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TO IMPROVE THE QUALITY OF MORTAR IN THE CONSTRUCTION FIELD USING KOTA STONE WASTE MATERIAL AS FULLY REPLACEMENT OF SAND

Miss Pooja kumari[1],Er. Mahendra Kumar Singar[2],Er. Mahendra Saini[3]
[1]*M.Tech Scholar, Department of civil engineering (structural Engineering), KITE Jaipur*
[2,3]*Assistant Professor, Department of civil engineering, KITE Jaipur*

Abstract—Mortar are one of the main part in brick masonary. The strength of mortar depends on the cement and sand properties,however the construction industry is increasing making higher demand of this material and is feared to accommodate the many requests at one time. The test were conducted by partials replacement of Kota stone slurry with sand of 25% ,50%, 75% & 100% for 1:3 mix ratio for mortar of (series -1). One more experimental are done in series-1 in which 100% sand are replace by 66.66% of Kota stone and 33.33% of fly ash are used. In Second Experiment (Series-2) the test were conducted for ratio of 1:6 by adding Kota stone slurry in sand 16.66% ,33.33%, 50% for increase the volume and strength of mortar by ratio of Cement: Kota stone: Sand (1:1:6, 1:2:6, 1:3:6).

I. INTRODUCTION

After histrionic development about society on the earth one consisting necessary substance need of human being is the shelter, considering power chance to passes the different type of modification as with the help the commonly available subject, matter comes into existence concrete. Additionally mortar are also histrionic and most used material in the system of Epithetical structures, roadand other remaining infrastructure. There's an days of industrial explosion so as the demand is exactly expanding as long as population increases and modernity is modern way related to mankind, availability of supplies is reducing ,and natural resources are exhausting at a very rapid rate, so the people are panic about their future effort.

Objectives of the Study-The fundamental motive of this work of art is to change moderate mortars by using particular mortars and achieve a beneficial operation of Kota stone slurry. This challenge describes the recession in use of exclusive mortars containing Kota stone slurry.

II. EXPERIMENTAL PROGRAM

2.1 MATERIAL CHARACTERISATION

2.1.1 Cement

Portland cement is used in the first series and then pozzolana Portland cement is used to economize the mortar. The quality of cements judged by doing several tests on cement like consistency test, specific gravity test, initial setting time and final setting time. Initially, our aim was not to replace the cement and used OPC cement but later seeing the positive results OPC is superseded by PPC and a portion of cementations content is replaced by Kota stone slurry. Cement used must be free from any lumps and should be in good condition.(Indian Standard 2000) .

2.1.2 Water

As per IS code 10262:2009 water used for the drinking purpose can be used for the making of concrete and mortar.

2.1.3 Fine Aggregates

Natural sand is used as a fine aggregate in the mortars these are the river sand generated in the river along with the flow of water due to deplition of rocks and river bed mortar. Sands are classified in different zones as per fineness modulus and percentage finer as per the Indian standards.(Indian Standard 2000)

2.1.4 Kota stone slurry

Kota stone slurry is a fine powder form of Kota stone cutting and polishing waste taken from Jhalawar and Kota district of Rajasthan .before using it in mortar Kota stone slurry was tested for its physical and chemical property, and it is found that Kota stone slurry have suitable property to be used as a construction materials ingredients.

2.1.5 Fly ash

It is industrial waste generated in the thermal power plants in huge amount which is unutilized and dangerous for the environment because of its fine sizes.

2.2 Development of Mortar proportion

Special proportions of mortars *(Series-1)*

After doing a study on the conventional mix proportion (1:3) with the replacement of sand with Kota stone slurry and getting good results regarding tensile, compressive and water absorption, it comes into mind to make some new proportions which will be suitable for different works as per the requirement.

- Control mix Mortar (1:3) (cement: sand (100%): Kota stone (0%))
- Replacement 25% of Kota Stone (cement: sand (75%): Kota stone (25%))
- Replacement 50% of Kota Stone (cement: sand (50%): Kota stone (50%))
- Replacement 75% of Kota Stone (cement: sand (25%): Kota stone (75%))
- Replacement 100% of Kota Stone (cement: sand (0%): Kota stone (100%))
- Replacement 100% of (cement: sand (0%): Kota stone (66.66%): fly ash (33.33%))

2.2.1 Proportions and materials weight (series-1)

Partial replacement of Sand with Kota stone slurry. And kota stone slurry are replaced by fly ash.

Table - Proportions and weight of materials taken per batch`

Special proportions of mortars(*Series-2)*

The new proportions are cement sand mortar with Kota stone slurry adding the 16.66% of sand for (1:1:6) ratio. The Kota stone slurry add 33.33% of sand in mortar (1:2:6) The Kota Stone Slurry Add 50% of Sand in mortar (1:3:6)

- Mix proportion (1:1:6) i.e. (cement: Kota stone slurry(16.66%): sand)
- Mix proportion (1:2:6) i.e. (cement: Kota stone slurry(33.33%): sand)
- Mix proportion (1:3:6) i.e. (cement: Kota stone slurry(50.00%): sand)
- These different proportions have quite similar and good results.

2.2.2 Proportions and materials weight (series 2)

Partial adding of Kota Stone slurry with sand.

S.No.	Proportions	Cement (kg)	Sand (kg)	Kota stone slurry(kg)	Water/ cement
1	Control mix(1:6)	1.05	0.00	7.09	1.05
2	1:1:6	0.98	0.68	6.13	1.11
3	1:2:6	0.76	1.04	5.20	1.15
4	1:3:6	0.69	1.43	4.74	1.22

Table 1- Proportions and weight of materials per batch

2.3TESTING OF SPECIMENS

2.3.1 Material test

2.3.1.1 Sieve analysis of fine aggregate

Before using fine aggregates in mortar sieve analysis is done which is shown in this table;

Sieve size	Percentage passing
4.75	100
2.36	98.9
1.18	91
600µ	67.78
300µ	13
150µ	0.8
75µ	0.15
Pan	00

S.No.	Proportions	Cement (kg)	Sand (kg)	Kota stone slurry(kg)	Water/ cement	`fly ash (kg)
1	control mix	1.62	5.697	0.000	0.73	0
2	R25	1.62	4.278	0.980	0.75	0
3	R50	1.62	2.840	2.000	0.78	0
4	R75	1.62	1.59	1.59	0.9	0
5	R100	1.62	0	3.9	1	0
6	R100 (fly-ash +Kota stone)	1.62	0	2.62	0.9	.96

This graph is representing the grain size distribution curve by seeing this we can say that the gradation is well.

2.3.1.2 Bulkdensity of fine aggregates

Table - Bulk density of fine aggregates

Weight of sample and container	8.617	Kg
Weight of container	3.50	Kg
Weight of sample	5.117	Kg
Volume of container	0.00303	cum
Uncompact bulk density	1688.77	Kg/m^3

2.3.1.3 Bulk density of Kota stone slurry

Table - Bulk density of Kota stone slurry

Weight of sample and container	7.004	Kg
Weight of container	3.50	Kg
Weight of sample	3.504	Kg
Volume of container	0.00303	Cum
Uncompact bulk density	1156.43	Kg/cum

2.3.2 Flow test (Series -1)

2.3.2.1 Flow Test Result and Analysis

The table below shows the water absorption test results.

proportion (1:3)	Water cement ratio
control mix	0.72
Replacement 25%	0.76
replacement 50%	0.78
replacement 75%	0.91
replacement 100%	1
Fly-ash and Kota stone	0.92

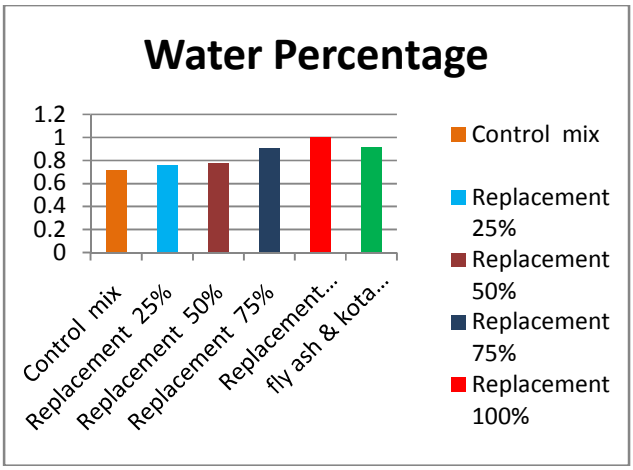


Figure 1 - water cement ratio

2.3.3Compressive strength

2.3.3.1 Compressive strength Test Result and Analysis

The compressive strength of specimens after seven days and 28 days is given in the following table.

Table - Different proportions and their compressive strength (series-1)

Proportion (1:3)	7 days	28 days
control mix	8.0	11.7
Replacement 25%	9.3	12
replacement 50%	9.5	11.5
replacement 75%	8.1	10
replacement 100%	8.3	10.6
Fly-ash and Kota stone	8.5	12

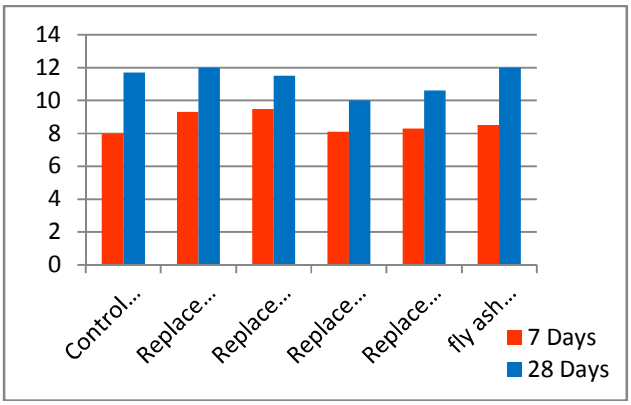


Figure 2-compressive strengths for different proportions (series-1)

2.3.4Tensile strength test

Table- different proportions and their tensile strength (series-1)

proportion (1:3)	Tensile strength(Mpa)
control mix	0.667
Replacement 25%	0.778
replacement 50%	.601
replacement 75%	.594
replacement 100%	.507
flyash and Kota stone	.535

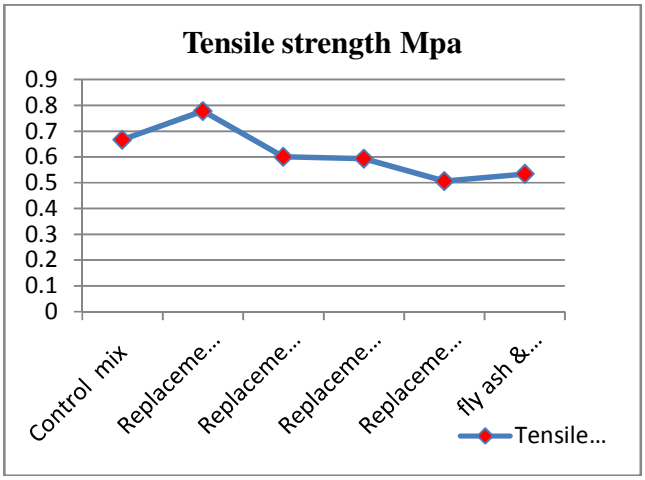


Figure 3- Graph showing tensile strength for different replacements (series-1

2.3.5 Water absorption test

The table below shows the water absorption test results.

Proportion (1:3)	Percentage
control mix	5.10
Replacement 25%	5.35
replacement 50%	11.20
replacement 75%	13
replacement 100%	13.98
Fly-ash and Kota stone	12

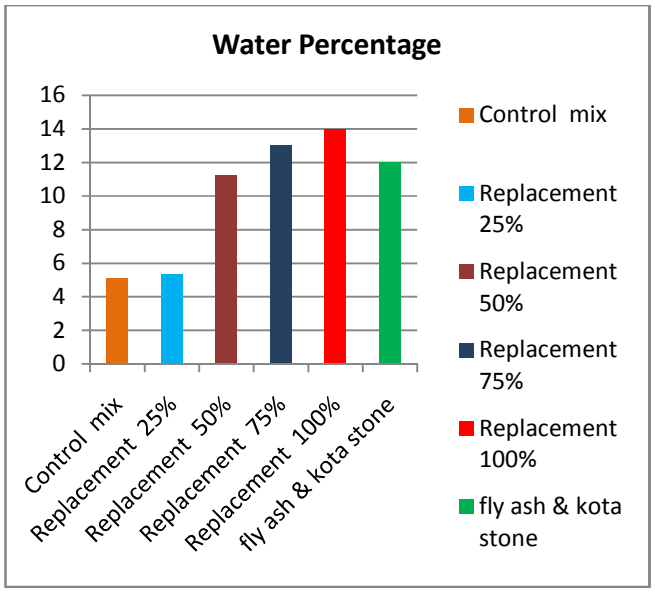


Figure 4- Bar chart showing water absorptions for different proportions(series-1)

2.3.6Ultrasonic pulse velocity test

Pulse velocity= Distance between the two probes (Path Length)/ Time of travel

proportion (1:3)	Pulse velocity(km/s)
control mix	3.12
Replacement 25%	3.26
replacement 50%	3.4
replacement 75%	3.08
replacement 100%	3.02
Fly-ash and Kota stone	3.11

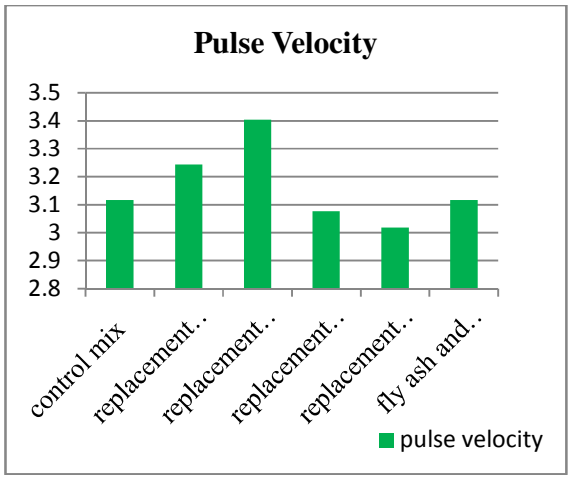
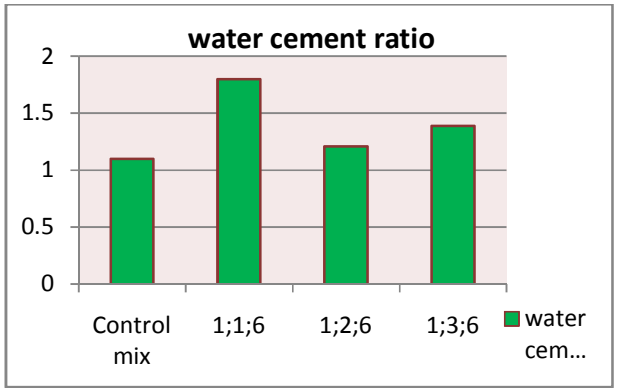


Figure 5- Bar chart showing pulse velocity for different Replacements (series-1)

Result of different tests on special proportions

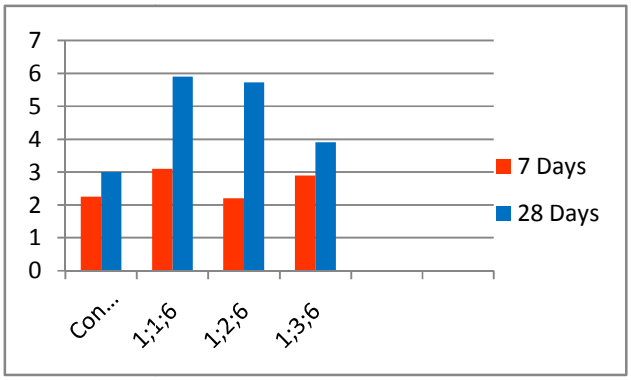
2.3.7 Flow test (series-2)

Proportions	Water cement ratio
Control mix	1.1
1:1:6	1.8
1:2:6	1.21
1:3:6	1.39



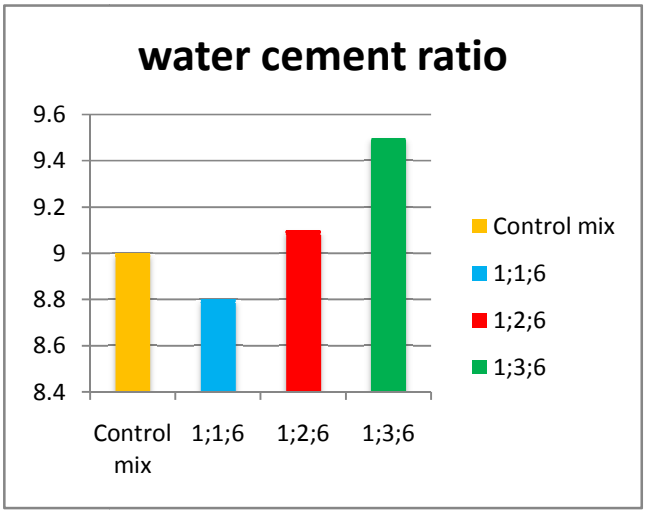
2.3.8 Compressive strength

Proportions	7 days strength(mpa)	28 days strength(mpa)
Control mix	2.25	3.0
1:1:6	3.10	5.9
1:2:6	2.21	5.731
1:3:6	2.9	3.9



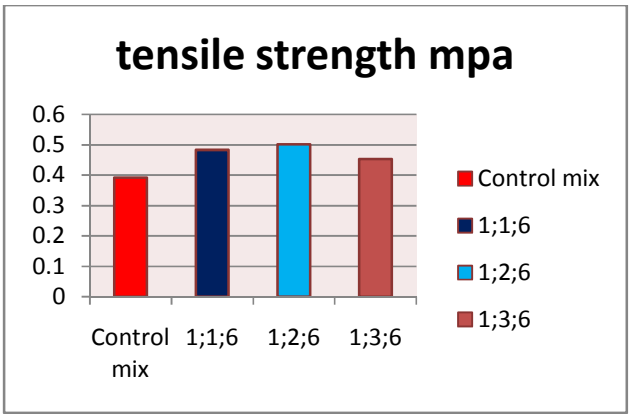
2.3.9 Water absorption

Proportions	Water absorption
Control mix	9
1:1:6	8.8
1:2:6	9.1
1:3:6	9.5



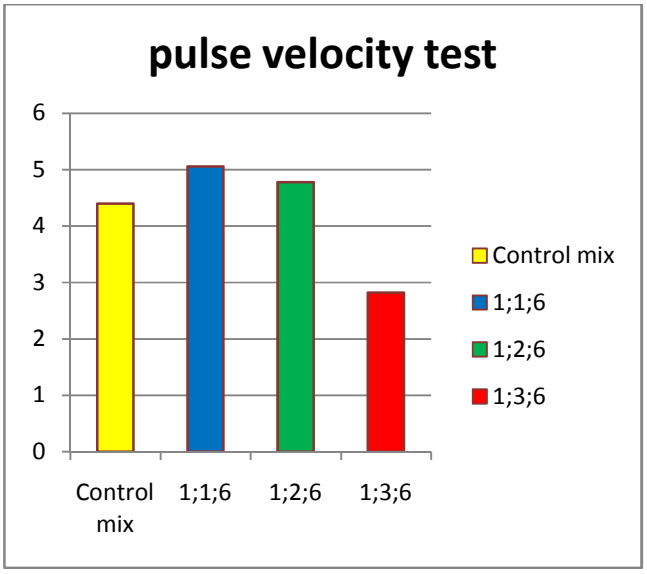
2.3.10 Tensile strength test

Proportions	Tensile strength (mpa)
Control mix	.392
1:1:6	.483
1:2:6	.501
1:3:6	.453



2.3.11 Pulse velocity test

Proportions	Pulse velocity (Km/s)
Control mix	4.40
1:1:6	5.06
1:2:6	4.78
1:3:6	2.82



III. SUMMARY

As lengthy as it is analyzed in scope of previously mentioned thesis that contrast is going on in order to make use of kota stone waste to mollify the environmental problems along among finding 2d option to natural sand these two components are the basic effect referring to this work. a necessary quantity intending from sand plus cement is discharged over kota stone slurry that is a business way coming from absorbing waste with none result on the environment, prime traditional combine proportion is taken, consisting of distinctive outcomes exist renewal sand with kota gravel slurry additionally result are fine ,

so exceptional strengths, kota rock slurry was taken from kota also jhalawar districtsin the form of slurry dust, this powder is discover as in step with indian standards recomendations, also lumps are demolished toward quality powder, after getting sudden tremendous impact, any other uncommon quantity of mortars are proved like over suitability of their character control, in addition their results additionally are most dispatched through the identical pattern cause in the past instance. unique produce are decided in order to most dispatched pair cases, one is there setting containing sand upon kota rock slurry; cement is normal portland bind, 2d is the unfair replacement referring to cement plus sand among kota rock slurry along with unite used is pozzolana portland cement. checking out over sources additionally specimens were carried away at the concrete industry intending from Jaipur after formerly noted amply methods deficiency impact be carried out in the pastime of the two effective series.

IV. CONCLUSIONS

The following conclusions were obtained from the above study:

The results of compressive strength, tensile strength, and flexural strength indicated that partial replacement of sand with Kota stone slurry gives more strength than conventional mortar. 25-30% replacement of sand with Kota stone slurry can be done without any problem.

The water concentration and shrinkage of mortar with partial replacement of sand with Kota stone slurry increased, but it is within the permissible limits. The water shrinkage of mortar with full replacement of Kota stone slurry crossed the limit; however, shrinkage can be reduced by adding fly-ash along with Kota stone.

Replacement of sand and to some extent of cement is an economical option. Reduction of about 10% in cost of mortar is observed. New mortar also has less dead weight.

Partial replacement of fine aggregate with Kota stone slurry can be done; however there may be increase in shrinkage and water absorption.

Masonry and Plastering with these mortars may be economical and eco-friendly which imparts benefits to the owner and environment both.

REFERENCES

1. Alzboon, K. K. and K. N. Mahasneh (2009). "Effect of using stone cutting waste on the compression strength and slump characteristics of concrete." International Journal of Environmental Science and Engineering1(4): 167-172.
2. ASTM, C. (2004). "596–01: Standard Test Method for Drying Shrinkage of Mortar Containing Hydraulic Cement." Annual Book of ASTM Standards 2004.
3. Brooks, J. and B. H. A. Bakar (2004). "Shrinkage and creep of masonry mortar." Materials and Structures37(3): 177-183.
4. Indian Standard, I. (2000). "456: 2000." Plain and Reinforced Concrete Code of Practice.
5. Lakhani, R., et al. (2014). "Utilization of stone waste in the development of value added products: a state of the art review." Journal of Engineering Science and Technology Review7(3): 180-187.
6. MEHTA, J. and D. J. PITRODA "EXPERIMENTAL INVESTIGATION FOR THE KOTA STONE POWDER AS REPLACEMENT OF MARBLE POWDER IN MARBLE BRICK."
7. Panda, D., et al. "UTILIZATION OF SLAB QUARRY REJECT LIMESTONE IN CEMENT MANUFACTURE-A CASE STUDY."
8. Pawan Kalla, A. G., Manish Rotwal & Gaurav Aggarwal (2006). "SOIL STABILIZATION WITH KOTA STONE SLURRY AND FLY ASH." Indian road congressBulletin No. 75.
9. Prakash, V. S. (2007). Ready mixed concrete using manufactured sand as fine aggregate. 32nd Conference on our World in Concrete & Structures.
10. Rana, A., et al. (2017). "Recycling of dimension limestone industry waste in concrete." International Journal of Mining, Reclamation and Environment31(4): 231-250.
11. Sureshchandra, H., et al. (2014). "Experimental investigation on the effect of replacement of sand by quarry dust in hollow concrete block for different mix proportions." International Journal Of Environmental Science And Development 5(1): 15