

**An Exploration on Green Concrete using Industrial Waste Material**Bhavesh Khatik¹, Hiral Thanki², Ronak Amre³, Dharmdeepsinh Chauhan⁴, Sanish Panchal⁵¹U.G. Student, Civil Engineering Department, ITM Universe, Vadodara²U.G. Student, Civil Engineering Department, ITM Universe, Vadodara³U.G. Student, Civil Engineering Department, ITM Universe, Vadodara⁴U.G. Student, Civil Engineering Department, ITM Universe, Vadodara⁵Assistant Professor, Civil Engineering Department, Vadodara

Abstract —The word green is not just limited to colour, nowadays it represents the environment, which is surrounding us. Green concrete is a definite mixture of cement, coarse aggregate, fine aggregate along with waste concrete (like slag, power plant wastes, recycled concrete, mining and quarrying wastes, waste glass, incinerator residue, red mud, burnt clay, sawdust, combustor ash and foundry sand) or waste material (which harms the environment). It is an approach to presents the study and analysis of green concrete using industrial waste material. The industrial waste like Marble Powder, Marble Chips, and Quarry dust are taken into account. A detailed literature review has been done which is based on analysis from the decomposition of industrial waste materials problem. The main objective of green concrete is to reduce greenhouse gas emissions such as co2 that generate from the production of cement. The other goal of green concrete is to reduce the use of a natural resource such as limestone, clay, natural river sand and natural rock. By using concrete deposition of waste material will be reduced. We can provide sustainable development in the construction industries by taking cognizance of Green Concrete.

Keywords - Green Concrete, Industrial Waste, Concrete test, Waste Management, Quarry Dust, Marble Powder,

I. INTRODUCTION

In today's world, Concrete has become a crucial part of our lives. With passing day, the use of concrete is increasing at a high rate. In Green Concrete Technology, we can save natural materials for future use or generations. If we use waste materials for construction, the waste materials will become reduced the cost. Marble powder, Marble chips, Quarry dust and fly ash are some of the materials used for making green concrete, as sustainable construction. One of the main components of concrete is Portland cement. Cement has exceptional binding properties and is very suitable for use in concrete, the manufacturing of cement results in the emission of large amounts of CO₂. Due to this, reason cement is partially replaced by fly ash, which is economical as well as environment-friendly. Fine Aggregate is also one of the most important components used in the manufacture of concrete. In order to protect natural resources, the use of fine aggregate in concrete production can be reduced by using alternative material such as Marble Powder, Marble Chips, and Quarry dust.

A. **FLY ASH:** During the generation of heat from burn pulverized coal, remain remnant have almost 80 % fly ash. Fly ash has greyish colour and it is manufactured at power stations of India. It looks like cement. The specific gravity of fly ash is 2.08. Fly ash has many advantages but in Construction, it is used as 100% Replacement of Portland cement. But for replacement of Portland cement with fly ash above 80 % require some chemicals agent. As per studies, the optimal replacement level of fly ash is around 30 %. The fly ash produces less heat in heat of hydration that's why it is suitable for mass concreting in large construction projects. The performance of the concrete in the fresh and hardened state is improved by the use of fly ash in concrete with optimal proportion. The water requires for the concrete is reduced due to the use of fly ash. And it also improves the behaviour of paste flow.

B. **MARBLE POWDER:** Marble is a metamorphic rock produced from limestone by pressure and heat in the earth's crust due to the geological process. Marble Powder is an industrial waste produced from cutting of marble stone. In India, marble processing is one of the most flourishing industry. Marble waste powder is an industrial waste containing heavy metals in constituent and fineness with 90% of particles passing by 300µm sieves. It was retained on IS-150 micron sieve before mixing in concrete. For experimental purpose, 50 % of sand is the replacement by marble powder. The specific gravity of marble powder is 1.95.

C. **MARBLE CHIPS:** Marble chips is an industrial waste product which is produced from cutting of marble stone. Nowadays in the construction field, marble waste is increasing day by day. Deposition of this waste material is one of the problems which required land for deposition. This problem suggests more sustainable use of such in construction development. In nowadays as per the research marble chips is used in the production of concrete. As per paper review use of marble chips in construction as aggregate can reduce 4% to 5% of the cost of concrete per meter cube in the

construction field. So it can be said as economical concrete. More research is still required for the full replacement of aggregate.

D. **QUARRY DUST:** The most regularly used fine aggregate for the making of concrete is natural sand which is drawn out from the riverbeds. Quarry Dust as a by-product from crushing activity during quarrying activities is one of those materials that have recently obtained attention to be used as concreting aggregates, particularly as fine aggregates. In concrete production, it could be used as a partial or full replacement of natural sand. Furthermore, the behalf of quarry waste, which itself is a waste material, will reduce the cost of concrete production.



II. METHODOLOGY



A. **MIX DESIGN:** Following proportions are taken for mix design.

✚ M25 Grade Concrete Cube: (1:1:2) ✓ Cement: 6 kg ✓ Sand: 10.5 kg ✓ Coarse Aggregates: 20 mm - 12.05 kg ✓ Coarse Aggregates: 12mm - 8.05 kg	✚ Marble Powder Concrete Cube: (1:1:3.88:0.42:0.78) - Cement (30% replace by fly ash) and Sand (50 % replace by marble powder) ✓ Cement: 3 Kg ✓ Fly ash: 2.3 kg ✓ Sand: 5.7 Kg ✓ Marble powder: 4.2 kg ✓ Coarse Aggregates: 20 mm: 11.4 kg ✓ Coarse Aggregates: 12 mm: 7.6 kg
✚ Marble Chips Concrete Cube: (1 : 1 : 3.88 : 0.42 : 1) - Cement (30% replace by fly ash) and Sand (50 % replace by marble chips) ✓ Cement: 3 Kg ✓ Fly ash: 2.3 kg ✓ Sand: 5 Kg ✓ Marble chips: 4.8 kg ✓ Coarse Aggregates: 20 mm - 11.4 kg ✓ Coarse Aggregates: 12 mm: 7.6 kg	✚ Quarry dust Cube: (1:1:3.88: 0.42 : 1.04) - Cement (30% replace by fly ash) and Sand (50 % replace by marble chips) ✓ Cement: 3 Kg ✓ Fly ash: 2.3 kg ✓ Sand: 5 Kg ✓ Quarry dust: 3.3 kg ✓ Coarse Aggregates: 20 mm - 11.4 kg ✓ Coarse Aggregates: 12mm - 7.6kg

B. CASTING OF CUBES



M25 GRADE CONCRETE CUBE



MARBLE POWDER CONCRETE CUBE



MARBLE CHIPS CONCRETE CUBE

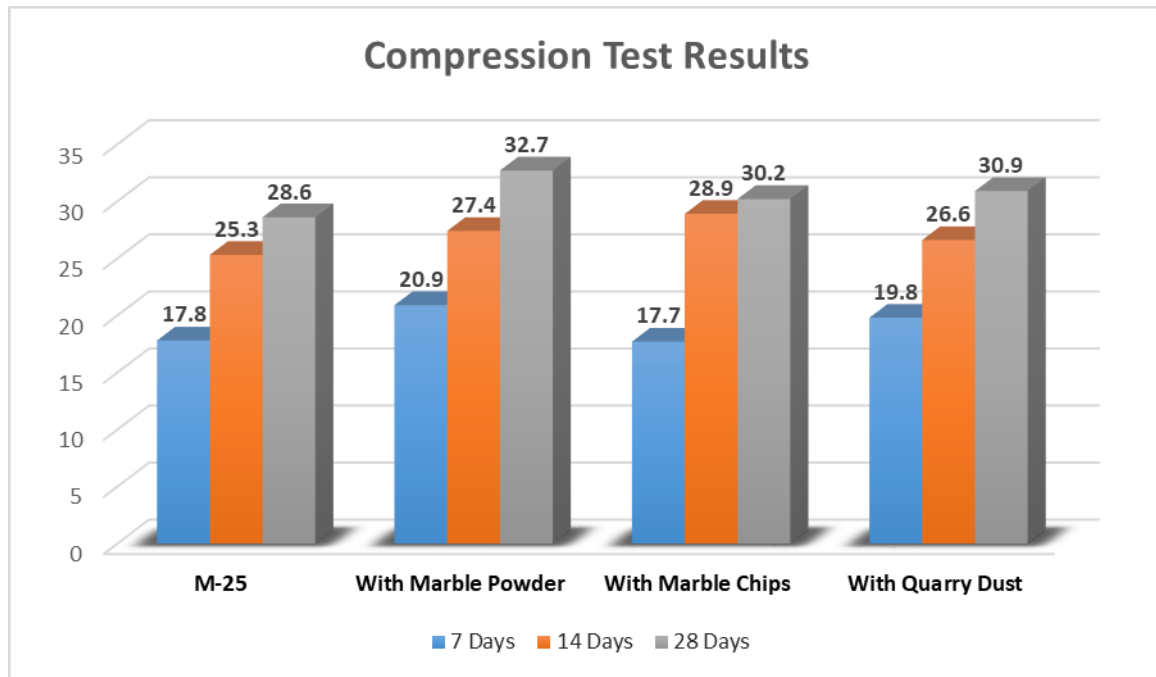


QUARRY DUST CONCRETE CUBE

III. RESULTS

The test results obtained from digital compression testing machine are tabulated below.

CUBE	7 DAYS STRENGT (MPA)	14 DAYS STRENGTH (MPA)	28 DAYS STRENGTH (MPA)
M25 Cube	17.8	25.3	28.6
Marble Powder & Fine Aggregates Cube	20.9	27.4	32.7
Marble Chips & Fine Aggregates Cube	17.7	28.9	30.2
Quarry Dust & Fine Aggregates Cube	19.8	26.6	30.9



IV. CONCLUSION

- A. As per the result of compressive strength, we found that marble powder concrete, marble chips concrete and quarry dust concrete give high compressive strength as compared to normal M25 grade concrete.
- B. As an economic point of view, Green Concrete is less costly as compared to normal concrete.
- C. Also, the use of Marble Powder in concrete results in a smoother surface of the cube, which helps in reducing the hurdles for getting a good aesthetic of the structure.

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