International Innovative Research Journal of Engineering and Technology
ISSN: 2456-1983 Vol: 2 No: 2 December 2016

Analysis on Crippled Sand as a Replacement for Natural Sand in High Performance Concrete

Beatrice Sylvia V.I
Anna University, Chennai, Tamil Nadu, India
rush2syl@yahoo.com

Abstract: The fundamental goal of this investigation is to look at the quality of High Performance Concrete utilizing Crushed Sand (Manufactured sand). The characteristic sand was supplanted by Crushed Sand in the extent of 0%, 20%, 40%, 60%, 80% and 100%. A progression of trials were led in M60 review HPC cement to think about the compressive quality, flexural quality, part malleable and modulus of flexibility. Water bond proportion is 0.32 and 10% of silica is likewise included. In view of the trial comes about the substitution by 60% Crushed Sand showed the most noteworthy compressive quality.

Keywords: High Performance Concrete, Crushed Sand, Natural Sand, Silica fume and strength.

1. INTRODUCTION

Concrete is a blend of bond, fine totals, coarse total and water with or without admixtures. Since the improvement in the development segment, there has been a fast exhaustion of common assets primarily stream sand [1]. The utilization of squashed stone fine total as substitute for common sand was contemplated and it was reasoned that there was noteworthy increment in quality and strength properties with pounded sand [2-4]. The pulverized stone waste as fine total in solid prompts increment in compressive quality, Modulus of burst and split elasticity. Be that as it may, the workability of cement diminished with higher level of stone clean as this can be expanded with the expansion of super plasticizer [5].

The use of silica exhaust in HPC has brought about expanded compressive and elastic qualities and furthermore the analysts inferred that the ideal substitution of silica rage in concrete in the scope of 5 to 15% [6-8]. The expansion of silica seethe in concrete enhances the strength properties, diminishes porousness and decreases dry shrinkage [9-12]. The Manufactured Sand as fine total in concrete marginally expands the compressive quality of cement [13-17]. A large portion of the exploration on Crushed Sand as incomplete substitution of waterway sand in solid, manages solid review up to M40. Be that as it may, restricted writings are accessible on HPC with higher review of cement. As a continuation of past examinations, this paper manages smashed sand as substitution of characteristic sand.

2. MATERIALS PROPERTIES

Conventional Portland bond of review 53, Elkem small scale silica 920 D, stream sand, squashed sand, coarse total and super plasticizer Glenium B233 were utilized as a part of this investigation. The particular gravity of concrete, silica smolder, stream sand, smashed sand, and coarse total superplasticizer is 3.13, 2.2, 2.68, 2.64, 2.7 and 1.09 individually. The underlying and last setting time of concrete was 35 minutes and 380 minutes. The fine total fitting in with evaluating of Zone III of IS 383[18]. Typical compact water, was utilized for blending the solid.

3. MIX DESIGN

ACI 211.4R-08 - Guide for choosing extents for high quality cement with portland bond and different cementations materials was utilized for blend outline and the blend was intended for M60 review concrete. The blend extent was 1:1.1:1.57, water concrete proportion was 0.32 and the measurement of super plasticizer was 2% by weight of water. 10 % of silica rage was additionally included for making High execution concrete. The control solid blend is named M1 and example name for pounded sand supplanted example was 20%, 40%, 60%, 80% and 100% were M-2,

International Innovative Research Journal of Engineering and Technology
ISSN: 2456-1983 Vol: 2 No: 2 December 2016

M-3, M-4, M-5 and M-6 separately. Weight clustering was embraced for estimating materials and blend machine was utilized for blending. The new cement was threw and was compacted utilizing table vibrator. Demoulding was done following 24 hours and cured the example in water until the required date of testing.

4. TEST PROGRAM

A pressure testing machine of limit 3000 kN was utilized for deciding the compressive load and split rigidity. The stacking rate of 140 kg/sq.cm/min was kept up for pressure test and split elastic test according to Seems to be: 516 [19]. The example measurements for pressure testing were 150 mm 3D squares. 150 mm width and 300 mm long example was utilized for part tractable test. For deciding flexural quality light emissions 100 mm X 100 mm X 500 mm were tried utilizing 1000 kN limit Flexure Testing Machine (FTM). Chambers of size 150mm width and 300mm long barrels were utilized to decide the youthful's modulus.

5. RESULTS AND DISCUSSIONS

5.1. Compressive Strength

The compressive quality trial comes about are organized in Table 1 and the graphical portrayal of exploratory outcomes are appeared in Figure 1. It is watched M4 example accomplished higher quality that is 60% of fine total supplanted with M sand. The quality improvement of M4 example is 11.54% than control example. The pressure test on solid shape example is appeared in Fig 2.

Table 1. Compressive strength of High Performance Concrete

Mix ID	Compressive strength in N/mm^2		
	3 days	7 days	28 days
M1	33	45	69
M2	33	48	70
M3	36	49	72
M4	37	48	78
M5	34	43	72
M6	29	40	68

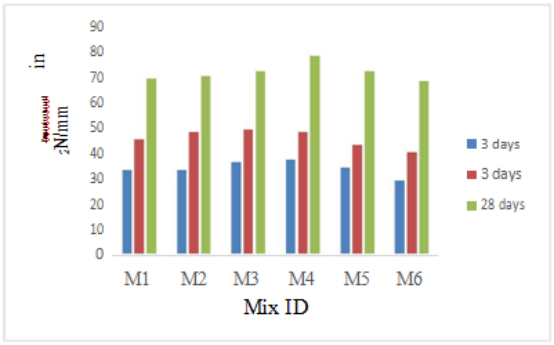

Figure 1. Compressive Strength of High Performance Concrete

Figure 2. Compression test Setup

The expansion in the compressive quality is because of the nearness of high fines in Crushed Sand fines builds the water request. Notwithstanding, the Crushed Sand fines add to an expansion in glue volume which is fortified by the joining of silica smoke and Super plasticizer. The above perceptions are upheld by crafted by different specialists who contemplated the impact of produced sand as fine total on the quality of cement [20, 21].

5.2. Split tensile strength

The 28 days split elasticity of different examples are given in Table 2. The graphical portrayal of rigidity of different examples are appeared in Figure 3. The elasticity esteems scope of 6.5 N/mm2 and 7.2 N/mm2 and furthermore it is seen that rigidity esteem is around 10 % of its compressive quality. The M4 example accomplished higher quality that is 60% of fine total supplanted with M sand. The quality upgrade of M4 example is 10.77% than control example. . The split elastic test on tube shaped example is appeared in Fig 4.

International Innovative Research Journal of Engineering and Technology
ISSN: 2456-1983 Vol: 2 No: 2 December 2016

Table 2. Split Tensile strength of High Strength Concrete

MIX ID	SPLIT TENSILE STRENGTH IN N/MM^2
	28 DAYS
M1	6.50
M2	6.55
M3	6.80
M4	7.20
M5	7.00
M6	6.40

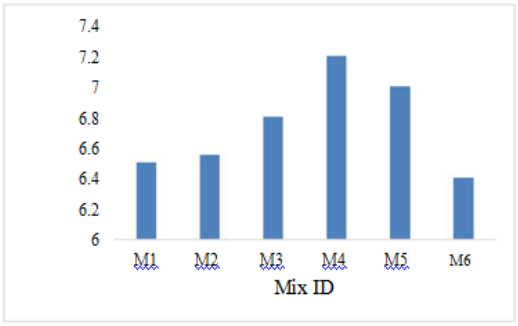

Figure 3. Split Tensile Strength of High Performance Concrete

Figure 4. Tensile strength test Setup

Table 3. Tensile strength of High Strength Concrete

Mix ID	Flexural strength in N/mm^2
	28 days
M1	7.2
M2	7.5
M3	8
M4	8.6
M5	7.4
M6	6.3

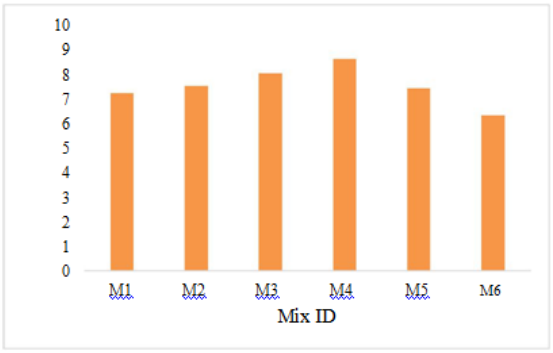

Figure 5. Flexural Strength of High Performance Concrete

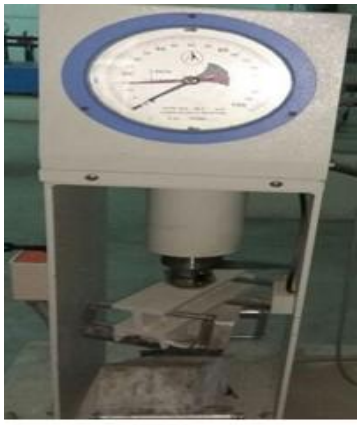

Figure 6. Flexural Strength Test Set up

5.3. Flexural strength

The flexure quality of cement at 28 years old days is organized in Table 3. The graphical portrayal of flexural quality of different examples are appeared in Figure 5. The rigidity esteems go between 6.3 N/mm2 and 8.6 N/mm2. The M4 example has accomplished higher quality. The quality upgrade of M4 example is 16.27% higher than control example.

5.4. Modulus of Elasticity

The graphical portrayal of Young modulus of different examples are appeared in Figure 7. The modulus of versatility esteems extend between 41 kN/mm2 and 45 kN/mm2

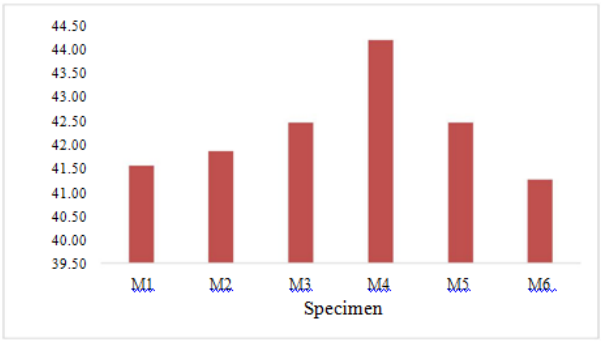

Figure 7. Modulus of Elasticity of High Performance Concrete

6. CONCLUSION

This examination manages High Performance Concrete with Crushed Sand utilized as substitute material to normal sand. The solid blend was intended to achieve the quality of 60 N/mm2. In pressure testing every one of the examples achieved more than 60N/mm2. Hence it is demonstrated that pounded sand can likewise be utilized as fine total of cement. In light of the test comes about it is apparent that the ideal level of smashed sand substitution is 60%.

REFERENCES

[1] Suresh,G., Ramasamy,V., Meenakshisundaram,V., Venkatachalapathy, R & Ponnusamy, V, A relationship between the natural radioactivity and mineralogical composition of Ponnaiyar river sediments, Indian Journal of Environmental Radioactivity, 102, 2011, 370– 377.

[2] Ahmed E. Ahmed, Properties of concrete incorporating Natural and Crushed Stone very fine Sand , ACI material Journal, 1989,86(4),417-424.

[3] Priyanka A and D.K.kulkarni, An Experimental Investigation on the properties of concrete containing Manufactured Sand, 3(2), 2012, 101-104.

[4] P.M.Shanmugavadivu and R.Malathy, Effects of chloride attack with the replacement of Natural sand by manufactured sand as fine aggregate", Journal of Structural engineering, 39(5), 2012, pp 564-573.

[5] B.Balapgol, S A Kulkarni and K M Bajoria Strength and Durability of concrete with crushed sand, proceedings of 27th conference on Our world in concrete & structures: 2002, 1-7.

[6] Bayasi, Z and Zhou, J., Properties of silica fume concrete and mortar, ACI Materials Journal, 90(4), 1993, 349-356.

[7] Duval. R and Kadir. E.H, Influence of silica fume on the workability and compressive strength of High Performance Concrete, Cement and Concrete Research, 28(4), 1998533-547.

[8] Hooton, R.D, Influence of silica fume replacement of cement on physical properties and resistance to sulphate attack, freezing and thawing and alkali –silica reactivity, ACI Materials Journal, 90(2), 1993,143-151.

[9] Mazloom, M., Ramezanianpour, A.A., and Brooks.J.J., Effect of silica fume on mechanical properties of High strength concrete, Cement and concrete Composites, 26, 2004, 347-357.

[10] Mohammad Iqbal Khan and RafatSiddique., Utilization of silica fume in concrete: Review of durability properties, Resources, Conservation and Recycling, 57, 2011, 30-35.

