

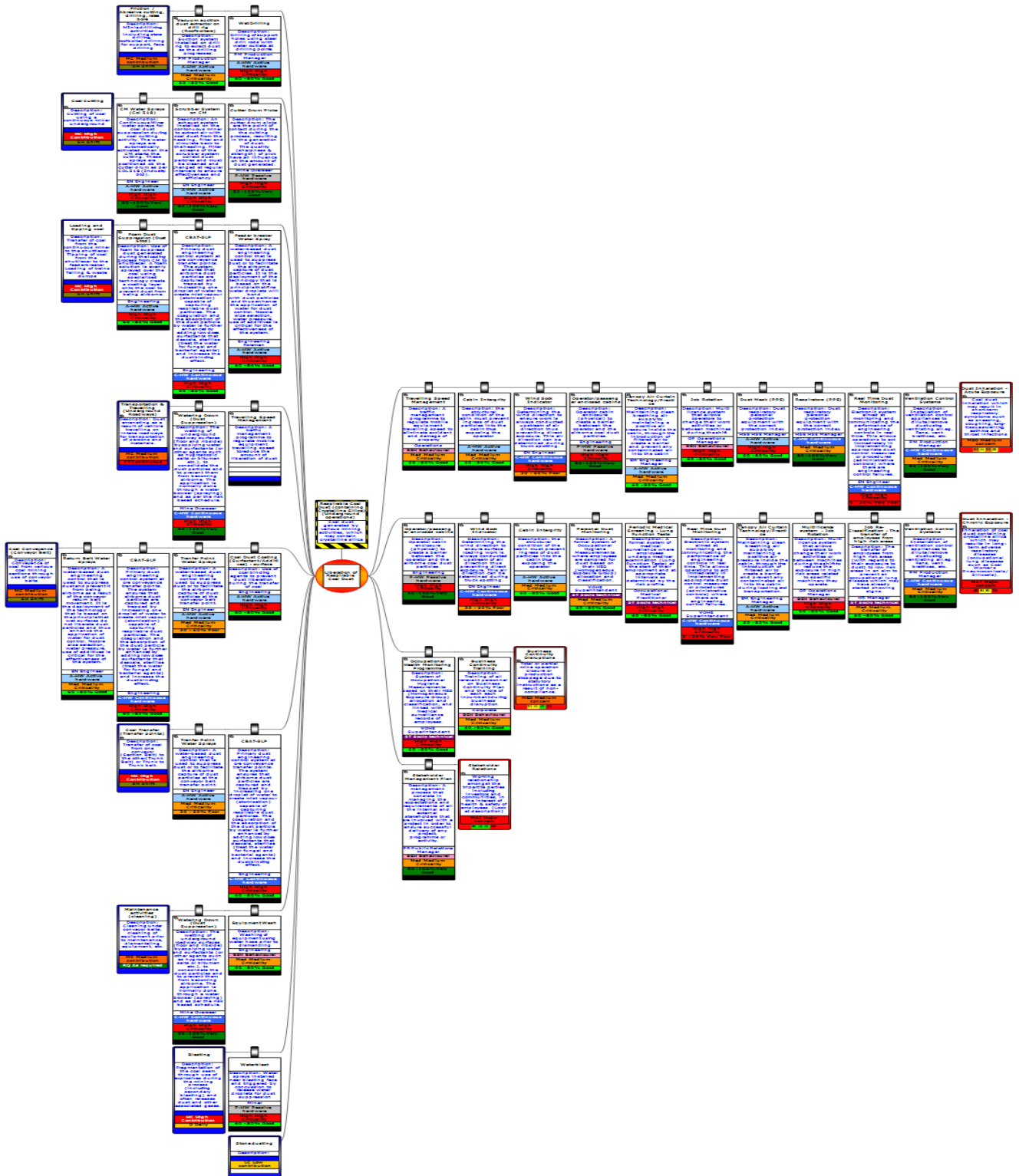
MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Hazard name	Respirable Coal Dust containing Crystalline Silica - Underground
BowTie Group	New BowTie Group
Top event	Liberation of Respirable Coal Dust
Affects	Health

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)



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Respirable Coal Dust containing Crystalline Silica (Underground)

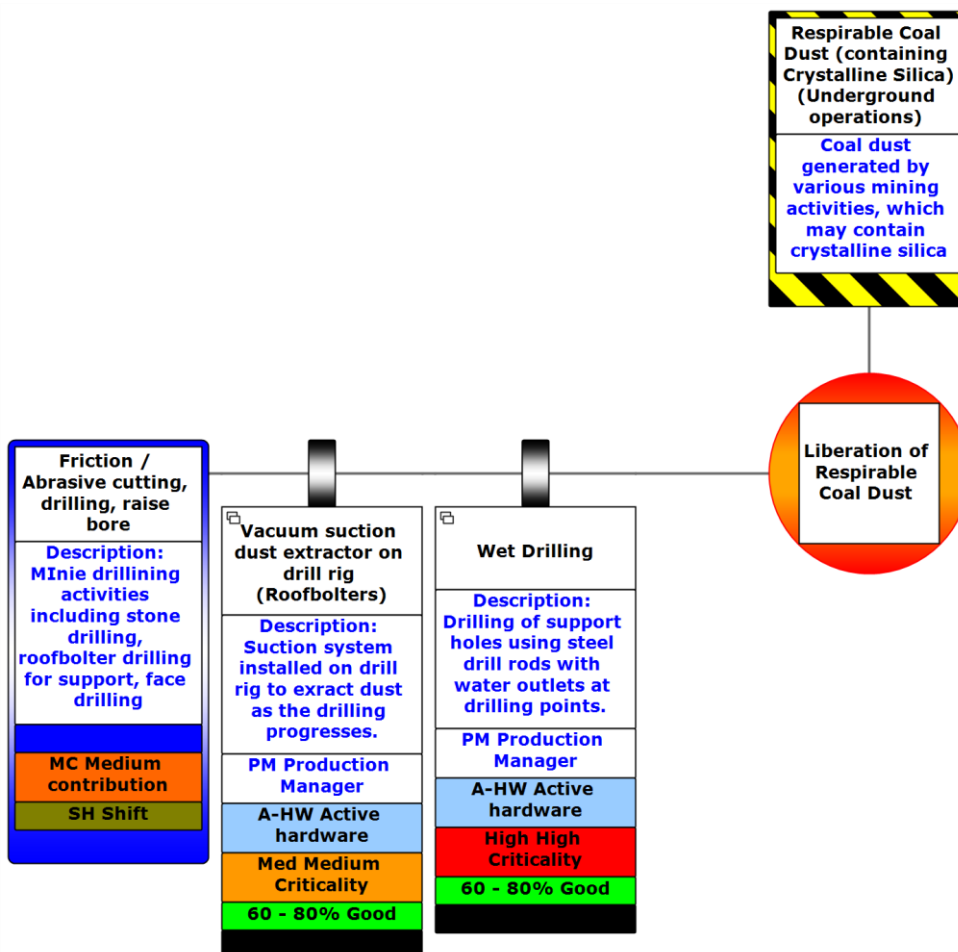
Hazard Description

Coal dust generated by various mining activities and may contain crystalline silica.

Threats

Threat: Friction / Abrasive cutting, drilling, raise bore

Mine drilling activities including stone drilling, roof bolter drilling for support, face drilling.



Barrier: Vacuum suction dust extractor on drill rig (Roof bolters)

Barrier Category	System
Barrier Type	Active hardware
Effectiveness	60 - 80% Good

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Accountable	Production Manager
Criticality	Med Medium Criticality

Description:

A suction system installed on drill rig to extract dust as the drilling progresses.

Verification:

Pre-Use Inspections by operator (Shift)
Scheduled maintenance.

Barrier: Wet Drilling

Barrier Category	Object
Barrier Type	Active hardware
Effectiveness	60 - 80% Good
Accountable	Production Manager
Criticality	High Criticality

Description:

Drilling of support holes using steel drill rods with water outlets at drilling points.

Verification:

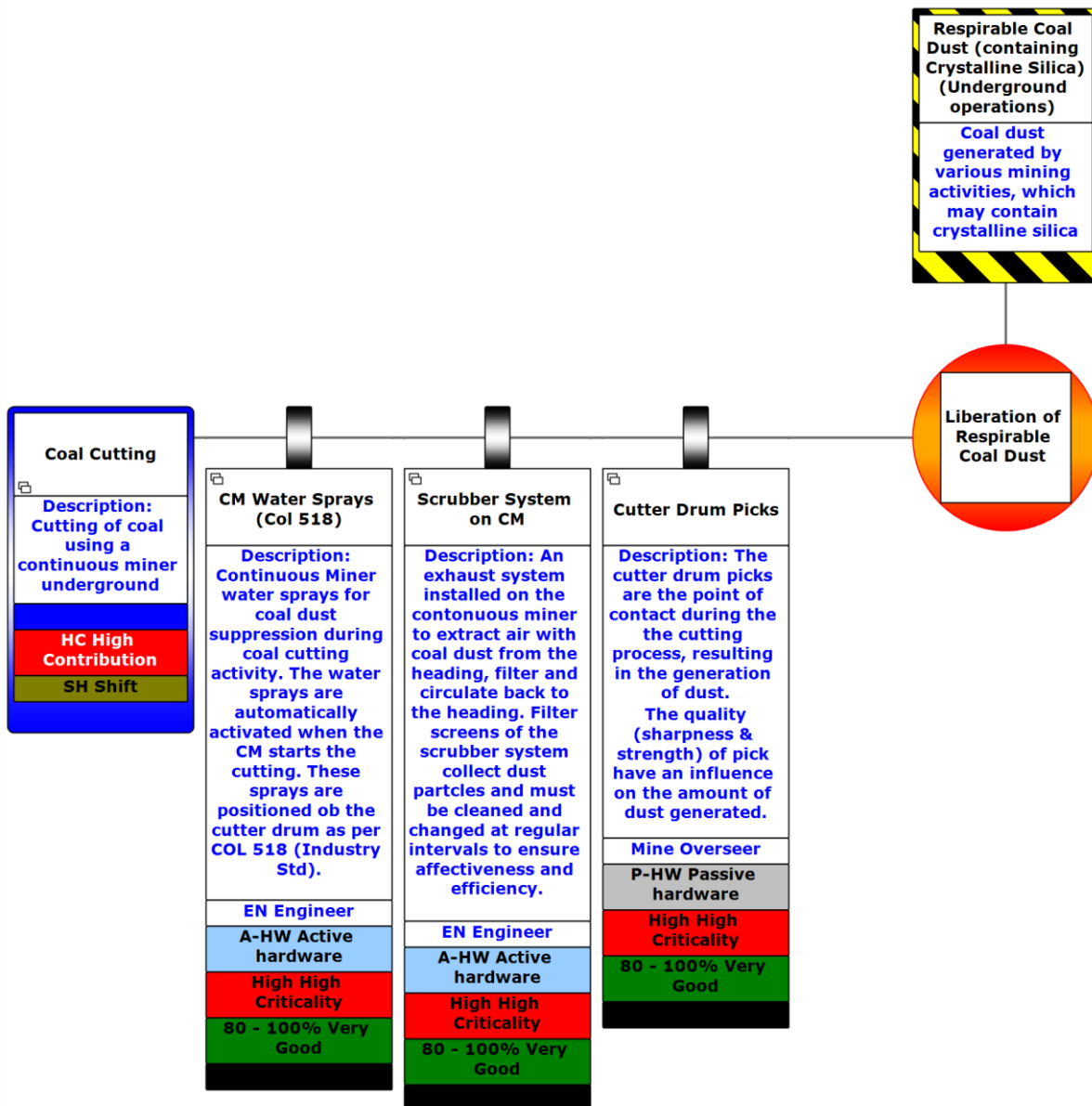
Monthly inspection of drilling machines (water supply & pressure)
Early Entry Examination by the Miner (water availability & pressure)
Pre-use inspection of drill machine by operator (Daily)

Threat: Coal Cutting

Cutting of coal using a continuous miner underground

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)



Barrier: CM Water Sprays (Col 518)

Barrier Category	Object
Barrier Type	Active hardware
Effectiveness	80 - 100% Very Good
Accountable	Engineer
Criticality	High Criticality

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Description:

Continuous Miner water sprays for coal dust suppression during coal cutting activity. The water sprays are automatically activated when the CM starts the cutting. These sprays are positioned on the cutter drum as per COL 518 (Industry Std).

Verification:

Daily inspections (Pre-use) by the CM operator before start of shift.
Regular ventilation surveys (Monthly) to determine condition of CM water sprays
Scheduled CM maintenance
Scheduled CM inspection by OEM.

Barrier: Scrubber System on CM

Barrier Category	Object
Barrier Type	Active hardware
Effectiveness	80 - 100% Very Good
Accountable	Engineer
Criticality	High Criticality

Description:

An exhaust system installed on the continuous miner to extract air with coal dust from the heading, filter and circulate back to the heading. Filter screens of the scrubber system collect dust particles and must be cleaned and changed at regular intervals to ensure effectiveness and efficiency.

Verification:

Daily inspections by the Miner at the start of shift
Scheduled scrubber maintenance by section artisans
Regular ventilation surveys (Monthly) to determine condition of CM scrubber.

Barrier: Cutter Drum Picks

Barrier Category	Object
Barrier Type	Passive hardware
Effectiveness	80 - 100% Very Good
Accountable	Mine Overseer
Criticality	High Criticality

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Description:

The cutter drum picks are the point of contact during the cutting process, resulting in the generation of dust. The quality (sharpness & strength) of pick has an influence on the amount of dust generated.

Verification:

Pre-Use Inspection at the start of each shift

Maintenance (Weekly)

Regular ventilation surveys (Monthly) to determine condition of CM cutter drum.

Threat: Loading and tipping coal

Transfer of coal from the continuous miner to the shuttle car.

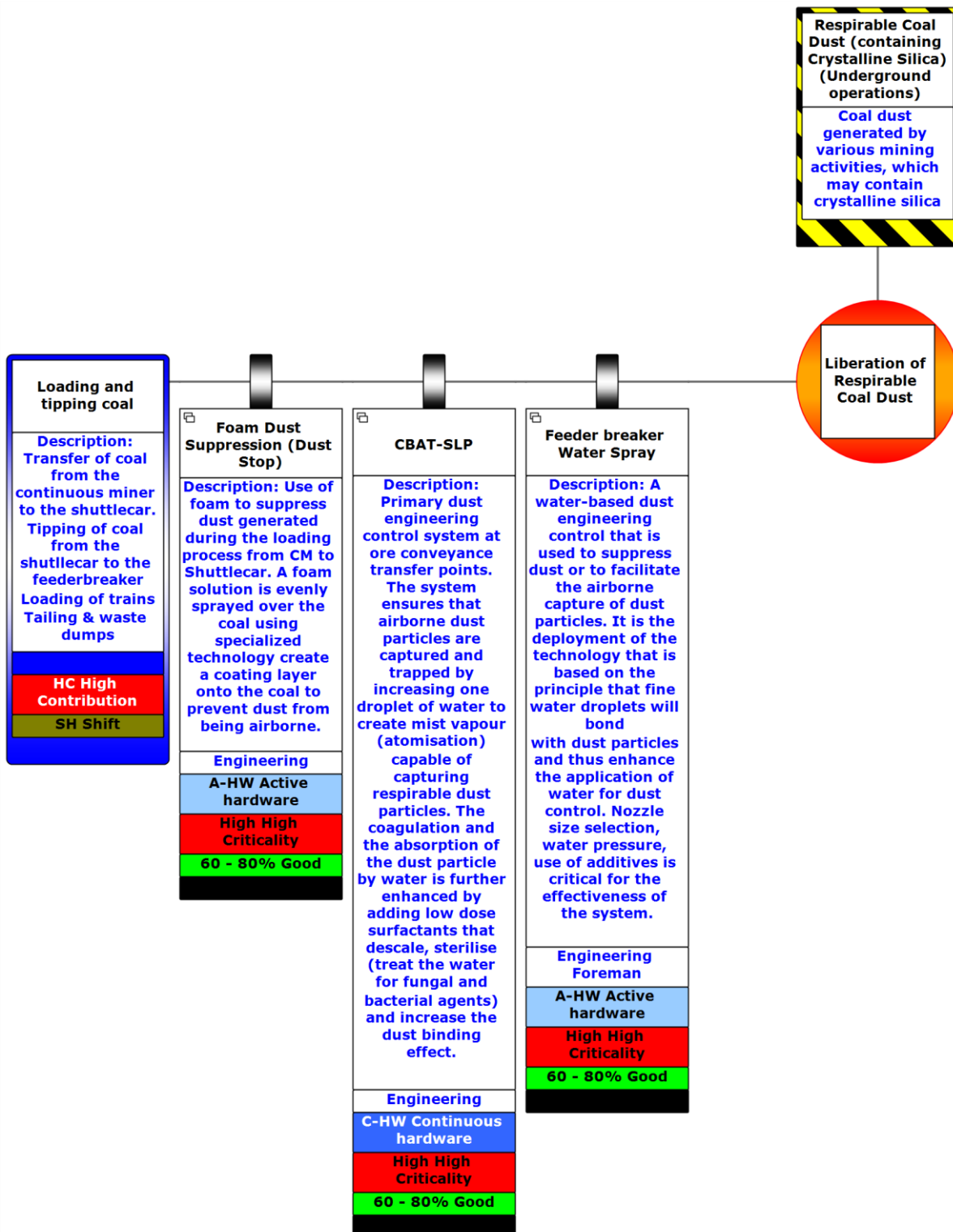
Tipping of coal from the shuttle car to the feeder breaker

Loading of trains

Tailing & waste dumps

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Respirable Coal Dust containing Crystalline Silica (Underground)



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Barrier: Foam Dust Suppression (Dust Stop)

Barrier Category	System
Barrier Type	Active hardware
Effectiveness	60 - 80% Good
Accountable	Engineering
Criticality	High Criticality

Description:

Use of foam to suppress dust generated during the loading process from CM to Shuttle car. A foam solution is evenly sprayed over the coal using specialized technology to create a coating layer onto the coal to prevent dust from being airborne.

Verification:

Pre-Use Inspection at the start of each shift
Scheduled maintenance
Regular ventilation surveys (Monthly)

Barrier: CBAT-SLP

Barrier Category	Object
Barrier Type	Continuous hardware
Effectiveness	60 - 80% Good
Accountable	Engineering
Criticality	High Criticality

Description:

Primary dust engineering control system at ore conveyance transfer points. The system ensures that airborne dust particles are captured and trapped by increasing one droplet of water to create mist vapor (atomization) capable of capturing respirable dust particles. The coagulation and the absorption of the dust particle by water is further enhanced by adding low dose surfactants that descale, sterilize (treat the water for fungal and bacterial agents) and increase the dust binding effect.

Verification:

Routine inspections by belt attendants
Scheduled maintenance
Regular ventilation surveys (Monthly/Quarterly)

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Barrier: Feeder breaker Water Spray

Barrier Category	Object
Barrier Type	Active hardware
Effectiveness	60 - 80% Good
Accountable	Engineering Foreman
Criticality	High Criticality

Description:

A water-based dust engineering control used to suppress dust or facilitate the airborne capture of dust particles. It is the deployment of the technology that is based on the principle that fine water droplets will bond with dust particles and thus enhance the application of water for dust control. Nozzle size selection, water pressure, and use of additives is critical for the system's effectiveness.

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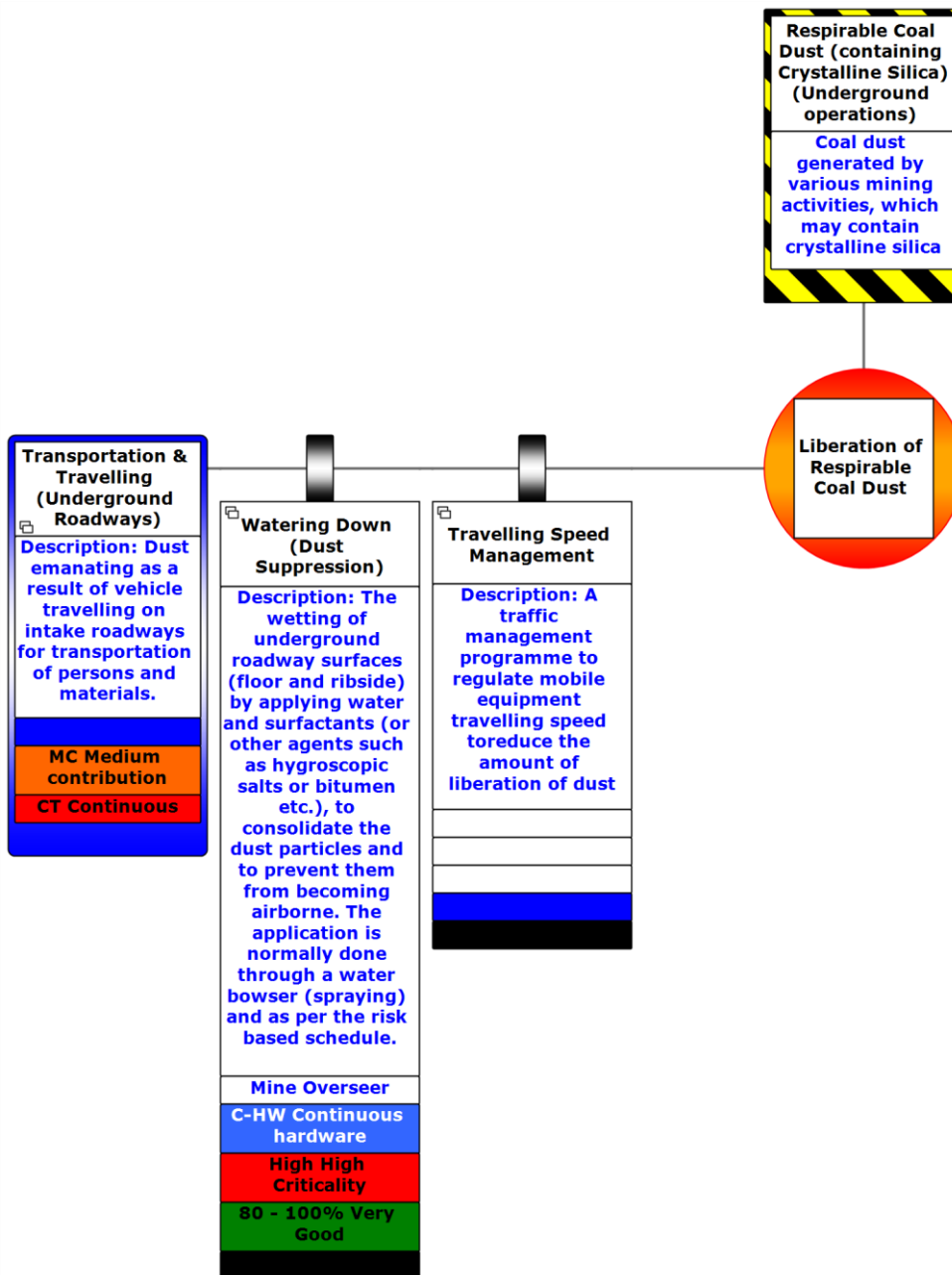
Pre-Use Inspection at the start of each shift
Scheduled maintenance
Regular ventilation surveys (Monthly)

Threat: Transportation & Travelling (Underground Roadways)

Dust comes from vehicles travelling on intake roadways for transportation of persons and materials.

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)



Barrier: Watering Down (Dust Suppression)

Barrier Category	System
Barrier Type	Continuous hardware
Effectiveness	80 - 100% Very Good

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Accountable	Mine Overseer
Criticality	High Criticality

Description:

The wetting of underground roadway surfaces (floor and rib side) by applying water and surfactants (or other agents such as hygroscopic salts or bitumen etc.), to consolidate the dust particles and to prevent them from becoming airborne. The application is normally done through a water bowser (spraying) and as per the risk-based schedule.

Verification:

Watering down schedules
Scheduled inspections by Out bye Shift Overseer – Out bye
Section dust control inspection by VOHE department – In bye

Barrier: Travelling Speed Management

Description:

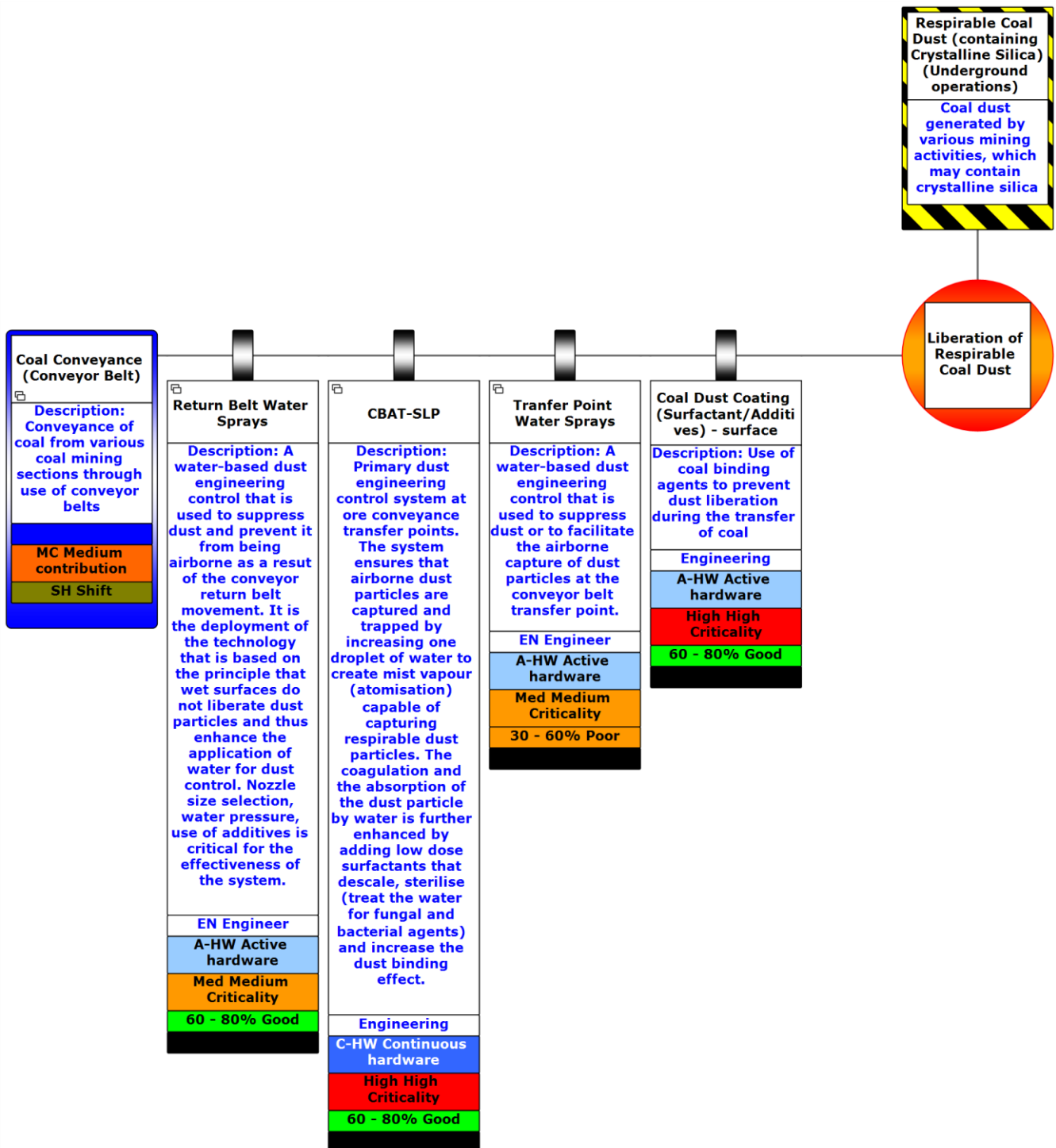
A traffic management programme to regulate mobile equipment travelling speed to reduce the amount of dust liberation.

Threat: Coal Conveyance (Conveyor Belt)

Conveyance of coal from various coal mining sections through use of conveyor belts

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

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MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Barrier: Return Belt Water Sprays

Barrier Category	System
Barrier Type	Active hardware
Effectiveness	60 - 80% Good
Accountable	Engineer
Criticality	Med Medium Criticality

Description:

A water-based dust engineering control used to suppress dust and prevent it from being airborne due to the conveyor return belt movement. The technology's deployment is based on the principle that wet surfaces do not liberate dust particles and thus enhance the application of water for dust control. Nozzle size selection, water pressure, and use of additives is critical for the system's effectiveness.

Verification:

Routine inspections by belt attendants
Scheduled maintenance
Regular ventilation surveys (Monthly/Quarterly)

Barrier: CBAT-SLP

Barrier Category	Object
Barrier Type	Continuous hardware
Effectiveness	60 - 80% Good
Accountable	Engineering
Criticality	High Criticality

Description:

Primary dust engineering control system at ore conveyance transfer points. The system ensures that airborne dust particles are captured and trapped by increasing one droplet of water to create mist vapor (atomization) capable of capturing respirable dust particles. The coagulation and the absorption of the dust particle by water is further enhanced by adding low dose surfactants that descale, sterilize (treat the water for fungal and bacterial agents) and increase the dust binding effect.

Verification:

Routine inspections by belt attendants
Scheduled maintenance
Regular ventilation surveys (Monthly/Quarterly)

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Barrier: Transfer Point Water Sprays

Barrier Category	Object
Barrier Type	Active hardware
Effectiveness	30 - 60% Poor
Accountable	Engineer
Criticality	Med Medium Criticality

Description:

A water-based dust engineering control used to suppress dust or facilitate the airborne capture of dust particles at the conveyor belt transfer point.

Verification:

Routine inspections by belt attendants
Scheduled maintenance
Regular ventilation surveys (Monthly/Quarterly)

Barrier: Coal Dust Coating (Surfactant/Additives) - surface

Barrier Category	System
Barrier Type	Active hardware
Effectiveness	60 - 80% Good
Accountable	Engineering
Criticality	High Criticality

Description:

Use of coal binding agents to prevent dust liberation during the transfer of coal.

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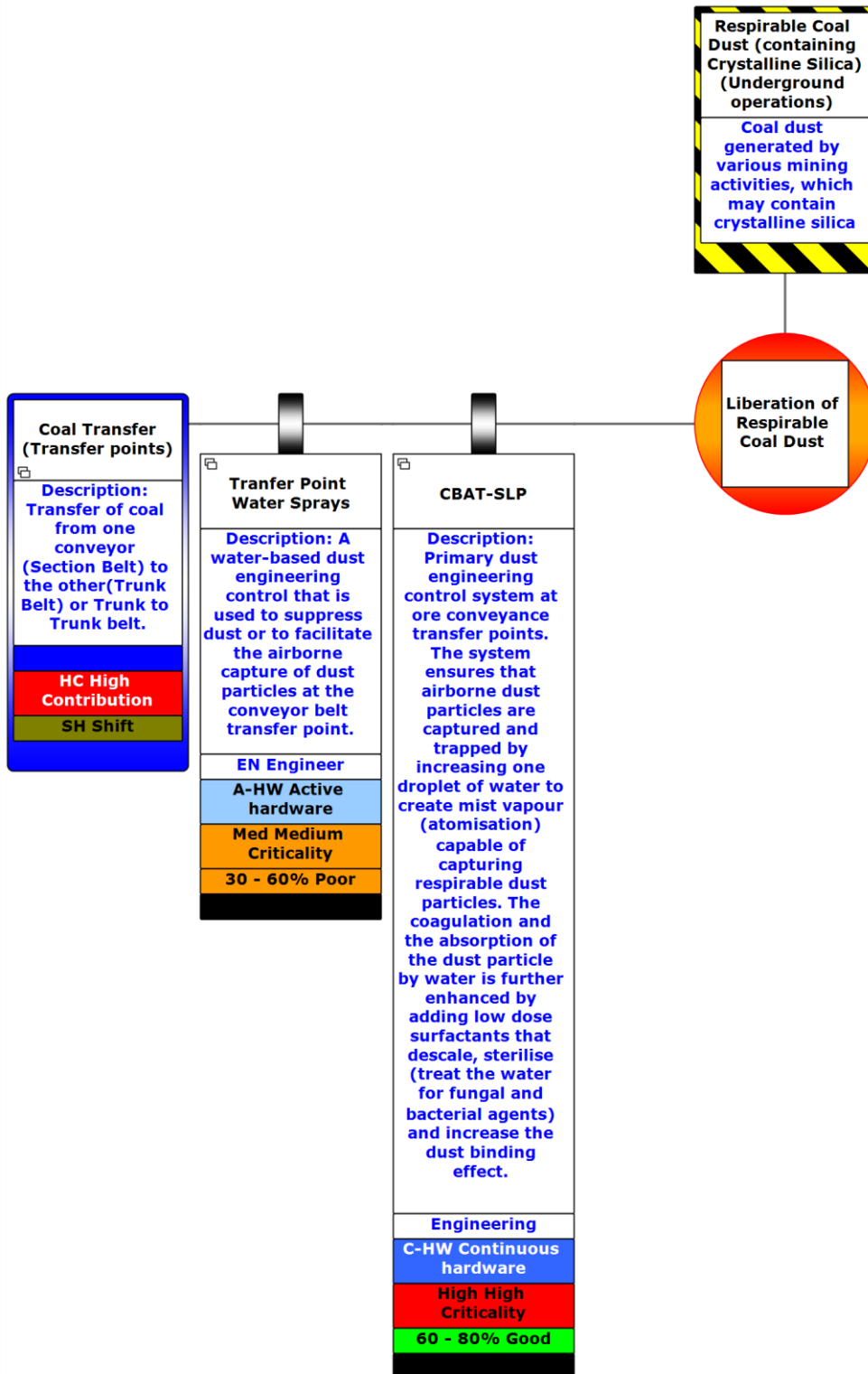
Routine inspections by belt attendants
Scheduled maintenance
Regular ventilation surveys (Monthly/Quarterly)

Threat: Coal Transfer (Transfer points)

Transfer of coal from one conveyor (Section Belt) to the other (Trunk Belt) or Trunk to Trunk belt.

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Barrier: Transfer Point Water Sprays

Barrier Category	Object
Barrier Type	Active hardware
Effectiveness	30 - 60% Poor
Accountable	Engineer
Criticality	Med Medium Criticality

Description:

A water-based dust engineering control used to suppress dust or facilitate the airborne capture of dust particles at the conveyor belt transfer point.

Verification:

Routine inspections by belt attendants
Scheduled maintenance
Regular ventilation surveys (Monthly/Quarterly)

Barrier: CBAT-SLP

Barrier Category	Object
Barrier Type	Continuous hardware
Effectiveness	60 - 80% Good
Accountable	Engineering
Criticality	High Criticality

Description:

Primary dust engineering control system at ore conveyance transfer points. The system ensures that airborne dust particles are captured and trapped by increasing one droplet of water to create mist vapor (atomization) capable of capturing respirable dust particles. The coagulation and the absorption of the dust particle by water is further enhanced by adding low dose surfactants that descale, sterilize (treat the water for fungal and bacterial agents) and increase the dust binding effect.

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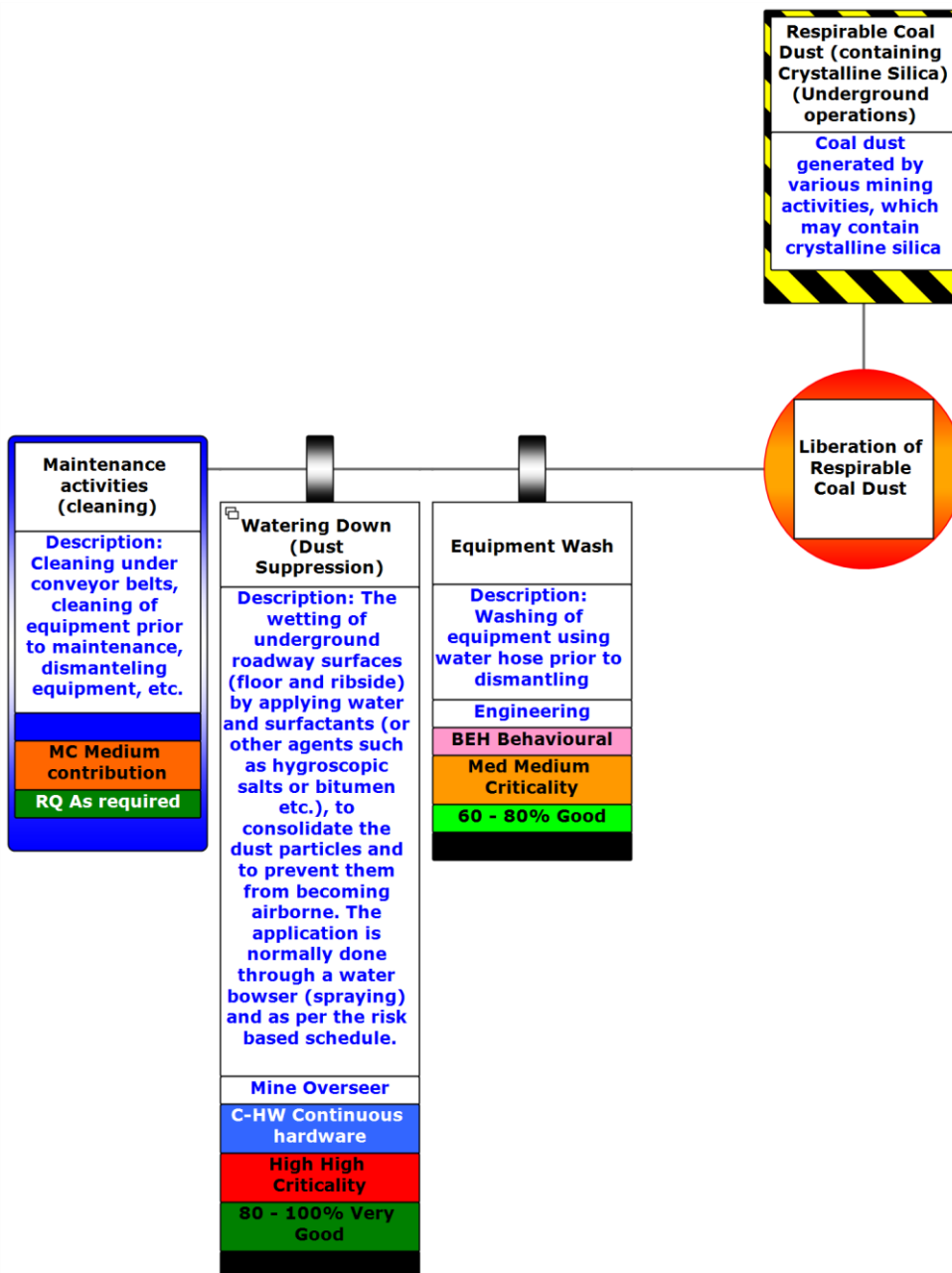
Routine inspections by belt attendants
Scheduled maintenance
Regular ventilation surveys (Monthly/Quarterly)

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Threat: Maintenance activities (cleaning)

Cleaning under conveyor belts, cleaning of equipment prior to maintenance, dismantling equipment, etc.



MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Barrier: Watering Down (Dust Suppression)

Barrier Category	System
Barrier Type	Continuous hardware
Effectiveness	80 - 100% Very Good
Accountable	Mine Overseer
Criticality	High Criticality

Description:

The wetting of underground roadway surfaces (floor and rib side) by applying water and surfactants (or other agents such as hygroscopic salts or bitumen etc.), to consolidate the dust particles and to prevent them from becoming airborne. The application is normally done through a water bowser (spraying) and as per the risk-based schedule.

Verification:

Watering down schedules

Scheduled inspections by Out bye Shift Overseer – Out bye

Section dust control inspection by VOHE department – In bye

Barrier: Equipment Wash

Barrier Category	Act
Barrier Type	Behavioral
Effectiveness	60 - 80% Good
Accountable	Engineering
Criticality	Med Medium Criticality

Description:

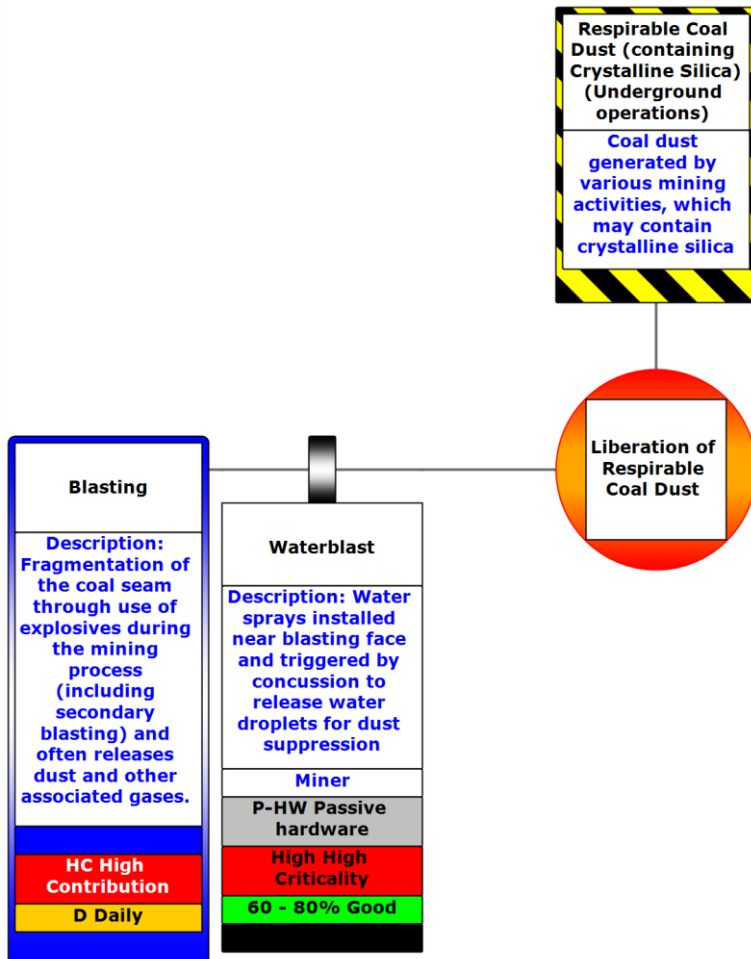
Washing of equipment using water hose prior to dismantling

Threat: Blasting

Fragmentation of the coal seam through explosives during mining (including secondary blasting) often releases dust and other associated gases.

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)



Barrier: Waterblast

Barrier Category	Object
Barrier Type	Passive hardware
Effectiveness	60 - 80% Good
Accountable	Miner
Criticality	High Criticality

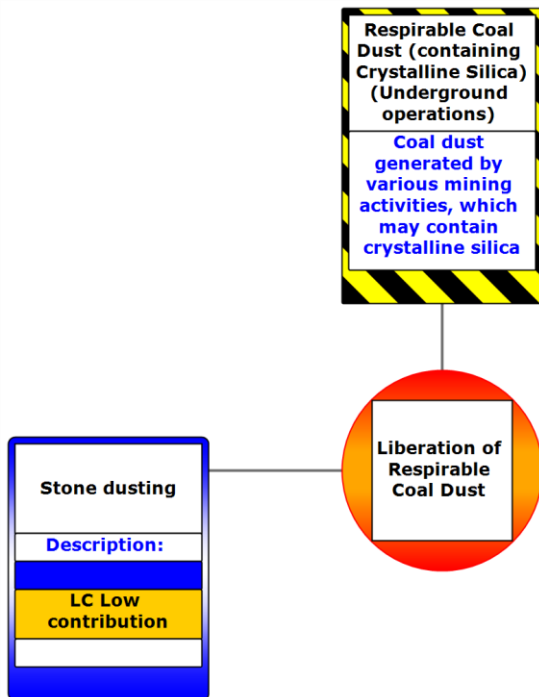
Description:

Water sprays installed near blasting face and triggered by concussion to release water droplets for dust suppression.

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Threat: Stone dusting



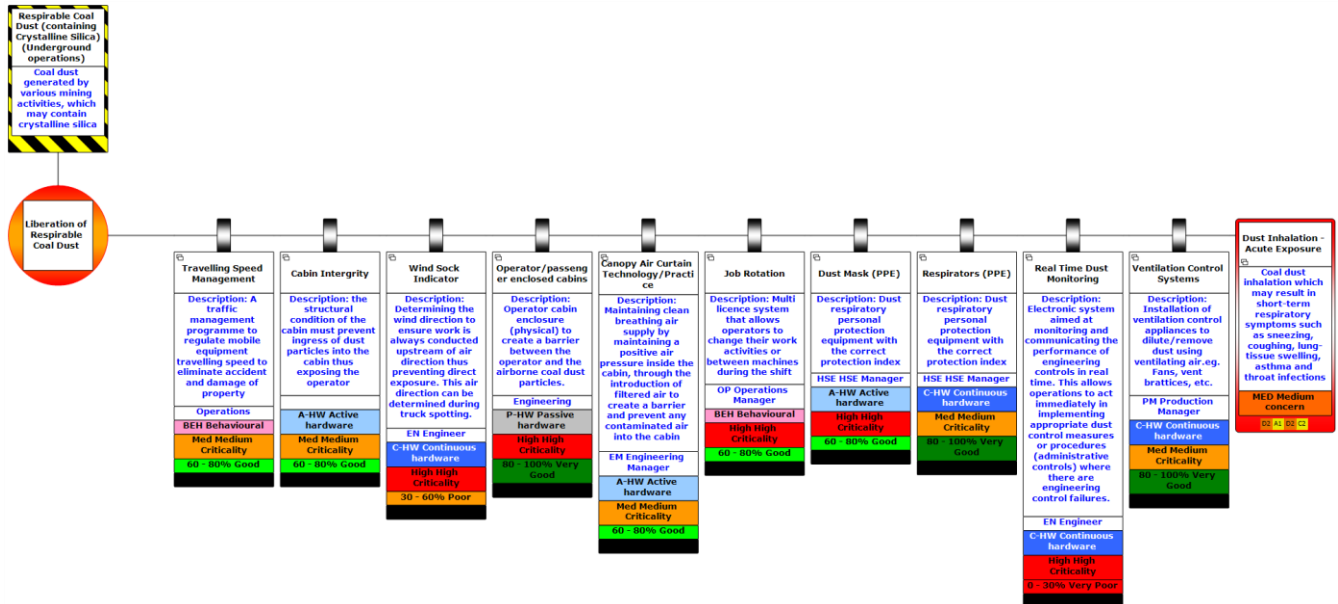
Consequences

Consequence: Dust Inhalation - Acute Exposure

Coal dust inhalation which may result in short-term respiratory symptoms such as sneezing, coughing, lung-tissue swelling, asthma and throat infections.

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)



Barrier: Travelling Speed Management

Barrier Category	System
Barrier Type	Behavioral
Effectiveness	60 - 80% Good
Accountable	Operations
Criticality	Med Medium Criticality

Description:

A traffic management programme to regulate mobile equipment travelling speed to eliminate accident and damage to property.

Barrier: Cabin Integrity

Barrier Category	Object
Barrier Type	Active hardware
Effectiveness	60 - 80% Good
Criticality	Med Medium Criticality

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Description:

The structural condition of the cabin must prevent ingress of dust particles into the cabin thus exposing the operator.

Barrier: Windsack Indicator

Barrier Category	Object
Barrier Type	Continuous hardware
Effectiveness	30 - 60% Poor
Accountable	Engineer
Criticality	High Criticality

Description:

Determining the wind direction to ensure work is always conducted upstream of air direction thus preventing direct exposure. This air direction can be determined during truck spotting.

Verification:

Pre-loading inspection checklist
Dust buckets

Barrier: Operator/passenger enclosed cabins

Barrier Category	Object
Barrier Type	Passive hardware
Effectiveness	80 - 100% Very Good
Accountable	Engineering
Criticality	High Criticality

Description:

Operator cabin enclosure (physical) to create a barrier between the operator and the airborne coal dust particles.

Verification:

Pre-Use Inspection at the start of each shift
Scheduled maintenance
Regular ventilation surveys (Monthly)

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Barrier: Canopy Air Curtain Technology/Practice

Barrier Category	Object
Barrier Type	Active hardware
Effectiveness	60 - 80% Good
Accountable	Engineering Manager
Criticality	Med Medium Criticality

Description:

Maintaining clean breathing air supply by maintaining a positive air pressure inside the cabin, through the introduction of filtered air to create a barrier and prevent any contaminated air into the cabin.

Verification:

Pre-Use Inspection at the start of each shift
Scheduled maintenance
Regular ventilation surveys (Monthly)

Barrier: Job Rotation

Barrier Category	System
Barrier Type	Behavioral
Effectiveness	60 - 80% Good
Accountable	Operations Manager
Criticality	High Criticality

Description:

A multi license system that allows operators to change their work activities or between machines during the shift.

Barrier: Dust Mask (PPE)

Barrier Category	Object
Barrier Type	Active hardware
Effectiveness	60 - 80% Good
Accountable	HSE Manager
Criticality	High Criticality

Description:

Dust respiratory personal protection equipment with the correct protection index.

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Verification:

Supervision
Visible Felt Leadership routines
PPE withdrawal reports

Barrier: Respirators (PPE)

Barrier Category	Object
Barrier Type	Continuous hardware
Effectiveness	80 - 100% Very Good
Accountable	HSE Manager
Criticality	Med Medium Criticality

Description:

Dust respiratory personal protection equipment with the correct protection index.

Verification:

Supervision
Visible Felt Leadership routines
Respirator Fit Testing

Barrier: Real Time Dust Monitoring

Barrier Category	System
Barrier Type	Continuous hardware
Effectiveness	0 - 30% Very Poor
Accountable	Engineer
Criticality	High Criticality

Description:

Electronic systems aimed at monitoring and communicating the performance of engineering controls in real time. This allows operations to act immediately in implementing appropriate dust control measures or procedures (administrative controls) where there are engineering control failures.

Verification:

Daily Exceptions Report
Scheduled/Reported Dust Investigations
Scheduled Maintenance

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Barrier: Ventilation Control Systems

Barrier Category	System
Barrier Type	Continuous hardware
Effectiveness	80 - 100% Very Good
Accountable	Production Manager
Criticality	Med Medium Criticality

Description:

Installation of ventilation control appliances to dilute/remove dust using ventilating air.eg. Fans, vent brattices, etc.

Verification:

Regular ventilation surveys (Monthly) to determine sufficient/required air quantities.

Early Entry Examination (Shift)

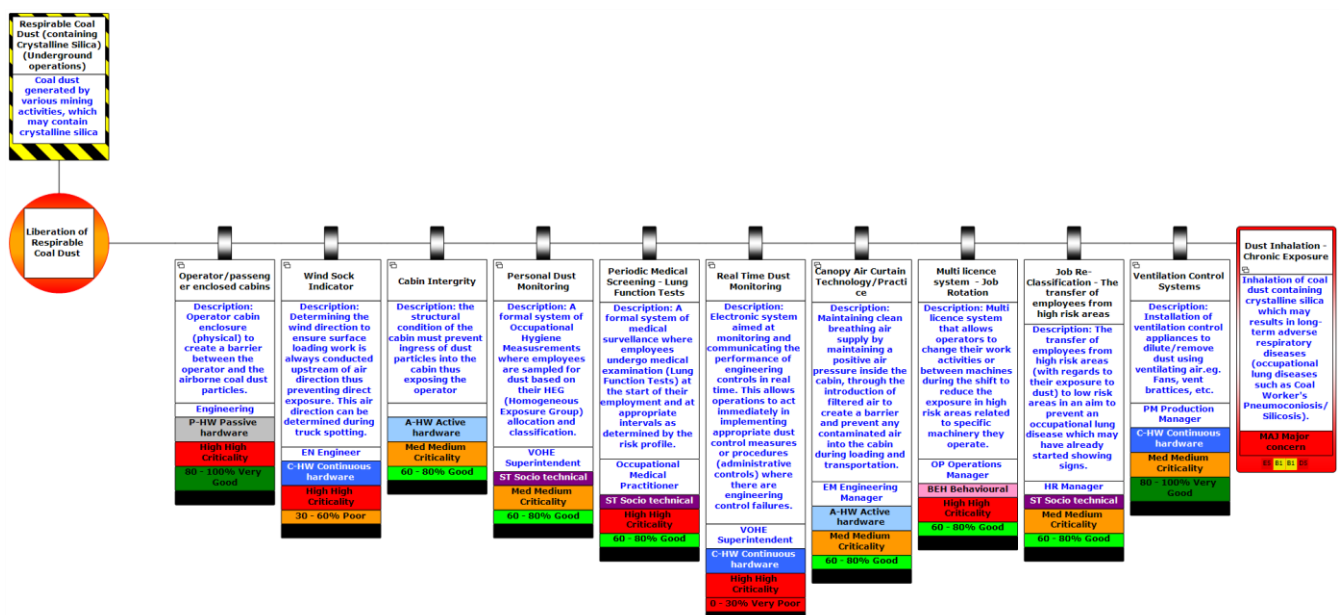
Regular inspection (Monthly) on surface performance

Regular maintenance of surface fans (Quarterly)

Quarterly inspection by external party

Consequence: Dust Inhalation -Chronic Exposure

Inhalation of coal dust containing crystalline silica which may result in long-term adverse respiratory diseases (occupational lung diseases such as Coal Worker's Pneumoconiosis/Silicosis).



MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Barrier: Operator/passenger enclosed cabins

Barrier Category	Object
Barrier Type	Passive hardware
Effectiveness	80 - 100% Very Good
Accountable	Engineering
Criticality	High Criticality

Description:

Operator cabin enclosure (physical) to create a barrier between the operator and the airborne coal dust particles.

Verification:

Pre-Use Inspection at the start of each shift
Scheduled maintenance
Regular ventilation surveys (Monthly)

Barrier: Windsock Indicator

Barrier Category	Object
Barrier Type	Continuous hardware
Effectiveness	30 - 60% Poor
Accountable	Engineer
Criticality	High Criticality

Description:

Determining the wind direction to ensure surface loading work is always conducted upstream of air direction thus preventing direct exposure. This air direction can be determined during truck spotting.

Verification:

Pre-loading inspection checklist
Dust buckets

Barrier: Cabin Integrity

Barrier Category	Object
Barrier Type	Active hardware

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Effectiveness	60 - 80% Good
Criticality	Med Medium Criticality

Description:

The structural condition of the cabin must prevent ingress of dust particles into the cabin thus exposing the operator.

Barrier: Personal Dust Monitoring

Barrier Category	Act
Barrier Type	Socio technical
Effectiveness	60 - 80% Good
Accountable	VOHE Superintendent
Criticality	Med Medium Criticality

Description:

A formal system of Occupational Hygiene Measurements where employees are sampled for dust based on their HEG (Homogeneous Exposure Group) allocation and classification.

Verification:

Monthly occupational hygiene sampling report

Barrier: Periodic Medical Screening - Lung Function Tests

Barrier Category	System
Barrier Type	Socio technical
Effectiveness	60 - 80% Good
Accountable	Occupational Medical Practitioner
Criticality	High Criticality

Description:

A formal system of medical surveillance where employees undergo medical examination (Lung Function Tests) at the start of their employment and at appropriate intervals as determined by the risk profile.

Verification:

Monthly COF (certificate of fitness) report

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Barrier: Real Time Dust Monitoring

Barrier Category	System
Barrier Type	Continuous hardware
Effectiveness	0 - 30% Very Poor
Accountable	VOHE Superintendent
Criticality	High Criticality

Description:

Electronic systems aimed at monitoring and communicating the performance of engineering controls in real time. This allows operations to act immediately in implementing appropriate dust control measures or procedures (administrative controls) where there are engineering control failures.

Verification:

Daily Exceptions Report
Scheduled/Reported Dust Investigations
Scheduled Maintenance

Barrier: Canopy Air Curtain Technology/Practice

Barrier Category	Object
Barrier Type	Active hardware
Effectiveness	60 - 80% Good
Accountable	Engineering Manager
Criticality	Med Medium Criticality

Description:

Maintaining clean breathing air supply by maintaining a positive air pressure inside the cabin, through the introduction of filtered air to create a barrier and prevent any contaminated air into the cabin during loading and transportation.

Verification:

Pre-Use Inspection at the start of each shift
Scheduled maintenance
Regular ventilation surveys (Monthly)

Barrier: Multi license system - Job Rotation

Barrier Category	System
Barrier Type	Behavioral

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Effectiveness	60 - 80% Good
Accountable	Operations Manager
Criticality	High Criticality

Description:

Multi license system that allows operators to change their work activities or between machines during the shift to reduce the exposure in high-risk areas related to specific machinery they operate.

Barrier: Job Re-Classification - The transfer of employees from high-risk areas

Barrier Category	Act
Barrier Type	Socio technical
Effectiveness	60 - 80% Good
Accountable	HR Manager
Criticality	Med Medium Criticality

Description:

The transfer of employees from high-risk areas (respecting their exposure to dust) to low-risk areas to prevent an occupational lung disease which may have already started showing signs.

Verification:

Monthly Employee report

Barrier: Ventilation Control Systems

Barrier Category	System
Barrier Type	Continuous hardware
Effectiveness	80 - 100% Very Good
Accountable	Production Manager
Criticality	Med Medium Criticality

Description:

Installation of ventilation control appliances to dilute/remove dust using ventilating air.eg. Fans, vent brattices, etc.

Verification:

Regular ventilation surveys (Monthly) to determine sufficient/required air quantities.
Early Entry Examination (Shift)

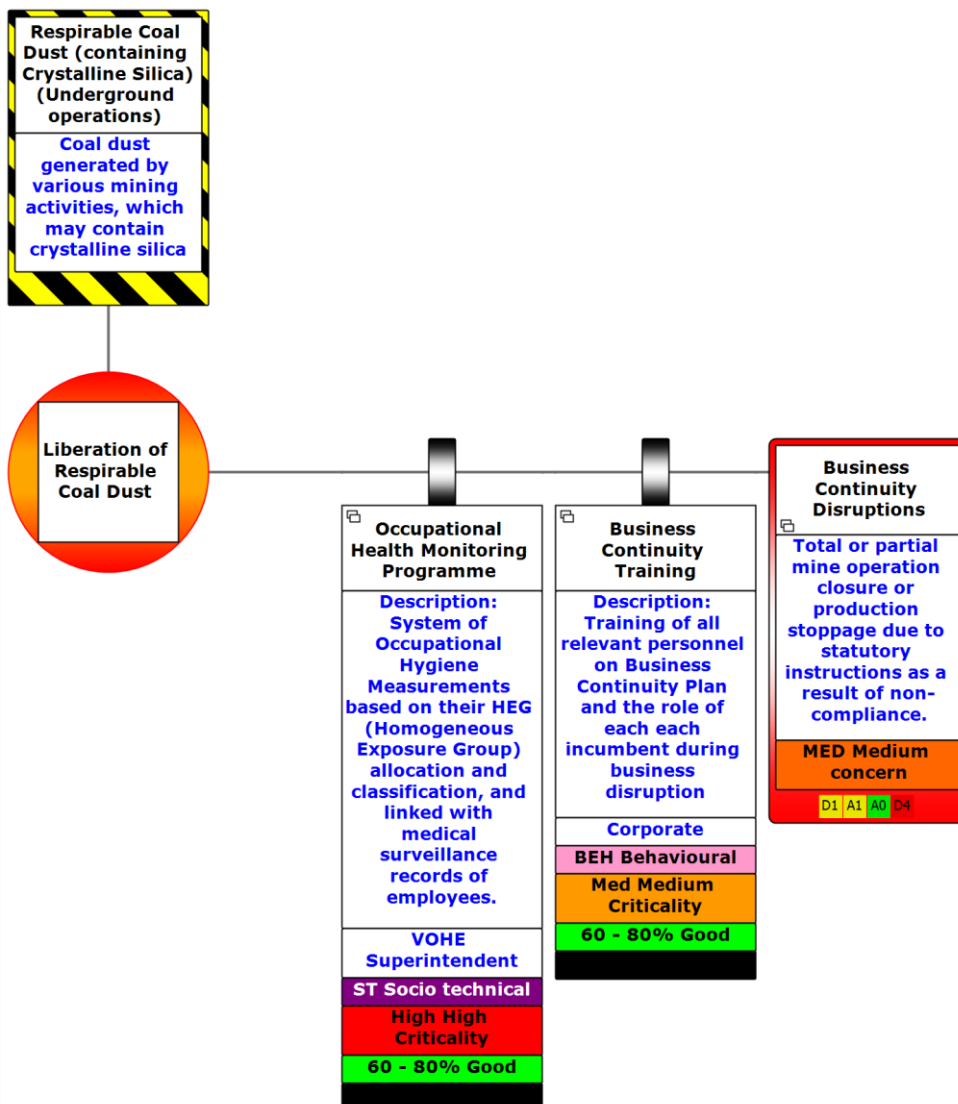
MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Regular inspection (Monthly) on surface performance
Regular maintenance of surface fans (Quarterly)
Quarterly inspection by external party

Consequence: Business Continuity Disruptions

Total or partial mine operation closure or production stoppage due to statutory instructions due to non-compliance.



MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Barrier: Occupational Health Monitoring Programme

Barrier Category	System
Barrier Type	Socio technical
Effectiveness	60 - 80% Good
Accountable	VOHE Superintendent
Criticality	High Criticality

Description:

System of Occupational Hygiene Measurements based on their HEG (Homogeneous Exposure Group) allocation and classification and linked with medical surveillance records of employees.

Verification:

Quarterly Statutory reporting

Barrier: Business Continuity Training

Barrier Category	System
Barrier Type	Behavioral
Effectiveness	60 - 80% Good
Accountable	Corporate
Criticality	Med Medium Criticality

Description:

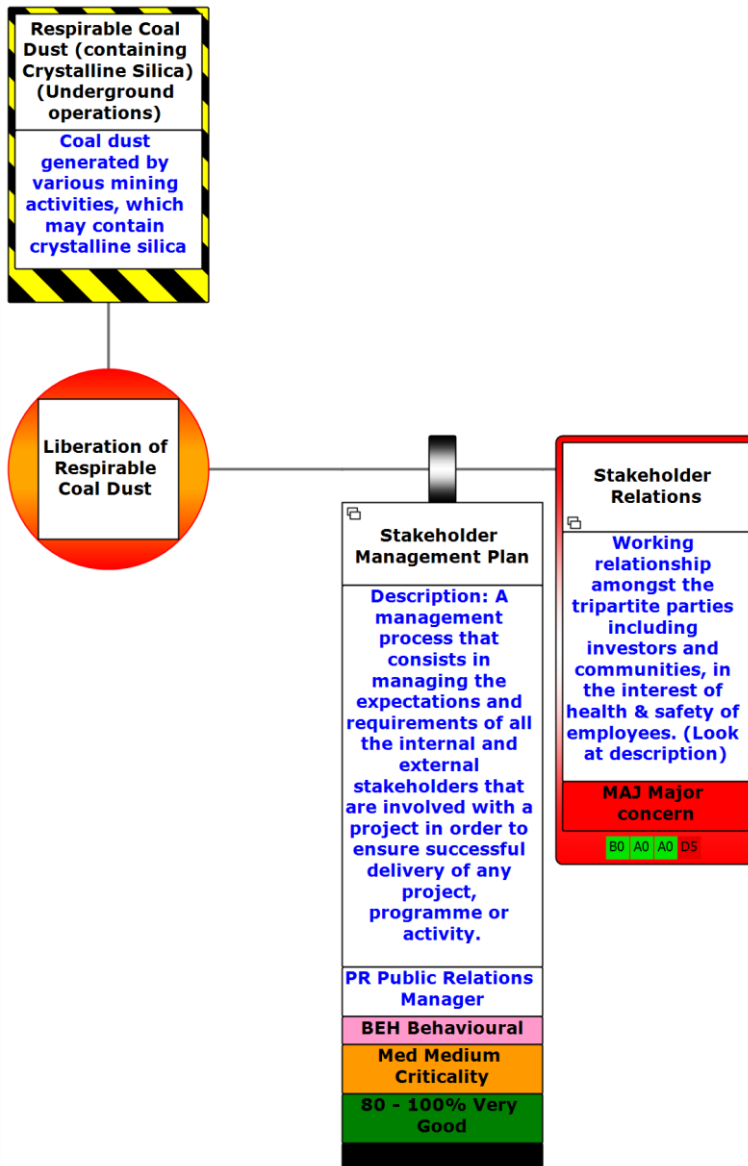
Training of all relevant personnel on Business Continuity Plan and the role of each incumbent during business disruption

Consequence: Stakeholder Relations

Working relationship amongst the tripartite parties including investors and communities, in the interest of health & safety of employees.

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)



Barrier: Stakeholder Management Plan

Barrier Category	System
Barrier Type	Behavioral
Effectiveness	80 - 100% Very Good
Accountable	Public Relations Manager
Criticality	Med Medium Criticality

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Description:

A management process that consists of managing the expectations and requirements of all the internal and external stakeholders that are involved with a project in order to ensure successful delivery of any project, programme or activity.

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Activities

DUST MANAGEMENT SYSTEMS

Code	Details	Category	Frequency	Responsible	Barriers
A01	<p>Training of employees</p> <p>Training of employees on risk prevention</p>	Training	Yearly	Training Manager	<p>Wet Drilling</p> <p>CM Water Sprays (Col 518)</p> <p>CBAT-SLP</p> <p>Feeder breaker Water Spray</p> <p>Return Belt Water Sprays</p> <p>Transfer Point Water Sprays</p> <p>Coal Dust Coating (Surfactant/Additives) - surface</p> <p>Dust Mask (PPE)</p> <p>Respirators (PPE)</p> <p>Real Time Dust Monitoring</p> <p>Personal Dust Monitoring</p> <p>Periodic Medical Screening - Lung Function Tests</p> <p>Job Re-Classification - The transfer of employees from high-risk areas</p> <p>Occupational Health Monitoring Programme</p> <p>Business Continuity Training</p> <p>Stakeholder Management Plan</p>
A02	Planning of mining activity	Planning	Monthly	Production Manager	<p>Watering Down (Dust Suppression)</p> <p>Job Re-Classification - The transfer of</p>

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Code	Details	Category	Frequency	Responsible	Barriers
					employees from high-risk areas Occupational Health Monitoring Programme
A03	Dust Monitoring Systems	Monitoring	Continuous	Underground ventilation officer	CM Water Sprays (Col 518) Watering Down (Dust Suppression) Coal Dust Coating (Surfactant/Additives) - surface Real Time Dust Monitoring Personal Dust Monitoring Occupational Health Monitoring Programme
A04	Auditing Systems	Quality Assurance	As required	HSE Manager	Coal Dust Coating (Surfactant/Additives) - surface Real Time Dust Monitoring Personal Dust Monitoring Periodic Medical Screening - Lung Function Tests Stakeholder Management Plan
A05	Design & Selection Selection of suction equipment to be based on sound and proven efficiency and effectiveness	Planning	As required	Engineering Manager	Vacuum suction dust extractor on drill rig (Roof bolters) Wet Drilling CM Water Sprays (Col 518) Scrubber System on CM Cutter Drum Picks Foam Dust Suppression (Dust Stop) CBAT-SLP Feeder breaker Water Spray

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Code	Details	Category	Frequency	Responsible	Barriers
					Watering Down (Dust Suppression) Return Belt Water Sprays Transfer Point Water Sprays Coal Dust Coating (Surfactant/Additives) - surface Dust Mask (PPE) Respirators (PPE) Real Time Dust Monitoring
A06	Design	Planning	As required	Engineering	Wet Drilling Scrubber System on CM Cutter Drum Picks Foam Dust Suppression (Dust Stop)
A07	Maintenance Suction units to be maintained at a frequency determined by the Engineering dept. This maintenance is simultaneous with the drill rig.	Maintenance	As required	Engineering	Vacuum suction dust extractor on drill rig (Roof bolters) Wet Drilling CM Water Sprays (Col 518) Scrubber System on CM Cutter Drum Picks Foam Dust Suppression (Dust Stop) Feeder breaker Water Spray Watering Down (Dust Suppression) Return Belt Water Sprays CBAT-SLP Transfer Point Water Sprays Real Time Dust Monitoring

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Code	Details	Category	Frequency	Responsible	Barriers
A08	Medical Surveillance	Monitoring	As required	Occupational Medical Practitioner	Job Rotation Respirators (PPE) Periodic Medical Screening - Lung Function Tests Multi license system - Job Rotation Job Re-Classification - The transfer of employees from high-risk areas Occupational Health Monitoring Programme
A09	Occupational Hygiene Programme	Monitoring	Continuous	HSE Manager	Job Rotation Dust Mask (PPE) Respirators (PPE) Personal Dust Monitoring Multi license system - Job Rotation Occupational Health Monitoring Programme
A10	Operator Competency				Vacuum suction dust extractor on drill rig (Roof bolters) Wet Drilling CM Water Sprays (Col 518) Scrubber System on CM Cutter Drum Picks Coal Dust Coating (Surfactant/Additives) - surface Dust Mask (PPE) Real Time Dust Monitoring

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Code	Details	Category	Frequency	Responsible	Barriers
A11	Early Warning Systems				CBAT-SLP Feeder breaker Water Spray Transfer Point Water Sprays
A14	Control Performance Monitoring				CBAT-SLP Feeder breaker Water Spray Transfer Point Water Sprays Real Time Dust Monitoring Personal Dust Monitoring
A15	Installation				CBAT-SLP Feeder breaker Water Spray Return Belt Water Sprays Transfer Point Water Sprays Real Time Dust Monitoring
A16	Interlocking to Conveyor Belt				CBAT-SLP Feeder breaker Water Spray Transfer Point Water Sprays
A17	Communication	Training			Job Rotation Multi license system - Job Rotation Business Continuity Training
A18	Shift Management				Job Rotation Multi license system - Job Rotation
A19	Multi-license/skill Training Employee training in multiple	Training	Yearly	HRD	Job Rotation Multi license system - Job Rotation

MOSH-INDUSTRY DUST RISK BOWTIE ANALYSIS

Respirable Coal Dust containing Crystalline Silica (Underground)

Code	Details	Category	Frequency	Responsible	Barriers
	disciplines or skills and acquiring license on a particular skill.				
A20	PPE Inventory always Ensuring availability of dust masks for employees	Inventory	Continuous	Supply Chain	Dust Mask (PPE) Respirators (PPE)
A22	Planned Task Observation				CM Water Sprays (Col 518)
A23	CM Continuous Monitoring System (Water/Air Pressure, CH4)	Monitoring	Continuous	Engineer	CM Water Sprays (Col 518)
A24	Ventilation Surveys				CM Water Sprays (Col 518)