International Journal of Advance Research in Engineering, Science & Technology(IJAREST),
ISSN(O):2393-9877, ISSN(P): 2394-2444,
Volume No 2 ,Issue No 6 , June 2015, Impact Factor: 2.125

Characteristic Properties of Ternary Blend Concrete

Umesh P. Patil[1], Vipin N. S[2], Samarth P[3], Prakash S[4], Ujjwal[5]

[1] Associate Professor,Department of Civil Engineering, KLE MSSCET Belagavi, umeshpp22@gmail.com

[2] Final year student,Department of Civil Engineering, KLE MSSCET Belagavi, vipinnsugandhi@gmail.com

[3] Final year student,Department of Civil Engineering, KLE MSSCET Belagavi, samarthp111@gmail.com

[4] Final year student,Department of Civil Engineering, KLE MSSCET Belagavi, prakash.sulikeri@gmail.com

[5] Final year student,Department of Civil Engineering, KLE MSSCET Belagavi,

ABSTRACT

The use of supplementary cementitious materials (SCM) is the basic requirement in production of economic concrete with high strength. The use of mineral admixtures or pozzolans such as silica fume (SF) and rice husk ash (RHA) in production of concrete not only reduces the impact on environment due to its mass disposal from various industries, but also acts as replacement of cement material in production of concrete which considerably reduces the present demand on manufacture of cement. The main objective of this experimental work was to study the properties of concrete using different admixtures by adopting total of 25%-30% replacement of cement material. Combinations of various mineral admixtures with varying percentage and use of chemical admixture to reduce water content was adopted. The above experimental work was done on M 30 concrete. Casting of 60 numbers of specimens was undertaken for testing compressive strength and split tensile strength. From the results of present experimental works, concrete containing 15% Rice husk ash and 12% Silica fume by partial replacement of cement yielded higher compression and split tensile strength.

Keywords- *Silica Fume, Rice Husk Ash, Conplast (super plasticizer), Compressive Strength, Split Tensile Strength*

I. INTRODUCTION

Concrete is most widely used man made material in the world. There are many types of concrete available, created by varying the proportions of the main ingredients below. In this way or by substitution for the cementitious and aggregate phases, the finished product can be tailored to its application with varying strength, density, or chemical and thermal resistance properties. The use of supplementary cementitious materials (SCM) is fundamental in developing low cost construction materials for use in developing countries. By addition of some pozzolanic materials, the various properties of concrete viz. workability, durability, strength, resistance to cracks and permeability can be improved. Many modern concrete mixes are modified with addition of admixtures, which improve the microstructure as well as decrease the calcium hydroxide concentration by consuming it through pozzolanic reaction. The subsequent modification of the microstructure improves the mechanical properties, durability and increases the service-life properties. In this work an attempt is made to determine the characteristic properties of concrete using pozzolanas or mineral admixtures like 'Rice husk ash' and Silica fume' replacement of cement content in varying combinations.

II. METHODOLOGY

In this work attempt was made to study the characteristic properties of ternary blend concrete using Silica Fume (S.F.) and Rice Husk Ash (R.H.A) with varying percentage 10% & 12% for S.F and 15% & 20% R.H.A. This work is carried for different Mix ID's viz. M_0, M_1, M_2, M_3, M_4.

M_0 – Reference Mx without Admixtures

M_1 – 10% S.F + 15% R.H.A
M_2- 10% S.F + 20% R.H.A
M_3- 12% S.F + 15% R.H.A
M_4 - 12% S.F + 20% R.H.A
For the above five Mix ID's Compressive and Split tensile Strength Tests were carried.

III. OBSERVATIONS AND DISCUSSIONS

The following are the results for compressive and spilt tensile strength of 60 numbers of specimens consisting varying combinations of the mineral admixtures like Silica fume and rice husk ash by partial replacement of cement content

3.1. Compressive Strength

Table.1: compressive strength in MPa

Mix ID	Compressive strength		Admixture	
	7days MPa	28days MPa	R.H.A (%)	S.F (%)
M_0	21.70	31.0	0	0
M_1	21.23	30.33	15	10
M_2	16.33	23.00	20	10
M_3	23.55	33.10	15	12
M_4	18.22	25.47	20	12

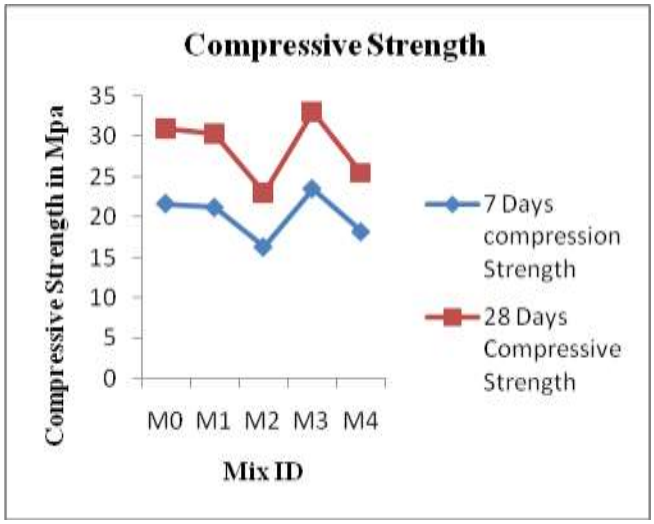

Chart.1: Compressive strength in MPa

Following observations were made with reference to compressive strength:

1. Compressive strength of Reference mix (M_0) after 28 days of normal curing is 31.00MPa.
2. Compressive strength of proposed mix (M_1) after 28 days of normal curing is 30.33MPa which is -2.16% lower than reference mix (M_0).
3. Compressive strength of proposed mix (M_2) after 28 days of normal curing is 23.00MPa which is -25.80% lower than reference mix (M_0).
4. Compressive strength of proposed mix (M_3) after 28 days of normal curing is 33.10MPa which is +6.77% higher than reference mix (M_0).
5. Compressive strength of proposed mix (M_4) after 28 days of normal curing is 25.47MPa

which is -17.83% lower than reference mix (M_0).

6. Thus peak compressive strength corresponds to Mix M_3

3.2 Tensile Strength

Table.2: Split tensile strength in MPa

Mix ID	Split tensile strength		Admixture	
	7days MPa	28days MPa	R.H.A (%)	S.F (%)
M_0	2.20	3.06	0	0
M_1	1.41	2.28	15	10
M_2	1.30	1.82	20	10
M_3	2.40	3.40	15	12
M_4	1.48	1.88	20	12

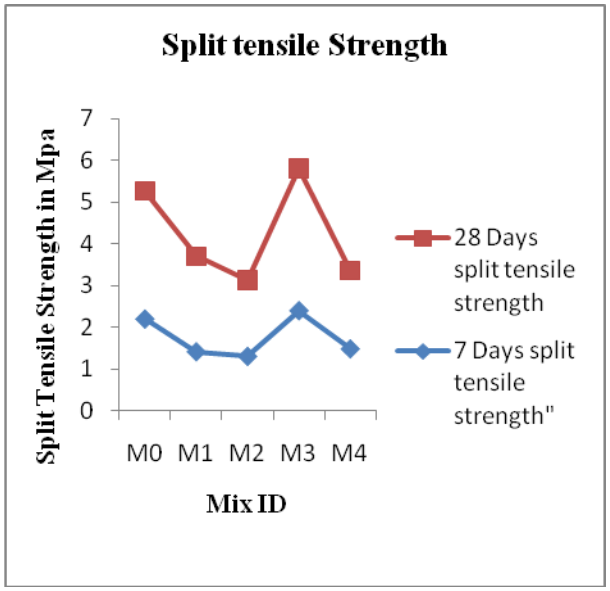

Chart.2: Split tensile strength in MPa

Following observations are made with reference to split tensile strength:

1. Tensile strength of reference mix (M_o) after 28 days of normal curing is 3.06 MPa.
2. Tensile strength of proposed mix (M_1) after 28 days of normal curing is 2.28 MPa which is -25.49% lower than reference mix. For this proposed mix, 15% Rice Husk Ash (RHA) and
3. Tensile strength of proposed mix (M_2) after 28 days of normal curing is 1.82 MPa which is -40.52% lower than reference mix. For this proposed mix 20% RHA and 10% SF admixtures
4. Tensile strength of proposed mix (M_3) after 28 days of normal curing is 3.40MPa which is +11.11% higher than reference mix (M_0). For this proposed mix 15% RHA and 12% SF admixtures are used.
5. Tensile strength of proposed mix (M_4) after 28 days of normal curing is 1.88 MPa which is -38.56% lower than reference mix ($M_{0)}$. For this

proposed mix 20% RHA and 12% SF admixtures are used.

6. Thus peak tensile strength corresponds to mix M3

IV. CONCLUSIONS

1. It is beneficial to use two admixtures from the point of strength and economy.
2. Increase in Rice husk ash beyond 15% is not beneficial from strength criteria.
3. Peak values of both compressive and tensile strength are obtained for the same mix M_3 which contains 15% Rice Husk Ash and 12% Silica Fume which means relatively low RHA and high SF.
4. Hence whenever Rice husk ash is used to make concrete greener and economical it is advisable to use one more admixture like Silica fume for strength enhancement.
5. It is difficult to achieve the desired target compressive strength by adding with 20% RHA in the concrete keeping other parameters constant.
6. By utilizing RHA and SF in sustainable proportions it is possible to produce Greener, Stronger and Economical concrete.

V. ACKNOWLEDGEMENT

The authors would like to thank Shri S C Metagud Chairman Governing council and Dr. Basavaraj G Katageri principal of Dr. M. S. Sheshgiri college of Engineering and Technology, Belgavi for their kind support and providing good infrastructure. The authors are grateful to Prof. (Smt) Bharti Chnivalar Head of Department for encouragement and support.

VI. REFERENCES

1. Akshatha K., Dr. K. B. Prakash - *"An Investigation on the Properties of High Volume Fly ash and Metakaolin Blends in Concrete "* International Journal Of Advance Research Vol 1, Issue8 (2013) pp (587-601).
2. M.U Dabai, C. Muhammad, B.U. Bagudo and A. Musa (2009) *"Studies on the Effect of Rice Husk Ash as Cement Admixtures"* Nigerian Journal of Basic and Applied Science ,Vol-17,Issue 2 ,(2009),pp (252-256).
3. *S. D. Nagrale, Dr. Hemant Hajare,* Pankaj R. *Modak "Utilization of Rice Husk Ash for Economical Concrete"*International Journal of Engineering Research and Application (IJERA) Vol 2,Issue-4,(July 2012),pp (001-005).
4. N. Bouzoubaâ and B. Fournier (1980) "*Optimization of Fly Ash Content in Concrete "* Cement and concrete composition ,Vol 12,No 4,(1990) pp (263-270)
5. Aiswarya S, Prince Arulraj G, Dilip C[13] (January 2013) " *A Review on Use of Metakaolin in Concrete"* IRACST-Engineering ,

Science and Technology International Journal (ESTIJ) Vol-31,No 3,(June 2013).

6. Santhakumar A.R. "Concrete Technology." Oxford University Press, New Delhi, 2007.
7. IS 10262: 2009 Concrete mix proportion guidelines.
8. IS 456 – 2000 "plain and reinforcement Concrete Code of practice", Indian standard Bureau, New Delhi, India.
9. IS 8112-1989, "Specification for 43 grade Portland pozollona cement (1st revision)", Indian standard Bureau, New Delhi, India.
10. IS 2386(part 3):1963, "Methods of testing for aggregate for Concrete: part 3 Specific gravity, voids, absorption and bulking", Indian Standards Bureau, New Delhi, India.
11. IS 383-1970, "Specification for Coarse and fine aggregate from natural sources for Concrete (2nd revision)", Indian standards bureau, New Delhi, India.
12. IS: 5816 – 1999:- Splitting Tensile Strength of Concrete method test.
13. IS: 516 – 1959:- Method of test for Strength of Concrete.
14. IS:9103-1979:-Concreteadmixture Specifications.