



## Mines Safety Bulletin No. 97

**Date:** 6 February 2012

**Subject:** Earthing of ANFO loaders used underground (re-issued)

### Introduction

This safety bulletin replaces Mines Safety Bulletin No. 83, dated 23 March 2009. The bulletin has been amended to be consistent with the earthing requirements (clause 4.2.2) of Australian Standard AS/NZS 1020:1995 *The control of undesirable static electricity*, which specifies a total resistance to earth of not more than 1 MΩ.

The pneumatic loading of ammonium nitrate based explosive generates electrostatic charge at a significant rate. Without effective controls, charge accumulation on the delivery hose can rapidly exceed energy levels capable of initiating explosive devices.

Requisite practice for safeguarding against this hazard is to prevent charge from accumulating by providing an efficient discharge path to ground through the use of semiconductive hosing and effective earthing of the loader.

### Requirements

Mines Safety and Inspection Regulation (MSIR) 8.41 prescribes the essential requirements to safeguard against this hazard:

- (3) A person must not use a pneumatic loader to load bulk AN-based explosive unless the loader, charging hose and earthing arrangements are safe and efficient and in accordance with the manufacturer's and supplier's recommendations.
- (4) A person using a pneumatic loader to load bulk AN-based explosive must ensure that the explosive is loaded through a semi-conductive hose or tube having a resistance of not less than 15 thousand ohms per metre and not more than 2 megohms for its total length.
- (5) A person charging bulk AN-based explosive must ensure that he or she removes any gloves and is effectively earthed to drain off any static electrical charge before handling and connecting any electric detonators.
- (6) A person must not use water lines, compressed air lines, wire covered hoses, rail or permanent electrical earthing systems as a means of earthing.
- (7) A person must use protected type detonators when pneumatic loading and electric firing.

These requirements are consistent with recommendations detailed in Australian Standard AS 2187.2:2006 *Explosives – Storage and use – Use of explosives*.

### Comments

Although non-electric initiating techniques are less susceptible to static than equivalent electrical systems, they are not to be regarded as immune and the requirements should be applied equally to all blasting systems.

## Hoses

Semiconductive loading hose is necessary to:

- provide an adequate discharge path to ground for static charge generated during operation of the loader, and
- present a sufficiently high resistance to extraneous ground currents that may be present and transmitted to the blast hole via the hose.

Fully conductive hose is hazardous. To safeguard against unsatisfactory replacement, semi-conductive hose should be readily identifiable. One brand of hose referred to as "LO-STAT" is black with a prominent yellow stripe along its length.

Hose conductivity is known to vary with age and usage. Periodic replacement or testing is necessary to ensure safe values are maintained.

## Earthing

The discharge path to ground is not complete unless the loader is effectively earthed.

Earthing may be effected by connecting a flexible electrical cable between metal parts that are in electrical contact with the loader hose and an electrode in fixed contact with the ground. The cable, electrode and connections must be reliable, appropriate for the environment and afford the required resistance. The total resistance between the loader hose and ground should not exceed 1 MΩ.

Certain materials, including galvanised steels, zinc, copper and alloys of these materials can form impact sensitive explosive compounds in the presence of ammonium nitrate. They should not be used in locations where contact with ANFO cannot be avoided.

## Electrodes

Earthing provided by physical contact of the loader with ground, contact of the hose within the borehole, and any chains or similar arrangements trailing on the ground below vehicles are regarded as supplementary earthing and not sufficiently reliable.

ANFO loaders permanently installed on mobile plant or operated from an elevating work platform may use extended out-rigger stabiliser legs as grounding electrodes, provided adequate conductivity levels have been confirmed by initial and periodic testing.

Rock bolts may also be used as grounding electrodes, provided an effective connection can be made and periodic sample testing in that area of the mine has shown that the ground conductivity levels afforded do not exceed 1 MΩ.

The use of water lines, compressed air lines, wire covered hoses, rail or permanent electrical earthing systems as a means of earthing is prohibited.

## Recommendations

A prominent notice should be displayed on or near ANFO loading apparatus requiring the "equipment to be effectively earthed prior to use in accordance with MSIR 8.41".

However remote the possibility, accidents caused by premature ignition of explosives are potentially lethal. Accordingly, these requirements should be widely communicated to all persons involved with the operation and maintenance of ANFO loaders.



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