

Comparison of Bulking Effect of Marble Slurry with Fine Aggregate

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Abstract: Talking about ecofriendly construction, using local and pollutant materials with low cost building only one thing strikes that is marble slurry. It is available in lot and free of cost in marble producing areas. In sequence of different experiments bulking effect is also necessary for finding it's utility in cement works. Concrete mixed with marble slurry will be also favorable making more paste for more effectively filling the pores or cavity of water.

Key words: Marble slurry, cavity, bulking effect, fine aggregate and pollutant.

Introduction

Marble Slurry is fine particles generated during process of cutting, grinding and polishing process dissolved in water. This suspension of marble fines in water, generated during processing and polishing because water is used as a cooling agent to the cutting blades.

Marble waste an Environmental Hazard:-This is becoming a major threat to the Environment in the state of Rajasthan. In the mining and processing activities near about one thousand Gangsaws and thousands of cutters are creating 1.5-2.0 million tons of marble waste i.e. marble slurry. This Marble waste is indestructible waste and harmful to common man, Animals and also to the Vegetation creating aesthetic problems. Some bad effects of the marble slurry on Environment may be listed as under: -

1. The waste cannot be destroyed.
2. The sites which are dumping grounds are limited and distort the overall scene of the Area.
3. The top fertile soil becomes unfertile due to Marble Dust.
4. The marble slurry flows with rain water into the rivers and other water bodies polluting them.
5. Polluted water affecting irrigation and drinking water resources.
6. Pollution of air.

These all the factors may give a thunder shock to the growth of the marble industry. It is therefore a scientific and engineering responsibility of government and industry to solve the problem.

MATERIALS

Fine aggregate is a major ingredient for construction.

For starting construction work nobody can imagine any type of construction without fine aggregate or sand. Now a days fine aggregate costs are very high and also availability is

very less. So construction cost is also increasing. On the other hand Marble slurry is a by product of marble industry creating environmental pollution, available in lot. If marble slurry is proved having appropriate properties for construction work it will be a revolution. It will result in low cost construction and reduce the pollution nuisance created by marble slurry.

Method

Bulking of Marble Slurry is the same effect as bulking fine aggregate or sand. This property is also important to research because if like sand or fine aggregate if marble slurry is used to prepare sub base and if bulking is extreme than it can erode the flooring material.

Apparatus

Measuring Jar:- 1000 and 250 ML, Stirring Rod, Tray, Scoop, 4 ml syringe and weighing balance etc

Procedure

- kept in a furnace in a dish at a heat of 100° C - 110° C for 24.0 ± 0.50 time period.
- Cool down the waste in an air packed vessel Desiccators.
- Taken 400ml (V0) Sample of oven dried of the Marble slurry and poured into a pan.
- Add 1% (by Volume) 4ml of water and mixed well.
- Poured the specimen inside a 1000 ml determining tubular container and level by scale smoothly.
- Level the surface and read the volume in ml (V1).
- Take out the total amount of marble waste and carry on the test by adding 1% water more each time up to 5% and note the corresponding volume of slurry (V2, V3, V4 and V5) further 5% water each time (V10, V15, V20, V25 and V30 5%, 10%, 15%, 20%, 25% and 30%) until the damp marble slurry volume starts decreasing up to the sample become fully saturated.

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Table:- 4.15 Marble slurry Bulking (Test1)

S,No.	Volume of Oven Dried Marble Slurry	Moisture added in %	Volume of Moisture ml.	Volume of Marble slurry sample After Mixing Moisture V_i	Volume of Marble Slurry after Bulking V_B
1.	400ml.	0%	0.00ml	400ml.	400.0ml
2.	400ml.	1%	4.00ml	404ml	470.0ml
3.	400ml.	2%	8.00ml	408ml	510.0ml
4.	400ml.	3%	12.00ml	412ml	540.0ml
5.	400ml.	4%	16.00ml	416ml	560.0ml
6.	400ml.	5%	20.00ml	420ml.	570.0ml.
7.	400ml.	10%	40.00ml	440ml.	580.0ml.
8.	400ml.	15%	60.00ml	460ml.	590.0ml.
9.	400ml.	20%	80ml	480ml.	580ml.
10.	400ml.	25%	100ml.	500ml.	530ml.
11.	400ml.	30%	120ml.	520ml.	380ml.

Table:- 4.16 Marble slurry Bulking (Test2)

S,No.	Volume of Oven Dried Marble Slurry	Moisture added in %	Volume of Moisture ml.	Volume of Marble slurry sample After Mixing Moisture V_i	Volume of Marble Slurry after Bulking V_B
1.	400ml.	0%	0.00ml	400ml.	400.0ml
2.	400ml.	1%	4.00ml	404ml	460.0ml
3.	400ml.	2%	8.00ml	408ml	520.0ml
4.	400ml.	3%	12.00ml	412ml	540.0ml
5.	400ml.	4%	16.00ml	416ml	560.0ml
6.	400ml.	5%	20.00ml	420ml.	570.0ml.
7.	400ml.	10%	40.00ml	440ml.	570.0ml.
8.	400ml.	15%	60.00ml	460ml.	580.0ml.
9.	400ml.	20%	80ml	480ml.	550ml.
10.	400ml.	25%	100ml.	500ml.	520ml.
11.	400ml.	30%	120ml.	520ml.	400ml.

Table No-4.17 Marble slurry Bulking (Test1)

S,No.	Moisture added in %	Volume of Marble slurry sample After Mixing Moisture V_i	Volume of Marble Slurry after Bulking V_b	% Bulking of marble slurry $(V_B - V_i) \times 100 / V_i$
1	0%	400	400	0.00
2	1%	404	470	16.34
3	2%	408	510	25.00
4	3%	412	540	31.07
5	4%	416	560	34.62
6	5%	420	570	35.71
7	10%	440	580	31.82
8	15%	460	590	28.26
9	20%	480	580	20.83
10	25%	500	530	6.00
11	30%	520	520	0.00

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Table No-4.18 Marble slurry Bulking (Test2)

S.No.	Moisture added in %	Volume of Marble slurry sample After Mixing Moisture V_i	Volume of Marble Slurry after Bulking V_b	% Bulking of marble slurry $(V_B - V_i) \times 100 / V_i$
1	0%	400	400	0.00
2	1%	404	460	13.86
3	2%	408	520	27.45
4	3%	412	540	31.07
5	4%	416	560	34.62
6	5%	420	570	35.71
7	10%	440	570	29.55
8	15%	460	580	26.09
9	20%	480	550	14.58
10	25%	500	520	4.00
11	30%	520	400	0.00

% of maximum bulking occurred =35.75%

% of water content at maximum bulking= 5%

% of water content when bulking is zero= 0% and 30%

Test for bulking of fine aggregates

Bulking of fine aggregate for comparison with marble slurry.

Table:-4.19 Sand bulking

S.No.	Volume of Oven Dried Sand	Moisture added in %	Volume of Moisture ml.	Volume of Sand sample After Mixing Moisture V_i	Volume of Sand after Bulking V_B
1.	400ml.	0%	0.00ml	400ml.	400.0ml
2.	400ml.	1%	4.00ml	404ml	450.0ml
3.	400ml.	2%	8.00ml	408ml	490.0ml
4.	400ml.	3%	12.00ml	412ml	530.0ml
5.	400ml.	4%	16.00ml	416ml	540.0ml
6.	400ml.	5%	20.00ml	420ml.	550.0ml.
7.	400ml.	10%	40.00ml	440ml.	560.0ml.
8.	400ml.	15%	60.00ml	460ml.	540.0ml.
9.	400ml.	20%	80.00ml	480ml.	530ml.
10.	400ml.	25%	100.00ml	500ml.	500ml.

Table No-4.20 Sand bulking

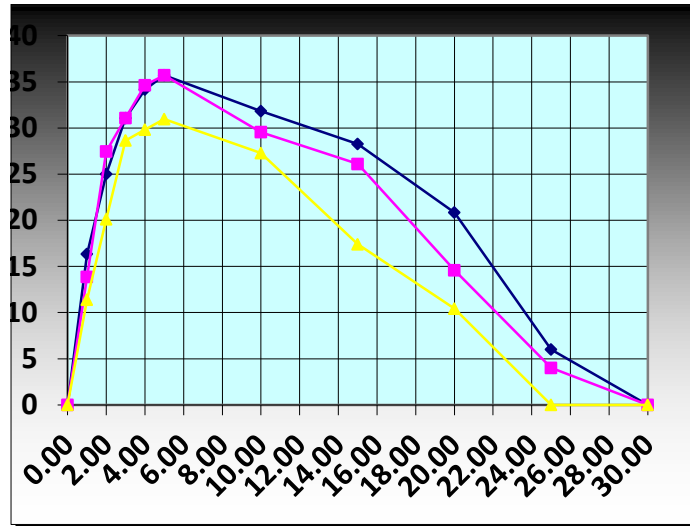
S.No.	Moisture added in %	Volume of Sand sample After Mixing Moisture V_i	Volume of Sand after Bulking V_B	% Bulking of Sand $(V_B - V_i) \times 100 / V_i$
1	0%	400	400	0.00
2	1%	404	450	11.39
3	2%	408	490	20.10
4	3%	412	530	28.64
5	4%	416	540	29.81
6	5%	420	550	30.95
7	10%	440	560	27.27
8	15%	460	540	17.39
9	20%	480	530	10.42
10	25%	500	500	0.00

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% of maximum bulking occurred = 31%
 % of water content at maximum bulking = 5%
 % of water content when bulking is zero = 0% and 25%

A graph plotted with % water content along X-axis and % bulking along Y-axis. After the graph, worked out maximum % of bulking happened, % of water content at extreme bulking, % of water content after bulking is zero & % of bulking for the primary water content (W) of the specimen.

% Bulking



% Moisture Content
 Figure-4.6 Bulking effect

% of Maximum bulking occurred = 36% in marble slurry and 31% in fine aggregate (Sand). Yellow line for Sand and Pink & Blue for Marble slurry % of water content at maximum bulking for both Sand and Marble Slurry = 5% of

water content when bulking is zero = 0% and 30% for Marble slurry and 0% and 25% for sand.

Result

Bulking behavior of marble slurry is near about same as of fine aggregate (sand). But more than that of fine aggregate (Sand). Bulking of Marble slurry is Maximum at the same moisture content 5% as of sand.

Conclusion

Marble slurry may be utilized as partial replacement of sand.

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