

# ANALYSIS OF COMPRESSIVE STRENGTH OF STRUCTURES ON THE BASIS OF VARIABLE AGGREGATE SIZES

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**ABSTRACT:** This research work is an effort to carry out the numerous requirements for the arrangement of concrete mix with different size of aggregates. M 25 grade of concrete has been chosen as the reference concrete specimen. Variable size of aggregate like 2mm, 3mm 4mm etc. has been used as quality aggregate in the reference with substitute of traditional excellent combination. This will help us to permit the sustainable use of aggregates to be had to us however offer an effective and mass management of concrete structures. The concrete specimen with different sizes of aggregate like 2mm, 3mm, 4mm, 10mm, 15mm is used and the curing of samples is done for 7, 14, 21 days, A compressive strength is checked and found that 4 mm mixture length complements better compressive strength in comparison to other samples.

**Keywords:** Concrete grade, variable Aggregate, Compressive Strength, quality concrete, curing

## I. INTRODUCTION

Concrete, usually PCC, is a composite material composed of extraordinary and coarse combination bonded collectively time most frequently inside the past a lime-based cement binder, collectively with lime putty, but now and again with unique Portland Cement. It is one-of-a-kind, non-cementations sorts of concrete all binding some form of mixture together. The cement reacts with the water and particular factors to form a tough matrix that binds the materials collectively right proper into a durable stone-like cloth that has many uses.[4] Often, components (along with pozzolans or extraordinary plasticizers) are protected within the mixture to decorate the physical houses of the wet blend or the completed material. Most concrete is poured with reinforcing substances (together with rebar) embedded to offer tensile power, yielding bolstered concrete. Concrete is one of the most usually used building materials. Its utilization worldwide, ton for ton, is times that of steel, wooden, plastics, and aluminum combined.

## II. METHODOLOGY & EXPERIMENTAL INVESTIGATION

### MATERIALS USED

The basic substances which have been used in this research are:

- OPC (ultra tech cement)
- Natural Coarse mixture (sedimentary rock source)
- Natural Fine combination (sand)
- Water (fresh drinkable water)

### PREPARATION OF CUBE & BEAM SAMPLES

Cube Samples	15 x 15 x 15 cm
Grade	M25
Volumetric Proportions for M25	1:1.5:3

M25 grade of concrete was considered for the preparation of samples. The Table 3.3 shows the weights of materials taken for the preparation of test samples.

The process included the 5 basic steps and these steps are as follows:

- Weighing & Batching
- Mixing
- Placing
- Compacting
- Curing

Table: Material Proportions (per m<sup>3</sup> of concrete)

CEMENT	FINE AGGREGATE	COARSE AGGREGATE	WATER	NO. OF CUBES PREPARED
373.38	609.60	1220.8	186.69	5
373.38	579.12	1220.8	149.31	5
373.38	548.64	1220.8	149.31	5
373.38	518.16	1220.8	149.31	5

### Weighing and Batching of materials

The first step inside the practice of the dice pattern is the weighing and batching of materials. The substances are batched consistent with the necessities and then a fixed quantity from this batched lot of materials is taken for the guidance of pattern. The determine 3.1 suggests the simple batching performed in the laboratory;



Figure: batching of materials



Figure: Mixing of aggregates

#### Mixing of materials

After the procedure of batching, the substances had been decided on in a ratio and they had been combined together, the manner is referred to as the Mixing. Mix was prepared the use of volumetric proportions for M25 i.e. A ratio of 1:1.5:3. The following determine 3.2 indicates the method of manual mixing of material..



Figure: Mixing of materials

#### Placing of concrete

After mixing of substances, they had been located within the dice mold and the determine three.4 indicates themethod of placing;



Figure: placing of concrete in mould

#### Curing of test samples

The total 24 samples have been organized the use of exclusive proportions as given in Table 3-3. These check samples had been cured for 7 days and 28 days respectively & the procedure of curing is proven in discern 3.4



Figure: curing of samples

#### COMPACTION FACTOR TEST

In addition to the above tests, Compaction Factor Test end up moreover finished on the easy rubberized concrete to analyze the workability .Work-capability of glowing concrete is the ability or ease with which concrete can be mixed, transported to the website on line and positioned. If concrete is of top workability then it may be compacted with an awful lot less compacting efforts. So there exists a relation amongst the quantity of work required to compact a given pattern of clean concrete and the art work-capability of the concrete. Slump cone take a look at is usually achieved to discover the work-functionality of the concrete but this is handiest recommended for the concrete of higher workability. For masses less capability concrete (having an lousy lot plenty much less water cement ratio), compaction element approach is desired. Relation between the compaction component and artwork-capability may be seen as better the compaction trouble better is the art work-functionality. Theoretical most price of the compaction component may be zero.Ninety six to at least one.Zero. For the existing study the compaction factor test modified into finished through following the method defined below;

#### Procedure for compaction factor test:

1. The concrete sample became gently placed inside the top hopper of the apparatus using the hand scoop and become leveled. After that the cylinder became included nicely.
  2. Trap door present at the bottom of the top hopper was opened in this sort of way that Concrete falls in to the lower hopper. Also, the concrete sticking on its sides became gently pushed with the road to the lower hopper.
  3. Then, the entice door of the decrease hopper become opened too and the concrete was allowed to fall in to the cylinder beneath.
  4. The extra of concrete gift above the top degree of cylinder changed into reduce off the use of trowels and was leveled.
  5. The outdoor of the cylinder changed into wiped clean.
- The figure shows the process of compaction factor done in the laboratory;



(a)



Figure: Compressive Strength test of cube samples in UTM of aggregate size of 3mm



Figure: Compressive Strength test of cube samples in UTM aggregate size of 4mm



Figure: Compressive Strength test of cube samples in UTM aggregate size of 15mm

### III. RESULT AND DISCUSSION COMPRESSIVE STRENGTH TEST RESULT

The compressive electricity test turned into completed at the cubes of length 15 cm x 15 cm x 15 cm to check the compressive power of rubberized concrete and the results acquired are given in Table 4.1.

$$\begin{aligned} \text{Target mean strength for 28 days for M25 concrete}(f'_{ck}) &= f_{ck} + 1.65 \times s \\ &= 20 + 1.65 \times 4 \\ &= 26.6 \text{ N/mm}^2 \end{aligned}$$

Where,  $f'_{ck}$  = target mean strength at 28 days  
 $f_{ck}$  = characteristic compressive strength at 28 days &  
 $s$  = standard deviation = 4 (for M25 concrete)

Table Results of compressive strength test

Aggregate Size 2 mm			
load	7 days	14 days	21days
200	18.3	18.9	19.1
400	17.8	18.2	18.6
600	17.4	17.7	18.3
700	16.9	17.1	17.9

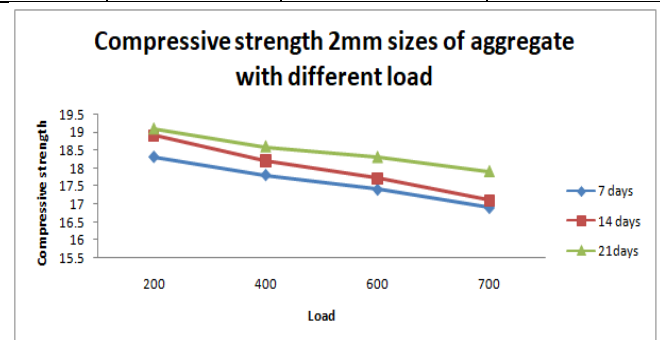


Figure Graph shows results of compressive strength test Above shown graph represents comparative analysis combination strength of denser and coarse aggregates for

compression trying out from above comparison the realization might be withdrawn for compressive electricity of 3mm mixture.

Table Results of compressive strength test

Aggregate Size 3 mm			
load	7 days	14 days	21days
200	18.8	19.3	19.7
400	18.3	19	19.2
600	17.6	18.4	18.6
700	17.2	17.9	18.1

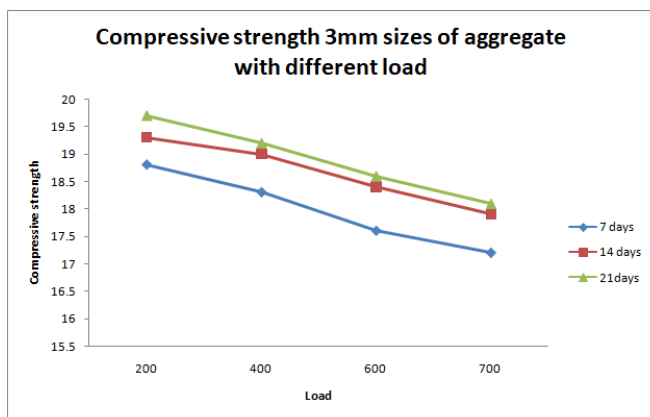


Figure Graph shows results of compressive strength test Above shown graph represents a comparative analysis aggregate strength of denser and coarse aggregates for compression testing from above comparison the conclusion would be withdrawn for compressive strength of 3mm aggregate.

Table Results of compressive strength test

Aggregate Size 4 mm			
load	7 days	14 days	21days
200	19.8	23.3	20.8
400	19.2	22.9	20.4
600	18.9	22.5	19.9
700	18.3	21.9	19.2

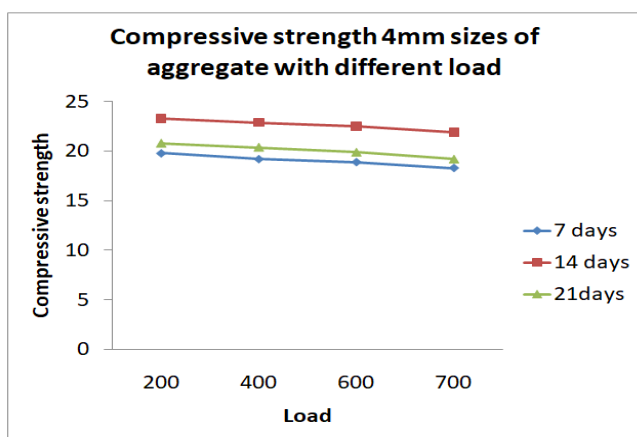


Figure Graph shows results of compressive strength test

Above proven graph represents a comparative analysis aggregate electricity of denser and coarse aggregates for compression testing from above contrast the belief would be withdrawn for compressive energy of 4mm mixture.

Table Results of compressive strength test

Aggregate Size 10mm			
load	7 days	14 days	21days
200	19.5	19.8	20.4
400	19.1	19.3	20.1
600	18.7	18.9	19.8
700	18.1	18.4	19.3

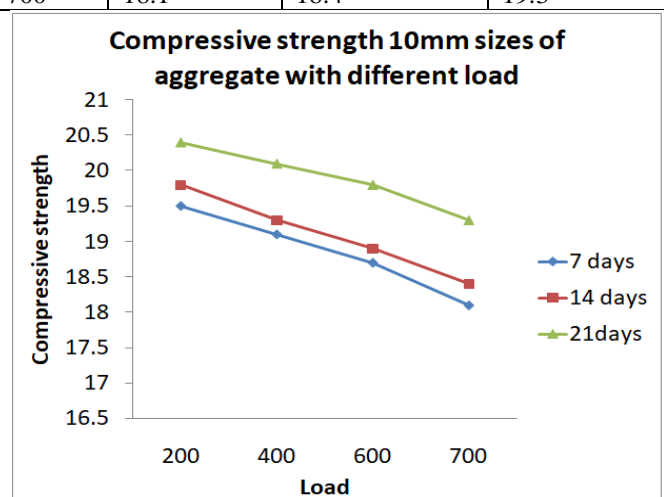


Figure Graph shows results of compressive strength test Above shown graph represents a comparative analysis aggregate electricity of denser and coarse aggregates for compression trying out from above contrast the belief might be withdrawn for compressive energy of 10mm combination.

Table Results of compressive strength test

Aggregate Size 15 mm			
load	7 days	14 days	21days
200	18.8	19.5	19.8
400	18.5	19.1	19.3
600	17.9	18.3	18.7
700	17.2	18.1	18.4

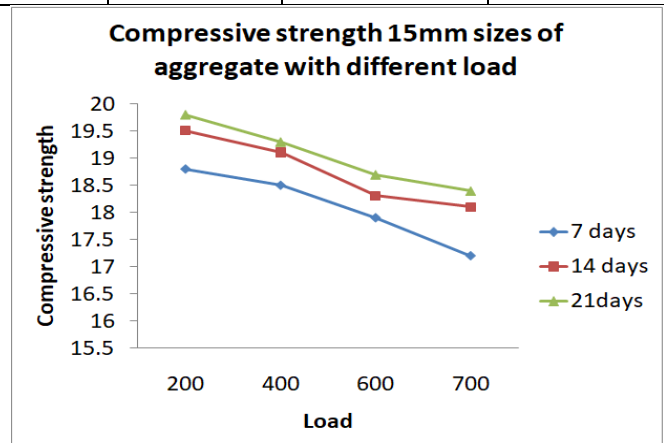


Figure Graph shows results of compressive strength test

Above proven graph represents comparative analysis mixture strength of denser and coarse aggregates for compression testing from above evaluation the conclusion might be withdrawn for compressive power of 15mm aggregate.

#### IV. CONCLUSIONS

- Concrete with big size of mix have low workability i.e with increase in length of aggregate the workability decreases.
- The compressive strength of the concrete reduces in all sizes of aggregate in curing of seven days. With the addition of first combination, the reduction in strength can't be simplified. However, these data provides simplest initial theory for the strength-loss of locally produced modified concrete in comparison with the conventional concrete.
- The high compressive strength is found in 4mm of combination as compared to all sizes of mixture concrete mixes in each days of cured samples.
- The addition of quality aggregate in concrete that might help to control noise and hence make the roof soundproof.

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