



Industry &
Investment

MINE SAFETY

INVESTIGATION UNIT

Human interaction with
backhoes and excavators

Industry and Investment NSW data

- 73 reported incidents involving backhoe and excavator type equipment (4 year period - August 2005 to 2009)
- 19 (average of 1 in 4) of the reported incidents resulted in injury to either the operator or person in the vicinity of the equipment.
- Significant injuries - one fatality, multiple skull fractures, fractures to the spine, pelvis, arms and crush injuries.

Type of work task resulting in injury

- Maintenance activity 5 injuries
- Operation/machine collisions 4 injuries
- Handling logs and trees 3 injuries
- Operator access/egress 3 injuries
- Handling polypropylene pipe 2 injuries
- Using arm as a lifting device 2 injuries

Person to Vehicle Incident

- *What happened*
 - Person located in between two steel structures and in front of a backhoe arm lifting a steel plate.
 - Backhoe operator not aware the person had entered into backhoe arm work zone
 - Unplanned slip and forward movement of the backhoe due to slope of ground
- *Result* – Person crushed across the hips by the steel handrail as the backhoe arm pushed against the handrail.
- *When* – 11 August 2008
- *Where* – Coal preparation plant, Southern Districts, NSW.
- Published Safety Alert SA 08 -11



Person to Vehicle Incident

- *What happened*
 - Person walked into the work zone of a backhoe excavator arm whilst levering out a log from a pile of timber logs.
- *Result* – Person struck in head by the root ball of the timber log as it ejected from the timber pile.
 - 32 skull fractures and brain injury
- *When* – 24 August 2008
- *Where* – Surface waste dump, Western Districts, NSW.
- *Published Safety Bulletins*
 - SB 08-08
 - SB 09-04

Injured
person
location



Person to Vehicle Incident

- *What happened*
 - Person located in the work zone of an excavator moving logs.
- *Result*
 - Person struck by the moving timber log. Fractured pelvis and internal injuries
- *When* – 18 November 2008
- *Where* – Extractives, Southern Districts, NSW.
- Published Safety Bulletin
 - SB 09-04



Operator struck in excavator cabin

- *What happened*
 - Excavator used to lift and drag 12m length of poly pipe weighing 600kg. The pipe slipped through the supporting chains and entered the operators cabin.
- *Result* – Poly pipe broke cabin window and struck the operator.
 - Crush injuries
- *When* – 31 March 2009
- *Where* – Extractives, Sydney Region, NSW.
- Published Safety Bulletin
 - SB 09-04



Significant incidents

- Fatal incident on 1 August 2009
 - Excavator pulling poly pipe resulted in the fatal injury of a person located nearby to the pipe being pulled. I&I NSW SA 09-10 and SB 09-03
- Fractures to leg on 30 January 2009
 - Excavator moving a tree stump, the stump entered the cabin and injured the operator
- Tree enters excavator cabin on 19 August 2008
 - Excavator lifting a tree with a grab onto a low loader. The tree slipped and broke the cabin windscreen.

Significant incidents

- Fractured vertebra on 16 May 2007
 - Mud fell from the base plate of excavator onto the head of a maintenance person
- Fractures on 10 October 2006
 - Maintenance person whilst replacing a hydraulic hose fell from excavator boom arm
- Broken arm on 29 November 2005
 - Person's arm was broken by the excavator arm as it was being lowered to lift a bundle of timber

Issues of concern

SB 08-08

- Failure of risk assessments to identify and control risky behaviour of persons in and around machinery
- Failure of plant operators and supervisors to identify and control risky behaviour of persons in and around machinery
- Failure to establish and maintain no-go zones, control zones and barricading around machinery
- Failure to maintain line of sight, and communications with persons working around mobile plant and machinery

Questions to consider –

SB 09-04

Hierarchy of control for human interaction

- Do your identified risk assessment controls related to human interaction consider hierarchy of control ?
 - AS 4801- 2001 OHS Management Systems
- Will the selected risk controls achieve
 - “ As Low as Reasonably Practicable” outcomes ?
(ALARP / ALARA)

Hierarchy of control for human interaction SB 09-04

- *Eliminate the risk* - remove the offsider from the work zone
 - place hard barrier controls
- *Substitute the risk* – substitute ‘hands on’ activity by the offsider
- *Engineering controls* – consider proximity detection systems to warn the operator of a person entering the work zone
- *Administration controls* – safe work method statement, training and supervision
- *PPE*

Recommendations

SB 08-08

- Review OHS management system and major hazard management plan to ensure that;
 - The working relationship between persons and machinery and primary hazards are examined. eg person to vehicle interaction (P to V)
 - Barriers, signs and markings are used to identify hazardous work areas, no-go zones and control zones. Persons should stay outside the mobile plant operating radius and turning circle.
 - Risk assessments and SWP for operation and maintenance of mobile plant are adequate to ensure that release of energy are identified.
 - Adequate training and information provided to operators and operator competency is reviewed.

Industry and Investment NSW and other published resources

■ Safety Alerts and Bulletins

- Directional boring fatality SA 09-10
- Broken pull chain results in fatality SB 09-03
- Worker crushed by sliding backhoe SA 08-11
- Mineworkers injured in machinery crush zones SB 08-08
- Human interaction with backhoes and excavators SB 09-04

■ Technical References

- MDG 5004 Pitzer Report – Study of risky positioning behaviour of operators of remote control mining equipment
- I&I NSW Small mines safety management kit (version 3)
- I&I NSW Investigation report slings and chains
- Workcover Code of practice 2002 – Safety in forest harvesting operations
- Workcover Guide 2003 – 6th edition – Dogging
- Workcover Guide 2005 – 2nd edition – Rigging
- AS 4801:2001 – OHSMS specification with guidance for use
- AS 4360:2004 – Risk Management
- AS 2294.1 Supp 1- 2003 – Earthmoving machinery – protective structures