



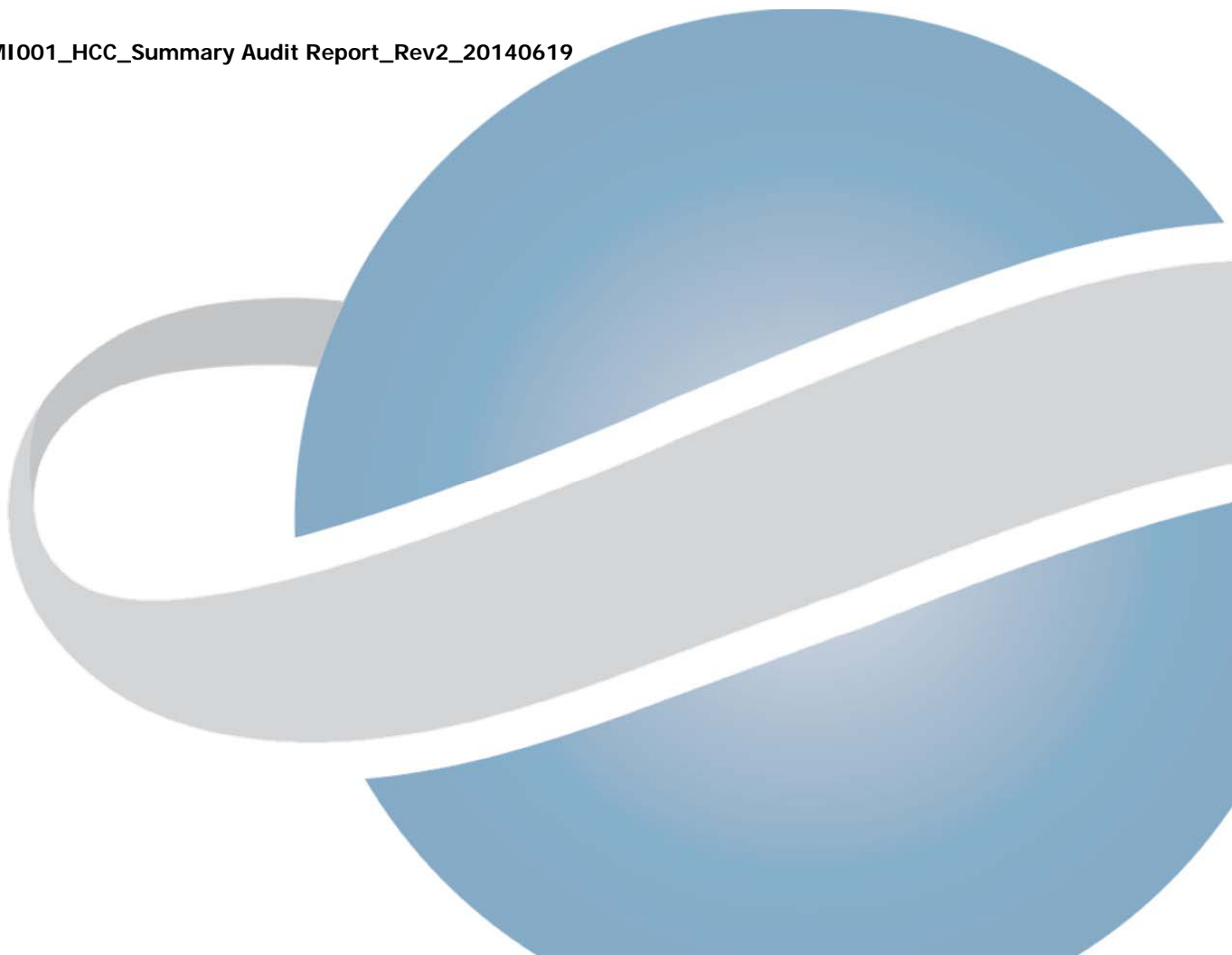
## **HINDUSTHAN CHEMICALS COMPANY**

Certification Audit: International Cyanide Management Code -  
Production Verification Protocol

Summary Audit Findings Report

18-19 February 2014

**RMI001\_HCC\_Summary Audit Report\_Rev2\_20140619**



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## SUMMARY AUDIT REPORT

Facility: Hindusthan Chemicals Company  
Facility Owner and Operator: Hindusthan Engineering and Industries Ltd.  
Responsible Manager: Mr A.K. Singh  
President- Plant  
aks@hcc-cyanides.com  
Address: GIDC Industrial Estate, Olpad-394 540  
State/Province: Dist. Surat, Gujarat India  
Telephone: 02621 221681-2-3 (3 lines) Fax: 02621 324222  
Email: [hccolp@sify.co](mailto:hccolp@sify.co)  
aks@hcc-cyanides.com

### LOCATION DETAIL AND DESCRIPTION OF OPERATION

Hindusthan Chemicals Company - HCC (formerly known as Cyanides & Chemicals Company) is a unit of Hindusthan Engineering & Industries Ltd. HCC cyanide production facility is located at the GIDC Industrial Estate of Olpad, 20 km from Surat city in Gujarat Province of India. Manufacturing activities commenced at the HCC production facility in 1982 with the manufacture of hydrogen cyanide to produce solid sodium cyanide and potassium cyanide tablets for gold mining. Subsequently, through research and development efforts, HCC added additional non-mining related cyanide products including: sodium ferrocyanide, potassium ferrocyanide, diphenyl guanidine, sodium dicyanamide and mandelonitrile. The site has approximately 230 employees and has gained third party accreditation to ISO 9001:2008 Quality Management Certifications. The company produces solid cyanide products (Main production is sodium cyanide and a minor proportion is potassium cyanide).

### AUDITOR'S FINDING

This operation is:

- in full compliance  
 in substantial compliance

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Hindusthan Chemicals Company



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not in compliance

with the International Cyanide Management Code Production Facility Verification Protocol.

### **Audit Company**

Sustainability Pty Ltd  
Suite 3, 118 Flora Terrace  
North Beach, WA, 6020  
AUSTRALIA

Telephone: +61 8 9246 6666  
Facsimile: +61 8 9246 6660  
[www.sustainability.net.au](http://www.sustainability.net.au)

### **Audit Team Leader**

John Miragliotta ([john.miragliotta@sustainability.net.au](mailto:john.miragliotta@sustainability.net.au))

### **Names and Signatures of Other Auditors**



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Dr William Danaher  
31 March 2014

### **Date(s) of Audit**

Inclusive of the period from 18-19 February 2014.

I attest that I meet the criteria for knowledge, experience and conflict of interest for Code Verification Audit Team Leader, established by the International Cyanide Management Institute and that all members of the audit team meet the applicable criteria established by the International Cyanide Management Institute for Code Verification Auditors.

I attest that this Summary Audit Report accurately describes the findings of the verification audit. I further attest that the verification audit was conducted in a professional manner in accordance with the International Cyanide Management Code Verification Protocol for Production Facilities and using standard and accepted practices for health, safety and environmental audits.

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**SUSTAINABILITY**  
FUTURE GROWTH



**Risk Management Intercontinental P/L**

Hindusthan Chemicals Company  
Name of Facility

Signature of Lead Auditor

31 March 2014  
Date

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## 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.

in full compliance with

The operation is  in substantial compliance with Production Practice 1.1

not in compliance with

#### **Summarize the basis for this Finding/Deficiencies Identified:**

HCC is in FULL COMPLIANCE with Production Practice 1.1, requiring the operation to design and construct cyanide production facilities consistent with sound, accepted engineering practices and quality control/quality assurance procedures. Records of the original construction and design documentation have been maintained at the HCC production facility which include quality assurance and controls processes completed during construction. Engineering records from construction include verification, by a suitable qualified engineer, of completion of construction in accordance with design standards. Commissioning records from the original construction and for subsequent modifications to plant at HCC include results of quality assurance tests. Interlocks and Alarms are provided in the HCN Plant and the NaCN Plant. These include alarms, and level indications to prevent overfilling of vessels. The HCC plant has been constructed within an engineered low permeability and corrosion resistant secondary containment structure designed to contain seepage and spillage from cyanide production activities. The secondary containment system is designed to contain the volume of the largest storage vessel with additional allowance for containment of a design rainfall event. The majority of pipe work is continuously welded and is also under vacuum and located within the secondary containment area of the plant. Where pipe joins occur, flange guards have been installed. Where cyanide piping crosses roads it is double sleeved. The outside sleeve contains brine solution at higher pressure than cyanide. Therefore any failure of the internal piping will lead to brine ingress and not release of cyanide solution.

## Production Practice 1.2

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

in full compliance with

The operation is  in substantial compliance with Production Practice 1.2

not in compliance with

HCC is in FULL COMPLIANCE with Production Practice 1.2, requiring the operation to develop and implement plans and procedures to operate cyanide production facilities in a manner that prevents accidental releases. These documents include manuals, procedures, plans and work instructions for safety and environment management controls of identified significant risks. HCC has a "Contingency Cyanide Management Plan" which addresses spills, fire and toxic gas releases. Standard Operating Procedures also include abnormal operations, shut-down and emergency shut-down and the consideration of worker safety and environmental protection measures. A Management of Change Procedure is implemented at the HCC plant and it is documented. A preventative maintenance programme is in place and is implemented. HCC has created Work Instructions for mechanical and electrical maintenance that include lists of equipment items and specify the required frequency of maintenance. There is then another set of Work Instructions that specify how maintenance activities are to be undertaken. Various process parameters are monitored throughout the production facility to ensure operation within the design parameters including pressure, temperature, flow and vessel levels. Calibration procedures are in place for all monitoring instruments and calibration records are maintained. HCC has procedures in place for collection of cyanide containing liquids from secondary containment and reuse of this material through the Effluent Treatment Plant. Procedures are in place and implemented for the collection of solid cyanide containing wastes and recycling of this material through the cyanide production facility or disposal to approved external waste treatment facilities. The solid cyanide product storage warehouse is a secure, ventilated and weatherproof designated cyanide storage area with no other chemicals stored in proximity. Packaging material and labelling is certified to relevant dangerous goods codes and has the required markings placed on the containers.

### Production Practice 1.3

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

in full compliance with

The operation is  in substantial compliance with Production Practice 1.3

not in compliance with

HCC is in FULL COMPLIANCE with Production Practice 1.3, requiring the operation to inspect cyanide production facilities to ensure their integrity and prevent accidental releases. Routine inspections are carried out throughout the HCC cyanide production facility including vessels, pipes, secondary containment, valves and pumps. Inspection frequencies are specified in accordance with the maintenance plans for specific equipment and are completed by adequately trained personnel in accordance with inspection procedures. The plant has developed and refined inspection frequencies based on 30 years of operation experience; external hazard assessments; regulatory requirements and project design recommendations. Inspection records are maintained and corrective actions and work orders are documented where identified from inspections.



## PRINCIPLE 2 – WORKER SAFETY

Protect workers' health and safety from exposure to cyanide.

### Production Practice 2.1

Develop and implement procedures to protect plant personnel from exposure to cyanide.

in full compliance with

The operation is  in substantial compliance with Production Practice 2.1

not in compliance with

HCC is in FULL COMPLIANCE with Production Practice 2.1, requiring the operation to develop and implement procedures to protect plant personnel from exposure to cyanide. Work instructions and manuals which include health and safety controls exist for all sections of the plant. The Safety Manual addresses the requirements for Personal Protective Equipment (PPE) and protective clothing and specified safety controls for normal operations, non-routine, emergency and maintenance activities. A safety booklet for all employees and contractors has been provided which includes key safety rules. The HCC Safety Manual, worker/visitor inductions and signage prohibit personnel from smoking, eating and drinking, and having open flames in areas where there is the potential for cyanide contamination. A PPE Matrix has also been developed which defines the requirements for each specific work area. The HCC Permit to Work System provides controls to ensure safety and health measures are identified prior to undertaking any potentially hazardous tasks, including routine operations, non-routine, emergency and maintenance related activities. A Safety Permit issued by the Safety Department is required for a more specific list of jobs including any work that may result in cyanide exposure. A Management of Change Procedure has been implemented and is documented. This addresses any physical or procedural process control changes in the plant and addresses the need to revise procedures, work instructions and manuals and, training materials where necessary to ensure that worker health and safety considerations have been addressed through the change process. Workers provide input to procedures through representation on the HCC Workman Safety Committee and the Central Safety Committee forums.

The cyanide production facility has fixed HCN monitors and workers are required to use personal monitors in production areas to warn of unsafe HCN gas levels. Dust monitoring is undertaken on a routine basis in the packaging area to ensure controls are adequate to prevent unsafe exposure to cyanide dust. Fixed and portable HCN gas monitors are calibrated, inspected and maintained by the supplier on a 6 monthly rotation in accordance with manufacturer recommendations. A "buddy system" is required when working, including maintenance work, in the cyanide production areas. . Emergency buttons are available in the plant in order to raise an alarm situation and a communication system also exists in the plant to allow direct communication with the control room. Pre-employment medicals are undertaken by HCC for all personnel working in the cyanide production areas and annual medical check-ups are provided to ensure continues fitness for work. HCC requires that all cyanide plant workers, including maintenance workers and contractors, wear plant specific clothing which is laundered onsite subsequent to use and before next use. Visitors entering the plant for a short period of time are required to wear protective clothing and are provided with relevant PPE including mask and gloves. Various warning signs are available within the plant requiring specific PPE requirements relative to that work area. Signage is available in English and Hindi language.

### Production Practice 2.2

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

The operation is  in full compliance with  
 in substantial compliance with      Production Practice 2.2  
 not in compliance with

HCC is in FULL COMPLIANCE with Production Practice 2.2, requiring the operation to develop and implement plans and procedures for rapid and effective response to cyanide exposure. HCC has developed an Emergency Response Plan to cover all major scenarios, including cyanide release, ammonia release, major fire, and chemical spill. The site has also developed a Contingency Plan which deals directly with cyanide related events and provides specific guidance for response. Eye wash stations, safety showers and dry chemical fire extinguishers are provided throughout the plant and storage warehouse and these are routinely inspected. Drinking water is available in the cyanide control room and medical centre. A fire water deluge system is in place for the facility. Oxygen reviver bottles and cyanide antidote kits are available in the HCC medical centre adjacent to the cyanide plant. The medical centre is attended to by dedicated medical staff at all times. The HCC Emergency Plan and the Contingency Plan provide for the transport of persons in case of medical incidents by HCC ambulance to nearby hospitals where arrangements have been made to ensure medical staff are familiar with cyanide response measures and can attend to emergency situations quickly.

An emergency notification and communication system exists on the plant which includes a system that requires personnel entering the HCN plant to notify the control room before entering. Alarms are placed at all work locations within the cyanide production plant so that workers can raise an alarm in case of emergency. Copies of Material Safety Data Sheets are available in the Emergency Plan and Contingency Plan documents. These are provided in English and local language. All cyanide process and storage tanks are labelled to identify contents. Cyanide solution pipelines are colour coded to identify contents and direction of flow. HCC has prescribed protective clothing requirements that cover all persons entering the plant. Those persons who work in the cyanide plant are required to wear plant specific clothing which is laundered subsequent to use and before next use. Visitors entering the plant for a short period of time are required to wear protective clothing and are provided with relevant PPE including mask and gloves. HCC arrange for mock emergency drills at the chemicals plant at least twice per year. Some of these relate to cyanide incidents and one major exercise involved external response provider participation. The HCC Safety Manual has been prepared and includes Incident Reporting procedures.

Incident Reports dating from 2012 and 2011 were sighted. The incident reporting procedures require incident investigations to be undertaken for significant incidents, which would include a cyanide exposure incident. The incident investigations must include root cause identification and corrective actions.

## 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.

in full compliance with

The operation is  in substantial compliance with Production Practice 3.1

not in compliance with

HCC is in FULL COMPLIANCE with Production Practice 3.1, requiring the operation to conduct environmental monitoring to confirm that planned or unplanned releases of cyanide do not result in adverse impacts. The facility discharges treated waste water from the Effluent Treatment Plant (ETP) to a surface water channel via a series of staged and controlled holding ponds. The ETP batch treats approximately 200m<sup>3</sup> per day from the HCC plant, which includes effluent from the cyanide production facility. The treated effluent is discharged to a surface drainage channel from the final treated effluent pond. Discharged effluent from the ETP is limited to a maximum of 0.2 ppm Total CN and there is no record of effluent discharge in excess of 0.16 ppm Total CN. The monitoring point established downstream of the established mixing zone is at the point where the site effluent/storm water discharge channel downstream of the final effluent pond intersects the natural surface water creek (the Masma Khadi) which flows outside the HCC site. This statutory monitoring point is established by the Gujarat Pollution Control Board who issues the HCC Effluent Discharge License. The monitoring results for the compliance monitoring point in the Masma Khadi indicates no results that have exceeded the HCC laboratory limit of detection of 0.01 ppm Total Cyanide. An indirect discharge to surface water occurs via storm water during the wet season. The storm water is managed via the same pond system which receives treated effluent from the ETP and is monitored at the final pond and at the point where the HCC surface discharge channel enters the Masma Khadi natural surface water system outside the HCC boundary. Daily monitoring undertaken by HCC at the Masma Khadi monitoring point has not identified any result in excess of the 0.01 ppm Total CN detection limit. Sampling is undertaken for each batch discharge from the ETP and daily at the natural surface water creek. Validation sampling and analysis is completed monthly by an external laboratory and on an ad hoc basis by the government regulator.

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Three groundwater wells located outside the perimeter of the facility are monitored by HCC on a monthly basis by an external laboratory since October 2013 and no cyanide has been detected from analysed results.

The HCC statutory limits for HCN gas from the incinerator gas emissions are 30mg/Nm<sup>3</sup>. Monitoring of incinerator emission by external laboratory indicates emission < 1 mg/Nm<sup>3</sup>.

The monitoring frequency is considered sufficient considering the batch discharge controls and in consideration of the historic record of results. Monthly monitoring of air emissions from the gas incinerator and monthly sampling of groundwater at nearby wells is sufficient frequency in consideration of historic and recent results.

## 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 plant in a manner that minimises the potential for cyanide exposures and releases.

in full compliance with

The operation is  in substantial compliance with Production Practice 4.1

not in compliance with

HCC is in FULL COMPLIANCE with Production Practice 4.1, requiring the operation to train employees to operate the plant in a manner that minimises the potential for cyanide exposures and releases. HCC has trained all personnel who undertake work on the site on the recognition of cyanide hazards and the necessary measures to protect human health and the environment from cyanide release and exposure, including first aid measures and protective clothing/equipment. These inductions are required to be complete before any work is undertaken onsite. Emergency response actions to alarms and evacuation requirements are provided for all personnel entering the site. Detailed safety inductions include specific measures to protect human health and the environment from cyanide release and exposure for those personnel that undertake work in and around the cyanide facilities. Operator training is provided in accordance with a needs analysis and scheduled in a training plan. The training includes use of appropriate PPE and emergency response equipment. All HCC training includes assessment of competency to verify effectiveness of the training either through written assessment or task observation. Refresher training is provided on an annual basis for all workers in cyanide production and packaging. Training is based on work instructions and manuals and is provided by highly experienced operational employees of HCC. Training records are documented and retained for all personal, including contractors and visitor inductions.

### Production Practice 4.2

Train employees to respond to cyanide exposures and releases.

in full compliance with

The operation is  in substantial compliance with Production Practice 4.2  
 not in compliance with

HCC is in FULL COMPLIANCE with Production Practice 4.2, requiring the operation to train employees to respond to cyanide exposures and releases. All personnel working in or around cyanide facilities are trained in the response to emergency cyanide release incidents in accordance with the planned response detailed in the Onsite Emergency Plan. Operators in the cyanide production area are trained annually for response to small spills inside the containment area through the procedure training. Emergency Response Training is provided to the HCC Fire Fighting and Rescue Team. There are 17 members of this team who are trained as first response to plant wide emergency incidents. The trained emergency response personnel include operators drawn from each operational area of the plant. The emergency response personnel have a dedicated training matrix which identifies all the training needs. Training of emergency response personnel includes emergency scenario training via desktop mock drill exercises and routine practical mock drills. Emergency training and mock drill exercises are evaluated and documented with improvement actions. Training records are maintained for all emergency response personnel and workers who undertake emergency response training.

## 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.

in full compliance with

The operation is  in substantial compliance with Production Practice 5.1

not in compliance with

HCC is in FULL COMPLIANCE with Production Practice 5.1, requiring the operation to prepare detailed emergency response plans for potential cyanide releases. The emergency response plans for the HCC cyanide production facilities are contained within the Emergency Response Plan and the Contingency Plan. The Emergency response plan is an overarching emergency plan for all emergencies that may occur at the premises, which includes, but is not limited to cyanide release incidents. This plan addresses both onsite and offsite events and covers all identified emergency scenarios. The plan includes responsibilities, emergency equipment lists, emergency telephone contacts, the use of cyanide antidote kits and importantly provides the ability to escalate an onsite emergency into an offsite emergency. The Emergency Response Plan is required by regulation and is also required to be updated annually. The Emergency Plan details the response actions for community notification, evacuation and engagement of external response providers. The Contingency Plan provides a more detailed emergency planning framework for specific response to release scenarios relevant to the HCN and NaCN plants. The Contingency Plan includes lists of preventative controls and also actions to be undertaken in response to a range of different scenarios including HCN gas release, liquid and solid cyanide spills.

### Production Practice 5.2

Involve site personnel and stakeholders in the planning process.

in full compliance with

The operation is  in substantial compliance with Production Practice 5.2

not in compliance with

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HCC is in FULL COMPLIANCE with Production Practice 5.2, requiring the operation to involve site personnel and stakeholders in the emergency response planning process. The Emergency Response Plan and the Contingency Plan are reviewed on an annual basis by HCC with input from the HCC employees. Employee input occurs through the emergency drill debrief meetings which allow workers participating in drills to make recommendations for plan improvements. Potentially affected communities are consulted on the HCC emergency planning process through various emergency planning engagement forums which include the District Crisis Group. A full practical Emergency mock drill involving various offsite agencies and communities is scheduled to occur every five years at the discretion of the District Magistrate. The outcomes from the full emergency drill include liaison with all participants to define emergency planning improvements and corrective actions. HCC has provided a community awareness booklet in two languages for local communities which outlines the nature of hazards posed by emergency scenarios at the HCC plant. The facility has engaged with nearby hospitals for response to medical emergencies at HCC and includes training of medical staff on response to cyanide exposure. The HCC operation does not rely on external medical services to treat cyanide cases. The expertise and antidotes are available onsite and external providers would only be used to respond to other aspects of emergencies, e.g. injuries through falls, fire, etc. or where the HCC medical treatment capacity is exceeded.

### Production Practice 5.3

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

in full compliance with

The operation is  in substantial compliance with Production Practice 5.3

not in compliance with

HCC is in FULL COMPLIANCE with Production Practice 5.3, requiring the operation to designate appropriate personnel and commit necessary equipment and resources for emergency response. The Emergency Response Plan designates primary and alternate Emergency Response Coordinators and assembly locations. The Plan also addresses Emergency Response Teams and the minimum resources and training required for each team. The Plan includes contact numbers for internal and external responders. The majority of HCC staff live in an accommodation building a short distance from the plant and therefore are able to be contacted easily and mobilised quickly. The Plan addresses specific duties and responsibilities of coordinators and team members. Suitable Emergency Response Equipment is available at HCC and is routinely inspected and maintained. The role of external emergency responders is included in the Emergency Response Plan. These response organisations are represented on the District Crisis Group which meets as required to review emergency planning. HCC has arrangements with local hospitals which outline what medical services may be required by HCC in case of emergency.

#### **Production Practice 5.4**

Develop procedures for internal and external emergency notification and reporting.

in full compliance with

The operation is  in substantial compliance with Production Practice 5.4

not in compliance with

HCC is in FULL COMPLIANCE with Production Practice 5.4, requiring the operation to develop procedures for internal and external emergency notification and reporting. The HCC Emergency Response Plan includes the processes for declaring an emergency and internal and external notifications required. The Plan prescribes: the various authorities and regulators required to be reported in the event of an emergency; communications with potentially affected communities; liaison with external response providers; public relations; and, the communication protocols required for offsite evacuations.

#### **Production Practice 5.5**

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

in full compliance with

The operation is  in substantial compliance with Production Practice 5.5

not in compliance with

HCC is in FULL COMPLIANCE with Production Practice 5.5, requiring the operation to incorporate into response plans and remediation measures monitoring elements that account for the additional hazards of using cyanide treatment chemicals. The Emergency Response Plan includes a description of potentially hazardous wastes from emergency scenarios and clean-up/decontamination and the appropriate handling, treatment and disposal of these wastes. Post emergency activities are described including removal of contamination, disposal to appropriate approved facilities; use of decontamination chemicals, monitoring requirements/methods and provision of alternative drinking water where necessary. The emergency plan includes a general prohibition on the use of chemicals such as hydrogen peroxide, ferrous sulphate or sodium hypochlorite for the removal of cyanide in or near surface waters.

### **Production Practice 5.6**

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

in full compliance with

The operation is  in substantial compliance with Production Practice 5.6

not in compliance with

HCC is in FULL COMPLIANCE with Production Practice 5.6, requiring the operation to periodically evaluate response procedures and capabilities and revise them as needed. The HCC Emergency Response Plan is reviewed annually in accordance with regulatory requirements. The facility carries out onsite emergency mock drills on a routine basis to test the adequacy of response readiness and resources. Offsite drills which include participation of local communities and external responders are planned on a five year cycle in liaison with local authorities. The facility undertakes a review of outcomes from emergency drills and following emergency incidents to identify improvements and implement corrective actions as required.