

**PUMPABLE ROOFBOLT AND
CABLE ANCHOR GROUTING SYSTEM**

PRODUCT INFORMATION AND RISK ASSESSMENT



MINOVA

Solutions from Materials Technology

**PUMPABLE ROOFBOLT
&
CABLE
ANCHOR GROUTING SYSTEM**

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INTRODUCTION:

DUE TO PROBLEMS EXPERIENCED WITH THE DIFFERENT SYSTEMS OF GROUTING ROOFBOLT INSTALLATIONS, MINOVA HAS DONE EXTENSIVE RESEARCH TO FIND SOLUTIONS TO SIMPLIFY THE OPERATION OF GROUTING BOLT INSTALLATIONS AND CABLE ANCHORS AT A GREATLY REDUCED PRICE.

IN 90 % OF THE CASES WHERE FALLS OF GROUND OCCURED UNDERGROUND, IT WAS FOUND THAT THE ROOFBOLTS WERE NOT FULL COLUMN GROUTED.

MAIN REASONS THEREFORE IS:

- 1) Ineffective or mechanical pump failures
- 2) Difficulty in getting the grout mix into the holes
- 3) Failure of the locking mechanisms or end washers on the roof bolts
- 4) Human factors - difficulty of installation and pumping
- 5) Ineffective tensioning of end anchored units

RESEARCH WERE DONE BY MINOVA, MANUFACTURERS OF CABLE GROUTS AND MECHANICAL PUMPS AND VIDEX, MANUFACTURERS OF ROOFBOLT SYSTEMS, TO DEVELOP A FAIL-SAFE, USER-FRIENDLY SYSTEM THAT WILL GUARANTEE A FULLY GROUTED ROOF BOLT OR CABLE ANCHOR.

THIS CAN BE SEEN BY THE ROCK ENGINEERING AND C.S.I.R. REPORT ATTACHED TO THIS RISK ASSESSMENT, THE BONDING STRENGTH IS WELL WITH IN THE REQUIRED SPECIFICATIONS OF ROOFBOLT INSTALLATIONS.

FOR YEARS, NORMAL A OPC GROUT MIXTURE WAS USED AND TESTS REVEALED THAT THIS PRODUCT IS USELESS WITHIN THE FIRST 4 HOURS OF INSTALLATION.

ALTHOUGH FULL COLUMN GROUTING IS THE MOST IMPORTANT PART OF THE SUCCESSFUL ROOFBOLT INSTALLATION, IT ONLY COUNTS FOR ABOUT 5 % OF THE TOTAL COST OF THE INSTALLATION BEARING IN MIND THE LABOUR COSTS, TRANSPORT COSTS, MATERIAL COSTS, AND SHAFT HEAD COSTS.

IT IS THEREFORE ADVISABLE TO USE A PROPER **FAIL SAFE SYSTEM TO ENSURE MAXIMUM SAFETY AT THE MINIMUM COST.**

CAPCEM B5 CEMENTITIOUS PUMPABLE CABLE GROUT

Capcem B5 Cable Grout was specifically developed for full column grouting of cable anchors and end-anchored roof bolts in the mining industry.

Cables varying in lengths from 4 to 10 metres, and can be fully grouted with this system.

MINOVA is supplying the grout in 10 kg bags and also supply the pumps to be utilised with this systems.

The unique feature of this grout is that it is a non-shrink fully thixotropic chemical mixture bonding to rock and steel. The Capcem B5 high strength grout peaks after 24 hours to nearly 10 tons per 200mm (SEPT)

Tests were conducted at the CSIR to determine the bond strength. (See CSIR Reports and graphs).

NOTE:

Protective clothing must be worn whilst pumping cable anchor and roof bolts, i.e. safety spectacles, gloves, long sleeved overalls etc.

PROCEDURE:

- a) Install roof bolts and pre-tension as per CRMO recommendation. Ensure that the grout-retaining washer is in position.
- b) Place grout pump on a level surface in close proximity to the cables anchors that will be filled with the grout. (Pumps supplied with a 8 meter x 20 mm filler tube)
- c) The mixing ratio is 4 liters of water = one bag of grout.
- d) Add the required water into the mixing bowl and add the cement grout slowly whilst rotating the handle on the mixing bowl.
- e) Mix thoroughly for 3 to 4 minutes. Start pumping whilst flushing hose back into the mixing bowl until the grout is fully mixed.

- f) When the mix has been fully prepared, connect the hose onto the filler tube of the roof bolt or cable anchor.
- g) Pump slowly until the hole is properly filled. This will be indicated by the breather tube suspended at the top of the bolt. Maintain pumping until thick grout emerges from the bottom of the breather tube. Bend the filler tube over and tie up with the o-ring supplied.
- h) Remove the filler hose and move it onto the next cable.
- i) On completion of grouting, clean the pump thoroughly and flush it with clean water. Pump the clean water through the filler hose until all the grout is cleared from the pump and system.
- j) Store the pump in a safe place for re-use on the following shift.

BENEFITS OF THE MINOVA SYSTEM

- 1) IMMEDIATE ACTIVE SUPPORT AS THE BOLT IS PRETENTIONED BY END ANCHORED SHELL AND RETAINING WASHER.
- 2) POST GROUTING WITH A 100 % GUARANTEE OF HAVING A FULLY GROUTED HOLE.
- 3) SAFETY – BETTER QUALITY SYSTEM HAVING END ANCHORAGE AND FULL COLUMN GROUTING.
- 4) COST EFFECTIVE - THE CABLE GROUT WILL HAVE SET FOUR HOURS AFTER PUMPING. WITHIN 24 HOURS IT WILL ALREADY HAVE REACHED APPROXIMATELY 10 Mpa. (SEE CSIR REPORTS).
- 5) EASE OF INSTALLATION - FOR EXAMPLE: A DEVELOPMENT END REQUIRING 15 ROOFBOLTS TO BE GROUTED CAN BE ACCOMPLISHED WITHIN HALF AN HOUR. (LESS LABOUR INTENSIVE)
- 6) THE MINOVA MK 1/111 GROUT PUMPS CAN BE USED FOR PUMPING

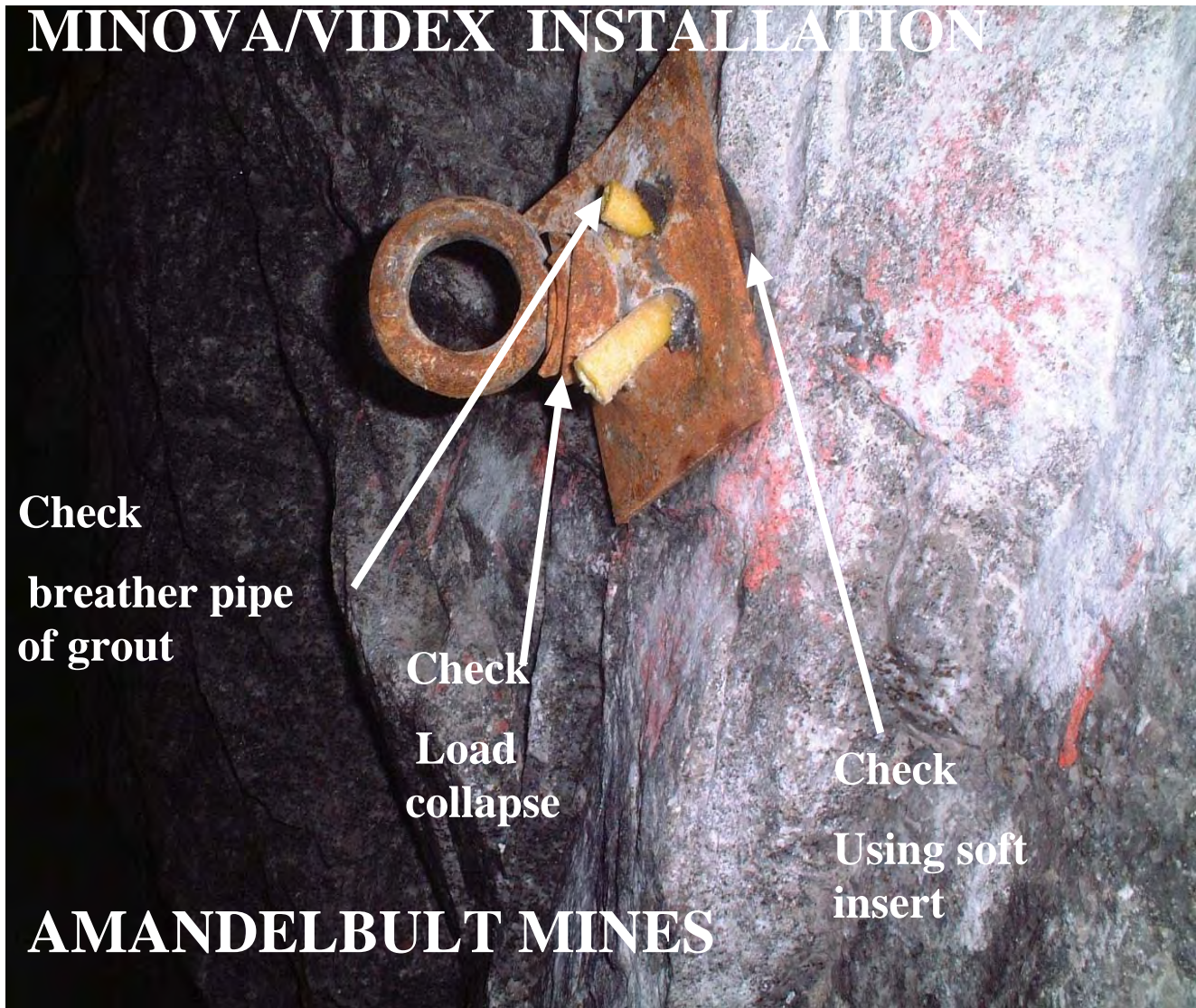
ROOFBOLTS IN DEVELOPMENT ENDS AS WELL AS FOR PRE-STRESSING PACKS IN STOPING APPLICATIONS.

- 7) EXCESSIVE WASTAGE CURRENTLY EXPERIENCED WITH CAPSULATED GROUTS WILL BE REDUCED, AS THERE IS NO WASTAGE OF GROUT BETWEEN FILLING THE HOLES ON THE MINOVA SYSTEM.

ONE BAG OF CAPCEM B5 GROUT WHEN MIXED WITH 4, 0 LITRES OF WATER WILL YIELD 7, 2 LITRES OF PUMPABLE GROUT MIX.

ONE 2, 2 METRE INSTALLATION USES 1, 8 LITRES OF GROUT AT 40 MM Ø

.º. 3 BOLT INSTALLATIONS CAN BE FILLED PER BAG



TYPICAL EXAMPLE OF AN EFFECTIVE BOLT INSTALLATION



AN EXCELLENT EXAMPLE OF A GOOD INSTALLATION

- A) THE BOLT WAS PRE-TENSIONED UNTIL THE LOAD WASHER COLLAPSED AT APPROXIMATELY 50 Kn.
- B) THE HOLE WAS PROPERLY FILLED WITH GROUT – NOTE CUT THROUGH VERSION OF FILLER AND BREATHER TUBES

MINOVA / VIDEX COMBO BOLT SYSTEM



PUMPING IN PROGRESS.

NOTE: THE TEXTURE OF GROUT RELEASED FROM THE BREATHER TUBE.
THIS INDICATES THAT THE HOLE HAS BEEN PROPERLY FILLED

HAND PUMP MK 1 **COMPLETE**

“THE PUMP THAT WILL NEVER LET YOU DOWN”



DESCRIPTION:

THE UNIQUE MINOVA ROOFBOLT NYLON HAND OPERATED PUMP. THIS PUMP WILL PUMP ALL FORMS OF LIQUID AND PUMPABLE GROUTS. THE PUMP INCORPORATES A LIGHT WEIGHT MIXING TANK AND DELIVERY ASSEMBLY.

THIS UNIT IS VERY EASILY DISMANTLED FOR EASE OF TRANSPORT IN DIFFICULT WORKING PLACES UNDERGROUND.

THIS PUMP IS RECOMMENDED WHERE MORE THAN 20KG OF GROUT IS TO BE MIXED AT ANY ONE TIME. THE PUMP IS EQUIPED WITH A MEASURING FLASK.

RECOMMENDED MAXIMUM MIX IS 40KG OF CABLE GROUT.

SPECIFICATIONS OF MINOVA MK 1 HAND/AIR OPERATED PUMP

	AIR PUMP	HAND PUMP
OVERALL LENGTH	100 CM	100 CM
OVERALL HEIGHT OF PUMP	82 CM	82 CM
WEIGHT OF PUMP ONLY	9.4 KG	6 KG
WEIGHT OF CONTAINER	21 KG	21 KG
TOTAL WEIGHT	30.4 KG	27 KG
PUMP DELIVERY	40 L PER MINUTE	20 L PER MINUTE
OUTPUT PRESSURE	UP TO 10 BAR	UP TO 10 BAR
CAPACITY TO MARK	56 L	56 L
DELIVERY HOSE 12.5mm	5 METRES	5 METRES

The pump can be removed from the container for quick servicing and maintenance. The ribbon-mixing scroll does not create air bubbles and agitation of the materials is quicker due to the design of the scroll.

The MINOVA hand pump is designed to achieve cost-effective performance, particularly in areas where auxiliary services are limited or are not available. The simple, robust design ensures that the unit is not only highly reliable but also easy to clean, service and maintain. It is light in weight and is easy to move, transport and set up.

ADVANTAGES OF MINOVA HAND PUMP:

- 1. Does not support combustion**
- 2. The pump can easily be removed from the container**
- 3. The unit has a minimum number of working parts**
- 4. Can be used in areas where air is not available**
- 5. No spanners required to overhaul pump**
- 6. Unskilled labour can repair pump**
- 7. Low cost on wearing parts**
- 8. Maintenance repair cost can be cut down to 90 %**
- 9. Capital cost for pumps can be reduced**

A demonstrator can be made available to the mine for the initial training of mine personnel.

HAND PUMP MK 2 **COMPLETE**

“THE PUMP THAT WILL NEVER LET YOU DOWN”



DESCRIPTION:

THE UNIQUE MINOVA ROOFBOLT NYLON HAND OPERATED PUMP. THIS PUMP WILL PUMP ALL FORMS OF LIQUID AND PUMPABLE GROUTS. THE PUMP INCORPORATES A LIGHT WEIGHT MIXING TANK AND DELIVERY ASSEMBLY.

THIS UNIT IS VERY EASILY DISMANTLED FOR EASE OF TRANSPORT IN DIFFICULT WORKING PLACES UNDERGROUND.

THIS UNIT FEATURES A WATER LEVEL MARK ON 4 LITER CAPACITIES. THIS IS ENOUGH TO MIX 10KG OF GROUT POWDER. (ONE BAG).

SPECIFICATIONS OF MINOVA MK 2 HAND OPERATED PUMP

OVERALL LENGTH	40 CM
OVERALL HEIGHT OF PUMP	80 CM
WEIGHT OF PUMP ONLY	7 KG
WEIGHT OF CONTAINER	4.4 KG
TOTAL WEIGHT	11.4 KG
PUMP DELIVERY	30 LITRES PER MINUTE
OUTPUT PRESSURE	UP TO 10 BAR
CAPACITY TO MARK	4 LITRES OF WATER
DELIVERY HOSE 12.5mm	5 METRES
4 LITRE MIXED WITH 10 KG GROUT	7.2 LITRES GROUT MIXTURE

The MINOVA hand pump is designed to achieve cost-effective performance, particularly in areas where auxiliary services are limited or are not available. The simple, robust design ensures that the unit is not only highly reliable but also easy to clean service and maintain. It is light in weight and is easy to move, transport and set up.

ADVANTAGES OF MINOVA HAND PUMP:

- 1) Does not support combustion**
- 2) The pump can easily be removed from the container**
- 3) The unit has a minimum number of working parts**
- 4) Can be used in areas where air is not available**
- 5) No spanners required to overhaul pump**
- 6) Unskilled labour can repair pump**
- 7) Low cost on wearing parts**
- 8) Maintenance repair cost can be cut down to 90 %**
- 9) Capital cost for pumps can be reduced**

A demonstrator can be made available to the mine to assist with the initial training of mine personnel

HAND PUMP MK 3 **COMPLETE**

“THE PUMP THAT WILL NEVER LET YOU DOWN”



DESCRIPTION:

THE UNIQUE MINOVA ROOFBOLT NYLON HAND OPERATED PUMP. THIS PUMP WILL PUMP ALL FORMS OF LIQUID AND PUMPABLE GROUTS. THE PUMP INCORPORATES A LIGHT WEIGHT MIXING TANK AND DELIVERY ASSEMBLY.

THIS UNIT IS VERY EASILY DISMANTLED FOR EASE OF TRANSPORT IN DIFFICULT WORKING PLACES UNDERGROUND.

THIS UNIT FEATURES A WATER LEVEL MARK ON 4 or 8 LITER CAPACITY.

THIS PUMP IS RECOMMENDED FOR A 10KG or 20KG GROUT MIXTURE.

SPECIFICATIONS OF MINOVA MK 3 HAND OPERATED PUMP

OVERALL LENGTH	40 CM
OVERALL HEIGHT OF PUMP	82 CM
WEIGHT OF PUMP ONLY	9,4 KG
WEIGHT OF CONTAINER	10 KG
TOTAL WEIGHT	19.4 KG
PUMP DELIVERY	30 LITRES PER MINUTE
OUTPUT PRESSURE	UP TO 10 BAR
CAPACITY TO MARK	4 or 8 LITRES OF WATER
DELIVERY HOSE 20mm	5 METRES
4 LITRE MIXED WITH 10 KG GROUT	7.2 LITRES GROUT MIXTURE
8 LITRE MIXED WITH 20 KG GROUT	14.2 LITRES GROUT MIXTURE

The MINOVA hand pump is designed to achieve cost-effective performance, particularly in areas where auxiliary services are limited or are not available. The simple, robust design ensures that the unit is not only highly reliable but also easy to clean service and maintain. It is light in weight and is easy to move, transport and set up.

ADVANTAGES OF MINOVA HAND PUMP:

- 1) Does not support combustion**
- 2) The pump can easily be removed from the container**
- 3) The unit has a minimum number of working parts**
- 4) Can be used in areas where air is not available**
- 5) No spanners required to overhaul pump**
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- 7) Low cost on wearing parts**
- 8) Maintenance repair cost can be cut down to 90 %**
- 9) Capital cost for pumps can be reduced**

A demonstrator can be made available to the mine for the initial training of mine personnel

MINOVA PRE-STRESS COMBO 2000 PUMP

“THE PUMP THAT WILL NEVER LET YOU DOWN”



DESCRIPTION :

THE UNIQUE MINOVA PRE-STRESS COMBO 2000 PUMPS COMPRISES AN AIR-OPERATED AND HAND OPERATED PRE-STRESS PUMP COMBINATION. THIS UNIT IS INCORPORATED WITH A LIGHT WEIGHT MIXING BOWL MADE OUT OF NYLON WITH A STEEL SCROLL AND MOUNTING FRAME.

THIS UNIT IS VERY EASILY DISMANTLED FOR EASE OF TRANSPORT IN DIFFICULT WORKING PLACES UNDERGROUND.

ADVANTAGES OF THE COMBO SYSTEM :

- A.) NO BLAST TO BE LOST DUE TO A BROKEN DOWN PRE-STRESS PUMP.**
- B.) STANDBY PUMPS AVAILABLE AT ALL TIMES DURING PRE-STRESSING.**
- C.) PRE-STRESSING CAN BE DONE IN REMOTE AREAS WHERE COMPRESSED AIR IS NOT AVAILABLE.**
- D.) PRE-STRESSING CAN CONTINUE IN THE EVENT OF COMPRESSOR FAILURES OR DAMAGED AIRLINES.**

- E.) IN THE EVENT OF PUMP BLOCKAGES OR BREAKDOWN REQUIRING AIR PUMPS TO GO FOR SERVICE ON SURFACE WORK CAN CONTINUE AS NORMAL WITH THE MANUAL UNIT UNTIL AN AIR UNIT IS REPAIRED OR RETURNED.**
- F.) MINOVA IS THE ONLY SUPPLIER OF THE COMBO UNIT IN THE MINING INDUSTRY WORLDWIDE.**
- G.) COST EFFECTIVE - THE RUCSET COMBO PUMP IS STILL CHEAPER THAN MOST OF THE NOMAL AIR-OPERATED PRE-STRESS PUMPS AVAILABLE TODAY.**
- H.) MOST OF ALL - SAFETY.**
- I.) FEWER PACKS BLASTED OUT CAUSING HAZARDOUS CONDITIONS FOR PERSONS AT RISK UNDERGROUND.**



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**RUCPAC B5 HIGH STRENGTH CABLE GROUT SHORT ENCAPSULATION 24 HOUR
SHEAR TESTS : SPECIMEN PREPARATION 16-11-2006**

The four test specimens used in the 24 hour tests carried out on 17th November 2006 were prepared in the following manner as witnessed by myself.

A jig supplied by Rucpac was used to hold the four specimens during the curing process. The 16mm ripple bar was approximately centralised in 200mm lengths of 40mm ID steam pipe sealed at the bottom. The ripple bar extended 350mm above the steam pipe and was threaded at the top to accommodate a 16mm nut.

The B5 high strength grout dated 5-11-2006 was check weighed at 10kg on an electronic scale. The same electronic scale was used to weight exactly 4.0kg (four litres) of water required for the mix.

The water temperature was 21.7 degrees centigrade. When poured into the Rucpac MK2 Pump container it filled it to the pre-marked level indicated on it. The dry grout ingredients were slowly added to the water while being continuously stirred. After completion the mix was mixed for a further half minute. The total mixing time was four minutes. The four test lengths of steam pipe were filled to about 25mm from the top and the ripple bars were dropped in and centralised after tapping them a few times. They were then placed in a climate control room where during the 24 hour curing period the temperature ranged between 26 and 23 degrees centigrade.

A thixotropic test was conducted in the following manner. A one metre length of 40mm ID steam pipe closed on one end was filled from the bottom to the top by pumping grout in and lifting the filler pipe at the same time. Once the steam pipe had been completely filled it was lifted off the floor and rotated through 180 degrees so that the open end was then at the bottom. There was no grout loss from the pipe. The grout had a consistency of tooth paste.

The excess grout in the pump container remained pumpable for 30 minutes from the time when the mixing had started. At this point in time it was decided to terminate this part of the test.

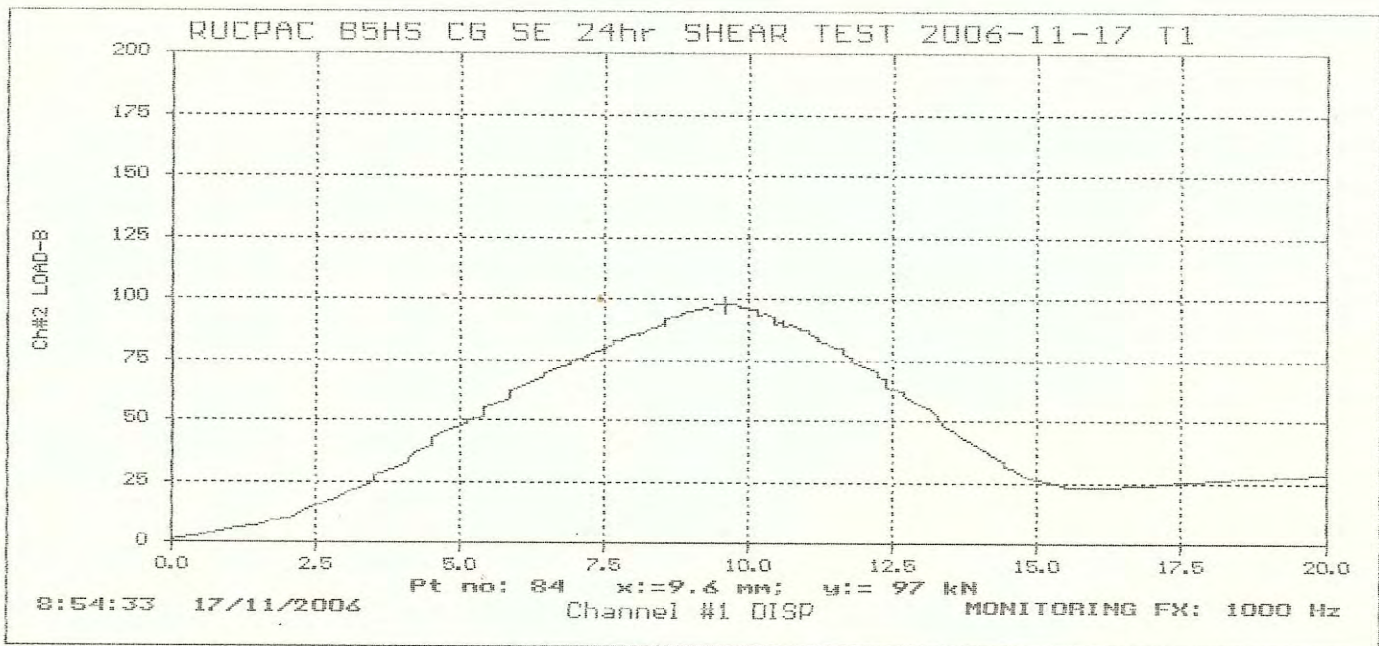
Yours faithfully



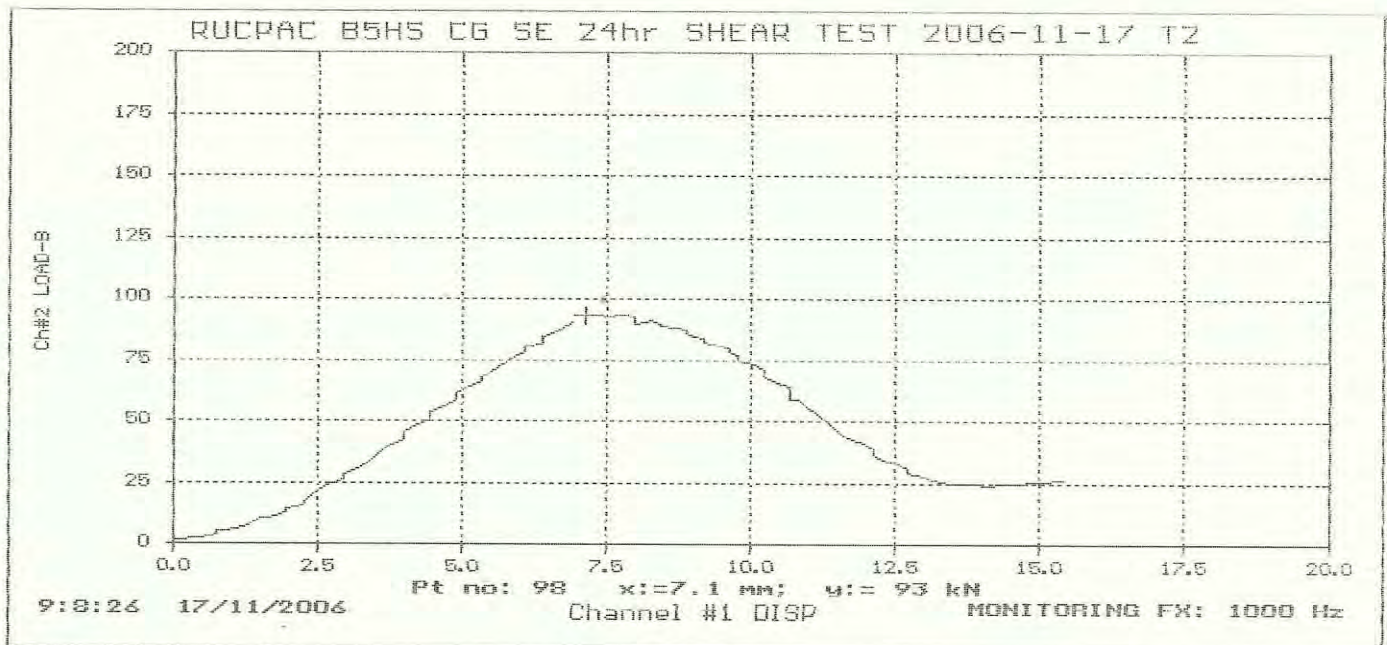
Bruce Jack
Support Testing laboratory
Tel 011 358 0216

Ms N Shikwane (Chairperson), Prof C de la Rey, Dr N Dlamini,
Dr N Msomi, Dr FW Petersen, Prof MJ Wingfield, Dr S Sibisi

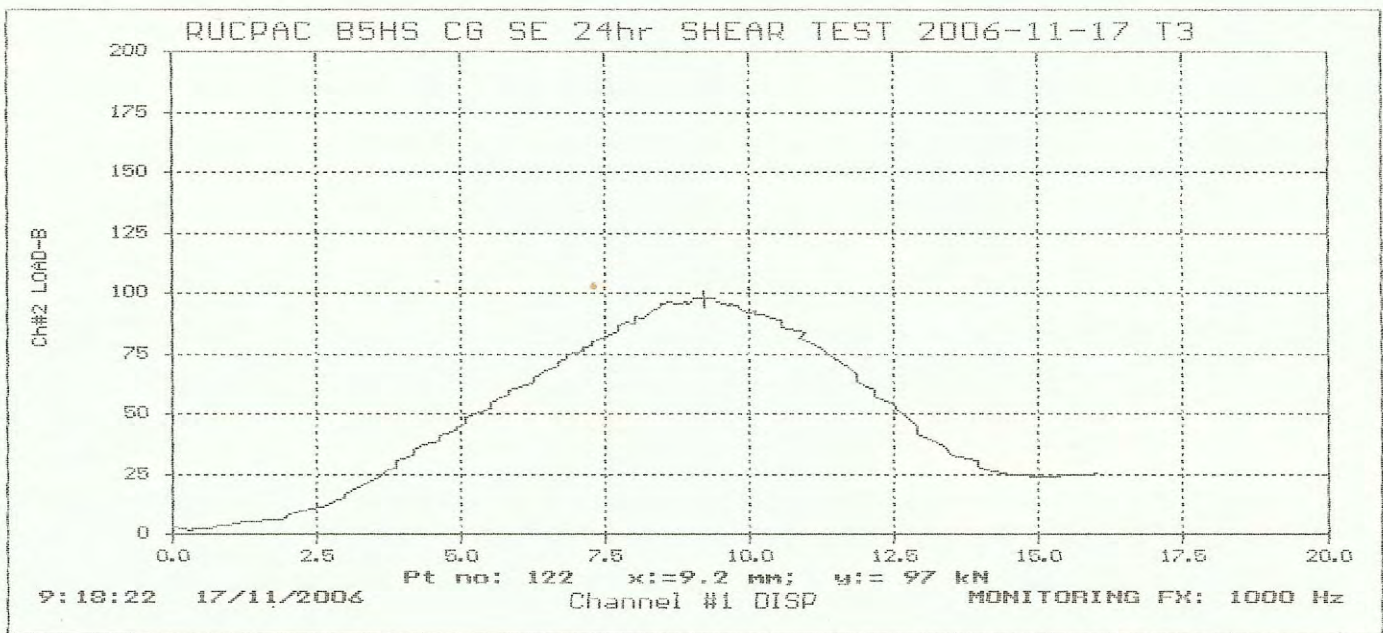
www.csir.co.za



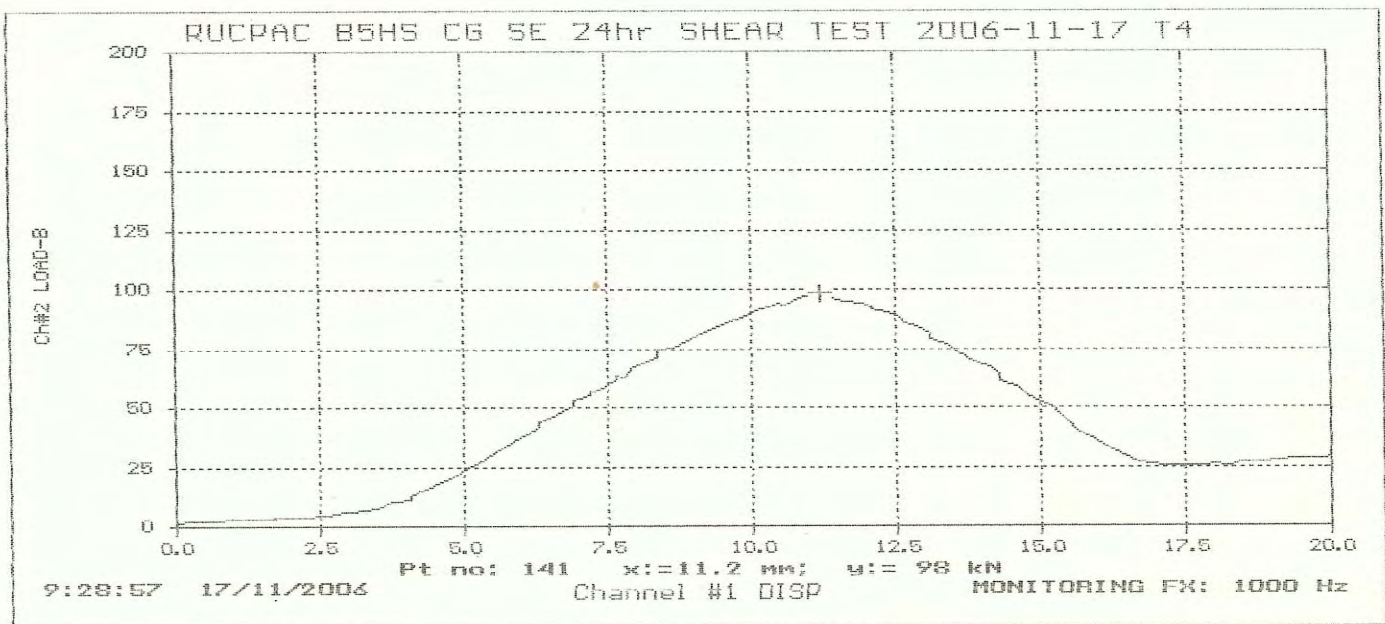
The use of these test results are subject to the conditions of the CSIR
The results do not indicate CSIR approval or endorsement of the product tested



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PRODUCT INFORMATION AND RISK ASSESSMENT

Date of risk assessment	February 2003
Revision Date	June 2008

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- 2. RISK ASSESSMENT ON MINOVA FULL COLUMN GROUT**
- 3. RISK ASSESSMENT ON MINOVA FULL COLUMN GROUT PUMPING SYSTEM**
- 4. RISK ASSESSMENT AND STANDARD PROCEDURE ON THE INSTALLATION AND FULL COLUMN GROUTING SYSTEM INCORPARATING THE VIDEX END-ANCHOR ROOFBOLT**

TEAM MEMBERS

TEAM MEMBERS

<i>Name</i>	Designation
Alfredo Piroddi	Operations Director
Wayne King	Quality Assurance Engineer
Peter Henning	Technical Manager
H van Wyk	Production Manager
David Hobbs	S.H.E.Q. Manager
Johann Steyn	Rock Engineer
Nico Grobler	Training Manager
S Nkuna	Safety Representative

B R Henning	Risk Facilitator Ultimate Risk Management Solutions
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- 1. INTRODUCTION**
- 2. EXECUTIVE SUMMARY**
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- 4. RISK ASSESSMENT WORK SHEET**
- 5. SAFETY RECOMMENDATIONS**

INTRODUCTION

INTRODUCTION

MINOVA FULL COLUMN GROUT.

This study serves to prove the commitment of the management of MINOVA towards the elimination, control and minimizing the risks to the Health and Safety of Company and Client Employees, in order to provide an environment that is free from hazards as required by legislation.

A Swift (STRUCTURED WHAT IF TECHNIQUE) hazard identification technique was conducted. The Swift technique is a system-orientated technique, which examines complete systems or sub-systems.

**MINOVA is an international Mining support Products Supply Company that is ISO 9001:2000 accredited. (Member of the Orica Group of Companies)
This risk assessment covers all the products and procedures required for safe pack pre-stressing**

1. Aim:

1.1 The aim of the study is to:

- 1.1.1 Identify and assess the hazards and risks to which the equipment may pose to employees in the working place.
- 1.1.2 Ensure the supply of the highest quality product to our clients at all times
- 1.1.3 Ensure that quality-manufacturing practices are maintained.
- 1.1.4 Develop safe handling, storage and transport practices to ensure the safe and effective application of MINOVA Grout.

2. Objective:

- 2.1 The objective of the study is to conduct a SWIFT study on the manufacturing, handling, storage, transport, risks because of exposure to and the safe and effective use of MINOVA Full Column Grout.
- 2.2 In analyzing hazards, reviewing existing controls and/or making recommendations, regarding potential hazards to the health and safety of employees.

3. Scope:

- 2.3 To do a Swift document on the manufacturing, handling, storage, transport, risks because of exposure to and the safe and effective use of MINOVA Full Column Grout.

4. Methodology

- 4.1 Through using personnel with the technical experience and knowledge, hazards and problem areas were identified that could pose a threat to the health and safety of employees.
- 4.2 A risk matrix, included in this report, was used to prioritize all risks identified.
- 4.3 Recommendations were then made, where existing controls were found according to the team to be insufficient for control and eliminating existing hazards. See the risk assessment and proposed standard attached to this document.

5. Hazards identified

5.1 Manufacturing, quality assurance, handling, storage, loading and transport of MINOVA full column grout.

- 5.1.1 Grout not manufactured to required manufacturer specifications
- 5.1.2 Bonding strength of grout not adequate.
- 5.1.3 Grout not handled correctly.
- 5.1.4 Substandard packaging.
- 5.1.5 Incorrect storage of manufactured grout.
- 5.1.6 Substandard loading of packaged grout onto company transport.
- 5.1.7 Load not securely fastened.
- 5.1.8 Client off-loading rules not known or adhered to

5.2 Handling, contact with, storage, transport and use of MINOVA full column grout by Client Company

- 5.2.1 Rough handling of grout by Client Company.
- 5.2.2 The grout powder comes into contact with the skin of client employees over an extended period while handling grout powder.
- 5.2.3 The grout powder comes into eye contact of employees handling grout powder.

- 5.2.4 The grout is ingested.
- 5.2.5 The grout is inhaled.
- 5.2.6 Grout is not stored correctly.
- 5.2.7 Incorrect loading of grout for transport underground.
- 5.2.8 Packaged rough handling of grout powder underground.
- 5.2.9 Package grout not properly stored underground.
- 5.2.10 Client employees underground are exposed to grout powder.
- 5.2.11 Incorrect mixing of grout
- 5.2.12 Using expired grout stock.

6. Acknowledgement

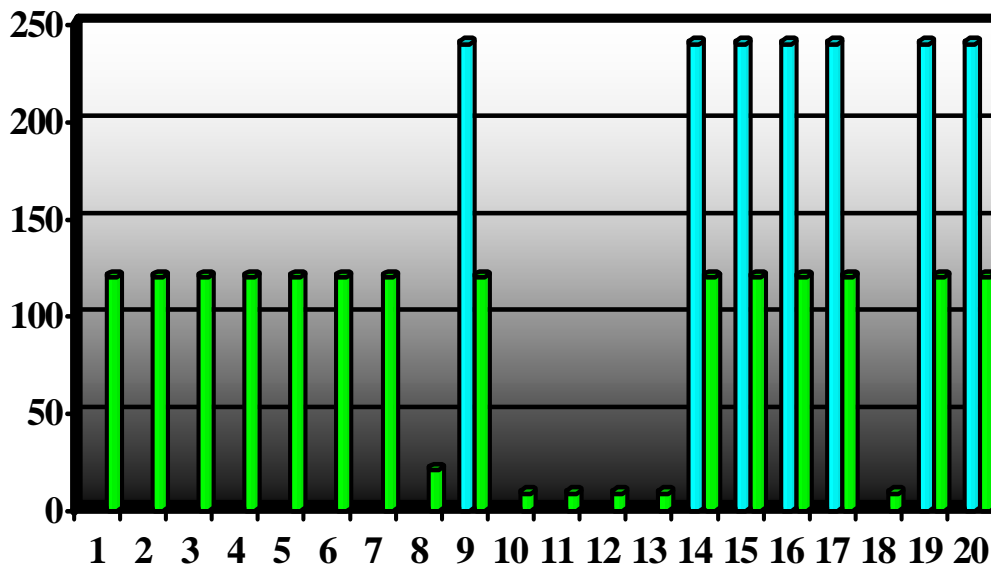
- 6.1 The team would like to "Thank" management for the opportunity to be part of this Risk Assessment and Standard Procedure team, affording them the opportunity to make their working environment safer.

EXECUTIVE SUMMARY

Executive Summary (Risk Profile)

Risk ranking taking into consideration current safeguards and risk reduction following recommendations

Legend	
A	High
B	Medium
C	Low



■	A Risks
■	B Risks
■	C Risks

Hazards identified

1. Manufacturing, quality assurance, handling, storage, loading and transport of MINOVA full column grout.

1. Grout not manufactured to required standard
2. Bonding strength of grout not adequate
3. Grout not handled correctly
4. Substandard packaging
5. Incorrect storage of manufactured grout
6. Substandard loading of packaged grout onto company transport.
7. Load not securely fastened
8. Client off-loading rules not known or adhered to

2. Handling, contact with, storage, transport and use of MINOVA full column grout by Client Company

9. Rough handling of grout by Client Company
10. The grout powder comes into contact with the skin of client employees over an extended period while handling grout powder.

11. The grout powder comes into eye contact of employees handling grout powder
12. The grout is ingested.
13. The grout is inhaled.
14. Grout is not stored correctly
15. Incorrect loading of grout for transport underground
16. Packaged rough handling of grout powder underground
17. Package grout not properly stored underground.

RISK MATRIX

RISK MATRIX USED

Probability (P)	Consequence (C)	Exposure (E)
Might well be expected (happens often) –10 Quite Possible –6 Unusual but possible – 3 Only remotely possible (has happened somewhere) –1 Conceivable but very unlikely (hasn't happened yet) – 0.5 Practically impossible (one in a million) – 0.2 Virtually impossible (approaches the impossible) 0 0.1	Catastrophic (many fatalities or damage over R10,000,000) – 100 Disaster (a few fatalities or damage over R1,000,000) – 40 Very serious (one fatality or damage over R500,000.00) – 15 Serious (serious injury or damage over R100,000.00) – 7 Important (temporary disability or damage over R10 000.00) –3 Of concern (minor injury or damage over R1,000.00) -1	Continuous –10 Frequently (daily) –6 Often (weekly) –3 Unusual (monthly) – 2 Unusual (a few per year) – 1 Rare (yearly) – 0.5 No exposure –0

(P) x (C) x (E) = Risk Result

Risk Classification:

Colour	Code	Description	Min Value	Max Value
	A	High	241	10000
	B	Medium	121	240
	C	Low	0.05	120

RISK ASSESSMENT WORKSHEETS

Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	RR	Responsible Person
1. Manufacturing, quality assurance, handling, storage, loading and transport of MINOVA full column grout.													
Grout not manufactured to required standard	The grout is not manufactured to manufacturer specification.	<i>Support failure</i> FOG Multiple Fatalities Serious injury to persons Damage to equipment and infrastructure Production loss	The factory is operated on the ISO 9000 system. Samples are taken by Q.C. officers to ensure quality standards are adhered to. Records are kept for future reference.	40	6	0.5	120						
Bonding strength of grout not adequate	The bonding strength of the grout is inadequate?	<i>Support failure</i> FOG Multiple Fatalities Serious injury to persons Damage to equipment and infrastructure <i>Production loss</i>	1. The bonding strength of the grout has been tested by the CSIR.(See attached tests conducted). 2. Quality Assurance officers ensure that test each batch manufactured to ensure compliance. 3. Regular tests by CSIR conducted to ensure compliance 3. Competent appointed personnel	40	6	0.5	120						

Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	RR	Responsible Person
Grout not handled correctly	The grout is not handled correctly	<p><i>Contamination of grout</i> Poor quality grout.</p> <p><i>Support failure</i> FOG Multiple Fatalities Serious injury to persons Damage to equipment and infrastructure</p> <p><i>Production loss</i></p>	<p>1. Manufacturing procedures in place. 2. Trained competent employees. 3. Each batch is tested by the Quality Assurance officer to ensure quality product.</p>	40	6	0.5	120						
Substandard packaging	The grout is packaged in the wrong packaging material.	<p><i>Contamination of grout</i> Poor quality grout.</p> <p><i>Support failure</i> FOG Multiple Fatalities Serious injury to persons Damage to equipment and infrastructure</p> <p><i>Production loss</i></p>	<p>1. Packaging standard in place. 2. Trained competent employees. 3. Each batch is tested by the Quality Assurance officer to ensure quality product.</p>	40	6	0.5	120						

Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	RR	Responsible Person
Incorrect storage of manufactured grout	The manufactured grout is stored incorrectly	<p><i>Contamination of grout</i></p> <p>Poor quality grout.</p> <p><i>Support failure</i></p> <p>FOG</p> <p>Multiple Fatalities</p> <p>Serious injury to persons</p> <p>Damage to equipment and infrastructure</p> <p><i>Production loss</i></p>	<p>1. Storage standard in place.</p> <p>2. Trained competent employees.</p> <p>3. Each batch is tested by the Quality Assurance officer to ensure quality product.</p> <p>4. The quality control officer oversees the storage of grout in the factory to ensure the standard is adhered to at all times.</p>	40	6	0.5	120						
Substandard loading of	The grout is loaded substandard	<p>To manufacturing company:</p> <p><i>Damage to packaging.</i></p> <p><i>Contamination of grout</i></p> <p>Financial loss</p> <p>To client mine:</p> <p>Poor quality grout.</p> <p>Short supply</p> <p><i>Support failure</i></p> <p>FOG</p> <p>Multiple Fatalities</p> <p>Serious injury to persons</p> <p>Damage to equipment and infrastructure.</p>	<p>1. Competent appointed personnel.</p> <p>2. Loading procedure in place.</p> <p>3. Loading supervised by dispatch official.</p>	40	6	0.5	120						

Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	RR	Responsible Person
	Load not securely fastened	<ol style="list-style-type: none"> 1. Load can fall from truck during transport 2. Damage to load. 3. Shortage of grout at client 4. Production loss 5. Client employees can take chances to blast with substandard support. 6. Multiple fatal 7. Serious injury to persons 8. Damage to equipment and infrastructure 9. Production loss 	<ol style="list-style-type: none"> 1. Competent appointed personnel. 2. Manufacturing Company loading procedure in place. 3. Manufacturing Company Loading supervised by dispatch official. 4. Only approved transport companies use. 	40	6	0.5	120						
Client off-loading rules not known	The manufacturer's drivers are not familiar with the clients off loading procedure.	<i>Time delay</i> Serious injury to person	<ol style="list-style-type: none"> 1. All new company drivers accompany experienced drivers before they are expected to deliver at a client for the first time. 2. Competent appointed drivers. 3. Manufacturing company selection procedures in place 	7	6	0.5	21						

Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	RR	Responsible Person
2. Handling, contact with, storage, transport and use of MINOVA full column grout by client company													
Rough handling of grout by client company	Grout is rough handled by the client	<p><i>Damage to packaging</i> Poor quality grout. Short supply</p> <p><i>Support failure</i> FOG Multiple Fatalities Serious injury to persons Damage to equipment and infrastructure Production loss</p>	<p>1. Competent appointed off loading mine personnel. 2. Client off loading procedures. 3. Supervision</p>	40	6	1	240	<p>1. Grout must be handled with care to prevent damage to grout packaging 2. The client must add the risk of rough handling of grout products to their off loading procedures.</p>	40	6	0.5	120	1 + 2 Client company
Client employees exposed to grout powder.	The grout powder comes into contact with the skin of client employees over an extended period while handling grout powder.	<i>If skin contact over a lengthy period is maintained, it will cause minor skin damage</i>	<p>1. Manufacturer risk assessment. 2. The grout powder is non toxic</p>	3	6	1	18	<p>1. The client to inform persons handling grout powder of the risk of skin contact. 2. . It is recommended that the grout powder is washed off the skin as soon as possible.</p>	3	6	0.5	9	Client company
	The grout powder comes into eye contact of employees handling grout powder	<i>The eye can become irritated and over an extended period serious damage caused to the eye.</i>	<p>1. Manufacture risk assessment 2. The grout powder is non toxic</p>	3	6	1	18	<p>1. The client to inform persons handling grout powder of the risks of eye contact. 2. The eye must be flushed with clean water for at least 10 minutes.</p>	3	6	0.5	9	Client company


Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	RR	Responsible Person
	The grout is ingested.	<i>If the powder remains in the digestive system for an extended period of time, it can cause serious damage.</i>	1. Manufacture assessment. 2. The grout powder is non toxic	3	6	1	18	1. The client to inform persons handling grout powder of the risks of ingesting grout powder. 2. The person effected to drink fluids and consult a doctor	3	6	0.5	9	Client company
	The grout is inhaled.	<i>If the powder remains in the respiratory system for an extended period of time, it can cause serious damage.</i>	1. Manufacture assessment. 2. The grout powder is non toxic	3	6	1	18	1. The client to inform persons handling grout powder of the risks of inhaling grout powder. 2. The person effected must be removed to fresh air and consult a doctor	3	6	0.5	9	Client company
Grout is not stored correctly	Grout is not stored correctly	<i>Damage to/reduced effectiveness of grout</i> Poor quality grout. Short supply <i>Support failure</i> FOG Multiple Fatalities Serious injury to persons Damage to equipment and infrastructure Production loss	1. Manufacture assessment.	40	6	1	240	1. Grout must be stored on pellets in a secure dry place until used. 2. The client to inform persons handling grout powder of the risks of improper storage of grout.	40	6	0.5	120	1 + 2 Client company

Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	RR	Responsible Person
Loading of grout for transport underground	Grout exposed to adverse weather conditions	<p><i>Damage to/reduced effectiveness of grout</i></p> <p>Poor quality grout. Short supply</p> <p><i>Support failure</i></p> <p>FOG Multiple Fatalities Serious injury to persons Damage to equipment and infrastructure Production loss</p>	1. Manufacture assessment.	40	6	1	240	<p>1. Grout must be preferably be loaded separately and in an enclosed material car.</p> <p>2. The client to inform persons loading for transport of grout powder</p>	40	6	0.5	120	1 + 2 Client company
Packaged rough handling of grout powder underground	Packaged grout is rough handled in underground workings.	<p><i>Damage to/reduced effectiveness of grout</i></p> <p>Poor quality grout. Short supply</p> <p><i>Support failure</i></p> <p>FOG Multiple Fatalities Serious injury to persons Damage to equipment and infrastructure Production loss</p>	1. Manufacture assessment.	40	6	1	240	<p>1. Grout must be handled separately and with care.</p> <p>2. Packaged grout must be carried and not dragged over the footwall or rough surfaces.</p> <p>3. The client to inform persons handling packaged grout underground of the risks involved.</p>	40	6	0.5	120	1 + 2 + 3 Client company

Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	RR	Responsible Person
Package grout not properly stored underground.	Grout is not stored correctly	<p><i>Damage to/reduced effectiveness of grout</i></p> <p>Poor quality grout. Short supply</p> <p><i>Support failure</i></p> <p>FOG Multiple Fatalities Serious injury to persons Damage to equipment and infrastructure Production loss</p>	1. Manufacture assessment.	40	6	1	240	1. Grout must be stored on pallets in a secure dry place until used. 2. The client to inform persons handling grout powder of the risks of improper storage of grout underground.	40	6	0.5	120	1 + 2 Client company
Client employees underground are exposed to grout powder.	The grout powder comes into contact with the skin of client employees over an extended period while handling grout powder.	<i>If skin contact over a lengthy period is maintained, it will cause minor skin damage</i>	1. Manufacturer risk assessment. 2. The grout powder is non toxic	3	6	1	18	1. The client to inform persons handling grout powder of the risk of skin contact. 2. It is recommended that the grout powder is washed off the skin as soon as possible.	3	6	0.5	9	Client company
	The grout powder comes into eye contact of employees handling grout powder	<i>The eye can become irritated and over an extended period serious damage caused to the eye.</i>	1. Manufacture risk assessment 2. The grout powder is non toxic	3	6	1	18	1. The client to inform persons handling grout powder of the risks of eye contact. 2. The eye must be flushed with clean water for at least 10 minutes.	3	6	0.5	9	Client company

Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	RR	Responsible Person
	The grout is ingested.	<i>If the powder remains in the digestive system for an extended period of time, it can cause serious damage.</i>	1. Manufacturer assessment. 2. The grout powder is non toxic	3	6	1	18	1. The client to inform persons handling grout powder of the risks of ingesting grout powder. 2. The person effected to drink fluids and consult a doctor	3	6	0.5	9	Client company
	The grout is inhaled.	<i>If the powder remains in the respiratory system for an extended period of time, it can cause serious damage.</i>	1. Manufacturer risk assessment. 2. The grout powder is non toxic	3	6	1	18	1. The client to inform persons handling grout powder of the risks of inhaling grout powder. 2. The person effected must be removed to fresh air and consult a doctor	3	6	0.5	9	Client company
Incorrect mixing of grout	The grout mix is made incorrectly	Poor quality grout. Short supply Support failure FOG Multiple Fatalities Serious injury to persons Damage to equipment and infrastructure Production loss	1. Manufacturer risk assessment and mixing standards.	40	6	1	240	1. Grout must mixed in accordance with the manufacturer specifications and standards. (See installation and full column grouting of the Videx End anchored roof bolt) 2. The client to inform persons handling grout powder of the risks of improper storage of grout underground.	40	6	0.5	120	1 + 2 Client company
Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	RR	Responsible Person
Using expired MINOVA Grout stock.	Expired MINOVA Grout used			40	6	1	240		40	6	0.5	120	Client company

SAFETY RECOMMENDATIONS

	<p align="center">Safety Recommendations</p>	<p>Number:</p>
<p align="center">MINOVA</p>	<p align="center">MINOVA Full Column Grout</p>	<p>Date JUNE 2008</p>

1. Grout must be handled with care to prevent damage to grout packaging.
2. The client must add the risk of rough handling of grout products to their off loading procedures.
3. The client to inform persons handling grout powder of the risk of skin contact. It is recommended that the grout powder is washed off the skin as soon as possible.
4. The client to inform persons handling grout powder of the risks of eye contact. The eye must be flushed with clean water for at least 10 minutes.
5. The client to inform persons handling grout powder of the risks of ingesting grout powder. The person effected to drink fluids and consult a doctor.
6. The client to inform persons handling grout powder of the risks of inhaling grout powder. The person affected must be removed to fresh air and consult a doctor.
7. Grout must be stored on pellets in a secure dry place until used.
8. The client to inform persons handling grout powder of the risks of improper storage of grout.
9. Grout must be preferably be loaded separately and in an enclosed material car.
10. The client to inform persons loading for transport of grout powder.
11. Grout must be handled separately and with care.
12. Packaged grout must be carried and not dragged over the footwall or rough surfaces.

13. The client to inform persons handling packaged grout underground of the risks involved.
14. Grout must be stored on pellets in a secure dry place until used.
15. The client to inform persons handling grout powder of the risks of improper storage of grout underground.
16. End anchored roof bolt grout must be mixed in accordance with the manufacturer specifications and standards. (See installation and full column grouting of the Videx End anchored roof bolt)
17. Expired MINOVA grout must not be issued or used. All grout comes with a batch number, date manufactured and expiry date. Employees using MINOVA grout must be informed in this regard and of the risks of using expired grout.

ADDITIONAL INFORMATION

Minova Full Column Grout Pump

Date of risk assessment	February 2003
Revision Date	June 2008

CONTENTS

- 1. INTRODUCTION**
- 2. EXECUTIVE SUMMARY**
- 3. RISK MATRIX**
- 4. RISK ASSESSMENT WORK SHEET**
- 5. SAFETY RECOMMENDATIONS**

INTRODUCTION

INTRODUCTION

MINOVA FULL COLUMN GROUT PUMP.

This study serves to prove the commitment of the management of MINOVA towards the elimination, control and minimizing the risks to the Health and Safety of Company and Client Employees, in order to provide an environment that is free from hazards as required by legislation.

A Swift (STRUCTURED WHAT IF TECHNIQUE) hazard identification technique was conducted. The Swift technique is a system-orientated technique, which examines complete systems or sub-systems.

**MINOVA is an international Mining support Products Supply Company that is ISO 9001:2000 accredited. (Member of the Orica Group of Companies)
This risk assessment covers all the products and procedures required for safe pack pre-stressing**

1. Aim:

1.2 The aim of the study is to:

- 1.2.1 Identify and assess the hazards and risks to which the equipment may pose to employees in the working place.
- 1.2.2 Ensure the supply of the highest quality product to our clients at all times
- 1.2.3 Ensure that sound manufacturing practices are maintained.
- 1.2.4 Develop safe handling, storage and transport practices to ensure the safe, continuous and productive application of the equipment.

2. Objective:

- 2.4 The objective of the study is to conduct a SWIFT study on the safe manufacturing, handling, storage, transport and application of the MINOVA Full Column Grout Pump
- 2.5 In analyzing hazards, reviewing existing controls and/or making recommendations, regarding potential hazards to the health and safety of employees.

3. Scope:

- 3.1 To do a Swift document on the safe manufacturing, handling, storage, transport and application of the MINOVA Full Column Grout Pump

4. Methodology

- 4.4 Through using personnel with the technical experience and knowledge, hazards and problem areas were identified that could pose a threat to the health and safety of employees.
- 4.5 A risk matrix, included in this report, was used to prioritize all risks identified.
- 4.6 Recommendations were then made, where existing controls were found according to the team to be insufficient for control and eliminating existing hazards. See the risk assessment and proposed safety recommendations attached to this document.

5. Hazards identified

5.1. Manufacturing, quality assurance, handling, storage, loading and transport of MINOVA Portable Hand Grout Pump.

- 5.1.1 Pump not manufactured to required manufacturer specification or incorrect materials used.
- 5.1.2 Incorrect handling and storage of manufactured grout pumps in the factory.
- 5.1.3 Substandard loading, transport and delivery of pumps to clients

5.2 Handling, storage, transport and use of MINOVA grout pumps by client company employees

- 5.2.1 Rough handling of pumps by client company employees.
- 5.2.2 Grout pumps are not stored correctly in client's surface store.
- 5.2.3 Loading and transport of grout pumps for use underground.
- 5.2.4 Grout pumps not correctly stored underground.
- 5.2.5 Pre-use inspection on grout pumps not done or incorrectly used

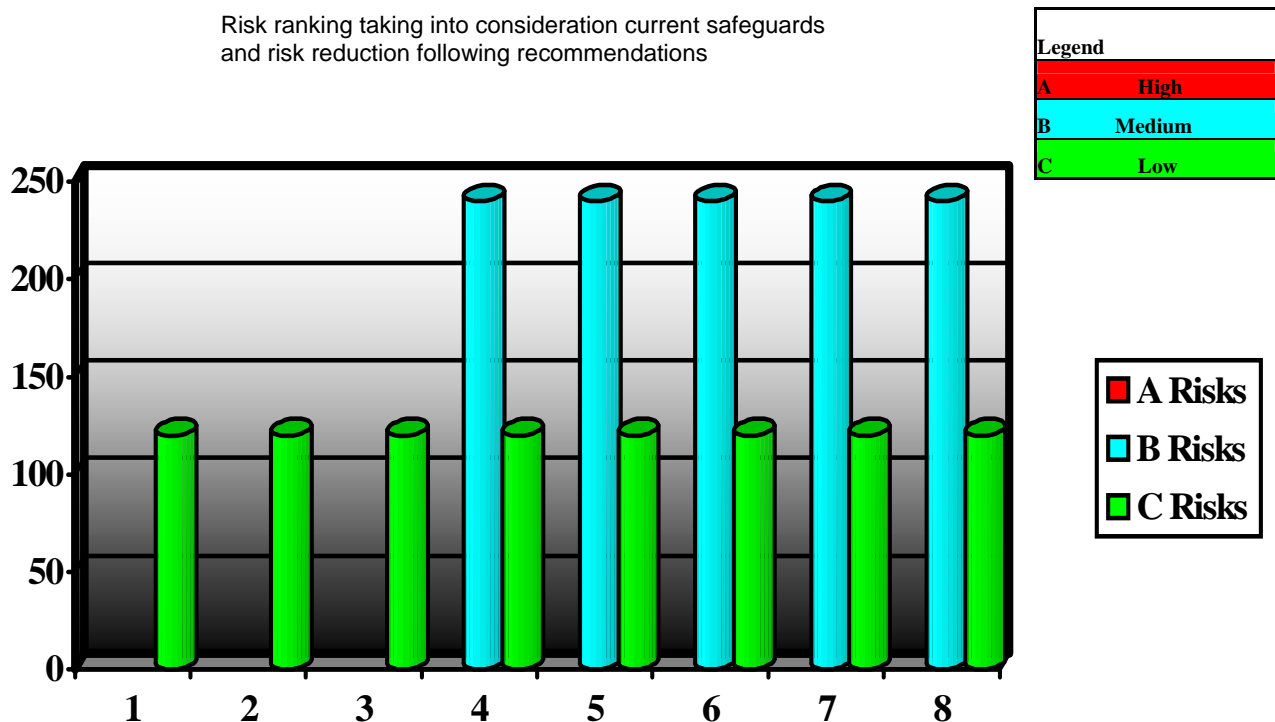
6. Acknowledgement

- 6.1 The team would like to "Thank" management for the opportunity to be part of this Risk Assessment and Standard Procedure team, affording them the opportunity to make their working environment safer.

EXECUTIVE SUMMARY

Executive Summary (Risk Profile)

Risk ranking taking into consideration current safeguards and risk reduction following recommendations



Hazards identified

1. Manufacturing, quality assurance, handling, storage, loading and transport of MINOVA Portable Hand Grout Pump.

1. Pump not manufactured to required manufacturer specification or incorrect materials used.
2. Incorrect handling and storage of manufactured grout pumps in the factory.
3. Substandard loading, transport and delivery of pumps to clients

2. Handling, storage, transport and use of MINOVA grout pumps by client company employees

4. Rough handling of pumps by client company personnel
5. Grout pumps are not stored correctly in client's surface store
6. Loading and transport of grout pumps for use underground
7. Grout pumps not correctly stored underground.
8. Pre-use inspection on grout pumps not done or incorrectly used

RISK MATRIX

RISK MATRIX USED

Probability (P)	Consequence (C)	Exposure (E)
Might well be expected (happens often) –10 Quite Possible –6 Unusual but possible – 3 Only remotely possible (has happened somewhere) –1 Conceivable but very unlikely (hasn't happened yet) – 0.5 Practically impossible (one in a million) – 0.2 Virtually impossible (approaches the impossible) 0 0.1	Catastrophic (many fatalities or damage over R10,000,000) – 100 Disaster (a few fatalities or damage over R1,000,000) – 40 Very serious (one fatality or damage over R500,000.00) – 15 Serious (serious injury or damage over R100,000.00) – 7 Important (temporary disability or damage over R10 000.00) –3 Of concern (minor injury or damage over R1,000.00) -1	Continuous –10 Frequently (daily) –6 Often (weekly) –3 Unusual (monthly) – 2 Unusual (a few per year) – 1 Rare (yearly) – 0.5 No exposure –0

(P) x (C) x (E) = Risk Result

Risk Classification:

Colour	Code	Description	Min Value	Max Value
	A	High	241	10000
	B	Medium	121	240
	C	Low	0.05	120

RISK ASSESSMENT WORKSHEETS

Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	RR	Responsible Person
1. Manufacturing, quality assurance, handling, storage, loading and transport of MINOVA Portable Hand Grout Pump.													
Pump not manufactured to required manufacturer specification or incorrect materials used.	The pump is not manufactured to manufacturer specification.	Risk to Manufacturer Company: 1. Financial loss 2. Loss of trust and credibility. 3. Legal implications Risk to client companies: 1. Client personnel supplied with damaged pump and risk continuing production with substandard installed support 2. Substandard support. (support holes not full column grouted) 3. Premature failure of support 4. FOG 5. Multiple Fatalities 6. Serious injury to persons 7. Damage to equipment and infrastructure 8. Client personnel can decide not to	1. The factory is operated on the ISO 9000 system. 2. Quality assurance personnel inspecting and approving each pump before it is allowed to leave the factory. 3. Competent appointed manufacturing personnel. 4. Manufacturer specifications. 5. Manufacturer's risk assessment.	40	6	0.5	120						

Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	RR	Responsible Person
1. Manufacturing, quality assurance, handling, storage, loading and transport of MINOVA Portable Hand Grout Pump.													
		install support and cause the Client to suffer a production loss											
Incorrect handling and storage of manufactured grout pumps in the factory.	The manufactured pump is rough handled or stored in adverse weather conditions.	<p>To manufacturing company:</p> <ol style="list-style-type: none"> 1. Financial loss 2. Loss of trust and credibility (supplying damaged product to client company. 3. Legal implications 4. Rusting and/or damage to critical working parts of the pump. 5. Damage to pump hose or fittings etc. <p>Risk to client companies:</p> <ol style="list-style-type: none"> 1. . Client personnel supplied with damaged pump and risk continuing production with substandard installed support 2. Substandard support. (support 	<ol style="list-style-type: none"> 1. Factory Storage standard in place. 2. Trained competent employees. 3. Quality assurance personnel inspect and approve each pump before it is allowed to leave the factory. 4. Records kept on all products for future references. 5. Manufacturer's risk assessment. 	40	6	0.5	120						

Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	RR	Responsible Person
1. Manufacturing, quality assurance, handling, storage, loading and transport of MINOVA Portable Hand Grout Pump.													
		holes not full column grouted) 3. Premature failure of support 4. FOG 5. Multiple Fatalities 6. Serious injury to persons 7. Damage to equipment and infrastructure 8. Client personnel can decide not to install support and cause the Client to suffer a production loss											
Substandard loading, transport and delivery of pumps to clients	The pumps are rough handled during loading and not secured on transport vehicle.	To manufacturing company: 1. Financial loss 2. Loss of trust and credibility (supplying damaged product to client company. 3. Legal implications 4. Damage to	1. Factory loading and transport standards in place. 2. Trained competent employees. 3. The Factory Manager oversees the loading and securing of pumps on transport vehicles. 4. The Factory is being operated on the ISO 9000 system 5. Only approved transport companies used	40	6	0.5	120						

Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	RR	Responsible Person
1. Manufacturing, quality assurance, handling, storage, loading and transport of MINOVA Portable Hand Grout Pump.													
		critical working parts of the pump. 5. Damage to pump hose or fittings etc. Risk to client companies: 1. Client personnel supplied with damaged pump and risk continuing production with substandard installed support 2. Substandard support. (Support holes not full column grouted) 3. Premature failure of support 4. FOG 5. Multiple Fatalities 6. Serious injury to persons 7. Damage to equipment and infrastructure 8. Client personnel can decide not to install support and cause the Client to suffer a production loss	for transporting of pumps. 6. Drivers of approved companies are inducted into the factory and client companies' loading/off loading and transport standards before they are made use of. 7. Manufacturer's risk assessment.										

Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	RR	Responsible Person
2. Handling, storage, transport and use of MINOVA grout pumps by client company employees													
Rough handling of pumps by client company personnel	Pumps are rough handled by the client personnel	1. Damage to critical working parts of the pump. 2. Pumps on short supply in store. 3. Client personnel supplied with damaged pump and risk continuing production with substandard installed support 4. Substandard support. (support holes not full column grouted) 5. Premature failure of support 6. FOG 7. Multiple Fatalities 8. Serious injury to persons 9. Damage to equipment and infrastructure 10. Client personnel can decide not to install support and cause the Client to suffer a production loss	1. Competent appointed off loading mine personnel. 2. Client off loading procedures. 3. Supervision 4. Manufacturer's risk assessment.	40	6	1	240	1. The client must add the risk of rough handling of grout pumps to their material handling procedures and inform personnel of these risks.	40	6	0.5	120	Client company

Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	RR	Responsible Person
Grout pumps are not stored correctly	Grout pumps are not stored correctly	<ol style="list-style-type: none"> 1. <i>Damage to working parts of the pump (Premature rusting)</i> 2. Pump failing to operate 3. Pumps in short supply 4. Client personnel might risk continuing production with substandard installed support 5. Substandard support. (Support holes not full column grouted) 6. Premature failure of support 7. FOG 8. Multiple Fatalities 9. Serious injury to persons 10. Damage to equipment and infrastructure 11. Client personnel can decide not to install support and cause the Client to suffer a production loss 	1. Manufacture assessment.	40	6	1	240	<ol style="list-style-type: none"> 1. Grout pumps must be stored in a secure dry place when not used. 2. The client to inform persons using grout pumps of the risks involved if grout pumps is not stored correctly. 	40	6	0.5	120	1 + 2 Client company


Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	RR	Responsible Person
Loading and transport of grout pumps for use underground	Grout pumps are loaded with other mine material or not secured.	<ol style="list-style-type: none"> 1. <i>Damage to working parts of pumps.</i> 2. Pumps in short supply. 3. Damaged grout pumps issued to client personnel. 4. Client personnel might risk continuing production with substandard installed support 5. Substandard support. (Support holes not full column grouted) 6. Premature failure of support 7. FOG 8. Multiple Fatalities 9. Serious injury to persons 10. Damage to equipment and infrastructure 11. Client personnel can decide not to install support and cause the Client to suffer a production loss 	<ol style="list-style-type: none"> 1. Manufacturer's risk assessment. 2. Manufacturer Training Instructors provided free of charge. 	40	6	1	240	<ol style="list-style-type: none"> 1. Grout pumps must be preferably be loaded separately and in an enclosed material car. 2. The client to inform persons loading or transporting grout pumps underground of the risks involved. 	40	6	0.5	120	1 + 2 Client company

Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	RR	Responsible Person
	Grout Pumps are rough handled by the client personnel during transport and off loading.	1. Damage to critical working parts of the pump. 2. Pumps on short supply. 3. Client personnel supplied with damaged pump and risk continuing production with substandard installed support 4. Substandard support. (Support holes not full column grouted) 5. Premature failure of support 6. FOG 7. Multiple Fatalities 8. Serious injury to persons 9. Damage to equipment and infrastructure 10. Client personnel can decide not to install support and cause the Client to suffer a production loss	1. Competent appointed off loading mine personnel. 2. Client transport and off loading procedures. 3. Supervision 4. Manufacturer's risk assessment.	40	6	1	240	1. The client must add the risk of rough handling of grout pumps to underground transport and off loading procedures and inform personnel of these risks. 2. Pumps must not be dragged on rough surfaces as it may damage working parts and render the pump ineffective.	40	6	0.5	120	Client company

Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	RR	Responsible Person
Grout pumps not correctly stored underground.	Grout pumps are not stored correctly underground	<ol style="list-style-type: none"> 1. <i>Damage to working parts of grout pumps rendering it inoperable.</i> 2. Pumps on short supply. 3. Client personnel supplied with damaged pump and risk continuing production with substandard installed support 4. Substandard support. (Support holes not full column grouted) 5. Premature failure of support 6. FOG 7. Multiple Fatalities 8. Serious injury to persons 9. Damage to equipment and infrastructure 10. Client personnel can decide not to install support and cause the Client to suffer a production loss 	<ol style="list-style-type: none"> 1. Manufacture assessment. 2. Manufacturer Training demonstrators available to assist with training. 	40	6	1	240	<ol style="list-style-type: none"> 1. Grout pumps must be stored in a secure dry place when not used. 2. The client to inform persons handling grout pumps of the risks of improper storage of grout pumps underground. 	40	6	0.5	120	1 + 2 Client company

Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	RR	Responsible Person
Pre-use inspection on grout pumps not done or incorrectly used.	Pre-use inspection on grout pumps are not carried out or grout pumps not used correctly	1. Grout pump failure to operate or not operating effectively. 2. Client personnel supplied with damaged pump and risk continuing production with substandard installed support 3. Substandard support. (support holes not full column grouted) 4. Premature failure of support 5. FOG 6. Multiple Fatalities 7. Serious injury to persons 8. Damage to equipment and infrastructure 9. <i>Client personnel can decide not to install support and cause the Client to suffer a production loss</i>	1. Manufacturer risk assessment and grout pump operating procedures. 2. Manufacturer Training demonstrators available to assist with taining.	40	6	1	240	1. The grout pump must be used in accordance with the manufacturer specifications and standards. (See installation and full column grouting of the Videx End anchored roof bolt) 2. The client to inform employees using grout pumps of the risks involved in the improper application thereof.	40	6	0.5	120	1 + 2 Client company

SAFETY RECOMMENDATIONS

	Safety Recommendations	Number:
MINOVA	MINOVA Full Column Grout Pumps	Date JUNE 2008

1. The client must add the risk of rough handling of grout pumps to their material handling procedures and inform personnel of these risks.
2. Grout pumps must be stored on in a secure dry place when not used. The client to inform persons using grout pumps of the risks involved if grout pumps is not stored correctly.
3. Grout pumps must be preferably be loaded separately and in an enclosed material car. The client to inform persons loading or transporting grout pumps underground of the risks involved.
4. The client must add the risk of rough handling of grout pumps to underground transport and off loading procedures and inform personnel of these risks. Pumps must not be dragged on rough surfaces as it may damage working parts and render the pump ineffective.
5. Grout pumps must be stored in a secure dry place when not used. The client to inform persons handling grout pumps of the risks of improper storage of grout pumps underground.
6. The grout pump must be inspected used in accordance with the manufacturer specifications and standards. (See installation and full column grouting of the Videx End anchored roof bolt). The client to inform employees using grout pumps of the risks involved in the improper application thereof.
7. MINOVA training demonstrators are available to assist with the initial training. It is recommended that they assist to train employees in the proper and safe use of the MINOVA Full Column Grout Pumps at the initial stages Permanent demonstrators can be hired at a fixed rate..

ADDITIONAL INFORMATION

Installation and full column grouting of the Videx End-Anchord Roof Bolt

Date of risk assessment	February 2003
Revision Date	June 2008

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- 6. ADDITIONAL INFORMATION.**

INTRODUCTION

INTRODUCTION

INSTALLATION AND FULL COLUMN GROUTING OF THE VIDEX END-ANCHORED ROOF BOLT.

This study serves to prove the commitment of the management of MINOVA towards the elimination, control and minimizing the risks to the Health and Safety of Company and Client Employees, in order to provide an environment that is free from hazards as required by legislation.

A Swift (STRUCTURED WHAT IF TECHNIQUE) hazard identification technique was conducted. The Swift technique is a system-orientated technique, which examines complete systems or sub-systems.

**MINOVA is an international Mining support Products Supply Company that is ISO 9001:2000 accredited. (Member of the Orica Group of Companies)
This risk assessment covers all the products and procedures required for safe pack pre-stressing**

1. Aim:

The aim of the study is to:

- 1.1 Identify and assess the hazards and risks to which the equipment may pose to employees in the working place.
- 1.2 Ensure the safe installation and full column grouting of the Videx End-Anchored Roof Bolt

2. Objective:

- 2.6 The objective of the study is to conduct a SWIFT study on the safe installation and full column grouting of the Videx End-Anchored Roof Bolt
- 2.7 In analyzing hazards, reviewing existing controls and/or making recommendations, regarding potential hazards to the health and safety of employees.

3. Scope:

- 3.1 To do a Swift document on the safe installation and full column grouting of the Videx End-Anchored Roof Bolt

4. Methodology

- 4.7 Through using personnel with the technical experience and knowledge, hazards and problem areas were identified that could pose a threat to the health and safety of employees.
- 4.8 A risk matrix, included in this report, was used to prioritize all risks identified.
- 4.9 Recommendations were then made, where existing controls were found according to the team to be insufficient for control and eliminating existing hazards. See the risk assessment and proposed standard attached to this document.

5. Hazards identified

5.1 Prepare , mark and drill holes for roof bolts to be installed.

- 5.1.1 Personal Protective Equipment not used.
- 5.1.2 Hanging and sidewall where full column grouted roof bolt is to be installed not examined and made safe prior to performing the task.
- 5.1.3 Personnel not protected against oncoming rolling stock.
- 5.1.4 Personnel not protected against oncoming trackless mobile machines.
- 5.1.5 Area to be marked not watered down.
- 5.1.6 Temporary support not installed to mine standard.
- 5.1.7 Support holes not marked in accordance with mine standards and geological discontinuities not taken into account.
- 5.1.8 Holes not drilled in accordance with mine standards.

5.2 Install a Videx End-Anchored Roof bolt.

- 5.2.1 Locking plate not in position.
- 5.2.2 Breather tube damaged or not in proper position.
- 5.2.3 Roof bolt not pushed to back of hole and pulled down to properly secure.
- 5.2.4 Filler and breather pipes not in proper position.
- 5.2.5 Bolt not adequately tightened.

5.3 Full column grout installed roof bolt.

- 5.3.1 Pump and accessories not inspected prior to use.
- 5.3.2 Incorrect grout mix.
- 5.3.3 Pump Hose not securely attached.
- 5.3.4 Grout not pumped until it emerges from the breather tube.

- 5.3.5 Breather and filler tube not tied off.
- 5.3.6 Grout pump and accessories not flushed and cleaned after use.
- 5.3.7 Pump and accessories not stored in a safe, clean and dry place

6. Acknowledgement

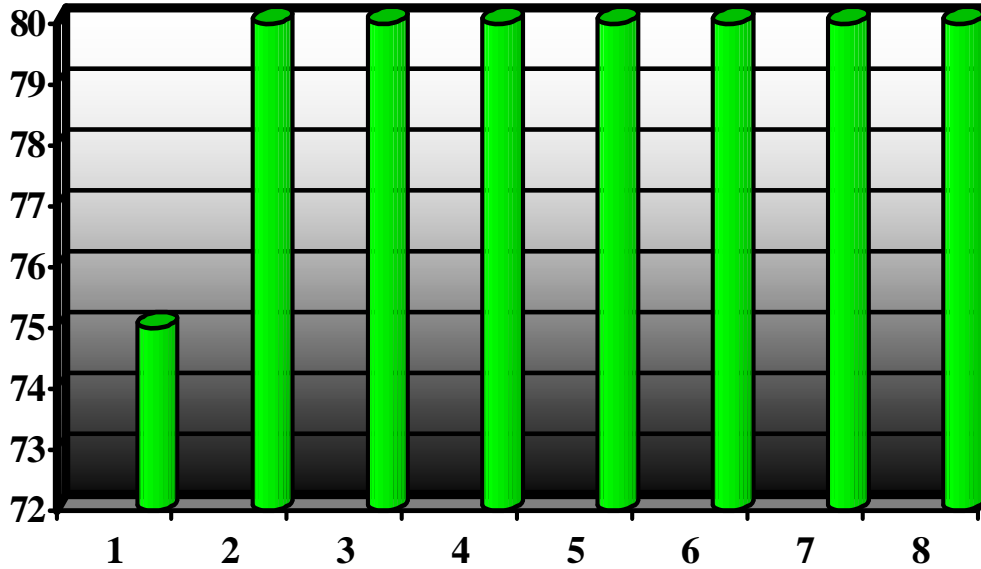
- 6.1 The team would like to "Thank" management for the opportunity to be part of this Risk Assessment and Standard Procedure team, affording them the opportunity to make their working environment safer.

EXECUTIVE SUMMARY

Executive Summary (Risk Profile)

Prepare, mark and drill holes for roof bolts to be installed.

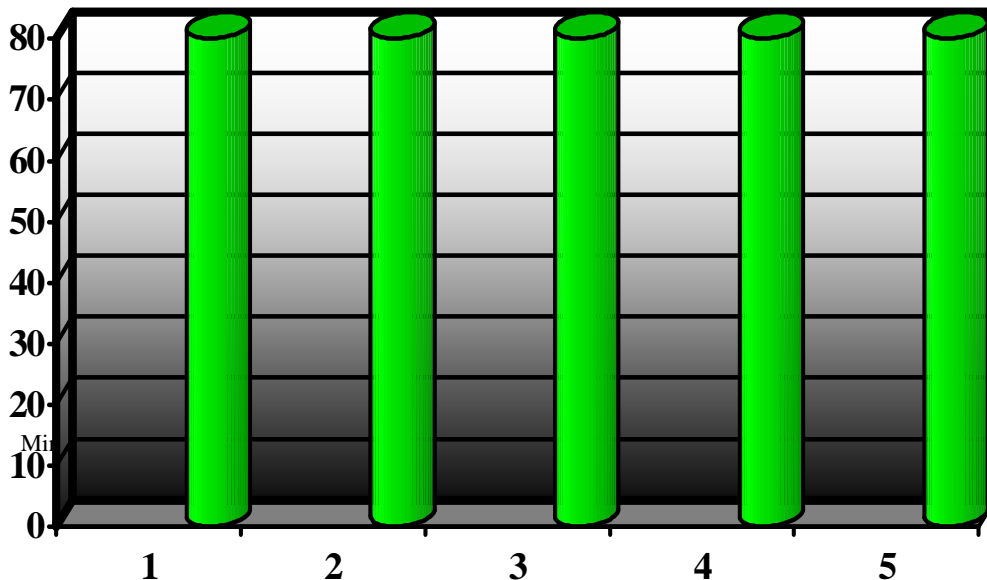
Legend	
A	High
B	Medium
C	Low



■	A Risks
■	B Risks
■	C Risks

1. Personal Protective Equipment not used.
2. Hanging and sidewall where full column grouted roof bolt is to be installed not examined and made safe prior to performing the task.
3. Personnel not protected against oncoming rolling stock.
4. Personnel not protected against oncoming trackless mobile machines.
5. Area to be marked not watered down.
6. Temporary support not installed to mine standard
7. Support holes not marked in accordance with mine standards and geological discontinuities not taken into account.
8. Holes not drilled in accordance with mine standards.

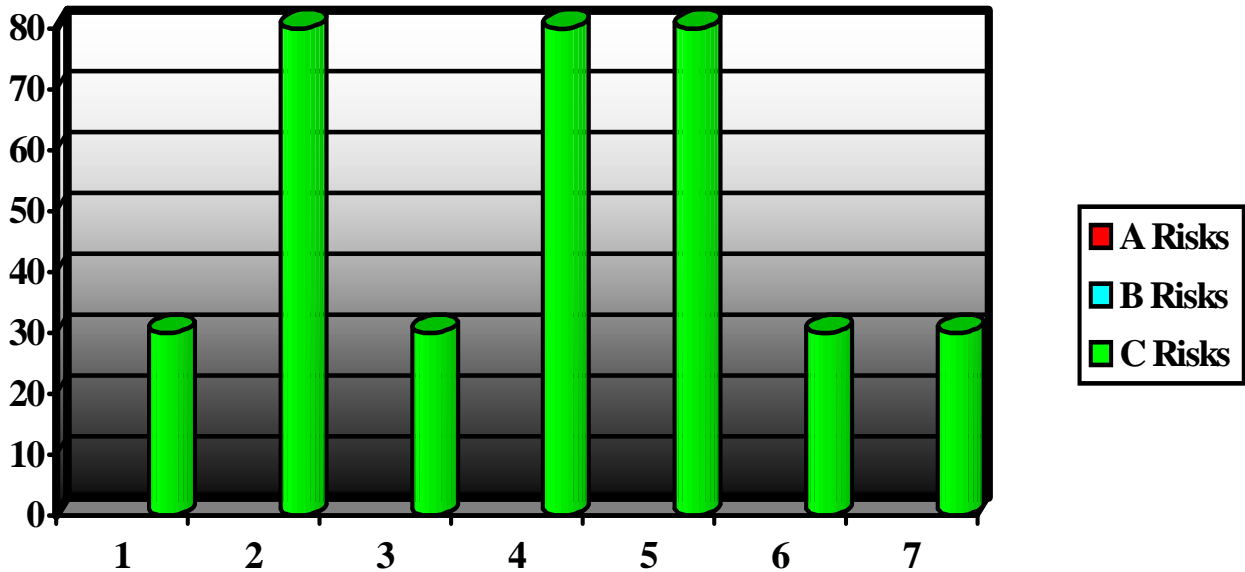
Install a Videx End-Anchored Roofbolt.



■	A Risks
■	B Risks
■	C Risks

1. Locking plate not in position.
2. Breather tube damaged or not in proper position
3. Roof bolt not pushed to back of hole and pulled down to properly secure.
4. Filler and breather pipes not in proper position
5. Bolt not adequately tightened.

3. Full column grout installed roof bolt.



1. Pump and accessories not inspected prior to use
2. Incorrect grout mix
3. Pump Hose not securely attached
4. Grout not pumped until it emerges from the breather tube.
5. Breather and filler tube not tied off
6. Grout pump and accessories not flushed and cleaned after use.
7. Pump and accessories not stored in a safe, clean and dry place

RISK MATRIX

RISK MATRIX USED

Probability (P)	Consequence (C)	Exposure (E)
Might well be expected (happens often) –10 Quite Possible –6 Unusual but possible – 3 Only remotely possible (has happened somewhere) –1 Conceivable but very unlikely (hasn't happened yet) – 0.5 Practically impossible (one in a million) – 0.2 Virtually impossible (approaches the impossible) 0 0.1	Catastrophic (many fatalities or damage over R10,000,000) – 100 Disaster (a few fatalities or damage over R1,000,000) – 40 Very serious (one fatality or damage over R500,000.00) – 15 Serious (serious injury or damage over R100,000.00) – 7 Important (temporary disability or damage over R10 000.00) –3 Of concern (minor injury or damage over R1,000.00) -1	Continuous –10 Frequently (daily) –6 Often (weekly) –3 Unusual (monthly) – 2 Unusual (a few per year) – 1 Rare (yearly) – 0.5 No exposure –0

(P) x (C) x (E) = Risk Result

Risk Classification:

Colour	Code	Description	Min Value	Max Value
	A	High	241	10000
	B	Medium	121	240
	C	Low	0.05	120

RISK ASSESSMENT WORKSHEETS

Category	Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	R R	Responsible Person
1. Don Personal Protective Equipment	Personal Protective Equipment not used.	A hard hat is not worn	Fatal Serious injury to employee	1. Personal Protective Equipment issued by client company. 2. MINOVA demonstrator available to assist with initial training. 3. Supervision 4. First aid treatment standard.	15	10	0.5	75						Employees using MINOVA equipment and grout and their Supervisors.
		Safety goggles are not worn.	If grout or grout powder enters the eye it may cause irritation and if not flushed cause damage to the eyes.	1. Safety goggles forms part off personal protective equipment at most mines. 2. Supervision 3. MINOVA Training demonstrators available to assist with initial training 4. First aid treatment standard.	3	10	0.5	15						Employees using MINOVA equipment and grout and their Supervisors.

Category	Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	R R	Responsible Person
		Dust masks not worn	<ol style="list-style-type: none"> Inhalation of grout dust powder If the respiratory system is exposed to grout dust powder for a pro-longed period of time it may cause damage to it 	<ol style="list-style-type: none"> Dust masks forms part off personal protective equipment at most mines. Supervision MINOVA Training demonstrators available for the initial training. First aid treatment standard. 	3	10	0.5	15						Employees using MINOVA equipment and grout and their Supervisors.
		Long sleeve clothing not worn	<p>If the skin is exposed to MINOVA Grout for an extended period of time it may cause irritation and minor burns.</p>	<ol style="list-style-type: none"> Supervision MINOVA Training demonstrators available to train mine personnel First aid treatment standard 	3	10	0.5	15						Employees using MINOVA equipment and grout and their Supervisors.

Category	Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	R R	Responsible Person
		Gloves not worn	1. Hand injury 2. If the skin is exposed to MINOVA Grout for an extended period of time it may cause irritation and minor burns.	1. Gloves forms part off personal protective equipment at most mines. 2. Supervision 3. MINOVA Training demonstrators available to assist with training. 4. First aid treatment standard. 5. Client first aid equipment available. 6. First aid training on mine	7	10	0.5	35						Employees using MINOVA equipment and grout and their Supervisors.
		Steel cap boots not worn.	F.O.G. during barring may cause amputation or serious foot injuries		7	10	0.5	35						Employees using MINOVA equipment and grout and their Supervisors.

Category	Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	R R	Responsible Person
		Safety Harnesses not used when working at heights or in steep areas.	Employees can fall down resulting in: Fatal Serious injury to person	1. Safety harnesses are supplied by client mines. 2. Supervision 3. MINOVA Training demonstrators available to assist with training. 4. First aid treatment standard. 5. Client first aid equipment available. 6. First aid training on mine 7. Legal requirements. 8. Mine standards	15	10	0.5	75						Employees using MINOVA equipment and grout and their Supervisors
2. Search and make safe	Hanging and sidewall where full column grouted roof bolt is to be installed not examined and made safe prior to performing the task.	Area to be worked in not examined and made safe.	Multiple Fatal Serious injury to employees.	1. Mine Standards. 2. Supervision 3. Training 4. MINOVA Risk Assessment. 5. Mine standards	40	10	0.2	80						Client employees

Category	Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	R R	Responsible Person
3. If the bolts are installed in a haulage, crosscut where rail bound equipment is used, a T-Sprag and stop signs must be placed at least three rail lengths on either side of the position where roofbolts are to be installed.	Personnel not protected against oncoming rolling stock.	Personnel are not safeguarded against oncoming rolling stock.	Multiple Fatal Serious injury to employees.	1. Mine Standards. 2. Supervision 3. Training 4. MINOVA Risk Assessment. 5. Mine standards	40	10	0.2	80						Client employees
	Personnel not protected against oncoming trackless mobile machines.	Personnel are not safeguarded against oncoming trackless mobile machines.	Multiple Fatal Serious injury to employees.	1. Mine Standards. 2. Supervision 3. Training 4. MINOVA Risk Assessment. 5. Mine standards	40	10	0.2	80						Client employees

Category	Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	R R	Responsible Person
5. Water down area to be marked.	Area to be marked not watered down.	Area to be marked is not watered down.	<ol style="list-style-type: none"> 1. Geological discontinuities will not be exposed. 2. Sub standard marking and support. 3. F.O.G. 4. Multiple Fatal 5. Serious injury to persons 6. Damage to equipment and infrastructure 7. Production loss. 	<ol style="list-style-type: none"> 1. Mine standards. 2. Supervision. 3. MINOVA Risk Assessment 4. Mine training 5. Competent appointed personnel 	40	10	0.2	80						Client employees
6. Install temporary support in area to be supported before marking, drilling or installation of roof bolts are done.	Temporary support not installed to mine standard	Temporary support is not installed to mine standard	<ol style="list-style-type: none"> 1. Sub standard temporary support. 2. F.O.G. 3. Multiple Fatal 4. Serious injury to persons 5. Damage to equipment and infrastructure 6. Production loss. 	<ol style="list-style-type: none"> 1. Mine standards. 2. Supervision. 3. MINOVA Risk Assessment 4. Mine training 5. Competent appointed personnel 	40	10	0.2	80						Client employees
7. Mark support holes taking into account geological discontinuities identified and mine support standards	Support holes not marked in accordance with mine standards and geological discontinuities not taken into account.	Support holes not marked in accordance with mine standards and geological discontinuities not taken into account.	<ol style="list-style-type: none"> 1. Sub standard support. 2. F.O.G. 3. Multiple Fatal 4. Serious injury to persons 5. Damage to equipment and infrastructure. 	<ol style="list-style-type: none"> 1. Mine standards. 2. Supervision. 3. MINOVA Risk Assessment 4. Mine training 5. Competent appointed personnel 	40	10	0.2	80						Client employees

Category	Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	R R	Responsible Person
8. Drill support holes in accordance with the mine's drilling standards and ensure it is of the correct diameter and length to accommodate the roof bolt to be installed.	Holes not drilled in accordance with mine standards.	Holes not drilled in accordance with mine standards.	<ol style="list-style-type: none"> 1. Fatal 2. Serious injury to mine employees. 3. Holes too short to accommodate length of roof bolt to be installed. 4. If a hole is drilled at the wrong angle and dip, the roof bolt will not support the strata correctly resulting in inadequate support. This can result in: <ol style="list-style-type: none"> 4.1. Sub standard support. 4.2. F.O.G. 4.3. Multiple Fatal 4.4. Serious injury to persons 4.5. Damage to equipment and infrastructure 4.6. Production loss. 	<ol style="list-style-type: none"> 1. Mine standards. 2. Supervision. 3. MINOVA Risk Assessment 4. Mine training 5. Competent appointed personne 6. Minova training demonstrators available to assist with initial training! 	40	10	0.2	80						Client employees

Category	Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	R R	Responsible Person
9. Install a Videx End-Anchored Roof bolt.														
9.1 Ensure the end anchor is in position	End anchor not in position.	The end anchor is not in position.	1. The locking mechanism will not function. This will result in: 1.1 Sub- standard support installation 1.2. F.O.G. 1.3. Multiple Fatals 1.4. Serious injury to persons 1.5. Damage to equipment and infrastructure 1.6. Production loss	1. MINOVA Training demonstrators available to assist with the initial training. 2. MINOVA Risk Assessment	40	10	0.2	80						Client employees and mine supervisors.

9.2 Ensure that the breather tube is in position to just below the end anchor.	Breather tube damaged or not in proper position	The breather tube is damaged or not in proper position		1. MINOVA Training demonstrators available to assist with the initial training 2. MINOVA Risk Assessment	40	10	0.2	80						Client employees and mine supervisors.
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Category	Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	R R	Responsible Person
9.3 Insert roof bolt to the back of the hole (ensuring end anchor is in position.) Pull bolt down to secure.	Roof bolt not pushed to back of hole and pulled down to properly secure.	Roof bolt is not pushed to back of hole and pulled down to properly secure	The end anchor will not grip properly resulting in: 1.1 Sub- standard support installation 1.2. F.O.G. 1.3. Multiple Fatal 1.4. Serious injury to persons 1.5. Damage to equipment and infrastructure 1.6. Production loss.	1. MINOVA Training demonstrators available to assist with initial training on the mines. 2. MINOVA Risk Assessment.	40	10	0.2	80						Client employees and mine supervisors.
9.4 Install grout plug and washer against hanging wall. Ensure filler and breather pipes are in position.	Filler and breather pipes not in proper position	The filler and breather pipes are not in the correct position		1. MINOVA Training demonstrators available to assist with the initial training on the mines. 2. MINOVA Risk Assessment.	40	10	0.2	80						Client employees and mine supervisors.

Category	Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	R R	Responsible Person
9.5 Spin bolt with spinning adaptor until the washer is firmly secured against the hanging wall and load indicator washer collapse.	Bolt not adequately tightened.	The bolt is not adequately tightened.	This will result in: 1. Sub- standard support installation 2. F.O.G. 3. Multiple Fatal 4. Serious injury to persons 5. Damage to equipment and infrastructure 6. Production loss.	1. MINOVA Training demonstrators are available to assist with the initial training. 2. MINOVA Risk Assessment.	40	10	0.2	80						Client employees and mine supervisors.
10. Full column grout installed roof bolt.														
10.1 Inspect the MINOVA Grout Pump and accessories	Framework damaged.	The framework is damaged.	1. The mixing tank may fall over or collapse when grout is mixed. 2. Time delay 3. Production loss	1. MINOVA .demonstrators are available to assist with the initial training. 2. MINOVA Risk Assessment. 3. Pre-use inspection list.	15	10	0.2	30						Client employees and mine supervisors.
	Mixing tank damaged	The mixing tank is damaged.	1. Grout will leak from the tank. 2. Time delay 3. Production loss	1. MINOVA demonstrators are available for the initial training. 2. MINOVA Risk Assessment. 3. Pre-use inspection list.	15	10	0.2	30						Client employees and mine supervisors.


Category	Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	R R	Responsible Person
	Grit, rock or pieces of cement in mixing tank.	There is grit, rock or pieces of cement in mixing tank before the grout mix is made.	<ol style="list-style-type: none"> 1. Grout will be contaminated and not enter the support hole 2. Time delay 3. Production loss 	<ol style="list-style-type: none"> 1. MINOVA Training demonstrators available to assist with training. 2. MINOVA Risk Assessment. 3. Pre-use inspection list. 	15	10	0.2	30						Client employees and mine supervisors.
	Paddle not clean and turning freely.	Paddle is not clean and turning freely.	<ol style="list-style-type: none"> 1. Grout will be contaminated and not enter the support hole 2. Inadequate mix 3. Time delay 4. Production loss 	<ol style="list-style-type: none"> 1. MINOVA Training demonstrators available to assist with training 2. MINOVA Risk Assessment. 3. Pre-use inspection list. 	15	10	0.2	30						Client employees and mine supervisors.
	Hose and hose fittings not inspected	The hose and hose fittings are not inspected.	<ol style="list-style-type: none"> 1. Grout will leak from the hose. 2. Time delay 3. Production loss 	<ol style="list-style-type: none"> 1. MINOVA Training demonstrators available to assist with training. 2. MINOVA Risk Assessment. 3. Pre-use inspection list. 	15	10	0.2	30						Client employees and mine supervisors.

Category	Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	R R	Responsible Person	
10.2 Mix grout	Incorrect grout mix	The mix is not correctly made.	<ol style="list-style-type: none"> 1. Inadequate bonding strength 2. Too thick or too thin (grout not entering or running from hole. 3. Sub- standard support installation resulting in: <ol style="list-style-type: none"> 3.1. F.O.G. 3.2 Multiple Fatal 3.3. Serious injury to persons 3.4. Damage to equipment and infrastructure 3.5. Production loss. 	<ol style="list-style-type: none"> 1. MINOVA Training demonstrators available to assist with training on the mine. 2. MINOVA Risk Assessment. 3. Manufacturer's mixing instructions displayed on grout bags 	15	10	0.2	30							Client employees and mine supervisors.
10.3 Attach pump hose to filler tube and pump	Pump Hose not securely attached	Pump Hose is not securely attached	<ol style="list-style-type: none"> 1. Grout will leak from the hose. 2. Time delay 3. Production loss 	<ol style="list-style-type: none"> 1. MINOVA Training demonstrators available to assist with training on the mine. 2. MINOVA Risk Assessment. 3. Pre-use inspection list. 	15	10	0.2	30							Client employees and mine supervisors.

Category	Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	R R	Responsible Person
10.2 Pump grout until grout emerge from the breather tube.	Grout not pumped until it emerges from the breather tube.	The grout is not pumped until it emerges from the breather tube.		1. MINOVA Training demonstrators available to assist with training on the mines. 2. MINOVA Risk Assessment.	15	10	0.2	30						Client employees and mine supervisors.

Category	Hazards	What If	Consequences	Existing controls	C	E	P	RR	Additional Recommended controls	C	E	P	R R	Responsible Person
10.3 Bend breather tube and filler tube over and tie off with O-Ring	Breather and filler tube not tied off	The breather and filler tubes are not tied off	1. Grout will leak from the hole resulting in: 1.1. Sub-standard support installation 1.2. F.O.G. 1.3 Multiple Fatal 1.4. Serious injury to persons 1.5 Damage to equipment and infrastructure 1.6 Production loss.	1. MINOVA Training demonstrators available to assist with training on the mines. 2. MINOVA Risk Assessment.	15	10	0.2	30						Client employees and mine supervisors.
10.4 When all holes are full column grouted, flush and clean the pump and accessories.	Grout pump and accessories not flushed and cleaned after use.	The grout pump and accessories are not flushed and cleaned after use.	1. Grout will harden and block pump and accessories resulting in damage to equipment and time delay when it needs to be used again. 2. Production loss	1. MINOVA Training demonstrators available to assist with training on the mines. 2. MINOVA Risk Assessment.	15	10	0.2	30						Client employees and mine supervisors.
10.5 Store pump and accessories in a safe, clean and dry place.	Pump and accessories not stored in a safe, clean and dry place after use.	The pump and accessories are not stored in a safe, clean and dry place after use.	1. Damage to pump and time delay when it needs to be used again. 2. Production loss	1. MINOVA Training Demonstrators available to assist the mine with training. 2. MINOVA Risk Assessment.	15	10	0.2	30						Client employees and mine supervisors.

PROPOSED SAFE WORK PRACTICE

	<p align="center">Safety Recommendations</p>	<p>Number:</p>
<p align="center">MINOVA</p>	<p>Install and full column grout the Videx End-Anchored Roof Bolt</p>	<p>Date JUNE 2008</p>

1. Prepare the area where support units are to be marked, drilled and full column supported.

1.1 Don Personal Protective Equipment.

1.1.1 The wearing of the following minimum PPE is advised:

- 1.1.1.1 Hardhat.
- 1.1.1.2 Safety goggles.
- 1.1.1.3 Earplugs.
- 1.1.1.4 Dust mask
- 1.1.1.5 Long sleeve clothing.
- 1.1.1.6 PVC Gloves.
- 1.1.1.7 Steel cap boots.

1.1.2 Safety harnesses to be used when working at heights and steep areas.

1.2 Search and make safe

1.2.1 Hanging and sidewall where full column grouted roof bolt is to be installed not examined and made safe and inspected for misfires prior to performing the task.

1.3 Safeguard workers

1.3.1 If the bolts are installed in haulage, crosscut where rail bound equipment is used, a T-Sprag and stop signs must be placed at least three rail lengths on either side of the position where roof bolts are to be installed.

- 1.3.2 If bolts are to be installed in a roadway, danger tape or a barrier chain must be installed across the roadway with a stop sign and red flickering danger light 60m on either side of the area where the task is to be performed to warn operators of trackless mobile machines of work in progress.

1.4 Water down area to be marked.

- 1.4.1 The hanging and sidewall must be watered down to enable the person marking the support holes to identify all geological continuities to ensure correct marking practices.

1.5 Install temporary support

- 1.5.1 Install temporary support in accordance with mine standard in the area to be supported before marking, drilling or installation of roof bolts is done

2. Marking of support holes.

- 2.1 Mark support holes taking into account geological discontinuities identified and mark in accordance with mine support standards (Patterns).

3. Drill support holes

- 3.1 Drill support holes in accordance with the mine's drilling standards and ensure it is of the correct diameter and length to accommodate the roof bolt to be installed.

4. Install Videx End-Anchored Roof Bolt.

- 4.1 Ensure the end anchor is in position
- 4.2 Ensure that the breather tube is in position to just below the end anchor.
- 4.3 Insert roof bolt to the back of the hole (ensuring end anchor is in position.) Pull bolt down to secure.
- 4.4 Install grout plug and washer against hanging wall. Ensure filler and breather pipes are in position.
- 4.5 Spin the bolt with spinning adaptor until the washer is firmly secured against the hanging wall and load indicator washer collapse.

5. Full column grout the installed roof bolt.

5.1 Pre-inspect MINOVA Grout Pump and accessories.

5.1.1 Inspect the MINOVA Grout Pump, accessories, and record findings on the Pre-use inspection list.

5.2 Mix the Grout

5.2.1 Place the pump on a level surface in close proximity to the cables or roof bolts being pumped. (Pump supplied with a 8 meter x 12mm filler hose)

5.2.2 Pour 4 liters of water in the mixing bowl of the Mk 2 pump up to mark and add 1 x 10 kg. Bag of pump able grout slowly whilst rotating mixing paddle.

5.2.3 When using the Mk 3 pump add 8 liters of water up to the mark and slowly add 2 x 10 kg. Bags or 1 x 20 kg bag pumpable grout whilst rotating the mixing paddle

5.2.4 (REMEMBER THE RATIO: 10 kg grout/4liters of water)

5.2.5 Mix thoroughly for 3 to 4 minutes.

5.2.6 Start pumping whilst flushing the hose back into the bowl until the grout has been fully dissolved.

5.3 Full column grout the hole.

5.3.1 Attach pump hose to filler tube and pump.

5.3.2 Pump slowly until the hole is properly filled. This will be indicated by the breather tube suspended from the top of the bolt and lower than the bottom of the bolt.


5.3.3 When grout emerges from the bottom outlet of the breather tube, the Operator will know that the hole is full column grouted.

5.3.4 Bend the breather tube and filler tube over and tie off with O-Rings provided.

6. Clean and store Pump and accessories.

6.1 When all holes are full column grouted, flush and clean the pump and accessories

6.2 Store pump and accessories in a safe, clean and dry place.

	<p align="center">Safety Recommendations</p>	<p>Number:</p>
<p align="center">MINOVA</p>	<p align="center">First aid measures in the event of contact with MINOVA Full Column Grout or Grout Cement Powder</p>	<p>Date JUNE 2008</p>

1. Skin Contact.

1.1 Effect:

1.1.1 If the skin is exposed to grout or cement powder over a lengthy period it may cause skin irritation or minor burns.

1.2 The grout powder or mixed grout pulp **must be rinsed off the skin as soon as possible** with clean water.

2. Eye Contact

2.1 Effect:

2.1.1 The eye can become irritated and over an extended period serious damage caused to the eye.

2.2 Treatment

2.2.1 Flush the eye with clean water for at least 10 minutes. If irritation persists, consult medical practitioner

3. Ingestion

3.1 Effect:

3.1.1 If the powder remains in the digestive system for an extended period of time, it may cause serious damage.

3.2 Treatment

3.2.1 Drink fluids and consult a medical practitioner as soon as possible.

4. Inhalation of dust.

4.1 Effect:

4.1.1 If the powder remains in the respiratory system for an extended period of time, it may cause serious damage.

4.2 Treatment

4.2.1 Remove the affected person to fresh air.

ADDITIONAL INFORMATION

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