



A GLOSSARY OF FREQUENTLY USED TERMS IN EXCAVATION AND BLASTING

AIR BLAST - 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. Air blast may or may not be audible.

AIR GAP - A blasting technique wherein a charge is suspended in a borehole, and the hole tightly stemmed to allow a time-lapse between detonation and ultimate failure of the rock (no coupling realized).

AMERICAN TABLE OF DISTANCE - A quantity-distance table published by IME as *Pamphlet No. 2*, which specifies safe explosives storage distances from inhabited buildings, public highways, passenger rail-ways, and other stored explosives materials.

AMMONIUM NITRATE (AN) - The most commonly used oxidizer in explosives and blasting agents.

ANFO - A blasting agent consisting of ammonium nitrate prills and fuel oil.

APPROVED EXPLOSIVES - Explosives approved by NPS Washington D.C. Blasting officer as outlined in *NPS-65*.

APPROVED STORAGE FACILITY/MAGAZINE - A facility for the storage of explosives materials conforming to the requirements in *TITLE 27 CFR, PART 55, Explosives Materials, Regulations, Subpart K, Storage; Bureau of Alcohol, Tobacco, and Firearms (BATF)*.

BACK BREAK AND BACKSHATTER - Rock broken at the hole collar beyond the limits of the last row

of holes. In shallow holes, it is often called cratering.

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

BEDS OR BEDDING - 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 a quarry or mine face, or in a road or trail cut, along which holes are drilled vertically. Benching is the process of excavating whereby terrace or ledges are worked in a stepped shape. Benching is also the horizontal surface of bench cuts in road and trail construction.

BLAST - The operation of rending (breaking) rock by means of explosives. Shot is also used to mean a blast.

BLAST AREA - The area near a blast within the influence of flying missiles, or damage-level concussion.

BLASTER-IN-CHARGE - A qualified person in charge of a blasting operation. Also, a person who has passed a test, approved by *NPS-65*, which certifies his or her qualifications to conduct and supervise blasting activities.

BLASTING AGENT - Any material or mixture, consisting of fuel and oxidizer, intended for blasting, not otherwise defined as an explosive, provided that the finished product, as mixed for shipment or use, cannot be detonated by means of a No. 8 test blasting cap when unconfined.

BLASTHOLE - A hole drilled into rock or other material for the placement of explosives.

BLASTING MAT - Used to cover a blast to hold down any possible fly material (debris); usually made of woven wire rope or cable, rope, or rubber.

BLASTING GALVANOMETER - A measuring instrument containing a silver chloride cell and a current-limiting device which is used to measure resistance in an electrical blasting circuit. Only a device specifically identified as a blasting galvanometer, blasting ohmmeter, or blasting multimeter shall be used for this purpose.

BLOCKHOLE - A hole drilled into a boulder to allow the placement of a small charge of explosives to break the boulder.

BOOSTER - A chemical compound used for intensifying an explosives reaction. A booster does not contain an initiating device, but must be cap sensitive. Usually of high velocity and density.

BOOTLEG - That portion of a borehole that remains relatively intact after having been charged with explosives and fired. A situation in which the blast fails to cause total failure of the rock due to insufficient explosives for the amount of burden (also called shotgunning), or caused by incomplete detonation of the explosives.

BOULDERING - Referred to also as “**ADOBE**” OR “**PLASTER SHOT**” - A charge of explosives fired in contact with the surface of a rock. May be covered with a quantity of mud, wet earth, or similar substance (no borehole used).

BRIDGEWIRE - A very fine filament wire embedded in the ignition element of an electrical blasting cap. An

electric current passing through the wire causes a sudden heat rise, causing the ignition element to be ignited.

BRIDGING - Where the continuity of a column of explosives in a borehole is broken, either by improper placement, as in the case of slurries or poured blasting agents, or where some foreign matter has plugged the hole.

BURDEN - Generally considered the distance from an explosives charge to the nearest free or open face. Technically, there may be an apparent burden and a true burden, the latter being measured always in the direction in which displacement of broken rock will occur following firing of an explosives charge.

BUS WIRE - Solid core 10-, 12- or 14-gauge uninsulated copper wire used in parallel and parallel-series blasting circuits.

CAP SENSITIVITY - The sensitivity of an explosive to shock initiation.

CAST PRIMER - A cast unit of explosives, usually pentolite or composition B, commonly used to initiate detonation in a blasting agent.

CENTERS - The distance measured between two or more adjacent blastholes without reference to hole locations as to row. The term has no association with the blasthole burden.

CLASS & DIVISION

CLASS-Means the hazard class of a material.

DIVISION-Means a subdivision of a hazard class.

CLASS I EXPLOSIVE MATERIALS

DIVISION 1.1 EXPLOSIVES - Solid or liquid explosives which display a major hazard of mass explosion (e.g. Articles, explosives, n.o.s.; articles pyrotechnic, black powder). (49 CFR 173.50)

DIVISION 1.2 EXPLOSIVES - Explosives which have the major hazard of dangerous projections (e.g.. Cartridges for weapons; charges, propelling, for cannon). (49 CFR 173.115)

DIVISION 1.3 EXPLOSIVES - Materials in which the major hazard is the release of radiant heat or violent burning, or both, but there is no projection or blast hazard (e.g., cartridges, signal, cases, combustible, empty, without primer). (49 CR 173.50)

DIVISION 1.4 EXPLOSIVES - Explosives where there is a small hazard with no mass explosion and no projection of fragments of appreciable size or range (e.g., charges, shaped. flexible, linear, charges, bursting, plastic bonded). (49 CFR 173.50)

DIVISION 1.4 COMPATIBILITY GROUP S (1.4S) EXPLOSIVES - Explosives where the hazardous effects are confined within the package or the blast and projection effects do not significantly hinder emergency response efforts (e.g. Cartridges, power device; cartridges, sinal). (49 CFR 173.50)

DIVISION 1.5 EXPLOSIVES (BLASTING AGENT) - A material designed for blasting, which after undergoing certain prescribed tests, is found to be so insensitive that there is very little probability of accidental initiation to explosion or of transition from deflagration to detonation (e.g. Explosive, blasting, type

B). (49 CFR 173.50)

DIVISION 1.6 EXPLOSIVES - A material, which after undergoing certain prescribed tests, is found to be an extremely insensitive detonating substance (EIDS) (e.g. Articles, explosive, extremely insensitive or Articles, EEI). (49 CFR 173.50)

CLASS 2 GASES

NON-LIQUEFIED COMPRESSED GAS-A gas, other than in a solution, which in a packaging under the charged pressure is entirely gaseous at a temperature of 20 degrees C (68 degrees F). (CFR 173.115)

LIQUEFIED COMPRESSED GAS-A gas which in a packaging under the charged pressure is partially a liquid at 20 degrees C (68 degrees F). (49 CFR 173.115)

COMPRESSED GAS IN A SOLUTION - A non-liquefied compressed gas which is dissolved in a solvent. (49 CFR 173.115)

CRYOGENIC LIQUID - A refrigerated liquid gas having a boiling point colder than -90 C (130 F) at 101.3 kPa (14.7 psi) absolute. (49 CFR 173.115)

REFRIGERANT GAS or DISPERSANT GAS - Terms apply to all nonpoisonous refrigerant gases, dispersant gases (fluorocarbons) and mixtures, or any other compressed gas having a vapor pressure not exceeding 1792 kPa (260 psi) at 54 degrees C (130 F) and restricted for use as a refrigerant, dispersant or blowing agent. (49 CFR 173.115)

COLLAR - The mouth or opening of a borehole or shaft. Also, to collar in drilling means the act of starting the drill steel in a bootleg.

CONDENSER DISCHARGE (CD) BLASTING MACHINE - Blasting machine that uses batteries or generator to energize a series of condensers which release stored energy into a blasting circuit.

CONNECTING WIRE - Any wire in a blasting circuit connecting cap leg wires with lead wire. Usually considered expendable.

CONFINED DETONATION VELOCITY - The detonation velocity of an explosive or blasting agent under confinement, such as in a borehole.

COYOTE BLASTING - Blasting of rock by detonating explosives-filled tunnels. The tunnels are usually at the base and parallel to the rock face. Includes the practice of drilling blasting holes (tunnels) horizontally into rock face at the foot of the shot. Used where it is impractical to drill vertically.

COUPLING - Degree to which an explosive fills the borehole. Bulk loaded explosives are completely coupled. Untamed cartridges are uncoupled. (Also intimate contact between explosives and rock.)

CRITICAL DIAMETER - The minimum diameter for propagation of a detonation wave at a stable velocity. Critical diameter is affected by conditions of confinement, temperature, and pressure on the explosive.

CUTOFF - Occurs when a column of explosives fails to detonate due to bridging, or to a shift of the rock

formation caused by an improper delay system. Also applies to disruption of detonating cord initiation systems due to improper layout or knots, or in some cases, to flyrock cutting the cord.

CUSHION BLASTING - A technique of firing a single row of decoupled holes along a neat excavation line to shear the rock between closely drilled holes. Fired after production blasting has been accomplished.

DEAD PRESSING - Desensitization of an explosive, caused by pressurization. Tiny air bubbles, required for sensitivity, are literally squeezed from the mixture.

DECIBEL - The unit of sound pressure commonly used to indicate air blast noise from explosives. The decibel scale is logarithmic.

DECK - In blasting, a smaller charge or portion of a blasthole loaded with explosives that is separated from the main charge by stemming or air cushion.

DECOUPLING - The use of cartridge products significantly smaller in diameter than the borehole. Decoupled charges are normally not used except in cushion blasting, smooth blasting, pre-splitting, and other situations where crushing is undesirable.

DEFLAGRATION - A burning process that proceeds at a rate less than 3000 fps, but produces sufficient gas pressure to rend or disrupt the material around it, including rock.

DELAY BLASTING - The use of delay detonators or connectors that cause separate charges to detonate at different times, rather than simultaneously.

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

DELAY ELEMENT - That portion of a blasting cap which causes a delay between the instant of impressment of energy on the cap and the time of detonation of the base charge of the cap.

DENSITY - The weight of material per unit volume, usually expressed in grams per cubic centimeter; with water = 1.0.

DETONATING CORD - A flexible cord containing a center core of high explosives and used to initiate other explosives.

DETONATION - An explosives reaction that consists of the propagation of a shock wave through the explosive, accompanied by a chemical reaction that furnishes energy to sustain the shock wave propagation in a stable, sustained manner, with gaseous formation and pressure expansion following shortly thereafter. The shock wave must propagate through the explosive at a rate higher than that of the velocity of sound in the undetonated explosives.

DETONATION PRESSURE - The head-on pressure created by the detonation proceeding down the explosive column. Detonation pressure is a function of the density of the explosive and the square of its velocity.

DETONATOR - Any device containing a detonating charge that is used to initiate an explosive. Includes, but is not limited to, blasting caps, electric blasting caps, and nonelectric instantaneous or delay blasting caps.

DOWNLINE - The line of detonating cord in the borehole which transmits energy from the trunkline down the hole to the primer.

DYNAMITE - A high explosives used for blasting, consisting essentially of a mixture of, but not limited to, nitroglycerin, nitrocellulose, ammonium nitrate, and carbonaceous materials.

ECHELON PATTERN - A delay pattern that causes the true burden, at the time of detonation, to be at an oblique angle from the original free face.

EMULSION - An explosives material containing substantial amounts of oxidizers suspended in water droplets surrounded by an immiscible fuel. Similar to a slurry in some respects.

EXPLOSION - A thermochemical process whereby mixtures of gases, solids, or liquids react with the almost instantaneous formation of high gaseous pressures and a heat release. There must always be a source of ignition and a proper temperature limit reached to initiate the reaction. Technically, a boiler can rupture, but cannot explode.

EXPLOSIVE - Any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion or to initiate explosives; the term includes dynamite and other high explosives, black powder, pellet powder, initiating explosives, detonators, safety fuses, squibs, detonating cord, igniter cord, and igniters.

EXTRANEOUS ELECTRICITY - Electrical energy, other than actual firing current, which may be a hazard with electric blasting caps. Includes stray current, static electricity, lightning, radio frequency energy, and capacitive or inductive coupling, (electromagnetic) waves, and time-varying electric and magnetic fields.

FACE - The end of an excavation toward which work is progressing or that which was last done. It is rock surface exposed to air.

FIRE - In blasting, it is the act of initiating an explosive reaction.

FIRING LINE - A line, sometimes permanent, extending from the firing location to the electrical blasting cap circuit. Also called lead wire.

FLASH OVER - Sympathetic detonation between explosives charges or between charged blastholes.

FLOOR - The bottom horizontal, or nearly so, part of an excavation upon which haulage or walking is done.

FLYROCK - Rock that is propelled through the air from a blast. Excessive flyrock may be caused by poor blast design or unexpected zones of weakness in the rock.

FRACTURE - Literally, the breaking of rock without movement of broken pieces.

FRAGMENTATION - The extent to which rock is broken into small pieces by primary blasting.

FUEL - In explosive calculations, it is the chemical compound used for purposes of combining with oxygen to form gaseous products and cause heat.

GALVANIC ACTION - Currents caused when dissimilar metals contact each other, or through a conductive medium. This action may create sufficient voltage to cause premature firing of an electrical blasting circuit, particularly in the presence of salt water.

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

GRADE - In excavation, it specifies the elevation of a roadbed, rail foundation, etc. When given a value such as percent or degree grade, it is the amount of fall or inclination compared to a unit of horizontal distance for a ditch, road, etc. To grade means to level ground irregularities to a prescribed level.

GRAINS - A system of weight measurement in which 7000 grains equal one pound.

GROUND VIBRATION - A shaking of the ground caused by the seismic waves emanating from a blast. Excessive vibration may cause damage to structures.

HANGFIRES - The detonation of an explosive charge at a time after its designed firing time. A source of serious accidents.

HARDPAN - A tight clay soil, often including sand, gravels, or even boulder content, which, when dry, is so cemented that it must be blasted or ripped in order to excavate.

HIGHWALL - The bench, bluff, or ledge on the edge of a surface excavation, and most often used only in strip mining.

HYGROSCOPIC - A tendency for an explosive product to absorb water/moisture, ie ammonium nitrate

IGNITACORD - A cord-like thermite fuse that burns progressively along its length with an external flame at the zone of burning and is used for lighting a series of safety fuses in sequence. Burns with a spitting flame similar to a Fourth of July sparkler.

INITIATION - The act of detonating a high explosives by way of a mechanical device or other means.

JOINTS - Planes within rock masses along which there is reduced resistance to separation and along which there has been no relative movement of the material on each side of the break. Joints, unlike strata, are unrelated to the order of geological deposition.

JUMBO/GANG DRILL - A machine with one or more mounted drilling units which may or may not be operated independently.

LEAD WIRE - The wires connecting the electrodes of an electric blasting machine with the final leg wires of a blasting circuit.

LOADING DENSITY - An expression of explosives density in terms of pounds of explosives per foot of a specific diameter.

MAGAZINE - Any building or portable structure used to store explosives and blasting caps.

MILLISECOND DELAY CAPS - Delay electric caps which have a built-in delay element. Timing usually consists of 25/1000 of a second intervals, consecutively. This timing may vary from manufacturer to manufacturer.

MISFIRE - A charge, or part of a charge, which for any reason has failed to fire as planned. All misfires are to be considered extremely dangerous until the cause of the misfire has been determined.

MUCK PILE - The pile of blasted and broken rock or dirt after the shot, that is to be loaded or removed.

NONELECTRIC DELAY BLASTING CAP - A detonator with a delay element, capable of being initiated nonelectrically. See shock tube system; gas detonation system; Detaline system.

OPEN PIT - A surface operation for the mining of metallic ores, coal, rock, etc.

OVERBURDEN - The material lying on top of the rock to be blasted; usually refers to dirt and gravel, but can mean another type of rock; for example, limestone over coal.

OXIDIZER - An ingredient in an explosives or blasting agent which supplies oxygen to combine with the fuel to form gaseous or solid products of detonation. Ammonium nitrate is the most common oxidizer used in commercial explosives.

PARTICLE VELOCITY - A measure of ground vibration. Describes the velocity at which a particle of ground vibrates when excited by a seismic wave.

PENTAERYTHRITOLTETRANITRATE (PETN) - An explosive used as the core load of detonating cord and the base charge of blasting caps.

PERMISSIBLE - An explosive approved by the U.S. Bureau of Mines for controlled heat and duration of detonation flame and allowed for use in underground work. Permissibles are allowed to produce more toxic fumes than non-permissibles. Reduces the possibility of ignition of coal dust or methane gas.

POWDER - A common synonym for explosive material.

POWDER FACTOR - The tons or cubic yards of rock affected per pound of explosives used.

PREMATURE DETONATION - Charge detonates before it is intended to.

PRE-BLAST SURVEY - The inspection and documentation of the existing condition of rock/ground formation or other medium, or structure, prior to blasting.

PRIMER - A unit, package, or cartridge of explosives used to initiate other explosives or blasting agents, and which contains: (1) detonator; (2) detonating cord to which is attached a detonator designed to initiate the detonating cord.

PROPAGATION - The detonation of explosives by an impulse from a nearby explosives charge in either columnar or linear spaced configuration.

QUARRY - An open or surface mine used for the extraction of rock such as limestone, slate, building stone, etc.

ROUND - A set of holes drilled and charged with explosives in any phase of explosives work, which are fired instantaneously or with delay detonators.

SAFETY FUSE - A cord containing a core of black powder and having a controlled burn rate, used to initiate blasting caps.

SCALED DISTANCE - A ratio 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 nine ms.

SEAM - A stratum or bed of mineral. Also a stratification plane in a sedimentary rock deposit. The seam may also be of sand or mud and may run vertically or horizontally, or at any angle in between.

SECONDARY BLAST - Using explosives to break up larger rock masses resulting from the primary blasts. These are the rocks that are too large for easy handling.

SEISMOGRAPH - An instrument that measures and supplies a permanent record of earth-borne vibration induced by earthquakes and/or blasting. (In blasting, except for seismic exploration, it is called a blast monitor.)

SENSITIZER - The ingredient used in explosives compounds to promote greater ease in initiation or propagation of the reactions.

SEQUENTIAL BLASTING MACHINE - A capacitor-discharge blasting machine with more than one circuit. Each circuit can have either a preset time or the time can be set by the blaster.

SHOT FIRER - Also referred to as the blaster-in-charge. The person who actually fires the blast. A powderman, on the other hand, may charge or load the blastholes with explosives, but may not actually fire the shot.

SHUNT - A piece of metal connecting two ends of leg wires to prevent stray currents from causing the possibility of accidental detonation of an electric blasting cap. The act of deliberately shorting any portion of an electrical blasting circuit.

SLOPE - Used to define the ratio of the vertical rise or height to horizontal distance in describing the angle that a bench or bench face makes with the horizontal plane. For example, a one and one-half to one slope means there would be a one and one-half feet rise to each one foot of horizontal distance.

SLURRY - An aqueous solution of ammonium and sodium nitrate with a fuel, sensitized usually by microballoon entrapped air and some chemical sensitizers, thickened, and cross-linked to provide a gelatinous consistency. Sometimes called a water gel. DOT may classify as a Class A explosives, a Class B explosives, or a blasting agent. An explosives or blasting agent containing a substantial portion of water (MSHA). See EMULSION; WATER GEL.

SNAKEHOLE - A hole drilled or bored under a rock or tree stump for the placement of explosives.

SPACING - In blasting, the distance between boreholes or charges in a row.

SPECIFIC GRAVITY - The density of a material compared to water.

SPRINGING - Sometimes called chambering. This is the process of enlarging a portion of a blasthole (usually the bottom) by firing a series of small explosives charges. May also refer to the enlargement of a blasthole by jet-piercing or spalling.

STEADY STATE VELOCITY - The characteristic velocity at which a specific explosive, under specific conditions, in a given charge diameter, will detonate.

STRENGTH - For dynamites, refers to the energy content of an explosives in relation to an equal amount of straight nitroglycerin dynamite or ANFO, depending on the scale being used. For other explosives, refers usually to a weight comparison with ANFO.

SUBDRILLING - The technique of drilling holes somewhat deeper than desired floor grade in order to achieve on-grade shear and eliminate toe.

SWELL FACTOR - The ratio of the volume of a material in its solid state to that when broken.

TAMPING - The process of compressing the stemming or explosives in a borehole.

TOE - The unbroken rock, higher than floor or bench grade, left in front of a detonated hole or row. It results in uneven floor, and is usually controlled through subdrilling.

TRANSIENT VELOCITY - A velocity, different from the steady state velocity, which a primer imparts to a column of powder. The powder column quickly attains steady state velocity

VELOCITY - The measure of the rate at which the detonation wave travels through explosives.

WATER GEL - An aqueous solution of ammonium and sodium nitrate with a fuel sensitized by explosive additives and/or microballoon entrapped air, thickened, and cross-linked to provide a gelatinous consistency. Also called a slurry. May be an explosives or a blasting agent.

WEIGHT STRENGTH - A rating that compares the strength of a given explosives with an equivalent weight of an explosives standard, expressed as a percentage. The explosive standard for dynamites is straight nitroglycerin dynamite. The standard for all other explosives is ANFO, which is given a base value of 100 (for example, 100 percent).