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Emerging Trends in Civil Engineering

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Abstract:- In this century India has developed more as I mean is technology has developed in India. There is the development of emerging trends in civil construction that is Bacterial Concrete by emerging crushed aggregate. As we know concrete is one of the most common material used in every construction and the main issue with the concrete is that it suffers from the cracks. Therefore, this paper reviews the types of Bacteria used in concrete for healing of the cracks. This paper also gives the idea about the properties of concrete after addition of different types of Bacterias and also replacing coarse aggregate by crushed aggregate.

Keywords:- *Cement , Sand, Recycled Course Aggregate, Bacterias.*

I. INTRODUCTION

Nowadays, there is an increase in construction and demolition that leads to pollution, reduced natural resources and higher energy consumption. As a result of this study, eco-friendly and recycled materials are made e.g. Crushed aggregate, Bacteria such as Bascillus Subtilis and Bascillus Megaterium.

These kinds of things are like:
• Reduce consumption.
• Reduce environmental impact.
• It does not harm human health.

This type of material first helps to strengthen the structure, to maintain it. And when the life of any building is finished and the demolition suffers, the property is reused in other buildings. This application is used to save on utility costs, reduce utility costs and extend the life of the building.

II. MATERIAL USED

There are different types of materials used in this experimental work

➢ *Cement*

It is commonly used as a binding material for all types of construction. It is a dry, fine grinded powder of calcining lime and clay. It forms mortar when water is added in it or form concrete when sand, coarse aggregate and water is mixed.

➢ *Fine Aggregates*

Sand plays an important role in concrete as a small size filler material. Sand is the type of aggregate having size less than 4.75mm and retained on 150 micron sieve. It acts as a filler material after addition of coarse aggregate. The Sand is selected in such a way that it made the concrete more durable, strong and cheaper. For example, on the basis of surface texture, grading zone, particle size and water absorption.

➢ *Coarse Aggregates*

Recycled coarse aggregate is the aggregate attached with mortar. It is the aggregate obtained from the demolition of the structures. Recycled aggregates are also known as crushed aggregate made up from debris. The size of the aggregate is 40 mm to 4.75 mm. This recycled coarse aggregate is selected on the basis of flakiness index, elongation index, water absorption, particle size distribution, impact value, crushing value.

Also the coarse aggregate are used. The size of coarse aggregate is as same as crushed aggregate.

➢ *Bacteria*

The bacteria is the free living organisms present on the earth. Bacteria is the living things which is not visible to the naked eye. The bacteria is the organisms present in any atmosphere. There are two types of Bacteria used in the research that are Bascillus Subtilis and Bascillus Megaterium.

III. METHODOLOGY

A. Preparation of Bacteria Culture:

- Chemicals such as magnesium sulphate, calcium carbonate, Potassium phosphate disbasic, Ferrous sulphate,agar are mixed together in six different parts.
- Add Bacillus Subtilis In two parts, Bascillus Megaterium in two parts Ani in the remaining two parts are the combination of Bacillus Subtilis and Bascillus Megaterium.

B. Preparation of Cubes:

- 8 cubes are casted in which 2 cubes are without Bacteria but 1 contain natural aggregate and other with crushed aggregate and 3 cubes are of natural coarse aggregate with addition of the Bacteria and remaining 3 cubes are of crushed aggregate with addition of Bacteria.
- Firstly mix the dry proportion of cement, sand and Natural Aggregate/ crushed aggregate of M15 grade.
- Prepare the homogeneous mixture and add water having the Water Cement Ratio 0.5.
- Take 8 cubes of 15cm x 15cm x15cm. Clean it and apply oil to it.

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Table No.1 Chemicals and materials with quantities.

Sr. No	Chemicals and Materials	Quantity
1.	$MgSo_4$	0.5 g
2.	$CaCo_4$	0.05 g
3.	$FeSo_4$	0.01 g
4.	K_2HPO_4	0.8 g
5.	Agar	12 g
6.	Urea	20 g
7.	Bascillus Subtilis	20 g
8.	Bascillus Megaterium	20 g
9.	Bascillus Subtilis + Bascillus Megaterium	20+20 g

- Caste first 2 mould without Bacteria. And other moulds with bacteria culture plus crushed aggregate as explained above.
- Fill the mould in 3 layers of 5 mm thick and Compact it by tamping rod also level the top surface of the mould.
- Then keep the cube in moist air for 7 days at temperature 27° ± 20°C.
- Remove the specimen from moist place and wipe it out from excess water.

C. Testing of specimens

➢ *Compressive* Strength.

- Take the weight of each specimen.
- Clen the bearing surface of Compressive testing machine and place the specimen in the machine centrally on the base plate.
- Rotate movable portion gently by hand so that it touches top surface of specimen.
- Apply load gradually at the rate of 140 Kg/m²/minute without shocks till the specimen suffers from visible cracks.
- Record the load
- Measure the thickness of the cracks using digital vernier caliper which is formed in the cubes.
- Place the specimen in cool place for some days and check the cracks daily.

➢ *Visual Examination.*

- Remove the specimens from the cool place.
- With the help of torch observe the cracks daily.

➢ *Crack size examination test (digital vernier caliper).*

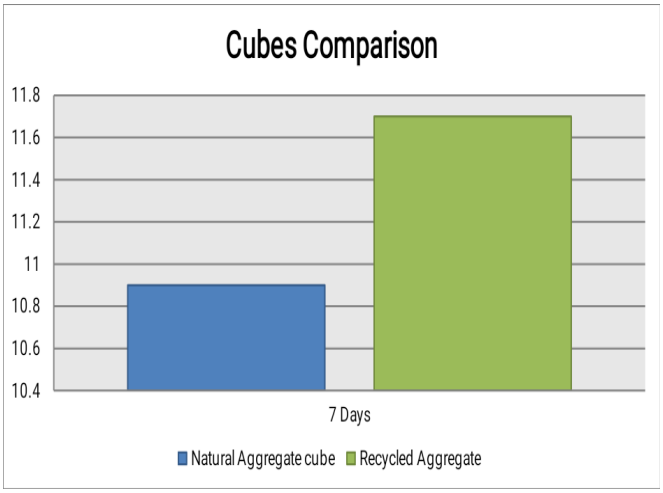
- Place the digital vernier caliper on the crack at fic position without any error.
- Record the readings displayed on the vernier caliper.

Fig. No 1. Compressive testing machine.

IV. RESULTS

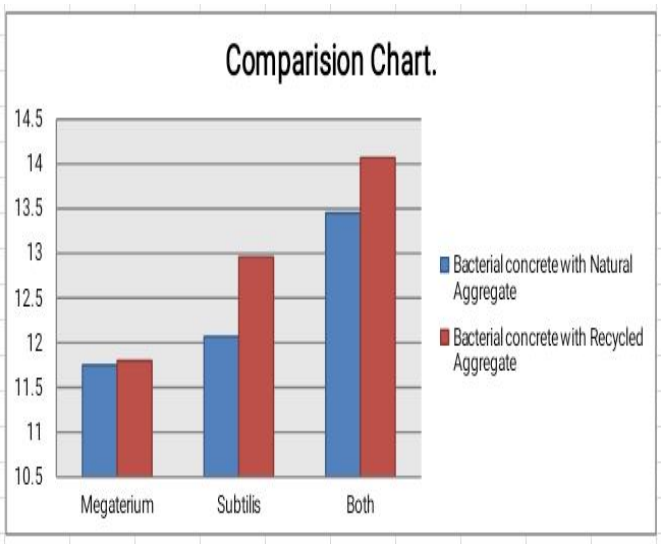
The cracks formed in the block were filled 35% by 7 days and the cracks were filled completely by 20 days.

Fig. No 2. Crack Healed blocks.



Graph No 1.Compressive strength comparison for different types of aggregate.

This graph shows the comparison of Natural Aggregate and Recycled Aggregate. From the graph it shows that the compressive strength of Recycled Coarse Aggregate cube is 5% greater than the Natural Coarse aggregate.



Graph No 2. Comparison of compressive strength for different types of Bacteria and aggregate.

Here is the comparison of 1.Bascillus Megaterium, 2.Bascillus Subtilis and 3. Combination of Both. This graph shows the result that the compressive strength of Bascillus Megaterium is low as compared to Bascillus Subtilis and the compressive strength is higher for the combination of both Bacteria as compared to single Bacteria used.

The weight of natural aggregate block is 8.0 kg.
The weight of Recycled Coarse aggregate block is 6.98 kg.

V. CONCLUSION

a) Bacteria plays an important role in increasing the compressive strength . it is found that there is increase in strength is mainly due to penetrable pores in between the concrete due to precipitation of limestone by bacteria.
b) The use of Recycled Coarse aggregate is comparatively moderate. With the use of Recycled Aggregate there will be reduction in the land use for disposal.
c) As the bacteria is eco friendly therefore it is not harmful to the human health.

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