Study On Strength And Durability Properties Of Concrete By Partial Replacement Of Cement With Sea Shell Ash Powder And Fine Aggregates With Brick Powder

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Abstract : The use of sea shell ash powder in concrete as fractional substitution of concrete is picking up significance today, essentially by virtue of the improvement in the drawn out strength of cement joined with environmental advantages. Sea shell, which is residue from marine waste, when used as replacement of cement in concrete results in reduction of cement consumption besides enhancing strength and durability property. The decrease in the wellsprings of normal sand and the prerequisite for decrease in the expense of solid creation has brought about the expanded need to distinguish substitute material to sand as fine totals in the creation of cement. Brick Powder is a side-effect acquired during squashing of fire consumed bricks. This current work is an endeavor to utilize brick powder as fractional substitution of fine aggregates. We are going to measure and compare with 0%,2%,4%,6%& 8% of cement replacing with sea shell ash powder. The design mix used to execute this project is M25 grade of concrete. Investigations were completed on concrete at 7 days and 28 days to study the strength properties of concrete. With an optimum percentage of sea shell ash powder, mix is made with 5%, 10%, 15%, 20%& 25% of fine aggregates replacing with brick powder. Experiments were made at 7 days and 28 days to study strength properties and at28 days to study durability properties. Finally, from the experimental study we can conclude that 6% of fly ash and 15% of quarry dust are taken as optimum proportions.

Keywords —Sea shell ash powder, Brick powder, Compressive strength, Split tensile strength, Durability test

I. INTRODUCTION

From the previous barely any years India has taken a significant activity on building up the foundations, for example, express roadways, power ventures and mechanical structures and so on., to meet the necessities of globalization, in the development of structures and different structures solid assumes the legitimate job and a huge amount of cement is being used. Numerous development enterprises of creating nations are in worry to recognize elective materials to substitute the interest for normal sand. Then again, the upsides of use of by items or totals acquired as waste materials are articulated in the parts of decrease in natural burden and waste administration cost, decrease of creation cost just as increasing the nature of cement. Concrete is the most famous structure material on the planet. Nonetheless, the creation of concrete has reduced the limestone holds on the planet and requires an extraordinary utilization of vitality. Waterway sand has been the most well known decision for the fine total segment of cement previously, yet abuse of the material has prompted natural concerns, the draining of securable stream sand stores and an accompanying cost increment in the material. Hence, it is alluring to acquire modest, ecologically amicable substitutes for concrete and waterway sand that are ideally by items.

II. AIM OF THE PROJECT

The Main aim of the project is to study the strength properties and durability properties of concrete mix of M25 grade on partial replacement of cement with sea shell ash powder by 0%, 2%, 4%, 6%& 8% and fine aggregates with brick powder by 5%, 10%, 15%, 20%& 25%.

III. PROPERTIES OF MATERIALS USED

1. **Cement** - Ordinary Portland concrete of 53grade evaluation adjusting to both the necessities of IS: 12269 and ASTM C 642-82 sort I was utilized.

 DOI : 10.35291/2454-9150.2020.0591

S.No	Property	Result
1	Normal Consistency	31%
2	Initial setting time	≮30min
3	Final setting time	≯10hrs
4	Specific gravity	3.18

2. Sea Shell Ash Powder

Specific gravity of sea shell ash powder is 2.51

3. Fine Aggreagate

S.No	Property	Result
1	Specific gravity	2.58
2	Water Absorption	0.5

4. Brick Powder

Specific gravity of Brick Powder is 2.40

5. Coarse Aggregate

S.No	Property	Result
1	Specific gravity	2.74
2	Water Absorption	1

IV. CONCRETE MIX PROPORTION

The grade of concrete used for this study is M25 with water-cement ratio of 0.44

Mix proportion of concrete is

Cement : F.A : C.A = 1 : 1.79 : 2.29

Concrete blend M1, M2, M3, M4, M5 is prepared by 0%, 2%, 4%, 6%& 8% halfway supplanting of concrete with sea shell ash powder. with an optimum mix, again fine aggregates are replaced with brick powder with proportionate of 5%, 10%, 15%, 20%& 25% and designate as M4N1, M4N2, M4N3, M4N4 & M4N5 respectively. Then these mix specimens are tried to consider strength and durability properties

V. RESULTS AND DISCUSSIONS

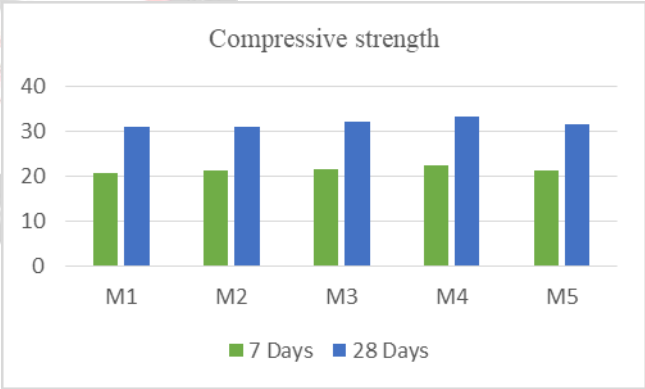
The study is carried out to find out the compressive strength and split tensile strength

1. Compressive strength

Fig.No-1: Compressive Strength

Table.No-1: Compressive Strength of cube specimens at 7 days & 28 days when cement is partially supplanted with sea shell ash powder in normal Curing:

S.No	M1	M2	M3	M4	M5
7 Days Compressive Strength N/mm²	20.81	21.22	21.60	22.48	21.17
28 Days Compressive Strength N/mm²	30.97	31.12	32.06	33.44	31.66



Graph.No-1

From the above compressive strength results we can conclude that the Optimum strength is obtained at 6% replacement of cement with Sea shell ash powder.

Table.No-2: Compressive Strength at 7 days & 28 days with optimum (6%) sea shell ash powder and Brick powder as partial supplement of fine aggregate in normal Curing:

S.NO	M4	M4N 1	M4N 2	M4N3	M4N4	M4N 5
7 Days Compressive Strength	22.48	23.06	23.98	24.18	22.97	22.58

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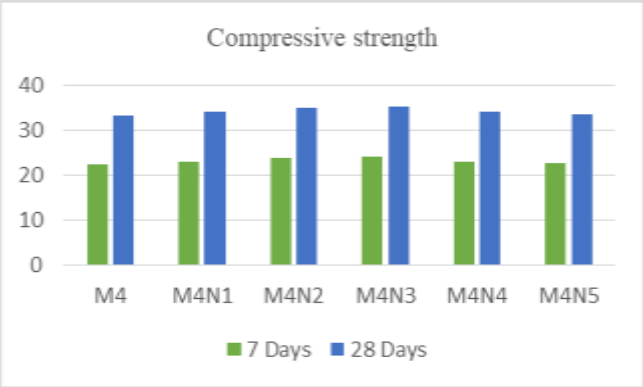
N/mm²						
28 Days Compressive Strength N/mm²	33.44	34.12	34.96	35.23	34.12	33.65



Graph.No-2

From the above compressive strength results we can conclude that the Optimum strength is obtained at 15% replacement of Fine aggregates with Brick powder.

2. Split Tensile strength

Fig.No-2: Split Tensile Strength

Table.No-3: Split Tensile Strength of cube specimens at 7 days & 28 days when cement is partially replaced with sea shell ash powder in normal Curing:

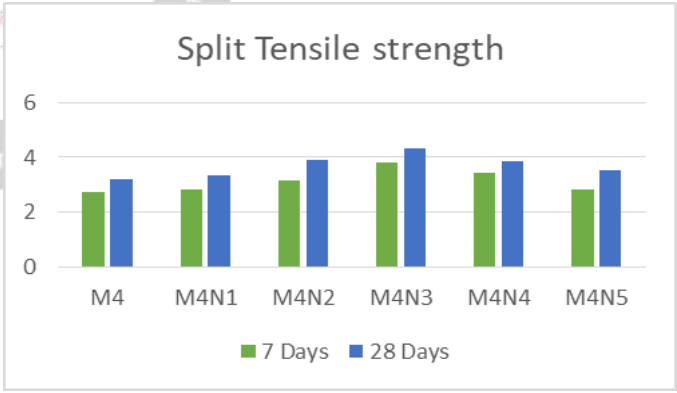
S.NO	M1	M2	M3	M4	M5
7 Days Split Tensile Strength N/mm²	2.26	2.56	2.61	2.72	2.38
28 Days Split Tensile Strength N/mm²	2.74	2.99	3.11	3.19	2.73

Graph.No-3

From the above Split Tensile strength results we can conclude that the Optimum strength is obtained at 6% replacement of cement with Sea shell ash powder.

Table.No-4: Split Tensile Strength at 7 days & 28 days with optimum (6%) sea shell ash powder and Brick powder as partial supplement of fine aggregate in normal Curing:

S.No	M4	M4N1	M4N2	M4N3	M4N4	M4N5
7 Days Split Tensile Strength N/mm²	2.72	2.83	3.17	3.81	3.42	2.85
28 Days Split Tensile Strength N/mm²	3.19	3.34	3.91	4.32	3.85	3.52



Graph.No-4

From the above split tensile strength results we can conclude that the Optimum strength is obtained at 15% replacement of Fine aggregates with Brick powder.

3. Duradility

28 Days Compressive Strength N/mm²	M4	M4N1	M4N2	M4N3	M4N4	M4N5

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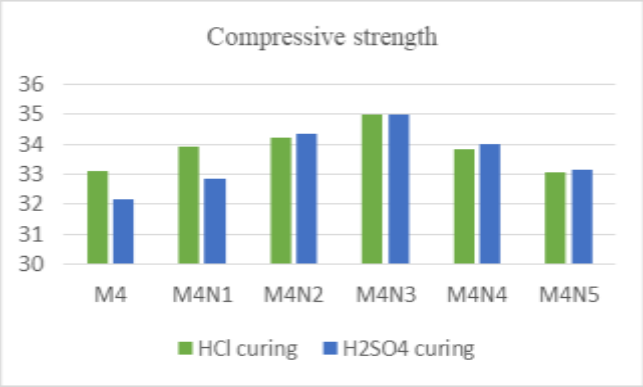
HCl curing	33.12	33.91	34.23	34.98	33.85	33.06
H_2SO_4 curing	32.17	32.85	34.35	35.01	34.02	33.14

Table.No-5: Compressive Strength of supplemented concrete when subjected to HCl and H_2SO4 curing



Graph.No-5

VI. CONCLUSIONS

1. It has been seen that the 7 days compressive strength for 6% partial substitution of sea shell ash powder is expanded by 8.02% contrasted with ordinary blend.
2. It has been seen that the 7 days split tensile strength for 6% partial substitution of sea shell ash powder is expanded by 20.35% contrasted with ordinary blend.
3. It has been seen that the 28 days compressive strength for 6% partial substitution of sea shell ash powder is expanded by 7.97% contrasted with ordinary blend.
4. It has been seen that the 28 days split tensile strength for 6% partial substitution of sea shell ash powder is expanded by 16.42% contrasted with ordinary blend.
5. It has been seen that the 7 days compressive strength for 15% partial substitution of Brick powder is expanded by 16.19% contrasted with ordinary blend.
6. It has been seen that the 7 days split tensile strength for 15% partial substitution of Brick powder is expanded by 40.07% contrasted with ordinary blend.
7. It has been seen that the 28 days compressive strength for 15% partial substitution of Brick powder is expanded by 13.75% contrasted with ordinary blend.
8. It has been seen that the 28 days split tensile strength for 15% partial substitution of Brick powder is expanded by 57.66% contrasted with ordinary blend.
9. It has been seen that the 28 days compressive strength when exposed to HCl relieving for 15% partial substitution of brick powder is expanded by 12.96% contrasted with ordinary blend.
10. It has been seen that the 28 days compressive strength when exposed to H_2SO_4 relieving for 15% partial substitution of brick powder is expanded by 13.04% contrasted with ordinary blend.

REFERENCES

[1] Monita Olivia, AnnisaArifanditaMifshella, LitaDarmayanti (SCESCM 2016) : Mechanical properties of seashell concrete

[2] Bee PohOngl, Umar Kassim (Journal of Advanced Research in Applied Mechanics 55, Issue 1 (2019) 12-21): Performance of Incorporating of Calm Shell as Partial Replacement of Ordinary Portland Cement (OPC)

[3] F.A.Olutoge, S.E.Nwabueze, S.O.A.Olawale, B.E.Yabefa (ISSN 2347-6435(Online) Volume 5, Issue 9, September 2016): Performance of Clam Shell Ash as a Substitute for Cement in Concrete.

[4] Wan Ahmad Soffian Bin Wan Mohammad, Nor Hazurina Othman, Mohd Haziman Wan Ibrahim, Masazurah A Rahim, Shahiron Shahidanand RahaAbd Rahman(IOP Conf. Series: Materials Science and Engineering 271 (2017) 012059) : A review on seashells ash as partial cement replacement

[5] A.Siva, Thamilselvi P, A. Nisha Devi and B.Ashvini (Volume-6, Issue-2, 2017, pp-01-04) : Experimental Investigation on Partial Replacement of Fine Aggregate Using Crushed Spent Fire Bricks

[6] R.Veerakumar, R.Saravanakumar (Volume 9, Issue 3, March 2018, Article ID: IJCIET_09_03_103) : A Detailed Study on Partial Replacement of Fine Aggregate With Brick Debris

[7] Dr.K.Chandramouli, A.Medha Sri Mrunalini (*Volume 4, Issue 3*, ISSN: 2454-132X) : Experimental study on fresh and hardened properties of concrete by incorporating fly ash, metakaolin and brick powder by partial replacement of cement for M40 grade concrete

[8] M.Usha Rani, J.Martina Jenifer (Volume 2 | Issue 08 | February 2016) : An Experimental Study on Partial Replacement of Sand With Crushed Brick in Concrete

 DOI : 10.35291/2454-9150.2020.0591