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Concrete Properties Made from Particular Rubble

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Introduction

Concrete is a heterogeneous mixture of aggregates, cement and water with some blanks and some other additives can be added to obtain certain properties.

The proportions of these materials are chosen in the concrete mix according to the type of work required and the materials available. With the mixing of these materials together, the concrete, which begins with progressive stiffness, is obtained over time to become solid and strong. Its strength varies according to the basic components, as well as by the casting method during the casting and the quality of the treatment.

Concrete Components

Cement

Cement is a soft, dark material that has a cohesive and contiguous properties in the presence of water, making it able to connect the concrete components to each other and to bond with reinforcing steel. Cement consists of 3 primary raw materials: calcium carbonate in limestone, silica in clay and sand, and alumina (aluminum oxide).

There are several types of cement named after their purpose and need to use but the basic components remain one and that the proportion of different types of different and the most important of these types:

Ordinary portland cement, fast-paced portland cement, low-temperature portland cement, salt-resistant cement, sulphate, alumina cement, etc.

Main components of ordinary portland cement

1. Tri-Calcium silicate (45-55%), which is responsible for giving strength to concrete during the first 28 days.

2. Calcium dicalcium (15-25%) which is responsible for the self-healing phenomenon, which closes the capillary cracks in the mortar and in the concrete as well as the tensile strength of the concrete.

3. Calcium triglycerides, ranging from 12-15%, react quickly at mixing and release high heat. Concrete gives strength on the first day but does not affect the final strength of the concrete.

4. Calcium tetra-calcium aluminate (7-4%), which react in the early days and give high heat but are slower than calcium triglycerides.

5. In addition to the previous components, cement contains secondary compounds in the form of oxides such as potassium oxides, sodium, magnesium, titanium and sulfur dioxide. These vehicles make up a small proportion of cement weight.

Characteristics and tests of cement: A number of tests are carried out on cement to determine its characteristics and to ensure its quality and conformity to specifications. The most important of these tests are:

1. Cement softness Fineness of Cement,

2. Examination of the standard strength of the cement dough,

3. Initial and Final Doubt Time Initial and Final setting time,

4. Chemical analysis of cement,

5. Cement stability,

6. Cement resistance for direct pressure,

7. Cement resistance for direct tension,

8. Check flexing.

The rubble (gravel)

The quality and properties of aggregates have a significant impact on the properties and quality of concrete as it occupies about 70-75% of the total size of the concrete block. Aggregates are generally composed of granulated granules of scale, including small granules such as sand and other granules such as gravel.

In addition to the fact that the aggregate forms the bulk of the concrete structure, which gives the concrete block stability and resistance to external forces and different weather factors such as heat, humidity and abatement, it reduces the volume changes caused by freezing and hardening of the cement paste or the exposure of concrete to moisture and drought. So the aggregates give the concrete better durability than if the cement paste was used alone.

From the above it is clear that the properties of aggregates greatly affect the durability and behavior of the concrete structure. When selecting aggregates for use in a particular concrete, three requirements are generally observed: the economic mixture, the inherent resistance of the hard block, and the potential durability of the concrete structure. Other important properties of concrete aggregates are the inclusion of granules (aggregates of aggregate grading scales according to the largest legal scale). For the purpose of obtaining a heavy concrete structure, the grading of concrete should be appropriate by determining the ratio of fine aggregate and coarse aggregate in the mixture. In addition, aggregation of aggregates is an important factor in controlling the operation of soft concrete. When determining the amount of aggregates in the concrete size unit, the mixture is more operable when the aggregation is appropriate and thus the need for the amount of water required for the mixture is lower, which in turn increases the resistance of the resulting concrete. The aggregate also affects the total cost of concrete. In general, the larger the amount of aggregates in concrete, the greater the concrete, the result is more economical so that the aggregate is cheaper than the cement.

For the purpose of obtaining solid concrete, it must be characterized by the lack of affected by various weather factors such as heat, cold

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and exhaustion, which lead to the disintegration of the aggregate and should not get harmful interaction between the minerals of aggregates and cement compounds, in addition to the need to free the debris from mud and non-clean materials, which affect the Resistance and stability of cement paste. The aggregates must be clean, strong, resistant to crushing and shock, suitable for absorption in an appropriate and indestructible form and texture, and corrosion and soil resistance.

Requirements for aggregates: A - The aggregate granules should be semi-spherical and non-flat and prefer many faceted species.

- The absorption rate shall not exceed 5%.
- The apparent weight should not be less than 2.35.
- The percentage of loss in the weight of the aggregates should not exceed 10-12% of the weight.
- The aggregate used in concrete mixtures shall be graded within the limits of the overall gradient curves attached in Annex 1.
- The aggregate must be washed before use to ensure that it is free.

Water

The importance of water:

1. Water is necessary for chemical reactions between cement and water.

2. It is also necessary to be absorbed by the aggregate used in concrete.

3. The water mixture, consisting of coarse, fine aggregate and cement, gives an appropriate degree of softness to help it operate and form.

4. In the presence of water, a larger amount of gravel can be mixed with the same amount of cement.

5. The water gives a concrete size ranging between 15-20%.

6. Part of the water in the concrete mixture is lost during evaporation.

7. Water is necessary for concrete deposition during hardening.

Cement water ratio: Is the ratio between the weight of the free water allocated to the reaction (other than the water absorbed by the aggregate) to the weight of the cement in the mixture. The concentration of the water in the mixture is very important and the strength of the mixture is stopped, its thickness, its separation, its bleeding and its ability to resist the weather conditions from coldness, heat and erosion, as the abundance of water weakens the concrete, causing separation, dehydration, porosity, lack of permanence, weariness, weakness, scaling, shrinkage and cracking. The following tables determine the maximum cement water content by concrete grade (ACI 211.3-76): (Table 1).

- Characteristics of water used in concrete:

1. The water used in the mixing and processing of concrete shall be free from harmful substances such as oils, greases, salts, acids, alkalis, organic matter, cork and soft materials, whether soluble or suspended, and other materials that have a reverse effect on the concrete in terms of breaking strength and durability.

2. Pure drinking water is suitable for the mixing of the concrete and its maintenance.

The standard cube strength after 28 days is the cement water ratio Kg/cm^2	Without Air	With Air
600	0.32	0.23
550	0.36	0.27
500	0.41	0.32
450	0.45	0.37
400	0.5	0.42
350	0.56	0.47
300	0.62	0.53
250	0.69	0.6
200	0.77	0.69
150	0.87	0.77
100	1	0.85

Table 1: The standard cube strength after 28 days is the cement water ratio. Kg/cm^2 without air with air.

3. The use of non-potable water is permitted if the drinking water is not available, and the concentration of impurities in it shall not exceed certain percentages specified by the specifications.

4. It is prohibited to use non-potable water in the mixing and mixing of concrete only after it has been proved by laboratory that the resistance of mortar cubes mixed with non-potable water is at least equal to 90% of the resistance of their counterparts prepared with drinking water at (7) days and (28) days according to American specifications ASTM C-109.

5. The concrete mixture is designed in the laboratory using the same potable water, which will be used in the concrete mixtures.

Additions

Additions are materials or structures of several materials added to the concrete during mixing to improve one or more properties of the concrete mix.

- The main purposes of the use of additives:

1. Improve the operability of soft concrete.

2. Accelerate stiffness to get high resistance in a short time.

3. Slow the process of doubling (doubt) in hot climates or long distance transport.

4. Reduce heat generated and reduce bleeding or bleeding (Bleeding).

5. Improve corrosion resistance and reduce shrinkage during hardening.

6. Prevent iron rust.

Types

Although there are many types of additives and their trade names, they mainly fall into three main categories:

1. Accelerated additions to the interaction.

2. Slow additions to the interaction.

3. Additive additives for waterproof.

These additions are harmful and should not be used except in the necessary cases and according to the instructions of the manufacturer and the lowest quantities. and an attempt to rely on improving the properties of the concrete by altering its main components.

Concrete mixtures: After testing the raw materials (the fine and

soft rubble, water, cement and additives) and after verifying their validity and conformity to the specifications, a concrete mixer is designed to determine the quantity of each material needed to obtain a concrete mix according to the working conditions and the type of origin or concrete element to be poured.

There are many factors that influence the design, such as the size, size, size, work nature, operation, thickness, material availability and temperature. However, during design, the components are to be covered so that all the aggregates are covered with cement so that the smaller particles enter the larger spaces, Required and necessary plasticity and be waterproof, durable, strong and weather resistant at the lowest cost.

Concrete grades: Concrete grades are determined according to the value of the characteristic resistance. The general specifications for each grade of concrete determine the minimum content of the cement according to the nature of the exposure to the weather factors. The maximum permissible water content is also determined as shown in the following table:

Concrete Grade: Minimum of 3 models after 28 days.

Kg/cm^2 The minimum of one sample within the sample (the ratio does not exceed 15% of the sample number,

Kg/cm^2 minimum cement content under normal conditions,

Kg/m^3 Maximum cement water content (Table 2).

Break resistance: The fracture resistance of the concrete is defined by the value of the fracture resistance by pressure of a cubic concrete test model (150 × 150 × 150 mm), 28 days underwater in the temperature (20°C).

Intermediate resistance: The average resistance of the fracture to the concrete is defined as the fracture resistance value of the different test models for one sample of concrete.

Featured resistance: The concrete resistance of concrete is defined as the minimum value of resistance to breaking different test patterns of a single sample of concrete.

Operation property: If the concrete needs to be put into the mold or cast on the site, it means that its operability is difficult and the mixture is rigid and vice versa. Easy formation means soft concrete. The mixture has many advantages that are different from those of the soft mixture. They are less expensive in terms of materials. They are stronger and the rubies do not escape and do not crack during dryness if they are well treated. They are used with slippery molds and do not get granular separation, which is less prone to freezing.

On the other hand, it needs an effort to pour it and its blood and it is nested. Therefore, a balance must be maintained between the advantages and the disadvantages so that the mixture is selected which is suitable for the nature of the work.

Operating measurement methods: The operation is measured either by the landing method or by the damping method used for low-operating mixtures. However, there are other ways to measure the operation, including: flow table, penetration ball, and vibration frequency.

Choose the operating grade: The degree of operation of the concrete shall be determined by the dilution and the crushing coefficient shown in the following table according to working conditions:

Working conditions operating degree slack (Cm) coefficient of blood

1) Using strong shaking.
2) Clips with simple arming with jig.
3) Clips with simple arming without shaking and clips with average armature with jig.
4) Clips with heavy arming with jig (Table 3).

Concrete treatment: The concrete's strength, cohesion and resistance to water penetration increase over time as long as the conditions are conducive to the continued chemical interaction between water and cement, as well as other concrete properties such as heat resistance, cold and volatile weather factors. The improvement in concrete properties is rapid in its early era, but it continues slowly thereafter for an indefinite period. The early, effective and continuous treatment in the early stages of the concrete age is necessary for the formation of strength, durability, non-permeability, ground resistance, stability of volume, and the basic conditions that must be met in order for the reaction to continue to be the appropriate temperature and humidity. The soft concrete contains more than enough water to complete the chemical reaction However, in most cases, a large part of this water evaporates due to heat. Therefore, the water must be constantly added to the concrete to compensate for the evaporating water. The concrete can be covered and the cover is moistened to ensure moisture and reaction water, and precautions should be taken with respect to heat.

The exams

Sampling fresh mix: The test sample must be collected during the unloading process from the central mixer or the site or truck mixer. This is done by placing an interceptor container during discharge or transferring the discharge to the sample vessel. For this purpose, the discharge speed can be reduced and the first or last 0.2 m3 should not be used % of the mixture). For small blenders, one sample from the middle of the discharge is sufficient. If the mixture has been emptied,

Concrete Grade	Minimum of 3 models after 28 days	Kg/cm^2 The minimum of one sample within the sample (the ratio does not exceed 15% of the sample number	Kg/cm^2 minimum cement content under normal conditions	Kg/m^3 Maximum cement water content
150	180	150	200	0.87
230	230	200	230	0.77
250	285	250	285	0.69
300	345	300	325	0.62
350	400	350	350	0.56
400	400	400	400	0.5

Table 2: Concrete Grade. The table is for 15 × 15 × 15 cm standard inspection specimens. Compression coefficients should be considered for stress stress if the test samples are used in other sizes as follows: Cubes 10 × 10 × 10 cm correction factor 0.975, Cylinder 15 × 30 cm correction factor 1.250.

Very low	Low	Medium	High
0-3	6-12.5	0.75	0.9
03-06.0	12.5-15	0.83	0.95

Table 3: Working conditions operating degree slack (Cm) coefficient of blood.

parts can be taken from different locations and then mixed together on a non-absorbent surface and protected from the weather to prevent gain or loss of water. Samples are taken according to British or American specifications or alternative specifications.

Soft concrete testing: 1) Testing of dilution carried out according to British standard BS 1881-102.

a. The inspection mold shall be in the form of an incomplete cone made of galvanized steel sheets thickness of (1.6) mm or more. Its interior surface is smooth and supplied from the outside with special hands and feet for lifting and fixing. Its dimensions and details shall conform to the standard specifications.

B. The rod is made of steel with a circular section of diameter 16 mm long and 600 mm wide. Its bottom edge is hemispherical.

T. The mold shall be placed on a flat, smooth, non-absorbent surface. A flat sheet of galvanized steel shall be used for this purpose. The surface shall be fixed horizontally using the water balance at a location away from any source of vibrations or concussions.

W. Fill the mold with fresh concrete on successive layers so that the thickness of one layer is equal to the height of the mold. Each layer is properly stamped with a hammer rod and a 25-stroke spread evenly over the entire surface of the layer. After the whole mold is filled, the final surface is finished using the filler with the top slot level of the mold.

C. Raise the mold vertically to the top slowly and carefully, ensuring that the concrete is not moved.

H. The mold is placed vertically next to the concrete block that has been lifted, and the concrete slack is measured by measuring the difference in height between the mold and the highest point of the concrete block.

X. The test shall be re-tested if a horizontal collapse of the fresh concrete occurs when the mold is removed. If such collapse occurs upon re-examination, the concrete strength shall not conform to these specifications.

Test the coefficient of blood: a. The top hopper is filled with fresh concrete using the scoop. Immediately after opening the hinge gate, the concrete falls under the weight of its weight only to fill the bottom hopper.

B. Close the bottom drum nozzle while filling the top hopper with concrete and open its gate to drop.

T. The lid is lifted from the concrete nozzle and the articulated gate of the concrete-filled bottom can be opened so that the concrete falls from the bottom hopper under its weight only to fill the cylinder.

W. It is permitted to use the rod to help the concrete to descend from the top hopper to the bottom hopper and from the bottom hopper to the cylinder, if the mixture is attached to the hopper's wall, from top to bottom.

C. The concrete is removed from the cylinder level using a malgine that holds each calf in hand.

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