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MOSH Industry Dust Bowtie Analysis

Coal – Respirable Coal Dust Containing Crystalline Silica (Underground)

Hazard: Respirable Coal Dust

Hazard name:	Respirable Coal Dust (containing Crystalline Silica)
Top event:	Liberation of Respirable Coal Dust
Affects:	Health
Description:	Coal dust, which may contain crystalline silica, generated by various mining activities

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List of Threats and Consequences

Threats	Threat Category
Friction / Abrasive cutting, drilling, raise bore	MC Medium contribution
Coal Cutting	HC High Contribution
Loading and tipping coal	HC High Contribution
Transportation & Travelling (Underground Roadways)	MC Medium contribution
Coal Conveyance (Conveyor Belt)	MC Medium contribution
Coal Transfer(Transfer points)	HC High Contribution
Maintenance activities (cleaning)	MC Medium contribution
Blasting	HC High Contribution
Stone dusting	LC Low contribution

Consequences	Consequence Category
Dust Inhalation - Acute Exposure	MED Medium concern
Dust Inhalation -Chronic Exposure	MAJ Major concern
Business Continuity Disruptions	MED Medium concern
Stakeholder Relations	MAJ Major concern

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List of Threats and Controls with descriptions

Threats	Controls
Friction / Abrasive cutting, drilling, raise bore. Mine drilling activities including stone drilling, roof bolter drilling for support, face drilling.	**Vacuum suction dust extractor on drill rig (Roofbolters)** Suction system installed on drill rig to extract dust as the drilling progresses.
	Wet Drilling Drilling of support holes using steel drill rods with water outlets at drilling points.
Coal Cutting Cutting coal using a continuous miner underground.	**CM Water Sprays (Col 518)** 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).
	Scrubber System on CM 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.
	Cutter Drum Picks 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 have an influence on the amount of dust generated.
Threats	**Controls**

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, tailings & waste dumps.	**Foam Dust Suppression (Dust Stop)** Use of foam to suppress dust generated during the loading process from CM to Shuttlecar. A foam solution is evenly sprayed over the coal using specialized technology create a coating layer onto the coal to prevent dust from being airborne.
CBAT-SLP 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.	**Feeder breaker Water Spray** A water-based dust engineering control that is used to suppress dust or to 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, use of additives is critical for the effectiveness of the system.
Transportation & Travelling (Underground Roadways) Dust emanating because of vehicle travelling on intake roadways for transportation of persons and materials.	**Watering Down (Dust Suppression)** The wetting of underground roadway surfaces (floor and ribside) 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.
	Travelling Speed Management A traffic management programme to regulate mobile equipment travelling speed to reduce the amount of dust liberation.
Threats	**Controls**

Coal Conveyance (Conveyor Belt) Conveyance of coal from various coal mining sections through use of conveyor belts.	**Return Belt Water Sprays** A water-based dust engineering control that is used to suppress dust and prevent it from being airborne as a resut of the conveyor return belt movement. It is the deployment of the technology that 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, use of additives is critical for the effectiveness of the system.
	CBAT-SLP 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.
	Transfer Point Water Sprays A water-based dust engineering control that is used to suppress dust or to facilitate the airborne capture of dust particles at the conveyor belt transfer point.
	Coal Dust Coating (Surfactant/Additives) – surface Use of coal binding agents to prevent dust liberation during the transfer of coal.
Coal Transfer (Transfer points) Transfer of coal from one conveyor (Section Belt) to the other (Trunk Belt) or Trunk to Trunk belt.	**Transfer Point Water Sprays** A water-based dust engineering control that is used to suppress dust or to facilitate the airborne capture of dust particles at the conveyor belt transfer point.

Threats	Controls
Coal Transfer (Transfer points) continue	**CBAT-SLP** 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.
Maintenance activities (cleaning) Cleaning under conveyor belts, cleaning of equipment prior to maintenance, dismantling equipment, etc.	**Watering Down (Dust Suppression)** The wetting of underground roadway surfaces (floor and ribside) 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.
	Equipment Wash Washing of equipment using water hose prior to dismantling
Blasting Fragmentation of the coal seam through use of explosives during the mining process (including secondary blasting) and often releases dust and other associated gases.	**Waterblast** Water sprays installed near blasting face and triggered by concussion to release water droplets for dust suppression
Stone dusting	

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List of Consequences and Controls with descriptions

Consequences	Controls
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.	**Travelling Speed Management** A traffic management programme to regulate mobile equipment travelling speed to eliminate accident and damage of property.
	Cabin Integrity The structural condition of the cabin must prevent ingress of dust particles into the cabin thus exposing the operator.
	Windsock Indicator 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.
	Operator/passenger enclosed cabins Operator cabin enclosure (physical) to create a barrier between the operator and the airborne coal dust particles.
	Canopy Air Curtain Technology/Practice 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.

Consequences	Controls
Dust Inhalation - Acute Exposure continue	**Job Rotation** Multi license system that allows operators to change their work activities or between machines during the shift
	Dust Mask (PPE) Dust respiratory personal protection equipment with the correct protection index**.**
	Respirators (PPE) Dust respiratory personal protection equipment with the correct protection index.
	Real Time Dust Monitoring Electronic system 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.
	Ventilation Control Systems Installation of ventilation control appliances to dilute/remove dust using ventilating air.eg. Fans, vent brattices, etc.

Consequences	Controls
Dust Inhalation -Chronic Exposure Inhalation of coal dust containing crystalline silica which may results in long-term adverse respiratory diseases (occupational lung diseases such as Coal Worker's Pneumoconiosis/Silicosis).	**Operator/passenger enclosed cabins** Operator cabin enclosure (physical) to create a barrier between the operator and the airborne coal dust particles.
	Windsock Indicator 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.
	Cabin Integrity The structural condition of the cabin must prevent ingress of dust particles into the cabin thus exposing the operator
	Personal Dust Monitoring A formal system of Occupational Hygiene Measurements where employees are sampled for dust based on their HEG (Homogeneous Exposure Group) allocation and classification.
	Periodic Medical Screening - Lung Function Tests 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.
	Real Time Dust Monitoring Electronic system 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.

Consequences	Controls
Dust Inhalation -Chronic Exposure continue	**Canopy Air Curtain Technology/Practice** 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.
	Multi license system - Job Rotation A 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.
	Job Re-Classification - The transfer of employees from high-risk areas The transfer of employees from high-risk areas (with regards to their exposure to dust) to low-risk areas in an aim to prevent an occupational lung disease which may have already started showing signs.
	Ventilation Control Systems Installation of ventilation control appliances to dilute/remove dust using ventilating air.eg. Fans, vent brattices, etc.
Business Continuity Disruptions Total or partial mine operation closure or production stoppage due to statutory instructions because of non-compliance.	**Occupational Health Monitoring Programme** System of Occupational Hygiene Measurements based on their HEG (Homogeneous Exposure Group) allocation and classification and linked with medical surveillance records of employees.
	Business Continuity Training Training of all relevant personnel on Business Continuity Plan and the role of each incumbent during business disruption

Consequences	Controls
Stakeholder Relations Working relationship amongst the tripartite parties including investors and communities, in the interest of health & safety of employees. (Look at description)	**Stakeholder Management Plan** A management process that consists in managing the expectations and requirements of all the internal and external stakeholders that are involved with a project to ensure successful delivery of any project, programme, or activity.