



# INTERNATIONAL CYANIDE MANAGEMENT INSTITUTE

## GUIDANCE FOR USE OF THE CYANIDE PRODUCTION VERIFICATION PROTOCOL

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# PRODUCTION GUIDANCE

## Table of Contents

<b>Introduction .....</b>	<b>1</b>
<b>General Guidance .....</b>	<b>1</b>
1. Use of the Cyanide Production Verification Protocol .....	1
2. Scope .....	2
3. Detailed Audit Findings Report .....	3
4. Management Plans and Procedures .....	4
5. Design, Construction and Quality Assurance/Quality Control Documentation .....	5
6. Risk Assessments and Code Compliance .....	6
7. Consideration of Risk in Determining Necessary Control Measures .....	7
8. Potential Audit Findings .....	7
9. Certification Decision .....	8
10. Submission of Audit Reports and ICMI Completeness Review .....	9
11. Pre-Operational Certification Audits .....	10
12. Recertification Audits .....	11
<b>Cyanide Production Guidance .....</b>	<b>17</b>
Principle 1   OPERATIONS .....	17
Production Practice 1.1 .....	17
Production Practice 1.2 .....	25
Production Practice 1.3 .....	30
Principle 2   WORKER SAFETY .....	33
Production Practice 2.1 .....	33
Production Practice 2.2 .....	36
Principle 3   MONITORING .....	41
Production Practice 3.1 .....	41
Principle 4   TRAINING .....	46
Production Practice 4.1 .....	46
Production Practice 4.2 .....	48
Principle 5   EMERGENCY RESPONSE .....	49
Production Practice 5.1 .....	49
Production Practice 5.2 .....	50



# PRODUCTION GUIDANCE

Production Practice 5.3.....	53
Production Practice 5.4.....	54
Production Practice 5.5.....	55
Production Practice 5.6.....	57



# PRODUCTION GUIDANCE

The International Cyanide Management Code (hereinafter “the Code”, “Code” or “the Cyanide Code”), this document, and other documents or information sources referenced at [www.cyanidecode.org](http://www.cyanidecode.org) are believed to be reliable and were prepared in good faith from information reasonably available to the drafters. However, no guarantee is made as to the accuracy or completeness of any of these other documents or information sources. No guarantee is made in connection with the application of the Code, the additional documents available or the referenced materials to prevent hazards, accidents, incidents, or injury to employees and/or members of the public at any specific site where gold or silver is extracted from ore by the cyanidation process. Compliance with this Code is not intended to and does not replace, contravene or otherwise alter the requirements of any specific national, state or local governmental statutes, laws, regulations, ordinances, or other requirements regarding the matters included herein. Compliance with this Code is entirely voluntary and is neither intended nor does it create, establish, or recognize any legally enforceable obligations or rights on the part of its signatories, supporters or any other parties.



# PRODUCTION GUIDANCE

## Introduction

This *Guidance for Use of the Cyanide Production Verification Protocol* (Production Guidance) is issued by the International Cyanide Management Institute (ICMI) to assist cyanide producers in understanding their obligations in implementing the International Cyanide Management Code (ICMC or Code) and to aid Code auditors in their evaluation of Code compliance.

Compliance is evaluated against the Code's Principles and Production Practices using the Cyanide Production Verification Protocol. The questions in the Verification Protocol are based on the measures that typically are necessary to meet these Principles and Production Practices. In most cases, these measures are presented in broad terms and include multiple options to allow their flexible implementation at operations with varying site-specific environmental, social and regulatory circumstances.

Companies operating facilities for the primary production, repackaging and transloading, and warehousing of cyanide must exercise professional judgment in determining the specific controls needed at their operation, and auditors must similarly exercise professional judgment to evaluate these operations for compliance with the Code. This Production Guidance places each Verification Protocol question in the appropriate context, describes the Code's expectations, identifies how various control measures can meet these expectations and advises operations and auditors on the factors to be considered when making these judgments. It provides a basis to evaluate alternatives to those measures typically employed to meet a Production Practice for compliance with the Code. This Production Guidance also includes important information on the audit process and preparation and submission of audit reports.

## General Guidance

### 1. Use of the Cyanide Production Verification Protocol

ICMI has prepared the Cyanide Production Verification Protocol and this Production Guidance to address each Principle and Production Practice and to evaluate and document a cyanide production operation's compliance with the Code. This guidance is suitable for use by operations in preparing for initial certification, recertification and pre-operational certification. General Guidance Sections 11 and 12 address the application of this Production Guidance to pre-operational certification and recertification, respectively.

Operations preparing for certification audits, either pre-operational or operational, are encouraged to use this Production Guidance as a template in preparing a Cyanide Management Plan that would describe how the operation plans to address or already addresses each Production Practice and associated Verification Protocol question and references the existing documentation available for review. Although such a plan is not required in order to comply with the Code, it would guide the facility in ensuring that all elements required for Code compliance have been accounted for in preparation for the audit.



# PRODUCTION GUIDANCE

## 2. Scope

The Cyanide Production Verification Protocol and this Production Guidance apply to cyanide production operations. Cyanide repackaging and transloading operations and cyanide warehouse operations, as well as operations which produce cyanide from chemical feedstock, are considered to be production operations. While cyanide warehouses are considered to be production operations, for certain Protocol questions, guidance for warehouse operations is presented separately from that of other cyanide production operations. Storage of cyanide at a mine is subject to the Mining Operations Verification Protocol.

Primary production operations are those at which cyanide is manufactured from chemical feedstock. Repackaging and transloading operations are those where cyanide is transferred from its existing packaging to other packaging or containers. Examples include facilities where solid cyanide briquettes are removed from lined Intermediate Bulk Containers (IBCs) or are transloaded from rail cars to isotainers for further transportation, or where liquid cyanide is transloaded from rail cars to tanker trucks. Warehouses are those facilities where cyanide is stored for subsequent distribution while remaining in its existing packaging, such as IBCs or as solids in isotainers. Examples include facilities where IBCs or drums of cyanide are transferred from sea containers into a warehouse, or where sea containers or isotainers of solid cyanide are stored without removal of the cyanide.

Where separate guidance for each type of production operation is given, the guidance applies to all facilities and activities at that operation. That is, the guidance for production operations addresses both the production facilities and the on-site storage of cyanide. Similarly, the guidance for cyanide repackaging operations addresses both the repackaging facilities and the on-site storage of cyanide. It is not necessary to separately apply the guidance for warehouses and storage operations to evaluate these activities when they are conducted at actual production and repackaging operations.

It should be noted that the Code is not an engineering document. That is, the Code 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 be 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.



# PRODUCTION GUIDANCE

## 3. Detailed Audit Findings Report

Detailed Audit Findings Reports should be organized in a sequential listing of the Production Principles, Production Practices and Verification Protocol Questions, as found in the Production Verification Protocol, with responses and supporting evidence for each question.

The Detailed Audit Findings Report should also include the following information:

- Date of the audit
- Names of auditors with the lead auditor and the auditing firm identified
- A description of the operation, similar to that required in the Summary Audit Report, identifying the facilities included within the scope of the audit, any new facilities or facilities that have undergone substantial changes since the previous audit (in the case of a recertification audit)

### Nature of Responses:

The Detailed Audit Findings Report must include responses to each Protocol question of sufficient detail to provide a clear justification for the resulting audit finding. A simple “yes” or “no” or “not applicable” answer, or simple repetition of the protocol question in the affirmative is not adequate. In responding 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 in discharges to surface waters, 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.

### Evidence:

As with any formal audit, various types of evidence are necessary to support the findings of a Cyanide Code certification audit. 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 actually is 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 how written procedures actually are implemented. It is also important to record the names of each person interviewed. Useful evidence may also be found in inspection reports prepared by applicable regulatory agencies.

The supporting evidence should be identified in the response to each Verification Protocol question 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



# PRODUCTION GUIDANCE

example, what records were reviewed to determine whether an inspection program was implemented?

## Necessary Compliance Measures:

The Verification Protocol questions are based on the measures typically necessary for Code compliance. Variations and alternatives also can be acceptable if they are demonstrated to achieve compliance with a Production Practice. Therefore, an operation can still be in full compliance with a Production Practice even if the auditor answers “no” to one of more of the Protocol questions under that Practice.

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

Site-specific conditions and local regulatory requirements may legitimately affect how an operation chooses to meet a given Production 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 cannot simply justify a finding based only on such regulatory compliance and instead should describe substantively how or why compliance with a local regulation ensures compliance with the Code.

## **4. Management Plans and Procedures**

Cyanide production operations are expected to develop and implement a number of documents to comply with the Code. These typically include plans, procedures and program documents for operational activities and systems, such as emergency response plans, operating procedures and training program documents, which the Code expects to be implemented for safe cyanide management.

The Code does not mandate any specific form or format for these procedures, plans and systems documents. 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 Production Practice. Moreover, none of these documents need be limited solely to issues involving cyanide management. Regardless of how they are structured, an operation’s management systems and procedures should demonstrate that the operation understands the controls and practices necessary to manage cyanide in a manner that prevents or limits releases and exposures.



# PRODUCTION GUIDANCE

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 Production Practices based on available evidence, the auditor 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 to calculate the necessary capacity of a secondary containment seems to be significantly lower than expected, the auditor should follow up to determine if the value is appropriate. But the auditor's judgment should not be substituted 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 Production 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 for an auditor to dig deeper into an issue is intrinsic to every audit. The auditor's professional judgment is especially important in this regard during Code audits.

## **5. Design, Construction and Quality Assurance/Quality Control Documentation**

In several places, 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 program records for facility 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 facility's construction met accepted quality standards.

In many cases, and especially at older operations, these records may not be available, either because no formal 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 prepared 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 Production Practices. A specific discussion of the nature of this "fit for service" review is included in question 1 under Production Practice 1.1.



# PRODUCTION GUIDANCE

## 6. Risk Assessments and Code Compliance

The degree of risk from managing cyanide varies from site to site. While risk assessments can play a significant role in determining the specific measures needed at a given operation, the production, transloading, repackaging, and warehousing of 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 identified 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 containment for product cyanide tanks or signage identifying a tank as 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 unnecessary at a given facility 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 is 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 achieve 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.



# PRODUCTION GUIDANCE

## 7. Consideration of Risk in Determining Necessary Control Measures

While Code compliance cannot be solely dependent on 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 provides for a consideration of risk by identifying various options to meet each Production Practice and allowing operations to select the most appropriate one for its site-specific circumstances.

For example, the worker safety provisions of Production Practice 2.1 call for some type of signage to alert workers to the presence of cyanide. However, the Code does not mandate specific wording to be used, the size of lettering, or the frequency and location of signs. The operation will consider site-specific risk in implementing this measure, as should the auditor in evaluating it. In any case, some management measures will be necessary to address the intrinsic risk presented by the production and handling 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.

Another area where consideration of site-specific risk would be appropriate relates to the use of alternative management measures that are not identified in the Cyanide Production Verification Protocol or this Production Guidance. Since Code compliance requires meeting the Principles and Production Practices rather than implementing a mandated technology, operations can employ control measures other than those that are identified in the Verification Protocol and this Production Guidance. An evaluation of the relative risk posed by such an alternative compared to that presented by the measure typically used to meet a Practice can be used in support of the alternative measure.

## 8. Potential Audit Findings

Auditors make separate findings for each Production 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 each Production Practice and with the Code itself is a "Pass/Fail" situation, but there are two passing categories: full compliance and substantial compliance.

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

An operation is in substantial compliance with a Production 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 Production Practice). However, the



# PRODUCTION GUIDANCE

following three (3) criteria must be satisfied for an auditor to make a finding of substantial compliance, and their evaluation can require a considerable degree of professional judgment.

First, the operation must have made a good-faith effort to comply. This means that it has made a reasonable attempt to manage cyanide in a manner consistent with the Production Practice rather than simply ignoring a particular aspect of the 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. Failure to correct an identified issue within a reasonable amount of time may also not constitute a good-faith effort.

Second, 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 completing implementation of a Corrective Action Plan.

Third, there can be no immediate or substantial risk to health, safety or the environment from a deficiency causing a substantial compliance finding. Many deficiencies related to record-keeping or documentation would not pose an immediate or substantial risk to health, safety or the environment, and if the other two criteria are met, these types of deficiencies can often result in a finding of substantial compliance. However, a finding of substantial compliance may not be appropriate in a situation where the cyanide antidote is out-of-date or stored beyond the temperature range marked on the packaging, as the lack of an effective antidote could present an immediate and substantial risk to worker health.

An operation may not be fully compliant with any of the Protocol questions under a given Production Practice, but can still be found in substantial compliance with that Practice if it met the three criteria discussed above for each of the questions.

An operation that is neither in full nor substantial compliance with a Production Practice is in non-compliance with that Practice. 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 the environment.

Any deficiency that drops the operation from full to substantial compliance or from substantial to non-compliance for a given Production Practice should only be applied to a single Production Practice.

## 9. Certification Decision

The certification status of the operation is based on the findings that have been made for each individual Production Practice. For this decision, the poorest individual finding for any Production Practice prevails as the overall audit finding.



# PRODUCTION GUIDANCE

An operation is in full compliance with the Code only if all Production Practices are found in full compliance. Operations found in full compliance are certified in full compliance with the Code.

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

An operation is in non-compliance with the Code if it is found in non-compliance with any Production Practice.

ICMI does not make a separate decision regarding an operation's certification. ICMI announces an operation's certification when it accepts an Audit Report which finds the operation in full or substantial compliance. ICMI has no independent means of determining whether an operation complies with the Code, and it therefore relies entirely on the findings of accredited professional auditors. 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 view and interpret the Cyanide Code's expectations from a similar perspective and reach consistent findings given the same set of facts, the professional auditors and technical experts conducting certification audits must use their own professional and expert judgment to reach their own independent conclusions.

Code certification is required for cyanide production companies that provide cyanide to mines which are certified in compliance with the Code. Certified cyanide production facilities are expected to comply with the Code at all times and in all cases, regardless of whether they are producing, repackaging or warehousing cyanide for use at mines that are Code-certified or mines and other facilities that are not Code-certified.

## 10. Submission of Audit Reports and ICMI Completeness Review

Lead auditors must submit the following documents to ICMI within 90 days of completing the site inspection portion of a certification audit: Detailed Audit Findings Report; Summary Audit Report; Corrective Action Plan (for operations found in substantial compliance with the Code); Auditor Credentials Forms; and a letter from an authorized representative of the audited operation granting ICMI permission to post the Summary Audit Report and Corrective Action Plan (if required) on the Code web site. 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 conducts 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 determines whether all relevant questions have been answered and confirms 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 that it includes



# PRODUCTION GUIDANCE

sufficient information to demonstrate the basis for each finding. As the Summary Audit Report is intended to be a summary of the information included in the Detailed Audit Findings Report, the Summary Audit Report should not include information that is not included in the responses to the Verification Protocol Questions contained in the Detail Audit Findings Report. Auditor Credentials Forms also are reviewed to confirm that the auditors met ICMI criteria at the time of the audit. 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 a letter from the audited facility is submitted authorizing ICMI to post the Summary Audit Report (and Corrective Action Plan, if required) on the Code website.

If the documentation is complete, ICMI informs the auditor and operation and posts the Summary Audit Report, Auditor Credentials Forms, and, if required, the Corrective Action Plan on the Code website and then announces the operation's certification. If the documentation is incomplete, ICMI advises the auditor and operation of the deficiencies and requests that revised documentation be submitted within 30 days. ICMI will not approve an incomplete audit report and an operation does not become certified until ICMI deems the audit report complete and posts the certification date on the Code website.

## 11. Pre-Operational Certification Audits

The Code allows for pre-operational certification of a cyanide production facility that is not yet active but that is sufficiently advanced in its planning, design or construction, such that its plans and proposed operating procedures can be audited for conformance with the Code. The same Verification Protocol used to determine compliance during an initial operational audit also is used for a pre-operational audit and the guidance provided in this document applies equally to both types of audits, but with one significant difference. Since cyanide production facilities that are not yet active cannot be audited for their actual operation, pre-operational certification is based on their commitments to design, construct and operate in full compliance with the Cyanide Code's Principles and Production Practices.

Auditors of cyanide production facilities seeking pre-operational certification must determine if the operation can reasonably be expected to be in full compliance with the Code's Principles and Production Practices once its plans are implemented and it becomes active. The auditor therefore should review materials such as design drawings, draft operating procedures, draft emergency response plans, draft training plans and other written documents. If detailed draft plans and procedures are not yet available, an operation may provide written commitments to develop and implement measures consistent with the Code. Such commitments can be in form of process descriptions, cyanide management plans, and other written statements of intent that conclusively demonstrate that, when constructed and in operation, the facility will fully comply with the Code. The commitment must include sufficient detail for the auditor to be confident in such a finding.

When using the Verification Protocol to evaluate pre-operational compliance of a production facility that has not yet been constructed, the Protocol questions should be applied prospectively. For example, a question such as "Are the materials used for construction of



# PRODUCTION GUIDANCE

cyanide production facilities compatible with reagents used and processes employed?” should be applied as “Based on the operation’s design drawings or other written commitments, will the materials used for construction of cyanide production facilities be compatible with reagents used and processes employed?” Similarly, a question such as “Does the facility inspect its first aid equipment regularly to ensure that it is available when needed?” should be applied as “Based on the operation’s draft plans and procedures or other written commitments, will the facility develop and implement procedures to inspect its first aid equipment regularly to ensure that it is available when needed?”

Some production operations seeking pre-operational certification may already have been constructed and/or have in place and implemented some of the documents, procedures, systems, and controls called for by the Verification Protocol. In such cases, the auditor should note in the audit reports the items that are in place and implemented and audit them on that basis. For example, if a facility has already been constructed, the auditor should review available QA/QC program documents and other construction documents rather than reviewing the facility’s commitment to comply with this requirement. A second example is a facility such as a warehouse which is being audited for pre-operational compliance. Although the facility would not yet be managing cyanide, it may have in place and have implemented inspection and maintenance procedures for safety features such as showers, eyewash stations, or fire extinguishers. The auditor therefore should review these procedures and their implementation for Code compliance.

A finding of full compliance is required for pre-operational certification; if found in substantial compliance, the operation must revise its plans and procedures such that it is reasonably expected to be in full compliance with all Principles and Production Practices one operational. A pre-operational facility found in full compliance is conditionally certified, subject to an on-site audit to confirm that the operation has been constructed and is being operated in compliance with the Code.

## 12. Recertification Audits

While the guidance provided in this document applies to both initial certification audits and subsequent recertification audits, the fact that recertification audits evaluate compliance over a three-year period results in some different considerations from those of an initial audit. More broadly, if a cyanide production facility has experienced potential deficiencies in compliance between its previous audit and its recertification audit, the auditor must consider a range of additional issues. Two types of situations merit special mention: 1) where compliance with a particular Verification Protocol question has already been audited and found in compliance, and 2) when cyanide facilities have been added or modified since an operation’s most recent audit.

### Previously Existing Facilities:

In situations where compliance is a one-time event, an auditor may use prior audit findings as evidence of current compliance. For example, Production Practice 1.1 requires implementation of a QA/QC program with certain specified attributes during construction of cyanide production



# PRODUCTION GUIDANCE

facilities. While a recertification audit must confirm that a facility has retained its QA/QC records for facilities that existed at the time of the previous audit(s), a prior audit report's confirmation that the QA/QC program included all appropriate documentation to satisfy Production Practice 1.1 would be sufficient evidence of compliance with this provision, and the auditor would not need to review the records again for the same previously-existing facilities.

## New and modified cyanide facilities or procedures:

One of the first questions an auditor should ask during a recertification audit is whether there have been changes to the operation, its cyanide facilities or its cyanide management procedures since its previous audit. Certified operations are expected to maintain Code compliance throughout the three-year period between audits. If there have been no changes, the audit simply revisits all the same facilities that were previously evaluated. However, if new cyanide facilities were constructed or existing facilities were modified, the audit must evaluate the design and construction documentation for these facilities and their related operating, training and emergency response procedures for Code compliance. Significantly, the audit also must determine if the operation followed the provisions of Production Practice 1.2 regarding management of change to ensure compliance both during the new construction or modification and once these facilities became operational.

All cyanide facilities that have been constructed or substantially modified since the previous audit should be clearly identified as such in the "description of operation" section of the Summary Audit Report, and their compliance with the Code should be discussed in the Detailed Audit Findings Report and Summary Audit Report in response to the applicable Verification Protocol questions.

## Potential compliance deficiencies between audits:

A certified cyanide production facility may experience various types of potential compliance deficiencies during the three years between certification audits. These deficiencies can range from missing documentation required by the Code (e.g., inspection reports, monitoring data, training records) to cyanide exposure resulting in worker fatality or cyanide releases that adversely impact the environment. Since an operation is expected to maintain compliance over the entire period between audits, auditors will need to evaluate the significance of any compliance deficiencies or potential non-compliance situations that may have occurred but have been corrected by the time of the recertification audit, in determining if any such deficiencies and/or situations should be identified in the audit report and how they affect the operation's compliance status.

One type of compliance deficiency or potential non-compliance situation should always be evaluated during a recertification audit and discussed in the Detailed Audit Findings Report and Summary Audit Report regardless of its effect on compliance. Signatory companies are required to notify ICMI of the occurrence of any "significant cyanide incidents," as defined in the Code's *Definitions and Acronyms*. The nature and cause of such incidents as well as the operation's response and the measures it has taken to prevent a reoccurrence should be



# PRODUCTION GUIDANCE

described, and the auditor's rationale for the resulting finding and compliance determination should be provided, based on the factors discussed below.

Auditors must use their professional judgment to determine if other potential compliance deficiencies or non-compliance situations merit inclusion in a recertification audit report. It may be appropriate for the Detailed Audit Findings Report to document those situations which appear insignificant but which by themselves or in combination with other items may indicate a trend that should be identified to subsequent auditors. For example, less than perfect implementation of an inspection program may appear as a few isolated instances. While deficiencies such as these may not be significant enough to merit discussion in the Summary Audit Report, the auditor should consider documenting such deficiencies in the Detailed Audit Findings Report (along with the rationale for the resulting finding) so that similar deficiencies found in the next audit could be evaluated in the proper context.

An auditor's findings and resulting compliance determinations regarding other potential compliance deficiencies or non-compliance situations will depend primarily on the cause and duration of the problem and the nature of the facility's response.

## Cause:

Potential compliance deficiencies or non-compliance situations can be separated into those that are isolated incidents and those that represent programmatic failures. Isolated incidents can include anything from a single missing monthly inspection form over three years of inspections to an upset in a cyanide production system that results in the emission of hydrogen cyanide gas exceeding applicable limits. If these situations are quickly corrected, measures are taken to prevent their reoccurrence, and the operation has demonstrated that it can maintain compliance, then the operation may be found in full compliance.

Similarly, incidents that are directly attributable to worker error can be viewed as isolated incidents beyond the operation's control as long as the operation had maintained its standard operating procedures and task training programs in full compliance with the Code and had a rapid and effective response to the incident. An operation experiencing a release or exposure resulting from a pipe rupture or other equipment failure also may be found in full compliance if it had conducted the required QA/QC or fit-for-service programs, had implemented inspection and preventive maintenance procedures that fully complied with the Code and had responded quickly and appropriately.

However, if these same incidents were due to an operation's failure to properly implement the underlying management systems on which its certification was based, then the auditor should find that their prevention was within the facility's control. Not conducting documented inspections of cyanide facilities, failing to train personnel or conduct preventive maintenance, or not being able to promptly or adequately respond to an emergency situation are evidence that the operation allowed these systems to fail. Such programmatic failures could result in a finding of substantial or even non-compliance depending on the specific scenario and the operation's efforts to maintain the systems needed to comply with the Code.



# PRODUCTION GUIDANCE

## Duration:

The duration of the potential compliance deficiency or non-compliance situation also must be considered when making an audit finding. While situations that present significant risks to workers, communities and the environment obviously require a response and correction as immediate as is practical, operations are expected to take prompt action to remedy all deficiencies regardless of the risk they present, in order to demonstrate the operation's good-faith efforts to comply with the Code. It therefore is possible for a relatively minor deficiency such as failure to maintain required documentation to result in a finding of substantial or even non-compliance if allowed to go on for an unreasonably long time, while a full compliance finding could result from a more serious problem that was identified and corrected immediately.

## Response:

Regardless of the cause of a deficiency or the severity of an impact, a rapid and effective response is necessary for an operation to be found in full compliance. This should include corrective actions to address the immediate deficiency, a determination of the root cause of the deficiency, the implementation of measures to prevent its reoccurrence, and follow-up evaluations as needed to ensure that the remedy remains effective.

## On-going compliance efforts:

An operation's efforts to maintain full compliance are indicative of its commitment to manage cyanide responsibly, and may therefore provide context with respect to a deficiency. An operation that identifies a deficiency during a three-year audit cycle as part of an interim audit or review of its Code compliance is more likely to be viewed as fully compliant than one that evaluates its compliance only immediately before or during a recertification audit. Although not required by the Code, operations that conduct their own internal or third party audits or program reviews demonstrate to their workforce that responsible cyanide management is an integral part of the operation rather than something that needs attention only every three years. This focus can enhance worker support for the Code and the facility's compliance. These audits or reviews can also identify potential problems before they occur and prevent a slow, incremental deterioration of the operation's cyanide management programs that may otherwise go unnoticed until a serious incident or accident occurs. As a result, the operation may maintain full compliance with the Code rather than falling into substantial compliance. Interim assessments should eliminate the need for a major compliance effort immediately prior to a recertification audit and create a record of continuous compliance, which then provides context to any isolated deficiencies that may be observed during the next certification audit. Most importantly, interim reviews and audits conducted between certification audits help meet the Code's ultimate goal of enhanced protection of workers, communities and the environment.

## Other factors:

Another factor for the auditor's consideration is the point in the three-year audit cycle at which the deficiency occurred. A finding of full compliance is more easily justified when a deficiency that occurred early in the audit cycle has not reoccurred, because it suggests that the



# PRODUCTION GUIDANCE

operation's response has adequately addressed the root cause of the deficiency. However, if the same problem had occurred just prior to a recertification audit, the adequacy of the response may be less clear, and a finding of substantial compliance may be more appropriate to allow the operation additional time to demonstrate its full control of the situation.

While the specific cause and duration of the incident, as well as the operation's response, are critical factors in determining the operation's compliance status, a secondary consideration in determining the compliance of a cyanide production facility that has experienced a significant cyanide incident is whether it provided the required notice to ICMI within 24 hours of the incident. Compliance with the notification requirements indicates that the operation is focused on its responsibilities under the Code and the identification of out-of-compliance situations, while the lack of the necessary notification suggests that Code compliance may not be a high priority for the operation. Auditors therefore should determine whether an operation that has experienced an incident requiring notification to ICMI has done so.

## Findings, compliance status and Summary Audit Report:

Once a deficiency has been fully corrected, a finding of substantial compliance loses its significance because there is no need for a Corrective Action Plan. Therefore, an operation that has corrected a deficiency and has had sufficient time to demonstrate that its remedy is effective, should typically be found in full compliance and be fully certified.

However, if the operation's response to a past deficiency was not complete or effective, or the deficiency was sufficiently recent that the auditor cannot be certain of the effectiveness of the response, a finding of substantial compliance should be made and the facility should be found and certified in substantial compliance, subject to implementation of a Corrective Action Plan. The same three criteria for a finding of substantial compliance during an initial audit also apply to a recertification audit: the facility must have made a good-faith effort to comply with the Code, the deficiency must be correctable within one year, and the situation cannot present an immediate or substantial risk to health, safety or the environment. If any of these three criteria are not met, the operation must be found in non-compliance and cannot be recertified.

## Statement of Evidence Reviewed:

Because recertification audits evaluate compliance over a three-year period, the auditor's responses and findings should indicate, where necessary, that the operation provided evidence demonstrating continuous implementation of its procedures over the current three-year audit period. As one example, in the case of routine facility inspections, the auditor should indicate that representative inspection records were reviewed over the three-year period following the previous Code audit to verify whether the operation maintained continuous compliance over the entire audit cycle.

## Compliance Statement:

The Summary Audit Report of a recertification audit must include one additional statement that is not required in the Summary Audit Report for an initial certification. For a cyanide production operation found in full compliance with the Code, the report must indicate whether the operation had any significant cyanide incidents or other compliance issues since its previous



# PRODUCTION GUIDANCE

certification and identify where in the report such information can be found. For a cyanide production operation found in substantial compliance or non-compliance, the report must identify the Production Practice(s) on which the finding was based.

One of the following two statements must be included directly following the overall compliance finding for an operation found in full compliance during a recertification audit:

“This operation has not experienced any compliance issues during the previous three-year audit cycle.”

or

“This operation has experienced compliance issues during the previous three-year audit cycle which are discussed in this report under Production Practice(s) \_\_\_\_\_.”

The following statement should be included directly following the overall compliance finding for an operation found in substantial compliance during a recertification audit:

“This operation was found in substantial compliance with the Cyanide Code based on the audit findings discussed in this report under Production Practice(s) \_\_\_\_\_.”

The following statement should be included directly following the overall compliance finding for an operation found in non-compliance during a recertification audit:

“This operation was found in non-compliance with the Cyanide Code based on the audit findings discussed in this report under Production Practice(s) \_\_\_\_\_.”



# PRODUCTION GUIDANCE

## Cyanide Production Guidance

### Principle 1 | OPERATIONS

Design, construct and operate cyanide production facilities to prevent release of cyanide.

#### Production Practice 1.1

*Design and construct cyanide production facilities consistent with sound, accepted engineering practices and quality control/quality assurance procedures.*

1. Have quality control and quality assurance programs been implemented during construction and modification of cyanide production and storage facilities?
  - a) Has design and construction documentation been retained?
  - b) Has an appropriately qualified person reviewed facility construction and provided documentation that the facility has been built as proposed and approved?

#### Production

The Code requires that cyanide facilities at a cyanide production operation be professionally designed and constructed. Cyanide facilities are defined in the Code's *Definitions and Acronyms* to include "storage, production, waste management or regeneration units for managing cyanide or process solution containing cyanide, and pollution control devices, equipment or installations used to prevent, control or minimize the risk of a cyanide release."

Tanks, vessels, pipelines, secondary containments for the production process, and all other equipment used for cyanide production are subject to this provision. Repackaging equipment such as feeding and conveying systems for solid cyanide, tanks and piping used to transfer, store, and manage liquid cyanide, and secondary containments for this equipment are subject to this provision. Within warehouses and storage buildings for outgoing or incoming cyanide are also subject to this provision. Cyanide facilities at warehouses and storage areas typically include floors and walls that provide impermeable barriers to potential releases, cranes, forklifts and racking systems used to move and store cyanide containers, tanks holding contaminated water and the secondary containments for these tanks.

Records demonstrating the implementation of quality control and quality assurance programs during construction and modification of these facilities, and as-built drawings stamped by a certified professional engineer should be available for the auditor's review. Construction records should also include documents such as a sign-off by the construction engineer or project manager that the facilities have been built in accordance with the design specifications and drawings. Records of the review and approval of a facility's design and construction by regulatory agencies may also provide evidence of compliance with this provision.

The intent of this provision is to evaluate whether the operation took the necessary and appropriate measures in designing and constructing these facilities rather than to substitute the auditor's judgment for that of engineers who designed and constructed them.



# PRODUCTION GUIDANCE

Auditors should clearly identify any cyanide facilities constructed or substantially modified since the previous Code audit.

For a certified operation undergoing a recertification audit, an auditor can reference earlier audit reports as evidence that cyanide facilities previously found in compliance with the Code's design, construction and quality assurance/quality control requirements remain in compliance. However, a recertification audit must evaluate an operation's compliance with these provisions with respect to any cyanide facilities that have been constructed or modified since its most recent certification audit. For example, this information must be provided for a new secondary containment facility or expansion of a cyanide production circuit that was constructed after the operation's previous audit. Additionally, the auditor must verify that the operation has retained the construction quality control and quality assurance records for all active cyanide facilities.

## Warehouse

The Code requires that cyanide facilities (defined in the Code's *Definitions and Acronyms* to include "storage, production, waste management or regeneration units for managing cyanide or process solution containing cyanide, and pollution control devices, equipment or installations used to prevent, control or minimize the risk of a cyanide release.") at a cyanide warehouse or storage operation be professionally designed and constructed.

Building floors and walls that provide impermeable barriers to potential releases, cranes and racking systems used to move and store cyanide containers, tanks holding contaminated water (such as wash water and water used to decontaminate clothing and equipment) and the secondary containments for these tanks are examples of cyanide facilities at warehouse operations.

Records demonstrating the implementation of quality control and quality assurance programs during construction and modification of these facilities, and as-built drawings stamped by a certified professional engineer should be available for the auditor's review. Construction records should also include documents such as a sign-off by the construction engineer or project manager that the facilities have been built in accordance with the design specifications and drawings. Records of the review and approval of a facility's design and construction by regulatory agencies may also provide evidence of compliance with this Production Practice.

The intent of this provision is to evaluate whether the operation took the necessary and appropriate measures in designing and constructing these facilities rather than to substitute the auditor's judgment for that of engineers who designed and constructed them.

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



# PRODUCTION GUIDANCE

## Production

Where QA/QC records cannot be located, or where no such program was implemented during facility construction, the Code offers the option of having the operation's cyanide facilities evaluated by an appropriately qualified person, as defined in the Code's *Definitions and Acronyms* document, such as a registered professional engineer, construction engineer or facility manager experienced in maintenance and operation of similar facilities, to determine if they are "fit for service" and can continue to be safely operated according to their existing procedures. Equipment including cyanide 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 should be evaluated to determine whether, from a stability and/or containment perspective, as appropriate, these built facilities are 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.

Equipment including feeding and conveying systems, the structures supporting this equipment and overhead cranes, and the floor, walls and roof, as well as secondary containments in the repacking operation and storage areas for incoming and outgoing cyanide containers, and any tanks and piping for cyanide solution or contaminated wash water should be evaluated to determine whether, from a stability and/or containment perspective, as appropriate, these built facilities are 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.

Based on a visual inspection and a review of its operating, maintenance and testing history, an appropriately qualified person may determine that a cyanide facility can continue to be operated safely according to existing procedures and that no further testing or evaluation is necessary. Where the inspection, age and history of the equipment is not sufficient for such a determination, pressure-testing, wall-thickness testing or other means may be necessary to 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.

Information regarding the design, construction and QA/QC of cyanide facilities need only be verified during the first audit following the construction of the facilities. In subsequent recertification audits, the auditor should reference the previous audit report(s) as evidence that the operation is in compliance with this Production Practice. Additional QA/QC information would be necessary in recertification audits only for cyanide facilities that have been added or modified since the previous audit and which have not been evaluated for compliance with this provision. However, if a fit-for-service inspection was used in a previous audit as an alternative to the original QA/QC and as-built reports, and any recommendations



# PRODUCTION GUIDANCE

for subsequent evaluations or repairs resulted from that fit-for service evaluation, then a new evaluation would be needed to address any of the recommended evaluations or repairs.

## Warehouse

Where QA/QC records cannot be located, or where no such program was implemented during facility construction, the Code offers the option of having the operation's cyanide facilities evaluated by an appropriately qualified person, as defined in the Code's *Definitions and Acronyms* document, such as a registered professional engineer, construction engineer or facility manager experienced in maintenance and operation of similar facilities, to determine if they are "fit for service" and can continue to be safely operated according to their existing procedures.

Surfaces on which cyanide is managed, the walls and roof of storage buildings, and the superstructure of overhead cranes and tanks and containments for contaminated wash water and storm water should be evaluated to determine whether, from a stability and/or containment perspective, as appropriate, these built facilities are fit to continue functioning as currently operated. Any records that the operation can provide regarding the maintenance and testing of the facility and associated equipment should also be considered in this evaluation.

Information regarding the design, construction and QA/QC of cyanide facilities need only be verified during the first audit following the construction of the facilities. In subsequent audits, the auditor should reference the previous audit report(s) as evidence that the operation is in compliance with this Production Practice. Additional QA/QC information would be necessary in subsequent certification audits only for cyanide facilities that have been added or modified since the previous audit and which have not been evaluated for compliance with this provision. However, if a fit-for-service inspection was used in a previous audit as an alternative to the original QA/QC and as-built reports, and any recommendations for subsequent evaluations or repairs resulted from that fit-for service evaluation, then a new evaluation would be needed to address any of the recommended evaluations or repairs.

3. Are the materials used for construction of cyanide production facilities compatible with reagents used and processes employed?

## Production

Cyanide facilities at production operations, including tanks, vessels, pipelines, and feeding and conveying systems that come into contact with liquid or solid cyanide should be constructed with materials such as mild or stainless steel or High-Density Polyethylene (HDPE) and the auditor should indicate the types of materials used. If other materials are used, the operation should provide the auditor with documentation that it is compatible with cyanide and high pH conditions.



# PRODUCTION GUIDANCE

## Warehouse

This provision does not apply to warehouse operations because they exclusively handle cyanide in closed packages or containers, such as Intermediate Bulk Containers, drums, or isotainers, and no reagents are used or processing takes place.

4. Are there automatic systems or “interlocks” to shut down production systems and prevent releases due to power outages or equipment failures?

## Production

Cyanide production operations should be equipped with automatic systems that will safely shut down the production process with no release of cyanide in the event of a power outage or equipment failure. Auditors should verify that such systems are in place and operational through interviews with plant personnel, review of documentation in facility design and/or operating plans, and inspection of these systems.

## Warehouse

This provision does not apply to warehouse operations because they exclusively handle cyanide in closed containers and packages, such as Intermediate Bulk Containers, drums, or Flo-Bins, and no containers are opened, such as occurs at repackaging operations where cyanide may be transferred from Intermediate Bulk Containers or rail cars into isotainers, or water may be added to isotainers.

5. Is cyanide managed on a concrete or other surface that can minimize seepage to the subsurface?

## Production

At production operations, tanks, vessels, pipelines and other facilities for cyanide production, storage and loading which contain cyanide solution should be installed with a concrete or other similarly impermeable barrier between the facilities and the ground. 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. All solid cyanide production, handling and storage activities at these operations also should be conducted on a concrete or other similarly impermeable surface.

Management of cyanide at repackaging operations, including the storage of incoming and outgoing cyanide containers, tanks of cyanide solution and contaminated wash water (including water used to decontaminate clothing and equipment), as well as the repackaging equipment itself should be located on a concrete or other similarly impermeable surface that provides protection against seepage. Cyanide containers built specifically for outside storage such as sea containers and isotainers do not require secondary containment under normal storage conditions.

In determining compliance with this provision, auditors should inspect the operation and confirm that concrete or other impermeable surfaces are intact and do not have cracks that compromise their ability to contain released cyanide. Where visual inspection cannot



# PRODUCTION GUIDANCE

confirm that the materials under large tanks is impermeable, auditors should examine as-built drawings for confirmation.

## Warehouse

Handling and storage of containerized or packaged solid cyanide and contaminated water (such as wash water and water used to decontaminate clothing and equipment) at a warehouse operation should be conducted on a concrete or other similarly impermeable surface. This does not apply to cyanide containers built specifically for outside storage such as sea containers and isotainers.

In determining compliance with this provision, auditors should inspect the operation and confirm that concrete or other impermeable surfaces are intact and do not have cracks that compromise their ability to contain released cyanide.

6. Does the facility employ, inspect, test, and maintain systems, such as level indicators and high-level alarms, to prevent the overfilling of cyanide process and storage vessels?

## Production

Cyanide process and storage tanks and vessels as well as systems used to load product cyanide into rail cars, isotainers or other containers used to transport cyanide to customers, should be equipped with functioning overfill protection, such as an automatic level indicator, high-level alarms, integrated tank and tanker valve-shutdown devices or dual level indicators, such as an ultrasonic and a mechanical gauge, which can be compared to confirm that they are both functioning. Production operations should implement procedures for inspecting, maintaining and testing such overfill protection equipment. The auditor should confirm this equipment is in place and functional through inspection of the operation and review of design drawings and inspection, testing and maintenance records.

## Warehouse

The requirements of this provision do not apply to warehouse operations managing solid cyanide in unopened containers and packaging, such as IBCs and drums.

7. Are secondary containments for process and storage tanks and containers constructed of materials that provide a competent barrier to leakage and sized to hold a volume greater than that of the largest tank or container of cyanide solution within the containment and any piping draining back to the tank, and with additional capacity for the design storm event (if applicable)?

## Production

Secondary containments for cyanide process and storage tanks and vessels and for storage and loading of product cyanide containers should be constructed with concrete, HDPE or other materials demonstrated to provide a competent barrier to leakage. Containments should be free of cracks and other breaches that compromise their ability to effectively contain releases.



# PRODUCTION GUIDANCE

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.

Repackaging equipment, incoming and outgoing cyanide container storage areas and tanks of cyanide solution and contaminated water (such as wash water and water used to decontaminate clothing and equipment) should have appropriately sized secondary containment. Containments should be free of cracks and other breaches that compromise their ability to effectively contain releases.

Sizing of containments that are subject to precipitation should account for a design storm event reasonable for the site's environment. A factor of 110% of the volume of the largest contained 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 drainage area collected by the containment is large.

Verification of the adequacy of secondary containment will typically be by observation of the facilities and review of design drawings and containment capacity calculations. The auditor should also verify through visual observation that the containment is competent and there are no materials stored within the containment that compromise the necessary capacity.

## Warehouse

A warehouse building's floor and walls typically serve as sufficient secondary containment for stored containers of solid cyanide, such as IBCs and drums. Secondary containment is also needed for any tanks of contaminated water, such as water used to address spills, or decontaminate clothing and equipment. Secondary containment does not apply to cyanide containers built specifically for outside storage such as sea containers and isotainers.

Although sea containers and isotainers are suitable for outside storage, solid cyanide may be released when these containers are moved or when individual packages of cyanide such as IBCs or drums are removed. The topography of the area and occurrence of precipitation can increase the risk to workers and the environment if such a release occurs. Measures should be in place in outside areas where these containers are stored to control potential releases of solid cyanide.

Compliance with this provision can be determined through the auditor's inspection of the facility and review of construction and maintenance records. The auditor should also verify that secondary containments are competent and there are no materials stored within the containment that compromise the necessary capacity.

8. Are spill prevention or containment measures provided for all cyanide solution pipelines?



# PRODUCTION GUIDANCE

## Production

Spill prevention measures for cyanide solution pipelines include focused inspections, preventive maintenance programs such as pipe wall thickness testing and pressure and/or flow monitoring. Building floors and walls, competent secondary containments and pipe-within-a-pipe systems are examples of typical containments.

Secondary containment should be provided for cyanide solution pipelines at repackaging operations that dissolve solid cyanide or otherwise handle liquid cyanide.

Compliance with this question should be determined through observation of the operation, review of inspection, construction and maintenance records, and employee interviews.

## Warehouse

This provision does not apply to warehouse facilities due to the dilute nature of any cyanide solution that may be managed, such as wash water and water used to decontaminate clothing and equipment.

9. Is cyanide stored:
  - a) With measures to avoid or minimize the potential for exposure of cyanide to moisture?
  - b) With adequate ventilation to prevent the build-up of hydrogen cyanide gas and cyanide dust?
  - c) In a secure area where public access is prohibited?
  - d) Separately from incompatible materials?

## All Operations

This provision applies to the on-site storage of cyanide at an operation that produces cyanide, a cyanide warehouse and a cyanide repackaging/transloading facility.

Solid cyanide should be stored in buildings or other roofed and enclosed structures to prevent contact with precipitation. Water systems for potable use, safety showers or any other purpose that are present in cyanide storage areas should be designed such that leaks or other potential releases will not come in contact with cyanide containers. Enclosed storage is not required for cyanide in tanks, isotainers, sea containers or other containers that are designed for outside storage.

Enclosed areas where cyanide is stored should have ventilation that prevents the build-up of cyanide dust and hydrogen cyanide gas. Determining the adequacy of ventilation is not intended to require an engineering-level evaluation, but rather visual confirmation that enclosed storage areas such as a warehouse holding solid cyanide in IBCs or drums are, in fact, ventilated in the event that cyanide is released and/or comes in contact with water.

For overall security purposes, cyanide should be stored to prevent access by the public and unauthorized personnel, such as within a secure building or the fenced access-controlled boundary of the operation. 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. Factors to consider include



# PRODUCTION GUIDANCE

whether valves related to storage of liquid cyanide are locked and whether solid cyanide is stored in sealed isotainers, sea containers 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.

These provisions should be verified by the auditor's observation of the storage facilities.

## Production Practice 1.2

*Develop and implement plans and procedures to operate cyanide production facilities in a manner that prevents accidental releases.*

1. Does the facility have plans or procedures that describe the standard practices necessary for its safe and environmentally sound operation?

### Production

A cyanide production operation should have written management systems, plans and/or procedures for operating its cyanide facilities in a manner which protects its workers and the environment. All cyanide production and management facilities and equipment, from the reactor where hydrogen cyanide is produced through the loading of the final product for shipment to customers, are considered to be cyanide facilities.

Repackaging facilities should have written management systems, plans and/or procedures for unloading and storing incoming cyanide, operating its repackaging equipment, storing and loading cyanide for delivery to customers, handling containers of cyanide and for managing any contaminated water, such as water captured in secondary containment or wash water. The plans should describe how the operation's cyanide management activities are conducted in a safe and environmentally sound manner that prevents cyanide releases and exposures.

It is the responsibility of the operation to identify those tasks that, if not performed properly, have the potential to cause cyanide exposures and/or releases. The operation should then develop and implement the management systems and procedures needed to protect health and the environment.

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.



# PRODUCTION GUIDANCE

The Code does not require the use of any single approach or framework for a 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 various forms including operating manuals, standard operating procedures, training documents, signs, and checklists. Regardless of their form, however, these written procedures should demonstrate that the operation understands how to produce and manage cyanide in a manner that prevents or controls releases to the environment and exposures to workers and communities.

Auditors should review the facility's written operating plans to confirm that they address the safe operation of all cyanide production and management activities that present a risk of an accidental release and/or exposure. Implementation of these plans should be confirmed through inspection of these activities, interviews with the personnel responsible for performing these tasks, and review of available documentation.

## Warehouse

Warehouse operations should have written management systems, plans and/or procedures for unloading, loading and handling containers of cyanide and for managing any contaminated materials or wash water. The plans should describe how cyanide containers and contaminated wash solutions are managed in a safe and environmentally sound manner that prevents cyanide releases and exposures.

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; operating manuals, standard operating procedures, training documents, signs, and checklists are all acceptable.

Auditors should review the facility's written operating plans to confirm that they address the safe management of cyanide. Implementation of these plans should be confirmed through observation of these activities, interviews with the personnel responsible for performing these tasks, and review of available documentation.

2. Does the facility have contingency plans for non-standard operating situations that may present a potential for cyanide exposures or releases?



# PRODUCTION GUIDANCE

## All Operations

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.

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 some non-standard operating situations and operational upsets, such as damage to a cyanide container during handling but without the release of cyanide briquettes, may be included in a facility's operating plans or in emergency response plans rather than in a separate contingency plan. The nature of the documentation does not matter for purposes of Code compliance, only that the operation's planned responses to the potential issues are addressed.

3. Does the facility have a procedure to identify when cyanide facilities or operating practices have or will be changed from those on which the initial design and operating practices were predicated? Does the procedure require review and sign-off by environment, health, and safety management?

## All Operations

All production 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 and adverse impacts on worker health and safety before such changes are implemented so that they can be evaluated and addressed as necessary. A written procedure requiring written notification to environmental, health and 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 environmental and health and safety personnel.

4. Are preventive maintenance programs implemented and activities documented for equipment and devices necessary for cyanide production and handling?

## Production

An operation should have a preventive maintenance program for its cyanide facilities where a failure can result in a cyanide release or exposure. Tanks, vessels, pumps, pipelines, treatment and destruction and/or regeneration equipment are examples of facilities that should be included in a preventive maintenance program. Cranes, forklifts, racking systems and other equipment used to move, store and load containers of product cyanide, as well as equipment such as isotainers and rail cars used for delivery to customers, also require preventive maintenance and should be included in the program, if the responsibility of the production facility.

A repackaging operation should have a preventive maintenance program for its repackaging and storage equipment, including forklifts, cranes, and any tanks, vessels, pumps, and pipelines holding cyanide solutions. Equipment used for delivery to customers, such as



# PRODUCTION GUIDANCE

isotainers and rail cars also require preventive maintenance and should be included in the program if the responsibility of the repackaging facility.

The frequency of various preventive maintenance activities is not specified in the Code, but the Code does expect that these activities be scheduled and documented, along with the basis for the maintenance frequency, such as hours of operation, or set time periods between maintenance. Auditors should inspect cyanide facilities, review maintenance records and interview employees to determine compliance with this provision.

## Warehouse

A warehouse operation should have a preventive maintenance program for its cranes, forklifts, racking systems and other equipment used to unload, load and otherwise manage containers of product cyanide to prevent a failure that results in a cyanide release or exposure. Tanks, pumps and piping associated with managing contaminated wash water also should be included in the preventive maintenance program, as should isotainers and other equipment used for delivery to customers, if such maintenance is the responsibility of the warehouse.

The frequency of various preventive maintenance activities is not specified in the Code, but the Code does expect that these activities be scheduled and documented, along with the basis for the maintenance frequency, for example hours of operation, or set time periods between maintenance. Auditors should, review maintenance records and interview employees to determine compliance with this provision.

5. Are process parameters monitored with necessary instrumentation and is the instrumentation calibrated according to manufacturer's recommendations?

## Production

Cyanide production operations should maintain, test and calibrate process monitoring equipment as recommended by its manufacturer. Records should be retained for at least three years and be 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.

## Warehouse

This provision does not apply to warehouses.

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

## Production

The operation should have a written procedure describing how water found in a secondary containment is managed, how the operation determines if the water contains cyanide, and how the operation treats and/or disposes of water contaminated with cyanide.



# PRODUCTION GUIDANCE

If water collected in a secondary 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 prior to discharge. Records of these analyses should be available for the auditor's review.

No written procedures other than those for inspections and maintenance may be necessary where a system of sumps and dedicated pumps and piping returns all such water to the production process.

## Warehouse

A cyanide warehouse should have impermeable floors and walls to provide secondary containment in the event that cyanide is released from stored containers. These operations should have written procedures describing how any water collected in the building is handled, how the operation determines if the water contains cyanide, and how it treats and/or disposes of water contaminated with cyanide. Procedures should also address management of water found in secondary containments for outside storage areas.

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

7. Does the facility have environmentally sound procedures for management and/or disposal of cyanide waste or cyanide-contaminated materials?

## All Operations

Cyanide production operations should have written procedures for management of cyanide materials such as off-specification or otherwise unsellable cyanide product, spilled product, and cyanide-contaminated materials such as packaging or used equipment.

Procedures should specify how any cyanide released from its primary containment is returned to the production process or disposed of and how wastes contaminated with cyanide are to be managed. Procedures also should describe how equipment that may be contaminated with cyanide should be decontaminated prior to disposal. If waste packaging or other contaminated materials are incinerated, the operation's procedures should include how the incineration process is conducted (e.g., the time and temperature of incineration) to ensure complete cyanide destruction.

Where a production operation relies on contracted external entities, such as firms specializing in management of hazardous material and hazardous wastes, auditors should ensure that the procedures of the contracted entity include language specific to decontamination, management, and disposal of cyanide-contaminated materials, including the ultimate destination of any disposed material.

8. Are there procedures to ensure that the cyanide is packaged and labeled as required by the political jurisdictions through which the packaged cyanide will pass?



# PRODUCTION GUIDANCE

## All Operations

Containers such as sea containers, isotainers, and individual IBCs and drums of cyanide stored for shipment at a production operation must meet the packaging requirements of those jurisdictions through which the material will pass, including international standards where applicable. This includes requirements for the container itself as well as for signage on containers identifying the presence of cyanide and its risks to health and the environment. Special labeling, marking and placarding requirements applicable to transport by sea are discussed in the Code's Auditor Guidance for Use of the Transport Verification Protocol under Transport Practice 1.5.

While cyanide arriving at a warehouse or repackaging facility should have been properly labeled and packaged by the operation that produced it, procedures should be in place to confirm that labeling and packaging has not been compromised when it is shipped to customers.

## Production Practice 1.3

*Inspect cyanide production facilities to ensure their integrity and prevent accidental releases.*

1. Does the facility conduct routine inspections of tanks, valves, pipelines, containments and other cyanide production and storage facilities, including:
  - 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) Pipelines, pumps and valves for deterioration and leakage?
  - d) Containers used for transportation, where the producer is responsible for their integrity?

## Production

Operations that produce cyanide should inspect tanks, vessels, pipelines, containment and all other process equipment to identify situations that pose a risk of cyanide release and exposure so they can be corrected prior to their failure. Reusable containers used in transportation such as isotainers and rail cars should be inspected prior to being filled with cyanide. Cyanide repackaging operations should inspect repackaging equipment, unloading, loading, and storage areas, and secondary containments to identify releases of cyanide or situations that pose a risk of a cyanide release (e.g., breach of containment walls or cracking of impermeable surfaces). Documentation should be retained for the auditor's review demonstrating that inspections have been conducted, that they have been focused on the identification of releases and on the elements critical to the prevention of releases and exposures, and that necessary clean-up measures and/or maintenance and repairs are made in a timely manner when deficiencies are identified.



# PRODUCTION GUIDANCE

Although specific formats or questions to be used for an inspection checklist are not mandated, inspections should be focused rather than general, and inspection forms should direct the inspector to evaluate specific items. Inspection forms that require only a single check-off or yes/no answer that an item is in good operating order invite 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 solution pump).

Auditor judgment will be necessary to determine if a specific inspection form provides sufficient detail regarding what to look for or what condition is acceptable. The auditor's own inspection of these facilities will provide evidence of whether the facility's inspections are identifying potentially hazardous conditions. For example, if the auditor observes precipitated salts on a cyanide solution 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 operation's compliance status. An isolated observation of salt accumulation 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 nor suggest what expectations are appropriate.

## Warehouse

Cyanide warehouses and storage operations should inspect all loading, unloading, and storage areas and secondary containments to identify releases of solid cyanide or situations that pose a risk of a cyanide release (e.g., cracking of impermeable surfaces). Documentation should be retained for the auditor's review demonstrating that inspections have been conducted, that they have been focused on the identification of releases and on the elements critical to the prevention of releases and exposures, and that necessary clean-up measures and/or maintenance and repairs are made in a timely manner when deficiencies are identified.

Although specific formats or questions to be used for an inspection checklist are not mandated, inspections should be focused rather than general and inspection forms should direct the inspector to evaluate specific items. Inspection forms that require only a single check-off or yes/no answer that an item is in good operating order invite 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 a surface where cyanide containers are stored) nor



# PRODUCTION GUIDANCE

reminded of the proper expectation to be met (e.g., no traces of solid cyanide observed on a warehouse floor).

Auditor judgment will be necessary to determine if a specific inspection form provides sufficient detail regarding what to look for or what condition is acceptable. The auditor's own inspection of these facilities will provide evidence of whether the facility's inspections are identifying potentially hazardous conditions. For example, if the auditor observes a ruptured cyanide container and/or cyanide dust outside of its packaging, 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.

2. Are inspection frequencies sufficient to assure that equipment is functioning within design parameters?

## All Operations

Facility inspections need to be conducted frequently enough to identify potential problems before they present a risk of cyanide release or exposure, but the Code does not specify the frequency of necessary facility inspections. Auditors must use professional judgment to determine if their frequency is sufficient to assure and document that equipment is functioning within design parameters, and must provide their professional opinion in both the Detailed Audit Findings Report and the Summary Audit Report as to whether inspection frequencies are sufficient to assure that equipment is functioning within design parameters.

3. Are inspections documented?
  - a) Does the documentation identify specific items to be observed and include the date of the inspection, the name of the inspector, and any observed deficiencies?
  - b) Are the nature and date of corrective actions documented, and are records retained?

## All Operations

Facility inspections should be documented on inspection forms, in logbooks 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 logbooks is that information may be entered by exception only. That is, when no deficiencies are noted, there may be no record that inspections were conducted. 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 logbook notations were trained to observe specific items, evaluate them against the appropriate expectation, and then to make an entry in the logbook only when a deficiency was identified.

The nature and date of corrective actions also should be documented along with the record of the inspection. However, corrective actions may be documented in maintenance records or work orders rather than on the inspection forms that identified the problem. The auditor should review the operation's inspection records and maintenance records, as necessary to verify that this information is recorded.



# PRODUCTION GUIDANCE

## Principle 2 | WORKER SAFETY

Protect workers' health and safety from exposure to cyanide.

### Production Practice 2.1

*Develop and implement procedures to protect facility personnel from exposure to cyanide.*

1. Has the facility developed procedures to minimize worker exposure during:
  - a) Normal operations from receipt of raw materials through finished product packaging and shipping?
  - b) Non-routine and emergency operations?
  - c) Maintenance related activities?

#### All Operations

The operation's management system discussed in Production Practice 1.2 should address those aspects of the operation that are necessary for protection of workers, including its inspection programs for its cyanide facilities and its preventive maintenance programs for critical equipment.

The same Standard Operating Procedures as those required under Production Practice 1.2 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.

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.

The operation should have formalized procedures for use of personal protective equipment and for 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 logbook.

The operation also should have procedures describing the specific steps necessary to decontaminate equipment, prior to its maintenance, which has been in contact with cyanide.

The auditor should review these procedures to determine if they describe safe work practices and determine if they are being implemented through employee interviews and observation.



# PRODUCTION GUIDANCE

2. Does the facility solicit and consider worker input in developing and evaluating health and safety procedures?

## All Operations

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.

3. Has the facility identified areas and activities where workers may be exposed to hydrogen cyanide gas and/or cyanide dust exceeding 10 parts per million (ppm) on an instantaneous basis or 4.7 ppm continuously over an 8-hour period, as cyanide, and does it require use of personal protective equipment and/or use administrative controls as necessary in these areas or when performing these activities?

## All Operations

Exposure to more than 10 ppm cyanide on an instantaneous basis and 4.7 ppm cyanide continuously over an 8-hour period as hydrogen cyanide gas is potentially harmful to humans. Operations should identify those areas and activities that may expose its workers to these cyanide concentrations and require all personnel entering these production areas to use necessary personal protective equipment.

Protection from exposure to levels of cyanide greater than 4.7 ppm cyanide continuously over an 8-hour period as hydrogen cyanide gas may also be achieved through administrative controls, such as limits to time worked in areas exceeding those concentrations.

The auditor should confirm that the operation has determined the areas and activities where such exposures may occur and require appropriate personal protective equipment or use administrative controls, as necessary. The auditor also should observe and/or interview workers to confirm that these protective measures are being implemented.

4. Does the facility use monitoring devices and associated alarms to confirm that controls are adequate to limit worker exposure hydrogen cyanide gas and/or cyanide dust exceeding 10 parts per million (ppm) on an instantaneous basis or 4.7 parts per million continuously over an 8 hour period, as cyanide?

## All Operations

Cyanide production operations should employ fixed monitors located in appropriate locations and use personnel monitors as necessary to confirm that workers are not exposed to concentrations of cyanide gas or dust exceeding 10 ppm on an instantaneous basis or 4.7 ppm continuously over an 8-hour period. Where alarms are used to identify when areas



# PRODUCTION GUIDANCE

exceed these concentrations, the operation should identify actions to be taken when the alarms are activated.

Compliance with this provision should be verified by observation of monitoring equipment, employee interviews and review of records of monitoring results.

5. Is hydrogen cyanide monitoring equipment maintained, tested and calibrated as recommended by the manufacturer, and are records retained?

## All Operations

Cyanide monitoring equipment should be maintained, tested and calibrated as recommended by the manufacturer. Records of these activities should be retained for at least three years and available for review by the auditor. Records should include the actual calibration information rather than simply a log or work order indicating that the equipment calibration was completed.

6. Does the facility have provisions to ensure that a buddy system is used or workers can otherwise notify or communicate with other personnel for assistance, help or aid where it has determined it necessary?

## All Operations

Cyanide production operations should implement procedures prohibiting an employee from entering the production area unless accompanied by a second employee who can immediately summon assistance in the event of an exposure to harmful concentrations of cyanide. While the buddy system should be used in the production area, the operation may determine that radios or other means of communication may be used to call for aid in storage areas or other locations presenting a lesser risk.

An auditor can evaluate compliance with this provision through review of safety procedures and interviews with and observation of employees.

7. Does the facility assess the health of employees to determine their fitness to perform their specified tasks?

## All Operations

Cyanide production operations should implement procedures to assess the health of their employees when they are hired and periodically thereafter to ensure their fitness for their jobs. Specific medical issues to be evaluated include the ability to use a respirator, hearing and vision, and pulmonary function. Evidence that such assessments are being conducted should be available for the auditor's review.

8. Does the facility have a clothing change policy or procedure for employees, contractors and visitors that enter areas with the potential for cyanide contamination of clothing?

## All Operations

Production operations should have a policy or procedure to ensure that individuals working or visiting the facility do not leave the premises with cyanide on their clothing. Individuals



# PRODUCTION GUIDANCE

should be given coveralls or other clothing to wear before entering areas where they may come in contact with cyanide, and this clothing should be left on site when they leave so that it can be washed at the facility and the contaminated wash water can be managed safely.

Auditors should confirm compliance with this provision by reviewing the procedure and interviewing and observing employees.

9. Are there warning signs advising workers that cyanide is present and that, if necessary, suitable personal protective equipment must be worn?

## All Operations

Cyanide production facilities are expected to place legible signage throughout the operation as necessary to ensure that all workers who may be exposed to cyanide are aware of the risks and take appropriate protective measures. Workers should be alerted to the presence of cyanide and the need for appropriate personal protective equipment. The Code does not mandate specific locations, sizes and wording of these signs.

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 also may be important in determining how the workforce has been alerted to the presence and risks of cyanide.

10. Are smoking, eating, drinking, and open flames prohibited in areas where there is the potential for cyanide contamination?

## All Operations

Cyanide production operations should prohibit smoking, eating, drinking and having open flames in all areas of the facility where cyanide is present. The prohibition should be included in the operation's safety training and should be re-enforced by signage in these areas.

Review of training plans and records, interviews with employees and observation of signage throughout the facility are the primary means of confirming compliance with this provision.

## Production Practice 2.2

*Develop and implement plans and procedures for rapid and effective response to cyanide exposure.*

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

## All Operations

The operation should have a written procedure detailing the necessary response to inhalation of cyanide gas or skin contact with liquid or gaseous cyanide. 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.



# PRODUCTION GUIDANCE

2. Are showers, low-pressure eye wash stations and non-acidic fire extinguishers located at strategic locations throughout the facility? Are they maintained and inspected or tested on a regular basis?

## Production

Safety showers, eye wash stations and fire extinguishers should be available in areas of operations where workers may be exposed to cyanide. As with warning signs, the Code does not mandate the number of showers, eye wash stations or fire extinguishers, but this equipment must be maintained and tested on a regular basis to ensure that it functions properly when needed.

Carbon dioxide fire extinguishers cannot be used where cyanide is present due to their acidic nature. Eye wash stations should operate at low pressure because water at line pressure can drive contaminants into the eye.

The auditor should inspect the operation to confirm that showers, eye wash stations and dry powder or non-acidic sodium bi-carbonate fire extinguishers are available where they may be needed and should test showers to confirm they are functional. Auditors should also check eye wash stations to confirm that they are in good working order and that they operate with low water pressure.

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

## Warehouse

Safety showers, eye wash stations and fire extinguishers should be available in or near areas of warehouses where workers may be exposed to cyanide. As with warning signs, the Code does not mandate the number of showers, eye wash stations or fire extinguishers, but this equipment must be maintained and tested on a regular basis to ensure that it functions properly when needed.

To prevent the potential for contact with cyanide, storage areas for solid cyanide at many warehouses are constructed without running water or safety showers. In these situations, safety showers and eye wash stations should be located outside of the storage area. Storage areas with running water and/or safety showers and eye wash stations should be designed, constructed and maintained to minimize the potential for water to come into contact with cyanide containers or cyanide released from containers during handling.

Carbon dioxide fire extinguishers cannot be used with cyanide due to their acidic nature. Eye wash stations should operate at low pressure because water at line pressure can drive contaminants into the eye.

The auditor should inspect the operation to confirm that showers, eye wash stations and dry powder or non-acidic sodium bi-carbonate fire extinguishers are available where they may be needed and should test showers to confirm they are functional. Auditors should also check



# PRODUCTION GUIDANCE

eye wash stations to confirm that they are in good working order and that they operate with low water pressure.

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

3. Does the facility have oxygen, resuscitator, antidote and a means of communication or emergency notification readily available for use?

## All Operations

Cyanide production operations should have the necessary equipment available 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.

Auditors should confirm compliance with this provision through inspection of the facility and interviews with employees.

4. Does the facility inspect its first aid equipment regularly to ensure that it is available when needed? Is first-aid and emergency response equipment stored and/or tested as directed by its manufacturer(s) and replaced on a schedule that ensures it will be effective when used?

## All Operations

All production operation should inspect their cyanide first aid equipment regularly and have inspection records available 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. Operations are 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.

5. Are Safety Data Sheets, first aid procedures or other informational materials on cyanide safety in the language of the workforce and available to workers in areas where cyanide is handled?

## All Operations

Employees should have access to Safety Data Sheets and/or other information on cyanide first aid in areas where cyanide is used. All safety information provided by the operation should be in the language of the workforce.

The auditor should observe that safety or warning signs, Safety Data Sheets, first aid procedures and other safety information are available in the language of the workforce where cyanide is used. However, the Code does not specify exact locations, and the auditor



# PRODUCTION GUIDANCE

must evaluate the need for and availability of this information within the context of the operation's overall safety and training programs.

6. Are storage tanks, process tanks, containers and piping containing cyanide identified to alert workers of their contents? Is the direction of cyanide flow in pipes designated?

## Production

Process and storage equipment including tanks, vessels, pipelines and containers containing cyanide should be identified as such. The Code 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 operation, and the auditor must use professional judgment to determine if their implementation at a given operation is adequate.

The intent of this provision 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, whether it provides workers and others with notice that a dangerous material is present as necessary to protect their health and safety.

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. The direction of flow in pipes carrying cyanide solution should be indicated to reduce the potential for releases and exposures during maintenance.

Auditors should determine compliance with this provision through inspection of the operation's cyanide production and handling equipment.

## Warehouse

Since warehouses exclusively manage cyanide in solid form, the labeling requirements of this provision apply only to cyanide containers. All containers of cyanide should be clearly identified as such. Auditors should determine compliance with this provision through inspection of cyanide containers stored at the operation.

7. Does the facility have a decontamination policy or procedure for employees, contractors and visitors leaving areas with the potential for skin exposure to cyanide?

## All Operations

Cyanide production operations should implement procedures for hand washing or showering for individuals who have been in areas of the facility posing the potential for skin exposure to cyanide. Auditors should review the procedure and confirm its implementation through observation of and interviews with employees.

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



# PRODUCTION GUIDANCE

## Production

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

9. Has the facility developed procedures to transport exposed workers to locally available qualified off-site medical facilities?

## All Operations

Cyanide production operations should have written procedures in the event that an exposed worker requires transport to an off-site medical facility for treatment. Auditors should review the operation's response procedures to determine compliance with this provision.

10. Has the facility made formalized arrangements with local medical facilities of the potential need to treat patients for cyanide exposure, and is the operation confident that the medical facility has adequate, qualified staff, equipment and expertise to respond to cyanide exposures?

## All Operations

Cyanide production operations 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.

Auditors should review the operation's documentation of its coordination with the off-site medical facility as necessary to ensure proper care for exposed personnel.

11. Are procedures in place and being implemented to investigate and evaluate cyanide exposure incidents to determine if the facility's programs and procedures to protect worker health and safety and to respond to cyanide exposures are adequate or need to be revised?

## All Operations

Cyanide production operations should have written procedures for investigating and evaluating incidents of cyanide exposure 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. If there are no written records indicating that



# PRODUCTION GUIDANCE

procedures have been revised in response to a previous incident, auditors should confirm that this has been done through interviews with site personnel.

## Principle 3 | MONITORING

Ensure that process controls are protective of the environment.

### Production Practice 3.1

*Conduct environmental monitoring to confirm that planned or unplanned releases of cyanide do not result in adverse impacts.*

1. Does the facility monitor for cyanide in discharges to surface water and in surface and ground water upgradient and downgradient of the site?

#### All Operations

Cyanide production operations that discharge potentially contaminated water (including process water, wash water and storm water) to streams, rivers or other surface water should monitor the discharge and the quality of both surface and ground water upgradient and downgradient of the discharge. The operation should have a written plan or procedure for its monitoring activities developed by an “appropriately qualified personnel,” as defined in the Code’s *Definitions and Acronyms* document. The monitoring plan should 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.

The auditor should review the monitoring plan to confirm that it was developed by an appropriately qualified person and includes the necessary information.

2. If the facility has a direct discharge to surface water:
  - a) Is it no greater than 0.5 mg/l WAD cyanide at the point of discharge?
  - b) Can the operation demonstrate that it does not cause the concentration of free cyanide in the receiving water to exceed 0.022 mg/l downstream of any established mixing zone?

#### Production

A direct discharge to surface waters from a cyanide production operation should not exceed 0.5 mg/l WAD cyanide at the point of discharge. The Code recommends that a discharge should not cause the concentration of free cyanide to exceed 0.022 mg/l in surface waters to protect aquatic life. Operations discharging to surface water should have analytical data for the auditor’s review demonstrating that these limits are 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.



# PRODUCTION GUIDANCE

If the operation discharges to surface water, the auditor should review the operation's analytical data to confirm that cyanide levels in the discharge and the receiving water do not exceed these limits. 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.

Where analytical data is needed to demonstrate that the 0.022 free cyanide concentration has been achieved, QA/QC and Method Detection Limit data and information for the analysis should be presented to ensure that results are accurate and above the Method Detection Limit.

## Warehouse

Warehouses that directly discharge potentially contaminated wash water or water collected in secondary containments to surface water should have analysis showing that the levels of cyanide are not above 0.5 mg/l WAD cyanide at the point of discharge and that the discharge does not result in a free cyanide concentration exceeding 0.022 mg/l in surface water to protect aquatic life. Operations discharging to surface water should have analytical data for the auditor's review demonstrating that these limits are 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.

If the operation discharges to surface water, the auditor should review the operation's analytical data to confirm that cyanide levels in the discharge and the receiving water do not exceed these limits. 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.

Where analytical data is needed to demonstrate that the 0.022 free cyanide concentration has been achieved, QA/QC and Method Detection Limit data and information for the analysis should be presented to ensure that results are accurate and above the Method Detection Limit.

3. Can the operation demonstrate that indirect discharges to surface water do not cause the in-stream concentration of free cyanide to exceed 0.022 mg/l taking into consideration any established mixing zone?

## Production

Cyanide production operations should ensure that indirect discharges to surface water are not adversely affecting aquatic life. An indirect discharge can result from leaks or spills of cyanide solution that escape containment and enter a surface water body through the subsurface. Operations should determine if indirect discharges are occurring by routinely



# PRODUCTION GUIDANCE

monitoring downstream surface water quality to ensure that the aquatic life is protected. When evaluating the need for such monitoring, auditors should consider the distance to surface waters, the physical condition of facility flooring tanks, and other secondary containment, and the facility's inspection program. Where an indirect discharge cannot reasonably be expected to reach surface water, monitoring should not be necessary.

## Warehouse

Since cyanide warehouse operations exclusively handle cyanide in solid form, the potential sources of indirect discharges are limited to leakage and spills from wash water systems and from secondary containments which enter a surface water body through the subsurface. Operations should determine if indirect discharges are occurring by routinely monitoring downstream surface water quality to ensure that the aquatic life is protected. When evaluating the need for such monitoring, auditors should consider the distance to surface waters, the physical condition of warehouse flooring and other secondary containment, and the facility's inspection program. Where an indirect discharge cannot reasonably be expected to reach surface water, monitoring should not be necessary.

4. Has the jurisdiction identified beneficial uses of groundwater at the operation, and have numerical standards for cyanide species (free, WAD, or total) in groundwater been established? Are cyanide concentrations in groundwater below or downgradient of the facility at or below levels that are protective of actual or identified beneficial uses of the groundwater?

## Production

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 downgradient from the operation's cyanide facilities. For purposes of the Code, this must either be the use designated by the applicable jurisdiction or, if no beneficial use has been officially designated, its existing actual use, such as for industrial uses, or as a source of drinking water for humans or livestock.

Where a beneficial use exists or is designated but there is 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.

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



# PRODUCTION GUIDANCE

## Repackaging/Transloading

This provision only applies to repackaging operations which receive, produce or otherwise manage cyanide solutions and which have experienced leaks or other releases of cyanide solution. These operations should monitor groundwater upgradient and downgradient to determine if cyanide is present and has adversely affected its beneficial use. For purposes of the Code, this must either be the use designated by the applicable jurisdiction or, if no beneficial use has been officially designated, its existing actual use, such as a source of drinking water for humans or livestock.

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.

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. 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.

## Warehouse

This provision does not apply to warehouse facilities exclusively handling unopened packages of solid cyanide.

5. If seepage from the facility has caused the cyanide concentration of the ground water to exceed that necessary to protect its beneficial use, is the facility engaged in remedial activity to prevent further degradation and restore beneficial uses?

## Production

A cyanide production or repackaging/transloading 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 goals of this provision, which 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.



# PRODUCTION GUIDANCE

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 plan implementation, and analytical results demonstrating that the plan is working as designed.

## Warehouse

This provision does not apply to warehouse facilities exclusively handling unopened packages of solid cyanide.

6. Can the operation demonstrate that the levels of atmospheric process emissions of hydrogen cyanide gas or cyanide dust are limited in order to protect the health of workers and the community?

## All Operations

Cyanide production operations should limit emissions of hydrogen cyanide gas (if managing liquid cyanide) and/or cyanide dust (if managing solid cyanide) from process equipment and storage areas to protect the health of workers and communities. The Code recommends a hydrogen cyanide and cyanide dust limit for worker exposure of 10 parts per million on an instantaneous basis or 4.7 parts per million continuously over an 8-hour period. The operation also should ensure that nearby communities are not exposed to concentrations of hydrogen cyanide gas or cyanide dust in excess of applicable limits for ambient air quality.

Operations should monitor hydrogen cyanide gas and/or cyanide dust emissions, in-plant concentrations and ambient air quality, as necessary to demonstrate that these standards are met. Operations that do not conduct such monitoring should have documentation supporting their determination that these emissions do not pose a health risk to workers and communities.

The auditor can confirm this by observation, interviews and review of records of hydrogen cyanide gas and/or cyanide dust emissions, in-plant concentrations and ambient concentrations. Auditors should also determine and indicate whether the operation's limits are based on the Code's recommendations, applicable laws and/or regulations, or self-imposed standards.

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

## All Operations

The Code does not mandate the frequency of monitoring activities, and the auditor must use professional judgment to evaluate the adequacy of the operation's monitoring frequencies and provide a professional opinion in both the detailed and summary audit reports, regarding the adequacy. 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 depth to groundwater, and the rate of movement.

Discharges to surface water are typically monitored daily, surface water is typically monitored weekly or monthly and ground water is typically monitored monthly or quarterly. Unless the



# PRODUCTION GUIDANCE

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

## Principle 4 | TRAINING

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

### Production Practice 4.1

*Train employees to operate the facility in a manner that minimizes the potential for cyanide exposures and releases.*

1. Does the facility train workers to understand the hazards of cyanide and is refresher training periodically conducted?

#### All Operations

Cyanide production operations should have written training programs or training materials that provide all personnel who may encounter cyanide with training in recognizing the cyanide materials present at the operation, the health effects of cyanide, the symptoms of cyanide exposure, and the procedures to follow in the event of exposure. Periodic refresher training should be provided to ensure employees retain this potentially lifesaving knowledge.

The auditor should review training materials and records and interview employees to verify that cyanide hazards are adequately addressed and potentially exposed personnel receive both initial and periodic refresher training.

2. Does the facility train workers in the use of personal protective equipment and when and where this equipment is required?

#### All Operations

Cyanide production operations should train their workers regarding the proper use of personal protective equipment and the specific personal protective equipment required for various tasks and in different areas of the facility. 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.

Auditors should review the operation's documentation of this training, observe the use of personal protective equipment at the facility and interview employees regarding their training.

3. Does the facility train workers to perform their normal production tasks with minimum risk to worker health and safety and in a manner that prevents unplanned cyanide releases?

#### All Operations

All personnel involved in the production and management of cyanide should be trained to perform their assigned tasks in a safe and environmentally sound manner. Task training need



# PRODUCTION GUIDANCE

not be focused on safety issues or protection of communities and the environment. Rather, task training is intended to instruct 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.

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

4. Are employees trained prior to allowing them to work with cyanide?

## All Operations

Task training should be provided to employees before they are allowed to work with cyanide in an unsupervised manner. This requirement should be specified in a policy or procedural document. Auditors should verify compliance by reviewing training materials and records and interviewing operational and supervisory personnel.

5. Is refresher training on normal production tasks provided to ensure that employees continue to perform their work in a safe and environmentally protective manner?

## All Operations

Refresher training on normal production tasks involving cyanide is one way for an operation to ensure that employees continue to perform their jobs in a safe and environmentally protective manner. Such training should be specific to their assigned tasks and should 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. Are the training elements necessary for each job identified in training materials?

## All Operations

A cyanide production operation's training program should identify the specific cyanide management elements that each employee must be trained in to properly perform the required tasks. Training based on written Standard Operating Procedures should comply with this provision. 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.

Auditors should review training materials and interview workers and trainers to evaluate compliance with this provision.

7. Is training provided by appropriately qualified personnel?



# PRODUCTION GUIDANCE

## All Operations

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.

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

## All Operations

Cyanide production operations should evaluate the effectiveness of their task training. Evaluation techniques include testing of employees at the completion of training and observation of employees performing their tasks after initial training.

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

## Production Practice 4.2

*Train employees to respond to cyanide exposures and releases.*

1. Does the facility train workers in the procedures to be followed if a cyanide exposure or release occurs?

## All Operations

Employees working in areas where cyanide is present should be trained in what to do in the event they observe a cyanide release and/or exposure. Depending on how the operation's response plans are structured, employees may be trained to call for the assistance of a designated Emergency Response Team or to provide cyanide first aid themselves.

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 appropriate training is provided to site personnel. Verification of the implementation of this provision would be through review of the response plan and records of response training, and through interviews with facility personnel.

2. Does the facility train workers to respond to worker exposure to cyanide and to cyanide releases?

## All Operations

Personnel at a production operation should be trained to carry out whatever cyanide exposure and release response actions they are assigned in the operation's emergency response plans. The operation's requirements for employee training, including records of the training that these employees receive, should be included in the operation's training



# PRODUCTION GUIDANCE

program, emergency response plans, training records, or otherwise documented for review by the auditor.

3. Are training records retained throughout an individual's employment documenting the training they have received and 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?

## All Operations

The operation should retain emergency response training records, including the information identified in this question, throughout each worker's employment. Auditors should review this documentation and interview trained personnel to determine compliance with this provision.

## Principle 5 | EMERGENCY RESPONSE

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

### Production Practice 5.1

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

1. Has the facility developed an Emergency Response Plan to address potential releases of cyanide that may occur on site or may otherwise require response?

## All Operations

This question asks only if the operation has plans for responding to a cyanide release emergency. Details of the plan are addressed in subsequent questions. 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 failure scenarios appropriate for its site-specific environmental and operating circumstances, including the following, as applicable?
  - a) Catastrophic release of hydrogen cyanide?
  - b) Releases of solid or liquid cyanide during packaging, storage, loading and unloading operations?
  - c) Releases during fires and explosions?
  - d) Pipe, valve and tank ruptures?
  - e) Power outages and equipment failures?
  - f) Overtopping of ponds, tanks and waste treatment facilities?

## All Operations

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. The



# PRODUCTION GUIDANCE

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.

3. Does the Plan describe:
  - a) Specific response actions, as appropriate for the anticipated emergency situations, such as evacuating site personnel and potentially affected communities from the area of exposure?
  - b) Use of cyanide antidotes and first aid measures for cyanide exposure?
  - c) Control of releases at their source?
  - d) Containment, assessment, mitigation and future prevention of releases?

## All Operations

Emergency response planning documents should address the types of releases and responses that may reasonably be expected to occur at the site and include sufficient details so that personnel know the specific actions they are expected to take in response to the emergency. However, 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, emergency response planning documents should address the types of releases and responses that may reasonably be expected to occur at the facility. 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.

The auditor's evaluation of the Emergency Response Plan and related documents should determine 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.

## Production Practice 5.2

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

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

## All Operations

An operation should involve its own site personnel in the emergency planning process, as they have the best knowledge of the operation and the identified potential release scenarios, available resources, and workable responses. While a site may use a consultant to prepare its response plan or may base its plan on one originally developed for use at another facility, input from or review by site personnel will result in a Plan that better reflects the site-specific circumstances of the operation and results in enhanced protection of workers, communities and the environment.



# PRODUCTION GUIDANCE

Stakeholders including potentially affected communities should also be involved in the emergency planning process to the extent that they may be affected by an emergency or are part of response actions called for in the Plan. Input from these stakeholders is needed to ensure the Plan's effectiveness if, for example, the Plan calls for evacuation of a nearby community.

Input to the emergency planning process may not be well documented. If the plan itself does not state how it was prepared, and there is no written record of stakeholder consultations, the auditor should interview site personnel and off-site stakeholders to determine compliance with this provision.

2. Has the facility 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 what communications and response actions are appropriate?

## Production

An operation should consult with neighboring communities or representatives of those communities 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 an emergency.

In some cases, the operation will also need to advise the community as to what it must do in the event of a release. For example, if the operation has identified a release of hydrogen cyanide gas as a potential emergency scenario, the operation should advise the community of the potential for such a release, the alarm system or procedure that would be used to alert them if the release occurs, and the need to evacuate the community. This consultation could be in the form of coordination with local municipal authorities, open town meetings, briefings for community leaders, or other forms.

This question would not be applicable if the release scenarios identified by the operation do not pose risks to the communities or if there is no community that may potentially be affected.

## Warehouse

A warehouse facility should consult with neighboring communities or representatives of those communities 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 an emergency. This is particularly important if the operation has identified a potential emergency scenario that requires the community to evacuate or otherwise act to protect itself. Community consultation could be in the form of coordination with local municipal authorities, open town meetings, briefings for community leaders, or other forms.

Consultation with local communities is not necessary if the release scenarios identified by the operation do not pose risks to the communities or if there is no community that may potentially be affected.



# PRODUCTION GUIDANCE

3. Has the operation identified external entities having emergency response roles, and involved those entities in the cyanide emergency response planning process?

## All Operations

External entities having a designated role in emergency response should be identified in the Emergency Response Plan. Any designated emergency responders should, at a minimum, have first-hand knowledge of the site and the available resources, and should have been involved in the emergency planning process to provide their input to the specific procedures and activities with which they would be involved, and confirm that they can fulfill their designated roles. Similarly, local police should be involved in the planning process if they are expected to divert traffic away from the scene of the emergency or otherwise assist in the response.

However, no such involvement would be necessary for an external entity that would not be part of the on-site response. For example, a medical facility that would not be part of the actual on-site response but was expected to treat cyanide exposure victims when brought to the facility might not be included in on-site response planning. Similarly, some regulatory agencies might require notification and would respond to an emergency, but have no designated roles. It is also possible that no local response agencies would be involved with a cyanide release or exposure incident at the operation.

If the involvement of local response agencies in the planning process has not been documented, the auditor's finding must be based on interviews with on-site and off-site personnel.

4. Does the operation engage in regular consultation or communication with stakeholders to assure that the Emergency Response Plan addresses current conditions and risks?

## All Operations

Continuing consultation with stakeholders regarding emergency response may be necessary in some cases. The frequency and nature of this consultation will depend on the nature of the Emergency Response Plan, operational changes, and the involvement of stakeholders such as external responders and communities.

Periodic dialogue with stakeholders would be appropriate when they have specific responsibilities under the Plan, such as emergency responders, or the operation's response actions are dependent on the actions of these responders. It is possible that no continuing consultation would be needed if the Plan does not designate any responsibilities to stakeholders, such as external 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 records are available, the auditor's finding must be based on interviews with on-site and off-site personnel.



# PRODUCTION GUIDANCE

## Production Practice 5.3

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

1. Does the Emergency Response Plan:
  - a) Designate primary and alternate emergency response coordinators with 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 all emergency response equipment that should be available?
  - g) Include procedures to inspect emergency response equipment and assure its availability when required?
  - h) Describe the role of any external responders, medical facilities, communities, or other entities having designated roles in emergency response procedures?

### All Operations

The Emergency Response Plan should address each of the items identified in this question with respect to response to a cyanide release or exposure. 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. Auditors also should confirm that these provisions are being implemented at the site through inspection of the operation and employee interviews.

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

### All Operations

External responders should be made aware of the roles designated to them in the Emergency Response Plan and should be part of any mock response drills that simulate a cyanide release or exposure 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 drills.



# PRODUCTION GUIDANCE

## Production Practice 5.4

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

1. Does the Emergency Response Plan include procedures and contact information for notifying management, regulatory agencies, external response providers and medical facilities of the emergency, as appropriate?

### All Operations

Company management and government agencies regulating worker safety and environmental protection should be notified in the event of a cyanide emergency. Procedures and contact information for notifying outside entities that may play a role in the response, such as police, firefighters and medical facilities, also should be included in the Plan.

It also should be noted that a cyanide emergency that constitutes a “significant cyanide incident”, as defined in the Code’s *Definitions and Acronyms*, requires notification to the International Cyanide Management Institute pursuant to Section V.A. of the Code’s *Signatory and Certification Process*. Auditors should note whether any such events occurred, and if so, whether ICMI was notified.

The auditor should review the Emergency Response Plan and/or other pertinent documentation to verify that this information is available and up to date.

2. Does the Plan include procedures and contact information for notifying potentially affected communities of the incident and/or response measures and for communication with the media?

### All Operations

The operation’s response planning documents should include procedures and contact information for notifying any communities that may be affected by a cyanide emergency. Contact information for local media should also be included. The necessary information should be available for the auditor’s review in the Emergency Response Plan or other documentation.

3. Does the operation have a written procedure for notifying ICMI of any significant cyanide incidents, as defined in ICMI’s *Definitions and Acronyms* document? Have all such significant cyanide incidents that have occurred been reported to ICMI?

### All Operations

The Emergency Response Plan or other documentation should include a requirement and details to notify ICMI of any significant cyanide incidents, as defined in ICMI’s *Definitions and Acronyms* document, and as required in ICMI’s Signatory Application Form. Operations should have evidence that ICMI has been notified when such incidents have occurred. Any incidents meeting the definition for significant cyanide incidents that have not been reported should be reported to ICMI prior to submission of the draft audit reports to ICMI.



# PRODUCTION GUIDANCE

## Production Practice 5.5

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

1. Does the Emergency Response Plan describe specific, appropriate remediation measures, 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, as appropriate?

### All Operations

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 released cyanide 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.

Where an operation relies on contracted external entities, such as firms specializing in emergency response, or management of hazardous material and hazardous wastes, auditors should ensure that the procedures of the contracted entity include language that address decontamination, management, and disposal of cyanide-contaminated materials, including the ultimate destination of any disposed material.

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 or that could reasonably be expected to enter surface water?

### All Operations

The two major chemical treatment methods used to remediate cyanide in the environment are oxidation (using chemicals such as sodium hypochlorite and hydrogen peroxide or biological treatment) and complexation (using ferrous sulfate). Although both can be effective in reducing the impacts of cyanide released onto the land, it must be recognized



# PRODUCTION GUIDANCE

that there are no safe and effective options to treat cyanide once it has entered natural surface waters such as streams and lakes.

Sodium hypochlorite and ferrous sulfate must never be used to treat cyanide that has been released into natural surface water bodies. Both of these chemicals are toxic to aquatic life. Treatment with sodium hypochlorite can produce cyanogen chloride (CICN), which is hazardous to humans and aquatic life. Moreover, these chemicals have very limited effectiveness in treating cyanide at the pH of natural surface waters. Their utility is further reduced by the practical difficulty of adding them to surface water in a manner that allows for adequate contact and mixing with a cyanide plume, especially in a flowing stream or river. Although hydrogen peroxide is a less toxic and persistent oxidant than sodium hypochlorite, it is also harmful to aquatic life and its effectiveness is similarly limited by the lack of a means to mix it with the cyanide.

This prohibition on the use of treatment chemicals in surface water 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 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.

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

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

Where an operation relies on an external entity for, such as a spill response company, for emergency response or remediation, the auditor should ensure that the contracted entity has a copy of the operation's procedure prohibiting use of these chemicals on surface waters, or has this prohibition in its own procedures.

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



# PRODUCTION GUIDANCE

## All Operations

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.

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 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.

## Production Practice 5.6

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

1. Does the Emergency Response Plan include provisions for reviewing and evaluating its adequacy on an established frequency?

## All Operations

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 the Plan is implemented. 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 dated update to the Emergency Response Plan and a copy of the Plan before the revision. It may be necessary to verify the implementation of the review through interviews with site personnel.

2. Are mock emergency drills conducted periodically to evaluate the operation's plans, training, resources, and preparedness for response to cyanide releases and to cyanide exposures of workers?

## All Operations

Mock emergency drills are invaluable for testing and evaluating an operation's response procedures for cyanide releases and exposures and testing and evaluating the training provided to response personnel, and should be included in the operation's response plans. The Code does not specify a frequency, but annual drills are recommended. 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, the frequency of specific drills for cyanide emergencies should be sufficient to evaluate the operation's plans, training,



# PRODUCTION GUIDANCE

resources, and preparedness for a response to cyanide releases and to cyanide exposures of workers.

The specific nature of the simulated event, (e.g., a release of cyanide solution from a process or storage tank, a spill of solid cyanide during loading of a truck), is up to the operation. At least one drill during an operation's three-year audit cycle should simulate the entire emergency response process. For example, a mock drill limited to response to a cyanide spill may be valuable from a response and remediation perspective, but it does not evaluate the full response procedure that would be followed if such a spill were accompanied by cyanide exposure to a worker at the spill location, such as might occur during the loading of liquid cyanide.

The operation should document the emergency scenario, the personnel involved, and the response actions taken, and should evaluate the drill to determine how well its procedures worked and the adequacy of the training provided to response personnel. The operation should revise its plans for response to cyanide releases and worker exposures and for training of response personnel based on the lessons learned from these emergency simulations.

The auditor should review the operation's documentation of its mock emergency drills to evaluate compliance with this provision.

3. Are there provisions to evaluate the Plan and revise as necessary after any emergency that required its implementation, and have such reviews been conducted?

## All Operations

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 dated update to the Emergency Response Plan and 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. The auditor should indicate whether the operation conducted any such reviews following any actual cyanide emergencies that occurred during the audit period.

