PARTIAL REPLACEMENT OF CEMENT IN CONCRETE BY BENTONITE

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Abstract

The Production of cement exposes 7% of CO2 in the atmosphere, which is one of the reasons of Global Warming. Bentonite, a product of volcanic ash is a rich source of silica which substitutes cement which has homogeneous properties. Two types of concrete is prepared with different water-binder ratio of 0.45 and 0.50 designed for M25 with 20%, 25%, 30%,35% and 40% replacement. The compressive strength is determined at,7 and 28 days. The results obtained from Bentonite replacement are Compressive Strength is achieved on long term basis.

Keyword: Cement, Bentonite powder, volcanic ash

1.INTRODUCTION

Concrete is one of the most widely used construction material in the world. It can be cast in diverse shapes. Concrete is a composite material formed by the combination of cement, sand, coarse aggregate and water in a particular proportion in such a way that the concrete produced meets the needs as regards its workability, strength, durability and economy. It is found to be versatile and hence gained importance in building materials

The concrete has high compressive strength, stiffness low thermal conductivity and low combustibility, but it has very low resistance tensile strength, limited ductility and little resistance to cracking. In the context of increased awareness regarding the ill effects of global warming, eco-friendly technologies are to be developed for the effective management of resources. The cost effectiveness in construction will be achieved only if we thinking from every corner of construction Materials. In this project, an attempt has made to overcome this problem by the limited use of Bentonite powder in place of Cement

1.1. Suitably Of Eco-Friendly Concrete in Structures

- Natural pozzolans is chemical name for the Bentonite.
- Natural pozzolans have many properties, such as high ultimate strength, low heat of hydration, low permeability, and high sulfate resistance, which make it a great benefit in mortar and concrete.
- Bentonite will help reduce greenhouse gas emissions and it will have a positive effect on system durability.
- It shows that nearly 7% of the world's total CO2 production comes from cement production process, and this trend is expected to remain stable over the next decade.
- Increased the usage of waste products in the concrete industry by 20%.
- Better thermal and fire resistance, as well as sound insulation than standard

2. LITERATURE REVIEWS

A. Honda said that there is a concern that the coexistence of cementations material and Bentonite cause the alteration of smectite due to this interaction function of hydraulics barrier.

2. Fiona Neal gave from his study that Shear strength (the ability to resist failure by a shear motion stress field) is independent of sodium replacement calcium in montmorillonite
3. P. Erik Mikkelsen gives the general view on strength and durability characteristic when cement is mixed with Bentonite This Graph gives the Compressive strength on 28 days of Cement Bentonite mixture

4. D.J.Morgan gives from his project that Bentonite are produced by dry processing methods, modest quantities of high value white Bentonite, in both the calcium and sodium form, are wet- refined using centrifuges to remove coarser impurities and to improve rheological properties.
5. If cement-Bentonite alteration results in porosity reduction that causes a permeability
   a. Summary was given by Y. Sakamoto, The evolution of porosity in Bentonite is important.
   b. The initial porosity is very high.

3. COMPRESSION STRENGTH READING

Specimens are casted in concrete cube of size (150mmx150xmm150mm) and cured the tested under compressive strength under compression testing Machine (CTM).

For compressive strength test, cube specimens of dimensions 150 x 150 x 150 mm were cast for M25 grade of concrete. The moulds were filled with different proportions of cement, Bentonite. Vibration was given to the moulds using table vibrator. The top surface of the specimen was leveled and finished. After 24 hours the specimens were remolded and were transferred to curing tank wherein they were allowed to cure for 3,7,14, and 28days. After 3, 7, 14, and 28 days curing, these cubes were tested on digital compression testing machine as per I.S. 516-1959[14]. The failure load was noted. In each category, three cubes were tested and their average value is reported.

3.1 RESULT AND CONCULSION

S.NO	CUBE SIZE	REPLACEMENT OF CEMENT	Compression Stress (N/mm^2)	
			7DAYS	28DAYS
1	15X15X15	100% Cement	12.3	19.1
2	15X15X15	80% Cement, 20% Bentonite	28.4	30.5
3	15X15X15	75% Cement, 25% Bentonite	30.6	31.8
4	15X15X15	70% Cement, 30% Bentonite	35.3	32.5
5	15X15X15	65% Cement, 35% Bentonite	22.6	28.7
6	15X15X15	60% Cement, 40% Bentonite	18.6	23.4

4. CONCULSION

It was observed that the compressive strength of the mixed concrete cubes has more strength than the concrete cubes up to certain ratio then it get reduced.
Compressive strength of concrete of 0% of Bentonite mixed concrete is 12.3 N/mm2 (7 days curing) Were as for 20%, 25%, 30 % it was 29.4N/mm2, 30.6 N/mm2and 37.3 respectively. But in case of 35% and 40 % compressive strength values were 23.4 N/mm2 and 19.4 N/mm2respectively (comparatively less).

Compressive strength of concrete of 0% is 19.1 N/mm2 (28days curing) Were as for 20% 25% 30 % it was 30.5 N/mm2, 32.5 N/mm2 and 35.4 N/mm2 respectively. And in case of 35% and 40% compressive strength values were 28.6 N/mm2and 25.1 N/mm2respectively (comparatively less)

From the above observations it is clear that values are increasing up to some ratio limit then it get decreased. And also it is noted that the compressive strength of 28 days curing value can be achieved by adopting just 20% Bentonite of 7 days curing

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