



# SAFETY BULLETIN NO: 56

## MINING INDUSTRY ELECTRICAL ACCIDENTS

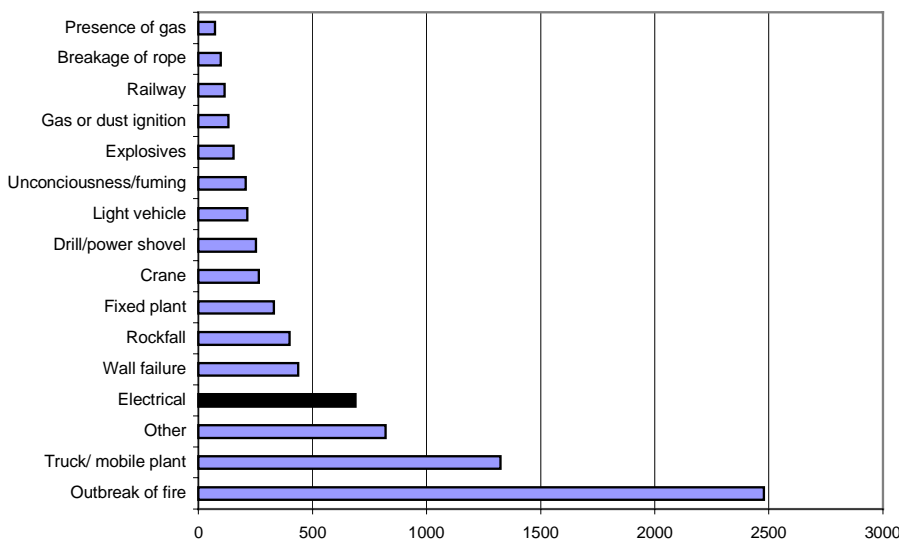
### INTRODUCTION:

A disturbing increase in the incidence of mining industry electric shocks reported to the Department raises serious concern and signals a clear need for all persons involved to exercise more care when dealing with electrical plant, and to adopt work-practices that will safeguard against this potentially life-threatening hazard.

Though the causes of electrical accidents vary, analysis continues to demonstrate that in many instances, the accidents are simply repeats of previous events. As with all accident categories we all must not fail to learn from the accidents that have already occurred, and with due diligence endeavour to ensure that the same outcomes do not recur. These ‘free lessons’ should be heeded, learned and remembered.

The Department has issued many publications that address and make recommendations regarding various aspects of mining safety, and will continue to do so. Their purpose is to provide guidance to industry on specific safety issues, and to build up a source of reference information which responsible persons can, and should, periodically review. The publications referred to can be readily accessed from the Department’s Website ([www.dme.wa.gov.au](http://www.dme.wa.gov.au)), as can many others posted by other State regulatory authorities on their Websites.

This Safety Bulletin is issued to draw attention to the current unacceptable incidence of electric shocks, a situation which must be acted on and remedied if foreseeable dire consequences are to be avoided.



### Electric shock accidents 1994-99

The bar-chart shows that mining industry electric shocks have now become the third highest accident individual category reportable under MSI Act Sections 78 and 79.



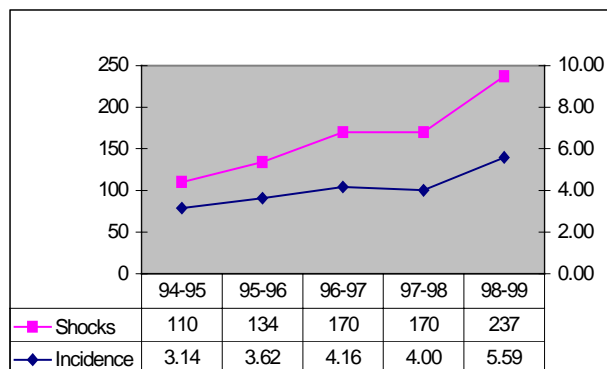
**ThinkSAFE MineSafe**

## Electric shock incidence rates 1994-99

237 electric shock accidents were reported in the period 1998-99, and this was a 39% increase when compared with 170 accidents reported in the previous year.

Incidence rates, (electric shocks/1000 employees), also increased 39% which demonstrates that the upward trend is valid.

Fatalities have occurred.



## Electrical fatalities 1980-2000

Seven electrical fatalities have been recorded in the WA mining industry in the last twenty years. Two have occurred since 1990 and the last electrocution was 12 February 1994. The brief details of the last 3 accidents are:

- 12 Feb 1994 - electrical contractor died after contacting 22 000 volt powerlines.
- 24 Mar 1991 - trade assistant died after digging into a 415 volt buried cable.
- 25 Nov 1988 - tradesman died after contacting faulty 415 volt welding transformer.

While the number of deaths caused by electricity may be considered low when compared with other major mining industry hazards and has markedly diminished in recent years, the number of serious 'near-hits' that have also occurred provide a stark reminder that matters could very easily have been much worse. By way of example, inadvertent contact with high-voltage overhead powerlines by mobile mining machinery remains a major concern and is further discussed below.

## Contacts with high-voltage overhead powerlines by mobile plant

Inadvertent contact with overhead powerlines was the cause of a non-mining fatality at a Belmont construction site on 12<sup>th</sup> January 2000. The accident occurred while the deceased was handling a load slung from a mobile crane and the machine's boom swung into 22 000 volt overhead conductors. A second person also handling the load was fortunate to survive.

While the Belmont accident attracted much media attention, and community outrage, only good fortune has prevented similar outcomes at WA minesites for several years. The Table below shows the range of mining equipment types that has been involved in some 47 powerline contact accidents at minesites since 1995. Incidents have continued during the current year.

Year	Trucks	Excavator	Drills	Cranes	Misc.	Accidents
1995	7	1	1	2	1	12
1996	1	1		1	2	5
1997	2	6		1	1	10
1998	4	3	2	3		12
1999	2	2		3	1	8
<b>Total</b>	<b>16</b>	<b>13</b>	<b>3</b>	<b>10</b>	<b>5</b>	<b>47</b>

ThinkSAFE MineSafe

**Serious electrical accidents**

Other serious electrical accidents that could have proved fatal may be referenced in the following Significant Incident Reports published by the Department, and are recommended reading:

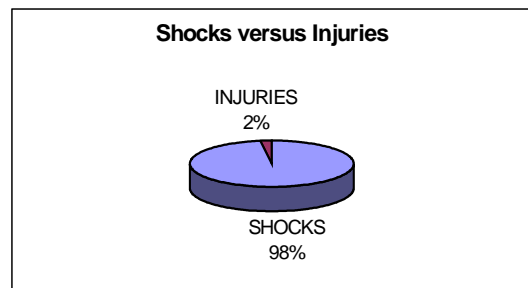
- SIR14 - Electric shock involving P+H Shovel
- SIR16 - Substation transformer explosion
- SIR24 - Crane dogman survives 22Kv shock from transformer
- SIR33 - Passenger lift serious accident
- SIR50 - Trailing cable coupler electrical accident
- SIR67 - High voltage circuit switched to earth
- SIR68 - Electrical test instrument serious accident

**Electrical shock accidents 1995/97 – causes and effects**

A detailed study of 304 mining industry electric shock accidents occurring in the period 1995-97 revealed the following findings that remain current:

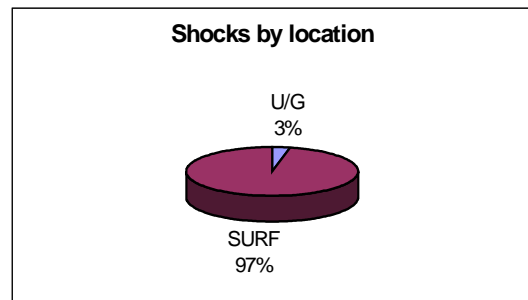
*Electric shock severity*

The majority of electric shocks (98%) do not result in injury; (an injury being recorded when follow-up medical treatment by a doctor is required). Though only 7 of the 304 shocks were recorded as injuries, in some instances the circumstances replicated those of previous fatal accidents.



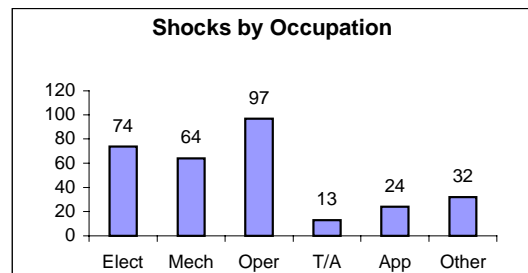
*Electric shocks by location*

Only 10 (3%) of the 304 incidents studied occurred underground. Taking into account that less than 10% of mining industry employees work underground, the probability of electric shock in surface operations is three times more likely. The lower underground incidence rate is heavily influenced by, and supports the current mandatory use of, SWA cables and earth-leakage protection.



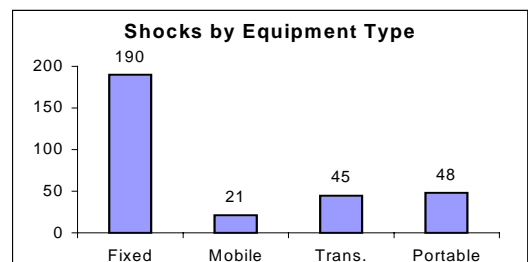
*Electric shocks by occupation*

More operators received electric shocks (while undertaking normal duties) than electrical workers directly involved in every-day maintenance and repair of electrical plant. The number of electric shocks involving apprentices demonstrates a clear need for improved supervision of this vulnerable group.



*Electric shocks by equipment type*

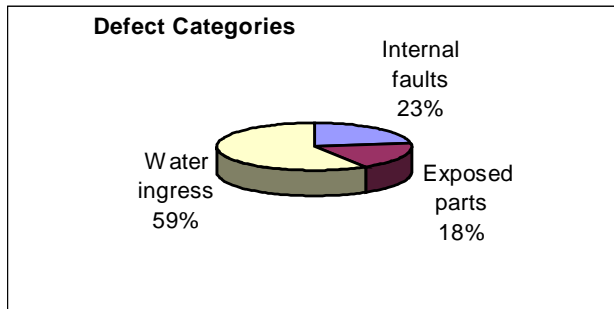
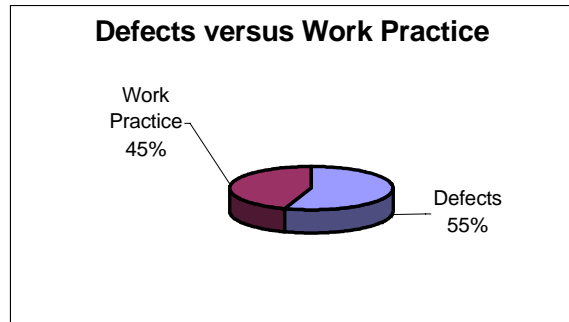
The majority of electric shocks result from contact with defective fixed plant, and this demonstrates an apparent need to improve maintenance in this area. In contrast, incidents involving portable tools were much more prevalent in earlier years and this reflects the increased attention being given to this category of equipment.



**ThinkSAFE MineSafe**

**Causes of electric shocks**

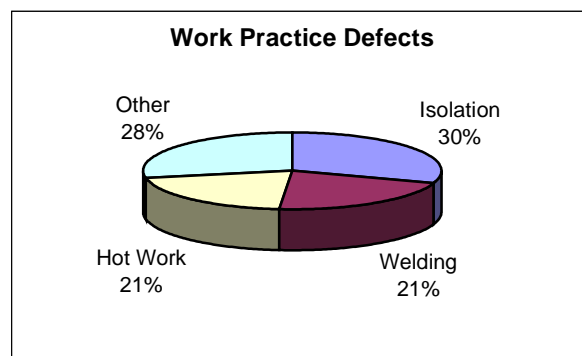
55% of electric shocks result from equipment defects and the remainder result from incorrect work-practices.



Analysis of equipment defects involved in accidents indicates that the majority of electric shocks result from the ingress of water into electrical equipment.

Most commonly, plant operators receive shocks when pressing start-buttons and similar controls that have become full of rain or hose water, or less commonly, condensation of moisture.

Failure to isolate properly is the most common incorrect work practice. “Hot work” incidents primarily involve electricians undertaking work in close proximity to ‘live’ parts.



Welding electric shocks typically arise from contact with the electrode, connections or work piece. Welding voltage reducers are readily available safeguards that eliminate this risk.

**COMMENT AND RECOMMENDATIONS:**

**Recommendations for Risk Management**

A concerted and sustained effort is required at every operation to eliminate or control the identified spectrum of risks with electrical equipment.

The Mines Safety and Inspection Regulations in **Part 5 – Electricity in Mines**, support the duty of care obligations in the Act with a framework for safe practice in standards, installation, operation and maintenance.

In the context of this Bulletin, the role and duties of the electrical supervisor (R5.10 and R5.11), and reporting of defects and keeping of records (R5.12 and R5.13), should be noted.

It is essential that all personnel who operate or maintain electrical plant and equipment support and provide information to the electrical supervisor in carrying out the obligations attached to that position, particularly R5.11(b) in respect of equipment being maintained in a safe working condition.

**ThinkSAFE MineSafe**

All electrical equipment that is subject to conditions which are known to be likely to cause deterioration, must be carefully monitored by all persons who use the equipment or supervise its use.

Where there is potential for moisture or corrosion, resulting from exposure to the weather, or splashing from plant process, or hosing down for clean up, to affect electrical equipment, particular attention should be given on a regular basis.

In brief each operation should make a regular assessment of electrical hazards and audit the condition of equipment thoroughly at appropriate intervals, and also when any modifications to or extensions of plant and equipment are made.

As stated earlier, there are very few accident or incident circumstances that have not previously occurred, and past experience should provide a constant reminder of the need to eliminate or control the risks. The objective and purpose of investigating accidents is prevention, rather than simply complying with reporting duties and registering more statistics.

**Remember, there is no such thing as a minor electric shock; they are all serious events and each has the potential to extinguish life in seconds.**

J M Torlach  
STATE MINING ENGINEER

**ThinkSAFE MineSafe**