

Performance of Marble Waste as Partially Replacement of Sand and Aggregate in Concrete

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Abstract: *Concrete is a versatile engineering composite material made with cement, sand, aggregates and admixtures in some cases. Due to the day by day innovations and developments in construction field, the global consumption of natural aggregates is very high and at the same time production of solid wastes from the demolitions and manufacturing units are also very high. Extensive use of concrete leads to the scarcity of natural aggregates. Because of this reasons the reuse of demolished construction wastes and solid waste from manufacturing came into the picture to reduce the solid wastes from demolition and manufacturing units and as well as to decrease the scarcity of natural basic aggregate.*

Our aim to study the suitability of waste crushed marble in the concrete mix .In this project, different mixes are casted, waste crushed marbles are used to partially replace the coarse aggregate and marble powder is used to partially replace the fine aggregate.

INTRODUCTION:

Numerous waste materials are generated from manufacturing process, service industries and municipal waste. The increasing awareness about environment has tremendously contributed to the concern about the disposal of waste. With the scarcity of land and due to ever increasing cost, Waste utilization has become a great alternative for disposal. Research is being carried out on the utilization of the waste products in concrete replacement of coarse aggregate. Waste such as Marble, recycled aggregate etc. Each of these waste products has provided a specific effect on the properties of fresh and hardened concrete. The use of waste products in concrete not only makes it economical, but also helps in reducing disposal problem.

Due to demand for reducing over Exploitation of the natural quarries, the use of the by-products from different industries has become an increasing practice in the sustainable construction industry.

OBJECT OF OUR WORK

GENERAL

From the previous chapter 2 it is clear that many authors have made their efforts to study and compare the different properties of marble waste in conventional concrete. In this chapter was will discuss the origin of the problem, need for this study and scope of the study.

ORIGIN OF THE PROBLEM

In many areas concrete aggregates are locally unavailable because of urban expansion and enforcement of laws has led to closing several aggregate plants. Consequently it becomes necessary to transport these bulky and heavy aggregates from increasingly longer distances, at a cost which frequently equals or exceeds that of mining the aggregates.

NEED OF STUDY

Annual generation of many waste materials on large scale leads to percentage increase of pollution in the world. Up to some extent this waste can be reduced by using them innovatively in various fields. Thus many researches are been carrying out for getting the solution for this problem.

Marble waste is generally dumped in the land which spoils the cultivable land and also increases the maintenance cost of the land and it is harmful to environment. Coarse aggregate and Fine aggregate in cement is partially or fully replaced by marble chips & marble powder. Hence studies are made to direct the physical and chemical properties of concrete.

EXPERIMENTAL MATERIAL

MARBLE

Marble is a metamorphic rock that forms when limestone is subjected to the heat and pressure of metamorphism. It is composed primarily of the mineral calcite (CaCO_3) and usually contains other minerals such as: clay minerals, micas, quartz, pyrite, iron oxides and graphite. Under the conditions of metamorphism the calcite in the limestone recrystallizes to form a rock that is a mass of interlocking calcite crystals. A related rock, dolomitic marble, is produced when dolostone is subjected to heat and pressure.

CEMENT General

Cement is a binding material that sets after addition of water and binds all the materials together and hardens independently. It is an important building material and plays an important role in construction field.

Cement is manufacture from raw materials such as calcareous materials (e.g. lime stone, chalk and marl) and argillaceous materials (clay and shale).

It is produced by 3 processes.

1. Wet process
2. Dry process
3. Semi dry process

AGGREGATES

General

Aggregates used in concrete are natural deposits of sand and gravel. The aggregates occupy about 70 % to 75 % of the volume of concrete and hence their influence on various properties of concrete is considerable. The aggregate acts as reinforcement to add strength to the overall composite material. Due to the relatively high hydraulic conductivity value as compared to most soils, aggregates are widely used in drainage applications such as foundation and French drains, septic drain fields, retaining wall drains, and road side edge drains. They are also used as base material under foundations, roads, and railroads due to its good strength. In other words, aggregates are used as a stable foundation or road/rail base with predictable, uniform properties (e.g. to help prevent differential settling under the road or building), or as a low-cost extender that binds with more expensive cement or asphalt to form concrete. Properties of aggregates greatly affect the properties of concrete such as workability, strength, durability and economy. To increase the density of concrete the aggregate is frequently used in two or more sizes.

By size aggregates are divided in two forms:-

- Fine aggregate
- Coarse aggregate
- **4 Water**

Water used for mixing and curing shall be clean and free from injurious amount of oils, salts, acids, alkalis, sugar, and or other deleterious materials. As a component of paste, about 20 percent water by weight is needed to hydrate all the cement (w/c, 0.20), and about 15 to 20 percent more to provide space for the cement hydration products. And then, usually more water is needed to make the mix workable.

At about 0.65 to 0.70 w/c the permeability of concrete increases exponentially, so it is usually best to limit the w/c to 0.60 if that is tolerable with

respect to other concrete properties. However, any w/c higher than 0.40 leads to micro "holes" as uncombined water evaporates and strength drops progressively.

CRITICAL LITERATURE REVIEW

Er. Raj P. Singh Kushwah, Prof. (Dr.), Ishwar Chand Sharma, Prof (Dr.) PBL Chaurasia(2015) presented in his paper that the marble can be utilized in concrete mix by replacement of fine aggregates. Different mechanical properties of marble slurry are determined like specific gravity, fineness modulus was founded and it also showed that utilization of marble slurry by replacing it with sand upto 30% which shows equal strength as of conventional concrete i.e. 1:2:4 cement concrete ratio with 0% marble slurry. It concludes that marble slurry can easily be utilized in cement concrete mix

Bahar Demirel (2010) presented the use of marble dust as in place of fine aggregate in concrete ix and check the mechanical properties of mix. In this experimental study, the effects of using waste marble powder have been studied as a fine material on the mechanical properties of the concrete. Four different series of concrete-mixtures were prepared by replacing the fine sand (passing 0.25 mm sieve) with waste marble powder at different proportions like 0, 25, 50 and 100% by weight. For determining the effect of the waste marble powder on the compressive strength with respect to the curing age, compressive strengths of the samples were recorded at the curing ages of 3, 7, 28 and 90 days. Different properties like the porosity values, ultrasonic pulse velocity (UPV), and dynamic modulus of elasticity and the unit weights of the series were determined and compared with each other.

TESTING PROGRAMME:

TESTS ON CONCRETE
FRESH CONCRETE
SLUMP TEST
COMPACTION FACTOR TEST

(2)HARDEN CONCRETE
COMPRESSION TEST
SPLIT TENSILE TEST

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