International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 02 | Feb 2021 www.irjet.net p-ISSN: 2395-0072

Influence of Bentonite in Concrete

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Abstract - *Today's environmental issues square measure a lot of and a lot of necessary. the economic the industrial produces several waste materials. one in all the foremost helpful ways that to resolve these issues is that the consumption of those waste materials in concrete. Production of every one tone of OPC emits concerning one tone of oxide. Cement trade is one amongst the most contributors to warming. This downside is also resolved by exchange typical cement by clay half. clay may be a product of volcanic ash and loaded supply of chemical compound which can be used as an alternate material. in addition, there is shortage of fine aggregates and coarse aggregates, Quarry mud is also used as fine aggregates half that in wise cases has shown vital advantage over natural fine aggregates. conjointly quarry dust is an economic and waste matter of rock and alternative to the river sand. standard concrete is that the most extensively used construction material worldwide, each in moderately and strongly aggressive environments. Mechanical properties – workability to compared with typical concrete characteristic properties of concrete square measure qualitatively related to its compressive strength so the modified concrete square measure progressing to be evaluated with compressive strength tests in conjunction with split strength tests which may offer United States of America necessary data required to determine the modified concrete.*

***Key Words*: clay, quarry mud, manufacturing sand, compressive strength, split enduringness, bentonite**

1.INTRODUCTION

Construction trade isn't ending industry, India could be a developing nation and also the demand isn't ending here. In any industry handiness and quality of materials play an important role. Cement is that the most essential component during this method. India is that the second largest manufacturer of cement within the world. The production of cement involves the consumption of huge quantities of raw materials, energy, and heat. Cement production additionally ends up in the discharge of a major quantity of solid waste materials and evaporated emissions. The producing method is incredibly complicated, involving an outsized variety of materials (with variable material properties), pyro processing techniques (e.g., wet and kiln, preheating, recirculation), and fuel sources (e.g., coal, fuel oil, fossil fuel, tires, venturous wastes, fossil oil coke). This trade accounts 5-7% of total dioxide emissions. The cement production wants the terribly high quantity of energy. Energy value represents four-hundredth of total production prices concerned in manufacturing of one metric weight unit of cement. Thermal energy demand (fuel) and current demand area unit the foremost necessary. Specific energy consumption depends on size and plant style, raw materials properties and its wet, specific caloric values of fuel, outturn of oven, sort of clinker and lots of different factors. Thermal energy demand is in vary of 3000 - 6500 MJ per one tone of clinker, the electricity demand varies from ninety to a hundred and fifty kWh per one a lot of cement. All this can be useful however the results area unit going out of hand. Major pollution issues in urban area units are massive concern. several scientists across the world area unit finding the most effective different material. Research has also been performed tests on the use of Bentonite clay as replacement of cement. **Peng Zhang** in his paper "Mechanical properties of plastic concrete containing Bentonite" Stated-Series of cube specimens were used to determine the compressive strength and split tensile strength, the strength was dependent on water-binder ratio. He concluded that there is tendency of decrease in the compressive strength and split tensile strength with increase in water to binder ratio, when the water to binder ratio increases by 0.3 basis points there is decrease in split tensile strength by 50%. **M. Karthikeyan** in his paper stated- The Bentonite samples were characterized by the main variable proportion of Bentonite in natural forms (0, 25, 30, 35 % by weight cement for a mix of M25) in the replacement mode. Compression split tensile and flexural strength tests after 7 days and 28 days of curing. The results obtained clearly mention that there is detectable decrease in strength when the substitution is 35% or more, hence the material is safe for use in construction purpose below this limit. **R.G.H BOYES** has mentioned in his paper that Bentonite is composed of the clay mineral montmorillonite, formed by the alteration in situ of volcanic glass, the individual particles of which are thin, flat sheets stacked in mica like layers. The sodium Bentonite will have greater

water retention properties than Calcium Bentonite. The availability of Bentonite is not an issue and can be found abundantly across varies quantities.

1.1 Materials and Methods:

The basic tests on Cement, Fine Aggregates and Coarse Aggregates used for the preparation of concrete were carried and the results are as tabulated in Table 2.1, Table 2.2, Table 2.3 and Table 2.4.

Table 2.1: Physical properties of Ordinary Portland cement

Properties	Test results
Standard consistency	33%
Initial Setting Time	150min
Final Setting Time	225 min
Specific Gravity	3.15
Fineness	7%

Table 2.2: Physical properties of manufacturing sand

Properties	Test results
Specific Gravity	2.55
Water Absorption	7%
Sieve Analysis	3.14

Table 2.3: Physical properties of Quarry dust

Properties	Test results
Specific Gravity	2.58
Water Absorption	3.6%
Sieve Analysis	3.23

Properties	Test results
Specific Gravity	2.58
Water Absorption	3.6%
Sieve Analysis	3.23

Table 2.4: Physical properties of bentonite

properties	Test results
Specific gravity	3.1
finesness	9%

Table 3: Mix Proportion

Material	Quantity (kg/m^3)
Cement	**325.52 kg/ m^3**
Water	**140 kg/m^3**
Admixture	**3.57 kg/ m^3**
Fine aggregate`	**750.8 kg/m^3**
Coarse aggregate	**12482.90 kg/m^3**
Water-cement ratio	**0.43**

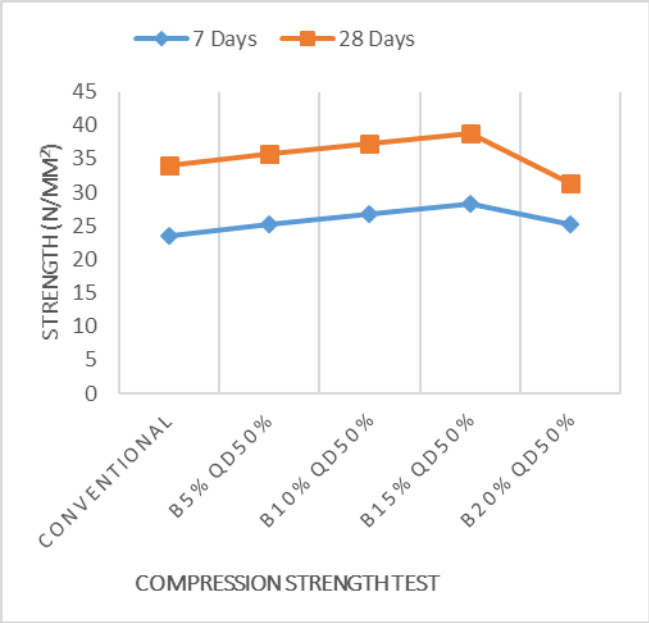
Before introducing bentonite into the concrete proper percentage of quarry dust replacement instead of fine aggregate is to be calculated for the same mix proportion. After obtaining maximum percentage of Quarry dust then kept constant and the Bentonite can be replaced instead of cement at regularities like 5%, 10%, 15% & 20% respectively.

3.TEST RESULTS

Compression Test:

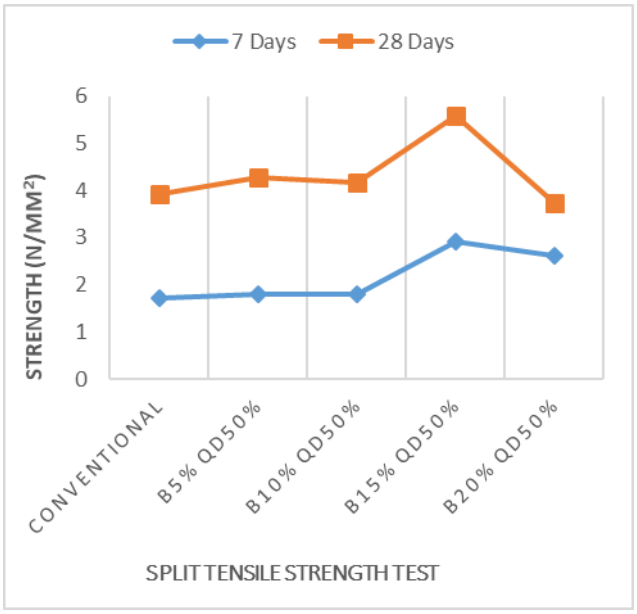
The cubes are tested for its compressive strength. Compressive strength of cubes is determined by testing the cubes under standard conditions using a Compression Testing Machine (CTM). The cubes are placed at the Centre of the loading platform of compression testing machine and tested under uniaxial compression without any eccentricity. The load is increased gradually till the specimen undergoes failure. The load at which the specimen fails is taken as the failure load to calculate the maximum stress.

The loads taken by all the specimens are noted and are tabulated. Cubes are tested for a partial replacement of cement with 5%, 10%, 15%, 20% of bentonite and the compressive strength values are reported.



Split Tensile Test:

The determination of the splitting tensile strength of cylindrical concrete samples such as molded cylinders. A diametral compressive load will be applied along the length of the sample at a continuous rate until failure occurs. This loading induces tensile stresses on the plane containing the applied load, causing tensile failure of the sample. The splitting tensile strength will be determined by dividing the maximum applied load by the appropriate geometrical factors.



4.CONCLUSION

PRESENT STUDY

The aim of the study was the utilization of the Bentonite and waste material Quarry dust collected from Quarry plant. The use of Bentonite and Quarry dust as partial replacement in cement and fine aggregate has positive impact on environment and lowers the cost effectively.

Using Bentonite in cement and Quarry dust in Fine Aggregate as substitute in concrete has own good results in mechanical properties.

From this experiment we can conclude that Bentonite and Quarry dust can be used as partial replacement with certain percentage.

Based on the compression and split tensile strength tests following conclusion can be made.

1) The physical properties of Bentonite and Quarry dust satisfy the requirements of cement and fine aggregate respectively.
2) The compressive strength for 20% replacement of Bentonite is not increased. There is little variation in the strength compared with

conventional concrete.

3) The optimum result is obtained for 15% replacement with Bentonite.

4) For optimum value there is increase of compressive strength by 20% than the conventional concrete.

SCOPE OF FUTURE STUDY

1) In this experimental study only compressive strength and split tensile strength has been checked for 7 and 28 days. In future work, it should be extended to 54, 90 days to analyze the strength variations.

2) Study related to flexural strength should be considered in future prospects.

3) Durability of the modified concrete should be checked for longer use.

4) Different grades of concrete with same procedure should be taken up.

5) Same grade of concrete with different water cement ratio will have to be checked.

6) Quarry dust replacement can be further extended up to 100% in fine aggregate for further analysis.

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