# Underground ventilation management audit Site: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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

# 1 Ventilation personnel

| **Point** | **Standard** | **Standard met** | **Comments** |
| --- | --- | --- | --- |
| 1.1 | The manager has appointed an underground ventilation officer for the mine. |  |  |
| 1.2 | The District Inspector of Mines was notified in writing of the appointment. |  |  |
| 1.3 | The underground ventilation officer is appropriately qualified. |  |  |
| 1.4 | The underground ventilation officer has the authority, in consultation with management, to close down operations in areas where inadequate ventilation is identified. |  |  |
| 1.5 | Underground ventilation technicians, undertaking measurements of air and atmospheric contaminants on behalf of the underground ventilation officer, are adequately trained. |  |  |
| 1.6 | Mine supervisors and operators receive basic mine ventilation training. |  |  |

# 2 Air measuring equipment

| **Point** | **Standard** | **Standard met** | **Comments** |
| --- | --- | --- | --- |
| 2.1 | The mine has ventilation instruments to conduct the required air pressure and flow measurements. |  |  |
| 2.2 | The mine has the appropriate measuring equipment, provided in house or externally, to measure the atmospheric contaminants anticipated to occur. |  |  |
| 2.3 | The mine has equipment to measure the levels of oxygen and gases when any toxic, asphyxiant, or explosive gases are anticipated to occur. |  |  |
| 2.4 | The mine has wet and dry bulb instruments to measure the temperature levels. |  |  |
| 2.5 | All measuring equipment is maintained and calibrated to manufacturers’ specifications. |  |  |
| 2.6 | When ventilation instruments and gas measuring equipment is sent away for calibration or repair, alternative equipment is made available. |  |  |
| 2.7 | A record is kept for each item of calibrated equipment that includes the latest date of calibration, the calibration factors and the next due date. |  |  |
| 2.8 | A procedure exists to ensure that where indicator tubes are used, the tubes are stored as recommended by the manufacturer and their use-by-date has not expired. |  |  |

# 3 Air measurement

| **Point** | **Standard** | **Standard met** | **Comments** |
| --- | --- | --- | --- |
| 3.1 | To ensure that the measurement and recording of airflows is carried out systematically.There is a written procedure for the measurement and recording of airflows. |  |  |
| 3.2 | Ventilation stations are selected with regard to obtaining a reliable velocity reading. |  |  |
| 3.3 | The position of each ventilation station is clearly marked underground. |  |  |
| 3.4 | The area of each ventilation station is accurately determined by the survey department. |  |  |
| 3.5 | The mine has carried out an assessment of the natural ventilation system. |  |  |
| 3.6 | Potential mine emergencies that may have an effect on the ventilation system have been modelled. |  |  |
| 3.7 | The mine emergency plan has contingencies in place to deal with the effects on the mine ventilation system from the potential mine emergencies modelled. |  |  |

# 4 Ventilation record keeping

| **Point** | **Standard** | **Standard met** | **Comments** |
| --- | --- | --- | --- |
| 4.1 | The Underground ventilation officer has a current copy of the Mines Safety and Inspection Act & Regulations. |  |  |
| 4.2 | A copy of the current National Exposure Standards NOHSC: 1003 is available at the mine. |  |  |
| 4.3 | The mine has a ventilation log book. |  |  |
| 4.4 | The mine ventilation log book indicates that inspections and testing occur at the required intervals for the various ventilation parameters, fan surveys and atmospheric contaminants. |  |  |
| 4.5 | Each ventilation and contaminant measurement is documented and retained at the mine. |  |  |
| 4.6 | Each entry in the ventilation record book is dated, signed and kept in area chronological order. |  |  |
| 4.7 | Each ventilation circuit has a diagram showing the air flow balance. |  |  |
| 4.8 | There is a procedure for the reporting and rectification of ventilation defects within the ventilation system. |  |  |
| 4.9 | Mine ventilation performance and costs are monitored and reviewed on a regular basis. |  |  |

# 5 Ventilation plans

| **Point** | **Standard** | **Standard met** | **Comments** |
| --- | --- | --- | --- |
| 5.1 | The mine has ventilation plans which are updated at intervals not exceeding 3 months. |  |  |
| 5.2 | The position of each ventilation station is clearly marked on the plans. |  |  |
| 5.3 | The direction and volume of air flows are clearly marked on the plans. (Intake air -blue, exhaust air – red). |  |  |
| 5.4 | The positions of fans and air moving equipment are clearly marked on the plans. |  |  |
| 5.5 | The positions of all ventilation control devices are clearly marked on the plans. |  |  |
| 5.6 | The positions of all fresh air bases are clearly marked on the plans. |  |  |
| 5.7 | The positions of all refuge chambers are clearly marked on the plans. |  |  |
| 5.8 | The positions of all telephones (including numbers) are clearly marked on the plans. |  |  |
| 5.9 | The positions of all second means of egress are clearly marked on the plans. |  |  |
| 5.10 | The positions of fire extinguishers and water hydrants are clearly marked on the plans. |  |  |
| 5.11 | An explanation key (legend) is provided on the ventilation plans. |  |  |
| 5.12 | Mine plans containing current ventilation and survey information are issued to the mine rescue team. |  |  |

# 6 Fans

| **Point** | **Standard** | **Standard met** | **Comments** |
| --- | --- | --- | --- |
| 6.1 | Fan selection is based on the pressure requirements for the mine parameters and the volume requirements for the equipment to be used. |  |  |
| 6.2 | Primary fans are equipped with the means to determine the air pressure across the fan and the air volume flowing through the fan. |  |  |
| 6.3 | Primary fans are equipped with vibration monitoring instruments. |  |  |
| 6.4 | Fans are maintained in accordance with the manufacturer’s requirements. |  |  |
| 6.5 | All fan air flow or damper adjustment controls are locked to prevent tampering. |  |  |
| 6.6 | Surface fan installations are located in an area that does not exhibit evidence of ground subsidence or wall failure. |  |  |
| 6.7 | Surface fan installations have fire breaks around them. |  |  |
| 6.8 | Primary fans located on the surface are equipped with permanent lighting. |  |  |
| 6.9 | There is an alarm system in place to indicate a primary fan failure. |  |  |
| 6.10 | There is a procedure in place to manage the occurrence of a primary fan failure. |  |  |
| 6.11 | The installation of each surface primary fan is such that recirculation of air is prevented. |  |  |
| 6.12 | Primary fans and circuit fans located underground are equipped with permanent lighting. |  |  |
| 6.13 | Each auxiliary fan is installed at a location that is free from obstruction and the fan is able to draw from the purest source of air available. |  |  |
| 6.14 | The installation of each auxiliary fan is such that the recirculation of air is minimised. |  |  |

# 7 Ventilation control devices

| **Point** | **Standard** | **Standard met** | **Comments** |
| --- | --- | --- | --- |
| 7.1 | Permanent ventilation control devices are of robust construction. |  |  |
| 7.2 | Permanent ventilation control devices are free from obstruction and easily accessible. |  |  |
| 7.3 | Air doors are designed and built to be self closing where practicable, and are able to be operated easily. |  |  |
| 7.4 | Signs are displayed indicating whether air doors should be left open or closed. |  |  |
| 7.5 | Regulators are provided with a means to prevent tampering. |  |  |
| 7.6 | Any instruction regarding a change to a brattice or regulator setting is recorded in the ventilation log book. |  |  |
| 7.7 | Permanent ventilation control devices are inspected regularly. |  |  |
| 7.8 | All temporary ventilation control devices such as parachutes, brattices, etc., that are installed to control airflow in a workplace, are inspected each shift for damage and leakage. |  |  |

# 8 Ventilation system operation

| **Point** | **Standard** | **Standard met** | **Comments** |
| --- | --- | --- | --- |
| 8.1 | There are no unnecessary activities in the vicinity of the intake airways that could generate dust or fumes. |  |  |
| 8.2 | Intake air velocities in roadways do not exceed 6 metres/second. |  |  |
| 8.3 | A means and procedure exists to provide dust suppression in the main intake air roadway. |  |  |
| 8.4 | Parallel ventilation circuits are utilised at the mine to ensure that atmospheric contaminant levels in each workplace are minimised. |  |  |
| 8.5 | Airways at the mine are maintained free from obstruction except for the purpose of control. |  |  |
| 8.6 | The volume of primary intake air to the mine exceeds the total air volume requirement specified for the diesel equipment operating in the mine at any one time. |  |  |
| 8.7 | The volume of air flowing into each area of the mine meets the legal requirement for the diesel equipment operating in each of those areas at any one time. |  |  |
| 8.8 | Ventilation ducting is maintained in a satisfactory condition. |  |  |
| 8.9 | The ventilating airflow is arranged such that fresh air sweeps the working place. |  |  |
| 8.10 | There is a procedure to be followed such that each working place ventilated by a multiple duct ventilation system is adequately ventilated. |  |  |
| 8.11 | There is barricading, with signage displayed, to prevent unauthorised entry into temporary unventilated areas. |  |  |
| 8.12 | The second means of egress from the mine is protected from smoke contamination by the installation of permanent control devices. |  |  |
| 8.13 | Specific areas within the mine with the potential to generate large volumes of atmospheric contaminants have a direct connection to the primary exhaust ventilation circuit return airway. |  |  |
| 8.14 | A computer generated model of the mine ventilation system has been developed. |  |  |

# 9 Contaminant control

| **Point** | **Standard** | **Standard met** | **Comments** |
| --- | --- | --- | --- |
| 9.1 | A procedure exists to monitor and control the formation or emission of toxic, asphyxiant and explosive gases in the mine. |  |  |
| 9.2 | A procedure exists for drillers to follow in the event of a gas inflow during drilling. |  |  |
| 9.3 | An evaluation of the potential for oxygen depletion in the underground workings has been carried out. |  |  |
| 9.4 | Procedures have been developed to manage the hazards associated with sulphide dust explosions. |  |  |
| 9.5 | Procedures have been developed to manage the hazards associated with stopes being filled with tailings containing residual chemicals. |  |  |
| 9.6 | Procedures have been developed to manage the release of ammonia gas due to the reaction between ammonium nitrate and shotcrete. |  |  |
| 9.7 | Blast fumes are cleared from all rise face areas by the use of a compressed air and pipe arrangement following blasting operations. |  |  |
| 9.8 | A written procedure or instruction exists to measure or evaluate the time for blasting fumes to clear from an area. |  |  |
| 9.9 | The clearance of blasting fumes is checked by gas monitoring before re-entry. |  |  |
| 9.10 | Contaminants are controlled in all workplaces where blasting and loading operations take place. |  |  |
| 9.11 | Mine workings that have high working temperatures have an adequate air velocity flow. |  |  |
| 9.12 | Where mine workings exhibit high working temperatures, safe operating procedures have been developed. |  |  |

# 10 Diesel equipment

| **Point** | **Standard** | **Standard met** | **Comments** |
| --- | --- | --- | --- |
| 10.1 | Enclosed cabins and cabin air conditioning equipment are provided on all underground trackless diesel equipment and for underground crushers and remote controlled equipment stations. |  |  |
| 10.2 | Air conditioner filters are regularly inspected, cleaned and changed in accordance with the manufacturer’s instructions. |  |  |
| 10.3 | Exhaust treatment devices are fitted to all underground diesel engines that are turbo charged or rated at 125 kW or greater. |  |  |
| 10.4 | Low sulphur, clean, diesel fuel is provided for underground engines. |  |  |
| 10.5 | The engine burn efficiency and contaminant emission of all underground diesel engines is monitored on a frequent basis. |  |  |
| 10.6 | Workplace atmospheric conditions are monitored for diesel particulates on a regular basis. |  |  |
| 10.7 | A register of all underground diesel units is maintained on site. |  |  |
| 10.8 | The register details the relevant information and ventilation requirements for each diesel unit. |  |  |

# 11 Disused areas

| **Point** | **Standard** | **Standard met** | **Comments** |
| --- | --- | --- | --- |
| 11.1 | Disused areas of the mine are isolated from the primary ventilation system by an effective barricade to prevent unwanted leakage of ventilating air. |  |  |
| 11.2 | When an area of the mine has been isolated from the ventilation system, a corresponding entry has been made in the ventilation log book. |  |  |
| 11.3 | Disused areas of the mine are provided with an effective barricade at every entrance to prevent inadvertent entry. |  |  |
| 11.4 | Notices are displayed at every entrance to a disused area forbidding entry to the area. |  |  |
| 11.5 | A procedure exists to re-establish ventilation in disused areas before re-entry and work recommences. |  |  |