

# GLOSSARY OF TERMS



## GEOLOGICAL TERMS

### A

#### **Alluvium**

A collective term for unconsolidated detritus such as clay, silt, sand and gravel deposited by streams and rivers as sorted or semi-sorted sediment in channels and over flood plains and deltas

#### **Anticline**

An arch-like fold in stratified rocks

### B

#### **Basalt**

A fine-grained basic igneous rock occurring in dykes, sills and lava-flows; essential minerals are plagioclase feldspar and augite. Dark grey to black in colour; relative density 2.8-3.3; aggregate crushing value 7-25.

#### **Basin**

A rock structure in which the strata dip inwards on all sides.

#### **Batholith**

A large and, originally, deep-seated igneous intrusion. See 'dyke'

#### **Bed**

A layer of rock or mineral

#### **Bedding**

A formation of distinct sedimentary rock layers or beds one upon another.

#### **Bedding plane**

The interface between two adjacent beds of sedimentary rock

#### **Bedrock**

The solid rock underlying superficial deposits

#### **Biotite**

A dark-coloured iron-bearing member of the mica group of rock-forming minerals. It occurs as a constituent of many igneous and metamorphic rocks.

#### **Boss**

A circular form of igneous intrusion; a small-scale batholith.

#### **Breccia**

A rock consisting of broken angular unworn fragments held together by a natural cement.

### C

#### **Calcite**

Calcium carbonate, CaCO<sub>3</sub>. Occurs in a variety of crystal forms which are usually white or yellowish in colour. Rhombohedral; relative density 2.7; hardness 3. It is the main constituent of chalk, limestone and marble.

#### **Cambrian**

The earliest period of the Palaeozoic era between about 590 and 505 million years ago, and the corresponding system of rocks

#### **Clay minerals**

Silicate minerals which are mainly formed by the weathering or alteration of feldspars and other primary minerals. Kaolin is one example.

#### **Cleavage:**

1. In a crystalline mineral, one or more series of parallel planes along which the mineral tends to split.
2. In a rock, definite parallel closely spaced planes along which it may split, and which may be highly inclined to the bedding planes.

#### **Conglomerate**

A rock consisting of rounded pebbles held together by a natural cement

#### **Contact metamorphism**

Changes brought about in a rock by contact with intruded or extruded molten igneous material.

#### **Cross-bedding**

Laminations, in a bed of sedimentary rock, which are inclined to the general stratification

#### **Cretaceous**

The final period of the Mesozoic era (144-65 million years ago).

# GLOSSARY OF TERMS

## D

### **Devonian**

A period of the Palaeozoic era spanning the time from 395 to 360 million years ago.

### **Detrital deposit**

A sandy or gravelly deposit formed by river or sea action, consisting of materials eroded from earlier deposits

### **Dimension stone**

Stone cut to regular shapes and sizes for use in the construction industry

### **Diorite**

A coarse-grained plutonic igneous rock with a high content of plagioclase feldspar. Very tough and used as concrete aggregate and road metal

### **Dip**

The inclination of the strata to the horizontal.

### **Dolerite**

A medium-grained basic igneous rock occurring as intrusions, eg dykes and sills. A typical dolerite contains plagioclase, augite and ilmenite. Used in road making and as concrete aggregate

### **Dolomite**

A mineral composed of calcium magnesium carbonate or a rock consisting predominantly of that mineral.

### **Dome**

A structure in which the strata dip outwards on all sides.

### **Dyke**

A more or less perpendicular wall-like igneous mass intruded into other rocks

## E

### **Eluvial deposit**

Rocks which have disintegrated through natural causes but which, unlike alluvial material which is transported away by water, have remained in situ.

### **Eocene**

An epoch of the Tertiary period between 54 and 38 million years ago.

### **Evaporites**

Rocks, such as anhydrite, rock salt, potash, salt etc, formed by evaporation of lakes or seas.

## F

### **Fault**

A plane of fracture in a rock body, along which there has been displacement.

### **Fault breccia**

The shattered rock material along a fault plane.

### **Fault plane**

Any surface along which relative movement between adjacent rock masses has taken place

### **Feldspar**

A family of rock-forming minerals consisting of aluminous silicates of barium, calcium, potassium and sodium. They occur as constituents of igneous rocks

### **Fluvial**

Relating to a river; a deposit produced by the action of a river

### **Fold**

A bend in bedded rocks

## G

### **Gneiss**

A metamorphic rock with constituents similar to that of granite but having a foliated or banded structure.

### **Granite**

A coarse-grained igneous rock consisting of quartz, orthoclase feldspar and mica. Relative density 2.5-2.8. Crushing strength up to 140N/mm<sup>2</sup>

### **Gravel**

Granular material in the size range 2mm to 60mm, generally arising in the form of sand and gravel deposits allied to river/ water activity

### **Greywacke**

A dark-coloured, poorly graded, argillaceous sandstone

## H



# GLOSSARY OF TERMS

## **Hypabyssal**

Medium-grained, intrusive igneous rocks forming dykes and sills.

## **I**

### **Igneous rock**

A rock that has solidified from molten matter (magma) from the Earth's interior.

### **Intrusion**

A mass of igneous rock which, while molten, was forced into or between other rocks

## **J**

### **Joint**

A plane or parting in rock, normally involving no visible displacement. Joints often occur in parallel sets, cutting the rock into blocks

## **K**

### **Kaolin**

White, or nearly white, clay of various origins including the decomposition of feldspar

## **L**

### **Laterite**

Highly weathered residual soil material rich in oxides of aluminium and iron, traditionally useful for brickmaking

### **Littoral deposit**

A marine deposit laid down between low and high tide marks usually consisting of boulders, pebbles and coarse sand.

### **Limestone**

Rock consisting predominantly of calcium carbonate

### **Lithology**

The character of a rock expressed in terms of its mineral composition, structure, grain size and arrangement of its component parts

### **Lithosphere**

The Earth's crust and overlying superficial deposits

## **M**

### **Magma**

Naturally occurring deep molten rock material from which igneous rocks are formed on cooling

### **Magnetite**

An iron ore mineral, Fe<sub>3O<sub>4</sub></sub> which occurs as a primary constituent of most igneous rocks

### **Marble**

Metamorphic rock produced from limestone by recrystallization caused by heat and pressure

### **Marl**

A calcareous clay or mudstone

### **Massive rock**

Rock without stratification, cleavage or schistosity; particularly applied to igneous rock-bodies but can be used to describe sedimentary rocks with thick or obscured bedding

### **Matrix**

The finer-grained material between the larger particles of a rock or the material surrounding a fossil or mineral

### **Metamorphic rock**

Rock which has been altered by the action of heat, pressure or migrating fluids acting separately or together

### **Mica**

Complex silicates of aluminium and potassium which are constituents of plutonic and volcanic rocks and which are characterized by their perfect basal cleavage.

### **Mineral**

A naturally occurring inorganic substance having definite physical and chemical properties

### **Mudstone**

A sedimentary rock consisting largely of hardened clay minerals, blackish and without lamination.

### **Muscovite**

A light-coloured mineral of the mica group, common in igneous and metamorphic rocks and in some sandstones

## **O**

# GLOSSARY OF TERMS

## **Olivine**

Magnesium iron silicate,  $(\text{MgFe})_2\text{SiO}_4$ , occurring in basic igneous rocks, eg olivine-basalts; typically dark olive-green to brown in colour

## **Oolites**

A group of sedimentary rocks consisting of oolitic limestones, clays, shales and sandstones made chiefly of ooliths cemented together. Uses include building stone, iron ore, brickmaking clays and fuller's earth

## **Ooliths**

Ellipsoidal or spherical accretionary bodies, usually less than 1mm in diameter, composed of concentric layers of calcite, aragonite or iron carbonate

## **Ore**

Solid mineral deposit of actual or potential economic interest

## **Orthoclase**

Potassium aluminium silicate ( $\text{KAlSi}_3\text{O}_5$ ) a member of the feldspar family. Important as a constituent of acid igneous rocks. Used in the manufacture of glass, pottery etc.

## **P**

### **Pegmatite**

A coarse-grained, quartz-feldspar igneous rock of variable colour and very variable physical properties

### **Perlite**

A variety of obsidian consisting of the oxides of silicon and aluminium combined as a natural glass. When crushed and heated, it expands to form a lightweight aggregate

### **Permian**

The final period of the Palaeozoic era between 286 and 248 million years ago, and the corresponding system of rocks

### **Petrology**

The study of the origin, chemical and mineral composition, structure and alteration of rocks

### **Phyllite**

A dark-grey or greenish metamorphic rock, coarser-grained and less perfectly cleaved than slate, but smaller grained and better cleaved than schist

### **Plagioclase**

Silicates of aluminium with calcium and sodium, a member of the feldspar family; an important constituent of many plutonic and volcanic rocks

### **Plate tectonics**

The concepts which ascribe vulcanicity and crustal weakness to the interaction of moving lithosphere plates.

### **Plutonic**

A term applied to a group of deep-seated, coarse-grained igneous rocks which solidified at great depth, eg granites

### **Porphyry**

An igneous rock which contains large feldspar crystals (phenocrysts) in a fine-grained groundmass

### **Pumice stone**

A lava froth containing minute gas cavities, used as a cleansing and polishing material and as an aggregate in lightweight concrete

### **Pyroclastic**

Descriptive of rock formed of fragments of igneous rock, ejected by volcanoes, embedded in finer material such as ash or tuff

## **Q**

### **Quartz**

Oxide of silicon  $\text{SiO}_2$  (silica). Common mineral in acid igneous rocks and forms bulk of sandstones and quartzites

### **Quartzite**

A metamorphic variety of sandstone composed of grains of quartz cemented together by silica. It is a very hard rock usually whitish in colour

## **S**

### **Sand**

A naturally occurring granular material in the size range 0.06mm to 2mm, often containing a high proportion of quartz.

### **Sandstone**

A bedded rock composed of grains of sand, principally of quartz, cemented naturally together

### **Schist**

A metamorphic foliated crystalline rock containing mica and various other minerals with bands that are often wavy and contorted

# GLOSSARY OF TERMS

**Scree**

Accumulation of angular pieces of rock near the base of a steep hillside

**Seam**

A layer or bed of mineral; generally applied to coal

**Sedimentary rock**

A rock formed from materials which have been deposited as a sediment in water or on land. They include rocks formed from fragments of pre-existing rocks, deposits formed from the hard parts of organisms and salts deposited from solution

**Shale**

A fissile indurated sedimentary rock consisting largely of clay minerals

**Sill**

An intrusive sheet of igneous rock parallel or nearly parallel to the general stratification

**Silt**

A fine-grained sediment having a particle size intermediate between that of fine sand and clay

**Slate**

Shale lowly metamorphosed by stress and moderate temperature; tough, fine-grained and capable of being split into thin plates at an angle not related to the bedding plane. Used as roofing slates and for decoration of buildings etc

**Stratum**

A single bed or layer of rock

**Subsoil**

The weathered soil or rock immediately below the topsoil

**Syncline**

A trough-like fold in stratified rocks

**T****Tectonics**

The study of the structures resulting from the deformation of the Earth's crust.

**Terrace**

An alluvial deposit laid down by an ancient river flowing at a higher level than the present river level

**Till**

Unsorted drift deposited by a glacier and comprising clay, sand, gravel and boulders.

**Tuff**

Compacted fine volcanic ash and dust

**Z****Zircon**

An accessory silicate mineral in acid igneous rocks

# GLOSSARY OF TERMS

## THE QUARRY

### A

#### **Armour-stone**

Large irregular lumps of hard rock used for sea defences etc

#### **Artesian well**

A well sunk into a permeable stratum which has impervious strata above and below it and from which water flows without pumping

### B

#### **Backfill**

Overburden or inferior mineral which is dumped into a worked out part of an excavation or behind a retaining wall.

#### **Backsight**

In surveying, a sight taken towards the previous station

#### **Batter**

A constructed, uniform, steep slope. The inclination to the vertical of such a slope is expressed as one unit horizontally to so many units vertically.

#### **Bearing**

The horizontal angle between a datum direction such as north and a given line.

#### **Benches**

The long horizontal levels or steps to which successive quarry faces are taken and along which mineral, stone or overburden is worked.

#### **Benching**

A method of working opencast pits or quarries in benches usually using rows of blastholes drilled parallel to the face

#### **Berm**

An embankment usually constructed from earth or overburden to form a safety barrier. See also Bund wall

#### **Borrow pit**

Excavation adjacent to works site to provide construction materials.

#### **Bund**

An earth mound or embankment. See also Berm

### C

#### **Camber**

The convexity given to the curved cross-section of a carriageway etc.

#### **Catchment area**

The area drained by a stream or river or supplying a reservoir.

#### **Closed travers**

A traverse which begins and ends at the same point; its accuracy can therefore be checked.

#### **Closing error**

In a closed traverse, the discrepancy between the starting point and the finishing point as calculated from the measurements taken. The error, if small enough, may be distributed throughout the series of measurements.

#### **Condition**

In relation to a planning consent, a limitation imposed by the appropriate statutory authority to achieve some desirable effect in relation to the permitted development.

#### **Contour**

A line on a plan joining points of equal altitude

#### **Crown**

The highest portion of the cross-section of a cambered carriageway

#### **Cut and fill**

A surface mining technique in which overburden is dumped to occupy the void created by the removal of the source of aggregate

### D

#### **Diggability**

A reference to the excavation characteristics of the rock to be dug

#### **Dressed stone**

Stone which has been 'squared' and smoothed on the face

### E

# GLOSSARY OF TERMS

## **Easement**

A liability attaching to land, whereby some person other than the owner has certain clearly defined rights over it and in perpetuity. Alternatively, a right over land granted in perpetuity by the owners to some person for a specific purpose, eg passage, laying of mains drainage etc

## **Environmental impact assessment**

Study of the potential environmental benefits and disbenefits arising from a development, usually conducted before a planning application is submitted

## **Erosion**

The wearing away of parts of the Earth's surface by the action of natural agents such as ice, water and wind

## **F**

### **Face**

An exposed surface of the extraction area, usually near vertical

### **Face profiling**

The process of producing a diagram showing variations in the face to be taken into account by the blast design. Often achieved by using EDM and computer

### **Floor**

1. The stratum immediately below the aggregate deposit
2. The base of an excavation

### **Fracturing**

Breaking of rock with or without movement of the broken pieces

## **G**

### **Gabion**

A wire cage containing rock which can be used to give protection against erosion or to counteract slope instability.

### **Geophone**

An instrument used for detecting the passage of sound waves through the strata.

### **Geotechnical appraisal**

An exercise conducted on a tip or excavation to determine whether movement or collapse would present a significant hazard. If so, the tip is notifiable and a geotechnical assessment is required

### **Geotechnical assessment**

A detailed study by a geotechnical specialist of the design and construction of a tip or excavation to determine the probability of failure

### **Ground water**

Water which has penetrated from the surface and filled the pores and fissures of the strata up to the water table

## **H**

### **Highwall**

In opencast mining, the wall of the pit at which work is in progress; the coal or ore and the overburden above it

### **Hydraulic mining**

A method of winning sand and stone by washing it with high-pressure jets of water, and subsequently transporting it in flumes or pipes.

## **L**

### **Leaching**

Selective removal of soluble constituents from soil or rock by the action of surface water penetrating downwards.

### **Lift**

In a quarry or opencast site may be used to denote the configuration of the face eg multiple lift (= several benches)

## **O**

### **Operator**

The person (or company) in overall control of the working of a quarry. In some jurisdictions legislation they are called the 'mine operator'.

### **Outcrop**

The area where part of a rock stratum, or any other deposit, appears at the surface, any cover of soil being ignored

### **Overburden**

Material, whether consolidated or not, which has to be removed before a mineral can be worked

### **Overburden ratio**

The ratio of the vertical thickness of the overburden to the thickness of the mineral to be mined in a stratified deposit

# GLOSSARY OF TERMS

## P

### **Prospect**

An area of land which shows sufficient promise of mineral wealth to warrant exploration.

### **Prospecting**

The search for indications of workable mineral deposits, usually on the surface.

## Q

### **Quarry**

An open pit or excavation from which stone, sand or gravel is extracted

## R

### **Rehabilitation**

The reinstatement of an excavated site to an acceptable form of after-use

### **Restoration**

Returning a site to its former use. This is often carried out progressively as the excavation continues

### **Revetment**

A cladding of stone or concrete to protect a sloping embankment or shoreline.

### **Rip-rap**

Rock in lump form used as bulk fill for stabilization or as protection against erosion

### **Rock**

A mass of mineral material, including organic material, either consolidated or not, but excluding soil

### **Rock mechanics**

The study of rocks in situ including their strengths, stresses, strains, friction, elasticity etc, and the use of this information in assessing such things as the stability of rock slopes.

### **Run of quarry**

The products of a mine/quarry before crushing, sorting and cleaning

### **Run-off**

The quantity of water, from rain and snowfall, flowing from a catchment area past a given point in a stated period of time

## S

### **Stripping**

The removal of overburden.

### **Stripping ratio**

The ratio of the overburden removed to the mineral mined in an opencast operation

### **Super-elevation**

The amount by which the outside of a curved track is raised above the inside to provide some of the cornering force required to hold a moving vehicle in the turn and so reduce the tendency for the tyres to lose adhesion outwards

## T

### **Topsoil**

The uppermost layer of soil, generally containing a high proportion of organic matter, that can support vegetation

### **Trenching**

The digging of trenches in the proving of overburden, unconsolidated sands and gravels

### **Trial pit**

A hole dug to prove an alluvial deposit or the depth to bedrock

## W

### **Water table**

The upper limit or surface of the ground water or zone of permanent saturation. It may follow approximately the profile of the land surface

### **Weathering**

Changes in rocks which occur as the result of the action of rain, snow, hail, wind, heat and cold, exposure to air and other atmospheric and chemical processes

### **Winning**

The several operations involved in breaking the rock from the solid and loading it for transport to the treatment plant



# GLOSSARY OF TERMS

## MACHINERY

### A

#### **Airlift pump**

A pump for the raising of water from a well or sump by the injection of compressed air into the bottom of a pipe which has been submerged to a considerable depth in the water. The compressed air expands and rises, and, as the overall density of water and air bubbles is lower than that of the water, it is forced to the surface by the higher pressure of the water outside the pipe

#### **Angle dozer**

A bulldozer with the blade set at an angle so that it pushes material forward and to the side

#### **Articulation**

The Articulated dump truck connection of two parts in such a way as to permit the same relative movement, eg the two sections of the frame joined by two or more pins to form an articulated dump truck

#### **Auger**

A tool developed from the Archimedean screw, used for soil sampling or drilling of shallow holes.

### B

#### **Backhoe loader**

Self-propelled wheeled machine with a main structural support designed to carry both a front-mounted bucket loading mechanism and a rear-mounted backhoe. When used in the backhoe mode, the machine normally digs below ground level with the bucket motion towards the machine; the backhoe lifts, swings and discharges the material while the undercarriage is stationary.

#### **Ballasted tyres**

Tyres filled with liquid or dry ballast in order to increase their weight when fitted to the wheels of tractors, graders, wheeled dozers etc. This, it is claimed, results in increased operating efficiency.

#### **Boom**

A cantilever structure attached to lifting or excavating equipment and at the outer end of which is fixed the pulley over which the hoist rope passes

#### **Bowl scraper**

A load-haul-dump machine in which the bowl is towed behind a tractor unit, fills by a planing action, hauls the spoil to the dump site and empties by means of an internal ejector blade pushing forward. Used in soft ground or in ground that fragments well after ripping or blasting.

#### **Breakout force**

The force with which an excavator is capable of pushing its bucket through the rockpile or face.

#### **Bucket-chain excavator**

A continuous-feed machine designed to give a high output of soft material using a chain of buckets and essentially designed for digging below grade.

#### **Bucket-ladder dredge**

A dredge having buckets moving in a continuous chain, reaching down into the deposit to be dredged, and lifting it for discharge into the vessel.

#### **Bucket-wheel excavator**

A continuous-feed machine, usually carried on crawler tracks, consisting essentially of a large cutting wheel with buckets mounted on the periphery.

#### **Bulldozer**

A high-powered track-mounted tractor fitted with a concave blade mounted in front of the machine. Used for smoothing out irregularities in working areas, levelling the tops of dumps, clearing spillage etc

### C

#### **Case-hardening**

Surface hardening of steel by heating in a carbonaceous medium to increase the carbon content in the surface layers, then quenching

#### **Cast iron**

An iron-carbon alloy containing more than 1.7% and usually above 2.5% carbon including substantial amounts of graphite. It is very fluid when molten and is suitable for making intricate castings by pouring into sand moulds. Applications include: cylinder blocks, hydraulic cylinders, crusher frames etc.

#### **Catenary**

The curve into which a uniform rope falls when suspended from its ends.

# GLOSSARY OF TERMS

## **Clamshell**

A twin-jawed bucket used with a crane jib for digging and loading loose material, eg sand and gravel from a flooded deposit.

## **Compaction**

The process of packing soil or aggregate particles more closely together, to increase the density.

## **Compactor**

A mobile piece of equipment designed to compact soil or aggregate particles closely together to increase density. Can have a smooth drum or sheep's foot roller.

## **Cross-ply**

Term applied to tyres having a number of casing plies, set one on another, running diagonally from bead to bead, each ply crossing the one immediately below it. This type of tyre has relatively stiff sidewalls.

## **Crowd**

Term describing the action of an excavator bucket being forced into the rock-pile

## **D**

### **Dragline**

An excavator the bucket of which is suspended by means of a wire rope from the end of a long light boom or jib. The bucket is filled by dragging it towards the machine. Draglines usually dig below the level on which they stand and a good operator can cast the spoil considerably beyond the end of the jib. See 'walking dragline'.

### **Draw-bar pull**

The tractive effort exerted by a tractor or a locomotive which is transmitted through draw-bars to the vehicles towed behind it.

### **Dredge**

A barge or pontoon carrying digging buckets or suction pump, used for excavating alluvial deposits below water

### **Drop-balling**

Rock breakage by dropping a heavy weight on a cable suspended from a crane or excavator jib or simply by dropping a ball from a shovel bucket.

### **Dump truck**

An off-highway self-propelled wheeled machine, having an open body, which transports and dumps or spreads material. Loading is performed by means external to the truck.

## **E**

### **Elevating scraper**

A self-loading bowl scraper able to operate without the help of a pusher dozer except in very difficult conditions. It is fitted with an elevating conveyor with flights at regular intervals which, as the scraper moves forward, carry the material sliced off from the ground up into the bowl

### **Excavator**

Self-propelled crawler or wheeled machine with an upper structure capable of rotation, which excavates, swings and discharges material by the action of a bucket fitted to the boom and arm, or telescoping boom, without moving the chassis or undercarriage during any part of the working cycle of the machine

## **F**

### **Faceshovel**

An excavator which digs away from itself into a bank or face with a toothed bucket fixed to a rigid arm supported by the boom; its crowd action provides a powerful digging force.

### **Fork-lift truck**

A vehicle with a power-operated fork at the front which can be raised or lowered as required for loading, transporting and unloading packages. The packages are usually stacked on pallets which provide sufficient ground clearance for the fork prongs to pass beneath them

### **Four-stroke cycle**

An internal combustion engine cycle completed in four piston strokes. On the first downward stroke induction takes place, followed by compression during the subsequent upward stroke; after combustion the power stroke and on the next upward stroke the exhaust gases are expelled

## **G**

### **Grab dredger**

A dredge, used in river and estuary operations, on which are mounted one or more grab cranes.

# GLOSSARY OF TERMS

## **Grader**

A machine used for the final surfacing and repairing of haul roads. It has a blade the tilt and angle of which can be varied while the machine is in motion and its wheel cambers can also be altered

## **Grading**

Shaping the ground surface, usually by means of a grader or bulldozer.

## **H**

### **Hard-facing**

The application, usually by welding, of a layer of hard material on the surfaces of the parts of machinery which are subject to heavy wear, e.g. shovel buckets.

### **Hard-standing**

A hard surface used for parking vehicles

### **Haul**

The distance quarry or opencast products must be moved to the treatment plant or dump

### **Hazard**

The potential to do harm to the health and safety of any person

**Heaped capacity:** The SAE heaped capacity for loaders and haulers is the capacity assuming the load above the sides has a slope of 2:1 and that of scrapers when the slope is 1:1.

## **J**

### **Jackhammer**

A light percussive drill used in the hand or with some light support.

## **M**

### **Monitor**

A device for directing a jet of water at high pressure to break down a mineral deposit

### **Motorized scrapers**

Single or twin engined bowl scrapers which are hydraulically operated. They are used on sites where large quantities of material have to be removed quickly and ground conditions are relatively firm

## **O**

### **Carbon monoxide**

A highly poisonous, tasteless, odourless gas which is a product of incomplete combustion of inorganic material, eg when an internal combustion engine is idling. It is also created when explosive materials are detonated. Excessive carbon monoxide is caused by an inadequate amount of oxygen in the explosive mixture (excessive fuel). Symbol: CO

## **P**

### **Payload**

The rated payload of a dump truck is the maximum load as specified by the manufacturer

### **Power-assisted steering**

A system in which the driver is assisted in the steering of the vehicle by, for instance, a hydraulic ram, powered by a hydraulic pump driven by the engine, fitted to the steering drag-link

### **Pull-push loading**

A system of loading in which twin-engined motor scrapers are operated in pairs, assisting in loading each other in turn. Scrapers used in this way are generally of the same type and require to be fitted with special connections

## **R**

### **Radial-ply**

Term applied to tyres having casing plies which run at right-angles to the beads, with the tread stabilized and braced by layers of material known as the belt and relatively little stiffening in the walls.

### **Retread**

A reconditioned tyre on which the tread has been renewed.

### **Rippability**

Term applied to rocks which indicates whether or not they can be ripped. The factors on which it depends include: the characteristics of the rock, the power of the ripper, the type and number of shanks etc

**Ripper:** The one or more hooked tines (pointed shanks) fitted to a dozer which can be forced into the ground hydraulically to break it up as the dozer moves forward

### **Ripping**

The process of breaking ground with a ripper.

# GLOSSARY OF TERMS

## **Roller and compactor**

Self-propelled, towed, manually controlled or attachment-type machine, which compacts (densifies) materials, eg rock fills, soil, asphalt surfacing or refuse, through a rolling, tamping or vibrating action of the machine.

## **Rolling resistance**

The force opposing the motion of a wheel rolling on a surface caused by the distortion of the line contact due to the normal force between them

## **Rope shovel**

A face shovel excavator which has a bucket controlled by steel ropes. Once common in rock quarries and opencast coal sites, now often replaced by hydraulic excavators or wheeled loading shovels

## **S**

### **Scarifier**

A self-propelled or towed implement used for breaking-up a surface to a regulated depth

### **Scarifying**

The systematic disruption or loosening of the top of a road or other surface by mechanical or other means

### **Shank**

The pointed tool which when fitted to a bulldozer can be forced into the ground hydraulically in order to rip the ground as the bulldozer moves forward

### **Skid-steer loader**

A mini wheeled loading shovel useful for clearing spillage in confined areas

### **Slewing**

Rotation of the jib or boom of a crane or excavator

### **Spotting**

The positioning of a vehicle ready for loading.

### **Spud**

A steel column on a dredger which is raised or lowered from the bed to serve as an anchor. A dredger has two spuds, one at each side of the stern

### **Straddle loading**

A method of loading bowl scrapers which involves first taking cuts along alternate strips, leaving the centre strips to be loaded after those on either side. This system helps in obtaining full loads in wet conditions when traction is poor.

### **Struck capacity**

The capacity of an earthmover vehicle when the load is level with the sides of the body

### **Suction dredger**

A vessel from which the suction pipe of a centrifugal pump is lowered into the deposit and by means of which sand and gravel is raised and either deposited in the vessel itself or delivered to barges for transhipment to a shore-based treatment plant or pumped direct by pipeline to the plant

### **Suction head**

The height to which a pump can raise water on its suction side, measured from the water level in the sump.

Theoretically this is approximately 10m, but in practice pumps should be sited so that it is kept to a minimum and it should not be more than about 6m

### **Suction valve**

A check or non-return valve attached to the lower end of a pump suction pipe which allows water to flow only in an upward direction

### **Suction-cutter dredge**

A suction dredge with a rotary cutter, mounted in front of the suction pipe, which breaks up the material to be pumped to the surface

## **T**

### **Tare**

The weight of an empty truck or other container.

### **Tine**

An excavating point or tooth in the leading edge of an excavator bucket or ripper attachment

### **Trailer dredge**

A large, powerful type of suction dredger which drags the suction pipe along behind it while steaming ahead.

### **Trailing cable**

A flexible cable carrying the power supply to transportable electrical apparatus, eg a dragline

### **Turbocharging**

The boosting of the induction pressure of a supercharged internal-combustion engine by means of a turbine driven by the exhaust gases from the engine

# GLOSSARY OF TERMS



## W

### **Walking dragline**

A large heavy dragline fitted with a walking device consisting of a pair of shoes which rest on the ground while an eccentric or a hydraulic mechanism lifts the tub and propels the dragline forward between them before moving the shoes forward for the next lift

# GLOSSARY OF TERMS

## DRILLING AND BLASTING

### A

#### **Air-flush**

Term applied to drilling using compressed air to clear the chippings and to cool the bit

#### **Air-line lubricator**

An oil reservoir connected into the compressed-air supply line 2m or 3m from the drill or air motor to which it feeds lubricating oil in the form of an atomized spray

#### **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

#### **Air-line lubricator**

An oil reservoir connected into the compressed-air supply line 2m or 3m from the drill or air motor to which it feeds lubricating oil in the form of an atomized spray.

#### **Ammonium nitrate (NH<sub>4</sub>NO<sub>3</sub>)**

The most commonly used oxidizer in explosives and blasting agents

#### **ANFO**

A mixture of ammonium nitrate and fuel oil in such proportions that the mixture can be detonated with a suitable initiator

#### **ANFO mixer**

A trailer- or truck-mounted machine for on-site mixing of ammonium nitrate and fuel oil and charging the blasthole

#### **Anticline**

An arch-like fold in stratified rocks

#### **Apparent dip**

The dip in any random vertical section, having a value between zero in the section containing the line of strike and full dip at right-angles to that line

#### **Atomizer**

A nozzle through which fuel oil is sprayed into the combustion chamber of an oil engine or burner. Its function is to break up the oil into a fine mist in order to ensure good combustion.

### B

#### **Back breakage**

The extent of rock breakage or fracture behind the burden taken in a blast.

#### **Bag filter**

An apparatus for removing dust from dust-laden air, employing a container made from woven material which permits passage of air but retains solid particles.

#### **Bailer**

A tube, fitted with a valve at its base, which is lowered into a borehole to remove cuttings and water.

#### **Base charge**

1. The detonating component in a detonator initiated by the priming charge
2. The bottom charge in a deep blasthole.

#### **Bit**

1. A cutting tool which is detachable from the drill rod.
2. The end of a drill stem that forms the actual cutting edge.

#### **Black powder**

A low explosive composed of sodium or potassium nitrate, charcoal and sulphur.

#### **Blast**

The detonation of explosives to break rock

#### **Blast area**

The area near a blast within the influence of flying rock missiles or concussion.

#### **Blasthole**

A hole drilled in rock or other material for the placement of explosives

#### **Blasting agent**

A primer sensitive explosive such as ANFO.

#### **Blasting gelatine**

A high explosive; the most powerful commercial explosive, taken as the standard of explosive power

#### **Blasting ratio**

The ratio of the yield of material from a blast to the weight of explosives used; measured in tonnes/kg.

#### **Blown-out shot**

A shot which has expended its force outwards from the line of the shothole without doing any appreciable blasting work.

# GLOSSARY OF TERMS

**Booster**

A unit of explosive or blasting agent used for perpetuating or intensifying an explosive reaction.

**Borehole logging**

The determination of physical, electrical and radioactive properties of the rocks traversed by a borehole

**Bottom initiation** see 'inverse initiation'

**Bulk mix**

A mass of explosive material prepared for use without packaging

**Bulk strength**

The strength of explosive per unit of volume expressed as a percentage of the value of blasting gelatine or ANFO as standard.

**Burden**

The distance between an explosive charge and the nearest free face which is a measure of the work to be done by the charge

**Button bit**

A percussive drill bit having tungsten carbide inserts the hemispherical ends of which protrude from the face of the bit.

**C**

**Cap:** see 'detonator'

**Chamber**

An excavation to accommodate an explosive charge.

**Cartridge**

An individual unit of explosive, usually wrapped in the form of a cylinder.

**Cartridge dust collector**

An alternative to a bag filter which uses lower filtration velocities and is more compact.

**Casing**

Piping used to support the sides of a borehole. Flush-coupled casing is joined with a coupling which has the same outside diameter as the casing, but has two male-threaded ends. Flush-joint casing has a male thread at one end and a female thread at the other; no coupling is used

**Casing drive hammer**

A weight used to drive casing down a hole.

**Chamber**

An excavation to accommodate an explosive charge.

**Charge**

The quantity of explosives in a particular shot hole.

**Chippings**

Single-size aggregate nominally between 3mm and 25mm inclusive.

**Circuit tester**

An instrument used to test series circuits in electrical shotfiring for continuity and resistance.

**Circulating fluid**

The fluid, which may be water, mud or air, circulated through the apparatus during drilling. Its chief functions are to remove cuttings, to cool the bit and, in the case of mud, to support the sides of the hole.

**Clinometer**

An instrument used to determine the amount and direction of deviation of a blasthole from the vertical or a hand-held instrument for the measurement of angles of slope.

**Collaring**

The operation of starting to drill a hole

**Column charge**

A continuous charge in a quarry blasthole

**Controlled blasting**

Techniques used to control over-break and produce a competent final excavation wall. See 'pre splitting and cushion blasting'.

**Core**

The cylindrical sample of rock bored out during core drilling

**Core box**

A long wooden box divided into sections wide enough to accommodate the cores taken from a borehole in the order they are removed for retention/examination

**Core drilling**

A method of rotary drilling in which a core is recovered

# GLOSSARY OF TERMS

## **Crimping**

The action of squeezing the open end of a plain detonator, or a detonating relay, over a length of fuse

## **Critical diameter**

The minimum diameter of an explosive for propagation of a stable detonation. Critical diameter is affected by confinement, temperature and pressure on the explosive.

**Cross bit:** see 'cruciform bit'.

## **Crown**

The part of a drill bit which contains the cutting diamonds

## **Cruciform bit**

A percussive bit having two cutting edges intersecting at right-angles

## **D**

### **Deck charge**

A charge which is divided into several separate components, down a blast hole, by inert material

### **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.

### **Delay element**

The part of a delay detonator interposed between the fuse head and the priming charge.

### **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

### **Delay interval**

The nominal period between the firing of successive delay detonators in a series of shots.

**Delay relay:** see 'detonating relay'.

### **Detonating fuse**

A fuse containing a core of detonating explosive. It has a velocity of detonation of approximately 6,500m/s and is sometimes used in quarrying and opencast blasting operations.

### **Detonation impedance**

The resistance of rock to blasting

### **Detonating relay**

A device used intermediately in a detonating fuse circuit to obtain a short time delay

### **Detonation**

The action of converting the chemicals in an explosive charge to gases at high pressure, by means of a self-propagating shock wave passing through the charge

### **Detonator**

A device for producing detonation in a high-explosive charge, and initiated by safety fuse, electrical current or shock

### **Deviation**

The wandering of a borehole from its intended course.

### **Diamond drilling**

A method of rotary drilling in rock, usually for exploratory purposes, using hollow diamond-crowned bits to obtain a core for examination.

### **Down-the-hole drill**

A percussive drill in which the percussive mechanism (hammer) is located immediately behind the drill bit

### **Drifter**

A heavy percussive drill requiring some form of rigid mounting.

### **Drill boom**

An adjustable arm projecting from the drill carriage to carry a drill and hold it in selected positions

### **Drill carriage**

A vehicle on which one or more drill booms are mounted to permit the drills to be brought easily to their work and be removed before blasting

### **Drill cradle**

The metal channel on which a heavy drill is fed forward as drilling proceeds

### **Drill head**

The assembly which applies the drilling pressure and rotation to the drill rods

### **Drill rig**

Any means of supporting a rock-drill at work.

**Drill steel:** see 'rod' and 'stem'



# GLOSSARY OF TERMS

## **Drill string**

The string of tools commonly used in rope drilling, namely: rope, socket, sinker bar, sliding jars, drill stem and drill bit

## **Drilling column**

The column of drill rods to the end of which the core barrel and/or bit is attached

## **Dust**

1. A term which, when used to describe dispersions of small solid particles in air or other gases, refers to those particles which are smaller than 75 micrometers.
2. In construction work, the term generally applies to -3mm rock product after crushing, (crusher dust)

## **Dynamite**

A general term relating to explosives in which the principal constituent, nitroglycerine, is contained within an absorbent substance

## **E**

### **Emulsion**

Explosive emulsions are mixtures of fuel and oxidizers (mainly nitrates) in a ratio of approximately 1:10, which have good water resistant properties and chemical stability. Emulsion/ANFO blends can be used to suit particular circumstances

### **Exploder**

A device designed specifically for producing an electric current for firing detonators.

### **Explosives store**

A magazine or a store licensed in accordance with applicable regulations or Acts for the storage of explosives.

**Explosives strengths:** see 'bulk strength' and 'weight strength'

## **F**

### **Fly-rock**

Material which is projected outside the declared danger zone by a quarry blast. Fly-rock may be caused by poor blast design or unexpected zones of weakness in the rock.

### **Fragmentation**

A term associated with rock quarrying to describe the degree of breakage by blasting evident in a rock pile.

### **Fuse**

An overcurrent protection device which prevents excessive currents from flowing in a circuit by the melting of a fuse element. See 'safety fuse'

## **H**

### **Hanging wall**

The rock immediately overlying a mineral deposit.

### **High explosive**

An explosive which contains at least one compound which, when fired, produces a chemical reaction which takes place at very high speed, producing a shattering type of detonation

## **I**

### **Igniter cord**

A cord which passes an intense flame along its length at a uniform rate to light safety fuses in succession.

### **Initiation**

In blasting, the method used to fire the charge, or the instant at which the explosion begins

## **L**

### **Loading density**

The mass of explosive per unit length of blasthole measured in kg/m.

### **Low explosive**

An explosive, such as black powder, which can be fired by simple ignition. Propagation is by rapid combustion and the rate of travel of the flame front is relatively slow, producing a heaving type of explosion

## **M**

**Magazine:** see 'explosives store'

### **Misfire**

A shot or any part of a shot, which fails to explode when an attempt is made to fire it, or where testing before firing reveals broken continuity which cannot be rectified

### **Muckpile**

Rock pile of stone fragmented by a blast. See: 'rock pile'

# GLOSSARY OF TERMS

## **Multi-row blasting**

A series of blastholes arranged in rows parallel to the free face. More common in surface mining than in rock quarrying

## **N**

### **Nitroglycerine**

A liquid high explosive, prepared by treating glycerine with a mixture of concentrated nitric and sulphuric acids; used as a basic sensitizer in some commercial explosives

## **O**

### **Oxidizer**

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

## **P**

### **Particle velocity**

A measure of ground vibration. Describes the velocity, in metres per second, at which a particle of ground vibrates when excited by a seismic wave.

### **Percussive drilling**

A method of drilling whereby repeated blows are applied by the bit, which is repositioned by intermittent rotation

### **Percussive-rotary drilling**

Rotary drilling combined with a percussive action on the bit

### **Pop-drilling**

The breaking of large boulders ('pops') by drilling holes for small explosive charges.

### **Powder factor**

The mass of explosive (kg) used to break each cubic metre of rock. It offers a comparative guide to blasting performance

### **Pre-splitting**

A blasting technique in which charges of low concentration are used in closely spaced holes of significantly greater diameter than the diameter of the charge, to create in a solid mass of rocks a plane of weakness which will determine the limit of breakage from subsequent blasts or subsequent detonations in the same blast

### **Primary blast**

The breaking out of stone from its natural state by means of explosives

### **Primer**

A boosting charge placed in contact with a detonator or detonating fuse to ensure detonation of the main charge

### **Primer cartridge**

The explosive cartridge into which the detonator has been inserted

## **R**

### **Ream**

To increase the diameter of a borehole using a reaming bit or reamer

### **Reaming bit**

A rotary bit used to enlarge the diameter of a borehole

### **Reaming shell**

A cutting cylinder, fitted between the bit and the core barrel or casing, used to maintain the diameter of a borehole

### **Relieving shot**

A shot fired to dislodge or expose a misfire

### **Rig**

Commonly used to denote a mobile drilling machine

### **Rock pile**

The broken rock resulting from a primary blast

### **Rod**

A bar the end of which is slotted, tapered or screwed for the attachment of a drill bit

### **Roller rock bit**

A rotary bit fitted with two or more hardened steel or tungsten carbide-tipped rollers of cylindrical or conical form.

## **S**

### **Secondary blasting**

The use of explosive to break into smaller pieces rock already blasted.

# GLOSSARY OF TERMS

**Sensitivity**

A measure of an explosive's susceptibility 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 of initiation or propagation of the detonation reaction

**Shank**

The end of the drill rod or stem that engages with the chuck of the drilling machine.

**Shell-and-auger drilling**

A type of percussive drilling used for site investigation which is particularly useful in obtaining samples of sand and gravel from below the water table but, by using a chisel in conjunction with the shell, the hardest rocks may be penetrated. The weight of the tools and rods is carried by shear legs or three-pole derrick but the drilling rig may also be truck-mounted

**Short-delay detonator**

A detonator in which the delay interval is expressed in milliseconds

**Shot**

An explosive charge contained within a blasthole. A single shot or a series of shots fired as part of a blast

**Shotfirer**

A person appointed by the manager in accordance with regulation to fire shots. The person appointed must have such training, knowledge and experience as are appropriate to ensure that he is competent to fire shots safely.

**Shim**

A thin strip of metal, used singly or in numbers, to take up space between clamped parts

**Single-row blasting**

The conventional system of blasting in rock quarries in which the blastholes are arranged in a single line parallel to the working face.

**Slurry explosives**

First developed as a result of attempts to waterproof, strengthen and sensitize ammonium nitrate. Slurries are available in a range of strengths and can be pumped into place or loaded in plastic film or cartridge

**Spacing**

The distance between a pair of holes in a line of holes, measured at right-angles to the burden and parallel to the face

**Stability**

The ability of an explosive material to maintain its physical and chemical properties over a period of time in storage

**Staggered pattern**

A pattern of blastholes in which holes in each row are drilled between the holes in the preceding row

**Sub-grade drilling**

The continuation of blastholes for a short distance below the quarry floor or bench level in order that, after blasting, these levels may be maintained

**T****Toe**

The rock left unbroken at the foot of a quarry face after a blast

**Toe hole**

A horizontal or upwardly inclined shothole placed at the foot of a quarry face.

**Tungsten carbide**

A hard-wearing material used for drill-bit tips and inserts.



# GLOSSARY OF TERMS

## PROCESSING (including Crushing, Screening and Sand Processing)

### **A**

#### **Actuator**

A machine using a form of energy (electrical, hydraulic, pneumatic) to move a load or apply a force

#### **Aggregate**

Particles of rock or inorganic manufactured material which when brought together in a bound or unbound condition form part or whole of a building or civil engineering structure.

#### **Alligator fastener**

A type of fastener used to join the ends of conveyor belts. It consists of a pair of steel strips, each incorporating a series of teeth along both edges which are hammered through the belt and their ends bent over; the ends of the belts are connected by a hinge pin

#### **Alloy steels**

Steels to which have been added elements not present in plain carbon steels to impart to them certain special properties

#### **Angle of friction**

The angle between the normal to two contacting surfaces and the direction of the resultant reaction between them, when a force is just tending to cause sliding

#### **Aperture size**

The dimension or dimensions defining the opening in the screen deck, usually with a qualification as to the shape of the aperture, e.g. round hole, square mesh, long slot

#### **Apron feeder**

A device, consisting of a series of steel flights (pans) bolted to heavy-duty chains which run on sprockets, used to draw material at a regulated rate from a stockpile, storage bin or feed hopper. The rate of flow is controlled by varying either the speed of the apron or the depth of material on it.

#### **Autogenous**

A term applied to grinding mills which use tumbling action to effect comminution which is achieved by the action of rock or ore particles on one another; no steel balls or rods are used.

### **B**

#### **Bag filter**

An apparatus for removing dust from dust-laden air, employing a container made from woven material which permits passage of air but retains solid particles

#### **Banana screen**

A multi-slope vibrating screen. The angle of the deck decreases from feed end to discharge end.

#### **Bank of cells**

A row of flotation cells in line.

#### **Bar or grizzly screen**

A stationary inclined screen, comprising longitudinal bars, spaced at intervals, on to which the material to be screened is fed at the upper end.

#### **Battery**

An assembly of similar units.

#### **Bearing**

Device provided to support and hold a revolving shaft in the correct position

#### **Belt feeder**

A short endless belt conveyor for feeding material, for example, from a bunker or feed hopper.

#### **Beneficiation**

The processing of rocks and minerals to remove unwanted constituents, i.e. improve their quality.

#### **Bevel gear**

A system of toothed wheels which connect shafts that are at an angle to each other but in the same plane.

#### **Blinding**

The blocking of screen apertures by the agglomeration of damp fine material, this results in a reduction of the effective area of the screen.

#### **Blow-bars**

The replaceable hammers rigidly attached to the rotor of an impact crusher.

#### **Bolted-plate fastener**

A type of conveyor belt fastener which consists basically of pairs of steel plates which are used to clamp the ends of the belt together. The plates may be in two halves connected by hinge pins.

#### **Boom**

A cantilever structure carrying conveyor used to feed a stockpile

# GLOSSARY OF TERMS

## **Bucket elevator**

A continuous line of buckets attached by pins to two endless chains running over tracks and driven by sprockets; alternatively, the buckets are attached to a rubber belt. Used for raising loose materials or slurries at high angles or vertically.

## **Bulk density**

The density of a material including any voids and water contained in it.

## **Bulldog clip**

A V-bolt specially designed to clamp a steel-wire rope doubled back on itself.

## **C**

### **Cantilever**

A beam which is firmly secured at one end and free at the other.

### **Cavitation**

The formation of a cavity between the impeller blades of a centrifugal pump and the water normally in contact with it. This can lead to the liberation of oxygen and corrosion of metal parts

### **Ceramics**

Articles produced by the firing of minerals, especially clay, at very high temperatures.

### **Chain-curtain feeder**

A feeder in which loops of heavy chain suspended from a rotating drum control the rate of flow of material from the chute into the primary crusher.

### **Chamber**

The cavity within a crusher in which the rock is subjected to crushing action.

### **Check valve**

A 'non-return valve'.

### **Cheek plates**

The liners on the two sides of the crushing chamber of a jaw crusher.

### **Chequered plate**

Patterned or perforated metal plate used to make non-slip flooring in mineral preparation plants, power stations etc.

### **Choke point**

That zone of a crushing chamber, usually near the outlet, where the capacity is at a minimum. It is in this zone that choking is most likely to occur.

### **Choke-fed**

The sustained feed to a cone crusher which ensures that the crushing zone remains over-full at all times. This results in a more cubical-shaped product, with the best shape occurring in the aggregate size at the crusher setting.

### **Choking**

A stoppage of the downward flow of rock through a crusher usually caused by the packing of compressed fines near the discharge point.

### **Clarifier**

A thickener used to separate slimes and wash water.

### **Classification**

The separation of particles according to their size, density and shape by control of their settling rate through a fluid medium.

### **Classifier**

A device which separates particles according to their size, shape and density by physical means other than screening.

### **Closed circuit**

A system in which the product from a crusher passes to a screen, the overflow from which is returned to the crusher for further treatment and the underflow released from the closed circuit.

### **Coarse aggregate**

Graded stone or gravel over 4mm in size for use in concrete or 2mm for coated material.

### **Comminution**

Size reduction of rocks and ores by crushing and grinding using compressive, impact and abrasive forces.

### **Compression crushers**

Crushers in which the rock is subjected to a squeezing action. This group includes gyratory, jaw and smooth rolls crushers.

### **Compressor**

An air compressor

### **Concaves**

The cast manganese liners of the chamber of a gyratory crusher.

# GLOSSARY OF TERMS

## **Conduit**

Pipe or trough to contain and protect cables or wires.

## **Cone crusher**

A gyrating compression crusher with both fixed and moving crushing members of greater diameter at the bottom than at the top and with mainly secondary and tertiary crushing applications.

## **Contraflow**

1. Water flow in the opposite direction to that of the mineral being treated in a washer.
2. The direction of vibration of an inclined screen to retard the passage of material along the screen.

## **Control valve**

In a hydraulic system, the valve which directs the flow of oil to operate the service in the direction required and connects the opposite service line to the reservoir.

## **Conveyor**

A mechanical device for transporting material in a continuous stream. The most common type of conveyor consists of a steel frame equipped with pulleys and idlers over which a continuous rubber belt travels loaded with material being moved from quarry to plant or within the plant

## **Conveyor system**

A movable or stationary item of plant designed for the conveying of materials continuously from one location to another.

## **Coolant**

Material used to remove heat from an electrical device or equipment, eg air, hydrogen, oil and water.

## **Crash box**

A hopper into which the material discharged from a crusher is deposited and from which it is removed by means of a feeder. This ensures that velocity is removed from the material which is then conveyed to the next stage at a controlled rate.

## **Crusher-run**

Crusher product which has not been subjected to any subsequent screening.

## **Cyclone**

A conical classifying device into which pulp is fed so as to take a circular path. Coarser and denser fractions of solids report to the apex of the cone, while finer particles overflow from the central vortex. Cyclones are also used for dewatering and in the removal of dust particles from air and other gases.

## **Cyclone dust collector**

An apparatus for the separation by centrifugal means of fine particles suspended in air or gas.

## **Cyclone dust separator**

A cone shaped air-cleaner which removes dust from air by centrifugal separation; a rapid vortex motion is applied to the air stream, causing dust to be thrown radially to the sides of the chamber

## **D**

### **Derrick**

A lifting device which takes a number of forms including: a pole, held in position by a number of guy ropes, at the top of which a hoisting rope passes over a pulley; and a three-legged framework over a borehole, used primarily to allow lengths of drill rod to be added to the drilling column.

### **Displacement pump**

Any pump with a pulsing action, produced by compressed air, steam or a plunger.

**Double-roll crusher:** see 'roll crushers'

### **Double-toggle jaw crusher**

A jaw crusher in which the motion of the eccentric shaft is transmitted through the pitman to a toggle joint, formed by two toggle plates hinged together, at its lower end. The opposite end of one plate is hinged on the back plate and the opposite end of the other at the load point, i.e. the jawstock. The effort applied at the common hinge point causes the obtuse angle between the plates to increase and considerable force is produced at the jawstock.

### **Discharge valve**

A valve for controlling the rate of flow from a pipe or a tank

### **Dust collectors:**

Can include 'settlement chambers', 'cyclone dust separators', 'venturi scrubbers', 'spray scrubbers', 'fabric filters' and 'electrostatic precipitators'.

## **E**

### **Eccentric**

Displaced with reference to a centre, e.g. the eccentric section of the shaft generating the motion of a four-bearing screen.

# GLOSSARY OF TERMS

## **Electromagnetic screen**

A screen to which is attached an electrically operated vibrator unit consisting of an armature and a stator connected to a halfwave rectified single-phase ac supply, which imparts a linear motion, usually of high frequency and low amplitude, to the screen.

## **Expanded metal**

A metal network made by stamping and stretching sheet metal to form an open mesh. Used as reinforcement in concrete, in the manufacture of safety guards for machines etc.

## **F**

### **Fabric filters**

Dust-collection devices in the form of vertical bags or sleeves with the lower ends closed. Dust-bearing gases pass into the sleeves through the fabric, the cleaned gas leaving by the open upper ends and dust being deposited on the outer surface of the sleeves.

### **Fabrication**

The preparation in a workshop of the steel members of a building framework for later erection on site.

### **Factor of safety**

The ratio, allowed for in design and manufacture, between the breaking load on a member or structure and the safe permissible load on it

### **Fail safe**

Design in which control or structural failure leads to automatic operation of protective devices and the cutting-off of the power supply.

### **Feed box**

A box, usually mounted on the feed end of a screen, used to reduce the velocity of the feed and to distribute it across the full width of the screen.

### **Feeder**

Machine which performs a conveying operation over a short distance and through which the rate of flow of material in a processing plant can be controlled.

### **Field conveyor or Cross-county conveyor**

A belt conveyor system for the overland transportation of excavated sand and gravel or rock crushed by an in-quarry mobile crusher.

### **Fine aggregate**

Graded material which, in the case of concrete aggregate, is smaller than 4mm, and for road-making material is below 2mm.

### **Fines**

1. Particles finer than 63µm
2. Sometimes used synonymously with 'fine aggregate'

### **Four-bearing screen**

A mechanically vibrated screen in which the circular motion is generated by eccentrics incorporated in the vibrator shaft acting through two outboard bearings on the base-frame and two inboard bearings on the side-plates.

### **Flakiness index**

The flakiness index is defined as the **percentage (by mass) of stones in an aggregate having an average least dimension (ALD) of less than 0.6 times their average dimension.** Flakiness index may be determined by AS 1141.15.

### **Flexible coupling**

A coupling used to connect two shafts in which rigid alignment is not possible. Typically the drive is transmitted between flanges on the shafts through a flexible disc or bushes

### **Flocculation**

Coalescence of minute particles into floccules to accelerate settlement as part of dewatering or thickening of a pulp. Chemicals are used to promote adhesion

### **Flow divider valves**

Hydraulic valves used to give priority to the flow requirements of a particular service. When these requirements are met, the remainder of the flow is diverted to another service or returned to the reservoir

### **Flow diagram**

A diagram or model which shows the location of specific activities carried out and the routes followed by workers, materials and equipment in their execution.

### **Flowsheet**

A diagrammatic representation of the flow of material through a processing plant, showing the sequence of operations and their interrelationship



# GLOSSARY OF TERMS

## **Fluid coupling**

A device used to gradually apply a high-inertia load to an electric motor or diesel engine.

## **Flume**

A concrete, steel or wooden trough used to convey pulp or water.

## **Flywheel**

Large-diameter wheel keyed to the end of the shaft of machines such as jaw crushers and the function of which is to restrict fluctuations of speed by absorbing and releasing quantities of kinetic energy for small speed variations

## **Follower**

The driven wheel of a pair of wheels engaging with each other.

## **Four-bearing screen**

A mechanically vibrated screen in which the circular motion is generated by eccentrics incorporated in the vibrator shaft acting through two outboard bearings on the base-frame and two inboard bearings on the side-plates.

## **Frequency**

The number of cycles which take place in one second. Symbol: f. Unit: hertz (Hz)

## **Fretting**

A form of wear encountered when surfaces are subject to continuous relative movement of small amplitude, eg in bearings supporting shafts which oscillate through a small angle, in ball or roller races of machines subject to vibration while stationary etc.

## **Friction**

The resistance to motion when it is attempted to slide one surface over another with which it is in contact

## **Fumes**

Cloud of airborne particles, generally visible, less than 1µm in size, of low volatility and formed by condensation of vapours or by chemical reaction. Noxious or poisonous fumes liberated from a blast may be due to low-fume-quality explosives or inefficient detonation.

## **G**

### **Gap-graded aggregate**

A material in which particular size fractions are absent.

### **Gate valve**

A stop valve which closes a pipe to the flow of fluid by means of a plate which moves in a plane at right-angles to the direction of flow. When closed, the plate seals the pipe and, when open, the full bore of the pipe is available for flow and resistance to flow is less than with other types of valve.

### **Gear pump**

A small pump consisting of a casing enclosing a driven gear wheel in mesh with a second gear wheel, the fluid being carried from the suction to the delivery side of the pump in the spaces between the teeth

### **Grab sample**

A random sample taken from a stockpile or consignment when there is insufficient time or labour to take a representative sample. Taken by an experienced sampler, it can be used to obtain a good estimate of the quality of the material.

### **Grading**

The percentage by weight of different sizes present in an aggregate, established by sieve analysis and expressed on a grading curve.

### **Grading curve**

A graphical representation of the proportions of different particle sizes in a material. There are many ways of recording the results of a sieving test, the most common being that of plotting the cumulative percentages of material passing through (or retained on) the sieves against apertures size. Particle size is usually plotted on a horizontal logarithmic scale and percentages on a vertical arithmetic scale

### **Granulator**

A jaw crusher with a high width/gape ratio, normally used for the reduction of oversize in gravel deposits at low capacity

### **Gravel pump**

A centrifugal pump with renewable impellers and linings for raising gravel and other abrasive materials. Many pumps of this type are rubber-lined.

### **Guard**

A fence or other device fitted to the moving parts of machinery to prevent injury to operators.

### **Gyradisc crusher**

A gyratory crusher mechanically similar to a cone crusher but with a much lower head angle and a principal application of producing high volumes of rock fines or stone chippings with good particle shape

### **Gyratory crusher**

A compression crusher consisting of a moving member, known as the head, in the form of an erect truncated cone rotating eccentrically within the fixed member (the outer shell), which is in the form of a frustum of an inverted cone.



# GLOSSARY OF TERMS

## H

### **Hammer mill**

An impact crusher consisting of a rotor, rotating at high speed, to which hammers are attached by hinge pins.

### **Harp wire**

Wire used in alternating straight and undulating warps or paired undulated wires, crossed periodically by wire binding to maintain the mesh structure of a screening surface. Used where sticky or damp material causes blinding in conventional screening media and where deflaking is required.

### **Head**

The potential energy per unit weight of fluid above a datum, i.e. the height in metres of the water level above that point. In theory this should include its actual potential energy, its kinetic energy and its pressure energy.

### **Heavy-media separation**

A mineral-processing operation in which mineral fragments can be separated on the basis of differences in density by being allowed to sink or float in a medium of intermediate density. The medium consists of a suspension of a finely ground high density solid (eg magnetite) in water. Can also be called 'dense-media separation'.

### **Hopper**

A vessel into which materials are fed, usually constructed in the form of an inverted pyramid or cone terminating in an opening through which the materials are discharged

### **Hydraulic**

Relating to the flow of fluids.

### **Hydraulic accumulators**

An accumulator consists of a chamber into which hydraulic fluid enters under pressure and in so doing compresses either a gas or a spring. A fall in the pressure at the inlet results in fluid being forced back into the system by the compressed gas or spring.

### **Hydraulic motors**

Multi-cylinder reciprocating machines which are essentially similar units to hydraulic pumps.

### **Hydraulic reservoir**

A reservoir which caters for varying oil volumes in the system as cylinders extend or compress, also for changes in volume due to temperature

### **Hydraulic test**

A test for boilers, pipes, pressure vessels etc by filling them with water to the required pressure

### **Hydrodynamics**

The use of the energy of a fluid in motion, as in power-transmission systems such as hydraulic couplings and torque converters

## I

### **Impact crushers**

Crushers in which the rock is fragmented by kinetic energy imparted into the feed material by a rotating mass (the rotor), which projects the material against a fixed surface, causing it to shatter.

### **Impact hammer**

Hydraulic or compressed -air-operated hammer used in quarries, usually mounted on the boom of an excavator, for secondary breakage

### **Impact idlers**

Idlers having rollers of moulded rubber disc construction, mounted on a steel supporting tube, which support and protect the conveyor belt at loading points by cushioning the shock where impact is severe.

### **Impact load**

The dynamic forces imposed on a structure by the motion of the live load

### **Impact plates**

The wear plates attached to the inside of the chamber of an impact crusher and against which rocks are projected by the blow bars on the rotor.

### **Impeller**

The rotating member of a centrifugal pump or of a compressor

### **Idler**

A broad roller carrying the weight of the conveyor and its load. Idler rollers are placed symmetrically about the belt centre line, usually in sets of three with the centre one horizontal and the two outer ones at an angle so as to bend the belt into a trough shape

## J

# GLOSSARY OF TERMS

## **Jaw crusher**

A compression crushing machine consisting of a fixed crushing face and a mobile face which moves so as to increase and decrease alternately the gap between the two faces.

## **Jawstock**

The swing jaw of a jaw crusher.

## **Journal**

The part of a shaft which is supported and held by a bearing.

## **Journal bearings**

Bearings which support rotating shafts loaded in such a way that the load is applied in a direction at right-angles to the axis of the shaft

## **L**

### **Lifting tackle**

Lifting blocks, ropes, chains, hooks, slings etc.

### **Limit switch**

A safety device fitted to electrically operated lifts, travelling cranes etc which prevents them passing a certain point by cutting off the power supply.

### **Live load**

All loads applied to a structure other than its own weight, eg the load applied to a bridge by the traffic moving over it.

### **Load**

The weight supported by a structure. See 'dead load' and 'live load'

### **Load-cells**

Load-measuring elements utilizing electrical or hydraulic effects which are remotely indicated or give digital read-outs

### **Lock nut**

A second nut screwed on to a bolt to prevent the first nut from loosening under vibration.

### **Log-washer**

A long water tank set at a slope, in which one or two shafts, or logs, fitted with paddles set helically rotate. The feed is introduced at the lower end of the tank, the paddles break it up and subject it to a tumbling action; dirty water and fines are discharged at the lower end and washed aggregate at the upper end. These washers are used where there is conglomerate or a high proportion of clay among the gravel

### **Los Angeles abrasion test**

A test for mechanical strength in which an aggregate sample is rotated in a horizontal drum with a charge of steel spheres. The percentage of the original sample which passes a standard sieve after 500 revolutions is reported as the percentage of wear.

## **M**

### **Mantle**

1. The cast steel liner, usually of manganese steel, which sits on the head of a gyratory crusher.
2. The rock layer between the Earth's crust and the core.

### **Mesh**

The aperture in a screen surface, or the size of the aperture.

### **Mill**

A machine for crushing or grinding, such as a ball mill or a hammer mill.

### **Mineral**

A naturally occurring inorganic substance having definite physical and chemical properties.

### **Multi-deck screen**

A screen with two or more superimposed decks mounted rigidly within a common frame.

### **Mill**

A machine for crushing or grinding, such as a ball mill or a hammer mill

### **Modular screen decks**

Screen decks comprised of numerous small panels held in position by quick-release pegs, making for easier handling, the ability to localize replacement of worn sections and the use of a combination of apertures where required

### **Multi-deck screen**

A screen with two or more superimposed decks mounted rigidly within a common frame.

## **N**

### **Nip angle**

The angle between the faces of a crusher

# GLOSSARY OF TERMS

## **Near-mesh material**

Material approximating in size to the aperture size in the screen deck, usually within  $\pm 25\%$  of the aperture size

## **Nominal screening size**

A notional size at which it is intended to divide a feed by screening

## **Nominal size**

The limit or limits of particle size used to describe a product of a sizing operation

## **Nip point**

A point of hazard on a conveyor where the clearance between the moving belt and the static structure, such as a chute, or at the convergence of the moving belt and a drum, is such that parts of a person could be trapped.

## **O**

### **Overflow**

That proportion of the feed discharged from the screen without having passed through the apertures.

### **Oversize**

Material in a product of a size greater than the upper nominal size; may be expressed as a percentage of the product

## **P**

### **Parallel pinch**

Term applied to gyratory crushers designed in such a way that the displacement of the head is the same from top to bottom, resulting in the full crushing stroke being applied to large pieces of rock immediately they enter the crushing chamber

### **Pegging**

The obstruction of a screen surface by single fragments which become wedged in the apertures.

### **Percentage open area**

The ratio of the total area of the apertures to the total area of the wire cloth, perforated plate or wedge-wire screening panel

### **Personal Protective Equipment (PPE)**

Special equipment worn for personal protection, such as boots, helmets, goggles, gloves, masks, ear-muffs etc

### **Piano wire**

High-tensile steel wires. Such wires may be stretched to a predetermined tension over a frame to form the screening medium for effective screening of damp, sticky, fine material.

### **Pilot plant**

A small-scale treatment plant in which representative tonnages of mineral can be treated under conditions which foreshadow those of the proposed full-scale operation

### **Pinion**

The smaller of a pair of high-ratio bevel gear wheels

### **Piston pump**

Piston pumps, as used in hydraulic systems, create a flow by pistons moving in and out of cylinder bores as the latter pass over inlet and outlet ports. The stroke is imparted to the pistons either by having the cylinder barrel set at an angle to the drive shaft or by means of a swashplate mounted on the drive shaft.

### **Pitman**

An old term for a rod which connects a rotary with a reciprocating object, such as the eccentric shaft with the toggle plates of a jaw crusher.

### **Pitting**

Wear consisting of small pits in the surface, believed to be due to fatigue failure of metal in the region of maximum shear stress, normally at a small depth below the surface; a common type of failure in the rolling elements of bearings.

### **Plain bearings**

Bearings in which the load-bearing surfaces slide relative to each other

### **Plate feeder**

A device consisting of a hopper the reciprocating base of which moves the rock forward on each stroke.

### **Plough plate**

A device fitted to a belt conveyor installation for the purpose of removing material from the top of the belt and spillage and fines from the return belt before it reaches the return drum

### **Plummer block**

A journal bearing consisting of a box-form casting holding the roller bearing or bearing brasses.

### **Polyurethane**

Range of resins, both thermoplastic and thermosetting, used in the lining of pipes, vessels and other parts subject to wear, and in the manufacture of screen panels.

# GLOSSARY OF TERMS

## **Preventive maintenance**

Inspections of plant and machinery at regular intervals with the condition of each item recorded. This system should reduce downtime by providing warnings of the need for overhauls and by parts replacement at predetermined intervals before breakdown.

## **Primary crushing**

The crushing of run-of-quarry stone from pieces of up to 1.5m across to rocks of up to 300-400mm.

## **Priming**

Filling a pump with water before starting

## **Probability screening**

A method of screening which by making extended use of the probability of a particle passing through an aperture, allows sizing at fine sizes to be performed with relatively large apertures.

## **Protective equipment**

Devices such as circuit breakers, earthleakage protection, overload protection etc which protect electrical equipment and its operators in the event of faults and overloads

## **Pulp**

A suspension of fine mineral particles in water, ie a slurry

## **Q**

### **Quality assurance**

The planned and systematic actions necessary to give confidence that a product or service will satisfy the necessary quality requirements.

### **Quality control**

The operational procedures used to fulfil requirements for quality

### **Quality management**

The management functions which determine and implement a firm's quality policy

### **Quartering**

The reduction of a sample to a desired volume by dividing a cone of material into four quarters and combining alternate quadrants. This is repeated until a sample of the required quantity is obtained

## **R**

### **Reclaim tunnel**

A tunnel, in the ground below a surge pile, which houses the feeder and conveyor used to draw off material at a controlled rate

### **Receiver**

A storage vessel for compressed air. It receives air from the compressor, smoothing out fluctuations in demand and allows moisture and oil carried in the air to collect and be drained off

### **Reduction ratio**

In general, the ratio of the size of the feed to the size of the product in a crushing operation. Note: There are several methods of expressing the ratio, e.g. limiting reduction ratio, 80% reduction ratio, and mean reduction ratio

### **Relieving deck or Breaker deck**

A screen plate with large apertures mounted over the screen deck in order to reduce the load on it.

### **Resonance screen**

A screen with a period of oscillation at or very close to the natural period of oscillation of the mass of the screen on its resilient mounting

### **Riffling**

Sample reduction using a riffle box. This is a box comprising a number of internal chutes directed alternately towards one of two trays. By this means the sample is halved and the material on one tray rejected

### **Risk**

A measure of the probability that a hazard will cause harmful consequences e.g. death, injury and damage

### **Rock pile**

The broken rock resulting from a primary blast.

### **Roll crushers**

1. Crushing rolls which break material by pressure continuously maintained between the faces of two revolving metal cylinders, with axes parallel to each other and separated by a space equal in size to that of the required finished product; used as fines crushers or for low reduction primary crushing of material of a friable and low-abrasive nature
2. Sledging rolls employ a combination of impact, shear and pressure. They have at intervals round the rolls, rows of teeth of varying length which grip the rock and feed it into the crushing chamber, also acting as picks to break the larger lumps; the optimum type of feed is stratified friable rock.

# GLOSSARY OF TERMS

## **Roller-bearing**

A shaft bearing consisting of inner and outer races between which are hard steel cylindrical rollers held in position by a cage. Bearings of similar construction to ball bearings with parallel, tapered or spherical steel rollers instead of steel balls. Suitable for heavier loads than ball bearings.

**Rotary screen** See 'trommel'

## **Run of mine/quarry**

The products of a mine/quarry before crushing, sorting and cleaning.

## **S**

### **Sampling**

Separation of a representative fraction of feed or product for testing or checking purposes

### **Scalping**

1. Generally to remove inferior top rock and clay from the main feed to a mineral-processing plant.
2. The action of rough screening to remove an oversize fraction.

### **Screen capacity**

The maximum tonnage rate at which a screen performs satisfactorily the size separation required.

### **Screen cloth**

A mesh of wires woven in a consistent manner to form apertures. Can also be made of rubber

### **Screen deck**

A surface provided with apertures of specified size for carrying out the operation of screening

### **Screen plate**

A plate provided with apertures of specified size for use as a screen deck.

### **Screening**

The separation of solid materials of different sizes by causing part to remain on a surface provided with apertures through which the remainder passes

### **Screening efficiency**

Screen undersize recovery efficiency is the mass of undersize passing through the screen expressed as a percentage of the mass of undersize in the feed.

### **Screw conveyor**

A conveyor consisting of a central shaft with helical paddles or a complete helical screw rotating within a stationary tube or trough filled with the material being conveyed

### **Scrubber**

A processing machine in which fine fragments and clay are washed from the surface of larger particles by a vigorous scrubbing action. One type of scrubber consists of a cylinder rotating at high speed, resulting in the material being subjected to a cascading action. See also 'venture scrubber' and 'spray scrubber'.

### **Secondary crushing**

The reduction of material from the primary crusher to 50-60mm in larger plants, probably -40mm in smaller operations.

### **Segregation**

The unwanted gravity separation of a graded aggregate caused by large particles rolling to the perimeter of a stockpile for example

### **Setting**

The distance between the fixed and moving members of a crusher measured at the discharge opening. This distance is known as the open-side setting (OSS) when the members are farthest apart and as the closed-side setting (CSS) when they are nearest together.

### **Settlement chamber**

A relatively simple device in which grit and large dust particles are removed from gases as they pass through a chamber of large cross-section, in which the velocity of flow is reduced, allowing time for them to fall out of the gas stream under the action of gravity.

### **Settling pond**

A reservoir of still water in which fine material is allowed to settle

### **Sheave**

A grooved pulley wheel for use with steel-wire ropes, vee-belts etc.

### **Sieve analysis**

The process or the result of the division of a sample into size fractions by the use of laboratory test sieves

### **Sieve bend**

A curved static screen used for dewatering and the removal of fines from slurries

### **Silo**

A tall cylindrical construction serving as a container for the storage of loose free-running material.

# GLOSSARY OF TERMS

**Single-toggle jaw crusher**

A jaw crusher in which the jawstock is suspended from an eccentric shaft and is braced by a toggle from the back plate so that the jawstock moves through an elliptical path. See 'jaw crusher'.

**Siphon**

A system of pipes and valves which may be used to convey water to a lower level over intervening higher ground without the use of a pump.

**Skirt**

A rubber or metal plate designed to prevent spillage, particularly at the feed point of a belt conveyor.

**Slimes**

Waste fines usually in the form of clay particles. Desliming involves the removal of very fine material from wash water or slurry

**Slurry**

A suspension of mineral particles in water

**Snub drum**

A belt-conveyor drum the function of which is to increase the angle of lap between the driving drum and the belt in order to increase the adhesion available for driving.

**Soundness**

A term used to describe an aggregate's resistance to weathering. Tests are either by repeated immersion and drying in a saturated solution of sodium or magnesium sulphate or by repeated freeze/thaw cycles

**Spherical roller-bearing**

A roller-bearing constructed so as to provide a degree of self-alignment.

**Spider**

The bridge across the top of a gyratory crusher in the central boss of which is housed the bearing carrying the upper end of the shaft on which the head is mounted.

**Splice**

A joint by overlapping the ends as used to join conveyor belting.

**Splines**

Narrow keys formed integral with a shaft produced by milling longitudinal grooves in the shaft and used instead of keys for maximum strength.

**Sprocket**

A toothed wheel used for chain drives.

**Stop valve**

A valve for turning on or shutting off completely a supply of liquid

**Stress**

The force acting on unit area of a material. Units: N/mm<sup>2</sup>

**Stroke**

The distance between the extreme positions of an oscillating or vibrating motion, ie the stroke is equal to twice the amplitude.

**Strut**

A light structural member which sustains an axial compressive load

**Sump**

A pit in which water collects before being pumped out. The pump suction is suspended in the sump

**Superstructure**

The visible part of a structure, ie that part above the substructure

**Surge bin/hopper**

A receptacle capable of receiving and re-dispensing tonnages of material, thus steadying any fluctuations in flow

**Swing jaw**

The moving member of a jaw crusher.

**T****Tailings**

Waste material which has been rejected in a mineral processing operation. Often occur as a slurry comprising finely divided material in suspension, requiring prolonged settlement

**Tertiary crushing**

The third stage of size reduction mineral (less than 20mm or even 10mm).

**Thickener**

Large circular tank in which solids settle slowly and form a slurry which is continuously removed from below while fairly clear water overflows. Also called a clarifier.

# GLOSSARY OF TERMS

## **Throughput**

The mass of material passing through a specified treatment in a given time; usually measured in tonnes/h

## **Tie**

A structural member sustaining only a tensile load

## **Toggle-plate**

A plate used as a link or element in a machine designed to withstand thrust and hinged at both ends. See 'single-toggle jaw crusher' and 'double-toggle jaw crusher'

## **Tramp iron**

Pieces of metal (eg bucket teeth) which have been removed with the mineral and which would damage crushing machinery if allowed to enter.

## **Trommel**

A rotary screen for sizing aggregate, coal or ore. It consists of a cylindrical shell of perforated plate or wire cloth, mounted on a central shaft inclined at a small angle to the horizontal. It may also be fitted to the discharge end of a washing barrel or scrubber.

## **Turnbuckle**

A long nut screwed internally with a right-handed thread at one end and a left-handed thread at the other. It is used to connect two rods which are to be joined together so that when the nut is tightened it draws the ends together, providing a means of adjusting the total length.

## **Two-bearing screen**

A mechanically vibrated screen in which the circular motion is generated by the rotation of out-of-balance weights attached to a shaft held in two bearings, one in each of the screen side-plates

## **U**

### **Underflow**

That proportion of the feed which has passed through the apertures in a screen deck

### **Undersize**

Material in a product of a size smaller than the lower nominal size; may be expressed as a percentage of the product

## **W**

### **Wet screening**

The addition of water to the feed or the spraying of water on to the screen deck in order to improve screening efficiency and increase capacity.

### **Washing screen**

An inclined vibratory screen with spray bars fixed above the deck. High-pressure water jets remove dust, loam and clay from the feed and assist in providing a tumbling action to give improved cleaning

### **Water absorption**

An aggregate property which can be tested to indicate porosity and hence strength and likely resistance to weathering

### **Wedge-wire screen**

A screen deck comprising wires of wedge-shaped cross-section spaced from each other at a fixed dimension; the underflow thus passes through an aperture of increasing cross-section.

# GLOSSARY OF TERMS

## UNITS OF MEASUREMENT

### A

#### **Los Angeles Value**

A measure of the resistance of an aggregate to abrasion as determined by the abrasion test defined in AS 1141.23.

abbr. LA

#### **Aggregate crushing value**

A measure of the resistance of an aggregate to crushing determined by the compression test as defined in AS 1141.21.

abbr. ACV..

#### **Angular acceleration**

The rate of change of angular velocity. Units: rad/s<sup>2</sup>.

#### **Angular velocity**

The rate of change of angular displacement. Units: rad/s

### B

#### **Bearing**

The horizontal angle between a datum direction such as north and a given line

#### **Bending moment**

At a given section of a beam, the bending moment is equal to the algebraic sum of the moments of all the forces to either side of the section

### C

#### **Coefficient of friction**

The ratio of the limiting friction to the normal reaction between the two surfaces.

### D

#### **Density**

The mass of unit volume of a substance. Units: kg/m<sup>3</sup>.

#### **Declination**

The angular variation, in degrees, of the magnetic compass needle, uninfluenced by local causes, from the true north and south. This varies from one locality to another and in any given locality it varies with time.

### E

#### **Electronic distance measurement**

A very accurate method of measuring distance by means of an electronic device. Most EDM instruments are operated by infra-red light or laser, with the beam being directed at a target which may be some kilometres away, and give a direct reading with an accuracy of 1 in 10000 or better

#### **Elevation**

The height of a point above sea level.

### F

#### **Fractional exposure**

The measure of the combined effect when the daily exposure is to a number of different sound-intensity levels each for its own period of time. It is the actual energy dosage received during each period expressed as a fraction of that corresponding to 90dB(A) for 8h and is used in determining whether the daily exposure is acceptable

### H

#### **Horsepower**

A practical unit of power approximately equal to 746 watts. Symbol: hp.

### J

#### **Joule**

The work performed when the point of application of a force of one newton is displaced through a distance of one metre in the direction of the force. Symbol: J (=INm)

### M

#### **Machine-hour**

The running of a machine or plant for one hour



# GLOSSARY OF TERMS

## **Moh's scale of hardness**

An indication of scratch resistance based on the relative hardness of 10 common minerals which, in order of increasing hardness, are: 1 talc, 2 gypsum 3 calcite, 4 fluorite, 5 apatite, 6 orthoclase, 7 quartz, 8 topaz, 9 corundum, 10 diamond

## **P**

### **Permeability**

The rate of diffusion of a fluid under pressure through a porous material.

### **Polished stone value**

A relative measure of the extent to which different types of roadstone in the wearing surface will polish under traffic as determined by the method defined in BS EN 1097 Part 8. abbr: PSV

## **R**

### **Reduced level**

The level of a point in relation to a prescribed datum

## **S**

### **Skid-resistance tester**

The equipment used to determine the PSV of an aggregate, by testing the coefficient of friction between a pendulum-mounted rubber pad and either a laboratory-prepared sample or directly on a road surface

### **Stress**

The force acting on unit area of a material. Units: N/mm<sup>2</sup>

### **Swell factor**

The ratio of the volume of material when broken to that when in situ; may also be expressed as the reciprocal of this number

## **T**

### **Temperature**

The degree of hotness or coldness of a substance. Temperature is measured on either the Celsius scale or the thermodynamic scale in degrees Celsius (C) and Kelvin (K) respectively. Celsius and Kelvin degrees represent equal intervals of temperature but the Kelvin scale takes as its zero absolute zero which is approximately -273°C

# GLOSSARY OF TERMS

## THEORIES

### **B**

#### **Bond's third theory**

A comminution theory concerned with the energy required to reduce a given size of feed to a required size of product. On his theory F.C. Bond based an empirical formula which may be used to compare the efficiencies of crushing plants etc

## CONCRETE

### **A**

#### **Accelerator**

In concrete technology, an admixture which speeds up the hydration process to produce a high early compressive strength

#### **Activators**

Added active items which enable an otherwise inert material to demonstrate improved properties, eg cement with ground granulated blast-furnace slag.

#### **Admixture**

A material, usually a liquid, which is added to a batch of concrete during mixing in order to modify the properties of the fresh or hardened concrete. There are many types of admixtures for concrete including: accelerators, retarders, plasticizers, air-entrainers etc

#### **Aerated concrete**

Concrete made by adding constituents to the mix, usually powdered aluminium, which, by chemical reaction, cause gas bubbles to form within the concrete. This reduces the density and increases the insulation value of the concrete

#### **Agitator**

A rotatable truck-mounted container used for keeping plant-mixed concrete in a fresh state

#### **Air entrainment**

The deliberate incorporation of air into a concrete mix, usually by admixture. See 'aerated concrete'

#### **Alkali-silica reaction**

A process of deterioration in concrete resulting from the reaction between alkalis, principally from the cement, and certain types of aggregate. abbr. ASR

#### **All-in aggregate or fully-graded aggregate**

A mixture of coarse and fine aggregate

#### **Alligator fastener or clips**

A type of fastener used to join the ends of conveyor belts. It consists of a pair of steel strips, each incorporating a series of teeth along both edges which are hammered through the belt and their ends bent over; the ends of the belts are connected by a hinge pin.

#### **Autoclaving**

The curing, in a steam chamber, of freshly cast concrete or sand-lime bricks for up to 24 hours at a steam pressure of about 10 atmospheres, which results in the material acquiring the same strength as would be achieved after a month if air-curing was used.

### **B**

#### **Batch mixer**

A mixer for concrete materials which mixes batches of such materials, as opposed to continuous mixers.

#### **Batching plant**

A plant containing the equipment to measure, by weight or volume, the quantities of different materials required to make a correct mix of concrete

#### **Binder**

Any cementing agent used for binding soil or aggregate.

#### **Bleeding**

Separation of water from concrete after compaction when there is a tendency for the solids to settle and the displaced water to be pushed to the surface.

### **C**

#### **Cement**

The manufactured powder which, through the addition of water, binds together aggregate particles into concrete.

#### **Clinker**

# GLOSSARY OF TERMS

1. The fused product from a cement-making kiln which is subsequently ground into powder.
3. Sintered or fused furnace ash which may be used for hard core or aggregate for concrete blocks

## **Compacting factor test**

Test for the workability of freshly mixed concrete by weighing the concrete which will fill a container of standard size, firstly when allowed to fall in under standard conditions and then when filled and compacted a layer at a time. The compacting factor is the ratio of the partially compacted weight to the fully compacted weight; a higher value indicates greater workability

## **Compression test**

Test in which specimens of the concrete are subjected to increasing compressive force until they fail by buckling, cracking or disintegration

## **Concrete**

A mixture of stone, sand, water and a binder, usually Portland cement, which hardens to a stone-like mass.

## **Continuous mixer**

A concrete mixer which receives a ribbon feed of raw materials at one end, discharging continuously through the other end.

## **Curing**

The process of preventing the loss of moisture from concrete while maintaining a satisfactory temperature until it has developed the necessary degree of impermeability and strength

## **D**

### **Designed mixes**

Mixes for which the concrete producer is responsible for selecting the mix proportions to produce concrete with the required performance.

### **Drying shrinkage**

Contraction which takes place in concrete as hydration occurs and in some aggregates which shrink on drying out

## **E**

### **Exposed aggregate**

A decorative concrete finish in which the mortar is removed to expose the coarse particles at the surface

## **F**

### **Formwork**

Temporary boarding or sheeting erected to contain freshly placed and compacted concrete until it has gained sufficient strength to be self-supporting. The appearance of the finished concrete depends on the face texture and stiffness of the formwork

## **G**

### **Gypsum**

Hydrated calcium sulphate,  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ , associated with other evaporite minerals in extensive beds. Used in the manufacture of plaster-board, Portland cement, fertilizer etc.

## **L**

### **Lightweight aggregates**

Aggregates used in the production of lightweight concretes. Natural types include pumice and diatomite and manufactured ones furnace clinker, foamed slag, expanded slate, expanded perlite, expanded vermiculite and plastic particles

## **M**

### **Mix design**

The choice and proportioning of aggregate, cement and water to produce a concrete with the required properties, the essential elements of which are usually durability and strength

## **P**

### **Plasticizer**

A water-reducing admixture which, when added to fresh concrete, increases its workability and, by reducing the amount of free water, increase its strength

### **Portland cement**

Cement made by burning together, in a kiln, a mixture of limestone and clay to form a clinker rich in calcium silicates. This is ground to a fine powder with a small proportion of gypsum which regulates the rate of setting when cement is

# GLOSSARY OF TERMS

mixed with water. Calcining occurs at temperatures in excess of 750°C and clinkering at +1,450°C. There are several types of Portland cement including: ordinary, rapid-hardening, sulphate-resisting and white

## **Ready-mixed, or Premixed Concrete**

Concrete which has been proportioned or batched at a plant and mixed at the plant in a static mixer or truck mixer prior to transport to site

## **S**

### **Slump test**

The test most commonly used to measure the workability of freshly made concrete. A conical mould is filled with concrete, rammed and then inverted and emptied over a flat plate. The slump is the difference between the height of the mould and the highest point of the concrete. Changes in the slump may indicate changes in materials, water content or in the proportions of the mix.

## **W**

### **Workability**

Term used to describe the ease with which concrete can be compacted. Wet concretes are workable but weak. Workability can be measured by the slump test and the compacting factor test.

### **Water/cement ratio**

The ratio of the weight of water to the weight of cement in a concrete. The higher the water/cement ratio, the lower the compressive strength of the concrete



# GLOSSARY OF TERMS

## ASPHALT, PRE-COATED AGGREGATE & PAVEMENTS

### A

#### **Asphalt or Asphaltic Concrete**

A mixture in which bitumen is used to bind aggregates

#### **Asphalt plant**

A heating, mixing and storage installation for the production of asphaltic concrete

### B

#### **Basecourse**

The layer(s) that form the main structural element of the road.

#### **Batch mixer**

A mixer for bituminous materials which mixes batches of such materials, as opposed to continuous mixers.

#### **Binder**

Bitumen used to cement aggregate particles or to stick chippings to a road surface.

#### **Bitumen**

A viscous liquid or solid consisting of hydrocarbons and their derivatives. It is soluble in carbon disulphide, substantially non-volatile and softens gradually when heated. It is black or brown in colour and has waterproofing and adhesive properties. It is derived from petroleum or from naturally occurring asphalt.

#### **Bituminous**

Containing bitumen.

#### **Bleeding**

The occurrence of free bitumen from an over-rich load of coated material in transit or on the road.

#### **Blinding**

The application of fine material to a surface to reduce the surface voids or to cover a bituminous binder.

#### **Burner**

The heater unit used in coating plants for raising the temperature of aggregate prior to mixing with the bitumen

### C

#### **Coating or pre-coating plant**

A general term used to cover any installation which produces coated material either as a macadam or an asphalt.

#### **Continuous asphalt plant**

A heating, mixing and storage installation, particularly suited to the production of high volumes of hot-rolled asphalt.

#### **Cut-back bitumen**

Bitumen whose viscosity has been reduced by the addition of a flux, usually a petroleum oil

### D

#### **Designed mixes**

Mixes for which the asphalt producer is responsible for selecting the mix proportions to produce asphalt with to meet stated parameters (void content, stability etc)

#### **Drum-mix plant**

A form of continuous asphalt plant in which the heated aggregate and bitumen are mixed in a rotating horizontal drum

#### **Dryer**

A means of heating aggregate before mixing with bitumen. It may take the form of a long drum (a continuous dryer) or a batch heater

### E

#### **Emulsion**

Bitumen emulsions, in which the bitumen is dispersed in water, through the use of emulsifying agents, as small globules permitting use at lower temperatures.

### F

#### **Filler**

A finely divided mineral powder added to road tar, bitumen or the like, or to a mixture containing the same, in order to effect some desired change in the properties of the binding material.

#### **Flexible pavement**

Any pavement in which high-strength concrete is not used as a construction layer

#### **Flux oil**

A substantially non-volatile diluent used for reducing the viscosity of bitumen

# GLOSSARY OF TERMS

## **Fretting**

The condition of early stages of wear of a road surface as evidenced in the loss of small-size aggregate from the bound surface

## **G**

### **Grit**

Small hard fragments of aggregate for application to a road surface.

## **P**

### **Pavement**

The part of the road structure above the sub-grade

### **Paver**

A self-propelled machine which receives road material, spreads it and partially compacts it into a pavement layer.

## **R**

### **Roadbase**

Term for the one or more layers of material constituting the main structural element of a pavement

Rigid pavement: Any pavement substantially constructed of high strength concrete.

## **S**

### **Stripping**

The loss of bitumen from aggregate exposed at a road surface which leads to a breakdown of the bond and the loosening of particles exposed to traffic.

### **Sub-base**

One or more layers of material situated between the roadbase and the sub-grade

### **Sub-grade**

The upper part of the soil, natural or constructed, which supports the loads transmitted by the overlying pavement

## **T**

### **Tack coat**

A thin film of binder to improve adhesion between courses in a road formation.