EXPERIMENTAL STUDY OF ECO-FRIENDLY CONCRETE MATERIAL IN CONSTRUCTION INDUSTRIES

DR.K.DHANASEKAR [1], S.VIJAYALAKSHMI [2], R.BHARGAVI [2], V.PRADEEPA [2], K.SWARNA GOPIKA[2]
PROFESSOR[1], STUDENT[2], DEPARTMENT OF CIVIL ENGINEERING,
PANIMALAR ENGINEERING COLLEGE, CHENNAI

ABSTRACT: In today's times there has been huge development among the sphere of "concrete technology", with his trends of changes in evolution instead of cement concrete "eco concrete" was established. Concrete chiefly includes of cement, sand, mixture as its main constituents. that once mixed with water in correct proportion offers a byproduct called as "concrete". when excess quantity of concrete is employed in structures, it results in environmental implications with regards to pollution and resource utilization. to beat these impacts the construct of "green concrete" came into existence. In 1998 Dr.WG in Denmark developed "Eco concrete". "Green concrete" could be a concrete during which one or additional of its constituents or replaced by a resource saving material, which ultimately has reduced environmental impacts in terms of each resource utilization and pollution impacts. An attempt has been made to study the strength parameters of green or Eco concrete(EC) experimentally.

KEYWORDS: Eco concrete, standard concrete, compressive strength, water Submerged curing, steam action.

1. INTRODUCTION

When we replace one or a lot of constituents of typical concrete, by environmental friendly materials or recycled materials, the concrete shaped is termed as "Green Concrete". As we all know the producing method of cement and combination causes immense environmental impact, and day by day this increasing demand of concrete materials is ultimately inflicting impact to our surroundings. Thus substitution cement and combination (conventional constituents of concrete) will successively facilitate in minimizing the environmental impact caused throughout producing method of combination and cement .The main objective of this analysis is to check typical concrete and inexperienced concrete in terms of compressive strength. The "Conventional Concrete" cubes were cured by "Water Submerged Curing" technique to check the compressive strength. It was used to cure cubes of "Green Concrete" and another set by "Steam Curing" technique. The curing of concrete cubes was meted out for three days, 7 days, and

twenty eight days afterwards and cubes were tested severally. M25 grade Concrete is used to set the cubes.

2. MATERIALS USED

CEMENT: The cubes are prepared by using Ordinary Portland Cement of grade 53. *The cement used was already tested for its numerous properties as per IS 4031-1988 and IS 12269-1987. Relative density of cement was 3.09, whereas fineness was 2600cm2/gram.*

FINE AGGREGATE: Fine aggregates are medium size crushed sand which is available locally in the market. The fine aggregates confirmed to Zone-II of IS 383-1983. Fineness Modulus of 3.23. Fine aggregate was 2.69 of Relative density.

COARSE AGGREGATE: Coarse aggregates are crushed angular aggregates which is available in local market.20 mm is the size of coarse aggregate used as maximum size, with relative density of 2.68 and Fineness Modulus of 7.2 for conventional concrete. the utmost size of coarse aggregate for green concrete was 20 mm. and it had been collected from the demolished sites.

WATER: For concrete mixing portable drinking water is used.

FLY ASH: Grade C 618 fly ash is used.

ALKALINE SOLUTION: Sodium Hydroxide having relative molecular mass of 40gm was used. The sodium silicate (soluble glass) (Na2Sio3) to (caustic soda) sodium hydroxide solution (NaOH) ratio utilized in this experiment was 1.5.

3. DESIGN MIX:

Study was carried out for both conventional concrete and green concrete. We have tried with M25 grade. Assuming the volume of overall aggregate as 60% and alkaline liquid to fly ash ratio as 0.31, the quantities of all ingredients used in conventional and green concrete are mentioned below in Table 1 and Table 2.

Table -1 Mix proportions for Conventional Concrete

S.NO	Constituents for M_{25}	Kg/m^3
1	Cement	330
2	Fine aggregate	748
3	Coarse aggregate	1326
4	Water	139
5	Water cement ratio	0.43

Table-2 Mix proportions for green Concrete

S .No	Ingredients for M_{25}	Kg/m^3
1	Fly ash	461.50
2	Fine aggregate	528.70
3	Coarse aggregate	1151.06
4	Sodium hydroxide solution	80
5	Sodium silicate solution	120

4. MIXING OF CUBES

Crushed granite chips of size 20mm were used for preparing cubes. The Specific gravity of crushed granite is 2.09, Water absorption is 0.50%, Crushing value is 24%, Los Angeles abrasion value is 20%. The above parameters are arrived as per IS: 2386- 1963.

Two-stage mixture has been performed during a rotating drum mixer as per the given delineated procedure.

In **1st stage**, procedure of blending concerned adding each coarse and fine aggregates into the drum mixer and dry mixed for 0.5 a min to permit aggregates to combine systematically.

Secondly, the primary 0.5 portion of {the mixture the blending} water would be further into the mixer and therefore the mixing continuing for one more a pair of minutes. The mixer was currently stopped for 3 min to market the absorption of water into aggregates. The cement was then further and therefore the mixer continuing for one more
0.5 minute.

Finally, the remaining half {the mixture the blending} water was further so mixing was performed for about for about. Mixing procedure and time are unbroken constant for all the blending. When completion of the blending, slump cone check was performed as we have a tendency to notable. Currently verify the workability of the mixes. To finalize the combo proportion, casting of cubes (150 × 150 × 150 mm), cylinders (150 mm diameter × 300 mm height) and prisms (100 × 100 × 500 mm) was distributed in 2 phases for determination of mechanical and sturdiness properties.

5. CASTING:

In **1st part**, casting of cubes was distributed by given per combine proportion shown victimization natural and fifty and 100% recycled coarse aggregates at w/c magnitude relation of 0.45 while not and with super plasticiser (0.25%).

In **second part,** casting of cubes, cylinder and prism was distributed victimization natural and unwashed recycled aggregates (50% and 100%) at reduced w/c magnitude relation (0.43) keeping the dose of super plasticiser constant. To gauge washed mixture performance in hardened concrete, 100% washed recycled coarse mixture was conjointly used for casting of concrete cubes victimization similar combine proportion as just in case of unwashed recycled coarse aggregates considering it as final combine. The casted cubes are indexed as C1, C2, C3 for normal concrete, whereas EC1, EC2, EC3, EC4, EC5, EC6 for Eco concrete.

6. CURING OF CUBES:

The minimum period to achieved maximum strength of the concrete is shown in table 3. Water submerged curing and Stream curing is done for eco concrete samples. Water Submerged Curing (WSC) method was adopted for conventional concrete cubes subsequently, "Water Submerged Curing" method was also adopted for one set of green concrete cubes. The another set of green concrete was cured by "Steam Curing(SC) method. After de-moulding, the cubes were placed in steam curing unit for 24 hours initially and then followed by water submerged curing.

Table 3 Strength attainment period for M25

S .No	Days	Strength
1	7 days	40-50%
2	14 days	60-75%
3	28 days	90-99%

5. TEST RESULTS:

The compressive strength results of conventional Concrete and green Concrete are mentioned below in Table-4 & Table-5 & Table-6 for a span of 3,7,28 days. The reults clearly shows that the average strength of Eco concrete is more when compared to

rest.

Table-4 Compressive strength results of conventional Concrete

S.no	Cube Samples	Strength of Normal concrete (Mpa)		
		3days	7days	28days
1	C1	9.5	15.3	24.6
2	C2	10.3	14.9	25.3
3	C3	10.6	15.2	24.9
Avg Strength		10.13	15.13	24.93

Table-5 Compressive strength results of Eco Concrete(water submerged Curing)

S.no	Cube Samples	Eco Concrete (Mpa)		
		3days	7days	28days
1	EC1	4.97	8.46	13.43
2	EC2	4.37	8.23	12.88
3	EC3	4.56	8.53	13.1
Average strength		4.63	8.4	13.13

Table-6 Compressive strength results of Eco Concrete *(steam curing)*

S.no	Cube Samples	Eco Concrete (Mpa)		
		3days	7days	28days
1	EC4	15.8	22.5	27.5
2	EC5	15.6	22.8	27.6
3	EC6	15.4	22.5	27.5
Average strength		15.6	22.6	27.53

Figure1 Analysis of compressive strength test results

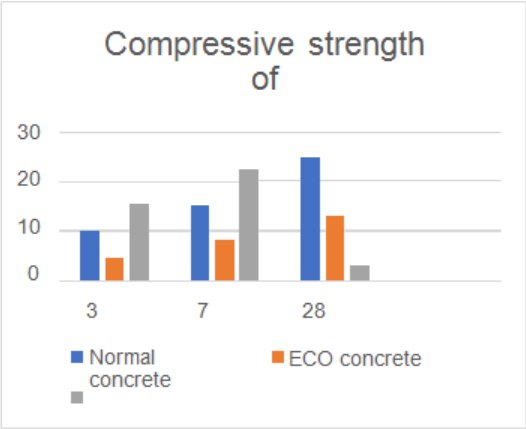

Figure 1 illustrates the compressive strength of normal and eco concrete in water submerged curing condition and steam curing condition.

6. CONCLUSION:

Under the stream curing 10% of the strength gained by the green concrete. Compressive strength is also less in under water submerged curing. Despite many limitations combined with the need of lowering the greenhouse gas emissions, has stimulated many number of researchers across the world to make the eco- concrete more durable and make it up to the mark like conventional concrete. Partial replacement of ingredients by the waste components and admixtures shows better compressive and tensile strength, ascending sulphate resistance etc. The above facts clearly state a broad and promising scope

& future for Eco-concrete in the upcoming era.

7. REFERENCES

1. D.B. Desai, A.K. Gupta And Pradeep Kumar,(2013) "Green Concrete: Need Of Environment", International Journal Of Advanced Science, Engineering And Technology, ISSN 2319-5924, Vol 2, Issue 2, pp. 134- 137.

2. M.S. Kakamare, V.V. Nair, (February 2015) "Sustainable Construction Materials and Technology: Green Concrete", International Journal of Advanced Technology In Engineering And Science. Volume No.03, Special Issue No. 02, ISSN: 2348 – 7550, Pp. 310-314.

3. M. Shahul Hameed And S. S. Sekar, (June 2009) "Properties Of Green Concrete Containing Quarry Rock Dust And Marble Sludge Powder As Fine Aggregate", ARPN Journal Of Engineering And Applied Sciences , ISSN 1819-6608 Vol. 4, No. 4, pp.
83-89.

4. Prof. Chetna. M. Vyas, Prof. (Dr.) Darshana R Bhatt, (July 2013) "Concept Of Green Concrete Using Construction Demolished Waste As Recycled Coarse Aggregate", International Journal Of Engineering Trends And Technology (IJETT) – ISSN: 2231-5381, Volume 4, Issue 7, pp. 3160-3165.

5. Chirag Garg and Aakash Jain, (Feb 2014) "Green Concrete: Efficient & Eco-FriendlyConstruction Materials", Impact: International Journal of Research In Engineering & Technology (Impact: IJRET), ISSN: 2321-8843, Vol. 2, Issue 2, pp. 259-264.

6. U.R.Kawade, P.A.Salunkhe, S.D.Kurhade, (April 2014) "Fly Ash Based Geopolymer Concrete", International Journal of Innovative Research In Science, Engineering And Technology, Volume 3, Special Issue 4, pp. 135-138.

7. Shivaji S. Bidwe and Ajay A. Hamane, "Effect of different molarities of sodium hydroxide solution on the strength of geopolymer concrete", American journal of engineering research, e- ISSN : 2320-0847, Volume 4, Issue 3, pp-139-145..

8. Swapnil Wanjari and Jerril Sebastian, (March 21, 2015) "Partial replacement of cement in geopolymer quarry rock dust concrete under different curing conditions", Proceedings of international conference on transportation and civil engineering, ISBN: 978-93-84468-
19-4, pp 12-1