

APPENDIX G

GLOSSARY OF TERMS USED IN EXPLOSIVES AND BLASTING

186

186

Glossary of Terms Used in Explosives and Blasting

AC - Alternating current

Acoustical Impedance - The mathematical expression characterizing a material as to its energy transfer properties. The product of its unit density and its sonic velocity.

Adobe Charge - See Mud Cap.

Airblast - An airborne shock wave resulting from the detonation of explosives. May be caused by burden movement or the release of expanding gas into the air. Airblast may or may not be audible.

Airdox - A system that uses 10,000 psi compressed air to break undercut coal. Airdox will not ignite a gassy or dusty atmosphere.

Aluminum - A metal commonly used as a fuel or sensitizing agent in explosives and blasting agents. Normally used in finely divided particle or flake form.

American Table of Distances - A quantity-distance table published by IME as pamphlet No. 2, which specifies safe explosive storage distances from inhabited buildings, public highways, passenger railways and other stored explosive materials.

Ammonium Nitrate (AN) - The most commonly used oxidizer in explosives and blasting agents. Its formula is $\text{NH}_4 \text{NO}_3$.

Ampere - A unit of electrical current produced by 1 volt acting through a 1 ohm resistance.

ANFO - A blasting agent consisting of ~94% ammonium nitrate and ~6% fuel oil. It is the most commonly used blasting agent.

Annulus - The void ring area between a outer wall of a packaged explosive and the wall of a borehole with a larger diameter

Arcing - In an electric detonator, the sustained discharge of electricity from the bridge wire posts to the detonator shell. This unplanned path of current flow, caused by excessive current for a prolonged period of time, can result in erratic timing, misfires or hangfires.

Axial Priming - A system for priming blasting agents in which a core of priming material extends through most or all of the blasting agent charge length.

Back Break - Rock broken beyond the limits of the last row of holes. The term is normally associated with rock loss at the crest of the adjacent bench caused by the back and upward movement of the explosive energy in the last row of holes.

Back Holes - The top holes in a tunnel of drift round.

Back Shatter - Rock broken beyond the limits of the last row of holes. The term is normally associated with the crushing of the rock in the face of the adjacent bench caused by lack of forward relief, excessive explosive energy, or a soft or weak geologic formation.

Base Charge - The main explosive charge in a detonator.

Ballistic Mortar - A laboratory instrument used for measuring the relative strength of an explosive material.

Barricaded - The effective screening of a building or magazine containing explosives from another magazine, building, railway, or highway by a natural or artificially erected barrier.

Barrier - A material object or objects that separates, keeps apart, or demarcates in a conspicuous manner, such as cones, a warning sign, or tape.

BATF - Bureau of Alcohol, Tobacco and Firearms, U. S. Department of the Treasury, which enforces explosives control and security regulations.

Beds, Bedding or Bedding Plains - Layers of sedimentary rock, usually separated by a surface of discontinuity. As a rule, the rock can be readily separated along these planes.

Bench - The horizontal ledge in or at the top of a highwall into which holes are drilled vertically for the purpose of blasting. Benching is the process of excavating whereby a highwall is worked in a stepped or lift sequence.

Bench Height - The vertical distance from the top of a bench to floor of top of the next lower bench.

Binary Explosive - An explosive based on two nonexplosive ingredients, such as nitromethane and ammonium nitrate, which are shipped and stored separately and mixed at the jobsite to form a high explosive.

Black Powder - A deflagrating or low explosive consisting of sodium or potassium nitrate, carbon and sulfur.

Blast, Blasting - The detonation of explosives to break or move rock or other material. The assembly of explosives materials for such a purpose.

Blast Area - The area surrounding a blast within the influence of flying rock missiles, post blast fumes and concussion.

Blaster - A qualified person in charge of and responsible for the design, loading and firing of a blast. Also, a person (blaster-in-charge) who has passed a test, approved by OSM, which certifies his or her qualifications to supervise blasting activities.

Blasters' Galvanometer - An electrical resistance measuring instrument containing a silver chloride cell designed specifically for testing electric detonators and circuits containing them. It is used to measure resistance and check electrical continuity.

Blasters' Multimeter - A multipurpose electrical test instrument used to check line voltages, firing circuits resistance and continuity, current leakage, stray currents and other measurements pertinent to electric blasting.

Blasters' Ohmmeter - An electrical resistance measuring instrument containing a current limiting device designed specifically for testing electric detonators and circuits containing them. It is used to measure resistance and check electrical continuity.

Blasthole - A hole drilled in rock or other material for the placement of explosives. Same as borehole.

Blasting Accessories - Non-explosive devices, tools and materials used in blasting to facilitate loading and detonating explosives.

Blasting Agent - An explosive that meets prescribed criteria for insensitivity to initiation. For storage, any material or mixture consisting of a fuel and oxidizer, intended for blasting, not otherwise defined as an explosive, provided that the finished product, as mixed and packaged for use or shipment, cannot be detonated by means of a No. 8 test blasting cap when unconfined (BATF). For transportation, a material designed for blasting which has been tested in accordance with CFR 49, Section 173.114a, and found to be so insensitive that there is very little probability of accidental initiation to explosion or transition from deflagration to detonation (USDOT).

Blasting Cap - A detonator that is initiated by safety fuse. See fuse cap. Also a slang term used for electric and non-electric detonators.

Blasting Circuit - The electrical circuit used to fire one or more electric detonators.

Blasting Crew - A group of persons who assist the blaster in loading and firing the blast.

Blasting Log - A written record containing all pertinent information about a specific blast as may be required by law or regulation.

Blasting Machine - A machine built expressly for providing electrical energy for the purpose of energizing detonators in an electric blasting circuit. CD type signifies Capacitor-Discharge.

Blasting Mat - See mat.

Blasting Switch - A switch used to connect a power source to a blasting circuit.

Blast Site - The area where explosive material is handled during loading, including the perimeter formed by the loaded blastholes and 50 feet in all directions from loaded holes along their entire length.

Blockhole - A hole drilled into a boulder (secondary blasting) to allow the placement of a small charge to break the boulder.

Booster - A unit of explosive for initiating, perpetuating or intensifying an explosive reaction in less sensitive explosive materials. A booster does not contain an initiating device but is often cap sensitive.

Bootleg - That portion of a borehole that remains relatively intact when the force of the detonated explosive it contains does not break the rock to its bottom. A bootleg may contain undetonated explosives and should be considered hazardous.

Borehole (blasthole) - A drilled hole, usually in rock, into which explosives are loaded for blasting.

Borehole Pressure - The pressure which the hot gases of detonation exert on the borehole wall. Borehole pressure is primarily a function of the density of the explosive and the heat of explosion.

Breakage - Fragmented rock size distribution created by blasting.

Bridge Wire - A very fine filament wire connected to the leg wires and imbedded in the ignition charge of an electric detonator. An electric current passing through the wire causes the ignition charge to ignite.

Brisance - The shattering power of an explosive as distinguished from its gas generating heave properties. A property of an explosive directly related to its detonation velocity.

Bubble Energy - The expanding gas energy of an explosive, as measured in an underwater test.

Bulk - Explosive material prepared for use without packaging. Normally handled by mechanical means with transportation by tanker or closed hauler, storage in bins or silos and loading by auger, pump or pneumatic hopper truck (bulk truck).

Bulk Strength - The strength of an explosive per unit volume calculated from its weight strength and density (cal/cc).

Bulldoze - See Mud Cap.

Bullet Resistance - Term used to describe magazine construction. Walls and doors of construction must resist penetration of a bullet of 150-grain M2 ball ammunition having a nominal muzzle velocity of 2700 feet per second fired from a 0.30 caliber rifle from a distance of 100 feet perpendicular to the wall or door. For complete test details consult the regulations.

Burden - 1.) The distance from an explosive charge to the nearest free or open face. Technically, there may be an apparent burden and a true burden, the latter being measured in the direction in which displacement of broken rock will occur following firing of the explosive charge. 2.) The distance between rows of boreholes as measured perpendicular to the spacing. 3.) The amount of material to be blasted by a given hole, given in tons or cubic yards.

Burn Cut - A parallel hole cut employing several closely spaced blastholes. Not all of the holes are loaded with explosive. The cut creates a cylindrical opening or internal free face by shattering the rock.

Bus Wires - Two separate expendable heavy gauge bare copper wires used to connect detonators or series of detonators in a parallel circuit. Each leg wire or each end of each series is connected to a different bus wire.

Butt - See bootleg.

Cap - Term used for detonator. See detonator.

Capacitor-Discharge Blasting Machine - A blasting machine in which electrical energy, supplied by batteries and stored on one or more capacitors, is discharged into a electric detonator blasting circuit.

Capped Fuse - A length of safety fuse to which a blasting cap has been attached.

Capped Primer - A package or cartridge of cap-sensitive explosive which is specifically designed to transmit detonation to other explosives and which contains a detonator (MSHA).

Cap Sensitivity - The sensitivity of an explosive to initiation by a detonator. Explosive material is considered to be cap sensitive if it detonates with an IME No. 8 test detonator.

Carbon Monoxide - A poisonous gas created by detonating explosive materials. Excessive carbon monoxide is caused by an inadequate amount of oxygen or excessive fuel in the explosive mixture.

Cardox - A system that uses a cartridge filled with liquid carbon dioxide, which when initiated by a mixture of potassium perchlorate and charcoal, creates a pressure adequate to break undercut coal.

Carton - A lightweight inner container for explosive materials, usually encased in a substantial shipping container called a case. Usually associated with initiation systems.

Cartridge - A rigid or semirigid closed shell, tube or bag of circular cross section containing explosive materials. Usually used in referring to small and intermediate size package diameters.

Cartridge Count (Stick Count) - The number of cartridges of explosives contained in a case of specified weight.

Cartridge Strength - See bulk strength.

Cast Booster - A cast unit of explosive, usually pentolite or composition B, used to detonate less sensitive explosive materials. (A booster does not contain a detonator. See primer)

Chambering - The process of enlarging a portion of blasthole (usually the bottom) by firing a series of small explosive charges. Chambering can also be done by mechanical or thermal methods.

Chapman-Jouguet (C-J) Plane - In a detonating explosive column, the plane that defines the rear boundary of the primary reaction zone.

Circuit - A completed non-interrupted path for conveying electrical current.

Circuit Tester - See galvanometer, ohmmeter, multimeter.

Class A Explosive - Old U. S. Department of Transportation (DOT) classification for an explosive that possess detonating or otherwise maximum hazard, such as, but not limited to, dynamite, nitroglycerin, lead azide, blasting caps and detonating primers. This classification has been replaced

with the International UN Classification.

Class B Explosives - Old DOT classification for an explosive that possess flammable hazard, such as, but not limited to, propellant explosives, photographic flash powders, and some special fireworks. This classification has been replaced with the International UN Classification.

Class C Explosive - Old DOT classification for an explosive that contains restricted quantities of Class A or Class B explosives. This classification has been replaced with the International UN Classification.

Collar - The mouth or opening of a borehole or shaft. In drilling, to collar means the act of starting a borehole.

Collar Height - The distance from the top of the powder column to the collar of the borehole, usually filled with stemming material.

Column Charge - A continuous, unbroken column of explosive or blasting agent in a borehole.

Column Height (Column Depth) - The length of each uninterrupted explosive charge in a borehole.

Commercial Explosives - Explosives designed and used for commercial or industrial applications, rather than for military purposes.

Composition B - A mixture of RDX and TNT which, when cast, has a density of 1.65 g/cm³ and a velocity of 25,000 fps. It is useful as a primer for blasting agents.

Connecting Wire - An expendable small gauge wire used in a blasting circuit to extend the lead line or leg wires.

Connector - See MS connector.

Controlled Blasting - Techniques used to control overbreak and produce a competent final excavation wall. See line drilling, presplitting, smooth wall blasting, and cushion blasting.

Core Load - The explosive core of detonating cord, expressed as grains per foot.

Cornish Cut - See parallel hole cut.

Coromant Cut - See parallel hole cut.

Coupling - The degree to which an explosive fills the borehole. Bulk loaded explosives are considered to be completely coupled. Untamped cartridges are considered to be decoupled.

Coyote Blasting - A method of blasting using a number of relatively large concentrated charges of explosives. placed in one or more small tunnels driven horizontally into a rock formation.

Crimp (Crimping) - The act of securing a fuse cap or an igniter cord connector to safety fuse by compressing the end of the cap shell around the fuse by means of a cap crimping tool.

Critical Diameter - The minimum diameter for propagation of a detonation front at a stable velocity. Critical diameter is affected by confinement, temperature and pressure on the explosives.

Crosslinking Agent - An organic ingredient added to a water gel or slurry, causing it to change from a liquid to a gel. The gel structure prevents separation and segregation of the explosive ingredients.

Current Leakage - Portion of the firing current bypassing part of the planned blasting circuit through grounding or other unintended path. It can result in all or a portion of the detonators in the circuit to fail.

Current Limiting Device - A electric or electromechanical device that limits current amplitude, duration of current flow, or total energy of current delivered to a blasting circuit.

Cushion Blasting - A blasting technique used to produce competent blast boundaries. The cushion holes, fired after the main charges, have reduced spacing and employ decoupled charges.

Cushion Stick - A cartridge of explosive loaded into a small diameter borehole before the primer. The

use of a cushion stick is generally not recommended because of possible resulting bootlegs.

Cut - An arrangement of holes used in and tunnel blasting to provide internal relief to which the remainder of the round can break. Also, a term used to describe the entire round in underground mining and tunneling.

Cutoff - A break in the path of detonation or initiation caused by ground shifting, flyrock, explosive desensitization, or failure to provide detonation path continuity.

Date-Shift Code - See IME Code

DC - Direct current

Dead Pressing - Desensitization of an explosive, caused by transient pressure from other detonated charge or high hydrostatic pressure. Tiny air bubbles, required for explosive sensitivity and the propagation of the detonation front, are literally squeezed from the mixture.

Decibel - The unit of air overpressure commonly used to measure airblast from blasting. The decibel scale is logarithmic.

Deck (Decking) - An explosive charge that is separated from other explosive charges in the same borehole by stemming or an air cushion. Decking is used to reduce vibration levels, remove explosives from voids, weak strata and minimal burden areas, and for controlled blasting especially at blast boundaries.

Decoupling - Explosive charge that does not completely fill the diameter of the borehole. The use of cartridge and bagged products, unless slit and tamped, will be decoupled. In controlled blasting techniques such as presplitting, cushion blasting, and smoothwall blasting, decoupled charges significantly smaller in diameter than the borehole are often utilized.

Deflagration - A subsonic explosive reaction (less than the speed of sound in the material) but an extremely rapid combustion accompanied by gas formation and borehole pressure.

Delay Blasting - The practice of initiating individual explosive charges at predetermined time intervals using delay detonators.

Delay Connector - See MS Connector

Delay Detonator - A detonator, either electric or nonelectric, with a built-in element that creates a predetermined lapse of time between the input of energy of the firing signal and the detonation of the detonator base charge. Both millisecond delay and long period (second) delay units are available.

Delay Element - That portion of a detonator that produces the predetermined time lapse between the receiving of the firing signal and the detonation of the base charge.

Density - The mass weight per unit volume of explosive, usually expressed as grams per cubic centimeter or pounds per cubic foot. See also Loading Density pounds per foot of borehole.

Department of Transportation (DOT) - A federal agency that regulates safety in interstate shipping of explosives and other hazardous materials.

Detaline System - A nonelectric initiating system utilizing a low-energy detonating cord in conjunction with inhole detonators, sliding inhole detonators and surface delays.

Detonating Cord - A flexible cord containing a core of high-velocity explosive, usually PETN, used to initiate charges of explosives.

Detonation - A supersonic explosive reaction (greater than the speed of sound in the material) that propagates a shock wave through the explosive accompanied by a chemical reaction that furnishes energy to sustain the shock wave propagation in a stable manner. Detonation creates both a detonation pressure and a borehole pressure.

Detonation Pressure - The pressure created in the reaction zone of a detonating explosive. It is a function of the explosive's density and the square of its velocity.

Detonation Velocity - See Velocity.

Detonator - Any device containing any initiating of primary explosive that is used to initiate an explosive detonation. Includes, but is not limited to, blasting caps, electric instantaneous and delay detonators, nonelectric instantaneous or delay detonators and detonating cord MS connectors.

Dewater - The act of removing water from the borehole by pump, air pressure, springing, or other means prior to loading the explosive charge.

Diameter - The cross sectional width of a borehole or an explosive cartridge or package.

Ditch Blasting - See Trenching.

DOT - See Department of Transportation.

Downline - The line of detonating cord, Detaline, or shock tube which transmits energy from the trunkline or surface delay system down the hole to the primer.

Drift - A horizontal opening in or near an ore body and parallel to the course of the long dimension of the ore body.

Drill - Equipment used to create the hole into which the explosive will be loaded. Also the act of creating the hole.

Drill Hole - See Borehole

Drill Pattern - See Pattern.

Drop Ball - An iron or steel weight connected to a crane by a wire rope, which is dropped from a height onto large boulders for the purpose of breaking. Also known also as a headache ball.

Dry-up - The process of loading stick or packaged explosive products into a wet borehole until the water volume is consumed in the annulus and the remaining unloaded portion of the hole is dry and can be loaded with ANFO or other dry blasting agent.

Dynamite - A high explosive consisting of a mixture of, but not limited to, nitroglycerin, nitrocellulose ammonium nitrate, sodium nitrate and various carbonaceous materials.

Echelon Pattern - A delay pattern that causes the true burden, at the time of detonation, to be at oblique angle from the original free face. The pattern is usually used with a bench having two or more open faces with the opening hole on the open corner.

Electric Detonator - A detonator designed to be initiated by an electric current.

Electric Storm - An atmospheric disturbance of intense electrical activity, producing lightning, and strong electric and magnetic field which present an extreme hazard for all blasting activities.

Emulsion - An explosive material containing substantial amounts of oxidizers dissolved in water droplets surrounded by an immiscible fuel.

Energy - A measure of potential for the explosive to do work.

Explosion - A thermochemical reaction in which mixtures of gases, solids or liquids react with the almost instantaneous formation of gaseous pressures and sudden heat release.

Explosion Pressure - See Borehole Pressure.

Explosive - Any chemical compound, mixture or device whose primary or common purpose is to function by explosion.

Explosive Charge - The quantity of explosives material used as one distinct unit, such as deck, borehole, or explosive device.

Explosive Materials - A term which includes, but is not necessarily limited to, dynamite and other high explosives, slurries, water gels, emulsions, blasting agents, black powder, pellet powder, initiating explosives, detonators, safety fuses, squibs, detonating cord, igniter cord and igniters.

Explosive Strength - The amount of energy released by an explosive on detonation that is an indicator of the explosives capacity to do work.

Extra Dynamite - A dynamite that derives the major portion of its energy from ammonium nitrate. Also called ammonia dynamite.

Extraneous Electricity - Electrical energy, other than actual firing current, which may be a hazard with electric detonators. Includes stray current, static electricity, lightning, radio-frequency (electromagnetic) energy and time-varying electric and magnetic fields.

Face - A rock surface in open pit blasting, usually vertical, exposed to air that provides room for expansion and displacement. Also called a free face or open face.

Fertilizer - In blasting, a slang term used for ANFO.

Fire Resistant - Construction designed to offer reasonable protection against fire.

Firing Current - Electric current purposely introduced into a blasting circuit for the purpose of initiation. Also, the amount of current required to activate an electric detonator.

Firing Line - A line consisting of wire, detonating cord or shock tube, extending from the blasters location to the blast bench which carries the detonation signal to the initiation system. In electric initiation, it is often a reusable or permanent wire. For non-electric initiation, it is normally consumed and not reusable. Also called a lead line.

Flashover - Sympathetic detonation between explosive charges or between charged blastholes.

Flyrock - Rock propelled from the blast area through the air or along the ground by the force of the detonated explosives. Excessive flyrock is usually caused by the lack of required burden as a result of poor blast design or unexpected zones of weakness in the rock.

Fracturing - The cracking or breaking of rock with or without movement of the broken pieces.

Fragmentation - The extent to which a rock is broken into pieces by blasting. Also the act of breaking rock.

Freezing - The semifusion and non-ejection of shot rock or ore from a blast round, generally caused by insufficient relief or void area, improper delay timing, or other design discrepancies.

Fuel - An ingredient in an explosive which reacts with an oxidizer to form gaseous products on detonation.

Fuel Oil - The fuel, usually No.2 diesel fuel, in ANFO.

Fume Classification --An IME quantification of the amount of poisonous and toxic gases generated by an explosive or blasting agent on detonation. Of particular importance in the use of explosives in underground mining and blasting in enclosed or confined areas.

Fume Quality - A measure of the toxic fumes to be expected when a specific explosive is properly detonated. See fumes.

Fumes - Noxious or poisonous gases liberated from a blast. May be due to a low fume quality explosive or inefficient detonation.

Fuse - See Safety Fuse.

Fuse Lighter - A pyrotechnic device for rapid and dependable lighting of safety fuse.

Galvanometer - See Blasters' Galvanometer

Gap Sensitivity - The maximum distance across which an explosive can propagate a detonation. The gap may be air or a defined solid material. Gap sensitivity is a measure of the likelihood of sympathetic propagation.

Gas Detonation System - A system for initiating detonators in which the firing signal energy is transmitted through the circuit by means of a gas detonation inside a hollow plastic tube.

Gelatin Dynamite - A highly water-resistant dynamite with a gelatinous consistency derived by the combination of nitroglycerin and nitrocellulose.

Generator Blasting Machine - A blasting machine operated by vigorously pushing down a rack bar or twisting a handle. Now largely replaced by capacitor-discharge blasting machines.

Grains - A system of weight measurement in which 7,000 grains equal one pound (16 oz.).

Ground Fault - Point of contact between part of the electric blasting circuit and the earth

Ground Vibration - Shaking of the ground, by the elastic waves emanating from a blast. Usually measured as particle velocity (inches per second). Excessive vibrations may cause damage to structures.

Guar - An organic ingredient used in some water gel explosives as a fuel and thickening agent. It is derived by grinding the seeds of a leguminous plant.

Hangfire - The detonation of an explosive charge at some undetermined time after its designed firing time. A potential source of serious accidents.

Heading - A horizontal excavation driven in an underground mine.

Hertz (Hz) - A term used to express the frequency of ground vibrations, airblast, and AC. One hertz is one cycle per second.

High Explosive - An explosive that is characterized by a high rate of reaction, high pressure development, the presence of a detonation wave in the explosive and sensitivity to a No.8 test cap. It is a classification used by BATF for explosive storage.

Highwall - A nearly vertical face at the edge of a bench, bluff or ledge on a surface excavation.

Hole Diameter - the cross section width of a borehole.

Ideal Explosive - An explosive having the same characteristics (velocity, detonation pressure, etc.) regardless of diameter, shape or environmental conditions. Examples are cast boosters, TNT, PETN, and nitroglycerin.

Igniter Cord - A small diameter pyrotechnic cord that burns at a uniform rate with an external flame at the zone of burning and used for lighting a series of safety fuses in a timed sequence.

IME - The Institute of Makers of Explosives. A trade organization dealing with the use of explosives, concerned with safety in manufacture, transportation, storage, handling and use. The IME publishes a series of blasting safety pamphlets.

Inhabited Building - A structure regularly occupied in whole or part as a habitation for human beings, or any church, public building, school, church, store, or other structure where people are accustomed to assemble, except any building occupied in connection with the manufacture, transportation, storage, or use of explosive materials.

Initiation - The act of causing an explosive material to detonate or deflagrate.

Instantaneous Detonator - A detonator that contains no delay element and essentially fires as soon as it receives firing signal energy.

Jet Loader - See Pneumatic Loading

Jackleg - A single rotary percussion pneumatically actuated drill with a air assisted footleg. Usually used in small underground development areas.

Joints - Planes within a rock mass along which there is no resistance to separation and along which there has been no relative movement of the material on either side. Joints occur in sets, the planes of which may be mutually perpendicular.

Jumbo - Vehicle mounted, boom fed rotary percussion drill unit used in large tunnels and underground room and pillar mining.

Kelly Bar - a hollow bar attached to the top of the drill column in rotary drilling to prevent collapse of the drill hole when drill steel is removed.

Kerf - A slot cut in a coal or soft rock face by a mechanical cutter to provide a free face for blasting.

Lead Line - Electric initiation, the wire connecting the electrical power source with the leg wires or connecting wires of a blasting circuit at the blast site. Non-electric initiation, it is the signal line, nomally shock tube or detoanting cord, which carries the detonation signal from the blaster to the initiation sytem at the blast site. It is also called firing line.

Leg Wires - The two wires connected to the bridge wire of an electric detonator and extending from the waterproof plug. The opposite ends are used to connect the detonator into a circuit.

Level - In underground mining, the horizontal passages used in the extraction of ore. They are usually spaced at regular intervals and are connected by shafts, slopes, raises, or winzes.

Lifters -The bottom holes in a tunnel or drift round.

Line Drilling - A method of overbreak control in which a series of very closely spaced holes are drilled at the perimeter of the excavation. These holes are not loaded with explosive.

Lithology - The character of rock formation.

Loading - Placing of explosive materials in a borehole.

Loading Density - The weight of explosive loaded per unit length of borehole. Usually expressed as pounds per foot of borehole.

Loading Factor - See Powder Factor.

Loading Pole - A pole made of nonsparking material, used to clear an obstruction in a borehole, or to push explosive cartridges down a borehole to insure a tightly pack and continuous explosive column.

Low Explosive - An explosive that are characterized by a speed of reaction slower than the speed of sound in the material, and the development of low pressure. It is a classification used by BATF for explosive storage.

Magazine - A building, structure or container specially constructed for storing of explosives, blasting agents, detonators or other explosive materials.

Man-made Structures - See "Structures"

Mat - A covering placed over a shot to hold down flying material; usually made of woven wire cable, rope or scrap tires.

Maximum Recommended Firing Current - The highest current (amperage) recommended for the safe and effective performance of an electric detonator.

Metalized - Sensitized or energized with finely divided metal flakes, powders or granules, usually aluminum.

Michigan Cut - See Parallel Hole Cut.

Microballons - Tiny hollow spheres of glass or plastic which are added to explosive materials to enhance sensitivity by assuring an adequate content of entrapped air.

Millisecond - The unit of time measurement, equal to one thousandth of a second.

Millisecond Delay Detonators - Delay detonators that have delay elements ranging from 25 milliseconds to 1000 milliseconds. Also known as short period delays.

Minimum Recommended Firing Current - The lowest recommended electrical current (amperage) that will ensure reliable performance of an electric detonator.

Misfire --A charge, or part of a charge, which for any reason has failed to detonate as planned.

Monomethylamine nitrate - A compound used as a sensitizer and fuel in some water gels.

MS Connector - A nonelectric, short-interval delay device for use in delaying blasts that are initiated by detonating cord.

MSHA - Mine Safety and Health Administration, part of the Department of Labor, which promulgates and enforces health and safety regulations in the mining industry.

Muckpile - The pile of broken rock, ore, or earth resulting from a blast.

Mud Cap - A mud-covered or unconfined charge of explosive fired in contact with the surface of a rock, without the use of a borehole. Also known as adobe, bulldoze, or plaster shot.

Multimeter - See Blasters' Multimeter

National Fire Protection Association (NFPA) - An association which publishes standards for explosive material and ammonium nitrate.

Nitrogen Oxides - Poisonous gases created by detonating explosive materials where an excess of oxidizer or a lack of fuel is present or by inefficient detonation.

Nitrolycerin (NG) - An explosive chemical compound used as a sensitizer in dynamites and represented by the formula $C_3H_5(ONO_2)_3$.

Nitromethane - A liquid compound used as a fuel in two-component (binary) explosives and as rocket fuel.

Nitropropane - A liquid fuel that can be combined with pulverized ammonium nitrate prills to make a dense blasting mixture.

Nitrostarch - A solid explosive, similar to nitrolycerin in function, used as the base of "nonheadache" powders.

Nonel - See Shock Tube System.

Nonelectric Delay Detonator - A detonator with a delay element, capable of being initiated nonelectrically. See Shock Tube System and Detaline System

Non-ideal Explosive - An explosive whose characteristics (velocity, detonation pressure, etc.) are dependent on diameter temperature, degree of confinement, etc. Examples are ANFO, emulsions, emulsion blends, water gels, and slurries.

Nonsparking Metal - A metal that will not produce a spark when struck with other metal tools, rocks or hard surfaces.

No.8 Test Cap - A detonator containing 0.40 to 0.45 grams of PETN base charge at a specific gravity of 1.4 g/cm^3 , and primed with standard weights of primer, depending on the manufacture. The detonator is used in determining if an explosive material qualifies as a blasting agent.

Ohm - A unit of electrical resistance

OSHA - Occupational Safety and Health Administration. An agency of the Department of Labor which enforces health and safety regulations in the construction industry, including blasting.

OSM - Office of Surface Mining Reclamation and Enforcement. An agency of the Department of Interior which enforces surface environmental regulations in the coal mining industry.

Overbreak - Excessive breakage of rock beyond the desired excavation limit.

Overburden - Worthless material lying on top of a deposit of useful materials. Overburden often refers to dirt or gravel, but can be rock, such as shale over limestone, or shale and sandstone over coal.

Overdrive - The act of including an explosive with a velocity higher than the steady state velocity in the remainder of the explosive column. The use of a powerful primer is an example. Overdrive is a temporary phenomenon and the explosive column quickly assumes its steady state velocity.

Oxides of Nitrogen - See Nitrogen Oxides.

Oxidizer - An ingredient in an explosive or blasting agent which readily yields oxygen or other oxidizing substances to stimulate the rapid combustion of fuels. Ammonium nitrate is the most common oxidizer used in commercial explosives.

Oxygen Balance - The theoretical percentage of oxygen in an explosive material or ingredient which is in equilibrium with the fuels and other materials to produce ideal reaction products. In an explosive detonation, these products are predominantly carbon dioxide, water vapor (steam), and free nitrogen.

Packaging - Material, usually of paper or plastic, used to contain an explosive for both shipment or use. Examples of packaging for shipment are fiber cartons, paper bags, plastic totes and poly-weave plastic lined bags. Examples of packaging for use are paper shells, plastic cartridges, chubs, and poly-weave plastic lined bags.

Parallel Circuit - A blasting circuit in which each detonator provides a separate path for current. The legwires of each detonator are connected across the firing line directly or through bus wires.

Parallel Hole Cut - A group of parallel holes, some of which are loaded with explosives, used to establish a free face in tunnel or heading blasting. One or more of the unloaded holes may be larger than the blastholes. Also called Coromant, Cornish, Burn, Shatter or Michigan cut.

Parallel Series Circuit - A blasting circuit in which detonators are connected into two or more series of approximately equal resistance. These series are then connected in a parallel circuit with the end wires of each series connected across the firing line or through bus wires. Also referred to as a series-in-parallel circuit.

Particle Velocity - A measure of ground vibration usually noted as inches per second. It describes the velocity at which a particle of ground vibrates when excited by a seismic wave.

Parting - A rock mass located between two seams of coal.

Pattern - The design plan for borehole layout on a face or bench. In bench blasting it is usually expressed as burden and spacing dimensions.

Pellet Powder - Black powder pressed into cylindrical pellets 2-inch-long, and 1-1/4-inch to 2-inch diameter.

Pentaerythritoltetranitrate (PETN) - A military explosive compound used as the core load of detonating cord, the base charge of detonators, and as an ingredient in cast boosters.

Pentolite - A mixture of PETN and TNT. It is the explosive mixture for cast boosters.

Permissible - A machine, explosive material, apparatus or device that has been investigated, tested and approved by the Department of Energy or MSHA, and is authorized for use in underground coal mines or other mining operations where gassy and dusty conditions exist.

Permissible Blasting -Blasting according to MSHA and State regulations for underground coal mines or other gassy underground mines.

Permissible Explosives - Explosives that have been approved by MSHA for use in underground coal mines or other gassy mines.

PETN - See Pentaerythritoltetranitrate.

Placards - Signs placed on vehicles transporting hazardous materials, including explosives, indicating the nature of the cargo.

Plaster Shot - See Mud Cap.

Pneumatic Loader - One of a variety of machines, powered by compressed air, used to load dry bulk blasting agents. The blasting agent is drawn from a pressurized container by the venturi principle and blown into the hole at high velocity through a semiconductive loading hose. Sometimes called a Jet Loader, Pressure Pot, Venturi Loader, or Powder Monkey. Pneumatic loaders have also been adapted to load small diameter cartridge water gels.

Powder - Any solid explosive. A slang term for explosives.

Powder Chest - A substantial, nonconductive, portable container equipped with a lid and used at blasting sites for temporary storage of explosives. Also called a Daybox or Type #3 Magazine.

Powder Factor --A ratio between the amount of powder loaded and the amount of rock broken, usually expressed as pounds per cubic yard, pounds per ton or tons per pound.

Preblast Survey - A documentation of the existing condition of a structure near an area where blasting will be conducted. The survey is used to determine whether subsequent blasting caused damage to the structure.

Premature - A charge that detonates before it is intended.

Preshearing - See presplitting.

Presplitting - A form of controlled blasting in which decoupled charges or air decked charges are fired in closely spaced holes at the perimeter of the excavation. A presplit blast is fired before the main blast. Also called preshearing.

Pressure Pot - A system for loading ANFO into small-diameter blastholes from a pressurized vessel through a semiconductive hose. See Pneumatic Loading.

Prill - In blasting, a small porous sphere of ammonium nitrate capable of absorbing more than 6 percent by weight of fuel oil. Blasting prills have a bulk density of 0.80 to 0.85 g/cm

Primary Blast - The main blast executed to sustain production.

Primary Explosive - An explosive or explosive mixture which normally detonates by simple ignition from a source such as a spark, flame, impact or friction.

Primer - A unit, package, cartridge, or other cap-sensitive explosive containing a detonator, used to initiate other explosives or blasting agents. It is a booster with the detonator inserted.

Propagation - The detonation of an explosive charge by an impulse received from the detonation of adjacent or nearby explosive charges.

Propagation Blasting -The use of closely spaced, sensitive charges. The shock from the first charge propagates through the ground, setting off the adjacent charge, and so on. Only one detonator is required. Its primary use was ditching in damp ground and used to drain swamp and agricultural areas. The practice is seldom used today.

Propellant Explosive - An explosive that normally deflagrates, and is used for propulsion.

Protected Structures - For purposes of blasting, dwellings, public buildings, schools, churches, or community or institutional buildings. See "Structures"

Pull - The quantity of rock or length of advance excavated by a blast round.

Radio Frequency Energy - Electromagnetic energy in the radio frequency spectrum traveling through the air. Under certain conditions, this energy can fire an electric . IME Pamphlet No. 20 recommends safe distances from transmitters to electric detonators.

Radio Frequency Transmitter - An electric device, such as a stationary or mobile radio transmitting station, which transmits a radio frequency wave.

Raise - A vertical or inclined passage driven upward from a point inside an underground mining operation for the purpose of connection to the level above or for mining of material above a level.

RDX - Cyclotrimethylenetrinitramine An explosive substance used in the manufacture of compositions B, C-3 and C-4. Composition B is useful as a cast primer.

Rectangular Pattern - A blasting pattern in which the boreholes of the succeeding rows are drilled directly behind the borehole in row in front and the burden dimension is nominally less than the spacing.

Relief - the effective distance from the explosive charge to the nearest free face.

Relievers - In a heading round, holes adjacent to the cut holes, used to expand the opening made by the cut holes.

Resistance - The measure of opposition to the flow of current through an electric circuit expressed in ohms.

Rib Holes --The holes at the sides of a tunnel or drift round, which determine the width of the opening.

Rip Rap - Coarse rocks used for river bank or dam stabilization to reduce erosion by water flow.

Rotational Firing - A delay blasting system in which each charge successively displaces its burden into a void created by an explosive detonated on an earlier delay period.

Round - A group or set of blastholes required to produce a unit of advance in underground headings or tunnels.

Safety Fuse - A core of potassium nitrate black powder, enclosed in a covering of textile and waterproofing, which burns at a is used continuous, uniform rate from the point of ignition to the point of use, usually a blasting cap.

Scaled Distance - A ratio used to predict ground vibrations. As commonly used in blasting, scaled distance equals the distance from the blast to the point of concern in feet, divided by the square root of the charge weight of explosive per delay in pounds. Normally, when using the equation, the delay period must be at least eight milliseconds.

Secondary Blasting - Using explosives to break boulders or high bottom resulting from the primary blast.

Seismograph - An instrument that measures and provides a record of earthborne vibrations and air overpressure induced by blasting.

Semiconductive Hose - A hose, used for pneumatic loading of explosive materials, which has an electrical resistance high enough as to limit the flow of stray currents to safe levels, yet not so high as to prevent the dissipation of static electricity to ground. A maximum total resistance of 2,000,000 ohms over its entire length but not less than 5,000 ohms per foot meet the requirements.

Sensitiveness - A measure of an explosive's ability to propagate a detonation.

Sensitivity - A classification of an explosive's ability to detonation upon receiving an external impulse such as impact, shock, flame, or friction.

Sensitizer - An ingredient used in explosive compounds to promote greater ease in initiation or propagation of the detonation reaction.

Sequential Blasting Machine - A blasting machine consisting of a series of capacitors which when fired will discharge through separate circuits at accurately timed intervals as set by the operator. Most unit have 10 separate circuits which can be augmented by adding additional slave units.

Series Circuit - A blasting circuit of electrical detonators in which the leg wires are connected to form a single path or loop through which the current will flow.

Series-in-Parallel Circuit - See Parallel Series Circuit.

Shaft - In underground mining, a vertical excavation extending downward from the surface or from some interior point, connecting the various levels of the mine with each other and the outside. Shafts may be used to transport men, equipment, supplies, and/or rock and ore. Some are used strictly for pumping or ventilation.

Shatter Cut - See Parallel Hole Cut.

Shelf Life - The length of time for which an explosive can be stored without losing its effective performance characteristics.

Shock Energy - The shattering force of an explosive caused by the detonation wave.

Shock Tube System - A non-electric initiation system in which the firing signal is transmitted to the detonators by means of a shock wave inside a hollow plastic tube.

Shock Wave--A pressure pulse that propagates at supersonic velocity.

Shot - A term used synonymously with blast. See Blast.

Shotfirer - A qualified person in charge of and responsible for designing, loading and firing the blast. The term is often used in underground explosive work. Same as Blaster. See Blaster.

Shunt - Shorting together the free ends of electric detonator legwires or the firing line, or a piece of metal or metal foil which the detonator manufacturer places on the free end of leg wires to short them together. The purpose to reduce the potential of stray currents from causing accidental detonation of an electric detonator or electric blasting circuit.

Silver Chloride Cell - A low-current power source used in a blasting galvanometer.

Slope - In underground mining, an inclined excavation extending downward from the surface or from some interior point, connecting the various levels of the mine with each other and the outside. Slopes may be used to transport men, equipment, supplies, and/or rock and ore.

Slurry --An explosive material consisting of oxidizers, fuels, and other liquid and solid ingredients plus a thickener to prevent ingredient separation or settling.

Smoothwall Blasting - A method of controlled blasting, used underground, in which a series of closely spaced holes is drilled at the perimeter of the excavation, loaded with decoupled charges, and fired on the highest delay period of the blast round.

Snake Hole - A borehole drilled slightly downward from horizontal into the floor of a quarry face usually for the purpose of removing toe. Also, a hole drilled under a boulder. Snake holes are normally associated with secondary blasting.

Sodium Nitrate - An oxidizer used as an ingredient in dynamites, water gels and other explosives.

Spacing - The distance between boreholes. In bench blasting, it is the distance between the boreholes in a row, measured perpendicular to the burden and parallel to the free face of expected rock movement.

Specific Gravity - The ratio of the weight of a given volume of any substance to the weight of an equal volume of water.

Splitter Cord - See Igniter Cord.

Springing - The unsafe practice of removing water from a borehole using small explosive charges. Also the practice of enlarging the bottom diameter of a borehole with small explosive charges. See Chambering.

Square Pattern - A blast pattern in which the boreholes of the succeeding rows are drilled directly behind the borehole in row in front and the burden and spacing are of equal dimension.

Squib - A firing device that burns with a flash, used to ignite black powder or pellet powder.

Stability - The ability of an explosive material to maintain its physical and chemical properties as set by the manufacturer when subjected to climatic and other environmental conditions over a particular period of time.

Staggered Pattern - A blast pattern in which the boreholes of the succeeding rows are offset half the spacing distance of the preceding row. The burden and spacing may be of equal dimension or the spacing may be larger than that of the burden..

Static Electricity - Electrical energy at rest and stored on a person or object in a manner similar to that of a capacitor. It is most often produced by the contact and separation of dissimilar insulated materials. When in near proximity to or in contact with an object of different potential, the electrical energy will flow. This current flow may be sufficient to cause electric detonators to prematurely detonate.

Steady State Velocity - The characteristic velocity at which a specific explosive, under specific conditions, in a given charge diameter, will detonate.

Stemming - The inert material, such as drill cuttings or angular crushed stone, used in the collar portion of a blasthole to confine the gaseous products of detonation, or between charges in the same blasthole to separate them. See Collar Height and Deck

Stick Count - See Cartridge Count.

Stope - In underground mining, an excavation area from which ore is or has been extracted.

Stray Current - A flow of electrical current flowing outside an insulated conductor system. A result of defective insulation, it may come from electrical equipment, electrified fences, electric railways, or similar items. Flow is facilitated by conductive paths, such as pipelines and wet ground or other wet materials. Galvanic action of two dissimilar metals, in contact or connected by a conductor, may cause stray current.

Strength - A property of an explosive described in various terms, such as cartridge or weight strength, seismic strength, shock or bubble energy, crater strength, ballistic mortar strength, etc.; used to express an explosive's capacity to do work.

String Loading - The procedure of loading cartridges end to end in a borehole without deforming them to insure explosive column continuity. Used mainly in controlled blasting and permissible blasting.

Structures - Any man-made structure within or outside the permit area which include, which includes but is not limited to dwellings, outbuildings, commercial buildings, public buildings, community buildings, institutional buildings, gas lines, water lines, towers, airports, underground mines, tunnels, and dams. The term does not include structures built and/or utilized for the purpose of carrying out the mining operation. It is more inclusive than the term protected structures. See "Protected Structures".

Subdrill - To drill blastholes beyond the planned grade lines or below floor level to insure breakage to the planned grade or floor level.

Subsonic - Slower than the speed of sound.

Supersonic - Faster than the speed of sound.

Swell Factor - The ratio of the volume of a material in its in situ pre-blasted state to that of the fragmented post blast state. May also be expressed as the reciprocal of this number.

Sympathetic Propagation (sympathetic detonation) - Detonation of an explosive material by means of an impulse from another detonation through air, earth or water. See Propagation.

Tamping - The process of compressing stemming or explosive in a blasthole.

Tamping Bag - A cylindrical bag containing stemming material, used to confine explosive charges in boreholes.

Tamping Pole - See Loading Pole.

Tectonic - The science of or relating to the deformation of the earth's crust, the forces involved in or producing such deformation, and the resulting forms, especially folding and faulting.

Test Detonator - See No.8 Test Cap

Theft Resistant - Constructed so as to deter illegal entry into facilities where explosive materials are stored.

Toe - In bench blasting, the horizontal distance between the free face and the borehole at the floor level of the bench. Also unbroken rock left at the floor level in front of the face from a previous blast.

Transient Velocity - A velocity, different from the expected steady state velocity, which an explosive of a different physical properties imparts to the explosive column. The explosive column quickly returns to its original steady state velocity.

Trinitrotoluene (TNT) - A military explosive compound used industrially as a sensitizer for slurries and as an ingredient in pentolite and composition B. Also is used as a free-running pelletized explosive.

Trunkline - The line of detonating cord used on the surface of the blast bench to connect the downlines or other detonating cord lines in a blast pattern. Delays may be imparted to the surface connections using MS Connectors.

Tunnel - A horizontal underground passage.

Two-component Explosive - See Binary Explosive.

Unbarricaded - The absence of a barrier, either natural or man made, around an explosive storage or manufacturing facility.

Unconfined Detonation Velocity - The detonation velocity of an explosive material not confined by a borehole or other confining medium. Normally lower than the Confined Detonation Velocity.

V-cut - A drill pattern employing two sets of angled holes, in close proximity at the bottom and spread at the collar, forming a wedge to provide relief toward the free face of a heading or tunnel blast round.

Velocity - The rate at which the detonation wave travels through an explosive. May be measured confined or unconfined.

Venturi Loader - See Pneumatic Loader.

Volt - The unit of electromotive force. It is the difference in potential required to make a current of one ampere flow through a resistance of one ohm.

Volume Strength - See Cartridge Strength or Bulk Strength.

Warning Signal - A visual and/or audible signal that is used to alert personnel in the vicinity of the blast area of an impending blast detonation.

Water Gel - An explosive consisting of oxidizers, fuels, and water, plus a cross linking agent utilized to prevent ingredient separation or settling and provide water resistance.

Water Resistance - A qualitative measure of the ability of an explosive material to withstand exposure to water without deterioration or becoming desensitized.

Water Stemming Bags - Plastic bags with a self-sealing device which are filled with water and used to stem blastholes. Classified as a permissible stemming device by MSHA.

Weight Strength - A rating that compares the strength of a given weight of explosive with an equivalent weight of straight nitroglycerin dynamite or other explosive standard, expressed as a percentage.

Winze - A vertical or inclined passage sunk from a point inside an underground mining operation for the purpose of connection to a lower level or for mining of material below a level.