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EXPERIMENTAL STUDY ON FLEXURAL & COMPRESSIVE BEHAVIOUR OF RCC MEMBER WITH REPLACEMENT OF SAND BY USING CLAY

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Abstract- **From the research conducted, the soil has the potential tobe used in place of conventional sand because it is nearly Omni presentand abundantly available. Thus the soil wouldnaturally be relatively cheap andsustainable construction material. Even there are abundantreserves of suitable sands, there is still an interest in the use ofsoil-cement, as the soil used is available on the construction siteand minimizes the environmental impacts of transporting clean andprocessed sand. Therefore, this study was conducted to investigatesuitability of soil in place of sand in producing the conventionalconcrete. This is a preliminary study which only limited to theinvestigation of compressive and flexural strengths. In this study investigated compressive, tensile, and flexural behavior of conventional concrete in presence of clay with constant ratio of (1:1:2) M-25.In this investigation were made with replacement of sand by using clay are 0%,5%,10%,15%,20%,and 25%.**

Keyword: clay, super plasticizer

1. INTRODUCTION

Concrete can be a strong durable building material that can be formed into many varied shapes and sizes ranging from a simple rectangular column, to a slender curved dome orshell, if the constituent materials are carefullyselected. The constituent materials are: cement, fine aggregate, coarse aggregate and water.

Concrete is a very variable material, having a wide range of strengths. Concrete generally increases its strength with age. The precise relationship will depend upon the type of cement used. Some codes of practice allow the concrete strength used in design to be varied according to the age of the concrete when it supports the design load. IS 456 does not permit the use of strength greater than 28 – day value in calculations. It is important that the aggregates for making concrete should be clean of all sorts of impurities.

In present day, the conventional fine aggregate has the presence of clay -soil content due to deep digging of river. The scarcity of sandy material has led to the increase in retail price and subsequently leads to higher production cost of concrete products. Thus, soil would naturally be an environmentally friendly, relatively cheap and sustainable constructionmaterial and minimizes environmental impacts of transporting clean and processed sand.

This study was conducted to investigate presence of soil in place ofsand in producing conventional concrete. This is a studywhich only limited to the investigation of compressive and flexural strengths.

2. MATERIALS USED

2.1 CEMENT

In the present investigation 53 grade Ordinary Portland cement has to be used. OPC 53 grade cement is most suitable for using in foamed concrete for better result. This meets the need of the consumers. The different laboratory tests were conducted on the cement to determine standard consistency, initial setting time and final setting time.

2.2 FINE AGGREGATE

Fine aggregates are the aggregates whose size is less than 4.75 mm. For increased workability and for the economy as reflected by the use of less cement, the fine aggregate should have a round shape. The purpose of the fine aggregate is to fill

the voids in the coarse aggregate and to act as a workability agent.

2.3 COARSE AGGREGATE

The fractions from 20 mm to 4.75 mm are used as coarse aggregate. The Coarse Aggregates from crushed Basalt rock, conforming to IS: 383 is being used. The Flakiness and Elongation Index were maintained well below 15%.

2.4 GRIT

Grit is a granular material that can be thought of as a transition stage between a coarse sand and small pebbles. Generally 2-6mm in size, grit has limited use in the construction industry on its own, other than as a surface dressing. However, over recent years with the development in block paving specifications, it has become a viable alternative bedding material for permeable paving and other forms of elemental paving used in areas of high water ingress.

2.5 WATER

Combining water with a cementations material form a cement paste by the process of hydration. The cement paste glues the aggregate together, fills voids within it, and makes it flow more freely. Lower water to concrete ratio will yield a stronger, more durable concrete; while more water will give a free flowing concrete with a higher slump. Impure water used to make concrete can cause problems when setting or in causing premature failure of the structure.

2.6 CLAY

Generally, the presence of clay in moderate amounts in a soil is desirable. Since clay has cohesive nature, it imparts plasticity to the soil when under moist conditions. Plasticity is due to the thin film of absorbed water which adheres strongly to the clay layers thus linking the particles together. Thus, the clay minerals act as natural binding agents for the cohesion less granular fractions of a soil (gravel, sand, & silt). Although, due to certain drawbacks are of clay are the facts that it has a high affinity towards water.

2.7 SUPER PLASTICIZER

For producing SANDY CLAY, the most important chemical admixture is the super plasticizers; which is a high range water reducing admixture. Super plasticizers are water reducers which are capable of reducing water contents by 30%. Depending on the solid content of the mixture, a dosage of 1 to 2% by weight of cement is advisable. For the present investigation a super plasticizer by the name CONPLAST SP-430 has been used for obtaining workable concrete at low w/c ratio. It meets the requirements for super plasticizer according IS: 9103-1999.

3. EXPEIMENTAL PROGRAM

Step 1: Literature collections
Step 2: Collection of materials
Step 3: Study on properties of the materials

1. Physical properties
2. Chemical properties

Step 4: Preparation of mix trials
Step 5: Preparation of concrete cubes
Step 6: Testing for Compressive Strength
Step 7: Selecting the optimum mix
Step 8: Casting of specimens
Step 9: Testing of Mechanical properties [Compression test]
Step 10: Comparative results and discussion
Step 11: Results and Conclusions.

4. RESULT AND DISCUSSION

4.1 FRESH CONCRETE

Slump cone test

Compaction factor

Sl.No	W/C ratio	Slump value in mm
1.	0.4	111
2.	0.4	101
3.	0.4	96

Table 5.1 SLUMP CONE TEST

1.	Empty Weight of compacted mould	5.8Kg
2.	Partially compacted	17.5Kg
3.	Fully compacted	18.2 Kg
4.	Compaction factor	94.3%

Table 5.2 COMPACTION FACTOR

4.2 COMPRESSIVE STRENGTH

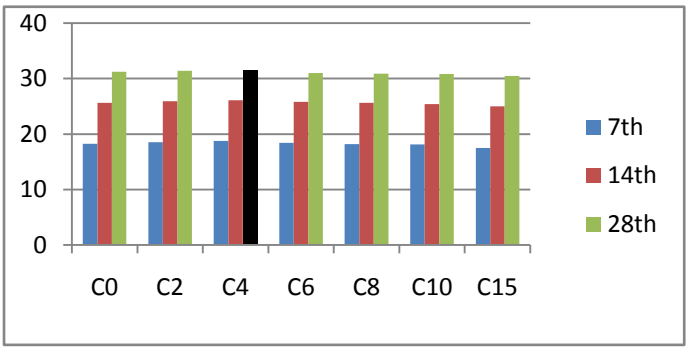

Figure 6.1: Relation between compressive strength of concrete and percentage clay

4.3 SPLIT TENSILE STRENGTH

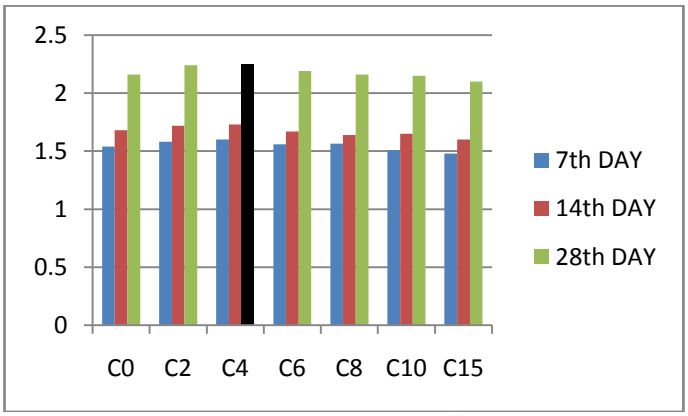

Figure 6.3: Relation between split tensile strength of concrete and percentage clay

5. CONCLUSION

The control mix for M25 grade and the replacement of clay/silt content by 0%, 1%, 2%, 3%, 4%, 5%, 10% and 15% by weight of natural sand were designed. The optimum level of replacement of clay/silt content was found to be 3-5% and the results were better than that of control mix. The workability of fresh concrete decreases with increase in the replacement of clay/silt content for the additional dosage of super-plasticizer is required. The compressive strength gradually increases from 0%, 1%, 2%, 3% replacement of clay/silt content and decreases for above 5% replacement of clay/silt content.

The 28 days average split tensile strength obtained for clay/silt content mix concrete shows 10.62% to 35.78% increase in split tensile strength when compared to control mix concrete. The 28 days average compressive strength obtained for clay/silt content mix concrete shows 0.3% to 27.87% increase in compressive strength when compared to control mix concrete & the maximum strain at service load should not exceed 0.0035 as per code IS: 456-2000. Therefore the experimental results shows that the maximum strain in all test beams are well within the limits. The flexural results show that there is an increase in cracking moment by 30.84% for 0.64% tensile reinforcement. The ultimate moments obtained from experimental results are greater that the theoretical results by 28.48%.Concrete incorporating clay/silt content exhibits good mechanical properties and therefore up to 3-4% by weight of natural sand can be replaced by clay/silt content.

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