# Mine survey audit Site: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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

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| 1 Mines Safety and Inspection Regulations 1995 - requirements |
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| **Point** | **Standard** | **Standard met** | **Comments** |
| 1.1 | The manager of a mine must cause a record to be made in the record book of the name of the mine surveyor appointed to make or draw the survey or plan of the mine and the day on which that person was appointed. |  |  |
| 1.2 | Mine surveys are carried out using instruments and equipment of precision equal to best current industry standards and technology unless approval is provided by the District Inspector of Mines that another standard is acceptable. |  |  |
| 1.3 | The mine surveys are carried out to a standard that accords with good engineering practice and is to an accuracy of not less than 1:5000 unless approval is provided by the District Inspector of Mines that another standard is acceptable. |  |  |
| 1.4 | A datum station serving as the origin for the survey and co-ordinate system used has been established in terms of The Map Grid of Australia 1994 (MGA) and the Australian Height Datum (AHD). |  |  |
| 1.5 | The relationship between any local grid system used and the MGA is established and documented. |  |  |
| 1.6 | Surveyors undertake adequate check surveys when workings are approaching each other to ensure that the breakthrough is coordinated and managed in a safe manner. |  |  |
| 1.7 | Development overbreak trigger, action, response standards are determined and check survey measurements are regularly taken and reported to management for action. |  |  |
| 1.8 | Stope and void overbreak trigger, action, response standards are determined and check survey measurements are regularly taken and reported to management for action. |  |  |
| 1.9 | A pit wall monitoring system with trigger, action, response standards and check survey measurements are taken and reported to management for action. |  |  |

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| 2 Code of practice - general |
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| **Point** | **Standard** | **Standard met** | **Comments** |
| 2.1 | There is a hard copy of a clearly labelled Survey Record Book. |  |  |
| 2.2 | The Survey Record Book documents the connection between the local Mine Grid and the MGA94, detailing pictorial and coordinated descriptions. Sufficient points of known coordinates in both the local mine grid and MGA94 must be provided to allow transformation of the mine plan onto the MGA94 grid. The datum reference points should be chosen to give a broad coverage of the mine lease area. |  |  |
| 2.3 | The Survey Record Book documents local false origin and height datum details. |  |  |
| 2.4 | The Survey Record Book documents efforts made to obtain all existing information about the extent and location of old workings. |  |  |
| 2.5 | Old workings are shown on the corresponding working horizon of all digital and hard copy survey data plans, including annotations as to whether they contain water or fill. |  |  |
| 2.6 | Local data sets converted to MGA94 are documented and dated in the Survey Record Book when they occurred. |  |  |
| 2.7 | Technical symbols, sign conventions and definitions for strata shown on the mine plan are detailed in the Survey Record Book. |  |  |
| 2.8 | The Survey Record Book documents regular and appropriate servicing, checking and adjustment of all survey equipment. |  |  |

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| 3 Code of practice - standards and procedures |
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| **Point** | **Standard** | **Standard met** | **Comments** |
| 3.1 | Closes and check surveys have been conducted and documented on an annual basis, with a rate of error comparable to industry standard. |  |  |
| 3.2 | The surface mine baseline is not less than 250 m in length has each end substantially marked. Mine baseline stations are permanent marks, tagged with the station name and set in concrete. A witness plate is placed adjacent to this mark. Permanent marks for a surface baseline are shown on the mine plans. Hard copies and electronic copies of all reference materials are recorded in the Survey Record Book. |  |  |
| 3.3 | A baseline has been established in the underground workings of each level off a shaft or at least every 750 m of traverse in a decline access. The underground baseline is in a suitable position and is as long as is practicable (at least 100 m in length). |  |  |
| 3.4 | Permanent baseline details are recorded on the mine plan. |  |  |
| 3.5 | The instrumentation used for control surveys and traversing adheres to the following precision specifications:• angular measurements (horizontal and vertical) — maximum standard error of ± 5”;• distance measurements — maximum standard error of ± (3 mm + 5 ppm);• GPS positioning — maximum standard error of horizontal positioning of ± (10 mm + 10 ppm); and• levelling — maximum standard error of levelling per kilometre of double run of ± 4 mm. |  |  |
| 3.6 | Each underground control station is adequately referenced and substantially marked. The station number is painted adjacent to the survey station and also on the adjacent wall. A durable tag indicating the station number is also attached. As far as practicable, they are in a position least likely to be disturbed by the effects of ground movement or mobile equipment. The stations are shown on the mine plans. |  |  |
| 3.7 | Correlation between surface and underground surveys are to the highest accuracy practicable. The correlation of surface and underground surveys are by:• traversing through an adit or a decline or incline ramp;• plumbing or plummeting one or more vertical shafts;• using a gyrotheodolite to establish azimuth; or• a combination of these methods. |  |  |
| 3.8 | Where an established mine uses a local height datum (LHD):• the relationship between the LHD and AHD should be detailed in the Survey Record Book• the relationship should also be shown on the mine plans as required under regulation 3.50(2). |  |  |
| 3.9 | Relative levels of forward stations are checked with redundant measurements. For conventional traversing, this could be either a re-survey or a level traverse. |  |  |
| 3.10 | All level traverses have been closed. The vertical closure rates of traverses are better than 12K mm, where K is the traverse length in kilometres (i.e. a closure rate of 12 mm/km). |  |  |
| 3.11 | Survey records are kept forsurface surveys• surface levelling• underground control surveys (which should also be recorded in the Survey Record Book)• underground check surveys (which should also be recorded in the Survey Record Book)• surface check surveys• underground levelling• calculations |  |  |
| 3.12 | Complete duplicate copies of survey records are kept and stored separately from the originals, on paper, microfilm, magnetic tape, disk or electronic medium, permanent physical medium, or off-site back-up facility or mechanism. |  |  |

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| 4 Mine plan requirements |
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| **Point** | **Standard** | **Standard met** | **Comments** |
| 4.1 | The mine plan, whether digital or hard copy, shows the following regulatory particulars:• a plan of the mine lease or tenement• the datum station established as the origin of the survey; the relationship to the Map Grid of Australia 1994; and the relationship to the local grid system;• In relation to quarry operations, a plan showing the true size and shape of all excavations and sufficient cross sections showing advances made in the quarry operations and the areas reclaimed or again filled in;• so far as is practicable, sufficient cross sections or projections to a scale that accords with good engineering practice that clearly shows the ore bodies and the parts of ore bodies mined out; and• the date and certification when the plan was made. |  |  |
| 4.2 | The mine plan, whether digital or hard copy, shows the following regulatory particulars for an underground mine:• a general plan of any underground levels to a scale that accords with good engineering practice that shows, so far as is practicable, the true size and shape of all development openings, but a composite plan may be accepted if each level on that plan can be clearly seen;• if any underground drill holes at the mine contain potentially hazardous services including electrical power cables, compressed air lines or diesel fuel lines, details of the location of those holes; and• so far as is practicable, longitudinal sections or projections to a scale that accords with good engineering practice that shows all underground mining operations. |  |  |
| 4.3 | The mine plan, whether digital or hard copy, shows the following details in addition to the regulatory requirements:• mine lease boundaries• survey stations and their identification• mine shafts, adits and declines• grid lines and values• all workings in the deposit, including workings of adjacent mines within 50 m of the lease boundary• for underground mines, the boundaries of all old workings on the horizon being shown on that plan• for underground mines, a detailed outline of current or associated workings in any direction of any development shown on a level plan sheet or section sheet on the horizon being shown on that plan• underground service holes clearly annotated as to their use• boreholes on the horizon being shown on that plan. |  |  |
| 4.4 | The surface mine plan shows all streets, roads, reservoirs, swamps, water bodies and any other permanent features that, if disturbed by mining operations, could cause damage to or danger in the mine. |  |  |
| 4.5 | A transparent surface overlay plan is available where underground mining operations are present. |  |  |
| 4.6 | Electrical plans showing the location and details of all high voltage cable and equipment, main switches and low voltage and high voltage cables installed in the ground are maintained at the mine. |  |  |
| 4.7 | Ventilation plans are kept updated at intervals not exceeding 3 months. |  |  |
| 4.8 | The direction course and volume of air currents and the position of ventilating fans, air doors, regulators, brattices, other ventilating devices and/or controls in use at the mine are recorded on the plans and sections of the mine. |  |  |
| 4.9 | Accident plan information includes:• the mine location within WA• the location of the accident within the mine• an outline of the mine workings at the accident site• the location of all fixed and mobile plant at the accident scene• the location of personal apparatus, equipment or clothing• sufficient annotation and labelling to clearly describe the condition and name of each object at the accident location |  |  |
| 4.10 | A key is provided to explain any symbols used on the mine plan. |  |  |
| 4.11 | Surface Mine Plans are certified by the person making the plan that the plan is correct. |  |  |
| 4.12 | The underground Mine Plan(s) carries the following endorsementThis is to certify that this survey has been done by myself (or by persons under my own supervision), subject to adequate inspection and field check, and is the actual result of the observations and measurements, and the survey and plan have been done in accordance with the requirements of the Mines Safety and Inspection Act 1994 and the regulations made under that Act. DATED the ......................... day of ......................... 20.......... Authorised Mine Surveyor GradeCertificate No. |  |  |
| 4.13 | The person certifying the underground mine plans holds the authorised mine surveyor’s certificate. |  |  |
| 4.14 | A copy of the mine plan(s) has been submitted to the State Mining Engineer for:• Open Pit – Within 1 year of commencement.• Underground – Within 1 year of commencement and/or within the last 5 years. |  |  |
| 4.15 | Mine plans have been submitted to the State mining engineer in the approved form. |  |  |

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| 5 Emergency plan preparation |
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| **Point** | **Standard** | **Standard met** | **Comments** |
| 5.1 | The emergency plans are available in hard copy in the Survey Office, the Emergency Control Centre and the Incident Management Room. |  |  |
| 5.2 | The emergency plans are all plotted at the same scale, with the exception of the whole of mine cross section showing ladder-ways and primary vent flows. |  |  |
| 5.3 | The emergency plans are plotted one plot to one piece of paper (NOT double sided). |  |  |
| 5.4 | The emergency plans have grid lines spaced at 100m intervals on the page. |  |  |
| 5.5 | The emergency plans have coordinates plotted at each end of each grid line and are labelled mN and mE. |  |  |
| 5.6 | The emergency plans have grid lines that extend across the full length and breadth of each plot. |  |  |
| 5.7 | The emergency plans have annotations that are of a large enough font to be read through the mask of breathing apparatus. |  |  |
| 5.8 | The emergency plans do not rely on colours to identify unique symbols. |  |  |
| 5.9 | The emergency plans have a legend. |  |  |
| 5.10 | Current ventilation and survey information is maintained on special emergency plans which are maintained in readiness for dealing with an emergency. |  |  |
| 5.11 | The emergency plans do NOT show features that are conceptual e.g. Geological features, proposed or actual mine design, decline centre lines etc. |  |  |
| 5.12 | The emergency plans all have north plotted in the same orientation on each page. |  |  |
| 5.13 | The emergency plans are uniquely numbered or named. |  |  |
| 5.14 | The emergency plans show workings only once in the entire set of plans i.e. The same length of decline or level is NOT shown on two separate plots. |  |  |
| 5.15 | The emergency plans show the name of each adjoining working shown on the plan. |  |  |
| 5.16 | The emergency plans are of a recognised standard scale between 1:500 and 1:2,000. |  |  |
| 5.17 | The emergency plans contain a longitudinal plan that shows the entire extent of the mine workings that is subdivided into labelled map sheets. |  |  |
| 5.18 | The emergency plans show the map sheet in the title block. |  |  |
| 5.19 | The emergency plans show the location of refuge chambers, fresh air bases, first aid stations, underground telephone locations, any air quality or gas monitoring points, bad or inaccessible ground, accumulations of water, filled voids, and any information identified as necessary for dealing with an emergency at the mine. |  |  |

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| 6 Field work |
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| **Point** | **Standard** | **Standard met** | **Comments** |
| 6.1 | A full risk analysis of all survey work has been carried out. |  |  |
| 6.2 | Safe work procedures have been developed and approved by the employer. |  |  |
| 6.3 | Surveyors are inducted, trained and assessed competent in the survey procedures and the mining hazards associated with surface and underground operations. |  |  |
| 6.4 | Suitable transportation is available for the surveyor(s) to carry out their work safely. |  |  |
| 6.5 | All survey equipment is safely secured during transportation |  |  |
| 6.6 | Surveyors are equipped with the appropriate PPE, sunscreen and water to carry out their work safely. |  |  |
| 6.7 | Surveyors are equipped with appropriate warning signage where any work is carried out within a road reserve or any other vehicle operating area on the surface or underground. |  |  |
| 6.8 | Fixed Survey stations in the open pit area are provided with a safe means of access. |  |  |
| 6.9 | Fixed survey stations at the open pit crest are provided with fall from height protection. |  |  |
| 6.10 | Non-entry survey techniques, equipment and tools are used at working faces and any other areas where there is a significant danger of serious injury or loss of life. |  |  |
| 6.11 | Survey stations and areas where survey work is carried out underground are made safe prior to carrying out any work. |  |  |

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