RSS Mining Pty Ltd | Rock Support Systems
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OPERATORS MANUAL

ROCKY RSE100

Table of Contents

1. Rocky RSE100 Technical Specifications

Category	Grouting ,Wet Shotcrete,TSL
Output Capacity	1.2 m3/h
Delivery Pressure	Up to 30bar
Horizontal Delivery Distance	Up to 60m
Vertical Delivery Distance	Up to 30m
Aggregate Size	Up to 8mm
Power Supply	380V,525V,1000V 3-Phase
Drive Motor	1.1Kw & 3Kw 380V,525V,1000V
Control Circuit	24V DC
Dry Weight	282 kg
Mixer Capacity	50L
Length	1620mm
Width	500mm
Height	1040mm

2. Principals of Operation

2.1. Materials

Among the commercially manufactured materials available in today's market are materials for structural repairs, floor toppings, high strength non-shrink grouts, special linings and other specialty materials.

Each of these materials has unique characteristics, which must be well understood to ensure a successful application.

2.2. Flow

In general, most materials need to be a flowable or pourable consistency for successful pumping. This means that if the material can be poured out of a pail or bucket, it can likely be pumped.

The exception to this requirement is repair mortars, which tend to be mixed in a thicker consistency and require special pumping techniques.

Materials that contain aggregates pump best and perform best when the consistency is kept to the lower range of pourable, that is, not too wet.

2.3. Setting Time

Some materials contain accelerating admixtures to reduce the setting time. This is particularly true of repairing mortars and other spray applied materials so that strength gain can be fairly rapid. It is important to keep moving when using these types of materials.

Once the material is mixed, it must be pumped immediately and kept in motion and subsequent batches must be mixed and pumped as rapidly as possible. Any delays in the application process could result in plugged hoses and equipment.

Temperature also has an effect upon these materials to the extent that exposure of the hose to the sun on a hot day will accelerate the set time even more, therefore this should be avoided. It may even be necessary in some

2.4. Pumping Distance

Pumping distances should always be kept to a minimum, and hoses should run as straight as possible no matter what material is being used.

Sometimes circumstances require longer than usual hose lengths, when this occurs, every effort should be made to use every advantage possible to insure a successful application. Some materials simply cannot be pumped for long distances, so it's best to know the proposed material characteristics before attempting a production procedure.

2.5. General Procedures

Before attempting to mix and pump production materials, it is important to rinse the mixer and charge the pump hopper with sufficient water to thoroughly flush the pump and all grout lines. This is to purge the grouting system of any residual materials or scale that may exist.

Once that is completed, remove the grout hose from the pump and drain out all water by elevating one end, or by progressively elevating the entire hose, at one end and proceeding to the other.

Mix slurry composed of Portland cement in approximate proportions of 25 litres of water to ½ a bag of cement, and pump this through the grouting system. This is to remove any residual water from the hose, lubricating it for the production material to follow. Now the production grout may be mixed and pumped immediately behind the slurry mix. The slurry mix may be retrieved in a bucket.

3. Operation & Safety

3.1. Introduction

The Rocky RSE100 is a compact rotor–stator driven pump engineered for precision grouting, thin skin liner (TSL) application, and wet shotcrete spraying. Its robust design ensures consistent and controlled delivery of low-volume materials, making it ideal for specialized support and repair operations in mining and tunneling environments.

Power is supplied by a 380V, 525V, or 1000V three-phase motor. The system is operated via a 24 V DC control circuit for safety and reliability. With a delivery capacity of up to 1.2 m³/h and a maximum pressure of 30 bar, the RSE100 provides steady material flow through delivery lines of up to 60 m horizontally and 30 m vertically.

Its efficient design accommodates aggregates up to 8 mm, with a 50 L mixer capacity, enabling smooth pumping performance even in demanding underground conditions. Compact dimensions (1620 mm L × 500 mm W × 1040 mm H) and a dry weight of 282 kg make it easy to transport and position in confined workspaces. The Rocky RSE100 delivers reliable, low-maintenance operation while maintaining the precise control required for quality surface application and structural support.

3.2. Safety Before Operation

As with all other rotating machinery, safety is critical when operating and maintaining the Rocky. The safety precautions outlined in this manual should be used as a guide only and should not be considered comprehensive safety instructions.

Only personnel trained in the use of shotcreting pumps and systems must be allowed to operate the Rocky.

Always refer to local mining or other site regulations before and during the operation and use of the equipment.

Always make sure the machine is clean and in good physical condition. This will reduce the possibility of injury or damage.

Before operating the machine, check and make sure of the following (Also refer to **Section 7:** Daily Check List):

- The machine is placed on a suitable horizontal surface
- Necessary signs or arrangements are in place for the use of the machine
- All guards and covers are in place and secure
- Hopper grid is closed and in good condition
- Hopper is clean and free of foreign objects
- The hopper lid is closed
- The electrical panel is closed and free of damage
- All switches are secured and in good working condition
- Electrical wiring and cables are correctly and securely connected and free of damage

- All limit switches are secured and undamaged

3.3. Safety During Operation

- Follow all local site regulations in terms of machine operation and personnel requirements
- Wear the required personal protective equipment
- Do not try to remove any foreign objects from the hopper through the grid. Completely switch off and isolate the machine before entering any part
- Keep clear of all moving parts
- Never open the electrical panel while the machine is in operation
- Do not remove pipes or clamps under pressure
- Only trained personnel should operate the machine

3.4. Operating the Pump - The Set-up

- In general, the most important factors in setting up are proximity to the work and access to materials and water supply, consideration should be given to the disposal of waste materials and wash-out residue.
- It is always best to keep grout lines as short as possible to reduce pumping distances. This is particularly important when pumping hard to-pump materials, such as sanded grouts and pre-blended materials.
- The source of solid materials (cement, fly ash, sand, etc.) should be readily accessible and adequate supply water should be available for mixing and cleaning
- When planning a project for high production rates, remember that the greatest consumption of time is when charging the mixers. A proper setup can reduce this to a minimum.

3.5. Operating the Pump - The Start-up & Production

- After setting up, visually inspect that there are no foreign objects or old set up materials in either the pump or the mixer, then make all necessary connections.
- With operating levers, valves, or handles in “NEUTRAL” or “OFF” position and the primary power source turned OFF, fill the pump hopper with clear water.
- Turn on the primary power source and observe that conditions are normal and the machine is ready to run.
- Check the mixer for proper operation by running the mixer and pump in the right direction.
- Next, start the delivery pump to discharge the water that was previously introduced into the pump hopper. This ideal opportunity to check the grouting system to

determine that all lines and hoses are clear and unobstructed. Pump condition may also be checked at this time by testing discharge pressure.

- When it is determined that all systems are normal, shut off the pump and drain the water from the pump and all lines.
- **NOTE** Some pre-blended materials and some on-site mixes of sand and cement tend to separate and clog the hoses upon contact with residual water in the hose, so it is a good procedure to mix and pump the production material, to lubricate the pump and hoses.
- During the production phase of work, monitor pump and mixer performance continuously, being alert to any signs of abnormality.
- Keep mixers free of material build-up; keep the outside of the machine clean.

3.6. Cleaning and Storage

- Never run a pump without fluid, as it will cause severe damage.
- After disposing of excess production material, carefully wash out mixer paddles, screen into the pump hopper, and pump the resulting washout material through the grout hoses to a suitable disposal site. Continue this operation until only clear water is discharged.
- It is advisable to drain all residual wash water from the pump and all hoses when washout is complete

3.7. Cleaning and Storage

- Load approximately 80% of the water or liquid anticipated for the size batch to be mixed and with the mixer running add the required amount of cement.
- Allow sufficient time for the slurry to mix to a creamy consistency, before pumping or adding filler material (sands, fly ash, etc.), slowly add sand if required, until the mix just begins to lose the cement colour. This should be the maximum amount of sand the mix can accommodate and it may be necessary to use slightly less sand for subsequent batches.
- The water may be adjusted for the relative wetness or dryness of sand to produce a grout that is just pourable.
- Never switch the mixer off during mixing batches. This will cause excessive load and will damage the motor and gearbox.

4. Maintenance

4.1. Pre- and Post-Operational Inspections

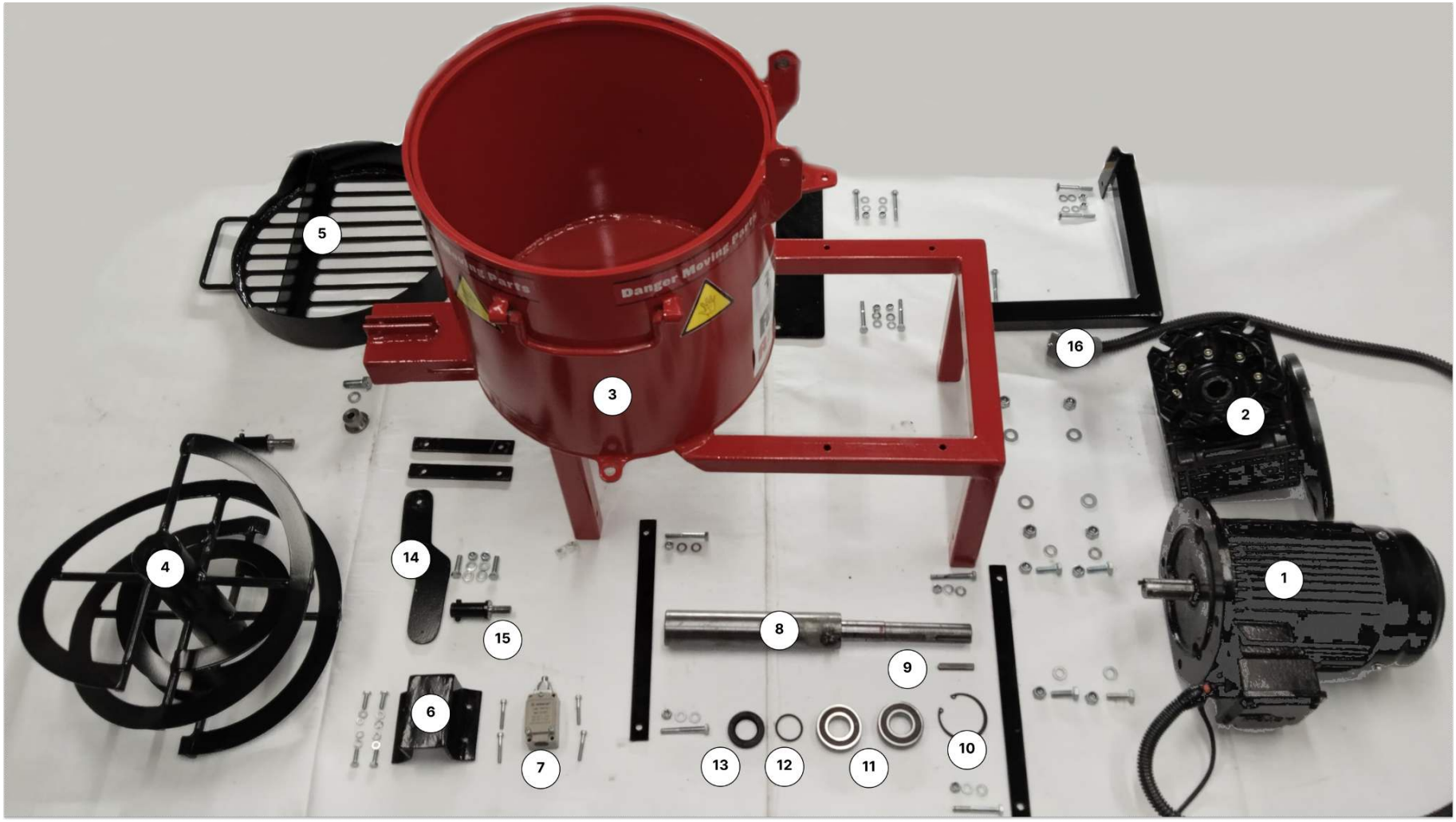
Regular inspection and maintenance will ensure optimum pump performance and increased machine life expectancy. Regular inspection will reduce the risk of injury or plant and equipment damage. Worn and damaged parts should be replaced immediately with OEM-approved parts.

- Swing Cylinder clevis, pin and securing pin
- Condition of hydraulic pipes and fittings
- Condition of all guards and covers
- Condition of the electrical panel, switches, cables and wires
- Level of hydraulic oil in the tank
- Excessive movement of the S-Tube indicates worn bushes and seals
- Concrete inside the lubrication box indicates worn piston cups
- Drastically reduced output is an indication of an incorrect mix or possible pump or cylinder damage
- Condition of seals
- General condition of the frame and structure
- Proper closing of the bottom gate

4.2. Running Maintenance

- For replacement of parts, always refer to the Spares List
- Replacement of the oil filter
- Greasing of the following points:
- Change-Over cylinder pin
- S-Tube bushes front and rear
- Hopper grid hinges
- Draining off moisture/water from the oil tank
- Refilling of the oil tank
- Retightening of any loose bolts or fittings

5. Parts Identification



1	RSEA028	Electric Motor 3kW	9	RSEA052	RSE Shaft Key
2	RSEA032	Gearbox 3kW	10	RSEA025	Internal Circlip for Ball Bearing 2mm
3	RSEA004	RSE Mixer drum	11	RSEA021	Ball Bearing 30x62x16
4	RSEA013	Mixer Spiral blade	12	RSEA023	Metric O-Ring 3x32
5	RSEA015	RSE Mixer Grid	13	RSEA024	Metric Oil Seal 30x50x7
6	RSEA019	Limit Switch Cover	14	RSEA054	Mixer Discharge door Handle
7	RM308	Limit Switch	15	RSEA017	Studs for RSE
8	RSEA044	Mixer Main Shaft	16	RSEA039 + RSEA042	Female Plug + Male Connector

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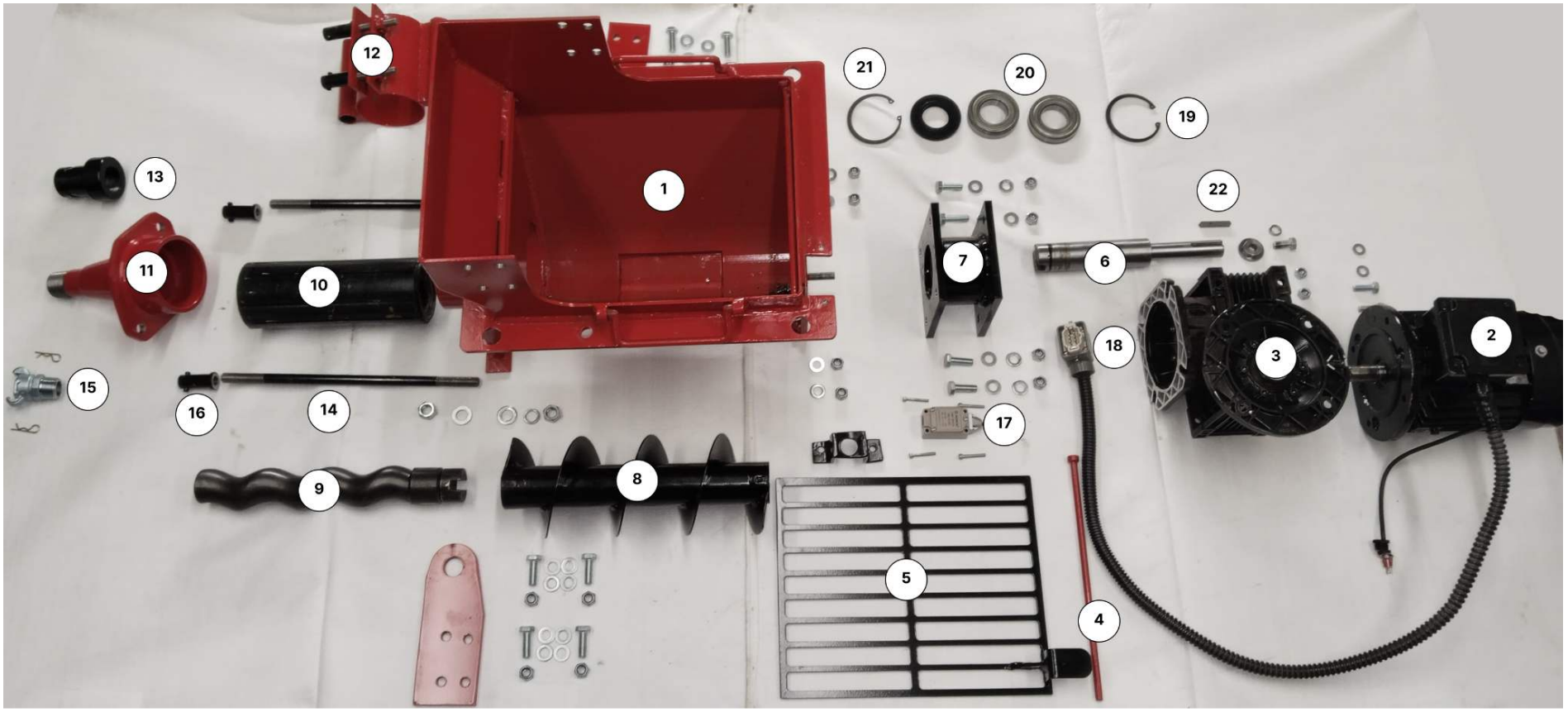

1	RSEA003	RSE Bottom Hopper	12	RSEA018	Stator Clamp
2	RSEA027	Electric Motor 1,1kW	13	RSEA010	Coupling on Reducer
3	RSEA031	Gearbox 1,1kW	14	RSEA053	Tie Rod RSE 16mm
4	RSEA050	Hopper Grid Locking Pin	15	RN5036	Claw Coupling 1" BSP - Male (USA Type)
5	RSEA051	Bottom Hopper Grid	16	RSEA017	Studs for RSE
6	RSEA008	Shaft to Rotor	17	RM308	Limit Switch
7	RSEA007	Bearing housing Rotor & Stator	18	RSEA039 + RSEA042	Female Plug + Male Connector
8	RSEA011	Spiral Feeder	19	RSEA026	Internal Circlip for Ball Bearing 3mm
9	RSEA002	Rotor 1L6	20	RSEA020	Ball Bearing
10	RSEA001	Stator 1L6	21	RSEA022	Metric Oil Seal 45x85x10
11	RSEA009	RSE Outlet Flange	22	RSEA052	RSE Shaft Key

1	R408	Start Button	7	R416	Phase sequence relay
2	R409	Emergency Stop	8	R407-525	Transformer 200VA
3	R451	Panel Lock Padlock	9	RM312	Contactor 3kw
4	RSEA041 + RSEA040	Male Plug + Female Connector	10	RM313	Overload 3kw 18A
5	R401	Circuit breaker 32Amp - 3pole	11	R448	2-Pole Fuse Holder DF102
6	R404	Circuit breaker 16A	12	R449-2A	2A ceramic fuse

6. Daily Check Lists

RSS MINING - PRE USE CHECK LIST				
Check By:				
Date:				
Time:				
Safety Precautions	**CHECK**			
1. Isolate all air & electrics during inspection and maintenance				
2. Keep hands away from moving parts				
3. Wear all necessary safety gear.				
BEFORE STARTING	**CHECK**	**GO**	**NO GO**	
1. Check that air and water pressure is sufficient	1			
2. Check all air, electrical & water connections are in safe working order.	2			
3. Check rotor and stator, if worn, replace. Apply grease before reassembling	3			
4. Check discharge, clean & replace if worn	4			
5. Check hoses for any material or blockages before turning on the machine	5			
6. Check and make sure the sieve is in place and secure.	6			
7. Check nozzle tip for any blockages, if blocked clean. Check o-rings. Apply grease on o-rings	7			
8. Check auger for wear.	8			
9. Check clamps & gaskets are in place and secure to all fittings.	9			
10. Check rotation of auger - anti clockwise	10			

7. Risk Assessment

7.1. Introduction

This risk assessment addresses the risk associated with the Rocky RSE. As there are different models of Rocky RSEs, the basic principle of operation is the same and for that reason this risk assessment can be considered as a generic risk assessment for all the Rocky RSEs manufactured by RSS Mining.

For this risk assessment only the Rocky RSE was considered. The risk assessment thus excludes any equipment or service that is not supplied as part of the Rocky RSE.

7.2. Methodology

For this risk assessment the Failure Mode and Effect Analyses (FMEA) and Fault Tree Analyses (FTA) techniques were used.

From the FMEA (Appendix I) follows that there are three categories of risk associated with the Rocky RSE, namely:

- Injuries to personnel
- Ill health to personnel
- Damage to equipment and production loss.

For these categories of risk three different Fault Tree Analyses were carried out as given in Appendix II, III and IV, respectively. The different combinations of basic events that could result in one of these three categories of risk are given in tables 1, 2 and 3 respectively.

The minimum combinations of basic events are events that have to happen simultaneously in order for the injury, ill health or damage to equipment/production loss to result.

It is important to note that the contents of tables 1, 2 and 3 must be read together with the Fault Tree Analyses given in appendices II, III and IV.

7.3. Conclusions and recommendations

From the analyses, as shown in Tables 1, 2 and 3, it follows that if the operating and maintenance procedures are adhered to and if the operating personnel are well trained and being aware of the hazards associated with the operation of the Rocky RSE, the risk should be acceptable. It is recommended that a pre-use inspection be put in place.

7.4. Table 1: The minimum combination of basic events that will result in injury to personnel

Minimum combination of events	Basic Events			
B3,C3	Maintenance is being carried out on thd RSA 100	RS 100 is not disconnected from air or power supply		
F4,C4	RSA 100 is not stopped timeously when blockage occurs (back pressure in RS100)	Foreign object in RSA 100		
F4,D4	RSA 100 is not stopped timeously when blockage occurs (back pressure in RS100)	RSA 100 running to fast		
F4,E4	RSA 100 is not stopped timeously when blockage occurs (back pressure in RS100)	Material hose not properly cleaned since prevouise use		
I4,J4	Dislodging of a blockage in the material hose take place	The material hose is not secured properly		
H,J	Pre-use inspection fails to detect a potential problem and have it rectified timeously.	Mechanical failure of the material hose connections take place		
H,B5	Pre-use inspection fails to detect a potential problem and have it rectified timeously.	Air hose come loose due to a loose bracket or damaged hose		
H,L	Pre-use inpsection fails to detect a potential problem and have it brectified timeously.	Mechaniccal failure of the material hose take place		
H,B2,C2	Pre-use inpsection fails to detect a potential problem and have it brectified timeously.	The sieve is removed from the RSA 100	RSA 100 is locked	

Minimum combination of events	Basic Events			
C,D,H,F	Air supply hose is connected to the RSA 100	Mechanical failure of the connecting coupling on the air supply hose take place	Pre-use inpecstion fails to detect a potential problem and have it rectified timeously	Safety chains/straps on the air supply hose fails
C,D,H,G	Air supply hose is connected to the RSA 100	Mechanical failure of the connecting coupling on the air supply hose take place	Pre-use inpecstion fails to detect a potential problem and have it rectified timeously	Safety chains/straps are not connected to the air supply hose(operating procedure to followed)

7.5. Table 2: The minimum combination of basic events that will result in ill health to personnel

Minimum combination of events	Basic Events	
C6,H	Incorrect clamping is used	Pre-use inspection fails to detect a potential problem and have it rectified timeously
H,E6	Pre-use inspection fails to detect a potential problem and have it rectified timeously	Critical parts are worn
H,G6	Pre-use inspection fails to detect a potential problem and have it rectified timeously	Nozzle is failed

7.6. Table 3: The minimum combination of basic events that will result in damage to equipment and or production loss

Minimum combination of events	Basic Events	
C7,H	Two or more of the filling hooks on the RSA 100	Pre-use inspection fails to detect a potential problem and have it rectified timeously
H,H7	Pre-use inspection fails to detect a potential problem and have it rectified timeously	Incorrect electrical connection exists
H,I7	Pre-use inspection fails to detect a potential problem and have it rectified timeously	Air motor is connected incorrect
E7,F7	A Foreign object is put into the RSA 100	The RSA 100 is not stopped timeously

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8. Appendix 1: Failure Mode and Effect Analyses

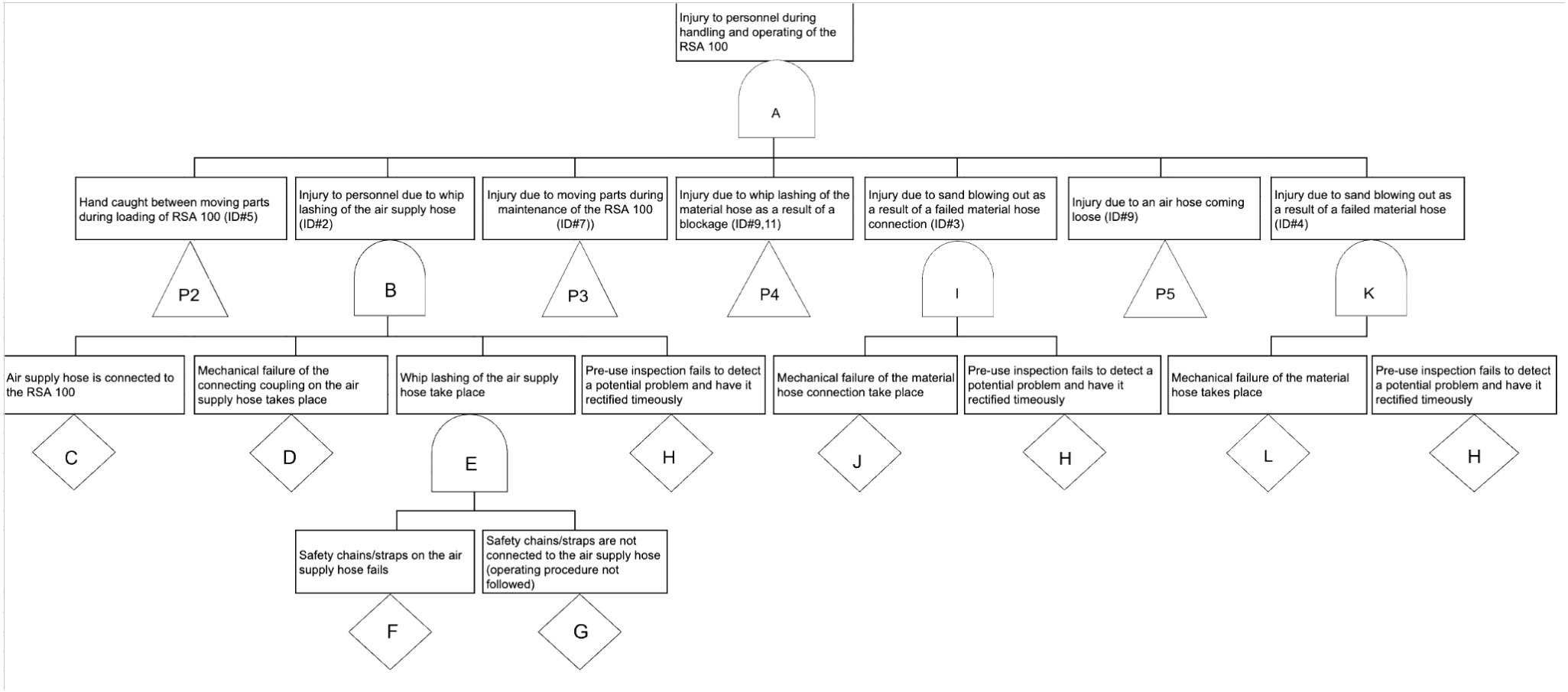
ID#	Failure Mode	Failure Mechanism	Failure Detect Mode	Protection or mitigating measures	Effects if protection Works	Effects if protection fails
1	Failures of more than one of the lifting/hoisting hooks during slining of the RSA 100	Mechanical failure of two or more of the lifting hooks	Visual inspection of lifting hooks	Visual inspection of lifting hooks prior to slinging	Nothing	RSA 100 going down the shaft and or damage to equipment
		Incorect failure of the connecting coupling	Visual Inspection	Training and awareness	Nothing	RSA 100 going down the shaft and or damage to equipment
2	Failure of the air supply connection to the RSA 100	Mechanical failure to the connecting coupling	Visual Inspection	Training , awareness and inspection operating procedure	Nothing	Whip lashing of the hose resulting in injury fatality
				Safety chains/straps	Nothing	Whip lashing of the hose resulting in injury fatality
3	Failure of the material hose connections	Mechanical failure of the connecting coupling	Visual Inspection	Training, awareness and inspection	Nothing	Injuries/splashes in eyes due to stand blowing out from the failed material hose.
4	Failure of the material hose during operation	Mechanical failure due to wear and tear	Visual Inspection	Training, awareness and daily inspection of hoses	Nothing	Injuries/splashes in eyes due to stand blowing out from the failed material hose.

ID#	Failure Mode	Failure Mechanism	Failure Detect Mode	Protection or mitigating measures	Effects if protection Works	Effects if protection fails
5	Hand or loose cllothing caught in moving parts during losding of RSA 100	Loading of sand and cement when the sieve is removed	Visual Inspection	Training, awareness not allowed to operate the RSA 100 without the sieve in place. Safety procedure	Nothing	Severe injuries to hand/arm
6	Mechanical damage to the RSA 100	Foreign objects entering through the sieve	Stalling of RSA 100	Sieve, training and awareness	Nothing	Production loss and repair cost
7	Exposure of personnel to moving parts during maintenance	Maintenance being carried out whislt machine is not disconnected	Visual	Training and awareness not allowed to carry out any maintenance on the RSA 100 whislt i operation or when power and or air is connected to it.	Nothing	Severe injuries to hand and other body parts
71	Screen on hopper to be pad locked	Maintenance beging carried our whilst machine is not disconnected	Visual	Training and awareness not allowed to carry out any maintenance on the RSA 100 whislt i operation or when power and or air is connected to it.	Nothing	Severe injuries to hand and other body parts
7.2	Main air in to have lockout on valve	Maintenance beging carried our whilst machine is not disconnected	Visual	Training and awareness not allowed to carry out any maintenance on the RSA 100 whislt i operation or when power and or air is connected to it.	Nothing	Severe injuries to hand and other body parts
8	Excessive dust during operation of RSA 100	ncorrect setting of RSA 100	Visual	Training, awareness and correct clamping procedure	Nothing	Ill health resulting from excessive exposure to

ID#	Failure Mode	Failure Mechanism	Failure Detect Mode	Protection or mitigating measures	Effects if protection Works	Effects if protection fails
						dust
		Worn parts	Visual Inspection	Training, awareness and scheduled maintenance		
		Loss of water pressure at the nozzle	Visual Inspection	Maintenance of the nozzle and inspection	Nothing	Ill health resulting from excessive exposure to dust
9	Blockages of the material hose	Foreign objects	Back pressure will cause exhausting in the hopper	Stop RSA 100 immediately	Nothing	Injury to personnel due to whip lashing of the material hose
		RSA 100 running to fast	Back pressure will cause exhausting in the hopper	Training and awareness . Stop RSA 100 immediately	Nothing	Injury to personnel due to whip lashing of the material hose
		RSA 100 material hose not properly cleaned since prevous use	Visual Inspection	Training and awareness	Nothing	Injury to personnel due to whip lashing of the material hose
10	Air hose on the RSA 100 coming loos	Loose clamp or damage hose	Pre-use inspection	Maintenance	Nothing	Injury to body parts
11	Whip lashing of the material hose during dislodging of a blockage	blackage of the material hose and over pressurisation	Visual	Training and awareness. Operating procedure	Nothing	Injury to personnel due to whip lashing of the material hose
12	Damage to electrical motor	Single phasing of the motor due to cable failure or incorrect connections	Pre-use inspection	Training and awareness	Nothing	Damage to electrical motor and consequential productions loss

ID#	Failure Mode	Failure Mechanism	Failure Detect Mode	Protection or mitigating measures	Effects if protection Works	Effects if protection fails
13	RSE 100 turning in the wrong way	Incorrect electrical connection	Pre-use inspection	Training and awareness	Nothing	RSE 100 will not operate
		Incorrect connection of the air motor	Pre-use inspection	Training and awareness	Nothing	RSA 100 will not operate

9. Appendix 2: Fault Tree Analyses (Injuries to operators)



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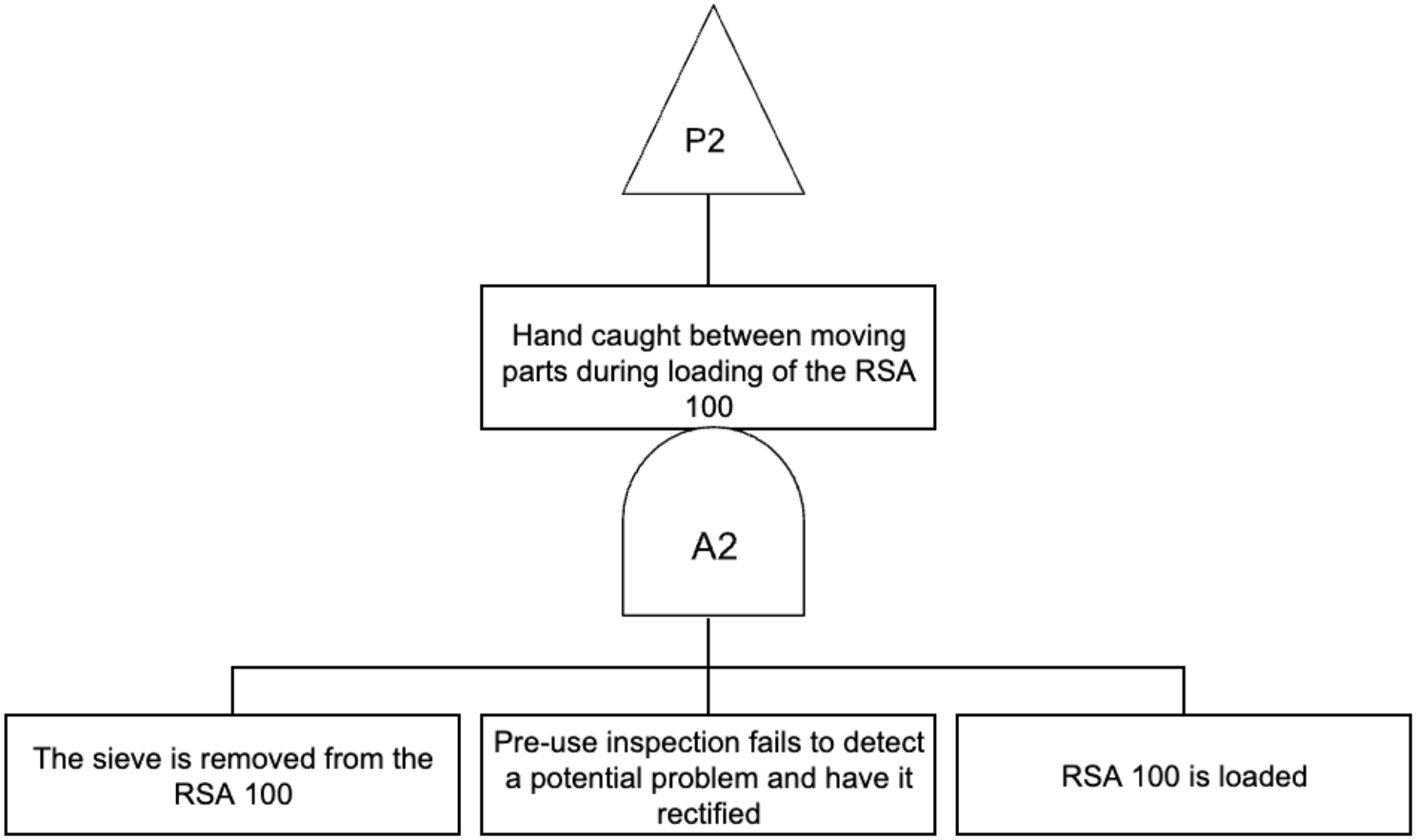
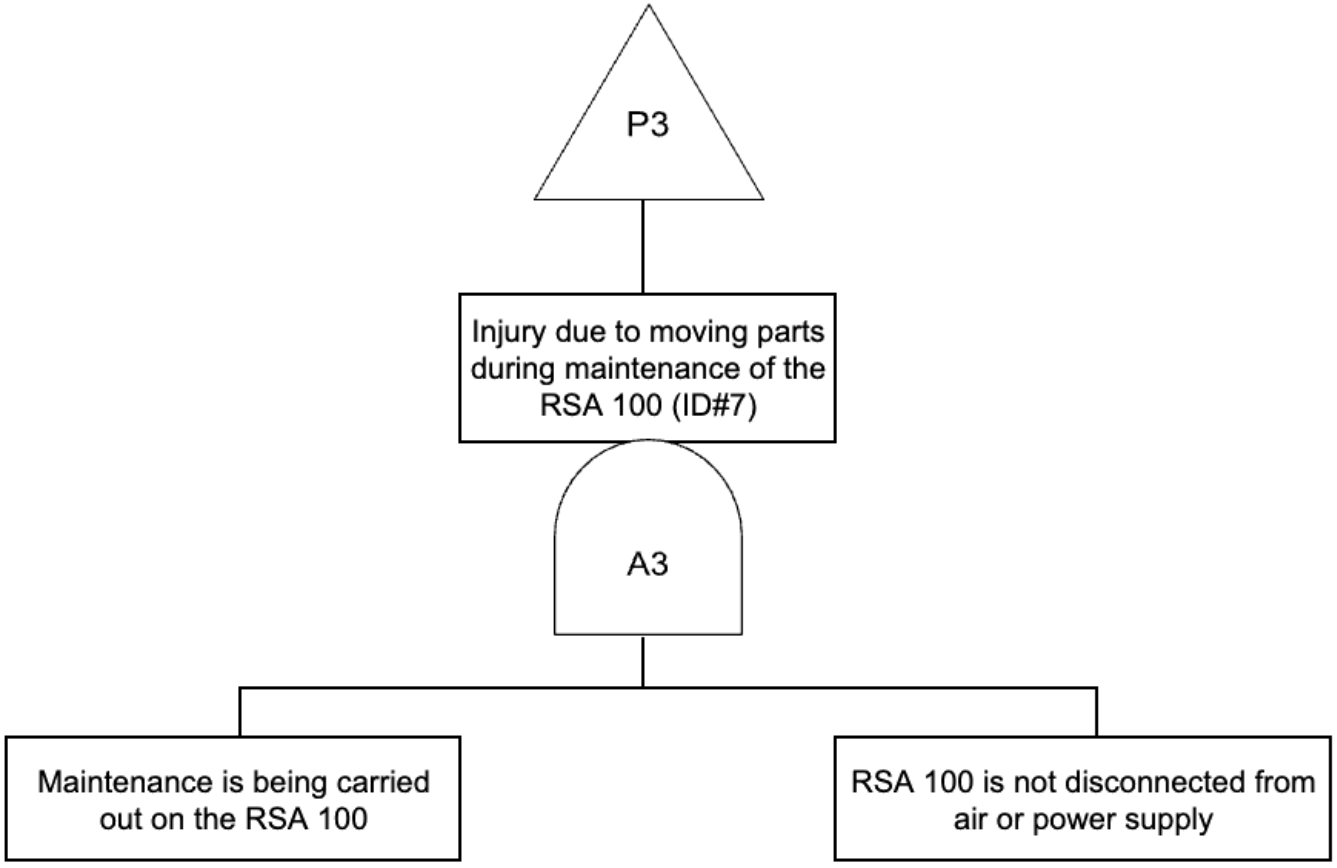
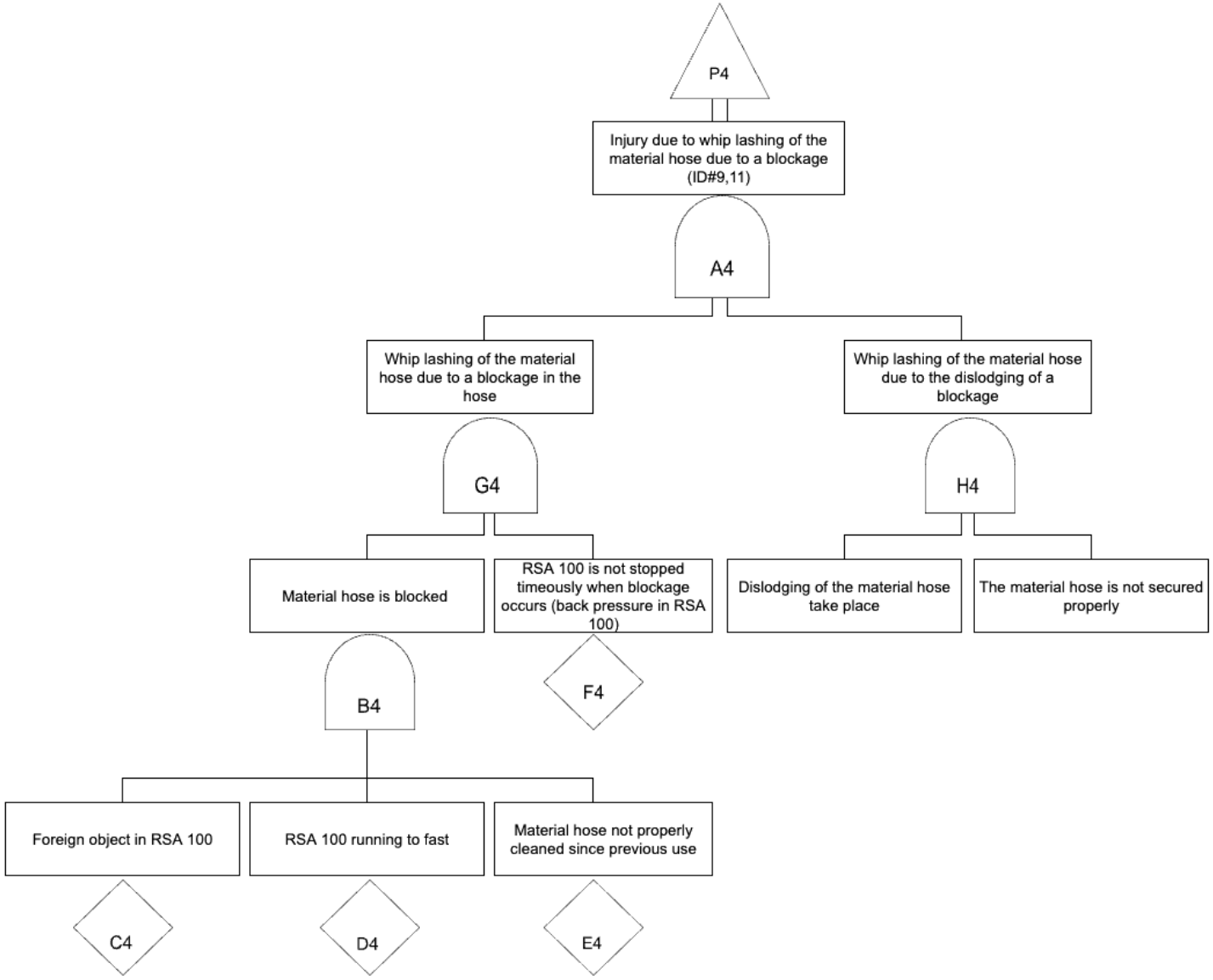
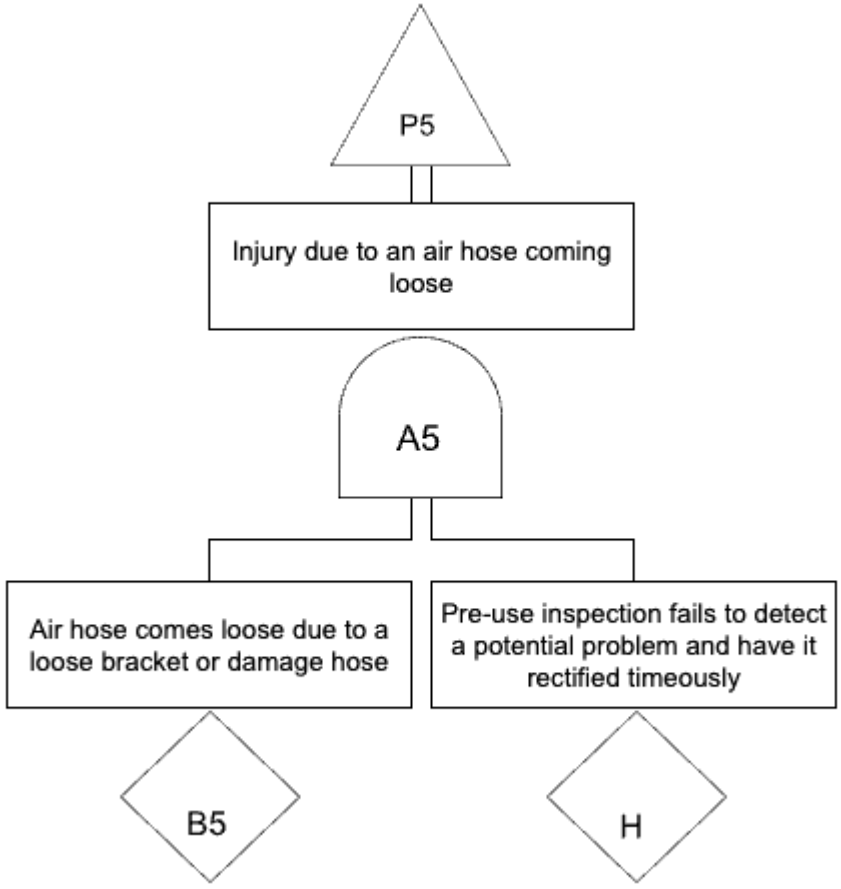
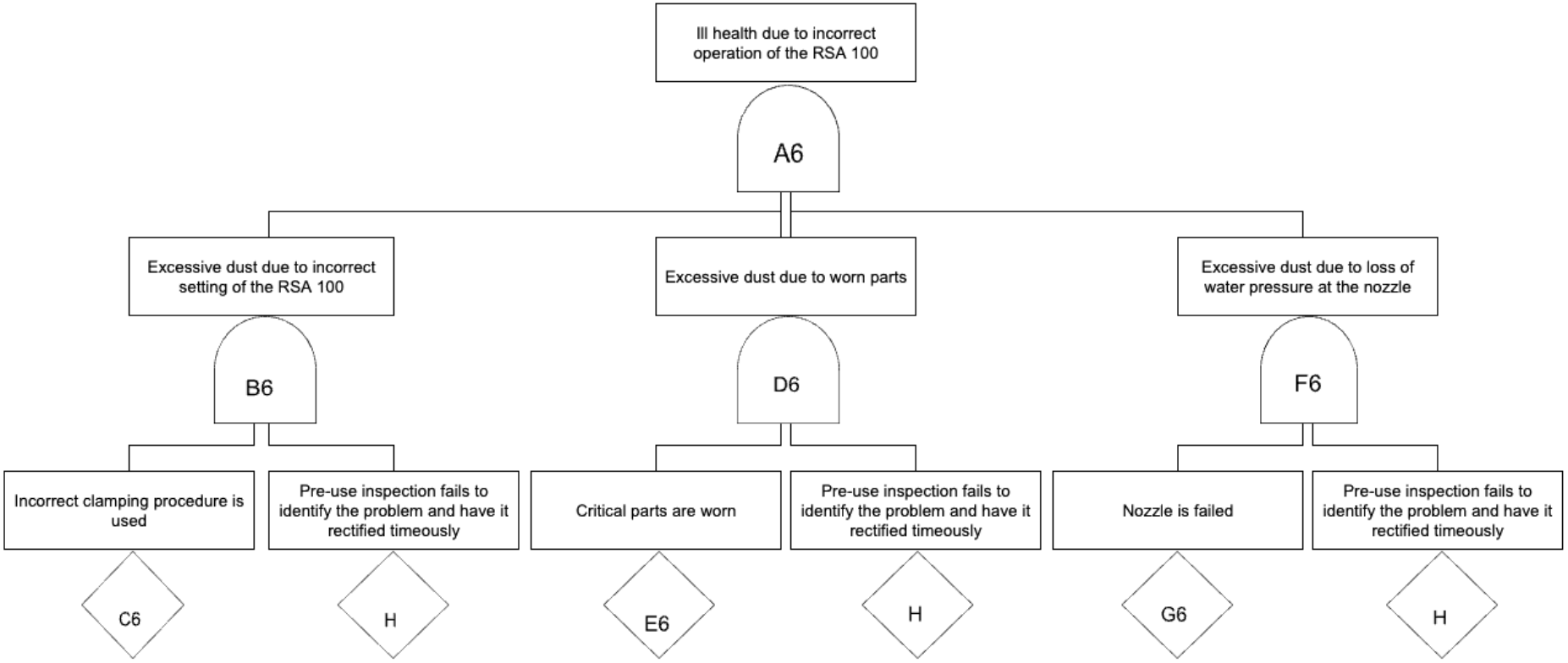



P3
Injury due to moving parts during maintenance of the RSA 100 (ID#7)
A3
Maintenance is being carried out on the RSA 100
RSA 100 is not disconnected from air or power supply


P4
Injury due to whip lashing of the material hose due to a blockage (ID#9,11)
A4
Whip lashing of the material hose due to a blockage in the hose
Whip lashing of the material hose due to the dislodging of a blockage
G4
H4
Material hose is blocked
RSA 100 is not stopped timeously when blockage occurs (back pressure in RSA 100)
Dislodging of the material hose take place
The material hose is not secured properly
B4
F4
Foreign object in RSA 100
RSA 100 running to fast
Material hose not properly cleaned since previous use
C4
D4
E4


P5
Injury due to an air hose coming loose
A5
Air hose comes loose due to a loose bracket or damage hose
Pre-use inspection fails to detect a potential problem and have it rectified timeously
B5
H

10. Appendix 3: Fault Tree Analyses (Ill Health to operators)



11. Appendix 4: Fault Tree Analyses (Damage to equipment/Production loss)