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Properties of Concrete with Binary and Ternary Cementanious Blends Of Lime Stone Powder and Fly Ash

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ABSTRACT
Concrete become a composite material from a combination of cement, coarse aggregate, fine aggregate and water. Waste fly ash is used as an additive to cement in the production of Portland cement. Lime stone powder has partially replaced cement, but has great potential. The aim of this design work is to investigate the properties of concrete using lime stone powder and fly ash as some substitutes for cement due to the compressive strength, creep rupture strength and flexural strength that are currently being investigated for 7,14, 28 days. In this project work, mix proportion of M30 grade These mixes were an inclusion of separate mixes of conventional concrete as well as different percentages of lime stone power and fly ash as a partial replacement The addition of lime stone powder and fly ash ranges from 10%,20% and 30%

Keywords: OPC, Lime stone powder, Fly ash

I. INTRODUCTION

1.1 GENERAL

Concrete is the largest material consumed by the human being. Concrete is a composite material consisting of small and large aggregates that mix with liquid cement(cement paste) and harden over time. Lime-based cementitious binders such as lime screed have been widely used in the past, but are sometimes used with other hydraulic cements such as a calcium aluminate cementer with cement to form Portland cement concrete(named for its visual resemblance to Portland stone). When the mixture is mixed with dry Portland cement and water, it forms a liquid suspension that can be easily poured and poured into mold.

Reducing the environmental impact of industrial products such as industrial waste, lime stone dust and fly ash, etc. Using these materials in concrete not only increases the strength of the concrete, but also allows these materials to be disposed of appropriately. In amorphous silica can be used in partial replacement of cement.

The use of limestone powder can enhance many aspects of cement-based systems. This paper presents a parametric experimental study investigating the possible use of combination to make in expensive and lightweight composites as building material. The aim of this study was to determine the effect of limestone powder (LP) on the reaction of sodium carbonate activated slag. The results showed that the incorporated LP up to improve the strength development, especially at advanced curing ages. Changes in the production of soda and chemical changes, including the conversion of soda to calcite, can affect the improvement generating natron and the transformation of natron to calcite, is potentially responsible for the enhanced mechanical properties.

1.2 LIME STONE POWDER

Limestone is a type of carbonate sedimentary rock. It is mainly composed of the minerals calcite and aragonite, which are different crystalline forms of calcium carbonate ($CaCO_3$). A closely related tock is dolomite, which contains a high percentage of the mineral dolomite. Mostly 10% of sedimentary rocks are limestones.

1.2.1 Classification of Limestone

The two main classification systems, Folk and Dunham, are used to identifying limestones and carbonate rocks.

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1.2.1.1 Folk Classification

Based on composition, there are three most important additives: allochems, matrix, and cement. The Folk gadget uses element names; the primary refers back to the grain and the second is the root.

1.2.1.2 Dunham Classification

Dunham divides the rocks into 4 important corporations based on relative proportions of coarser clastic particles. The Dunham scheme is more beneficial for hand samples due to fact it's far primarily based on texture.

1.2.2 Limestone Characteristics and Properties

- It can be found in just about any colour depending upon which elements are combined with the calcium carbonate in the rock.
- It is often used in construction such as being added to paint as a thickening agent.
- When roofing styles have texture, it is normally because of crushed limestone being added to roofing tar.
- It is often located in medicines and cosmetics.
- It is utilized in sculptures because of its suitability for carving.

1.2.3 Limestone Uses

- It is the raw material for the production of lime, cement and mortar.
- Powdered limestone is used as a soil balm to neutralize acidic soils.
- Overload is used for inert use. It is a soild foundation for many roads as well as in asphalt concrete.
- Geologic limestone strata make up the majority of large oil reservoirs.

1.4 FLY ASH:

Fly ash from the combustion of lignite or sub-bituminous coal has pozzolonic properties and some of its own cementitious properties. In the presence of water, Class C fly ash solidifies over time. Class C fly ash generally contains more than 20% lime (CaO). Unlike Class F, no activators are required for cementing Class C fly ash. The alkali and sulphate (SO_4) content is usually higher in Class C fly ashes.

At least one US manufacturer has been announced a fly brick containing up to 50% Class C fly ash. Testing shows the bricks meet or exceed the performance standards listed in ASTMC 216 for conventional clay brick. It is also within the allowable shrinkage limits for concrete brick in ASTM C 55, Standard Specification for Concrete Building Brick. It is estimated to the production method used in fly ash bricks will reduce the embodied energy of masonry construction by up to 90%. Brick and pavers were expected to available in commercial quantities before the end of 2009.

1.4.1 Types of Fly ash

Two classes of fly ash are defined by ASTM C618: **Class F fly ash** and **Class C fly ash.** The chief difference between these classes are the amount of calcium, silica, alumina and iron content are in the ash.

1.4.2 ADVANTAGES

- Increased late compressive strengths (after 28 days).
- Increased resistance to alkali silica reaction (ASR).
- Increased resistance to sulfate attack.
- Less heat generation during hydration.
- Increased pore refinement
- Decreased water demand.
- Increased workability.

II. OBJECTIVE

- The lime stone powder and fly ash are using in concrete to reduce cement content for overall concrete.
- Several types of industrial and agricultural waste material recycling in this process.
- The overall cement production are very high so CO_2 is highly pollutant in our nation so this type of process is eco free concrete producing.
- To investigate the utilization of Industrial wastes as a replacement for cement in concrete and influence of this on the Strength of concretes made with different cement replacement levels with admixtures.
- To Reduce overall cost of concrete with using of Limestone powder and Fly ash. Fly ash Reduces the cement content, Limestone powder increase the binding strength of concrete.

III. SCOPE OF THE PRESENT INVESTIGATION

- To investigate the compressive strength, flexural strength and split tensile strength at 7, 14 and 28 days of curing period.
- To compare the strength parameters of conventional concrete and partial replacement of cement by 10, 20 and 30%.

IV. RESULTS

4.1 Compressive strength test

This test was conducted for cube at 7 days, 14 days and 28 days of curing as convention mix of concrete.

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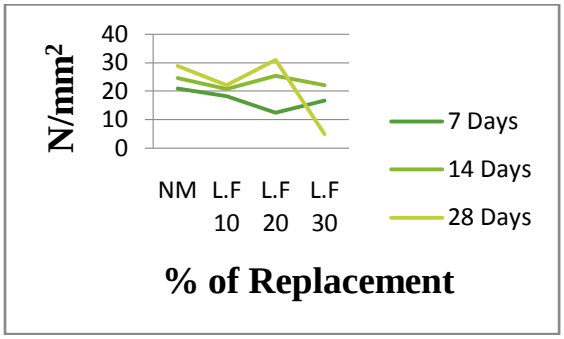
Table-1Compressive strength of cube (N/mm^2)

Mix	Lime stone powder	Fly ash	7 days	14 days	28 Days
NC	0	0	20.9	24.6	28.7
M1	0.5	0.5	18.14	20.74	22.1
M2	0.10	0.10	21.5	25.36	30.9
M3	0.15	0.15	16.78	22.10	25.9



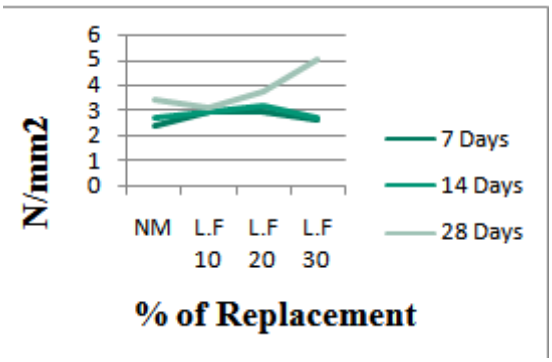
For all the above proportions, compressive strength of the cubes was tested using compressive testing machine. More than two cubes were tested for each proportion and the average values are used to find out the compressive strength of the concrete. Therefore, average strength of the concrete is measured in 7 days, 14 days and 28 days. Addition of lime stone powder and fly ash along with the 0.2% enhances the maximum compressive strength of 30.91 N/mm^2.

4.2 Split tensile strength

This test was conducted for cylinder at 7 days, 14 days and 28 days of curing as convention mix of concrete.

Table-2Split tensile of cylinder (N/mm^2)

Mix	Lime stone powder	Fly ash	7 days	14 days	28 days
NC	0	0	2.41	2.73	3.42
M1	0.5	0.5	2.95	2.96	3.09
M2	0.10	0.10	2.99	3.2	3.7
M3	0.15	0.15	2.65	2.73	2.84



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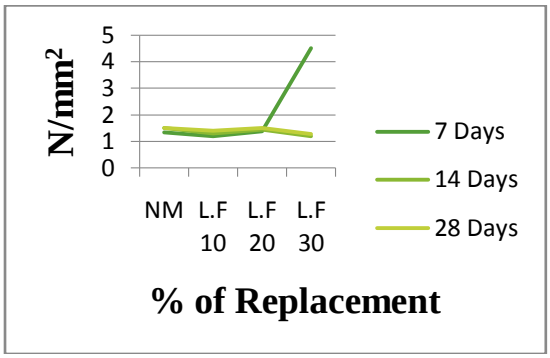
Due to fragility of nature, concrete has very low stresses and can withstand unexpected situations. The concrete cylinder develops crack when it is subjected to maximum tensile force. Average split tensile strength of the concrete is measured in 7 days, 14 days and 28 days. From the test we came to know that the addition of lime stone powder and fly ash with 0.2% of attains high strength among the other proportions.

4.3 Flexural strength

This test was conducted for prism at 7 days, 14 days and 28 days of curing as convention mix of concrete.

Table-3 Flexural strength of prism (N/mm^2)

Mix	Lime stone powder	Fly ash	7 days	14 days	28 Days
NC	0	0	1.35	1.5	1.5
M1	0.5	0.5	1.2	1.3	1.4
M2	0.10	0.10	1.39	1.45	1.5
M3	0.15	0.15	1.1	1.2	1.27



The concrete prism develops cracks when it is subjected to maximum force. Average flexural strength of the concrete is measured in 7 days, 14 days and 28 days. The result obtained in second mix proportion, which is with 0.10% lime stone powder and 0.10% flyash gains high flexural strength when compared with other two mix proportions and achieves the flexural strength of conventional concrete.

V. CONCLUSION

In this experimental investigation, the compressive strength, split tensile strength, flexural strength of the concrete.

This result describes the conventional reinforced concrete beam and reinforced concrete beam at different proportion of 10%, 20% and 30% details with appropriate curing period.

1. The conventional concrete of compressive strength of cube is 28.76 N/mm^2, split tensile test of cylinder is 3.42 N/mm^2, and Flexural strength of prism is 1.5 N/mm^{2}at 28 days of curing period.
2. The compressive strength of the concrete in 10%, 20% and 30% replacement of limestone powder and fly ash is 22.1 N/mm^2, 30.91 N/mm^2 and 25.99 N/mm^{2}at 28 days of curing period.
3. The Split tensile strength of the concrete in 10%, 20% and 30% replacement of limestone powder and Fly ash is 3.09N/mm^2, 3.7 N/mm^2 and 2.84 N/mm^{2}at 28 days of curing period.
4. The Flexural strength of the concrete in 10%, 20% and 30% replacement of limestone powder and Fly ash is 1.4 N/mm^2, 1.5 N/mm^2 and 1.27N/mm^2 at 28 days of curing period.

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