

Impact Of Size Of Course Aggregate On Compressive Strength Of Concrete

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*Abstract: This paper is about the aggregate size of the concrete and its direct impact on its compressive strength. This study was conducted in Iqra National University Peshawar. In this research the size of aggregate was randomly selected as (1.5 inch, 1 inch, 0.8 inch, 0.4 inch and 0.2 inch). Different combination of aggregate mixing were made with ordinary Portland cement and sand of fineness modulus (3.48), proper paste were prepared and placed in cylindrical mould having dimensions (6inch*12inch). The cylindrical concrete is then tested in the compression testing machine in laboratory and resulted that 0.4 inch and 0.6 inch aggregate expresses higher compressive strength than other aggregate sizes.*

Keywords: High strength, concrete, compressive strength, aggregate size.

I. INTRODUCTION

It is a general assumption that the strength of the concrete is directly related to the size and quality of the material used in it. There are many things which are the same responsible for the strength and quality which included the balance mixing of the material, the size and quality of aggregate, the quality of cement, the quality of sand and the water used in it are responsible for the effectiveness and quality sort of concrete in construction. There are some time tested and approved standards for the material making, mixing, transportation of it and time of its use, as well as its proper utilization in proper time and weather. Size of aggregate was a great topic of discussion and experimentation in past and it was always under study by many construction and civil development organization. The size of aggregate is observed to be a matter of fact and it was concluded by many studies that aggregate size can affect the concrete strength's. The aggregate size is supposed to be an important factor in bringing improvements in the strength of concrete. Ezeldin and Aitein (1991) in their study found that different size of aggregates can affect the strength of concrete. They studied that the size of aggregate is

directly related to the endurance and life of concrete used in different areas. In their study they studied four different sizes and it was concluded that the size of aggregate is connected to the strength of the concrete. Darwin et al (1996) identified that apart from other essential features and elements responsible for the high strength of concrete there is one most basic and needed element and that is the element of the size of the aggregate in the concrete strength, if the aggregate used is of small size then it will be good but if the size of aggregate used is average then it will give more strength and at the same time formulas, materials, weight, mixture and mixing of the materials would all be responsible for the quality of concrete. Though there is no proper formula for the good and poor quality of concrete but still there is a complete distinction available in good quality and poor quality of concrete strength due to size.

OBJECTIVE OF THE STUDY

The objective of the research included:

- ✓ To provide practical recommendations for the best aggregate size and effective strength of concrete.

- ✓ To Study the size of concrete impact on its strength.

RESEARCH QUESTIONS

- ✓ What practical recommendation for the best aggregate size and effective strength of concrete will be made?
- ✓ Is the size of a concrete can affect its strength?

II. LITERATURE REVIEW

Giaccio et al (1993) made a comparative study about fracture energies of multiple strengths with compressive strengths. The level of these were from 20 Mpa to 90 Mpa ,aggregate materials were lime stone basalt and gravel its sizes were 0.3 inch ,0.6 inch ,and 1.3 inch. also the rough surface of aggregate was included as variables . The study revealed that the strength and force of the aggregate was depending upon the material size and compressive strength of concrete.

Zhou et al (1995) stated that when the mixture criteria of different materials is of the some standard quality measures, then the size of the concrete will be same strong and powerful. Xie et al (1995) studied that though the mixing formula for the materials would be the same but still there were difference in the strength due to its aggregate size 0.4inche and 0.8inch that would be more strengthen and powerful as compared to the concrete of more than 1.2inch of size. This study further explains that the shape of the concrete can bring changes in the strength and force of concrete size. It's stated that the split type of cylinder concrete is durable and strengthens the force of concrete.

Perdikaris and Romeo (1995) also found in their work that the size is the main element of the concrete strength, as in their study they concluded that a moderate size is different to be broken than large size. Mather and Darwin (1976, 1977) identified that the medium size is the more strengthen and durable concrete type.

Burnet and wolsier (1989) indicated that building made of concrete materials always be considered as strong and valid as the materials used in it, would be assumed and reassured as of high quality and high standard. In this line the size of the aggregate will be of great importance and worth because the size is considered a major element in the strength measuring. Though there are no exiting parameters in the size selection and size measurement but aggregate size may not be strength as compared to major size aggregate. Quality concrete is supposed to be more reliable and good than that of low standard concrete. It is fact that a 100Mpa should have high force and strength than that of 20Mpa solid costs. All the aggregate size in a locally made concrete sizes may be observed in all the available materials but in that study it was concluded that locally made concrete size will have lesser impact on strength of concrete of different size aggregate.

Other researchers like Plorato (2003), Neville and Adam (1997) and Tasdemir (2003) also found in their studies that the size of the concrete if made by the same mixture of materials in the same time period would depend upon its size. If the size of the aggregate is small then it will be more powerful and strong than the concrete having large size of the aggregates. It

shows that if the material is homogenous but size of aggregate is different then one of the aggregate will be more durable and strong. It also concluded that the mixture elements should be of equal and must have all the same type materials which include aggregates, ratio of cement and water, sand, weight of the materials and days of its completion.

III. RESULT ANALYSIS

A. THE AGGREGATE SIZE COMBINATION I-E 1.5INCH & 1INCH WITH W/C RATIO = 0.3

Ratio of mixture	Ratio of mixture	Slumps	The content of concrete/kgm	One week compressive strength Mpa	Two weeks compressive strength Mpa	Four week compressive strength Mpa
1:1.5:3	.3	2	227	7	10	8
1:1.25:2.1	.3	11	283	18	20	53
1:1:2	.3	15	423	22	26	66
1:0.75:1.5	.3	Collapse	503	28	35	120

Table 1

B. THE AGGREGATE SIZE COMBINATION I-E 1INCH & 0.8INCH WITH W/C RATIO = 0.3

Ratio of mixture	Ratio of mixture	slumps	The content of concrete/kgm	One week compressive strength Mpa	Two weeks compressive strength Mpa	Four week compressive strength Mpa
1:1.5:3	.3	2	227	9	10	55
1:1.25:2.1	.3	12	283	19	22	95
1:1:2	.3	18	423	22	27	137
1:0.75:1.5	.3	collapse	503	29	38	155

Table 2

C. THE AGGREGATE SIZE COMBINATION I-E 0.8INCH & 0.4INCH WITH W/C RATIO = 0.3

Ratio of mixture	Ratio of mixture	Slumps	The content of concrete/kgm	One week compressive strength Mpa	Two weeks compressive strength Mpa	Four week compressive strength Mpa
1:1.5:3	.3	4	237	21	49	141
1:1.25:2.1	.3	6	483	25	56	45
1:1:2	.3	Collapse	523	28	67	157
1:0.75:1.5	.3	collapse	553	40	95	180

Table 3

D. THE AGGREGATE SIZE COMBINATION I-E 0.4INCH & 0.INCH WITH W/C RATIO = 0.3

Mix ratio	Water concrete ratio	slumps	Concrete content/kgm	7 days compressive strength Mpa	14 days compressive strength Mpa	28 days compressive strength Mpa
1:1.5:3	.3	6	237	21	49	109
1:1.25:2.1	.3	8	483	25	56	162
1:1:2	.3	Collapse	523	28	67	167
1:0.75:1.5	.3	collapse	553	40	95	170

Table 4

IV. DISCUSSION

The study was an attempt to find out the impact of aggregate size on its strength and vitality when all its content and materials were same. The study was divided into four types of experimental design therefore the data is explained in four tables. The effect of size of aggregate on the concrete was

studied and it was found that aggregate size directly influencing strength of concrete. As different strength were measured with different time frame and with different strength and it was concluded that there were an association between the concrete strength and aggregate size of concrete.

V. CONCLUSION & RECOMMENDATION

It was concluded that the water taking into amount the after effects of investigations, the accompanying conclusion might be drawn.

- ✓ The compressive quality of concrete relies on various compound and materials; for example blend proportion, size and texture of coarse and fine total technique for the period of curing and compaction.
- ✓ The blend proportion 1:0.75:1.5 provides greater quality than the one with low workability and it also provide good strength.
- ✓ The aggregates having size of 10mm and 15mm depicts best quality from all other aggregates.
- ✓ Blend proportion 1:0.75:1.5 having sizes 10mm and 15mm provides ideal quality.
- ✓ The size and strength should be kept in mind while making any solution to maintain a quality strength and standard.
- ✓ The aggregate size and age is directly linked with the material
- ✓ Proportion, so the aggregate must be mixed in a balanced formulation to avoid damages.
- ✓ The size of aggregate should be used according to the need and demand of the building, so that the building may absorb the force of needed strength.
- ✓ The study recommended that the concrete solution should be made according to international made measurements and guidelines.

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