



Government of **Western Australia**
Department of Mines, Industry Regulation and Safety
Resources Safety

Gold room audit – guide

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Introduction

This document was reviewed and updated in September 2016 after it was reformatted in November 2015. In November 2015 no material changes were made to the content of the guide, which was originally published in February 2008 under the title *Guide to gold room HIF audit 2008*.

Note: The Safety Regulation System (SRS) has replaced the AXTAT system and all reporting is done online through SRS.

This audit is designed to cover the standards related to management of the risks and hazards many gold room operators are exposed to. Then changes made to this audit were made since many gold room operators are also responsible for the operation of the elution columns, acid wash columns, elution heater and carbon regeneration kiln.

Note for Section 1 of the audit: The hazard and risk assessment can be done after SWP's have been completed which ensures that significant task risks are incorporated. The hazard and risk assessment for the gold room may be incorporated into that for processing but it should be possible to separate them. Hazards and risks associated with acid wash, elution and carbon regeneration should also be included.

Note for Section 5 of the audit: Many operations are now providing locked gates to tailings screen and tailings hopper accesses where high cyanide gas levels are a potential issue. Supervisors hold the gate keys and are aware of anyone gaining access. Permanent cyanide gas monitors help but are not a definitive solution.

Note for Section 8 of the audit: The need for specific biological monitoring can be determined in the Risk Based Hygiene Management Plan (RBHMP) or through dust and gas sampling done during operation or as specific needs are identified from feed or gravity samples or geological advice.

Note: Where, in the intent, the word "verify" is used, this means that it is a regulatory requirement, which is mandatory and has to be complied with. Where, in the intent, the word "ensure" is used, it is not a mandatory requirement, but it does set out a recommended safe method that, if followed, should minimise the potential for an adverse incident to take place.

1 Risk assessment and work procedures

The hazard and risk assessment can be done after SWP's have been completed which ensures that significant task risks are incorporated. The hazard and risk assessment for the gold room may be incorporated into that for processing but it should be possible to separate them. Hazards and risks associated with acid wash, elution and carbon regeneration should also be included.

Point	Standard	Guideline
1.1	A hazard and risk assessment has been undertaken of the gold room operations. This includes acid wash, elution and carbon regeneration.	<p>Intent: To ensure that all the activities carried out in the gold room have been subject to a risk analysis.</p> <p>Personnel: Process manager, senior metallurgist.</p> <p>Method: View the risk assessment documentation.</p>
1.2	Appropriate measures have been implemented as a result of that assessment.	<p>Intent: To ensure that the hazards, and the consequent risks identified, are being managed by applying the appropriate hierarchy of control.</p> <p>Personnel: Process manager, senior metallurgist.</p> <p>Method: View the risk assessment documentation and inspect the gold room.</p>
1.3	Written safe work procedures (SWP) are available for the gold room operations. It is possible to prepare the SWP's with hazards and controls then work back to the risk register/assessment.	<p>Intent: To ensure that procedures have been developed for conducting activities in the gold room safely. The procedures must include all areas of the gold room operators' responsibility which may include acid wash, elution and carbon regeneration.</p> <p>Personnel: Process manager, senior metallurgist.</p> <p>Method: View the safe work procedure documentation</p>
1.4	Those procedures include safety information relating to the hazards identified in the risk assessment.	<p>Intent: To ensure that the gold room safe work procedures include information on the identified hazards.</p> <p>Personnel: Process manager, senior metallurgist.</p> <p>Method: View the safe work procedure documentation.</p>

2 Hazardous substance management

Hazardous substance management

Point	Standard	Guideline
2.1	<p>During induction all employees are informed of the potential risk of exposure to those hazardous substances used, or produced, in and around the gold room.</p> <p>A Gold Room Induction should include information on chemicals or gases such as cyanide solutions, cyanide gas, ammonia gas, sodium hydroxide, hydrochloric acid, lime, oxygen, lead nitrate and any others used or produced.</p>	<p>Intent:</p> <p>To ensure that gold mine employees are advised as to the presence of any hazardous substances at the mine.</p> <p>Personnel:</p> <p>Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method:</p> <p>View induction documentation. Interview employees.</p>
2.2	<p>Specific training is provided to gold room employees on the hazards of the chemicals used in gold room work, including the applicable precautionary measures, such as safe handling procedures and the use of personal protective equipment. Refer to those substances noted in 2.1 above.</p>	<p>Intent:</p> <p>To ensure that gold room employees are specifically trained to use hazardous substances safely.</p> <p>Personnel:</p> <p>Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method:</p> <p>View training documentation. Interview gold room employees.</p>
2.3	<p>Material safety data sheets (MSDS) are readily available for all the various fluxes, acids, cyanide, caustic and by-products (e.g. ammonia and cyanide gas) which are encountered in the gold room. See the suggested list in 2.1 above.</p>	<p>Intent:</p> <p>To ensure that all the requisite safety information is readily available to the gold room employees.</p> <p>Personnel:</p> <p>Senior metallurgist.</p> <p>Method:</p> <p>View the MSDS information.</p>
2.4	<p>Employees are advised as to the location and availability of the MSDS information for substances encountered by Gold Room operators.</p>	<p>Intent:</p> <p>To ensure that the employees know how to access the required MSDS information.</p> <p>Personnel:</p> <p>Gold room personnel.</p> <p>Method:</p> <p>Interview personnel.</p>

2.5	There is a mechanism for the regular updating of the MSDS register used by the Gold Room operators.	<p>Intent: To ensure that the MSDS information is current.</p> <p>Personnel: Senior metallurgist, stores personnel.</p> <p>Method: Randomly check the MSDS data base against the chemicals in the gold room. Interview personnel.</p>
2.6	Hazardous substances are appropriately stored.	<p>Intent: To ensure that hazardous substances are stored safely.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method: Inspect hazardous substance storage.</p>
2.7	Where hazardous substances are used in enclosed systems, such as tanks and pipes, there is legible signage to indicate the presence of the hazardous substance.	<p>Intent: To ensure that pipes and tanks containing hazardous substances are clearly identified as to the contents.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method: Inspect any such installation for clear, legible signs.</p>
2.8	Other hazardous substances and reagents (e.g. fluxes, acids, etc.) are appropriately packaged and labelled.	<p>Intent: To ensure that hazardous substances are safe to handle and are identified.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method: Inspect hazardous substance storage.</p>
2.9	New chemicals are assessed from a safety and health perspective before they are introduced to the gold room. Site must have a document that is signed off by applicable department managers that details why the new chemical is needed and whether or not there is an increased or changed risk to employees beyond what is presently used. MSDS sheets for the new chemical must also be attached.	<p>Intent: To ensure that any new chemicals are fully investigated and evaluated for safety prior to use.</p> <p>Personnel: Senior metallurgist, stores personnel.</p> <p>Method: Interview personnel about the procedures for introducing new chemicals.</p>

2.10	Records are available of accidents / incidents which have occurred in the gold room, particularly those relating to hazardous substances or process safety.	<p>Intent: To verify compliance with legislated accident/incident recording requirements.</p> <p>Personnel: Gold room employees, OHS Representative, senior metallurgist, Training Representative.</p> <p>Method: Interview personnel and view records. Refer MSIA Part 7, Division 2 – Accidents and occurrences</p>
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3 Ventilation

Ventilation

Point	Standard	Guideline
3.1	There is effective ventilation of the gold room.	<p>Intent:</p> <p>To ensure that adequate ventilation is provided in the gold room. Adequacy of design is to be verified by regular air quality monitoring by a competent person. A first impression can be obtained on entry to the gold room by the presence or absence of ammonia should all equipment be operating. This can be followed up on the electrowinning cell floor.</p> <p>Personnel:</p> <p>Senior metallurgist, ventilation officer</p> <p>Method:</p> <p>Inspect the gold room ventilation system. Various methods could be utilised here such as: air conditioning, natural ventilation, exhaust fans (wall or roof mounted), local exhaust ventilation e.g. on electrowinning cells or where material is acid treated.</p>
3.2	There are warning alarms for the presence of hazardous gases e.g. ammonia, hydrogen cyanide.	<p>Intent:</p> <p>To ensure that the presence of a hazardous gas is immediately made known. Monotox type units are acceptable providing they are worn by the operators or placed at strategic locations within the gold room and are calibrated regularly.</p> <p>Personnel:</p> <p>Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method:</p> <p>Inspect the gold room and interview operators. Sight the system used.</p>
3.3	There is equipment available to test for gases and vapours, e.g. electronic testers or stain tubes. This equipment may be provided by site or contractors.	<p>Intent:</p> <p>To ensure that there is a means of testing for hazardous and other gases, in the gold room.</p> <p>Personnel:</p> <p>Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method:</p> <p>Sight test equipment or obtain the name of the contractor that performs these tests.</p>

3.4	<p>The testing equipment is appropriate for the potential hazards, e.g. ammonia, hydrogen cyanide, mercury, oxides of nitrogen.</p> <p>If contracted the type and model of equipment used should be available to the auditor.</p>	<p>Intent:</p> <p>To ensure that the testing equipment is appropriate for the hazards expected.</p> <p>Personnel:</p> <p>Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method:</p> <p>Obtain information on equipment used by contractor or sight equipment used by site.</p>
3.5	<p>Atmospheric testing is undertaken for metals and other fumes, e.g. NOX, As₂O₃, Hg, and SO₂.</p> <p>Requirements for metal analysis of dust samples taken for gold room operators must be included in the Risk Based Hygiene Management Plan. (Data on respirable and inhalable dust and silicates is not sufficient).</p>	<p>Intent:</p> <p>To ensure that there is a regular test of the efficiency of the ventilation system.</p> <p>Personnel:</p> <p>Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method:</p> <p>View test records.</p>
3.6	<p>Exhaust ventilation has been designed to collect all the fumes from the melting furnace.</p>	<p>Intent:</p> <p>To ensure the capture of the furnace fumes.</p> <p>Personnel:</p> <p>Gold room employees, OHS representative, senior metallurgist, training representative, ventilation officer.</p> <p>Method:</p> <p>View design documentation.</p>
3.7	<p>There is a mechanism to collect fumes during the pouring of dore bars. Generally it is an extension of the fume hood over the furnace.</p>	<p>Intent:</p> <p>To ensure the capture of fumes from the mould area.</p> <p>Personnel:</p> <p>Gold room employees, OHS Representative, senior metallurgist, training representative, ventilation officer.</p> <p>Method:</p> <p>View methods to control fumes emitted during the pouring of ingots. This particularly applies where there are impurities such as arsenic, lead or mercury.</p>
3.8	<p>Electrowinning cells are fitted with exhaust ventilation systems to remove ammonia and other fumes.</p>	<p>Intent:</p> <p>To ensure the capture of electrowinning cell fumes.</p> <p>Personnel:</p> <p>Gold room employees, OHS representative, senior metallurgist, training representative, ventilation officer.</p> <p>Method:</p> <p>Inspect the installation.</p>

3.9	Electrowinning cell fume hoods are not opened or removed until the contained solution has cooled sufficiently to prevent excessive gas discharge.	<p>Intent: To ensure the capture of electrowinning cell fumes prior to opening.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method: Check SWP and discuss with operators.</p>
3.10	Electrowinning exhaust ventilation systems cannot be blocked if an electrowinning cell overfills with solution.	<p>Intent: To ensure the control of electrowinning cell fumes.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative, ventilation officer.</p> <p>Method: Inspect the installation. Some cells, when overfilled, drain into the exhaust pipe work.</p>
3.11	There is an exhaust ventilation system to remove the fumes generated during digestion.	<p>Intent: To ensure the capture of digestion fumes.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative, ventilation officer.</p> <p>Method: Inspect the installation.</p>
3.12	There is an exhaust ventilation system to remove the fumes from the calcine oven. These fumes are exhausted externally to the gold room.	<p>Intent: To ensure the capture of calcine fumes.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative, ventilation officer.</p> <p>Method: Inspect the installation.</p>
3.13	There is no evidence of any build-up of deposits, e.g. mercury droplets, inside the calcine oven.	<p>Intent: To ensure the maintenance of a clean calcining oven.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method: Inspect the calcining oven.</p>

3.14	If mercury is present, there is a system to collect and condense any mercury vapour.	<p>Intent: To ensure that any mercury vapour is captured.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative, ventilation officer.</p> <p>Method: Inspect the installation.</p>
3.15	Any collected mercury is suitably stored and disposed of appropriately.	<p>Intent: To ensure that mercury is completely controlled.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method: View records.</p>
3.16	Maintenance and testing procedures are in place for the ventilation systems. This is included in the site's maintenance system and testing is carried out by a competent person on a defined schedule.	<p>Intent: To ensure that the ventilation systems of the gold room operate as intended.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative, ventilation officer, maintenance personnel.</p> <p>Method: View maintenance and test records. Interview personnel.</p>
3.17	Gold room air conditioning and other air intakes are separated from ventilation system discharges taking into account seasonal wind direction.	<p>Intent: To ensure that no exhausted fumes are drawn back into the gold room.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative, ventilation officer.</p> <p>Method: Inspect the installation.</p>

4 Personal protective equipment

Personal protective equipment

Point	Standard	Guideline
4.1	The site has assessed and provided appropriate protective clothing.	<p>Intent: To ensure that the appropriate PPE is available, e.g. heat resistant jackets, aprons, gloves, face shields.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist.</p> <p>Method: Inspect the PPE available. Interview personnel.</p>
4.2	Appropriate respiratory protection is provided. A fit for purpose type of respiratory protection is provided that is matched to the level of hazard and specific job requirements. Consider operators standing under the fume hood when checking a pour for readiness.	<p>Intent: To ensure that the appropriate respiratory equipment is available, e.g. filters for ammonia, acid fumes, hydrogen cyanide and particulates.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist.</p> <p>Method: Inspect the respiratory protection available. Interview personnel.</p>
4.3	Gold room operators have been trained in the selection and use of the appropriate PPE.	<p>Intent: To ensure that the personnel know how to use their PPE.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method: Interview personnel.</p>
4.4	Personal protective equipment is correctly maintained.	<p>Intent: To ensure that the PPE is safe for use.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method: Inspect the PPE used. Check storage methods and replacement dates on any filter respirators. Interview personnel.</p>

5 Operations

Many operations are now providing locked gates to tailings screen and tailings hopper accesses where high cyanide gas levels are a potential issue. Supervisors hold the gate keys and are aware of anyone gaining access. Permanent cyanide gas monitors help but are not a definitive solution.

Point	Standard	Guideline
5.1	Analysis of treatment plant gravity circuit or plant feed material has been undertaken to determine if hazardous substances, e.g. lead as galena, arsenic as arsenopyrite, mercury, might be present. An ICP analysis should be considered.	<p>Intent: To ensure the identification of possible hazardous substances that may be encountered in gravity circuits or process plant feed.</p> <p>Personnel: Senior metallurgist.</p> <p>Method: View written documentation.</p>
5.2	A system is in place whereby geologists advise processing of potential changes in plant feed that may result in the introduction of hazardous elements or compounds to the process.	<p>Intent: To ensure the plant is informed of possible hazardous substances that may be encountered in gravity circuits or plant feed.</p> <p>Personnel: Senior metallurgist.</p> <p>Method: View written documentation.</p>
5.3	A system is in place for provision of broad spectrum analysis for toll treated ores.	<p>Intent: To ensure the identification of possible hazardous substances that may be encountered in plant feed from another site.</p> <p>Personnel: Senior metallurgist.</p> <p>Method: View written documentation.</p>
5.4	Appropriate control measures been implemented where hazardous substances have been identified.	<p>Intent: To ensure that where hazardous substances have been identified as being present, they are being controlled.</p> <p>Personnel: Senior metallurgist.</p> <p>Method: View written documentation.</p>
5.5	A system is in place to prevent acid from contacting caustic/cyanide in an acid wash column. A single column may be used for both acid wash and elution which relies on instrumentation for control.	<p>Intent: To ensure the separation of all non-compatible substances.</p> <p>Personnel: N/A.</p> <p>Method: Inspect tanks, etc. Ensure plant upset scenarios have been considered.</p>

5.6	Disposal of acid wash solution is appropriately managed. Where acid wash waste is disposed to tails screens, hoppers or thickeners and ready access is available, warning devices such as lights or alarms and informative signage should be provided to warn operators that acid wash waste is being transferred. Control of access to these areas is managed appropriately.	<p>Intent: To ensure the separation of all non-compatible substances.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the disposal system for residue. Check that there are mechanisms in place to ensure that acid is not sent to a tails hopper when cyanide is present and that the area is free of personnel in case of HCN generation.</p>
5.7	Pressure relief valves (PRV's) are calibrated or changed out as required for pressure vessels.	<p>Intent: To ensure the valves will function if required.</p> <p>Personnel: Classified plant maintenance or maintenance planner, operator.</p> <p>Method: Check for tags and discuss with above personnel.</p>
5.8	Where PRV and burst disk piping are combined, the size of piping must be adequate to handle the combined flow.	<p>Intent: To ensure the piping will handle the combined flow if required.</p> <p>Personnel: classified plant maintenance or maintenance planner, operator.</p> <p>Method: Check for tags and discuss with above personnel.</p>
5.9	A safe drainage system is provided on a PRV discharge line where the PRV discharges to a higher elevation.	<p>Intent: To ensure the PRV's can be removed without a risk to the fitter.</p> <p>Personnel: classified plant maintenance or maintenance planner, fitters, operator.</p> <p>Method: Discuss with maintenance personnel.</p>
5.10	The termination of the discharge piping from both PRV's and burst discs does not present a hazard to employees caused by spraying or splashing.	<p>Intent: To ensure workers are not sprayed if the PRV or burst disc discharges.</p> <p>Personnel: Operator, metallurgist.</p> <p>Method: Discuss and check location of discharge.</p>

5.11	Laboratory type pneumatic pressure filters for the dewatering of samples or material prior to drying are considered pressure vessels and are maintained appropriately. They are fitted with an air pressure regulator and the vessel is fitted with a PRV.	<p>Intent:</p> <p>To ensure sites realise these are pressure vessels and must be designed, constructed and tested as per MSIR 6.33(c).</p> <p>Personnel:</p> <p>Metallurgist, classified plant person, maintenance planner.</p> <p>Method:</p> <p>Discuss, observe and check tag.</p>
5.12	LPGas isolation valves are located remotely from the furnace, elution heater and carbon regeneration kiln.	<p>Intent:</p> <p>To ensure isolation valves are present and in an appropriate location. Individual isolation valves may be located on each piece of equipment but may be of no use in an emergency.</p> <p>Personnel:</p> <p>Operator, metallurgist.</p> <p>Method:</p> <p>Observation.</p>
5.13	A main gas isolation valve is available that will shut off gas supply to all parts of the process simultaneously. These valves are located remote from the equipment being isolated.	<p>Intent:</p> <p>To ensure gas can be isolated quickly to all parts of the operation in a safe manner should there be a fire.</p> <p>Personnel:</p> <p>Operator, metallurgist.</p> <p>Method:</p> <p>Observation.</p>
5.14	Gas isolation valves are easily accessible.	<p>Intent:</p> <p>To ensure valves can be accessed quickly in an emergency without the need of a portable ladder.</p> <p>Personnel:</p> <p>Operator, metallurgist.</p> <p>Method:</p> <p>Observation.</p>
5.15	Gas isolation valves are protected from being struck by mobile equipment.	<p>Intent:</p> <p>To ensure gas piping and isolation valves cannot be struck by mobile equipment.</p> <p>Personnel:</p> <p>Operator, metallurgist.</p> <p>Method:</p> <p>Observation.</p>

5.16	Gas isolation valve signage clearly indicates the piece or pieces of equipment being isolated.	<p>Intent: To ensure there is no confusion regarding the purpose of the isolation valve.</p> <p>Personnel: Operator, metallurgist.</p> <p>Method: Observation.</p>
5.17	The location and purpose of each gas isolation valve is included in relevant training documents and training programs.	<p>Intent: To ensure operators are aware of the location of each gas isolation valve.</p> <p>Personnel: Operator, metallurgist.</p> <p>Method: Check training documents or SWP's.</p>
5.18	Safe work procedures are used whenever dore bars are being acidified. Generally bars are cleaned using a needle gun or some other mechanical method	<p>Intent: To minimise the risk to personnel during the acidification of dore bars.</p> <p>Personnel: Gold room employees, senior metallurgist.</p> <p>Method: View procedures. Interview personnel.</p>
5.19	The carbon regeneration kiln is an isolated area during operation to prevent contact with the hot kiln surface or hot unquenched carbon.	<p>Intent: To ensure the control of heat hazards associated with carbon regeneration.</p> <p>Personnel: Gold room employees, senior metallurgist.</p> <p>Method: Inspect the installation. Interview personnel.</p>
5.20	Procedures have been developed to manage hang-ups in the carbon regeneration kiln feed hopper. This generally applies to vertical kilns but hang-ups in the feed hopper to horizontal kilns can occur.	<p>Intent: To ensure the control of heat hazards associated with carbon regeneration.</p> <p>Personnel: Gold room employees, senior metallurgist.</p> <p>Method: View the procedures. Interview personnel.</p>

5.21	No damp material e.g. sludge, can be introduced to a furnace already containing molten material.	<p>Intent: To ensure that the risk of an explosion from released vapour is minimised.</p> <p>Personnel: Gold room employees, senior metallurgist.</p> <p>Method: View procedures. Interview personnel. Refer to Significant Incident Report 9. Review site incident logbook. Inspect gold room for signs of molten metal splatter (roof, walls, etc.).</p>
5.22	Electrowinning circuits are regularly examined for signs of short circuiting or high temperatures.	<p>Intent: To minimise the risk of fires breaking out due to overheating of electrowinning equipment.</p> <p>Personnel: Gold room employees, senior metallurgist.</p> <p>Method: View procedures. Interview personnel.</p>
5.23	Electrowinning cell bodies and fume hoods are manufactured from non-flammable materials.	<p>Intent: To minimise the risk of fires.</p> <p>Personnel: Gold room employees, senior metallurgist.</p> <p>Method: Observation</p>
5.24	Documented training is provided regarding the checks required on electrowinning cell electrical connections and faults that may occur.	<p>Intent: To minimise the risk of fires.</p> <p>Personnel: Gold room employees, senior metallurgist.</p> <p>Method: View training documents and interview personnel.</p>
5.25	Rectifiers are checked by electricians as part of a maintenance program.	<p>Intent: To minimise the risk of fires.</p> <p>Personnel: Gold room employees, senior metallurgist, electricians.</p> <p>Method: Confirm it is part of a scheduled maintenance program. Interview personnel.</p>

5.26	Flammable sprays/liquids are not used for cleaning near hot equipment.	<p>Intent: To minimise the risk of fire breaking out when flammable material contacts hot surfaces.</p> <p>Personnel: Gold room employees.</p> <p>Method: View procedures. Interview personnel.</p>
5.27	Monorails used for lifting operations in the gold room have an SWL noted on the beam.	<p>Intent: Ensure the beam capacity is not exceeded.</p> <p>Personnel: Gold room employees, senior metallurgist.</p> <p>Method: Observation</p>
5.28	The capacity of the hoist does not exceed the SWL for the beam.	<p>Intent: Ensure the beam capacity is not exceeded. The SWL for the hoist must also be indicated on the hoist.</p> <p>Personnel: Gold room employees, senior metallurgist.</p> <p>Method: View procedures. Interview personnel.</p>
5.29	A system is available and used for cooperation between maintenance and operations regarding isolations and maintenance work to be carried out on any piping containing hazardous substances.	<p>Intent: To minimise the risk of injury to maintenance personnel due to stored energy in pipe systems.</p> <p>Personnel: Gold room employees, senior metallurgist</p> <p>Method: View procedures. Interview personnel.</p>
5.30	Operators wear a full face shield when handling hot gold bars	<p>Intent: To minimise the risk of injury to operations personnel due to potentially exploding gold bars.</p> <p>Personnel: Gold room employees, senior metallurgist</p> <p>Method: View procedures. Interview personnel.</p>
5.31	Cooling off area for gold bars is clearly defined and is clean and dry.	<p>Intent: To minimise the risk of injury to operations personnel due to potentially exploding gold bars.</p> <p>Personnel: Gold room employees, senior metallurgist</p> <p>Method: View procedures. Interview personnel.</p>

5.32	A minimum cooling off period is specified before quenching in water.	<p>Intent: To minimise the risk of injury to operations personnel due to the potential of exploding gold bars.</p> <p>Personnel: Gold room employees, senior metallurgist</p> <p>Method: View procedures. Interview personnel.</p>
5.33	Where products such as Leach Aid are used and fed into a reactor using a screw feeder there is a scheduled maintenance program to clean the internals of the screw feeder.	<p>Intent: To minimise the risk of fire. Leach Aid will burn at temperatures above 300 degrees C. These temperatures can be achieved in screw feeders not properly maintained due to build-up of fines or mechanical reasons. There are two types UL and XL. The XL contains lead nitrate. Use of the XL type may indicate a need for biological monitoring for lead.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method: View procedures. Interview personnel.</p>
5.34	Only the shift requirements for quantities of products such as Leach Aid are stored in the gold room and are not stored next to the screw feeder.	<p>Intent: To minimise the risk of fire.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method: View procedures. Interview personnel.</p>

6 Spill management

Spill management

Point	Standard	Guideline
6.1	Tanks and pipes containing hot liquids are insulated to prevent accidental contact by personnel.	<p>Intent: To ensure that personnel are not exposed to hot surfaces.</p> <p>Personnel: Gold room employees, senior metallurgist.</p> <p>Method: Inspect tanks and pipes containing hot liquids.</p>
6.2	Containment is provided for tank overflow spillage by individual bunding rather than overflow into a common sump. Separate sumps and bunds for acid and cyanide solutions are acceptable.	<p>Intent: To ensure that cyanide solutions cannot come into contact with acids. This applies to the gold room as well as the elution area where separate acid wash and elution columns are used. For single column systems, a PLC control method must be used, regular valve maintenance procedures are required and the spillage sump discharge must be switchable depending on acidic or caustic spills.</p> <p>Personnel: Gold room employees, senior metallurgist.</p> <p>Method: Inspect tank overflows and location of sump.</p>
6.3	Leaks from acid pipelines cannot get into tanks, bunds or sumps containing caustic or cyanide solutions.	<p>Intent: To ensure the separation of all non-compatible substances.</p> <p>Personnel: Gold room employees, senior metallurgist.</p> <p>Method: Inspect pipelines, tanks etc.</p>
6.4	There is a means of containing any acid spillage, so that it does not enter a sump and contact caustic or cyanide solutions.	<p>Intent: To ensure the separation of all non-compatible substances.</p> <p>Personnel: Gold room employees, senior metallurgist.</p> <p>Method: Inspect the areas where acid is present.</p>

6.5	Mechanisms are in place to prevent electrowinning cells overflowing.	<p>Intent: To ensure the provision of spill prevention controls in the design of the electrowinning cells.</p> <p>Personnel: Senior metallurgist, ventilation officer.</p> <p>Method: Inspect installation.</p>
6.6	Where electrowinning cells are on a mezzanine, or higher, floor there is flooring or other means to prevent leaks or spills falling onto people working below or making contact with electrical systems such as lighting.	<p>Intent: To ensure the provision of a spill containment method where elevated electrowinning cells are installed. Ensure electrical equipment is rated to withstand chemical spillage.</p> <p>Personnel: Senior metallurgist.</p> <p>Method: Inspect installation.</p>
6.7	Concrete floor is appropriately coated to prevent an attack on the concrete by spilt acid.	<p>Intent: To ensure the provision of acid resistant coating on flooring if acid is used in the gold room. This also applies to the acid wash column area and acid storage area.</p> <p>Personnel: Gold room employees, senior metallurgist.</p> <p>Method: Inspect the floors and bunds.</p>
6.8	Spillage containment and clean up equipment is available in the gold room.	<p>Intent: To ensure that the necessary equipment is immediately available to contain and clean up any spills.</p> <p>Personnel: Gold room employees, senior metallurgist.</p> <p>Method: Inspect containment and clean up equipment.</p>
6.9	Spill control procedures are available for the gold room, acid wash/elution and carbon regeneration areas.	<p>Intent: To ensure that spill control procedures are readily available for all areas for which gold room operators are responsible.</p> <p>Personnel: Gold room employees, senior metallurgist.</p> <p>Method: View procedures. Interview personnel.</p>

6.10

Gold room operators are suitably trained as to how to clean up spillages in all areas of responsibility such as acid wash/elution and carbon regeneration.

Intent:

To ensure that gold room employees know how to deal immediately with spills.

Personnel:

Gold room employees. senior metallurgist

Method:

Interview personnel and view training records.

7 Emergency response

Emergency response

Point	Standard	Guideline
7.1	There are safety showers and eyewash stations in the gold room. The number of units will depend on risk and size of the gold room.	<p>Intent: To ensure that emergency water deluge facilities are immediately available in the event of a person being splashed with a hazardous substance.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method: Inspect the gold room.</p>
7.2	The safety shower and eyewash are readily accessible and unobstructed in the event of an emergency.	<p>Intent: To ensure that there is minimum delay in accessing the emergency facilities.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method: Inspect the gold room.</p>
7.3	If there are occasions where only one operator is present in the gold room the safety shower and eyewash will activate an alarm when operated. An emergency push button alarm can also be located at the eyewash station.	<p>Intent: To ensure that the attention of personnel will be drawn whenever the emergency facilities are utilised. The system selected must allow frequent use of the facilities to ensure the water is cool and clean.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method: Inspect the gold room.</p>
7.4	The safety shower and eyewash are correctly maintained.	<p>Intent: To ensure that the emergency facilities will operate as designed.</p> <p>Personnel: Gold room employees, senior metallurgist.</p> <p>Method: Inspect the gold room.</p>

7.5	Fixed fire suppression systems are automatically activated.	<p>Intent:</p> <p>To ensure that fixed fire suppression systems will activate without the intervention of personnel. Many gold rooms do not have fixed systems and rely on operator or ERT intervention.</p> <p>Personnel:</p> <p>Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method:</p> <p>Inspect any fixed fire suppression system.</p>
7.6	Firefighting equipment is provided in the gold room.	<p>Intent:</p> <p>To ensure that any outbreak of fire can be immediately dealt with.</p> <p>Personnel:</p> <p>Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method:</p> <p>Inspect the gold room for fire extinguishers, fixed fire suppression systems, etc.</p>
7.7	The firefighting equipment is appropriate for the hazards present.	<p>Intent:</p> <p>To ensure that the firefighting equipment provided is capable and suitable for dealing with the hazards present.</p> <p>Personnel:</p> <p>Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method:</p> <p>Inspect the fire extinguishers for types, ratings, etc.</p>
7.8	The firefighting equipment is correctly located and easily accessed.	<p>Intent:</p> <p>To ensure that the firefighting equipment provided is readily available for immediate use. Note where the hazards are and the accessibility of firefighting equipment.</p> <p>Personnel:</p> <p>Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method:</p> <p>Inspect the gold room for the siting of the fire extinguishers.</p>

7.9	The firefighting equipment is regularly inspected and maintained.	<p>Intent:</p> <p>To ensure that the firefighting equipment provided will operate as designed. A method of recording inspections such as tags is used by a competent person performing the inspections. Inspections are carried out 6 monthly as per AS1851-2012.</p> <p>Personnel:</p> <p>Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method:</p> <p>Inspect the firefighting equipment inspection and maintenance records.</p>
7.10	There is an unobstructed second means of egress from the gold room in the event of an emergency.	<p>Intent:</p> <p>To verify that the risk of being trapped inside the gold room is minimised. A large maintenance access door locked by padlocks is suitable. The main pedestrian door may be part of this larger door but will likely require entry by a card or cards. Operators must have immediate access to keys for the padlocks. This provides a secondary egress in the event the card system fails. Site must ensure that there is no risk of a fire or other emergency that could prevent operators from accessing the exit. It is essential that a mechanical method of unlocking doors is available if electronic systems fail.</p> <p>Personnel:</p> <p>Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method:</p> <p>Inspect the gold room for a clear emergency exit both inside and outside. Refer to MSIR r. 4.31.</p>
7.11	When there is a single operator working in the gold room there is a system in place to raise the alarm should there be an emergency.	<p>Intent:</p> <p>To ensure that assistance can be immediately rendered to a sole employee working in the gold room. Surveillance cameras alone cannot be relied upon. Most gold rooms require a minimum of two employees and telephones, mobiles, CCTV cameras and two way radios are generally available. Many also have a panic button type of alarm for emergencies.</p> <p>Personnel:</p> <p>Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method:</p> <p>Interview personnel.</p>

7.12	The emergency plan allows appropriately trained personnel ready access to the gold room.	<p>Intent:</p> <p>To ensure that an emergency in the gold room can be responded to by the appropriate personnel. There is a conflict between safety and security. Extra access cards may be locked in a safe with personnel always on site to permit access. A risk assessment should be done for this.</p> <p>Personnel:</p> <p>Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method:</p> <p>View the emergency plan.</p>
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8 Health surveillance

The need for specific biological monitoring can be determined in the Risk Based Hygiene Management Plan (RBHMP) or through dust and gas sampling done during operation or as specific needs are identified from feed or gravity samples or geological advice.

Point	Standard	Guideline
8.1	Biological monitoring of personnel is undertaken where applicable, e.g. urinary mercury tests.	<p>Intent: To ensure that the health of employees is being monitored. Refer to Exposure Standards for Atmospheric Contaminants in the Occupational Environment and the Guideline: Risk-based health surveillance and biological monitoring.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method: Inspect medical records.</p>
8.2	Exposure/health assessment results are reported to all relevant personnel in an effective, timely and documented manner, e.g. explanation of results.	<p>Intent: To ensure that personnel are fully apprised of any deviation from the normal.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method: Interview personnel.</p>
8.3	Appropriate records are kept of the results of exposure/health assessments.	<p>Intent: To ensure that medical surveillance test results are available for future perusal.</p> <p>Personnel: Gold room employees, OHS representative, senior metallurgist, training representative.</p> <p>Method: Inspect medical records.</p>