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A STUDY ON WASTE UTILIZATION OF MARBLE DUST IN HIGH STRENGTH CONCRETE MIX

I. Siva Kishore, Ch. Mallika Chowdary
Assistant Professor, K.L University,
Civil Engineering Department, Andhra Pradesh, India

ABSTRACT

Marble is a standout amongst the most imperative materials utilized as a part of the development business. Marble powder is delivered from the preparing plants amid the sawing and cleaning of the marble squares and around 20 - 25% of the handled marble is transformed into powder structure i.e., marble powder. Marble dust which is a waste material from development site is blended with concrete as a substitution. As marble powder is the waste item which is gotten amid the procedure of sawing and molding of the marble by the guardian marble rock, contains substantial metals in it which makes the water unfit for use. Marble powder makes numerous ecological issues. Because of ecological issues, it greatly affects the human wellbeing and also on the nature. To control its belongings we need to utilize this waste. Marble dust which is a waste material from the development site is blended with the solid.

Key words: Marble, Marble Dust, Construction Waste.

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1. INTRODUCTION

Leaving the waste materials to nature specifically can bring about ecological issue. Henceforth the reuse of waste material has been stressed. Marble dust is a waste material acquired from development locales. Shortly a lot of marble dust are produced in regular stone handling plants with an imperative effect on environment and people. Marble dust is essentially made by macerating marble in a macerator or pulverize.

- Marble is a mineral which is exceedingly utilized as a part of the development business.
- Marble Dust-It is acquired from pounding the marble into powdered struct

1.1.Common constituent of marble

- Marble is one of the non-foliated changeable rock which is made out of recrystallized carbonate mineral that is most ordinarily calcite or dolomite.
- Geologists utilize the term marble as the transformed limestone; stonemasons utilize the term all the more comprehensively to incorporate it as metamorphosed limestone.
- Marble is generally utilized as a part of model furthermore as building material.

Figure 1.1 Pulverized Marble

1.2 Physical origins

Marble is a stone coming about because of transformative nature of sedimentary carbonate rocks, most ordinarily limestone or dolomite rock. Transformative nature causes variable recrystallization of the first carbonate mineral grains. The subsequent marble rock is commonly made out of an interlocking mosaic of carbonate precious stones. Essential sedimentary surfaces and structures of the first carbonate rock (protolith) have regularly been altered or wrecked.

Unadulterated white marble is the consequence of transformative nature of an extremely immaculate (silicate-poor) limestone or dolomite protolith. The trademark whirls and veins of colourful marble assortments are generally because of different mineral contaminations, for example, earth, residue, sand, iron oxides, or chart which were initially present as grains or layers in the limestone. Green shading is frequently because of serpentine coming about because of initially high magnesium limestone or dolostone with silica pollutions. These different contaminations have been prepared and recrystallized by the extraordinary weight and warmth of the transformative nature.

Figure 1.2 Powdered Marble

1.3. Sculpture

White marble has been prized for its utilization in models since established times. This inclination needs to do with its delicate quality, which made it less demanding to cut, relative isotropy and homogeneity, and a relative imperviousness to shattering. Additionally, the low record of refraction of calcite permits light to infiltrate a few millimetres into the stone before being scattered out, bringing about the trademark waxy look which offers "life" to marble figures of any sort, which is the reason numerous artists favoured and still incline toward marble for chiselling.

1.4. Quarrying

The utilization of explosives in the quarrying of marble is restricted due to the risk of shattering the stone. Rather, directing machines that use etch edged steel bars make cuts around 5 cm (2 inches) wide and a couple meters profound. Wherever conceivable, favourable position is taken of normal joints officially show in the stone, and cuts are made toward least demanding part, which is an outcome of the parallel lengthening of platy or sinewy minerals. The marble squares sketched out by joints and cuts are isolated by driving wedges into drill gaps. Factory sawing into chunks is finished with sets of parallel iron cutting edges that move forward and backward and are sustained by sand and water. The marble may be machined with machines and carborundum haggles then cleaned with progressively better evaluations of rough. Indeed, even with the most watchful quarrying and assembling techniques, in any event half of the aggregate yield of marble is waste. Some of this material is made into chips for terrazzo ground surface and stucco divider completion. In different areas it is put to the greater part of the significant uses for which high-calcium limestone is suitable.

2. STUDY OBJECTIVES

- To study the influence of partial replacement of concrete with marble dust, and to compare it with the compressive and tensile strength of high strength concrete mix.
- To find the percentage of marble dust replaced in concrete that makes the strength of the concrete maximum.

2.1. USES OF MARBLE

Marbles are utilized mainly for structures and landmarks, inside enrichment, statuary, table tops, and curiosities. Shading and appearance are their most vital qualities. Imperviousness to scraped spot, which is an element of attachment between grains and also the hardness of the part minerals, is vital for floor and stair treads. The capacity to transmit light is essential for statuary marble, which accomplishes its gloss from light entering from around 12.7 to 38 mm (0.5 to 1.5 inches) from where it is reflected at the surfaces of more profound lying gems. Brecciated, shaded marbles, onyx marble, and very obsolescent are utilized essentially for inside adornment and for oddities. Statuary marble, the most significant assortment, must be unadulterated white and of uniform grain size. For perseverance in outside use, marble ought to be uniform and nonporous to keep the passageway of water that may stain the stone or cause freezing so as to break down. It likewise ought to be free from pollutions, for example, pyrite that may prompt recoloring or weathering. Calcite marbles that are presented to barometrical dampness made corrosive by its contained carbon dioxide, sulfur dioxide, and different gasses keep up a moderately smooth surface amid

weathering; yet dolomite limestone may climate with an unpredictable, sandy surface from which the dolomite precious stones emerge.

The fundamental mineral in marbles is calcite, and this present mineral's variety in hardness, light transmission, and different properties in jumpers headings has numerous down to earth outcomes in setting up a few marbles. Calcite precious stones are doubly refractive—they transmit light in two headings and all the more light in one bearing; pieces arranged for utilizations in which translucency is critical are accordingly sliced parallel to that course. Bowing of marble pieces has been ascribed to the directional warm extension of calcite precious stones on warming.

3. COLLECTION OF SAMPLE

The sample was collected from Madipadu village of Guntur District. The area is rich in marble mineral content. We used the marble waste and pulverized into powdered form.

4. DESCRIPTION

Marble, granular limestone or dolomite (i.e., rock made out of calcium-magnesium carbonate) that has been recrystallized affected by warmth, weight, and watery arrangements. Economically, it incorporates all enhancing calcium-rich shakes that can be cleaned, and additionally certain serpentines.

Petro graphically marbles are gigantic instead of dainty layered and comprise of a mosaic of calcite grains that once in a while demonstrate any hints of crystalline structure under the magnifying lens. They are navigated by moment breaks that agreement with the rhombohedral cleavage (planes of crack that meet to yield rhombic structures) of calcite. In the all the more extremely distorted rocks, the grains show stripes and may be lengthened in a specific bearing or even squashed.

Marble: transformative marble. Even the purest of the changeable marbles, for example, that from Carrara, contain some adornment minerals, which, by and large, shape a significant extent of the mass. The commonest are quartz in little adjusted grains, sizes of dry or light yellow mica (muscovite and phlogopite), dim sparkling pieces of graphite, iron oxides, and little precious stones of pyrite.

These minerals speak to polluting influences in the first limestone, which responded amid transformative nature to shape new mixes. The alumina speaks to an admixture of dirt; the silicates get their silica from quartz and from earth; the iron originated from limonite, hematite, or pyrite in the first sedimentary rock. Now and again the first sheet material of the calcareous dregs can be identified by mineral banding in the marble. The silicate minerals, if present in any extensive sum, may shading the marble; e.g., green on account of green pyroxenes and amphiboles; chestnut in that of garnet and vesuvianite; and yellow in that of epidote, chondrodite, and titanite. Dark and dim hues result from the vicinity of fine sizes of graphite.

Groups of calc-silicate rock may exchange with groups of marble or shape knobs and patches, some of the time creating intriguing improving impacts, yet these stones are especially hard to complete due to the considerable contrast in hardness between the silicates and carbonate minerals.

5. RESULTS AND DISCUSSIONS

Parameters for mix design M40

- w/c : cement : FA : CA= 0.292 : 1 : 1.216 : 2.643
- Marble dust = 0%, 10%, 15%, 20%
- Specific gravity– cement= 3.15

  FA= 2.61

  CA (20mm) = 2.65

  CA (10mm) = 2.66

  Min. cement= 400 kg/m^3

  Max. W/c= 0.292

Mix calculations

- Target mean strength= 48.25 MPa
- w/c= 0.292
- Water content= 129 kg/m^3
- Cement content= 412 kg/m^3

Mix details per m^3

- Cement= 412 kg
- Water= 144 kg
- FA= 671 kg
- CA 20mm= 717 kg
- CA 10mm= 478 kg
- Admixture= 0.6% by weight of cement

  = 2.472 kg

Marble Dust (MD) replacing in FA

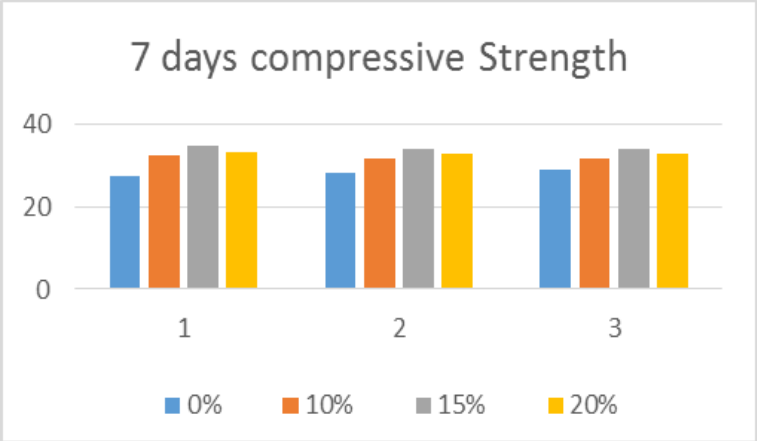
- 0% MD= 671 kg
- 10% MD= 67.1 kg
- 15% MD= 100.65 kg
- 20% MD= 134.2 kg

Compressive strength (N/mm^2) of concrete for 7 days

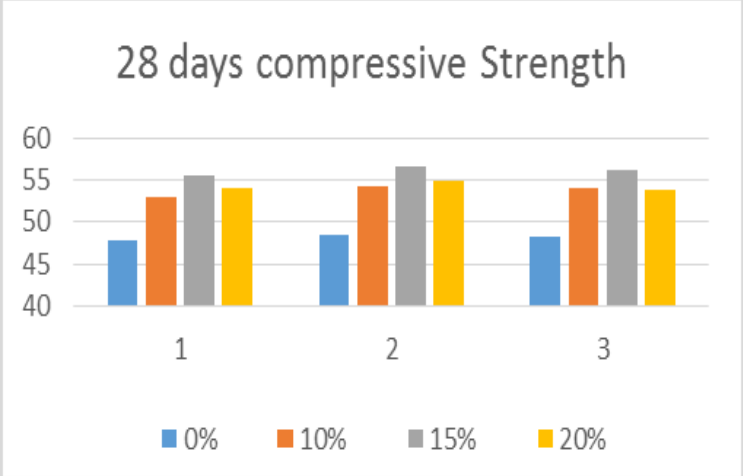
Sample	0%	10%	15%	20%
1	28.95	32.424	34.6	33.10
2	28.10	31.540	33.9	32.84
3	29.20	31.460	34.1	32.836
Average	28.75	31.808	34.2	32.925

Compressive strength (N/mm^2) of concrete for 28 days

Sample	0%	10%	15%	20%
1	28.95	32.424	34.6	33.10
2	28.10	31.540	33.9	32.84
3	29.20	31.460	34.1	32.836
Average	28.75	31.808	34.2	32.925



7days compressive strength



28 days compressive strength

6. CONCLUSION

- We can observe maximum optimum compressive strength at 15% of marble dust mixed with concrete.
- 20% of marble dust also gives high strength when mixed with FA.
- 10% of marble dust mixed with fine aggregate also gives somewhat more strength when compared normal mix.

7. RECOMMENDATIONS

The 15% mix of marble dust has shown positive result of more than that of 0% marble dust. It can be used in construction.

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