AN EXPERIMENTAL INVESTIGATION ON CONCRETE USING LIGNITE ASH AND CRUSHER DUST

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ABSTRACT

This project work describes the investigation on concrete by using lignite ash and crusher dust. The experimental investigation presents the development of concrete containing lignite ash in various percentages of 10%, 20% and 30%. Concrete cube were cast and cured in ages of 7, 14 and 28 days. Compressive and flexural strength as part of mechanical properties were determined. These properties were compared with that of normal concrete. It was concluded from this investigation that lignite ash can be substituted in place of cement and crusher dust can be replace of sand in the production of concrete. This mineral admixture are adding to the concrete for the uses of improving strength and low cement quantity for use of concrete.

Keyword: *Fine aggregate, Cement, Lignite ash, Crusher dust, Coarse aggregate.*

1. INTRODUCTION

1.1 GENERAL

In this project review explores that concrete admixtures are materials other than cement, water and aggregates that are added immediately before or during mixing. The admixtures are added to improve the quality of concrete in the fresh and hardened state. This admixtures which possess certain characteristics through which they influence the properties of concrete differently and added admixtures in concrete to improve the quality of concrete. The reported benefits of mineral admixtures are often associated with the harden properties of concrete.

The lignite ash and the concrete, made by adding lignite ash, were examined by means of mineralogical, chemical and physical analyses. Micro-cracks in the concrete appeared due to the reduced interconnection of the lignite ash with the aggregates. Lignite ash may act as adhesive material filling the cracks of the concrete. Tests of the strength on models made by this concrete have shown comparable results in strength with reference concrete produced without ash. The use of lignite ash in concrete does not affect its strength and sometimes it fills the cracks of the concrete mass. Lignite ash has very small particles which makes the concrete highly dense and reduces the permeability of concrete. It can add greater strength to the building. The concrete mixture generates a very low heat of hydration which prevents thermal cracking.

1.2 OBJECTIVE OF THE INVESTIGATION

The main objective of this investigation is to conduct an experiment on partial replacement of fine aggregate with lignite ash and crusher dust in concrete in the proportions of 0,10%,20%,30%. And to study the strength parameters of compressive strength and flexural strength by,

1. Compression test
2. Flexural strength test
3.

2. LIGNITE ASH

The lignite ash and the concrete, made by adding lignite ash, were examined by means of mineralogical, chemical and physical analyses. Micro-cracks in the concrete appeared due to the reduced interconnection of the lignite ash with the aggregates. Lignite ash may act as adhesive material filling the cracks of the concrete. Tests of the strength on models made by this concrete have shown comparable results in strength with reference concrete produced without ash. The use of lignite ash in concrete does not affect its strength and sometimes it fills the cracks of the concrete mass. Lignite ash has very small particles which makes the concrete highly dense and reduces the permeability of concrete. It can add greater strength to the building. The concrete mixture generates a very low heat of hydration which prevents thermal cracking.

Figure 1. Lignite Ash

3.CRUSHER DUST

Stone dust is a waste material obtained from crusher plants. It has potential to be used as partial replacement of natural river sand in concrete. Use of stone dust in concrete not only improve the quality of concrete but also conserve the natural river sand for future generations. In the present investigation, an experimental program was carried out to study the workability and compressive strength of concrete made using stone dust as partial replacement of fine aggregate in the range of 10%-100%. M25 grade of concrete was designed using Portland pozzolana cement (PPC) for referral concrete. Workability and Compressive strength were determined at different replacement level of fine aggregate viz a viz referral concrete and optimum replacement level was determined based on compressive strength. Results showed that by replacing 60% of fine aggregate with stone dust concrete of maximum compressive strength can be made as compared to all other replacement levels.

Figure 2 Crusher dust

4. RESULTS AND DISCUSSIONS

The results of compressive strength, Flexural test are discussed as follows.

4.1 COMPRESSIVE STRENGTH

The compressive strength of concrete is given in terms of the characteristic compressive strength of 150mm size cubes tested after 28 days of curing. The cubes are tested as per the guide lines given in IS 516 – 1979. The tests are done on an electro hydraulically operated compression testing machine. The specimen is placed in the bearing surface of the compression testing machine and compressive load is applied on opposite faces axially, slowly at the rate of 14 MPa/minute.

PROCEDURE

- Remove cube from the curing tank.
- Wipe off surface water and grit with a damp cloth.
- Wipe test machine platens with dry cloth.
- Place the test cube centrally on the lower platen of the test machine with the rough surface of the test cube facing towards you.
- Lower the top platen onto the cube and ensure a uniform seating by gently rotating the top platen as it is brought to bear on the cube.
- Make sure that test machine is set to the correct loading and pointers are zero.
- Apply the load without shock and continuously increase at approximately 15 MPa per minute.
- Record the maximum load the cube can sustain.

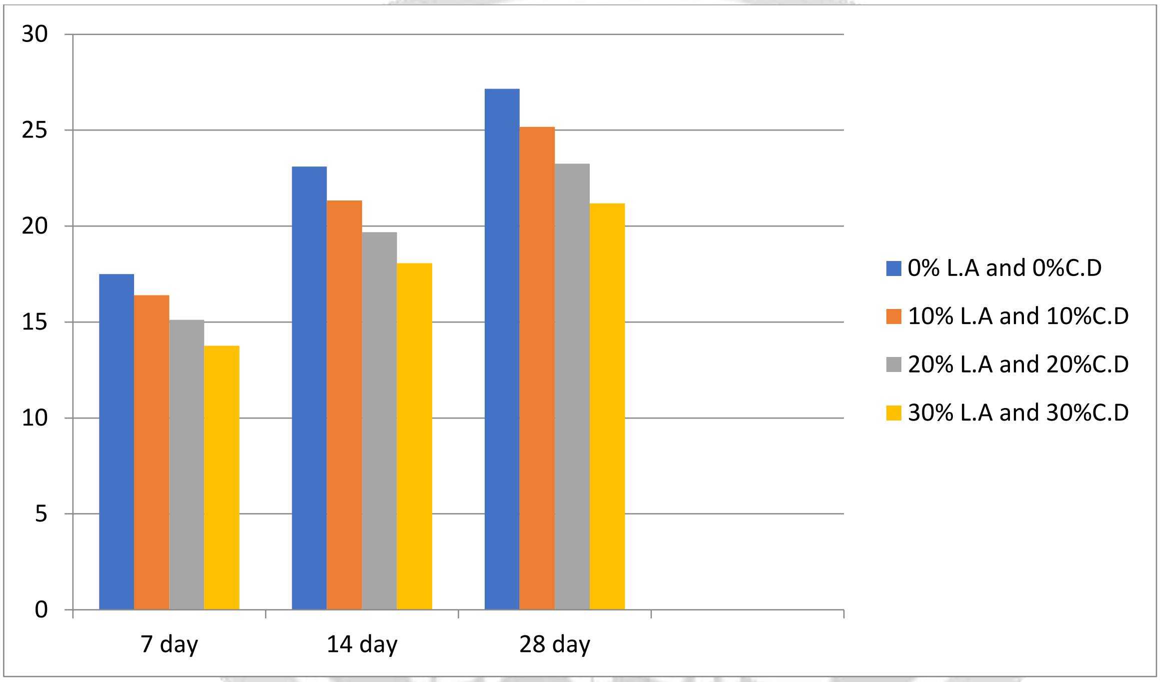

Figure 3 compressional testing values

4.2 FLEXURAL STRENGTH

In flexural test the beam specimen is placed in the machine in such manner in such a manner that the load is applied to the upper most surface as cast in the mould. All beams are tested under tow points in Universal Testing Machine of 60 tones capacity. The load is applied at a rate loading specimens. The load is increased until the specimen failed and the failure load is recoded.

$$F = \frac{PL}{bd^2}$$

The testing machine should be provided with two rollers of 38mm diameter on which the specimen is placed and the rollers are spaced that the between two rollers. If full contact is not obtained between the specimen and the load applying or the support blocks so that there is a gap, the contact surface of the specimen are capped. The specimen is loaded continuously and without shock at until rupture occurs. The maximum load indicated by the testing machine is recorded.

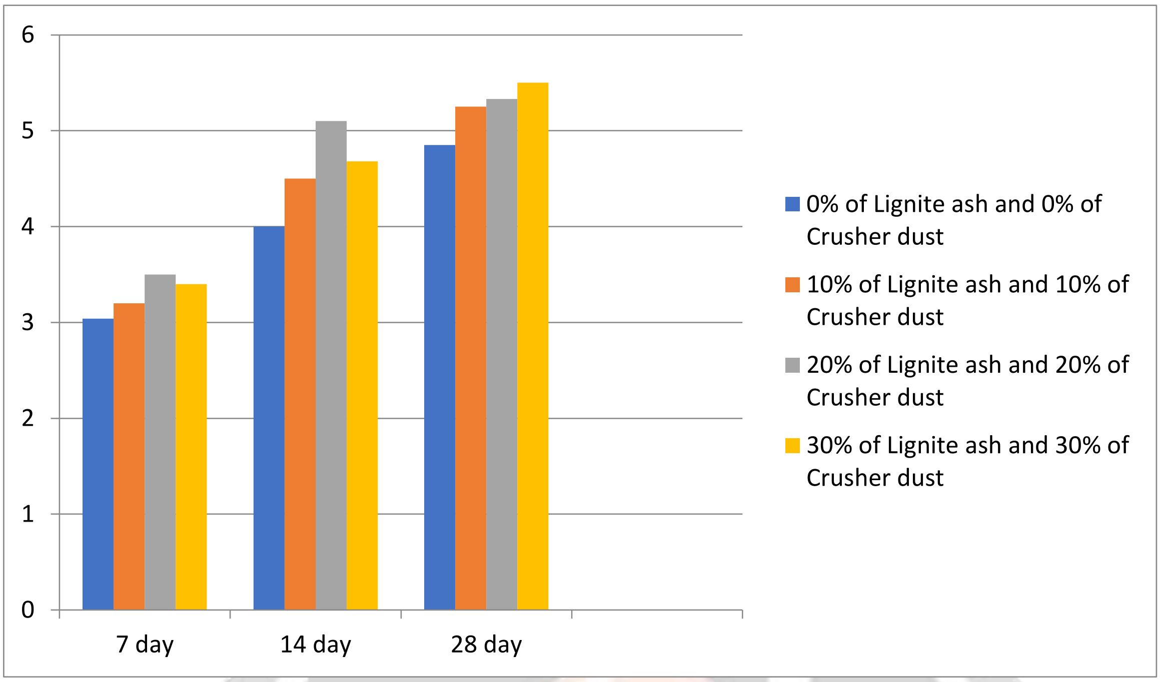

figure 4 flexural strength values

Discussion:

In this research the values of compressive strength for different replacement levels of Lignite ash and Crusher dust (0%, 10%,20% and 30%) at the end of the curing periods (7 days,14 days and 28 days) are taken. These values are plotted in figs. This shows the variation of compressive strength with fine aggregate replacement at different curing ages respectively.

It is evident from figure, that compressive strength increases up to 30% replacement of lignite ash and crusher dust.

5.CONCLUSION

From the test results observed, the following conclusion have been drawn:

1.The maximum size of aggregates should not be greater than 10 mm to 20 mm.

2.Angular shapes of coarse aggregates are used.

3.Slump of concrete is 50 mm.

4.Flexural strength is increased when 20% to 30% replacement is done. Optimum flextural strength of M20 is achieved at 30% replacement

5.All procedures are done as per Indian standards.

6.Water absorption for coarse aggregates and fine aggregates are less than 2%.

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