



RADIO-FREQUENCY ENERGY - HAZARDS & SAFEGUARDS

Introduction

This safety bulletin is issued to draw attention to hazards that can arise from the use of radio-frequency transmitting devices at or near minesites, and to remind employers of their responsibilities to identify and implement any safeguards necessary to prevent accidents and injuries to persons.

Radio Transmission Sources

Sources of radio-frequency energy that may be present above or below-ground include:

- fixed and mobile radio communications
- mobile telephones, cordless phones, and paging systems
- citizen band (CB) radio systems
- broadcast transmitting aerials and repeater stations
- aviation and/or marine radar and navigational systems
- distributed 'leaky-feeder' aerial transmitters
- ULF 'Ped' communication and blast initiating systems
- geophysical survey equipment
- remotely controlled machines such as LHD's, dozers, and OHET cranes
- process instrumentation and telemetry systems

The presence of radio-frequency energy is not always apparent and consideration must also be given to influences originating from 'outside' equipment not owned or installed by the employer at the mine-site. Delivery vehicles, maintenance contractors, and other visitors to the workplace may each introduce and use radio equipment of which the employer is not aware. Seemingly distant transmitting aerials can radiate considerable power levels, and may compound with other transmission sources to increase the overall hazard.

Explosives Hazards

The possibility of an explosive charge being inadvertently and prematurely initiated by the induction of a radio-frequency current in an electrical firing circuit is very real, and without doubt can result in extreme consequences.

The hazard is associated with the use of electric detonators and arises when the lead wires to the detonator are unwound and extended into a configuration that resembles and behaves as a dipole receiving aerial, capable of absorbing radio-frequency energy. Risk increases significantly when a number of detonators are connected together in a series array and/or to necessarily long firing lines; the magnitude of induced electrical current being limited only by the propagating wave field strength and its characteristics.

Fundamentally, electric shot firing techniques must not be practised at locations where radio-frequency transmissions are present unless a safe separation distance has been established, and members of blast crews should not carry or use any mobile radio-transmitting device whilst handling or connecting electric detonators.

Regulation 8.35(2) of the Mines Safety and Inspection Regulations (1995) states:

"A person who has possession at a mine of any electrical detonators must ensure that those detonators are kept at a safe distance from sources of electromagnetic radiation to prevent the possibility of induced ignition of the detonators by such sources."

Information in regard to the determination of 'safe separation distances' should be available from respective explosives manufacturers/suppliers, and may also be referenced from:

British Standard BS6657:1991 - Guide to Prevention of inadvertent initiation of electro-explosive devices by radio-frequency radiation.

Remotely Controlled Machinery Hazards

Since the early 1980's radio control systems have increasingly been used in mines to remotely operate mobile machines such as load-haul-dumps and overhead travelling cranes; and more recently the technology is finding further application in automatic vehicle guidance systems.

Recognition must be given to the fact that a radio remote control system is not only a source of radio-frequency energy that is potentially capable of interacting with other systems, but itself may also be adversely affected by external interference.

Particularly in regard to radio-controlled mobile plant, the very apparent hazards likely to arise from any unplanned or unexpected machine movement require close scrutiny, and demand a level of engineering integrity that will eliminate all possibilities of such events occurring.

Specific design requirements applicable to remotely controlled machines and intended to prevent unplanned movement are contained in the following Australian Standards, and are given legal standing by reference in regulations 6.33 and 10.45 of the Mines Safety and Inspection Regulations (1995):

AS/NZS 4240:1994 - Remote controls for mining equipment

AS1418.1:1994 - Cranes (including hoists and winches) Part 1 - General requirements

Microprocessor and telemetry system hazards

All electronic and programmable systems used in safety related applications need to be assessed to ensure that the equipment will either not malfunction under the influence of radio frequency transmissions, or that it will fail to a safe condition if it is susceptible.

Voice communication hazards

Mobile radio communications commonly play a vital role in the execution of essential services such as ambulance fire-fighting and mines rescue, and these functions can be seriously jeopardised if radio contact is not maintained, or is interfered with by extraneous radio frequency transmissions.

Similarly, radio communications used in a more everyday manner to relay critical operating instructions, (such as those given by a rigger or dogman to a crane driver who may not be in visual range of the 'slung' load), must remain secure and uncompromised. Any response by the crane driver to an unauthorised voice transmission or a failure by the driver to comprehend a legitimate 'stop' command could result in serious injury.

Summary

Employers have a duty to identify all possible sources of radio-frequency energy present at the site and ensure that any risks of hazards arising from the effects of those sources on susceptible equipment and work practices are eliminated or effectively controlled.

While some issues can be readily dealt with by providing dedicated frequency channels or controlling unauthorised use, other more complex equipment issues will require detailed assessment and may need to be referred to the original equipment manufacturer/supplier or other competent persons, for assistance on engineering solutions.

J M Torlach
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