NSW DEPARTMENT OF
PRIMARY INDUSTRIES

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Submission

Standards and Accreditation

March 2006

Safety in the NSW Mining Industry

Safety depends on a management systems approach, utilising fit for purpose equipment competent people, proper procedures and a managed work environment.

Standards and accreditation for the above elements are important strategies for achieving mine safety and managing catastrophic risk.

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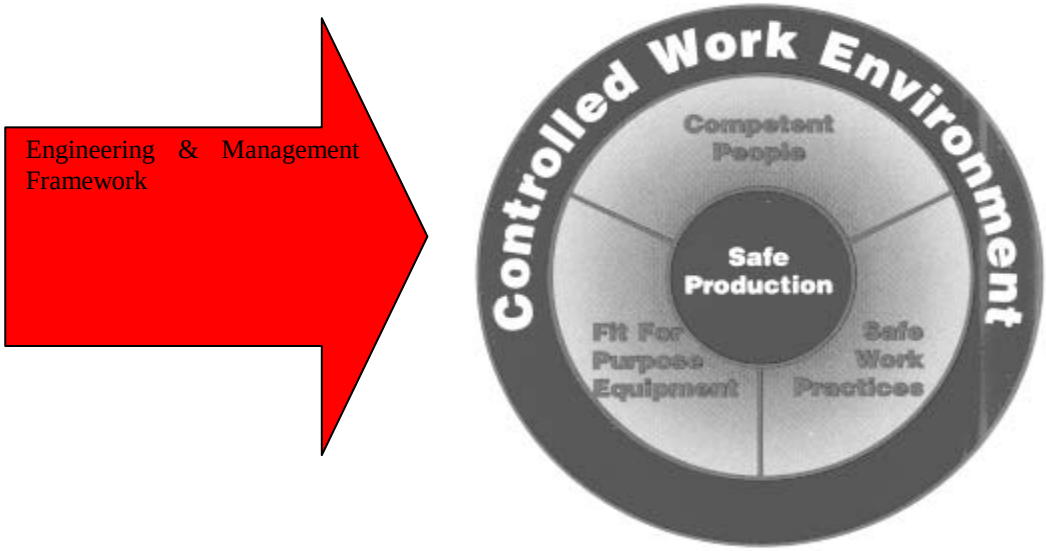
Introduction – Mine Safety in NSW

Mining, Electrical and Mechanical Engineering decisions are critical to attaining safe production at mine sites. To achieve safety, these decisions must be of the highest quality. A model for making these quality decisions is the Minerals Industry Risk Management Model (MIRM Model). MIRM has two main elements; these are the management system and the work process factors. The management system incorporates the management and engineering framework for the design and operation of the site. As such, it supplies the inputs to the daily work processes to achieve safe production within a controlled work environment, by, competent people, fit for purpose equipment and safe work practices. This is expressed in the diagram below. (Refer: www.mishc.uq.edu.au)



The quality of the decision depends on the quality of the engineering and management process that designs, purchases, installs, commissions, operates, maintains (including repair and overhaul), modifies, trains, standardises and otherwise defines the nature of the day-to-day work process. To do this the management system has to be defined and formally documented so that the quality of key decisions is not left to chance. (Refer to Australian/New Zealand Standard AS/NZS 4801:2001 *Occupational health and safety management systems—specification with guidance for use)*

All of the above must be present and effective at every stage of the equipment and mine's life cycle, and must be effectively supported by the organisational culture. If any element is deficient, or, there is ineffective support from the organisational culture – safe production is left to chance.

The role of standards and accreditation for Mine Safety in NSW

Each of the areas depicted above rely on Standards of some form to guide decision makers. This guidance takes on a number of forms, namely Australian Standards, International Standards and Regulatory Guidelines and Codes of Practice. As many safety issues are common across industries, and within the mining industry common across state borders (and often, international borders) Australian & International Standards are an ideal method of providing guidance and removing interstate / international inconsistencies. Regulatory Guidelines and Codes of Practice are well placed to cater for particular state issues that arise where there is a gap in Australian & International Standards or particularly unique circumstances for a particular state. Often these Guidelines and Codes of Practice refer to Australian and International Standards.

Within the mining industry there are a number of catastrophic risk areas and over the years Australian and International Standards have been developed to give confidence that if equipment is designed and tested in accordance with the standards then the risk will be dramatically reduced. The higher the risk, the greater the level of scrutiny that is required to ensure compliance with the standards. So, over the years accreditation schemes have developed to give confidence in that scrutiny.

These Standards and Accreditation schemes are useful, effective and efficient tools for:

- OH&S duty holders and regulators to base many safety decisions on.
- the regulator to adopt, in lieu of developing and implementing their own systems, and
- stakeholder consultation and acceptance.

If these “tools” were to disappear, duty holders and regulators would have to individually develop their own standards setting capabilities and scrutiny of testing organizations – leading to variable confidence in outcomes and more regulatory intervention,

In summary:

- Standards and accreditation of organizations that conduct testing of equipment and chemicals are an essential component for mine safety in NSW.
- Standards provide an efficient means for OH&S duty holders to provide a safe work place
- Standards provide an efficient method for regulators to provide guidance
- Standards are an avenue to remove interstate and international barriers
- Accreditation of testing organizations gives OH&S duty holder’s confidence in testing with minimal direct oversight.
- Accreditation of testing organizations gives regulators confidence in testing with minimal direct oversight.

An example of a regulator using both Standards and Accreditation are given in the attached extracts of an industry discussion paper which has a proposal relying on Standards and Accreditation and encompasses many of the issues mentioned.

Standards development

The NSW Department of Primary Industries, Mine Safety Operations and the Mine Technology Centre (Thornton) have programs for developing Standards, Guidelines and Codes of Practice across the full spectrum of mining activities, management systems and equipment (electrical and mechanical powered) at mines.

Staff is involved in many standards committees. Many of these committees relate to matters that are common to many types of industry, not just mining, these can be termed “general standards”. Some committees are specifically for mining (e.g. EL-023, ****) and can be termed “mining standards”. It is our policy to strive for mining industry safety and engineering concerns to be addressed in all of the standards.

There are significant advantages for us as a mining regulator in taking this approach, these are:

- When published the standards are accepted by all the key stakeholders and become an industry minimum benchmark.
- The extent of DPI work relates to our technical expertise and safety concerns; we do not have to “manage” the publication of such standards.
- Our focus for standards development is on product quality, without being encumbered with administrative costs. The resources for standards development are given freely and budgeted for on an annual basis.
- General standards involvement exposes our staff to international developments and contemporary approaches, which can be used in mining specific areas for improving safety.
- General standards development and adoption is consistent with the OH&S legislative approach of aligning mine safety legislation with general OH&S legislation.
- International and interstate legislative and trade barriers to equipment use can be removed, with the consequent ease of implementing new technology and systems to improve safety.

As an aside, when participating on International Standards the credibility of Australia can be enhanced by the professional approach currently taken.

A program for developing industry standards relating to electrical engineering safety is given below. The importance of Australian and International standards development is self evident.

Industry Standards Program

For

Inspectors of Electrical Engineering

2006 - 2010

A basis for fit for purpose electrical equipment and systems

Program for establishing standards, guidelines, codes of practice and handbooks for Electrical Engineering Safety in the NSW Mining and Extractive Industries

TEST BEFORE YOU TOUCH

Foreword

This document should be read in conjunction with the Strategic and Operational Plan for Electrical Engineering Safety in the NSW Mining and Extractives Industry. It deals specifically with a program of developing Industry Standards. Industry standards are an essential tool in achieving specific DPI Mine Safety targets for electrical engineering safety within the mining industry.

Industry Standards fit well with contemporary OH&S legislation and are a source of essential information. Industry Standards provide:

- Useful information for all industry stakeholders and are essential to implementing sound engineering.
- A contemporary basis to which existing and proposed mine site installations and plant can be compared as a starting point for making sound engineering decisions.
- A minimum compliance basis to which plant designers and suppliers can benchmark their existing and proposed plant.

Industry standards are a repository for technical and practical information with established assessment and test criteria. Industry standards often document human experience, proven engineering methods, solutions to known problems, well established risk controls, proven engineering design and hard earned lessons. Not only are these standards useful today, but they will be a useful source of information for our successors.
Industry standards are also a source of contemporary engineering and management methods, in particular in the area of risk management and functional safety. Industry standards can be revised at suitable intervals to ensure ongoing improvements and relevance by industry stakeholders.
For all of these reasons Industry Standards are a cornerstone for fit for purpose electrical equipment, systems, installations and practices, and without them a great deal of resources would be expended “re-inventing the wheel”.

Industry Standards consist of:

- Australian Standards,
- International Standards,
- DPI MDG’s,
- DPI CoP’s,
- Workcover CoP’s, and
- Handbooks

A structured Industry standards program will:

- Develop guidance on the life-cycle management of electrical engineering safety
- Facilitate safe plant design
- Set a minimum expectation for plant design (and, where appropriate, other life-cycle safety issues such as maintenance).
- Provide a risk based engineering process that delivers engineered risk controls with the appropriate safety integrity
- Develop guidance on competency requirements for electrical workers, mine electrical engineers and hazardous area equipment workers
- Develop guidance on safe electrical work systems and procedures
- Develop guidance on emerging technical and practical mining issues (eg high voltage distribution underground, safety critical systems, high energy explosion protection),
- Develop an industry culture of standards use through industry ownership of standards and guidance material, and reinforce workplace responsibility for OHS management,
- Evaluate international; technical standards prior to adoption into Australia,
- Facilitate intelligent and informed decision making in maters of electrical engineering safety,
- Apply a consistent approach and format to technical guidance material that reflects its role in the legislative framework, and
- Embody the minimum expectations of the regulator.

John Francis Waudby
Senior Inspector of Electrical Engineering

Contents

Purpose of this Document

For a number of years The Inspectors of Electrical Engineering have been actively engaged in an improvement project designed to deliver a model for operating that will be best practice.

The result is a construct consisting of a solid foundation based on the Corporate Plan, RIMS, and the Strategic Plan for Electrical Engineering Safety, through to development of documented assessment criteria, and work plans that are designed to deliver our objectives in accordance with identified priorities.

The IEE will continually improve industry standards processes so that they always reflect the electrical engineering safety aspirations of the DPI and the Mining Industry.

The Industry Standards Program will be used by Inspectors of Electrical Engineering to:

- Prepare work plans for a 1 year and 3 year outlook.
- Show other officers in the DPI what we are trying to do and why we are trying to do it.
- Solicit constructive comment on our industry standards activities to help us improve.

Other industry stakeholders will benefit from the document by being able to align their expectations with a documented plan, and participate in industry standards programs knowing what the important standards are and which standards are in what stage of development / implementation. In particular mines will be able to integrate industry standards work with standards of engineering practice (SEP's).

Internal and external organisations will be able to adjust their own processes to integrate with the processes documented here for greater efficiency and effect.

Policy concerning Industry Standards.

Electrical team:

Develop industry standards for Electrical Engineering Key Risk Areas and Electrical Engineering Safety Key Risk Controls through a planned program that will:

- Adopt appropriate standards guidelines, codes of practice and handbooks from the non-mining industry
- Develop industry Codes of Practice to support legislation
- Focus on the development and review of Australian and International Standards in preference to DPI Guidelines
- Develop DPI Guidelines where there is no equivalent Australian or International Standard and there is an immediate need (safety and DPI operational)
- Where DPI Guidelines are required – develop, implement and transform into Australian Standards

Electrical team policy statement 1. Australian Standards

1. Australian Standards are created by appropriate personnel, to which the Standard relates.
2. Draft Australian Standards are important and must be thoroughly reviewed prior to their release to ensure the views of the DPI are represented and that industry is aware of the foreseeable impacts of implementation.
3. Draft Australian Standards are not applied in enforcement actions, however, they are a point of reference for the electrical team.
4. The defined year of print of an Australian Standard is the year of implementation.
5. Australian Standards are not retrospective, however,
    a. When a Plant is installed to an Australian Standard that plant remains compliant within that standard as long as the plant is maintained to that standard.
    b. Subsequent Australian Standards which supersede the standard, to which the plant was installed, should be assessed to determine if the latter Standard has identified issues which create a hazard to the plants operation in its current state.
    c. Appropriate action should be taken to remove the hazard from the plant which the latter Standard identified.
    d. When extensions / upgrades / modernisations are made to an existing plant, the current standard should be the benchmark.
    e. There is no requirement to upgrade an existing plant to the latter Standard, if there are no issues identified in the latter Standard which are assessed as creating a hazard in the original plants operation.

6. The Occupational Health and Safety Standards Coordination Group (OHS SCG) have developed a generic solution with the view that:-
    "Retrospectivity should be implemented only where major safety issues are involved, and even then it is necessary for Regulatory Authorities to treat the matter with sensitivity"
7. All appropriate Australian Standards are attempting to have some form of wording which incorporates the concept of a time frame for compliance.

Electrical team policy statement 2. Australian Standards

Tuesday, 20 January 2004 – Letter to industry (ID 292232000)

Re: Standards for Electrical Equipment (apparatus and cables) used in NSW coal mines.

Standards for electrical equipment and installations can be considered a minimum standard to be achieved in providing a safe workplace.

There are a number of Standards that relate specifically to electrical equipment used in coal mines, which are amended from time to time. When a standard is amended, the Department of Mineral resources expects all

relevant parties to review the standards; in particular any changes, and give due consideration to upgrading electrical equipment to the latest standard, as soon as practicable and in a manner appropriate to the level of risk.

The application of some standards can be made mandatory by legislation. AS2081 "Electrical equipment for coal and shale mines – Electrical protection devices," is such a standard. Clause 140(3) Coal Mines (Underground) Regulation 1999 requires electrical protection for earth leakage, earth continuity or earth fault lockout underground at the mine to comply with AS2081.

Clause 140(3) came into effect in 1999; the standard to which it referred was AS2081: 1988. In August 2002 AS2081 was amended and republished as AS/NZS 2081:2002. Clause 140(3) does not specify whether amendments to AS2081: 1988 are mandatory or not. The issue becomes when should equipment be upgraded to comply with the amended standard.

The Department of Mineral Resources expects

1. All relevant parties review standards when they are re-published; in particular any changes, and plan to upgrade electrical equipment to the latest standard, at the first repair, overhaul or conformance modification opportunity and in a manner appropriate to the level of risk.
2. New equipment complies with the latest standard or complies with any requirements imposed under product certification schemes such as the AUS Ex Scheme, ANZ Ex Scheme and IEC Ex Scheme.
3. In particular, that earth leakage, earth continuity and earth fault lockout devices comply with AS2081: 1988, and a plan to upgrade to AS2081: 2002 be implemented consistent with the above advice.

Electrical team policy statement 3. Australian and International Standards

There are many Australian and International Standards related to electricity. They are a point of reference for the electrical team. The electrical team is expected to use standards that are considered relevant. For example: A mine wishes to install 33kv systems underground – a critical reference standard would be standards relating to "Insulation Coordination", although there is no foreseeable reason why the DPI should be represented on that standard.
The electrical team will only participate in the development of Australian and International Standards where it coincides with electrical engineering safety priorities for us.
Individuals are free to comment on any standard to the relevant standards committee at any time but must make that comment as an individual, not as a DPI representative.
Where an individual identifies a need for the DPI to comment on any standard, the matter must be discussed at an IEE meeting and authorised by the SIEE before comment is made. The individual will be responsible for that correspondence.
For standards where the DPI is represented, feedback on current work will be given at IEE meetings and topical matters discussed. The responsible DPI representative will take the electrical team's position back to the relevant committee. The responsible DPI representative will inform the SIEE on any contentious matter that is not consistent with the DPI position.

Electrical team policy statement 4. Australian and International Standards

Refer to Industry Standards Issues Document for matters to be addressed during Standards review

Mine Safety Planning & Industry Standards

Mine Safety Business Plan

Outcome: 3.3: Mining industry operates to best practice health and safety standards

Corporate Strategy 3.3(a):
Develop the regulatory model and industry standards, and enforce those standards and analyse information to improve on the safe extraction of a resource
Corporate Strategy 3.3(b): Evaluate industry performance through site assessments and conduct responsive and effective investigations.

The corporate strategies both require the setting of standards as a basis for safety improvement and a benchmark for the regulator against which to measure industry performance.

Within the Strategic and Operational Plan for Electrical Engineering Safety in the NSW Mining and Extractives Industry includes a strategy for Legislation and industry standards development and it states:

OBJECTIVES

Industry Standards for electrical equipment provide guidance on all aspects of electrical engineering safety and complement the legislation.

OUTCOMES

Mines have total responsibility for ensuring electrical technology is used in a safe manner.

Information on electrical engineering safety risk controls is readily available for mine operators, manufacturers and suppliers of plant, service providers and other stakeholders

Information on electrical engineering safety risk controls is readily available for the DPI electrical team.

Industry standards encompass all the electrical engineering safety key risk controls

Industry standards encompass all types of electrical plant, installations and systems.

STRATEGIES

Industry Standards

Identify Australian and International Standards committees that are important for electrical engineering safety at mine sites.

Participate on those Australian and International standards committees with a significant relevance to mining.

Participate on those Australian and International standards committees that are contemporary in relation to safety of plant.

Comment on Australian and International standards for general industry that are applicable to improving mine safety.

Good liaison maintained between the DPI and interstate agencies.

Document hard earned lessons, successful practical experience and proven good engineering practice.

Develop DPI guidelines in specialist areas.

Develop CoP's to support legislation and "fill in the gaps".

Aim for DPI guidelines to be developed into Australian Standards.

WHAT ARE INDUSTRY STANDARDS?

Industry standards encompass:

- IEC standards
- Australian (AS or AS/NZS) standards
- Australian Standards Handbooks
- DPI MDG's
- DPI Codes of Practice
- Other CoP's (Workcover)

They are documents that provide technical and practical guidance or specific requirements on management systems, management methods, specific risks, specific equipment and specific applications.

INDUSTRY STANDARDS IN CONTEXT

The quality of safety management decisions depends on the quality of the engineering and management process that designs, purchases, installs, commissions, operates, maintains (including repair and overhaul), modifies, trains, standardises and otherwise defines the nature of the day-to-day work process. To do this the management system has to be defined and formally documented so that the quality of key decisions is not left to chance. (Refer to Australian/New Zealand Standard AS/NZS 4801:2001 *Occupational health and safety management systems—specification with guidance for use).* All of the above must be present and effective at every stage of the equipment and mine's life cycle, and must be effectively supported by the organisational culture. If any element is deficient, or, there is ineffective support from the organisational culture – safe production is left to chance.

Access and use of advisory material such as standards, guidelines, codes of practice is essential for each of the elements of the MIRM Model. Further, through the development of such material come ownership, deeper understanding and confidence in decision making.
A For over 25 years, DPI Mine Safety (in all its former guises) has recognised the importance of establishing advisory material and promoting its use in improving mining electrical engineering safety. Mine Safety has been instrumental in initiating numerous coal mining Australian Standards & Handbooks, participating and adding value to numerous other electrically related Australian Standards & Handbooks and International Standards. Specific departmental guidelines have also been developed and implemented.

Much of the advisory material has been developed from proven practical experience, proven engineering design, accidents, incidents and near misses. There has also been a significant adoption of contemporary OH&S, Risk Management and Engineering Management and knowledge and practices. Also, Mine Safety has recognised that the development of such advisory material extends to other engineering disciplines and management.

WHAT'S HAPPENING NOW

The development of industry standards is a central and key area for the strategic plan for electrical engineering safety. To maximise the benefit and to allow the efficient use of DMR resources there has to be a focus on the most important industry standards without "losing sight" of the "whole picture".
A key requirement is to encourage more industry input.

INDUSTRY STANDARDS AND ELECTRICAL ENGINEERING SAFETY KEY RISK CONTROLS

The strategic and operational plan also identifies the key risk controls that must be in place, usually in combination, and which are critical to realising the vision. The Industry standards program is designed to give guidance in each of these aspects. These key electrical engineering safety risk controls are:

1) Electrical technology management systems incorporating incident investigation.
2) Competency (of people engaged in electrical equipment and systems throughout the life cycle.).
3) Fit for purpose (FFP) electrical equipment, including:
   - High energy electrical systems
   - Electrical protection.
   - Earthing and lightning protection.
   - Electrical equipment (cables and apparatus) in non hazardous areas.
   - Machine (M/C) Control circuits.
   - Signage
   - Electrical apparatus in a hazardous zone (includes gas monitoring).
   - Cables in a hazardous zone
4) Safe Procedures, including:
   - Hazardous zone classification
   - Removal/restoration of power procedures
   - Isolation procedures
   - Electrical testing procedures
   - Electric welding procedures.
   - Electric Shock and Burn protocols.
   - Use of portable apparatus underground procedures
   - Remote control equipment use procedures
   - High Voltage Work Practices

Part 2 – Industry Standards Products

Detailed description

of the

Industry Standards and their relevance

Note: Technical references relating to licensing of cable repair workshops and competency of cable repairers is dealt with in the Industry Infrastructure Support Program.

Electrical technology management systems (incorporating incident investigation)

EES KEY RISK CONTROL

Electrical technology management systems incorporating incident investigation.

Important Industry Standards

AS/NZS4360

AS4801

AS4804

MDG1010

CoP – Electrical Engineering Management Plans

Risk Management & Classification of hazardous areas

AS/NZS4360

Relevance of Standard

Provides principles of risk management

Application by Industry

Risk Management systems used by industry stakeholders are consistent with AS/NZS4360

DPI Process

DPI rep.	Input	Input Initiator	Input to	Input method	Review Point
None	Public comment process	Any / all electrical staff.	Australian Standards Project Officer	Correspondence	IEE meeting – ad hoc

AS/NZS4801 & AS/NZS4804

Relevance of Standard

Provides principles and guidance on OH&S management

Application by Industry

OH&S management systems used by industry stakeholders are consistent with AS/NZS4801 & AS/NZS4804

DPI Process

DPI rep.	Input	Input Initiator	Input to	Input method	Review Point
None	Public comment process	Any / all electrical staff.	Australian Standards Project Officer	Correspondence	IEE meeting – ad hoc

MDG1010

Relevance of Standard

Provides principles of risk management as applied in the mining industry

Application by Industry

Risk Management systems used by industry stakeholders comply with MDG1010 as a minimum or demonstrate equivalence

DPI rep.	Input	Input Initiator	Input to	Input method	Review Point
SIME	DPI review process	Any / all electrical staff.	SIME	Correspondence	MDG WG

DPI CoP – ELECTRICAL ENGINEERING MANAGEMENT PLAN (EEMP)

Relevance of Standard

Provides details of DPI expectations of the content of a mine EEMP and integration into the mine OH&S Management System. It encompasses all the legislative requirements.

Application by Industry

Mine EEMP's comply as a minimum to the CoP.

DPI Process

DPI rep.	Input	Input Initiator	Input to	Input method	Review Point
IEE Spruce	IEE CSAC, MSAC, EISAC, & EE Meetings	Any / all electrical staff.	SIEE	Correspondence, meeting minutes	IEE CSAC, MSAC, EISAC, & EE Meetings

RISK MANAGEMENT & CLASSIFICATION OF HAZARDOUS AREAS

Relevance of Standard

Provides details of classification of hazardous areas using risk assessment techniques

Application by Industry

Mine surface hazardous area classification

Process for determining underground hazardous areas not specified by legislation.

DPI Process

DPI rep.	Input	Input Initiator	Input to	Input method	Review Point
SIEE Waudby	Australian Standard committee	Any / all electrical staff.	SIEE	Correspondence, meeting minutes	IEE, CSAC, MSAC and EISAC

CoP - MANAGEMENT OF Ex EQUIPMENT AT MINES

Relevance of Standard

Provides requirements for the life-cycle management of Ex equipment at U/G coal mines. It has links to key hazardous area standards, hazardous area competencies and workshop licensing.

Application by Industry

U/G coal mines to have management systems that comply with the CoP.

DPI Process

DPI rep.	Input	Input Initiator	Input to	Input method	Review Point
MSO-EE P De Gruchy	IEE meeting, CASC, EE Meetings	Any / all electrical staff. Industry	SIEE	Correspondence, meeting minutes	IEE meeting CSAC EE Meetings

Competency of people

(engaged in electrical equipment and systems throughout the life cycle.)

IMPORTANT INDUSTRY STANDARDS

Mine Electrical Engineers Certificate of Competence

CoP for Electrical Work

AS/NZS 4761 (Hazardous area competencies)

Technical Reference for Cable Repairer Competencies

MITAB Competencies (Mine Electrical Engineers)

NUITAB Competencies

MINE ELECTRICAL ENGINEERS CERTIFICATE OF COMPETENCY

Relevance of Standard

Provides minimum requirements to qualify for examination in the qualification Certificate of Competency, Mine Electrical Engineer

Application by Industry

All U/G coal mines must employ a Manager of Electrical Engineering with this qualification.

All O/C mines must consult with a qualified engineer.

DPI Process

DPI rep.	Input	Input Initiator	Input to	Input method	Review Point
IEE Kennedy	Coal Competency Board and public comment process	Any / all electrical staff.	SIEE	Correspondence	IEE meeting

CoP FOR ELECTRICAL WORK

Relevance of Standard

The aim of this code of practice is to provide the mining industry with a set of safety measures that can be incorporated into the Electrical Engineering Management Plan, to align electrical work practices with those that are regulated in non mining settings (Note: Industry in general has considered electrical work to be “special” and with the potential to contribute to death and injuries in the community if the electrical work is not done properly. For this reason electrical workers are required top be trades qualified and licensed.).

The object is to ensure the safety of electrical installations at mines by nominating minimum standards and procedures for electrical installation work and testing of that work; and requirements for the maintenance of electrical installations.
Electrical installations at mines should be designed by qualified electrical engineers with relevant experience in the mining industry.

Electrical work is considered to be specialist work. It is therefore necessary to ensure that any electrical work is carried out by competent qualified people.
These measures aim to protect life and property from the potential dangers of electricity and to provide written certification of electrical safety to operators of coal operations where work is carried out on an electrical installation by employees or contractors.

Application by Industry

Mine EEMP's comply as a minimum to the CoP.

DPI rep.	Input	Input Initiator	Input to	Input method	Review Point
MSO De Gruchy	IEE, CSAC, MSAC, EISAC meetings	Any / all electrical staff.	SIEE	Correspondence	IEE meeting

AS/NZS 4761 (HAZARDOUS AREA COMPETENCIES)

AS/NZS 4761.1 Competencies for working with electrical equipment for hazardous areas (EEHA) - Competency Standards
AS/NZS 4761.2 Competencies for working with electrical equipment for hazardous areas (EEHA) - Guide for training and assessment

Relevance of Standard

Provides minimum requirements for competencies to undertake any of the life-cycle activities related to Ex equipment.

Application by Industry

Electrical staff at mines working on any of the life-cycle activities associated with Ex equipment must have the relevant competencies (hazardous area competencies).

Hazardous area competencies must be integrated into mine OH&S plans and the EEMP.

Workshops that repair and overhaul All U/G coal mines must employ competent persons with the relevant hazardous area competencies. A competent person in a workshop has defined responsibilities – refer AS/NZS3800.

DPI Process

DPI rep.	Input	Input Initiator	Input to	Input method	Review Point
IEE Maginnis	Australian Standard P-012 committee work	Any / all electrical staff.	IEE Maginnis	Correspondence and committee work	IEE meeting

TECHNICAL REFERENCE FOR CABLE REPAIRER COMPETENCIES

Relevance of Standard

Flexible mining cables are of a special construction and use special materials. The repair of such cables is highly specialised work requiring specific competencies. This technical reference provides minimum requirements for competencies to undertake repair, inspection and testing of flexible mining cables used in hazardous zones.

Application by Industry

Underground coal mines are required to have flexible cables repaired at a licensed facility, which in turn requires the work to be done or oversighted by a competent cable repairer.

Many open cut mine and underground metalliferous cables are similar in construction and materials to underground coal mine cables. Safe repair requires special competencies.

Cable repair competencies must be integrated into mine OH&S plans and the EEMP.

DPI Process

DPI rep.	Input	Input Initiator	Input to	Input method	Review Point
SIEE Waudby	Through IEE and Cable Repairers meeting	Any / all electrical staff.	SIEE Waudby	Correspondence and meeting work	Cable repairers Meeting

MITAB COMPETENCIES (MINE ELECTRICAL ENGINEERS)

Relevance of Standard

Could eventually replace the requirement for statutory examination for the Certificate of Competence, Mine Electrical Engineer

Application by Industry

All U/G coal mines must employ a Manager of Electrical Engineering with this qualification.

All O/C mines must consult with a qualified engineer.

DPI Process

DPI rep.	Input	Input Initiator	Input to	Input method	Review Point
IEE Maginnis	Through MITAB	Any / all electrical staff.	IEE Maginnis	Correspondence	IEE meeting

NUITAB COMPETENCIES

Relevance of Standard

National Utilities competencies, covers electrical work in specific industrial situations and general electrical competencies applied to all industries.

Application by Industry

Many competencies required to do electrical work at mines are covered by NUITAB competencies.

DPI Process

DPI rep.	Input	Input Initiator	Input to	Input method	Review Point
None	Through NUITAB	Any / all electrical staff.	NUITAB	Correspondence	IEE meeting – ad hoc

Fit for Purpose (FFP) electrical equipment

Fit for purpose (FFP) electrical equipment specifically includes:

- High energy electrical systems
- Electrical protection.
- Earthing and lightning protection.
- Electrical equipment (cables and apparatus) in non hazardous areas.
- Machine (M/C) Control circuits.
- Signage
- Electrical apparatus in a hazardous zone (includes gas monitoring).
- Cables in a hazardous zone

There are a multitude of equipment standards and system standards that cover the above matters, many of them applying to general industry as well as mining. The industry standards identified for DPI involvement are given in Table 1. These standards relate to the essential fit for purpose equipment risk controls as identified.

Safe Procedures

- Hazardous zone classification
- Removal/restoration of power procedures
- Isolation procedures
- Electrical testing procedures
- Electric welding procedures.
- Electric Shock and Burn protocols
- Use of portable apparatus underground procedures
- Remote control equipment use procedures
- High Voltage Work Practices

The Industry Standards related to Safe Procedures are given in Table 2

Table of Industry Standards – Fit for Purpose Equipment

Table 1 – Pages 19 - 22

Committee No	Standard No.	Subject	Essential FFP Equipment risk control
EL-03	AS1972	Electric cables - Underground coal mines - Other than reeling and trailing	➢ Electrical equipment (cables and apparatus) in non hazardous areas ➢ Cables in a hazardous zone
EL-03	AS1802	Electric cables - Reeling and trailing - For underground coal mining purposes	➢ Cables in a hazardous zone
EL-03	AS2802	Electric cables - Reeling and trailing for mining and general use (other than underground coal mining)	➢ Electrical equipment (cables and apparatus) in non hazardous areas ➢ Cables in a hazardous zone
EL-03	AS1747	Reeling, trailing and feeder cables used for mining - Repair, testing and fitting of accessories	➢ Cables in a hazardous zone
EL-03	Handbook	U/g cable management practices	➢ Electrical equipment (cables and apparatus) in non hazardous areas ➢ Cables in a hazardous zone
EL-014	Main Committee	Coordinate all hazardous area work undertaken by Standards Australia.	➢ EL-014 – Equipment for hazardous areas ➢ EL-023 – Equipment for coal mines ➢ MS-011 – Classification of hazardous areas ➢ P-008 – Management Committee ANZEx Scheme ➢ ET-006-01 – Management Committee (Australia) IEC Ex Scheme ➢ P-012 – Hazardous area competencies
EL-014	AS 1826	Electrical equipment for explosive atmospheres - Special protection - Type of protection s	➢ Electrical apparatus in a hazardous zone (includes gas monitoring).
EL-014	AS/NZS 2381, Parts 1-7	Electrical equipment for explosive atmospheres - Selection, installation and maintenance ➢ General requirements ➢ Flameproof enclosure d ➢ Increased safety e ➢ Intrinsic safety i	➢ Electrical apparatus in a hazardous zone (includes gas monitoring).
EL-014	AS/NZS 3800	Electrical equipment for explosive atmospheres - Overhaul and repair	➢ Electrical apparatus in a hazardous zone (includes gas monitoring).
EL-014	60079.14 & 60079.17	Pt 14 – Electrical installation in hazardous areas Part 17 Inspection and maintenance	➢ Electrical apparatus in a hazardous zone (includes gas monitoring).
EL-014	60079.19	Overhaul and repair	➢ Electrical apparatus in a hazardous zone (includes gas monitoring).
EL-014	AS/NZS 61779 Parts 1-6	Electrical apparatus for the detection and measurement of flammable gases – ➢ General requirements and test methods ➢ Performance requirements for group I apparatus indicating a volume fraction up to 5% methane in air ➢ Performance requirements for group I apparatus indicating a volume fraction up to 100% methane in air	➢ Electrical apparatus in a hazardous zone (includes gas monitoring).

Committee No	Standard No.	Subject	Essential FFP Equipment risk control
		➢ Guide for the selection, installation, use and maintenance of apparatus for the detection and measurement of flammable gases	
EL-014	IEC 31/387/NP	Equip in explosive atmospheres in mines **Issue:** Need to monitor closely	➢ Electrical apparatus in a hazardous zone (includes gas monitoring). ➢ Category M1 equipment.
EL-014	AS/NZS60079, Parts 0-29	Electrical apparatus for explosive gas atmospheres ➢ General requirements ➢ Flameproof enclosure (d) ➢ Intrinsic safety 'i' ➢ Pressurized enclosures (p) ➢ Intrinsically safe systems ➢ Fieldbus intrinsically safe concept (FISCO) ➢ Powder filling 'q' ➢ Oil-immersion 'o' ➢ Increased safety (e) ➢ Functional safety of fixed gas detecting systems	➢ Electrical apparatus in a hazardous zone (includes gas monitoring). ➢
EL-014	HB13	Electrical equipment for hazardous areas	➢ Electrical apparatus in a hazardous zone (includes gas monitoring).
EL-O17	IEC60204, Parts 1-11	Safety of machinery - Electrical equipment of machines ➢ General requirements – LV Machines ➢ HV Machines	➢ High energy electrical systems ➢ Electrical protection ➢ Earthing and lightning protection ➢ Electrical equipment (cables and apparatus) in non hazardous areas ➢ Machine (M/C) Control circuits ➢ Cables in a hazardous zone ➢ Electrical apparatus in a hazardous zone (includes gas monitoring).
EL-017	IEC62061	Functional safety of machines	➢ Machine (M/C) Control circuits
EL-023	AS/NZS 2081, Parts 1-5	Electrical equipment for coal and shale mines - Electrical protection devices – ➢ General requirements ➢ Earth-continuity monitoring devices ➢ Earth-leakage protection systems for use on earth-fault current limited systems (IT systems) ➢ Lockout earth-fault protection devices ➢ Earth-fault limiters	➢ Electrical protection ➢ Earthing and lightning protection ➢ Electrical equipment (cables and apparatus) in non hazardous areas ➢ Electrical apparatus in a hazardous zone (includes gas monitoring).
EL-023	AS/NZS4871, Parts 1 – 6	Electrical equipment for coal mines, for use underground – ➢ General requirements ➢ Distribution, control and auxiliary equipment ➢ Substations ➢ Mains powered electrical mobile equip ➢ Battery powered electrical mobile equip ➢ Wiring of diesel engine machines	➢ High energy electrical systems ➢ Electrical protection ➢ Earthing and lightning protection ➢ Electrical equipment (cables and apparatus) in non hazardous areas ➢ Machine (M/C) Control circuits ➢ Cables in a hazardous zone ➢ Electrical apparatus in a hazardous zone (includes gas monitoring).
EL-023	Handbook	HV practices at mines	➢ High energy electrical systems ➢ Electrical protection

Committee No	Standard No.	Subject	Essential FFP Equipment risk control
			➢ Earthing and lightning protection ➢ Electrical equipment (cables and apparatus) in non hazardous areas ➢ Machine (M/C) Control circuits ➢ Cables in a hazardous zone ➢ Electrical apparatus in a hazardous zone (includes gas monitoring). ➢ Signage
EL-023	Handbook	Repair of haz area equipment	➢ Electrical apparatus in a hazardous zone (includes gas monitoring).
EL-023	AS4242	Earth-moving machinery and ancillary equipment for use in mines - Electrical wiring systems at extra-low voltage	➢ Electrical equipment (cables and apparatus) in non hazardous areas.
EL-023	AS1147.1	Electrical equipment for coal mines - Insulating materials - Materials for insulating power conducting components	➢ High energy electrical systems ➢ Earthing and lightning protection. ➢ Electrical equipment (cables and apparatus) in non hazardous areas. ➢ Electrical apparatus in a hazardous zone (includes gas monitoring). ➢ Cables in a hazardous zone
EL-023	AS1299	Electrical equipment for coal mines - Flameproof restrained plugs and receptacles	➢ Electrical apparatus in a hazardous zone (includes gas monitoring). ➢ Cables in a hazardous zone
EL-023	AS1300	Electrical equipment for coal mines - Bolted flame-proof cable coupling devices	➢ Electrical apparatus in a hazardous zone (includes gas monitoring). ➢ Cables in a hazardous zone
EL-023	AS2290, PARTS 1 & 3	Electrical equipment for coal mines - Maintenance and overhaul – ➢ Maintenance of electrical equipment for hazardous areas ➢ Maintenance of gas detecting and monitoring equipment	➢ Electrical apparatus in a hazardous zone (includes gas monitoring).
EL-023	AS/NZS4240	Remote Controls for Mining Equipment	➢ Machine (M/C) Control circuits.
El-023	AS3007, Parts 1-5	Electrical installations - Surface mines and associated processing plant ➢ Scope and definitions ➢ General protection requirements ➢ General requirements for equipment and ancillaries ➢ Additional requirements for specific applications ➢ Operating requirements	➢ High energy electrical systems ➢ Electrical protection. ➢ Earthing and lightning protection. ➢ Electrical equipment (cables and apparatus) in non hazardous areas. ➢ Signage ➢ Machine (M/C) Control circuits.
EL-023	AS/NZS 62013, Parts 1 & 2	Caplights for use in mines susceptible to firedamp - General requirements ➢ Construction and testing in relation to the risk of explosion ➢ Performance & other safety matters	➢ Electrical apparatus in a hazardous zone (includes gas monitoring). ➢ Cables in a hazardous zone
EL-025	AS/NZS 1020	The control of undesirable static electricity	➢ Electrical apparatus in a hazardous zone (includes gas monitoring).
EL-049	AS/NZS61010, Parts 1 - 32	Safety requirements for electrical equipment for measurement, control and laboratory use ➢ General requirements ➢ Safety requirements for hand-held	➢ Electrical equipment (cables and apparatus) in non hazardous areas.

Committee No	Standard No.	Subject	Essential FFP Equipment risk control
		probe assemblies for electrical measurement and test ➢ Particular requirements for hand-held and hand-manipulated current sensors for electrical test and measurement	
DPI	MDG2005	Technical reference for the approval of mine winders	➢ Electrical equipment (cables and apparatus) in non hazardous areas. ➢ Machine (M/C) Control circuits. ➢ Signage
DPI	Safe Mining Handbook	Energy Section and plant section (Note the energy section is equivalent to MDG2001)	➢ High energy electrical systems ➢ Electrical protection. ➢ Earthing and lightning protection. ➢ Electrical equipment (cables and apparatus) in non hazardous areas. ➢ Machine (M/C) Control circuits. ➢ Signage
DPI	CoP	Electrical protection and earthing	➢ High energy electrical systems ➢ Electrical protection. ➢ Earthing and lightning protection. ➢ Electrical equipment (cables and apparatus) in non hazardous areas. ➢ Electrical apparatus in a hazardous zone (includes gas monitoring). ➢ Cables in a hazardous zone

Table of Industry Standards – Safe Procedures

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Committee No	Standard No.	Subject	Essential FFP Equipment risk control
EL-014	AS/NZS 2430, Parts 1 & 3.1 – 3.9 -	Classification of hazardous areas ➢ Gas atmospheres ➢ Specific occupancies Classification of hazardous areas - Examples of area classification ➢ General ➢ Flammable liquids ➢ Flammable gases	➢ Hazardous zone classification
EL-014	AS/NZS 60079.10	Electrical apparatus for explosive gas atmospheres – Classification of hazardous areas	➢ Hazardous zone classification
EL-044	AS/NZS 4836	Safe working on low-voltage electrical installations	➢ Isolation procedures ➢ Electrical testing procedures
EL-049	Handbook	Selection of electrical test instruments	➢ Electrical testing procedures
DPI	MDG25	Safe cutting and welding for mines	➢ Electric welding procedures.
DPI	CoP	Removal and restoration of power	➢ Removal/restoration of power procedures
DPI	CoP	Portable apparatus	➢ Use of portable apparatus underground procedures
DPI	MDG5002M	Use of remote controlled mining equipment – Underground Metals	➢ Remote control equipment use procedures
DPI	MDG5002C	Use of remote controlled mining equipment – Underground Coal	➢ Remote control equipment use procedures
DPI	Safe Mining Handbook	Energy Section and Plant section (Note the energy section is equivalent to MDG2001)	➢ Hazardous zone classification ➢ Removal/restoration of power procedures ➢ Isolation procedures ➢ Electrical testing procedures ➢ Electric welding procedures. ➢ Electric Shock and Burn protocols ➢ Remote control equipment use procedures ➢ High Voltage Work Practices
EL-023	Handbook	HV Practices for mines	➢ High Voltage Work Practices

Note: Some form of guideline needs developing for electric shock protocols – we only have our own internal document

Notes:

Accreditation

Accreditation relies on more than NATA it encompasses accreditation by JASANZ (Joint Australia & new Zealand Accreditation System). JASANZ accreditation is a prerequisite for certification bodies, which in turn certify equipment and facilities for the repair and overhaul of hazardous area electrical equipment. However as the terms of reference do not relate to JASANZ, no further comment will be made in that area.

The DPI, Mine Safety Operations has a technical facility at Thornton, NSW and is undergoing laboratory accreditation through NATA. NATA accreditation gives credibility and confidence to the range of testing undertaken for approval purposes and for investigation purposes.

NATA laboratory accreditation is the basis for Australian based certification of electrical equipment for use in hazardous areas. This NATA accreditation gives the regulator confidence that electrical equipment certified for use in hazardous areas has been thoroughly tested and if used properly will not be an ignition source for a catastrophic coal mine explosion. This confidence has been a catalyst for the DPI, Mine Safety Operations to accept certified equipment as suitable for approval, under new legislation certified equipment will be considered as registered. With the acceptance of certified equipment as approved, there has come the re-allocation of resources to have a greater mine site presence as required by recent state mine safety reviews. If NATA accreditation were not available, the DPI would need to identify laboratory benchmarks and assess laboratories as suitable for producing test reports as a basis for approval and certification and may be forced into testing and assessment of equipment for hazardous areas with an increase in cost (both monetary and time) in getting product into the market. Additional ongoing costs to the DPI, and in turn, the mining industry, would be incurred in administration of such activities.

Further, through the NATA Inspection program, facilities that overhaul and repair electrical equipment for use in hazardous areas are accredited. Also facilities that maintain and calibrate flammable gas detecting instruments are also accredited. The accreditation of these facilities gives a high degree of confidence that after overhaul, repair or calibration the equipment will not cause an explosion in a coal mine. The calibration of gas detecting instruments gives a high degree of confidence that dangerous concentrations of methane will be detected before an explosion can occur. It should be noted that the DPI has in the past approved such facilities, but has now completed the transition to accepting properly accredited facilities as deemed to be approved.

Standards & Accreditation

The use of Standards and Accreditation are key elements in achieving mine safety in NSW. They are:

- Both interlinked and neither would be truly effective without the other.
- Provide an effective and efficient method of giving a high degree of confidence to the regulator that catastrophic risk events are managed at key points in the life-cycle.
- Provide an effective and efficient method of giving a high degree of confidence to the prime OH&S duty holders that catastrophic risk events are managed at key points in the life-cycle.

Discussion Paper

Registration of Explosion Protected Electrical Plant

February 2006

Electrical Engineering Safety

Gas and dust explosions are catastrophic risk events.
Electricity is a significant source of ignition.
A key risk control in preventing explosions is Explosion Protected (Ex) electrical plant

Foreword

NSW OH&S legislation places the duties for plant safety on the employer and the manufacturer / supplier. For plant used in hazardous zones the employer's and the manufacturer / supplier's duties extend to providing explosion protected (Ex) electrical plant as a basis for preventing explosions.

Because the risk of explosions is so high, there must be a high degree of confidence in the Ex properties of plant throughout the life-cycle of the plant. However, irrespective of how well a mine manages plant once it arrives at the mine, if it is not Ex and it is used in a hazardous zone, then the risk of explosion will be unacceptably high. Mine owners and operators need to have a high degree of confidence that plant they purchase for use in hazardous zones is Ex. A process for this high degree of confidence is:

- to have the Ex design tested and assessed against set standards by an independent, competent and recognized body,
- some form of certificate issued that states compliance to the set standards, and
- a quality management system for actually manufacturing the Ex plant.

Traditionally, the above process has been approval by the regulator; however, no regard was given to assessing quality manufacturing capabilities. In recent years approval of Ex plant has evolved into the acceptance of certified Ex plant as being considered approved, if specified conditions are met. These conditions encompass:

- acceptable certification schemes,
- the provision of sufficient information to mine operators so that the plant can be maintained in an Ex condition through its life-cycle, and
- risk management practices being implemented by the mine in relation to the Ex plant.

Proposed legislation, planned for promulgation in 2006 requires certain plant to be registered. Generally the plant to be registered is considered "high risk". This plant includes Ex plant in general (electrical and mechanical). Therefore Ex electrical plant will need to be registered.

This discussion paper proposes that if electrical Ex plant is suitably certified then it considered registered with no further registration activities imposed on the DPI, mines or manufacturers/suppliers of electrical Ex plant. This registration can be considered as completing the transition from regulatory approval to acceptance of certified equipment. It is worth noting that the latest certification schemes (ANZ Ex and IEC Ex) have ongoing quality manufacturing as part of certification requirements.

The completion of this transition also brings with it a different way the regulator overviews electrical Ex plant used in mines. The regulator will:

- Increase participation in Ex scheme management bodies,
- Continue its high level of participation in standards development,
- Implement a focussed and ongoing assessment of how mines manage electrical Ex plant, and
- Review of Ex plant, either randomly or as part of an investigation.

If the prime duty holders (employers and manufacturer/supplier's) and other industry stakeholder's desire additional scrutiny of electrical Ex plant, then arrangements for additional scrutiny will need to be developed.

John Francis Waudby
Senior Inspector of Electrical Engineering

Contents

Executive Summary

EXCUTIVE SUMMARY

The high risk of an explosion in an underground coal mine dictates the need for explosion protected (Ex) electrical plant to be used in all hazardous zones. To ensure a sufficiently high degree of confidence that electrical plant is actually explosion protected, compliance to standards must be established in a credible manner, such as:

1. Testing and assessment against acceptable equipment standards by an independent, competent and recognised body.
2. An additional compliance review stage by an independent, competent and recognised body.
3. Registration attesting conformance to the equipment standards.
4. Quality management systems for the manufacture of Ex plant.
5. Life–cycle management of Ex equipment being incorporated in mine OH&S systems.

From the 1970's to 2003, points 1 – 3 were all part of the approval process. Since 2003, points 1-3 have been achieved by the national Ex certification schemes (AUS Ex, ANZ Ex and Australian bodies in IEC Ex). Quality management systems for Ex plant are now incorporated in the ANZ Ex and IEC Ex schemes. The AUS Ex scheme is being phased out.

As part of the proposed legislation a plant registration scheme is proposed to confirm items 1 to 3 above for new equipment. Existing approved equipment currently in use in the hazardous zones of underground coal mines is proposed to have a transitionary arrangement requiring compliance with registration requirements within set time frames.

The proposed registration scheme accepts as registered explosion protected electrical plant that is certified under the AUS Ex, ANZ Ex and IEC Ex schemes. Standard conditions of registration will be applied; these conditions place obligations on suppliers and users.

Complementing the registration scheme are Mine Safety Operations, DPI activities, which will include:

- Increase participation in Ex scheme management bodies,
- Continue its high level of participation in standards development,
- Implement a focussed and ongoing assessment of how mines manage electrical Ex plant, and
- Review of Ex plant, either randomly or as part of an investigation.

Registration of explosion protected plant is a key element in preventing explosions from electrical ignition sources.

Note 1: Registration does not limit the duties of employers and manufacturer's/supplier's to provide safe plant. Registration could be deemed as a system that aids duty holders to fulfil their obligations.

Note 2: This proposal differs from the current approval requirements. The current approval requirements require electrical Ex plant to have a certificate of conformity issued by an Australian Certification Body. This proposal includes acceptance of certificates of conformity by any Certification Body participating in the international (IEC) Ex scheme.

Note 3: If the prime duty holders (employers and manufacturer/supplier's) and other industry stakeholder's desire additional scrutiny of electrical Ex plant, then arrangements for additional scrutiny will need to be developed. It is likely that this additional scrutiny will incur additional time delays in product being able to be used at mines (effectively analogous to the approval schemes operated in the 1970's, 1980's and 1990's). Additional scrutiny could have implications for Mine Safety Regulatory funding.

Part 1

Proposal for Registration of Electrical Ex Plant

PROPOSAL

A gazette notice to be published, pursuant to the legislation that considers electrical Ex plant to be registered if it has a valid Ex Certificate of Conformity (CoC) and employers and manufacturer's/supplier's comply with the specified conditions.

VALID EX CoC

1. The CoC must be:
   - i a valid AUS Ex certificate of conformity, or
   - ii a valid ANZ Ex certificate of conformity, or
   - iii a valid IEC Ex certificate of conformity.
2. The CoC must be:
   - iv For Group I (mines susceptible to firedamp) as defined in Section 4 of Part 0 of AS/NZS 60079.0 *Electrical apparatus for explosive gas atmospheres* or the plant satisfies the specification for the use of Group II certified intrinsically safe plant given below.
   - v For restrained plugs and receptacles the Certificate of Conformity must attest to compliance with AS1299 "Electrical equipment for coal mines – Flameproof restrained plugs and receptacles"

Specification for the use of Group II certified intrinsically safe plant.

Group II electrical apparatus as defined in Section 4 of Part 0 of AS/NZS 60079.0 *Electrical apparatus for explosive gas atmospheres*, for which

- i a valid AUS Ex certificate of conformity, or
- ii a valid ANZ Ex certificate of conformity, or
- iii a valid IEC Ex certificate of conformity, and
- iv The CoC must be for Group II as defined in Section 4 of Part 0 of AS/NZS 60079.0 *Electrical apparatus for explosive gas atmospheres*, and
- v the plant is located in an explosion protected enclosure, or the plant satisfies the requirements for Group I plant with regard to exposed light metal alloys, and the plant is located in a non-hazardous zone.

Note: point v allows for such equipment as IS barriers certified for Group II to be used in Group I applications. This is acceptable as IS parameters for Group II are more onerous than for Group I

SPECIFIED CONDITIONS

(a) The supplier of the apparatus must ensure that adequate records are maintained so that product safety notifications and/or product recalls may be readily undertaken.

(b) Before the apparatus is introduced into a hazardous zone the user of the apparatus must –

- (i) conduct a site specific risk assessment that conforms to MDG 1010 *Risk management handbook for the mining industry* or AS/NZS 4360:1999 *Risk management* encompassing the full life cycle of the plant; and
- (ii) make particular consideration to the risk of initiating an explosion associated with the plant, including
  - static electricity,
  - environmental suitability of the plant, and
  - inspection and maintenance.
- (iii) implement all appropriate risk controls identified.

(c) All conditions of installation, use and maintenance specified by the manufacturer and/or identified on the certificate of conformity must be complied with.

(d) When a manufacturer or supplier of plant supplies plant, it must be supplied with a copy of the certificate of conformity and sufficient information (including plant drawings) to enable the

plant to be verified as conforming to the certificate of conformity when installed, used, maintained, overhauled, and repaired.

(e) The drawings supplied as part of the information must:

i identify all features of the plant that form part of the explosion protected properties.

ii give sufficient detail so that the plant can be verified as complying to the drawing, and

iii must be traceable to the relevant drawings used in testing and assessment for certification purposes.

(f) Sufficient information must be maintained at the mine, or some other location determined as acceptable by the Manager of Electrical Engineering, to enable the plant to be verified as conforming to the certificate of conformity, installed, used, maintained, overhauled, and repaired. This information must also comply with the requirements of AS2290.1 "*Electrical equipment for coal mines – Introduction and maintenance. Part 1 For hazardous areas."*

Important Notes

Transitional arrangements (Approval – Registration)

The proposed registration requirements do not cover transitional arrangements for plant that DOES NOT have an Ex CoC AND has been APPROVED as Ex. This type of plant can be termed TRANSITIONAL Ex PLANT. These transitional arrangements are covered in the proposed legislation. The proposed transitional arrangements are that for transitional Ex plant approved over twenty years ago, there is a proposed one year period to facilitate registration. For transitional Ex plant that was approved less than twenty years ago, there is a proposed two year period to facilitate registration.

Differences between this proposal and current arrangements

The proposal differs from current approval requirements in relation to certification bodies and specified conditions.

CERTIFICATION BODIES

Current requirements

CoC's have to be issued by an Australian Certification Body. Currently Ex plant with an IEC Ex CoC issued, for example, by a United States of America IEC Ex certification body, must be recertified by an Australian Ex certification body before it can be used in a NSW coal mine.

AUS Ex and ANZ Ex CoC's can only be issued by Australian / New Zealand certification bodies as per Australian Standards publications MP69 and MP87.

Proposal

AUS Ex and ANZ Ex CoC's can only be issued by Australian / New Zealand certification bodies as per Australian Standards publications MP69 and MP87.

The proposal does not put a limitation on the country of origin of the IEC Ex CoC.

IEC Ex CoC's can be issued by any certification body recognised by the IEC Ex scheme. Any such certification body must be from a country that is participating in the IEC Ex scheme. This means that Ex plant with, for example, an IEC Ex CoC issued by an IEC Ex certification body in the United Kingdom, could be purchased and used in a NSW coal mine without any further certification.

Review question for mine operators

Do IEC Ex CoC's issued by non-Australian IEC Ex certification bodies give the required degree of confidence that plant is explosion protected?

SPECIFIED CONDITIONS – INFORMATION

Information provided at the time of acquisition is the basis for ongoing management of Ex plant. Information provided must support verification of ongoing compliance with the CoC. There are continual arguments between suppliers of plant and end users as to what information should be supplied. The DPI view is detailed in the specified conditions.

Current requirements

1. Each user of the apparatus must be supplied with a copy of the certificate of conformity and sufficient information (including apparatus drawings) to enable the apparatus to be installed, used and maintained in its certified condition.
2. Sufficient information (including apparatus drawings) must be maintained at the mine to enable the apparatus to be installed, used and maintained in its certified condition.

Proposal

(a) When a manufacturer or supplier of plant supplies plant, it must be supplied with a copy of the certificate of conformity and sufficient information (including plant drawings) to enable the plant to be verified as conforming to the certificate of conformity, installed, used, maintained, overhauled, and repaired.

(b) Sufficient information must be maintained at the mine, or some other location determined as acceptable by the mine, to enable the plant to be verified as conforming to the certificate of conformity, installed, used, maintained, overhauled, and repaired. This information must also comply with the requirements of AS2290.1 "*Electrical equipment for coal mines – Introduction and maintenance. Part 1 For hazardous areas."*

(c) The drawings supplied as part of the information must:

- identify all features of the plant that form part of the explosion protected properties.
- give sufficient detail so that the plant can be verified as complying to the drawing, and
- must be traceable to the relevant drawings used in testing and assessment for certification purposes.

Review question for mine operators

Do the specified information requirements support the ongoing management of Ex plant, and provide for a sufficient degree of confidence that the plant is in a certified condition?

Part 2

Background & Legislation

Historical Context

Historically, electricity has been the ignition source of many catastrophic coal mine explosions world wide. As a result of those explosions, special techniques (explosion protection techniques (Ex)) have been developed for the design of electrical plant, which significantly reduces the risk of an explosion of coal dust or methane gas. Those techniques have been developed into equipment conformity standards that document criteria that must be adopted to reduce risk. Initially those standards were developed country by country, more recently they have been transformed into International (IEC) standards.

The catastrophic consequences, and consequent high risk, of an explosion in an underground coal mine, has caused regulators world wide to insist that Ex electrical plant be tested by an independent (from the designer and manufacturer), competent and recognised body[1] to verify compliance with the standards. The Mine Safety regulator has then reviewed the outcomes of the independent testing and if suitable "approved" the plant.

The key elements of approval have been:

1. Testing and assessment by an independent, competent recognised body. (Independent from the designer, manufacturer, applicant or the regulator.)
2. Review by the regulator or an independent competent person belonging to a competent recognised body (Independent from the testing/assessing persons)
3. Issue of an approval by the regulator or a competent recognised body

In addition to the regulatory approval schemes, non-government compliance schemes have operated for certification of Ex plant, initially for the non-mining industry and more recently embracing the mining industry. These certification schemes have evolved to include the auditing of manufacturers to verify the strict design criteria of the original tested sample, is maintained in ongoing manufacture of the plant.

The key elements of certification are:

1. Testing and assessment by an independent, competent and recognised body
2. Review by an independent competent person belonging to a competent recognised body. (Independent from the testing/assessing persons.)
3. Issue of a Certificate of Conformity (CoC) by an independent person belonging to a competent recognised body. (Independent from the testing/assessing persons.)

Mine Safety Operations, DPI (and its predecessors) has approved Ex electrical plant for use in NSW underground coal mines where there is a potential for explosive atmospheres. After several years of monitoring the integrity and viability of the Australian certification schemes and building on the experience of the Queensland mining regulator[2], the DPI, in 2002 - 2003 had two notices gazetted; the first accepting plant certified under an Australian scheme as approved; the second accepting plant certified under an Australian scheme or the IEC Ex scheme as approved, providing the certification was by an Australian certification body.

The DPI has been monitoring the integrity and viability of the IEC Ex Scheme since its inception and is now confident that the IEC Ex scheme provides an equivalent level of integrity and viability as the Australian schemes.

The proposed Coal Mine Health and Safety Regulation 2006 is expected to require plant registration of explosion protected electrical plant and provides for a gazette notice to be published stating that certain types of plant may be deemed to be registered provided.

[1] These are facilities with expertise in explosion protection and equipment to do the testing. They are also assessed and accredited by a third party organisation such as NATA.

[2] The Queensland mining regulator ceased approving Ex plant in 1994 and legislated that certified Ex equipment was to be used.

Current Approval Requirements for Electrical Ex Plant

APPROVAL OF EXPLOSION-PROTECTED ELECTRICAL APPARATUS
GAZETTE NOTICE EXPLANATION NOTE
On 14 November 2003, the following notice was published in the NSW Government Gazette No. 179, on pages 10616 - 10618
The gazette notice is re-produced below – an explanation follows

COAL MINES REGULATION ACT 1982

APPROVAL OF EXPLOSION PROTECTED ELECTRICAL APPARATUS Pursuant to clause 70 of the Coal Mines (General) Regulation 1999, I, Robert Regan, Chief Inspector of Coal Mines approve, for the purposes of clause 140(1) of the Coal Mines (Underground) Regulation 1999, the type of explosion protected electrical apparatus described in the Schedule for the period and subject to the conditions set out in the Schedule.

Dated this 30th day of November 2003

ROBERT REGAN

Chief Inspector of Coal Mines

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SCHEDULE

1 Type of apparatus approved

The type of apparatus approved is Group I electrical apparatus as defined in Section 4 of Part 0 of AS/NZS 60079.0:2000 *Electrical apparatus for explosive gas atmospheres,* for which

i) a valid AUS Ex certificate of conformity has been issued, or

ii) a valid ANZ Ex certificate of conformity has been issued, or

iii) a valid certificate of conformity has been issued under the IEC Ex Scheme by an Australian Ex Certification Body (ExCB)

2 Commencement and duration of approval

This approval takes effect on and from 30 November 2003 and remains in force until it is revoked, varied or amended. The approval has effect with respect to a specified certificate number or other unique identifier.

3 Conditions of approval

This approval is given subject to the following conditions:

(a) The supplier of the apparatus must ensure that adequate records are maintained so that product safety notifications and/or product recalls may be readily undertaken.

(b) Before the apparatus is introduced into a hazardous zone (within the meaning of the Coal Mines (Underground) Regulation 1999), the user of the apparatus must –

(i) conduct a site specific risk assessment that conforms to MDG 1010 *Risk management handbook for the mining industry* or AS/NZS 4360:1999 *Risk management* encompassing the full life cycle of the apparatus; and

(ii) implement all appropriate risk controls identified.

(c) All conditions of installation, use or maintenance both specified by the manufacturer and identified on the certificate of conformity must be complied with.

(d) Each user of the apparatus must be supplied with a copy of the certificate of conformity and sufficient information (including apparatus drawings) to enable the apparatus to be installed, used and maintained in its certified condition.

(e) Sufficient information (including apparatus drawings) must be maintained at the mine to enable the apparatus to be installed, used and maintained in its certified condition.

4 Effect of approval

Clause 140(1) of the Coal Mines (Underground) Regulation 1999 states that explosion protected electrical apparatus must not be used in a hazardous zone at a mine unless it is of an approved type. Under Clause 5 of the Coal Mines (Underground) Regulation 1999, it is the duty of the mine manager to ensure that clause 140(1) is complied with. Clause 70 of the Coal Mines (General) Regulation 1999 allows the Chief Inspector to approve, subject to conditions, a type of apparatus for the purposes of clause 140(1) of the Coal Mines (Underground) Regulation.

The effect of this approval is that the relevant mine manager must ensure that only explosion protected electrical apparatus of the approved type is used in a hazardous zone and that the conditions of the approval are complied with.

This approval and the requirements under its conditions do not limit –

(a) any obligations imposed on the mine manager or a mine electrical engineer by clause 9 (Standards of mechanical engineering practice & electrical engineering practice) of the Coal Mines (General) Regulation 1999 or any other provision of the Coal Mines Regulation Act 1982, the Occupational Health & Safety Act 2000 or the regulations under either of those Acts; or

(b) any obligations imposed on the mine owner or any other person by any provision of those Acts or regulations.

5 This approval does not affect existing approvals

This approval –

(a) does not apply to any apparatus (or apparatus of a type) covered by an approval given before 30 November 2003 pursuant to clause 70 of the Coal Mines (General) Regulation 1999 for the purposes of clause 140(1) of the Coal Mines (Underground) Regulation 1999 (or covered by an approval that has effect under clause 88 of the Coal Mines (General) Regulation 1999 for the purposes of clause 140(1) of the Coal Mines (Underground) Regulation 1999); and

(b) does not affect the continuing operation of any approval referred to in paragraph (a), including the conditions of such an approval.

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Definitions:

ANZ Ex certificate of conformity = A certificate of conformity issued under the Australian/New Zealand Certification Scheme for explosion- protected electrical equipment

AUS Ex certificate of conformity = A certificate of conformity issued under the Australian Certification Scheme for explosion - protected electrical equipment

Ex CB = Ex Certification Body, is a body which has been accepted according to IECEx 02, 2nd edition, “IEC Scheme for Certification to standards for Electrical Equipment for Explosive Atmospheres”.

IEC = International Electrotechnical Commission

IEC Ex Scheme = IEC Scheme for the certification to Standards for Electrical Equipment for Explosive Atmospheres

Proposed Legislation

The Occupational Health and Safety Act, Occupational Health and Safety Regulation, Coal Mine Health and Safety Act – 2002 and the proposed Coal Mine Health and Safety Regulation 2006 all impose duties for the provision of safe plant. The proposed Coal Mine Health and Safety Regulation 2006 are specific in the requirements to provide for a high degree of confidence that electrical plant used in hazardous zones is explosion protected. This is done through requirements for an Electrical Engineering Management Plan and by registration of explosion protected plant

The following extract from a preliminary draft of the legislation details the particular requirements:

Clause 10(e) requires that a particular element of the mine OH&S management system is ***an electrical engineering management plan.*** The management plan ***must*** prevent initiation of gas or coal dust explosions by electrical energy. To do this, the plan, as a minimum, must make provision (under clause 16) for:

- the control of electrical energy in hazardous zones at a coal operation, including the following:
    - only electrical plant and installations registered as explosion-protected being energised in a hazardous zone (except specified cables and specified portable plant used under specified conditions)
    - only electrical plant and installation of a specified type being energised in a hazardous zone where a flammable gas concentration is greater than 1.25%,
    - the maintenance of explosion-protected plant and installations in an explosion- protected state,
    - the overhaul and repair of electrical plant and installations, including the following:

        (i) the overhaul and repair of explosion-protected plant (being work that may alter the explosion-protected properties of the plant) being carried out only at a facility licensed for the purpose,…
- the prevention of the ignition of gas by a static electric charge.

Clause 126 requires design registration of explosion protected plant, including electrical plant.

Registration of explosion protected plant is a key element in preventing explosions from electrical ignition sources.

SUMMARY

The high risk of an explosion in an underground coal mine dictates the need to use Ex electrical equipment in hazardous zones. Legislation provides for life-cycle management of Ex plant at the mine. In general, the mine has the responsibility to specify the requirements of the plant prior to purchase and takes on the full responsibility once the plant arrives at the mine. The mine has little control of life-cycle activities related to the design of the explosion protected properties of the plant, therefore the mine needs to have a high degree of confidence that the plant design is explosion protected. Plant registration must provide this confidence. To establish a high degree of confidence that electrical plant used in hazardous zones is explosion protected, compliance to standards must be demonstrated in a credible manner, such as through:

1. Testing and assessment against recognised standards by a competent recognised body.
2. Review by an independent competent person (independent from the testing/assessing persons) belonging to a competent recognised body.
3. Some form of registration attesting conformance to the set standards.
4. Life-cycle management of Ex plant being incorporated in mine OH&S systems.

Review of this Document

This document is intended for review primarily by mine electrical engineers and the relevant professional body (Mining Electrical and Mining Mechanical Engineers Society (MEMMES) of IEAust); however comment from other interested parties is welcomed. These groups should seek their own advice from:

- Their employer,
- Electrical Ex plant manufacturers/suppliers,
- Certification Bodies,
- Test Laboratories,
- Standards setting organizations, and
- Certification scheme management bodies.

In reviewing this document, the following basic questions need to be considered;

"Does this proposal provide?

- a mine with a sufficient degree of confidence that the electrical equipment selected for use in a hazardous zone is explosion protected,
- support the mines need for information for ongoing management of the electrical Ex plant, and
- provide for compliance with specific electrical legislation and plant legislation in general."

COMMENTS

Any comments on the proposal should be made on the attached form and forwarded to:

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