



NSW DEPARTMENT OF
PRIMARY INDUSTRIES

Plant and Equipment Mechanical Presentation

**Presented to the Mine Managers
Association NSW Coal Mines
3 May 2007**

TOPICS

- **Trucks**
- **Loaders**
- **Conveyors**
- **High-Pressure Hydraulics**
- **Drilling and Bolting Equipment**

**Prepared and presented by W J Koppe, BSc Mech. Eng.
Inspector of Mechanical Engineering
Mine Safety Operations
NSW Department of Primary Industries**

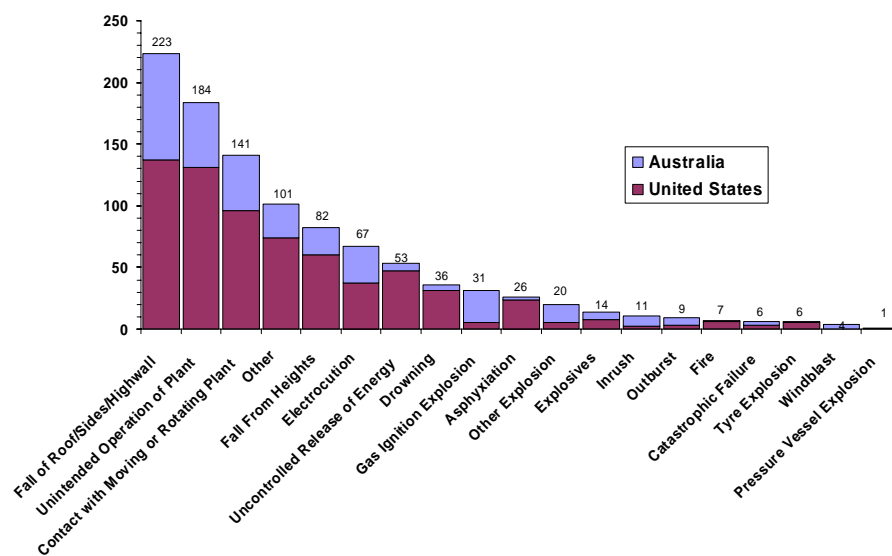


Introduction

In order to assist in identifying where the efforts of the mechanical section of the NSW Department of Primary Industries (NSW DPI) Inspectorate should be concentrated, a fatality review was carried out by a final-year university student, Russell Noon. The result was the identification of 1022 fatalities in Australia and the USA, each of which was allocated to various categories

This data will be placed on the NSW DPI Mine Safety website in the near future.

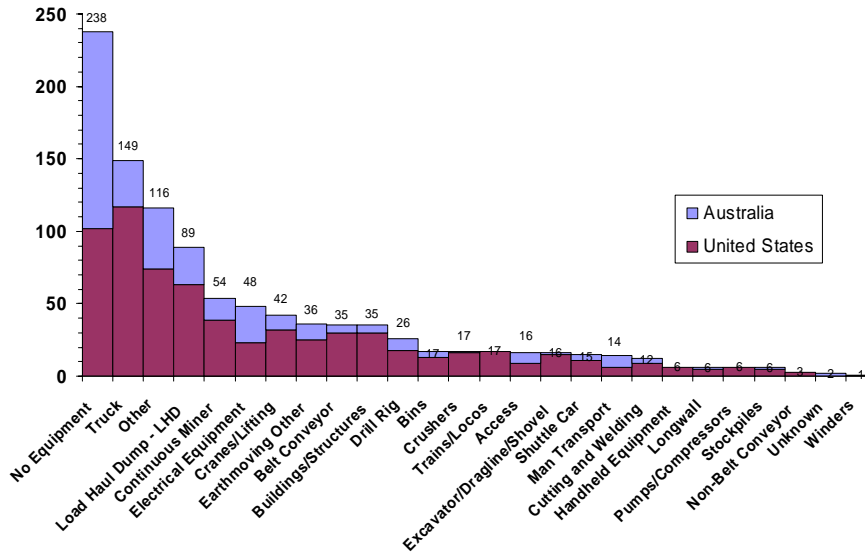
Agent of Fatality – Total 1022



It was identified that core-risk or high-risk activities were involved in less than half of the fatalities and that more than half of the fatalities were equipment related.

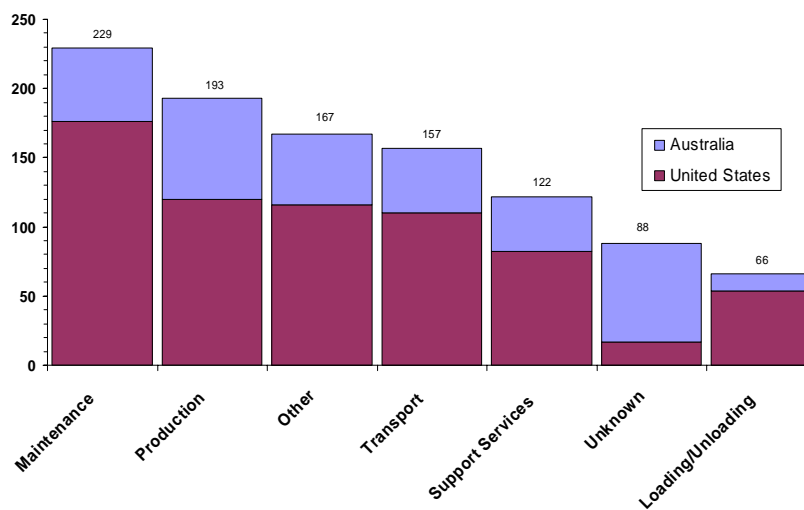


Equipment Involved



The activities at the time of the fatality were also analysed.

Activities at Time of Incident

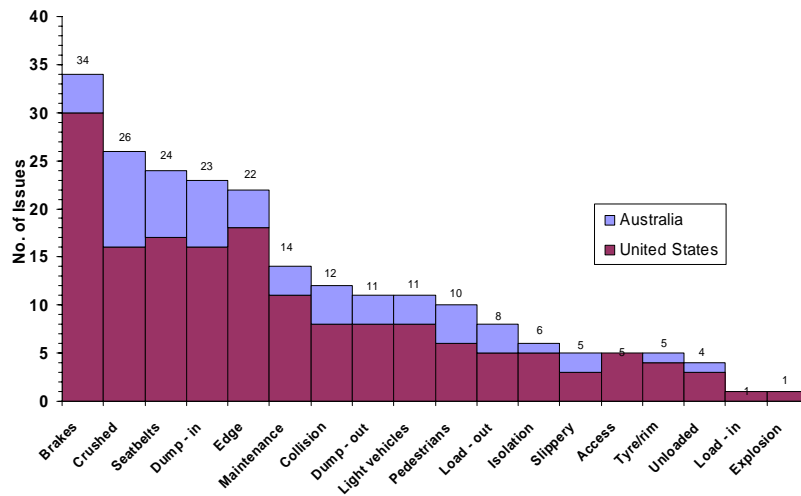




The issues involved with specific areas of equipment types were also reviewed for the following equipment:

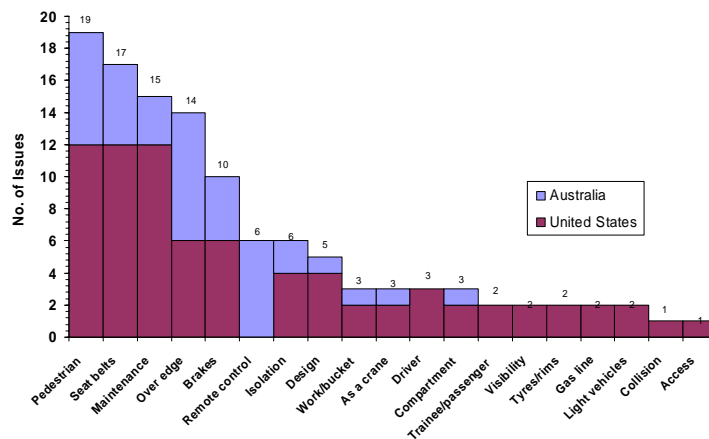
Trucks /Light Vehicles

**Trucks/Light Vehicles – 147 Fatalities
222 Issues**



Load Haul Dump Vehicles

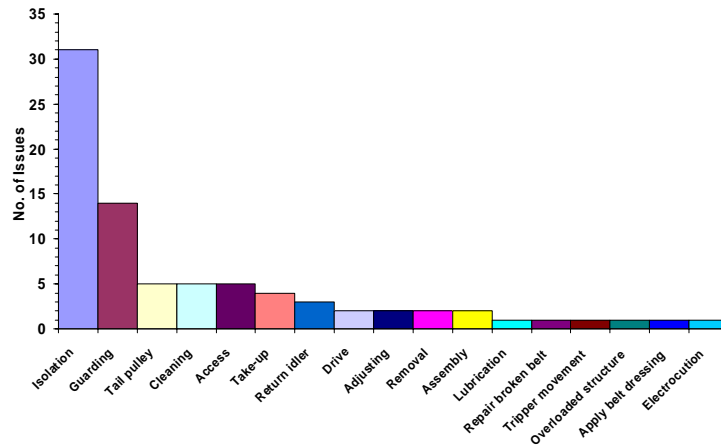
**Load Haul Dump Vehicles – 90 Fatalities
116 Issues**





Conveyors

Conveyors – 37 Fatalities 81 Issues



The foregoing was presented to Mine Mechanical Engineers at the Mechanical Safety Seminar during 2004.

Since this seminar there have been numerous further fatalities involving the same type of equipment, in particular:

- Conveyor fire – USA
- Shuttle car – QLD
- Tyre changing - NSW
- QLD
- High pressure LW hydraulics - NSW
- USA
- Winder – NSW
- LHD – NSW



DRILLING AND BOLTING EQUIPMENT

Drill Rigs

NSW DPI has for some time been attempting to promote improvements in safety relating to drill rigs which were involved in 26 fatalities in the Australia/USA database. Further analysis of the fatalities involving roof/rib falls has identified 52 fatalities involving bolting and drilling equipment.

FATALITIES – Drilling/Bolting

NSW - Queensland - Western Australia -
Tasmania - New Zealand - USA

Open Cut	15
Underground	35
Unknown	2
TOTAL	52

The categories of these fatalities are shown on Slide 8 (below)

CATEGORIES

<u>ROOF FALL</u>	<u>22</u>
<u>RIB FALL</u>	<u>4</u>
HIGHWALL FAILURE	2
GROUND FAILURE	2
ROLL OVER	2
RELOCATING	3
STOPPING	1
DROWN	1
<u>MAINTENANCE</u>	<u>2</u>
<u>MACHINE DESIGN</u>	<u>16</u>



Machine design includes entanglement and accidental operation.

MACHINE DESIGN 16	
ENTANGLEMENT	7
ACCIDENTAL OPERATION	3

A presentation covering *Strata Drill Rigs Machine Mounted – Accident Prevention – Progress* was made to District Mechanical Engineer-in-Charge meetings during late 2004.

Presentations on improvements to drill rigs have been made at two Mechanical Mine Safety Seminars by a representative from ARO/Hydromatic.

A guideline for drill rigs MDG 35 is very close to publication. It is already in use by many in the mining industry.

This guideline includes an analysis of Coal Mine Services Insurance data to further identify specific issues and how they are covered by the guideline.

NOTE: The current draft of the guideline has not included the many incidents involving hydraulic hose failures. These will be added before publication.

7.3 APPENDIX C – INCIDENT STATISTICS

7.3.1 Accident Report Data

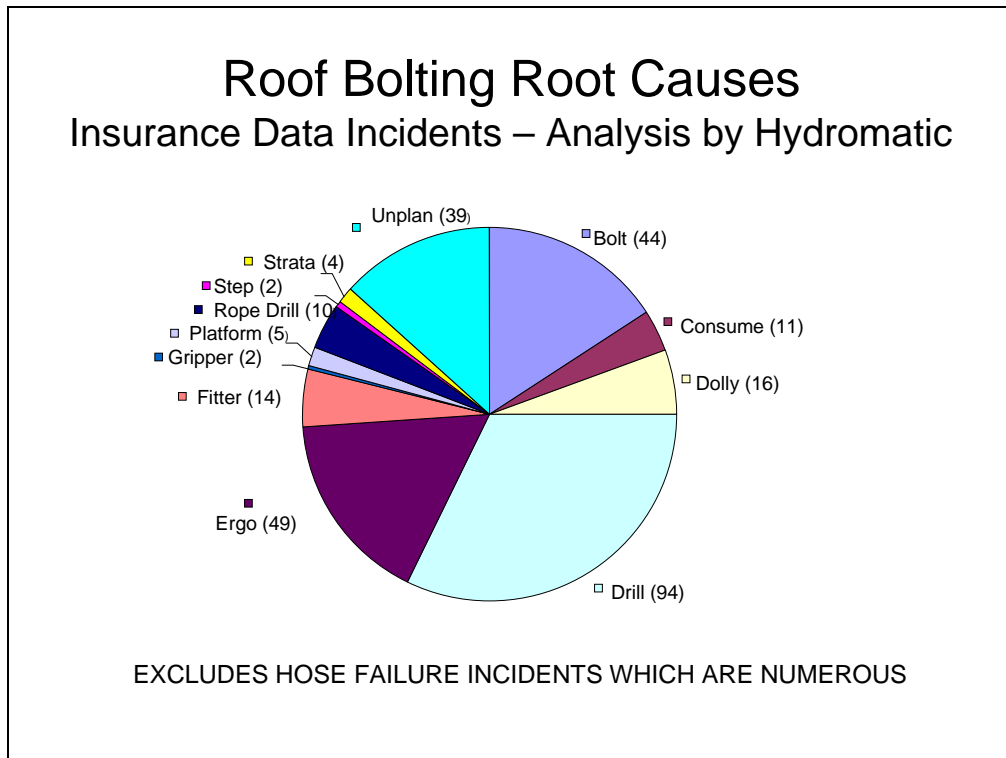
Analysis of accidents from Roof and Rib Bolting Practices in NSW coal mines

The following information is an analysis of data supplied by Coal Services Pty Ltd on the accidents involving mobile bolting equipment used in NSW coal mines. The study covers the years from 1999 to 2004 shows:

- 292 accidents associated with operating and maintaining roof bolting equipment
- 55 accidents occurred during some part of the rib bolting process



The graph below gives a broad breakdown of the root causes of roof bolting injuries.



The majority of drilling/bolting equipment currently does not adequately comply with:

Non Compliances

1. Priority (heirarchy) of risk control
2. Guarding requirements (AS4024)
3. Isolation requirements
4. A Safe Work Procedure (SWP)



Issues

Minimise

- Man/machine interface
- Inadvertent operation
- Manual mechanical drill guides
- Potential to mix up controls
- Potential for rib/roof injuries
- Ergonomic issues
- Hydraulic hose failures

Risk Barriers

- Two handed control
- Slow speed for one handed control
- Individual shaped control knobs
- Pre-start warning
- User friendly hydraulic isolation/emergency valves
- Operator protection - rib
- roof
- MDG41 Compliant

NOTE: Although the MDG 35 working group considered adopting the USA Operator Protection Requirements, it was determined that this was too prescriptive in some areas, hence alternative means of achieving adequate operator protection has been included. For example, modification to conventional timber jacks so that they are capable of better protecting the operator and providing some roof support when drilling is being carried out.



Fatalities Involving Surface Drilling Equipment

A number of fatalities have occurred involving large surface drilling equipment. At least four separate coroners inquests are available and the associated recommendations should be adhered to.

What Equipment Requires Improvements

- Rib bolters
- Roof bolters
- CH₄ drainage drilling equipment
- Underground exploration drilling equipment
- Surface exploration/blasting drilling equipment



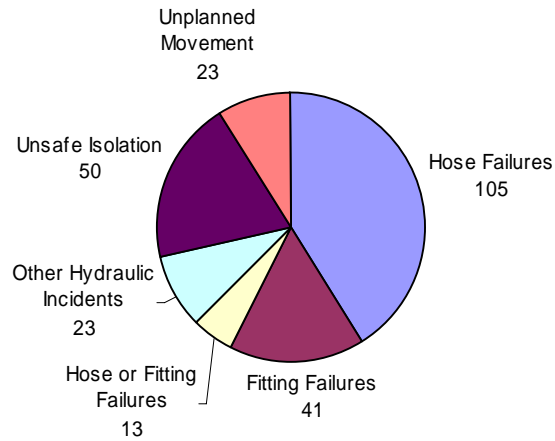
HIGH-PRESSURE HYDRAULICS

FATALITIES

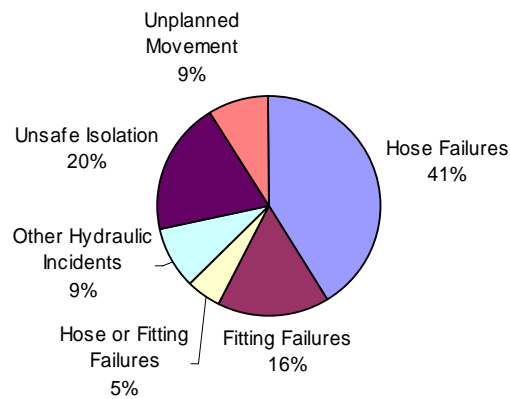
- Gretley – Hydraulic intensification of chock leg circuit – oil injection
- South Coast – Failed accumulator fitting on accumulator start circuit of diesel engine – oil injection
- Angus Place – Disconnected staple fitting on LW hydraulic pump station
- USA – staple fitting broke on hose between tailgate chocks



**255 Longwall Hydraulic Incidents over 8 years
from C.M.S. Insurance**

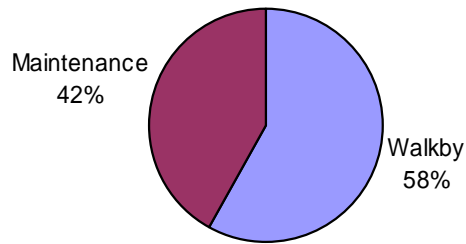


Longwall Hydraulic Incidents

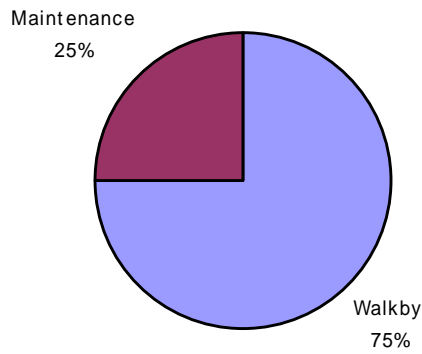




255 Incidents



Hose or Fitting Failure 159 Incidents





Conclusions

Longwalls at some mines may not be a safe workplace to walkby

BECAUSE

- Hose and fittings management
 - Unplanned movement
 - Miscellaneous

In addition

Working on high pressure hydraulics may not be safe

BECAUSE

- Unsafe isolation

Standards & Guidelines

- MDG 40 Isolation – needs better hydraulic section
- MDG 41 Final Draft completed
- AS 2671 \cong ISO 4413
- AS4002.2 \cong ISO 4021 Sampling
- AS 4024
- EN 982



Current DPI / Industry Project

Extend MDG41 with a

- Specific Longwall section to improve hoses and fitting management
- Isolation practice/equipment
- Unplanned movement potential
- Pump Stations
- Monorails
- Staple hydraulic fitting standards
- Competency

Longwall Hydraulic Hazards Workshop 16 May 2007

- DPI
- Major Mining Groups
- Major LW suppliers
- Pump station suppliers
- Hose and fitting suppliers



Recommendations

1. Ensure at least one of your engineers attends the Longwall Hydraulic Hazards Workshop on 16 May 2007
2. Conduct an audit/review of your
 - Drill rigs
 - Hydraulicsto identify the gap analysis
3. Consider the issues involved with truck, loader and conveyor fatalities and ensure these issues are adequately managed
4. Risk review and prioritize
5. Allocate capital



NSW DEPARTMENT OF PRIMARY INDUSTRIES

Date	Mine Type	Operation Type	Country	States	Mine Name	Agent of Fatality	Equipment Involvement	Equipment Fit For Purpose Aspects	Activities at Time of Accident	Accident Location	Management and Human Behaviours	No. Killed	Occupation of Deceased	Summary Of Events	Recommendations	'COMET' Event ID
4/10/1990	Non-Coal	Underground	Australia	Queensland	Hilton Mine	Fall of Roof/Sides/High wall	Drill Rig	None	Production	Mining Area	Procedural error	1	Drill Jumbo Operator	A slab of rock fell from side wall pinning driver against boom of drill jumbo. Rock bolt holes drilled, but bolts not installed.	Face personnel be constantly alert for deteriorating ground conditions and continual need to bar down. Procedures should be adopted to minimise personnel exposure to unsecured ground. Machinery	
20/01/1982	Non-Coal	Underground	Australia	Queensland	Isa Mine	Fall of Roof/Sides/High wall	Drill Rig	None	Production	Mining Area	No direct or obvious human error involved	1	Miner	Rock fall while drilling rockbolt hole with a rising feed.		
1/09/1997	Non-Coal	Underground	Australia	Western Australia		Fall of Roof/Sides/High wall	Drill Rig	None	Production	Mining Area	No direct or obvious human error involved	2	Multiple	A member of a jumbo stoping party, employed by a mining contractor, suffered fatal injuries after being caught in a rockfall in a stope. The jumbo operator, also employed by the same contractor, died in the local nursing post following the accident.		
2/10/1996	Non-Coal	Underground	Australia	Western Australia		Fall of Roof/Sides/High wall	Drill Rig	None	Production	Mining Area	Procedural error	1	Jumbo Operator	A drill jumbo operator was struck by some 1.5 tonnes of falling rock from the back of the drive at an underground nickel mine. He had completed about half his work when he went under unsupported ground to place a collar support plate on a bolt.	A system should be developed to assess procedures both practical and theoretical, of an employee's understanding of work practices, bearing in mind the dynamic nature of safeworking practices and the	
25/10/1995	Coal	Underground	United States	Colorado	Golden Eagle Mine	Fall of Roof/Sides/High wall	Drill Rig	None	Production	Mining Area	No direct or obvious human error involved	1	Roof Bolter	An ATRS was in place and a roof bolting machine was moved into position when a fall of roof occurred inby. The slab that fell broke off and hit the operator who was outby of the ATRS. At the time of fall the operator dust from a suction hose.		
11/03/1999	Coal	Underground	United States	Kentucky	J & A Coal Corporation, No. 1 Mine	Fall of Roof/Sides/High wall	Drill Rig	None	Production	Mining Area	Unknown	1	Scoop Operator	A scoop operator was fatally injured assisting in the installation of roof bolts in a cavity, created for a loading point. A section of mine roof fell striking the victim.	Never work or travel under unsupported roof. Always know and follow the provisions of your approved Roof Control Plan. Take additional measures to protect yourself if unusual hazards or	
24/07/1996	Non-Coal	Underground	United States	Nevada	Sterling Mine	Fall of Roof/Sides/High wall	Drill Rig	None	Production	Mining Area	Procedural error	1	Miner	On July 24, 1996, a miner was killed at an underground gold mine. The employee was drilling at the face when he was buried by material that fell from the roof. He died from suffocation.	Roof an ribs should be supported and unsupported ground should not be entered. Safe work procedures should be in place for working alone in hazardous work places.	
1/04/1997	Non-Coal	Underground	United States	Tennessee	Crab Orchard Mine	Fall of Roof/Sides/High wall	Drill Rig	Temporary Roof Support	Production	Mining Area	No direct or obvious human error involved	1	Driller	A driller was fatally injured drilling blast holes using an air-track drill in preparation of removing an additional 25 feet of the floor from the existing drift when a ground fall occurred from a pillar, crushing him.		
3/02/1997	Non-Coal	Underground	United States	Tennessee	Clinch Valley Mine	Fall of Roof/Sides/High wall	Drill Rig	None	Production	Mining Area	No direct or obvious human error involved	1	Drill Jumbo Operator	A driller with 5 years of mining experience was killed at a zinc operation. The employee was operating a single boom jumbo drill, drilling blast holes in a brow. The victim was crushed when a massive roof fall occurred which collapsed the canopy.		