

# Comparative Assessment Study of Traditional Concrete and Green Concrete

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Submitted: 30-08-2021

Revised: 03-09-2021

Accepted: 05-09-2021

**ABSTRACT:** In the current modern world, there has been enormous development in the field of "Concrete Technology". With this development, there has also been enormous use of concrete in our routine life. Cement, sand, and aggregate are the main constituents, which when mixed with water in correct proportion gives a by product called "Concrete". The excess use of concrete has led to an environmental impact in terms of resources utilization as well as in terms of pollution. To overcome these impacts the concept of "Green Concrete" came into existence nowadays as sustainable development. Green Concrete in which one or more of its constituents are ultra by a resource-saving material, which ultimately has reduced environmental impacts in terms of both, resource utilization with pollution impacts together.

**KEYWORDS:** Traditional Concrete, Green Concrete, Environmental Impact, Compressive Strength, Water Submerged Curing, Steam Curing, Efficiency of Concrete.

## I. INTRODUCTION

The word green in the "Green Concrete" does not represent the color of the concrete. It represents that the concrete is environmentally friendly. We are aware of the manufacturing process of cement and aggregate which causes tremendous environmental impact, and day by day this increasing demand for concrete materials is ultimately causing an impact on our environment. Thus replacing cement and aggregate (conventional constituents of concrete) can in turn help in minimizing the environmental impact caused during the manufacturing process of aggregate and

cement. The main objective of this research is to compare traditional concrete and green concrete in terms of compressive strength. The M25 grade of concrete was used for assessment. To check the compressive strength property the "Traditional Concrete" cubes were cured by the "Water Submerged Curing" method, and the "Green Concrete" cubes were cured by the "Water Submerged Curing" method and another set by the "Steam Curing" method. The curing of concrete cubes was carried out for 3,7,28 days subsequently and cubes were tested on a compression testing machine.

## II. METHODOLOGY

The experimental investigation was planned to know the compare Traditional concrete and green concrete in terms of compressive strength. The M25 grade of concrete was used for assessment. Two types of concrete were prepared as samples of 150x150x150 mm cube size. Cube TC refers to Traditional concrete, GCA refers to Cube of Green Concrete cured by water submerged curing, GCB refers to a Cube of Green Concrete cured by Steam Concrete.

## III. MIX DESIGN

Standard Mix Design for traditional concrete was carried out as per IS standards Assuming the volume of overall aggregate as 65% and alkaline liquid to fly ash ratio as 0.30, the quantities of all ingredients used in conventional and green concrete are mentioned below in Table 1 and 2.

**Table 1:**Mixing Proportions of Traditional Concrete

Sr. no	Constituents for M25	(Kg/m3)
1	Cement	320
2	FA Fine aggregate	751
3	CA Course aggregate	1356
4	Water	137
5	W/c ratio	0.43

**Table 2:**Mixing Proportions of Green Concrete

Sr. no	Ingredient for M25	(Kg/m3)
1	Fly ash	463.50
2	FA Fine aggregate	530.70
3	CA Course aggregate	1154.0
4	Solution of Sodium hydroxide solution	80
5	Solution of Sodium silicate	120

The following standard tests were performed on the aggregates included sieve analysis, flakiness, and elongation index, specific gravity, impact value test, and crushing of aggregates. All tests performed were confirmed to IS code standards.

**Mixing and Casting Of Cubes:**

The traditional method of mixing was used for green concrete. First of all, ingredients were mixed in dry condition i.e. dry mix, for about 4 to 5 minutes. Then the combination of sodium hydroxide solution and sodium silicate solution was being added to the dry mix. The mixing was carried out in a trial mixer for about 6 to 8 minutes. The moulds were properly oiled and kept ready before pouring concrete into them. After proper mixing of material, the concrete was poured into a 150 mm X 150 mm X 150 mm size cube mould. For proper compaction of concrete was poured in three layers and each layer was tamped 25 times.

These cubes were demoulded after 24 hours. The cubes were then transferred for curing.

**Curing Of Cubes:**

For conventional concrete, the cubes were submerged into a rectangular tank filled with water. The “Water Submerged Curing” method was also adopted for one set of green concrete cubes. Another set of green concrete was cured by the “Steam Curing” method. After demolding, the cubes were placed in a steam curing unit for 24 hours initially and then followed by water submerged curing

**IV. RESULTS AND DISCUSSION**

The results of the compressive strength test were conducted on both conventional and green concrete after a span of 3 days, 7 days, and 28 days .A compression testing machine was used to test the cubes. Test results are reflected in Table 3, Table 4, and Table 5

**Table 3:** Results of Compression testing on traditional concrete.

Sr. no.	Days Cube	Traditional Concrete (N/mm 2)		
		3 Days	7 Days	28 Days
1	Cube TC 1	9.4	15.3	24.1
2	Cube TC 2	10.4	14.8	25.3
3	Cube TC 3	10.3	15.6	24.5
Average Strength		10.03	15.23	24.63

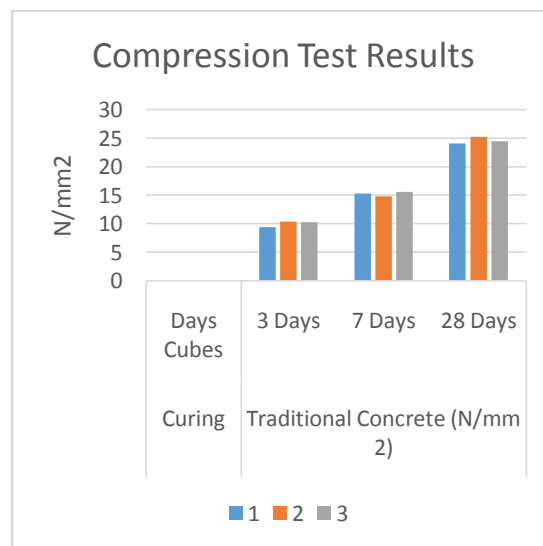
**Table 4:** Results of Compression testing on Green Concrete by water submerged curing.

Sr no.	Days Cubes	Green Concrete (N/mm <sup>2</sup> )		
		3 Days	7 Days	28 Days
1	Cube GCA1	4.92	8.46	13.43
2	Cube GCA 2	4.37	8.33	12.88
3	Cube GCA 3	4.45	8.51	12.3
Average Strength		4.58	8.43	12.87

**Table 5:** Results of Compression testing on Green Concrete by Steam curing.

Sr. no	Days Cubes	Green Concrete (Steam curing) (N/mm <sup>2</sup> )		
		3 Days	7 Days	28 Days
1	Cube GCB1	15.89	22.5	26.9
2	Cube GCB 2	15.53	22.77	27.3
3	Cube GCB 3	15.41	22.4	27.5
Average Strength		15.61	22.56	27.23

Fig 1, Fig 2 and Fig 3 below reflects the comparison of compressive strength of Traditional concrete and Green concrete after 3, 7 and 28 days .



**Fig. 1** Compressive strength Analysis of test results after 3 days

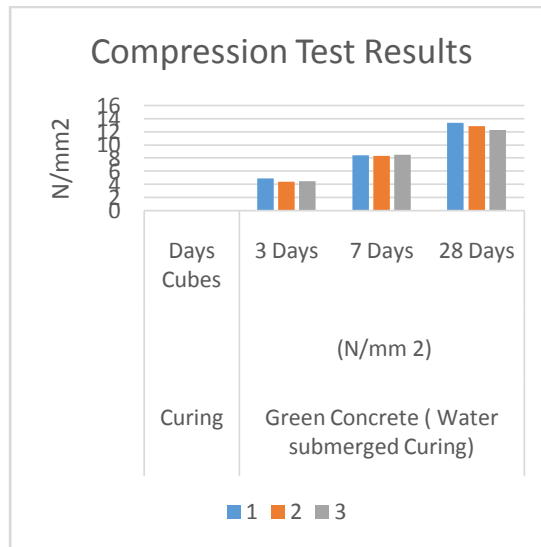


Fig. 2 Compressive strength Analysis of test results after 3 days

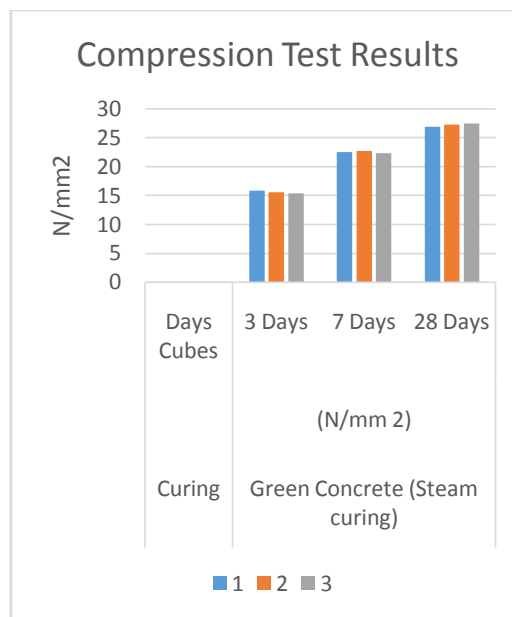


Fig. 3 Compressive strength Analysis of test results after 3 days

### V. CONCLUSION

The following conclusions are drawn from the current experimental investigation. The experimental comparative assessment result concludes that,

The rate at which the compressive strength is gained by the green concrete GCA (underwater submerged curing) is less compared to the compressive strength of the traditional concrete TC (underwater submerged curing).

However, the compressive strength of the Green Concrete GCB (under steam curing) is showing high compared to the other methods of cube curing carried out during assessment.

It can be concluded that the compressive strength gained by the green concrete cubes GCB under steam curing is 10.55 % higher compared to the tests conducted on cubes in water submerged curing conditions.

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