Construction Terms Part 1

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Construction Management - It may refer to the contractual arrangement under which a firm supplies construction management services to an owner.

Quality Management - Includes such activities as specification development, process control, product acceptance, laboratory and technician certification, training, and communication.

Quality Control - Primarily concerned with the process control function.

Earthmoving - The process of moving soil or rock from one location to another and processing it so that it meets construction requirements of location, elevation, density, moisture content, and so on.

Loadability - Measure of the difficulty in excavating and loading a soil.

Plate line capacity - Bucket volume contained within the bucket when following the outline of the bucket sides.

Struck capacity - Bucket capacity when the load is struck off flush with the bucket sides.

Water line capacity - Assumes a level of material flush with the lowest edge of the bucket.

Heaped volume - The maximum volume that can be placed in the bucket without spillage based on a specified angle of repose for the material in the bucket.

Dragline - A very versatile machine that has the longest reach for digging and dumping of any member of the crane shovel family.

Cranes - Primarily used for lifting, lowering, and transporting loads. They move loads horizontally by swinging or traveling

Grade resistance - Represents that component of vehicle weight which acts parallel to an inclined surface.

Rolling resistance - Primarily due to tire flexing and penetration of the travel surface

Fixed time - Represents those components of cycle time other than travel time.

Variable time - Represents the travel time required for a unit to haul material to the unloading site and return

Ground modification or soil stabilization - The process of giving natural soils enough abrasive resistance and shear strength to accommodate traffic or design loads

Compaction - The process of increasing the density of a soil by mechanically forcing the soil particles closer together, thereby expelling air from the void spaces in the soil.

Dynamic compaction - Involves dropping a heavy weight from a crane onto the ground surface to achieve soil densification.

Vibratory compaction - The process of densifying cohesionless soils by inserting a vibratory probe into the soil.

Surcharging - Done by placing additional weight on the soil surface, has long been used to densify cohesive soils.

Soil Stabilization - Refers to the improvement of the engineering properties of a soil by use of physical or chemical admixtures.

Grading - The process of bringing earthwork to the desired shape and elevation (or grade).

Finish grading - Also called finishing, involves smoothing slopes, shaping ditches, and bringing the earthwork to the elevation required by the plans and specification.

Balancing - In highway construction, the process of cutting down high spots and filling in low spots of each roadway layer is called

Trimming - The process of bringing each roadway layer to its final grade.

Loosening, Loading, Hauling, and Compacting - The four phases of the process of rock moving

Concrete - Produced by mixing portland cement, aggregate, and water.

Batching, Mixing, Transporting, Placing, Consolidating, Finishing, and Curing - The construction operations involved in the production of concrete include

Normal-weight concrete - Usually weighs from 140 to 160 lb/cu ft (2243-2563 kg/m^3), depending on the mix design and type of aggregate used.

Lightweight insulating concrete - May weigh from 15 to 90 lb/cu ft (240-1442 kg/m^3) and have a 28-day compressive strength from about 100 to 1000 lb/sq in. (690-6895 kPa).

Mass concrete - Concrete used in a structure such as a dam in which the weight of the concrete provides most of the strength of the structure.

Heavyweight concrete - Made with heavy aggregates such as barite, magnetite, and steel punchings; it is used primarily for nuclear radiation shielding.

No-slump concrete - Concrete having a slump of 1 in. (2.5 cm) or less.

Slump - A measure of concrete consistency obtained by placing concrete into a test cone following a standard test procedure (ASTM C143) and measuring the decrease in height (slump) of the sample when the cone is removed.

Refractory concrete - Concrete that is suitable for high temperature applications such as boilers and furnaces.

Precast concrete - Concrete that has been cast into the desired shape prior to placement in a structure.

Architectural concrete - Concrete that will be exposed to view and therefore utilizes special shapes, designs, or surface finishes to achieve the desired architectural effect.

Type I (normal) portland cement - A general-purpose cement suitable for all normal applications.

Type II (modified/moderate) portland cement - Provides better resistance to alkali attack and produces less heat of hydration than does Type I cement.

Type III (high early strength) cement - Provides 190% of Type I strength after 1 day of curing. It also produces about 150% of the heat of hydration of normal cement during the first 7 days.

Type IV (low heat) cement - Produces only 40-60% of the heat produced by Type I cement during the first 7 days. However, its strength is only 55% of that of normal cement after 7 days

Type V (sulfate-resistant) cement - Provides maximum resistance to alkali attack

Aggregate - Used in concrete to reduce the cost of the mix and to reduce shrinkage.

Water - Is required in the concrete mix for several purposes. Principal among these is to provide the moisture required for hydration of the cement to take place.

Hydration - The chemical reaction between cement and water which produces hardened cement.

0.40 to 0.70 - Range of water/cement ratio

Air-entrained concrete - Has significantly increased resistance to freezing and thawing as well as to scaling caused by the use of deicing chemicals.

Water-reducing agents - Increase the slump or workability of a concrete mix. Thus, with a water-reducing agent the amount of water in the mix may be reduced without changing the concrete's consistency.

Retarders - Slow the rate of hardening of concrete.

Accelerators - Decrease setting time and increase the early strength of concrete.

Pozzolans - Reduce the heat of hydration, increase the workability, and reduce the segregation of a mix.

Workability agents or plasticizers - Increase the workability of a mix.

Batching - The process of proportioning cement, water, aggregates, and additives prior to mixing concrete.

Truck mixers or transit mix trucks - Are truck-mounted concrete mixers capable of mixing and transporting concrete.

Ready-mixed concrete - Delivered by truck-mounted concrete mixers capable of mixing and transporting concrete.

Coarse aggregate - Consists of gravel, crushed stone, or another suitable material larger than ¼ in. (6.4 mm) in diameter.

Admixtures - Materials other than portland cement, aggregates, and water that are added to concrete either immediately before or during its mixing to alter the properties of the concrete in a variety of ways. For example, they can be used to:
• Improve workability
• Reduce separation of coarse and fine aggregates due to settling out of the heavier coarse aggregate
• Entrain air
• Accelerate or retard setting and hardening

Water-reducing admixtures - Permit a lower water content, improve workability, and increase the efficiency of the portland cement in a mix, which lowers a concrete's cost relative to its performance.

High-range water-reducing admixtures (super plasticizers) - Mostly used in concrete that is to be pumped. They produce a mix that flows easily, with no increase in its water content.

Retarders - Admixtures that have a retarding effect on the set of portland cement overcome the accelerating effect that temperature has on setting during hot weather and in large masses of concrete, and delay the early stiffening of concrete placed under difficult conditions.

Accelerators - Increase the rate of early strength development in concrete.

Formworks - Because concrete is unable to maintain a particular shape before it sets, it must be placed in a form or mold called

Flying forms - Are made by building a large section of form, as described earlier for centering, and supporting the entire section on deep steel trusses.

Slip forming - A method of continuously moving a form for vertical structures, such as elevator or stair shafts, upward on jacks as new concrete is placed on top of the old.

Waterstops - Rubber or vinyl inserts designed to be placed in concrete joints to prevent water from penetrating the joint.

Isolation and separation joints - Often necessary to separate concrete sections and prevent the bonding of one concrete section with another, or to separate a concrete section from another material or structural part so that one can move independently of the other.

Water-cement ratio - Should be the lowest value of ratio required to meet design requirements such as durability, strength, and impermeability.

Concrete that will be exposed to a combination of wet-dry and freeze-thaw cycling and de-icing chemicals requires the following for durability:
I. a low water-cement ratio,
II. air-entrainment,
III. suitable materials,
IV. adequate curing, and
V. good construction practices.

Plastic concrete - Readily molded and yet will change its form only slowly if the mold is removed.

Concrete is handled and transported by:
I. Chutes
II. Push buggies
III. Buckets handled by cranes
IV. Pumping through a pipeline
V. Pneumatically forcing through a hose (shotcrete)

Placing - The movement of plastic concrete into its final position (usually within forms).

Shotcrete - Pneumatically placed concrete, used primarily for swimming pools and other in-ground and aboveground free-form structures and for repairing damaged concrete.

Concrete should be compacted by a method appropriate to the material and its location to:
I. Eliminate stone pockets and large air bubbles
II. Consolidate each layer with that previously placed
III. Completely embed reinforcing and fixtures
IV. Bring just enough fine material to the faces and top surfaces to produce the desired finish

Spading or puddling - Medium- to high-slump concrete should be compacted and worked into place by

Screeding, leveling, edging, jointing, floating, troweling, and broom finishing - The finishing of standard-weight concrete slabs proceeds through several steps in a defined order. These steps are:

Bleeding - Generally, the dry materials used in making quality concrete are heavier than water. Thus, shortly after placement, they have a tendency to settle to the bottom and displace the mixing water to the surface, which is called

Screeding - The surface of newly placed concrete is struck off (screeded) by moving a straightedge back and forth with a sawlike motion across the top of the forms and screeds.

Leveling - Bringing of a concrete surface to true grade with enough mortar to produce the desired finish.

Edging - Rounds off the formed edge of a slab to prevent chipping or damage.

Jointing - Except when joints will be later sawed, immediately following or during edging, premolded inserts are placed in concrete slabs to control cracking in the concrete as a result of shrinkage.

Floating - May be done when the water sheen has disappeared and the concrete will support the weight of the finisher.

The purpose of floating is to:
I. Embed large aggregate just beneath the surface.
II. Remove slight imperfections, humps, and voids to produce a level or plane surface.
III. Consolidate mortar at the surface in preparation for other finishing operations.
IV. Open the surface to permit excess moisture to escape.

Troweling - Done on slabs that are to be left exposed or to receive thin finishes, such as resilient flooring, carpet, tile, or paint.

Broom Finishing - Steel-troweled concrete surfaces are very smooth and become slippery when wet. They can be slightly roughened to produce a nonslip surface by brushing or brooming them.

Scaling - Breaking away of the hardened concrete surface of a slab to a depth of about 1/6 to 3/16 in. (1.6 to 4.8 mm). It usually occurs at an early age of the slab.

Crazing - The occurrence of numerous fine hair cracks in the surface of a newly hardened slab due to surface shrinkage.

Dusting - The appearance of a powdery material on the surface of a newly hardened concrete slab.

Fuel-resistant asphalt - Often based on a polymer-modified asphalt (PMA), is available and has demonstrated high resistance to rutting and cracking as well as to petroleum fuels

Asphalt cutback - liquid at room temperature, is created when petroleum distillates are mixed with asphalt cement.

Asphalt emulsions - Contain particles of asphalt dispersed in water by means of emulsifying agents.

Flash point - Temperature at which liquid produces sufficient vapor to ignite in the presence of air and an open flame.

Slipform paver - Capable of spreading, consolidating, and finishing a concrete slab without the use of conventional forms.

Tack coat - Thin coating of light bituminous material applied to a previously paved surface to act as a bonding agent.

Dust palliative - A substance applied to an unpaved surface to reduce the amount of dust produced by vehicular traffic and wind.

Fog seal - A light application of a slow-setting asphalt emulsion diluted by one to three parts of water.

Emulsion slurry seal - Composed of a mixture of slow-setting asphalt emulsion, fine aggregate, mineral filler, and water.

Sand seal - Composed of a light application of a medium-viscosity liquid asphalt covered with fine aggregates.

Aggregate surface treatments - Made up of alternate applications of asphalt and aggregate.

Single-pass surface treatment - Constructed by spraying on a layer of asphalt and covering it with a layer of aggregate approximately one stone in depth.

Recycling - Consists of the demolition of old pavement, recrushing of the pavement material, and reusing it in new asphalt or concrete mixes.

Foundation - Supports the weight of the structure and its applied loads.

Spread footing - The simplest and probably the most common type of building foundation. They include individual footings, combined footings, and mat foundations.

Mat or raft foundations - Consist of a heavily reinforced concrete slab extending under the entire structure, in order to spread the structure's load over a large area.

Floating foundation - A type of mat foundation in which the weight of the soil excavated approximately equals the weight of the structure being erected.

Ground modification or soil stabilization - The process of improving soils in place.

Pile - It is nothing more than a column driven into the soil to support a structure by transferring building loads to a deeper and stronger layer of soil or rock.

Precast concrete piles - May be manufactured in almost any desired size or shape.

Cast-in-place concrete piles or shell piles - Constructed by driving a steel shell into the ground and then filling it with concrete.

Steel piles - Capable of supporting heavy loads, can be driven to great depth without damage, and are easily cut and spliced.

Composite piles - Piles made up of two or more different materials.

Bulb piles - They are a special form of cast-in-place concrete pile in which an enlarged base (or bulb) is formed during driving.

Pier - A column, usually of reinforced concrete, constructed below the ground surface.

Caisson - A structure used to provide all-around lateral support to an excavation. Caissons may be either open or pneumatic

Liquefaction - If the water pressure exactly equals soil weight, the soil will behave like a liquid.

Boiling or piping - If the water pressure is strong enough to move subsurface soil up through the bottom of the cut.

Shoring - Lateral support for the sides of an excavation.

Lagging - Sheeting placed horizontally.

Sheet piling - Sheeting of concrete, steel, or timber that is designed to be driven by a pile driver.

Trench shields or trench boxes - Used in place of shoring to protect workers during trenching operations.

Dewatering - The process of removing water from an excavation.

Soil permeability - The ease with which water flows through the soil, is primarily a function of a soil's grain size distribution.

Wellpoint - The perforated assembly placed on the bottom of the inlet pipe for a well.

Vacuum wells - Wellpoints that are sealed at the surface by placing a ring of bentonite or clay around the well casing.

Electroosmosis - Process of accelerating the flow of water through a soil by the application of a direct current.

Grouting or pressure grouting - The process of injecting a grouting agent into soil or rock to increase its strength or stability, protect foundations, or reduce groundwater flow.

Flat slabs - Slabs may be supported directly by columns without the use of beams or joists.

Precast concrete - Concrete that has been cast into the desired shape prior to placement in a structure.

Prestressed concrete - Concrete to which an initial compression load has been applied.

Pretensioning - Places the prestressing material (reinforcing steel or prestressing cables) under tension in the concrete form before the member is poured.

Posttensioning - Places the prestressing steel (usually placed inside a metal or plastic tube cast into the member) under tension after the concrete member has been erected.

Consolidation - The process of removing air voids in concrete as it is placed.

Finishing - The process of bringing the surface of concrete to its final position and imparting the desired surface texture.

Vacuum dewatering - Employed to reduce the amount of free water present in plastic concrete after the concrete has been placed and screeded.

The five most common masonry pattern bonds:
I. Running bond
II. Common bond
III. Flemish bond
IV. English bond
V. Stack bond

Running bond - Uses only stretcher courses with head joints centered over stretchers in the course below.

Common bond - Uses a header course repeated at regular intervals; usually every fifth, sixth, or seventh course.

Flemish bond - Alternates stretchers and headers in each course with headers centered over stretchers in the course below.

English bond - Made up of alternate courses of headers and stretchers, with headers centered on stretchers.

Stack bond - Provides no interlocking between adjacent masonry units and is used for its architectural effect.

Bond beam - A continuously reinforced horizontal beam of concrete or masonry designed to provide additional strength and to prevent cracking in a masonry wall.

Expansion or control joints - Used to permit differential movement of wall sections caused by shrinkage of concrete foundations and floor slabs, temperature and moisture changes, and foundation settlement.

Flashing - Consists of layers of impervious material used to seal out moisture or to direct any moisture that does penetrate back to the outside.

Bar graph or bar chart schedule - A graphical schedule relating progress of items of work to a time schedule.

PERT - Utilizes probability concepts to deal with the uncertainty associated with activity time

CPM - Assigns each activity a single fixed duration.

Activity-on-arrow - Each activity is represented by an arrow that has an associated description and expected duration.

Dummy activity - They do not represent any work and, hence, always have a duration of zero.

Early event time - The earliest time at which each event may occur based on an arbitrary starting time of zero.

Critical path - That path through the network which establishes the minimum project duration

Float (slack in PERT terminology) - The amount of scheduling leeway available to an activity.

Circle diagram or circle notation - Each activity is represented by a circle containing the activity description, an identifying number, and the activity duration.

Precedence diagram - An extension of the activity-on node format that provides for incorporation of lag-time factors as well as permitting additional precedence relationships.

Early start schedule - When all activities are scheduled to start at the earliest allowable time, such a schedule is referred to as an

Late start schedule - When all activities are started at their latest allowable starting time

Owning costs - Fixed costs that are incurred each year whether the equipment is operated or not.

Owning costs are made up of the following principal elements:
I. Depreciation
II. Investment (or interest) cost
III. Insurance cost
IV. Taxes
V. Storage cost

Operating costs - Incurred only when the equipment is used.

Depreciation - Represents the decline in market value of an item of equipment due to age, wear, deterioration, and obsolescence.

Investment cost - Represents the annual cost (converted to an hourly cost) of the capital invested in a machine.

Insurance cost - Represents the cost of fire, theft, accident, and liability insurance for the equipment.

Tax cost - Represents the cost of property tax and licenses for the equipment.

Storage cost - Represents the cost of rent and maintenance for equipment storage yards and facilities, the wages of guards and employees involved in handling equipment in and out of storage, and associated direct overhead.

Total equipment owning cost - Found as the sum of depreciation, investment, insurance, tax, and storage.

Service cost - Represents the cost of oil, hydraulic fluids, grease, and filters as well as the labor required to perform routine maintenance service.

Repair cost - Represents the cost of all equipment repair and maintenance.

Financial planning - Construction project includes cost estimating prior to bidding or negotiating a contract, forecasting project income and expenditure (or cash flow), and determining

the amount of work that a construction firm can safely undertake at one time

Cost estimating - Involves estimating the total cost to carry out a construction project in accordance with the plans and specifications.

Project cost control - Involves the measurement and recording of project costs and progress and a comparison between actual and planned performance.

Qualification of a contractor - Determination that the contractor possesses both the technical and financial ability to perform the work required by the contract

Prequalification - Under this procedure only those contractors determined to be capable of performing are invited to submit bids for the project.

Bid bond - Guarantees that a contractor will provide the required performance and payment bonds if awarded the contract.

Payment bond - Guarantees the payment of subcontractors, laborers, and suppliers by the contractor.

Performance bond - guarantees completion of the project as described in the contract documents.

Subcontracts - Contracts between a prime contractor and secondary contractors or suppliers.

Negotiated contract - One negotiated between an owner and a construction firm.

Lump-sum contract - Provides a specified payment for completion of the work described in the contract documents.

Unit-price contracts - Specify the amount to be paid for each unit of work but not the total contract amount.

Fixed price with escalation contracts - Contain a provision whereby the contract value is adjusted according to a specified price index.

Cost plus percentage - Pays the contractor a fee that is a percentage of the project's actual cost.

A construction contract consists of the following documents:
I. Agreement.
II. Conditions of the Contract (usually General Conditions and Special Conditions).
III. Plans.
IV. Specifications.

Agreement - Describes the work to be performed, the required completion time, contract sum, provisions for progress payments and final payment, and lists the other documents making up the complete contract.

General Conditions - Contain those contract provisions applicable to most construction contracts written by the owner.

Special Conditions - Contain any additional contract provisions applicable to the specific project.

Value engineering - The analysis of a design with the objective of accomplishing the required function at a lower cost.

Contract Time - The time allowed (expressed as either days allowed or as a required completion date) for completion of a construction project is normally specified in the contract along with the phrase ¨time is of the essence.

Liquidated damages clause - The contract may be used to simplify the process of establishing the amount of damages resulting from late completion.

Construction plans - Drawings that show the location, dimensions, and details of the work to be performed.

Construction technical specifications - Detailed requirements for the materials, equipment, and workmanship to be incorporated into the project.

Shop drawings - Drawings, charts, and other data prepared by a contractor or supplier which describe the detailed characteristics of equipment or show how specific structural elements or items of equipment are to be fabricated and installed.

Progress payments - Made at the interval specified in the contract, usually monthly or upon completion of certain milestones.

Change order - The usual construction contract contains a clause authorizing the owner or owner's representative to order changes to the project within the general scope of the contract. The document directing such a change is referred to as a

Retainage or retention - It is customary to withhold a percentage of the value of work completed as a guarantee against defective work and to ensure that the remaining work can be completed within the unpaid amount of the contract. The amount withheld is referred to as

Consequential costs - Frequently, it will be found that changes or delay in one activity will necessitate changes in resource allocation or progress on other activities that result in additional project cost. These costs are sometimes referred to as

Delays in the orderly progress of a construction project may result from a multitude of causes. The three general categories of delay include:
I. those beyond the control of either the contractor or the owner ("acts of God"),
II. those under the control of the owner, and
III. those under the control of the contractor.

Punch list of record - The list of deficiencies to be corrected which is prepared at the final inspection is sometimes referred to as

Claim - A request by the contractor for a time extension or for additional payment based on the occurrence of an event beyond the contractor's control that has not been covered by a change order.

Disputes - Disagreements between the contractor and owner over some aspect of contract performance.

Drawings - Construction documents that "show in graphic and quantitative form the extent, design location, relationships, and dimensions of the work to be done.

Project manual - A single volume that contains all written requirements for a building construction project.

Specifications - Constitute that portion of the written requirements for a building construction project that are contained in the divisions of a project manual.

Building Information Modeling (BIM) - Presents a database that includes design data, drawings, specifications, materials and systems parameters, and life cycle data, for all the various disciplines involved in a project and relates those data to each other and to the project as a whole to present an overall view of the project.

Bidding - a process whereby a prime design professional engaged by an owner, and the design professional's consultants, prepare bidding documents and issue them to a group of constructors.

Negotiation - A process whereby an architect engaged by an owner, and the architect's consultants, prepare negotiation documents.