

EXPERIMENTAL INVESTIGATION OF FOAM CONCRETE USING MICRO FINE M-SAND

D.Pradeep Kumar¹,Gowthami.C²,Hariprasath.T³, Kalai Kumar.S⁴, Vasanth Karanan.T⁵

¹Asst.professor, ^{2,3,4,5}UG Student, Department of Civil Engineering,

Sri Eshwar College Of Engineering, Coimbatore

¹*pradeep.d@sece.ac.in*, ²*gowthamichinnayan@gmail.com*

Abstract:Foam concrete is an aired, light weight concrete in which coarse aggregate is replaced with foam. The foam is generated by using a protein based natural surfactant, soap nut. Fine aggregate is replaced by micro fine M-sand (particle size less than 75 microns). Cement aggregate ratio varies from 1:2 to 1:3. Water-cement ratio is fixed as 0.5. Foam is used in the proportions, 50%, 60% of water. The density of concrete will be within the range of 300 to 1850 kg/m³. Hardened concrete test is performed and results were discussed.

Keywords: Foam concrete, Micro fine M-sand, Light weight,Natural surfactant.

1. Introduction

The preparation of concrete, mainly its ingredients such as cements and aggregates; meets various sustainability issues that need to be met up. The production of concrete has continually resulted in huge exploitation of natural resources. Moreover, continuous extraction of coarse aggregate by quarrying rock over the decade, resulted in deforestation which ultimately leads to famine, landslide and global warming. So, coarse aggregate is replaced with foam, which not only prevents the usage of coarse aggregate but also makes the concrete lighter and so the self-weight of the concrete is reduced. Foam concrete has Load carrying capacity by weight ratio greater than that of steel and other materials.

2. Materials Used

The materials used in the foam concrete are as follows

- 1.Cement
2. Micro fine M-sand
3. Foam

2.1 Cement

Portland pozzolona cement (PPC) is used in this project. The cement has a consistency of 32% with 28 minutes as the initial setting time and 596 minutes as the final setting time. The fineness as tested by using sieving method (as per IS 4031 Part 1:1996) has fineness modulus of 2.41, while the specific gravity is 3.05.

2.2 Micro fine M-sand

Micro fine manufactured sand is used as the fine aggregate. It is used instead of river sand for concrete construction. Hard granite is crushed to produce Manufactured Sand. These sand is in

cubical shape with rounded edge, washed and used as construction material. The size of micro fine manufactured sand is smaller than 75microns which is sieved using the 75micron sieve.

Table 1 Result for material test

S.No	Description	Micro fine M-Sand
1	Specific gravity	2.63
2	Water absorption	1.25%
3	Bulk density	1750 Kg/m ³

2.3 Foam

Foam is generated using soap nut which is a protein based natural surfactant which is blended with water, heated and a solution is prepared. Then the solution is mixed using a generator to obtain foam solution.

3. Mix Proportions

The various mix proportions are calculated based on the trial and error method are tabulated below.

Table 2 Mix Ratio

Mix	Cement (Kg/m ³)	Sand (Kg/m ³)	Water (Kg/m ³)	Foam (litres)
Trial 1	390	780	195	97.5
Trial 2	370	740	185	92.5
Trial 3	350	700	175	87.5
Trial 4	390	1170	195	117
Trial 5	370	1110	185	111
Trial 6	350	1050	175	105

4. Test On Hardened Concrete

4.1 Compressive Strength Test

Compressive strength test was carried out on 150mm length, 150mm width, 150mm depth cube specimen as mentioned in IS 516 – 1959(1989). The

results of the test of various mix proportioned foam concrete at seven days and twenty-eight days is tabulated.

Table 3 Compressive Strength

Mix	7 days Strength (N/mm ²)	28 days Strength (N/mm ²)
Conventional	25.62	38.95
Trial 1	13.97	40.19
Trial 2	12.64	35.34
Trial 3	10.78	37.25
Trial 4	14.33	40.65
Trial 5	13.15	35.97
Trial 6	10.80	39.52

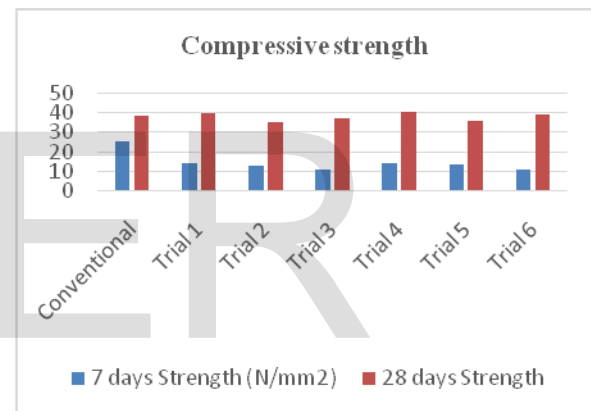


Fig. 1 Graph of Compressive strength for various trials

4.2 Split Tensile Strength Test

The split tensile strength test is carried out on cylindrical specimen of 150mm diameter and 300mm height. The results of the split tensile strength of foam concrete at seven days and twenty-eight days are tabulated.

Table 4 Split Tensile Strength

Mix	7 days Strength (N/mm ²)	28 days Strength (N/mm ²)
Conventional	1.37	3.36
Trial 1	1.76	3.29

Trial 2	1.46	3.15
Trial 3	1.17	3.49
Trial 4	1.92	3.34
Trial 5	1.58	3.41
Trial 6	1.12	3.56

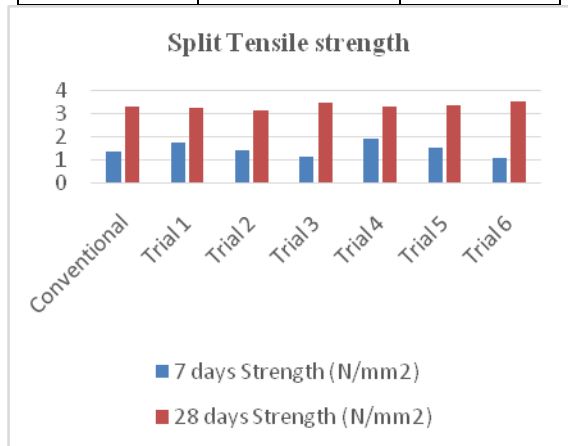


Fig. 2 Graph of Split tensile strength for various trials

4.3 Flexural Strength Test

The flexural strength test is carried out on prisms of cross section 700mm length, 150mm width, 150mm depth. The results of flexural strength of foam concrete at seven days and twenty-eight days are tabulated.

Table 5 Flexural Strength

Mix	7 days Strength (N/mm²)	28 days Strength (N/mm²)
Conventional	3.46	4.35
Trial 1	3.25	4.43
Trial 2	2.19	4.41
Trial 3	2.59	4.42
Trial 4	3.31	4.49
Trial 5	3.04	4.42
Trial 6	3.72	4.39

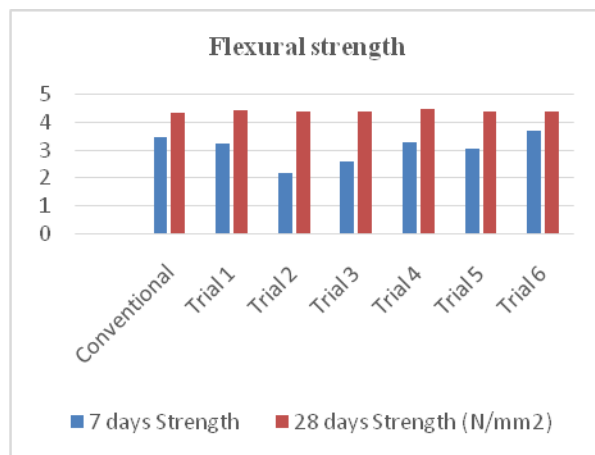


Fig. 3 Graph of Flexural strength for various trials

5. Conclusion

- Use of micro fine M sand as fine aggregate has increased the strength of concrete.
- The thermal insulation of concrete increases as the curing period increases.
- Due to the occurrence of voids, the weight of the concrete is less and hence it can be used for high rise buildings.
- As there is no coarse aggregate, workability is high and self-compacting.
- When compared with all trials, trial4 has the maximum strength.
- The maximum density of the concrete is 940 Kg/m³.

6. Reference

1. K Jagdeesh and Furqan Ahmed "Foam Concrete" International Journal of Civil Engineering Research. ISSN 2278-3652 Volume 8, Number 1 (2017), pp. 1-14.
2. Aswathy .M "Experimental Study On Light Weight Foamed Concrete" International Journal of Civil Engineering and Technology (IJCIET) Volume 8, Issue 8, August 2017, pp. 1404-1412, Article ID: IJCIET_08_08_154 .

3.D.Kavitha , K.V.N Mallikarjunrao “Design and Analysis of Foam Concrete”International Journal of Engineering Trends and Applications (IJETA), Volume 5 Issue 3, May- June 2018.

4. Praveen kumar. K, Radhakrishna “Effect of Micro fines on characteristics of Manufactured sand”International Research Journal of Engineering and Technology (IRJET), Volume: 03 Issue: 08 | Aug-2016

5. IS 516-1959, Methods of tests for strength of concrete.

6. IS 10262-2009, Guidelines for Concrete mix

design proportioning.

7. IS 5816-1970, Method of test for splitting tensile strength of concrete cylinders.

8. J.M. Illston, “construction Materials their nature and behaviour”.

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