Properties of Sabarmati River Sand

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Abstract— This study mainly focus on characteristic of sand of Sabarmati river. Representative soil samples were collected from the Sabarmati River bed near Gandhinagar area and were investigated as per Indian standard for their index properties with a view to classifying for their use in infrastructural development. Mainly this location is leading sites of sand mining from where the soils are supplied as construction material. Mainly three samples were collected. These samples were classified as per depth at which these samples collected.

Keywords: Pycnometer Method, Sieve Analysis

I. Introduction

The purpose of this paper is to identify appropriate methods of geotechnical soil assessment to establish engineering parameters for geotechnical design. Geotechnical soil parameters should be based on the results of a complete geotechnical investigation, which includes in-situ field-testing and/or a laboratory-testing program, used separately or in combination. Such investigation is carried out in order to avert structural failures, as these failures could lead to disasters which pose serious threats to public safety. The ultimate goal of site investigation is to have an appreciable understanding of the behaviour of the soil which will bear load to be transmitted by the proposed structure. In the last decade, the involvement of geophysics and geotechnical methods in civil engineering has become a promising approach Geotechnical measurements may greatly improve the quality of construction in civil engineering as it will focus on the behaviour and performance of soils and rocks in the design and construction of civil engineering structures.

II. Literature Review

SHUBHAM BHATT, R.D.SHAH, VASU PANCHOLI, VINAY DWIVEDI AND NISARG "INDEX PROPERTIES OF SOIL OF SABARMATI RIVER, GANDHINAGAR DISTRICT, GUJARAT" 2017

The present work is mainly focused on the Geotechnical properties of the areas in Gandhinagar district. The recent growth which is associated with urbanization in Gandhinagar - Ahmadabad Township calls for appropriate geotechnical investigations of soils of the area. The soil sample was collected from different locations of the mapped areas in Gandhinagar district. Samples from each site were collected at 3m depth and analyzed using standard geotechnical test e.g. Moisture content test (IS: 2720 (PART-2) -1973), Particle size distribution test (IS: 460-1962), Atterberg limit test (IS: 2720 (PART-5) 1985), Specific gravity test (IS: 2720 (PART-3) 1980). Based on the test results obtained from the study areas, the comparison was made with some standard specifications and it was revealed that samples from all the location are uniform size sand (SP soil) and it can be a good option as a construction material.

III. Experimental Investigation

A. Sieve Analysis:

Determination of particle size is more important in Civil Engineering, as the particle size determines the effectiveness of final product. The characters of particle such as bulk density, physical stability, permeability and many more are decided by its size. To determine the size distribution of particles, the sieve analysis test procedure is an effective method that prevailed from the past. In sieve analysis, the particle size distribution is defined using the mass or volume. Sieve analysis is laboratory test procedure in which

Particles will move vertically or horizontally through sieve mesh. Depending on the needs and particle material different sieving methods are available for the application. They are manual sieving method, mechanical sieving method, dry sieving method and wet sieving method.

B. Oven Dry Method:

The oven dry method is widely used laboratory method determines the water content or moisture content of given soil sample. It gives very accurate results.

C. Pycnometer Method:

The Pycnometer is used for determination of specific gravity of soil particles of both fine grained and coarse grained soils. The determination of specific gravity of soil will help in the calculation of void ratio, degree of saturation and other different soil properties.

D. Sand Replacement Method:

The field density test of soil is conducted in the field to know whether the specified compaction is achieved or not. Normally Sand Replacement Method is adopted for this purpose. In this study sand replacement was use for determine density of soil.

IV. Result and Analysis

A. Sieve analysis:

Sieve opening	Wt.of sieve + soil	Wt.of retained	Wt.of sieve	Retained %	Cumm. % retained	% finer
2	551	243	308	17.4	17.4	82.6
1	622	295	327	21.13	38.53	61.47
0.6	507	140	367	10.02	48.558	51.44
0.425	902	540	362	38.68	85.238	14.76
0.15	524	155	369	11.1	96.338	3.662
0.075	291	17	274	1.21	97.548	2.452
Pan	247	6	241	0.429	97.977	92.023

Table 1: Sample I Sieve Analysis

Sieve opening	Wt.of sieve + soil	Wt.of sieve	Wt.of retained soil	% retained	Cumm. % retained	% finer
2	535	311	224	16.057	16.057	83.943
1	544	330	214	15.34	31.397	68.603
0.6	437	349	88	6.3	37.697	62.303
0.425	606	365	241	17.27	54.967	45.033
0.15	842	379	463	33.189	88.156	11.844
0.075	432	273	159	11.39	99.54	0.45
Pan	246	240	6	0.43	99.97	0.02

Table 2: Sample Ii Sieve Analysis

Sieve opening	Wt.of sieve + soil	Wt.of sieve	Wt. Of retained soil	% retained	% cumm. retained	% finer
2	550	310	240	17.19	17.19	82.81
1	607	331	276	19.77	30.96	69.04
0.6	470	352	118	8.542	39.502	60.498
0.425	653	363	290	20.773	60.275	39.725
0.15	745	374	371	26.57	86.845	13.155
0.075	371	274	97	9.348	96.193	3.867
Pan	245	241	4	0.286	96.479	3.527

Table 3: Sample Iii Sieve Analysis

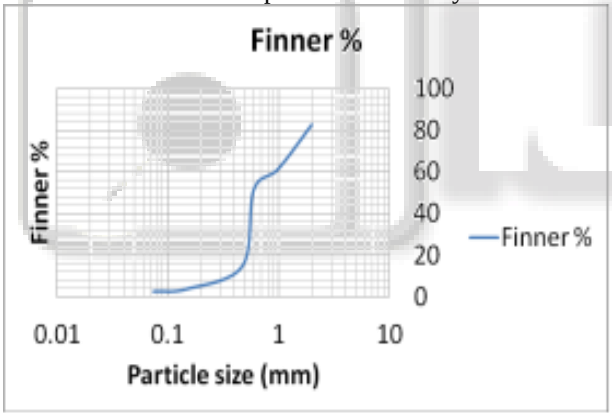

Fig. 1: sample I Semi log graph

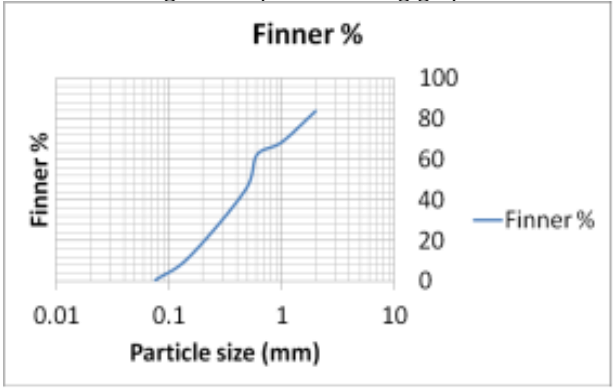

Fig. 2: Sample II semi log graph

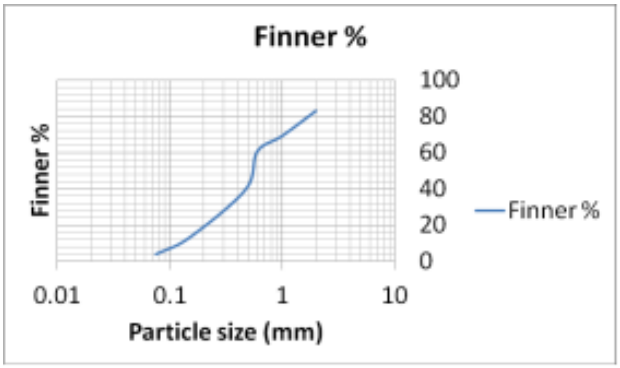

Fig. 3: Sample III Semi log graph

Diameter	I	II	III
D10	0.475	0.15	0.15
D30	0.6	0.475	0.475
D60	1	0.6	0.6
C_u =D60/D10	2.10	4	4
C_C=$D30^2$/D60*D30	0.75	2.50	2.50

Table 4: C_U & C_C

B. Oven Dry Method:

Observation				
1	Sample No.	I	II	III
2	Mass of empty container (M1)(gm)	90	96	90
3	Mass of container + soil (M2)(gm)	229	261	257
4	Mass of container + dry soil (M3)(gm)	224	255	252
Calculations				
5	Mass of water Mw= M2 – M3(gm)	5	6	5
6	Mass of solids, Ms= M3 – M1(gm)	134	159	162
7	Water content= (5)/(6)x100	3.73%	3.77%	3.086%

Table 5: Moisture Content for Sample I

Observation				
1	Sample No.	I	II	III
2	Mass of empty container (M1)(gm)	89	86	92
3	Mass of container + soil (M2)(gm)	191	201	202
4	Mass of container + dry soil (M3) (gm)	189	199	201
Calculations				
5	Mass of water Mw= M2 – M3(gm)	2	2	2
6	Mass of solids, Ms= M3 – M1(gm)	100	113	109
7	Water content= (5)/(6)x100	2%	1.76%	1.83%

Table 6: Moisture Content for Sample II

Observation				
1	Sample No.	I	II	III
2	Mass of empty container (M1)(gm)	90	92	100
3	Mass of container + soil (M2) (gm)	190	192	200

4	Mass of container + dry soil (M3) (gm)	189	191	198
Calculations				
5	Mass of water Mw= M2 – M3(gm)	1	1	2
6	Mass of solids, Ms= M3 – M1(gm)	99	99	98
7	Water content= (5)/(6)x100	1.01%	1.01%	2%

Table 7: Moisture Content for Sample III

C. Pycnometer method:

Observation				
1	Sample no.	I	II	III
2	Mass of empty Pycnometer (M1) (gm)	664	665	664
3	Mass of Pycnometer and dry soil (M2) (gm)	864	865	864
4	Mass of Pycnometer, soil and water(M3) (gm)	1744	1740	1741
5	Mass of Pycnometer and water (M4) (gm)	1616	1608	1612
Calculations				
6	M2 – M1 (gm)	200	200	200
7	M3 – M4 (gm)	128	125	73
8	Calculate G using formula	2.77	2.66	2.73

Table 8: Specific Gravity for Sample I, II, III

D. Sand Replacement Method:

Observation	I	II	III
Volume of calibrating container Vc (cm3)	1177.5	1178	1178
Weight of pouring cylinder+sand,w1 (gm)	7136	7076	7019
Wt. After filling cone(container + sand) w2 (gm)	6742	6687	6630
Wt. After filling Cone and calibre. Container w3(gm)	4611	4684	4457
Wt. Of sand filled in cone (w1-w2) (gm)	394	389	389
Wt. Of sand filled in cylinder & cone (w2-w3) (gm)	2131	2003	2173
Wt. Of sand in calibrating container (w2-w3)-(w1-w2) (gm)	1737	1614	1784
Density of sand = Wc/Vc (gm/cm3)	1.47	1.4	1.51
Dry density of soil (gm/cm3) =	1.42	1.29	1.49

Table 9: Dry Density and Bulk Density for Sand

V. CONCLUSION

As per above result, sieve analysis Cc & Cv indicate sand have uniform size. Moisture content between 1.34% to 3.52%, specific gravity between 2.66 to 2.77. Average bulk density and dry density is 1.4 and 1.3.This result is indicating this type of soil is favourable as a construction materiel. Also we can improve sand characteristic by various soil improvement techniques, which will use when any construction carried out near Sabarmati River.

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