

STUDY OF SAND HAVING MORE ORGANIC IMPURITIES

¹D.D.PARKHE, ²R.V.SHRIGRIWAR, ³R.V.PANSE

^{1,2,3}Maharashtra Engineering Research Institute,
Dindori Road, Nashik, Maharashtra
E-mail: ¹sro_soilmechanics@outlook.com

Abstract- The organic impurities in sand primarily comprise of carbon material in the form of decay of vegetables, trees and remains of animals. This paper covers an approximate determination of presence of possible injurious organic compounds in natural sand, which is to be used in cement mortar or concrete. The value of the test determines whether further test of the sand regarding its reactivity with cement mortar/concrete is necessary before it is approved for use. This method is of significance in making a preliminary determination of acceptability of sand. When a sample subjected to this test produces darker colour, then it is advisable to perform the test for the effect of organic impurities on compressive strength of mortar/concrete prepared using this sand.

Keywords- Organic Sand, Organic Impurities, Compressive Strength, Mortar Cubes.

I. INTRODUCTION

Sand is a key ingredient in cement mortar & cement concrete. Sand to the tune of 35% in concrete and 85% in the cement mortar is generally used in the construction works. Construction activities are increased due to the growth in population and industrialization. The demand of good quality natural sand has increased and hence the natural resources of good quality sand deposits in the rivers within economical leads are being depleted rapidly. Nobody uses bad sand deposits which has greenish-blackish colour and bad odours. Organic impurities (carbons material) in the sand are in the form of decays of

vegetables, trees and remains of animals. This type of sand is harmful for use in construction work. About 38 quality control laboratories in Maharashtra which carry out the testing works for Government projects were contacted and requested to submit information about whether they have come across the sand having organic impurities and location of them. To this 23 laboratories have answered, in negation. As such, it was decided to collect sand samples directly from the rivers for this study. Sand samples from 22 locations were collected on visual inspection based on colour and odor. The rivers selected are mentioned in Table 1.

Table 1: The Rivers Selected

Sr.	Region	River
1	Nashik	Darna, Godavari, Deonadi, Kadwa, Pravara
2	Pune	Bori, Krishna, Tarali, Agrani
3	Vidharbha	Khadakpurna

II. EXPERIMENTAL DETAILS

2.1. Test Procedure for Organic Impurities

The sand is to be taken as delivered and without drying. A 350 ml graduated clear medicine glass bottle is filled up to 75 ml by 3% NaOH solution. The sand is added slowly until the volume measured by the sand layer is 125 ml. Some of the NaOH solution gets filled in the voids of sand particles. The NaOH solution is again added to set level at the 200 ml mark. The bottle is capped and shaken vigorously to make intimate contact of sand particles with the NaOH solution and the mixture is allowed to settle for 24 hours.

After 24 hours, the colour of the suppressant solution above the sand is compared with the colour of

standard reference solution. If the suppressant solution above the sand is darker than the colour of standard reference solution, then the sand sample is said to contain organic compounds. Since this test produces no numerical value, determination of precision and accuracy is not practical. This method is of significance in making a preliminary determination of acceptability of sand. When a sample subjected to this test produces darker colour, then it is advisable to perform the test for the effect of organic impurities on compressive strength of mortar prepared using this sand. Using above procedure all 22 sand samples were tested for presence of organic impurities. It was observed that only four samples contain organic impurities as demonstrated in Table 2.

Table2: Sand collected from Selected Rivers in Maharashtra

Sr. No.	Date of sample collection	Name of River	Sample collection Spots	Tal./Dist.	Organic Impurities Status	Remarks
1	01-Feb-01	Darna	Daundat	Igatpuri, Dist. Nashik	Present	Darker brown colour
2	01-Feb-01	Darna	Pimpripada	Igatpuri, Dist. Nashik	Present	
3	01-Feb-01	Godavari	Dhamsangvi	Niphad, Dist. Nashik	Absent	
4	01-Feb-01	Godavari	Sangvi	Niphad, Dist. Nashik	Absent	
5	08-Feb-01	Godavari	Chasnali	Kopargaon, A. Nagar	Absent	
6	08-Feb-01	Godavari	Nandurmadhmeshwar	Niphad, Dist. Nashik	Present	Darker colour
7	08-Feb-01	Deonadi	Somthanc	Sinnar, Dist. Nashik	Absent	
8	08-Feb-01	Godavari	Baktarapur	Kopargaon, A. Nagar	Absent	
9	08-Feb-01	Kadwa	Niphad	Niphad, Dist. Nashik	Absent	
10	09-Feb-01	Khadpurna	Buldhana	Buldhana	Absent	
11	13-Feb-01	Pravara	Sangmner	Ahamadnagar	Absent	
12	13-Feb-01	Bori	Junnar	pune	Absent	
13	14-Mar-01	Krishna	Mahuli	Satara	Absent	
14	14-Mar-01	Krishna	Koregaon	Satara	Absent	
15	14-Mar-01	Krishna	Kashil	Satara	Absent	
16	14-Mar-01	Krishna	Venegaon	Satara	Absent	
17	14-Mar-01	Krishna	Umbraj	Satara	Absent	
18	14-Mar-01	Tarali	Umbraj	Satara	Present	Darker colour
19	15-Mar-01	Agrani	Begampura	Kawathemala, Sangli	Absent	
20	15-Mar-01	Agrani	Dhulgaon	Kawathemala, Sangli	Absent	
21	15-Mar-01	Agrani	Dhulgaon	Miraj, Sangli	Absent	
22	15-Mar-01	Krishna	Takari	Walva, Sangli	Absent	
23	16-Mar-01	Krishna	Kawatha	Shirol, Kolhapur	Absent	

Table 3: Effect of Organic Impurities on the strength of the Mortar

Sr. No.	Name of River	Location of Sand samples	7 days cement Mortar crushing strength in Kg/cm ²		Strength increases in %	28 days cement Mortar in Kg/cm ²		Strength increases in %
			Unwashed Sand	Washed Sand by NaOH		Unwashed Sand	Washed Sand by NaOH	
1	Darna	Daundat	168	190	13	313	316	1.0
2	Darna	Pimpripada	145	164	13	280	313	12
3	Godavari	Nandurmadhameshwar	202	208	3	393	400	2
4	Tarali	Umbraj	208	212	2	430	443	3.0

2.2. Test Procedure for Mortar test:

Sand samples found to contain organic impurities were selected for mortar test. The sand was washed with 3% NaOH solution and subsequently washed by water several times until the organic impurities vanished. After removal of organic impurities by washing, mortar cubes were cast. The compressive strength of mortar cubes at the end of 7 and 28 days was determined and compared with those mortar samples cast using unwashed sand. The results are furnished in Table 3 above.

III. PREPARATION OF REQUIRED CHEMICALS

3% Sodium Hydroxide Solution (NaOH)	Standard Reference Colour Solution
Dissolve 3 Parts by Wt. of NaOH in 97 Parts of distilled water.	Add 2.5 ml of (2% Tannic acid + 10% Alcohol) in 97.5 ml of 3% NaOH Solution. Shake the mixture vigorously and allow to stand for 24 hours. The colour of the solution is compared with the colour of solution above the sand.

CONCLUSIONS

The major conclusions are as follows:

1. It is observed that river sand is found to contain more organic impurities near populated zones.
2. In this test no numerical value is expected to be determined, hence utmost precision and accuracy is not warranted.
3. The organic impurities can only be determined qualitatively on the basis of colour comparison.
4. When the suppressant solution above the sand is darker than the colour of standard reference solution, then the sand sample is said to contain high organic compounds.
5. It is desirable that the mortar test should be conducted on sands having organic impurities as specified in ASTM C-87-83 (Vol. 0.04-02) before using in the construction.
6. It is seen that the compressive strength of mortar prepared with washed sand (sans organic impurities) is increased. This may not be the case every time. Therefore, mortar test is essential before using the sand having organic impurities.

7. Inquiries with the field quality control laboratories revealed that they have not come across the sands having more organic impurities.
8. For 7 days strength of Darna river samples, the strength of mortar of washed sand increased by 13%. However, for Godavari & Tarali river samples, it is increased only by 2 to 3% for washed sand.
9. For 28 days strength of Pimpripada location of Darna river sample, the strength of mortar of washed sand is increased by 12%. However, for the rest of samples it increased only by 1 to 3% for washed sand.

REFERENCES

- [1] The study on Quality and Quantum of natural sand from selected rivers in Maharashtra, Carried out by MT division MERI in Dec-1998
- [2] The Indian standards 458:2000 and ASTM Vol. 04.02-section 4, Vol. 06.02-section 6 etc were referred for this study.
- [3] The IS-2386 (Part II): 1963 used for Organic impurity test.
- [4] The IS-383:1970 is used for physical properties for sand.
- [5] 5. The IS-2386 (Part V): 1963 is used for Morter test.
