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SAFETY BULLETIN NO: 57

MINE SURVEYING - RISKS IN LOSS OF ACCURACY AND INTEGRITY

BACKGROUND

The maintenance of accuracy and integrity in carrying out mine survey work and in preparation, maintenance and checking of plans is of paramount importance in relation to the safety and efficiency of operations.

This is particularly the case for underground mines, but is also of importance in surface mines, in open pit wall stability monitoring, in open pits intersecting old underground workings, and surface controls over existing underground workings.

The history of mining disasters includes a number of inrushes into underground mines, and also cases of subsidence and collapse into workings, where deficiencies in surveying, or in maintenance and interpretation of plans were factors.

The most recent such event in Australia was at Gretley Colliery in NSW in 1996.

In some measure, a factor which has contributed to an identified decline in performance standards has been the evolution of semi-automated electronic surveying equipment (total station etc) which, while it affords great efficiency and convenience, can lead to oversights and errors which were more readily checked on and detected with the earlier more simple and document based procedures.

However the problem goes deeper than this. In part it stems from lack of in-depth training in some fundamental sound practices. In some cases turnover of staff and lack of continuity at handover, as well as Long Distance Commute regular handovers, creates the opportunity for oversights.

ISSUES AND DEFICIENCIES IDENTIFIED

Surveying Professionals on the Mines Survey Board have advised of a range of deficiencies from their own experience and that of colleagues in carrying out contract and check surveying at mines in Western Australia.

These problems are not normally found at the larger (and longer term) established operations, but are often readily identified at smaller mines, which may also be a function of lack of resources, and of mentoring by experienced survey professionals.

Commonly found deficiencies and oversights are listed as dot points.

Survey Practice

- In most cases there is a lack of hard copy records

  - The Origin for coordinates and R.L. do not exist.
  - There are no Traverse Sheets.
  - There is no evidence that surveys are checked.
  - There is no filing system.

- No hard copy of survey procedures and standards is available. In some cases no procedures and standards are observed.

- A lack of basic fundamentals in regard to underground surveying techniques is evident.

- No evidence of re-traversing, plumbing down rises and spirit levelling was available.

- Site plans are, as a rule not up to date.

- Major surface control is not closed and balanced.

Shortfalls in Instrument Maintenance and Controls

- Instrument calibration and adjustment.

- Instrument service schedule “up to date.”

- Prism constant calibration.

- Atmospheric calibration (ie, p.p.m. correct).

- Control registers up to date, closed and adjusted.

- Traverse equipment adjusted including optical zeniths and plummets.

This does not imply that there is any serious lack of competency in most persons carrying out survey work.

It does, however, show that controls and checks on standards of practice and verification of precision and integrity are lacking in some cases, and the process needs to be better managed, with adequate monitoring and mentoring by professionals with in-depth experience.

It is for these reasons that mine surveying remains a registered occupation (requiring statutory appointment) under the Mines Safety and Inspection Act 1994.

As an example, it is essential to have available a comprehensive and accurate set of current working plans available at underground mines at all times, so that should a mine emergency arise, plans for emergency response (mines rescue) teams are immediately available.

Cases have been found where the surveyor is away and the required information is stored electronically, in a computer not readily accessed.

RECOMMENDED ACTIONS

Registered Mine Managers and Authorised Mine Surveyors should thoroughly audit all aspects of surveying and plan preparation and maintenance at each mine.

The problem of running "lean and mean", which has presented itself in a variety of forms at current mining operations, must not be allowed to put at risk the integrity of surveying upon which safety in mining operations depends.

Registered Managers should ensure that where an Authorised Surveyor is to leave an operation, the validation of all plans and records is ensured so that integrity is maintained at handover.

Failures and oversights can have and have had, catastrophic consequences.

This Safety Bulletin will be sent to the tertiary institutions providing training in surveying, to highlight the need for awareness and capacity in these critical functions.

CONCLUSION

The Board has resolved that an audit of surveying functions and practices will be developed which can be added to the series of High Impact Function Audits carried out by the Department's mining inspectorate.

It is the intention of the inspectorate to progressively outplace auditing and the survey audit will certainly lend itself to being carried out by competent third party auditors.

To assist surveyors in the industry to achieve and maintain surveying standards the Board has proposed to develop a Guideline titled "**Mine Surveying Standards and Procedures.**"

Following circulation of the draft to the professional surveying institutes, the Guideline will be provided to MOSHAB for endorsement and distribution.

J M Torlach
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