Guideline for the compilation of a

Risk assessment

on the

JackPack

(Cluster Pack & Mat Pack)

This guideline has been prepared by New Concept Mining (Pty) Ltd to assist the Mine in compilation of their own Risk Assessment as required by the Mine Health and Safety Act

18/02/1999

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Section 1 Summary

Introduction

The JackPack has been developed as an alternative method of pre-stressing packs. The units can be used on various types of packs including, the conventional timber slab pack, cement packs and pole cluster packs. The clusters can be any number of poles from two to six depending on the size or the shape of the JackPack and the diameter of the poles in use.
A limited number of shapes are available depending on the mine requirement, rectangular and square Jackpacks being the most common. One large unit covering the area of the pack or a number of smaller units may be used to cover the same area.

The unit consists of two sheets of steel that are welded together using a high voltage seam welder. The filler valve arrangement is the same as the Jackpot range of products, so no special equipment is required to install the JackPack. It is recommended that a pneumatic pump be used during this operation so as to speed up the operation.

During installation the pack, cluster or other, must be installed as close to the hanging wall as possible to eliminate over inflation. This ensures that time is not wasted pumping and the unit is not unstable and susceptible to blast out. The Jackpot hand pump is capable of pumping these units up, but it would very tedious work and therefore not recommended. This becomes more evident when multiple JackPacks are used in a single layer. Simultaneous inflation is recommended for stable installations.

Care should be taken to limit the inflation of the JackPack to 80mm maximum. If inflated higher than this the geometry changes around the weld and the material could fail. Particular care should be taken when inflating a JackPack on a cluster of poles. The poles only make contact with a portion of the steel and the rest of the JackPack will over inflate if allowed. Care should be taken to cut each pole accurately to limit over inflation. Further to this, in a MatPack, if over inflated the contact area shrinks and point loading occurs.

In the case of Cluster Packs, if pencil props are used the JackPack should be placed at the “large end” and not the pencilled sections.

Over inflation can be prevented using a PRV (Pressure Relief Valve). These valves are set at 3,5 MPa which will inhibit over inflation but generates sufficient load to prevent blast outs. When loading occurs in the form of hanging wall sag or subsidence then the valve allows water to flow out in a controlled manner thus not allowing pressure to build up thereby causing the JackPack from rupturing.

Section 2 – Objectives

The objectives of the risk assessment are as follows:

Operational Risk Analysis

To identify the hazards, prioritise the risks associated, and highlight the controls required to eliminate/minimise the risks related to the **JackPack** and its operation, as well as any risk of failure, primarily from the point of view of the health and safety of the workforce, but also production delay and asset damage and /or a combination of the three.
Note. It is important to note that ALL new sections that are introduced to the JackPack will be trained by New Concept Mining staff in the safe use and installation of the product to avoid risk of any nature as far as possible.

Section 3 - Risk analysis method

The risk analysis followed two accepted methods. All risk analyses follow a general scheme that can be described as follows:

- Describe the system under analysis (including equipment, personnel, procedures, work environment, management and supervisory systems etc.).

- Identify loss scenarios (i.e. sequences of events leading up to potential or actual losses i.e. incidents or accidents) in the form of hazards, potential productivity interruptions, asset damage events, environmental issues etc.
- Evaluate the risks of each loss scenario by determining the relative likelihood of each event, and the relative consequence of each event.
- Evaluate the currently planned controls, barriers and safeguards.
- Identify additional, potential controls, barriers and safeguards.

In the current exercise, a select team from **New Concept Mining (Pty) Ltd** accomplished these steps:

Identify the possible system hazards

This step postulated the maximum reasonable consequence of loss scenarios or failures (i.e. of circumstances leading up to or resulting in hazards). The consequences were classified as losses to people (Health & Safety) in this instance.

Determine the level of risks

Risks associated with each step in the operational process were considered. This is achieved by considering the event frequency or probability, and the event severity or consequence.

The ranking system used is described below:
Risk is defined as the product of **probability** and **consequence**.

Probability categories

Probability categories were defined as follows.

A = Common

B = Has Happened

C = Could Happen

D = Not Likely

E = Practically Impossible

Consequence categories

Consequence categories were defined for health and safety.

	Health & Safety
1	Fatality / Permanent disability
2	Reportable Injury
3	Disabling Injury
4	Dressing Station Case
5	Self Treated

Risk categories

Risk categories were defined by combining the probability and consequence categories above according to a matrix of prioritised risk ranking as follows.

consequence category	A	B	C	D	E
1	1	2	4	7	11
2	3	5	8	12	16
3	6	9	13	17	20
4	10	14	18	21	23
5	15	19	22	24	25

A risk score of 1 denotes the highest (most significant) risk; and a risk score of 25 denotes the lowest (least significant) risk. **In the current exercise, all losses and failure were considered severe, and therefore all hazards were examined.**

Define and describe the system controls and barriers

This step identified existing controls and barriers, and also considered planned, and possible additional controls and barriers which could be used to manage the operational risk.

Assess the adequacy of the controls

The adequacy of the nominated controls in terms of design devices, management and operational practices and system amendments was reviewed by the team to ensure that additional scope for risk reduction has not been overlooked within the time available. If the controls are considered inadequate, recommendations to improve the situation are made. The test team bearing in mind cost-benefit

Document the study process and results

The report is presented so that the company can review the planned and proposed controls and barriers and can *devise an implementation plan* to incorporate additional approved controls established through the risk analysis.

Analysis logistics

The risk analysis was conducted over one day being the …23rd August 1999….. at **New Concept Mining (Pty) Ltd** offices with a selected risk review team participating in the exercise.
Participants are listed below: This Risk assessment is reviewed as regularly as is required and as more is learned about the safe use of the product.

Section/Position	*Name*
1. Technical Director…….	Paul McKelvey B.Sc. MSc (Mech. Eng.)…
2. Sales Team…….	Andre Human, Teno van der Riet, Llen Barber
3. Director…….	Owen McMahon…….
4. Technical Support and Safety…….	Simon Mangena…….
5. Manufacture…….	Greg La Vita …….

6. Design Engineer.…… Dave Tyrer B.Sc (Mech. Eng)…….

Signed ……..
For New Concept Mining.

Section 4 - results

The risk analysis exercise generated results which are presented overleaf in a Risk Analysis table.

JackPack Risk Analysis Table
(JackPack square, rectangular and triangular)

STEP	POTENTIAL ACCIDENT	Probability	Consequence	Rank	CONTROLS	ISSUES	Probability	Consequence	Rank
1. JackPack Manufacture	Failure leading to pressure loss and sticks/mat fall out and FOG injury to people.	A	1	1	1) Check material batch chemical analysis certificates 2) Quality Acceptance testing on all material and components. 3) Implementation of ISO 9000 in progress.	Correct QA procedures for : 1) Steel Procurement 2) Fabrication/weld. 3) Testing	C	1	4
1. Transport into stope	Worker drops unit causing injury	A	3	6	1) Training 2) PPE (boots, gloves and hard hat)	1) Use mono rope where possible, (see RA on mono-rope installation and operation) 2) Handle supplied for attachment to Mono rope. 3) PPE supplied by mine 4) Carry, do not throw	C	3	13
	Rolling/sliding material causing injury	B	2	5	Training and Supervision	1) Stack correctly in stope storage areas	C	2	8
	Unit falls off mono rope or is dropped leading to injury (steep areas)	B	2	5	Mine Standards	1) Gate stulls. 2) Mine standards for steep areas apply.	C	2	8
	Slip and fall leading to injury	C	4	18	1) Mine Standards 2) PPE issued. (boots, hard hat and gloves)	1) Area >35-degree steep area, safety belts needed. 2) Good house keeping. 3) Gate stulls. 4) Mine procedure to prevent rolling rocks etc.	D	4	21

2. Preparation for installation **5a. All new sections being introduced to the JackPack, will be trained by New Concept Mining staff on the safe use of the product in the situation of a single JackPack or multiple units.**	FOG injures worker	A	1	1	Mine Standard	1) Make safe	B	1	2
	Support installed at incorrect spacing causing inadequate support resistance and possible F.O.G	A	1	1	Mine Standard. Support design as per Rock Engineering department.	2) Mark off positions of packs on hanging wall	B	1	2
	Pack can blast out because it is installed on loose rock and insufficient pre-load is obtained – F.O.G and wastage of material	A	1	1	Training	3) Clean footwall to solid rock	B	1	2
	Pack can blast out because it is installed with insufficient pre-load - F.O.G and wastage of material	A	1	1	Training	4) Check water hose, pump and air supply.	B	1	2
	Pack can blast out because it is installed with insufficient pre-load - F.O.G and wastage of material	A	1	1	Is setting gauge and setting tool available?	5) Check pressure relief valve setting on pump – (see RA on Jackpot Setting Pistol.)	B	1	2
3. Measure and cut. (Cluster pack)	Poles cut to wrong length causing production delay	C	1	4	Training	1) Measure correctly to ensure tight fit of poles against hanging wall	D	1	7
	Injured by bow saw	B	4	18	PPE issued by mine (gloves, boots hard hat)	1) Training	C	4	18
	Poles sawn excessively skew or short so that JackPack cannot accommodate misalignment and is over inflated – pack blasts out or JackPack ruptures.	B	1	2	Training to be done to ensure production team do not over inflate. 80mm inflation maximum.	1) Saw to within 10mm of straightness will limit inflation height	C	1	4
3.1 Strapping.	Poles fall over injuring operators. Poles cut excessively short causing JackPack to over inflate. 80mm inflation maximum.	B	1	2	Strapping to be used in keeping poles upright and 90 degrees to the strata.	Correct tool to be used to tighten straps.	C	2	8

4. Installing the pack (Cluster & Mat) as gully, breaker line or internal stope support.	Knocking the hanging wall with hammer causing FOG or rock fragments leading to eye injury	A	1	1	Training and PPE (gloves, boots and hard hat)	1) Make safe • Sound • Bar • Barricade • Warning signs	C	1	4
	Pack blasts out causing risk of F.O.G	A	1	1	Training	1) Install at 90° to strike and dip	C	1	4
	Pack or rocks fall during installation or handling causing injury	A	1	1	Training	1) No workers to work below installation 2) Use gate stulls	C	1	4
	Pack falls out due to hanging wall structure (i.e. Jagged/Smooth).	A	1	1	Training	1) Install normal to dip. (90deg)	C	1	4
5. Remote pre-stressing (This operation is critical when single or multiple JackPacks are being used) **6. PRV (pressure relief valve) used to limit inflation.**	Pack falls during pre-loading leading to injury.	B	1	2	Training	1) Accurately measure and saw timber poles. Block Mat pack correctly to avoid excessive inflation. 2) Remotely pre-stress with pump.	C	1	4
	Bursting of JackPack, causing high pressure water in eyes. (3.5Mpa pressure recommended)	A	1	1	PPE supplied by mine (boots , hard hat, gloves & goggles)	1) Correct QA procedures by Supplier. Random burst tests done at CSIR and in house. > 90 ton achieved.	C	1	4
	Struck by hose.	C	2	8	Training	1) Attach hoses securely.	D	2	12
	Valve fails after pre-stressing resulting in loss of load PRV is damaged by fly rock.	C	1	4	QA by supplier	1) Unit low pressure tested prior to departure 2) PRV to be replaced and repumped.	D	1	7
	Valve damaged by flying rock.	D	5	24	N/A	1) Internal valve unaffected by fly rock.	D	5	24
	Unit blasted out causing FOG and loss of production.	A	1	1	Training & Supervision	1) Clean footwall 2) Pumped to correct pre-load	C	1	4

7. Support Selection	Pack fails leading to FOG injury and production delays	A	1	1	Use support with required resistance and energy absorption capability. As specified by Rock Engineering Department.	Correct selection of support system according to: 1) Static closure rate 2) Dynamic closure rate 3) Stoping width 4) Energy Release Rate 5) Hanging wall ride	C	1	4

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