EXPERIMENTAL INVESTIGATION ON STRENGTH AND DURABILITY PROPERITIES OF M30 GRADE CONCRETE BY PARTIAL REPLACEMENT OF CEMENT BY MARBLE POWDER AND ADDITION OF STEEL FIBERS

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Abstract- There is developing enthusiasm for the development of solid asphalts, because of its high quality, strength, better usefulness and generally speaking economy over the long haul. Show day development cost is at its tallness with utilizing essential materials like bond, coarse totals and fine totals. Leaving waste materials to nature particularly can realize ecological issues. Along these lines, reuse of waste materials has been accentuated. Enterprises deliver heaps of waste materials, which may be useful in fractional substitution of fundamental materials because of their structure and it tends to be demonstrated conservative. The solid business is continually looking for supplementary material with the objective of diminishing the strong waste transfer issue. As we probably am aware cement is powerless in pressure along these lines, to defeat this, steel filaments has been utilized. There are few reuse and reusing answers for this modern result, both in trial stage and have valuable applications. These mechanical squanders are dumped in the near to territories and characteristic productivity of the dirt is destroyed. The physical, mechanical and substance properties of squanders are examined.

In this examination, marble powder and silica fume (10%) has supplanted Cement, the entire research is completed on M30 review concrete with mostly supplanting Cement by 0%, 5%, 10%, 15%, 20%, and 25% of marble dust, with the expansion of steel strands at proportion 0.25%and 0.50% by volume in order to get most prominent compressive quality, flexural quality and besides split elasticity and Durability.

I. INTRODUCTION

Marble is a non-foliated changeable shake made out of re-solidified carbonate minerals, most ordinarily calcite or dolomite. Geologists utilize the expression "marble" to allude to transformed limestone; in any case, stonemasons utilize the term all the more comprehensively to envelop un-transformed limestone. Marble is a changeable shake coming about because of the change of an unadulterated limestone. The virtue of the marble is in charge of its shading and appearance: it is white if the limestone is made exclusively out of calcite (100%CaCO3). Marble is utilized for development and enhancement; marble is strong, has a respectable appearance, and is thusly in incredible request. Synthetically, marbles are crystalline rocks made prevalently out of calcite, dolomite or serpentine minerals. The other mineral constituents change from source to starting point. Quartz, muscovite, tremolite, actinolite, miniaturized scale line, powder, garnet, osterite and biotite are the real mineral polluting influences though SiO2, limonite, Fe2O3, manganese, 3H2O and FeS2 (pyrite) are the significant compound contaminations related with marble. The principle polluting influences in crude

limestone (for concrete) which can influence the properties of completed bond are magnesia, phosphate, drives, zinc, salts and sulfides.

The headway of solid innovation can decrease the utilization of regular assets and vitality sources and reduce the weight of poisons on condition. By and by a lot of marble dust are created in normal stone handling plants with a critical effect on condition and people. This task depicts the possibility of utilizing the marble ooze dust in solid creation as fractional substitution of concrete. In India, the marble and rock stone preparing is a standout amongst the most flourishing industry the impacts if shifting marble dust substance on the physical and mechanical properties of crisp and solidified cement have been examined. Droop and air substance of crisp cement and assimilation and compressive quality of solidified cement were likewise explored. Test outcomes demonstrate that this modern bi item is equipped for enhancing solidified solid execution up to 10%,Enhancing crisp solid conduct and can be utilized in building solid blends containing white concrete. The compressive quality of cement was estimated for 7 and 28 days. With a specific end goal to assess the impacts of marble dust on mechanical conduct, various mortar blends were tried.

- ***Objectives of the study***
- The principle goal of the proposed work is are
- The grade of concrete evaluations M30.
- To consider Effects of silica fume and Marble dust doses on Compressive Strength, split elastic, flexural of cement.
- To clarify the adjustment in properties of cement, if any by clarifying the microstructure.
- To think about the crisp and solidify properties (i.e. compressive quality, functionality test) fractional substitution of bond by Silica smoke and Marble dust in various rate.
- After assessing the mechanical properties for the different blend and it is contrasted and the best outcome.

II. LITERATURE REVIEW

Prof. Veena G. Pathan, Prof. Md. GulfamPathan, et al..,(2014)

Marble dust is a strong waste material created from the marble handling and can be utilized either as a filler material in bond or fine totals while planning concrete. It has been utilized as a substitution of fine totals in numerous writing works however this paper displays the achievability of the substitution of marble squander for bond to accomplish economy and condition sparing.

G V Vigneshpandian, E AparnaShruthi, C Venkatasubramanianand D Muthu, et al.,(2017)

This paper explores the quality properties of concrete samples cast utilizing waste marble dust as substitution of fine total. The marble pieces are finely pulverized to powdered and the degree is contrasted and regular fine total. Solid example were thrown utilizing wmd in the research facility with various extent (25%, half and 100%) by weight of bond and from the examinations it uncovers that expansion of waste marble dust as a substitution of fine total barely enhances compressive, ductile and flexural quality in concrete.

III. MATERIALS AND MIX DESIGN

The properties of materials utilized for making concrete blend are resolved in research facility according to applicable codes of training. Distinctive materials utilized in show consider were Cement, Coarse aggregates, Fine aggregates, Silica fume, Steel fibers and super-plasticizer. The point of an investigation of different properties of material is utilized to check the appearance with codal necessities and to empower an architect to outline a solid blend for a specific quality. The portrayal of different materials which were utilized in this examination is given beneath:

Portland cement

Portland cement is the most widely recognized sort of concrete all in all utilization around the globe as a fundamental element of solid, mortar, stucco, and non-forte grout. A few sorts of Portland bond are accessible. The most well-known, called common Portland bond (OPC), is dark in shading, however white Portland concrete is additionally accessible.

OPC 53 Grade Cement

Aggregates

Aggregates constitute the main part of a concrete blend and give dimensional soundness to concrete. To build the thickness of coming about blend, the totals are oftentimes utilized in at least two sizes. The most critical capacity of the fine total is to help with creating usefulness and consistency in blend.

Coarse aggregates

Those particles that are prevalently held on the 4.75 mm (No. 4) sifter and will go through 3-inch screen are called coarse total. The coarser the aggregate, the more temperate the blend. Bigger pieces offer less surface region of the particles than a comparable volume of little pieces.

Coarse aggregates

Fine aggreagtes:

Those particles passing the 9.5 mm (3/8 in.) Sieve, essentially passing the 4.75 mm (No. 4) strainer, and transcendently held on the 75 µm (No. 200) strainer are called fine total. For expanded usefulness and for economy as reflected by utilization of less concrete, the fine total ought to have an adjusted shape.

Fine aggregates

Marble dust (md)

Marble is a non-foliated transformative shake made out of re-solidified carbonate minerals, most ordinarily calcite or dolomite. Geologists utilize the expression "marble" to allude to transformed limestone; be that as it may, stonemasons utilize the term all the more extensively to include un-transformed limestone. Marble is a changeable shake coming about because of the change of an unadulterated limestone.

Marble dust

Silica fume (sf)

Silica fume, otherwise called microsilica, (CAS number 69012-64-2, and EINECS number 273-761-1) is a shapeless (non-crystalline) polymorph of silicon dioxide, silica. It is a ultrafine powder gathered as a side-effect of the silicon and ferrosilicon amalgam generation and comprises of round particles with a normal molecule distance across of 150 nm. The primary field of use is as pozzolanic material for superior cement.

Silica fume

Steel fiberes (sfs)

Mild steel strands having 30mm thickness and 60mm length i.e.aspect proportion (l/d) 50 which are creased and gotten through cutting of steel wires have been utilized. The filaments have been sliced by fiber slicing machine to an exact size. Two unique extents 0.25%, 0.5% have been utilized.

Steel fibers

SUPER PLASTICIZER

Super plasticizers, otherwise called high range water reducers, are substance admixtures utilized where very much scattered molecule suspension is required. These polymers are utilized as dispersants to stay away from molecule isolation (rock, coarse and fine sands), and to enhance the stream attributes (rheology) of suspensions, for example, in solid applications.

Conplast SP423

Mix design of concrete

Mix design is a methodology of choosing the appropriate elements of cement and their relative extents with a goal to get ready cement of certain base quality, wanted usefulness and sturdiness as financially (esteem built) as would be prudent.

Final for M30 grade concrete is 1:1.67:2.68 at w/c of 0.45

IV EXPERIMENTAL INVESTIGATION

Casting of cubes and cylinders

Casting of concrete shapes and chambers as improved the situation M30 review concrete, the blend extent is for which we are casting cubes and cylinders for typical cement, with the incomplete substitution of solid silica fume and Marble dust.

Compaction with compacting bar

150 mm molds ought to be filled in three roughly break even with layers (50 mm profound). A compacting bar is accommodated compacting the solid. It is a 380 mm long steel bar, weighs 1.8 kg and has a 25 mm square end for smashing.

Compacting the concrete in the cube mould

cylindrical moulds

Curing

The concrete specimens were relieved utilizing six unique strategies until when their compressive qualities were resolved at ages 7,28 days and 56.

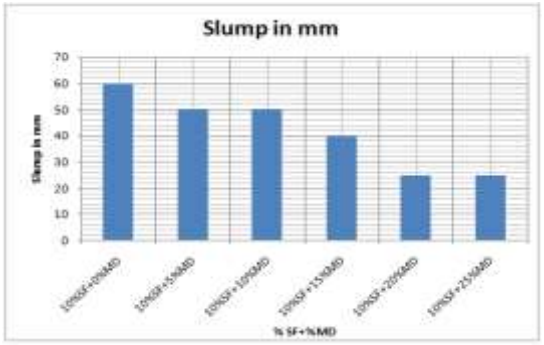
Curing of specimens

Tests to be conducted on concrete

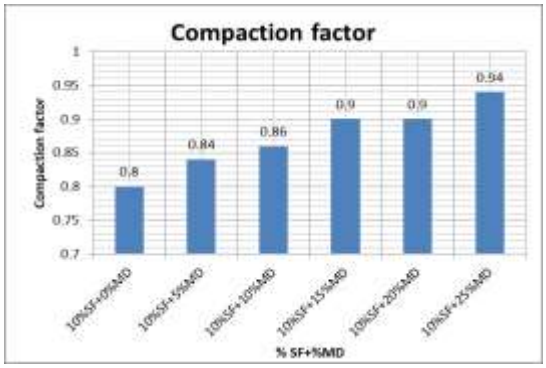
1. Slump Cone test
2. Compaction factor test
3. Compressive strength
4. Split tensile strength
5. Flexural strength
6. Durability

V. RESULTS AND ANALYSIS

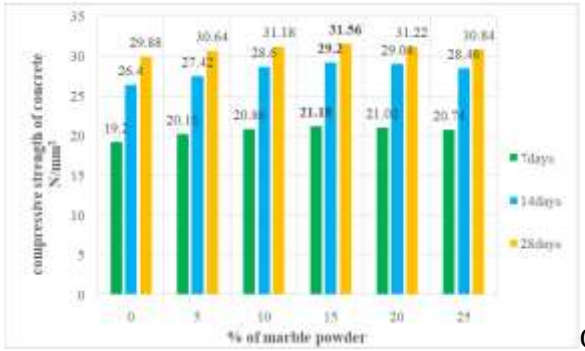
Slump cone test



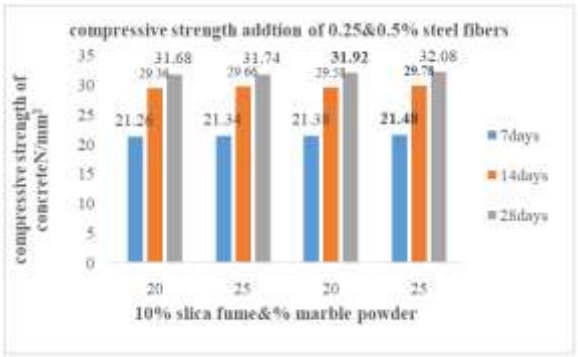
Compaction factor test



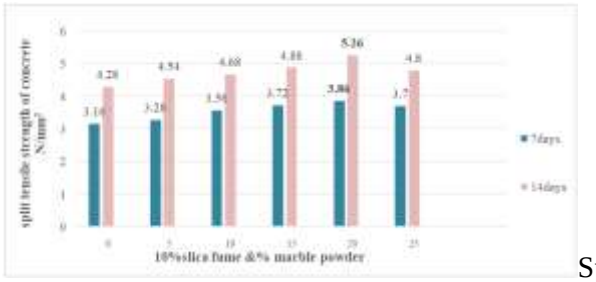
Compressive strength of concrete



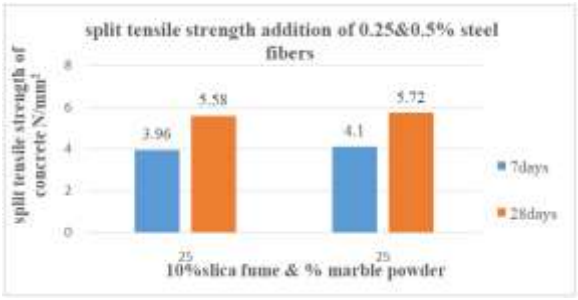
Compressive strength of concrete addition of steel fibers (0.25%v& 0.5%)



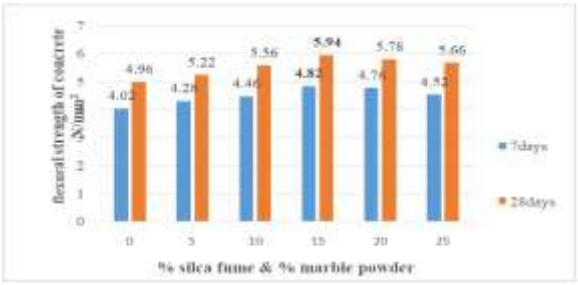
Split tensile strength



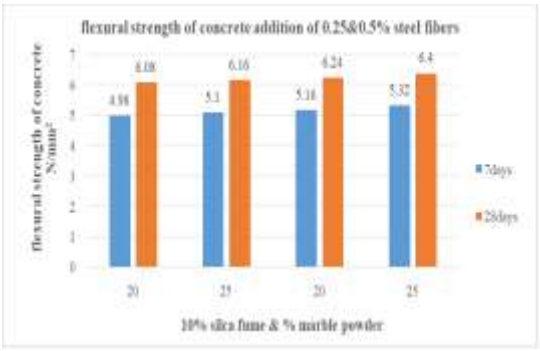
Split tensile strength of concrete addition of steel fibers (0.25%v& 0.5%)



Flexural strength



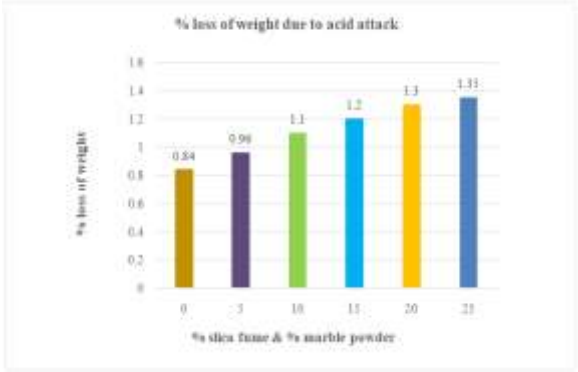
Flexural strength of concrete addition of steel fibers (0.25%)



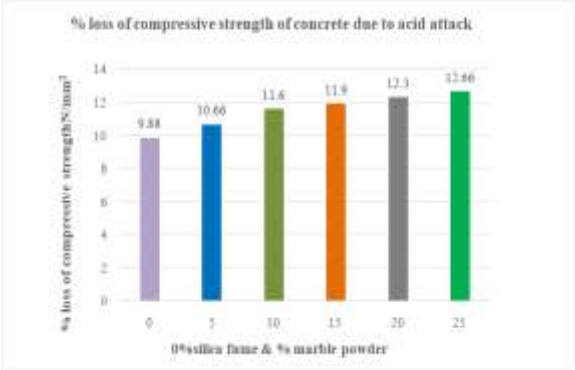
Durability of concrete

ACID ATTACK

Percentage of loss of weight due to acid attack

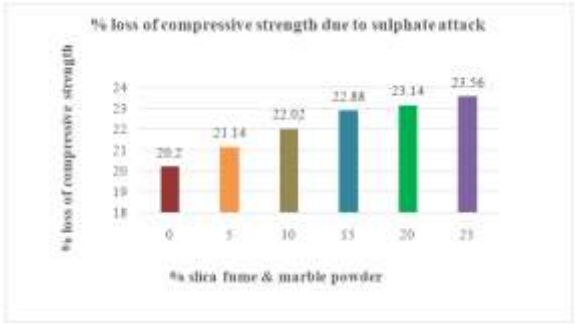


Percentage of loss of compressive strength due to acid attack



SULPHATE ATTACK

Percentage of loss of weight due to sulphate attack



VI. CONCLUSIONS

From the above experimental study the following conclusions were made

1. The value of slump decreases with increase in the percentage of marble dust from 10%SF+0%MD to 10%SF+25%MD.
2. The value of compaction factor increases with increase in the percentage of marble dust from 10%SF+0%MD to 10%SF+25%MD.
3. The optimal value (maximum value) of compressive strength was observed at 10%SF+15%MD for 7days, 14 days and 28 days.
4. After 10%SF+15%MD the compressive strength of concrete decreases the compressive strength of concrete can be increased by addition steel fibers of 0.25% and 0.5%
5. The optimal value (maximum value) of Split tensile strength was observed at 10%SF+20%MD for 7days and 28 days. Similar to the compressive strength split tensile strength can be increased by addition of steel fibers of 0.25% and 0.5%
6. The optimal value (maximum value) of split tensile strength was observed at 10%SF+20%MD for 7days and 28 days. Similar to the compressive strength split tensile strength can be increased by addition of steel fibers of 0.25% and 0.5%
7. The optimal value (maximum value) of Flexural strength was observed at 10%SF+15%MD for 7days and 28 days. Similar to the compressive strength split tensile strength can be increased by addition of steel fibers of 0.25% and 0.5%
8. The durability of concrete due to acid attack, alkalinine attack, sulphate attack increases with increase in the percentage of Marble dust.
9. Marble dust can be used as the replaced material for the cement for decrease in the cost of construction and increase in the strength.

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