

**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.



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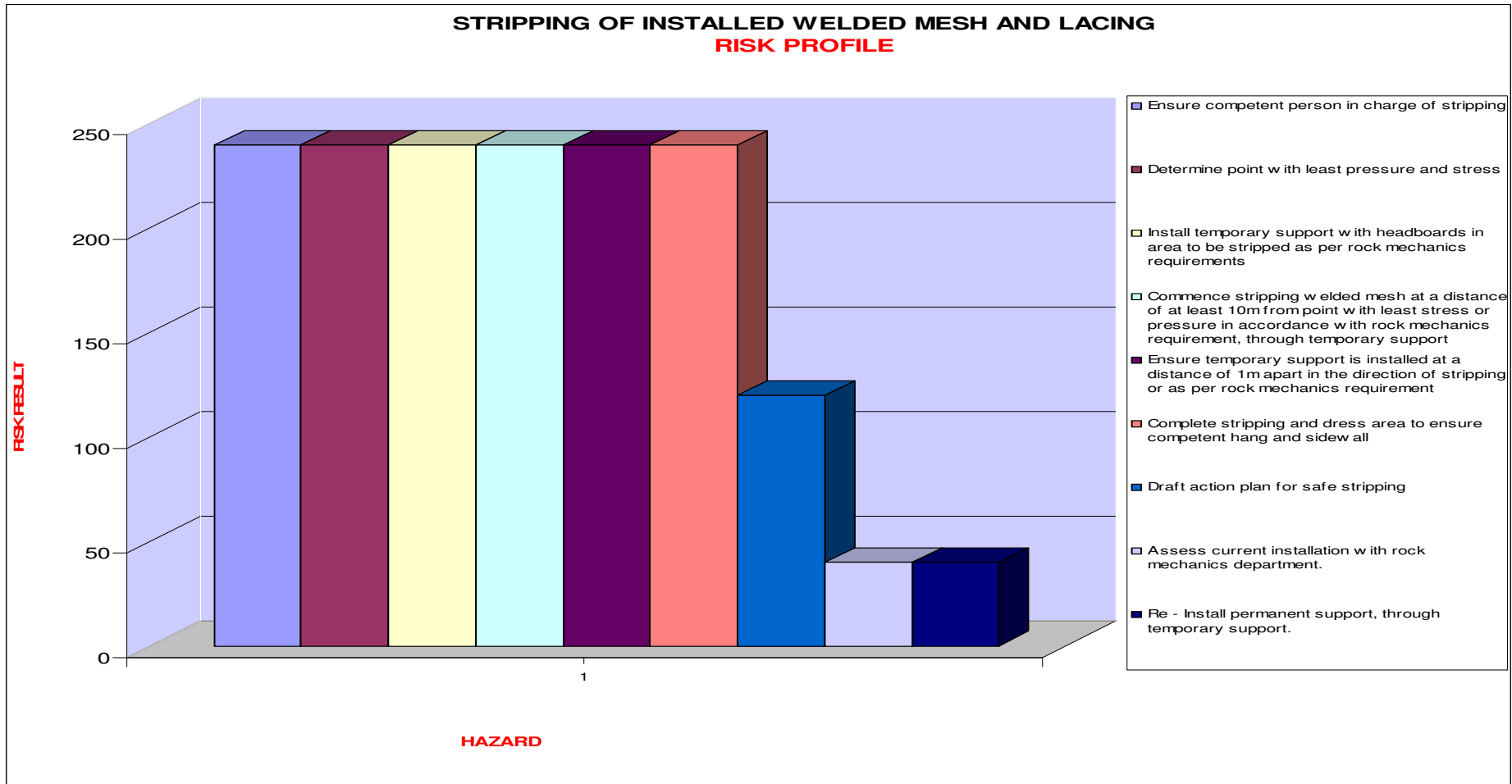
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F - STRIPPING OF INSTALLED WELDED MESH BY USER:



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F - STRIPPING OF INSTALLED WELDED MESH AND LACING BY USER:

No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
1.	Assess current installation with rock mechanics department	No assessment done	Falls of ground, injuries, property damage, product damage, production losses, financial loss, down time, loss of mining areas	40	1	1	40	No attempt of stripping the welded mesh should be done unless the rock mechanics department has done a thorough assessment.
2.	Draft action plan for safe stripping	No action plan	Falls of ground, injuries, property damage, product damage, production losses, financial loss, down time, loss of mining areas	40	1	3	120	No attempt of stripping the welded mesh to take place unless thorough action plans with relevant responsibilities has been issued by the rock mechanics department.
3.	Ensure competent person in charge of stripping process	No competent person in charge	Falls of ground, injuries, property damage, product damage, production losses, financial loss, down time, loss of mining areas	40	2	3	240	No attempt of stripping to take place if a competent person is not in charge and issues relevant instructions for safe stripping.

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No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
4.	Determine point with least pressure and stress	Starting at a high pressure and stress point	Falls of ground, injuries, property damage, product damage, production losses, financial loss, down time, loss of mining areas	40	2	3	240	Point of stripping to determined by roc mechanics and strict adherence to rock mechanics must be adhered to.
5.	Install temporary support with headboards in area to be stripped as per rock mechanics requirements	Not installing temporary support	Falls of ground, injuries, property damage, product damage, production losses, financial loss, down time, loss of mining areas	40	2	3	240	All temporary support to be installed as per rock mechanics specifications and under the direct supervision of the competent person in charge.
6.	Commence stripping welded mesh at a distance of at least 10m from point with least stress or pressure in accordance with rock mechanics requirements, through temporary support	Not adhering to rock mechanics requirements	Falls of ground, injuries, property damage, product damage, production losses, financial loss, down time, loss of mining areas	40	2	3	240	Stripping only to be done as per rock mechanics requirements.

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No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
7.	Ensure temporary support is installed at a distance of 1m apart in the direction of stripping or as per rock mechanics requirements	Not adhering to rock mechanics requirements	Falls of ground, injuries, property damage, product damage, production losses, financial loss, down time, loss of mining areas	40	2	3	240	Temporary support installation to be done as per rock mechanics requirements.
8.	Complete stripping and dress area to ensure competent hang and sidewall	Incorrect stripping, not dressing area for safety	Falls of ground, injuries, property damage, product damage, production losses, financial loss, down time, loss of mining areas	40	2	3	240	Stripping to commence and be completed as per rock mechanics requirements and the area to be dressed as per rock mechanics specifications.
9.	Re-install permanent support, through temporary support	Not installing permanent support, not working under temporary support	Falls of ground, injuries, property damage, product damage, production losses, financial loss, down time, loss of mining areas	40	1	1	40	Permanent support to be installed whilst working under temporary support and in accordance with rock mechanics requirements.

RECOMMENDED SAFE WORKING PRACTICE FOR STRIPPING INSTALLED WELDED MESH AND LACING BY THE USER:

Component	Potential Hazard	Recommendation/Controls
Assess current installation with rock mechanics department	No assessment done	No attempt of stripping the welded mesh should be done unless the rock mechanics department has done a thorough assessment.
Draft action plan for safe stripping	No action plan	No attempt of stripping the welded mesh to take place unless thorough action plans with relevant responsibilities has been issued by the rock mechanics department.
Ensure competent person in charge of stripping process	No competent person in charge	No attempt of stripping to take place if a competent person is not in charge and issues relevant instructions for safe stripping.
Determine point with least pressure and stress	Starting at a high pressure and stress point	Point of stripping to determined by roc mechanics and strict adherence to rock mechanics must be adhered to.
Install temporary support with headboards in area to be stripped as per rock mechanics requirements	Not installing temporary support	All temporary support to be installed as per rock mechanics specifications and under the direct supervision of the competent person in charge.
Commence stripping welded mesh at a distance of at least 10m from point with least stress or pressure in accordance with rock mechanics requirements, through temporary support	Not adhering to rock mechanics requirements	Stripping only to be done as per rock mechanics requirements.
Ensure temporary support is installed at a distance of 1m apart in the direction of stripping or as per rock mechanics requirements	Not adhering to rock mechanics requirements	Temporary support installation to be done as per rock mechanics requirements.
Complete stripping and dress area to ensure competent hang and sidewall	Incorrect stripping, not dressing area for safety	Stripping to commence and be completed as per rock mechanics requirements and the area to be dressed as per rock mechanics specifications.
Re-install permanent support, through temporary support	Not installing permanent support, not working under temporary support	Permanent support to be installed whilst working under temporary support and in accordance with rock mechanics requirements.

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G - INSPECTIONS ON ARTICLES BY USER BEFORE INSTALLATION:



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G - INSPECTIONS ON ARTICLES BY USER BEFORE INSTALLATION:

Component	Check/Test	In order	Out of order	Possible causes if not in order	Recommended controls
Welded mesh					
<ul style="list-style-type: none"> 4mm Galvanised longitudinal and cross wire 	Check that wires are galvanised and physical damage is not evident or rusted			Incorrect manufacturing, incorrect product delivered, damaged during transport or handling, rusted because wires not galvanised or exposed to excessive water.	User to notify supplier if wires not galvanised. If damaged or rusted it is recommended the article not be used for installation purposes.
<ul style="list-style-type: none"> Electric resistance welding 	Check welding in tact.			Poor manufacturing. Damaged during transport and handling.	User to notify supplier if welding not in tact.
<ul style="list-style-type: none"> Edge flush cut 	Check that all protruding points have been cut flush with cross wire edge.			Poor manufacturing.	User to notify supplier and take caution in using article to prevent hand injuries by ensuring people using article are wearing the correct PPE.
<ul style="list-style-type: none"> 75mm x 75mm Square Aperture 	Check that it is a 4mm wire and the aperture is a 75mm square.			Incorrect deliveries, incorrectly ordered or poor manufacturing.	User to notify supplier and return articles for exchange for correct required items as per order.

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Component	Check/Test	In order	Out of order	Possible causes if not in order	Recommended controls
Washer					
• Mild steel washer	In tact			Damage	User to notify supplier to replace washer.
• Dome	Check I is domed and not flattened			Poor manufacturing	Notify supplier to be exchanged
• Dog ear	In tact, and has hole through it			Poor manufacturing	Notify supplier for exchange
• Dog ear hole	Check not off centre			Poor manufacturing	Notify supplier and exchange
• Washer hole	Check not off centre			Poor manufacturing	Notify supplier and exchange
• Washer ribs	Check not flat			Incorrect delivery	Notify supplier for exchange
• Washer slot	Check that it is a slot and not a hole as per order			Incorrect delivery	Notify supplier for exchange.
• Nut	In place, and free running			Man handled or rusted	Ensure nut in place and free running before installation.

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Component	Check/Test	In order	Out of order	Possible causes if not in order	Recommended controls
Lacing Clip					
• Mild steel clip	In tact			Poor manufacturing	Notify for exchange
• Clip V	In place			Poor manufacturing, incorrectly punched	Notify for exchange
• Clip Point	In place			Poor manufacturing	Notify for exchange
• Clip V legs	In place			Poor manufacturing	Notify for exchange
Sheppard crook	Sufficient quantities available				
Split set	Sufficient quantities available				
Re-bar	Sufficient quantities available				
Aussie bar	Sufficient quantities available				
Lacing wire	Sufficient quantities available				
Capcem 60	Sufficient quantities available				
Resin	Sufficient quantities available				
Grout pump	In serviceable condition			Abuse	Only a serviceable pump to be used



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RECOMMENDED INSPECTION PROCEDURE FOR INSPECTION ON THE ARTICLES AND COMPONENTS BY THE USER BEFORE INSTALLATION:

Component	Check/Test	Recommended controls
Welded mesh		
<ul style="list-style-type: none"> 4mm Galvanised longitudinal and cross wire 	Check that wires are galvanised and physical damage is not evident or rusted	User to notify supplier if wires not galvanized. If damaged or rusted it is recommended the article not be used for installation purposes.
<ul style="list-style-type: none"> Electric resistance welding 	Check welding in tact.	User to notify supplier if welding not in tact.
<ul style="list-style-type: none"> Edge flush cut 	Check that all protruding points have been cut flush with cross wire edge.	User to notify supplier and take caution in using article to prevent hand injuries by ensuring people using article are wearing the correct PPE.
<ul style="list-style-type: none"> 75mm x 75mm Square Aperture 	Check that it is a 4mm wire and the aperture is a 75mm square.	User to notify supplier and return articles for exchange for correct required items as per order.
Washer		
<ul style="list-style-type: none"> Mild steel washer 	In tact	User to notify supplier to replace washer.
<ul style="list-style-type: none"> Dome 	Check I is domed and not flattened	Notify supplier to be exchanged
<ul style="list-style-type: none"> Dog ear 	In tact, and has hole through it	Notify supplier for exchange
<ul style="list-style-type: none"> Dog ear hole 	Check not off centre	Notify supplier and exchange
<ul style="list-style-type: none"> Washer hole 	Check not off centre	Notify supplier and exchange
<ul style="list-style-type: none"> Washer ribs 	Check not flat	Notify supplier for exchange
<ul style="list-style-type: none"> Washer slot 	Check that it is a slot and not a hole as per order	Notify supplier for exchange.
<ul style="list-style-type: none"> Nut 	In place, and free running	Ensure nut in place and free running before installation.

Component	Check/Test	Recommended controls
Lacing Clip		
• Mild steel clip	In tact	Notify for exchange
• Clip V	In place	Notify for exchange
• Clip Point	In place	Notify for exchange
• Clip V legs	In place	Notify for exchange
Sheppard crook	Sufficient quantities available	
Split set	Sufficient quantities available	
Re-bar	Sufficient quantities available	
Aussie bar	Sufficient quantities available	
Lacing wire	Sufficient quantities available	
Capcem 60	Sufficient quantities available	
Resin	Sufficient quantities available	
Grout pump	In serviceable condition	Only a serviceable pump to be used

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H - INSPECTIONS ON ARTICLES BY USER AFTER INSTALLATION:



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H - **INSPECTIONS ON ARTICLES BY USER AFTER INSTALLATION:**

Component	Check/Test	In order	Out of order	Possible causes if not in order	Recommended controls
Welded mesh					
4mm Galvanised longitudinal and cross wire	In tact and not damaged			Damaged during handling	Monitor to ensure no excessive deterioration takes place
Electric resistance welding	In tact			Damaged during handling	Clip with lacing clips
Edge flush cut	If flush cut			Cut for installation	Flush cut edges
75mm x 75mm Square Aperture	In tact			Damaged by handling	Monitor for deterioration
Washer					
<ul style="list-style-type: none"> Mild steel washer 	In tact, flush with hang or sidewall			Not installed correctly	Retention if possible or re-install
<ul style="list-style-type: none"> Dome 	That it has not collapsed			Taking pressure	Install additional support
<ul style="list-style-type: none"> Dog ear 	In tact			Abuse	Dog-ear can only handle a maximum of three tons.
<ul style="list-style-type: none"> Dog ear hole 	In tact			Abuse	Do not overload
<ul style="list-style-type: none"> Washer hole 	Not damaged			Taking pressure	Install additional support
<ul style="list-style-type: none"> Washer ribs 	In tact			Pressure	Install additional support
<ul style="list-style-type: none"> Washer slot 	In tact			Abuse	Monitor for deterioration
<ul style="list-style-type: none"> Nut 	In place, and tensioned			Incorrect installation	Re-install

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Component	Check/Test	In order	Out of order	Possible causes if not in order	Recommended controls
Lacing Clip					
• Mild steel clip	In tact			Poor installation	Re-install
• Clip V	In tact				
• Clip Point	In tact				
• Clip V legs	In tact				
Sheppard crook	Not protruding excessively			Poor installation, short holes, incorrect lengths	Re-install
Split set	Not protruding excessively			Poor installation, short holes, incorrect lengths	Re-install
Re-bar	Not protruding excessively			Poor installation, short holes, incorrect lengths	Re-install
Aussie bar	Not protruding excessively			Poor installation, short holes, incorrect lengths	Re-install
Lacing wire	In tact			Poor installation	Re-install
Capcem 60	Not visible				
Resin	Not visible				



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

Component	Check/Test	Recommended controls
Welded mesh		
<ul style="list-style-type: none"> 4mm Galvanised longitudinal and cross wire 	In tact and not damaged	Monitor to ensure no excessive deterioration takes place
<ul style="list-style-type: none"> Electric resistance welding 	In tact	Clip with lacing clips
<ul style="list-style-type: none"> Edge flush cut 	If flush cut	Flush cut edges
<ul style="list-style-type: none"> 75mm x 75mm Square Aperture 	In tact	Monitor for deterioration
Washer		
<ul style="list-style-type: none"> Mild steel washer 	In tact, flush with hang or sidewall	Retention if possible or re-install
<ul style="list-style-type: none"> Dome 	That it has not collapsed	Install additional support
<ul style="list-style-type: none"> Dog ear 	In tact	Dog-ear can only handle a maximum of three tons.

Component	Check/Test	Recommended controls
• Dog ear hole	In tact	Do not overload
• Washer hole	Not damaged	Install additional support
• Washer ribs	In tact	Install additional support
• Washer slot	In tact	Monitor for deterioration
• Nut	In place, and tensioned	Re-install
Lacing Clip		
• Mild steel clip	In tact	Re-install
• Clip V	In tact	
• Clip Point	In tact	
• Clip V legs	In tact	
Sheppard crook	Not protruding excessively	Re-install
Split set	Not protruding excessively	Re-install
Re-bar	Not protruding excessively	Re-install
Aussie bar	Not protruding excessively	Re-install
Lacing wire	In tact	Re-install
Capcem 60	Not visible	
Resin	Not visible	

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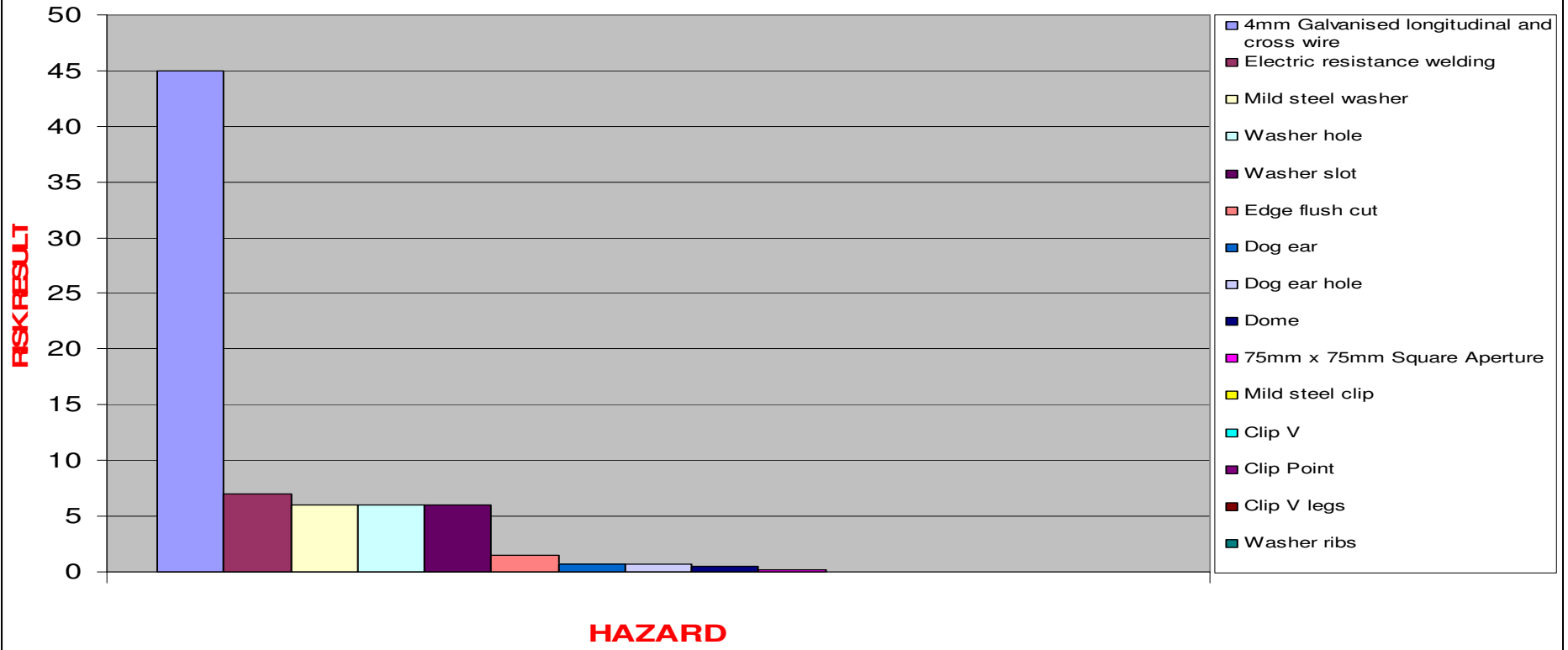
I - FAILURE MODES AND EFFECTS OF ARTICLE COMPONENTS:



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FAILURE MODES AND EFFECTS OR ATRICLES COMPONENTS RISK PROFILE



I - FAILURE MODES AND EFFECTS OF ARTICLE COMPONENTS:

Equipment	Components	Function	Failure Mode	Cause of failure	C	E	P	Risk Result	Recommendation
Welded mesh	4mm Galvanised longitudinal and cross wire	To form a welded mesh to facilitate sufficient coverage of fragile ground	Snap, shear, rust	Excessive stress, excessive water	15	1	3	45	User to ensure that welded mesh is installed as per rock mechanics specifications for best results and from a storage point of view kept clear from excessive water to reduce the possibility of rust.
	Electric resistance welding	To bind longitudinal and cross wires together to form a welded mesh	Break, corrosion	Poor manufacturing, poor welding, excessive water, abuse	7	2	0.5	7	From storage point of view the articles should be clear from excessive water to reduce the possibility of the welding being corroded. User to prevent deliberate damage of welding as far as reasonably practicable.
	Edge flush cut	To prevent protruding edges and points	Not flush cut by manufacturer or user	Poor workmanship	3	1	0.5	1.5	When user cut panels for certain installations the user to ensure that all protruding edges and points are cut flush to prevent any possibility of injury.
	75mm x 75mm Square Aperture	Facilitates the installation of roof bolts through welded mesh	Reams	Pressure	1	0.5	0.5	0.25	User to monitor aperture after installation and if aperture does ream to the extend where welding or wire actually breaks additional support to be installed.

I - FAILURE MODES AND EFFECTS OF ARTICLE COMPONENTS:

Equipment	Components	Function	Failure Mode	Cause of failure	C	E	P	Risk Result	Recommendation
Lacing Clips	Mild steel clip	To clip welded mesh together	Corrode	Water	1	0.5	0.1	0.05	From a storage point of view user to prevent storage of clips in excessive water.
	Clip V	To house the clip point	N/A	N/A	0	0	0	0	N/A
	Clip Point	To ensure a better fit	N/A	N/A	0	0	0	0	N/A
	Clip V legs	To facilitate a better fit	N/A	N/A	0	0	0	0	N/A
Washer	Mild steel washer	To allow a roof bolt to protrude through washer hole and keep up welded mesh	Collapse, corroded	To much pressure, water	3	2	1	6	User to monitor the washer for any collapse and should this take place the user to install additional support with new washers. From storage point of view the washer should not be stored in water.

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Equipment	Components	Function	Failure Mode	Cause of failure	C	E	P	Risk Result	Recommendation
	Dome	Strengthens washer and serves as pressure indicator	Collapse	Pressure	1	1	0.5	0.5	User to monitor the dome for indication of pressure and should dome collapse user tom install additional support with new washer.
	Dog ear	To house the dog ear hole for equipment suspension	To much tension	Overload	3	0.5	0.5	0.75	User to ensure that only a maximum weight of 3 tons can be tolerated by the dog-ear and it should not be overloaded.
	Dog ear hole	To suspend equipment from	Tare	Overload	3	0.5	0.5	0.75	User to ensure that only a maximum weight of 3 tons can be tolerated by the dog-ear and it should not be overloaded.
	Washer hole	To allow the roof bolt to protrude through washer	Tare, collapse	Too much pressure	3	2	1	6	User to monitor washer for any collapse and install additional support with new washer if washer hole collapse and roof bolt pulls through washer.
	Washer ribs	To strengthen washer	N/A	N/A	0	0	0	0	N/A
	Washer slot	Too allow Sheppard crooks to protrude through washer	Tare, collapse	Too much pressure	3	2	1	6	User to monitor washer for any collapse and install additional support with new washer if washer hole collapse and roof bolt pulls through washer.

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Equipment	Components	Function	Failure Mode	Cause of failure	C	E	P	Risk Result	Recommendation
Sheppard crook	Refer to suppliers risk assessment.								
Split set	Refer to suppliers risk assessment.								
Re-bar	Refer to suppliers risk assessment.								
Aussie bar	Refer to suppliers risk assessment.								
Lacing wire	Refer to suppliers risk assessment.								
Capcem 60	Refer to suppliers risk assessment.								
Resin	Refer to suppliers risk assessment.								
Grout pump	Refer to suppliers risk assessment.								



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RECOMMENDATIONS FOR PREVENTION OF ARTICLE AND COMPONENT FAILURE

Components	Cause of failure	Recommendation
Welded mesh		
4mm Galvanised longitudinal and cross wire	Excessive stress, excessive water	User to ensure that welded mesh is installed as per rock mechanics specifications for best results and from a storage point of view kept clear from excessive water to reduce the possibility of rust.
Electric resistance welding	Poor manufacturing, poor welding, excessive water, abuse	From storage point of view the articles should be clear from excessive water to reduce the possibility of the welding being corroded. User to prevent deliberate damage of welding as far as reasonably practicable.
Edge flush cut	Poor workmanship	When user cut panels for certain installations the user to ensure that all protruding edges and points are cut flush to prevent any possibility of injury.
75mm x 75mm Square Aperture	Pressure	User to monitor aperture after installation and if aperture does ream to the extend where welding or wire actually breaks additional support to be installed.
Lacing Clips		
Mild steel clip	Water	From a storage point of view user to prevent storage of clips in excessive water.
Clip V	N/A	N/A
Clip Point	N/A	N/A
Clip V legs	N/A	N/A
Washer		
Mild steel washer	To much pressure, water	User to monitor the washer for any collapse and should this take place the user to install additional support with new washers. From storage point of view the washer should not be stored in water.
Dome	Pressure	User to monitor the dome for indication of pressure and should dome collapse user tom install additional support with new washer.
Dog ear	Overload	User to ensure that only a maximum weight of 3 tons can be tolerated by the dog-ear and it should not be overloaded.
Dog ear hole	Overload	User to ensure that only a maximum weight of 3 tons can be tolerated by the dog-ear and it should not be overloaded.
Washer hole	Too much pressure	User to monitor washer for any collapse and install additional support with new washer if washer hole collapse and roof bolt pulls through washer.
Washer ribs	N/A	N/A
Washer slot	Too much pressure	User to monitor washer for any collapse and install additional support with new washer if washer hole collapse and roof bolt pulls through washer.

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Components	Cause of failure	Recommendation
Sheppard crook		Refer to suppliers risk assessment.
Split set		Refer to suppliers risk assessment.
Re-bar		Refer to suppliers risk assessment.
Aussie bar		Refer to suppliers risk assessment.
Lacing wire		Refer to suppliers risk assessment.
Capcem 60		Refer to suppliers risk assessment.
Resin		Refer to suppliers risk assessment.
Grout pump		Refer to suppliers risk assessment.



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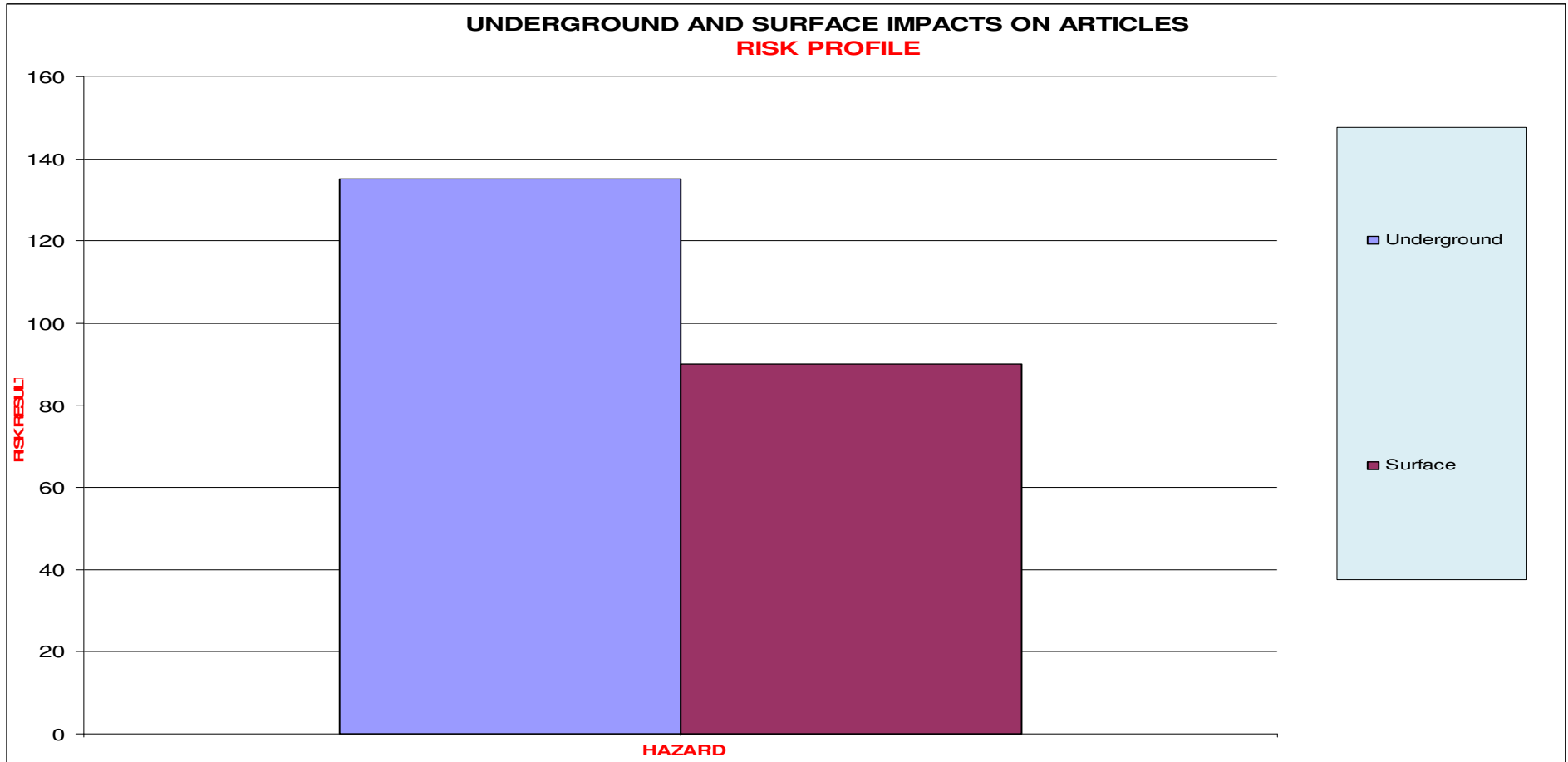
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J - UNDERGROUND AND SURFACE IMPACTS ON ARTICLES:



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J - UNDERGROUND AND SURFACE IMPACTS ON ARTICLES:

Unit	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation
Underground	Storage of articles in water, inadequate clearances when storing articles, no demarcated areas for storage, articles used for build of barricades, articles used for building walkways, articles used as re-enforcing, articles use for gates, articles used for store fencing	Product loss, financial loss, injury, production loss, down time	15	3	3	135	User to understand that the articles are safety critical items and should only be used for the reason it is designed for and not be used for any thing else then the specific design intension and reason of supply.
Surface	Storage of articles in water, inadequate clearances, no demarcated areas for storage, articles used for fencing on surface, articles used for barricades, theft	Product loss, financial loss, injury, production loss, down time	15	2	3	90	User to understand that the articles are safety critical items and should only be used for the reason it is designed for and not be used for any thing else then the specific design intension and reason of supply.

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

Unit	Potential Hazard	Recommendation
Underground	Storage of articles in water, inadequate clearances when storing articles, no demarcated areas for storage, articles used for build of barricades, articles used for building walkways, articles used as re-enforcing, articles use for gates, articles used for store fencing	User to understand that the articles are safety critical items and should only be used for the reason it is designed for and not be used for any thing else then the specific design intension and reason of supply.
Surface	Storage of articles in water, inadequate clearances, no demarcated areas for storage, articles used for fencing on surface, articles used for barricades, theft	User to understand that the articles are safety critical items and should only be used for the reason it is designed for and not be used for any thing else then the specific design intension and reason of supply.

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5. SPECIFICATIONS

Refer to **APPENDIX 2** for details.



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6. DESIGN INTENTION

Welded mesh - To provide a cost effective method of rock support. To provide quick and safer working environments for rock miner's underground. With ergonomics and employees health and safety in mind the welded mesh was designed for easy handling, and installation to enhance the safety of the working environments.

ADVANTAGES:

- Cost effective;
- Easy to install;
- Quick to install;
- Easy to maintain;
- Minimum labour required for installation;
- Easy to handle;
- No fire hazard;
- Durable;
- Enhances safety of work environment;
- Enhances safety of tramming and travelling routes;
- Reduces rock falls;
- Reduce production loss;

- Reduced injuries;
- Gives visual indication of stressed areas
- Various lengths available;
- Prolongs rock integrity;
- Enhances life of mine.

DISADVANTAGES:

- Could cause injury if not handled properly;
- Ineffective without components;
- Co-operation between grout and bolt suppliers a necessity;
- Good supervision required;
- Very little indication of pressure build up high up in the strata;
- Corrosive;
- Sharp strap ends;
- Requires assistance in handling product;
- Requires sufficient storage space;
- Articles are bulky and heavy;
- Installation adaptors required for installation

Lacing Clips – To replace and reduce the use of long lacing wire, and to ensure easier and quicker effective installation.

ADVANTAGES:

- Easy to handle;
- Easy to install;
- Light weight;
- Cost effective;
- Durable

DISADVANTAGES:

- Corrosive;
- Loose easily;
- Prone to theft

7. CONCLUSION

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

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

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

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

Only then one can ensure as far as reasonably practicable the articles will be used properly.

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

Office - 016-421 3520; or

**Cell - 078 456 7697 James Sheppard
Plant Engineering Specialist**

**083 643 7088 Renier Strydom
Production Manager**



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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.

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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 tramming 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.

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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	Incorrect installation	Sub standard installation, falls of ground, time delay, property damage, possible loss of production, injury	15	0.5	0.5	3.75	Sheppard crooks is placed into hole and reamed home until the short leg reaches the welded mesh, at this point the user to ensure that the short leg is inserted into the next aperture causing one wire strand is caught in the loop serving as the anchor.

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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.
15.	Remove temporary support	Falling jacks, premature 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.

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No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
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.

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

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 tramping ways, all tramping operators to be made aware of planned activities and exercise caution at all times. In tramping 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.
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.

Activity	Potential Hazard	Recommendation/Controls
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.
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 tramming 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 fir 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.

Activity	Potential Hazard	Recommendation/Controls
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.
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	Incorrect installation	Sheppard crooks is placed into hole and reamed home until the short leg reaches the welded mesh, at this point the user to ensure that the short leg is inserted into the next aperture causing one wire strand is caught in the loop serving as the anchor.

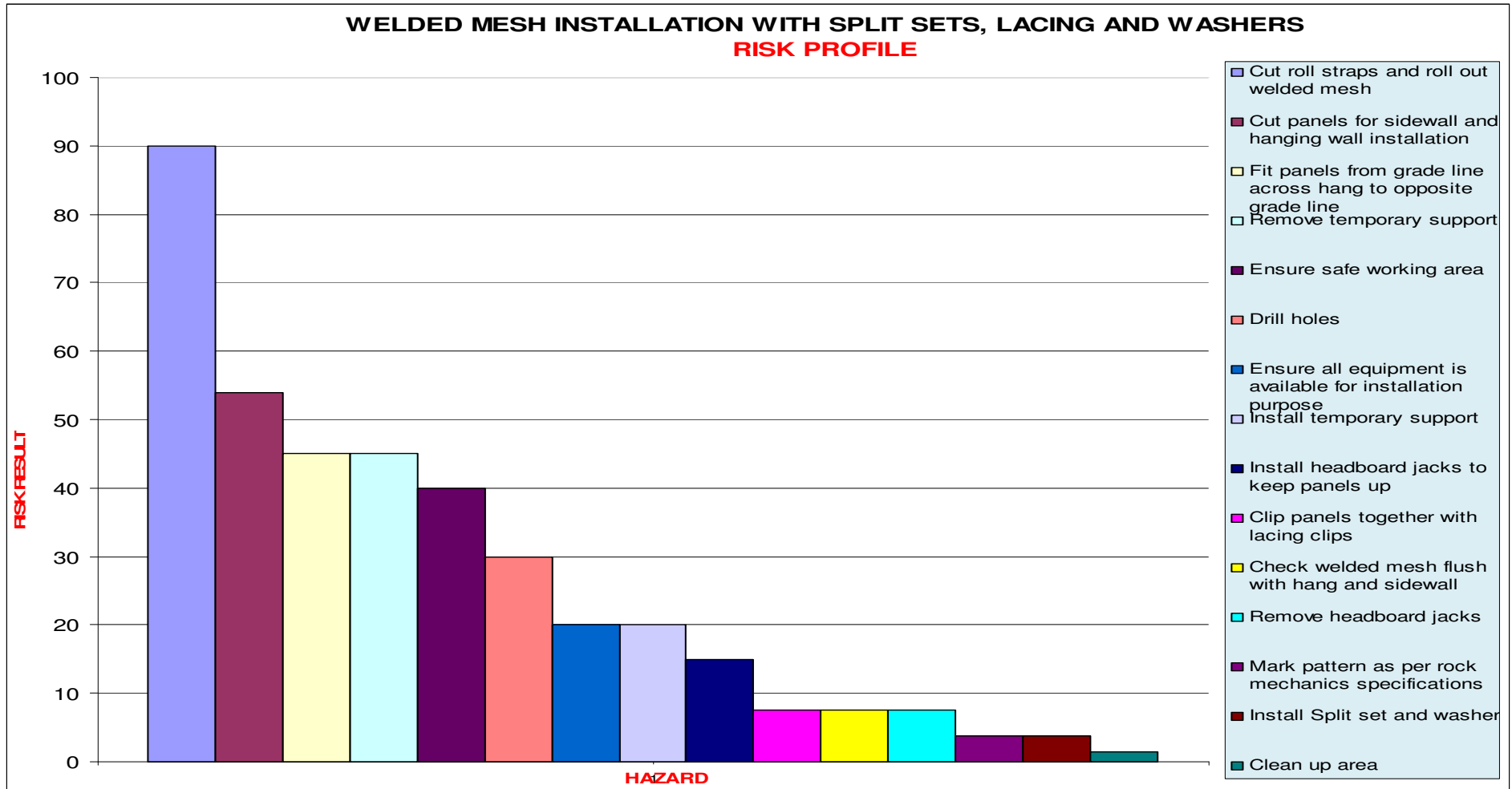
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Activity	Potential Hazard	Recommendation/Controls
Clip panels together with lacing clips	Shortage of clips, using defective clipping pliers	BRC suppliers clip pliers to the user for use in clipping the lacing clips. User to ensure that a sufficient 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 on time should be clipped together using the lacing clip.
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.



3. WELDED MESH INSTALLATION WITH SPLIT SETS, 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 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 trammings ways, all trammings operators to be made aware of planned activities and exercise caution at all times. In trammings 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.

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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.

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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 tramming 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.

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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.	Install Split set and washer	Incorrect installation	Sub standard installation, falls of ground, time delay, property damage, possible loss of production, injury	15	0.5	0.5	3.75	Split set to be inserted into hole and reamed home.
11.	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.

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No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
12.	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.
13.	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.
14.	Remove temporary support	Falling jacks, premature 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.
15.	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.

3. WELDED MESH INSTALLATION WITH SPLIT SETS, 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 tramping ways, all tramping operators to be made aware of planned activities and exercise caution at all times. In tramping 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.
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.

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Activity	Potential Hazard	Recommendation/Controls
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.
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 tramming 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 fir 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.

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Activity	Potential Hazard	Recommendation/Controls
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.
Install Split set and washer	Incorrect installation	Split set to be inserted into hole, reamed home and tensioned.

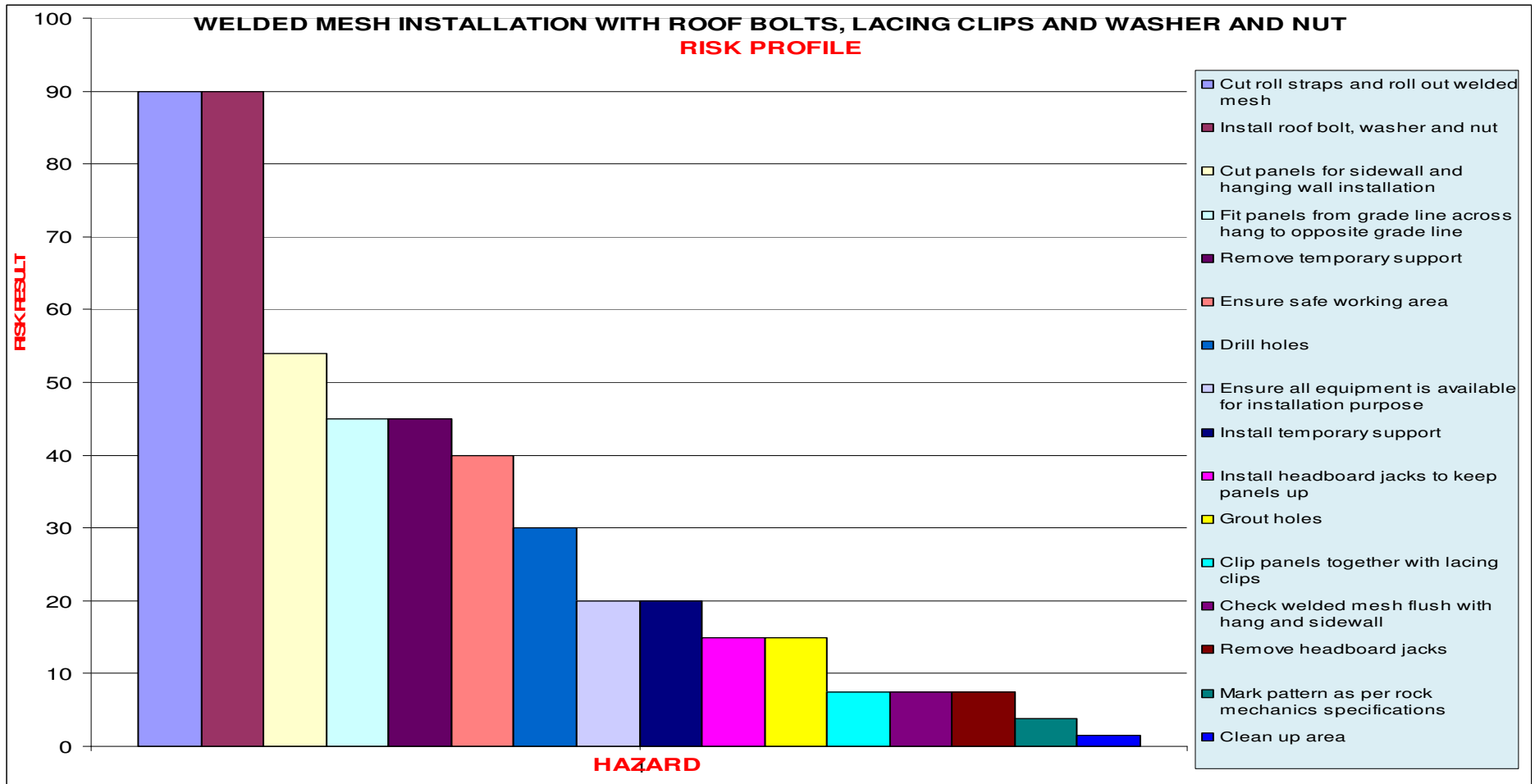
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Activity	Potential Hazard	Recommendation/Controls
Clip panels together with lacing clips	Shortage of clips, using defective clipping pliers	BRC suppliers clip pliers to the user for use in clipping the lacing clips. User to ensure that a sufficient 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.
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.



4. WELDED MESH INSTALLATION WITH ROOF BOLTS, LACING CLIPS, WASHER AND NUT

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.

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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.

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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 tramming 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.

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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	Resin not available, using incorrect resin, expired resin used	Sub standard installation, falls of ground, time delay, property damage, possible loss of production, injury	15	1	1	15	User to ensure the resin is placed in the hole as per specification from resin suppliers risk assessment or procedures and that no expired resin is used but only resin as specified by rock mechanics requirements.
11.	Install Roof bolt, washer and nut	Falling roof bolts, incorrect spinning, using defective equipment	Sub standard installation, falls of ground, time delay, property damage, possible loss of production, injury	15	2	3	90	User only to use trained personnel who are familiar with correct spinning and setting times of resin. Install into hole ensuring the roof bolts is equipped with a washer and nut, spin roof bolt into hole as per required spinning time and holed as per required setting time and ensure roof bolt washer is flush with hang or sidewall and tension washer to required tension.

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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 on 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.
15.	Remove temporary support	Falling jacks, premature 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.

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No.	Activity	Potential Hazard	Consequences	C	E	P	Risk Result	Recommendation/Controls
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.



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4. WELDED MESH INSTALLATION WITH ROOF BOLTS, LACING CLIPS, WASHER AND NUT

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.
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.

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Activity	Potential Hazard	Recommendation/Controls
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.
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 tramming 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 fir 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.

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Activity	Potential Hazard	Recommendation/Controls
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.
Grout holes	Resin not available, using incorrect resin, expired resin used	User to ensure the resin is placed in the hole as per specification from resin suppliers risk assessment or procedures and that no expired resin is used but only resin as specified by rock mechanics requirements.
Install Roof bolt, washer and nut	Falling roof bolts, incorrect spinning, using defective equipment	User only to use trained personnel who are familiar with correct spinning and setting times of resin. Install into hole ensuring the roof bolts is equipped with a washer and nut, spin roof bolt into hole as per required spinning time and holed as per required setting time and ensure roof bolt washer is flush with hang or sidewall and tension washer to required tension.
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.