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**भारतीय मानक मसौदा**

**नदी घाटी परियोजनाओं सम्बन्धी परिभाषिक शब्दावली  
भाग 19 ग्राउटिंग**

(IS 4410 भाग 19 का पहला पुनरीक्षण)

***Draft Indian Standard***

**GLOSSARY OF TERMS RELATING TO RIVER VALLEY PROJECTS  
PART 19 GROUTING**

*(First Revision of IS 4410 Part 19)*

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Foundation and Foundation Treatment Sectional  
Committee, WRD 08

Last Date for Comments:  
15 Mar 2025

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**FOREWORD**

*(Formal clauses of the foreword will be added later)*

A large number of Indian Standards have already been printed covering various aspects of river valley projects and some more are in the process of formulation. These standards include technical terms, and precise definitions for these are required for avoiding ambiguity in their interpretation. To achieve this aim, standardization of the terminologies relating to water resources projects has been brought out as Glossary of terms relating to river valley projects (IS 4410), published in parts. This part contains definitions of terms relating to grouting works.

The standard was published in 1996. The first revision of this standard has been brought out to update the terminology related to grouting based on the latest advancements and field practices. In the updation of this standard, assistance has been derived significantly from the ASCE journal of Geotechnical and Geoenvironmental Engineering Dec 2005.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated expressing the result of a test or analysis should be rounded off in accordance with IS 2 : 2022 "Rules for rounding off numerical values (*second revision*)". The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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## **1 SCOPE**

This standard (Part 19) covers the definitions of terms relating to grouting for river valley projects.

## **2 TERMINOLOGY**

### **2.1 Absorption**

The assimilation of fluids into interstices, for example water loss from unstable grout when injected into porous rock, or movement of chemical grout into sand.

### **2.2 Accelerator**

A material that increases the rate at which chemical reactions in grout would otherwise occur.

### **2.3 Activator**

A material that causes a chemical reaction to initiate in a grout, especially a resin grout or certain other chemical grouts.

### **2.4 Advancing Slope Grouting**

A method of grouting by which the front of a mass of grout is caused to move horizontally, for example, through preplaced aggregate, by use of a suitable grout injection sequence.

### **2.5 Ascending Stage Grouting**

Grouting a hole in stages as defined by packers in the hole from the bottom upwards.

### **2.6 Backfill Grouting**

Due to the irregular excavated section of the rock, empty pockets are left behind the concrete in the lining in the arch portion of a tunnel or a cavity. Backfill grouting is the

process of filling these spaces by sand-cement grout. The grout is injected through pipes set in concrete lining or through holes drilled through concrete lining.

## **2.7 Backpack Grouting**

Archaic term referring to the filling with grout of the annular space between a permanent tunnel lining and the surrounding formation.

## **2.8 Batch**

Quantity of grout mixed at one time.

## **2.9 Batch Mixer**

A machine that mixes batches of grout, in contrast to a continuous mixer.

## **2.10 Batch System**

A grouting system in which a selected quantity of grout is mixed and/or catalyzed at one time prior to injection.

## **2.11 Bentonite**

A clay composed principally of minerals of the montmorillonite group, characterized by high absorption and a very large volume change with wetting or drying. Commonly used as an additive in cement based grouts.

## **2.12 Blanket Grouting**

A procedure in which relatively closely spaced and usually shallow holes are drilled and grouted for the purpose of reducing the permeability of the upper portions of the bedrock beneath the site of an embankment dam. Generally but not necessarily done either on a grid pattern or in rows parallel to the grout curtain. Commonly includes “off-pattern” holes to treat selected geologic defects such as fracture or shear zones. Sometimes confused with or improperly considered to be synonymous with consolidation grouting.

## **2.13 Bleed**

Separation of excess water from a particulate suspension grout as a result of settlement. Commonly expressed as a percentage of the initial volume of the mixed grout.

## **2.14 Bleeding**

Exudation of water from grout, especially following injection. Depending upon the size of the opening, may be due to confining pressure, settlement of grout particles, or a combination of both.

### **2.15 Bleeding Rate**

The rate at which water is released from grout by bleeding.

### **2.16 Bond Strength**

Resistance to separation of set grout from surfaces such as bedrock joints, cracks in concrete, or tunnel lining material with which it is in contact.

### **2.17 Catalyst**

A material that causes chemical reactions (such as gelation of chemical grouts or hardening of resin grouts) to begin, while theoretically not entering into the reaction.

### **2.18 Catalyst System**

A group of materials that, in combination, cause chemical reactions to begin. Catalyst systems normally consist of an initiator (catalyst) and an activator.

### **2.19 Cellular Grout**

Also called Cellular Foam Grout. A lightweight grout composed principally of cement and a natural or synthetic foam.

### **2.20 Cement Factor**

The amount of cement, in terms of dry weight in pounds, that remains in the ground after mixing, per cubic yard of in situ soil-cement, which is also referred to as Residual Cement Factor.

### **2.21 Cement Grouting**

The injection of hydraulic cement based grouts for the purpose of altering the properties of a soil or rock mass.

### **2.22 Chemical Grout**

Any grouting material characterized by being a pure solution or, as in the case of sodium silicate based grouts, a grout that contains such fine particles in suspension that it behaves essentially as a Newtonian or near Newtonian fluid during injection.

### **2.23 Chemical Grout System**

A lightweight grout composed principally of cement and a natural or synthetic foam.

## **2.24 Circuit Grouting**

A grouting method by which grout is circulated through a pipe extending the bottom of the hole and back up the hole via the annular spaces outside the pipe, thence passing through a packing gland at the top of the hole and through a screen mounted on the agitator tank.

## **2.25 Circulating System**

The piping arrangement by which grout is conveyed from the grout pump to the grout hole and through a return line from the hole to the grout tank.

## **2.26 Closure**

In curtain grouting, closure refers to achieving the desired reduction in grout take and permeability by progressively splitting the hole spacing. If closure is being achieved, there will be a progressive decrease in grout take and permeability as primary, secondary, tertiary, and higher order holes are grouted.

## **2.27 Cohesion**

A physical property of grout which theoretically controls its ability to flow through fine fractures in bedrock. It is equivalent to the yield stress of a grout as measured in a viscometer.

## **2.28 Collar**

The surface opening of a grout hole; usually the top of a casing or pipe nipple that has been grouted into the formation to which the grout delivery line is attached.

## **2.29 Colloid**

A substance composed of fine particles that, following vigorous mixing, do not settle out of an aqueous suspension. For example, sodium silicate.

## **2.30 Colloidal Grout**

A grout in which the dispersed solid particles remain in suspension. (Term sometimes is applied to cement based grouts formulated in a high speed/high shear mixer. However, no cement based grouts are truly colloidal).

## **2.31 Colloidal Mixer**

Misnomer for a mixer that has been claimed to produce colloidal grout by means of repeatedly circulating the grout between rapidly rotating impeller disks in the pump or by circulating it through a pump chamber within which it is subjected to high turbulence. More

properly called a “High Shear Mixer” in either case, as complete diminution of all grout material particles to colloidal size is unlikely to be achieved.

### **2.32 Communication**

Grout travel through the subsurface from the injection location to another hole.

### **2.33 Compaction Grout**

Grout injected with less than 25 mm slump. Normally a soil-cement with sufficient silt sizes to provide mobility together with sufficient sand and gravel sizes to develop sufficient internal friction to cause the grout to act as a growing mass as injection continues under pressure. The grout generally does not enter soil pores (except, perhaps, where openwork boulder gravels are present) but remains a homogeneous mass that gives controlled displacement to compact loose non plastic soils, gives controlled displacement for lifting structures, or both.

### **2.34 Compensation Grouting**

The introduction of a fluid or semifluid grout into the ground, increasing the local volume at the point of injection. This in turn causes movement by expansion of ground away from the area of injection, either compensating for movement in an opposing sense or causing movement to accumulate in the direction of expansion. Two processes have been traditionally used in conjunction with excavation for underground structures.

### **2.35 Concrete, Preplaced Aggregate:**

Concrete produced by injecting a portland cement based grout or resin grout to fill the interstices of coarse aggregate.

### **2.36 Consistency**

The relative mobility or ability of freshly mixed mortar or grout to flow; the usual measurements are slump for stiff mixtures and flow for more fluid grouts.

### **2.37 Consolidation Grouting**

In rock, consolidation grouting consists of injection of cement based grout for the purpose of strengthening the rock mass by filling open fractures and thus eliminating a source of settlement. Incidental to this main purpose, consolidation grouting may also serve to reduce the uplift potential beneath concrete dams by reducing the permeability. Generally done by drilling and grouting shallow holes on a grid pattern in the foundation area of concrete dams but may include “off-pattern” holes to treat selected geologic defects such as fracture or shear zones. The term is commonly and improperly used as a synonym for blanket grouting.

### **2.38 Contact Grouting**

The filling of relatively minor voids between a permanent tunnel lining and the surrounding formation, such as at the crown of a tunnel.

### **2.39 Continuous Mixer**

A mixer into which the ingredients of the mixture are fed without stopping, and from which the mixed product is discharged in a continuous stream.

### **2.40 Concrete Grouting Pad**

A concrete grouting pad/slab is provided with or without embedded pipes on the rock foundation under the impervious core of fill dams to enable grouting of shattered upper layers of the rock.

### **2.41 Consolidation Grouting**

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### **2.42 Contact Grouting or Pack Grouting**

The process of grouting behind the concrete lining or steel liner to fill the shrinkage gap and voids, if any, between the concrete lining and the rock surface and/or between the steel liner and the concrete behind it.

### **2.43 Collar of Hole**

The opening of hole at surface or opening of stand pipe, protruding out of ground level is called collar of hole.

### **2.44 Contraction Joint Grouting**

Contraction joint grouting is done to seal the contraction joint opening between blocks to make whole concrete to behave as monolith.

### **2.45 Core**

A cylindrical sample of hardened grout, concrete, rock, or grouted deposits usually obtained by means of a core drill.

### **2.46 Core Recovery**

Ratio of the length of core recovered to the length of hole drilled, usually expressed as a percentage.

### **2.47 Cover**

The thickness of rock and soil material overlying the stage of hole being grouted.

### **2.48 Cure Time**

The time period between the injection of a grout and its hardening to a required strength level.

### **2.49 Curtain Grouting**

Curtain grouting refers to grouting through one or more lines of deep holes into subsurface formations in order to create a barrier transverse to the direction of seepage and it is necessary to reduce the uplift pressure.

### **2.50 Deformability**

A measure of the elasticity of the grout to distort in the interstitial spaces in response to movement of the enclosing soil or rock mass.

### **2.51 Descending Stage Grouting**

It involves drilling a shallow hole and grouting under low pressure. The hole is redrilled to a greater depth and regrouting is done at higher pressure. The process is repeated as often as desired.

### **2.52 Dispersing Agent**

An admixture, such as a high range water reducing agent (also known as a superplasticizer) that promotes dispersion of particulate grout ingredients by reduction of inter particle attraction or by temporarily placing a repelling charge on the grout particles.

### **2.53 Displacement Grouting**

Injection of grout into a formation in such a manner as to controllably displace or move the formation.



### **2.54 Drainage Curtain**

A row of open holes drilled parallel to and downstream from the grout curtain of a concrete dam for the purpose of reducing uplift pressures. Also, sometimes built as a post construction remedial measure to intercept excessive seepage at the downstream toe of an embankment dam during or following first filling of a reservoir.

### **2.55 Drainage Gallery**

A passageway from which grout holes or drainage holes, or both, are drilled. Most commonly constructed within the base of concrete dams, but less commonly within a concrete core block in the base of an embankment dam.

### **2.56 Drill**

A machine or piece of equipment designed to penetrate earth or rock formations, or both, using either rotary, rotary-percussive, sonic, or driving techniques.

### **2.57 Drill Mud**

A slurry used in rotary drilling to prevent caving of the bore hole walls, as a circulation medium to carry cuttings away from the bit and out of the hole, and to seal fractures or permeable formations, or both, preventing loss of circulation fluid. The most common drill mud for exploratory holes is a water-bentonite mixture. However, a polymer based “mud” is preferred for drilling grout holes in unstable materials.

### **2.58 Dry Pack**

Dry cement or a cement-sand mix with minimal water content used to repair imperfections in concrete or to fill small openings in rock foundations to control surface leakage during curtain, blanket, or consolidation grouting.

### **2.59 Dye Tracer**

An additive the primary purpose of which is to add a distinctive color to grout to facilitate its recognition. A dye injected into a subsurface location such as a dam foundation, or placed in an apparent seepage source location such as an apparent entry point at the upstream face of a dam, for the purpose of locating leakage paths preparatory to designing a remedial grouting program.

### **2.60 Efflux Time**

Time required for a measured volume (commonly 1 liter) of grout to flow from a flow cone or funnel.

### **2.61 Electrokinetics**

Application of an electric field to soil for the purpose of dewatering materials of very low permeability to enhance stability. The electric field produces negative pore pressures near a grout pipe potentially facilitating grout injection.

### **2.62 Envelope Grouting**

Grouting of rock surrounding a hydraulic pressure tunnel for the purpose of consolidation, and primarily, reduction of permeability.

### **2.63 Extender**

An additive whose primary purpose is to increase total grout volume. Also known as filler.

### **2.64 Fissure**

An extensive crack, break, or fracture in rock or soil mass.

### **2.65 Foam Grout**

Grout that has been blended with a foaming agent during or following initial mixing in order to reduce its unit weight and/or to help reduce the cost of filling voids.

### **2.66 Foundation Gallery**

A passage along most of the length of the gravity dam, close to the rock surface and parallel to the dam axis. It collects the seepage of water through the foundation of the dam. Holes are drilled to the floor of the gallery for curtain grouting in the foundation as well as the body of the dam.

### **2.67 Fracture**

A break or crack in a rock mass. In general, usage includes joints, however, the terms are sometimes used in conjunction to distinguish between joints breaks that are relatively smooth and planar and usually occur in parallel sets, and fractures breaks having rough irregular surfaces and generally random orientation.

### **2.68 Full Depth Grouting**

Grouting in which the entire depth of a hole is grouted in one operation by connecting the grout supply line to the manifold at the top of the hole.

## **2.69 Gauge Protector or Saver**

A device used to transfer grout pressure to a gauge without the grout coming in actual contact with the gauge.

## **2.70 Gel**

The condition in which a liquid grout begins to exhibit measurable shear strength, or in which the grout changes from a liquid to a plastic state.

## **2.71 Gel Time**

The time that it takes for a liquid grout to exhibit measurable shear strength, or to change from a liquid or a plastic consistency.

## **2.72 Groutability**

The ability of a rock or soil mass to accept grout.

## **2.73 Groutability Ratio (Of Granular Soils):**

The ratio of the 15% size of the formation particles to be grouted to the 85 percent size of the grout particles (suspension type grout).

## **2.74 Groutable Rock Bolts**

Rock bolts with hollow cores or with tubes attached to the periphery of the bolts and extending to the bottom of the bolts to facilitate filling the holes surrounding the bolts with grout after tensioning.

## **2.75 Grout Cap:**

A “cap” that is formed by placing concrete on the foundation surface along the top of a grout curtain or incised within the foundation at the top of the curtain. In the former case, the cap functions to protect weak and/or decomposed foundation rock during movement of drilling and grouting equipment. In the latter case, the objective of the cap is to form an impermeable barrier in essentially ungroutable weak rock at the top of a grout curtain. In either case, the grout cap facilitates securing grout nipples.

## **2.76 Grout Gallery**

An opening or passageway within and or beneath a dam, and/or in the abutments of a dam, utilized for grouting operations. (Depending upon the type and configuration of the dam and on the foundation geologic conditions, may also serve as a drainage and inspection gallery.)

### **2.77 Grout Header**

An assembly that mounts on a hole casing or standpipe and serves as a means of connection of the grout delivery line. Will commonly contain pressure gauges, valves, and other required control fittings.

### **2.78 Grout Slope**

The natural slope of grout injected into preplaced aggregate or other porous mass.

### **2.79 Grout Take**

Volume of grout injected per unit length of grout hole or curtain or in the rock formation or soil mass as a whole.

### **2.80 Grouting**

Process of injecting mixtures of cement slurry or other suitable material into confined and inaccessible spaces (cracks and crevices) so that the whole formation may act as a monolithic mass to withstand the high pressure and loads to which it may be subjected.

### **2.81 Grouting Pattern**

An arrangement of holes for grouting.

### **2.82 Grout Pressure**

The pressure under which the grout is injected is called the grout pressure.

### **2.83 Grout Nipple**

A short length of pipe, installed at the top of a grout hole through which drilling is done and/or to which the grout header is attached for the purpose of injection by grout.

### **2.84 Grouting Rate**

The rate at which the grout is accepted by the hole at the specified pressure.

### **2.85 Grout Refusal**

When rate of grout intake of a hole or stage reduces beyond a specified limit, averaged over a given time, at a particular pressure, the hole is said to have attained a state of grout refusal and grouting of a hole is said to be completed.

## **2.86 Hardener**

In a two component epoxy or resin grout, the chemical component that causes the base component to cure.

## **2.87 High Mobility Grouting**

Injection of grouts with low apparent viscosity, such as any of those typically used for permeation grouting.

## **2.88 Hydration**

A chemical reaction between water and hydraulic cement which starts as soon as they come in contact with one another.

## **2.89 Hydraulic Fracturing**

Fracturing of a soil or rock mass by the pressure of a fluid grout or a grout that behaves as a fluid when under pressure in the ground.

## **2.90 Hydraulic Jacking**

In the context of dam foundation grouting, injection of grout into pre existing openings, such as joints and fractures, at sufficient pressure to cause elastic (i.e., temporary) widening of those openings to facilitate entry of the grout. Also, displacement or uplift of an overlying or adjacent rock mass as a consequence of continued injection at pressure in excess of confining pressure.

## **2.91 Hydrofracture Grouting**

Deliberate injection of grout at sufficiently high pressures to produce fractures in a weak formation to promote intrusion and distribution of the grout. Depending upon the nature of the formation and of the preexisting stresses, the grout may move out in fingers, sheets, and/or lenses. Most commonly done in alluvium, but also done in grouting practice for deep mines.

## **2.92 Inhibitor or retarder**

A material that stops or slows a chemical reaction from occurring. In cement grouting practice, a material that delays the start of hydration or that slows the rate of hydration.

## **2.93 Inspection gallery**

A passage in the gravity dam that gives access to the inside of the dam so that the structure can be inspected and the behavior of the dam can be studied.

## **2.94 Jetting**

Systematic washing of groups of holes in order to remove the erodible material in the intervening rock mass.

## **2.95 Jet Grouting Terms Single System**

The jet grouting process in which the disaggregation and cementing of soil are achieved by a high energy jet of a single fluid, usually a cement grout.

## **2.96 Jet Grouting Parameters**

The jet grouting parameters include:

- a) Pressure of the fluid(s) within the jet grouting string;
- b) Flow rate of the fluid(s) within the jet grouting string;
- c) Grout composition;
- d) Rotation speed of the jet grouting string;
- e) Translation speed of the jet grouting nozzle; and
- f) Quantity of grout deposited per unit of hole length

## **2.97 Jet Mixing**

Use of the Venturi effect to form grout or drilling mud by drawing powdered solids through a funnel into a fluid flowing at high velocity through a constricted channel.

## **2.98 Joint**

**2.98.1** *In Geology* — A fracture or parting that interrupts the physical continuity of a rock mass. Joints are relatively planar and usually occur in sets which are often subparallel to parallel.

**2.98.2** *In Drilling* — a single length, or the juncture between two connected lengths, of casing, drill rod, or grout pipe.

## **2.99 Joint Set**

A group of more or less parallel joints in a rock mass.

## **2.100 Joint System**

Two or more (commonly three) joint sets or any group of related joints with a characteristic pattern.

### **2.101 Jumbo**

A specially built mobile carrier used to provide a work platform for one or more tunneling operations, such as drilling and loading blast holes, setting tunnel supports, installing rock bolts, grouting, etc.

### **2.102 Kelly**

A heavy wall tube or pipe, usually square or hexagonal in cross section, which works inside the matching center hole in the rotary table of a drill rig to import rotary motion to the drill string. (Also referred to as a “Kelly bar.”)

### **2.103 Liquid Volume Measurement**

Measurement of grout on the basis of the total volume of solid and liquid constituents.

### **2.104 Low Mobility Grout (LMG)**

Low slump grout, such as compaction type grout, that does not travel freely and that becomes immobile when injection pressure ceases.

### **2.105 Lubricity**

The physiochemical characteristic of a grout material flow through a soil or rock that is the inverse of the inherent friction of that material to the soil or rock. Comparable to “wetness.” For fluid grouts it is the “wetability,” which is a function of the contact angle of the grout to a given surface.

### **2.106 Lugeon**

A measure of the permeability of a geological formation. One Lugeon unit is equal to 1 liter of water per meter of test hole per minute at an injection pressure of 10 bars (approximately 150 psi). The most common unit in which permeability is calculated by means of packer tests in conjunction with design or construction of grout curtains.

### **2.107 Manifold or Header**

The piping arrangement at the mouth of the hole for connecting the supply/return lines to the hole being grouted.

### **2.108 Marsh Funnel**

A device used for the field measurement of apparent viscosity of drilling muds and high mobility grouts. Analogous to the flow cone that is used for thick mortars, but much smaller and more sensitive to small differences in apparent viscosity.

### **2.109 Modifier**

An additive used to change the normal chemical reaction or final physical properties of a grout.

### **2.110 Neat Cement Grout**

A mixture of hydraulic cement and water without any added aggregate or filler materials; may or may not contain admixtures.

### **2.111 Packer**

A device used in a hole to segregate a part of a hole for grouting or installed at suitable elevation for maintaining pressure in the hole.

### **2.112 Packer Grouting**

Grouting of a hole which has been drilled to its final depth, in any desired sequence of sections which are isolated by use of packers from the ungrouted sections.

### **2.113 Paddle Mixer**

A grout mixer in which the mixing is accomplished by paddles rotating around a shaft. There are two basic types: a vertical cylindrical tub in which the paddle rotates on a vertical or slightly inclined shaft; and a horizontal trough, commonly with a semicylindrical base, in which the paddles rotate on a horizontal shaft.

### **2.114 Particulate Grout**

Any grout characterized by undissolved (insoluble) particles suspended in the mix. Also referred to as suspension grout or slurry grout.

### **2.115 Pattern**

Arrangement of holes in plan and/or vertical section.

### **2.116 Penetration Grouting**

Filling joints or fractures in rock or pore spaces in soil with a grout without disturbing the formation.

### **2.117 Percussion Drilling**

A drilling process in which a hole is advanced by using a series of impacts to the drill steel and attached bit; the bit is normally rotated during drilling.



### **2.118 Percolation Test**

Feeding water by gravity flow or by pumping of water into a hole through a direct connection or a packer to measure acceptance under test conditions.

### **2.119 Permeation Grouting**

Filling of voids in a soil or rock mass with a grout fluid at a low injection pressure to strengthen and/or reduce permeability, while not destroying the original structure of the soil or rock.

### **2.120 Pig**

Large pneumatic tanker or silo used to hold dry powder such as cement, bentonite, or fly ash. Also, a plug like mass pumped through grout delivery lines to clean them and/or a tool pulled through pipes prior to grouting.

### **2.121 Progressive Cavity Pump**

A rotary pump (such as a Moyno pump) wherein a helical steel rotor rotates inside a softer stator. Spaces containing the grout advance along the rotor in a positive screwing motion resulting from the single helix shape of the rotor and the double helix shape of the stator.

### **2.122 Proportioning Pump**

A pump that, together with one or more other pumps, is used in an arrangement that permits pumping of the various components of a grout system in any desired proportions or in fixed proportions.

### **2.123 Pressure Testing**

Pumping water into a hole through a direct connection or a packer to measure the rate of acceptance water under pressure (sometimes also referred to as water testing).

### **2.124 Pumpability**

A relative measure of the properties of a particular grout mix to be pumped, as limited by the equipment being used, including not only the pump but also the pipes, valves, and hoses through which the grout must pass.

### **2.125 Pumping Test**

A field procedure used to determine in situ permeability, the ability of a formation to produce or accept water, or the ability of a formation to accept grout at a given pressure.

### **2.126 Refusal**

A rate of grout take that is low or zero at the maximum allowable injection pressure for the grout hole or grout injection stage.

NOTE – The “maximum allowable injection pressure” commonly is based on some “rule of thumb” that takes into account the depth of the top of the grouting stage beneath the surface or the shortest distance from that stage to a free face. Optimally, it will be based on the results of extensive pressure tests during a test grouting program, or upon the strength of the rock mass as otherwise determined, and is the pressure which exceeded may cause hydrofracture or ground surface displacement.

### **2.127 Resin Grout**

A grout system composed of essentially resinous materials such as epoxies, polyester, and urethanes.

### **2.128 Reverse Circulation**

A drilling system in which the circulating medium flows down through the annulus and up through the drill rod.

### **2.129 Rotary Drilling**

A drilling process in which a hole is advanced by rotation of a drill bit under constant pressure without impact.

### **2.130 Running Ground**

In tunneling, a granular material that tends to move or “run” into the excavations.

### **2.131 Shrinkage Compensating**

Characteristic of grout made using an expansive cement or an admixture that causes a volume increase. If restrained, induces expansive stresses that are intended to offset the tendency of drying shrinkage to induce tensile stresses.

### **2.132 Single Stage Grouting**

Grouting the entire depth of the hole, drilled to the final designed depth, in one operation.

### **2.133 Single Line System**

The piping arrangement by which grout is conveyed from a grout pump to the grout hole through a single line of pipe without a return line.

### **2.134 Slabjacking**

Injection of grout under a concrete slab in order to level and/or raise it to a specified grade.

### **2.135 Slaking**

Deterioration of rock on exposure to air or water.

### **2.136 Slump**

A measure of the consistency of freshly mixed concrete, compaction grout, or low mobility grout (LMG).

### **2.137 Slurry Grout**

A fluid suspension of cementitious materials, sometimes together with noncementitious materials, in water.

### **2.138 Slurry Trench**

A trench that is kept filled with a bentonite slurry or other stabilizing agent during the excavation process to stabilize the walls of the trench. Sometimes constructed in conjunction with a grouted cutoff.

### **2.139 Slush Grouting**

Application of cement slurry to surface rock as a means of filling cracks and surface irregularities or open joints to prevent leakage and slacking.

### **2.140 Split Spacing Grouting Method**

A sequence of drilling and grouting holes in which widely spaced holes are drilled and grouted initially and the spacing is subdivided by intermediate holes. The initial set of holes are termed as primary holes and intermediate holes are termed secondary, tertiary, etc, according to the sequence of subdivision. This process is continued until one or more specified criteria such as a reduced grout acceptance, maximum allowable grout pressure, increased resistance or blow count, or a reduction in grout take to a specified value are achieved.

### **2.141 Solution Cavity**

Opening in bedrock, commonly developed along open joint or bedding planes or the juncture of two such planes, by dissolution and removal of soluble rocks such as limestone, gypsum, and phosphate rock by moving water.

### **2.142 Sounding Well**

A hole, usually cased with slotted casing, which is used to measure the groundwater level. Also, a vertical conduit in a mass of coarse aggregate for preplaced aggregate concrete, which contains closely spaced openings to permit entrance of grout; the grout level is determined by means of a measuring line on a float within the sounding well.

### **2.143 Split Spacing Grouting**

A grouting sequence in which initial (primary) grout holes are relatively widely spaced and subsequent grout holes are placed midway between previous grout holes to “split the spacing.” This process is continued until one or more specified criteria such as a reduced grout acceptance, maximum allowable grout pressure, increased resistance or blow count, or a reduction in grout take to a specified value are achieved.

### **2.144 Stable Grout**

A suspension grout that exhibits little or no settlement, bleed, or shrinkage. Historically defined as a grouting mix with a bleed less than 5 percent in 2 h. However, lesser percentages of bleed and hence enhanced stability are readily achievable with contemporary multicomponent grout formulations.

### **2.145 Stage**

A complete operational cycle of drilling, cleaning, washing, pressure testing (as may be required) and pressure grouting over a predetermined length/section of the drill hole.

### **2.146 Stage Grouting**

A grouting operation in which the hole is drilled and grouted in stages, redrilling through set grout if unavoidable, instead of being drilled to the entire depth and then grouted either in one operation as in single stage grouting, or in different operations using packers.

### **2.147 Tremie**

A concrete, mortar, or grout placement procedure in which the material is injected through a pipe extending to the bottom of a drill hole, water filled opening, or cavity, gradually raising the pipe as appropriate to avoid either plugging or mixing with water during the injection process.

### **2.148 Tube A Manchette**

A grout pipe perforated with rings of small holes, typically at intervals of about 305 mm to 1000 mm. Each ring of perforations is enclosed by a short rubber sleeve fitting tightly around the pipe so as to act as a one-way valve when used with an inner pipe containing

two packer elements that isolate a stage for injection of grout. Also called a sleeve port grout pipe.

### **2.149 Undersealing**

A grouting procedure for filling voids that result from pumping at transverse and longitudinal joints or cracks in concrete pavement. Neat cement grout or cement fly ash grout is injected through holes drilled at each joint or crack.

### **2.150 Umbrella Grouting**

Grouting from the face of the excavation in a pattern resembling a half opened umbrella to consolidate the rock prior to excavation.

### **2.151 Vent Hole**

A hole drilled to allow the escape of air, water, diluted grout, and/or natural gas. Sometimes used to monitor the flow of grout.

### **2.152 Vent Pipe**

A small diameter pipe, such as may be inserted in a foundation opening or tunnel lining, used to permit escape of air, water, or diluted grout.

### **2.153 Wettability**

The relative ease of fluid flow across a surface or into a pore system due to surface tension as measured by the contact angle of a drop of fluid on a plane of the particular surface.

### **2.154 Wetting Agent**

A substance capable of lowering the surface tension of liquids, facilitating the wetting of solid surfaces and facilitating the penetration of liquids into the capillaries.

### **2.155 Yield**

The volume of freshly mixed grout produced from a known quantity of ingredients.