



Mines Safety Bulletin No. 85

Date: 4 June 2009

Subject: Mobile equipment contact with high-voltage overhead powerlines

Introduction

This safety bulletin is prompted by serious concern regarding the number of incidents involving a variety of mobile plant items inadvertently coming in contact with high-voltage overhead powerlines on Western Australian mines sites.

A review of occurrence reports for the ten-year period from 1998 to 2008 reveals that:

- there have been 74 reported contacts with overhead powerlines;
- on average, eight incidents where heavy machinery has contacted powerlines are reported each year; and
- excavators cause the highest number of powerline contacts (Figure 1).

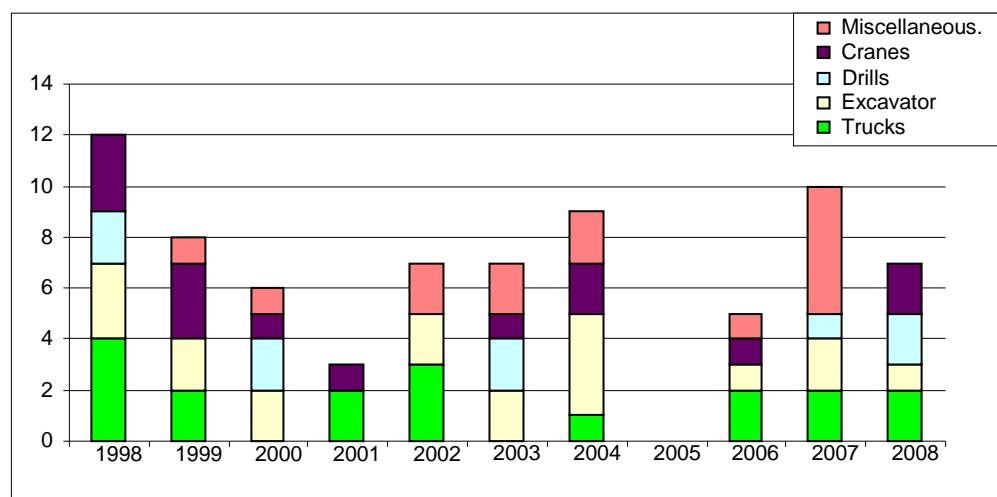


Figure 1 Graph showing number of powerline contacts reported to Resources Safety between 1998 and 2008

In the current year, Resources Safety has already received four incident reports where mobile equipment has contacted powerlines. Only "good fortune" prevented fatal consequences. Others have not been quite so "lucky". In the period 1995 to 2005, about a quarter of all workplace electrocutions (i.e. death caused by electricity) in Western Australia were caused by contact with powerlines.

Previous safety alerts from Resources Safety on this topic include Mines Safety Bulletins 51 and 56, released in 2001, and Mines Safety Significant Incident Reports 16 (1990) and 46 (1994). So it is timely to issue another reminder to all employers, managers, supervisors, contractors and workers responsible for the use of cranes, excavators, drills, elevating work platforms (EWPs) or similar plant on mine sites.

Contributory factors and consequences

The Mines Safety and Inspection Regulations 1995 — specifically, regulations 5.18(2)(f), and 5.28(1)(c) and (d) — require employers to ensure adequate clearances are maintained when certain activities are

carried out using plant with elevating parts near overhead powerlines. Any overhead powerline must be considered energised unless the owner of the line or the electric utility company indicates that it has been de-energized and it is visibly grounded.

The review of occurrence reports from 1998 to 2008 indicates that many operators, their employers, supervisors and contractors who work with or around cranes, drills and excavators were not fully aware of the hazards of operating mobile equipment near overhead powerlines. Proper safety procedures for controlling these hazards were not implemented.

Common incident causes identified include:

- no “powerline corridor access permit” procedures in place;
- contractors or employees were not aware of the site’s powerline corridor access permit system;
- error of judgment by mobile plant operators;
- absence or inadequacy of signage around powerline corridor; and
- potential hazards of working near powerlines not identified on the job safety analysis (JSA).

The possible consequences of powerline contact or near-contact include:

- electrocution or electric shock to operators and bystanders;
- damage to mobile plant;
- damage to infrastructure;
- tyre explosions and fires; and
- electrical flash-over or arcing.

Recommendations

- Establish a powerline corridor access permit procedure.
- Train all employees, including contractors, in the requirements of the permit procedure.
- Consider all overhead powerlines as energised until the line owner or electric utility indicates otherwise.
- Install adequate signage (Figure 2) at road crossings along the powerline corridor to warn plant operators of the hazard.
- Where necessary, define the areas that cranes and other mobile plant should not enter using warning signs, rigid barriers or tape barriers with high visibility ‘bunting’ or similar to delineate the limits of the approach distance.



Figure 2 Examples of warning signage (left) and clearance indicator (right) on approach to high-voltage overhead powerlines on a mining operation

Table 1 Minimum clearances for vehicle movement in the vicinity of overhead powerlines
 Reference: AS 3007.5:2004, table 2

Powerline voltage (phase to phase) (kV RMS)	Minimum safe distance (metres)
Up to 1.1 kV	1.0
Greater than 1.1 kV and less than or equal to 33 kV	2.3
Greater than 33 kV and less than or equal to 66 kV	2.5
Greater than 66 kV and less than or equal to 110 kV	3.0
Greater than 110 kV and less than or equal to 220 kV	4.0

- Identify and agree on permissible routes for mobile equipment based on the location of powerlines. In particular, know the location and voltage of all overhead powerlines at the site before operating or working with any crane. Many accidents arise when operators deviate from established routes.
- Before any work is performed near powerlines, identify all the hazards and set-up appropriate control measures on the JSAs. Evaluate the job site to determine the safest areas for material storage, the best placement for machinery during operations, and the size and type of machinery to be used.
- If powerlines cannot be de-energized in a work area, only operate mobile equipment in the area if the safe minimum clearance (i.e. distance between the powerlines and any part of the equipment or its load; Table 1) can be maintained, as prescribed in Australian Standard AS 3007.5:2004 *Electrical installations – Surface mines and associated processing plant – Operating requirements*.
- Where it is difficult for the mobile plant operator to maintain safe clearance by visual means, designate a person to observe the clearance and give immediate warning before equipment reaches the limits of safe clearance.
- Before beginning operations near powerlines, notify the line owner (or authorised representative) and provide relevant information, such as type of equipment (including length of boom for cranes) and date, time and type of work involved.
- Train workers to recognise the hazards associated with high-voltage overhead powerlines, and the proper techniques to use when rescuing persons or recovering equipment in contact with electrical energy.

Procedure to follow in the event of mobile equipment contacting powerlines

The following actions are recommended should contact be made with a live overhead powerline or a flash-over occurs between a live overhead powerline and a crane or other item of mobile plant.

- Stop all work in the vicinity of the incident and summon help to have the powerline isolated.
- Keep all personnel away from the mobile plant, ropes and load, as the equipment and ground around the machine could be energized (Figure 3). Be aware that any fallen conductors could also whip around unexpectedly.
- If assistance is unavailable, attempt to break the machinery's contact with the live overhead powerline by moving the jib or driving the machine clear.
- Jumping from affected plant while the powerline is still energised is not recommended and can result in serious injury. However, where there is a risk of imminent danger, such as fire, jumping may be a necessary option. Leap clear of the plant and specifically avoid simultaneous physical contact between the plant and ground.
- Report the incident to management, any network authority and Resources Safety.

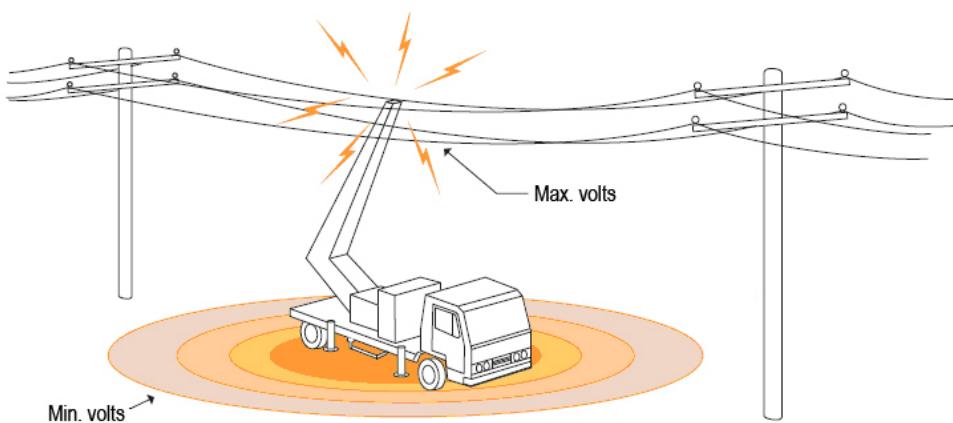


Figure 3 Diagrammatic representation showing mobile plant contacting high-voltage powerline and voltage gradient

- After de-energisation of the powerline, an exclusion zone of 300 metres should be maintained around rubber-tyred mobile plant for at least 24 hours after contact. This is to ensure that no-one is put at risk in the event of a tyre explosion. Further information on this hazard is available in Resources Safety's guideline on tyre safety, fires and explosions.
- Providing the electricity supply has been disconnected, operators may step across to an adjacent vehicle to avoid exposure to the risks posed by possible tyre explosion.
- The operator should be sent to have a precautionary electrocardiogram (ECG).
- When a crane or other item of mobile plant has been in contact with a live overhead powerline, it must be checked by a competent person for damage. Any actions recommended by the competent person must be completed before the mobile plant is returned to service.

Simon Ridge

DIRECTOR, MINES SAFETY BRANCH