

Effect of Aggregate Flakiness on the Compressive Strength and Workability of Concrete A REVIEW

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Abstract

In this paper effects of aggregate flakiness on the compressive strength and Workability of concrete cubes have been studied using experiments. Total 36 cubes will be cast using variation of flaky aggregates (20%, 30%, 40%, 50%, 60%, 70%) with water cement ratios 0.5. Concrete mix design of M25 grade will be done according to IS: 10262-2009. Workability will be measured in terms of slump test. Concrete cubes will be tested for compressive strength. It will be studied that flaky aggregates beyond certain limit decreases strength and workability and hence the strength of concrete greatly depends on internal structure and flakiness aggregates.

Key word: Flaky aggregates, workability, compressive strength, Concrete cube ,concrete.

1. INTRODUCTION

Concrete is a composite material produced by the homogenous mixing of selected proportions of water, cement, and aggregates (fine and coarse). In absolute volume terms the aggregate amounts to 60-80% of the volume of concrete and is, therefore, the major constituent of the concrete. To know more about the concrete it is essential that one should know more about the aggregates. Since the aggregate characteristics are critical to the performance of the concrete mixes. It is well known that shape of aggregate plays very important role in 'Shaping' the properties of concrete . The presence of flaky aggregates beyond certain limits increases the degradation of the concrete mixes. The presence of high percentage of flaky aggregates makes the mix harsh and difficult to work with . Here the flaky aggregate is stated as that the aggregate with a ratio of the shortest diameter and the average diameter is less than 0.60. Flaky particles tend to orient in one plane and cause laminations which adversely

affect the durability of the concrete. Flaky aggregate was shown to have lower compatibility and higher breakage . Highly flaky aggregates have more voids and reduce the workability. Workability of the fresh concrete be such that the concrete can be properly compacted, transported, placed and finished concrete should not segregate i.e. it has to be cohesive. A workable concrete should not shown segregation or bleeding. This results in large voids, less durability and strength.

2. OBJECTIVES

The objectives of the study are:

- To investigate the effect of flaky aggregate on the strength of concrete.
- To investigate the effect of flaky aggregate on the workability of concrete.
- To determine the most suitable percentage of flaky aggregates in the concrete .

3. BASIC ASPECTS

3.1 Materials:

- **Portland pozzolana cement**

The Portland Pozzolana Cement is a kind of Blended Cement which is produced by either inter-grinding of OPC clinker along with gypsum and pozzolanic materials in certain proportions or grinding the OPC clinker, gypsum and Pozzolanic materials separately and thoroughly blending them in certain proportions. Pozzolana such as fly ash is essentially a siliceous material which while in itself possessing little or no cementitious properties will, in finely divided form and in the presence of water, react with calcium hydroxide at

ambient temperature to form compounds possessing cementitious properties.

Following tests will be conducted, on cement:

1. Consistency limit test .
2. Initial setting time and final setting time .

- **Sand**

The sand used in the investigation will be ordinary river sand. The sand passing through 4.75 mm sieve will be used in the preparation of specimens. Sieve analysis for the sand will be carried out in the laboratory as per the procedure mentioned in IS2386 (part-I)-1963. The sizes of sand vary between 2 mm to 4.75 micron .

- **Coarse aggregate**

The coarse aggregate used in the investigation will be 20 mm size crushed granite stone obtained from quarries. The physical properties will be determined as per IS: 3286-1963.

- **Water**

The water used in the mix design was potable water from the water supply and is free from suspended solids and organic materials, which might have affected the properties of the fresh and hardened concrete. The presence of tannic acid or iron compounds is objectionable. The general required of water for mixing and curing concrete shall be as per IS: 456-2000.

4. Review of Related Literature

A large number of researchers have extensively studied the effect of flakiness on the compressive strength & workability of concrete..

M R Vyawahare, P O Modani , have studied on Improvement in Workability and Strength of Concrete with Flaky and Elongated Aggregates, it was concluded that extremely flaky and elongated aggregate can also produce quality concrete which can be used for PCC works .

Jian-Shiuh Chend, M.K. Chang & K.Y. Lin , have studied on Influence of coarse aggregate shape on the strength of asphalt concrete Mixtures, it was concluded that flaky aggregate in a mixture resulted in lower resistance to shear deformation and it was shown to have lower compactibility and higher breakage.

Bambang Ismanto siswosoebrotho & Kariantoni ginting , have studied on Workability and resilient modulus of asphalt concrete mixtures containing flaky aggregates shape, it was concluded that the values of Workability Index are influenced by the flaky aggregate content the values of workability decrease with increasing the flaky aggregate content and flaky aggregate does influence the properties of asphalt mixture and its use should therefore be limited to avoid the unexpected mixture properties that might be occurred during construction.

D. Sakthibalan , have studied on Influence of Aggregate Flakiness on Dense Bituminous Macadam & Semi Dense Bituminous Concrete Mixes, it was concluded that the parameters such as stability, flow, voids filled with bitumen and tensile strength ratio decreases with increase in proportion of flaky aggregates for both DBM and SDBC mixes. The parameters such as air voids and voids in mineral aggregate increases with increase in proportion of flaky aggregates for both DBM and SDBC mixes.

Ganapati Naidu .P and S. Adishesu , have studied on Influence of Coarse Aggregate Shape Factors on Bituminous Mixtures, it was concluded that the Particle shape parameter, higher sphericity value obtained for cubical shape aggregates and lower value for blade shape aggregate, because the sphericity value higher indicates the roundness of the aggregate.

Sandor Popovics and Janos Ujhelyi , have studied on contribution to the concrete strength versus water-cement ratio relationship.

Animesh Das , have studied on A revisit to aggregate shape parameters found that Aggregates constitute major part of the pavement structure. The engineering properties of the aggregates, as well as its shape (*i.e.* form and angularity) and texture, substantially affect the overall performance of the pavement .

5. PROPOSED METHODOLOGY

The experimental work was divided into two phases. In first phase, preliminary tests were conducted on materials. In second phase, Concrete cubes were casted for compressive strength . The concrete is prepared by increase in flaky aggregate percentage from 20% ,30%, 40%, 50%, 60% and 70% with water cement ratios of 0.5 . Fresh concrete were tested for slump test and Hardened

concrete were tested for compressive strength. They were tested for compressive strength after 7 and 28 days of water curing.

6. EXPECTED OUTCOMES

It expected that flaky aggregates beyond certain limit decreases strength and workability and hence the strength of concrete greatly depends on internal structure and of flakiness aggregates.

It also expected that the compressive strength of concrete decreases with increases in percentage of flaky aggregates because of increases in voids.

7. REFERENCES

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