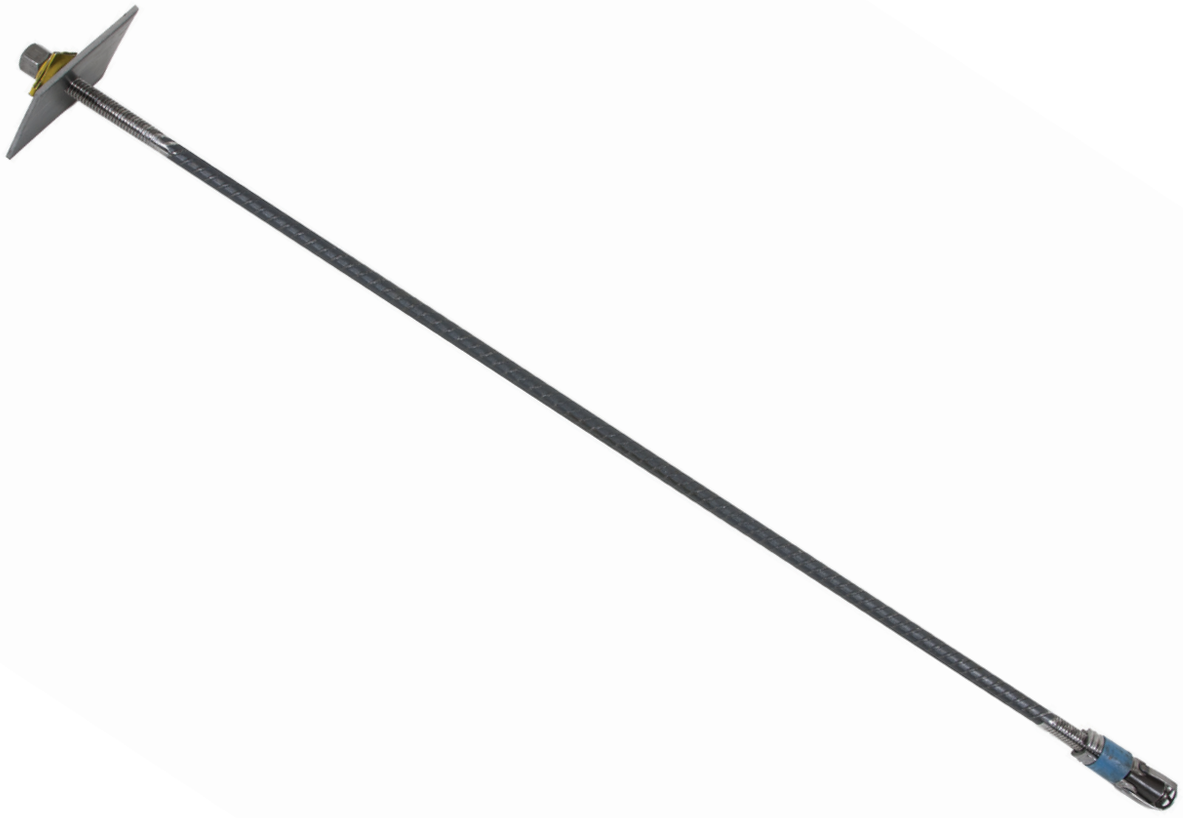
RSC Ekusasa Mining

Risk Assessment

Mechanical Anchored Rock Bolts



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BARNES GROUP OF COMPANIES

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INTRODUCTION

RSC Ekusasa Mining is a well-established company owned by The Barnes Group. RSC Ekusasa Mining has a Level 5 BEE status and a 80% BEE Procurement Recognition which is accredited through SANAS.

Black Woman Ownership of 26% and fronting listed as low.
RSC EKUSASA Mining is ISO 9001, ISO 14001 and OHSAS 18001 Accredited and has a certified Integrated Management System in place.

RSC Ekusasa Mining has been involved in various ground control and underground roof support projects throughout the world. RSC Ekusasa Mining often works with other companies in order to provide cost effective solutions to our customer needs. The range of critical / safety products and services supplied, includes a wide range of lateral and reinforcing roof support systems. The group's services extend from initial manufacture to the ultimate supply of high quality, roof support tendons. RSC Ekusasa Mining adheres strictly to the standards of the ISO 9001: 2008 and the SANS 1408: 2002 requirements for "Mechanical Components of tendon based rock support systems.

These roof support tendons are delivered to the mine on purchase and these articles is used and installed by the mine's employees and or contractors employed by the mine.

The Mine Health and Safety Act (Act 29 of 1996) section 21 however states the following:
"21.1 Any person who-

(a) Designs, manufactures, repairs, imports or supplies any article for use at a mine must ensure, as far as reasonably practicable –
  (i) that the article is safe and without risk to health and safety when used properly; and
  (ii) that it complies with all the requirements in terms of this Act;

(b) erects or installs any article for use at a mine must ensure, as far as reasonably practicable, that nothing about the manner in which it is erected or installed makes it unsafe or creates a risk to health and safety when used properly; or

(c) Designs, manufactures, erect or installs any article for use at a mine must ensure, as far as reasonably practicable, that ergonomic principles are considered and implemented during design, manufacture, erection or installation.

21.2 Any person who bears a duty in terms of sub-section (1) is relieved of that duty to the extent that is reasonable in the circumstances, if –

(a) that person designs, manufactures, repairs, imports or supplies an article for or to another person; and

(b) That other person provides a written undertaking to take specified steps sufficient to ensure, as far as reasonably practicable, that the article will be safe and without risk to health and safety when used properly and that it complies with all prescribed requirements."

Because of this legal requirements RSC Ekusasa Mining embarked on a full risk assessment with Business Risk Management (BRM), to ensure as far as reasonably practicable, that all potential health, safety and financial hazards are identified, relevant risks measured and control measures taken to ensure the articles are safe and without risk to the user.

Furthermore, the risk assessment serves as proof of RSC Ekusasa Mining's due diligence towards the mine, its employees, and assets and contributes in ensuring a healthy and safe work environment as far as reasonably practicable.

2. SCOPE OF WORK

Objective – To conduct a suitable and sufficient risk assessment that will, as far as reasonably practicable, identify all potential health, safety and financial hazards the articles could pose to the user and measure the level of risk of each hazard identified in order to recommend controls to mitigate or control the relevant risks.

Aim – To provide the user with sufficient information – specified steps - that can/should be used to train and guide employees to enable them to use the articles properly.

The risk assessment on the support articles were structured as follows:

- **A - Loading, transport and off-loading of articles by supplier**
- **B - Storage of articles on surface by user**
- **C - Loading, transport and off-loading of articles by user**
- **D - Storage of articles underground by user**
- **E - Installation of roof bolts by user**
  1. **Mechanical roof bolt without grouting**
  2. **Mechanical roof bolt with hole pre-grouted**
  3. **Mechanical roof bolt with hole post-grouted without grout tubes**
- **F - Maintenance on articles by user**
- **G - Inspections on articles by user before installation**
- **H - Inspections on articles by user after installation**
- **I - Failure modes and effects of article components**
- **J - Underground and surface impacts on articles**

3. EXECUTIVE SUMMARY

Introduction - The risk assessment on the support articles considered activities such as loading, off-loading, transport, storage, installation, maintenance, and inspections, which are typical activities the user performance whenever using the articles being supplied. These activities are normally performed on surface and mainly underground. The risk assessment was therefore structured in such a manner that all potential health, safety and financial hazards and relevant risks could be identified, as far as reasonably practicable, whenever performing any of the activities using the articles being supplied. The format of the risk assessment was laid out such, that the user can use the information as specified steps, whenever performing any of the activities using the articles.

Mentioned activities were broken down into specific task steps, as the supplier foresees the user using the articles, then all potential hazards were identified, related risks measured and recommendations made to guide the user of the most effective means in handling the articles when performing such activities.

Risks were measured using a risk index, which considers the three factors influencing the degree of risk such as consequence; exposure and probability **(Refer to APPENDIX 1 for an example of the Risk Index used)**. The reason for risk measurement is to prioritize the hazards identified looking at the significant risks it poses, and then deciding whether the risks should be eliminated, controlled, minimized or are the risks perhaps tolerable as is.

Result – A detailed hazard identification and risk measurement database is available in section 4 of this report, in summary the highest risks pertaining to each activity is listed below:

A - Loading, off-loading and transport by supplier:

- Loading - Over loading of truck
- Transport - Traffic and public roads
- Off-loading - Unsafe off-loading with forklift and truck standing on uneven Surface for off-loading

B - Storage of articles on surface by user:

- Ensure sharp ends not protruding from stored stack

C - Loading, transport and off-loading of articles by user:

- Loading - Handling articles manually
- Transport - Using defective loco for transport
- Off-loading - Bundle strapping loose

D - Storage of articles underground by user:

- Ensure sharp ends not protruding from stored stack

E - Installation of roof bolts by user

1. Mechanical roof bolt without grouting

- Ensure immediate area is safe.

2. Mechanical roof bolt with hole pre-grouted

- Ensure immediate area is safe.

3. Mechanical roof bolt with hole post-grouted without grout tubes

- Ensure immediate area is safe.

F - Maintenance on articles by user

- Friction rock stabilizers

G - Inspections on articles by user before installation

- Serves as checklist only.

H - Inspections on articles by user after installation

- Serves as checklist only.

I - Failure modes and effects of article components

- Friction rock stabilizers steel tube.

J - Underground and surface impacts on articles

- Using articles for purposes not designed for.

Benefits – The following benefits resulted from the risk assessment being conducted:

- Legal compliance;
- Mutual understanding between user and supplier regarding hazards and risks when using the articles;
- Specified steps for the user to use the articles properly;
- Revision on the adequacy of design of the support articles;
- Recommended safe use of the articles; therefore
- Health and safe working practices;
- Prevention of downtime;
- Reduce potential for production loss;
- Reduce potential for financial loss;
- Reduce potential for personal injury;
- Reduce potential for equipment damage;
- Specified steps can/should be used as training material; therefore
- Improved hazard awareness;
- Improved workmanship; and
- Quality installations; therefore
- Improved safety;
- Less falls of ground occurrences;
- Improved production;
- Financial gain;
- Improved health and safety work environment and
- Improved workforce output.

4. RISK ASSESSMENT DATABASE

The following is incorporated in the risk assessment database of all the issues as described in the structure of the risk assessment explained under the scope of work:

4.1 Hazard identification and risk measurement database

4.2 Recommended safe working procedures/practices

4.1 Hazard identification and risk measurement database

A - LOADING, TRANSPORT AND OFF-LOADING OF ARTICLES BY SUPPLIER:

A - LOADING, TRANSPORT AND OFF-LOADING OF ARTICLES BY SUPPLIER:

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
1.	Loading	Loading the incorrect product to be delivered	Time delay, production loss, business loss, blasting without support, possible injuries, financial loss to mine, installation of sub standard products	15	0.5	0.5	3.75	Every bundle is tagged with the order specifications. The quality officer and loading supervisor over inspects the load to be distributed; this is recorded on a standard loading instruction form. If the user receives the incorrect product the user must contact or notify the supplier as soon as possible and the supplier will deliver the correct product within 48 hours at no additional cots to the user.
		Not ensuring that bundles are strapped properly	Possible injury to people, time delay, falling of truck whilst in transport, possible traffic accidents	40	0.5	0.5	10	The quality officer and loading supervisor inspect every load for being in order. No bundle is loaded without proper strapping. All bundles are strapped and tagged from the production line and checked by quality control. Strapping used consists of steel straps; four straps are used per bundle to ensure sufficient support.
		Loading incorrect quantities	Time delay, production delay, business loss, blasting without support, possible injuries, financial loss, installation of sub standard products	15	1	0.5	7.5	The quality control officer and loading supervisor over inspects every load and loading is controlled by a loading instruction. The user to notify the supplier as soon as possible if the incorrect quantity has been supplied and record it on the proof of delivery as such. The supplier will supply the correct quantity within 48 hours at no additional costs to the user.
		Over loading of truck	Possible tyre burst, breakdowns, time delay, product falling of truck, traffic accidents, unsafe control of truck, damage of roads, time delay, production loss, blast without support, possible injury, loss of business, financial loss	40	2	1	80	The quality officer and loading supervisor over inspects the loading and the factory manager plans the loading of trucks. The contractor and company drivers has the right to refuse to move the truck if overloaded. The user to notify the supplier if any overloaded trucks is observed so that the necessary action can be taken to prevent a re-occurrence.

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
		Uneven distribution of load, exceeding axle load	Possible tyre burst, breakdowns, time delay, product falling of truck, traffic accidents, unsafe control of truck, damage of roads, time delay, production loss, blast without support, possible injury, loss of business, financial loss	40	2	0.5	40	The quality officer and loading supervisor over inspects the loading and the factory manager plans the loading of trucks. The contractor and company drivers has the right to refuse to move the truck if load is unevenly distributed. The user to notify the supplier if any uneven loaded trucks is observed so that the necessary action can be taken to prevent a re-occurrence.
		Unsafe securing of load	Traffic accidents, product falling of truck, possible injuries, time delay, production loss, financial loss	40	0.5	0.5	10	The factory manager or appointee oversees the securing of the load. The driver has the right to refuse to move the truck if load is not secured. The driver takes personal responsibility to ensure the load is secured before moving the truck. The user to notify the supplier if any load is observed not to be secured so that the supplier can take the necessary action to prevent a re-occurrence.
		Unsafe bundle quantities	Possible injury, time delay, user using for example a 2 ton forklift to off-load a 4 ton bundle, financial loss	15	0.5	0.5	3.75	Bundles are packed in 300kg – 2 ton quantities. The user to ensure that the forklift used for off-loading is capable of handling a 2-ton load to prevent forklift from capsizing, possible injury and possible damage to property.
		Loading defective products	Time delay, production loss, installation of sub standard support, possible injury, financial loss, business loss	15	0.5	0.5	3.75	Quality assurance plan is in place, the supplier is ISO 9002 compliant. The user to allow the supplier to train the store supervisor on mine on identifying sub standard products to prevent sub standard products being used which could jeopardize the health and safety of employees.
		Contractor trucks not available for loading	Time delay, production loss, loss of business, blasting without support, possible injury, financial loss	15	0.5	0.5	3.75	Supplier makes use of alternative contractors to ensure timorous deliveries. The user to keep sufficient stock to ensure such an occurrence does not affect them in any way.

		People not trained for proper loading	Time delay, possible injuries, traffic accidents, production loss, financial loss, loss of business	40	0.5	0.5	10	Designated and trained people are used for loading the product. Over inspections conducted by quality officer, loading supervisor and factory manager. If any defective products are observed at off-loading or hazardous loading is observed by the user, the user to notify the supplier as soon as possible.

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
2.	Transport	Vehicle not road worthy	Accidents, time delay, possible injury, financial loss, production loss, blasting without support	40	0.5	0.5	10	Vehicles test regularly for road worthy. If the user observes any vehicle having any defects, the supplier to be notified.
		Driver fatigue due long distances	Accidents, time delay, possible injury, financial loss, production loss, blasting without support	40	0.5	0.5	10	If the user notices any fatigue of the driver, the driver should be allowed to rest before departure from the site.
		Driver under the influence	Accidents, time delay, possible injury, financial loss, production loss, blasting without support	40	0.5	0.5	10	Standing instruction from supplier to contractor not allowing the moving of trucks if the driver is under the influence. The driver under the influence observed by the user not to be allowed to leave the premises and supplier to be notified.
		Hi-jacking of vehicle	Time delay, possible injury, financial loss, production loss, blasting without support	15	2	1	30	All drivers issued with cell phones and trucks equipped with tracking devices. The user to notify the supplier if the truck has not arrived on expected time so that effective follow up can be carried out on the status of the expected delivery.
		New driver not familiar with destination	Time delay, possible injury, financial loss, production loss, blasting without support	15	0.5	0.5	3.75	The supplier gives new drivers telephone to indicate directions, and the responsible area rep will guide a new driver to the required destination. If any delay occurs because of a new driver the user to notify the supplier.
		Incorrect choice of vehicle	Time delay, possible damage to property, possible injury, possible unsafe off-loading	7	0.5	0.5	1.75	Factory manager plans loading and off-loading. If the user places an order, the supplier should be notified if any constraints exist as far as vehicle access is concerned.

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
		Traffic and public roads	Accidents, time delay, possible injury, financial loss, production loss, blasting without support	40	10	3	1200	Legally licensed drivers, vehicles checked for roadworthy and telephone communications are controls in place. If the user observes any hazardous situation as far as traffic and roads are concerned the supplier to be notified to prevent possible exposures to any losses.
		Poor communication with drivers	Time delay, possible business loss, financial loss, accidents, possible injury, production loss, blasting without support	15	2	0.5	15	Drivers issued with cell phones, open door policy, and tracker system is provided for communication with drivers. Should a driver experience any communication problems it will be appreciated if the user allows the driver to use telephone on site to communicate with supplier head office or area rep.
		Speeding trucks, ignoring road rules	Accidents, time delay, possible injury, financial loss, production loss, blasting without support	40	1	1	40	Drivers are licensed. If the user observes any unsafe acts the supplier should be notified as soon as possible.

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
3.	Off-loading	Truck on unstable/uneven surface for off-loading	Time delay, forklift accidents, possible injury, financial loss, business loss	15	0.5	1	7.5	The user to ensure on arrival of the truck that an even and safe area is indicated for off-loading of articles.
		Inadequate moving space for off-loading	Damage to property, possible injury, financial loss	15	1	1	15	The user to ensure adequate and designated areas for off-loading with adequate space for forklift movement.
		Unsafe off-loading by forklift	Possible injury, financial loss, time delay	15	0.5	0.5	3.75	The user to ensure only trained and experienced forklift operators are used for the off-loading of the articles being supplied.
		Bundle strapping broken or loose	Possible injury, financial loss, time delay, possible loss of business	15	0.5	0.5	3.75	Four steel strapping per bundle, quality assurance and ISO 9002 compliance from supplier side. Any bundles having loose or broken strapping it is recommended that the user secure the load to ensure safe transport of the load.
		Off-loading in wrong area	Time delay, production loss, obstructing traveling and escape ways, possible injuries, damage to property, financial loss	15	0.5	0.5	3.75	Suppliers report to designated store area for off-loading, with products clearly marked. The user to demarcate specific areas for different products to be delivered to avoid the possibility of off-loading the incorrect articles in the wrong areas. The originator to be notified by the stores that the ordered articles have arrived to ensure the articles is disposed of to the required area of use. User to keep record of bundle tags to ensure sufficient record is available for tracing batches being supplied.

B - STORAGE OF ARTICLES ON SURFACE BY USER:

B - STORAGE OF ARTICLES ON SURFACE BY USER:

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
1.	Area demarcated for article storage.	No area demarcated for articles, wrong product being issued, difficult loading	Time delay, production loss, financial loss, possible injury, damage to property	15	1	1	15	Articles are supplied in strapped bundles, to ensure specific quantities and safer handling by employees. The user to ensure a sufficient and clearly marked designated area is provided for storage to prevent wastage of articles, damage to property and wrong issue of the articles to the end user.
2.	Ensure correct stack height	Stacking to high, falling bundles, stacking loose articles which is not strapped	Possible injury, property damage	15	1	0.5	7.5	The user to ensure a maximum stacking height of about knee high, to reduce the severity of injury should stack fall over, to facilitate safer loading and to ensure proper control when loading the articles. It is further recommended that spacers such as wooden blocks of +/- 50mm be used as spacers between bundles to ensure sufficient space for forklift forks to load bundle, and reduce the possibility of damaging bundles with forklift.
3.	Ensure sufficient clearances between articles and traveling ways	Inadequate clearances, obstructed traveling and escape routes, slip and fall	Possible injury, damage to property, financial loss	15	2	0.5	15	The user to ensure that sufficient clearances is maintained between stored articles and traveling as well as escape routes, to prevent slip and fall, to reduce the possibility of articles being damaged by vehicles and reduce the chance of personal injury.
4.	Ensure sharp ends not protruding from stored stack	Sharp ends protruding from stored stack	Possible injury, property damage, financial loss	15	3	0.5	22.5	The user to ensure that the flat ends of the articles faces the direction of traveling and escapes routes, to prevent possible injury or damage to property such as cutting of tyres.
5.	Ensure easy accessibility	Inadequate access, difficult loading	Possible injury, property damage, financial loss	15	2	0.5	15	The user to ensure that demarcated areas is used and a sufficient perimeter for traveling with a forklift is available for safe handling and loading of the articles to prevent any injury or damage to property which might result in a financial loss as well.
6.	Safeguard against natural elements	Rain, poor visibility at night time	Rusting articles, defective articles, sub standard installation, possible injury, financial loss	15	2	0.5	15	The user must as far reasonably practicable ensure the articles are stored under cover from the natural elements, whether a under roof store or articles covered with plastic.

C - LOADING, TRANSPORT AND OFF-LOADING OF ARTICLES BY USER:

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
1.	Loading	Unsafe loading with forklift	Possible injury, financial loss, damage to property	15	2	1	30	User to ensure bundles are strapped properly when loaded with forklift, to ensure safe loading. The load must be balanced on forklift by loading bundle with the forks in centre of bundle.
		Using a defective forklift for loading	Possible injury, financial loss, damage to property	15	2	1	30	The user only to use a well maintained and in proper condition forklift for loading the articles, using a defective forklift might result in injury or property damage because of the nature of the articles being loaded.
		Using a insufficient capacity forklift for loading	Possible injury, financial loss, damage to property	15	1	1	15	User to ensure before loading any bundles that the forklift is of a minimum capacity of 2-tons to ensure safe loading of the articles to prevent any injury resulting from the forklift capsizing because of the load.
		Insufficient space for loading with forklift	Possible injury, financial loss, damage to property	15	2	1	30	The user to ensure demarcated areas are available for stacking of articles and sufficient clear space is available for loading the articles to prevent any possible injury or damage to property.
		Using an unskilled forklift operator	Possible injury, financial loss, damage to property	15	2	1	30	Due to the nature of the articles being supplied the user should only use skilled operators to load the articles to prevent any possible injury and damage to property and to ensure safe loading.
		Bystanders in vicinity whilst forklift is loading/transporting articles	Possible injury, financial loss, damage to property	15	3	1	45	Due the nature of the articles to be transported it is recommended that the user ensures that a minimum clearance of at least 10m is maintained between the forklift and any bystanders to prevent possible injury and damage to property.
		Unsafe stacking of articles by forklift in designated areas for further distribution	Possible injury, financial loss, damage to property	15	3	1	45	It is recommended that the articles are placed on ground level and no stacking to any height should be permitted, to reduce the possibility of articles falling onto employees and to facilitate for safer loading onto material cars by hand.
		Bundle straps broken or loose	Articles falling from forklift, possible injury, financial loss, property damage	15	3	0.5	22.5	Any loose bundles with broken straps should be secured before loading by using a temporary strap for transport to avoid any loose articles falling of forklift in transit.

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
		Protruding sharp edges from bundle being transported by forklift	Possible injury, property damage, financial loss	15	3	0.5	22.5	User to ensure sufficient space whilst traveling with load and any bystanders not to be closer than 10m from moving forklift with load to prevent any possible injury and damage to property.
		Handling articles manually	Hand injuries, foot injuries, eye injuries, back injuries	7	10	3	210	Articles are supplied in bundles of quantities of five to ten per bundle strapped with three straps to facilitate safer manual handling, it is recommended that all bundles are loaded with two employees assisting each other to prevent back injuries, falling bundles and foot and hand injuries. All employees should use the prescribed PPE for handling material. Bundles range in weight from 10kg to 30kg and where possible bundles should rather be loaded using a forklift to reduce the exposure of manual handling.
		Loading on an unsecured material car	Tipping material car, falling off of bundles, possible injury, property damage, financial loss	7	3	1	21	Before any bundles are loaded onto material cars the material should be secured by means of sprags to ensure a stable car for loading the articles, to prevent any possible runaway cars and ultimately injuries to employees.
		Load not secured onto material car	Falling off bundles, possible injuries, damage to property, financial loss, articles falling down shaft, time delay, financial loss, unsafe material being loaded or unloaded from cage	15	2	0.5	15	The load should be secured onto material car by using chains to secure load if it is a flat car, if a open material car is used the load should be secured by chaining the articles together in a bundle to secure the load and prevent any articles from falling off/out the material car.
		Sharp ends protruding from material car	Possible injury, damage to property, financial loss	15	3	0.5	22.5	When loading the articles it is recommended that the load is secured properly and no sharp ends protrude from the side of the material car to prevent any injury or property damage. If the articles are loaded into an open container the sharp ends should always point away from the direction of travel to minimize the possibility of employees being injured by the sharp edges. The articles are supplied with sharp ends and washers on both sides of the bundles for the reason of balancing the bundle for safer strapping and transport. Some bundles are supplied with washers on the top in the centre of the bundle.

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
		Overloading material car	Falling off bundles, possible injuries, damage to property, financial loss, articles falling down shaft, time delay, financial loss, unsafe material being loaded or unloaded from cage	15	3	0.5	22.5	It is recommended that the user determine the safe load capacity for the type of material cars being used on site for safe loading of articles and prevention of over loading.
		Loading defective articles	Sub standard installations, possible injuries, damage to property, financial loss	15	2	1	30	Supplier to supply user with examples of usable and non-usable articles. Any defective articles observed by the user should be discarded and not loaded for use to prevent the sub standard installation of support and possible injury and property damage.
		Incorrect material car used for loading articles	Falling off bundles, possible injury, property damage, financial loss	15	3	0.5	22.5	The user to determine the most suitable material car for loading the articles which will be safe and most suitable for articles being loaded to prevent any possible injury, property damage and financial loss.
		Incorrect stacking of articles on material car	Falling off bundles, possible injuries, damage to property, financial loss, articles falling down shaft, time delay, financial loss, unsafe material being loaded or unloaded from cage, electrocution	15	1	1	15	As far as reasonably practicable the articles should be loaded lying flat on the material car, to prevent falling off bundles and ensuring adequate clearances at all times.
		Using a defective material car	Falling off bundles, possible injuries, damage to property, financial loss, articles falling down shaft, time delay, financial loss, unsafe material being loaded or unloaded from cage	15	2	0.5	15	Before any loading of articles is done the user to ensure the car is in good operational order to prevent any possible injury, damage to property or financial loss.
		Bundles being loaded by one person without assistance	Back injury, hand injury, foot injury	7	3	1	21	Bundles should always be loaded with two employees assisting each other to avoid possible injury to employees.

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
2.	Transport	Derailments	Possible injury, damage to property, financial loss	15	1	1	15	User to adhere to mine standards whilst transporting the articles and ensure proper track maintenance for safe transport.
		Bundles falling off	Possible injury, damage to property, financial loss	15	3	0.5	22.5	Before any transport with articles is done the user to ensure the bundles are strapped and secured onto the material car to avoid any bundles from falling off.
		Transport at high speed	Possible injury, damage to property, financial loss	15	6	3	270	Due to the nature of the articles being transported it is important for the user to adhere to mine standards and always maintain a reasonable speed during transport to prevent any derailments or road accidents and subsequent losses that may occur
		Items protruding from side	Possible injury, damage to property, financial loss, electrocution	15	2	0.5	15	User to ensure before transporting articles that there is no protruding ends from the material cars to prevent any possible losses; transport crews should at regular intervals check the load for being in tact.
		Bundles becoming loose	Possible injury, damage to property, financial loss, electrocution	15	2	0.5	15	During transport vibration could cause bundles becoming loose and therefore the user from time to time should inspect the bundles for being in tact.
		Articles transported to incorrect destination	Time delay, loss of production, sub standard support, possible injury, financial loss	15	2	1	30	Material cars used for transporting the articles should be clearly marked for required destination, and sufficient stock levels should be maintained to avoid the possibility of articles being transported to the incorrect destination having an impact on the safety of any working section.
		Inadequate clearances for transport	Possible injury, damage to property, financial loss, electrocution, time delay derailments	15	3	1	45	The correct material cars should be used and correct loading should be done to transport the articles. Transport should be done with adequate clearances prevailing at all times.
		Transporting material car by hand	Possible injury, damage to property, financial loss, time delay, derailments, slip and fall	15	6	0.5	45	User to ensure that the car is not over loaded, any material car with articles transported by hand should have a guard at least 30m in front of the car and sufficient warning signals and lights to be used to ensure safe transport by hand.

		Using defective loco for transport	Possible injury, damage to property, derailments, financial loss, time loss, accidents	100	2	1	200	User only to use serviceable locos for transport and ensure a pre-use check has been conducted before transporting the articles by loco.

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
		Not securing material car in cage for transport	Possible injury, damage to property, financial loss, time loss, shaft accident	100	3	0.5	150	The user should ensure that cars loaded with the articles are loaded and secured in the cage in such a manner that the articles always points to the rear of the cage and never to the front, to prevent the articles from protruding from the conveyance at any time.
		Transporting articles by hand	Hand injury, back injury, electrocution, slip ad fall, injury to bystanders	15	10	1	150	Employees required to transport articles by hand should do so with never less than two employees assisting each other and carrying the articles below shoulder height to prevent any possible injury to employees or over exertion whilst carrying the articles
		Transporting articles by mono winch or scraper winch	Possible injury, damage to property, financial loss	15	6	0.5	45	User never to use scraper winch for the transport of articles. Transporting articles with a mono winch the user to ensure the articles are properly suspended and traveling ways are clear for transporting the articles, to prevent any possible injury to employees and property damage. If the articles are used for the first time in a section, which will use a mono winch for transport purposes, the user to first investigate the mono way to ensure the article will pass through all access routes without any impact on any employee's safety or possible damage to property.
		Transporting articles with TM3 equipment	Possible injury, damage to property, falling bundles, financial loss, electrocution	15	6	0.5	45	The user to ensure that only designated TM3 equipment is used for the transport of the articles, and the load is properly secured for transport purposes, to prevent any possible injury, property damage or financial loss.
		Overloading of transport equipment with articles	Falling bundles, injury to people, property damage, financial loss, electrocution, product damage	15	6	6	540	User to ensure that the correct transport equipment is utilized to prevent overloading of roof bolts. User never to allow overloaded transport equipment to convey articles to prevent any injury, product damage and property damage due to the size and weight of the product.
		Unavailability of transport equipment	Overloading, transport at high speed, personal injury, property damage, product damage, financial loss, production loss, down time, electrocution	15	6	6	540	User to ensure that proper transport planning is conducted to ensure that transport is available at all times to transport the articles being critical safety items to required destinations. User to ensure that properly maintained vehicles are used for this purpose, and proper control systems are in place to ensure safe transport operations.

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
3.	Off-loading	Unsafe off-loading	Possible injury, electrocution, property damage, financial loss	15	6	0.5	45	The user to ensure the employees responsible for off-loading is adequately trained in the safe off-loading procedures to prevent possible injury and damage to property.
		Off-loading in wrong area	Time loss, possible sub standard support, possible injury, damage to property, financial loss	15	3	0.5	22.5	Material cars should be clearly marked for the required designated area of delivery and sufficient stock levels to be maintained by sections to prevent this occurrence having an impact on the employee and property safety.
		Bundle strapping loose	Possible injury	7	6	3	126	User to ensure the employees responsible for off-loading has the required PPE to do so and loose strapping to be removed before actually off-loading the articles to prevent any possible injury to employees.
		Sharp edges on articles	Possible injuries	7	6	1	42	User to ensure the employees responsible for off-loading has the required PPE to do so and loose strapping to be removed before actually off-loading the articles to prevent any possible injury to employees.
		Sharp edges on steel strapping	Possible injuries	7	6	1	42	User to remove the strapping prior to off-loading the articles to ensure a lower possibility of employees being injured.
		Off-loading into traveling and escape ways	Possible injuries, slip and fall, electrocution, damage to property, financial loss	15	6	1	90	User to ensure at all times that articles are off-loaded in the designated areas and never in front of escape routes, to prevent the obstruction of these routes.
		Insufficient assistance for off-loading	Possible injury, electrocution	15	3	0.5	22.5	User to ensure at all times that two or more people are assisting each other in the off-loading of the articles to prevent any exertion or possible injury.

D - STORAGE OF ARTICLES UNDERGROUND BY USER:

D - STORAGE OF ARTICLES UNDERGROUND BY USER:

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
1.	Ensure a safe area for storage purposes	Unsafe area, falls of ground, inadequate ventilation, excessive water, gasses, poor illumination, uneven surfaces	Possible injuries, financial loss, damage to property, production loss	15	3	1	45	The user to identify an area for storage purposes and have a competent person examine the area before being used as a store facility. Storing areas should be easily accessible from traveling ways from which off-loading takes place. The area should be well ventilated and illuminated and free of gasses to ensure it is safe at all times.
2.	Area demarcated for article storage.	Area not demarcated, mixed with other articles	Sub standard support, possible injury, damage to property, financial loss	15	3	0.5	22.5	The user to demarcate a specific area for the articles and as far as reasonably practicable avoids storing articles with other products, which might hamper the access to the articles.
3.	Ensure correct stack height	Stacking to high, incorrect stacking	Possible injury	7	3	1	21	The user to ensure the maximum stacking height does not exceed knee height.
4.	Ensure sufficient clearances between articles and traveling ways	Inadequate clearances, obstructed traveling ways, slip and fall, damage by rolling stock or TM3 equipment	Possible injury, financial loss, damage to property	15	3	0.5	22.5	The user to ensure that a sufficient clearance as specified by the mine standard is adhered to at all times to prevent any possible injury or damage to property.
5.	Ensure sharp ends not protruding from stored stack	Sharp edges	Possible injury	7	6	3	126	As far as reasonably practicable ensure that a sharp edges point away from traveling ways and adequate clearances prevails at all times. Employees handling the articles should always ensure the required PPE is used.
6.	Ensure easy accessibility	Poor accessibility, inadequate clearances	Possible injury, slip and fall	15	3	0.5	22.5	Because the articles are classified as safety critical items, the articles should be easily accessible at any point in time.
7.	Safeguard against natural elements	Underground water, gasses	Rust, explosion caused by a spark from the articles, sub standard installations, possible injury, financial loss, property damage, production loss	15	3	0.5	22.5	The user to ensure the storage area is well ventilated and as dry as reasonably practicable to prevent the articles from rusting. The user to ensure the articles is not exposed to natural underground water that continuously drips on articles, which might result in the articles becoming defective.

E - INSTALLATION OF ROOF BOLTS BY USER:

1. **MECHANICAL ROOF BOLT WITHOUT GROUTING**

2. **MECHANICAL ROOF BOLT WITH HOLE PRE-GROUTED**

3. **MECHANICAL ROOF BOLT WITH HOLE POST-GROUTED WITHOUT GROUT TUBES**

E - INSTALLATION OF ROOF BOLTS BY USER:

1. MECHANICAL ROOF BOLT WITHOUT GROUTING

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
1.	Ensure immediate area is safe	Area not barred, not inspected by competent person, gasses/fumes, falls of ground, water, loose material on ground, steep areas, slip and fall, bystanders, electrical equipment, sockets/misfires, geological features, moving conveyance, tip areas, no PPE, poor ventilation, poor visibility	Personal injury, time loss, production loss, financial loss, property damage, fire, explosion	40	10	1	400	The user to ensure a competent person establishes a safe working area, and clearly mark any geological features and take the necessary precautions before any work commences, to reduce the possibility of any injury, property damage or financial loss.
2.	Install temporary support	No temporary support used, incorrect temporary support used	Falls of ground, possible injury, time loss, production loss, financial loss, damage to property	40	6	1	240	No attempt to be made to install any form of support unless temporary support is adequately installed and over inspected by a competent person before any work commences, to reduce the possibility of injury, property damage or any financial loss.
3.	Ensure required equipment is available for task to be performed	Using sub standard equipment, using defective grout pumps, using defective support articles, inadequate PPE, using equipment unsafely, employees not trained on use of equipment	Personal injury, time loss, production loss, property damage, sub standard installation, financial loss	40	6	1	240	The user to ensure that only skilled and properly trained employees are used to install support with equipment fit for the task to be performed to reduce the possibility of any injury, property damage and financial loss. It is important for the user to involve the supplier on specific training requirements for employees as far as the use of the articles are concerned so that the supplier could issue the user with relevant safe working procedures. The user to ensure the employees is issued with the required PPE to ensure the safe performance of the task.

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
4.	Drill required length of hole - 0.9m - 1.0m - 1.2m - 1.5m - 1.8m - 2.1m, or - 2.4m	Holes drilled too short, Holes not drilled to required direction to strata, inadequate spacing between holes, holes drilled too long, correct length of drill steel not available	Sub standard installation, possible injury, time loss, financial loss, property damage, falls of ground	40	3	1	120	The user to ensure that a competent person indicates the position of holes to be drilled as per required mine standard, and the correct length of drill steel is available for the task. A competent person to conduct regular planned task observations on the drilled holes for correct direction and length. Employees to be trained on the consequences of incorrectly drilled holes to prevent the possibility of injury, property damage and financial loss.
5.	Ensure required diameter of hole	Hole diameter to big or small, correct size drill bits not available, incorrect drill bits available	Mechanical bolts not fitting in hole, bolts falling out of hole, sub standard installation, lost time, possible injury, property damage, production loss, financial loss, falls of ground	40	3	1	120	The user to follow the supplier's recommendations on hole diameter. User to have a go, no go measuring gauge available. Employees to be trained in the correct use and importance of the measuring gauge. No installation to take place unless the hole is of specified diameter to prevent possible injury, property damage and financial loss.
6.	Remove shell from mechanical roof bolt assembly	Not removing shell, loosing the shell	Not able to correctly measure hole, financial loss, sub standard installation, possible injury, property damage, production loss	15	2	1	30	The user to remove the shell and place in such a place that the shell can easily be found and be replaced on the stud, or have a measuring stick available at all times which will eliminate the practice of removing the shell for testing the length of hole.
7.	Measure the drilled hole with stud	Falling/slipping stud	Personal injury, damage to property, defective article, sub standard installation, production loss, financial loss	15	2	0.5	15	The user to ensure the employee use stud with extreme caution to prevent the stud from slipping and falling, which may damage the stud and ultimately result in sub standard installations. It is recommended that a measuring stick be available at all times to eliminate this practice.
8.	Replace shell on mechanical roof bolt stud	Missing shell, thread damage, not properly securing shell on stud	Sub standard installation, loss time, possible injury, financial loss, falls of ground	15	1	0.5	7.5	No article to be installed unless the shell has firmly been replaced on the stud.

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
9.	Remove plast6ic sleeve from shell	Sleeve not removed	Shell not able to expand, sub standard installation, possible injury, property damage, falls of ground, time loss, financial loss	15	3	0.5	22.5	The user to train employees with the involvement of the supplier in the importance of removing the sleeve.
10.	Push mechanical roof bolt assembly into hole by hand until bearing plate reaches hanging wall to ensure roof bolt is completely inserted	Slipping and falling roof bolt	Personal injury	7	6	1	42	The user to ensure employees is properly trained with the involvement of the supplier on the correct technique for pushing in the roof bolt.
11.	Turn mechanical roof bolt stud anti clockwise by hand to allow expansion of the shell and sufficient to allow roof bolt to remain in hole for further tensioning	Slipping and falling bolt from hole	Personal injury	7	2	0.5	7	The user to train employees with the involvement of the supplier in the correct method of turning the stud and securing it in the hole for further tensioning.
12.	Tension mechanical roof bolt crimp nut until the stud protrudes from the back of crimp nut to a minimum size equal to the thickness of the bearing plate.	Inadequate tensioning, excessive strain by manual tensioning, unsafe use of equipment for mechanical tensioning, slip and fall	Personal injury, property damage, sub standard installation, falls of ground, financial loss	15	3	1	45	The user to train employees with the involvement of the supplier on the correct method of tensioning the roof bolt and ensure the correct tensioning equipment is available and in good order for use.
13.	Remove temporary support to ensure completion of installation	Unsafe removal of temporary support, removing temporary support pre maturely, slip and fall	Falls of ground, personal injury, loss time, financial loss	15	3	3	135	The user to ensure employees is equipped with remote release equipment and support not to be removed until the bolt is properly tensioned.

1. MECHANICAL ROOF BOLT WITH HOLE PRE-GROUTED

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
1.	Ensure immediate area is safe	Area not barred, not inspected by competent person, gasses/fumes, falls of ground, water, loose material on ground, steep areas, slip and fall, bystanders, electrical equipment, sockets/misfires, geological features, moving conveyance, tip areas, no PPE, poor ventilation, poor visibility	Personal injury, time loss, production loss, financial loss, property damage, fire, explosion	40	10	1	400	The user to ensure a competent person establishes a safe working area, and clearly mark any geological features and take the necessary precautions before any work commences, to reduce the possibility of any injury, property damage or financial loss.
2.	Install temporary support	No temporary support used, incorrect temporary support used	Falls of ground, possible injury, time loss, production loss, financial loss, damage to property	40	6	1	240	No attempt to be made to install any form of support unless temporary support is adequately installed and over inspected by a competent person before any work commences, to reduce the possibility of injury, property damage or any financial loss.
3.	Ensure required equipment is available for task to be performed	Using sub standard equipment, using defective grout pumps, using defective support articles, inadequate PPE, using equipment unsafely, employees not trained on use of equipment	Personal injury, time loss, production loss, property damage, sub standard installation, financial loss	40	6	1	240	The user to ensure that only skilled and properly trained employees are used to install support with equipment fit for the task to be performed to reduce the possibility of any injury, property damage and financial loss. It is important for the user to involve the supplier on specific training requirements for employees as far as the use of the articles are concerned so that the supplier could issue the user with relevant safe working procedures. The user to ensure the employees is issued with the required PPE to ensure the safe performance of the task.

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
4.	Drill required length of hole 0.9m 1.0m 1.2m 1.5m 1.8m 2.1m, or 2.4m	Holes drilled too short, Holes not drilled to required direction to strata, inadequate spacing between holes, holes drilled too long, correct length of drill steel not available	Sub standard installation, possible injury, time loss, financial loss, property damage, falls of ground	40	3	1	120	The user to ensure that a competent person indicates the position of holes to be drilled as per required mine standard, and the correct length of drill steel is available for the task. A competent person to conduct regular planned task observations on the drilled holes for correct direction and length. Employees to be trained on the consequences of incorrectly drilled holes to prevent the possibility of injury, property damage and financial loss.
5.	Ensure required diameter of hole	Hole diameter to big or small, correct size drill bits not available, incorrect drill bits available	Mechanical bolts not fitting in hole, bolts falling out of hole, sub standard installation, lost time, possible injury, property damage, production loss, financial loss, falls of ground	40	3	1	120	The user to follow the supplier's recommendations on hole diameter. User to have a go, no go measuring gauge available. Employees to be trained in the correct use and importance of the measuring gauge. No installation to take place unless the hole is of specified diameter to prevent possible injury, property damage and financial loss.
6.	Remove shell from mechanical roof bolt assembly	Not removing shell, loosing the shell	Not able to correctly measure hole, financial loss, sub standard installation, possible injury, property damage, production loss	15	2	1	30	The user to remove the shell and place in such a place that the shell can easily be found and be replaced on the stud, or have a measuring stick available at all times which will eliminate the practice of removing the shell for testing the length of hole.
7.	Measure the drilled hole with stud	Falling/slipping stud	Personal injury, damage to property, defective article, sub standard installation, production loss, financial loss	15	2	0.5	15	The user to ensure the employee use stud with extreme caution to prevent the stud from slipping and falling, which may damage the stud and ultimately result in sub standard installations. It is recommended that a measuring stick be available at all times to eliminate this practice.
8.	Replace shell on mechanical roof bolt stud	Missing shell, thread damage, not properly securing shell on stud	Sub standard installation, loss time, possible injury, financial loss, falls of ground	15	1	0.5	7.5	No article to be installed unless the shell has firmly been replaced on the stud.

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
9.	Push grout tube to back of hole	Grout tube not pushed to back of hole, no grout tube available, damaged grout tube	Sub standard installation, possible injury, property damage, financial loss	15	3	1	45	The user to ensure the correct length and diameter grout tube is available and regular planned task observations to be conducted by the supervisor and area reps from supplier to ensure the correct pushing of the grout tube in the hole is conducted.
10.	Place pump able grout into hole with pump through grout tube until hole is completely filled	Incorrect consistency of the grout, defective grout pump, inadequate pressure, not fully grouting holes, alkalinity of grout, loose hose fittings and perished hoses, poor quality of grout, shortage of grout	Personal injury, eye injuries, skin burns, loss time, financial loss, sub standard installation, falls of ground	15	6	1	90	User to use pre- mixed grout from a reputable grout supplier to ensure a good quality grout. No articles to be installed unless the grout pump and equipment is in a good operational order that will ensure a good quality of installation. Employees to be trained with the involvement from the supplier on proper installation of grout procedure and the hazard and risks involved in the use of grout, and the control measures to be adhered to safeguard themselves against the hazards and risks. The employees must at all times use the correct and sufficient PPE supplied to them by the user.
11.	Remove grout tube from hole	Unsafe extraction of grout tube, spilling grout	Eye injuries, personal injury, skin burns, damage of grout tube	7	6	1	42	User to ensure employees are using proper PPE to protect them against the grout spillage, and prevent the tube from bending whilst removing it from the hole.
12.	Remove plastic sleeve from shell	Sleeve not removed	Shell not able to expand, sub standard installation, possible injury, property damage, falls of ground, time loss, financial loss	15	3	0.5	22.5	The user to train employees with the involvement of the supplier in the importance of removing the sleeve.
13.	Push mechanical roof bolt assembly into hole by hand as far as possible, and use machine and air leg to push mechanical roof bolt until bearing plate reaches hanging wall to ensure roof bolt is completely inserted	Slipping machine and air leg, slip and fall, not ensuring the bolt is completely inserted	Personal injury, property damage, sub standard installation, time loss	15	3	0.5	22.5	The user to ensure employees is properly trained with the involvement of the supplier on the correct technique for pushing in the roof bolt.

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
14.	Turn mechanical roof bolt stud anti clockwise by mechanical means to allow expansion of the shell and tension crimp nut until stud protrudes from the back of the crimp nut to a minimum size equal to the thickness of the bearing plate	Inadequate tensioning, excessive strain by manual tensioning, unsafe use of equipment for mechanical tensioning, slip and fall	Personal injury, property damage, sub standard installation, falls of ground, financial loss	15	3	1	45	The user to train employees with the involvement of the supplier on the correct method of tensioning the roof bolt and ensure the correct tensioning equipment is available and in good order for use.
15.	Remove temporary support to ensure completion of installation	Unsafe removal of temporary support, removing temporary support pre maturely, slip and fall	Falls of ground, personal injury, loss time, financial loss	15	3	3	135	The user to ensure employees is equipped with remote release equipment and support not to be removed until the bolt is properly tensioned.

3. MECHANICAL ROOF BOLT WITH HOLE POST-GROUTED WITHOUT GROUT TUBES

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
1.	Ensure immediate area is safe	Area not barred, not inspected by competent person, gasses/fumes, falls of ground, water, loose material on ground, steep areas, slip and fall, bystanders, electrical equipment, sockets/misfires, geological features, moving conveyance, tip areas, no PPE, poor ventilation, poor visibility	Personal injury, time loss, production loss, financial loss, property damage, fire, explosion	40	10	1	400	The user to ensure a competent person establishes a safe working area, and clearly mark any geological features and take the necessary precautions before any work commences, to reduce the possibility of any injury, property damage or financial loss.
2.	Install temporary support	No temporary support used, incorrect temporary support used	Falls of ground, possible injury, time loss, production loss, financial loss, damage to property	40	6	1	240	No attempt to be made to install any form of support unless temporary support is adequately installed and over inspected by a competent person before any work commences, to reduce the possibility of injury, property damage or any financial loss.
3.	Ensure required equipment is available for task to be performed	Using sub standard equipment, using defective grout pumps, using defective support articles, inadequate PPE, using equipment unsafely, employees not trained on use of equipment	Personal injury, time loss, production loss, property damage, sub standard installation, financial loss	40	6	1	240	The user to ensure that only skilled and properly trained employees are used to install support with equipment fit for the task to be performed to reduce the possibility of any injury, property damage and financial loss. It is important for the user to involve the supplier on specific training requirements for employees as far as the use of the articles are concerned so that the supplier could issue the user with relevant safe working procedures. The user to ensure the employees is issued with the required PPE to ensure the safe performance of the task.

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
4.	Drill required length of hole - 0.9m - 1.0m - 1.2m - 1.5m - 1.8m - 2.1m, or - 2.4m	Holes drilled too short, Holes not drilled to required direction to strata, inadequate spacing between holes, holes drilled too long, correct length of drill steel not available	Sub standard installation, possible injury, time loss, financial loss, property damage, falls of ground	40	3	1	120	The user to ensure that a competent person indicates the position of holes to be drilled as per required mine standard, and the correct length of drill steel is available for the task. A competent person to conduct regular planned task observations on the drilled holes for correct direction and length. Employees to be trained on the consequences of incorrectly drilled holes to prevent the possibility of injury, property damage and financial loss.
5.	Ensure required diameter of hole	Hole diameter to big or small, correct size drill bits not available, incorrect drill bits available	Mechanical bolts not fitting in hole, bolts falling out of hole, sub standard installation, lost time, possible injury, property damage, production loss, financial loss, falls of ground	40	3	1	120	The user to follow the supplier's recommendations on hole diameter. User to have a go, no go measuring gauge available. Employees to be trained in the correct use and importance of the measuring gauge. No installation to take place unless the hole is of specified diameter to prevent possible injury, property damage and financial loss.
6.	Remove shell from mechanical roof bolt assembly	Not removing shell, loosing the shell	Not able to correctly measure hole, financial loss, sub standard installation, possible injury, property damage, production loss	15	2	1	30	The user to remove the shell and place in such a place that the shell can easily be found and be replaced on the stud, or have a measuring stick available at all times which will eliminate the practice of removing the shell for testing the length of hole.
7.	Measure the drilled hole with stud	Falling/slipping stud	Personal injury, damage to property, defective article, sub standard installation, production loss, financial loss	15	2	0.5	15	The user to ensure the employee use stud with extreme caution to prevent the stud from slipping and falling, which may damage the stud and ultimately result in sub standard installations. It is recommended that a measuring stick be available at all times to eliminate this practice.
8.	Replace shell on mechanical roof bolt stud	Missing shell, thread damage, not properly securing shell on stud	Sub standard installation, loss time, possible injury, financial loss, falls of ground	15	1	0.5	7.5	No article to be installed unless the shell has firmly been replaced on the stud.

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
9.	Remove crimp nut and bearing plate and plastic sleeve from shell	Loosing the nut and bearing plate	Sub standard installation, injury, property damage, financial loss, time loss, falls of ground	15	2	0.5	15	The user to ensure the nut and bearing plate is placed where it can easily be found and replaced when required.
10.	Push stud and shell assembly into hole leaving a minimum of 100mm protruding from hole	Slipping and falling roof bolt	Personal injury	7	6	1	42	The user to ensure employees is properly trained with the involvement of the supplier on the correct technique for pushing in the roof bolt.
11.	Turn stud anti clockwise by hand to allow expansion of shell to prevent bolt from falling out and to facilitate grouting without the bolt being pushed further up the hole	Slipping and falling bolt from hole	Personal injury	7	2	0.5	7	The user to train employees with the involvement of the supplier in the correct method of turning the stud and securing it in the hole.
12.	Place grout tube over roof bolt and push tube to back of hole up to shell	Not pushing tube to the back of hole	Sub standard installation, injury, financial loss, property damage	15	3	0.5	22.5	The user to ensure the correct length and diameter tube is used and regular planned task observations to be conducted by supervisors and area reps from suppliers on the performance of this task.
13.	Place pump able grout into hole with pump through grout tube until hole is completely filled	Incorrect consistency of the grout, defective grout pump, inadequate pressure, not fully grouting holes, alkalinity of grout, loose hose fittings and perished hoses, poor quality of grout, shortage of grout	Personal injury, eye injuries, skin burns, loss time, financial loss, sub standard installation, falls of ground	15	6	1	90	User to use pre- mixed grout from a reputable grout supplier to ensure a good quality grout. No articles to be installed unless the grout pump and equipment is in a good operational order that will ensure a good quality of installation. Employees to be trained with the involvement from the supplier on proper installation of grout procedure and the hazard and risks involved in the use of grout, and the control measures to be adhered to safeguard themselves against the hazards and risks. The employees must at all times use the correct and sufficient PPE supplied to them by the user. The grout tube must have a minimum annulus of 8mm between the bolt and grout tube inner wall.

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
14.	Remove grout tube from hole	Unsafe extraction of grout tube, spilling grout	Eye injuries, personal injury, skin burns, damage of grout tube	7	6	1	42	User to ensure employees are using proper PPE to protect them against the grout spillage, and prevent the tube from bending whilst removing it from the hole.
15.	Clean roof bolt threats from excess grout	Not removing access grout	Nut not able to screw onto bolt, sub standard installation, injury, production loss	15	3	0.5	22.5	Nut not to be replaced on stud unless stud is completely cleared from access grout.
16.	Replace bearing plate and crimp nut	Lost nuts and plates, not replacing nut and plate	Sub standard installation, injury, property damage, financial loss, time loss, falls of ground	15	2	0.5	15	The user to ensure the nut and bearing plate is placed where it can easily be found and replaced when required.
17.	Tension crimp nut until stud protrudes from back of crimp nut for a minimum size of bearing plate thickness	Inadequate tensioning, excessive strain by manual tensioning, unsafe use of equipment for mechanical tensioning, slip and fall	Personal injury, property damage, sub standard installation, falls of ground, financial loss	15	3	1	45	The user to train employees with the involvement of the supplier on the correct method of tensioning the roof bolt and ensure the correct tensioning equipment is available and in good order for use.
18.	Remove temporary support to ensure completion of installation	Unsafe removal of temporary support, removing temporary support pre maturely, slip and fall	Falls of ground, personal injury, loss time, financial loss	15	3	3	135	The user to ensure employees is equipped with remote release equipment and support not to be removed until the bolt is properly tensioned.

F - MAINTENANCE ON ARTICLES BY USER:

F - MAINTENANCE ON ARTICLES BY USER:

No.	Component	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
1.	Roof bolts	Excessive corrosion on threaded portions, articles stored for a long period of time and components becoming missing, damaged articles	Defective articles, sub standard installations, injury, property damage, financial loss, production loss, time loss	15	3	0.5	22.5	If it is foreseen that the articles is stored for a long period of time the user must maintain the roof bolts by lubricating the threat ends and ensure the loose components are kept in tact with the roof bolts to ensure complete and no defective articles when required for use.

G - INSPECTIONS ON ARTICLES BY USER BEFORE INSTALLATION:

G - INSPECTIONS ON ARTICLES BY USER BEFORE INSTALLATION:

Component	Check/Test	In order	Out of order	Possible causes if not in order	
Mechanical Roof bolts					
Bail	In tact with leave assembly, not bend			Damaged by man handling	Do not man handle the unit which may cause the bail to be damaged or separated from leave assembly
Leaves sub assembly	Check spot weld in tact, check for cracks, ensure all leaves are in tact, leaves should not be bend, check for excessive rust			Poor manufacturing, man handling, miss use and abuse, improper storage, exposed to natural elements	Do not abuse or miss use the assembly, ensure correctly stored. Poor manufacturing reported to supplier. Do not use or issue product if leave assembly damaged.
Plug	Check plug in tact with assembly			Not supplied, lost during transport, used for other purposes	If plug is missing do not issue or use article.
Plug thread	Not damaged, free running			Man handled and abused, rusted, poor quality from supplier.	If rusted lubricate to ensure free running, if not free running do not issue for use.
Plastic sleeve	Plastic sleeve in tact			Not supplied, man handling and abuse, removed.	Employees to be made aware of importance and purpose of plastic sleeve and the consequences if prematurely removed
Deformed bar	Not bend, not excessively corroded			Man handling, abused, incorrectly stored, damaged by rolling stock or moving equipment, exposed to excessive water	Ensure it stored in a safe place and if any damages observed article not to be used or issued
Stud threaded ends	Thread not damaged, rust, not covered with debris, correct assembly of components			Incorrectly stored, man handled, abuse, excessive water, poor manufacturing, components incorrectly assembled by employees	Ensure assembly with nut on long threaded side and shell assembly on short threaded side. Ensure threads are free of debris.
Bearing plate	In tact, not damaged, burrs, wrong way around			Not supplied, poor manufacturing, lost during transport, incorrectly assembled by employees	Ensure in tact, not to supply units without bearing plate. Ensure bearing plate dome faces the nut before using item.
Bearing plate dome	Not flat, not cracked			Man handling, abuse, poor manufacturing, damaged during transport	If cracked do not issue for use.

Component	Check/Test	In order	Out of order	Possible causes if not in order	
Bearing plate hole	Test nut not going through hole, burrs, centre on dome			Poor manufacturing.	Place nut or seat against plate, if any light is transferred through the hole on the side of the nut, the plate should not be used.
Bearing plate dog ear	In tact and not excessively bended			Poor manufacturing, damage during transport	Do not issue and use if excessively damaged.
Bearing plate dog ear hole	Check that a minimum of 5mm thickness prevails to any edge of the plate.			Poor manufacturing	Not to use or issue or use as utility hanger if a minimum of 5mm to any edge does not prevail on the plate from the hole.
Hemispherical seat	In tact, not damaged or cracked, free running, flat end facing nut			Not supplied, poor manufacturing, lost in transport, removed by employees for other use, employee incorrectly assembled item	Ensure the seat is in tact and the flat end faces the nut. Do not issue or use item if seat is not in tact.
Hexagonal crimped nut	In tact, crimped, not stripped			Poor manufacturing, lost in transport, removed by employees	Do not issue or use if not crimped and notify supplier immediately.

H - INSPECTIONS ON ARTICLES BY USER AFTER INSTALLATION:

H - INSPECTIONS ON ARTICLES BY USER AFTER INSTALLATION:

Component	Check/Test	In order	Out of order	Possible causes if not in order	
Mechanical Roof bolts					
Bail	Not visible after installation				
Leaves sub assembly	Not visible after installation				
Plug	Not visible after installation				
Plug thread	Not visible after installation				
Plastic sleeve	Not visible after installation				
Deformed bar	Not visible after installation				
Stud threaded ends	The thread protrudes a minimum distance of the bearing plate thickness behind the nut			Not properly tensioned	Re-tension until the thread protrudes a minimum distance equal to the thickness of the bearing plate behind the nut.
Bearing plate	Firm against hang/side wall, plate not missing			Not tensioned properly, not used during installation	Re-tension until plate firm with hang/side wall. If plate is missing re-install new unit with plate.
Bearing plate dome	Maximum dome and nut / seat contact, dome facing correct direction pointing to nut			Incorrect installation	Remove nut and turn plate correct way around.
Bearing plate hole	Not visible after installation				
Bearing plate dog ear	In tact and not excessively bended			Poor manufacturing, damage during transport	Do not issue and use if excessively damaged.
Bearing plate dog ear hole	Check that a minimum of 5mm thickness prevails to any edge of the plate.			Poor manufacturing	Not to use or issue or use as utility hanger if a minimum of 5mm to any edge does not prevail on the plate from the hole.
Hemispherical seat	Maximum contact with dome, correct way around with flat end facing nut, in tact, damaged			Incorrect installation	Ensure seat in tact and maximum contact with dome.
Hexagonal crimped nut	Crimp has been broken, not stripped			Not properly tensioned, poor quality of nut and poor manufacturing	Re-tension to break crimp or notify supplier if crimp does not brake.

Component	Check/Test	In order	Out of order	Possible causes if not in order	
Fully threaded mechanical Roof bolts					
Bail	Not visible after installation				
Leaves sub assembly	Not visible after installation				
Plug	Not visible after installation				
Plug thread	Not visible after installation				
Plastic sleeve	Not visible after installation				
Fully threaded stud	Must not protrude for an access of 100mm			Poor installation	Loosen nut, turn stud clockwise, one full turn, and try to push further into hole if successful turn anti clockwise until firm and re-tension nut. If not successful then re-install new unit.
Bearing plate	Firm against hang/side wall, plate not missing			Not tensioned properly, not used during installation	Re-tension until plate firm with hang/side wall. If plate is missing re-install new unit with plate.
Bearing plate dome	Maximum dome and nut / seat contact, dome facing correct direction pointing to nut			Incorrect installation	Remove nut and turn plate correct way around.
Bearing plate hole	Not visible after installation				
Bearing plate dog ear	In tact and not excessively bended			Poor manufacturing, damage during transport	Do not issue and use if excessively damaged.
Bearing plate dog ear hole	Check that a minimum of 5mm thickness prevails to any edge of the plate.			Poor manufacturing	Not to use or issue or use as utility hanger if a minimum of 5mm to any edge does not prevail on the plate from the hole.
Hexagonal nut	In tact, secured			Poor installation	If not in tact, replace and secure.

I - FAILURE MODES AND EFFECTS OF ARTICLE COMPONENTS:

I - FAILURE MODES AND EFFECTS OF ARTICLE COMPONENTS:

Equipment	Components	Function	Failure Mode	Cause of failure	C	E	P	Risk Result	Recommendation
Mechanical Roof bolts	Bail	To hold leaves in tact	Shear, corrode, rust	Sheared by bolt, ground water	3	3	1	9	User not to use bails which is rusted or corroded. If rusted place oil on bail to reduce chance of corrosion.
	Leaves sub assembly	Facilitate the wedge to anchor	Spot weld cracking or braking	Poor manufacturing, man handling, abuse, wrong diameter hole	15	3	0.5	22.5	Any defective leaf sub assembly on an item should not be allowed to be used or installed.
	Plug	Expands leaves to wedge	Strip, crack, rust, corrode	Poor quality, ground water	15	1	0.5	7.5	Any visible defects observed on the plug should allow the user not to use the article. Oil plug before installation if rusted to ensure free running.
	Plug thread	To allow the plug to facilitate the wedging	Strip, rust, corrode, covered with debris	Improper storage, ground water, abuse, rain	15	1	0.5	7.5	Oil if rusted and ensure proper storage.
	Plastic sleeve	To keep leave assembly in tact before installation	Removed, shear	Man handling, abuse	1	6	6	36	Employees to be trained by supplier and user on the importance and function of sleeves.
	Deformed bar	To allow better anchorage when used in conjunction with grout	Shear, snap, rust, corrode	Poor quality steel, excessive loads applied, ground water	40	2	0.5	40	User to ensure proper support pattern designed.
	Stud threaded ends	To house the nut and plug used for tensioning	Strip, rust, corrosion, shear	Improper design, over tensioning, ground water, overload	40	3	0.5	60	User to ensure proper support pattern designed.

Equipment	Components	Function	Failure Mode	Cause of failure	C	E	P	Risk Result	Recommendation
	Bearing plate	For even distribution of bearing load	Rust, corrode	Ground water	15	1	0.5	7.5	If excessive rust or corrosion is detected, consider new installation.
	Bearing plate dome	Indicates excessive load	Collapse	Excessive load	15	2	0.5	15	If dome collapses it indicates excessive pressure is applied to the bolt. Install new bolt and revise support pattern design.
	Bearing plate hole	To allow the bar to protrude through the plate	Wear out, corrode	Ground water, excessive load	15	2	1	30	If hole wears out the bearing plate will become loose which will indicate a new installation is required.
	Hemispherical seat	Allows bolt to be at different angles to the bearing plate, with maximum load transfer	Crack	Poor quality	15	1	0.5	7.5	Any cracked seat observed should indicate a new installation.
	Hexagonal crimped nut	To facilitate proper expansion of the expansion shell and to tension bolt	Incorrect crimping, strip	Poor quality, poor manufacturing	15	2	1	30	If crimp brakes premature contact supplier immediately. If nut strips off install new unit and contact supplier.

Equipment	Components	Function	Failure Mode	Cause of failure	C	E	P	Risk Result	Recommendation
Fully threaded mechanical Roof bolts	Bail	To hold leaves in tact	Shear, corrode, rust	Sheared by bolt, ground water	3	3	1	9	User not to use bails which is rusted or corroded. If rusted place oil on bail to reduce chance of corrosion.
	Leaves sub assembly	Facilitate the wedge to anchor	Spot weld cracking or braking	Poor manufacturing, man handling, abuse, wrong diameter hole	15	3	0.5	22.5	Any defective leaf sub assembly on an item should not be allowed to be used or installed.
	Plug	Expands leaves to wedge	Strip, crack, rust, corrode	Poor quality, ground water	15	1	0.5	7.5	Any visible defects observed on the plug should allow the user not to use the article. Oil plug before installation if rusted to ensure free running.
	Plug thread	To allow the plug to facilitate the wedging	Strip, rust, corrode, covered with debris	Improper storage, ground water, abuse, rain	15	1	0.5	7.5	Oil if rusted and ensure proper storage.
	Plastic sleeve	To keep leave assembly in tact before installation	Removed, shear	Man handling, abuse	1	6	6	36	Employees to be trained by supplier and user on the importance and function of sleeves.
	Fully threaded stud	To house the nut and plug used for tensioning	Strip, rust, corrosion, shear	Improper design, over tensioning, ground water, overload	40	3	0.5	60	User to ensure proper support pattern designed.
	Bearing plate	For even distribution of bearing load	Rust, corrode	Ground water	15	1	0.5	7.5	If excessive rust or corrosion is detected, consider new installation.
	Bearing plate dome	Indicates excessive load	Collapse	Excessive load	15	2	0.5	15	If dome collapses it indicates excessive pressure is applied to the bolt. Install new bolt and revise support pattern design.
	Bearing plate hole	To allow the bar to protrude through the plate	Wear out, corrode	Ground water, excessive load	15	2	1	30	If hole wears out the bearing plate will become loose which will indicate a new installation is required.

Equipment	Components	Function	Failure Mode	Cause of failure	C	E	P	Risk Result	Recommendation
	Bearing plate dog ear	Allows access to dog ear hole	Damaged	Misuse	7	2	1	14	Ensure sufficient access to hole, especially after installation.
	Bearing plate dog ear hole	To be used as utility hanger for weight up to 250kg	Torn, worn	Excessive load, poor manufacturing	7	2	1	14	Do not use as a utility hanger for a weight of more than 250kg, if worn or torn do not use as a utility hanger at all and replace bearing plate if required for suspension.
	Hexagonal nut	To tension and keep bearing plate in place	Strip, shear	Excessive tension	15	2	1	30	Never use a nut which is defective for any installation.

J - UNDERGROUND AND SURFACE IMPACTS ON ARTICLES:

J - UNDERGROUND AND SURFACE IMPACTS ON ARTICLES:

Unit	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation
Underground	Misused for pins etc., build store gates, used as concrete re-enforcing, building racks, used as hand rails, used as burglar bars, used for step ladders, used for barricades, used for modifications on equipment, used as grizzly segments, used as hooks on tip, used for suspension, used in stores for hanging material, ground water, corrosion, rust	Personal injury, financial loss, production loss, time loss, sub standard installations	15	10	0.5	75	Articles only to be used for purpose being supplied for, always remember these articles are classified as critical safety articles.
Surface	Concrete re-enforcing, garden chairs and equipment, used in flower beds, used as gates, used as burglar bars, used as fencing, Theft for home use, rain, soled as raw material, used by shaft and engineering people for lifting or moving equipment	Personal injury, financial loss, time loss, production loss, sub standard installation	15	10	0.5	75	Articles only to be used for purpose being supplied for, always remember these articles are classified as critical safety articles.

4.3 Recommended safe working procedures/practices

A - RECOMMENDED SAFE WORKING PRACTICE FOR LOADING, TRANSPORT AND OFF-LOADING OF ARTICLES BY SUPPLIER:

Activity	Potential Hazard	Recommendation/Controls
Loading	Loading the incorrect product to be delivered	Every bundle is tagged with the order specifications. The quality officer and loading supervisor over inspects the load to be distributed; this is recorded on a standard loading instruction form. If the user receives the incorrect product the user must contact or notify the supplier as soon as possible and the supplier will deliver the correct product within 48 hours at no additional cots to the user.
	Not ensuring that bundles are strapped properly	The quality officer and loading supervisor inspect every load for being in order. No bundle is loaded without proper strapping. All bundles are strapped and tagged from the production line and checked by quality control. Strapping used consists of steel straps; four straps are used per bundle to ensure sufficient support.
	Loading incorrect quantities	The quality control officer and loading supervisor over inspects every load and loading is controlled by a loading instruction. The user to notify the supplier as soon as possible if the incorrect quantity has been supplied and record it on the proof of delivery as such. The supplier will supply the correct quantity within 48 hours at no additional costs to the user.
	Over loading of truck	The quality officer and loading supervisor over inspects the loading and the factory manager plans the loading of trucks. The contractor and company drivers has the right to refuse to move the truck if overloaded. The user to notify the supplier if any overloaded trucks is observed so that the necessary action can be taken to prevent a re-occurrence.
	Uneven distribution of load, exceeding axle load	The quality officer and loading supervisor over inspects the loading and the factory manager plans the loading of trucks. The contractor and company drivers has the right to refuse to move the truck if load is unevenly distributed. The user to notify the supplier if any uneven loaded trucks is observed so that the necessary action can be taken to prevent a re-occurrence.
	Unsafe securing of load	The factory manager or appointee oversees the securing of the load. The driver has the right to refuse to move the truck if load is not secured. The driver takes personal responsibility to ensure the load is secured before moving the truck. The user to notify the supplier if any load is observed not to be secured so that the supplier can take the necessary action to prevent a re-occurrence.

Activity	Potential Hazard	Recommendation/Controls
	Unsafe bundle quantities	Bundles are packed in 300kg – 2 ton quantities. The user to ensure that the forklift used for off-loading is capable of handling a 2-ton load to prevent forklift from capsizing, possible injury and possible damage to property.
	Loading defective products	Quality assurance plan is in place, the supplier is ISO 9002 compliant. The user to allow the supplier to train the store supervisor on mine on identifying sub standard products to prevent sub standard products being used which could jeopardize the health and safety of employees.
	Contractor trucks not available for loading	Supplier makes use of alternative contractors to ensure timorous deliveries. The user to keep sufficient stock to ensure such an occurrence does not affect them in any way.
	People not trained for proper loading	Designated and trained people are used for loading the product. Over inspections conducted by quality officer, loading supervisor and factory manager. If any defective products are observed at off-loading or hazardous loading is observed by the user, the user to notify the supplier as soon as possible.

Activity	Potential Hazard	Recommendation/Controls
Transport	Vehicle not road worthy	Vehicles test regularly for road worthy. If the user observes any vehicle having any defects, the supplier to be notified.
	Driver fatigue due long distances	If the user notices any fatigue of the driver, the driver should be allowed to rest before departure from the site.
	Driver under the influence	Standing instruction from supplier to contractor not allowing the moving of trucks if the driver is under the influence. The driver under the influence observed by the user not to be allowed to leave the premises and supplier to be notified.
	Hi-jacking of vehicle	All drivers issued with cell phones and trucks equipped with tracking devices. The user to notify the supplier if the truck has not arrived on expected time so that effective follow up can be carried out on the status of the expected delivery.
	New driver not familiar with destination	The supplier gives new drivers telephone to indicate directions, and the responsible area rep will guide a new driver to the required destination. If any delay occurs because of a new driver the user to notify the supplier.
	Incorrect choice of vehicle	Factory manager plans loading and off-loading. If the user places an order, the supplier should be notified if any constraints exist as far as vehicle access is concerned.
	Traffic and public roads	Legally licensed drivers, vehicles checked for roadworthy and telephone communications are controls in place. If the user observes any hazardous situation as far as traffic and roads are concerned the supplier to be notified to prevent possible exposures to any losses.
	Poor communication with drivers	Drivers issued with cell phones, open door policy, and tracker system is provided for communication with drivers. Should a driver experience any communication problems it will be appreciated if the user allows the driver to use telephone on site to communicate with supplier head office or area rep.
	Speeding trucks, ignoring road rules	Drivers are licensed. If the user observes any unsafe acts the supplier should be notified as soon as possible.

Activity	Potential Hazard	Recommendation/Controls
Off-loading	Truck on unstable/uneven surface for off-loading	The user to ensure on arrival of the truck that an even and safe area is indicated for off-loading of articles.
	Inadequate moving space for off-loading	The user to ensure adequate and designated areas for off-loading with adequate space for forklift movement.
	Unsafe off-loading by forklift	The user to ensure only trained and experienced forklift operators are used for the off-loading of the articles being supplied.
	Bundle strapping broken or loose	Four steel strapping per bundle, quality assurance and ISO 9002 compliance from supplier side. Any bundles having loose or broken strapping it is recommended that the user secure the load to ensure safe transport of the load.
	Off-loading in wrong area	Suppliers report to designated store area for off-loading, with products clearly marked. The user to demarcate specific areas for different products to be delivered to avoid the possibility of off-loading the incorrect articles in the wrong areas. The originator to be notified by the stores that the ordered articles have arrived to ensure the articles is disposed of to the required area of use. User to keep record of bundle tags to ensure sufficient record is available for tracing batches being supplied.

B - RECOMMENDED SAFE WORKING PRACTICE FOR STORAGE OF ARTICLES ON SURFACE BY USER:

Activity	Potential Hazard	Recommendation/Controls
Area demarcated for article storage.	No area demarcated for articles, wrong product being issued, difficult loading	Articles are supplied in strapped bundles, to ensure specific quantities and safer handling by employees. The user to ensure a sufficient and clearly marked designated area is provided for storage to prevent wastage of articles, damage to property and wrong issue of the articles to the end user.
Ensure correct stack height	Stacking to high, falling bundles, stacking loose articles which is not strapped	The user to ensure a maximum stacking height of about knee high, to reduce the severity of injury should stack fall over, to facilitate safer loading and to ensure proper control when loading the articles. It is further recommended that spacers such as wooden blocks of +/- 50mm be used as spacers between bundles to ensure sufficient space for forklift forks to load bundle, and reduce the possibility of damaging bundles with forklift.
Ensure sufficient clearances between articles and traveling ways	Inadequate clearances, obstructed traveling and escape routes, slip and fall	The user to ensure that sufficient clearances is maintained between stored articles and traveling as well as escape routes, to prevent slip and fall, to reduce the possibility of articles being damaged by vehicles and reduce the chance of personal injury.
Ensure sharp ends not protruding from stored stack	Sharp ends protruding from stored stack	The user to ensure that the flat ends of the articles faces the direction of traveling and escapes routes, to prevent possible injury or damage to property such as cutting of tyres.
Ensure easy accessibility	Inadequate access, difficult loading	The user to ensure that demarcated areas is used and a sufficient perimeter for traveling with a forklift is available for safe handling and loading of the articles to prevent any injury or damage to property which might result in a financial loss as well.
Safeguard against natural elements	Rain, poor visibility at night time	The user must as far reasonably practicable ensure the articles are stored under cover from the natural elements, whether a under roof store or articles covered with plastic.

C - **RECOMMENDED SAFE WORKING PRACTICE FOR LOADING, TRANSPORT AND OFF-LOADING OF ARTICLES BY USER:**

Activity	Potential Hazard	Recommendation/Controls
Loading	Unsafe loading with forklift	User to ensure bundles are strapped properly when loaded with forklift, to ensure safe loading. The load must be balanced on forklift by loading bundle with the forks in centre of bundle.
	Using a defective forklift for loading	The user only to use a well maintained and in proper condition forklift for loading the articles, using a defective forklift might result in injury or property damage because of the nature of the articles being loaded.
	Using a insufficient capacity forklift for loading	User to ensure before loading any bundles that the forklift is of a minimum capacity of 2-tons to ensure safe loading of the articles to prevent any injury resulting from the forklift capsizing because of the load.
	Insufficient space for loading with forklift	The user to ensure demarcated areas are available for stacking of articles and sufficient clear space is available for loading the articles to prevent any possible injury or damage to property.
	Using an unskilled forklift operator	Due to the nature of the articles being supplied the user should only use skilled operators to load the articles to prevent any possible injury and damage to property and to ensure safe loading.
	Bystanders in vicinity whilst forklift is loading/transporting articles	Due the nature of the articles to be transported it is recommended that the user ensures that a minimum clearance of at least 10m is maintained between the forklift and any bystanders to prevent possible injury and damage to property.
	Unsafe stacking of articles by forklift in designated areas for further distribution	It is recommended that the articles are placed on ground level and no stacking to any height should be permitted, to reduce the possibility of articles falling onto employees and to facilitate for safer loading onto material cars by hand.
	Bundle straps broken or loose	Any loose bundles with broken straps should be secured before loading by using a temporary strap for transport to avoid any loose articles falling of forklift in transit.

Activity	Potential Hazard	Recommendation/Controls
	Protruding sharp edges from bundle being transported by forklift	User to ensure sufficient space whilst traveling with load and any bystanders not to be closer than 10m from moving forklift with load to prevent any possible injury and damage to property.
	Handling articles manually	Articles are supplied in bundles of quantities of five to ten per bundle strapped with three straps to facilitate safer manual handling, it is recommended that all bundles are loaded with two employees assisting each other to prevent back injuries, falling bundles and foot and hand injuries. All employees should use the prescribed PPE for handling material. Bundles range in weight from 10kg to 30kg and where possible bundles should rather be loaded using a forklift to reduce the exposure of manual handling.
	Loading on an unsecured material car	Before any bundles are loaded onto material cars the material should be secured by means of sprags to ensure a stable car for loading the articles, to prevent any possible runaway cars and ultimately injuries to employees.
	Load not secured onto material car	The load should be secured onto material car by using chains to secure load if it is a flat car, if a open material car is used the load should be secured by chaining the articles together in a bundle to secure the load and prevent any articles from falling off/out the material car.
	Sharp ends protruding from material car	When loading the articles it is recommended that the load is secured properly and no sharp ends protrude from the side of the material car to prevent any injury or property damage. If the articles are loaded into an open container the sharp ends should always point away from the direction of travel to minimize the possibility of employees being injured by the sharp edges. The articles are supplied with sharp ends and washers on both sides of the bundles for the reason of balancing the bundle for safer strapping and transport. Some bundles are supplied with washers on the top in the centre of the bundle.

Activity	Potential Hazard	Recommendation/Controls
	Overloading material car	It is recommended that the user determine the safe load capacity for the type of material cars being used on site for safe loading of articles and prevention of over loading.
	Loading defective articles	Supplier to supply user with examples of usable and non-usable articles. Any defective articles observed by the user should be discarded and not loaded for use to prevent the sub standard installation of support and possible injury and property damage.
	Incorrect material car used for loading articles	The user to determine the most suitable material car for loading the articles which will be safe and most suitable for articles being loaded to prevent any possible injury, property damage and financial loss.
	Incorrect stacking of articles on material car	As far as reasonably practicable the articles should be loaded lying flat on the material car, to prevent falling off bundles and ensuring adequate clearances at all times.
	Using a defective material car	Before any loading of articles is done the user to ensure the car is in good operational order to prevent any possible injury, damage to property or financial loss.
	Bundles being loaded by one person without assistance	Bundles should always be loaded with two employees assisting each other to avoid possible injury to employees.

Activity	Potential Hazard	Recommendation/Controls
Transport	Derailments	User to adhere to mine standards whilst transporting the articles and ensure proper track maintenance for safe transport.
	Bundles falling off	Before any transport with articles is done the user to ensure the bundles are strapped and secured onto the material car to avoid any bundles from falling off.
	Transport at high speed	Due to the nature of the articles being transported it is important for the user to adhere to mine standards and always maintain a reasonable speed during transport to prevent any derailments or road accidents and subsequent losses that may occur
	Items protruding from side	User to ensure before transporting articles that there is no protruding ends from the material cars to prevent any possible losses; transport crews should at regular intervals check the load for being in tact.
	Bundles becoming loose	During transport vibration could cause bundles becoming loose and therefore the user from time to time should inspect the bundles for being in tact.
	Articles transported to incorrect destination	Material cars used for transporting the articles should be clearly marked for required destination, and sufficient stock levels should be maintained to avoid the possibility of articles being transported to the incorrect destination having an impact on the safety of any working section.
	Inadequate clearances for transport	The correct material cars should be used and correct loading should be done to transport the articles. Transport should be done with adequate clearances prevailing at all times.
	Transporting material car by hand	User to ensure that the car is not over loaded, any material car with articles transported by hand should have a guard at least 30m in front of the car and sufficient warning signals and lights to be used to ensure safe transport by hand.
	Using defective loco for transport	User only to use serviceable locos for transport and ensure a pre-use check has been conducted before transporting the articles by loco.

Activity	Potential Hazard	Recommendation/Controls
	Not securing material car in cage for transport	The user should ensure that cars loaded with the articles are loaded and secured in the cage in such a manner that the articles always points to the rear of the cage and never to the front, to prevent the articles from protruding from the conveyance at any time.
	Transporting articles by hand	Employees required to transport articles by hand should do so with never less than two employees assisting each other and carrying the articles below shoulder height to prevent any possible injury to employees or over exertion whilst carrying the articles
	Transporting articles by mono winch or scraper winch	User never to use scraper winch for the transport of articles. Transporting articles with a mono winch the user to ensure the articles are properly suspended and traveling ways are clear for transporting the articles, to prevent any possible injury to employees and property damage. If the articles are used for the first time in a section, which will use a mono winch for transport purposes, the user to first investigate the mono way to ensure the article will pass through all access routes without any impact on any employee's safety or possible damage to property.
	Transporting articles with TM3 equipment	The user to ensure that only designated TM3 equipment is used for the transport of the articles, and the load is properly secured for transport purposes, to prevent any possible injury, property damage or financial loss.
	Overloading of transport equipment with articles	User to ensure that the correct transport equipment is utilized to prevent overloading of roof bolts. User never to allow overloaded transport equipment to convey articles to prevent any injury, product damage and property damage due to the size and weight of the product.
	Unavailability of transport equipment	User to ensure that proper transport planning is conducted to ensure that transport is available at all times to transport the articles being critical safety items to required destinations. User to ensure that properly maintained vehicles are used for this purpose, and proper control systems are in place to ensure safe transport operations.

Activity	Potential Hazard	Recommendation/Controls
Off-loading	Unsafe off-loading	The user to ensure the employees responsible for off-loading is adequately trained in the safe off-loading procedures to prevent possible injury and damage to property.
	Off-loading in wrong area	Material cars should be clearly marked for the required designated area of delivery and sufficient stock levels to be maintained by sections to prevent this occurrence having an impact on the employee and property safety.
	Bundle strapping loose	User to ensure the employees responsible for off-loading has the required PPE to do so and loose strapping to be removed before actually off-loading the articles to prevent any possible injury to employees.
	Sharp edges on articles	User to ensure the employees responsible for off-loading has the required PPE to do so and loose strapping to be removed before actually off-loading the articles to prevent any possible injury to employees.
	Sharp edges on steel strapping	User to remove the strapping prior to off-loading the articles to ensure a lower possibility of employees being injured.
	Off-loading into traveling and escape ways	User to ensure at all times that articles are off-loaded in the designated areas and never in front of escape routes, to prevent the obstruction of these routes.
	Insufficient assistance for off-loading	User to ensure at all times that two or more people are assisting each other in the off-loading of the articles to prevent any exertion or possible injury.

D - RECOMMENDED SAFE WORKING PRACTICE FOR THE STORAGE OF ARTICLES UNDERGROUND BY THE USER:

Activity	Potential Hazard	Recommendation/Controls
Ensure a safe area for storage purposes	Unsafe area, falls of ground, inadequate ventilation, excessive water, gasses, poor illumination, uneven surfaces	The user to identify an area for storage purposes and have a competent person examine the area before being used as a store facility. Storing areas should be easily accessible from traveling ways from which off-loading takes place. The area should be well ventilated and illuminated and free of gasses to ensure it is safe at all times.
Area demarcated for article storage.	Area not demarcated, mixed with other articles	The user to demarcate a specific area for the articles and as far as reasonably practicable avoids storing articles with other products, which might hamper the access to the articles.
Ensure correct stack height	Stacking to high, incorrect stacking	The user to ensure the maximum stacking height does not exceed knee height.
Ensure sufficient clearances between articles and traveling ways	Inadequate clearances, obstructed traveling ways, slip and fall, damage by rolling stock or TM3 equipment	The user to ensure that a sufficient clearance as specified by the mine standard is adhered to at all times to prevent any possible injury or damage to property.
Ensure sharp ends not protruding from stored stack	Sharp edges	As far as reasonably practicable ensure that a sharp edges point away from traveling ways and adequate clearances prevails at all times. Employees handling the articles should always ensure the required PPE is used.
Ensure easy accessibility	Poor accessibility, inadequate clearances	Because the articles are classified as safety critical items, the articles should be easily accessible at any point in time.
Safeguard against natural elements	Underground water, gasses	The user to ensure the storage area is well ventilated and as dry as reasonably practicable to prevent the articles from rusting. The user to ensure the articles is not exposed to natural underground water that continuously drips on articles, which might result in the articles becoming defective.

E - **RECOMMENDED SAFE WORKING PROCEDURE FOR THE INSTALLATION OF ROOF BOLTS BY THE USER UNDERGROUND:**

1. MECHANICAL ROOF BOLT WITHOUT GROUTING

Activity	Potential Hazard	Recommendation/Controls
Ensure immediate area is safe	Area not barred, not inspected by competent person, gasses/fumes, falls of ground, water, loose material on ground, steep areas, slip and fall, bystanders, electrical equipment, sockets/misfires, geological features, moving conveyance, tip areas, no PPE, poor ventilation, poor visibility	The user to ensure a competent person establishes a safe working area, and clearly mark any geological features and take the necessary precautions before any work commences, to reduce the possibility of any injury, property damage or financial loss.
Install temporary support	No temporary support used, incorrect temporary support used	No attempt to be made to install any form of support unless temporary support is adequately installed and over inspected by a competent person before any work commences, to reduce the possibility of injury, property damage or any financial loss.
Ensure required equipment is available for task to be performed	Using sub standard equipment, using defective grout pumps, using defective support articles, inadequate PPE, using equipment unsafely, employees not trained on use of equipment	The user to ensure that only skilled and properly trained employees are used to install support with equipment fit for the task to be performed to reduce the possibility of any injury, property damage and financial loss. It is important for the user to involve the supplier on specific training requirements for employees as far as the use of the articles are concerned so that the supplier could issue the user with relevant safe working procedures. The user to ensure the employees is issued with the required PPE to ensure the safe performance of the task.
Drill required length of hole □ 0.9m □ 1.0m □ 1.2m □ 1.5m □ 1.8m □ 2.1m, or □ 2.4m	Holes drilled too short, Holes not drilled to required direction to strata, inadequate spacing between holes, holes drilled too long, correct length of drill steel not available	The user to ensure that a competent person indicates the position of holes to be drilled as per required mine standard, and the correct length of drill steel is available for the task. A competent person to conduct regular planned task observations on the drilled holes for correct direction and length. Employees to be trained on the consequences of incorrectly drilled holes to prevent the possibility of injury, property damage and financial loss.

Activity	Potential Hazard	Recommendation/Controls
Ensure required diameter of hole	Hole diameter to big or small, correct size drill bits not available, incorrect drill bits available	The user to follow the supplier's recommendations on hole diameter. User to have a go, no go measuring gauge available. Employees to be trained in the correct use and importance of the measuring gauge. No installation to take place unless the hole is of specified diameter to prevent possible injury, property damage and financial loss.
Remove shell from mechanical roof bolt assembly	Not removing shell, loosing the shell	The user to remove the shell and place in such a place that the shell can easily be found and be replaced on the stud, or have a measuring stick available at all times which will eliminate the practice of removing the shell for testing the length of hole.
Measure the drilled hole with stud	Falling/slipping stud	The user to ensure the employee use stud with extreme caution to prevent the stud from slipping and falling, which may damage the stud and ultimately result in sub standard installations. It is recommended that a measuring stick be available at all times to eliminate this practice.
Replace shell on mechanical roof bolt stud	Missing shell, thread damage, not properly securing shell on stud	No article to be installed unless the shell has firmly been replaced on the stud.
Remove plastic sleeve from shell	Sleeve not removed	The user to train employees with the involvement of the supplier in the importance of removing the sleeve.
Push mechanical roof bolt assembly into hole by hand until bearing plate reaches hanging wall to ensure roof bolt is completely inserted	Slipping and falling roof bolt	The user to ensure employees is properly trained with the involvement of the supplier on the correct technique for pushing in the roof bolt.
Turn mechanical roof bolt stud anti clockwise by hand to allow expansion of the shell and sufficient to allow roof bolt to remain in hole for further tensioning	Slipping and falling bolt from hole	The user to train employees with the involvement of the supplier in the correct method of turning the stud and securing it in the hole for further tensioning.
Tension mechanical roof bolt crimp nut until the stud protrudes from the back of crimp nut to a minimum size equal to the thickness of the bearing plate.	Inadequate tensioning, excessive strain by manual tensioning, unsafe use of equipment for mechanical tensioning, slip and fall	The user to train employees with the involvement of the supplier on the correct method of tensioning the roof bolt and ensure the correct tensioning equipment is available and in good order for use.
Remove temporary support to ensure completion of installation	Unsafe removal of temporary support, removing temporary support pre maturely, slip and fall	The user to ensure employees is equipped with remote release equipment and support not to be removed until the bolt is properly tensioned.

2. MECHANICAL ROOF BOLT WITH HOLE PRE-GROUTED

Activity	Potential Hazard	Recommendation/Controls
Ensure immediate area is safe	Area not barred, not inspected by competent person, gasses/fumes, falls of ground, water, loose material on ground, steep areas, slip and fall, bystanders, electrical equipment, sockets/misfires, geological features, moving conveyance, tip areas, no PPE, poor ventilation, poor visibility	The user to ensure a competent person establishes a safe working area, and clearly mark any geological features and take the necessary precautions before any work commences, to reduce the possibility of any injury, property damage or financial loss.
Install temporary support	No temporary support used, incorrect temporary support used	No attempt to be made to install any form of support unless temporary support is adequately installed and over inspected by a competent person before any work commences, to reduce the possibility of injury, property damage or any financial loss.
Ensure required equipment is available for task to be performed	Using sub standard equipment, using defective grout pumps, using defective support articles, inadequate PPE, using equipment unsafely, employees not trained on use of equipment	The user to ensure that only skilled and properly trained employees are used to install support with equipment fit for the task to be performed to reduce the possibility of any injury, property damage and financial loss. It is important for the user to involve the supplier on specific training requirements for employees as far as the use of the articles are concerned so that the supplier could issue the user with relevant safe working procedures. The user to ensure the employees is issued with the required PPE to ensure the safe performance of the task.

Activity	Potential Hazard	Recommendation/Controls
Drill required length of hole - 0.9m - 1.0m - 1.2m - 1.5m - 1.8m - 2.1m, or - 2.4m	Holes drilled too short, Holes not drilled to required direction to strata, inadequate spacing between holes, holes drilled too long, correct length of drill steel not available	The user to ensure that a competent person indicates the position of holes to be drilled as per required mine standard, and the correct length of drill steel is available for the task. A competent person to conduct regular planned task observations on the drilled holes for correct direction and length. Employees to be trained on the consequences of incorrectly drilled holes to prevent the possibility of injury, property damage and financial loss.
Ensure required diameter of hole	Hole diameter to big or small, correct size drill bits not available, incorrect drill bits available	The user to follow the supplier's recommendations on hole diameter. User to have a go, no go measuring gauge available. Employees to be trained in the correct use and importance of the measuring gauge. No installation to take place unless the hole is of specified diameter to prevent possible injury, property damage and financial loss.
Remove shell from mechanical roof bolt assembly	Not removing shell, loosing the shell	The user to remove the shell and place in such a place that the shell can easily be found and be replaced on the stud, or have a measuring stick available at all times which will eliminate the practice of removing the shell for testing the length of hole.
Measure the drilled hole with stud	Falling/slipping stud	The user to ensure the employee use stud with extreme caution to prevent the stud from slipping and falling, which may damage the stud and ultimately result in sub standard installations. It is recommended that a measuring stick be available at all times to eliminate this practice.
Replace shell on mechanical roof bolt stud	Missing shell, thread damage, not properly securing shell on stud	No article to be installed unless the shell has firmly been replaced on the stud.

Activity	Potential Hazard	Recommendation/Controls
Push grout tube to back of hole	Grout tube not pushed to back of hole, no grout tube available, damaged grout tube	The user to ensure the correct length and diameter grout tube is available and regular planned task observations to be conducted by the supervisor and area reps from supplier to ensure the correct pushing of the grout tube in the hole is conducted.
Place pump able grout into hole with pump through grout tube until hole is completely filled	Incorrect consistency of the grout, defective grout pump, inadequate pressure, not fully grouting holes, alkalinity of grout, loose hose fittings and perished hoses, poor quality of grout, shortage of grout	User to use pre- mixed grout from a reputable grout supplier to ensure a good quality grout. No articles to be installed unless the grout pump and equipment is in a good operational order that will ensure a good quality of installation. Employees to be trained with the involvement from the supplier on proper installation of grout procedure and the hazard and risks involved in the use of grout, and the control measures to be adhered to safeguard themselves against the hazards and risks. The employees must at all times use the correct and sufficient PPE supplied to them by the user.
Remove grout tube from hole	Unsafe extraction of grout tube, spilling grout	User to ensure employees are using proper PPE to protect them against the grout spillage, and prevent the tube from bending whilst removing it from the hole.
Remove plastic sleeve from shell	Sleeve not removed	The user to train employees with the involvement of the supplier in the importance of removing the sleeve.
Push mechanical roof bolt assembly into hole by hand as far as possible, and use machine and air leg to push mechanical roof bolt until bearing plate reaches hanging wall to ensure roof bolt is completely inserted	Slipping machine and air leg, slip and fall, not ensuring the bolt is completely inserted	The user to ensure employees is properly trained with the involvement of the supplier on the correct technique for pushing in the roof bolt.
Turn mechanical roof bolt stud anti clockwise by mechanical means to allow expansion of the shell and tension crimp nut until stud protrudes from the back of the crimp nut to a minimum size equal to the thickness of the bearing plate	Inadequate tensioning, excessive strain by manual tensioning, unsafe use of equipment for mechanical tensioning, slip and fall	The user to train employees with the involvement of the supplier on the correct method of tensioning the roof bolt and ensure the correct tensioning equipment is available and in good order for use.
Remove temporary support to ensure completion of installation	Unsafe removal of temporary support, removing temporary support pre maturely, slip and fall	The user to ensure employees is equipped with remote release equipment and support not to be removed until the bolt is properly tensioned.

3. MECHANICAL ROOF BOLT WITH HOLE POST-GROUTED WITHOUT GROUT TUBES

Activity	Potential Hazard	Recommendation/Controls
Ensure immediate area is safe	Area not barred, not inspected by competent person, gasses/fumes, falls of ground, water, loose material on ground, steep areas, slip and fall, bystanders, electrical equipment, sockets/misfires, geological features, moving conveyance, tip areas, no PPE, poor ventilation, poor visibility	The user to ensure a competent person establishes a safe working area, and clearly mark any geological features and take the necessary precautions before any work commences, to reduce the possibility of any injury, property damage or financial loss.
Install temporary support	No temporary support used, incorrect temporary support used	No attempt to be made to install any form of support unless temporary support is adequately installed and over inspected by a competent person before any work commences, to reduce the possibility of injury, property damage or any financial loss.
Ensure required equipment is available for task to be performed	Using sub standard equipment, using defective grout pumps, using defective support articles, inadequate PPE, using equipment unsafely, employees not trained on use of equipment	The user to ensure that only skilled and properly trained employees are used to install support with equipment fit for the task to be performed to reduce the possibility of any injury, property damage and financial loss. It is important for the user to involve the supplier on specific training requirements for employees as far as the use of the articles are concerned so that the supplier could issue the user with relevant safe working procedures. The user to ensure the employees is issued with the required PPE to ensure the safe performance of the task.

Activity	Potential Hazard	Recommendation/Controls
Drill required length of hole - 0.9m - 1.0m - 1.2m - 1.5m - 1.8m - 2.1m, or - 2.4m	Holes drilled too short, Holes not drilled to required direction to strata, inadequate spacing between holes, holes drilled too long, correct length of drill steel not available	The user to ensure that a competent person indicates the position of holes to be drilled as per required mine standard, and the correct length of drill steel is available for the task. A competent person to conduct regular planned task observations on the drilled holes for correct direction and length. Employees to be trained on the consequences of incorrectly drilled holes to prevent the possibility of injury, property damage and financial loss.
Ensure required diameter of hole	Hole diameter to big or small, correct size drill bits not available, incorrect drill bits available	The user to follow the supplier's recommendations on hole diameter. User to have a go, no go measuring gauge available. Employees to be trained in the correct use and importance of the measuring gauge. No installation to take place unless the hole is of specified diameter to prevent possible injury, property damage and financial loss.
Remove shell from mechanical roof bolt assembly	Not removing shell, loosing the shell	The user to remove the shell and place in such a place that the shell can easily be found and be replaced on the stud, or have a measuring stick available at all times which will eliminate the practice of removing the shell for testing the length of hole.
Measure the drilled hole with stud	Falling/slipping stud	The user to ensure the employee use stud with extreme caution to prevent the stud from slipping and falling, which may damage the stud and ultimately result in sub standard installations. It is recommended that a measuring stick be available at all times to eliminate this practice.
Replace shell on mechanical roof bolt stud	Missing shell, thread damage, not properly securing shell on stud	No article to be installed unless the shell has firmly been replaced on the stud.
Remove crimp nut and bearing plate and plastic sleeve from shell	Loosing the nut and bearing plate	The user to ensure the nut and bearing plate is placed where it can easily be found and replaced when required.
Push stud and shell assembly into hole leaving a minimum of 100mm protruding from hole	Slipping and falling roof bolt	The user to ensure employees is properly trained with the involvement of the supplier on the correct technique for pushing in the roof bolt.

Activity	Potential Hazard	Recommendation/Controls
Turn stud anti clockwise by hand to allow expansion of shell to prevent bolt from falling out and to facilitate grouting without the bolt being pushed further up the hole	Slipping and falling bolt from hole	The user to train employees with the involvement of the supplier in the correct method of turning the stud and securing it in the hole.
Place grout tube over roof bolt and push tube to back of hole up to shell	Not pushing tube to the back of hole	The user to ensure the correct length and diameter tube is used and regular planned task observations to be conducted by supervisors and area reps from suppliers on the performance of this task.
Place pump able grout into hole with pump through grout tube until hole is completely filled	Incorrect consistency of the grout, defective grout pump, inadequate pressure, not fully grouting holes, alkalinity of grout, loose hose fittings and perished hoses, poor quality of grout, shortage of grout	User to use pre- mixed grout from a reputable grout supplier to ensure a good quality grout. No articles to be installed unless the grout pump and equipment is in a good operational order that will ensure a good quality of installation. Employees to be trained with the involvement from the supplier on proper installation of grout procedure and the hazard and risks involved in the use of grout, and the control measures to be adhered to safeguard themselves against the hazards and risks. The employees must at all times use the correct and sufficient PPE supplied to them by the user. The grout tube must have a minimum annulus of 8mm between the bolt and grout tube inner wall.
Remove grout tube from hole	Unsafe extraction of grout tube, spilling grout	User to ensure employees are using proper PPE to protect them against the grout spillage, and prevent the tube from bending whilst removing it from the hole.
Clean roof bolt threats from excess grout	Not removing access grout	Nut not to be replaced on stud unless stud is completely cleared from access grout.
Replace bearing plate and crimp nut	Lost nuts and plates, not replacing nut and plate	The user to ensure the nut and bearing plate is placed where it can easily be found and replaced when required.
Tension crimp nut until stud protrudes from back of crimp nut for a minimum size of bearing plate thickness	Inadequate tensioning, excessive strain by manual tensioning, unsafe use of equipment for mechanical tensioning, slip and fall	The user to train employees with the involvement of the supplier on the correct method of tensioning the roof bolt and ensure the correct tensioning equipment is available and in good order for use.
Remove temporary support to ensure completion of installation	Unsafe removal of temporary support, removing temporary support pre maturely, slip and fall	The user to ensure employees is equipped with remote release equipment and support not to be removed until the bolt is properly tensioned.

F - RECOMMENDED SAFE WORKING PRACTICE FOR MAINTENANCE ON THE ARTICLES BY THE USER

Component	Potential Hazard	Recommendation/Controls
Roof bolts	Excessive corrosion on threaded portions, articles stored for a long period of time and components becoming missing, damaged articles	If it is foreseen that the articles is stored for a long period of time the user must maintain the roof bolts by lubricating the threat ends and ensure the loose components are kept in tact with the roof bolts to ensure complete and no defective articles when required for use.

G - RECOMMENDED SAFE WORKING PROCEDURE FOR INSPECTION ON THE ARTICLES AND COMPONENTS BY THE USER BEFORE INSTALLATION:

Component	Check/Test	Recommended controls
Mechanical Roof bolts		
Bail	In tact with leave assembly, not bend	Do not man handle the unit which may cause the bail to be damaged or separated from leave assembly
Leaves sub assembly	Check spot weld in tact, check for cracks, ensure all leaves are in tact, leaves should not be bend, check for excessive rust	Do not abuse or miss use the assembly, ensure correctly stored. Poor manufacturing reported to supplier. Do not use or issue product if leave assembly damaged.
Plug	Check plug in tact with assembly	If plug is missing do not issue or use article.
Plug thread	Not damaged, free running	If rusted lubricate to ensure free running, if not free running do not issue for use.
Plastic sleeve	Plastic sleeve in tact	Employees to be made aware of importance and purpose of plastic sleeve and the consequences if prematurely removed
Deformed bar	Not bend, not excessively corroded	Ensure it stored in a safe place and if any damages observed article not to be used or issued
Stud threaded ends	Thread not damaged, rust, not covered with debris, correct assembly of components	Ensure assembly with nut on long threaded side and shell assembly on short threaded side. Ensure threads are free of debris.
Bearing plate	In tact, not damaged, burrs, wrong way around	Ensure in tact, not to supply units without bearing plate. Ensure bearing plate dome faces the nut before using item.
Bearing plate dome	Not flat, not cracked	If cracked do not issue for use.
Bearing plate hole	Test nut not going through hole, burrs, centre on dome	Place nut or seat against plate, if any light is transferred through the hole on the side of the nut, the plate should not be used.
Bearing plate dog ear	In tact and not excessively bended	Do not issue and use if excessively damaged.
Bearing plate dog ear hole	Check that a minimum of 5mm thickness prevails to any edge of the plate.	Not to use or issue or use as utility hanger if a minimum of 5mm to any edge does not prevail on the plate from the hole.
Hemispherical seat	In tact, not damaged or cracked, free running, flat end facing nut	Ensure the seat is in tact and the flat end faces the nut. Do not issue or use item if seat is not in tact.
Hexagonal crimped nut	In tact, crimped, not stripped	Do not issue or use if not crimped and notify supplier immediately.

Component	Check/Test	Recommended controls
Fully threaded mechanical Roof bolts		
Bail	In tact with leave assembly, not bend	Do not man handle the unit which may cause the bail to be damaged or separated from leave assembly
Leaves sub assembly	Check spot weld in tact, check for cracks, ensure all leaves are in tact, leaves should not be bend, check for excessive rust	Do not abuse or miss use the assembly, ensure correctly stored. Poor manufacturing reported to supplier. Do not use or issue product if leave assembly damaged.
Plug	Check plug in tact with assembly	If plug is missing do not issue or use article.
Plug thread	Not damaged, free running	If rusted lubricate to ensure free running, if not free running do not issue for use.
Plastic sleeve	Plastic sleeve in tact	Employees to be made aware of importance and purpose of plastic sleeve and the consequences if prematurely removed
Fully threaded stud	Not bend, not excessively corroded, not stripped or damaged	Ensure it stored in a safe place and if any damages observed article not to be used or issued
Bearing plate	In tact, not damaged, burrs, wrong way around	Ensure in tact, not to supply units without bearing plate. Ensure bearing plate dome faces the nut before using item.
Bearing plate dome	Not flat, not cracked	If cracked do not issue for use.
Bearing plate hole	Test nut not going through hole, burrs, centre on dome	Place nut against plate, if any light is transferred through the hole on the side of the nut, the plate should not be used.
Bearing plate dog ear	In tact and not excessively bended	Do not issue and use if excessively damaged.
Bearing plate dog ear hole	Check that a minimum of 5mm thickness prevails to any edge of the plate.	Not to use or issue or use as utility hanger if a minimum of 5mm to any edge does not prevail on the plate from the hole.
Hexagonal dome nut	In tact, not damaged or cracked, free running, flat end facing nut	Ensure the seat is in tact and the flat end faces the nut. Do not issue or use item if seat is not in tact.

H - RECOMMENDED INSPECTION PROCEDURE FOR INSPECTION ON THE ARTICLES AND COMPONENTS BY THE USER AFTER INSTALLATION:

Component	Check/Test	Recommended controls
Mechanical Roof bolts		
Bail	Not visible after installation	
Leaves sub assembly	Not visible after installation	
Plug	Not visible after installation	
Plug thread	Not visible after installation	
Plastic sleeve	Not visible after installation	
Deformed bar	Not visible after installation	
Stud threaded ends	The thread protrudes a minimum distance of the bearing plate thickness behind the nut	Re-tension until the thread protrudes a minimum distance equal to the thickness of the bearing plate behind the nut.
Bearing plate	Firm against hang/side wall, plate not missing	Re-tension until plate firm with hang/side wall. If plate is missing re-install new unit with plate.
Bearing plate dome	Maximum dome and nut / seat contact, dome facing correct direction pointing to nut	Remove nut and turn plate correct way around.
Bearing plate hole	Not visible after installation	
Bearing plate dog ear	In tact and not excessively bended	Do not issue and use if excessively damaged.
Bearing plate dog ear hole	Check that a minimum of 5mm thickness prevails to any edge of the plate.	Not to use or issue or use as utility hanger if a minimum of 5mm to any edge does not prevail on the plate from the hole.
Hemispherical seat	Maximum contact with dome, correct way around with flat end facing nut, in tact, damaged	Ensure seat in tact and maximum contact with dome.
Hexagonal crimped nut	Crimp has been broken, not stripped	Re-tension to break crimp or notify supplier if crimp does not brake.

Component	Check/Test	Recommended controls
Fully threaded mechanical Roof bolts		
Bail	Not visible after installation	
Leaves sub assembly	Not visible after installation	
Plug	Not visible after installation	
Plug thread	Not visible after installation	
Plastic sleeve	Not visible after installation	
Fully threaded stud	Must not protrude for an access of 100mm	Loosen nut, turn stud clockwise, one full turn, and try to push further into hole if successful turn anti clockwise until firm and re-tension nut. If not successful then re-install new unit.
Bearing plate	Firm against hang/side wall, plate not missing	Re-tension until plate firm with hang/side wall. If plate is missing re-install new unit with plate.
Bearing plate dome	Maximum dome and nut / seat contact, dome facing correct direction pointing to nut	Remove nut and turn plate correct way around.
Bearing plate hole	Not visible after installation	
Bearing plate dog ear	In tact and not excessively bended	Do not issue and use if excessively damaged.
Bearing plate dog ear hole	Check that a minimum of 5mm thickness prevails to any edge of the plate.	Not to use or issue or use as utility hanger if a minimum of 5mm to any edge does not prevail on the plate from the hole.
Hexagonal nut	In tact, secured	If not in tact, replace and secure.

I - RECOMMENDATIONS FOR PREVENTION OF ARTICLE AND COMPONENT FAILURE

MECHANICAL ROOF BOLTS

Components	Cause of failure	Recommendation
Bail	Sheared by bolt, ground water	User not to use bails which is rusted or corroded. If rusted place oil on bail to reduce chance of corrosion.
Leaves sub assembly	Poor manufacturing, man handling, abuse, wrong diameter hole	Any defective leaf sub assembly on an item should not be allowed to be used or installed.
Plug	Poor quality, ground water	Any visible defects observed on the plug should allow the user not to use the article. Oil plug before installation if rusted to ensure free running.
Plug thread	Improper storage, ground water, abuse, rain	Oil if rusted and ensure proper storage.
Plastic sleeve	Man handling, abuse	Employees to be trained by supplier and user on the importance and function of sleeves.
Deformed bar	Poor quality steel, excessive loads applied, ground water	User to ensure proper support pattern designed.
Stud threaded ends	Improper design, over tensioning, ground water, overload	User to ensure proper support pattern designed.
Bearing plate	Ground water	If excessive rust or corrosion is detected, consider new installation.
Bearing plate dome	Excessive load	If dome collapses it indicates excessive pressure is applied to the bolt. Install new bolt and revise support pattern design.
Bearing plate hole	Ground water, excessive load	If hole wears out the bearing plate will become loose which will indicate a new installation is required.
Hemispherical seat	Poor quality	Any cracked seat observed should indicate a new installation.
Hexagonal crimped nut	Poor quality, poor manufacturing	If crimp brakes premature contact supplier immediately. If nut strips off install new unit and contact supplier.

FULLY THREADED MECHANICAL ROOF BOLT

Components	Cause of failure	Recommendation
Bail	Sheared by bolt, ground water	User not to use bails which is rusted or corroded. If rusted place oil on bail to reduce chance of corrosion.
Leaves sub assembly	Poor manufacturing, man handling, abuse, wrong diameter hole	Any defective leaf sub assembly on an item should not be allowed to be used or installed.
Plug	Poor quality, ground water	Any visible defects observed on the plug should allow the user not to use the article. Oil plug before installation if rusted to ensure free running.
Plug thread	Improper storage, ground water, abuse, rain	Oil if rusted and ensure proper storage.
Plastic sleeve	Man handling, abuse	Employees to be trained by supplier and user on the importance and function of sleeves.
Fully threaded stud	Improper design, over tensioning, ground water, overload	User to ensure proper support pattern designed.
Bearing plate	Ground water	If excessive rust or corrosion is detected, consider new installation.
Bearing plate dome	Excessive load	If dome collapses it indicates excessive pressure is applied to the bolt. Install new bolt and revise support pattern design.
Bearing plate hole	Ground water, excessive load	If hole wears out the bearing plate will become loose which will indicate a new installation is required.
Bearing plate dog ear	Misuse	Ensure sufficient access to hole, especially after installation.
Bearing plate dog ear hole	Excessive load, poor manufacturing	Do not use as a utility hanger for a weight of more than 250kg, if worn or torn do not use as a utility hanger at all and replace bearing plate if required for suspension.
Hexagonal nut	Excessive tension	Never use a nut which is defective for any installation.

J - RECOMMENDATIONS FOR THE PREVENTION OF SURFACE AND UNDERGROUND IMPACTS ON THE ARTICLES

Unit	Potential Hazard	Recommendation
Underground	Misused for pins etc., build store gates, used as concrete re-enforcing, building racks, used as hand rails, used as burglar bars, used for step ladders, used for barricades, used for modifications on equipment, used as grizzly segments, used as hooks on tip, used for suspension, used in stores for hanging material, ground water, corrosion, rust	Articles only to be used for purpose being supplied for, always remember these articles are classified as critical safety articles.
Surface	Concrete re-enforcing, garden chairs and equipment, used in flower beds, used as gates, used as burglar bars, used as fencing, Theft for home use, rain, soled as raw material, used by shaft and engineering people for lifting or moving equipment	Articles only to be used for purpose being supplied for, always remember these articles are classified as critical safety articles.

DESIGN INTENTION

ROOF BOLTS - To provide a cost effective method of active / passive rock support. To provide quick and safer working environments for rock miner's underground. With ergonomics and employees health and safety in mind the roof bolt was designed for easy handling and installation to enhance the safety of the working environments.

ADVANTAGES:

- Cost effective;
- Easy to install;
- Quick to install;
- Easy to maintain;
- Choice between active / passive support;
- Minimum labour required for installation;
- Easy to handle;
- Minimum storage space required;
- No fire hazard;
- Durable;
- Enhances safety of work environment;
- Enhances safety on the face;
- Reduces rock falls;
- Reduce production loss;
- Enhanced cleaning operations;
- Reduced injuries;
- Gives visual indication of stressed areas
- Gives opportunity to support between packs;
- Reduced transport / shaft times and costs;
- Various lengths and diameters available;
- Prolongs rock integrity;
- Supplied as complete unit;
- Enhances life of mine.

DISADVANTAGES:

- Could cause injury if not handled properly;
- Ineffective without components;
- Co-operation between grout and bolt suppliers a necessity;
- Good supervision required;
- Very little indication of pressure build up high up in the strata;
- Corrosive;
- Burrs and sharp strap ends;
- Components loose easily;
- Installation adaptors required for installation

7. CONCLUSION

This risk assessment is not absolute and should always be seen as a live document, because risk assessment in any form is a process and not a once-off activity.

Part of this process is that the user receiving the risk assessment from the supplier should scrutinize it, make recommendation or relevant comments and contribute to the assessment to make it more suitable and sufficient and thus more applicable for the proper use of the articles.

Should any recommendations be made from the user, or the supplier should add or remove anything as far as the design of the article is concerned, such recommendations or changes should be incorporated into this risk assessment, thus, and the risk assessment should be revised for its adequacy.

Most importantly is that the user should take the recommended specified steps made by the supplier, evaluate them for practical implementation, and incorporate the information into the organizations specific training material, and train employees accordingly? This must be done to ensure the employees responsible for using the articles are familiar with potential hazards and risks they or any other employee might be exposed to. Only then one can ensure as far as reasonably practicable the articles will be used properly.

If any significant problems or health and safety issues are identified by the user, and the user would like to bring it under the attention of the supplier, the supplier can be contacted at the following numbers:

Office : **011- 824 8660**
info@rscekusasa.co.za
Web Address: **www. rscekusasa.co.za**

8. APPENDICES

1. RISK MEASUREMENT INDEX

2. DRAWINGS

3. QUALITY ASSURANCE

4. WRITTEN UNDERTAKING FROM USER – FORMAT EXAMPLE

1. RISK MEASUREMENT INDEX

CONSEQUENCES (Worst case scenario if hazard should realize)	Index Value	Result
Catastrophic (many fatalities or damage over R100,000,000)	100	
Disaster (a few fatalities or damage over R10,000,000)	40	
Very Serious (one fatality or damage over R1,000,000)	15	
Serious (serious injury or damage over R 100,000)	7	
Important (temporary disability or damage over R10,000)	3	
Of Concern (minor injury or damage over R1,000)	1	

EXPOSURE (How often hazardous event occurs or is present)	Index Value	Result
Continuous (many times daily)	10	
Frequent (once daily)	6	
Occasionally (once per week to monthly)	3	
Unusual (once / month to once / year)	2	
Rare (yearly)	1	
Very rarely (not known to have occurred but remotely possible)	0.5	

PROBABILITY (Chance of loss / harm during the exposure period) Current controls / safeguards in place to be objectively assessed for sufficiency.	Index Value	Result
Is the most likely and expected result if event occurs	10	
Quite possible (50/50 chance)	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)	0.1	

RISK RESULT = CONSEQUENCE x EXPOSURE x PROBABILITY

RISK CLASSIFICATION

MORE THAN 400	**Very High Risk, immediate correction with high level input**
200 to 400	**High Risk, immediate correction required**
70 to 200	**Substantial Risk, correction needed**
20 to 70	**Possible Risk, attention indicated**
LESS THAN 20	**Risk perhaps tolerable as is**

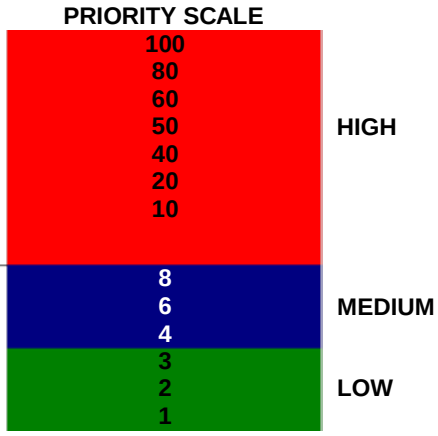
RISK REDUCTION

% REDUCTION	DESCRIPTION	VALUE
10%	SMALL	6
20%	SMALL	4
50%	EFFECTIVE	3
75%	VERY EFFECTIVE	2
100%	ELIMINATED	1

ESTIMATED COSTS

More than R1 000 000	10
R500 000 – R1 000 000	6
R100 000 – R500 000	4
R50 000 – R100 000	3
R20 000 – R50 000	2
R10 000 – R20 000	1
Less than R10 000	0.5

PRIORITY = $\dfrac{\textit{RISK RESULT}}{\textbf{RISK REDUCTION x ESTIMATED COST}}$



2. DRAWINGS

Refer to the attached file *Drawings*

4. QUALITY ASSURANCE

Refer to the attached file *Quality Assurance*

6. WRITTEN UNDERTAKING FROM USER – FORMAT EXAMPLE

Organization:

Division:

Mine:

Date:

Herewith a written undertaking, to take all specified steps sufficient to ensure, as far as reasonably practicable, that the articles will be used properly, and in such a manner that it will not effect the health and safety of persons working there with or in the vicinity of working with the articles.

It is herewith we the user accepts the information supplied to be sufficient in ensuring the proper use of the articles.

Signed on the _____ of _____ 20___, at _____

Manager:

Engineer:

Risk Manager:

Quality Control Officer:

Training Manager: