

## SELF HEALING BACTERIAL CONCRETE

Choudhari P.G., Jamaiwar R.Y., Meshram P.R., Majumdar P.M., Hatmode T.L., Gaidhane R.C.

Civil Department, G.H.Raisoni Academy of Engineering & Technology, Nagpur, Maharashtra, India

[Prakash.choudhari@raisoni.net](mailto:Prakash.choudhari@raisoni.net), [jamaiwarritesh@gmail.com](mailto:jamaiwarritesh@gmail.com), [pranaym115@gmail.com](mailto:pranaym115@gmail.com)

**ABSTRACT:** This paper researches about the use of bacteria in concrete and comparing the compressive strength of concrete with that of conventional concrete. The bacteria is used in different proportions and mixed with the concrete at the time of mixing. The various proportions like 10ml, 20ml, 30ml, and 40ml is being used in the research. Cubes are prepared using bacteria and tested and compared with conventional concrete. The results were very positive. The compressive strength of concrete is increased considerably by using the bacteria bacillus subtilis.

**Key words:** Bacteria Bacillus Subtilis, Water, Cement, Concrete, Compressive Strength.

### 1. INTRODUCTION

Bacterial concrete or self-healing concrete fills up the cracks developed in structures and increase the compressive strength of concrete when compared with conventional concrete and also makes the concrete more durable by the help of bacterial reaction in the concrete after hardening. Types of bacteria, its mechanism and preparation of bacterial concrete is discussed. In modern days, the use of technology has taken the standards of construction to a new high level. Different types of procedures, methods and materials are used to attain a very good, sustainable and economic concrete construction. To overcome this types of problems, many remedial procedures are undertaken before and after the construction. Recently a new term bio-concrete is used for concrete mixture which possess high workability, high compressive strength, low permeability. The bio-concrete is called as the self-healing concrete has high self-healing efficiency. With growing population, industrialization and urbanization, there is a corresponding growth in infrastructure. Several studies have shown that the performance of concrete can be significantly increased by using bio-concrete are the most effective additives used in cement or concrete because of their high self-healing properties. We have used bacteria Bacillus-Subtilis.

### 2. METHODS & MATERIALS

#### 1.1 Bacteria

The bacteria used for the research work is Bacteria Bacillus subtilis. The bacteria generally lives in soil and on stones.

#### 1.2 SAND

Sand is used is less than 4.75 MM in making plastic paver block. Also we take the physical properties on sand and it's compared to IS code value.

#### 1.3 Coarse Aggregate:

Locally available coarse aggregates were used in this work. Aggregates passing through 12mm sieve and retained on 10mm sieve were sieved and tested as per Indian standard specification IS: 383-1970

#### 1.4 Preparation of Test Specimen

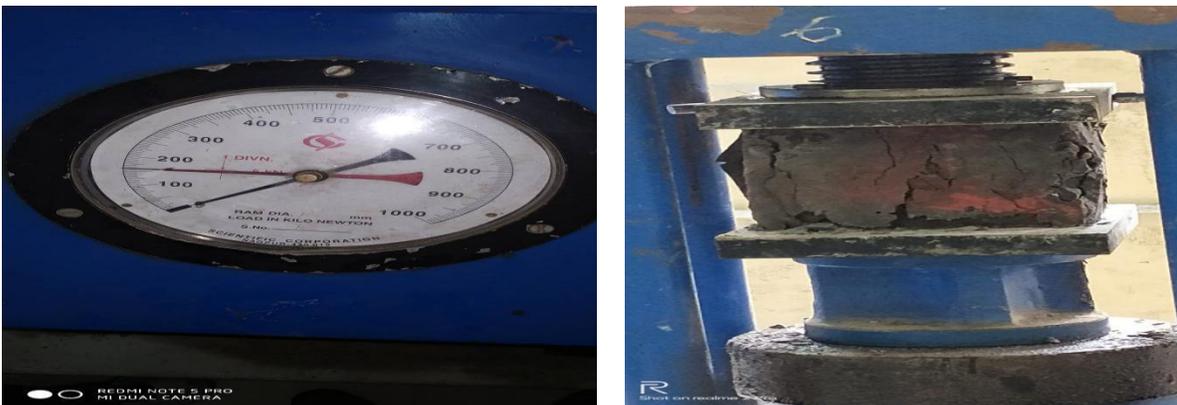
The cubes are prepared taking the proportions M20 grade of concrete for checking the compressive strength of conventional concrete. Then cubes are prepared using bacteria bacillus subtilis taking various proportions like 10ml, 20ml, 30ml, and 40ml. After that the cubes were kept for curing for 3 days, 14 days and 28days.



**Fig1. Concrete Mixing & Cubes Preparation.**

### 2.1 Testing of Specimen.

Cubes were taking out from the curing tank and kept for drying. After the drying of the cubes in the atmospheric temperatures, cubes are ready for the testing. Cubes will be tested on Compression Testing Machine and results were expected.



**Fig2. Testing of Cubes**

### 3. RESULTS & DISCUSSION

Sr. No	Type of Concrete	Age of Concrete (Days)	Reading in CSTM(KN)	Compressive Strength (N/mm <sup>2</sup> )	Remark

1	Conventional Concrete	3	160	7.11	40 % strength gain
		7	295	13.04	65 % strength gain
		28	445	19.71	98 % strength gain
2	Bacterial Concrete (Bacillus-subtilis) 10ml	3	170	7.406	2 % increase compressive strength
		7	310	13.7	3 % increase compressive strength
		28	465	20.67	4.6 % increase compressive strength
3	Bacterial Concrete (Bacillus-subtilis)20ml	3	190	8.29	5 % increase compressive strength
		7	320	14.45	7 % increase compressive strength
		28	505	22.44	12.16 % increase compressive strength
4	Bacterial Concrete (Bacillus-subtilis)30ml	3	215	9.406	11 % increase compressive strength
		7	350	15.56	13 % increase compressive strength
		28	545	24.07	18.11 % increase compressive strength
5	Bacterial Concrete (Bacillus-subtilis)40ml	3	230	10.23	16 % increase compressive strength
		7	370	16.44	17 % increase compressive strength
		28	575	25.56	22.88 % increase compressive strength

#### 4. CONCLUSION

The following conclusions were drawn from the experimental investigation:

- The compressive strength of concrete prepared by embedding the bacteria comes out more as compared with conventional concrete.

- Concrete prepared using 40ml bacteria bacillus subtilis gave an increase in compressive strength of 22.88 % after 28 days of curing.

## **5. ACKNOWLEDGEMENTS**

We are appreciative to Mr. Prakash Choudhari professor of G.H.Raisoni Academy of Engineering And Technology, Nagpur (GHRAET) for consolation useful remarks by our guides assisted with improving the change original copy.

## **REFERENCES**

- [1] Ashish Babarao Gawande, Yash Suneel Khandekar, Ojas Pravin Rahate “Applicability of concrete treated with self-healing bacterial agents”
- [2] A. Gandhimathi, D. Ramya “Experimental study on self-healing concrete”
- [3] Koustubh A. Joshi “Study of self-healing Mechanism and its impact on bacillus bacteria”
- [4] Nele De Belle, “Application of bacteria in concrete”
- [5] Magudeaswaran Palanisamy, “Bacterial Concrete”
- [6] Dhanraj Suji, “Development of concrete to increase split tensile strength using bacteria”
- [7] Jayesh kumar pitroda, “Bacterial concrete”
- [8] HenkM Jonkers, “Bacteria based self-healing concrete”
- [9] Willy Verstraete, Nele De Belie, “Use of bacteria to repair cracks”
- [10] Mayur Shantilal Vekariya, “Bacterial concrete :new era of construction”
- [11] A Textbook of high performance concrete by P C Aitcin.
- [12] A Text book of Concrete Technology by M.S.SHETTY.