A REVIEW OF THE EFFECTS OF CONCRETE STRENGTH ON SIZE, SHAPE, AND LOAD

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ABSTRACT
Concrete characteristics are the most significant and crucial physical material property when reinforced concrete constructions are \splanned. Because of the development and in kinds and nature of material utilized to increase the concrete innovation, materials\sand mix proportions, test measure, mixing strategy, and testing condition have notable affects on highlights of concrete strength, in view of the fact that the control specimen sizes and shapes could be distinct in relation from State to State. Testing of mechanical characteristics (particularly compressive strength and tensile strength) of concrete is one of the most urgent phases of development. To regulate the nature of the concrete, there are several molds used for pouring concrete samples according to various orientations in different nations. Many studies have noticed that the exact shapes and sizes of concrete samples might produce distinct sorts in the repercussions of compressive strength or tensile strength. The relationship between the compressive strength of the concrete cube and the cylinder is complicated. In this paper discuss the Size, Shape and Load Effect on Strength of concrete.
Keywords: Concrete, size, shape, effect, strength

INTRODUCTION

Because of its ability to withstand varying loads on constructions, concrete has long been considered one of the most important building materials. There are many experiments, like with other building materials, for regulating the quality of concrete, each one designed to define distinct features of concrete. Among these trials, the ones assigned to assess the resistance of concrete to loads are the most common. Two of the most important investigations are the compressive strength test and the splitting tensile strength test. Although all of the tests are intended to assess various mechanical properties of concrete samples, results may be influenced by a variety of factors such as ambient conditions, concrete sample shape, and size.

CONCRETE MIX AS A SYSTEM

According to studies, concrete will continue to be the most widely used man-made building material for years and decades to come. Concrete is adaptable because its basic components, cement, aggregate, and water (and sometimes admixtures), can be customised to meet the specific needs of each project. Because cement and aggregates are simply intermediary products, concrete is the true construction material. Precast concrete and ready-mixed concrete are two examples of concrete being treated as an entityAs a result, concrete is regarded as a complete construction material. In this context, a concrete mix is referred to as a'system.' Concrete mixes, unlike other common construction materials such as steel, are typically made on-site, so quality control and the inherent unpredictability of their characteristics become critical factors.

CLASSIFICATION OF CONCRETE MIXES

Many different types of concrete mixes exist, and many of them are determined by the type of specification used. There are 'prescriptive' specifications that specify the proportions of the ingredients and their properties (such as the type of cement used, the maximum aggregate size allowed, and so on) in the hope that adherence to these specifications will result in satisfactory performance. You could also use a "performance" specification instead. Specifications are established in order to obtain the desired qualities of concrete (example - strength, workability or any other property). Concrete is acceptable as long as these conditions are met and the manufacturer has complete control over the mix's components and quantities. Based on the preceding principles, concrete can be classified as a 'nominal mix' or a 'designed mix,' according to IS: 456-2000*.

GRADES OF CONCRETE

Concrete's compressive strength is regarded as the most important of the various qualities of concrete and has been used as an indicator of its overall quality. The compressive strength of concrete appears to be linked to a slew of other technical parameters. As a result, the compressive strength of concrete is the primary criterion for its classification. The different concrete grades are specified in IS: 456-2000 and IS: 1343-1980. You cannot use concrete grades lower than M 15 or lower than M 20 when constructing a pre-stressed or reinforced structure. The 28-day characteristic strength of concrete has been used to grade concrete, as has ISO and the majority of other codes of practise.

PROPERTIES OF CONCRETE

Properties of concrete are divided into two major groups

1. Properties of Fresh concrete
2. Properties of Hardened concrete

CONCRETE BLEEDING

The term "water gain" refers to concrete bleeding. Because water has the lowest specific gravity of the concrete's other elements, some of the water rises to the top in this type of segregation. Bleeding is more common in improperly proportioned and/or blended concrete. There is a lot of bleeding when concrete is exposed to the sun and in thin parts, such as roof slabs or road slabs.

Prevention of Bleeding in concrete

- With correct sizing and mixing, bleeding may be minimized.
- Pozzolanic materials with finely separated particles minimize bleeding by providing a longer channel for the water to go along.
- The use of an air-entrainment agent is quite beneficial in minimizing bleeding.
- Finer cement or cement with a lower alkali percentage may aid in the reduction of bleeding. Rich mixes are less prone to bleeding than lean mixes.

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SEGREGATION IN CONCRETE

The separation of the basic components of concrete is referred to as segregation. All of the materials must be evenly distributed throughout the mixture to produce a good concrete. Concrete's constituent materials are available in a variety of sizes and specific gravities. As a result, it's natural for the materials to degrade.

Segregation may be of three types

1 **Coarse aggregate** separating out or setting down from the rest of the matrix.

2 **Paste** separating away from coarse aggregate.

3 **Water** separating out from the rest of the material being a material of lowest specific gravity.

HYDRATION IN CONCRETE

Concrete's strength and durability are due to the hydration of cement particles. Cement hydration is a long-term process rather than a one-time event. Water absorption is rapid at first, but slows as time passes in the field and during actual work, necessitating even higher water/cement ratios. Because concrete is porous, the water used in the mix evaporates quickly, leaving less available water for effective hydration in the top layer. To replenish the water that has been absorbed and evaporated, additional water must be provided. To put it another way, at this early stage of the process, the curing process can be viewed as the formation of an ideal environment for continuous hydration. The ideal conditions include a comfortable temperature and plenty of moisture.

Properties of Harden Concrete

- Compressive strength
- Tensile strength

INFLUENCE OF SIZE OF SPECIMEN ON STRENGTH

The size of the test specimens in strength testing is specified in the applicable standards, but more than one size can be used. Furthermore, there have been some arguments in favour of using smaller specimens on occasion. Here are some of their advantages: Miniature specimens are easier to handle and less likely to be damaged than larger specimens; moulds are less expensive; a lower capacity testing machine is required; and less concrete is used, which means less storage, curing, and processing space in the laboratory, as well as less aggregate to be processed. The size of the test specimen may also have an effect on the strength and unpredictability of the test results. As a result, the effect of specimen size on strength test results must be considered carefully. It is reasonable to conclude that the greater the volume of concrete exposed to stress, the more likely it is to contain an element with a specific extreme (low) strength.

SIZE EFFECTS IN TENSILE STRENGTH TESTS

Rossi et al. tested concrete cylinders with compressive strengths ranging from 5000 to 18 500 psi using direct tension. Surprisingly, they discovered that as the size of the concrete increases, the tensile strength decreases and the test results become more variable. However, there appears to be no relationship between concrete strength and the coefficient of variation, which decreases as specimen size increases. a1 and Rossi Explain how the variety of mix components affects this strong effect. Because aggregate particles are weaker than mortar, a larger specimen size has a greater influence on strength than a smaller specimen. This difference is negligible in high-strength concrete and lightweight aggregate concrete.

SIZE EFFECTS IN COMPRESSIVE STRENGTH TESTS

As a member's size increases, the size effect diminishes, resulting in an increase in both compressive and tensile strength without a reduction in the member's size. At a diameter of 457 mm (18 inches), the strength curve is said to be parallel to the size axis, meaning that cylinders with a diameter of 457mm (18 inches), 610mm (24 inches), and 914mm (36 inches) would all have the same strength, according to the U.S. Bureau of Reclamation. Lean mixtures lose strength less rapidly than rich ones as specimen size increases, according to the same study. The relative strength of 457 mm (18 inch), 610 mm (24 inch), and 1200 mm (60 inch) cylinders to the 152 mm (6 inch) cylinder is 85% for rich mixtures, but 93% for lean The results of these experiments are critical in dispelling the myth that extremely huge buildings would have dangerously low strengths if the size effect were taken into account. Local failure does not imply collapse, hence this can't be the case.

FACTORS INFLUENCING THE STRENGTH RELATIONSHIP OF CONCRETE CUBE AND STANDARD CYLINDER

Compressive strength reigns supreme when it comes to structural longevity. Variables such as specimen size, shape, and loading, as well as matrix porosity and transition zone porosity, all have an impact on design parameters. A common misconception is that a cylinder's strength is directly proportional to its volume; however, this is not always true. A variety of factors, including age, influence the compressive strength of core concrete. These characteristics are important in addition to the core compressive strength, core diameter, core height ratio, coreing orientation, core moisture condition at the time of testing, and the presence of reinforcement inside the concrete core.

The relationship between the compressive strength of a concrete cube and a cylinder is complicated. A variety of factors influence the strength growth of concrete structures, including the following: -Effects of concrete cube / cylinder casting, curing and testing procedures.

- Effects of geometry of specimen
- Effect of concrete strength level
- Direction of loading and machine characteristics
- Grading of aggregates

CONCLUSION

1 Slow loading has a lower strength than quick loading because of creep, which occurs when the load is maintained for an extended period of time.

2 IS 10262 2009 may be used to create all of the typical grades of concrete, including M20 and M30.

3 Concrete's compressive and tensile strengths are affected by the concrete's form and size, respectively, although the size influence is less pronounced.

4 Due to the Restraining effect and friction, the greater the size, the greater the load-carrying ability.

5 Square and circular forms are stronger than rectangular and triangular ones.

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