Royal Commission on the Pike River Coal Mine Tragedy

Te Komihana a te Karauna mōte Parekura Ana Waro o te Awa o Pike

Short Form Glossary (Solid Energy)

After damp	Noxious mixture of Mine Gases resulting from a coal mine explosion
Air short circuiting	When all or part of the airflow of a ventilation circuit does not complete the planned air circuit. This can be caused by leakage, when a ventilation device is open, a blockage of the airway or if the auxiliary fan capacity is greater than the roadway airflow.
Airflow	Movement of air through underground roadways
Alimak	AlimakHek AB is a Swedish-based manufacturer of specialised elevators for developing a shaft or steep incline such as the shaft used to link the underground workings with the vent shaft in Pike River. In the context of Pike River "Alimak Rise" refers to the tunnel connecting the return and the vent shaft.
Anemometer	Instrument for measuring air velocity within roadways
Ascentional ventilation	Movement of air to a higher point (uphill)
Auxiliary fan	Smaller fan used to ventilate dead-end roadways underground. Used in conjunction with ducting to force or extract air to or from the end of the road.
Barometric pressure	Atmospheric pressure as indicated by a barometer
Bleeder heading	Return roadway on the downwind side of an extraction area that is not directly connected by a roadway to the intake (fresh air) side. Used to draw seam gas away from the extraction area – carries the contaminated air.
Booster fan	Fan located underground within the main ventilation circuit to increase airflow. The fan is installed so that all air passes through the fan.
Bore Hole/Drill hole	Drillhole created by drilling to gather geology information or gas drainage. Can be done from the surface or underground
Brattice(FRAS)	Impervious plastic/fabric cloth used in the construction of ventilation control devices, eg stoppings.
CABA system	Compressed Air Breathing Apparatus - Same system used by fire-fighters. A CABA system may include a fixed compressed air supply where units can be refilled while being used or a back pack system similar to scuba diving.

Caving / roof fall	Process where the roof is undermined and fails to the extent that the roof collapses (unplanned)
CO/CO_2 Ratio	Ratio of carbon monoxide to carbon dioxide concentration used to assist the assessment of spontaneous combustion. A high proportion of CO is indicative that spontaneous combustion is occurring. Typical ratios are: • <0.02: normal; • <0.05: temperature of coal <60°C; • <0.10: temperature of coal <80°C; • <0.15: temperature of coal <100°C.
Control Room	Surface location performing the centralised function of monitoring, operating and controlling the mine. This involves items such as data recording, controlling pump and conveyor systems, monitoring the mine atmosphere and responding to alarms. The control room acts as central communication point as is typically manned when personnel are underground.
Continuous Miner (or Miner) (CM)	Purpose built machine for driving/developing roadways in coal. Capable of loading the cut material into the coal transport system (e.g. flume, shuttle car, conveyor).
Conveyor	Fixed equipment used for transporting stone or coal.
Crosscuts	Underground roadways developed at regular intervals to join one or more main roadways
Cutter head pin	Mechanical protection device on the continuous miner that will shear if sufficient force is applied to the cutting head of the machine
Descensional Ventilation	Movement of air to a lower point (downhill)
Dedicated bore holes	Drillhole with a single use/purpose
Designated air reading station	Location underground with known cross sectional area where air velocity measurements are taken.
Down-dip	Located down the slope of a dipping coal seam
Drift/drive/ tunnel/Adit	Roadway driven in stone
Drill	Equipment for developing boreholes/drillholes
Drill Stub	Generally a small extension roadway (2-5m) off main roadway to allow drilling equipment to be set-up to avoid blocking the main roadway
Driving to the rise	Excavating a roadway up hill
Explosion doors	Protection device in the form of hinged doors/covers on the ducting leading to the main fan that are forced open by the pressure generated by an explosion. This is done to provide some protection to the fan from the force of the blast.
Explosion limits	Concentration of gas in air which will ignite.

FAB – Fresh air Base/ emergency refuge	Location underground where a known fresh air source is available, this may have an air source that is independent of the main ventilation air. An emergency refuge will generally have a supply of self contained breathing apparatus or refill station if using a CABA system. This was a roadway stub developed off the main access road within Pike River.
Fan and its components	CENTRIFUGAL or AXIAL FAN Housing - Contains the internals Fan Internals - Impellor & Blades Diffuser - Duct on outlet side Ducting - Connection to Mine working Motor - Located next to housing Control System & Electrics - Controls motor A mechanical device used to create the air current within the mine, drawing in fresh air and removing “contaminated or bad” air.
Flume	Open steel channel for transporting coal and water downstream of the mining areas
FRAS (Fire resistant Anti-Static) hoses	Hoses made from a conductive material that prevents static charge and prevents the propagation of a flame
Gas drainage pipes/ system	Network of pipe work to reticulate the seam gas being emitted from the in-seam boreholes to a discharge point. The system may include valves, water traps to collect condensation in the pipeline and a flame arrestor at the discharge point to prevent ignition. A pump on the surface may be used to assist the gas to flow and reduce the required size of the pipework.
GC - Gas Chromatograph	Specialised equipment used to precisely measure an increased number of constituents of a Mine Gas sample,.
Goaf	Collapsed or partially collapsed mining area that is no longer suitable for access for people or equipment following the extraction process.
Graben	A block of rock/coal that lies between two faults that has moved downward.
Graham’s Ratio;	Ratio using selected mine gas concentrations to determine the intensity of oxidation and therefore whether spontaneous combustion is occurring. Typical ratios are: • <0.4: normal; • >0.4: possible early stages of spon com; • >1.0: spon com event almost certain; • >2.0: serious spon com event; • >3.0: active fire.
Grizzly	This is a term specific to Pike where the cables for the fan were taken from underground up a wide borehole to the fans. The top of the hole has a grizzly, that is, a grating, to allow the cables to pass through, so it is a specific location and gas monitoring point rather than the normal mining term.
Headings	Two or more roadways generally driven parallel to access different parts of the mine.
Hydraulic mining / hydro monitor	Process of excavating stone or coal with the use of high pressure water and specialised equipment. This was the planned extraction process within Pike River. The hydromonitor is the high pressure

	water equipment.
In seam drainage	Removal of coal seam gas with the use of inseam drill holes and possibly associated pipe work.
In seam drilling	Drilling of boreholes in and around the coal seam from an underground location
Inbye	The direction towards the coal face from any point of reference.
Inclination (of strata)	To lie at an angle to the horizontal plane, as a rock stratum or seam
Inseam Drillers	Personnel who operate underground drilling equipment
Intake	U/G roadways that have uncontaminated/fresh air moving through.
Jones-Trickett Ratio;	Ratio using the concentrations of Mine Gases to help differentiate between gas or coal dust explosions. Typical ratios are: • <0.4: normal; • <0.5: methane fire possible; • <1.0: coal fire possible.
JORC Code	Code of practice from the Joint Ore Reserves Committee which sets minimum standards for public reporting in Australia and New Zealand of Exploration Results, Mineral Resources and Ore Reserves.
LHD	Load Haul Dump machine – low profile front end loader
Liquid inclined manometer	Pressure measuring device using liquid columns in an inclined tube
Loader	Same as LHD
Maihak tube bundles	Gas monitoring system that continually draws (vacuum based) air/gas samples through a network of plastic tubes placed around the mine to the surface for analysis. There is a delay from when the sample is taken to when it reaches the analyser. SICK Maihak GmbH is the leading manufacturer of such systems.
Main fan / Primary fan	Largest fan(s) that draw or push all air through the mine
Mains/ Section/ panels	
Mains	Group of roadways that provide long term people and equipment access and ventilation pathway to get to and from the mining areas (panels/sections)
Section	Also known as panel. Mining area connected to the mains roadways consisting of access roads and extraction areas with a separate ventilation circuit.
Panel	Also known as section. Mining area connected to the mains roadways consisting of access roads and extraction areas with a separate ventilation circuit.
Manometer	Instrument for measuring pressure differences
MCC – Motor Control Centre	Set of electrical switch gear for controlling electrical equipment. May be located on the surface or underground
Methane outburst	The sudden ejection from the solid coal face into the mine workings of methane, carbon dioxide and generally including coal

	and rock.
Mine Gases	
Carbon Monoxide (CO)	A colourless, odourless gas, CO, formed by the incomplete combustion of carbon or a carbonaceous material (eg diesel machines, mine fire, spontaneous combustion of coal) Highly flammable (12.5 to 74%) & very toxic in low concentrations 25 PPM No Effect (TWA) 1000 PPM - Headache, nausea, and dizziness vomit after 30 mins 1500 PPM - Possible collapse after 15 mins 3,000 PPM - Immediate physiological effects, unconsciousness after 5 mins.
Carbon Dioxide (CO_2)	0.03% of Air. Formed U/G by engine exhaust, oxidation of coal or fire. May be a coal seam gas Colourless but pungent odour 0.5% - Slight Increase in respiration (TWA) 2% - 50% Increase in respiration 3% - (STEL) 5% - 300% increase in respiration 10% - Intolerable
Hydrogen (H_2)	Colourless tasteless and odourless. Highly flammable (4 to 74%). May be produced as product of spontaneous combustion
Hydrogen Sulphide (H_2S)	Colourless gas with rotten egg odour. Flammable (4.3% to 45%). Detected by smell at 0.1ppm 10 PPM - TWA 15 PPM - STEL <100 PPM: irritation to eyes and respiratory tract
Methane (CH_4)	Coal seam gas Colourless tasteless and odourless. Highly flammable (5.0 to 15%). Auto Ignition (that is, will burn) temperature 537□ C
Ethylene (C_2H_4)	Spontaneous combustion indicator - detectable only with Gas Chromatograph. Presence in low quantities indicates temperature of 100-150° C
PPM	Parts per Million
STEL	Short-term exposure limit means the maximum average exposure (to the gas) measured over any 15-minute period in the working day. Measures over STELs will require removal of personnel from the exposure area.
Monitoring non-restricted environment/ non restricted environment qualification	

Restricted Zone	Defined by Mining Regulations (Underground) 1999. Restricted zone means— (a) all parts of a ventilation district in a gassy mine that are on the intake side and within 100 metres of— (i) the most inbye completed line of crosscuts; or (ii) a longwall or shortwall face; or b) a part of a gassy mine in which flammable gas, whether or not normally present, is likely to occur in such a quantity as to be 2% by volume or more in the general body of air in the gassy mine; or (c) a part of a gassy mine in which electrical equipment is located and that has not been shown to be free from flammable gas; or (d) all of the return side of a gassy mine The Regulations stipulate additional equipment restrictions, record keeping and air management standards for restricted zones.
Non Restricted Zone	Areas within a mine not classified as a Restricted zone.
Outbye	The direction away from the coal face from any point of reference.
Overcast	A structure built in an underground roadway intersection to keep air paths separated. An air crossing between intake and return roadways.
Oxidation	The reaction of coal with oxygen that produces heat and gas. The rate of oxidation is affected by the surface area of coal, coal type, temperature, and available oxygen.
Pit bottom	First area to be developed in the coal seam where underground services are established e.g. the area of initial mine development at the end of the stone access roadway within Pike River
Portal	Surface entry of a main roadway into the mine
Power Pack	Portable device for providing electrical or hydraulic power to equipment
Raise bore	Method of developing a shaft where initially a pilot hole is drilled from the surface to an existing underground roadway. A drill head is attached underground and is pulled/rotated back to the surface to enlarge the hole.
Rescue station	Resourced mine specific rescue station with on call mine rescue personnel, such as that located in Dunollie.
Return	Any underground roadways that have ”used, contaminated” air moving through them towards the surface after it has passed a mining area.
Rewanui & Brunner coal measures	A coal measure comprises strata containing coal seams deposited in the same geological period - In the Grey coalfield there are four named measures including the Rewanui and Brunner.
Roadheader	Purpose built machine for driving roadways in stone capable of loading the cut material into the stone/coal transport system (e.g. flume, shuttle car, LHD, conveyor).

Roof bolt/roof bolting techniques/ cable bolts	Boreholes from 1 to 2.5 metres long are drilled upward in the roof and bolts of 25cm diameter or more are inserted into the holes and anchored at the top by a chemical resin or mechanical device. The bolt end protrudes below roof level and is used to support mesh and simple steel plates pulled tight up to the roof by a nut on the bolt head. The bolts are put up to a defined pattern. The purpose is to clamp together the several roof beds to form a composite beam with a strength considerably greater than the sum of the individual beds acting separately. Cable bolts are constructed like a wire rope and are used in conjunction with roof bolts where roof conditions are poor and where longer length (4 – 11 metres) support is required.
Self-contained self-rescuer/self-rescuer/SCSR	A temporary breathing system for use when the mine atmosphere becomes unbreathable. There are two possible systems: one with a simple filter (rarely used); the other, using potassium peroxide, reacts with exhaled CO_2 and produces sufficient oxygen for approximately 30 to 60 minutes of use. Intended to allow the user to move from current location to fresh air or other air source.
Shaft	Vertical access way between two points e.g. 100 metres long and 5 metres in diameter
Shaft bottom	Lowest point in the shaft
Shaft sinking	Process of excavating a shaft e.g. raise bore
SIMTARS	Safety in Mines Testing and Research Station (SIMTARS). Queensland Government organisation focusing on research, consulting, testing, certification and training services for the improvement of mining industry safety and health.
Single inlet centrifugal fan/	Type of Main Fan
Slimline Shaft	Small diameter shaft. This was located within the pit bottom area of Pike River.
Smoke lines	A series of rope lines and small cones hung along underground roadways to assist in guiding people through the mine to a point of safety in the event of an emergency and low visibility.
SMV	Specialised Mining Vehicle – personnel carrier. Also known as a drift runner
Spontaneous combustion	Coal reacts with atmospheric oxygen even at ambient temperatures and this reaction creates heat. If the heat liberated during the process is allowed to accumulate, the rate of the above reaction increases exponentially and there is a further rise in temperature. When this temperature reaches the ignition temperature of coal, the coal starts to burn and the phenomena is described as spontaneous combustion
Stand pipes	3-6m pipe that is inserted and grouted into the start of an in-seam borehole to enable a valve or coupling to be installed. This enables the hole to be sealed or connected to a gas drainage pipeline
Sump into the face	First cut by the CM or roadheader where the cutting head excavates into the solid coal

Telemetric system	System where data (gas monitoring) is collected and analysed at an underground location and result relayed electronically to another point (control room) for evaluation. Compare with Maihak system, where gas is collected underground but analysed on the surface.
Tell-tales	Device installed into the roof for measuring ground movement in the immediate/near roof strata.
Tube bundle	Bundle of tubes spread throughout underground workings to transport gas samples to the surface for Maihak (or other) analysis.
Tunnel	Horizontal roadway primarily driven in rock that links the surface operations to the coal seam. An underground roadway could be used along with similar terms as: roadway, drift, heading
TWA	Time Weighted Average (Total exposure in day (concentration × time)/ 8 Hours) The exposure is likely to relate to gas levels in this case.
Underground monitor pump	Pump that generates high pressure and high volume water that is used to excavate coal via the hydromonitor.
Up-dip	Located up the slope of a dipping coal seam
Ventilating pressure	Pressure required to overcome the resistance of air moving through the mine
Ventilation circuit	Pathway that air follows through the mine or section/panel of the mine
Ventilation shaft	Vertical access with a primary purpose of passing air in or out of the mine
Ventilation system	Roadways and equipment required to direct, control, push, pull air throughout the mine. This involves fans, ducting, artificial walls etc.