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GLOSSARY OF TERMS RELATING TO RIVER VALLEY PROJECTS

PART XIV SOIL CONSERVATION AND RECLAMATION

Section 2 Reclamation

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0. FOREWORD

0.1 This Indian Standard (Part XIV/Sec 2) was adopted by the Indian Standards Institution on 31 March 1977, after the draft finalized by the Terminology Relating to River Valley Projects Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 A number of Indian Standards have already been printed covering various aspects of river valley projects and a large number of standards are in the process of formulation. These standards include technical terms, the precise definitions of which are required to avoid ambiguity in their interpretation. To achieve this end, the Institution is bringing out this glossary of terms relating to river valley projects (IS : 4410) which is being published in parts. The other parts of this standard so far published are given on page 50.

0.3 Part XIV covers the important field of soil conservation and reclamation and in view of the vastness of this subject, this is being covered in two sections. While this section covers terms relating to reclamation, Section 1 covers terms relating to soil conservation.

The glossary of terms connected with drainage and water logging is under preparation.

0.4 In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country. This has been met by deriving assistance from the following publications:

UNITED NATIONS. ECONOMIC COMMISSION FOR ASIA AND THE FAR EAST. Glossary of hydrologic terms used in Asia and Far East. 1956, Bangkok.

INDIA. INTERNATIONAL COMMISSION ON IRRIGATION AND DRAINAGE. Multilingual technical dictionary on irrigation and drainage. 1967.

INDIA. CENTRAL BOARD OF IRRIGATION AND POWER. Glossary of irrigation and hydro-electric terms and standard notations used in India. 1954. Manager of Publications, Delhi.

Nomenclature for hydraulics. 1962. American Society of Civil Engineers. New York.

0.4.1 All the definitions taken from ' Multilingual technical dictionary on irrigation and drainage ' are marked with asterisk (*) in the standard.

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1. SCOPE

1.1 This standard (Part XIV / Sec 2) covers the definitions of terms relating to reclamation.

2. PEDOLOGY

2.1 General Terms

2.1.1 *Aggradation* — A process which tends to build up the land surface by deposition of solid material.

2.1.2 *Agronomy* — A branch of agricultural science which deals with the theory and practice of field crop production and soil management.

2.1.3 *Braided River* — River with many streams flowing around alluvial bars in a series of dividing and re-uniting channels due to inability to handle its bed load.

2.1.4 *Degradation* — A process which tends to wear down the land surface.

2.1.5 *Meandering River* — River flowing in a sinuous curve.

2.1.6 *Pedology* — A branch of soil science which deals with the origin, genesis and distribution of soils.

2.1.7 *Soil* — The soil is a three dimensional dynamic natural body of mineral and organic constituents, differentiated into horizons, of variable depth, which differ from the material below in morphology, physical make-up, chemical properties and composition, and biological characteristics. In agricultural practice the term soil is applied only to the thin uppermost weathered layer of earth's crust which is the seat of intense biological activity in which plants are able to strike root, derive their food and all other conditions essential to their growth from it.

The following subdivision is recognized:

a) *Surface Soil* — The more or less completely weathered surface layer, rich in soluble material and containing a relatively higher proportion of organic matter and fine earth; also called top soil. The zone of aeration and intense root and microbiological activity. The layer ordinarily moved in tillage or its equivalent in uncultivated soil, about 10 to 20 cm in thickness.

b) *Sub-soil* — The layer immediately below the surface soil in which roots normally grow. Although a common term, it cannot be defined precisely.

2.2 Soil Formation

2.2.1 *Aeolian Soil** — Soil formed from wind-transported soil material.

2.2.2 *Alluvial Soil** — Azonal soil, developed from material, mainly and relatively recently deposited by water (alluvium) characterized by a weak modification (or none) of the original material by soil-forming processes. (Soils with well developed profiles that have formed from alluvium are grouped with other soils having the same kind of profiles and not with alluvial soils.)

2.2.3 *Calcification** — A general term used for that process or those processes of soil formation in which the soil is kept supplied sufficiently with calcium to saturate the soil colloids to a high degree with exchangeable calcium and thus render them relatively immobile and nearly neutral in reaction.

2.2.4 *Carbonation* — The act or process of impregnating with carbonic acid or carbondioxide.

2.2.5 *Colluvial Soil* — Soil derived from colluvium.

2.2.6 *Ectodynamorphic Soil** — Soil shaped by influences other than parent material.

2.2.7 *Endodynamorphic Soil** — Soil influenced mainly by parent material.

2.2.8 *Hydration* — Any chemical process involving combination with water or the elements of water.

2.2.9 *Hydrolysis* — Reaction of a substance with water or more specifically with hydrogen and hydroxyl ions of water.

2.2.10 *Hydromorphic Soil** — Soil developed in the presence of excess water all or part of the time.

2.2.11 *Immature Soil** — Soil lacking a well-developed profile.

2.2.12 *Loess* — Wind blown silt or silty clay having little or no stratification. Its peculiarities are light colour, angularity of the particles, porous structure, high permeability and the tendency to break or cleave along vertical cliffs.

2.2.13 *Mature Soil** — Soil having a fully developed profile in equilibrium with its present environments.

2.2.14 *Mineral Soil* — A soil whose properties are dominated by the mineral matter, usually containing less than 20 percent organic matter, or with only a thin surface organic layer (less than 30 cm thick).

2.2.15 *Organic Soil* — Soil containing organic matter in sufficient quantities to dominate its characteristics.

2.2.16 *Oxidation** — Any chemical change involving the addition of oxygen or its chemical equivalent, technically any chemical change involving an increase of positive or a decrease of negative valency.

2.2.17 *Residual Soil or Sedentary Soil* — Soil resting on the material from which it was formed, that is, *in-situ*.

2.2.18 *Rhizosphere* — The soil region in the immediate neighbourhood of root system of plants in which the abundance or composition of the microbial population is affected by the presence of the roots.

2.2.19 *Skeletal Soil** — An azonal soil having no clearly expressed soil morphology and consisting of a freshly and imperfectly weathered mass of rock fragments.

2.2.20 *Soil Morphology* — The physical constitution of the soil including colour, texture, structure, porosity, consistency, etc, of the various soil horizons, their kind, thickness and arrangement in the soil profile.

2.2.21 *Truncated Soil** — Soil having lost all or part of the upper horizons.

2.2.22 *Weathering** — The geological processes, caused by physical and chemical action by atmospheric agencies upon rocks at or near the surface of the lithosphere, which result in the disintegration and decomposition of such rock and in some instances its removal to other locations by separate wind and water action.

2.3 Soil Profile and Characteristics

2.3.1 *A Horizon* — The uppermost layers of a mineral soil profile having maximum biological activity or eluviation or both.

2.3.2 *B Horizon* — The layer of a soil profile in which material leached from the overlying ' A horizon ' is accumulated or clay developed *in-situ*.

2.3.3 *C Horizon* — C Horizon of weathered rock material little affected by biological soil-forming processes; usually referred to as parent material from which the overlying horizon (or a part of B horizon) has developed.

2.3.4 *Clay Pan* — Dense subsoil horizon formed by washing down of clay or by the formation of clay *in-situ*, manifesting slow permeability. Such a pan is generally hard when dry thus limiting root penetration.

2.3.5 *Concretion* — Hard grains, pellets or modules formed from concentration, of certain compounds, such as calcium carbonates or iron and manganese in the soil that cement the soil grains together. Concretion can be of various sizes, shapes and colours (in India, predominently carbonaceous concretions are known as *KANKAR*).

2.3.6 *Crotovine or Krotovine* — Animal burrows in soil filled with earthen, organic and calcareous debris.

2.3.7 *R Horizon** — Unweathered rock below the 'C horizon'.

2.3.8 *Hard Pan* — A hardened or cemented soil horizon which is formed by precipitation of dissolved materials, such as calcium carbonate, iron oxides or silica compounds, at certain depths below the surface with age. When such an accumulation takes place, the subsoil is rendered more or less cemented and is not amenable to softening when wetted, thereby limiting downward movement of water and penetration of roots (*also see* **2.3.13**).

2.3.9 *Horizon* (*Soil Horizon*) — A layer of soil profile distinguished principally by its colour, texture, structure and chemical constituents produced by soil forming processes.

NOTE — Further subdivisions of various soil horizons designated as A, B, C and R will come under the standard on agricultural soil classification (*under preparation*).

2.3.10 *Indurated* — Cemented, hardened, or .rocklike condition of soil which will not soften when wetted. Induration is the process by which such soils are formed.

2.3.11 *Iron Pan* — Layer usually of sand, cemented with oxides of iron.

2.3.12 *Monolith* — A column of soil encased in a frame or mounted on a panel, with the profile preserved in its natural state.

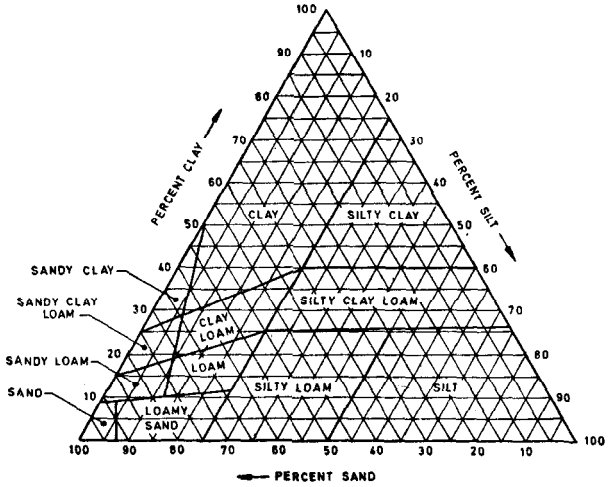
2.3.13 *Ortstein* — Hard, dark yellow to nearly black sandy material of the solum, unequally cemented by iron oxides.

2.3.14 *Plansols* — An intrazonal, hydromorphic soil having a clay pan or hard pan covered with a leached surface layer, developed in a humid to sub-humid climate.

2.3.15 *Plough Sole* — A compacted layer of soil below surface caused by compression due to passage of the plough bottom. Also called 'Ploughpan'.

2.4 Soil Texture

2.4.1 *Clay* — The finer mineral soil less than 2 μm particle size, which is plastic, when wet and manifesting colloidal properties. *See* Textural Classification of Soil based on Triangular Diagrams Fig. 1 and 2.



TRIANGULAR TEXTURE Diagram based on Fractions with effective Diameters 0·002, 0·02 and 2·0 mm for the upper limits of the clay, silt and sand fractions, respectively.

FIG. 1 INTERNATIONAL TEXTURAL CLASSIFICATION

The Classification of soil into sand, sandy loam, clay loam, loam, silt, etc is based on the proportion of sand, silt and clay as depicted in the diagrams.

2.4.2 *Degree of Dispersion** — Extent to which soil aggregates are broken down to primary particles by any given treatment.

2.4.3 *Intermediate Soil Textures* — Some of the intermediate soil textures (based on different percentages of sand, silt and clay) are termed as silty, clay, sandy clay, silty clay loam, sandy clay loam, clay loam, silty loam, sandy loam and loamy sand on the basis of the triangular classification as illustrated in Fig. 1 and 2.

2.4.4 *Loam* — An even mixture of sand, silt and clay fractions (*see* Fig. 1 and 2).

2.4.5 *Primary Particle** — Particle as of sand, silt, clay, etc.

2.4.6 *Sand* — The fine material, easily distinguishable by the unaided eye, resulting from the natural disintegration of rock or crushing of friable rock. According to the standards adopted by International Society of Soil Science, particles of sediment 0·02 mm to 2 mm in diameter (or 0·05 mm to 2 mm according to U.S.D.A. Classification) (*See* Fig. 1 and 2).

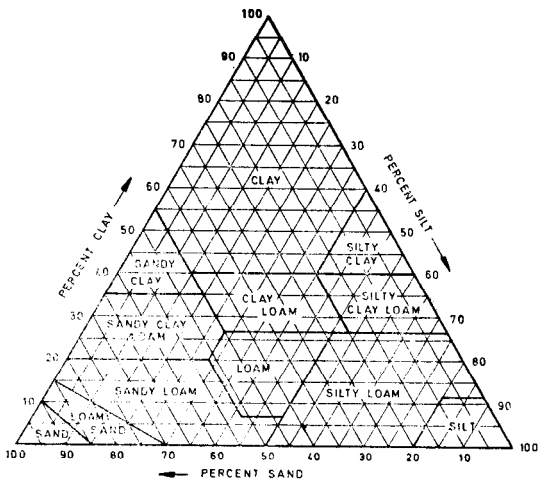


Chart showing the percentage of clay (below 0·002 mm), silt (0·002 mm to 0·005 mm) and sand (0·05 mm to 2 mm) in the basic soil textural classes.

FIG. 2 †USDA TEXTURAL CLASSIFICATION

The classification of soil into sand, sandy loam, clay loam, loam silt, etc., is based on the proportion of sand, silt and clay as depicted in the diagrams.

†Present trend of soil classification is to base the same on USDA Soil Texanomy. As is obvious, the USDA Textural Classification differs from International in that the silt fraction ranges from 0·05 mm to 0·002 mm instead of 0·02 mm to 0·002 mm.

2.4.7 *Secondary Particle** — Particle as of an aggregate.

2.4.8 *Silt*

a) Individual mineral particles of soil that range in diameter between the upper size of clay 0·002 mm, and the lower size of very fine sand 0·02 mm (0·0 or 0·05 mm according to U.S.D.A. Classification) and 0·002 mm to 0·075 mm according to IS : 1498-1970‡.

‡Classification and identification of soils for general engineering purposes (*first revision*).

b) Sometimes the term silt is used broadly to denote composite sediment load carried by streams; in other instances it denotes only particles of a given size range within the composite load.

c) *See* Textural classification of soil based on Triangular Diagrams Fig. 1 and 2.

2.4.9 *Soil Particle* — Any unit, either primary or secondary, which is a part of the make up of soil.

2.4.10 *Soil* p*H* — The *p*H value of hydrogen-ion concentration, is a measure of the acidity or alkalinity (basicity) of a soil. It is expressed as follows:

$$p\text{H} = \log \frac{1}{(\text{H}^*)}$$

where

H* is the hydrogen-ion concentration in moles / l.

2.4.11 *Soil Separates** — The several groups of soil particles having definite size limits.

2.4.12 *Soil Texture* — Characterization of soil with respect to its particle size distribution.

2.5 Soil Structure

2.5.1 *Aggregate* — A cluster of soil grains or particles gathered into a mass, such as a ped, block, prism, crumb, or granule.

2.5.2 *Blocky Structure* — Structure in which the cube-like peds are of considerable size having flat or rounded faces. When the faces are flat and edges mainly sharp angular, the structure is termed as ' angular blocky ', and when the faces and edges are mainly rounded it is called ' subangular blocky '.

2.5.3 *Columnar Structure* — Structure with vertically elongated and flat sided aggregates in the shape of prisms; where the prisms are rounded at the top, they are designated ' columnar '.

2.5.4 *Crumb Structure** — A term applied to granular structure when the granules are more porous and irregular in size and shape.

2.5.5 *Degree of Aggregation** — Measure of the proportion in which aggregates are present.

2.5.6 *Dispersion* — The breaking down of soil aggregates to individual particles, resulting in a single grain structure. Ease of dispersion is an important factor influencing the erodibility of soils.

2.5.7 *Floccules or Floc* — Individual particles clustered into a small loose open-structured gelatinous mass in the presence of coagulants or through biochemical processes.

2.5.8 *Granule* — A cluster of soil particles behaving as a unit in soil structure.

2.5.9 *Granular Structure* — Structures composed of soil granules.

2.5.10 *Laminar Structure** — Structure having aggregates with horizontal dimension greater than vertical dimension. When the units are thin, they are termed laminar.

2.5.11 *Macrostructure* — Soil structure presenting the aggregates of the mineralogical complexes into larger units, as the result of cementation.

2.5.12 *Massive** — A large coherent mass of soil manifesting irregular shape and cleavage.

2.5.13 *Microstructure* — Refers to the pattern of the mineralogical complexes of the soil materials or ' soil fabric ' in relation to each other.

2.5.14 *Penetrometer* — An apparatus used for determination of variations in penetration resistance of soils along depths; also applied as a device for measuring structural conditions of soil and index of tilth *in-situ*.

2.5.15 *Platy Structure* — *See* **2.5.10**.

2.5.16 *Prismatic Structure* — Structure with vertically elongated and flat sided aggregates in the shape of prisms; where the prisms are rounded at the top, they are designated ' columnar '.

2.5.17 *Puddle* — To change soil structure with a view to reduce permeability and water losses.

2.5.18 *Single-Grained Structure** — Physical state of soil in which there is no aggregation of the separate particles.

2.5.19 *Soil Stabilization* — The process by which soil aggregates become resistant to the disintegrating influence of water and mechanical manipulation.

2.5.20 *Soil Structure** — The arrangement of soil particles into aggregates which occur in a variety of recognized shapes and sizes.

2.5.21 *Structure Factor (Dispersion Ratio)* — The ratio of the difference between the total clay obtained by complete dispersion and the clay obtained by water dispersion expressed as a percentage of the former.

2.5.22 *Structure Index** — A soil property which is measurable and may be evaluated on a numerical scale and is related to soil structure, that is, aggregation, bulk density, moisture retention and penetrometer force.

2.6 Classification and Types of Soils

2.6.1 *Azonal Soil** — Soil without well developed profile characteristics.

2.6.2 *Brown (Steppe) Soil** — A zonal group of soils having a brown surface horizon which grades below into a lighter-coloured soil and finally into a layer of carbonate accumulation; developed under short grasses, bunch grasses, and shrubs in a temperate to cool, semi-arid climate.

2.6.3 *Catena* — A sequence of different soils usually from similar parent material but varying in characteristics due to differences in relief and drainage.

2.6.4 *Chernozem* — A zonal group of soils having deep, dark to nearly black surface horizons and rich in organic matter, which grade into lighter coloured soil below usually having accumulation of calcium carbonate. These group of soils develop under tall and mixed glasses in a temperate to cool sub-humid climate.

2.6.5 *Desert Soil (Kraspozem Soil)* — A zonal group of soil having a light-coloured surface soil, usually underlain by calcareous material and frequently by a hardpan, developed under an extremely scant vegetation in warm to cool, arid climates.

2.6.6 *Intrazonal Soil** — Fairly well-developed soil whose morphology reflects the influence of some local factor, such as relief, parent material or age rather than of climate and vegetation.

2.6.7 *Laterite Soil or Latosol* — A zonal group of soil in humid tropical and equatorial regions which are deeply weathered; strongly leached; relatively low in organic matter, primary minerals and clay activity; and having an accumulation of sesquioxides and leaching of silica giving a low silica-sesquioxide ratio of the clay fraction.

2.6.8 *Pedalfer* — A soil with maturely developed profile in which there is a zone of aluminium and iron oxide accumulation in the profile but with no horizon of carbonate accumulation.

2.6.9 *Pedacal* — A soil with a horizon containing a concentration of carbonate usually calcium carbonate in the soil profile in higher percentages than in the parent geological formation.

2.6.10 *Pedzol** — A zonal group of soils having a surface organic matter and a very thin organic mineral layer above grey-leached layers which rest upon an illuvial dark-brown horizon developed under coniferous or mixed forests or underneath vegetation in a cool, temperate, moist climate.

2.6.11 *Ped Earth* — Tropical soil, usually leached, deep red, clayey and moderately low in combined silica and predominantly of sesquioxidic character.

2.6.12 *Red Loam** — Tropical soil, usually leached, deep red, friable, having high percentage of aluminium silicate as constituent.

2.6.13 *Regur or Black Cotton Soil* — Dark-coloured, clayey, predominantly montmorillonitic usually calcareous tropical soil with low organic matter content exhibiting high coefficient of expansion (swelling) on wetting and cracks deeply on drying.

2.6.14 *Rendzina* — An intrazonal, calcimorphic group of soils characterized by a brown to black friable surface horizon and a light grey or pale yellow soft underlying horizon; developed under grass vegetation in humid and semi-arid regions. It contains fragments of lime stone or dolomite of various sizes.

2.6.15 *Sierozem or Grey Desert Soil** — A zonal group of soils having a brownish grey surface horizon that grades through lighter coloured material into a layer of carbonate accumulation and frequently into a hardpan layer, developed under mixed shrub vegetation in a temperate to cool, arid climate.

2.6.16 *Soil Association* — A group of defined and named taxonomic soil units associated geographically in a defined proportional pattern.

2.6.17 *Soil Complex* — An association of series, types or phases of soil that cannot be differentiated individually.

2.6.18 *Soil Family* — Soil groups intermediate between soil series and great soil group and/or subgroups having similar edaphological characteristics.

2.6.19 *Soil Phase** — A subdivision of any class or any category in the system of soil classification, based on features, such as relief, stoniness, erosion and others, important to soil use and management, but not significant in the natural landscope for native plants. Soil phase has most commonly been used as a segment of soil type.

2.6.20 *Solum* — The part of the earth's crust influenced by climate and vegetation. Solum in matured soils include A and B Horizons.

2.6.21 *Transitional Soil** — Soil intermediate in character between two different soils.

2.6.22 *Zonal Soil** — Soil having a well-developed profile which shows a dominant influence of climate and vegetation.

2.7 Physical Properties

2.7.1 *Absolute Specific Gravity* — The ratio of mass, referring to vacuum, of an equal volume of gas-free distilled water under standard conditions.

2.7.2 *Air Capacity of Soil** — The quantity of air in the soil when the soil is at field moisture capacity.

2.7.3 *Apparent Specific Gravity/Volume Weight/Bulk Density* — The ratio of mass of a unit of given volume of oven-dry soil, air space included, to the mass of an equal volume of water.

2.7.4 *Bulk Density* — The mass per unit volume of a soil core or clod.

2.7.5 *Capillary Pore Space* — Total space not occupied by solid soil particles and which holds water by capillarity.

2.7.6 *Capillary Porosity* — The ratio of the capillary pore space to the total volume of the soil or rock.

2.7.7 *Cohesion* — The state or process by which the particles of a body or substance are bound together, due to the force of attraction between the molecules. Cohesion is high in clays but may be very low in silt and entirely lacking in sand.

2.7.8 *Consistency* (*Soil Cohesion*) — Resistance to separation of soil particles to the crushing of structural aggregates and to the deformation of whole mass.

2.7.9 *Degree of Aeration of Air Space Ratio* — Ratio between the volume of air and the volume occupied by the voids.

2.7.10 *Effective Porosity* — The portion of pore space in saturated porous media in which movement of water takes place.

The ratio of the volume of the voids of a soil mass that can be drained by gravity to the total volume of mass.

2.7.11 *Electrical Conductivity* — A physical quantity that measures the readiness with which the medium transmits electricity commonly used for expressing the salinity of irrigation waters and soil extracts.

2.7.12 *Liquid Limit* — Is that moisture content expressed as a percentage of the mass of overdried soil at which the soil will just begin to flow when lightly jarred. At this stage cohesion and internal friction are practically zero.

The water content at which a part of soil cut by a groove of standard dimensions, will flow together far a distance of 12 mm under the impact of 25 blows in a standard liquid limit apparatus.

2.7.13 *Non-capillary Pore Space** — Total space occupied by large pores in soil that do not hold water by capillarity.

2.7.14 *Non-capillary Porosity** — The ratio of the non-capillary pore space to the total volume of soil or rock.

2.7.15 *Plastic Limit* — The lowest moisture content expressed as a percentage of the mass of the overdried soil, at which the soil can be rolled into thread 3 mm in diameter, without showing signs of crumbling.

2.7.16 *Plastic State* — The range of consistency within which a soil exhibits plastic properties.

2.7.17 *Plasticity* — The property of a soil which allows it to be deformed beyond the point of recovery without cracking or appreciable volume change.

2.7.18 *Plasticity Index* — The numerical difference between the liquid and the plastic limit. This shows the percentage in moisture content through which soil remains plastic.

2.7.19 *Pore Space* — The fraction of bulk volume within a soil mass that is not occupied by solid particles.

2.7.20 *Porosity* — Porosity is an index of the void characteristics of a soil or stratum as pertaining to percolation and is the ratio, usually expressed as a percentage, of the volume of voids of a given soil mass, to the total volume of soil mass.

2.7.21 *Shrinkage Limit* — The maximum water content at which reduction in water content will not cause a decrease in volume of the soil mass.

2.7.22 *Stickiness* — The property of adhesion of soil to other substance when wet.

2.7.23 *Sticky Point** — The lowest moisture content of soil at which stickiness first appears.

2.7.24 *Void Ratio* — The ratio of the volume of void space to the volume of solid particles in a given soil mass.

2.8 Colloidal Complex

2.8.1 *Absorption* — In contrast, it refers to surface penetration which takes place when nutrients and water enter plant roots. Thus, cat-ions for instance, are absorbed as they are taken in by plant roots but adsorbed by soil colloids.

2.8.2 *Acidoid** — Colloid manifesting acidic properties.

2.8.3 *Adsorption* — It refers to the adhesion of substances to the surfaces of solids. In soils, it has to do with the attraction of ions and of water molecules to colloidal particles. The ions are not too tightly held, being replaceable by or exchangeable with ions of a like charge.

2.8.4 *Aggregation* — A term referring to the action of uniting homogenous particles of soil into masses; the state of being aggregated. Quantitatively aggregation is determined as the total mass of a given fraction in the undispersed state — the mass of thes ame fraction when completely dispersed is taken as the quantity of aggregates in the soil having that particular size.

2.8.5 *Ampholytoid** — Colloid manifesting both acidic and basic properties.

2.8.6 *Basoid** — Colloid manifesting basic properties.

2.8.7 *Coagulation* — A separation or precipitation from dispersed state of suspensoid particles resulting from their growth; may result from prolonged heating, addition of an electrolyte, or from a condensation reaction between solute and solvent; an example is a setting of a gel.

2.8.8 *Cohesion* — *See* **2.7.7.**

2.8.9 *Colloids* — Very small sized particles of matter, both inorganic and organic, having correspondingly very large surface area per unit mass. They have high ionic-exchange activity, are filterable, can be dispersed, but fail to diffuse through a membrane.

2.8.10 *Colloidal Moisture Equivalent Ratio* — The percentage of colloids in the soil divided by that of the moisture equivalent of the soil (*see* **2.9.29**). It indicates the capacity of the soil to hold moisture. This ratio is used to express the relative permeability and gives an idea of erosion with which it is inversely related.

2.8.11 *Colloidal System or Colloidal Complex** — A complex in which a tremendously large interface is attained by the very fine, heterogeneous dispersion of one (or more) substance in a second substance or material.

2.8.12 *Deflocculation** — Reverse of flocculation; the reduction, separation or breaking of soil aggregates of clays into their individual particles.

2.8.13 *Double Layer** — Arrangements of two oppositely charged ions in layers near the surface of a clay particle.

2.8.14 *Flocculation*

a) The coming together or coalescing into wooly flakes of minute particles in liquid.

b) The formation of flocks; the coagulation and rapid precipitation of finely divided solids, which normally remain in suspension in water and other liquid.

2.8.15 *Granulation** — The cementation of particles in the soil itself into masses as grains, aggregates or clumps, essentially as the result of flocculation followed by the process of stabilization of the granules.

2.8.16 *Heat of Wetting** — The heat evolved when dry soil is wetted. It is expressed in calories per gram of dry soil.

2.8.17 *Hydrophilic Colloid or Lyophilic Colloid* — A colloid which readily disperses in water.

2.8.18 *Hydrophobic or Lyophobic Colloid* — A colloid which disperses in water only with difficulty.

2.8.19 *Mobile Soil Colloids** — Soil colloids sufficiently dispersed so that they may move in the soil with the percolating waters.

2.8.20 *Peptizing Agent** — A material which encourages the formation of a colloidal dispersion and contributes to its stability when formed.

2.8.21 *Plasticity* — *See* **2.7.17.**

2.8.22 *Viscosity of Colloidal Solution** — The friction between the water molecules of the water hull and those of the dispersion medium.

2.9 Soil Moisture — *See* Fig. 3 for details.

2.9.1 *Available Water*

a) The amount of water in the soil at any time in excess of the wilting coefficient, expressed either as percentage by mass of dry soil, or as equivalent of water per unit depth of soil.

b) The difference between the field capacity and permanent wilting point.

2.9.2 *Bound Water* — In soils particularly containing large proportions of colloided material and fine clay particles, water so tightly held by physical and chemical forces that it cannot move, or be absorbed by plant roots. Also called ' unfree water '.

2.9.3 *Capillarity* — The phenomenon by which water or other liquids are carried by minute pores throughout the soil or upwards into the plant.

2.9.4 *Capillary Fringe* — Water in the zone immediately above the water table. It may consist solely of capillary water (called capillary fringe) or it may be combined with gravity water in transit to the water table.

2.9.5 *Capillary Moisture or Capillary Water* — Water held by surface tension in the capillary spaces and as a continuous film around the particles, free to move under the influence of capillary forces, and available to plants.

2.9.6 *Capillary Movements** — Movements of soil moisture in any direction caused by capillary tension.

2.9.7 *Capillary Rise* — The height above a free water elevation to which water will rise by capillary action.

2.9.8 *Capillary Yield** — The quantity of capillary water in millimetres per day or in litres / second / hectare, rising through a plane parallel to the phreatic surface, situated at a certain depth below the ground surface.

2.9.9 *Coefficient of Permeability, Hydraulic Conductivity or Coefficient of Conductivity* — The rate of flow of a fluid through a unit cross section of a porous mass under a unit hydraulic gradient, at a specified temperature. Also sometimes called 'unit of permeability', 'transmission constant' or 'coefficient of transmission'.

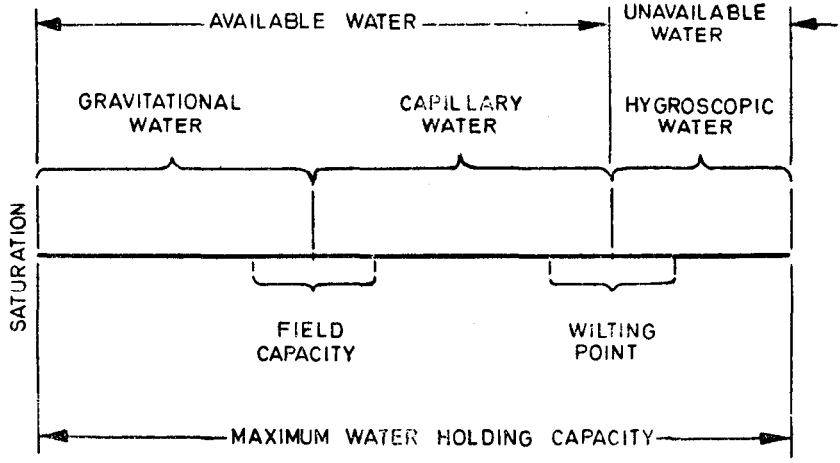


FIG. 3 CLASSIFICATION OF SOIL MOISTURE

2.9.10 *Coefficient of Transmissibility* (T) — Characterizes the ability of the aquifer to transmit water and is given by the following formula:

$$T = kb$$

where

k = coefficient of permeability, and

b = aquifer thickness.

2.9.11 *Combined Water* — Water in the soil held by chemical rather than physical forces.

2.9.12 *Degree of Aeration** — *See* **2.7.9.**

2.9.13 *Degree of Saturation*

a) Ratio between the volume of water and the volume of voids.

b) The ratio expressed as a percentage of the volume of water in a given soil mass to the total volume of voids.

2.9.14 *Field Capacity or Field Moisture Capacity* — The amount of water held in the soil after the excess gravitational water has drained away and after the rate of downward movement of water has materially decreased.

2.9.15 *Field Moisture Deficiency* — The amount of water required to bring the soil moisture content up to the field capacity. It is often expressed in centimetres of water per metre of soil depth.

2.9.16 *Fifteen-Atmosphere Percentage* — The moisture percentage in a soil sample which has been wetted and then brought to equilibrium on a cellulose membrane in the pressure-membrane apparatus at a pressure of 16 kgf / cm^2 (225 lb / in^2) or pF of 4·2, or at 15 atmospheres. This characteristic moisture value for soils is expressed in terms of moisture percentage, dry-mass basis and lies in the wilting range for many soils.

2.9.17 *Free Energy or Free Energy Deficit** — The sum of the soil moisture tension and the osmotic potential of the soil solution.

2.9.18 *Gravitational Head of Water** — Gravitational head of water in soil at a given point is the elevation of the point with respect to an arbitrary datum.

2.9.19 *Gravitational Water* — Water which drains through the soil under the influence of gravity.

2.9.20 *Hydraulic Gradient* — The decrease in hydraulic head per unit distance in the soil in the direction of flow.

2.9.21 *Hydraulic Head* — The hydraulic head has a value at each point in the soil-water system and is defined as the height with respect to a standard datum at which water stands in a riser (or piezometer or manometer) which connects to the point in question. In soil-water, the kinetic energy head associated with velocity is usually negligible compared with the pressure and gravity heads.

2.9.22 *Hygroscopicity* — The tendency to absorb moisture from the atmosphere.

2.9.23 *Hygroscopic Coefficient*

a) The percentage of moisture (on an oven-dry basis) that a soil holds when in equilibrium with an atmosphere saturated with water vapour.

b) Ratio of the mass of water absorbed by a dry soil in a saturated atmosphere at a given temperature to the mass of oven dried soil.

2.9.24 *Hygroscopic Moisture or Hygroscopic Water* — Water absorbed on the surface of soil particles in equilibrium with atmospheric vapour.

2.9.25 *Infiltration* — The movement of water through the surface into the soil.

2.9.26 *Infiltration Rate* — The rate at which infiltration takes place expressed in depth of water per unit of time usually in millimetres per hour.

2.9.27 *Moisture Characteristics** — Refers to the relation between the soil moisture content and soil moisture tension. This may be expressed in terms of the soil moisture characteristic curve or discrete characteristic moisture values, such as the one-third atmosphere percentage and 15-atmosphere percentage.

2.9.28 *Moisture Content* — The ratio expressed as a percentage of the mass of water in a given soil mass to the mass of solid particles under a specified testing condition.

2.9.29 *Moisture Equivalent* — Ratio of mass of water which a soil, after saturation, will retain against a centrifugal force of 1 000 times the force of gravity, to mass of the soil when dry.

2.9.30 *Moisture Gradient* — The rate of change of moisture content of the soil with distance in a specified direction.

2.9.31 *Moisture Holding Capacity or Maximum Water Capacity* — The amount of water required to fill all the pore spaces between the soil particles, that is the upper limit of the possible moisture content. It is often expressed as percentage of the dry mass or as equivalent centimetres of water per metre of soil depth. Also called ' saturation capacity '.

2.9.32 *One-Third Atmosphere Percentage* — The moisture retained in an air-dried and screened sample of soil that has been wetted and then brought to equilibrium on a permeable membrane at a soil moisture tension of 345 cm H_2O or pF of 2·5 or a pressure of 0·345 kgf/cm^2 (4·9 lb/in^2) or at one-third atmospheres. The characteristic moisture value for soils is expressed in terms of moisture percentage, dry-mass basis, and closely approximates the moisture equivalent and field capacity for many soils.

2.9.33 *Optimum Moisture** — The quantity of soil moisture at which plants, as a rule, thrive best.

2.9.34 *Osmosis* — The diffusion which proceeds through a semipermeable membrane, separating two solutions or a solvent and solution, and tending to equalize their concentration.

2.9.35 *Osmotic Potential* — Osmotic pressure of the extracted soil solution.

2.9.36 *Osmotic Pressure* — The excess of pressure that the solvent molecules possess on the side of the pure solvent over the solvent molecules on the solution side of the semipermeable membrane. It may be measured by determining the excess of pressure that has to be applied upon the solution to produce a state of equilibrium in the system in order just to prevent osmosis.

2.9.37 p*F of Soil Water* — The common logarithm of the height in centimetres of water necessary to produce the suction corresponding to the capillary potential. Term introduced by Schofield to express the energy with which water is held by soils.

2.9.38 *Pellicular Water* — Water forming a film around soil particles over adsorption water and held by the forces of molecular attraction but with less strength than adsorption water and without perceptible emission of heat.

Adsorption water is entirely fixed, whereas pellicular water may move from one particle to another.

2.9.39 *Percolation* — The downward movement of water within the soil in response.

2.9.40 *Permanent Wilting Point* — The percentage of moisture in a soil at which the plants wilt and fail to recover when placed in an atmosphere saturated with water vapour. Also called 'wilting percentage'.

2.9.41 *Permeability* — Soil permeability is defined as the quality of a soil horizon that enables water or air to move through it. Quantitatively it is expressed in terms of flow of water through a unit cross section in unit time under specified temperature and hydraulic conditions.

2.9.42 *Pressure Head* — The height of a column of fluid required to develop a given pressure the height at the hydraulic grade line above a point. It is the head represented by the expression p/r where p is pressure and r is mass.

2.9.43 *Relative Wetness** — A term to express the ratio of moisture content to moisture equivalent.

2.9.44 *Saturated Soil** — Soil having all pore spaces filled up with water.

2.9.45 *Saturation Capacity* — *See* **2.9.31.**

2.9.46 *Saturation Extract** — The solution extracted from a soil at its saturation percentage.

2.9.47 *Saturation Percentage** — The moisture percentage of a saturated soil paste, expressed on a dry-mass basis.

2.9.48 *Soil Moisture* — Water held within soil; also the quantity of that water (*see* **2.9.54**).

2.9.49 *Soil Moisture Accretion* — That part of infiltration which is retained in the zone of soil moisture and which does not pass on downward to the water table.

2.9.50 *Soil Moisture Deficit* — The amount of water that must be applied to the soil to bring it to field capacity.

2.9.51 *Saturated Soil Paste* — A particular mixture of soil and water. At saturation the soil paste, as it reflects light, flows slightly when the container is tipped, and the paste slides freely and cleanly from a spatula for all soils at its saturation percentage.

2.9.52 *Soil Moisture Stress* — The sum of the soil moisture tension and the osmotic pressure of the soil solution. It is the suction or negative pressure to which water must be subjected to be at equilibrium through a semi-permeable membrane with the solution in soil.

2.9.53 *Soil Moisture Tension or Moisture Tension** — The equivalent negative pressure or suction in the soil moisture. This tension may be expressed in any convenient pressure units. In the 1 atmosphere tension range it is the negative pressure to which water in a porous cup must be subjected in order to bring the water in the cup into static equilibrium through the porous wall with the moisture in the soil. Tension does not include osmotic pressure values.

2.9.54 *Soil Water* — Suspended water in uppermost belt of soil of zone of aeration lying near enough to surface to be discharged into atmosphere by transpiration of plants or by evaporation from the soil; includes hygroscopic water, capillary and non-capillary water. Also called ' soil moisture '.

2.9.55 *Total Soil Moisture Stress** — The osmotic and physical force with which water is held in the soil.

2.9.56 *Unavailable Soil Moisture or Unavailable Water** — Soil moisture held so firmly by molecular forces that it cannot ordinarily be absorbed by plant roots with sufficient rapidity to produce growth.

2.9.57 *Unsaturated Soil* — Soil in which the pore spaces are only partially filled with water.

2.9.58 *Water-Depth Ratio* — The moisture content of soil in terms of the equivalent depth of free water per unit depth of soil.

2.9.59 *Water of Imbibation* — The moisture associated with soil colloidal material.

2.9.60 *Zone of Aeration, Aeration Zone, Zone of Suspended Water Unsaturated Zone* — Zone of earthen materials or rock from which the ground and capillary water has drained out, leaving the interstices filled with air and water held or suspended by molecular forces, such as cohesion, adhesion and surface tension.

3. MICROBIOLOGY

3.1 Actinomycetes* — One-celled organisms that are a higher form of plant life than bacteria and are thread like in shape.

3.2 Aerobic Organisms — Organisms using oxygen for the oxidation of substates.

3.3 Algae — Autotrophic thallophytes having simple mode of reproduction. They contain chlorophyll.

3.4 Aminization* — Microbiological decomposition of protein to amino compounds.

3.5 Ammonification* — Microbiological transformation of nitrogenous compounds to ammonia nitrogen.

3.6 Anaerobic Decomposition* — The incomplete breakdown of organic material by bacteria in the absence of free oxygen.

3.7 Anaerobic Organisms — Organisms oxidizing substrate in absence of oxygen for gaining energy.

3.8 Anthraciny* — The breakdown of organic material by fungi and the further transformation of the results by passage through the alimentary canals of insects and worms, giving a dark coloured soil.

3.9 Autotrophic Organisms — Organisms which obtain their energy by the oxidation of inorganic compounds and use inorganic materials, such as salts, water and carbon dioxide, for their development. Most of them use solar energy.

3.10 Azotobactor* — A genus of bacteria including those species capable of fixing free nitrogen.

3.11 Carbon-nitrogen Ratio — Mass or percentage ratio of organic carbon to total nitrogen in a soil or plant.

3.12 Denitrification* — The complete reduction of nitrates to atmospheric nitrogen and oxides of nitrogen.

3.13 Edaphone* — The whole living community of the soil.

3.14 Fulvic Acid* — The alkali-soluble fraction of humus not precipitated by acid.

3.15 Fungi — These are a group of primitive plants which lack chlorophyll and are mostly saprophytic or parasitic. These reproduce by fission, budding, fragmentation and scattering of spores.

3.16 Heterotraphic Organisms — Organisms which obtain their carbon from complex organic compounds and their energy from the oxidation of organic compounds.

3.17 Humic Acid* — Organic matter extractable from soil by alkali and precipitated by acid.

3.18 Humification* — The process of the formation of humus.

3.19 Humin* — The alkali-insoluble fraction of humus.

3.20 Humus* — Dark, brown-black colloidal organic matter of the soil, and so decomposed that it has lost all signs of its original structure; the organic portion of the soil.

3.21 Hymatomelanic Acid* — The alcohol-soluble fraction of humic acid.

3.22 Mineralization* — Release of mineral matter from organic combination by microbial decomposition.

3.23 Mycorrhiza* — Symbiotic association of fungi and roots.

3.24 Nitrification* — Biological oxidation of nitrogenous matter to nitrate.

3.25 Nitrogen Fixation — Conversion of atmospheric nitrogen into a form available for plant use. Nitrogen may be fixed by bacteria in the nodules of leguminous plants and by blue-green algae and aerobic and anaerobic bacteria in the soil.

3.26 Non-symbiotic Bacteria — Organisms that live in the soil without any association with other plants.

3.27 Photosynthesis — Synthesis of carbohydrates and other organic molecules from carbon dioxide and water by green organs in the presence of sunlight as the source of energy.

3.28 Stable Humus* — The part of humus that is resistant to microbial attack (and is insoluble in acetyl bromide).

3.29 Sulfofication, or Sulphofication* — The oxidation of sulphur (sulfur), either free or from organic or inorganic compounds, into oxides of sulphur largely through the action of micro-organisms. In the soil these oxides are quickly changed into sulphites or sulphates.

3.30 Symbiosis — Mutually beneficial association of two organisms.

3.31 Symbiotics Bacteria — Organisms that live in the nodules on the roots of legumes and take nitrogen from the soil air and supply it in reduced form to the host plant on which they live.

3.32 Synthesis — The building up of complex organic molecules from the simple molecules.

3.33 Thallophyta (Cryptogamia)* — A major division of the plant kingdom including fungi, algae, bacteria and a number of small groups. The plant body is a thallus, but varies a good deal in complexity and the plants do not produce flowers or seeds.

3.34 Thallus — A plant body without a clear stem and roots; it may be a single cell, a filament of cells, or a complicated branching multicellular structure, in which case it has no true root.

3.35 Unstable Humus* — Readily decomposable part of humus, corresponding approximately to that soluble in 80 percent sulphuric acid.

4. BOTANICS

4.1 Available Nutrients* — The amount of plant nutrients present in the soil in a condition available to plants.

4.2 Baule Unit* — Named after the scientist Baule, a unit of growth factor that will produce 50 percent of the maximum possible yield or yield producing capacity.

4.3 Burning* — Destruction of organic matter on soils by fire. Also the injury to seeds or plants from too high a concentration of fertilizer or spray or dusting material for control of insects or disease.

4.4 Critical Percentage* — The point (percentage of the limiting element in the plant) above which there is luxury consumption and below which there is poverty adjustment.

4.5 Daily Mean Soil Temperature* — The average of the values observed during a day (at any regular intervals or maximum and minimum) of soil temperature.

4.6 Daily Range of Soil Temperature* — The difference between maximum and minimum values of soil temperature.

4.7 Essential Elements or Primary Elements — Those elements that must be present for a plant to grow. These may be 'primary' (those needed in large quantity) or 'minor' elements (those needed in small amount).

4.8 Fertility

a) The ability of soil to aid plant growth with supply of nutrients in desirable proportions and amounts.

b) Quality of soil that enables it to provide compounds, in adequate amount and in proper balance, for growth of specified plants, when other growth factors, such as light, moisture, temperature and the physical conditions of the soil are favourable.

4.9 Foliar Diagonosis* — Estimation of plant-nutrient requirement based on analysis of leaves.

4.10 Halophobe* — A plant which will not grow in a soil containing any appreciable amount of salt.

4.11 Halophytes — A plant which lives in soil containing an appreciable amount of common salt or of other inorganic salts.

4.12 Hydrophytes* — Plants that grow in water or in wet soils partially or wholly immersed.

4.13 Hygroscopic — Materials which absorb water or moisture from the atmosphere.

4.14 Indicator Plants — Plants which reflect specific growth conditions either by their presence or by character of growth.

4.15 Legume — A leguminous plant is one grown as a forage or green manure crop, such as various pulses, namely, lucern, berseem, soyabeans, etc.

4.16 Lodging* — The inelastic displacement of the plant from the vertical or initial position.

4.17 Luxury Consumption — The consumption of an element above the point at which the element increases very small plant growth, resulting in an increase in content of that element in the plant.

4.18 Mesophytic Vegetation — Plants growing in an area with optional moisture not having both extremes of moisture or drought; plants which are immediate between ' hydrophytes ' and ' xerophytes '.

4.19 Non-symbiotic — The living together of dissimilar organisms with no benefit to either.

4.20 Photosynthesia — *See* **3.27.**

4.21 Phreatophytes — Deep-rooted plants which obtain their water from the water table.

4.22 Plant Food* — The organic compounds, elaborated within the plant, which nourish its cells (sometimes used loosely as an equivalent of plant nutrient).

4.23 Plant Nutrients — The elements taken in by the plant, essential to its growth, and used by it in the elaboration of its food and tissue. These include nitrogen, phosphorous, calcium, potassium, sulphur, iron, manganese, boron, copper, zinc and others obtained from the soil and carbon, hydrogen and oxygen, obtained from the air and water.

4.24 Productivity (of Soil)* — The capacity of a soil for producing a specified plant or sequence of plants under a specified system of management. It emphasizes the capacity of soil to produce crops and should be measured in terms of unit yields.

4.25 Response Curves* — Curves showing the relationship between yield and magnitude of any growth factor, such as nitrogen or phosphorous supply.

4.26 Soil-Temperature* — The temperature values at any time and at every location in the root zones of the plants being grown.

4.27 Symbiotic — The living together of dissimilar organisms, with benefit to both.

4.28 Trace Elements — The essential elements needed only in small amounts (iron, copper, zinc, manganese, boron, molybdenum, etc). Also referred to as secondary or minor or micronutrients.

4.29 Transpiration Efficiency — The increase in dry weight of plant per unit weight of water transpired.

4.30 Tolerant — Capable of withstanding a condition usually unfavourable. Some plants are tolerant of soil acidity and others are tolerant of soil alkalinity.

4.31 Zerophytes or Xerophytes — Plants which can subsist with a small amount of moisture, as a desert plant or plant under conditions where excess of salts makes it difficult to take in water.

5. RECLAMATION OF WATERLOGGED, INUNDATED AND SALT AFFECTED SOILS

5.1 General Terms

5.1.1 *Arterial Drainage** — Drainage pertaining to main channels, such as rivers, streams and large watercourses.

5.1.2 *Artificial Drainage** — Drainage laid by human efforts.

5.1.3 *Capillary Water — See* **2.9.5.**

5.1.4 *Drainage* — Process of removing ground water or surface water by artificial or natural means.

5.1.5 *Drainage Area, Drainage Basin, Catchment, Catchment Area, Catchment Basin, River Basin* — The area from which a lake, stream or waterway and reservoir receives surface flow which originates as precipitation.

5.1.6 *Drainage Channel* — An open channel, either artificial or natural for carrying off surplus ground or surface water.

5.1.7 *Drainage Coefficient or Drainage Modulus** — The discharge of an underdrainage system expressed in millimetres of depth of water which must be removed from the drainage area in 24 hours.

5.1.8 *Drainage Head** — The difference between the level of water in a drain at any given point and the lowest level of the land.

5.1.9 *Drainage System* — A system comprising a main drain, its branches and subsidiary drains.

5.1.10 *Free Water — See* **2.9.19.**

5.1.11 *Ground Water** — Surface water occupying the zone of saturation which is free to move under gravity. The term is not meant to include a temporary saturated zone at or near the ground surface that is produced immediately after precipitation or by the awing. In a strict sense the term applies only to water below the water table.

5.1.12 *Inundated Land** — Land covered with or subject to overflows water, such as from floods and tides.

5.1.13 *Isopachs** — Lines of equal ground-water rise or fall during a specified period of time.

5.1.14 *Isopiestic Lines* — Contour drawn on the piezometric surface of an artesian aquifer.

5.1.15 *Land (Agricultural) Drainage* — The disposal of storm water from agricultural lands and removal of water excess from agricultural lands to prevent or to relieve waterlogging, the accumulation of harmful amounts of salts and deterioration of soil structure.

5.1.16 *Natural Drainage** — As applied to a given area, refers to the natural condition of that area for disposing of surface water from it.

5.1.17 *Natural Runoff* — Natural runoff from an area is that part of the runoff from it which it will discharge without artificial works intended to collect the waters which fall upon it.

5.1.18 *Non-contributing Area, Closed-Drainage Area**

a) Area in which surface flow collects in sinks or lakes having no surface outlet either to other streams or to the sea.

b) In hydrology, that portion of a drainage area that, because of physical characteristics or topography, does not contribute surface runoff into a river system. In determining drainage basin yields, a noncontributing area is that which does not contribute either surface or ground water runoff.

5.1.19 *Percolation* — *See* **2.9.39.**

5.1.20 *Reclamation** — Act or process of reclaming swampy, marshy, deteriorated, desert and virgin lands and making them suitable for cultivation or habitation; also conversion of foreshores into properly drained land for any purpose, either by enclosure and drainage, or by deposition of material thereon.

5.1.21 *Runoff* — That portion of the precipitation which is not absorbed by the deep strata but finds its way into the streams after meeting the persistent demands of evapo-transpiration including interception and other losses. It includes surface runoff received into the channels after rainfall, delayed runoff that enters the streams after passing through portion of the earth, and other delayed runoff that has been temporarily detained as snow-cover and stored in natural lakes or swamps.

5.1.22 *Saturated soil* — *See* **2.9.44.**

5.1.23 *Soil Water** — *See* **2.9.54.**

5.1.24 *Waterlogging**

a) State of land in which the subsoil water table is located at or near the surface with the result that the yield of crops commonly grown on it is reduced well below the normal for the land, or, if the land is not cultivated, it cannot be put to its normal use because of the high subsoil water table.

b) A condition of land where the ground water stands at a level that is detrimental to plant growth. It may result from excessive irrigation or seepage, coupled with inadequate drainage.

5.1.25 *Waterlogged Land** — Land effected by waterlogging.

5.1.26 *Water Table** — The upper surface of a zone of saturation, where the body of ground water is not confined by an overlying impermeable formation. Whereas overlying confining formation exists, the aquifer in question has no water table.

5.1.26.1 *Free water elevation (ground water surface), free water surface (ground water elevation)* — Elevations at which the pressure in the water is zero with respect to the atmospheric pressure.

5.2 Subsurface Drainage

5.2.1 *Box Drain* — A small rectangular drain constructed of brick, concrete, rubble masonry, wood, or other suitable material.

5.2.2 *Composite System* — A combination of systems of tile drain arrangement, such as the herringbone and grid-iron system (*see* Fig. 4).

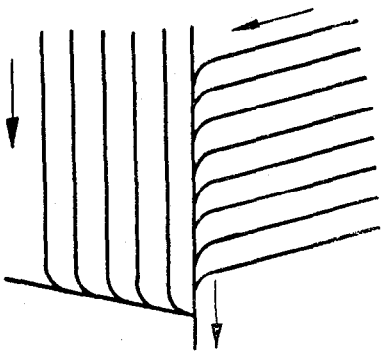


FIG. 4 COMPOSITE SYSTEM

5.2.3 *Cutoff System or Intercepting System** — A drainage system for draining seepage along hill sides; tiles are placed along the hillside to intercept the seepage water to prevent it from reaching the bottom land.

5.2.4 *Double-Main System* — A system of drains, similar to a herringbone system, except that two main drains are used, one on each side of the depression (*see* Fig. 5).

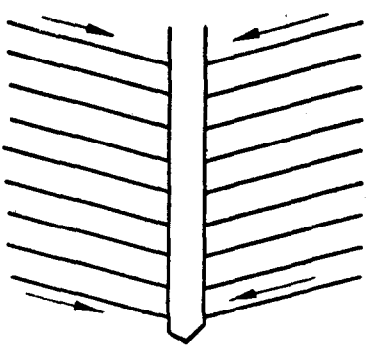


FIG. 5 DOUBLE MAIN SYSTEM

5.2.5 *Drain Tile* — Pipe of burnt clay, concrete, etc, in short lengths, usually laid with open joints to collect and remove drainage water.

5.2.6 *Gridiron System* — A form of layout of a system of drains, generally used for flat lands or lands with a uniform slope, where the field drains are constructed in parallel lines along the direction of the slope and join the main drain at its bottom (*see* Fig. 6).

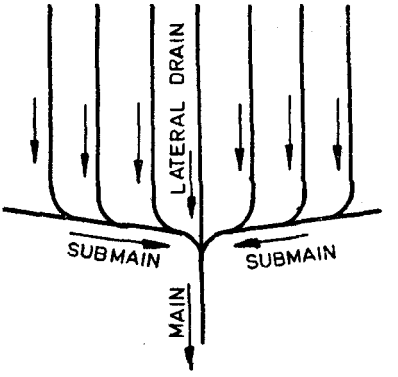


FIG. 6 GRIDIRON SYSTEM

5.2.7 *Grouping System** — A system similar to the natural system, except that a few short laterals may be provided in wet areas or ponds along the system (*see* Fig. 7).

5.2.8 *Head of a Drain** — The upstream end of a drain.

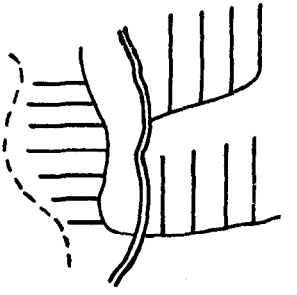


FIG. 7 GROUPING SYSTEM

5.2.9 *Herringbone System* — A form of layout of a system of drains, generally used for lands lying on both sides of a narrow depression or swale, and consisting of a main or subdrain along the depression with parallel lines of field drains sloping toward the main drain, and joining it at staggered intervals (*see* Fig. 8).

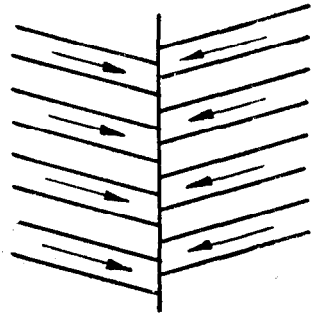


FIG. 8 HERRINGBONE SYSTEM

5.2.10 *Intercepting Drain* — A drain constructed at the upper end of the area to be drained, to intercept surface or ground water flowing towards the protected area from higher ground, and carry it away from the area. Also called 'curtain drain'.

5.2.11 *Lateral Drain** — A single line which collects the water from the soil and empties into a main or sub-main. Also called 'collector drain'.

5.2.12 *Main Drain or Conducting Drain** — A principal drain which serves as an outlet to all subsidiary drains which discharge into it.

5.2.13 *Mole Drainage** — The method of draining soil by means of mole drains.

5.2.14 *Mole Drains** — Cylindrical drains formed in the subsoil by pulling a mole plough usually at a depth of 60 to 70 cm.

5.2.15 *Mole Plough** — A plough by which a steel ball following a pointed-iron shoe makes an underground channel, resembling the track of a mole, to serve as a drain.

5.2.16 *Natural Systems* — A system of drains, similar to the trunk system, but covering a much larger area. The main drains are located along the depressions, or low spots, to conform to topography. Such systems are generally installed in areas of rolling or broken topography.

5.2.17 *Parallel System** — A system of drains with long parallel, laterals emptying into a single main drain.

5.2.18 *Pipe Outlet** — A subsurface drainage for removing water from a ponded area where the drains or field ditches are not practicable.

5.2.19 *Relief System** — A system which consists of a series of lateral tile lines laid out in a grid or herringbone pattern, each line being connected to a main trunk which in turn outlets into an open ditch.

5.2.20 *Rubble Drain* — A small shallow trench filled with coarse rubble, clinker or similar material, with or without field drain pipes.

5.2.21 *Sink Hole Drainage System** — A system of tile drains similar to the outoff system and used for the same purpose, namely, to intercept seepage water, but has, in addition, wells dug at regular intervals to let the water come up from a lower stratum and enter the drain. Also known as 'sink-hole drainage' (*See* Fig. 9).

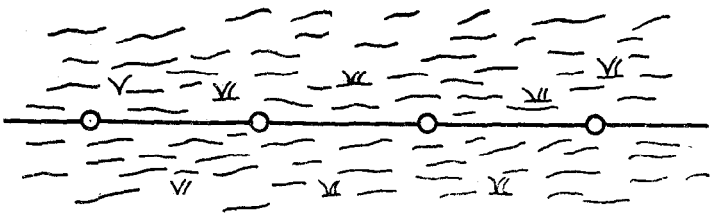


FIG. 9 SINK HOLE DRAINAGE SYSTEM

5.2.22 *Sub-lateral** — A line collecting the water from the soil and discharging it into a lateral. Also called 'branch'.

5.2.23 *Sub-main** — A subsidiary drain which discharges into a main drain and which serves as an outlet to all the laterals which discharge into it.

5.2.24 *Subsurface Drain* — A conduit below the surface of the ground.

5.2.25 *Subsurface Drainage* — The removal of surplus or excess ground water, it is accomplished by means of natural drainage (for gravelly subsoil) or by artificial means, such as drains placed under the surface.

5.2.26 *Underdrained** — Land is said to be underdrained if tile laterals are spaced wider than desirable.

5.2.27 *Vertical Drainage or Inverted Well** — Disposal of drainage water through wells into a porous layer of earth or an open rock formation.

5.2.28 *Zigzag System** — System in which field drains as well as mains are constructed zigzag to reduce high velocities (*see* Fig. 10).

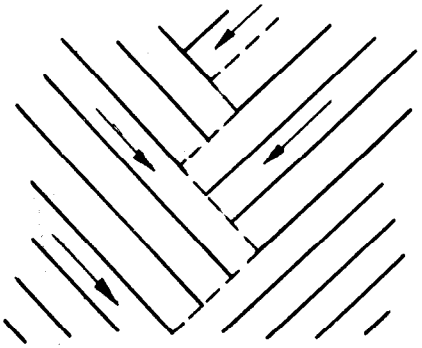


FIG. 10 ZIGZAG SYSTEM

5.3 Surface Drainage

5 3.1 *Annular Drainage Pattern** — A ring like drainage pattern subsequent in origin and associated with maturely dissected dome or basin structures (*see* Fig. 11).

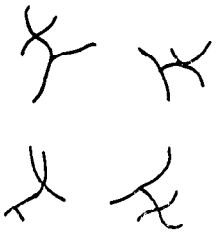


FIG. 11 ANNULAR DRAINAGE PATTERN

5.3.2 *Anastomatic Drainage Pattern* — A drainage pattern characterized by a network of interlocking channels found on flood plains and deltas (*see* Fig. 12).

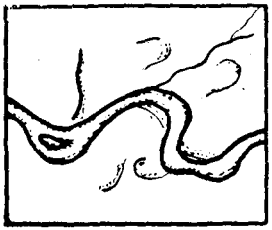


FIG. 12 ANASTOMATIC DRAINAGE PATTERN

5.3.3 *Bedding* — A method of surface drainage of land of narrow width in which shallow drains or dead burrows (depth varying from 15 to 45 cm) run parallel to the prevailing land slope. Suitable on flat slopes of less than 1·5 percent (*see* Fig. 13).

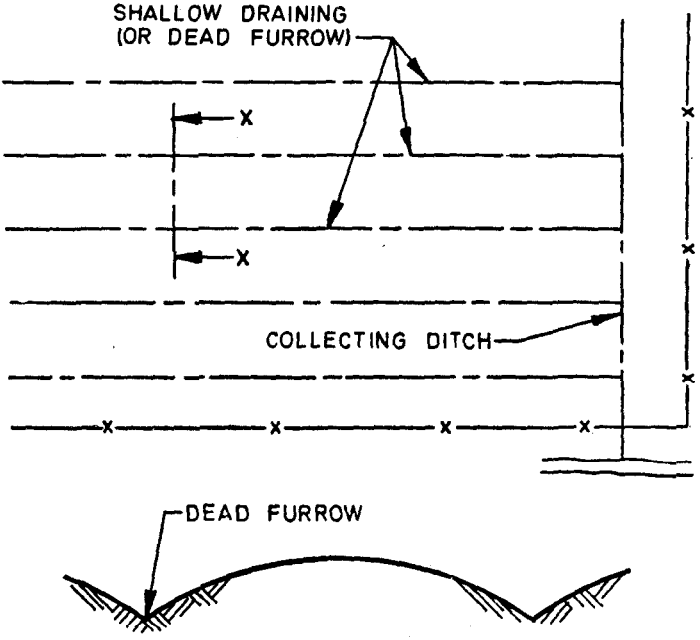


FIG. 13 BEDDING

5.3.4 *Carrier Drain** — Open or subsurface drain which receives the water from the relief drain and may in addition be also functioning as a relief drain for the area through which it passes.

5.3.5 *Collecting Ditch* — A field ditch which receives water from the dead furrows or small field ditches and conducts it to an outlet ditch (*see* Fig. 13).

5.3.6 *Dead Furrow* — A double furrow left in the middle of the field or between two lands in ploughing (*see* Fig. 13).

5.3.7 *Dendritic Drainage Pattern* — Drainage pattern treelike in form generally typical of flat homogeneous lithology and indicative of easily corrodable rock material and horizontal structure (*see* Fig. 14).

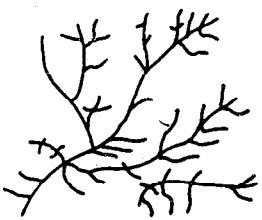


FIG. 14 DRAINAGE PATTERN

5.3.8 *Dichotomic* — A diverging branching pattern found on alluvial fars and deltas (*see* Fig. 15).

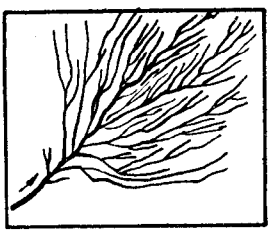


FIG. 15 DICHOTOMIC

5.3.9 *Diversion Ditch** — A ditch constructed to intercept the water which would otherwise flow into an area from the land outside it and to carry that water to the outlet stream below.

5.3.10 *Drainage Density** — The average length of streams, natural or artificial, per unit area within the basin.

5.3.11 *Drainage Pattern** — A special arrangement of natural drainages of an area and controlled by its slope, the resistance of the formations and their structures.

5.3.12 *Drainage Texture* — The number and relative spacing of streams (drainage courses) per unit area of a basin or sub-basin. It has two components drainage density and stream frequency.

5.3.13 *Drainage Type Terraces or Cross-Slope Ditch System** — A system of ditches for the drainage of sloping land. Ditches in this system usually function both for surface drainage and for erosion control. Where designed specifically for the control of erosion, these ditches are called ' terraces ' (*see* Fig. 16).

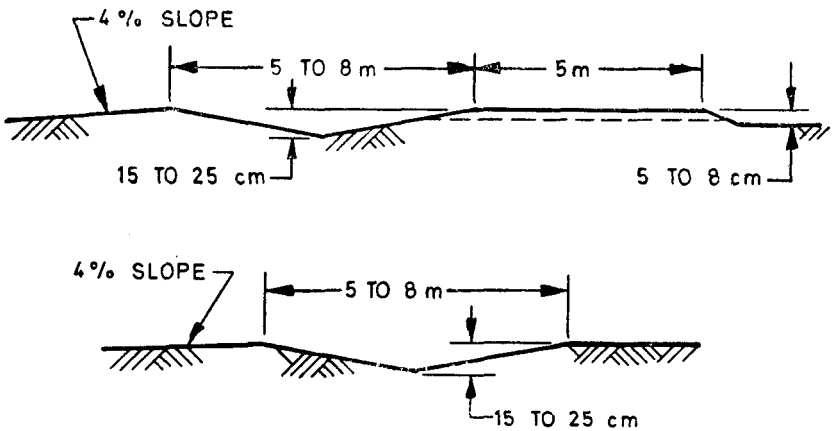


FIG. 16 DRAINAGE-TYPE TERRACES

5.3.14 *Intercepting Drain — see* **5.2.10**.

5.3.15 *Land Grading** — The operation of producing a plane land surface with a continuous slope. Also called ' land shaping or land smoothing '.

5.3.16 *Open-Channel Drainage** — Drainage accomplished by open channels of ditches.

5.3.17 *Open Ditches or Open Drains** — Open drain which provide outlets for tile drains and tributary ditches and remove drainage water directly.

5.3.18 *Outlet Ditches or Outlet Channels** — Large open ditches whose primary function is to collect from large areas all free surface flow resulting from any cause, and the discharge from tile drainage systems and to carry it to final outlets (rivers, lakes, seas, etc).

5.3.19 *Parallel Drainage Pattern** — Drainage pattern in which streams or their tributaries are parallel or nearly parallel to each other (*see* Fig. 17).

FIG. 17 PARALLEL DRAINAGE PATTERN

5.3.20 *Ponding** — The condition produced by surface water collecting in shallow pocket in an area.

5.3.21 *Radial Drainage Pattern** — Drainage pattern resembling the spokes of a wheel in which drainage channels flow radially either outward from a peak or inward toward a basin (*see* Fig. 18).

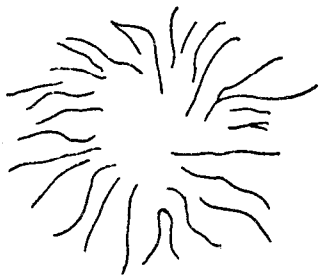


FIG. 18 RADIAL DRAINAGE PATTERN

5.3.22 *Rectangular Drainage Pattern** — Drainage pattern showing the influence of the angular pattern of rock joints (*see* Fig. 19).

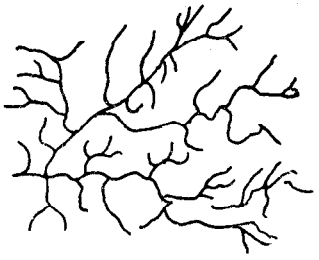


FIG. 19 RECTANGULAR DRAINAGE PATTERN

5.3.23 *Rectilinear Drainage Pattern* — Man-made rectangular form of irrigation ditches.

5.3.24 *Relief Drain* — Open or subsurface drain provided to relieve a saturated soil of its superfluous water which percolates from the soil into it. Also called 'seepage drain'.

5.3.25 *Seepage Drain* — *see* **5.3.9**.

5.3.26 *Surface-cum-Seepage Drain** — Drains which, though carrying a continuous seepage discharge, are designed to deal also with storm water in the area they traverse.

5.3.27 *Surface Drainage* — The removal of surplus or excess surface water collecting on land. It is accomplished by natural or artificial means, such as levees, open ditches and terracing.

5.3.28 *Surface Drains** — Drains normally used for the removal of excess surface irrigation water from the lower portions of the field, or for the disposal of storm waters.

5.3.29 *Trellis Drainage Pattern** — Drainage pattern comparable to a vine, on a garden trellis (*see* Fig. 20). Also called 'grapevine drainage pattern'.

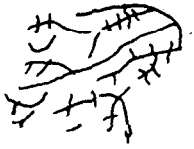


FIG. 20 TRELLIS DRAINAGE PATTERN

5.4 Evacuation of Water

5.4.1 *Backwater** — A water reserve obtained at high tide and to be discharged at low tide.

5.4.2 *Bottom Land** — Low-lying land.

5.4.3 *Diurnal* — Daily, recurring once each day.

5.4.4 *Diurnal Range* — The difference between the mean higher high and the mean lower low waters.

5.4.5 *Diurnal Tides** — Tides requiring a full day to complete their cycle, that is only one high and one low water in each lunar day.

5.4.6 *Duration of Ebb Tide* — *See* **5.4.8.**

5.4.7 *Duration of Flood Tide* — *See* **5.4.8.**

5.4.8 *Duration of Tide** — Duration of flood tide or a rising tide is interval of time from low water to following high water; and duration of ebb tide or falling tide is interval of time from high water to following low water. Together, they cover a period of 12·42 hours for a semi-diurnal tide; the duration of the flood tide and duration of the ebb tide are each approximately 6·21 hours, but the duration may be modified by the presence of non-tidal flow. In a river, duration of ebb tide is usually longer than duration of flood tide because of fresh water drainage. Also called 'duration of rise' and 'duration of fall of tide'.

5.4.9 *Dyke** — An artificial bank built along a river for the purpose of protecting adjacent land from inundation by flood. Also called 'embankment', 'stop bank' or 'bund' [*see also* IS : 4410 (Part III)-1967†].

5.4.10 *Ebb Tide* — The occurrence of falling water surface of a tide.

5.4.11 *Flood Tide* — The occurrence of rising water surface of a tide.

5.4.12 *Foreshore** — The portion of bank or shore, lying adjacent to water and sloping gradually to it, which is falling dry between high water and low water.

5.4.13 *Great Diurnal Range* — Difference in elevation between mean higher high waters and two low waters in each lunar day.

5.4.14 *Littoral Current** — Current that moves along the seashore parallel to shore line.

5.4.15 *Littoral Drift** — Movement of material along the sea coast due to littoral current.

†Glossary of terms relating to river valley projects: Part III River and river training.

5.4.16 *Lunar Day* — The interval between two successive transits of the moon's centre over the same meridian.

5.4.17 *Mean Tidal Range* — Difference in elevation between mean high water and mean low water; ' spring range ' and ' neap range ' are the near ranges of spring tides and neap tides respectively.

5.4.18 *Mixed Tides** — Those which are preponderantly semi-diurnal at sometimes and diurnal at others, according to the declination of the moon.

5.4.19 *Neap Range — See* **5.4.17.**

5.4.20 *Neap Tide* — Tide of small amplitude occurring twice during a lunar month, near the time of quadrature of the moon with the sun, that is, when the resultant tractive force active upon the Earth is at a minimum.

5.4.21 *Non-tidal Current** — Current brought about by causes independent of the tides and includes the permanent current in the general circulatory systems of the sea as well as temporary current arising from meteorological conditions; also, river current.

5.4.22 *Polder** — A tract of low land reclaimed from the sea, or other body of water, by dikes, etc. In the polder, the runoff is controlled by sluicing or pumping and the water table is independent of the water table in the adjacent areas.

5.4.23 *Tide Station* — A place at which tide observations are taken. It is termed a primary tide station when continuous observations are to be taken over a number of years to obtain basic tidal data for the locality. A ' secondary tidal station ' is one which is operated over a short period of time to obtain data for a specific purpose.

5.4.24 *Secondary Tidal Station — See* **5.4.23.**

5.4.25 *Semi-diurnal Tides** — Tides requiring approximately one-half lunar day to complete their cycle, that is, two high waters and two low waters in each lunar day; predominating type of tide throughout the world is semi-diurnal.

5.4.26 *Sill Dam** — A dam generally of strong brushwood matters weighted with heavy rip-rap, constructed on the sea side in the foreground, for the purpose of guarding against scouring of the sea bottom by the over-flowing water and consequent damage to the structures and other works.

5.4.27 *Slack Water or Slack Tide* — Tide water during the period where there is no horizontal motion of water at the surface.

5.4.28 *Solar Day* — The interval between two successive transits of the sun's centre over the same meridian.

5.4.29 *Spring Range — See* **5.4.17.**

5.4.30 *Spring Tide* — Tide of large amplitude occurring twice during a lunar month when resultant tractive force of the sun and the moon acting upon the earth is at a maximum.

5.4.31 *Stream Frequency* — Total number of streams of a basin divided by its total area.

5.4.32 *Tidal Bench Mark* — A bench mark set as reference to a tide staff at a tidal station and the elevation of which is determined with relation to the local tidal datum.

5.4.33 *Tidal Bore** — High crested roaring wave caused by rushing of flood tide up a tidal river or narrow estuary or by meeting of tides.

5.4.34 *Tidal Current** — Current caused by the tide-producing forces of the moon and the sun and is a part of the same general movement of the sea that is manifested in the vertical rise and fall of the tides.

5.4.35 *Tidal Datum** — A datum defined by a phase of the tide.

5.4.36 *Tidal Flood Strength* — Tidal flood current at the time of maximum velocity.

5.4.37 *Tidal Marsh** — Low, flat marsh land traversed by interlacing channels and tidal sloughs and usually inundated by high tides.

5.4.38 *Tidal Outlet** — A structure to control the overflow of tidal water.

5.4.39 *Tidal River** — A river in which flow and water surface slope are affected by tides. In some rivers, the effect may extend a hundred miles or more upstream from the mouth, and may be sufficient to reverse temporarily the direction of flow of the stream.

5.4.40 *Tidal Tables** — Tables which give daily predictions of the times and heights of the tide.

5.4.41 *Tidal Water Level** — Altitude reached by tidal surface.

5.4.42 *Tide** — The periodic rise and fall of the water due principally to the gravitational attraction of the sun and the moon.

5.4.43 *Tide Day** — The interval between the arrival of any two consecutive high waters of the direct tide (or of the opposite tide) at any given place, its average length being 24 hours 51 minutes.

5.4.44 *Tide Gate** — An opening, through which water may flow freely in one direction, but which closes automatically and prevent the water from flowing in the other direction.

5.4.45 *Tide Head** — The head of the stretch of land up to which the influence of the tide is felt or the utmost limit of land coming within the zone of influence of the tide.

5.4.46 *Tide Land or Tidal Land* — All coastal areas that are situated above mean low tide and below mean high tide, particularly as such areas are alternately uncovered and covered by the ebb and flow of the ordinary daily tides.

5.4.47 *Tide Mark** — A high water, or rarely low water, mark left by tidal water of a flood; the point it reaches; also, a mark placed to indicate this point.

5.4.48 *Tide Range* — The difference in level between high water and low water of a tide. The range is specific to a particular tide if consecutive high and low water are used. Otherwise, the range can refer to extremes of high and low water over any specified period of time. (Tidal amplitude may be regarded as the difference between the water level at high or low water and mean sea level at a given point or the mean elevation of the tide.)

5.4.49 *Tide Station* — *See* **5.4.23.**

5.4.50 *Tideway** — A channel in which the tide runs; also a rush of tidal water through a channel or stream.

5.4.51 *Tropic Tide** — The tide occurring semi-monthly when the effect of the moon's maximum declination is greatest.

5.4.52 *Warping** — A process of allowing the tide to overflow low lying lands so as to deposit thereon the silt which it carries in suspension.

5.5 Organic and Peat Soils

5.5.1 *Bog Soil** — Muck or peaty surface soil underlain by peat developed under swamp or marsh type of vegetation.

5.5.2 *Compost** — A mingled and decomposed mixture for manuring. Plant parts, lime, soil, or commercial fertilizer that may be added, mixed, moistered and placed in a pit and decomposed.

5.5.3 *Dressing* — Application of manure, compost or earth to the soil surface.

5.5.4 *Fibrous Peat** — Peat formed from sedges of various kinds, mosses, reeds and other grasses, cattails and their mixtures. Hence the names moss peat, sedge peat, reed peat, etc.

5.5.5 *Half Bog Soil* — Swampy or marshy soil with an organic horizon overlying gray mineral soil.

5.5.6 *Heathland** — Shallow acid peat land.

5.5.7 *Humification* — *See* **3.18.**

5.5.8 *Lacustrine, Lowmoor or Fen Soil** — Peaty land, concave in shape formed in low-lying positions under anaerobic conditions and containing much sedimentary material.

5.5.9 *Liming** — Manuring (amendment) of the soil by lime.

5.5.10 *Mild Humus or Mull** — Forest humus layer of mixed organic and mineral matter with a gradual transition to the underlying mineral horizon.

5.5.11 *Muck* — Fairly well decomposed organic material, relatively high in mineral content, dark in colour, and accumulated under conditions of imperfect drainage.

5.5.12 *Peat** — Under decomposed or partly decomposed organic matter developed essentially under wet anaerobic conditions.

5.5.13 *Peat Clay or Organic Silt** — The lowest layer of a moor in which mineral and organic constituents are mixed.

5.5.14 *Raw Humus or Duff* — The more or less firm organic layer in forests. It consists of fallen vegetative matter in the process of decomposition including everything from pure humus below to the litter on the surface. Duff is a general, non-specific term.

5.5.15 *Slush** — Soft mud or mire used as organic manure in some peat areas.

5.5.16 *Swamp* — An area of moist or wet land, with water standing on or just below the surface of the ground, usually covered with a heavy and dense growth of vegetation. The term is usually applied to rather large freshwater areas (*see also* **5.4.37**).

5.5.17 *Woody Peat** — Peat, usually loose and non-fibrous, built up from partially decomposed remains of deciduous and coniferous trees and their undergrowth.

5.6 Reclamation of Deteriorated Soils

5.6.1 *Acid Soil** — A soil having an acid reaction (below *p*H 7·0). A soil having a preponderance of H^* ions over OH ions in the soil solution.

5.6.2 *Acid Saline Soils* — A soil having a *p*H value of less than 7 0 and electrical conductivity of more than 4 mhos/cm at 25°C in saturation extract.

5.6.3 *Agricultural Lime* — A compound of calcium and/or magnesium used to correct the harmful effects of acid soils on plant growth.

5.6.4 *Agricultural Slag* — Usually granulated slag in sizes 6 mm to dust, which is mixed with soil for the purpose of aeration and neutralizing acid soils.

5.6.5 *Alkali Flat** — A sterile plain containing an excess of alkali, typically at the bottom of an underdrained basin in an arid region.

5.6.6 *Alkalinization (Alkalinisation)* — The formation of sodium adsorption compounds through base exchange.

5.6.7 *Banding Fertilizer** — The method of placement of commercial fertilizer in concentrated strips. Usually below the soil surface.

5.6.8 *Black Alkali Soil** — A term introduced by Hilgard who divided the alkali soil into two types : white alkali and black alkali.

NOTE — In the current literature, the term 'white alkali soil' is used as synonymous to 'saline soil' and 'black alkali soil' to 'alkali soil'.

5.6.9 *Bog Iron Or Bog Ore** — Hydrated iron oxide originating in marshy places.

5.6.10 *Calcareous Soil** — Soil that is alkaline because of the presence of free calcium or magnesium carbonate or both.

5.6.11 *Caliche** — A more or less cemented deposit of calcium carbonate or of mixed calcium and magnesium carbonates, characteristic of soils of warm or hot desert and semi-desert regions (popularly known as *KANKAR*).

5.6.12 *Capillary Fringe** — The zone immediately above the water table in which water is held above the water table by capillarity.

5.6.13 *Carrier** — Fertilizer materials are spoken as carrier. Superphosphate, rock phosphate, and bones are called carriers of phosphorous. Similarly, muriate and sulphate of potash and kainite are said to be carriers of potassium.

5.6.14 *Commercial Fertilizer* — Impure salts of the elements (nitrogen, phosphorous and potassium) used as fertilizers. They may be of low analysis. (1-2 percent or more) or high analysis (18-20 percent or more).

5.6.15 *Complete Fertilizer* — A fertilizer containing all three of the fertilizer elements (nitrogen, phosphorous and potassium) in sufficient amounts to be of value as nutrients.

5.6.16 *Compost* — *See* **6.5.3.**

5.6.17 *Cover Crops* — Crops that are grown primarily to provide protection to the soil.

5.6.18 *Crop Residue* — The vegetative matter left in the field after harvest.

5.6.19 *Crop Rotation* — The process of planting or sowing different crops in rotation on the same land not only to retard the deterioration of the soil but also to improve the soil in some of the contents [*see also* IS : 4410 (Part I)-1967†].

†Glossary of terms relating to river valley projects: Part I Irrigation practices.

5.6.20 *Decalification** — Removal of calcium carbonate from the soil by leaching.

5.6.21 *Degradation Solodization (Solodisation or Solotization)* — The replacement of Na* ions by H* ions which tends to render the base-exchange material of the soil chemically unstable.

5.6.22 *Degree of Salinity* — Percentage of soluble salts in the soil.

5.6.23 *Desalinization** — Removal (chiefly by leaching) of soluble salts.

5.6.24 *Dialysis** — Separation of a colloid from a solute by diffusion of the latter through a suitable semipermeable membrane.

5.6.25 *Drilled Fertilizers** — Commercial fertilizer placed below the soil surface, usually by a fertilizer-drill.

5.6.26 *Electrodialysis** — An electro-reclamation process which increases the rate of percolation and opens up the soil. Dialysis assisted by applying the potential difference between electrodes on either side of the semi-permeable membrane. The ions of any salt present are attracted to the electrodes and diffusion is accelerated.

5.6.27 *Fertilization** — The process of adding plant food through chemical fertilizers to the soil for purpose of plant growth.

5.6.28 *Fertilizer Elements** — The three primary essential elements; nitrogen, phosphorus and potassium artificially supplied to the soil as manure or commercial fertilizer.

5.6.29 *Fertilizer Ratio** — The ratio of nitrogen, phosphoric anhydride and potash in a fertilizer. The ratio is expressed in small, whole number, such as 1-2-1, 1-3-2.

5.6.30 *Field Capacity Zone** — A buffer zone in which water is held against gravity under free drainage. It is this zone which holds the moisture and consequently prevents the salts from moving in a vertical upward direction.

5.6.31 *Gley Soil** — Soil with high ground-water table and iron oxide accumulation in the region of water table.

5.6.32 *Green Manure Crop** — A crop grown mainly for ploughing into the soil in its green condition.

5.6.33 *Gypsum** — Calcium sulphate ($CaSO_4$, $2H_2O$). Used for the replacement of sodium by calcium in alkali soils.

5.6.34 *Heavy Soil* — A soil containing high percentage of clay (more than 35 percent) with sticky and plastic consistency and rendering it difficult for tillage operations.

5.6.35 *Humic Gley Soil** — Continually or intermittently moist soil with or without a peaty covering, but having a prominent dark horizon and gleyed horizon.

5.6.36 *Hydrolytic Acidity** — Acidity produced by treating soil with a solution of a salt of a strong base and weak acid.

5.6.37 *Incomplete Fertilizer, or Single Carrier** — A commercial fertilizer which supplies only one plant nutrient.

5.6.38 *Leaching*

a) Removal of materials in solution.

b) Solution of minerals and organic matter followed by percolation of the dissolved substances.

c) The removal of soluble constituents from soils or other material by percolating liquid.

d) The removal of salts and alkali from soils by abundant irrigation combined with drainage.

e) The disposal of a liquid through a non-watertight artificial structure conduit, or porous material by downward or lateral drainage, or both, into the surrounding permeable soils.

5.6.39 *Leaching Requirement** — The fraction of water entering the soil that must pass through the root zone in order to prevent soil salinity from exceeding a specified value. Leaching requirement is used primarily under steady state or long-term average conditions.

5.6.40 *Leys** — Grasses and leguminous fodder crops included in a crop rotation to restore fertility by providing organic matter and nitrogen.

5.6.41 *Marl** — An earthy crumbling deposit consisting chiefly of calcium carbonate mixed with clay or other impurities in varying proportions. It is used frequently as an amendment for soils deficient in lime.

5.6.42 *Molasses** — A thick treacle that is obtained as a by-product in the manufacture of sugar from sugar-cane and used for reclamation of alkali soils.

5.6.43 *Mottled** — Spots of different colours irregularly scattered in the soil matrix.

5.6.44 *Mulch* — A natural or artificially applied layer of plant residues or any other loose material on the surface of the soil to help conserve moisture, control temperature, prevent surface compaction or crusting, reduce runoff and erosion, improve soil structure, or control weeds.

5.6.45 *Neutral Soil** — A soil that is not significantly acid or alkaline; strictly, one having a *p*H of 7·0; practically, one having a *p*H between 6·6 and 7·3.

5.6.46 *Non-calcareous Soil** — Soil free from calcium carbonate.

5.6.47 *Non-saline Alakali Soil** — A soil contains sufficient exchangeable sodium to inhibit the growth of most crop plants and does not contain appreciable concentrations of soluble salts. The exchangeable sodium percentage is greater than 15, the conductivity of the saturation extract is less than 4 mmhos/cm at 25°C, and the *p*H of the saturated soil usually exceeds 8·5.

5.6.48 *Parts per Million (PPM)* — The concentration of a substance expressed as the number of unit masses of that substance per million units of mass of water.

5.6.49 *Pellicular Zone** — The maximum depth from the natural surface up to which the evaporation can have its effect.

5.6.50 *Percent Salt** — This is the quantity of salt expressed as a percentage of the dry mass of the soil.

5.6.51 *Press Mud* — The precipitated impurities, contained in the sugar-cane juice after treatment and removed by filteration in the process of sugar manufacture.

5.6.52 *Puddling* — The process by which a soil loses structure. It is caused by excessive water, and tillage.

5.6.53 *Ridge Planting* — Placement of plants on top or sides of ridges of soil.

5.6.54 *Saline Sodic Soils* — A soil containing a combination of soluble salts and exchangeable sodium sufficient to interfere with the growth of most crops. The electrical conductivity of the saturation extract is more than 4 mmhos/cm at 25°C and exchangeable sodium percentage is more than 15 m.e/100 g.*p*H is usually 8·5 or less in saturation paste.

5.6.55 *Saline Soil* — A non-sodic soil containing sufficient soluble salts to impair its productivity. The electrical conductivity of saturation extract is more than 4 mmhos/cm at 25°C.

5.6.56 *Salinization** — The process of accumulation of soluble salts at the surface or at some point below the surface of the soil profile.

5.6.57 *Scraping** — Removal of the alkali incrustations that have accumulated at the surface due to excessive evaporation.

5.6.58 *Side Dressing** — The placement of fertilizers along the side of the row after the row is established.

5.6.59 *Slick Spots** — Small areas in a field that are some what slick when wet due to alkali or high exchangeable sodium.

5.6.60 *Sodic Soils* — A soil containing sufficient exchangeable sodium (usually more than 15 m.e/100 g) to interfere with the growth of most crops.

5.6.61 *Sodium Complex* — Colloidal matter in alkali soil with sodium dominant in its exchange components.

5.6.62 *Soil Amendment* — Any material, such as lime, gypsum, sawdust or synthetic conditioners that is worked into the soil to make it more productive.

5.6.63 *Soil Conditioner* — Substance which is added to the soil in small quantities to improve its structure, for example sodium or ammonium polyacrylates with very high molecular weights, such as Krilium.

5.6.64 *Soil Horizon of Carbonate Accumulation* — A developed soil horizon, beneath the surface, containing more calcium (or magnesium and calcium) carbonate than the soil above or below it.

5.6.65 *Soil Sterlization** — The art or process of artificial treatment of soils and consists of adding physical or chemical agents which at first partially sterilize the soil by destroying animal and insect pests and organisms capable of invading plant roots but later restores soil fertility.

5.6.66 *Solod or Soloth** — An intrazonal group of soils, developed by intensive leaching of solonetz, having a thin surface layer of brown friable soil above a grey-leached horizon which rests upon a brown or dark-brown horizon. The formation of solod from solonetz is termed 'solodization' or 'solotization'.

5.6.67 *Solonchak** — An intrazonal group of soils having a high concentration of soluble salts, usually light coloured, without characteristic structural, form.

5.6.68 *Solonetz** — An intrazonal group of soils having a variable surface horizon of friable soil underlain by dark hard soil, ordinarily with columnar structure, usually highly alkaline. The influence of sodium ion is dominant in the development of such soils by the leaching of solonchaks.

5.6.69 *Spent Wash* — The liquid (exhausted wash) discharged from the fermentation still.

5.6.70 *Subsoiling* — A process of mechanically loosening or fracturing subsoil to increase infiltration, penetrability to plant roots and aeration.

5.6.71 *Waterlogged Land* — Land effected by waterlogging.

5.6.72 *White Alkali Soil* — *see* **5.6.8.**

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