# Gold room audit Site: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Date conducted:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| 1 Risk assessment and work procedures |
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| **Point** | **Standard** | **Standard met** | **Comments** |
| 1.1 | A hazard and risk assessment has been undertaken of the gold room operations. This includes acid wash, elution and carbon regeneration. |  |  |
| 1.2 | Appropriate measures have been implemented as a result of that assessment. |  |  |
| 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. |  |  |
| 1.4 | Those procedures include safety information relating to the hazards identified in the risk assessment. |  |  |

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| 2 Hazardous substance management |
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| **Point** | **Standard** | **Standard met** | **Comments** |
| 2.1 | 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.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. |  |  |
| 2.2 | 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. |  |  |
| 2.3 | 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. |  |  |
| 2.4 | Employees are advised as to the location and availability of the MSDS information for substances encountered by Gold Room operators. |  |  |
| 2.5 | There is a mechanism for the regular updating of the MSDS register used by the Gold Room operators. |  |  |
| 2.6 | Hazardous substances are appropriately stored. |  |  |
| 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. |  |  |
| 2.8 | Other hazardous substances and reagents (e.g. fluxes, acids, etc.) are appropriately packaged and labelled. |  |  |
| 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. |  |  |
| 2.10 | Records are available of accidents / incidents which have occurred in the gold room, particularly those relating to hazardous substances or process safety. |  |  |

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| 3 Ventilation |
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| **Point** | **Standard** | **Standard met** | **Comments** |
| 3.1 | There is effective ventilation of the gold room. |  |  |
| 3.2 | There are warning alarms for the presence of hazardous gases e.g. ammonia, hydrogen cyanide. |  |  |
| 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. |  |  |
| 3.4 | The testing equipment is appropriate for the potential hazards, e.g. ammonia, hydrogen cyanide, mercury, oxides of nitrogen.If contracted the type and model of equipment used should be available to the auditor. |  |  |
| 3.5 | Atmospheric testing is undertaken for metals and other fumes, e.g. NOX, As2O3, Hg, and SO2.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). |  |  |
| 3.6 | Exhaust ventilation has been designed to collect all the fumes from the melting furnace. |  |  |
| 3.7 | 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. |  |  |
| 3.8 | Electrowinning cells are fitted with exhaust ventilation systems to remove ammonia and other fumes. |  |  |
| 3.9 | Electrowinning cell fume hoods are not opened or removed until the contained solution has cooled sufficiently to prevent excessive gas discharge. |  |  |
| 3.10 | Electrowinning exhaust ventilation systems cannot be blocked if an electrowinning cell overfills with solution. |  |  |
| 3.11 | There is an exhaust ventilation system to remove the fumes generated during digestion. |  |  |
| 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. |  |  |
| 3.13 | There is no evidence of any build-up of deposits, e.g. mercury droplets, inside the calcine oven. |  |  |
| 3.14 | If mercury is present, there is a system to collect and condense any mercury vapour. |  |  |
| 3.15 | Any collected mercury is suitably stored and disposed of appropriately. |  |  |
| 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. |  |  |
| 3.17 | Gold room air conditioning and other air intakes are separated from ventilation system discharges taking into account seasonal wind direction. |  |  |

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| 4 Personal protective equipment |
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| **Point** | **Standard** | **Standard met** | **Comments** |
| 4.1 | The site has assessed and provided appropriate protective clothing. |  |  |
| 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. |  |  |
| 4.3 | Gold room operators have been trained in the selection and use of the appropriate PPE. |  |  |
| 4.4 | Personal protective equipment is correctly maintained. |  |  |

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| 5 Operations |
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| **Point** | **Standard** | **Standard met** | **Comments** |
| 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. |  |  |
| 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. |  |  |
| 5.3 | A system is in place for provision of broad spectrum analysis for toll treated ores. |  |  |
| 5.4 | Appropriate control measures been implemented where hazardous substances have been identified. |  |  |
| 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. |  |  |
| 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. |  |  |
| 5.7 | Pressure relief valves (PRV’s) are calibrated or changed out as required for pressure vessels. |  |  |
| 5.8 | Where PRV and burst disk piping are combined, the size of piping must be adequate to handle the combined flow. |  |  |
| 5.9 | A safe drainage system is provided on a PRV discharge line where the PRV discharges to a higher elevation. |  |  |
| 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. |  |  |
| 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. |  |  |
| 5.12 | LPGas isolation valves are located remotely from the furnace, elution heater and carbon regeneration kiln. |  |  |
| 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. |  |  |
| 5.14 | Gas isolation valves are easily accessible. |  |  |
| 5.15 | Gas isolation valves are protected from being struck by mobile equipment. |  |  |
| 5.16 | Gas isolation valve signage clearly indicates the piece or pieces of equipment being isolated. |  |  |
| 5.17 | The location and purpose of each gas isolation valve is included in relevant training documents and training programs. |  |  |
| 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 |  |  |
| 5.19 | The carbon regeneration kiln is an isolated area during operation to prevent contact with the hot kiln surface or hot unquenched carbon. |  |  |
| 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. |  |  |
| 5.21 | No damp material e.g. sludge, can be introduced to a furnace already containing molten material. |  |  |
| 5.22 | Electrowinning circuits are regularly examined for signs of short circuiting or high temperatures. |  |  |
| 5.23 | Electrowinning cell bodies and fume hoods are manufactured from non-flammable materials. |  |  |
| 5.24 | Documented training is provided regarding the checks required on electrowinning cell electrical connections and faults that may occur. |  |  |
| 5.25 | Rectifiers are checked by electricians as part of a maintenance program. |  |  |
| 5.26 | Flammable sprays/liquids are not used for cleaning near hot equipment. |  |  |
| 5.27 | Monorails used for lifting operations in the gold room have an SWL noted on the beam. |  |  |
| 5.28 | The capacity of the hoist does not exceed the SWL for the beam. |  |  |
| 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. |  |  |
| 5.30 | Operators wear a full face shield when handling hot gold bars |  |  |
| 5.31 | Cooling off area for gold bars is clearly defined and is clean and dry. |  |  |
| 5.32 | A minimum cooling off period is specified before quenching in water. |  |  |
| 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. |  |  |
| 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. |  |  |

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| 6 Spill management |
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| **Point** | **Standard** | **Standard met** | **Comments** |
| 6.1 | Tanks and pipes containing hot liquids are insulated to prevent accidental contact by personnel. |  |  |
| 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. |  |  |
| 6.3 | Leaks from acid pipelines cannot get into tanks, bunds or sumps containing caustic or cyanide solutions. |  |  |
| 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. |  |  |
| 6.5 | Mechanisms are in place to prevent electrowinning cells overflowing. |  |  |
| 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. |  |  |
| 6.7 | Concrete floor is appropriately coated to prevent an attack on the concrete by spilt acid. |  |  |
| 6.8 | Spillage containment and clean up equipment is available in the gold room. |  |  |
| 6.9 | Spill control procedures are available for the gold room, acid wash/elution and carbon regeneration areas. |  |  |
| 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. |  |  |

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| 7 Emergency response |
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| **Point** | **Standard** | **Standard met** | **Comments** |
| 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. |  |  |
| 7.2 | The safety shower and eyewash are readily accessible and unobstructed in the event of an emergency. |  |  |
| 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. |  |  |
| 7.4 | The safety shower and eyewash are correctly maintained. |  |  |
| 7.5 | Fixed fire suppression systems are automatically activated. |  |  |
| 7.6 | Firefighting equipment is provided in the gold room. |  |  |
| 7.7 | The firefighting equipment is appropriate for the hazards present. |  |  |
| 7.8 | The firefighting equipment is correctly located and easily accessed. |  |  |
| 7.9 | The firefighting equipment is regularly inspected and maintained. |  |  |
| 7.10 | There is an unobstructed second means of egress from the gold room in the event of an emergency. |  |  |
| 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. |  |  |
| 7.12 | The emergency plan allows appropriately trained personnel ready access to the gold room. |  |  |

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| 8 Health surveillance |
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| **Point** | **Standard** | **Standard met** | **Comments** |
| 8.1 | Biological monitoring of personnel is undertaken where applicable, e.g. urinary mercury tests. |  |  |
| 8.2 | Exposure/health assessment results are reported to all relevant personnel in an effective, timely and documented manner, e.g. explanation of results. |  |  |
| 8.3 | Appropriate records are kept of the results of exposure/health assessments. |  |  |

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