

**COMPARISON OF PERMEABILITY OF MARBLE SLURRY AND FINE AGGREGATE**

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\*<sup>1</sup>Research Scholar, Suresh Gyan Vihar University, Jaipur**ABSTRACT**

Talking about eco-friendly construction, reducing environmental hazards, using local materials with low cost, one thing comes in mind that is Marble slurry should be utilized. In this research paper the aim is to find out the Permeability of Marble slurry. If the property comes out nearby or same as of fine aggregate or in between the range of fine aggregate than it can be considered equivalent to fine aggregate. Marble slurry can be considered as equivalent to the fine aggregate if it's permeability is in between the range of permeability of fine aggregate

**Keywords:**

Marble slurry, Fine aggregate, Permeability eco-friendly and Equivalent

**INTRODUCTION**

Marble occur abundant in nature. It is used and mined many places in the world since early time. Around 90% of the world's production of marble comes from India and approx 85% of India's production is received from Rajasthan and almost all mining and processing activities are concentrated around Makrana, where the proposed study is planned for research. Rajasthan has more than 4000 marble mines and about 1100 marble gang saws (processing units). At the same time it leads to growth of many processing units in respective areas. These two activities in Rajasthan have been extended in 20-25 years and have played important role in the economy of the state providing direct and indirect employment to majority of people and therefore also raising their living standard. The industry involves mining and processing units for the production of tiles for walls and floors, articles, waste production and other ancillary works. The marble mining and the industry as a whole are different from other industries to the very fact that, the marble is a "Dimensional Stone", which means the stone is sold by size not by weight (In other words in sqm not in ton). Since the selling price increases with size, all the operations involving mining and processing are aimed to get slabs as big as possible.

**Marble slurry generation**

Marble Slurry is a suspension of marble fines in water, generated during processing and polishing, etc. Environmental Hazards due to waste. It is shaping as major threat of the Environment in the state by mining and processing activities. Nearly one thousand Gang saws and thousands of cutters are producing 15-20 lac tons of marble slurry waste which is indestructible waste and harm to general Public. Some of effects of the marble slurry may be listed as under: -

- [1] The waste is indestructible.
- [2] The sites which can be used as dumping ground are limited and gives repulsive dirty look.
- [3] Contamination of top fertile soil cover.
- [4] Contamination of the rivers and other water bodies there by adversely affecting irrigation and drinking water resources.
- [5] Contamination of air.

**AIMS & OBJECTIVIES**

Utilization of the Marble slurry is the only complete solution of the Marble slurry Pollution. For this purpose the most useful steps can be: (A) Re-utilization of water after separating the Marble slurry. (B) Utilization of Marble slurry. Proper separation of water is essential. Nearly 50,00,000 tons slurry is generated annually which contains 4000,000 tons of water. Hence an effort should be made to get the maximum possible water out of it and slurry be converted in the form of cakes. These cakes can far more easily be transported for utilization at distance sites. This will help in saving the natural resources of water and also the sand lowering the damage to eco-system.

**Permeability test keeping constant head:**

The information of this belongings is greatly valuable in resolving difficulties of leakage from side to side earthen dams, permanency of earthen dams with help of Marble slurry, and reducing seepage through canal bank (making core wall with marble slurry) affected by seepage, settlement etc.

#### Planning and organization

- [1] Preparation of the Marble slurry sample for the test
- [2] Discover the release from side to side the sample under specific head water.

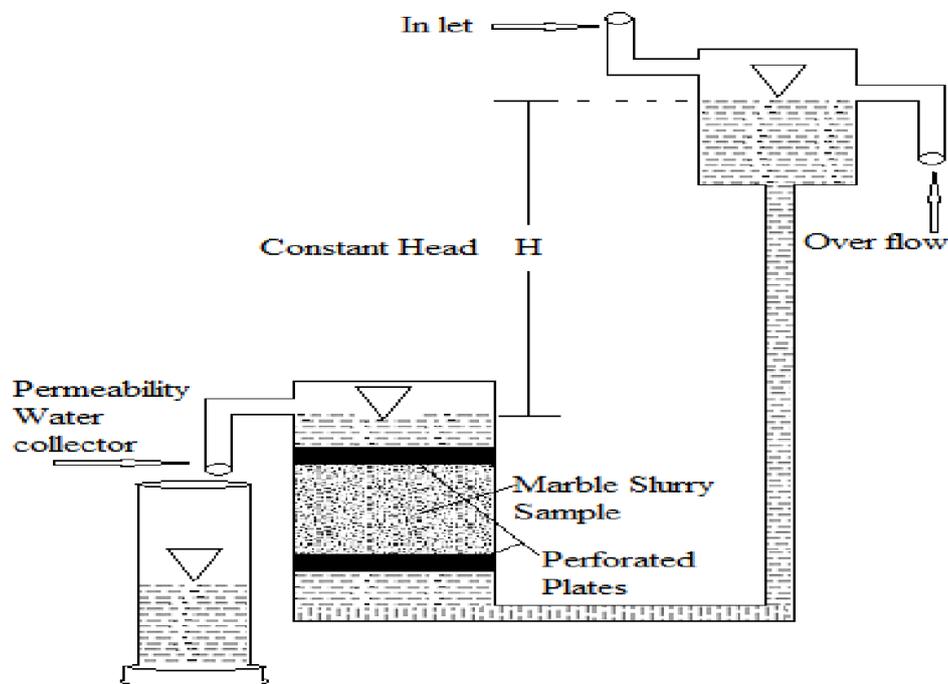
#### Meaning of constant of perviousness

The amount of flow lower than laminar flow circumstances from side to side a unit cross sectional area of permeable medium below unit hydraulic pitch is well-defined as constant of perviousness.

#### Apparatus Used

Permeameter mold of non-corrosive metal of a capacity of 1000 ml, having inside diameter of  $100.0 \pm 0.10$  mm and inner operative depth of  $127.30 \pm 0.10$  mm.

-The mold should be fixed with a removable base plate and detachable allowance counter.



-Compressing tools: 50 mm dia. cylindrical, weight 2.760 kg and height of fall 310.0 mm as stated in IS-2720 part-VII-1965.

-Drain out bed: A bed comprising a pervious disk, 12 mm thick who has the permeability 10 times the probable permeability of soil.

[Provided:- 1.Permeameter mold of inner dia. of  $110 \pm 0.130$  mm and inner active depth of  $125.0 \pm 0.10$  mm.

Compaction apparatus: 40 mm dia. cylindrical Bar, weight 1.86 kilogram and 25 Strokes in three Layers.]

-Drain out cap: A permeable discus of 12 mm thick having a fitting for connection to water inlet or outlet.

-Constant head tank: A suitable water reservoir capable of supplying water to the permeameter under constant head.

-Graduated glass cylinder to receive the discharge.

-Stop watch to note the time.

-A meter scale to measure the head differences i.e. 530 mm.

#### Importance of permeability

The following applications illustrate the importance of permeability in geotechnical design:

-Permeability influences the rate of settlement of a saturated soil under load.

-The scheme of earth dams is actually established on the perviousness of the soils taken.

- The permanency of grades and retentive structures may be badly affected by the perviousness of the soils used.
- Strainers prepared of soils are planned based upon their perviousness.
- Marble slurry having same permeability shows equivalence of property and may replace the fine aggregate.

**Use of Permeability**

Information of the perviousness belongings of soil is essential to:

- Approximation the amount of subversive leakage.
- Resolving difficulties containing driving leakage water from building quarry.
- Permanency studies of earthen constructions and earth retentive barriers exposed to leakage forces.

**Hydraulic conductivity**

Hydraulic percolation of soils rest on more than few factors:

- Fluid viscidness
- Opening size spreading
- Grain size spreading
- Cavity ratio
- Resolving difficulties containing driving leakage water from building quarry.
- Permanency studies of earthen constructions and earth retentive barriers exposed to leakage forces.

*Table No.-1 Standard permeability results of Sand(Fine aggregate)*

Material	k cm/sec	k(gal/ft <sup>2</sup> /day or Meinzers)	K (darcies)
<b>1. Ranges of Values</b> Gravel	1 - 10 <sup>2</sup>	10 <sup>4</sup> - 10 <sup>6</sup>	10 <sup>3</sup> - 10 <sup>5</sup>
Clean sands (good aquifers)	10 <sup>-3</sup> - 1	10 - 10 <sup>4</sup>	1 - 10 <sup>3</sup>
Clayey sands, fine sands (poor aquifers)	10 <sup>-6</sup> - 10 <sup>-3</sup>	10 <sup>-2</sup> - 10	10 <sup>-3</sup> - 1
<b>2. Specific Values</b> Argillaceous limestone, 2% porosity	8.6 × 10 <sup>-8</sup>	1.8 × 10 <sup>-3</sup>	10 <sup>-4</sup>
Limestone, 16% porosity	1.2 × 10 <sup>-4</sup>	2.5	1.4 × 10 <sup>-1</sup>
Sandstone, silty, 12% porosity	2.23 × 10 <sup>-6</sup>	4.74 × 10 <sup>-2</sup>	2.6 × 10 <sup>-3</sup>
Sandstone, coarse, 12% porosity	9.4 × 10 <sup>-4</sup>	19.9	1.1
Sandstone, 29% porosity	2.1 × 10 <sup>-3</sup>	43.6	2.4
Very fine sand, very well sorted	8.4 × 10 <sup>-3</sup>	1.8 × 10 <sup>0</sup>	9.9
Medium sand, very well sorted	2.23 × 10 <sup>-1</sup>	4.7 × 10 <sup>2</sup>	2.6 × 10 <sup>2</sup>
Coarse sand, very well sorted	3.69 × 10 <sup>1</sup>	7.83 × 10 <sup>5</sup>	4.3 × 10 <sup>4</sup>
Montmorillonite clay	≈ 10 <sup>-8</sup>	≈ 10 <sup>-4</sup>	≈ 10 <sup>-5</sup>

Report the test results in tabular form.

Permeability Test results of Marble Slurry:-

Coefficient of Permeability  $K=Q/i.A.T$

*Table No.-2 Marble slurry permeability results (1)*

S.No.	Time elapsed T in Hours	Time elapsed T in Seconds	Cumulative Discharge Volume Through Sample Q	Coefficient of Permeability $K=Q/i.A.T$
1	0	1	0	0
2	4	14400	68	1.16903E-05
3	8	28800	137	1.17762E-05
4	12	43200	205	1.17476E-05
5	16	57600	273	1.17332E-05
6	20	72000	340	1.16903E-05

*Table No.-3 Marble slurry permeability results (2)*

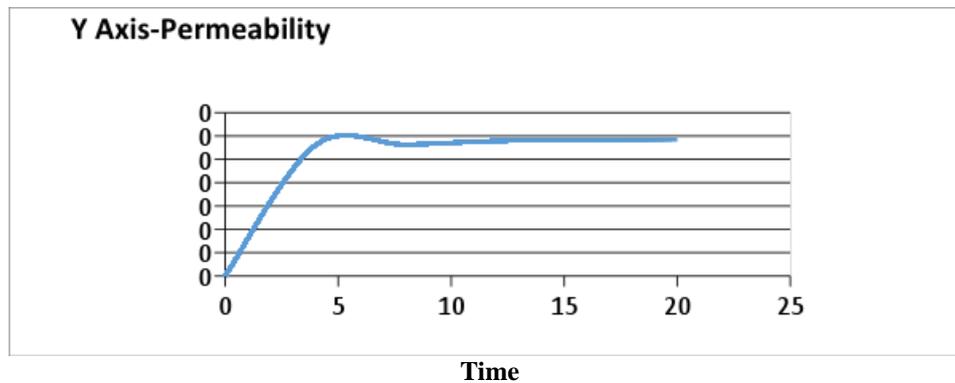
S.No.	Time elapsed T in Hours	Time elapsed T in Seconds	Cumulative Discharge Volume Through Sample Q	Coefficient of Permeability $K=Q/i.A.T$
1	0	1	0	0
2	4	14400	63	1.08307E-05
3	8	28800	121	1.04009E-05
4	12	43200	199	1.14037E-05
5	16	57600	268	1.15184E-05
6	20	72000	329	1.13121E-05

*Table No.-4 Marble slurry permeability results (3)*

S.No.	Time elapsed T in Hours	Time elapsed T in Seconds	Cumulative Discharge Volume Through Sample Q	Coefficient of Permeability $K=Q/i.A.T$
1	0	1	0	0
2	4	14400	65	1.11745E-05
3	8	28800	135	1.16043E-05
4	12	43200	202	1.15757E-05
5	16	57600	273	1.17332E-05
6	20	72000	349	1.19997E-05

*Table No.-5 Marble slurry average permeability*

S.No.	Test 1 Permeability	Test 2 Permeability	Test 3 Permeability	Average Permeability $K=(K1+K2+K3)/3$
1	0	0	0	0
2	1.16903E-05	1.08307E-05	1.11745E-05	1.12318E-05
3	1.17762E-05	1.04009E-05	1.16043E-05	1.12605E-05
4	1.17476E-05	1.14037E-05	1.15757E-05	1.15757E-05
5	1.17332E-05	1.15184E-05	1.17332E-05	1.16616E-05
6	1.16903E-05	1.13121E-05	1.19997E-05	1.16673E-05

**RESULT**

It was found that the Permeability behavior of marble slurry is near about same as that of clay (very fine sand). Marble slurry maximum Permeability was found to be  $1.14794 \times 10^{-5}$  ml/sec and of fine sand is  $10^{-6}$  to  $10^{-3}$  ml/sec

**CONCLUSION**

Permeability of Marble slurry is in between the range of Permeability of fine aggregate. On the basis of this property Marble slurry can be considered equivalent to fine aggregate and may be utilized as local material for construction works.

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