EXPERIMENTAL INVESTIGATION OF THE SF'S COMPOSITION AND EFFECTS ON THE CHARACTERISTICS OF FRESHLY-POURED AND CURED CONCRETE USING DOLOMITE AND SILICA FUME POWDERS

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ABSTRACT
This essay offers an experimental examination of the use of silica fume and dolomite power to replace cement. Dolomite powder is made by processing sedimentary rock, a type of mineral. Up to a particular proportion, dolomite can be used in place of cement in concrete. Dolomite powder has certain cement-like characteristics. By weight of cement, replacement percentages of 0%, 5%, 10%, 15%, 20%, and 25% were all tested. Dolomite powder's compressive and flexural strengths were compared to those of reference specimens. The 28-day curing result shows that adding dolomite powder in place of some of the cement has boosted the strength of the resulting concrete. The use of Silica Fume (SF) in short period of time had one of the most dramatic impacts on the industry's ability to routinely and commercially produce SF modified concrete of flowable in nature but yet remain cohesive, which in turn would develop both high early and high later-age strengths including resistant to aggressive environments. This paper features an experimental study on the nature of SF and its influences on the properties of fresh and hardened concrete. In the present study, an attempt has been made to investigate the strength parameters of concrete made with partial replacement of cement by SF. The present investigation has been aimed at to bring awareness amongst the practicing civil engineers regarding advantages of these new concrete, to reduce this effect up to some extent we use dolomite and silica fume materials as replacement of cement. The partial replacement material content is 5%, 10%, 15% and 20% by weight of cement.
Keywords—Concrete, Dolomite powder, Silica fume, compressive strength , Flexural strength

INTRODUCTION

Concrete is a composite material that primarily consists of cement, aggregate, and water. To achieve the desired physical qualities, it may be necessary to add reinforcements and additives to the concrete mixture. These materials may be combined in a certain ratio to create a solid mass that is easily moldable into any shape. In the grace period, a hard matrix made of cement joins the other elements into a single hard (rigid) durable substance that may be used for a variety of purposes, such as paving roads and building structures. The ancient Romans utilized technology on a huge scale throughout the Roman Empire, The Colosseum in Rome was constructed primarily of concrete and is the biggest unreinforced concrete building in the world. Following the fall of the Roman Empire in the mid-18th century, the technology was developed it became rare for the usage of concrete Today; in terms of tonnage the widely used man made material is concrete.

WORKABILITY

The property of fresh concrete which determines easy and homogeneity in which is take the process is mixing, transporting, placing, compacting and finishing then If all these works is done easy manner then it is known as workability of concrete To find the workability of concrete thoroughly mix cement, sand And coarse aggregate accordingto designed mix proportions to form a homogenous mix of concrete.

Equipment's required for Concrete Slump Test:

Mould for slump test, non- porous base plate, measuring scale, temping rod. The mould for the test is in the form of the frustum of a cone having height 30 cm, bottom diameter 20 cm and top diameter 10 cm. The tamping rod is of steel 16 mm diameter and 60cm long and rounded at one end.

Procedure:

- The mould for the slump test will be frustum of a cone, with 300 mm (12 in) of height. The base of cone is 200 mm(8in) in diameter and cone has a smaller opening at the top of 100 mm (4 in).
- For testing of workability, the base should be placed on a smooth surface and the container is filled with concretesample in three layers.
- Each layer should be tamped 25 times with a standard 16 mm (5/8 in) diameter of a steel rod, at rounded end.
- The top surface is struck off by means of screening and rolling motion of the temping rod when the mould is completelyfilled with concrete.
- For does not moving due to the pouring of concrete the mould must be firmly held against its base during the entire operation and this can be done by means of handles or foot - rests brazed to the mould.
- The concrete is levelled immediately after filling is completed, the cone is slowly and carefully lifted vertically, anunsupported concrete will now slump.
- The decrease in the height of the centre of the slumped concrete is called slump.
- The slump cone is measured by placing the cone just besides the slump concrete and the temping rod is placed over thecone so that it should also come over the area of slumped concrete.
- The decrease in height of concrete to that of mould is noted with scale

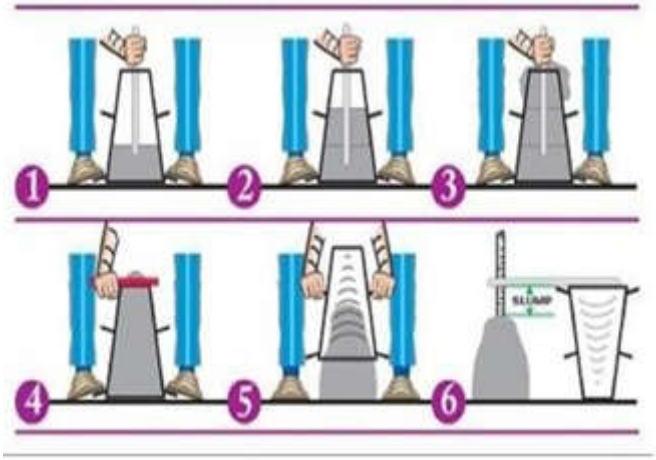

Figure-1: Concrete Slump Test Procedure

When the slump test is carried out, following are the shape of the concrete slump that can be observed:

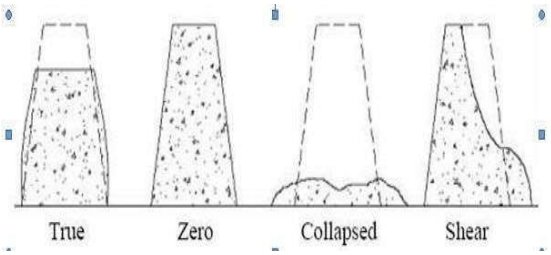

Figure-2: Types of Concrete Slump Test Results

True Slump – True slump is the only slump that can be measured in the test. The measurement is taken between the topof the cone and the top of the concrete after the cone has been removed as shown infigure-1.
Zero Slump – Zero slump is the indication of very low water- cement ratio, which results in dry mixes. These type ofconcrete is generally used for road construction.
Collapsed Slump – This is an indication that the water-cement ratio is too high, i.e. concrete mix is too wet or it is a highworkability mix, for which a slump test is not appropriate.
Shear Slump – The shear slump indicates that the result is incomplete, and concrete to be retested.

WORKABILITY RESULTS

The ideal concrete is the one which is workable in all conditions i.e, can prepared easily placed, compacted andmoulded. In this chapter, the workability is assessed by two methods as follows:

Slump Cone Test: The test was conducted for fresh concrete prepared before the moulding process. A total of 14 concrete mixes are prepared at different times. Workability Results obtained from slump cone test for M30 gradeof concrete is shown in table1.

Table 1: Test results from slump cone test for workability in mm

S.No	Mix ID	Water/cement ratio	Workablity (mm)
1	CW1	0.49	68
2	CW2	0.59	55

CW1:-Concrete with M25 grade

CW2:-Concrete with M25 grade with dolomite power and silica fume

COMPRESSIVE STRENGTH

A Total Of 42 Cubes Of Size 150 X 150 X 150mm Were Casted And Tested For 28 Days Testing Each Of 13 SpecimensAfter Conducting The Workability Tests. The Results Are Tabulated Below:

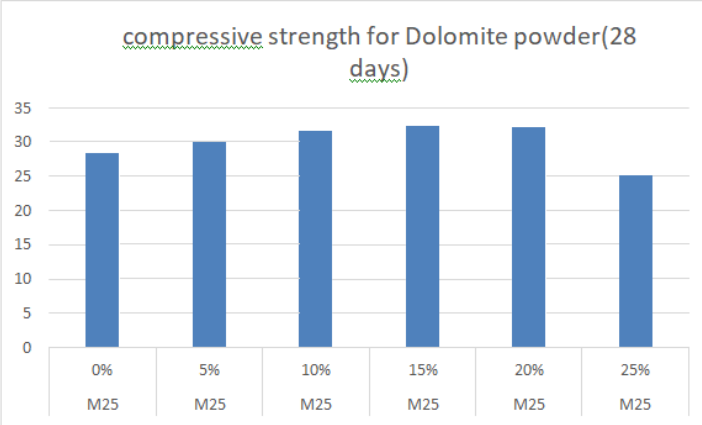

Table: 02: Compressive strength results of dolomite power with its percentage replacement

S.NO	Grade Of Concrete	Percentage of replacement %	COMPRESSIVE STRENGTH for 28 days
1	M25	0	28.36
2	M25	5	29.39
3	M25	10	31.58
4	M25	15	32.34
5	M25	20	32.05
6	M25	25	25.75

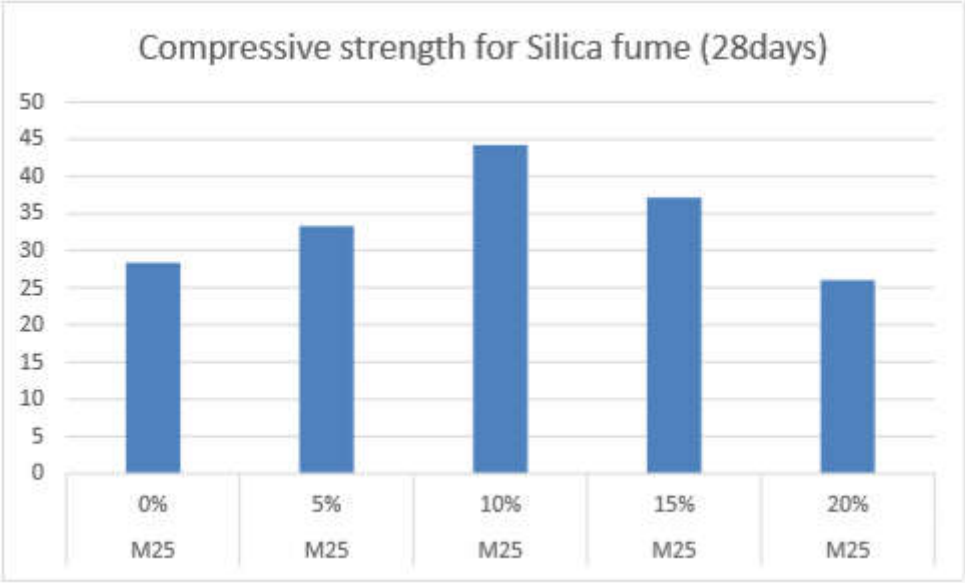

Chart 1: Compression test results comparison b/w CC&DP

Table: 03:Results of silica fume with its percentage replacement

S.NO	Grade ofconcrete	Percentage of replacement %	Compressive strength(MPa)
1	M25	0	28.36
2	M25	5	33.31
3	M25	10	44.2
4	M25	15	37.133
5	M25	20	25.99

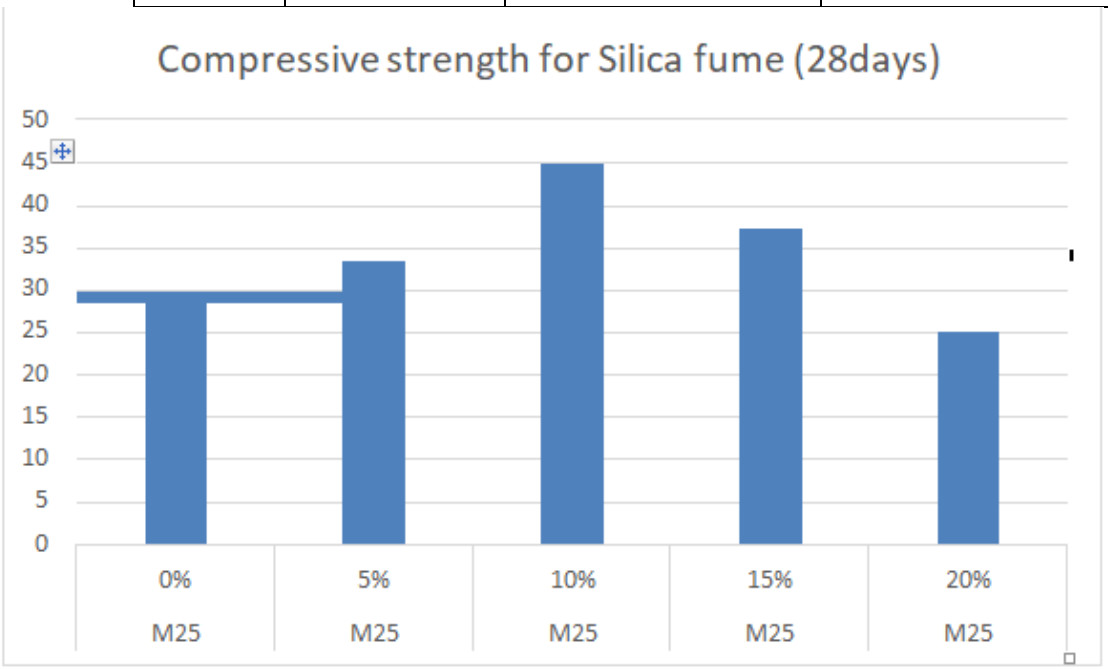

Chart 2: Compression test results comparison b/w CC&SF

Compressive Strength of Cubes (150x150x150) for M25 Mix for Percentage Replacement of Dolomite power and Silica fume The strength i.e., the tensile strength, from the results is clearly in an increment way compared to the conventional concrete at all the curing ages of 28days.There placement of aggregates by various proportions haspositive effect on the strength of the concrete.

FLEXURAL STRENGTH

The flexural test was conducted for M25 mix only since it has the highest compressive and split tensile strength to compare it with conventional Concrete i.e., M25Grade. After Conducting the Workability Tests. The ResultsAre Tabulated Below for Flexural test results for 28 days

Table: 04: Flexural strength results of dolomite power with its percentage replacement

S.NO	Grade of concrete	Percentage of replacement %	Flexural strength (MPa)
1	M25	0	7.27
2	M25	5	7.77
3	M25	10	8.08
4	M25	15	8.66
5	M25	20	7.96
6	M25	25	6.69

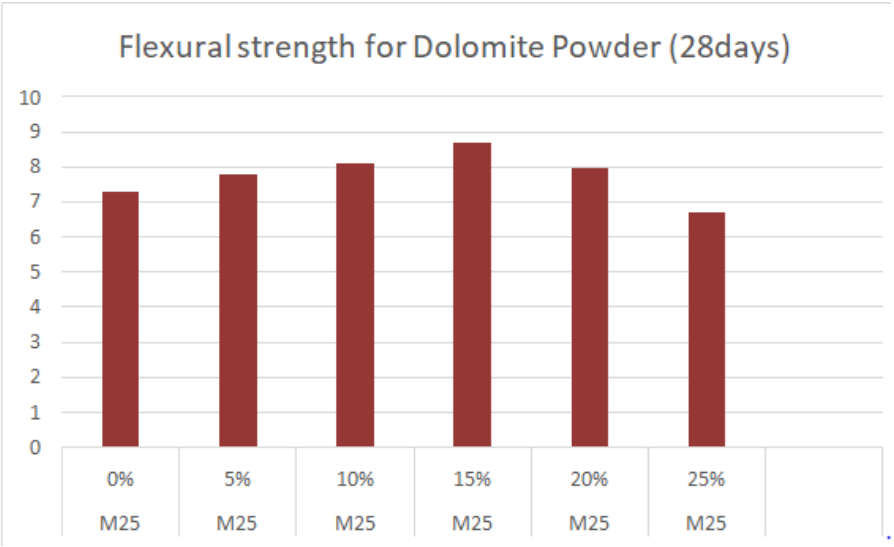

Chart 3: Compression test results comparison b/w CC&DP

Table: 05:Results of silica fume with its percentage replacement

S.NO	Grade of concrete	Percentage of replacement %	Flexural strength(MPa)
1	M25	0	7.27
2	M25	5	7.81
3	M25	10	8.1
4	M25	15	7.87
5	M25	20	6.40

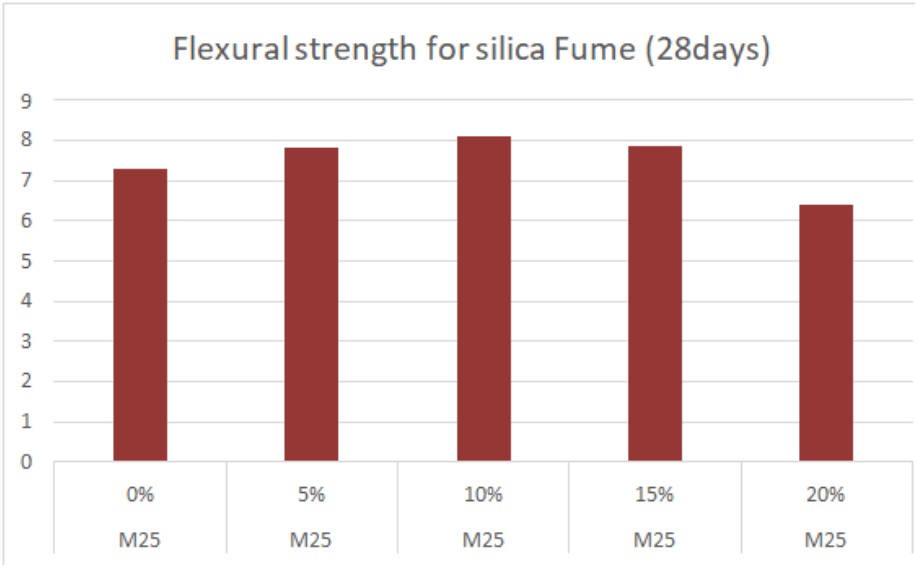

Chart 4: Flexural strength results comparison b/w CC&SF

Flexural Strength of Cubes (150x150x150) for M25 Mix for Percentage Replacement of dolomite power and silica fume The strength i.e., the Flexural strength, from the results is clearly in an increment way compared to the conventional concrete at all the curing ages 28days. The replacement of aggregates by various proportions haspositive effect on the strength of the concrete.

CONCLUSIONS

- Conventional concrete with compressive strength of is28.36MPAwhileadding15% of dolomite powder with the strength in compressiveincreasesby14%.
- The dolomite powder is replaceable stop to 20% in concrete because the strength in compressive ismorethanconventionalconcretenear20%whiledolomitepowderis added i.e.,(adding of dolomite powder the compressive strength is 32.05 MPA, the compressive strength of conventional concreteis28.36MPA)
- The strength in flexuralofconventionalconcreteis7.27MPAwhileadding15% of dolomite powder the strength in flexuralincreasesby19%.
- The strength in flexural may increase up to20%ofdolomitepowderaddinginconcrete.
- The flexural strength ofconcretewhileadding20%ofdolomitepowderis7.96 MPA, the flexuralstrength of conventionalconcreteis7.27MPA.
- By increasing the dolomite powder in conventional concrete, the concrete workability isincreasing.
- The conventionalconcretecompressivestrengthis28.36MPAwhileadding10% of silica fume the strength in compressive increases by 19%.
- Thesilicafumeisreplaceableupto15% in concrete because the compressive strength is more than the conventional concrete near 15%.
- The compressive strength of concrete while adding 15% of silica fume is 37.13 MPA, the compressive strength of conventional concrete is 28.36 MPA.
- The flexural strength of conventional concrete is 7.27 MPA while adding 10% of silica fume the flexural strength increases by 11%.
- The flexural strength may increases upto15% of silica fume adding in conventional concrete.
- The flexural strength of conventional concrete while adding 15% of silica fume is 7.87 MPA, the flexural strength of conventional concrete is 7.27 MPA.

- By increasing the silica fume in conventional concrete the workability of concrete is increasing

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