

TABLE OF CONTENTS

	Page
1. INTRODUCTION	3 - 5
2. SCOPE OF WORK	6 - 7
3. EXECUTIVE SUMMARY	8 - 14
4. RISK ASSESSMENT DATABASE	15 - 129
5. SPECIFICATIONS	130
6. DESIGN INTENTION	131 - 133
7. CONCLUSION	134 - 135

**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

**REV. BRM
01**

8. APPENDICES:

136 - 160

- 1. RISK MEASUREMENT INDEX**
- 2. SPECIFICATIONS**
- 3. IDENTIFICATION TAG EXAMPLE / PROOF OF DELIVERY NOTE EXAMPLE**
- 4. QUALITY CONTROL**
- 5. COMPANY OVERVIEW**
- 6. WRITTEN UNDERTAKING FROM USER - FORMAT EXAMPLE**



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1. INTRODUCTION

BRC Mesh Reinforcing (Pty) Ltd is one of the reinforcing steel contractors holdings group of companies, which is owned by reinforcing steel holdings.

BRC Mesh Reinforcing (Pty) Ltd was formed in 1991 as a result of the acquisition of BRC weld mesh (Pty) Ltd by Mesh Reinforcing (Pty) Ltd.

Both of these original companies were very well known in the welded mesh and wire industry through out South Africa and the rest of the world.

This company employs the latest plant and technology in the manufacture of its products and the members of its management and staff apply expertise in both production and marketing.

The range of products the company produces is enormous, catering for the industry and the private consumer. The spectrum of applications covers agriculture, civil engineering, mining, tunneling, sea and river embanking as well as fencing of homes, parks, golf courses and high security areas.

BRC Mesh Reinforcing (Pty) Ltd supplies welded mesh to the mining industry where the product is used by the mine, and contractors for the mine, for installation.



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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, erects 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.

(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.”

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 articles by user**
1. **Welded mesh installation with Sheppard crooks, lacing clips and washers**
 2. **Welded mesh installation with Sheppard crook and lacing clips without washers**
 3. **Welded mesh installation with split sets, lacing clips and washers**
 4. **Welded mesh installation with roof bolts, lacing clips, washer and nut**
- F** - **Stripping of installed welded mesh**
- 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 welded mesh considered activities such as loading, off-loading, transport, storage, installation, stripping, and inspections, which are typical activities the user performance when ever 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** - Shortage of product
- **Transport** - Public roads and road users
- **Off-loading** - No forklift for off-loading
- Manual off-loading

B - **Storage of articles on surface by user:**

- Ensure correct stacking of articles
- Ensure sufficient clearances between articles and raveling ways.

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

- **Loading** - Manual loading
- **Transport** - Articles transported to incorrect destination
- **Off-loading** - Inadequate clearances for off-loading

D - Storage of articles underground by user:

- Ensure correct clearances

E - Installation of articles by user

1. Welded mesh installation with Sheppard crooks, lacing clips and washers

- Cut roll straps and roll out welded mesh
- Grout holes

2. Welded mesh installation with Sheppard crook and lacing clips without washers

- Cut roll straps and roll out welded mesh
- Grout holes

3. Welded mesh installation with split sets, lacing clips and washers

- Cut roll straps and roll out welded mesh

4. Welded mesh installation with roof bolts, lacing clips, washer and nut

- Cut roll straps and roll out welded mesh
- Install roof bolt washer and nut

F - Stripping of installed mesh by user

- Not ensuring a competent person in charge of activities

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**

- Failure of 4mm Galvanized longitudinal and cross wire

J - **Underground and surface impacts on articles**

- Underground impacts

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 weld mesh 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;

BRC
MESH AND WIRE
DIVISION

RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS

Jan-10

REV. BRM
01

- Less falls of ground occurrences;
- Improved production;
- Financial gain;
- Improved health and safety work environment and
- Improved workforce output.



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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:

- a. Risk profiles
- b. Hazard identification and risk measurement database
- c. Recommended safe working procedures/practices

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RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS

Jan-10

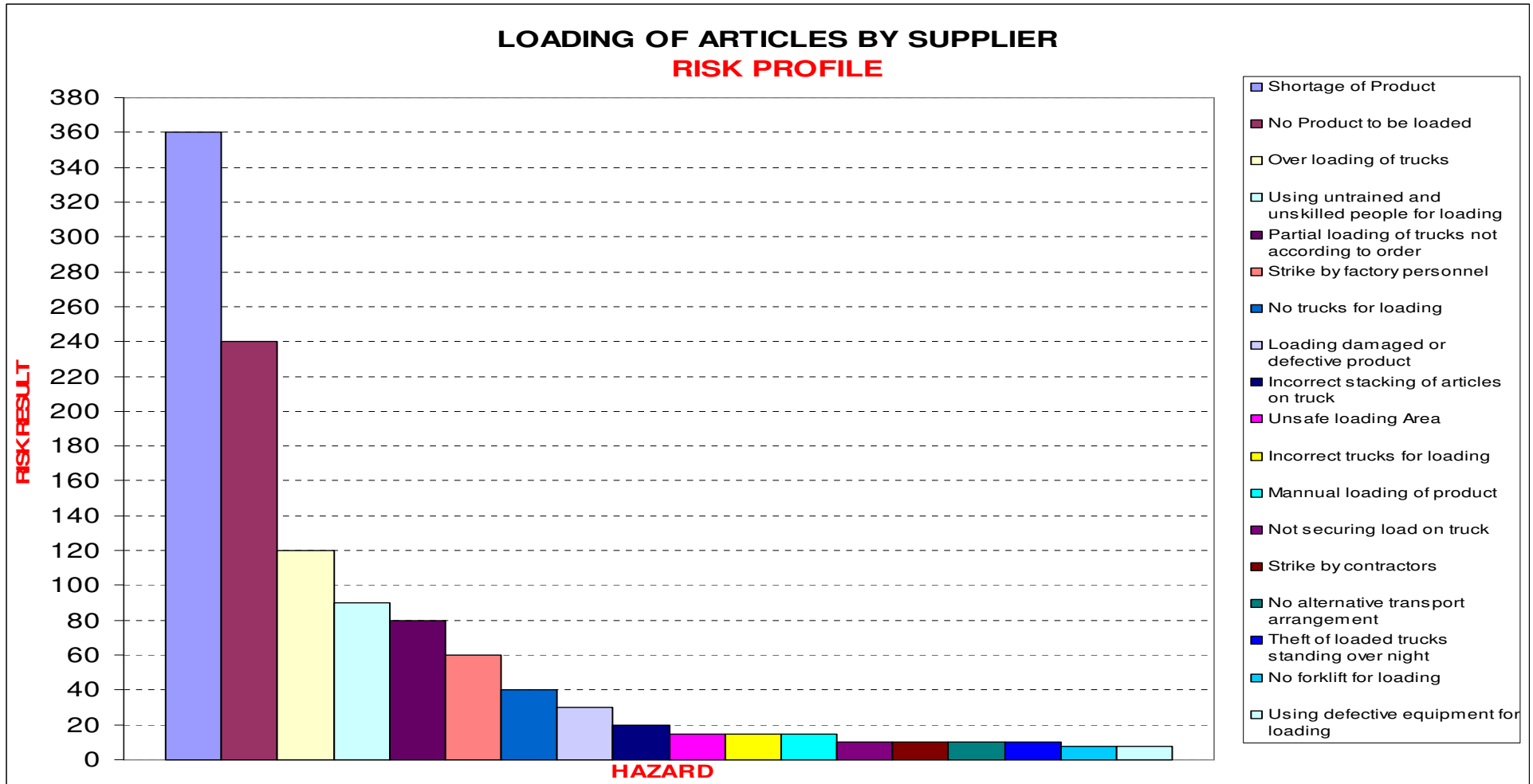
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A - LOADING, TRANSPORT AND OFF-LOADING OF ARTICLES BY SUPPLIER:



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

No	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
1.	Loading	No product to be loaded	Delayed delivery, down time, possible production loss, financial loss, loss of trade	40	2	3	240	BRC has alternative suppliers; production is increased to ensure a sufficient stock level, streamlined production line increases stock levels. With BRC's increasing support from the mining industry as suppliers of welded mesh products for support, BRC considers implementing additional manufacturing equipment to enable them to supply the mining industry with welded mesh and maintain sufficient stock levels.
		Shortage of product	Delayed delivery, down time, possible production loss, financial loss, loss of trade	40	3	3	360	BRC has alternative suppliers; production is increased to ensure a sufficient stock level, streamlined production line increases stock levels. With BRC's increasing support from the mining industry as suppliers of welded mesh products for support, BRC considers implementing additional manufacturing equipment to enable them to supply the mining industry with welded mesh and maintain sufficient stock levels.
		Loading damaged or defective product	Defective product supplied to user, sub standard installation, possible injury, property damage, financial loss, down time, possible production loss, loss of trade	15	2	1	30	BRC has a quality control system in place, which uses inspection systems and tags to ensure a quality product is loaded and despatch of. The despatch supervisor inspects and oversees loading of product as well as the transport supervisor and will remove any damaged or defective product not fit for transport or use.
		Unsafe loading area	Possible injury, damage to property, damage to equipment and product, financial loss, delayed deliveries, down time, loss of trade	15	2	0.5	15	The factory has good and proper loading areas using overhead cranes with adequate clearances to ensure safe loading at all times. Forklift used for loading has adequate space to move safely about loading the product. All loading is done under direct supervision by the transport and despatch supervisor.

**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

**REV. BRM
01**

No	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
		No trucks for loading	Delayed delivery, down time, possible production loss, financial loss, loss of trade	40	1	1	40	BRC uses a reputable contractor for transport, alternative transport contractors are available. RSC has trucks available for transport. With current controls in place BRC will be able to meet all orders and welded mesh requirements.
		Incorrect trucks for loading	Insufficient product delivered to user, over loading of truck, break down of truck, partial loading of order, financial loss, down time, loss of trade	15	2	0.5	15	BRC uses a reputable contractor for transport, alternative transport contractors are available. RSC has trucks available for transport. With current controls in place BRC will be able to meet all orders and welded mesh requirements.
		No forklift for loading	Manual handling of product, injury, down time, delays, possible production losses, loss of trade	15	1	0.5	7.5	Maintenance schedule is in place for forklifts, competent drivers of the forklifts are used. A sufficient amount of forklifts are available for loading should one have a breakdown.
		Strike by factory personnel	Delayed delivery, down time, possible production loss, financial loss, loss of trade	40	0.5	3	60	An open door policy and participation by employees prevails. Job security and motivational schemes and a sound workforce. Alternative arrangements are in place to ensure that production will not be affected by a strike, and these arrangements are reviewed annually.
		Using untrained and unskilled people for loading	Delayed delivery, down time, possible production loss, financial loss, loss of trade, possible injury, product damage, property damage	15	2	3	90	Supervisors are in place that oversees the loading of the product and ensures that only trained and skilled people are used for loading purposes. The company uses reputable training resources to conduct in house training. BRC to investigate the possibility of drafting a training manual that will serve as proof of the workforce competency levels as far as the manufacturing and handling of the product is concerned.
		Using defective equipment for loading	Delayed delivery, down time, possible production loss, financial loss, loss of trade, possible injury, product damage, property damage	15	0.5	1	7.5	The group consist of a maintenance division that ensures all assets are maintained in a serviceable condition at all times. Contractor company does crane and accessory maintenance.

**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

REV. **BRM**
01

No	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
		Incorrect stacking of articles on truck	Falling articles from truck, uncontrollable truck, road accidents, delayed delivery, down time, possible production loss, financial loss, loss of trade, possible injury, product damage, property damage	40	0.5	1	20	Supervisors are in place that oversees the loading of the product and ensures that only trained and skilled people are used for loading purposes. A standing rule of the company with the transport contractor is that no truck is allowed to leave the premises unless the load is declared competent for transport by the despatch and contractor supervisor. The truck driver is allowed to refuse to move the truck if the truck is not correctly loaded. Should the user observe any incorrect loading of trucks which may hamper the off-loading of the articles the user to contact the supplier to ensure the correct stacking of articles at all times.
		Not securing load on truck	Falling articles from truck, uncontrollable truck, road accidents, delayed delivery, down time, possible production loss, financial loss, loss of trade, possible injury, product damage, property damage	40	0.5	0.5	10	Supervisors are in place that oversees the loading of the product and ensures that only trained and skilled people are used for loading purposes. A standing rule of the company with the transport contractor is that no truck is allowed to leave the premises unless the load is declared competent for transport by the despatch and contractor supervisor. The truck driver is allowed to refuse to move the truck if the truck is not correctly loaded. Should the user observe any unsecured loads the user to contact the supplier to ensure the correct securing of articles at all times.
		Over loading of trucks	Unstable loads, breakdowns, illegal, falling product, road accidents, injury, property damage, product loss, financial loss, loss of trade	40	1	3	120	Supervisors are in place that oversees the loading of the product and ensures that only trained and skilled people are used for loading purposes. A standing rule of the company with the transport contractor is that no truck is allowed to leave the premises unless the load is declared competent for transport by the despatch and contractor supervisor. The truck driver is allowed to refuse to move the truck if the truck is not correctly loaded. Should the user observe any overloading the user to contact the supplier to ensure the correct loading of articles at all times.

**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

REV. **BRM**
01

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
		Partial loading of trucks not according to order	Possible production loss, down time, financial loss, cancellation of orders, loss of trade, increased transport costs	40	2	1	80	Transport supervisor ensures the delivery schedule overseen by the warehouse manger is adhered to, to ensure the correct quantity of product is delivered as ordered.
		Strike by contractors	Delayed delivery, down time, possible production loss, financial loss, loss of trade, possible injury, product damage, property damage	40	0.5	0.5	10	BRC uses a reputable contractor for transport, alternative transport contractors are available. RSC has trucks available for transport. With current controls in place BRC will be able to meet all orders and welded mesh requirements.
		No alternative transport arrangements	Delayed delivery, down time, possible production loss, financial loss, loss of trade, possible injury, product damage, property damage	40	0.5	0.5	10	Annual review of transport contractor contracts. Alternative transport contractors available and RSC has trucks available for delivery purposes.
		Theft of loaded trucks standing over night	Delayed delivery, down time, possible production loss, financial loss, loss of trade, possible injury, product damage, property damage	40	0.5	0.5	10	Security contractors are used for ensuring good security around the premises; razor welded mesh and electric gates secure the property. There is controlled entrance and exit.
		Manual loading of product	Down time, delayed deliveries, injury, financial losses, production losses	15	1	1	15	The company discourages manual handling therefore forklifts are available to ensure sound ergonomics principles are adhered to and the risk of possible injury due to manual handling is reduced to a minimum.

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

Activity	Potential Hazard	Recommendation/Controls
Loading	No product to be loaded	BRC has alternative suppliers; production is increased to ensure a sufficient stock level, streamlined production line increases stock levels. With BRC's increasing support from the mining industry as suppliers of welded mesh products for support, BRC considers implementing additional manufacturing equipment to enable them to supply the mining industry with welded mesh and maintain sufficient stock levels.
	Shortage of product	BRC has alternative suppliers; production is increased to ensure a sufficient stock level, streamlined production line increases stock levels. With BRC's increasing support from the mining industry as suppliers of welded mesh products for support, BRC considers implementing additional manufacturing equipment to enable them to supply the mining industry with welded mesh and maintain sufficient stock levels.
	Loading damaged or defective product	BRC has a quality control system in place, which uses inspection systems and tags to ensure a quality product is loaded and dispatch of. The dispatch supervisor inspects and oversees loading of product as well as the transport supervisor and will remove any damaged or defective product not fit for transport or use.
	Unsafe loading area	The factory has good and proper loading areas using overhead cranes with adequate clearances to ensure safe loading at all times. Forklift used for loading has adequate space to move safely about loading the product. All loading is done under direct supervision by the transport and dispatch supervisor.
	No trucks for loading	BRC uses a reputable contractor for transport, alternative transport contractors are available. With current controls in place BRC will be able to meet all orders and welded mesh requirements.
	Incorrect trucks for loading	BRC uses a reputable contractor for transport, alternative transport contractors are available With current controls in place BRC will be able to meet all orders and welded mesh requirements.
	No forklift for loading	Maintenance schedule is in place for forklifts, competent drivers of the forklifts are used. A sufficient amount of forklifts are available for loading should one have a breakdown.

**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

REV. **BRM**
01

Activity	Potential Hazard	Recommendation/Controls
	Strike by factory personnel	An open door policy and participation by employees prevails. Job security and motivational schemes and a sound workforce. Alternative arrangements are in place to ensure that production will not be affected by a strike, and these arrangements are reviewed annually.
	Using untrained and unskilled people for loading	Supervisors are in place that oversees the loading of the product and ensures that only trained and skilled people are used for loading purposes. The company uses reputable training resources to conduct in house training. BRC to investigate the possibility of drafting a training manual that will serve as proof of the workforce competency levels as far as the manufacturing and handling of the product is concerned.
	Using defective equipment for loading	The group consists of a maintenance division that ensures all assets are maintained in a serviceable condition at all times. Contractor company does crane and accessory maintenance.
	Incorrect stacking of articles on truck	Supervisors are in place that oversees the loading of the product and ensures that only trained and skilled people are used for loading purposes. A standing rule of the company with the transport contractor is that no truck is allowed to leave the premises unless the load is declared competent for transport by the dispatch and contractor supervisor. The truck driver is allowed to refuse to move the truck if the truck is not correctly loaded. Should the user observe any incorrect loading of trucks which may hamper the off-loading of the articles the user to contact the supplier to ensure the correct stacking of articles at all times.
	Not securing load on truck	Supervisors are in place that oversees the loading of the product and ensures that only trained and skilled people are used for loading purposes. A standing rule of the company with the transport contractor is that no truck is allowed to leave the premises unless the load is declared competent for transport by the dispatch and contractor supervisor. The truck driver is allowed to refuse to move the truck if the truck is not correctly loaded. Should the user observe any unsecured loads the user to contact the supplier to ensure the correct securing of articles at all times.
	Over loading of trucks	Supervisors are in place that oversees the loading of the product and ensures that only trained and skilled people are used for loading purposes. A standing rule of the company with the transport contractor is that no truck is allowed to leave the premises unless the load is declared competent for transport by the dispatch and contractor supervisor. The truck driver is allowed to refuse to move the truck if the truck is not correctly loaded. Should the user observe any overloading the user to contact the supplier to ensure the correct loading of articles at all times.



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**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

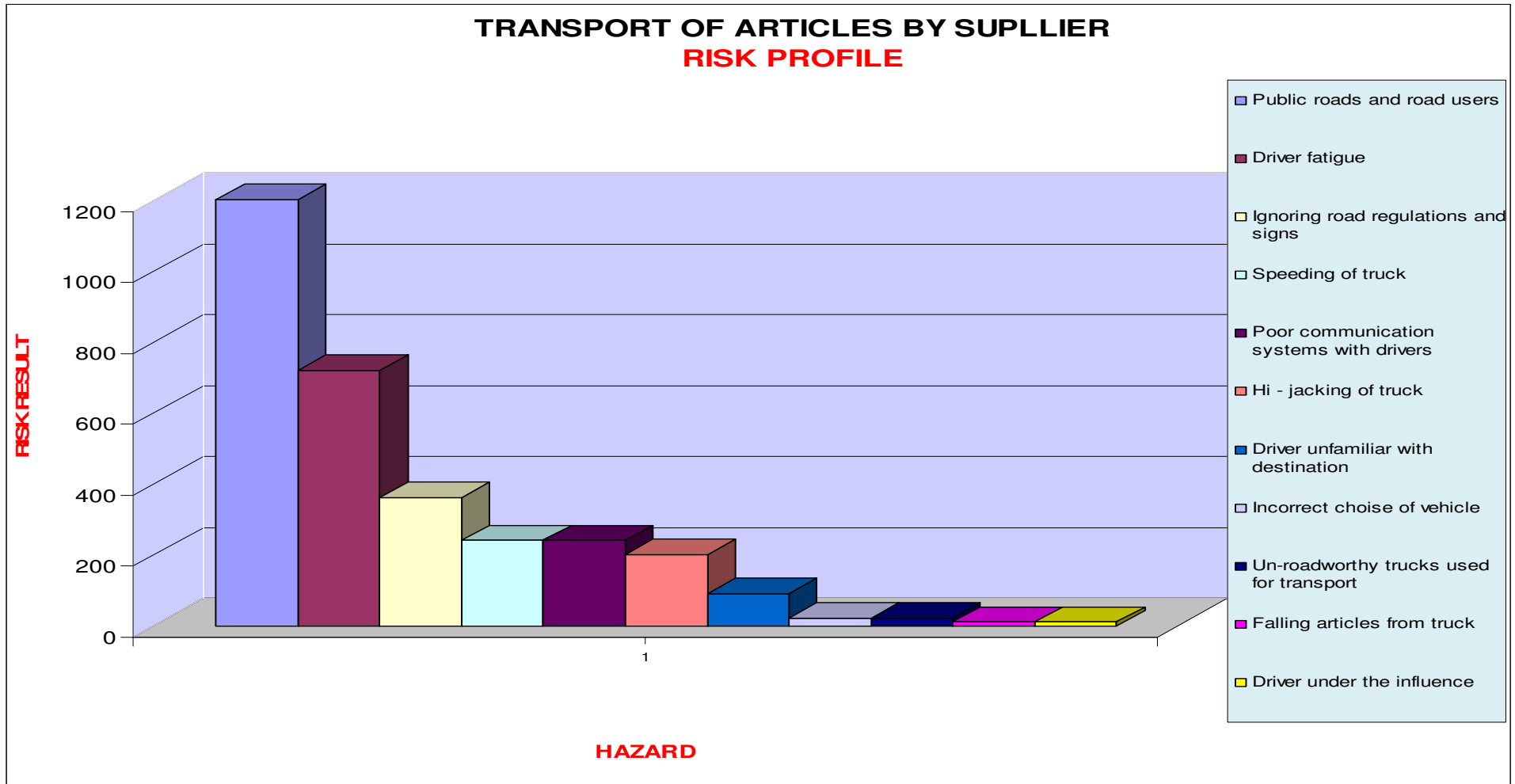
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Activity	Potential Hazard	Recommendation/Controls
	Partial loading of trucks not according to order	Transport supervisor ensures the delivery schedule overseen by the warehouse manger is adhered to, to ensure the correct quantity of product is delivered as ordered.
	Strike by contractors	BRC uses a reputable contractor for transport, alternative transport contractors are available for transport. With current controls in place BRC will be able to meet all orders and welded mesh requirements.
	No alternative transport arrangements	Annual review of transport contractor contracts. Alternative transport contractors
	Theft of loaded trucks standing over night	Security contractors are used for ensuring good security around the premises; razor welded mesh and electric gates secure the property. There is controlled entrance and exit.
	Manual loading of product	The company discourages manual handling therefore forklifts are available to ensure sound ergonomics principles are adhered to and the risk of possible injury due to manual handling is reduced to a minimum.



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**BRC
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DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

REV. **BRM**
01

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
2.	Transport	Falling articles from truck	Road accidents, product damage, delayed deliveries, production loss, down time, financial loss, loss of trade, injury	40	0.5	0.5	10	The load is tied down and secured with strapping, wire and chains to ensure the load is competent and articles will not fall from truck whilst in transport. Drivers do continuous inspections on the articles to ensure it is in order at all times.
		Hi-jacking of truck	Delayed delivery, down time, possible production loss, financial loss, loss of trade, possible injury, product damage, property damage	40	10	0.5	200	Radio communication with drivers are in place for quick reaction if hi-jacked, high volume traffic routes are used for delivery purposes to reduce possibilities of hi-jacking.
		Speeding with truck	Road accidents, product damage, delayed deliveries, production loss, down time, financial loss, loss of trade, injury	40	2	3	240	BRC uses a reputable contractor for transport, and track record serves as proof of speeding trucks being a rare occurrence.
		Public roads and road users	Road accidents, product damage, delayed deliveries, production loss, down time, financial loss, loss of trade, injury	40	10	3	1200	BRC uses a reputable contractor for transport, and track record serves as proof of sound transport activities being the order of the day.
		Ignoring road regulations and signs	Road accidents, product damage, delayed deliveries, production loss, down time, financial loss, loss of trade, injury	40	3	3	360	BRC uses a reputable contractor for transport, and track record serves as proof of sound transport activities being the order of the day.
		Driver fatigue	Road accidents, product damage, delayed deliveries, production loss, down time, financial loss, loss of trade, injury	40	3	6	720	BRC uses a reputable contractor for transport, and track record serves as proof of sound transport activities being the order of the day.

**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

REV. **BRM**
01

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
		Driver under the influence	Road accidents, product damage, delayed deliveries, production loss, down time, financial loss, loss of trade, injury	40	0.5	0.5	10	BRC uses a reputable contractor for transport, and track record serves as proof of sound transport activities being the order of the day.
		Un-roadworthy trucks used for transport	Road accidents, product damage, delayed deliveries, production loss, down time, financial loss, loss of trade, injury	40	0.5	1	20	On signing up as the transport contractor, the contractor is scrutinized by the supplier for adequacy as far as road worthy vehicles is concerned.
		Drivers unfamiliar with destination	Delayed deliveries, production loss, down time, financial loss, loss of trade, injury	15	2	3	90	Continuous radio contact with drivers, same drivers used for specific areas which they are well familiar with. Drivers have road maps available for clear directions.
		Poor communication systems with drivers	Delayed deliveries, production loss, down time, financial loss, loss of trade, injury, hi-jacking	40	2	3	240	BRC uses a reputable contractor and the track record serves as proof of sound communications systems with the drivers.
		Incorrect choice of vehicle	Delayed deliveries, production loss, down time, financial loss, loss of trade, injury, insufficient space at delivery point to turn truck around, off-loading in wrong area	15	2	1	30	Field marketing personnel supplies feedback to the transport contractor on the most suitable truck to be used for specific destinations.

Activity	Potential Hazard	Recommendation/Controls
Transport	Falling articles from truck	The load is tied down and secured with strapping, wire and chains to ensure the load is competent and articles will not fall from truck whilst in transport. Drivers do continuous inspections on the articles to ensure it is in order at all times.
	Hi-jacking of truck	Radio communication with drivers are in place for quick reaction if hi-jacked, high volume traffic routes are used for delivery purposes to reduce possibilities of hi-jacking.
	Speeding with truck	BRC uses a reputable contractor for transport, and track record serves as proof of speeding trucks being a rare occurrence.
	Public roads and road users	BRC uses a reputable contractor for transport, and track record serves as proof of sound transport activities being the order of the day.
	Ignoring road regulations and signs	BRC uses a reputable contractor for transport, and track record serves as proof of sound transport activities being the order of the day.
	Driver fatigue	BRC uses a reputable contractor for transport, and track record serves as proof of sound transport activities being the order of the day.
	Driver under the influence	BRC uses a reputable contractor for transport, and track record serves as proof of sound transport activities being the order of the day.
	Un-roadworthy trucks used for transport	On signing up as the transport contractor, the contractor is scrutinized by the supplier for adequacy as far as road worthy vehicles is concerned.
	Drivers unfamiliar with destination	Continuous radio contact with drivers, same drivers used for specific areas which they are well familiar with. Drivers have road maps available for clear directions.
	Poor communication systems with drivers	BRC uses a reputable contractor and the track record serves as proof of sound communications systems with the drivers.
	Incorrect choice of vehicle	Field marketing personnel supplies feedback to the transport contractor on the most suitable truck to be used for specific destinations.

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
3.	Off-loading	No demarcated area for off-loading	Off-loading in wrong area, obstruction of travelling, escape routes, electrical installations and emergency services, time delay, double handling of product, damage to product, financial loss, injury, property damage	15	1	0.5	7.5	User to ensure a demarcated area is available for off-loading of the articles to ensure drivers become familiar with the demarcated areas to ensure speedy off-loading of articles. The demarcated areas should be adequate in space and clearances to ensure safe off-loading by using a forklift to prevent any possibility of injury or down time during the off-loading activity.
		Truck on uneven or unstable surface for off-loading	Stacks rolling off truck, unbalanced loaded forklift, injury, product damage, property damage, down time, financial loss, forklift falling over, loss of trade	15	3	0.5	22.5	User to ensure the truck is always parked on an even and stable surface for off-loading the articles, due to the nature of the articles being stacked on the truck an unstable or uneven surface could result in the articles rolling from the truck having far reaching consequences to the employees responsible for off-loading.
		No forklift for off loading	Result in manual off-loading, time delay, injury, possible product damage, financial loss, down time, property damage	15	3	3	135	User to ensure that a serviceable forklift is available for off-loading of articles to prevent the possibility of injury or property damage due to manual off-loading. Should manual off-loading take place for whatever reason the user to ensure that a minimum of four people is used to handle a roll of welded mesh to prevent the possibility of over exertion and injuries. People doing manual off loading should be vigilant and use the necessary PPE to perform the task safely.
		Manual off-loading	Time delay, injury, possible product damage, financial loss, down time, property damage	15	3	3	135	User to ensure that a serviceable forklift is available for off-loading of articles to prevent the possibility of injury or property damage due to manual off-loading. Should manual off-loading take place for whatever reason the user to ensure that a minimum of four people is used to handle a roll of welded mesh to prevent the possibility of over exertion and injuries. People doing manual off loading should be vigilant and use the necessary PPE to perform the task safely.

**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

REV. **BRM**
01

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
		Off-loading in wrong area	Obstruction of travelling, escape routes, electrical installations and emergency services, time delay, double handling of product, damage to product, financial loss, injury, property damage	15	1	0.5	7.5	User to ensure a demarcated area is available for off-loading of the articles to ensure drivers become familiar with the demarcated areas to ensure speedy off-loading of articles. The demarcated areas should be adequate in space and clearances to ensure safe off-loading by using a forklift to prevent any possibility of injury or down time during the off-loading activity.
		Inadequate moving space or clearances for off-loading	Time delay, injury, possible product damage, financial loss, down time, property damage	15	1	0.5	7.5	User to ensure that sufficient space and clearances is maintained at all times for safe off-loading of truck using a forklift to reduce the possibility of any injury, damage to product or property damage.
		Welded mesh strapping coming loose	Injury, down time, delays, obstruction of travelling and escape routes	7	0.5	0.1	0.375	User to ensure that any roll of welded mesh which has loose strapping should be secured before the roll is handled in any way to ensure the roll is safe for handling and transport

Activity	Potential Hazard	Recommendation/Controls
Off-loading	No demarcated area for off-loading	User to ensure a demarcated area is available for off-loading of the articles to ensure drivers become familiar with the demarcated areas to ensure speedy off-loading of articles. The demarcated areas should be adequate in space and clearances to ensure safe off-loading by using a forklift to prevent any possibility of injury or down time during the off-loading activity.
	Truck on uneven or unstable surface for off-loading	User to ensure the truck is always parked on an even and stable surface for off-loading the articles, due to the nature of the articles being stacked on the truck an unstable or uneven surface could result in the articles rolling from the truck having far reaching consequences to the employees responsible for off-loading.
	No forklift for off loading	User to ensure that a serviceable forklift is available for off-loading of articles to prevent the possibility of injury or property damage due to manual off-loading. Should manual off-loading take place for whatever reason the user to ensure that a minimum of four people is used to handle a roll of welded mesh to prevent the possibility of over exertion and injuries. People doing manual off loading should be vigilant and use the necessary PPE to perform the task safely.
	Manual off-loading	User to ensure that a serviceable forklift is available for off-loading of articles to prevent the possibility of injury or property damage due to manual off-loading. Should manual off-loading take place for whatever reason the user to ensure that a minimum of four people is used to handle a roll of welded mesh to prevent the possibility of over exertion and injuries. People doing manual off loading should be vigilant and use the necessary PPE to perform the task safely.
	Off-loading in wrong area	User to ensure a demarcated area is available for off-loading of the articles to ensure drivers become familiar with the demarcated areas to ensure speedy off-loading of articles. The demarcated areas should be adequate in space and clearances to ensure safe off-loading by using a forklift to prevent any possibility of injury or down time during the off-loading activity.
	Inadequate moving space or clearances for off-loading	User to ensure that sufficient space and clearances is maintained at all times for safe off-loading of truck using a forklift to reduce the possibility of any injury, damage to product or property damage.
	Welded mesh strapping coming loose	User to ensure that any roll of welded mesh which has loose strapping should be secured before the roll is handled in any way to ensure the roll is safe for handling and transport

BRC
MESH AND WIRE
DIVISION

RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS

Jan-10

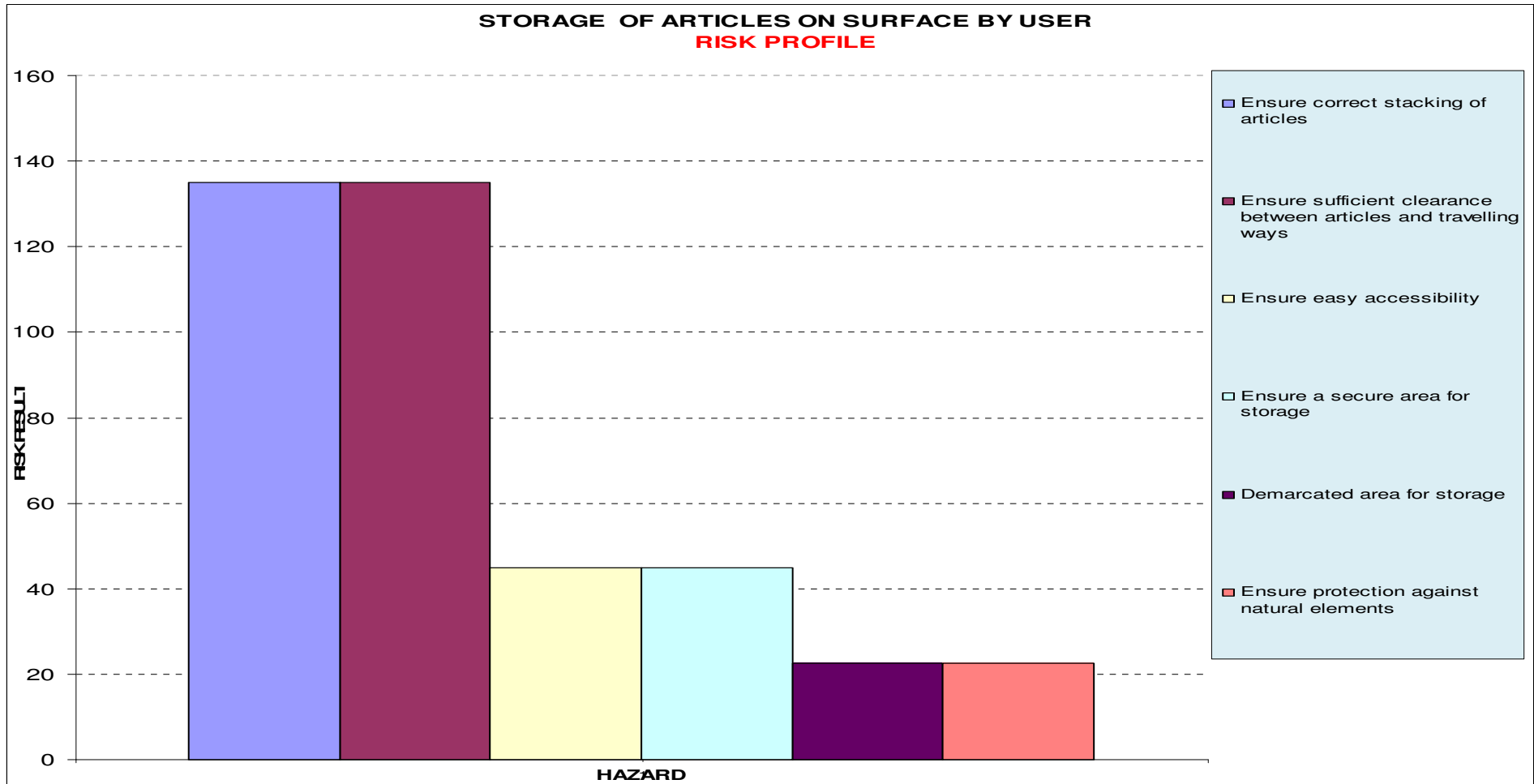
REV. BRM
01

B - STORAGE OF ARTICLES ON SURFACE BY USER:



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B - STORAGE OF ARTICLES ON SURFACE BY USER:

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
1.	Demarcated area for storage	No demarcated area for storage, dumping or storage of articles in wrong and confined areas, blockage of travelling ways and emergency services, incorrect stacking, difficult loading of articles	Time delay, possible production loss, possible injury to people, financial loss, possible damage to property	15	3	0.5	22.5	BRC has marketing personnel in the field available for any assistance with regards to method of storage and most suitable demarcation of areas for storage purposes. User to ensure that a sufficient demarcated area is available for the volume of articles to be delivered for use by the mine.
2.	Ensure correct stacking of articles	Incorrect stacking, stacking articles to high, falling stacks, protruding sharp edges, stacking articles standing up straight	Injury to people and property, damage to product, financial loss	15	3	3	135	BRC has marketing personnel available in the field for assistance with regard to correct stacking of articles. As far as reasonably practicable the user to ensure that a maximum of six roles are laid on the ground and a maximum of five roles of welded mesh is stacked on top in a pyramid shape, user to block end roles on the bottom with stop block, to prevent roles at bottom sliding and giving way causing stack to fall and causing possible injury or damage.
3.	Ensure sufficient clearances between articles and travelling ways	Insufficient clearances, sharp edges in travelling ways, blocked entrances and exists, difficult loading with forklift	Possible injury, time delay, product damage, financial loss, property damage	15	3	3	135	BRC has marketing personnel in the field that can assist with regard to safe clearances between the articles and travelling ways. User to ensure that sufficient clearances between articles and travelling ways are maintained at all times to allow easy access by a forklift and ensure that no entrances or exists are blocked in any manner, to ensure safe handling and loading of articles.
4.	Ensure easy accessibility	No accessibility, restrictions, climbing over stacks, falling from stacks, improper loading	Possible injury, property damage, product damage, financial loss, time delay, production down time	15	3	1	45	BRC has personnel in the field for assistance with regards to ensure easy accessibility when storing the articles. User to ensure that sufficient accessibility is maintained to allow the articles to be loaded by forklifts or cranes, to prevent any restrictions, which may result in possible injury, product or property damage and ultimately production down time.

**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

REV. **BRM**
01

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
5.	Ensure a secure a area for storage	Inadequate secured area, theft	Financial loss, loss of product, down time	15	6	0.5	45	The welded mesh is classified as a critical safety item and range in cost of R400-00 to R500-00 per role of welded mesh and the user should ensure adequate and secured areas for storage purposes to minimize the chance of financial loss due to theft. The product is subject to abuse for purposes other then welded mesh and lacing support such as being used for barricades for example.
6.	Ensure protection against natural elements	Rain or excessive water	Rust, resulting in inferior material, sub standard installation, weakened material, rock falls, injury, property damage, financial loss, production down time	15	3	0.5	22.5	User to ensure the articles are stored in areas, which are not water, locked, the articles are galvanised but water can take its toll if the articles remain in water for a period longer than sixty days, which might result in the welded mesh rusting and becoming inferior.

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

Activity	Potential Hazard	Recommendation/Controls
Demarcated area for storage	No demarcated area for storage, dumping or storage of articles in wrong and confined areas, blockage of traveling ways and emergency services, incorrect stacking, difficult loading of articles	BRC has marketing personnel in the field available for any assistance with regards to method of storage and most suitable demarcation of areas for storage purposes. User to ensure that a sufficient demarcated area is available for the volume of articles to be delivered for use by the mine.
Ensure correct stacking of articles	Incorrect stacking, stacking articles to high, falling stacks, protruding sharp edges, stacking articles standing up straight	BRC has marketing personnel available in the field for assistance with regard to correct stacking of articles. As far as reasonably practicable the user to ensure that a maximum of six roles are laid on the ground and a maximum of five roles of welded mesh is stacked on top in a pyramid shape, user to block end roles on the bottom with stop block, to prevent roles at bottom sliding and giving way causing stack to fall and causing possible injury or damage.
Ensure sufficient clearances between articles and traveling ways	Insufficient clearances, sharp edges in traveling ways, blocked entrances and exists, difficult loading with forklift	BRC has marketing personnel in the field that can assist with regard to safe clearances between the articles and traveling ways. User to ensure that sufficient clearances between articles and traveling ways are maintained at all times to allow easy access by a forklift and ensure that no entrances or exists are blocked in any manner, to ensure safe handling and loading of articles.
Ensure easy accessibility	No accessibility, restrictions, climbing over stacks, falling from stacks, improper loading	BRC has personnel in the field for assistance with regards to ensure easy accessibility when storing the articles. User to ensure that sufficient accessibility is maintained to allow the articles to be loaded by forklifts or cranes, to prevent any restrictions, which may result in possible injury, product or property damage and ultimately production down time.
Ensure a secure area for storage	Inadequate secured area, theft	The welded mesh is classified as a critical safety item and range in cost of R400-00 to R500-00 per role of welded mesh and the user should ensure adequate and secured areas for storage purposes to minimize the chance of financial loss due to theft. The product is subject to abuse for purposes other than welded mesh and lacing support such as being used for barricades for example.
Ensure protection against natural elements	Rain or excessive water	User to ensure the articles are stored in areas, which are not water, locked, the articles are galvanized but water can take its toll if the articles remain in water for a period longer than sixty days, which might result in the welded mesh rusting and becoming inferior.

BRC
MESH AND WIRE
DIVISION

RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS

Jan-10

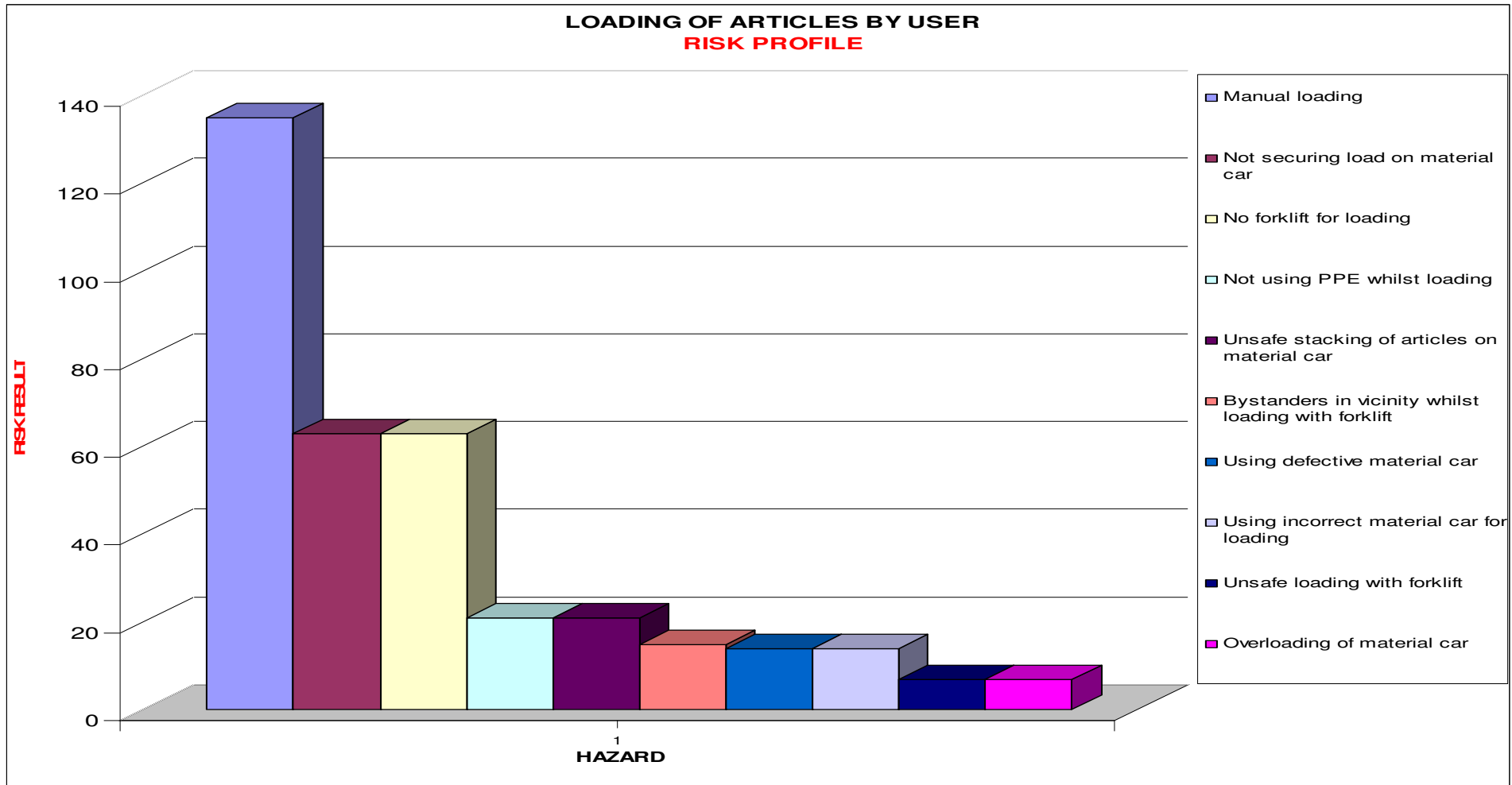
REV. BRM
01

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



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

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
1.	Loading	Manual loading	Time delay, over exertion, injury	15	3	3	135	If the user has to do manual loading it must be ensured that the correct PPE is used whilst handling the articles. Due to the weight of the rolls, ranging from 50-150 kg per roll, the user to ensure that sufficient assistance is available for manual handling to prevent over exertion and any sub sequent injury.
		Not securing load on material car	Falling rolls, injury, slip and fall, restriction of travelling and escape ways, product damage, damage to property	7	3	3	63	User to ensure that only rolls with proper strapping is loaded onto material cars and rolls loaded on material cars are secured by means of rope, chain or wire to prevent any rolls falling off during transit to prevent any injury, damage to product and property.
		Using defective material car	Derailments, injury, property damage, obstructions, product damage	7	2	1	14	User to ensure that only serviceable material cars are used for transport due the length and weight of the articles the user should not allow defective cars to be used to prevent derailments and subsequent injuries to people or damage to product and property.
		No forklift for loading	Causing manual loading, over exertion, injury, time delay	7	3	3	63	User to ensure that serviceable forklift is available for loading of material cars. As far as reasonably practicable the user not to allow manual loading.
		Unsafe loading with forklift	Injury, product damage, property damage, down time	7	1	1	7	User to ensure that only qualified and competent drivers are used to operate forklifts due to the nature of the articles being loaded to prevent injuries, product damage and damage to property.
		Not using PPE whilst loading	Injury, down time	7	1	3	21	User to ensure that the people required loading the articles is using the necessary PPE to do so, such as gloves, and gumboots.
		Bystanders in vicinity whilst loading with forklift	Injuries	15	1	1	15	User to ensure that no bystanders are in the vicinity of the forklift whilst loading the articles due to the length, 1.8m to 2.4m, being transported which may cause injury to bystanders due to forklift operator's visibility being restricted.

**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

REV. **BRM**
01

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
		Unsafe stacking of articles on material car	Injury, damage to product, damage to property, inadequate clearances, poor visibility	7	1	3	21	User to ensure the articles are stacked parallel and in the direction of travelling, the articles must be secured and loaded such that visibility around the material car is not impaired. User not to allow any material car to be transported if load is not safe for transport purposes. User to stack a maximum of six roles on a car, three at the bottom, two on top of them and one at the most top in a pyramid shape.
		Using incorrect material car for loading	Incorrect stacking methods, injury, articles, protruding from car, inadequate clearances, product damage, property damage	7	2	1	14	User to ensure that articles are only loaded using flat material cars to facilitate safe loading, stacking and securing of load for transport.
		Overloading of material car	Derailments, injury, property damage, product damage, time delay	7	1	1	7	User to stack a maximum of six roles on a car, three at the bottom, two on top of them and one at the most top in a pyramid shape, to reduce overloading and sub sequent consequences.

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

Activity	Potential Hazard	Recommendation/Controls
Loading	Manual loading	If the user has to do manual loading it must be ensured that the correct PPE is used whilst handling the articles. Due to the weight of the rolls, ranging from 50-150 kg per roll, the user to ensure that sufficient assistance is available for manual handling to prevent over exertion and any sub sequent injury.
	Not securing load on material car	User to ensure that only rolls with proper strapping is loaded onto material cars and rolls loaded on material cars are secured by means of rope, chain or wire to prevent any rolls falling off during transit to prevent any injury, damage to product and property.
	Using defective material car	User to ensure that only serviceable material cars are used for transport due the length and weight of the articles the user should not allow defective cars to be used to prevent derailments and subsequent injuries to people or damage to product and property.
	No forklift for loading	User to ensure that serviceable forklift is available for loading of material cars. As far as reasonably practicable the user not to allow manual loading.
	Unsafe loading with forklift	User to ensure that only qualified and competent drivers are used to operate forklifts due to the nature of the articles being loaded to prevent injuries, product damage and damage to property.
	Not using PPE whilst loading	User to ensure that the people required loading the articles is using the necessary PPE to do so, such as gloves, and gumboots.
	Bystanders in vicinity whilst loading with forklift	User to ensure that no bystanders are in the vicinity of the forklift whilst loading the articles due to the length, 1.8m to 2.4m, being transported which may cause injury to bystanders due to forklift operator's visibility being restricted.

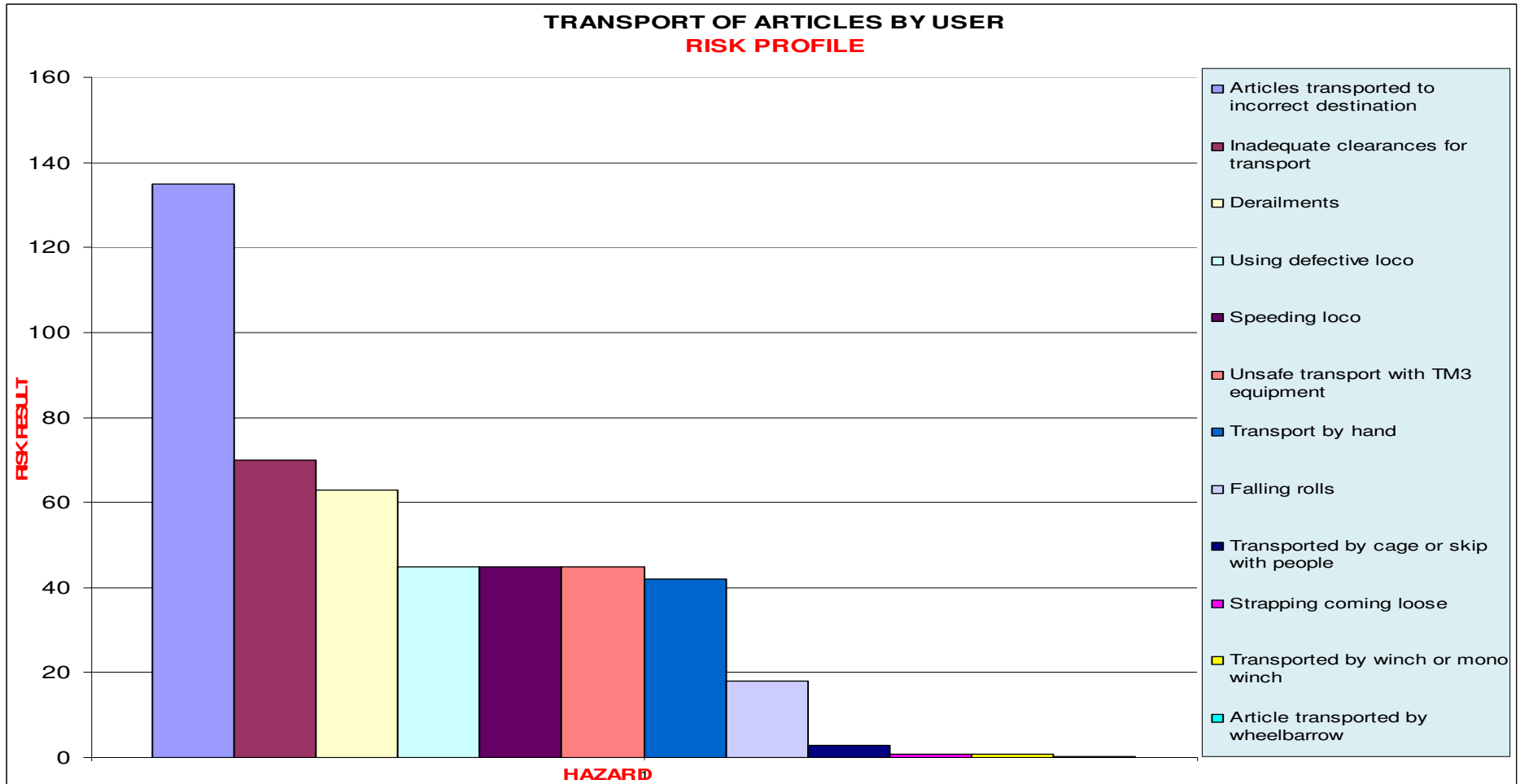
**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

**REV. BRM
01**

Activity	Potential Hazard	Recommendation/Controls
	Unsafe stacking of articles on material car	User to ensure the articles are stacked parallel and in the direction of traveling, the articles must be secured and loaded such that visibility around the material car is not impaired. User not to allow any material car to be transported if load is not safe for transport purposes. User to stack a maximum of six roles on a car, three at the bottom, two on top of them and one at the most top in a pyramid shape.
	Using incorrect material car for loading	User to ensure that articles are only loaded using flat material cars to facilitate safe loading, stacking and securing of load for transport.
	Overloading of material car	User to stack a maximum of six roles on a car, three at the bottom, two on top of them and one at the most top in a pyramid shape, to reduce overloading and sub sequent consequences.



**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

REV. **BRM**
01

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
2.	Transport	Derailements	Injury, time delays, product damage, property damage	7	3	3	63	User to transport articles according to mine standards and ensuring proper rail maintenance to prevent the possibility of derailements.
		Using defective loco	Injury, time delay, product damage, property damage	15	1	3	45	Due the weight of the articles the user to ensure that only serviceable loco and competent drivers are used to transport the articles by locos. No transport by loco to take place unless a pre-use checklist has been completed and the loco is found to be in serviceable condition for transport purposes.
		Falling rolls	Injury, product damage, property damage	3	2	3	18	Transport crew to ensure articles are properly strapped for transport and continuous observation by transport crew for any articles becoming loose during transit. Should articles become loose the transport crew to stop the loco and secure articles for further transport.
		Strapping coming loose	Injury, falling rolls	3	0.5	0.5	0.85	User to re-strap roll if strapping came loose before any transport takes place.
		Speeding loco	Derailements, injury, property damage, product damage	15	1	3	45	User to ensure that transport crew adheres to tramming procedures and standards to prevent any derailements and sub sequent injuries, damage or losses.
		Unsafe transport with TM3 equipment	Falling rolls, injury, product damage, property damage	15	1	3	45	Only allocated TM3 equipment for the transport of articles to be used and user to ensure transporting is done as per transport procedures and standards.
		Transport by hand	Over exertion, injury, time delay, product damage	7	2	3	42	If transport to be done by hand user to ensure that transport is done according to mine standard, if the material car is pushed by hand a guard should lead at least 30m ahead of the car being pushed to warn any other traffic of the car being pushed by hand. As far as reasonably practicable user not to allow transport by hand but rather ensure a loco is available for transport purposes.
		Transported by winch or mono winch	Product damage, possible injury, possible property damage	3	0.5	0.5	0.85	User to refrain from using any winch or mono winch for the transport of articles.

**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

REV. **BRM**
01

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
		Articles transported to incorrect destination	Time delay, production delay, double handling of articles	15	3	3	135	Because of the articles being a safety critical item, the area of delivery and batch for delivery should be clearly marked and indicated for off-loading in the correct area.
		Article transported by wheelbarrow	Injury, time delay, damage to product, damage to property	1	0.5	0.5	0.25	User to refrain from using wheelbarrows for transport and ensure articles is delivered as close as possible to point of installation.
		Transported by cage or skip with people	Injury	3	1	1	3	Use to ensure that articles are never transported with people, to prevent any possibility of injury.
		Inadequate clearances for transport	Time delay, injury, product damage, property damage	7	10	1	70	User to ensure that adequate clearances are maintained at all times for the safe transport of articles.

**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

REV. **BRM**
01

Activity	Potential Hazard	Recommendation/Controls
Transport	Derailments	User to transport articles according to mine standards and ensuring proper rail maintenance to prevent the possibility of derailments.
	Using defective loco	Due the weight of the articles the user to ensure that only serviceable loco and competent drivers are used to transport the articles by locos. No transport by loco to take place unless a pre-use checklist has been completed and the loco is found to be in serviceable condition for transport purposes.
	Falling rolls	Transport crew to ensure articles are properly strapped for transport and continuous observation by transport crew for any articles becoming loose during transit. Should articles become loose the transport crew to stop the loco and secure articles for further transport.
	Strapping coming loose	User to re-strap roll if strapping came loose before any transport takes place.
	Speeding loco	User to ensure that transport crew adheres to tramming procedures and standards to prevent any derailments and subsequent injuries, damage or losses.
	Unsafe transport with TM3 equipment	Only allocated TM3 equipment for the transport of articles to be used and user to ensure transporting is done as per transport procedures and standards.
	Transport by hand	If transport to be done by hand user to ensure that transport is done according to mine standard, if the material car is pushed by hand a guard should lead at least 30m ahead of the car being pushed to warn any other traffic of the car being pushed by hand. As far as reasonably practicable user not to allow transport by hand but rather ensure a loco is available for transport purposes.

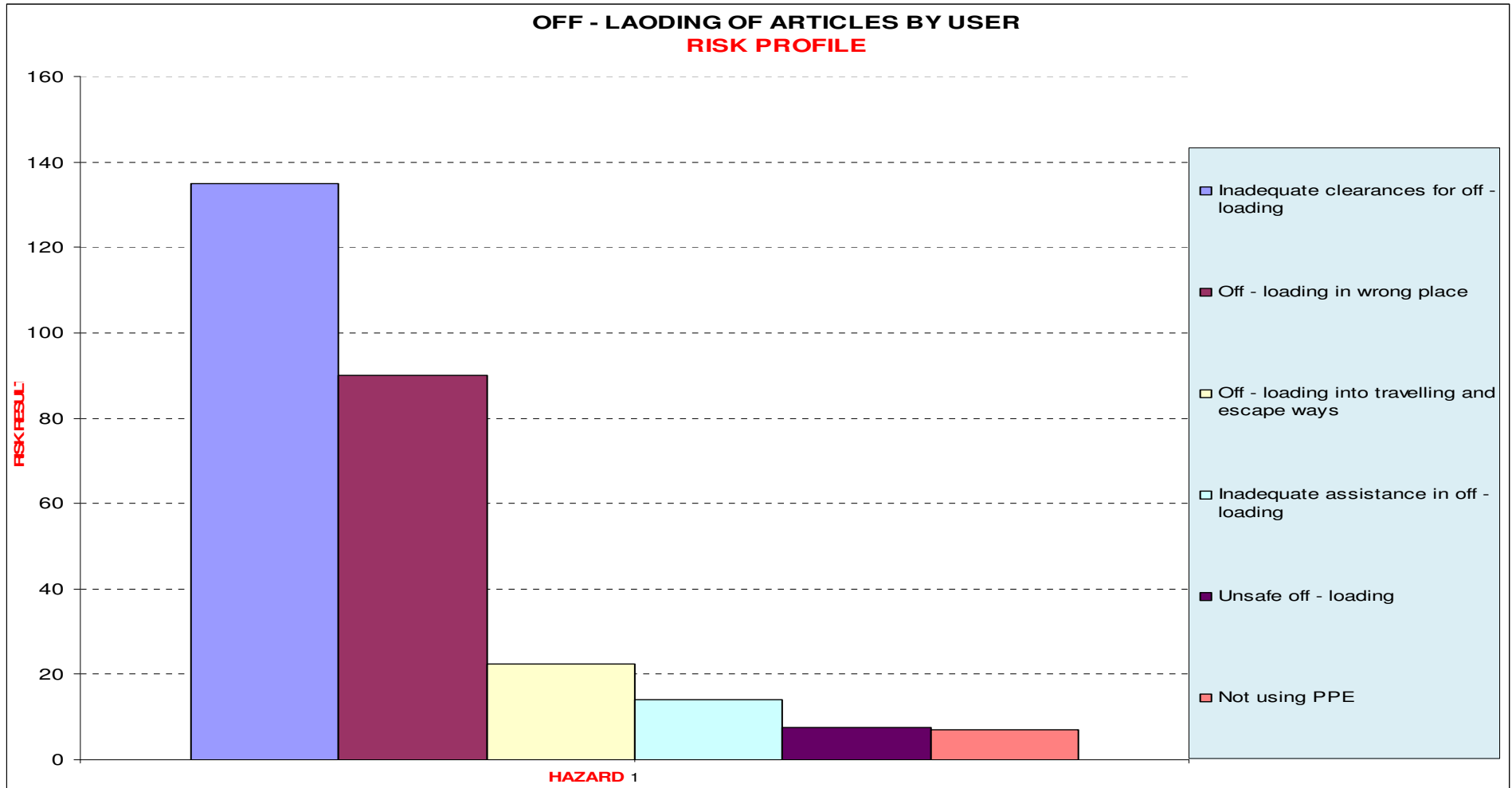
**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

**REV. BRM
01**

Activity	Potential Hazard	Recommendation/Controls
	Transported by winch or mono winch	User to refrain from using any winch or mono winch for the transport of articles.
	Articles transported to incorrect destination	Because of the articles being a safety critical item, the area of delivery and batch for delivery should be clearly marked and indicated for off-loading in the correct area.
	Article transported by wheelbarrow	User to refrain from using wheelbarrows for transport and ensure articles is delivered as close as possible to point of installation.
	Transported by cage or skip with people	Use to ensure that articles are never transported with people, to prevent any possibility of injury.
	Inadequate clearances for transport	User to ensure that adequate clearances are maintained at all times for the safe transport of articles.



No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
3.	Off-loading	Inadequate assistance in off-loading	Injury, over exertion, time delay, slip ad fall, property damage, product damage	7	2	1	14	User to ensure that adequate assistance is available for off-loading and off-loading should preferably be done under direct supervision to minimise the possibility of injury, damage or any losses.
		Inadequate clearances for off-loading	Injury, product damage, time delay, property damage, electrocution, financial losses	15	3	3	135	User to ensure that specific off-loading areas are demarcated for off-loading purposes and these areas should be a safe distance from any electrical installation, travelling ways and escape routes to prevent any possible losses.
		Not using PPE	Injury, time delay	7	1	1	7	User to ensure that employees responsible for off-loading the articles are in possession and uses the PPE to protect them against any possible injury during off-loading activities.
		Off-loading in the wrong place	Obstructions, time delay, double handling of articles, product losses, financial losses	15	2	3	90	User to ensure that specific off-loading areas are demarcated for off-loading purposes and these areas should be a safe distance from any electrical installation, travelling ways and escape routes to prevent any possible losses.
		Off-loading into travelling and escape ways	Obstructions, injury, slip and fall	15	3	0.5	22.5	User to ensure that specific off-loading areas are demarcated for off-loading purposes and these areas should be a safe distance from any electrical installation, travelling ways and escape routes to prevent any possible losses.
		Unsafe off-loading	Injury, product damage, property damage, time delay, financial loss, production losses	15	1	0.5	7.5	User to ensure that employees responsible for off-loading the articles are trained in the associated hazards and risks when unsafe off-loading is done. User to ensure off-loading is preferably done under direct supervision to minimise the possibility of any losses.

Activity	Potential Hazard	Recommendation/Controls
Off-loading	Inadequate assistance in off-loading	User to ensure that adequate assistance is available for off-loading and off-loading should preferably be done under direct supervision to minimize the possibility of injury, damage or any losses.
	Inadequate clearances for off-loading	User to ensure that specific off-loading areas are demarcated for off-loading purposes and these areas should be a safe distance from any electrical installation, traveling ways and escape routes to prevent any possible losses.
	Not using PPE	User to ensure that employees responsible for off-loading the articles are in possession and uses the PPE to protect them against any possible injury during off-loading activities.
	Off-loading in the wrong place	User to ensure that specific off-loading areas are demarcated for off-loading purposes and these areas should be a safe distance from any electrical installation, traveling ways and escape routes to prevent any possible losses.
	Off-loading into traveling and escape ways	User to ensure that specific off-loading areas are demarcated for off-loading purposes and these areas should be a safe distance from any electrical installation, traveling ways and escape routes to prevent any possible losses.
	Unsafe off-loading	User to ensure that employees responsible for off-loading the articles are trained in the associated hazards and risks when unsafe off-loading is done. User to ensure off-loading is preferably done under direct supervision to minimize the possibility of any losses.

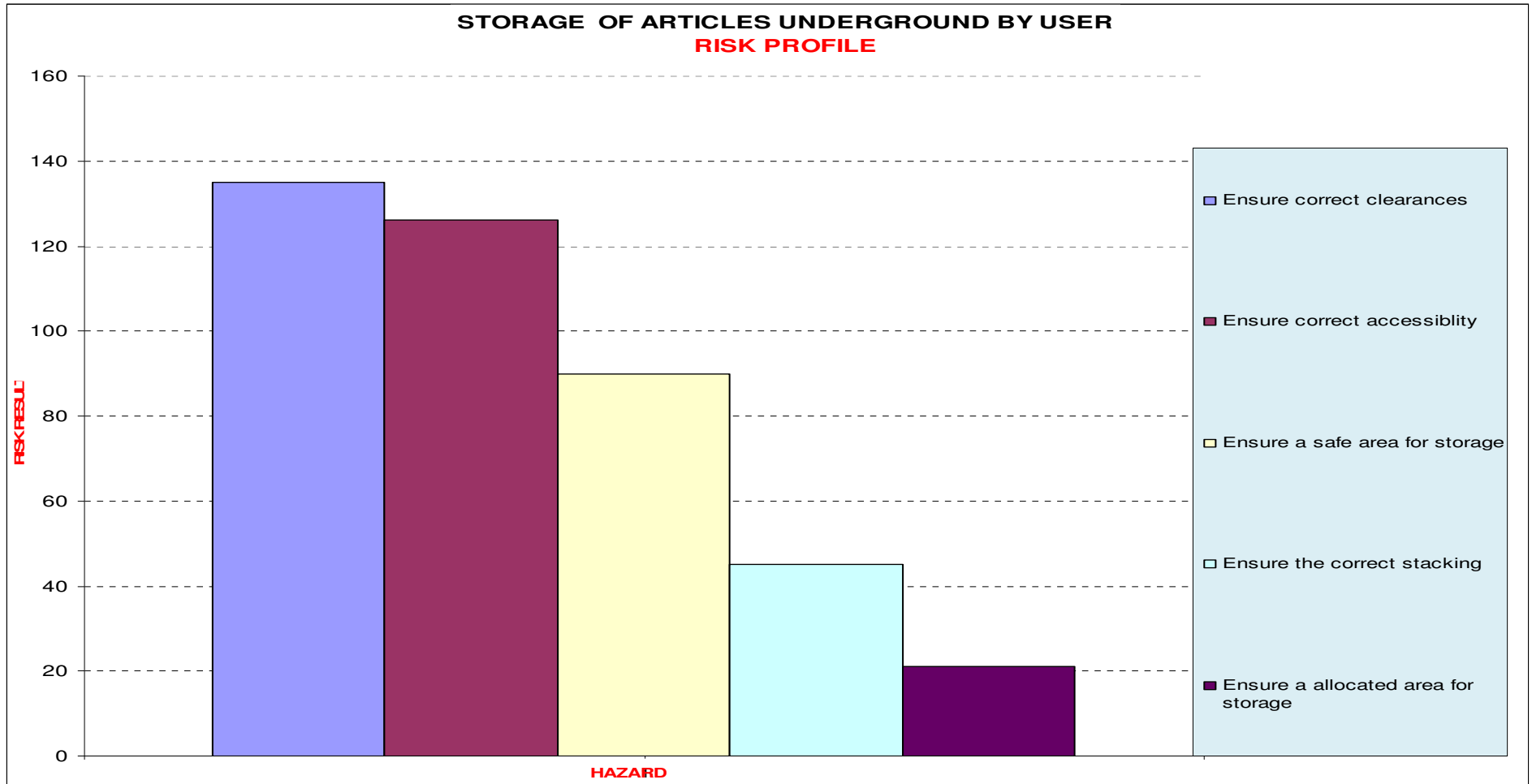
BRC
MESH AND WIRE
DIVISION

RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS

Jan-10

REV. BRM
01

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	Unsafe storage area, bad hang and sidewall, unsupported area, unventilated area, old and abandoned areas	Possible injury, product damage, financial loss, down time, possible build up of gas and fumes	15	2	3	90	User to ensure that a competent person ensures a safe area for storage of the article, the area should be well ventilated, well supported, have a competent hang and side wall and be well supported for the purposes of storage, to prevent any possible injury or loss of product due to potential falls of ground and subsequent injury to person or property damage.
2.	Ensure a allocated area for storage	No allocated area for storage, storing articles causing obstruction of travelling and escape ways, storing articles in front of electrical installation or emergency equipment, causing inadequate clearances	Loss of material, slip and fall, possible injury, financial loss, down time, production loss	7	1	3	21	User to ensure that an allocated area as close to the site of installation is allocated for the purpose of storing the articles to ensure as soon as the article reaches the site for installation it is used as soon as possible to prevent articles being stored in un-allocated areas which may cause obstructions of travelling and escape routes or inadequate clearances which may result in injury to people or property and product resulting in a financial loss to the user.
3.	Ensure the correct stacking	Incorrect stacking, stacking to high, falling stacks, poor stacking causing inadequate clearances, poor stacking causing obstructions, stacking in contact with electrical equipment or in contact with open electrical cables	Personal injury, electrocution, production loss, down time, financial loss	15	1	3	45	User to ensure the articles are stacked away from electrical installations or cables because the galvanised welded mesh is a good conductor of electricity, the articles must be stacked clear from any travelling or escape routes, must be stacked a safe distance from the actual working crew to prevent any slip and fall hazards, must be stacked a minimum of 1.5 meters from rails and travelling ways to ensure sufficient clearances, and if possible it must be stacked lying on the footwall parallel to tracks to ensure safe and adequate clearances at all times, to prevent any possible injury or damage to the articles or other property. As far as reasonably practicable never stack articles on top of each other to prevent any rolling articles, which may cause injury or damage to property or the product.

**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

REV. **BRM**
01

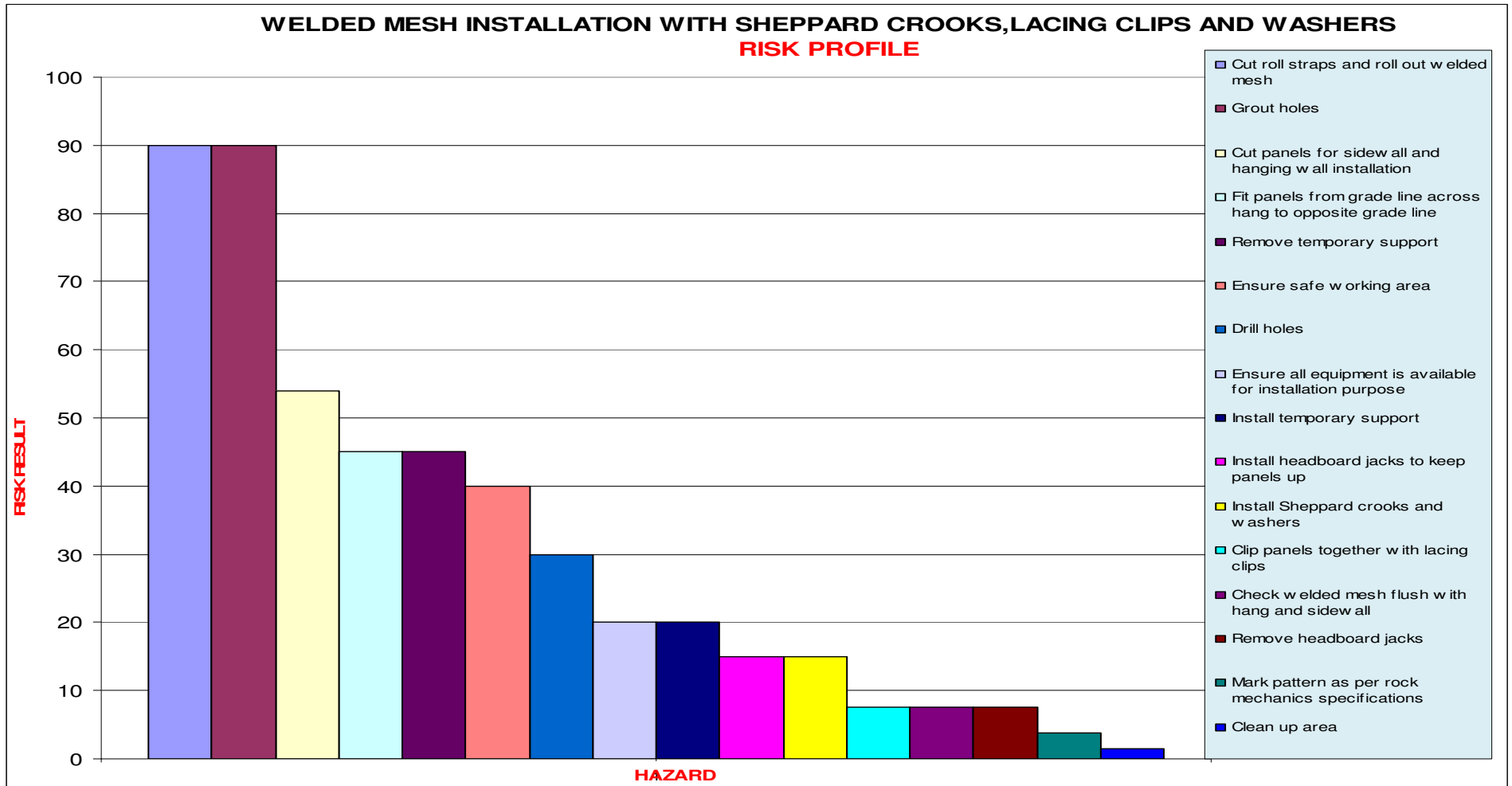
No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
4.	Ensure correct clearances	Inadequate clearances, obstructed travelling and escape routes, obstructed emergency and electrical equipment, difficult handling	Possible injury, property damage, down time, slip and fall	15	3	3	135	User to ensure that the article is stored a minimum of 1.5 metres from all travelling ways and not in front of electrical or emergency equipment and clear from working crews to prevent obstructions, which may cause injury or property damage.
5.	Ensure correct accessibility	Inadequate accessibility, difficult handling and loading of articles	Personal injury, property damage	7	3	6	126	User to store the articles on the footwall lying down parallel to the tracks with no rolls of welded mesh stacked on top of each other to ensure easy and safe accessibility to handle the articles and reduce the possibility of injury to people or damage to property.

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

Activity	Potential Hazard	Recommendation/Controls
Ensure a safe area for storage	Unsafe storage area, bad hang and sidewall, unsupported area, unventilated area, old and abandoned areas	User to ensure that a competent person ensures a safe area for storage of the article, the area should be well ventilated, well supported, have a competent hang and side wall and be well supported for the purposes of storage, to prevent any possible injury or loss of product due to potential falls of ground and subsequent injury to person or property damage.
Ensure a allocated area for storage	No allocated area for storage, storing articles causing obstruction of traveling and escape ways, storing articles in front of electrical installation or emergency equipment, causing inadequate clearances	User to ensure that an allocated area as close to the site of installation is allocated for the purpose of storing the articles to ensure as soon as the article reaches the site for installation it is used as soon as possible to prevent articles being stored in un-allocated areas which may cause obstructions of traveling and escape routes or inadequate clearances which may result in injury to people or property and product resulting in a financial loss to the user.
Ensure the correct stacking	Incorrect stacking, stacking to high, falling stacks, poor stacking causing inadequate clearances, poor stacking causing obstructions, stacking in contact with electrical equipment or in contact with open electrical cables	User to ensure the articles are stacked away from electrical installations or cables because the galvanized welded mesh is a good conductor of electricity, the articles must be stacked clear from any traveling or escape routes, must be stacked a safe distance from the actual working crew to prevent any slip and fall hazards, must be stacked a minimum of 1.5 meters from rails and traveling ways to ensure sufficient clearances, and if possible it must be stacked lying on the footwall parallel to tracks to ensure safe and adequate clearances at all times, to prevent any possible injury or damage to the articles or other property. As far as reasonably practicable never stack articles on top of each other to prevent any rolling articles, which may cause injury or damage to property or the product.
Ensure correct clearances	Inadequate clearances, obstructed traveling and escape routes, obstructed emergency and electrical equipment, difficult handling	User to ensure that the article is stored a minimum of 1.5 meters from all traveling ways and not in front of electrical or emergency equipment and clear from working crews to prevent obstructions, which may cause injury or property damage.
Ensure correct accessibility	Inadequate accessibility, difficult handling and loading of articles	User to store the articles on the footwall lying down parallel to the tracks with no rolls of welded mesh stacked on top of each other to ensure easy and safe accessibility to handle the articles and reduce the possibility of injury to people or damage to property.

E - INSTALLATION OF ARTICLES BY USER:

- 1. Welded mesh installation with Sheppard crooks, lacing clips and washers**
- 2. Welded mesh installation with Sheppard crook and lacing clips without washers**
- 3. Welded mesh installation with split sets, lacing clips and washers**
- 4. Welded mesh installation with roof bolts, lacing clips, washer and nut**



E - INSTALLATION OF ARTICLES BY USER:

1. WELDED MESH INSTALLATION WITH SHEPPARD CROOKS, WASHER AND LACING CLIPS

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
1.	Ensure safe working area	Area not safe, poor hang and side wall conditions, inadequate support, poor ventilation, accumulation of gasses and fumes, excessive dust, deteriorating conditions, misfires, rolling stock, mobile equipment, water of unknown depth, high areas, geological features such as dykes	Injury, product damage, property damage, financial losses, production loses, down time, fire, heat stroke, heat exhaustion	40	1	1	40	User to ensure that a competent person examines and take all necessary action to provide a safe area for working. If installation takes place in tramming ways, all tramming operators to be made aware of planned activities and exercise caution at all times. In tramming sections sufficient notices such as stop boards to be placed 30 meters on either side of working crew. Working crew should be competent and trained in relevant procedures to be followed for installation activities. No work to be commenced unless area is declared safe by rock mechanic department for installation purposes. The competent person in charge of the activity should ensure sufficient supervision at all times and monitor conditions for any deterioration for swift action to be taken as necessary.
2.	Ensure all equipment is available for installation purpose	Incorrect equipment used, faulty equipment, inadequate quantities of equipment, sub standard equipment, shortage of equipment	Injury, down time, production loss, financial losses	40	1	0.5	20	User to ensure that proper pre-planning is done and only serviceable equipment is used for installation purposes, to prevent any possible losses.
3.	Install temporary support	Temporary support not available, temporary support not serviceable, not installed, installed incorrectly, poor quality of support, falling jacks	Injury, product damage, property damage, financial losses, production loses, down time	40	0.5	1	20	User to ensure that temporary support for installation conforms to rock mechanic specifications. Temporary support should be installed under direct supervision and no work is to commence without any temporary support. Person in charge should conduct continuous inspections on the adequacy and effectiveness of temporary support according to rock mechanics specifications.

**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

REV. **BRM**
01

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
4.	Cut roll straps and roll out welded mesh	Sharp edges and points on strap and roll, roll under tension, using the incorrect equipment for cutting	Injuries	3	10	3	90	User to cut roll straps using a wire cutter, the straps are 3mm wire and should facilitate easy cutting with a wire cutter, once the straps are cut the roll tension will be released up to a point whilst the roll is still in tact. The roll can now be rolled out, user to ensure that people doing the cutting uses the correct hand protection and that sufficient space is available to roll out the roll of welded mesh flat on the ground for its entire length of 10m.
5.	Cut panels for sidewall and hanging wall installation	Sharp edges and points on roll, using incorrect equipment for cutting	Injuries, damage to product	3	6	3	54	User to ensure that people cutting the panels has the correct PPE to perform the task. User to refrain from using equipment such as a hammer to cut rolls which may result in the welded mesh welding being damaged which may cause a defective product being used for support
6.	Fit panels from grade line across hang to opposite grade line	Inadequate assistance, working at height, over exertion, not using safety equipment at height, slip and fall, falling product, bystanders	Injury, time delay, loss of product, damage to property	15	3	1	45	User to ensure people performing task uses the correct safety and personal protective equipment when fitting the panels. The person in charge must ensure that sufficient assistance is available for pulling panels across hang and no bystanders are in the vicinity of the task being perform to minimise the possibility of injury or damage to product. It is recommended that when people performing the task of fitting panels at a height of 4m above ground floor level the user to consider installing a dedicated life line for the purposes of attaching safety belts onto, to ensure safe operations.

**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

REV. **BRM**
01

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
7.	Install headboard jacks to keep panels up	No headboard jacks available, jacks unserviceable, incorrect installation, incorrect jacks available, not adhering to rock mechanic specifications, obstructing travelling and tramping ways, not ensuring correct clearances, falling jacks, inadequate assistance in installation	Injuries, property damage, product damage, down time, possible loss of production, possible financial loss	15	1	1	15	User to ensure that the correct equipment is available for installation and is as per rock mechanic specifications, if not, no work to commence unless specification from rock mechanics are complied with. User to ensure that sufficient assistance is available for the installation of jacks with headboards and people responsible for the installation are well familiar with the installation procedure of the jacks to prevent incorrect installation and subsequent losses which may result there from. These installations should be done under the direct supervision of the competent person in charge of the operations, and the person in charge should satisfy himself that every installation complies to rock mechanics specifications before any work commences.
8.	Mark pattern as per rock mechanics specifications	Working under unsupported areas, incorrect marking, dripping paint	Injuries, eye injuries, time delay, sub standard installation, falls of ground, production loss, down time, financial loss, property damage, product damage	15	0.5	0.5	3.75	User to ensure that all crew members are made aware of the rock mechanics recommended marking pattern for drilling and installation to reduce the possibility of misunderstanding, or confusion which may lead to the incorrect pattern being marked which may result in sub standard installation which may incur losses. It is recommended that the pattern to be marked or support rule should be visually displayed at the waiting place for all to see and assist in identifying any non-conformance. The user to ensure that only a competent is responsible and performs the marking of any patterns for installation purposes.

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
9.	Drill holes	Short drilling of holes, drilling incorrect diameter of hole, incorrect direction of drilling, falling rocks, inadequate assistance in drilling, high noise levels, impaired visibility because of fog, inadequate air and water pressure for drilling, falling equipment	Sub standard installation, falls of ground, time delay, property damage, possible loss of production, injury, hearing loss	15	2	1	30	User to ensure holes is drilled as per rock mechanics specification, the correct length of drill steel with the correct drill bit to be used. User to ensure that sufficient assistance is available whilst drilling is done and that drilling is only done under installed temporary support. People performing drilling activities must use adequate PPE to protect them against high noise levels.
10.	Grout holes	Not fully grouting hole, no pump for grouting, no air to operate grout pump, using incorrect grout, grout in contact with eye, using defective equipment	Sub standard installation, falls of ground, time delay, property damage, possible loss of production, injury	15	2	3	90	User to ensure that equipment use for grouting is in serviceable condition and only grout as per rock mechanics specifications are used for the installation. Holes should be fully grouted to ensure a proper installation and enhance the life span of the support installation. Grouting must be done under the direct supervision of the person in charge to ensure a proper installation.
11.	Install Sheppard crooks and washer	Sheppard crooks to short, closed legs on Sheppard crooks, installed into short drilled hole, not installing a washer, falling Sheppard crooks, falling equipment	Sub standard installation, falls of ground, injury, property damage, time delay, possible loss of production	15	1	1	15	User to ensure the correct length of Sheppard crooks is used as per rock mechanics specifications. User to place washer onto Sheppard crook, bend close short leg and push washer up against loop. Place Sheppard crook in hole, close short leg to allow Sheppard crook to be inserted into hole up to full length. The short leg will kick out in hole, which ensures the Sheppard remains in hole. The Sheppard crook can now be reamed home by means of a hammer to ensure the washer is flush with the hang or side wall. User to ensure the washer covers the aperture of the welded mesh to prevent the welded mesh from pulling over washer. No installation of Sheppard crook to be done if hole is not the correct length.

**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

REV. **BRM**
01

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
12.	Clip panels together with lacing clips	Shortage of clips, using defective clipping pliers	Sub standard installation, falls of ground, injury, property damage, time delay, possible loss of production	15	1	0.5	7.5	BRC suppliers clip pliers to the user for use in clipping the lacing clips. User to ensure that a sufficient quantity of clips is available for installation purposes. The panels should overlap by one length of aperture at least to ensure sufficient material is available for the use of lacing clips. Place clip in clipping pliers and place clip over wires and crimp clip to ensure wires are clipped together. Only two wires at any one time should be clipped together using the lacing clip.
13.	Check welded mesh flush with hang and sidewall	Welded mesh not flush with hang and sidewall, causing inadequate clearances	Scaling rock, rolling stock damage product, sub standard support, falls of ground, injury, property damage, time delay, property damage, possible loss of production	15	1	0.5	7.5	User to conduct visual inspections on a regular basis to ensure the welded mesh remains flush with hang or sidewall, should any deviation be observed the user to consider strengthening the area or more roof bolts can be installed to prevent the welded mesh not being flush with hang and sidewall.
14.	Remove headboard jacks	Falling jacks, premature removal of jacks	Injury, falls of ground, time delay, property damage, product damage, re-installation, financial loss	15	0.5	1	7.5	User to ensure after complete installation of welded mesh that headboard jacks remains in tact for at least one shift to allow sufficient setting time for the grout used and ensuring competent support once the jacks are being removed.

**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

REV. **BRM**
01

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
15.	Remove temporary support	Falling jacks, pre-mature removal of jacks	Injury, falls of ground, time delay, property damage, product damage, re-installation, financial loss	15	3	1	45	User to ensure after complete installation of welded mesh that temporary support remains in tact for at least one shift to allow sufficient setting time for the grout used and ensuring competent support once the jacks are being removed. Should any temporary support be removed for the purpose of allowing through rolling stock, such temporary support will only be removed under the direct supervision of the competent person in charge and only with his authorisation to do so.
16.	Clean up area	Poor housekeeping, wire cut off's with sharp edges, equipment not retrieved for re-use	Obstructions, slip and fall, injury, loss of property, financial loss	3	1	0.5	1.5	User to ensure that sound housekeeping standards are adhered to and equipment is retrieved for re-use to prevent any obstructions, possible injuries or a loss of equipment. This clean up activity should be done under the direct supervision of the person in charge to ensure it complies with housekeeping standards.

RECOMMENDED SAFE WORKING PROCEDURE FOR THE INSTALLATION OF WELDED MESH BY THE USER UNDERGROUND

1. WELDED MESH INSTALLATION WITH SHEPPARD CROOKS, WASHER AND LACING CLIPS

Activity	Potential Hazard	Recommendation/Controls
Ensure safe working area	Area not safe, poor hang and side wall conditions, inadequate support, poor ventilation, accumulation of gasses and fumes, excessive dust, deteriorating conditions, misfires, rolling stock, mobile equipment, water of unknown depth, high areas, geological features such as dykes	User to ensure that a competent person examines and take all necessary action to provide a safe area for working. If installation takes place in tramming ways, all tramming operators to be made aware of planned activities and exercise caution at all times. In tramming sections sufficient notices such as stop boards to be placed 30 meters on either side of working crew. Working crew should be competent and trained in relevant procedures to be followed for installation activities. No work to be commenced unless area is declared safe by rock mechanic department for installation purposes. The competent person in charge of the activity should ensure sufficient supervision at all times and monitor conditions for any deterioration for swift action to be taken as necessary.
Ensure all equipment is available for installation purpose	Incorrect equipment used, faulty equipment, inadequate quantities of equipment, sub standard equipment, shortage of equipment	User to ensure that proper pre-planning is done and only serviceable equipment is used for installation purposes, to prevent any possible losses.
Install temporary support	Temporary support not available, temporary support not serviceable, not installed, installed incorrectly, poor quality of support, falling jacks	User to ensure that temporary support for installation conforms to rock mechanic specifications. Temporary support should be installed under direct supervision and no work is to commence without any temporary support. Person in charge should conduct continuous inspections on the adequacy and effectiveness of temporary support according to rock mechanics specifications.

**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

REV. **BRM**
01

Activity	Potential Hazard	Recommendation/Controls
Cut roll straps and roll out welded mesh	Sharp edges and points on strap and roll, roll under tension, using the incorrect equipment for cutting	User to cut roll straps using a wire cutter, the straps are 3mm wire and should facilitate easy cutting with a wire cutter, once the straps are cut the roll tension will be released up to a point whilst the roll is still in tact. The roll can now be rolled out, user to ensure that people doing the cutting uses the correct hand protection and that sufficient space is available to roll out the roll of welded mesh flat on the ground for its entire length of 10m.
Cut panels for sidewall and hanging wall installation	Sharp edges and points on roll, using incorrect equipment for cutting	User to ensure that people cutting the panels has the correct PPE to perform the task. User to refrain from using equipment such as a hammer to cut rolls which may result in the welded mesh welding being damaged which may cause a defective product being used for support
Fit panels from grade line across hang to opposite grade line	Inadequate assistance, working at height, over exertion, not using safety equipment at height, slip and fall, falling product, bystanders	User to ensure people performing task uses the correct safety and personal protective equipment when fitting the panels. The person in charge must ensure that sufficient assistance is available for pulling panels across hang and no bystanders are in the vicinity of the task being perform to minimize the possibility of injury or damage to product. It is recommended that when people performing the task of fitting panels at a height of 4m above ground floor level the user to consider installing a dedicated life line for the purposes of attaching safety belts onto, to ensure safe operations.

**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

REV. **BRM**
01

Activity	Potential Hazard	Recommendation/Controls
Install headboard jacks to keep panels up	No headboard jacks available, jacks unserviceable, incorrect installation, incorrect jacks available, not adhering to rock mechanic specifications, obstructing traveling and tramping ways, not ensuring correct clearances, falling jacks, inadequate assistance in installation	User to ensure that the correct equipment is available for installation and is as per rock mechanic specifications, if not, no work to commence unless specification from rock mechanics are complied with. User to ensure that sufficient assistance is available for the installation of jacks with headboards and people responsible for the installation are well familiar with the installation procedure of the jacks to prevent incorrect installation and subsequent losses which may result there from. These installations should be done under the direct supervision of the competent person in charge of the operations, and the person in charge should satisfy himself that every installation complies to rock mechanics specifications before any work commences.
Mark pattern as per rock mechanics specifications	Working under unsupported areas, incorrect marking, dripping paint	User to ensure that all crew members are made aware of the rock mechanics recommended marking pattern for drilling and installation to reduce the possibility of misunderstanding, or confusion which may lead to the incorrect pattern being marked which may result in sub standard installation which may incur losses. It is recommended that the pattern to be marked or support rule should be visually displayed at the waiting place for all to see and assist in identifying any non-conformance. The user to ensure that only a competent is responsible and performs the marking of any patterns for installation purposes.
Drill holes	Short drilling of holes, drilling incorrect diameter of hole, incorrect direction of drilling, falling rocks, inadequate assistance in drilling, high noise levels, impaired visibility because of fog, inadequate air and water pressure for drilling, falling equipment	User to ensure holes is drilled as per rock mechanics specification, the correct length of drill steel with the correct drill bit to be used. User to ensure that sufficient assistance is available whilst drilling is done and that drilling is only done under installed temporary support. People performing drilling activities must use adequate PPE to protect them against high noise levels.

**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

REV. **BRM**
01

Activity	Potential Hazard	Recommendation/Controls
Grout holes	Not fully grouting hole, no pump for grouting, no air to operate grout pump, using incorrect grout, grout in contact with eye, using defective equipment	User to ensure that equipment use for grouting is in serviceable condition and only grout as per rock mechanics specifications are used for the installation. Holes should be fully grouted to ensure a proper installation and enhance the life span of the support installation. Grouting must be done under the direct supervision of the person in charge to ensure a proper installation.
Install Sheppard crooks and washer	Sheppard crooks to short, closed legs on Sheppard crooks, installed into short drilled hole, not installing a washer, falling Sheppard crooks, falling equipment	User to ensure the correct length of Sheppard crooks is used as per rock mechanics specifications. User to place washer onto Sheppard crook, bend close short leg and push washer up against loop. Place Sheppard crook in hole, close short leg to allow Sheppard crook to be inserted into hole up to full length. The short leg will kick out in hole, which ensures the Sheppard remains in hole. The Sheppard crook can now be reamed home by means of a hammer to ensure the washer is flush with the hang or side wall. User to ensure the washer covers the aperture of the welded mesh to prevent the welded mesh from pulling over washer. No installation of Sheppard crook to be done if hole is not the correct length.
Clip panels together with lacing clips	Shortage of clips, using defective clipping pliers	BRC supplies clip pliers to the user for use in clipping the lacing clips. User to ensure that a sufficient quantity of clips is available for installation purposes. The panels should overlap by one length of aperture at least to ensure sufficient material is available for the use of lacing clips. Place clip in clipping pliers and place clip over wires and crimp clip to ensure wires are clipped together. Only two wires at any on time should be clipped together using the lacing clip.

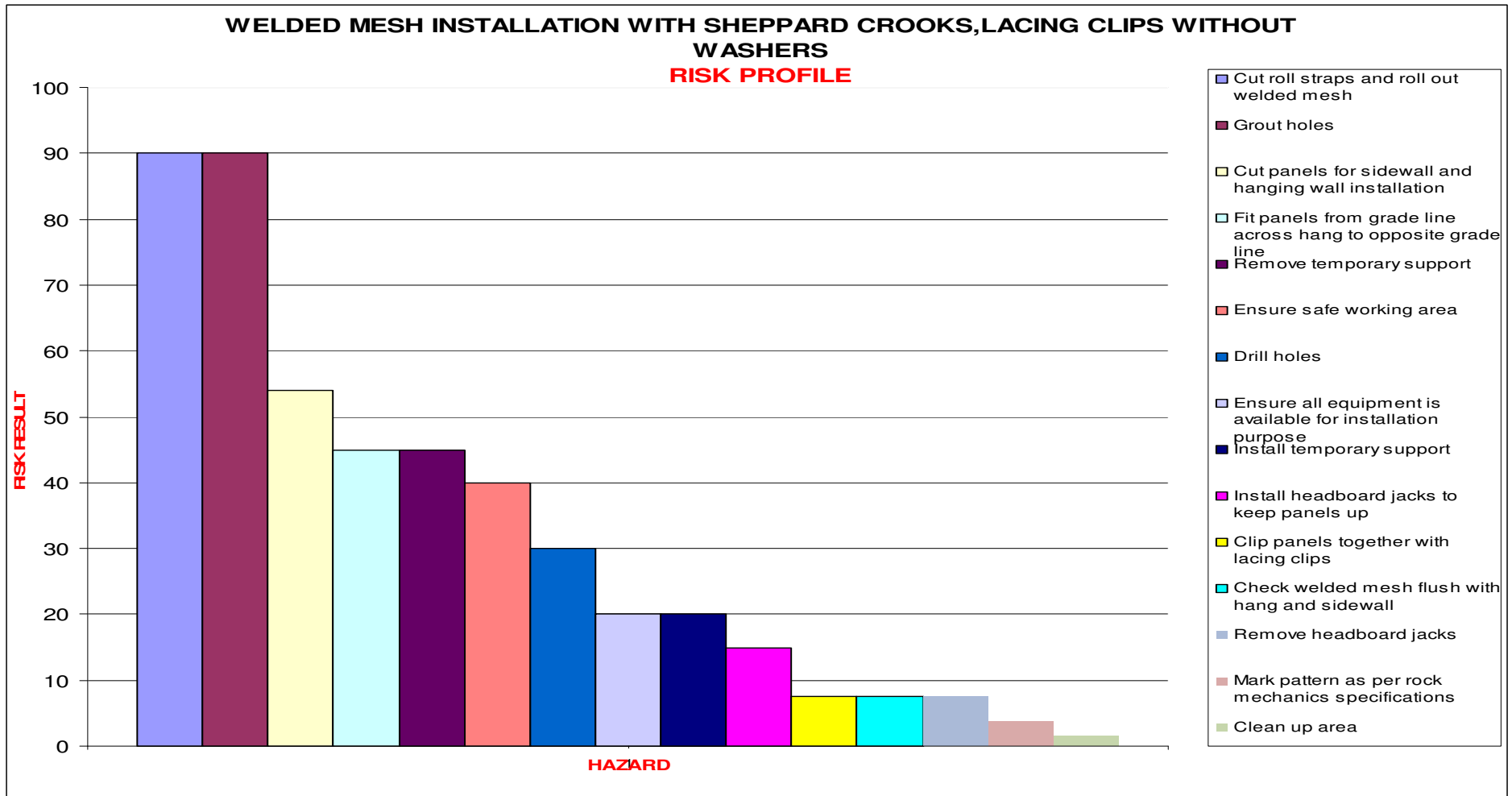
**BRC
MESH AND WIRE
DIVISION**

**RISK ASSESSMENT ON THE
WELDED MESH SUPPORT
PRODUCTS**

Jan-10

REV. **BRM**
01

Activity	Potential Hazard	Recommendation/Controls
Check welded mesh flush with hang and sidewall	Welded mesh not flush with hang and sidewall, causing inadequate clearances	User to conduct visual inspections on a regular basis to ensure the welded mesh remains flush with hang or sidewall, should any deviation be observed the user to consider strengthening the area or more roof bolts can be installed to prevent the welded mesh not being flush with hang and sidewall.
Remove headboard jacks	Falling jacks, pre-mature removal of jacks	User to ensure after complete installation of welded mesh that headboard jacks remains in tact for at least one shift to allow sufficient setting time for the grout used and ensuring competent support once the jacks are being removed.
Remove temporary support	Falling jacks, pre-mature removal of jacks	User to ensure after complete installation of welded mesh that temporary support remains in tact for at least one shift to allow sufficient setting time for the grout used and ensuring competent support once the jacks are being removed. Should any temporary support be removed for the purpose of allowing through rolling stock, such temporary support will only be removed under the direct supervision of the competent person in charge and only with his authorization to do so.
Clean up area	Poor housekeeping, wire cut off's with sharp edges, equipment not retrieved for re-use	User to ensure that sound housekeeping standards are adhered to and equipment is retrieved for re-use to prevent any obstructions, possible injuries or a loss of equipment. This clean up activity should be done under the direct supervision of the person in charge to ensure it complies with housekeeping standards.



2. WELDED MESH INSTALLATION WITH SHEPPARD CROOKS AND LACING CLIPS WITHOUT WASHER

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
1.	Ensure safe working area	Area not safe, poor hang and side wall conditions, inadequate support, poor ventilation, accumulation of gasses and fumes, excessive dust, deteriorating conditions, misfires, rolling stock, mobile equipment, water of unknown depth, high areas, geological features such as dykes	Injury, product damage, property damage, financial losses, production losses, down time, fire, heat stroke, heat exhaustion	40	1	1	40	User to ensure that a competent person examines and take all necessary action to provide a safe area for working. If installation takes place in tramming ways, all tramming operators to be made aware of planned activities and exercise caution at all times. In tramming sections sufficient notices such as stop boards to be placed 30 meters on either side of working crew. Working crew should be competent and trained in relevant procedures to be followed for installation activities. No work to be commenced unless area is declared safe by rock mechanic department for installation purposes. The competent person in charge of the activity should ensure sufficient supervision at all times and monitor conditions for any deterioration for swift action to be taken as necessary.
2.	Ensure all equipment is available for installation purpose	Incorrect equipment used, faulty equipment, inadequate quantities of equipment, sub standard equipment, shortage of equipment	Injury, down time, production loss, financial losses	40	1	0.5	20	User to ensure that proper pre-planning is done and only serviceable equipment is used for installation purposes, to prevent any possible losses.
3.	Install temporary support	Temporary support not available, temporary support not serviceable, not installed, installed incorrectly, poor quality of support, falling jacks	Injury, product damage, property damage, financial losses, production losses, down time	40	0.5	1	20	User to ensure that temporary support for installation conforms to rock mechanic specifications. Temporary support should be installed under direct supervision and no work is to commence without any temporary support. Person in charge should conduct continuous inspections on the adequacy and effectiveness of temporary support according to rock mechanics specifications.