

DRAFT TANZANIA STANDARD

**TBS/MMDC 2 (5180) P3 Glossary of mining terms-part 3: Drilling
and Blasting**

TANZANIA BUREAU OF STANDARDS

Glossary of Mining terms.

Part 3: Drilling and Blasting

1 Foreword

This draft Tanzania Standard is being prepared by the Mining Technical Committee (MMDC 2), under the supervision of the Mining and Minerals Standards Divisional Committee (MMDC).

This draft Tanzania Standard consists of the following parts, under the general title Glossary of Mining terms:

Part 1: Surveying.

Part 2: Boring and exploration.

Part 3: Drilling and blasting.

Part 4: Ventilation

Part 5: Shafts and associated equipment.

Part 6: Transport.

Part 7: Drainage.

Part 8: Strata control.

Part 9: Geology.

Part 10: Winning and working.

Part 11: Electrical engineering and lighting.

In preparation of this draft Tanzania standard assistance was derived from Indian national standard IS 15838:2008 Mining – Glossary of terms and British standard BS 3618-6:1972 Glossary of mining terms, Part 6: Drilling and Blasting

2 Scope

This part of draft Tanzania standard covers the definition of terms used in mining industry in connection with drilling and blasting.

3 Terms and definitions

For the purposes of this draft Tanzania standard, the following definitions apply.

3.1 Terms Relating to Drilling

3.1.1 Airleg — A device, incorporating a pneumatic cylinder, providing support and thrust for a rock drill.

3.1.2 Angle Shot — A shot in a delay round in which the charge has been wholly or partially exposed to atmosphere by reason of the detonation of an earlier shot in the round.

3.1.3 Back holes — These are holes that are shot last among others in a blasting pattern. They are used during shaft sinking, raising, or drifting.

- 3.1.4 Bit** — The end of a drill rod forming the cutting edge, which is either integral part of the rod or detachable cutting edge.
- 3.1.5 Chisel Bit** — A percussive drill bit having a single cutting edge.
- 3.1.6 Circulating Fluid** — The fluid, which may be water, mud or air, circulated through the drilling apparatus during drilling. Its chief functions are to remove the cuttings, to cool the bit, and in the case of mud to support the sides of the hole.
- 3.1.7 Chisel bit** — A percussive bit having a single cutting edge.
- 3.1.8 Collaring** — The operation of initial slow drilling for making a proper recess for the drill bit in the rock before drilling of a hole is commenced with full speed.
- 3.1.9 Cross Bit** — A percussive drill bit having cutting edge intersecting in the form of a cross.
- 3.1.10 Cruciform Bit** — See 'Cross Bit'.
- 3.1.11 Down-the-Hole Drill** — A percussive drill located immediately behind the drill bit in a rotary percussive drill.
- 3.1.12 Drifter** — A heavy percussive drill requiring some form of rigid mounting.
- 3.1.13 Drill Bit** — See 'Bit'.
- 3.1.14 Drill Boom** — An adjustable arm projecting from a drill carriage to carry a drill and hold it in position.
- 3.1.15 Drill Carriage** — A vehicle on which one or more drill booms are mounted to permit the drills to be brought easily to their work site and to be removed before blasting (see also Jumbo).
- 3.1.16 Drill Cradle** — The metal channel on which a heavy drill is fed forward as drilling proceeds.
- 3.1.17 Drill Rig** — A device equipped with one or more drills with means to support and/or feed the drills. It may be stationary or mobile.
- 3.1.18 Drill Rod** — A bar, the end of which is slotted, tapered or screwed for the attachment of a drill bit or a drill rod.
- 3.1.19 Drill Steel** — See 'Drill Rod'.
- 3.1.20 Drilling** — The use of a machine to create holes for exploration or for loading with explosives.
- 3.1.21 Fir-tree bit** — A rotary bit in which a number of cutting edges are arranged behind a pilot bit to enlarge the hole to the required diameter.
- 3.1.22 Flushing** — An operation of driving water or some other thicker liquid, such as a mixture of water and clay into the borehole through the rod and bit during hole drilling activities. The water rises along the rod on its outer side, between the walls of the borehole and the rod, with such a velocity that the broken rock fragments are carried up by this water current.

- 3.1.23 Hammer Drill** — A percussive drill operated by compressed air.
- 3.1.24 Hydra-leg** — A device, incorporating a hydraulic cylinder, providing support and thrust for a jackhammer.
- 3.1.25 Jackhammer** — A light percussive drill used in the hand or with some light support.
- 3.1.26 Jambo**
- a) A drill carriage.
 - b) A mobile carriage with scaffold, carrying drills for drilling large size headings underground.
- 3.1.27 Jumbo** — See 'Jambo'.
- 3.1.28 Lifter holes** — Shotholes drilled along the floor of a tunnel for lifting the rock to floor level
- 3.1.29 Line Oiler**— A device for lubricating a drill by feeding oil gradually into the compressed air supply.
- 3.1.30 Percussive Drilling** — A method of drilling whereby repeated blows are applied by the bit, while undergoing intermittent rotation.
- 3.1.31 Rod**— See 'Drill Rod'.
- 3.1.32 Rotary Drilling** — A method of drilling in which rotation and thrust are applied to the bit, producing a continuous cutting action.
- 3.1.33 Rotary-Percussive Drilling** — A method of drilling in which repeated blows are applied to the bit which is continually rotated under power.
- 3.1.34 Scroll** — A helical projection on a drill rod or stem to remove the cutting from the hole.
- 3.1.35 Shank** — The end of the drill rod or stem that engages with the chuck of the drilling machine.
- 3.1.36 Stem** — See 'Drill Rod'.
- 3.1.37 Stoper** — A medium to light weight percussive drill requiring a suitable mounting for drilling upward in raises and overhead stopes.
- 3.1.38 Tipped Bit** — A drill bit in which the cutting edge is made of special hard material.
- 3.1.39 Wagon Drill** — A drilling machine mounted on a light, wheeled carriage.
- 3.1.40 Water Swivel** — A device by which flushing water can be fed into a hollow drill rod or stem as it rotates.

3.2 Terms Relating to Blasting

- 3.2.1 Air Blast** — A method of blasting by means of a suitable device in which compressed air at very high pressure is piped to a steel shell in a shothole and discharged.

- 3.2.2 ANFO** — An explosive mixture of ammonium nitrate and fuel oil (commonly diesel oil) used for blasting.
- 3.2.3 Backbreak** — The rock which is broken beyond the required dimensions or 'neat lines', of a tunnel, sinking shaft or bench.
- 3.2.4 Base Charge** — A charge at the bottom of the detonator or a blasthole which is initiated by the priming charge.
- 3.2.5 Battery** — A group of two or more primary cells or accumulators electrically connected in series or parallel to provide electric current.
- 3.2.6 Bench** — A single level of operation in an open pit or a quarry above which minerals or waste materials are excavated from a contiguous bank or bench face.
- 3.2.7 Berm** — A horizontal shelf or ledge built into the embankment or sloping wall of an open pit or quarry to break the continuity of an otherwise long slope and to strengthen its stability or to catch and arrest slide material.
- 3.2.8 Black Powder** — A low explosive composed of sodium or potassium nitrate, charcoal and sulphur.
- 3.2.9 Blasthole** — A hole drilled in a material to be blasted, for the purpose of containing an explosive charge.
- 3.2.10 Blasting** — The ignition of a heavy explosive charge.
- 3.2.11 Blasting Gelatine** — A high explosive which is the most powerful of commercial explosives, taken as the standard of explosive power. It consists of guncotton and nitroglycerine.
- 3.2.12 Blown-Out Shot** — A shot which has expanded its force outwards along the line of the shothole without any appreciable fragmentation around the shothole.
- 3.2.13 Booster** — An explosive of special character used in small quantities to improve the performance of another explosive, the latter forming the major portion of the charge.
- 3.2.14 Break Detector** — A tool used to detect breaks or fissures intersected by a shothole (usually combined with a scraper).
- 3.2.15 Bulk Strength** — The strength of an explosive per unit volume expressed as a percentage of the value for blasting gelatine as a standard.
- 3.2.16 Burden**
- a) The least distance between an explosive charge and a defined free face which is a measure of the work to be done by the charge, or
 - b) Distance between boreholes measured perpendicular to the spacing.
- 3.2.17 Burn Cut** — A cut consisting of a cluster of shotholes placed close together, in different patterns drilled approximately at right angles to the face and parallel to each other, some holes remaining uncharged to provide free face (see Fig. 1).

- 3.2.18 Bursting time** — The total time interval between the first application of current to a detonator and its explosion.
- 3.2.19 Cap Detonator** — A device for producing detonation in a high explosive charge, and initiated by a safety fuse or by electricity.
- 3.2.20 Capped Fuse** — A safety fuse fitted to a detonator.
- 3.2.21 Cardox** — A metal cylinder containing liquid carbon dioxide and a combustible to be ignited by tin electric cap for vaporizing the liquid at a high pressure blasting the coal without flame.
- 3.2.22 Cartridge** — An individual unit of explosive, usually wrapped in the form of a cylinder closed at both ends.
- 3.2.23 Chamber** — An excavation to accommodate an explosive charge usually in the widened part of a blast hole.
- 3.2.24 Chambering** — The operation of forming a chamber by special drilling techniques or by springing (see also Springing).
- 3.2.25 Charge** — The quantity of explosives in a shothole.
- 3.2.26 Churn Drill** — A percussive drill used for drilling in benches in quarries where a chisel is reciprocated by a rope, with an incorporated mechanism for turning the chisel bit after each stroke, causing 'Churning' in the hole.
- 3.2.27 Circuit Tester** — An instrument used to test series circuits in electrical shot-firing for continuity and resistance.
- 3.2.28 Column Charge** — A charge of explosives in a blast hole in the form of a long continuous unbroken column.
- 3.2.29 Cone Cut** — A cut in which a number of central holes are drilled towards a focal point and, when fired, break out a conical section of strata (see Fig. 2).
- 3.2.30 Cooling Agent** — Chemical or chemicals added to an explosive during manufacture to suppress, quench or inhibit the flame and to reduce the temperature of gases produced during blasting.
- 3.2.31 Coromant Cut** — A type of parallel hole cut in which the uncharged central hole consists of two overlapping holes giving a slot in the form of figure of '8' roughly, to which the blasting holes can fire. In principle, it is double spiral cut (see Fig. 3).
- 3.2.32 Crimping** — The action of squeezing the open end of a plain detonator, or a detonating relay, over the end of a length of fuse or lead wire.
- 3.2.33 Cushion Blasting** — A method of blasting in which an air space is left between the explosive charge and the stemming, or in which the shothole is of substantially larger diameter than the cartridge.

- 3.2.34 Cut/Cutholes** — The group of holes fired first in a round to provide additional free faces for the succeeding shots.
- 3.2.35 Cut-Off** — A portion of a blasting pattern which fails to detonate.
- 3.2.36 Cut Shots (Sumpers)** — Shots which initially break ground to provide a free face for subsequent shots
- 3.2.37 Deck Charge** — A charge which is divided into several separate components along a borehole (of column charge).
- 3.2.38 Deflagration** — The burning of a detonating explosive subsequent to its failure to detonate.
- 3.2.39 Delay Detonator** — A detonator in which there is a designed interval of time between the application of an electric current to the detonator and its detonation.
- 3.2.40 Delay Element** — That part of a delay detonator interposed between the fuse head and the priming charge to give designed delay between the application of an electric current to the detonator and its detonation.
- 3.2.41 Delay Firing** — The firing of several shots in sequence, at designed intervals of time usually by means of delay detonators, detonating relays or sequence switches.
- 3.2.42 Delay Interval** — The nominal period between the firing of successive delay detonators in a series of shots.
- 3.2.43 Detonating Fuse** — A fuse containing a detonating explosive.
- 3.2.44 Detonating Relay** — A device used intermediately in a detonating fuse circuit to obtain a short time delay.
- 3.2.45 Detonation** — The almost instantaneous action of converting the chemicals in an explosive charge to gases at a high pressure, by means of a high velocity self-propagating shock wave passing through the charge.
- 3.2.46 Detonator**— A device for producing detonation in a high explosive charge, and initiated by a safety fuse or by electricity.
- 3.2.47 Diamond Cut** — A cut in which four central holes are drilled converging to but not meeting at a point, and when fired break out a tetrahedral section of strata (see Fig. 6).
- 3.2.48 Direct Initiation** — A method of blasting in which the primer cartridge is placed at the end of the explosive charge nearest the entrance to the shothole with the detonator facing towards the end of the shothole.
- 3.2.49 Drag Cut** — A cut in which groups of holes are drilled at increasing heights above floor level and at increasing angles from the free face. The shots are fired to break out successive wedges of strata across the width of the face (see Fig. 4).

- 3.2.50 Dynamite** — A general term relating to explosives in which the principal constituent nitroglycerine is contained within an absorbent substance.
- 3.2.51 Easer** — Ring of holes drilled approximately concentrically around the cut holes and fired after cut holes.
- 3.2.52 Equivalent-to-Sheathed Explosive** — An explosive incorporating intimately mixed cooling agents which is equivalent in safety in respect of ignition of methane/air mixture and/or coal dust on a charge weight basis to an explosive having a sheath of cooling agents surrounding the explosive.
- 3.2.53 Excitation Time** - The minimum time for which electric current must flow in the fuse head of a detonator to ensure the ignition of the fuse head.
- 3.2.54 Exploder** — A device having a small magnet generator actuated by hand or dry cell discharging through a condenser enough electrical current for the brief period necessary to fire electric detonated or detonators.
- 3.2.55 Explosive Casting** — A system of blasting in opencast mines by which a major part of the overburden blasted from a bench or benches is cast over to the backfill, without the necessity of mechanical handling.
- 3.2.56 Fan Cut** — A cut in which holes of equal or increasing length are drilled in the pattern of a fan to break out a considerable part of it before the rest of the round is fired; the holes are fired in succession in accordance with the increasing angle they form in relation to the face (see Fig. 5).
- 3.2.57 Firing**— The process of initiating the action of explosive charge or the operation of a mechanism which results in a blasting action.
- 3.2.58 Flanking Hole** — A shothole drilled at an acute angle to the coal face for the purpose of trimming it.
- 3.2.59 Foam injection** — The injection of foam into a shothole and connecting breaks to displace any firedamp present and to minimize further firedamp emission into the shotholes, thereby reducing the risk of ignition of the gas during shot firing.
- 3.2.60 Free Face** — A surface in the vicinity of a shothole of which the rock is free to move under the force of the explosion.
- 3.2.61 Fuse** — See 'Detonating Fuse' and 'Safety Fuse'.
- 3.2.62 Fusehead** — That part of an electric detonator consisting of twin metal conductors bridged by fine resistance wire and surrounded by a head of igniting compound which burns when the firing current is passed through the bridge wire.
- 3.2.63 Fuse Lighter (Igniter)** — A hand-held device for lighting safety fuse.
- 3.2.64 Gelatines** — A general term relating to explosives in which a principal constituent (nitroglycerine) is given a gelatinous consistency by mixing it with nitro-cotton.

- 3.2.65 Gelnite** — A general term relating to explosives of the gelatine type in which there is proportion of woodmeal and oxygen-containing salts.
- 3.2.66 Group** — A number of shots sufficiently close together to be treated in common in respect of preparation for firing.
- 3.2.67 Gunpowder** — See 'Black Powder'.
- 3.2.68 Heading Blast** — A quarry blast in which the explosive charge is located in one or more chambers excavated behind the quarry face.
- 3.2.69 High Explosive** — An explosive which explodes with detonation and detonates at velocities varying from about 1500 to 7500 m/s, and produces large volume of gases at exceptionally high pressure.
- 3.2.70 High Tension Detonator** — A detonator requiring an electrical potential of about 50 Volts for firing.
- 3.2.71 Hydraulic Booster** — A hydraulic mechanism which when inserted into a large diameter shothole, breaks down the strata by means of pistons operating transversely.
- 3.2.72 Hydrox** — A method of blasting using the discharge of chemically produced gases at a high pressure from a steel shell.
- 3.2.73 Igniter Cord** — A cord which passes in intense flame along its length at a uniform rate to light safety fuses in succession.
- 3.2.74 Indirect Initiation** — A method of blasting in which the detonator is placed at the end of the explosive charge farthest from the entrance to the shothole pointing towards the open head of the shothole.
- 3.2.75 Induction Time** — The interval between the bursting and lag times of a detonator.
- 3.2.76 Inert Primer** — A cylinder of inert material which enshrouds a detonator, but which does not interfere with the detonation of the explosive charge.
- 3.2.77 Infusion Shotfiring** — A technique of shotfiring in which an explosive charge is fired in a shothole which is filled with water under pressure and in which the strata around the shothole have been infused with water.
- 3.2.78 Instantaneous Detonator** — A detonator in which there is no designed delay period between the passage of an electric current through the detonator and its bursting.
- 3.2.79 Inverse Initiation** — See 'Indirect Initiation'.
- 3.2.80 Jointing Sleeves** — A tube with insulating material used for jointing the wires in an electric blasting circuit to prevent current leakage under damp conditions.
- 3.2.81 Lag Time** — The time between the initial application of current and the rupture of the circuit within the detonator.

- 3.2.82 Leading wires** — The wires, forming part of an electric detonator, to which the shotfiring cable is connected.
- 3.2.83 Leads** — See 'Leading wires'.
- 3.2.84 Store** — A place or building licensed under Explosives Act, for the storage of explosives (see also Magazine).
- 3.2.85 Lifters** — Holes drilled at floor level.
- 3.2.86 Low Density Explosive** — An explosive having a lower density compared with that of standard explosive such a blasting gelatine.
- 3.2.87 Low Explosive** — An explosive which explodes merely by igniting it with a safety fuse without production of intense shock waves.
- 3.2.88 Low Tension Detonator** — A detonator requiring minimum current of one ampere for firing and having a resistance of about one ohm. It has a low tension fusehead.
- 3.2.89 Lox** — Liquid oxygen absorbed in a combustible absorbent which can be detonated only under confinement.
- 3.2.90 Magazine** — A building for the storage of explosives licensed under Explosives Act, to provide for circumstances where the more usual licensed store is inadequate or inappropriate (see also 'Licensed Store').
- 3.2.91 Mains Firing** — The firing of a round of shots by means of current supplied from the mains.
- 3.2.92 Millisecond Delay Detonator** — A detonator in which the interval of time delay is incremental in milliseconds.
- 3.2.93 Misfire** — A charge or part of charge which has failed to explode.
- 3.2.94 Muffle Blasting** — A system of blasting commonly practiced in open cast mines in populated areas in which a screen or some type of obstruction is placed over the shotholes immediately before firing the shots to prevent accidents from flying fragments of rocks.
- 3.2.95 Multi-Shot Firing** — The action of firing several shotholes either simultaneously or by delay firing.
- 3.2.96 Non-permitted Explosive** — An explosive which is not approved by statutory authority for use in gassy and dusty mines.
- 3.2.97 Ordinary (Plain) Detonator** — A detonator for use with safety fuse.
- 3.2.98 Overbreak** — See 'Back break'.
- 3.2.99 Parallel Firing** — The firing of detonators in a round of shots by dividing the total supply current between the individual detonators (see also Series Firing).

- 3.2.100 Permitted Explosive** — Explosive of a type which has been tested and approved by statutory authority for use in mines where there is a risk of ignition of firedamp and/or coal dust. (See also Normal Permitted Explosives; Sheathed Explosives; Equivalent-to-Sheathed Explosives).
- 3.2.101 Pattern** — The system followed in arranging boreholes.
- 3.2.102 Plaster Shooting** — A form of secondary blasting in which explosive is detonated in contact with the rock without the use of a shothole.
- 3.2.103 Pneumatic Loading** — The process of loading a powdered or palletized explosive into a shothole through a pneumatic hose.
- 3.2.104 Pop Shooting** — A form of secondary blasting with the help of shallow shotholes.
- 3.2.105 Pricker** — A non-sparking tool for making a hole in the primer cartridge to receive the detonator.
- 3.2.106 Primer Cartridge** — The explosive cartridge into which the detonator has been inserted.
- 3.2.107 Primer Charge** — A charge of more sensitive explosive placed in contact with a detonator to ensure detonation of the main charge.
- 3.2.108 Priming Charge** — The charge in a detonator which is ignited by the fusehead.
- 3.2.109 Pull** — The linear advance resulting from the firing of a round of shots.
- 3.2.110 Pulsed Infusion Shotfiring** — See 'Infusion Shotfiring'.
- 3.2.111 Pyramid Cut** — See 'Diamond cut'.
- 3.2.112 Relieving Shot** — A shot fired to dislodge or expose a misfire.
- 3.2.113 Rib holes** — Holes that are drilled at the periphery of an excavation that are charged and fired to give the excavation its final outline
- 3.2.114 Rotary Blasthole Drill** — A heavy duty rotary drill used for drilling in benches with the cuttings removed from the hole by a blast of air.
- 3.2.115 Round** — A number of shots intended to be fired either simultaneously or with delay periods between shots.
- 3.2.116 Safety Fuse** — A fuse with a black powder core having a prescribed covering and designed to burn at a specified speed.
- 3.2.117 Scraper** — A tool designed to remove drill cuttings from a shothole before the insertion of the explosive charge (usually combined with a break detector).
- 3.2.118 Secondary Blasting** — The use of explosive to break the rock already blasted into smaller pieces.

- 3.2.119 Series Firing** — The firing of detonators in a round of shots by passing the total supply current through each of the detonators (see Parallel Firing).
- 3.2.120 Series Parallel Firing** — The firing of detonators in a round of shots by dividing the total supply current into branches, each containing a certain number of detonators connected in series.
- 3.2.121 Sheathed Explosive** — A permitted explosive in which each cartridge is surrounded by a sheathed of inert cooling material, such as sodium bicarbonate.
- 3.2.122 Shell** — A steel tube from which air or other gas at high pressure is discharged with explosive force in a shothole (as used with cardox, hydrox and air blasting).
- 3.2.123 Shooting Valve** — The control valve provided for the purpose of admitting compressed air to an air blasting shell and of venting to atmosphere residual air, in the shell and hose.
- 3.2.124 Short-Delay Detonator** — See 'Millisecond Delay Detonator'.
- 3.2.125 Shot** — An explosive charge contained within a shothole.
- 3.2.126 Shotfiring** — The action of detonating or igniting a charge of explosive, usually in a drilled hole.
- 3.2.127 Shothole** — A hole drilled for the purpose of shotfiring.
- 3.2.128 Simultaneous Shotfiring** — The firing of a round of shots using instantaneous detonators.
- 3.2.129 Socket** — The part of a shothole which remains unbroken after the firing of a shot.
- 3.2.130 Springing** — A quarry blasting method in which a succession of charges is fired on a borehole to open up a chamber to accommodate a large charge for the final blasting.
- 3.2.131 Squib** — A thin tube filled with gun powder, forming a slow burning fuse to explode a stemmed charge of gun powder.
- 3.2.132 Stem** — To insert and pack stemming in a shothole.
- 3.2.133 Stemming** — Inert material packed between the explosive charge and the outer end of the shothole, or between adjacent charges in deck charging.
- 3.2.134 Stemming Rod** — A non-sparking rod used to push explosive cartridges into position in a shothole, and to ram right the stemming.
- 3.2.135 Store** — See 'Licensed store'.
- 3.2.136 Storage box** — A box licensed by relevant government authority under Explosives act, to be used as a storage for explosives.
- 3.2.137 Sumpors** — See 'Cut Shots'.
- 3.2.138 Tchisa (Cheesa) Stick** — See 'Fuse Lighter'.

3.2.139 Toe — Unbroken rock lying at the foot of a bench.

3.2.140 Toe Hole — A horizontal or upwardly inclined shothole placed at the foot of a bench.

3.2.141 Trimmers — See 'Rib holes'.

3.2.142 Tump — See 'Stress'.

3.2.143 Tunnel Blast — See 'Heading Blast'.

3.2.144 Velocity of Detonation (VOD) —The velocity with which the shock wave traverses an explosive charge on detonation.

3.2.145 Water Ampoule — A fire-resistant plastics container filled with water used in stemming as a safety precaution in shotholes.

3.2.146 Wedge Cut — A cut in which the central holes are positioned to break out a wedge-shaped section of strata when fired (see Fig. 7).

3.2.147 Weight Strength — The strength of an explosive per unit weight, expressed as a percentage of the value of a standard explosive, such as blasting gelatine.

3.2.148 Well Drilling — A percussive drill used for drilling in rocks where a heavy cutter is reciprocated by a rope.

3.2.149 Wellhole Blast — A method of quarry blasting in which the explosive charges are placed in rows of vertical holes. Deck charge is usually employed and a powerful gelatinous explosive is loaded at the bottom of the holes.

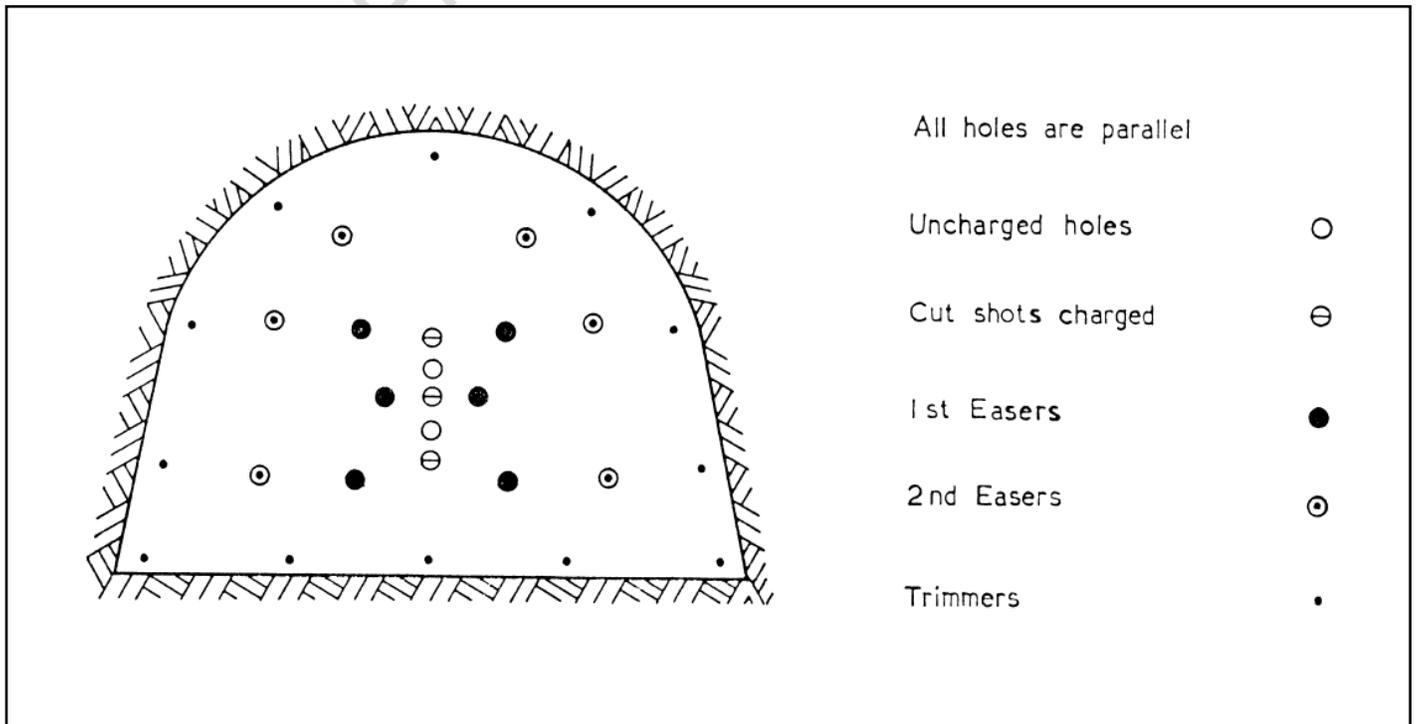


Figure 1: The Burn Cut

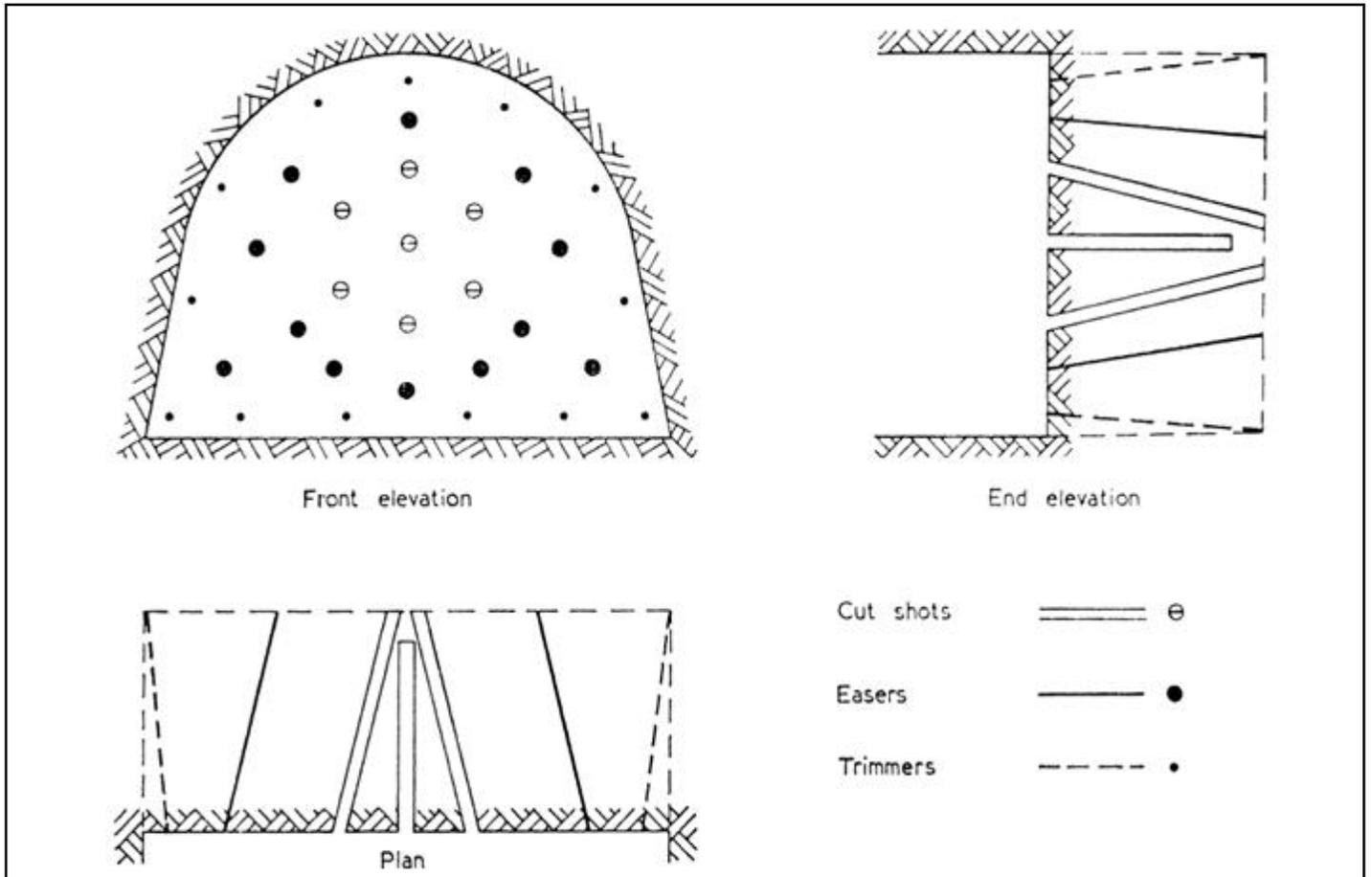


Figure 2: Cone Cut

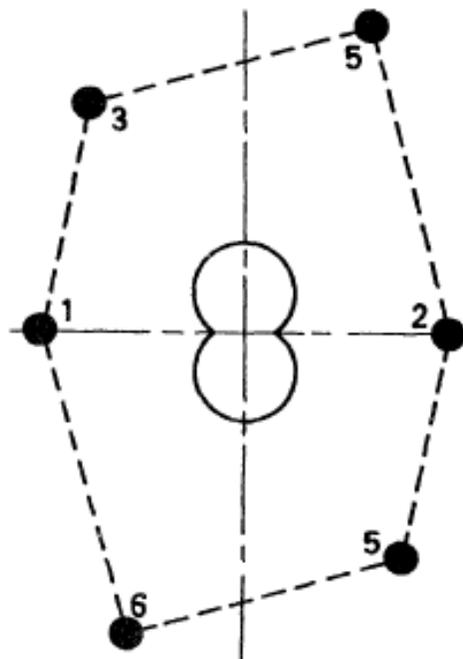


Figure 3: Coromant Cut

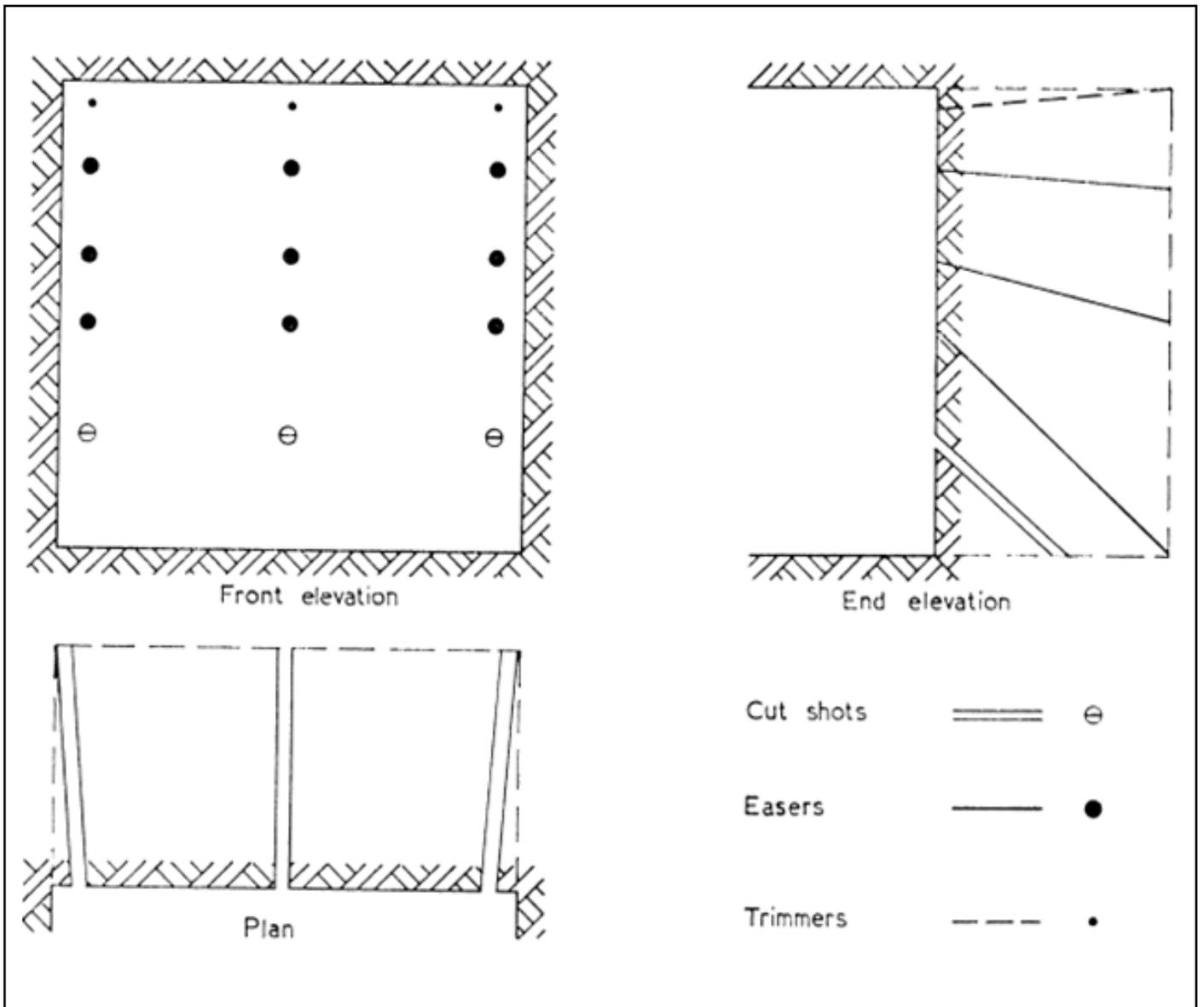


Figure 4 : Drag Cut

FOR STA

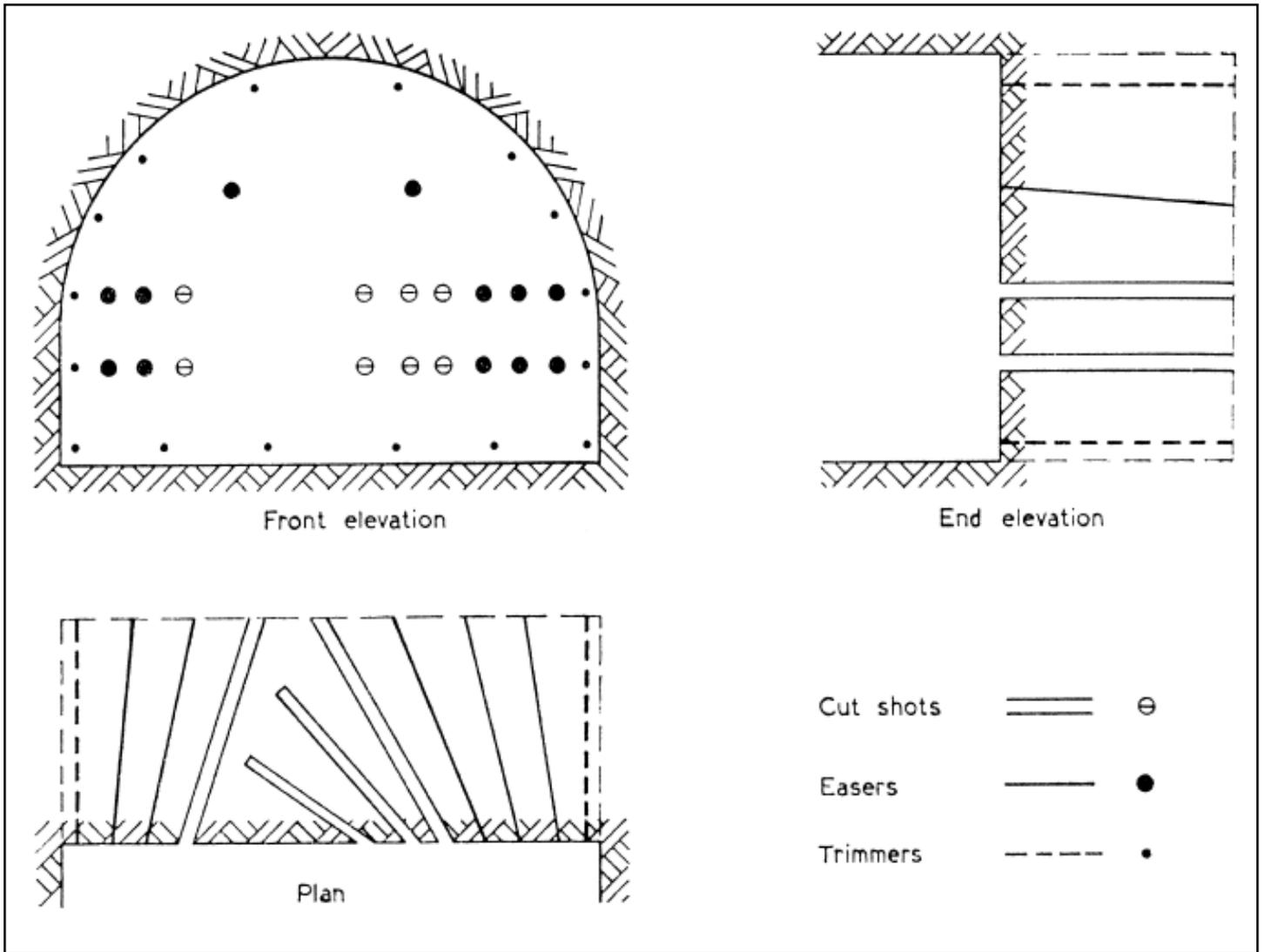


Figure 5: Fan Cut

FOR STAKEHOLDERS

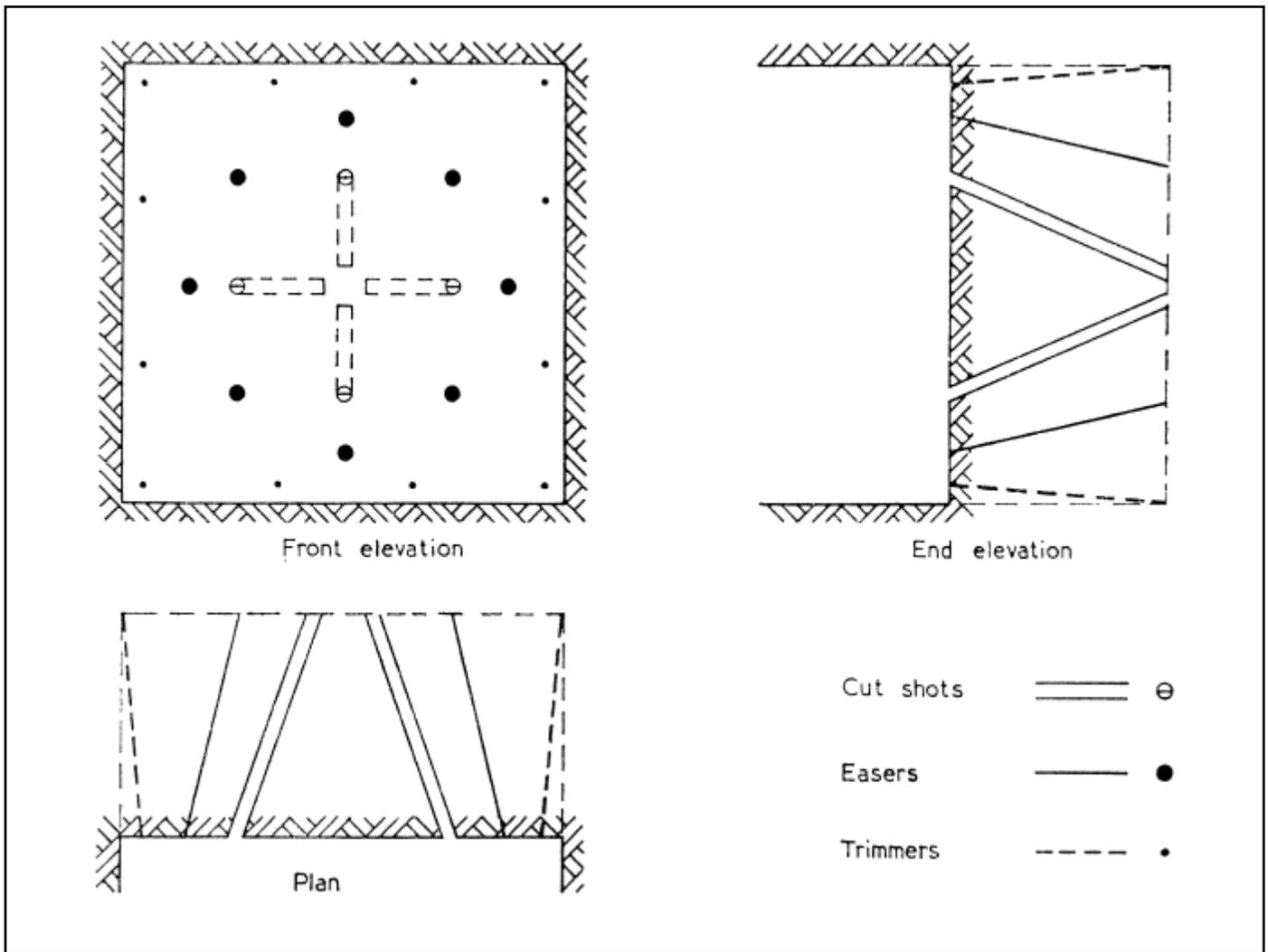


Figure 6: Pyramid Cut

FOR STAKEHOLDERS

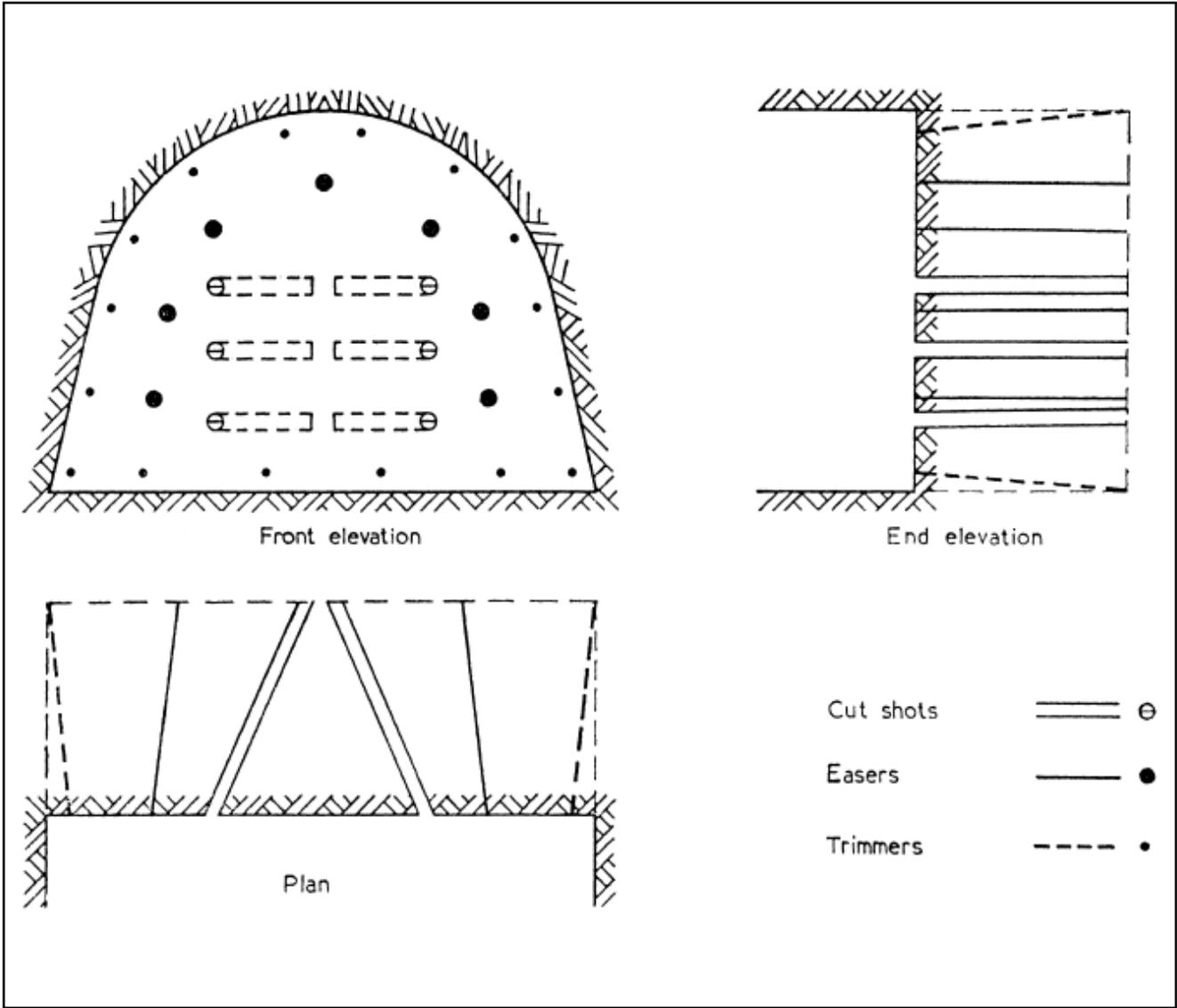


Figure 7: Wedge Cut

FOR STAKE