Auditor Criteria document. If not already included on this list, however, the auditor of the gold mine would need to evaluate the organization against ICMI's Auditor Criteria.

If these conditions are met, a finding of full compliance can be made for Standard of Practice 1.1 regardless of the response to question 1. However, the gold mine would be in non-compliance if the audit of the production facility was not conducted during the past 3 years or if its auditors did not meet ICMI criteria.

5. If cyanide is purchased from an independent distributor(s), has the distributor(s) provided evidence that the cyanide shipped to the gold mining operation is from a manufacturer(s) meeting either #2 or #3 and #4 above?

All of these same concepts and possibilities also apply to a situation where the gold mine purchases its cyanide from an independent distributor. In such a case, the mine should have:

- a statement from the distributor identifying the manufacturer(s) of cyanide sold to gold mine;
- chain of custody or other documentation showing that the cyanide delivered to the mine was produced at the identified facility or facilities; and
- evidence that the cyanide production facility either is certified under the Code or has successfully undergone a non-certification audit as identified in questions 3 and 4.

## **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.

1. Is there a written agreement between the operation, the cyanide producer, distributor, and transporter(s) designating responsibility for the following, as applicable?
  - a) Packaging as required by the United Nations for international shipments and by the political jurisdiction(s) the shipment will pass through

- b) Labeling in languages necessary to identify the material in the political jurisdiction(s) the shipment will pass through, and as required by these jurisdiction(s) and by the United Nations (for international shipments)
- c) Storage prior to shipment
- d) Evaluation and selection of routes, including community involvement
- e) Storage and security at ports of entry
- f) Interim loading, storage and unloading during shipment
- g) Transport to the operation
- h) Unloading at the operation
- i) Safety and maintenance of the means of transportation (e.g., aircraft, vessels, vehicles, trains, etc.) throughout transport
- j) Task and safety training for transporters and handlers throughout transport
- k) Security throughout transport
- l) Emergency response throughout transport

The intent of this question is to ensure that all parties in the supply chain understand their required responsibilities. It does not matter which party has which designated responsibilities for purposes of Code compliance as long as they are clearly assigned to one of the parties. This designation of responsibilities should be explicit for the elements identified in the question rather than simply stating that one of the parties has “full responsibility” during cyanide transport, so that all parties clearly understand the expectations.

Necessary evidence may be in the mining operation’s contract with the producer or transporter, or in one or more separate written agreements. Each of the elements in this question should be addressed in the agreement, and if not, the auditor should determine and document the specific reason why this information is unnecessary.

It must be recognized, however, that as part of their audits (either for Code certification or to demonstrate responsible cyanide management), the cyanide producer and transporter will be evaluated for the same elements addressed in this question. The elements must be adequately addressed in order that both the producer and transporter pass their audits. Therefore, as an alternative to executing such a written agreement, a gold mining operation can be found in full compliance if its producer and transporter have successfully passed Code certification audits or equivalent audits demonstrating responsible cyanide management.

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

The auditor must review the contract or other written agreements to ensure that subcontractors are expected to fulfill their designated responsibilities. As an alternative, the contract could specify that no subcontractors will be used.

Also, since use of subcontractors is included in the Code’s Transportation Audit Protocol, this issue will be addressed as part of that audit. Therefore, if the cyanide transporter has

successfully passed a Code certification audit or an equivalent audit demonstrating responsible cyanide management, the mine can be in compliance with this Standard of Practice without having the specified agreement.

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

1. Does the operation's contract with the cyanide transporter(s) require that the transporter(s) either a) be certified under the Code or b) provide the results of an independent third party audit of the cyanide transportation activities?

The auditor should review the operation's contract for transport of cyanide to verify that it requires the transporter to either be certified under the Code or, alternatively, to be audited and found to implement programs, practices and procedures consistent with ICMI's Cyanide Transportation Audit Protocol. The alternative demonstration is addressed in more detail in questions 3 and 4 below.

While the Code expectation is for a contractual provision requiring the transporter to be Code-compliant, a mine can still be in full compliance as long as it has its cyanide transported by a transporter that is either certified or otherwise found to fully comply with the Code, as noted in the guidance to the following question.

2. Is the cyanide transporter(s) certified under the Code? If so, no further demonstration is required to comply with this Standard of Practice.

If the cyanide transporter is certified under the Code, then no further evidence is needed. The auditor should be able to compare the operation's purchase or transport agreement with the listing of certified cyanide transporters on the ICMI web site to confirm that the cyanide was, in fact, transported by a certified transporter. If this question is answered affirmatively, then the gold mine can be found in compliance with this Standard of Practice regardless of the answer to the first question.

If the transporter is fully certified under the Code, then a finding of full compliance with Standard of Practice 2.2 can be made and no further evidence is needed. The auditor does not need to go through the other questions under this Standard of Practice.

If the cyanide transporter was found in substantial compliance during a Code Verification Audit and was certified conditionally, then the gold mining company would be in substantial compliance with this Standard of Practice, and assuming that it is not in non-compliance with other Standards of Practice, it must develop a Corrective Action Plan to bring this (as well as any other Standards of Practice found in substantial compliance) into full compliance.

The Corrective Action Plan for the mine could include such measures as:

- periodic monitoring of the status of the cyanide transporter in becoming fully certified (that is, monitoring the transporters' implementation of its own Corrective Action Plan);

- providing assistance to the transporter in implementing its Corrective Action Plan; or
- investigating alternate arrangements for transport of cyanide using a transporter that is fully certified or one that has made the necessary demonstration of responsible cyanide management.

If the transporter is not certified either fully or conditionally, then the auditor must continue to the next question.

It is possible that during the three-year period between certification audits, a certified gold mining operation's supply of cyanide transported by certified transporters may be disrupted. The mine is not expected to cease operations if it cannot immediately contract with another certified cyanide transporter (or one that has otherwise demonstrated its responsible management of cyanide as described below in questions 3 and 4), nor is it necessarily in non-compliance with the Code. In such a case, the auditor's finding depends on the nature of the disruption and the mine's response. The auditor should consider following factors when determining whether the gold mining operation was in full, substantial or non-compliance with Standards of Practice 2.2 during the preceding three-year audit cycle:

- What caused the disruption in the supply from the certified transporter?
- How did the mine operator respond when its certified supply was disrupted?
- Did the mine operator re-establish a certified cyanide supply as soon as reasonably practical?

In general, full or substantial compliance could be indicated when a) the disruption was due to forces beyond the mine's control, b) the mine made good-faith efforts to use another certified transporter but was unable to do so, and/or c) the mine re-established its certified supply in a reasonable period of time. Substantial or non-compliance may result when a) the mine elected to use a non-certified transporter due to the higher cost of certified cyanide transportation, b) the mine used up a large stockpile of certified cyanide before it sought an alternate certified transporter, and was then forced to use non-certified transporter because it had not made arrangements for certified cyanide transport in a timely manner, and/or c) when the mine continued to use a non-certified transporter for a prolonged period even though a certified transporter was available. The auditor's decision is highly dependent on site-specific circumstances, and should be well supported in the Detailed Audit Findings Report and Summary Audit Report. Mining operations that experience such disruptions should document their circumstances and responses to provide the auditor with a basis for his finding.

3. Does the gold mining operation have a copy of an audit of each individual transporter's cyanide transport activities and/or of the cyanide transport activities along its supply chain demonstrating the implementation of programs, practices and procedures consistent with ICMI's Cyanide Transportation Audit Protocol?

If the transporter is not certified under the Code, the gold mining operation must be able to present to the auditor a copy of an audit report signed by lead auditor of the cyanide transporter. This report must conclude that the transporter "implements programs, practices

and procedures consistent with ICMI's Cyanide Transportation Audit Protocol" or similar language indicating full or substantial compliance. However, since the transporter is not seeking certification, it is not required to submit a Detailed Audit Findings Report, as would be required for certification. ICMI requests, but does not require, that transport auditors submit their results to the gold mine using the ICMI Transportation Summary Audit Report Form.

If the transporter was found to be substantially compliant, the report also must include a statement identifying the deficiencies and a plan to correct them and achieve full compliance by a specified date which can be no later than one year after its audit. The transporter must also commit to present the necessary evidence of full compliance to the auditor by the specified date and have the auditor provide the gold mine with a statement confirming that the necessary measures have been implemented and that the transporter is fully compliant with the Code. If this and the following question are answered affirmatively, the operation must be found in compliance with this Standard of Practice regardless of the response to the first question. Any review of a non-certification audit for items not specifically identified in this Standard of Practice (e.g., for completeness or substantive issues) is not within the gold mine auditor's purview.

One key difference between the approach for cyanide producers and cyanide transporters is the allowance for the demonstration of responsible cyanide management during transport to apply to a specific "supply chain" from a manufacturer to a gold mine rather than to an individual transport company. This "supply chain" may include several different transporters with, for example, one picking up the cyanide from the manufacturer and taking it to a port, another placing it on board a ship and transporting it to another continent, and then one or more other transporters eventually delivering it to a mine. The entire supply chain can be the subject of a single audit and the results would apply to that distinct supply chain only and not to the respective transport companies' other activities.

The gold mining operation would be in non-compliance with this Standard of Practice and therefore with the Code if:

- no such audit report or auditor statement is available;
- if the report or statement indicates that the cyanide transporter or supply chain did not implement programs, practices and procedures that are fully or substantially consistent with ICMI's Cyanide Transportation Verification Protocol;
- if found to be substantially compliant, the report did not a) identify the transporter's deficiencies, b) include a plan to correct them within one year, b) commit to demonstrate that it has done so to the auditor's satisfaction, and c) commit to provide the auditor's statement to that effect to the gold mine; or
- if the transportation audit did not employ ICMI's Transportation Verification Protocol or equivalent.

If the cyanide transporter was found in substantial compliance during its non-certification audit, then the gold mining company would be in substantial compliance with this Standard of Practice, and assuming that it is not in non-compliance with other Standards of Practice,

the mine must develop a Corrective Action Plan to bring this (and other Standards of Practice found in substantial compliance) into full compliance.

4. Was the audit conducted within the past three years by an independent third-party meeting the qualifications established by ICMI?

The transporter's audit report or statement of results must demonstrate that the audit was conducted by auditor(s) meeting ICMI criteria. Additionally, the audit of the transporter or of the supply chain must have been conducted within the 3 years prior to the gold mining audit. The date reported for the audit is considered to be acceptable evidence; it is not necessary for the auditor to independently verify the date of the audit through other means.

The auditor is also expected to check that the lead auditor of the transporter or the supply chain meets ICMI's auditor criteria. The initial check would be to determine if the lead auditor's certifying organization is included on ICMI's list of acceptable organizations in the Auditor Criteria document. If not already included on this list, however, the auditor of the gold mine would need to evaluate the organization against ICMI's Auditor Criteria.

If these conditions are met, a finding of full compliance can be made for Standard of Practice 2.2. However, the gold mine would be in non-compliance if the transportation audit was not conducted during the past 3 years or if the auditors did not meet ICMI criteria.

5. Does the operation have chain of custody records identifying all elements of the supply chain (producer, transporter(s), interim storage facilities) that handle the cyanide brought to its site? Have all identified transporters been included in the responses to questions 2 and/or 3 above?

Chain of custody records or other documentation must be reviewed to identify each of the parties in the supply chain, so that the auditor can confirm that each of these parties is included in the transport audit results. Although this question specifically calls for chain of custody documentation, other types of documentation are acceptable. The intent of this question is to ensure that each link in the supply chain is identified to the auditors so that their review of the transportation audits will be complete. Although the transporter is required to have inventory controls and/or chain of custody documentation to prevent loss of cyanide during shipment, this is evaluated during the audit of the transporter or supply chain, not the audit of the gold mine.

### **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/quality assurance procedures, spill prevention and spill containment measures.

1. Have facilities for unloading, storing and mixing cyanide been designed and constructed in accordance with cyanide producers' guidelines, applicable jurisdictional rules and/or other sound and accepted engineering practices for these facilities?

The Code requires that unloading, mixing and storage facilities for reagent cyanide be professionally designed and constructed rather than be fabricated on-site by individuals without the necessary knowledge. The type of evidence to show this includes:

- design drawings stamped by a certified professional engineer; or
- documentation of the use of designs developed by cyanide producers; or
- records of the review and approval of design and construction documents by regulatory agencies; or
- a report of an evaluation or audit of these facilities by experts such as professional engineers or representatives of the cyanide producer.

As with many of the Code's provisions, the intent here is not to substitute the auditor's judgment for that of engineers who designed and constructed these facilities but to evaluate whether the operation took the necessary and appropriate measures in designing and constructing them.

This requirement applies exclusively to the design basis of unloading, mixing and storage facilities. It should not be confused with requirements for Quality Control and Quality Assurance during facility construction, which are addressed in question 5, Standard of Practice 4.8 and are applied broadly to all cyanide facilities.

2. Are unloading and storage areas for liquid and solid cyanide located away from people and surface waters? If not, has the operation evaluated the potential for releases to surface water and/or human exposure, and implemented precautions to minimize these potentials?

This provision is intended to reduce risks to workers and adjacent communities and to surface water quality in the event of a release of reagent-strength cyanide or cyanide gas during unloading, storage and mixing activities. No minimum distance is recommended, and it is recognized that this can only be implemented to the extent practical. Moreover, the thrust of the Implementation Guidance is for the operation to evaluate the risks to people and surface water that exist based on the location of these facilities, and to institute the necessary safeguards and protections.

If reagent unloading, storage and mixing facilities are located near an office or shop where many workers congregate, near communities that may adjoin the operation, or near surface water bodies, then the auditor should evaluate whether the appropriate controls are in place, such as:

- a hydrogen cyanide gas monitor equipped with visual and/or audible alarms;
- enhanced or additional containment structures, as appropriate for the specific location of these facilities; and/or
- specific emergency procedures for notification, evacuation, response and remediation, as appropriate for the situation.

- 3 Is liquid cyanide unloaded on a concrete or other surface that can minimize seepage to the subsurface?

This question addresses the need for some type of pad on which a truck or tanker car would park when unloading liquid cyanide. An alternative to concrete could be any material that was relatively impermeable and was structurally adequate to withstand the load.

4. Is the cyanide unloading area designed and constructed to contain, recover or allow remediation of any leakage from the tanker truck?

This question also applies to unloading of liquid cyanide, and the concept behind it is that the transport vehicle is much safer and less likely to have a major release while parked at the facility for unloading than it was while in transport. Although loss of the entire load may be possible, it is much more likely that minor and localized spills may occur, particularly when hose connections are made and broken.

The Code does not require a full secondary containment system for the entire capacity of a tanker truck. Although such a system is certainly acceptable, an operation could have a pad that prevented minor drips and spills from reaching the ground, coupled with procedures to recover lost solution and remediate the land surface as necessary to protect surface and ground water quality.

5. Is there a method to prevent the overfilling of cyanide storage tanks, such as a level indicator and high-level alarm?

Some type of overflow protection on cyanide storage tanks should be in place and functional. Techniques other than direct observation and manual gauging should be provided, such as an automatic level indicator, a high-level alarm, or an integrated tank and tanker valve-shutdown device. The auditor can confirm that the overflow protection is functional by reviewing testing and/or maintenance records. Also, many tanks have dual level indicators, such as an ultrasonic and a mechanical gauge, which can be compared to confirm that they are both functioning.

- 6 Are cyanide mixing and storage tanks located on a concrete or other surface that can prevent seepage to the subsurface?

Storage and mixing tanks should be located on a concrete or other surface that will prevent seepage to the subsurface environment. Visual observation and/or design drawings are the expected evidence to answer this question. Alternatives to concrete would be acceptable if they are structurally adequate and prevented releases to the subsurface.

Reagent cyanide storage and mixing tanks containing free cyanide solutions of 10,000 mg/l (1%) or greater should be installed with a concrete or other impermeable barrier between them and the ground. In these situations, alternatives such as leak collection and recovery systems, either within or beneath the tank, are not acceptable under the Code regardless of whether the tank is new or existing at the time the operation becomes subject to the Code.

- 7 Are secondary containments for cyanide storage and mixing tanks constructed of materials that provide a competent barrier to leakage?

Secondary containments for cyanide storage and mixing tanks should be constructed with concrete, asphalt, plastic or other materials demonstrated to provide a competent barrier to leakage. Unlined earthen containment is not acceptable. Secondary containment systems can include multiple containments connected by piping, or systems that overflow from a low point in one containment to another containment.

8. Is cyanide stored:
- a) With adequate ventilation to prevent the build-up of hydrogen cyanide gas?
  - b) Under a roof, off the ground or with other measures to minimize the potential for contact of solid cyanide with water?
  - c) In a secure area where public access is prohibited, such as within the fenced boundary of the plant or within a separate fenced and locked area?
  - d) Separately from incompatible materials such as acids, strong oxidizers and explosives and apart from foods, animal feeds and tobacco products with berms, bunds, walls or other appropriate barriers that will prevent mixing?

The storage of reagent cyanide is subject to a number of provisions. These apply generally to both solid and liquid, but their main focus is on solid cyanide. Storage issues are verified by observation of the storage facilities.

Determining the adequacy of ventilation is not intended to require an engineering-level evaluation, but rather a simple confirmation that enclosed storage areas such as a warehouse filled with crates of solid sodium cyanide are, in fact, ventilated in the event that the cyanide comes in contact with water.

While storage in a warehouse may be used to prevent contact of solid cyanide with water, containers such as metal flo-bins also are adequate for this purpose. The key to the need for a roof or enclosure is the overall security of the container; metal bins designed for outdoor storage should be secure and acceptable, while open storage of wooden crates containing bags of cyanide is a borderline situation at best even in very dry climates.

For overall security purposes, cyanide should be stored to prevent access by the public. This could be within its own fenced and locked area or within the boundary of the plant if the plant is fenced and access is controlled. The level or type of security necessary at a given operation will also depend on whether the cyanide is stored as a liquid or a solid. It is easier for an individual to take a significant amount of solid cyanide from an operation than liquid cyanide. Factors to consider include whether valves related to storage of liquid cyanide are locked and whether solid cyanide is stored in sealed metal bins or in boxes and bags.

Separation of incompatible materials is a necessary practice in the management of all hazardous materials including cyanide. The main materials of concern with respect to incompatibility with cyanide are acids, strong oxidizers like chlorine, and explosives. The

auditor should check the flow path a released material would take to determine whether releases from the separate areas may commingle in a drainage ditch common to both storage areas.

#### Cross Reference in Standard of Practice 3.1

Standard of Practice 3.1 also includes by reference questions 1, 2, 5 and 7 under Standard of Practice 4.7 and all the questions under Standard of Practice 4.8 as they apply to unloading, storage and mixing facilities. These Standards of Practice address spill prevention and containment, materials of construction, and quality control and quality assurance programs. The responses to those questions should be entered under their respective Standards of Practice, but also should be considered when the auditor makes a finding for Standard of Practice 3.1.

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.

1. With respect to empty cyanide containers, are procedures in place and implemented to:
  - a) Prevent empty cyanide containers from being used for any purpose other than holding cyanide?
  - b) Rinse empty cyanide drums, plastic bags and liners with water three times and add the rinse water to the cyanidation process or otherwise dispose of it in an environmentally sound manner?
  - c) Crush empty cyanide drums prior to disposal in a landfill and burn or otherwise dispose of empty wooden crates in an environmentally sound manner?
  - d) Clean any cyanide residue from the outside of cyanide containers that are returned to the vendor and securely close them for shipment?

Regardless of how rigorous an operation's procedure for rinsing may be, the reuse of cyanide drums for purposes other than holding cyanide will always present a risk to human health. Similarly, there is no known effective method of ensuring that wooden cyanide crates are free of all cyanide residue. Therefore, no alternative measures for management of these empty containers are known to achieve the Standard of Practice.

The Code's expectation for management of empty reagent cyanide containers is both for some type of formalized procedure and for evidence that the procedure is being implemented. The procedure can be documented as a Standard Operating Procedure, a sign posted at a mixing station where drums or bags are emptied, part of a worker training program, etc.

The evidence of implementation could be observation of employees performing these tasks, or field interviews with personnel responsible for them.

2. Has the operation developed and implemented plans or procedures to prevent exposures and releases during cyanide unloading and mixing activities such as:
  - a) Operation of all valves and couplings for unloading liquid cyanide and mixing solid or liquid cyanide;
  - b) Handling cyanide containers without rupturing or puncturing;

- c) Limiting the height of stacking of cyanide containers;
- d) Timely clean up of any spills of cyanide during mixing;
- e) Providing for safe unloading of liquid cyanide and manual mixing of solid cyanide by requiring appropriate personal protective equipment and having a second individual observe from a safe area, or remote observation by video?

The Code's expectation with respect to unloading and mixing activities is for written procedures as well as evidence that these procedures are being implemented. Procedures for these tasks may be in any form, including an Operating Manual, Standard Operating Procedures, training documents, signs, checklists or other written formats

The operation's procedures need not be limited to or specific for management of cyanide. For example, the procedure to prevent rupturing or puncturing of cyanide containers may actually be part of the training document for fork lift operators.

Where the operation receives cyanide in solid form and mixes it into solution on site, the auditor should inspect the mixing area for evidence of spillage, such as cyanide flakes or briquettes on top of mix tank or in gratings of adjacent platforms or walkways, to confirm that clean-up procedures are being implemented.

Having an observer present and ready to assist or summons help in the event of a cyanide release and exposure is necessary for safe management of reagent-strength cyanide. Observation by video is an acceptable alternative for on-site observation only where there is some evidence, such as a written procedure, that the observer actually will be viewing the process. An acceptable option for operations that receive cyanide in liquid form, or where solid cyanide is mixed with water in the delivery truck and then pumped into the operation's storage tank, is having the observer present only when the various connections are made and broken, rather than during the entire time the tanker is mixing and/or off-loading the reagent.

Implementation of all these procedures can be verified by observation and/or interviews with the personnel responsible for performing these tasks.

#### Cross Reference in Standard of Practice 3.2

Standard of Practice 3.2 also includes questions 1, 3 and 6-8 under Standard of Practice 4.1 and question 3 under Standard of Practice 4.7 as they apply to unloading, storage and mixing facilities. These Standards of Practice address necessary written operating practices and procedures, and management of solution collected in secondary containments. The responses to those questions should be entered under their respective Standards of Practice, but should also be considered when the auditor makes a finding for Standard of Practice 3.2.

#### **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.

1. Have written management and operating plans or procedures been developed for cyanide facilities including unloading, mixing and storage facilities, leach plants, heap leach operations, tailings impoundments, and cyanide treatment, regeneration and disposal systems?

An operation is expected to have written management systems, plans and/or procedures for operating its cyanide facilities. The term “cyanide facilities” is defined in the Definitions and Acronyms document on the ICMI web site as “A storage, production, waste management or regeneration unit for managing cyanide or cyanide-containing process solution,” or “A pollution control device, equipment or installation used to prevent, control or minimize the risk of a cyanide release.”

Since the Code defines a processes solution as any solution with 0.5 mg/l WAD cyanide or greater, the following would likely be cyanide facilities at most operations:

- Reagent cyanide storage tanks and solid cyanide storage facilities;
- Secondary containments associated with cyanide storage and production facilities;
- Leaching facilities, including leach vessels, and leach heaps, pads and associated ponds;
- Counter-current decantation plants;
- Merrill-Crowe plants;
- Carbon washing, stripping and handling facilities;
- Cyanide treatment, destruction or regeneration units;
- Tailings storage facilities;
- Most milling equipment where tailings reclaim water is used;
- All pumps and piping connecting these facilities; and
- Surface water diversions that protect these facilities from run-on.

However, while all these may meet the definition of “cyanide facilities,” there are two factors that should be considered in determining what Standard Operating Procedures are necessary at a given gold mining operation. First, operating procedures are not required for those cyanide facilities that are not actually “operated.” For example, there will not be operating procedures for surface water diversions, individual pumps and piping, or secondary containments (although inspections and maintenance activities are considered in questions 7 and 9). The auditor will have to use his judgment with regard to other equipment or installations that may meet the definition of cyanide facilities but are not “operated” and therefore, which cannot reasonably be expected to have “operating procedures.”

The second factor is related to the goal of this Standard of Practice, which in this context is to implement procedures designed to protect human health and the environment. It is the responsibility of the operation to identify those tasks that, if not performed properly, have the potential to cause cyanide exposures or releases. The operation should then develop and implement the management systems and procedures needed to protect health and the environment. Standard Operating Procedures unrelated to potential cyanide releases and exposures are not within the scope of the Code.

The issue of the adequacy of these plans is addressed in the other questions under this Standard of Practice, which identify specific items that these management systems should address. This question focuses only on the existence of these plans, procedures and systems.

Many different models for these management systems are available, including, as of this writing:

- ISO 14000;
- British Standards BS 7750;
- the European Community's Eco-Management & Audit Scheme (EMAS); and
- the Organization for Economic Cooperation and Development's (OECD) Guidelines for Multinational Enterprises.

The Code does not require the use of any single approach or framework for an environmental management system nor does it accept any of these systems in lieu of the development and implementation of the plans and procedures identified in the Code. As with all the provisions calling for written plans, the Code does not require that the documents be limited to cyanide or mandate any specific format, and they can be in any of the forms previously mentioned. Regardless of their form, however, these written procedural documents should demonstrate that the operation understands how to manage cyanide in a manner that prevents or controls releases to the environment and exposures to workers and the community.

When preparing the Detailed Audit Findings Report, information regarding cyanide unloading, mixing and storage activities should be included in the answer to this question but considered in the findings for Standard of Practice 3.2.

2. Does the operation have plans or procedures that identify the assumptions and parameters on which the facility design was based and any applicable regulatory requirements (e.g., freeboard required for safe pond and impoundment operation; the cyanide concentrations in tailings on which the facility's wildlife protection measures were based) as necessary to prevent or control cyanide releases and exposures consistent with applicable requirements?

A facility's management systems provide the link between its design and the necessary operational practices. The site's operating plans and procedures, therefore, should incorporate or reference the assumptions and parameters on which the design was based, as well as applicable regulatory requirements related to prevention of cyanide releases and exposures. In this way, the operation can keep track of why it is operating according to a specific plan.

For example, an operation may have been designed to operate its leach pad below 50 mg/l WAD cyanide, and therefore it has not been necessary to implement any measures to prevent the access of birds to its solution ponds. The Standard Operating Procedure for the pond or other management documentation should note what the target concentration is in the leach solution, as necessary for bird protection, so there is recognition of the reason that no protective measures such as netting or bird balls are necessary.

The Code's expectation is only for major parameters to be included in operating plans and procedures, such as:

- the design or required freeboard for ponds and impoundments;
- the concentration of cyanide discharged to and allowed in surface water;
- the concentration of WAD cyanide in open tailings water and in leach ponds and pads; and
- the design storm events for solution ponds and impoundments.

The necessary evidence will be inclusion of these parameters in the facility's operating plans and procedures.

3. Does the operation have plans or procedures that describe the standard practices necessary for the safe and environmentally sound operation of the facility including the specific measures needed for compliance with the Code, such as inspections and preventive maintenance activities?

The operation's management system should also address those aspects of the operation that are necessary for protection of workers, communities and the environment. Specific items that should be addressed in operating plans or procedures include:

- water management procedures, such as how and when heap leach and/or tailings solutions must be managed to retain the design storage capacity in these facilities;
- inspection programs for various cyanide facilities such as process tanks and pipelines, leach facilities and tailings impoundments; and
- preventive maintenance programs for critical equipment.

These management systems need not be in the form of Standard Operating Procedures. For example, the only documentation of a preventive maintenance program may be the work orders produced automatically by a computerized system, and the system itself.

When preparing the Detailed Audit Findings Report, information regarding cyanide unloading, mixing and storage activities should be included in the answer to this question but considered in the findings for Standard of Practice 3.2.

4. Does the operation have a procedure to identify when changes in a site's processes or operating practices may increase the potential for the release of cyanide and to incorporate the necessary release prevention measures?

Operations should have some formalized way of managing changes to the facility. A change management procedure should identify changes to the facility or its operating practices that may increase the potential for cyanide releases before such changes are implemented so that they can be evaluated and addressed as necessary. A written procedure requiring written notification to environmental personnel and a sign-off before the change can be instituted is the best way to address this. Verification would be through a review of the procedure as well as completed forms that have been signed off by environmental personnel.

Another acceptable alternative particularly for smaller operations would be regular discussion of all proposed changes at a formal, weekly staff meeting, supported by a policy statement or procedure requiring that such changes be discussed with environmental staff prior to implementation. Where a formalized written procedure is not used, auditor judgment based on interviews with management and field personnel will be necessary to determine whether an unwritten change procedure is being effectively implemented.

5. Does the operation have cyanide management contingency procedures for situations when there is an upset in a facility's water balance, when inspections and monitoring identify a deviation from design or standard operating procedures, and/or when a temporary closure or cessation of operations may be necessary?

An operation's management system should include contingency plans for non-standard operating situations. While the operation cannot plan for every eventuality, some situations are sufficiently likely that pre-planned responses can and should be developed. These include measures to be taken in response to:

- an upset in the operational water balance to restore the design containment capacity;
- problems identified by facility monitoring or inspection; and
- temporary closure or cessation of operations.

The lines between what is considered to be a standard occurrence, one that requires a contingency plan and one that should be addressed in an emergency response plan are not exact. Contingency actions for upsets in the operational water balance, or for an identified leak in a leach pond liner, for example, may be included in a facility's operating plans rather than in a separate contingency plan. The nature of the documentation doesn't matter for purposes of Code compliance, only that the operation's planned responses to the potential issues are addressed.

6. Does the operation inspect cyanide facilities on an established frequency sufficient to assure and document that they are functioning within design parameters?

Facility inspections need to be conducted frequently enough to identify potential problems before they become severe, but the Code does not specify the frequency of necessary facility inspections. The auditor must use his judgment to determine if their frequency is sufficient to assure and document that equipment is functioning within design parameters. Generally, formal inspections using a checklist would typically be appropriate on a weekly or monthly basis, while daily inspections are often only documented in a log book. One exception to this are inspections for wildlife mortality, which typically are necessary on a daily basis where solutions approach or exceed 50 mg/l WAD cyanide to confirm that wildlife is protected and/or that controls such as bird balls are functioning as designed.

When preparing the Detailed Audit Findings Report, information regarding cyanide unloading, mixing and storage activities should be included in the answer to this question but considered in the findings for Standard of Practice 3.2.

7. Does the operation inspect the following at unloading, storage, mixing and process areas, as applicable to the site?
  - a) Tanks holding cyanide solutions for structural integrity and signs of corrosion and leakage
  - b) Secondary containments for their integrity, the presence of fluids and their available capacity, and to ensure that any drains are closed and, if necessary, locked, to prevent accidental releases to the environment
  - c) Leak detection and collection systems at leach pads and ponds, as required in the design documents
  - d) Pipelines, pumps and valves for deterioration and leakage
  - e) Ponds and impoundments for the parameters identified in their design documents as critical to their containment of cyanide and solutions and maintenance of the water balance, such as available freeboard and integrity of surface water diversions

Although the Code does not mandate the specific format or questions to be used for an inspection checklist, it does recommend that inspections be focused rather than general. Too often, an inspection form requires only a single check-off or yes/no answer that a tank or other facility is in good operating order. This approach invites complacency, as the inspector is neither prompted to actually look at the specific items that need to be evaluated (e.g., the presence of cracking on the floor of a secondary containment) nor reminded of the proper expectation to be met (e.g., no accumulation of precipitated salt on a cyanide reagent pump).

Inspections of cyanide facilities should be focused on items of potential concern such as those identified in this question. Inspection forms should reflect this focus and direct the inspector to evaluate these specific items. Auditor judgment will be necessary to determine if a specific inspection form provides sufficient detail with regard to what to look for or what condition is acceptable. The auditor's own inspection of these facilities will provide evidence of whether or not the facility's inspections are identifying potentially hazardous conditions.

For example, if the auditor observes precipitated salts on a cyanide distribution pump, and the operation's inspection form only included a check-off box to indicate if this part of the facility was inspected, it may suggest that the inspection and the form were deficient.

Depending on other factors, an observation of salts may lead to different findings with respect to the operations compliance status. An isolated observation of salt formation at an operation where it appears that inspections are adequate could result in a finding of full or substantial compliance, especially where the salt accumulation is minor and may have occurred between formal inspections. Alternatively, widespread accumulations and/or a major encrustation may indicate a programmatic deficiency, and could lead to a finding of substantial or even non-compliance if it appears that inspections are not picking up these releases. This may be the case particularly where the inspection forms are vague and neither focus the inspector on specific items or suggest what expectations are appropriate.

When preparing the Detailed Audit Findings Report, information regarding cyanide unloading, mixing and storage activities should be included in the answer to this question but considered in the findings for Standard of Practice 3.2.

8. Are inspections documented, including the date of the inspection, the name of the inspector, and any observed deficiencies? Are the nature and date of corrective actions documented? Are records retained?

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. One caution with the use of log books is that information is typically entered by exception only. That is, there may be no record that inspections were conducted when no deficiencies are noted. In these cases, the record would not provide evidence of continuous compliance unless there was some type of written procedure and additional records of training to substantiate that the personnel performing the inspection and making the log book notations were trained to observe specific items, evaluate them against the appropriate expectation, and then to only make an entry in the log book when a deficiency was identified.

The nature and date of corrective actions also should be documented along with the record of the inspection. The auditor should review the operation's inspection records to verify that this information is recorded.

When preparing the Detailed Audit Findings Report, information regarding cyanide unloading, mixing and storage activities should be included in the answer to this question but considered in the findings for Standard of Practice 3.2.

9. Are preventive maintenance programs implemented and activities documented to ensure that equipment and devices function as necessary for safe cyanide management?

An operation should have a preventive maintenance program for its cyanide facilities where a failure can result in a cyanide release or exposure. Pumps, pipelines, treatment and destruction and/or regeneration equipment are examples of facilities that should be included in a preventive maintenance program. However, depending on the nature of the equipment, operations may have redundant pumps installed and ready to run, or spare equipment or parts on hand in lieu of including a specific pump under a preventive maintenance system. These can be acceptable approaches as long as the operation has determined which equipment is critical in preventing releases and exposures and has prepared for its possible failure through preventive maintenance, redundancy or some other manner.

The frequency of various preventive maintenance activities is not specified in the Code, but the Code does expect that these activities be documented. The Code does not prescribe the specific nature of preventive maintenance activities. This will depend on the type of equipment and its maintenance history, and is not within the scope of the audit.

10. Does the operation have necessary emergency power resources to operate pumps and other equipment to prevent unintentional releases and exposures in the event its primary source of power is interrupted? Is the back-up power generating equipment maintained and tested? If the back-up power generating equipment is not present on site, has sufficient draindown time been incorporated into the water balance to allow acquisition, installation, and activation of such equipment?

Operations should have emergency generators to power pumps and other equipment, as necessary to prevent unintentional releases and exposures in the event its primary source of power is interrupted. This equipment should be maintained and tested as necessary to assure that it is available if and when needed.

It may not be necessary to have this equipment on site if it is available within the time allowed for in the facility's design. For example, operations size their pregnant leach solution ponds with capacity for a specified volume of drain-down from a heap leach pad. The operation may be in compliance with this provision if it can acquire power generating equipment from other nearby operations or from commercial vendors and get it into operation before the pond capacity is exceeded.

It is also possible that a facility's design may be such that little or no back-up power generating capability is necessary. For example, a mill and tailings impoundment may be designed so that all transfers of cyanide slurry and solution require pumping. If no portion of the facility allows gravity flow, then a power outage may not result in a release or exposure. Similarly, a leach facility may have storage capacity in its solution ponds for the amount of solution in inventory in its leach pad, and not require emergency power to keep solution circulating.

In evaluating the need for back-up power, it should be noted that the scenario to be considered involves a power outage only, not one that occurs simultaneously with other equipment failures such as a break in a pipeline or during the design storm event. However, containment capacity for the design storm event must always be available and cannot be used in lieu of providing back-up power.

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

Standard of Practice 4.2 applies solely to milling operations, the intent being to limit the use of cyanide to that optimal for economic recovery of gold so that the waste tailings material has as low a cyanide concentration as practical. If the operation does not have a mill, the auditor should note that the Standard of Practice is "not applicable" and state the reason on the Detailed Audit Findings Report and the Summary Audit Report.

The decision of what is "optimal" rests solely with the operation. The auditor's job is to determine if the operation has a method to meet this Standard, not to judge whether the operation's dose rate is "optimal" in his own view.

1. Does the operation conduct a program to determine appropriate cyanide addition rates in the mill and evaluate and adjust addition rates as necessary when ore types or processing practices change cyanide requirements?

This question refers to how the operation determined the standard rate of cyanide addition to mill ore and how it varies this rate as ore characteristics change. Records of the initial bottle roll or other types of test work used to establish the standard dose would be one type of acceptable evidence. The operation should also have a procedure to identify when ore characteristics change and cyanide addition rates should be increased and decreased.

2. Has the operation evaluated various control strategies for cyanide additions?

While the first question addresses the standard cyanide dose rate that may have been determined prior to start-up of the facility and periodically thereafter, the other questions under this Standard of Practice address real-time adjustments to this rate to account for variations in the ore and its leaching characteristics. The operation should evaluate methods to determine if it is adding the necessary and appropriate amount of cyanide and to adjust it in real time as ore characteristics fluctuate. These include a program of manual sampling and control, and automated systems of sampling of leach solution or tailings to determine residual cyanide and adjust addition rates accordingly.

This question should not be interpreted as requiring that an operation evaluate multiple options in order to be in compliance with the Code.

3. Has the operation implemented a strategy to control its cyanide addition?

Once it has determined what control strategy is best suited to its particular circumstances, the operation should implement that strategy. As with the optimal dosage rate, the decision on what strategy to implement is solely the operation's responsibility and is not within the scope of the audit. It is also possible that the operation has determined that its ore characteristics are sufficiently consistent such that no control is needed. The operation would, however, need to provide data to support such a determination.

This final question is the one that determines compliance with this Standard of Practice. An operation should be considered to be in full compliance if it is implementing a system to control its cyanide additions, even if data on the original testing cannot be found and/or the operation has selected one control strategy without evaluating others.

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

Standard of Practice 4.3 addresses the facility's initial water balance.

An adequate water balance is one of the most important tools in preventing potentially catastrophic releases of cyanide at mine sites. Therefore, auditors should confirm that a water balance has been prepared, that it has reasonably considered the appropriate factors, and that the

site implements the necessary practices to maintain the balance. However, Code auditors are not expected to revisit each issue involved in an operation's water balance and substitute their own judgment in place of the engineers and hydrologists that prepared the balance. Code auditors have neither the time nor the expertise for this.

Also, it is important to keep in mind that although this Standard of Practice addresses the operation's water balance, the Code's intent is to prevent overtopping of ponds and impoundments and it is not concerned with the water supply side of the balance.

1. Has the operation developed a comprehensive, probabilistic water balance?

An operation's water balance is comprehensive if it has considered the factors necessary for such an evaluation, including, as applicable

- solution application rates;
- tailings deposition rates;
- precipitation, evaporation and seepage rates;
- undiverted run-on from upgradient areas;
- impacts of freezing and thawing;
- potential power outages; and
- the capacity and availability of any treatment systems for surface discharges.

To be probabilistic, the balance must take into account the uncertainty and variability inherent in the prediction of precipitation patterns. The frequency and distribution of precipitation events needs to be considered along with extremes and seasonal variations, not just average conditions.

2. Does the water balance consider the following in a reasonable manner and as appropriate for the facilities and environment?

- a) The rates at which solutions are applied to leach pads and tailings that are deposited into tailings storage facilities
- b) A design storm duration and storm return interval that provides a sufficient degree of probability that overtopping of the pond or impoundment can be prevented during the operational life of the facility
- c) The quality of existing precipitation and evaporation data in representing actual site conditions
- d) The amount of precipitation entering a pond or impoundment resulting from surface run-on from the upgradient watershed, including adjustments as necessary to account for differences in elevation and for infiltration of the runoff into the ground
- e) Effects of potential freezing and thawing conditions on the accumulation of precipitation within the facility and the upgradient watershed
- f) Solution losses in addition to evaporation, such as the capacity of decant, drainage and recycling systems, allowable seepage to the subsurface, and allowable discharges to surface water
- g) The effects of potential power outages or pump and other equipment failures on the draindown from a leach pad or the emergency removal of water from a facility

- h) Where solution is discharged to surface waters, the capacity and on-line availability of necessary treatment, destruction or regeneration systems
- i) Other aspects of facility design that can affect the water balance, such as the assumed phreatic surface in a tailings storage facility

While the first question under this Standard of Practice asked if the water balance considered the necessary factors, this question asks if they have been addressed appropriately. The auditor should review the balance to identify fatal flaws, assumptions that are questionable or other significant issues, but should not substitute his judgment for that of the professionals that prepared the water balance unless the discrepancy has material bearing on the adequacy of the balance.

The factors to review are listed in this question. The significance of these factors will vary depending on the facility's environment, including both temperature and precipitation. It is also dependent on the nature of its operations, and many of these parameters are much more critical for heap leach operations than for milling and tailings disposal.

- 3. Do the operating procedures incorporate inspection and monitoring activities to implement the water balance and prevent overtopping of ponds and impoundments and unplanned discharge of cyanide solutions to the environment?

The inspection and monitoring activities necessary to ensure that the operation follows its water balance should be included in its operating plans. This should include items such as monitoring of the freeboard or solution volume in ponds and impoundments and inspecting diversion structures for run-on from upgradient watersheds.

Verification would be based on a review of the facility's operating plans and procedures.

- 4. Are ponds and impoundments designed and operated with adequate freeboard above the maximum design storage capacity determined to be necessary from water balance calculations?

The water balance or design documents for ponds and impoundments should be reviewed to confirm that a minimum freeboard over the design storage capacity was specified. The Code does not mandate a specific freeboard. However, the Implementation Guidance notes that one-half to one meter is a typical freeboard for tailings impoundments, while a larger freeboard is typically necessary for leach ponds due to their much smaller ratio of surface area to drainage area.

The operation's inspection records should be reviewed to verify that these inspection and monitoring activities are being conducted.

- 5. Does the operation measure precipitation, compare the results to design assumptions and revise operating practices as necessary?

The operation should measure precipitation at the site and routinely compare it to the design assumptions. The operation may need to revise its operating practices if it finds that actual precipitation deviates from that assumed for the facility design. This may be very important for operations in remote areas that do not have a long history of precipitation records. It is also recognized that an operation need not monitor on-site precipitation if an established weather station is sufficiently close and at comparable topographic conditions such that its precipitation data is representative of conditions at the site.

Operations with heap leach facilities have the greatest need to evaluate precipitation data and use it as necessary to update a water balance or revise operating practices, since water management is an ongoing and critical part of operating these facilities. In some cases, however, updates to the water balance or changes to operating practices may be of little benefit. For example, where a tailings impoundment has been designed to contain, for example, a 100-year, 24-hour event and there is minimal undiverted upgradient watershed, a slight increase in the amount of precipitation will have minimal effect on the water elevation in the impoundment. Updating the water balance may also be of limited value where an operation has only been active for a short time and has collected a small amount of data, or when the data is consistent with that used for the initial calculations.

The operation should be able to provide monitoring records for the auditor's review. Review of precipitation data and any resulting changes to operating practices may be documented as updates to the water balance or to Standard Operating Procedures. If there is no written record of such comparison and updating, then interviews with operations personnel may be the only available evidence.

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

1. Has the operation implemented measures (i.e., fencing, filling in collection ditches with gravel, and covering or netting solution in ponds and impoundments) to restrict access by wildlife and livestock to all open waters where WAD cyanide exceeds 50 mg/l?

One of the few numerical guidelines included in the Verification Protocol is a 50 mg/l WAD cyanide limit for exposure of birds, other wildlife and livestock included in the Implementation Guidance. This recommended limit is based on evidence that solutions with 50 mg/l WAD cyanide are typically non-lethal to wildlife. Operations that restrict access of birds and other wildlife to open waters above this level are typically in full compliance with this Standard of Practice.

This recommended limit applies solely to water in tailings impoundments, heap leach facilities and other open ponds and impoundments to which wildlife has access. The Code does not specify that this limit applies at the discharge to a tailings impoundment. However, certain types of birds commonly drink tailings water as it flows across the beach of an impoundment. Therefore, in areas where such birds are found, the quality of tailings water is subject to the 50 mg/l limit before it enters the supernatant pond. This recommended limit

also applies to solution ponds and open solution trenches or ditches at a heap leach pad, as well as leach solution ponded on the surface of a leach pad due to poor infiltration.

The 50 mg/l limit does not apply to open-topped process tanks and vessels such as CIL tanks or to catchment ponds and containments that collect process solutions in an emergency but which are cleaned up as soon as practical. It also is not intended for protection of insects and small animals such as mice that cannot be excluded from ponds and impoundments with most fencing or netting.

Operations must implement measures to prevent access by wildlife where the WAD cyanide concentration exceeds 50 mg/l regardless of whether or not they have experienced wildlife mortality. In many cases, operations have maintained open ponds with toxic concentrations of cyanide for years with few wildlife mortalities. However, such “good luck” is not sufficient for Code compliance, and operations are required to take positive measures to prevent wildlife mortality. The Implementation Guidance specifically notes that hazing techniques typically are not adequate to meet this Standard of Practice.

The auditor will need to inspect leach facilities and tailings impoundments where the concentration of WAD cyanide exceeds 50 mg/l to observe restrictions on access of birds and other wildlife. These may include netting of impoundments, ponded areas on pads, and solution collection ditches, or filling in open solution ditches with gravel or rock to submerge the flow. It also may include covering of ponds with netting or bird balls. Fencing should be adequate to discourage the type of terrestrial animals that are in the area from accessing the solution, but it is recognized that absolute prevention of access by some animals may not be practical. Wildlife mortality not attributable to cyanide (e.g., birds caught in netting) should not be considered to be a violation of the Code.

It may also be possible for operations to use alternative methods to meet this Standard of Practice. Operation could demonstrate that a higher concentration of WAD cyanide in open water does not cause wildlife mortality due to site-specific reasons. For example, if there are no birds that drink from the beach of an impoundment in the area of an operation, then the 50 mg/l limit would not apply at the discharge point. Similarly, if the operation could demonstrate that a 50 mg/l concentration of WAD cyanide is not lethal to the specific types of birds and other wildlife that live and pass through the area, then some higher but still protective level would be appropriate.

However, making these demonstrations to the auditor’s satisfaction will not, and should not, be easy. Anecdotal evidence such as “we’ve never seen any bird mortality” is not sufficient, although any assertion that the 50 mg/l limit is unnecessary must be supported with comprehensive, daily inspection records demonstrating that there are no mortalities. The operation must also present the scientific rationale for the lack of mortality at a cyanide concentration that would otherwise be toxic. This could be a study by an appropriately qualified person concluding, for example, that no wading or shore birds are known to be in the area, or that the local population of birds and wildlife are resistant to this cyanide concentration. Such a study must be peer-reviewed and sufficiently rigorous that a causal relationship is established. Like any competent scientific study, the results must be

independently reproducible and predictive. The operation should also implement those recommendations included in the study for additional control measures to optimize the protective nature of the alternative measure, continued monitoring to validate the study's conclusions, or other measures deemed necessary by the study's authors to meet this Standard of Practice.

For purposes of compliance with this Standard of Practice, peer review is an independent, documented evaluation of scientific research for competence and validity. The review checks the assumptions, calculations, extrapolations, alternate interpretations, methodology, and conclusions of the research to ensure that the science is sound and the conclusions are well-founded. When necessary, the peer review process suggests ways to clarify assumptions, findings and conclusions, filters out possible biases, identifies oversights, omissions and inconsistencies, and encourages authors to more fully acknowledge limitations and uncertainties.

Peer reviewers must have technical expertise in the subject matter to be reviewed (or a subset of the subject matter to be reviewed) to a degree at least equivalent to that needed for the original work. Reviewers cannot be involved as a participant, supervisor, technical reviewer, or advisor in the work being reviewed, and must be free of conflicts of interest as defined in ICMI's Auditor Criteria document.

A single peer reviewer is not adequate. Peer review is typically conducted by a panel of three or more independent experts. At a minimum, however, research should be evaluated by at least two independent experts. If these experts disagree on any significant aspects of the study, then a third reviewer should be engaged to resolve the issue.

Peer review often occurs when a research paper is submitted for publication in a technical or professional journal. However, it is recognized that not all the scientific studies conducted in support of a Code certification will be published. Therefore, reviewers may be contracted and compensated to conduct a peer review of research that is not submitted for publication in a technical or professional journal.

Even though the initial Verification Audit looks at current compliance at the time of the audit, an operation attempting to demonstrate that an alternative to limiting the WAD cyanide concentration to 50 mg/l is acceptable must have historical data to support such a claim.

2. Can the operation demonstrate that the cyanide concentration in open water in TSFs, leach facilities and solution ponds does not exceed 50 mg/l WAD cyanide?

Operations must present analytical data demonstrating that an open solution contains 50 mg/l or less of WAD cyanide. The amount of data necessary for the auditor to make his finding will require judgment. Since the initial audit is a snapshot in time and the operation could not be expected to be in compliance with the Code before it became a signatory, it is generally inappropriate to review historical data for this initial audit. However, it is not unreasonable to expect the operation to be able to show that it is managing its solutions in compliance with the Code, and therefore, the auditor should question a situation where the 50

mg/l level has been exceeded with any regularity before the audit but is below this level the day the auditors arrive. For example, it may be appropriate for the operation to have data demonstrating that its open solutions consistently meet this recommended limit for at least 3-6 months prior to the initial audit.

If the facility has just implemented procedures to lower its WAD cyanide concentration for purposes of Code compliance, and the auditor has no historical data that suggests the operation can meet this new commitment, it may be necessary to make a finding of substantial compliance subject to submission of additional confirmatory data over the next several months.

3. Is maintaining a WAD cyanide concentration of 50 mg/l or less in open water effective in preventing significant wildlife mortality?

In most cases, if an operation implements all the measures identified in the Implementation Guidance as typically necessary to meet a Standard of Practice, it will be found in full compliance with that Standard. However, with respect to the wildlife protection provision of Standard of Practice 4.4, that may not be the case.

While 50 mg/l WAD cyanide is assumed to be protective, this Standard of Practice calls on operations to protect birds, wildlife and livestock. This means that an operation with 50 mg/l WAD cyanide or less in its open water, but which still has significant wildlife mortality from contact with cyanide is not in compliance with this Standard of Practice.

The auditor must determine if such wildlife mortality is “significant” or not. Generally, isolated cases involving a few bird mortalities annually would not be considered to be “significant” and would not trigger a requirement to further reduce WAD cyanide levels or for measures to restrict access to the solution. If, however, bird mortality due to ingestion of cyanide was a routine and continuing occurrence, even if the number of birds was not great, the auditor could find that the operation may not be in full or even substantial compliance with this Standard of Practice. The specific finding would depend on whether the operation was taking any further action to determine why a concentration below 50 mg/l WAD cyanide was still lethal to birds, or was implementing other measures that indicated its “good faith efforts” to comply with this Standard of Practice.

4. Does the operation apply leach solutions in a manner designed to avoid significant ponding on the heap surface and limit overspray of solution off the heap liner?

The fines content of some ore will restrict infiltration and promote ponding of leach solution on the surface of a heap leach facility. While this cannot always be completely eliminated, and some level of ponding can be expected, operations should take appropriate measures to limit excessive ponding that provides an attractive water source for birds.

The Code does not establish a numerical standard for what level of ponding is considered to be excessive, but each operation should determine this itself. Where the nature of the ore is such that ponding may occur, operations should routinely inspect active leach cells and have

procedures for ripping the surface of a heap as needed to increase its permeability and enhance infiltration of leach solution into the heap, and/or reducing or suspending solution application if excessive ponding is observed.

Excess ponding can cause saturation of the ore and resulting instability of the heap, and should be avoided regardless of the WAD cyanide concentration of the leach solution. While netting or otherwise covering ponded solution would be an acceptable alternative to having solution in excess of 50 mg/l ponded on the surface of a heap, this would not address concerns with structural stability.

Overspray of leach solution off a pad should also be avoided regardless of the cyanide concentration, simply from a chemical stewardship perspective. Auditors should inspect heap leach operations to verify that overspray is minimized to the extent practical.

The auditor should inspect active leach cells to determine if solution is ponding on the heap surface. Written procedures for inspection and remediation of excessive ponding would provide evidence that the operation is addressing the issue, but may not be necessary where the ore is free-draining and ponding is not experienced. Interviews with pad operators would also provide suitable evidence that ponding was being identified and addressed, especially where the ponding is minimal and no written inspection or remediation procedures have been developed.

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

1. Does the operation have a direct discharge to surface water and if so, is it no greater than 0.5 mg/l WAD cyanide?

If the operation discharges to surface water, the auditor can verify the quality of discharge by reviewing analytical data. The auditor can verify the lack of discharge through observation of the facility. If there is no discharge, and no surface water or drainages that can be adversely affected by the operation, then it can be stated as such in the audit report.

2. Is the concentration of free cyanide 0.022 mg/l or lower downstream of any established mixing zone? How has this been determined?

The Code recommends a free cyanide concentration of 0.022 mg/l or less in surface water for protection of aquatic life. Operations discharging to surface water should provide analytical data demonstrating that this value is achieved. The Code does not establish mixing zones but recognizes that some political jurisdictions have established them. Without such a mixing zone, the 0.022 mg/l free cyanide concentration must be achieved at the point of discharge, effectively applying this value in the discharge itself. If the facility has a mixing zone established by the applicable regulatory agency, then the 0.022 mg/l free cyanide concentration must be achieved immediately beyond the zone.

Unfortunately, analysis of free cyanide in the 0.022 mg/l range is problematic, and requires highly trained analysts using the most sophisticated equipment. While not beyond the capability of some gold mining companies, many operations will not be able to accurately measure this concentration in-house. Operations presenting data for such analysis should also provide quality control and quality assurance information demonstrating that the results are accurate.

Due to the difficulty of analysis of free cyanide at the parts per billion level, the Code offers other options. If the operation discharges to an authorized mixing zone, it may be able to analyze the higher concentration discharge and calculate the in-stream concentration based on the dilution from the natural stream flow. The operation could also determine the WAD cyanide concentration, which is easier to analyze at low levels. The WAD cyanide concentration could be used as a surrogate for free cyanide (that is, assume that all WAD cyanide exists as free cyanide), or the operation may be able to establish a fairly constant ratio between free and WAD cyanide in its discharge.

Most significantly, operations can also demonstrate that they protect aquatic life through biotoxicity testing using species and techniques accepted by the applicable jurisdiction. If biotoxicity test results are acceptable, the measured cyanide concentration would not matter for Code compliance.

With regard to the answers to this question, any of the other questions under this Standard of Practice, as well as the operation's overall compliance with this Standard of Practice, the auditor must keep in mind that the auditable provisions of the Code are the Principles and Standards of Practice and not the recommended numerical standards included in the Implementation Guidance as typically necessary to achieve the goals of the Standards of Practice. In a situation where environmental factors such as steepness of terrain or naturally-occurring water quality may preclude aquatic life, then meeting these numerical limits in that section of a receiving stream may not be necessary.

Similarly, where a stream segment has been designated for a use other than as aquatic habitat by the applicable jurisdiction, then the Code would not require the operation to meet a standard for protection of aquatic life. It is also possible that the aquatic life in a surface water body receiving a discharge from a mine may be more resistant to the affects of cyanide than those most sensitive organisms used to develop the numerical standards. In these situations, it is incumbent on the operation to demonstrate to the auditor's satisfaction that there are no aquatic resources to protect in the receiving water, or that the specific organisms present are able to tolerate a higher free cyanide concentration.

An operation's assertion that there are no aquatic resources to protect can be supported by the applicable jurisdiction's designation of a beneficial use less restrictive than aquatic habitat, along with data demonstrating that such resources, in fact, are not present. Support for a higher allowable cyanide concentration could be done through biotoxicity testing as previously mentioned or possibly using academic studies of the existing populations and their sensitivity to cyanide.

The support for such alternate means of achieving this Standard of Practice is similar to that discussed with regard to alternate means of protecting birds and other wildlife from ingestion of toxic concentrations of cyanide. As discussed in the guidance for question 1 under Standard of Practice 4.4, making such a demonstration to the auditor's satisfaction will not, and should not, be easy, and must be supported by credible, peer-reviewed and reproducible scientific data and rationales. In particular, the guidance under question 1 of Standard of Practice 4.4 regarding implementation of the study's recommendations and the nature of the necessary peer review also apply to operations using scientific studies in support of alternatives to meeting the recommended numerical standards for protection of aquatic life. Further, even where a less stringent cyanide concentration can be adequately supported for the surface water segment receiving a discharge, the operation must be able to demonstrate that aquatic life is protected at whatever point downstream such life, or more sensitive populations, actually do exist.

3. Does the operation have an indirect discharge to surface water? If so, does it result in a concentration of free cyanide in excess of 0.022 mg/l downstream of any established mixing zone?

Seepage from a tailings impoundment or other cyanide management facility also can enter surface waters as an indirect discharge. Operations that do not have direct discharges should ensure that indirect discharges are not adversely affecting aquatic life. Operations should determine if indirect discharges are occurring by inspecting their facilities for visible seepage that may enter surface waters and/or by routinely monitoring downstream surface water quality to ensure that the aquatic life is protected. However, the auditor must evaluate the need for such inspection or monitoring with a consideration of the distance to surface waters. Where an indirect discharge cannot reasonably be expected to reach surface water, inspections and/or monitoring should not be necessary.

4. If indirect discharges from the operation have caused cyanide concentrations in surface water to rise above levels protective of a designated beneficial use for aquatic life, is the operation engaged in remedial activity to prevent further degradation and restore beneficial use?

Operations that have adversely impacted surface water quality are not necessarily out of compliance with the Code. For example, in a case where the designated beneficial use of a surface water is for support of aquatic life, such an operation can be in full compliance if it is engaged in a remedial action to prevent further degradation and restore the waters use as aquatic habitat.

Necessary evidence would include an initial investigation of the specific cause of the contamination, a plan for its remediation, observation of the implementation of the plan, and analytical results demonstrating that the plan is working as designed.

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

The Code addresses the protection of ground water somewhat differently than it does surface water quality or wildlife protection, for two distinct reasons.

First, the Code intentionally does not specify designs for tailings impoundments or leach facilities. Although some general guidelines are included in the Implementation Guidance, the Code is not intended to be an engineering manual. Such manuals are available from or being developed by various groups and agencies such as the International Conference on Large Dams (ICOLD). Dam and impoundment designs tend to be very site-specific. Also, it would have not been appropriate for the Code to address leach facilities and impoundments in the gold mining industry separately from similar base metals facilities.

Second, the Code does not recommend a numerical standard for protection of ground water. Unlike surface water, where the default beneficial use of aquatic habitat can generally be appropriate, uses of ground water vary from the extremes of base flow to surface water used as aquatic habitat to no use at all. Protection of ground water is a controversial topic in many political jurisdictions, and decisions on the use of ground water are best left to communities and their governments.

Therefore, this is one of the few Code provisions that is directly linked to how the applicable jurisdiction has decided to protect its resources. Compliance with the Code requires that the operation protect the actual beneficial use of ground water, or the beneficial use established by the applicable regulatory agency rather than achieving a use or level of protection presumed necessary by the Code or by implementing specific design, construction and operational methods.

1. Does the operation implement specific water management or other measures to manage seepage to protect the beneficial use(s) of ground water beneath and/or immediately down gradient of the operation?

Although the Code does not recommend or require specific methods for protecting ground water quality, operations are expected to implement some measures to accomplish this goal. These may include but are not limited to full or partial lining of tailings impoundments with natural or synthetic materials, tailings deposition and pond management techniques, lining of leach pads and ponds with synthetic materials, and installation of leach collection and recovery systems between leach pond liners.

This first question asks what methods the operation employs to protect ground water. It is for informational purposes only and does not have direct bearing on the finding for this Standard of Practice.

Verification will include a review of the facility's design and operating practices, observation of the facilities and interviews with personnel. A complete answer to this question will include a description of the measures used by the operation at each of its tailings storage facilities, tailings under drainage collection ponds and leach pads and ponds to protect beneficial uses of ground water.

2. Are WAD cyanide concentrations (or other species of cyanide for which there is a numerical standard established by the applicable jurisdiction) in groundwater at compliance points below or down gradient of the facility at or below levels that are protective of identified beneficial uses of the groundwater?

This question asks about the beneficial use of the ground water and the concentration of cyanide measured in the ground water. To respond fully, the auditor must determine the beneficial use of the ground water beneath and/or immediately down gradient from the operation's cyanide facilities. For purposes of the Code, this must either be a use designated by the applicable jurisdiction or one that it currently serves, such as a source of drinking water for humans or livestock.

Compliance with the beneficial use standard is measured either at the point of compliance established by the regulatory jurisdiction or, if there is no designated use or compliance point, at the point of actual ground water withdrawal for an actual use.

Use of ground water as base flow to a stream would be addressed under Standard of Practice 4.6 as an indirect discharge to surface water rather than be evaluated under this Standard of Practice.

Where a beneficial use exists or is designated but there was no applicable numerical standard for protection of that use, then the auditor would apply an appropriate standard for that use based on standards from the political jurisdiction of the operation's owner or from technical literature. If no actual or designated beneficial use exists, or if the jurisdiction has established a beneficial use but not a point of compliance, then the auditor should indicate that this question does not apply and explain the reason. Further, unless the next question applies to the operation, this entire Standard of Practice would not be applicable.

3. If the operation uses mill tailings as underground backfill, have the potential impacts to worker health and the beneficial uses of ground water been evaluated and have measures been implemented as necessary to address them?

Operations using mill tailings as backfill in an underground mine should have conducted studies to determine the potential impacts of this activity. The auditor should review the evaluation to determine if it reasonably identified the potential impacts to workers and to ground water quality from the presence of residual cyanide in the tailings and the necessary protective measures. The requirement for protection of the beneficial use of the ground water also applies to this activity. The auditor should then inspect the operation and review applicable documentation to determine if these protective measures are being implemented and if beneficial uses are protected.

4. If seepage from the operation has caused cyanide concentrations of ground water to rise above levels protective of beneficial use, is the operation engaged in remedial activity to prevent further degradation and restore beneficial use?

An operation that has adversely impacted the beneficial use of ground water is not necessarily out of compliance with the Code. Such an operation can be in full compliance if it is engaged in a remedial activity to prevent further degradation and restore the beneficial use at the point(s) of compliance or use.

The Code does not define the term “remedial activity.” Hydrogeologic studies to determine the cause of the problem and potential responses, as well as modeling to predict the outcomes of various approaches, clearly can be part of an operation’s remedial measures. However, studies and modeling alone do not accomplish the goal of this Standard, which, as discussed in the Implementation Guidance, is both to protect existing beneficial uses and to restore beneficial uses that have been adversely impacted. Further, while extracting the contaminated ground water at the compliance well may be part of the remediation, this alone does not restore the beneficial use at that point nor does it necessarily prevent future adverse impacts at this or other points of compliance.

Necessary evidence for the auditor to review would include the initial investigation of the specific cause of the contamination, a plan for its remediation, observation of the implementation of the plan, and analytical results demonstrating that the plan is working as designed.

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

1. Are spill prevention or containment measures provided for all cyanide unloading, storage, mixing and process solution tanks?

Secondary containment would typically be expected for tanks containing cyanide solution. This is particularly the case for reagent strength cyanide solution managed during unloading, storage and mixing activities.

Containments may be a single area or multiple containments as long as they are adequately sized and are connected such that they can convey solution to the next containment without overflowing. This question also implies that the containments are competent; that is, a concrete secondary containment that is cracked and would not hold solution would not be considered to provide actual containment.

Tanks installed on ring beams with no concrete or other impermeable barrier between them and the ground do not have competent secondary containment. For existing tanks containing free cyanide solutions of less than 10,000 mg/l (1%), alternatives such as leak collection and recovery systems within the ring or the tank itself would be acceptable as long as they allowed for identification and remediation of leakage through the bottom of the tank before it entered the environment.

Existing tanks on ring beams that are not monitored for leakage within the tank or ring beam can use a combination of monitoring in the environment (e.g., in ground water or the unsaturated zone) and a risk-based inspection (RBI) program in lieu of full and competent

secondary containment. RBI programs use a formal and documented evaluation of the risk of a release from a tank and the consequence of a release to develop an inspection program appropriate for the site-specific situation. Inspection frequencies and techniques are based on the findings of an initial detailed inspection of the tank, and subsequent inspections are used to determine if the tank is performing as expected or if changes in the inspection program are needed.

For purposes of Code compliance, the evaluation of the potential consequences of a release must be predicated on the goal of preventing any impacts on health and the environment, regardless of site-specific environmental factors. While estimation of the risk of a release occurring should be based on the various factors affecting corrosion (e.g., the physical and chemical properties of the solution and the conditions of the tank), the estimation of the consequences of a leak should consider any release to the environment as being significant and to be prevented. Existing environmental conditions such as poor quality ground water cannot be used to justify a less rigorous inspection program or frequency than would otherwise be appropriate for high quality ground water. The nature of the monitoring program should also be considered, as the inspection program may differ if monitoring occurs in the unsaturated zone directly beneath a tank, at some distance from the tank, or in the ground water.

A number of methodologies can be used to evaluate the initial condition of a tank on a ring beam and develop the appropriate RBI program. The American Petroleum Institute's (API) Recommended Practice 580, and other methodologies that provide a similarly rigorous procedure, can all be acceptable. Code auditors should review the methodology used, the results of the initial tank inspection, the inspection program that is developed, and the results of subsequent inspections, to confirm that the program can reasonably be expected to prevent releases.

At existing operations, an acceptable alternative to a secondary containment surrounding tanks containing lower-strength process solution may be an external containment where leakage from the tanks can be directed. See question 4, below, for additional information.

The release scenario addressed in this question is a slow leak rather than a catastrophic failure or a hole in the tank that would be subject to pressure from the solution above it. Therefore, the Code does not apply a standard typical for pressurized tanks specifying the height of the containment wall or its distance from the tank as necessary to account for a pressurized stream of released solution that would shoot over the containment wall.

Verification for this question will typically be by observation of the facilities and review of design drawings.

When preparing the Detailed Audit Findings Report, information regarding cyanide unloading, mixing and storage activities should be included in the answer to this question but also considered in the findings for Standard of Practice 3.1.

2. Are secondary containments for cyanide unloading, storage, mixing and process tanks sized to hold a volume greater than that of the largest tank within the containment and any piping draining back to the tank, and with additional capacity for the design storm event?

Secondary containments must have adequate capacity to hold the volume of the largest tank within the containment as well as any piping that would drain back to the tank and additional capacity for the design storm event.

As with the Standard of Practice regarding the water balance, the Code does not specify a design storm event, and the auditor must determine if the one used by the operation is reasonable for the site's environment.

A factor of 110% of the volume of the largest tank can usually be used as a rule of thumb for the adequacy of secondary containment. However, this approximation may not be adequate where the volume of the largest tank is relatively small and the size of the containment (or in the case discussed in question 4, below, the drainage area collected by the containment) is large.

In some cases, the adequacy of containment's capacity will be obvious from a visual inspection, while in others, the auditor will need to review data on tank size and calculations of the containment's volume. The auditor should also verify through visual observation that there are no materials stored within the containment that compromise this capacity.

When preparing the Detailed Audit Findings Report, information regarding cyanide unloading, mixing and storage activities should be included in the answer to this question but also considered in the findings for Standard of Practice 3.1.

3. Are procedures in place and being implemented to prevent discharge to the environment of any cyanide solution or cyanide-contaminated water that is collected in a secondary containment area?

Water found in a secondary containment may be from precipitation or leakage from the tank. The operation should have a written procedure describing how this water is handled, how the operation determines if the water contains cyanide or not, and what is done with the water.

If water collected in a containment may be discharged to the environment, criteria for this decision should be documented and the procedure should require that it be sampled and analyzed. Records of these analyses should be available for the auditor's review.

Alternatively, the system may be designed with sumps and dedicated pumps and piping to return all such water to the production process, and in such a case, no written procedure would be necessary.

When preparing the Detailed Audit Findings Report, information regarding cyanide unloading, mixing and storage activities should be included in the answer to this question but also considered in the findings for Standard of Practice 3.2.

4. For cyanide process tanks without secondary containment, are there procedures for remediation of any contaminated soil such that adverse impacts on surface or ground water are prevented?

This question applies to existing facilities where tanks containing lower-strength process solution may not be located within a secondary containment. For example, many older operations were constructed with minimal or no containment around CIL tanks and/or tailings reclaim water tanks. Some of these operations have lined or unlined external ponds to which a release from these tanks could be routed. Flow to the ponds may be through a lined or unlined ditch or over a graded land surface. If the entire system is lined, then it is equivalent to a competent secondary containment system and would be evaluated under question 2, above. However, if the impoundment, ditch and/or flow pathway are unlined, then these systems can be acceptable under the Code only if they are managed as emergency situations. They cannot be used for routine operational purposes (e.g., emptying a CIL tank for maintenance), and the operation must implement a written procedure to respond and remediate the release such that adverse impacts to surface and groundwater are protected.

The procedure should include a rapid response and removal of as much standing solution as practical, neutralization and/or excavation of all impacted soil, and proper management and disposal of the soil, such as in a TSF or on a leach pad. The operation should implement a written procedure for sampling the subsurface after the initial excavation and for continued excavation and sampling until a predetermined clean-up concentration of cyanide has been achieved.

Additionally, the system must be designed to contain the release, and is subject to the same capacity requirement discussed in question 2, above. That is, the release must be collected in an impoundment or catch basin rather than simply flowing across the ground, and the system must be sized to contain the volume of the largest tank within the drainage area, any piping that would drain back to the tank, and the volume of precipitation collected from the drainage area during the design storm event.

Unlike the ground water protection provisions of Standard of Practice 4.6, which is related to protection of a particular beneficial use, the concept in this Standard of Practice is chemical stewardship and prevention of contamination. As an alternative to competent secondary containment, this release response is intended to prevent any impact to ground water regardless of existing ground water quality.

The auditor should visually inspect these facilities and review the operation's response and remediation procedures. Review of the calculation of the system's containment capacity is especially critical, as the drainage area flowing to the external pond may be large and the technique of approximating the necessary containment capacity by using 110% of the largest tank volume may not be valid in these cases.

5. Are spill prevention or containment measures provided for all cyanide process solution pipelines to collect leaks and prevent releases to the environment?

Spill prevention measures include a number of techniques. Preventive maintenance programs such as pipe wall thickness testing and rotation of transite tailings pipelines are used to prevent excessive wear on one side of a pipe. Interlock systems that automatically shut down upstream pumps when a downstream pump goes out of service can prevent overflows of intermediate ponds or tanks. Pressure and/or flow monitoring with alarms or automatic shut-offs can identify and control pipeline leaks, although it must be noted that these systems are effective at identifying a major leak or pipe failure but do not typically identify smaller leaks.

Routine formal inspections are another preventive measure, and are typically necessary in all cases regardless of what other measures are in place. The frequency of inspections should be related to capacity of any containment system to prevent releases. Informal inspection programs or situations where an operation maintains that “there are always people around the area who would observe a leak if it occurs” are not sufficient for full compliance. If these are the only pipeline inspections that are conducted, then interviews with site personnel would be the auditor’s only evidence verifying that inspections were being conducted. Therefore, at least some of the inspections should be documented.

Buildings, concrete secondary containments, lined or unlined ditches and double walled pipe or pipe-within-a-pipe systems are examples of typical containments. Ditches may also include lined or unlined catchment areas located strategically along a pipeline to collect solution released from the pipe.

Buried pipelines can be problematic. At some operations, HDPE pipes are buried to minimize movement as they expand and contract due to temperature variations. Depending on how deep they are buried, the characteristics of the soil and the rate of leakage from these pipes, leakage from the pipeline may or may not surface and be identified during inspections. Where a significant length of pipe is buried or where pipes are buried at significant depth, the operation should be prepared to present evidence demonstrating that slow leaks will surface and be detected. This could include case histories where such a leak was identified accompanied by an estimation of the leakage rate and total volume, as well as data on the permeability of the soil and the depth to ground water. Installation of a synthetic membrane beneath buried pipelines, or other measures to allow a more rapid identification of leakage, may be appropriate if there is no reason to believe that slow leaks will be detected.

Release prevention and containment systems must be evaluated in their totality, and with consideration of their environmental context. Moreover, the auditor must note that this Standard of Practice calls for “spill prevention or containment measures” but not necessarily both. For example, lined pipeline containments would be more appropriate with higher strength solutions, less frequent inspections, and/or relatively shallow ground water. Unlined pipeline containments or even no containment may be acceptable where solution strengths are low, groundwater is deep and/or of very poor quality, the frequency of inspections and preventive maintenance is high or the lines are equipped with pressure or flow sensors and automatic shutoffs.

Observations and interviews would be used to verify compliance with this question.

When preparing the Detailed Audit Findings Report, information regarding cyanide unloading, mixing and storage activities should be included in the answer to this question but also considered in the findings for Standard of Practice 3.1.

6. Have areas where cyanide pipelines present a risk to surface water been evaluated for special protection needs?

Evaluation of the adequacy of spill prevention or containment measures for pipelines must be based on the entire system and the environment. The Code specifically identifies the proximity to surface water as a significant factor in determining the necessary control measures.

Where a release from a pipeline can reach surface water, such as where a pipeline crosses a stream or runs in close proximity to a surface water body, pipe-within-a-pipe systems or lined secondary containments with provisions for collection of leakage, alarms, or other special protective measures should be used.

An auditor's observation that such measures are in place is sufficient evidence that the operation evaluated the situation and acted appropriately. If it appears to the auditor that such special measures may be necessary, and the operation has not implemented them, then the operation would not be in full compliance, or possibly even substantial compliance unless it had conducted and documented an evaluation that reasonably concluded that no special precautions were necessary. This could lead to a finding of substantial compliance if the evaluation was reasonable but the auditor believed that special controls were, in fact, necessary and appropriate.

7. Are cyanide tanks and pipelines constructed of materials compatible with cyanide and high pH conditions?

Generally speaking, use of materials such as HDPE and mild or stainless steel is necessary for cyanide tanks and pipelines. Where other materials are used, the operation should provide documentation of the material's compatibility with cyanide and high pH conditions.

When preparing the Detailed Audit Findings Report, information regarding cyanide unloading, mixing and storage activities should be included in the answer to this question but also considered in the findings for Standard of Practice 3.1.

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.

1. Have quality control and quality assurance programs been implemented during construction of all new cyanide facilities and modifications to existing facilities, including cyanide unloading, storage, mixing facilities and other cyanide facilities?

This question simply asks whether quality control/quality assurance (QA/QC) programs were implemented during construction of “cyanide facilities.” The term “cyanide facilities” is defined in the Code’s Definitions and Acronyms to include “storage, production, waste management or regeneration units for managing cyanide or cyanide containing process solution, and pollution control devices, equipment or installations used to prevent, control or minimize the risk of a cyanide release.” Cyanide process solutions include all reagent and in-process solution such as leach solution and tailings reclaim water but exclude solution containing less than 0.5 mg/l WAD cyanide.

QA/QC programs may not have been implemented for some cyanide facilities, such as a surface water diversion used to prevent water from an upstream watershed from entering a tailings impoundment or leach pond. The Code is more concerned with QA/QC for major installations such as tailings impoundments, leach pad and pond liner construction, mill buildings and equipment, reagent-strength cyanide tanks, and the concrete containments, supports and piping related to these facilities.

It may be possible to answer this question affirmatively based on evidence other than review of the documents themselves. For example, some jurisdictions require that operations implement these programs and their approval of the facility’s permit to operate implies that it was, in fact, conducted. The facility’s design documents or other construction-related records may also allude to or reference a QA/QC program. Site personnel may have been present during facility construction and therefore may know that a QA/QC program was followed.

Such evidence is acceptable for the auditor’s response to this question, although as noted in question 3, below, this is not adequate evidence for full compliance with this Standard of Practice.

When preparing the Detailed Audit Findings Report, information regarding cyanide unloading, mixing and storage activities should be included in the answer to this question but also considered in the findings for Standard of Practice 3.1.

2. Have quality control and quality assurance programs addressed the suitability of materials and adequacy of soil compaction for earthworks such as tank foundations and earthen liners, the installation of synthetic membrane liners used in ponds and leach pads, and for construction of cyanide storage and process tanks?

The auditor is not expected to conduct an engineering level evaluation of QA/QC records, but rather review them to see if they have generally addressed the items identified in this question, as applicable to the facilities at the operation.

When preparing the Detailed Audit Findings Report, information regarding cyanide unloading, mixing and storage activities should be included in the answer to this question but also considered in the findings for Standard of Practice 3.1.

3. Have quality control and quality assurance records been retained for cyanide facilities?

If QA/QC records are available, verification will be rather straight-forward. However, if records cannot be located or are incomplete, an alternate demonstration as discussed in question 5, below, will be necessary for compliance with this Standard of Practice.

When preparing the Detailed Audit Findings Report, information regarding cyanide unloading, mixing and storage activities should be included in the answer to this question but also considered in the findings for Standard of Practice 3.1.

4. Have appropriately qualified personnel reviewed cyanide facility construction and provided documentation that the facility has been built as proposed and approved?

Construction records should also include a sign-off by the construction engineer or project manager that the facilities have been built as shown in the design drawings.

When preparing the Detailed Audit Findings Report, information regarding cyanide unloading, mixing and storage activities should be included in the answer to this question but also considered in the findings for Standard of Practice 3.1.

5. Where there is no available quality control and quality assurance documentation or as-built certification for cyanide facility construction, has an appropriately qualified person inspected those elements of the facility involving cyanide and issued a report concluding that its continued operation within established parameters will protect against cyanide exposures and releases?

Where QA/QC records cannot be located, or where no such program was implemented during facility construction, the Implementation Guidance offers the option of having the operation's cyanide facilities evaluated by an appropriately qualified person, such as a professional engineer, to determine if they can continue to be safely operated according to their existing procedures.

Two types of reviews may be part of this evaluation depending on the nature of the facilities. An appropriately qualified person, such as a registered professional engineer, should conduct a visual inspection of tanks, vessels, pipelines, pumps and associated valves and fittings, concrete and/or steel structures supporting this equipment, and secondary containments of process solution tanks and vessels. The evaluation should determine whether, from a stability and/or containment perspective, as appropriate, this equipment is fit to continue functioning as currently operated. Any records that the operation can provide regarding the maintenance and testing of this equipment should also be considered in this evaluation.

It is recognized that this review may not result in absolute certainty regarding the suitability of the equipment, as that would require extensive, costly and time-consuming testing in all cases regardless of any other factors. Rather, it is to have an appropriately qualified professional visually inspect the operation's cyanide facilities to determine if there is any reason to believe that they cannot continue to be operated safely. No further testing may be

necessary unless the age of the equipment, its operating, maintenance and testing history, or the visual inspection suggests otherwise. Where the inspection, age and history of the equipment is not sufficient for a determination, pressure-testing, wall-thickness testing or other means may be necessary confirm the integrity or suitability of the equipment. The evaluation may result in recommendations to address a situation either immediately or within some specified time period, that operating practices should be revised based on the condition of the facilities, or that the equipment is fit for continued operation without additional testing or revision of existing operating practices but should be re-evaluated at some time in the future.

This same engineering evaluation could also be used to address question 1 under Standard of Practice 3.1 regarding the design basis of unloading, storage and mixing facilities. That is, operations that lack the original documentation demonstrating that these facilities were designed and constructed in accordance with cyanide producers' guidelines, applicable jurisdictional rules and/or other sound and accepted engineering practices can use the same engineering evaluation as alternative evidence both for acceptable design and construction and for the QA/QC provision.

With respect to cyanide facilities such as liner systems in impoundments or heap leach pads where inspections are not feasible, the only indication that the facility was constructed properly is its performance. For example, in lieu of QA/QC records showing that the liner of a leach solution pond was properly installed, the auditor should review records of leakage into a leak collection and recovery system (if present), along with ground water quality data to determine if the liner system is functioning properly. While this performance evaluation may be adequate for a leach facility, however, the original QA/QC for construction of a tailings impoundment would also have addressed the placement of embankment materials. Therefore, an alternative engineering review of tailings storage facilities should also include an evaluation of dam stability.

Another acceptable option for an operation that was constructed using a QA/QC program but which cannot locate the necessary records is for the operation to provide a statement by the engineer who originally signed off on the QA/QC program describing the nature of the program and its results. This is appropriate because the auditor would have accepted his original certification that the QA/QC program was properly implemented had that documentation been available.

Information regarding the design, construction and quality assurance/quality control of cyanide facilities need only be verified during the initial audit. In subsequent audits, the auditor should reference the initial audit report as evidence that the operation is in compliance with these Standards of Practice. Additional QA/QC information would be necessary in subsequent Verification Audits only if the cyanide facilities have been modified or additional cyanide facilities have been constructed. However, if an engineering inspection is used as an alternative to the original QA/QC and as-built reports, then a new evaluation would be needed consistent with any recommendations for subsequent evaluations or repairs that resulted from the inspection.

When preparing the Detailed Audit Findings Report, information regarding cyanide unloading, mixing and storage activities should be included in the answer to this question but also considered in the findings for Standard of Practice 3.1.

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

1. Has the operation developed written standard procedures for monitoring activities?

This question simply asks if the operation has a written monitoring plan or procedures, and verification consists of identifying the documentation.

2. Have sampling and analytical protocols been developed by appropriately qualified personnel?

Sampling procedures can be developed by operational personnel or by outside consultants as long as they meet the Code's definition of "appropriately qualified personnel." The term is defined in the Code's Definitions and Acronyms document generally as "An individual with the training, expertise and experience to carry out the technical functions discussed in the Code and Implementation Guidelines." With specific reference to preparing environmental monitoring and analysis plans, the definition notes that "a degree in an appropriate scientific discipline and experience with sampling and analytical techniques typically would be required."

In many cases, an operation's sampling plan is based on generic procedures taken from manuals prepared by governmental agencies or consultants and revised by company personnel as necessary to account for site-specific conditions. This is acceptable, as the appropriately qualified person is the government employee or consultant who developed the actual sampling procedures. If the sampling manual was developed or adapted by site personnel, it may not identify the author, and it may be necessary for the auditor to rely on interviews with site personnel to determine the origin of these procedures.

3. Do procedures specify how and where samples should be taken, sample preservation techniques, chain of custody procedures, shipping instructions, and cyanide species to be analyzed?

The auditor should review the sampling and sample handling procedures to determine if they include information on how and where samples should be taken, sample preservation techniques, chain of custody procedures, shipping instructions, and cyanide species to be analyzed. It is not necessary for all this information to be in a single document, as long as it is all available in some form.

4. Are sampling conditions (e.g., weather, livestock/wildlife activity, anthropogenic influences, etc.) and procedures documented in writing?

The operation should have some type of field report, which could be a sampling log book or check list, where sampling conditions that may affect the analysis are recorded. The auditor should review completed documents, rather than a blank form, to verify that the operation actually records this information.

5. Does the operation monitor for cyanide in discharges of process water to surface water and in surface and ground water down gradient of the site?

Data should be reviewed demonstrating that the operation monitors for cyanide in discharges of process water to surface water (if there is such a discharge) and in surface and ground water down gradient of the site. The Code does not establish minimum or maximum distances to surface waters where sampling would be required or not, and the auditor must use his professional judgment in making this determination. For purposes of this specific question, the actual measured levels of cyanide are not at issue, as they are addressed under other Standards of Practice.

6. Does the operation inspect for and record wildlife mortalities related to contact with and ingestion of cyanide solutions?

Many operations may claim that they do not observe wildlife mortalities due to cyanide, but without documentation that the operation conducts regular inspections for this purpose, the auditor cannot verify that such mortality does not occur. While not specifically required, the best approach would be use of a daily inspection checklist for each pond or impoundment that includes a check off for observation of wildlife mortality.

An alternative of only recording mortality when observed, but never documenting its absence, could be acceptable if, for example, a written training program or procedure for these inspections specifically included observation for wildlife mortality as one of the necessary components of a daily inspection.

Additionally, daily documented inspections for wildlife mortality typically would not be expected at operations where the concentration of WAD cyanide in open ponds and impoundments is well below 50 mg/l.

7. Is monitoring conducted at frequencies adequate to characterize the medium being monitored and to identify changes in a timely manner?

The Code does not mandate the frequency of monitoring activities, and the auditor must use his judgment to evaluate the adequacy of the operation's monitoring frequencies. Factors that may be appropriate to consider include the amount of existing data, the stability of the parameters being monitored, and for ground water, the rate of movement.

The Implementation Guidance identifies typical monitoring frequencies as daily for wildlife mortality and discharges to surface waters, weekly or monthly for surface water, and monthly, quarterly or longer for ground water.

Unless the operation's frequency of monitoring appears to be inappropriate or unreasonable, and would have a significant bearing on the operation's compliance, the auditor should not substitute his judgment for that of the operation.

**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.

1. Has the operation developed written procedures to decommission cyanide facilities at the cessation of operations?

This question requires the auditor to confirm that the operation has a decommissioning plan. This needn't be a single or separate plan related to cyanide but could be within a closure plan for the entire operation or as separate procedures to achieve what the Code defines as "decommissioning."

Decommissioning is that aspect of closure that addresses the cyanide remaining on site upon cessation of production activities and prepares the site for its closure and post closure period. The term is defined in the Definitions and Acronyms document, and generally refers to "treating, neutralizing or otherwise managing cyanide and cyanide containing process solutions remaining in storage and production facilities in preparation for closure so that they do not present a risk to people, wildlife or the environment due to their cyanide content."

Decommissioning includes activities such as:

- decontamination of equipment;
- removal of residual cyanide reagents;
- rinsing of heap leach pads (if part of the operation's closure plan); and
- installation of measures necessary for control or management of surface or ground water such as pumping and treatment systems that would operate during the facility's closure period.

Decommissioning does not include activities such as:

- physical stabilization or recontouring of tailings storage facilities or heaps;
- reclamation, rehabilitation or revegetation of disturbed land;
- long-term management of seepage from leaching facilities or tailings storage facilities; and
- environmental monitoring.

An operation is in full compliance with this question if it has written plans to conduct the necessary activities, as applicable to its facilities.

2. Does the plan include an implementation schedule for decommissioning activities?

The operation's decommissioning plans and procedures should include a schedule for carrying out its proposed activities. The schedule need not be linked to a specific date, but rather can simply show the order in which the planned activities will be conducted starting from the point in time the operation ceases production or an individual cyanide facility is no longer in use. The operation should make a reasonable attempt at scheduling its decommissioning activities, with the recognition that the schedule may change in the future.

3. Does the operation review its decommissioning procedures for cyanide facilities during the life of the operation and revise them as needed?

Decommissioning plans should be reviewed and revised during the active life of the operation to keep them current and applicable to the actual ongoing operation as it changes over time. The Code does not prescribe a frequency, but the operation should update its plans with sufficient frequency to reflect changes in the operation as they affect decommissioning, as well as changes in planned decommissioning techniques and measures.

The plan itself may have a provision requiring its periodic review and revision, or the operation may have previous plans that have been superseded by updated ones. It is also possible that the operation has not been active long enough to require a review and revision to its decommissioning plans. In such a case, the auditor can only evaluate the operation's intent to do so, as shown in a written policy or procedure calling for such review and revision.

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

1. Has the operation developed an estimate of the cost to fully fund third party implementation of the cyanide-related decommissioning measures as identified in its site decommissioning or closure plan?

The rationale for financial assurance contemplates a situation where the operation lacks the financial resources to execute its decommissioning plan. Therefore, the "cost to fully fund the plan" is the cost for a third-party contractor to mobilize, conduct the planned activities, and demobilize from the site, rather than the cost for in-house implementation of the plan.

The operation should have such a cost estimate either prepared by an outside contractor or based on rates quoted by or applicable to an outside contractor. Ideally, the Plan will include line items for site decommissioning and corresponding cost estimates. However, it is likely that some or all of the cyanide-related decommissioning activities and costs may be included within broader activities being planned for complete site closure. This may require a careful examination of the cost estimate to confirm that it includes adequate funds for cyanide-related decommissioning activities.

2. Does the operation review and update the cost estimate at least every five years and when revisions to the plan are made that effect cyanide-related decommissioning activities?

Decommissioning cost estimates should be reviewed and updated at least every five years, and also when changes are made to the plan that effect cyanide-related decommissioning activities and costs.

This question would not apply to operations that have been in operation less than 5 years and which have not changed their decommissioning plans. It may also be difficult to verify that cost estimates have been updated unless previous plans are still available. Policy or procedural documentation requiring such a review and update, or interviews of site personnel may be the only reasonably available evidence for the auditor's response to this question.

3. Has the operation established a financial mechanism approved by the applicable jurisdiction to cover the estimated costs for cyanide-related decommissioning activities as identified in its decommissioning and closure strategy? If so, no further demonstration is required to comply with this Standard of Practice.

If the political jurisdiction in which the operation is located requires financial assurance for closure or decommissioning, and the operation has provided it in a manner satisfactory to that jurisdiction, then the operation is in compliance with this part of the Standard of Practice regardless of the nature of the mechanism, as long as the amount is sufficient to cover its proposed decommissioning activities.

It is recognized that if full closure activities are covered by this financial instrument, its amount will be significantly larger than is required for cyanide decommissioning. In such a case, the Code does not require that funding for the cyanide-related decommissioning activities be somehow separated from the overall closure funds.

The necessary evidence for the auditor would be documentation from the applicable jurisdiction that the operation has met its requirements for financial assurance in an amount no less than the operation's estimate of third-party decommissioning costs.

4. If the applicable jurisdiction does not require financial guarantees, has the operation established a mechanism other than self-insurance or self-guarantee to cover estimated costs for the cyanide-related decommissioning activities as identified in its decommissioning and closure strategy? If so, no further demonstration is required to comply with this Standard of Practice.

If not required by the applicable political jurisdiction, then the operation must establish a financial assurance mechanism independently to comply with the Code. This question addresses situations where the operation has provided financial assurance in the form of cash, a bond, a letter of credit or outside insurance.

The auditor should review the operation's documentation that the financial assurance mechanism is in place and in an amount that at least covers its estimated third-party decommissioning costs.

5. If the operation has established self-insurance or self-guarantee as a financial assurance mechanism, has the operation provided 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?

Operations that use self-insurance or self-guarantee as a financial assurance mechanism for closure or decommissioning must provide the Code auditor with a statement from a qualified financial auditor that it has sufficient financial strength to fulfill this obligation. The financial auditor must base his evaluation on an accepted financial evaluation methodology. Several tests of financial strength used by environmental regulators in the US and Canada are referenced in the Implementation Guidelines as acceptable for this purpose, and other financial tests can be used if they are considered acceptable by professional financial auditors.

Verification by the Code auditor would require review of the statement from the financial auditor and confirmation that the insurance or guarantee was calculated for an amount that covers the operation's estimated decommissioning cost. Additionally, the financial auditor must provide evidence of his professional certification.

It must be noted that this question applies only where the political jurisdiction has no requirement for financial assurance. If the political jurisdiction requires financial assurance and allows self-insurance or self-guarantee, then the operation is subject to the first of the three financial assurance options discussed under question 3, above.

## **6. WORKER SAFETY: Protect workers' health and safety from exposure to cyanide.**

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

1. Has the operation developed procedures describing how cyanide-related tasks such as unloading, mixing, plant operations, entry into confined spaces, and equipment decontamination prior to maintenance should be conducted to minimize worker exposure?

The operation should have written procedures for the tasks identified in this question, as well as others that require management of cyanide. Procedures can be Standard Operating Procedures, training materials, signs, checklists, etc.

The same Standard Operating Procedures as those reviewed under question 1, Standard of Practice 4.1 which focused on operations typically would be sufficient for this question, and the related safety issues may be addressed either explicitly or implicitly. That is, the procedures can be operational as long as they describe safe practices. Alternately, the operation may have separate safety-related procedures. The level of detail in these procedures should be commensurate with the risks involved with the task.

The auditor should review these procedures to determine if they describe safe work practices.

2. Do the procedures require, where necessary, the use of personal protective equipment and address pre-work inspections?

The operation should have formalized procedures for use of personal protective equipment and should conduct pre-work inspections, as appropriate and necessary for the operation. Use of personal protective equipment may be addressed in Standard Operating Procedures, safety policies or procedures, safety training programs, signs posted in specific work areas or otherwise disseminated to the employees. Pre-work inspections are typically focused on safety and operational issues, and documented by exception in an operator's log book.

3. Does the operation implement procedures to review proposed process and operational changes and modifications for their potential impacts on worker health and safety, and incorporate the necessary worker protection measures?

Question 4 under Standard of Practice 4.1 asked about a change management procedure designed to prevent environmental releases. This question addresses the same issue with regard to worker safety and preventing exposures, but does not require a separate and distinct change management procedure for worker safety. A single such procedure can be used to address both environmental releases and worker exposures.

Operations should have some formalized way of managing changes to the facility. A change management procedure should identify changes to the facility or its operating practices that may increase the potential for workers to be exposed to cyanide before such changes are implemented so that they can be evaluated and addressed as necessary. A written procedure requiring written notification to safety personnel and a sign-off before the change can be instituted is the best way to address this. Verification would be through a review of the procedure as well as completed forms that have been signed off by safety personnel.

Another acceptable alternative particularly for smaller operations would be regular discussion of all proposed changes at a formal, weekly staff meeting, supported by a policy statement or procedure requiring that such changes be discussed with safety staff prior to implementation. Where a formalized written procedure is not used, auditor judgment based on interviews with management and field personnel will be necessary to determine whether an unwritten change procedure is being effectively implemented.

4. Does the operation solicit and actively consider worker input in developing and evaluating health and safety procedures?

The operation should have some method for getting employee input regarding its health and safety procedures, and should consider this input in developing and evaluating its procedures. These could consist of formal safety meetings, informal pre-work safety sessions, suggestion boxes, involvement of work crews in developing or reviewing Standard Operating Procedures, or other methods.

The auditor's evidence may include a written procedure calling for such meetings, observation of meetings and/or suggestion boxes, documentation of formal safety meetings or worker's suggestions, and interviews with personnel.

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.

1. Has the operation determined the appropriate pH for limiting the evolution of hydrogen cyanide gas during mixing and production activities?

Keeping cyanide in solution is one of the most important considerations in limiting the potential for worker exposure to hydrogen cyanide gas. The solubility of cyanide in water is related to the pH, so maintaining the necessary pH is very important.

The operation's target pH may be stated in its general operating plans and procedures or may be within its mixing or dilution procedures. The auditor should also confirm that the operation implements its procedures to maintain the necessary pH of its process solutions. This may include monitoring pH at various points in the production process and adding reagents as necessary to maintain the proper pH conditions.

Evidence may be found in Standard Operating Procedures, daily operator logs and through interviews.

2. Where the potential exists for significant cyanide exposure, does the operation use ambient or personal monitoring devices to confirm that controls are adequate to limit worker exposure to hydrogen cyanide gas and sodium, calcium or potassium cyanide dust to 10 ppm on an instantaneous basis and 4.7 ppm continuously over an 8-hour period, as cyanide?

Operations should be monitoring any area or task where the concentration of cyanide gas or dust can exceed 10 parts per million on an instantaneous basis or 4.7 parts per million continuously over an 8-hour period. Typically, these may include:

- reagent unloading and storage areas;
- mixing facilities;
- carbon stripping, washing and regeneration areas;
- the tops of process tanks that are enclosed in buildings;
- CIL screen-cleaning activities; and
- cyanide treatment, destruction and recovery systems

Operations should have fixed monitors in these locations or use personnel monitors to confirm that workers are not being exposed to excess cyanide levels in these areas or when performing these tasks. Operations that do not monitor for hydrogen cyanide should have documentation supporting their determination that these areas and/or tasks do not present a potential for workers exposure to hazardous cyanide concentrations.

The auditor can confirm this by observation, interviews and review of records of fixed or portable monitors and/or personnel surveys.

3. Has the operation identified areas and activities where workers may be exposed to cyanide in excess of 10 ppm on an instantaneous basis and 4.7 ppm continuously over an 8-hour period, and require use of personal protective equipment in these areas or when performing these activities?

Exposure to more than 10 ppm cyanide on an instantaneous basis and 4.7 ppm cyanide continuously over an 8-hour period hydrogen cyanide gas is not a usual occurrence at most gold mines. However, these cyanide concentrations may be experienced at some operations or under some conditions, such as where hypersaline process water makes it difficult to maintain a high pH, and/or when metallurgical conditions require leaching with very high strength cyanide solutions. Concentrations of cyanide dust in excess of 4.7 parts per million can occur during mixing of solid cyanide or possibly in warehouse of solid cyanide.

Where exposure to harmful concentrations of cyanide are possible, operation should require use of necessary personal protective equipment, either through use of signage, Standard Operating Procedures, training, etc.

4. Is hydrogen cyanide monitoring equipment maintained, tested and calibrated as directed by the manufacturer, and are records retained for at least one year?

The operation should maintain, test and calibrate its stationary and portable cyanide monitoring equipment as required by the manufacturer. Records should be retained and available for review by the auditor. Records may be retained by instrument technicians or be part of the computer record of a preventive maintenance program. Records should include the actual calibration information rather than simply show that a work order for equipment calibration was completed. Although audits are conducted every three years and cover the period since the previous audit, operations are only required to retain calibration records for one year.

5. Have warning signs been placed where cyanide is used advising workers that cyanide is present, and that smoking, open flames and eating and drinking are not allowed, and that, if necessary, suitable personal protective equipment must be worn?

Workers should be alerted to the presence of cyanide and reminded of the various prohibitions regarding its use. The Code does not mandate specific locations, sizes and wording of these signs. Signs can be on doors or other entrances leading to mill or other process buildings, posted at storage warehouses and process tank installations, or on gates entering an operation.

Cyanide is also present at heap leach pads and ponds and at tailings impoundments, and this provision also applies to these facilities. The availability of signs should be evaluated in conjunction with the overall safety training program at the operation, other existing

prohibitions, the educational level of the workforce, and other parameters that may affect the need for signage.

For example, signs prohibiting eating near a cyanide process tank may not be necessary if eating is allowed only in designated areas of an operation and this prohibition is part of the operation's written training program. Similarly, the prohibition on open flames is more appropriate with regard to high strength reagent cyanide than dilute process solutions, as it is hydrogen cyanide gas that is highly flammable, not cyanide salts or solutions.

The auditor's observation of signage around the facility would be the primary means of verification. Interviews with site personnel and review of the overall safety and training programs with respect to cyanide safety may also be important in determining how the workforce has been alerted to the presence and risks of cyanide.

6. Are showers, low-pressure eye wash stations and dry powder or non-acidic sodium bi-carbonate fire extinguishers located at strategic locations throughout the operation and are they maintained, inspected and tested on a regular basis?

As with warning signs, the Code does not mandate specific numbers and locations of safety showers, eye-wash stations or fire extinguishers. In general, this equipment should be available at reagent cyanide off-loading, mixing and storage areas, the tops of CIL tanks, and other areas where personnel may be exposed to cyanide in the normal course of their work.

Carbon dioxide fire extinguishers cannot be used with cyanide due to their acidic nature. The auditor should evaluate whether dry powder or non-acidic sodium bi-carbonate fire extinguishers are available where necessary.

Since water at line pressure can drive contaminants into the eye, the auditor should spot-check some eye-wash stations to confirm that the water pressure is not too high.

The operation should also be able to present maintenance, testing and/or inspection records to the auditor demonstrating that this safety equipment has been routinely evaluated to ensure it is available if and when needed.

7. Are unloading, storage, mixing and process tanks and piping containing cyanide identified to alert workers of their contents, and is the direction of cyanide flow in pipes designated?

Operations should identify tanks and pipes that contain cyanide solution. The Implementation Guidance does not call for specific terminology, size of signs and labels, or the location and frequency of such identification. These variables are intentionally left to the discretion of the gold mining operation, and the auditor must use professional judgment to determine if their implementation at a given operation is adequate.

The intent of this Standard of Practice is to ensure that individuals that may come into contact with cyanide or cyanide solutions (including employees involved in maintenance, and any other individual that may be exposed to released solution) be alerted to its presence.

Labeling must be evaluated on its functionality; that is, does it provide workers and others with notice that a dangerous material is present as necessary to protect their health and safety. The nature, frequency and specifics of the necessary signage are also related to the operation's overall safety and training programs.

Labeling on a pipe where access is restricted to trained employees could use words such as "barren solution" rather than "cyanide" if the workers are trained that barren solution contains cyanide and the training is documented. Where the general public may have greater access, a more descriptive label specifically identifying the presence of cyanide or, more generically, a hazardous, poisonous or toxic chemical would be more appropriate.

The size and frequency of pipeline labeling should allow personnel to track the line and identify its contents, but such labels need not be located to be visible or legible from great distances or from all angles and perspectives. Labels are typically most appropriate at or near pipe junctions, valves, or other locations where releases are most likely or which may require frequent maintenance. Also, labeling of pipes within a tailings impoundment or heap leach pad would not be necessary if these facilities themselves had signs identifying the presence of cyanide.

The direction of flow in pipes carrying cyanide solution should be indicated to reduce the potential for releases and exposures during maintenance. Since the intent of this Standard of Practice is protection of worker health and safety, identifying the flow direction on individual pipes may not be necessary if cyanide concentrations are sufficiently low. A WAD cyanide concentration of approximately 10 to 15 mg/l may be an appropriate cut-off for the need for individual labeling. This means that in many cases where tailings decant water is recycled back to a mill, it may not be necessary to indicate the direction of flow in every individual pipe carrying mill water.

Verification of this question will entail an observation of the cyanide piping and tanks at the facility, which would include following the reagent pipeline from the off-loading or mixing tank to the locations that the cyanide is added to the production circuit. It may also be necessary to review analytical data to confirm that unlabeled pipes or tanks, or those without the flow direction indicated, contain cyanide solutions in concentrations that do not pose a threat to worker health and safety.

8. Are MSDS (Material Data Safety Sheets), first aid procedures or other informational materials on cyanide safety in the language of the workforce available in areas where cyanide is managed?

Employees should have access to MSDS and/or other information on cyanide first aid in areas where cyanide is used. Access to this information is particularly important where reagent strength cyanide is managed. All safety information provided by the operation should be in the language of the workforce.

The auditor should observe that safety or warning signs, MSDS, first aid procedures and other safety information are available where cyanide is used in the language of the

workforce. However, the Code does not specify exact locations, and the auditor must evaluate the need for and availability of this information within the context of the operation's overall safety and training programs. Facilities that have MSDS information on their computer system may not have MSDS available except in control rooms. In many cases, having first aid information available with the cyanide first aid kits and/or where reagent-strength cyanide is managed will be sufficient.

9. Are procedures in place and being implemented to investigate and evaluate cyanide exposure incidents to determine if the operation's programs and procedures to protect worker health and safety, and to respond to cyanide exposures, are adequate or need revising?

The operation should have a written procedure for investigating and evaluating incidents of cyanide exposure with the intent to determine if the operation's policies and programs to prevent such incidents are adequate or whether they need to be revised. This procedure need not be specific to cyanide incidents.

The auditor should review the written procedure as well as records of past investigations. If there have not been any cyanide-related incidents, then records of other accidents or incidents should be reviewed to confirm that the general program for investigation of accidents and incidents is being implemented. There may not be any written records indicating that procedures have been revised in response to a previous incident.

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

1. Does the operation have water, oxygen, a resuscitator, antidote kits and a radio, telephone, alarm system or other means of communication or emergency notification readily available for use at cyanide unloading, storage and mixing locations and elsewhere in the plant?

The auditor must determine if the operation has the necessary equipment for emergency response to a worker's exposure to cyanide. It must be noted that allowable antidotes for cyanide poisoning differ between various political jurisdictions, and in some cases, no antidote other than oxygen is permitted. A separate resuscitator is not required if the operation has medical oxygen with a valved mouthpiece that can also be used as a resuscitator. Any means of emergency communication or notification (radio, alarm system, or telephone) is equally acceptable.

2. Does the operation inspect its first aid equipment regularly to ensure that it is available when needed, and are materials such as cyanide antidotes stored and/or tested as directed by their manufacturer and replaced on a schedule to ensure that they will be effective when needed?

The operation should inspect its cyanide first aid equipment regularly and have inspection records for the auditor's review. The auditor should observe the dates on antidotes to ensure they have not expired, and determine if they are stored at the temperature specified by their manufacturer. Although anecdotal evidence suggests that antidote may remain effective even if out of date or stored incorrectly, an operation would need to present scientific evidence in

support of such assertions to be in compliance with this Standard of Practice. The operation is not required to place a recording thermometer with the antidote to verify the temperature range to which is it exposed; this can be estimated from ambient conditions or the general range of temperature-controlled areas.

Where antidotes such as amyl nitrite are available on site, they must be maintained within the prescribed temperature range and labeled expiration date regardless of the presence of other antidotes. That is, an operation that provides an antidote such as amyl nitrite is expected to maintain it in a useable condition even if its procedures call for its use only as a last resort when oxygen is not effective.

3. Has the operation developed specific written emergency response plans or procedures to respond to cyanide exposures?

The operation should have a written procedure detailing the necessary response to cyanide exposure. Although the procedure need not be identical to that discussed in the Implementation Guidance, it should include similar elements. The procedure can be on signs that are posted at strategic locations, included in the cyanide first aid kits, in an Emergency Response Plan, or included in Standard Operating Procedures, Safety Procedures or other documentation.

4. Does the operation have its own on-site capability to provide first aid or medical assistance to workers exposed to cyanide?

The operation should have some type of on-site capability to respond to cyanide exposures. This could be trained medical personnel, emergency medical technicians, or, at a minimum, operations personnel who are trained in cyanide first aid. For other than doctors and nurses, the auditor should be able to review training records demonstrating that the individual has received specific training in cyanide first aid, including use of antidotes (where allowed) and administration of oxygen.

5. Has the operation developed procedures to transport workers exposed to cyanide to locally available qualified off site medical facilities?

Depending on the operation's location, transport to an off-site medical facility may be as simple as a quick trip by car or as elaborate as evacuation by plane or helicopter. Typically, the operation should have a written procedure in the event that an exposed worker requires treatment at an off-site medical facility. However, an operation with on-site medical capabilities and equipment may not need any procedure for off-site transport of an exposed worker.

6. Has the operation made formalized arrangements with local hospitals, clinics, etc., so that these providers are aware of the potential need to treat patients for cyanide exposure? Is the operation confident that the medical facility has adequate, qualified staff, equipment and expertise to respond to cyanide exposures?

Operation planning to transport a cyanide exposure victim to an off-site medical facility for treatment should have made some type of formalized arrangement with that facility. At a minimum, the operation should have made the facility aware in writing that it may be asked to treat a victim of cyanide poisoning, and the operation should have determined if the medical facility had adequate and qualified staff, equipment and expertise to treat the patient. However, the operation is not expected to conduct an exhaustive investigation into the qualifications of the medical staff. Rather, the operation should at least be sufficiently familiar with the facility to know that it has the equipment and expertise necessary to provide a patient with the appropriate treatment.

7. Are mock emergency drills conducted periodically to test response procedures for various cyanide exposure scenarios, and are lessons learned from the drills incorporated into response planning?

The operation should conduct drills of its procedures for response to worker exposure to cyanide to determine if the procedures are adequate. The Code does not specify the nature or frequency of these drills, but something between annual and every 3 years would usually be sufficient. The operation should retain records of these drills, and these records should identify any deficiencies in response procedures that require revision.

The auditor should review these records to verify that drills are being conducted and if deficiencies in the response procedures were identified. The auditor should also determine if any such deficiencies identified during the drills have been addressed, through document reviews or interviews.

**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.

1. Has the operation developed an Emergency Response Plan to address potential accidental releases of cyanide?

This question asks if there is an Emergency Response Plan. Details of the Plan are addressed in subsequent questions and Standards of Practice. The Code does not require that the necessary information be compiled in a single Emergency Response Plan, a specialized document addressing cyanide only, or in any other specified format. Emergency response information also may be included in Standard Operating Procedures, Operating Plans, Contingency Plans, First Aid or Safety Procedures, or other documents.

2. Does the Plan consider the potential cyanide failure scenarios appropriate for its site-specific environmental and operating circumstances, including the following, as applicable?
  - a) Catastrophic release of hydrogen cyanide from storage or process facilities

- b) Transportation accidents
- c) Releases during unloading and mixing
- d) Releases during fires and explosions
- e) Pipe, valve and tank ruptures
- f) Overtopping of ponds and impoundments
- g) Power outages and pump failures
- h) Uncontrolled seepage
- i) Failure of cyanide treatment, destruction or recovery systems
- j) Failure of tailings impoundments, heap leach facilities and other cyanide facilities

The Plan should be a well thought-out document that addresses the potential release scenarios at the site in a realistic manner and with an appropriate degree of specificity. Too often, Emergency Response Plans and other similar documents are prepared as a paper exercise to comply with some requirement but have little utility beyond that. These Plans are generic in nature, with the most general of response procedures such as “stop the release if possible” or “clean up the spilled material,” but they lack any specific instructions as to how these tasks are to be accomplished.

Although formal risk assessments, dam break analyses or other documented evaluations all can be used to determine the potential release scenarios appropriate for consideration in the Emergency Response Plan, such detailed and documented approaches are not required for Code compliance. If the scenarios addressed in the emergency planning documents are appropriate, the method used by the operation to identify them is not relevant to Code compliance.

The operation’s Emergency Response Plan and/or related documentation should focus on site-specific circumstances and responses, at least with respect to cyanide. The auditor should determine if these documents address those release scenarios that may reasonably be expected to occur and result in significant impacts to its workers, community and environment, as applicable to the site-specific features of the operation and its environmental setting. However, compliance with the Code does not require that each scenario be separately addressed under its own heading; rather, the response actions included in the Plans should be appropriate for the applicable scenarios.

Note that this specific question is focused on whether the Emergency Response Plan considers appropriate release scenarios, and not on whether the responses are appropriate, which is addressed in question 4, below.

3. Has planning for response to transportation-related emergencies considered transportation route(s), 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)?

Operations will typically need to address releases during transport of reagent cyanide to the site, even if this is limited to that portion of the delivery route that takes place within the operation’s property. This may also include areas in proximity to the site if such response by

the operation is included in the agreement between the producer, transporter and mine discussed with respect to Standard of Practice 2.1.

The factors identified in this question should be considered and directly addressed in the Plan to the extent that they affect the nature and location of the release and the necessary response action.

4. Does the Plan describe specific response actions (as appropriate for the anticipated emergency situations) such as clearing site personnel and potentially affected communities from the area of exposure, use of cyanide antidotes and first aid measures for cyanide exposure, control of releases at their source, and containment, assessment, mitigation and future prevention of releases?

Many Emergency Response Plans direct personnel to “stop the release if this can be safely done,” without providing any information as to how this is to be accomplished. It is not the intent of the Code to require infinite details for every conceivable release scenario and variation, or for the operation to generate lengthy and complex response plans that do not provide useful information. At a minimum, though, emergency response planning documents should address the types of releases and responses that may reasonably be expected to occur at the site. The degree of detail and specificity needed in the Plans will depend on the environmental setting of the operation, the nature of potential receptors, and the controls in place at the facility.

In complex terrain or at locations with surface water or nearby or downstream communities, it may be appropriate to identify the flow path for spills from specific segments of a process solution pipeline, and to provide specific response actions such as shutting off a particular pump to stop the flow or constructing an emergency dike at a pre-determined location to prevent the release from entering the water body.

In other cases where all releases from a site would be to adjacent soil only, there may be little need to specify each potential release scenario or to differentiate between response actions.

The Plan itself does not necessarily need to identify all possible scenarios if they all lead to the same response. For example, a Plan could indicate that potential releases fall into the following categories: release of high strength cyanide solution, release of low strength cyanide solution, releases during dry conditions and releases during wet conditions. Responses could then address each situation and if the specific location of the release doesn't change the response, (for example, all releases can only go to the soil), then no further detail would be necessary. In such a case, or where all facilities and pipelines are within secondary containment, it may not be necessary for the Emergency Response Plan to identify specific valves, switches or pumps that must be used to stop the flow. Similarly, if the operation's procedure is to notify a control room operator of the release and for the operator to shut-down the appropriate equipment and cease the flow of released material, then the identification within the Plan of specific valves, switches or pumps would not be necessary.

However, when addressing strong cyanide solutions, it typically will more be appropriate to identify critical valves, switches or pumps so that worker exposure to reagent-strength cyanide can be halted as soon as possible.

The auditor's evaluation of the Emergency Response Plan and related documents should consider these factors of environmental setting, potential receptors, and the facility's overall response strategy (that is, whether the first responder is expected to halt the release or is this the responsibility of operations personnel) in determining if its level of detail is appropriate. This may be an area where an auditor finds the operation in full compliance but still recommends that additional details be added.

Standard of Practice 7.2:      Involve site personnel and stakeholders in the planning process.

1. Has the operation involved its workforce and stakeholders, including potentially affected communities, in the cyanide emergency response planning process?

The operation should involve its own site personnel in the emergency planning process. The site personnel have the best knowledge of the operation, so they can best identify potential release scenarios, available resources, and workable responses. Too often, a site's Emergency Response Plan was originally developed for use at another facility and simply transferred to the new operation with little change. In fact, it is all too common for an Emergency Response Plan to have another operation's name still in the text, or include contact information for governmental agencies in a different country, reflecting its origin as a document developed elsewhere. Basing an operation's Emergency Response Plan on that developed for another facility is acceptable as long as it is revised to fit the site-specific circumstances of the operation.

This question also applies to outside stakeholders including potentially affected communities. If, for example, the Plan calls for evacuation of a nearby community, or notification to a community that its water supply may have been contaminated, then that community or its representatives should be included in the planning process.

The evidence for the necessary involvement in plan preparation may not be well documented. The plan itself may not state how it was prepared, and there may be no written record of consultation with outside stakeholders. In such a case, the auditor must rely on interviews with site personnel and off-site stakeholders as well as information in the Plan itself to answer this question.

On the other hand, the involvement of outside stakeholders in the emergency planning process is not necessary for Code compliance if no outside stakeholders have designated responsibilities under the Plan. For example, if there is no nearby or downstream community that must react to a release, then the operation need not involve these outside stakeholders in the response planning process.

2. Has the operation made potentially affected communities aware of the nature of their risks associated with accidental cyanide releases, and consulted with them directly or through community representatives regarding appropriate communications and response actions?

Even when a nearby community has not been assigned a designated role in emergency response, it still may be necessary to make the community aware of the potential risk and advise it of any actions that may be required. An operation should have consulted with the community or its representatives as necessary to identify the risks of any release scenarios that may affect it, and to advise the community of how the operation will communicate with it.

In some cases, the operation will also need to advise the community as to what it must do in the event of a release. An example of this would be a situation where the operation has identified a spill to a nearby river as a potential release scenario and where a community down gradient of the operation uses the river water for drinking. In such a case, the operation should advise the community and its water authority of the potential for a release, the alarm system or procedure that would be used to alert them in the event of a release, and the need to close the intake of its water supply system. This consultation could be in the form of open town meetings, briefings for community leaders, coordination with the water authorities, or other forms.

This question would not be applicable if there is no community that may potentially be affected.

3. Has the operation involved local response agencies such as outside responders and medical facilities in the cyanide emergency planning and response process?

If an Emergency Response Plan designates specific on-site response roles for outside responders or medical facilities, then at a minimum, those responders and medical facilities should have been involved in the emergency planning process. The nature of such involvement depends on the role the outside responder would play. Involvement may be as simple as reviewing the Emergency Response Plan to confirm that the outside responder can fulfill its designated role. If, for example, the Emergency Response Plan calls for an outside fire department or hazmat team to respond to an on-site release, then the responders should have first-hand knowledge of the site and the available resources as well as provide their input to the specific procedures to be used. If an outside medical facility were to respond to an on-site release and exposure, that facility should be familiar with the site and also review and provide input to the Emergency Response Plan.

However, no such involvement would be necessary if, for example, the medical facility was expected to treat cyanide exposure victims when brought to the facility, but would not itself be part of the actual on-site response. It is also possible that no local response agencies would be involved with a cyanide release from the operation. In such a case where the operation took full responsibility for response to a release, this question would not apply.

There may be little documentation that the auditor can use as evidence of outside involvement. If no records of meetings or other involvement in emergency response planning are available, the auditor must base his findings on interviews with on-site and off-site personnel.

4. Does the operation engage in consultation or communication with stakeholders to keep the Emergency Response Plan current?

Continuing consultation with stakeholders regarding emergency response may be appropriate in some cases. The frequency and nature of this consultation will depend on the nature of the Emergency Response Plan and the involvement of outside responders and communities.

Periodic dialogue with outside responders would be appropriate when these stakeholders have specific responsibilities in the Plan or the operation's response actions are dependent on the actions of others. It is possible that no continuing consultation would be needed if the Plan does not designate any responsibilities to outside responders and communities.

The necessary consultation may be difficult to verify if the operation has not documented the process. If no records of meetings or other consultation are available, the auditor must base his findings on interviews with on-site and off-site personnel.

Standard of Practice 7.3: Designate appropriate personnel and commit necessary equipment and resources for emergency response.

1. Do the cyanide-related elements of the Emergency Response Plan:
  - a) Designate primary and alternate emergency response coordinators who have explicit authority to commit the resources necessary to implement the Plan?
  - b) Identify Emergency Response Teams?
  - c) Require appropriate training for emergency responders?
  - d) Include call-out procedures and 24-hour contact information for the coordinators and response team members?
  - e) Specify the duties and responsibilities of the coordinators and team members?
  - f) List emergency response equipment, including personal protection gear, available along transportation routes and/or on-site?
  - g) Include procedures to inspect emergency response equipment to ensure its availability?
  - h) Describe the role of outside responders, medical facilities and communities in the emergency response procedures?

The Emergency Response Plan should address each of the items identified in this question with respect to response to a release of cyanide. These are all relatively straight forward and the auditor should review the operation's documentation to ensure that each is addressed as appropriate for the operation. This information need not be in a specific document called an Emergency Response Plan. Rather, the issues should be addressed in some procedural document and their on-the-ground implementation should be verified through records reviews and interviews.

2. Has the operation confirmed that outside entities included in the Emergency Response Plan are aware of their involvement and are included as necessary in mock drills or implementation exercises?

Outside responders should be made aware of the roles assigned to them in the Emergency Response Plan, and should be part of any mock response drills that simulate a release which would trigger their involvement.

The evidence needed to verify this would include records of meetings, confirmation that these entities were sent copies of the Emergency Response Plan, and interviews with on-site and off-site personnel, as well as documentation of mock drills indicating the various parties that participated in the drill.

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

1. Does the Plan include procedures and contact information for notifying management, regulatory agencies, outside response providers and medical facilities of the cyanide emergency?

The auditor should review the Emergency Response Plan and/or other documentation to verify that this information is available and appears to be up to date. The auditor is not expected to confirm that each individual or contact number in the Plan is current and accurate. However, any such deficiencies that are identified should be noted. With regard to outside responders, the Plan need only provide contact information for those responders with designated responsibilities in implementing the Plan.

2. Does the Plan include procedures and contact information for notifying potentially affected communities of the cyanide related incident and any necessary response measures, and for communication with the media?

This question is similar to question 1, above, but addresses notification to the public. The necessary information should be available for the auditor's review in the Emergency Response Plan or other documentation. Procedures and contact information regarding potentially affected communities is necessary only when there is such a community.

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

1. Does the Plan describe specific remediation measures as appropriate for the likely cyanide release scenarios, such as:
  - a) Recovery or neutralization of solutions or solids?
  - b) Decontamination of soils or other contaminated media?
  - c) Management and/or disposal of spill clean-up debris?
  - d) Provision of an alternate drinking water supply?

The Emergency Response Plan or other documentation should address each of the remediation issues in this question, although the potential provision of an alternate drinking water supply will only be applicable where a release from the operation can adversely impact a drinking water supply. Simple generic statements such as “clean up the spilled material” or “neutralize with sodium hypochlorite” are not sufficient, as they do not provide any guidance on how these tasks are to be accomplished.

Procedures for recovery of solution or solids should specify where these materials are to be taken. Procedures for neutralization or decontamination of cyanide spills should, to some degree:

- identify what treatment chemical is to be used and where it is stored;
- describe how the treatment chemical is to be prepared to the appropriate concentration; and
- define the end point of the remediation, including how samples will be taken, what analysis will be performed, and what final concentration will be allowed in residual soil as evidence that the release has been completely cleaned up.

2. Does the Plan prohibit the use of chemicals such as sodium hypochlorite, ferrous sulfate and hydrogen peroxide to treat cyanide that has been released into surface water?

Sodium hypochlorite, ferrous sulfate and hydrogen peroxide are all hazardous to aquatic life and should not be used to treat a cyanide release once it has entered surface water. This prohibition also applies to normally dry drainages since these may flow in response to precipitation and deposit residual treatment chemicals into downstream surface water. The operation’s Emergency Response Plan or other documentation should include a specific prohibition on such use of treatment chemicals. This prohibition would not be necessary is where a release would not reasonably be expected to enter surface water because there are no surface water bodies in the immediate vicinity of the operation.

This prohibition also would not be necessary in a situation where concerns with protection of human health outweigh the risk to aquatic life, and, therefore, an engineered system has been installed to address this potential scenario. However, without an engineered system to introduce these chemicals into a surface water body, there will be insufficient mixing and pH adjustment to allow for effective treatment. Therefore, such a system for pH adjustment and mixing must be in place in advance of a release to surface water in order for it to be of any actual benefit.

3. Does the Plan address the potential need for environmental monitoring to identify the extent and effects of a cyanide release, and include sampling methodologies, parameters and, where practical, possible sampling locations?

To the extent practical, an operation should plan for the necessary monitoring activities in the event of a release. Based on the potential release scenarios identified in its Emergency Response Plan, the operation should determine the sampling and analytical methodologies it will use if cyanide is released to the land surface or to surface water.

In many cases, it may also be feasible to determine the necessary sampling locations. For example, if the potential flow path of a release can be predicted from the site's topography, then sampling locations can be established at the point of entry into a surface water as well as upstream and downstream. To the extent practical, this type of information, which may also address the sampling associated with remediation activities, should be included in the Emergency Response Plan or other available documentation for the auditor's review.

Alternately, sampling locations could be identified in a more generic manner. For example, the Emergency Response Plan could call for sampling of the released material, sampling immediately downstream of the point the release enters a river, and sampling at specified distances upstream and downstream from the point the release enters the river.

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

1. Does the operation review and evaluate the cyanide related elements of its Emergency Response Plan for adequacy on a regular basis?

The Code sets no specific time frame for a review the cyanide-related elements of the Emergency Response Plan. Information such as the names and contact information for Emergency Response coordinators and Response Team members should be updated as needed to ensure its accuracy when and if needed. A requirement for this review and revision should be included within the Plan itself or some other policy or procedural document.

The evidence that such a review and revision have been conducted may be in the form of a recently-dated update to the Emergency Response Plan and possibly a copy of the Plan before the revision. It may be necessary to verify the implementation of the review through interviews with site personnel if not otherwise documented within the Plan itself.

2. Are mock cyanide emergency drills conducted periodically as part of the Emergency Response Plan evaluation process?

Mock emergency drills are invaluable for testing an operation's procedures for response to cyanide releases as well as exposures. Although the Code does not specify a frequency, operations should conduct such drills periodically. Many of the more general provisions of the Emergency Response Plan, such as call-out procedures for the Emergency Response Team, are tested regardless of the nature of the simulated emergency, so all drills need not be related to cyanide incidents. However, specific drills for cyanide emergencies should be conducted periodically to evaluate the operation's plans for a response to a release of cyanide.

The specific nature of the simulated event, (a spill from a truck delivering reagent cyanide, overtopping of a solution pond, a release from a reagent distribution pump), is up to the operation. The drill should simulate the entire emergency response process and not just

portions of it. For example, a mock drill limited to response to a cyanide exposure situation may be valuable from a first aid perspective, but it does not evaluate the full response procedure that would be followed if such an exposure were to occur during the off-loading of a cyanide delivery truck. It may not test the full call-out procedure or the measures to halt and contain the release or remediate the area. However, where a response simply consists of using heavy equipment to push up an earthen berm, or where the operation has had ample practice in cleaning up spilled process solution from actual releases, conducting simulations of such actions may not be necessary.

The operation should document and evaluate the drill to determine how well its procedures worked and so that any necessary revisions to the Emergency Response Plan can be made.

3. Are provisions in place to evaluate and revise the Emergency Response Plan after any cyanide related emergency requiring its implementation? Have such reviews been conducted?

The Plan itself or other procedural documentation should call for an evaluation of the Plan after any emergency that required its implementation.

The evidence of such a review may be in the form of a recently-dated update to the Emergency Response Plan and possibly a copy of the Plan before the revision. It may be necessary to verify the response to this question based on interviews with site personnel if not documented within the Plan itself. There will be no evidence that the Plan was reviewed after its implementation if the Emergency Response Plan has never been implemented.

## **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.

1. Does the operation train all personnel who may encounter cyanide in cyanide hazard recognition?

The operation should have a written training program or training materials that provides all personnel who may encounter cyanide with training in recognizing the cyanide materials present at the operation, the health effects of cyanide, symptoms of cyanide exposure, and procedures to follow in the event of exposure.

The auditor should review these materials and verify that personnel receive this training by reviewing training records and conducting interviews in the field with employees who may encounter cyanide.

2. Is cyanide hazard recognition refresher training periodically conducted?

Periodic refresher training in cyanide hazard recognition should be provided to all employees who may encounter cyanide.

The auditor should review training materials to verify that cyanide hazards are covered, and verify that refresher training is being conducted by reviewing training records and interviewing personnel in the field.

3. Are cyanide training records retained?

The auditor should be able to locate the operation's training records for the personnel interviewed in the field to verify that they received both initial and refresher training in cyanide hazard recognition.

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.

1. Does the operation train workers to perform their normal production tasks, including unloading, mixing, production and maintenance, with minimum risk to worker health and safety and in a manner that prevents unplanned cyanide releases?

All personnel involved in the management of cyanide should be trained to perform their assigned tasks in a safe and environmentally sound manner. However, task training need not be focused on safety issues or protection of communities and the environment. Rather, task training is intended to instruct new employees on how to accomplish their assigned tasks safely, and implicit in this is that the required procedures are designed such that the tasks are accomplished in a manner that prevents exposures and releases.

This question asks if such training is given, and the answer is not dependent on how formalized the training may be.

Verification would be through interviews with field personnel engaged in cyanide management activities and review of the operation's training materials.

2. Are the training elements necessary for each job involving cyanide management identified in training materials?

The operation's training program should identify the specific cyanide management elements that each employee must be trained in to perform his job properly. Training based on the written Standard Operating Procedures discussed in question 1 under Standard of Practice 4.1 should comply with this Standard of Practice. However, compliance does not require that detailed step-by-step task training documents be used, but rather that, at a minimum, there be some type of list or identification of the important items or elements that must be conveyed to a new employee regarding how various cyanide-related tasks must be performed.

Operations that rely solely on experienced personnel to train new employees may not be in compliance with this Standard of Practice unless there is a written list of the important elements of each job to verify that the training addresses the necessary cyanide-related issues.

3. Do appropriately qualified personnel provide task training related to cyanide management activities?

Employee task training should be conducted by individuals with knowledge of the specific tasks to be accomplished and experience in effective communication techniques. This could include dedicated trainers with knowledge of the necessary tasks or supervisory or line personnel with experience in training. If operations personnel conduct the training, verification may include interviews with trainers to determine their level of expertise in operating the facilities and in training.

4. Are employees trained prior to working with cyanide?

Employees should have received their task training before being allowed to work with cyanide in an unsupervised manner. This may be a standard practice, but where an operation has not included it in a policy or procedural document, verification would be by interview with field and supervisory personnel.

5. Is refresher training on cyanide management provided to ensure that employees continue to perform their jobs in a safe and environmentally protective manner?

Refresher training on cyanide management is one way for an operation to ensure that employees continue to perform their jobs in a safe and environmentally protective manner. Such training may be specific to their assigned tasks or may more generically address cyanide safety.

As an alternative to refresher task training, an operation could conduct formal or informal evaluations of how well employees perform their assigned tasks. Formal evaluations can be verified by a review of the evaluation record, but if evaluations are informal observations, then interviews with supervisory personnel will be the primary evidence.

6. Does the operation evaluate the effectiveness of cyanide training by testing, observation or other means?

Operations should evaluate the effectiveness of their task training. This could be testing at the completion of training, observation of employees performing their tasks after initial training, or some other method of evaluation.

The auditor's verification of such evaluation would be through a review of records for formally documented evaluations or from interviews with site personnel.

7. Are records retained throughout an individual's employment documenting the training they receive? Do the records 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?

While verification solely through interviews can be appropriate for some of the training aspects, the Code expects operations to retain records of task training. Records of personnel interviewed in the field should be compared with verbal information to verify that

- they have received initial task training;
- the task training addressed the critical elements of safe performance of tasks;
- qualified personnel provide the training;
- personnel are trained prior to working with cyanide in an unsupervised manner; and
- the operation evaluates the effectiveness of task training.

However, the auditor must recognize that many employees will have worked at the operation for years. These employees received their task training prior to the operation seeking certification under the Code, and very possibly prior to development of the Code itself. Since there can be no expectation that the operation was Code-compliant when these employees were trained, documentation of initial task training cannot be expected for these employees. Therefore, there may only be a limited number of employees who have undergone a formalized and documented task training program, and especially during the initial Verification Audit, the auditor may have to focus on the task training program itself rather than its implementation in the past.

Standard of Practice 8.3: Train appropriate workers and personnel to respond to worker exposures and environmental releases of cyanide.

1. Are all cyanide unloading, mixing, production and maintenance personnel trained in the procedures to be followed if cyanide is released?

Employees involved in reagent handling and production activities are the most likely to be the first on the scene if a release occurs. These employees should be trained in the operation's response procedures. However, the Code does not require that these employees necessarily be designated and trained as emergency responders. The operation may address emergency response by requiring personnel observing an exposure incident to call for the assistance of a designated Emergency Response Team rather than providing every employee with cyanide first aid training and expecting them to respond.

The auditor should review the operation's training program, safety program or other policies, procedures and plans to determine how the operation's response program is structured and if training is provided to the designated response personnel. Verification of the implementation of this provision would be through interviews with field personnel and review of training records.

2. Are site cyanide response personnel, including unloading, mixing, production and maintenance workers, trained in decontamination and first aid procedures? Do they take part in routine drills to test and improve their response skills?

Workers that may be the first on the scene of a cyanide exposure should be trained in cyanide decontamination and first aid procedures. All personnel that may be expected to provide such a response should take part in routine response drills to ensure they are able to perform these tasks if and when required.

The operation's requirements for training and participation in mock drills should be documented in writing, for example in the operation's training program, emergency response plan, or in other plans, procedures and policies.

Initial verification of the implementation of this provision would be through interviews with these personnel. An acceptable alternative to training all such personnel would be to have a sufficient number of trained response personnel available at all times on site. As discussed in question 1, above, the standard procedure in the event of a cyanide incident would be to call out this designated response team rather than have the individual witnessing the incident respond himself. The Response Team members would then be expected to have participated in mock response drills.

3. Are Emergency Response Coordinators and members of the Emergency Response Team trained in the procedures included in the Emergency Response Plan regarding cyanide, including the use of necessary response equipment?

Designated responders must be familiar with their response roles as described in the Emergency Response Plan, or other applicable emergency response procedures, as well as with the use of the necessary response equipment. Question 1 under Standard of Practice 7.3 asked if the Plan included the necessary training requirements for response personnel. This question focuses on the implementation of that provision, and verification would be through interviews with these personnel and review of training records.

4. Has the operation made off-site Emergency Responders, such as community members, local responders and medical providers, familiar with those elements of the Emergency Response Plan related to cyanide?

Coordination with outside responders is only necessary to the extent that they are designated with specific duties or responsibilities in the Emergency Response Plan.

Unless the operation has retained notes of meetings and/or correspondence with outside responders, the auditor will have to rely on interviews with site and off-site personnel to verify that this has been done.

5. Is refresher training for response to cyanide exposures and releases regularly conducted?

This question applies to all employees with designated roles or responsibilities in the event of a cyanide exposure. Whether the operation requires the observer of an exposure to make the necessary notifications but not necessarily to respond himself, or has trained all personnel in response procedures, personnel should be given regular refresher training to remind them of the required procedures.

Verification would be through interviews with these personnel and review of training records.

6. Are simulated cyanide emergency drills periodically conducted for training purposes? Do they cover both worker exposures and environmental releases?

Question 2 under Standard of Practice 7.6 addressed the use of mock emergency drills to evaluate the operation's response plans and procedures. The first part of this question asks if these same mock drills are used as training tools for designated responders. If there is no documentation of this use, the auditor must rely on interviews with response personnel to verify that this is done.

As discussed in Question 2 under Standard of Practice 7.6, records should be reviewed to verify that mock drills have simulated responses both to cyanide exposures and cyanide releases. However, every drill need not simulate both these events, and they can be addressed in separate exercises. Drills for response to releases need not be limited to cyanide, because the response to many chemical releases will include similar elements as a response to a release of process solution containing cyanide.

7. Are cyanide emergency drills evaluated from a training perspective to determine if personnel have the knowledge and skills required for effective response? Are training procedures revised if deficiencies are identified?

The operation's documentation of each drill should address whether response personnel had the proper training to carry out the response according to the Emergency Response Plan or other applicable procedures, or whether additional or revised training is needed.

The auditor should review these records to verify that the evaluation of drills considers the adequacy of training.

Verification that training procedures have been revised in response to the outcome of a drill may be through review of the records of a drill and interviews with site personnel. If mock drills have not resulted in changes to response training, then the documentation and evaluation of the drill should reflect that personnel performed appropriately and as trained.

8. Are records retained documenting the cyanide training, including the names of the employee and the trainer, the date of training, the topics covered, and how the employee demonstrated an understanding of the training materials?

The operation should retain records of emergency response training including the information identified in this question. This documentation will provide the auditor with additional evidence that the operation

- provided initial and refresher training in response to cyanide exposures and releases for appropriate personnel;

- made designated response personnel familiar with implementation of the Emergency Response Plan; and
- required designated responders to demonstrate their understanding of the training material.

Operations may also provide responders with training by outside third party contractors specializing in hazmat response, emergency response and/or first aid. This can provide broader training than may be available on site, but does not substitute for site-specific training on the types of releases and defined responses that are addressed in the operation's own Emergency Response Plan or other applicable procedures.

## **9. DIALOGUE: Engage in public consultation and disclosure.**

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

1. Does the operation provide the opportunity for stakeholders to communicate issues of concern regarding the management of cyanide?

The single question under this Standard of Practice focuses on providing stakeholders with a way of making their concerns with the use of cyanide known to the operation. The frequency and format for this input is not specified by the Code, and should be appropriate for the issues discussed and the nature of the concern. Opportunities for stakeholders to raise issues of concern include "open-door" policies for responding to inquiries, providing tours, having staff available to interact with stakeholders, or other methods of responding directly to stakeholders who come to the operation with specific questions on, or general interest in, how the operation manages cyanide. An operation also could advertise a phone number that interested parties can call to get information on cyanide management or ask questions of site personnel.

Opportunities for public input may also be available during the development and review of environmental assessments, or reviews of permits and licenses required by applicable jurisdictions. However, input in response to environmental assessments and permits may only occur before operations are initiated and sporadically thereafter, and are not typically sufficient as the only opportunity for stakeholders to communicate issues of concern.

In evaluating this question, the auditor must take the location of the operation and its potential stakeholders into account. The options available to an operation located in close proximity to a local population will be significantly greater than for an operation where there is no local population and the workforce is flown into the site and lives in an on-site company camp.

If there is no formal documentation of the manner in which the operation provides these opportunities for stakeholder input, the auditor must rely on interviews with site personnel to verify the answer to this question.

As with many of the questions where documentation is absent but the auditor can verify that some action has been taken through interviews with site personnel, this may be a situation where an operation is found in full compliance but where the audit still recommends, for example, that a memo to the files or other similar record be maintained to better document the operation's compliance.

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

1. Are there opportunities for the operation to interact with stakeholders and provide them with information regarding cyanide management practices and procedures?

The single question under this Standard of Practice addresses how the operation creates opportunities for interaction with stakeholders. This could include hosting public meetings for local communities or community leaders, creating citizens' advisory panels, advertising the availability of site tours for interested parties and addressing cyanide management during the tour, and distributing newsletters or prepared briefing papers on its cyanide management practices.

In evaluating this question, the auditor must take the location of the operation and its potential stakeholders into account. The options available to an operation located in close proximity to a local population will be significantly greater than for an operation where there is no local population and the workforce is flown into the site and lives in an on-site company camp.

Verification may be through various types of records, such as meeting notes or tour sign-up sheets or waivers. Where the operation has not maintained a record of these interactions, the auditor must rely on interviews.

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

1. Has the operation developed written descriptions of how their activities are conducted and how cyanide is managed? Are these descriptions available to communities and other stakeholders?

Operations should develop written descriptions of cyanide management activities in appropriate local languages, and make these descriptions available to communities and stakeholders. The level of technical detail should be appropriate for the intended audience. The 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.

This information should be available for the auditor's review.

2. Has the operation disseminated information on cyanide in verbal form where a significant percentage of the local population is illiterate?

Where a significant percentage of the local population is illiterate, operations should provide information through presentations or direct, regular consultations with communities or community leaders. The Code does not specify what constitutes “a significant percentage,” and the auditor must use professional judgment to determine if verbal dissemination of information is necessary.

3. Does the operation make information publicly available on the following confirmed cyanide release or exposure incidents?
  - a) Cyanide exposure resulting in hospitalization or fatality
  - b) Cyanide releases off the mine site requiring response or remediation
  - c) Cyanide releases on or off the mine site resulting in significant adverse effects to health or the environment
  - d) Cyanide releases on or off the mine site requiring reporting under applicable regulations
  - e) Releases that are or that cause applicable limits for cyanide to be exceeded

This question is focused on spills and other similar unintentional releases. It is not intended to require reporting of permitted releases other than releases that exceed permit or other regulatory conditions (item e). Reporting of releases such as the evolution of hydrogen cyanide gas from the surfaces of ponds or leach facilities or the cyanide in seepage from a tailings impoundment would not be required under this provision unless it was required by the applicable political jurisdiction. In those cases, the report submitted to the governmental agency would be sufficient for purposes of this question as long as the information is available to the public.

Only releases confirmed to meet the listed criteria need be reported, so that operations can fully evaluate an incident and be sure that reporting is necessary. Many operations notify governmental agencies of a release as soon as it occurs to ensure compliance with reporting regulations, only to determine after subsequent sampling or evaluation that the release did not exceed the applicable regulatory threshold. Such a release would not be subject to item d under this question because it was not confirmed as requiring reporting under applicable regulations.

An operation can make the necessary information publicly available in a variety of ways, including in a company’s or corporation’s Annual Report or Health, Safety and Environmental report, on a company’s own website, or reported as part of applicable governmental reporting requirements, as long as these reports are public information.

The auditor should review the information to verify that it addresses the items in the question and is publicly available.