

AN EXPERIMENTAL INVESTIGATION OF LOAD SETTLEMENT BEHAVIOUR OF PLATE LOAD TEST ON M-SAND FOR FOUNDATION PURPOSE

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Abstract: River sand is a widely used construction material all over the globe. There is a strong need for research on river sand substitutes for foundation purpose. Manufactured sand or M-sand is used as an alternative for river sand. Due to the tremendous growth of construction field the demand of sand has exponentially increased thus causing a deficiency of suitable river sand in many parts of the world and due to the depletion in good quality of river sand for the use of manufactured sand has seen a sudden surge in recent times. Every type of structure rests on the soil beneath them and its stability is directly dependent upon the load bearing /carrying capacity of soil on which it rests. We many a times fill some inches of sand generally natural sand under every footing. The purpose of this is to provide stability to the foundation and it may differ according to the requirement of the soil condition and the need. The main purpose of this investigation is to use M sand in place of Natural sand for foundation purpose. There are different methods to determine bearing capacity of soil. One of them is a plate load test. It is used for the design of footing. Therefore, eighteen plate load tests using a tank size (25cm x 25cm x 25cm) having plate sizes of (9cm x 9cm), (7cm x 7cm) & (6cm x 6cm) were conducted to study the load settlement behavior of both M sand and Natural sand in different states (dense state, medium dense state and loose state) and comparing the results of M sand and Natural sand.

Keywords: M sand, Natural sand, bearing capacity, settlement, footing.

I. INTRODUCTION

River sand or natural sand are worn out and weathered rock particles and are of different sizes and grades and is dependent upon the amount of wearing. In today's world fair and good sand is not available readily it requires long distance transportation also Resources of natural sand are also exhausting very rapidly. Therefore it is the need of the hour to find some alternates of river sand. The artificial sand also known by the name Manufactured sand or M sand-is manufactured by proper machines can become a good alternative to river sand. The M-sand should be of good gradation (particles should range should be between 4.75 mm to 75 micron in good proportion).

1.2 Need and Scope:

The main aim of this investigation is to utilize M Sand in the field of geotechnical engineering. In this investigation an attempt is made to use M Sand for foundation purpose as a replacement of natural sand (because of its non availability and high price an transportation charges)

1.3 Literature Review:

This review presents a general overview of the literature on the several different experiments carried by many authors on the replacement of fine aggregate by the manufactured sand, quarry dust and the results there of highlighting the signification of usage the manufactured sand in place of the natural sand. Jeffrey etal. (2016) found that the generation of quarry fines is due to the extraction and processing operations in quarries. There are several parameters that influence the production of fine M-sand which are relevant to the rock characteristics and the involved processes. Shanmugapriya T and Uma (2012) have shown from water permeability test that permeability decreased with increase in the proportion of manufactured sand. The British Geological Survey (2003) reported that the fine M-sand produced depends on the type of crusher used and the parent rock. Nagaraj, T.K. Ullagaddi, P.B (2012) studied experimentally the effect of shape and size of footing on sand foundation. Sai K Vanapalli and Won Taek Oh (2008) suggest that the plate load test is considered as the most dependable method of testing to estimate the applied stress versus surface settlement (SVS) behavior of shallow foundations

1.4 Experimental Procedure:

The setup consists of apparatus of PLT (Plate load test). It consists of three parts and these three parts are 1) Cell pressure unit, 2) the back-pressure unit and the 3) tri-axial cell. The sample is placed in the tri-axial cell and load is applied axially to the sample through the plate which is placed at the centre through the load cell and the loading frame. The axial displacements are measured by the dial gauge which is mounted above solid part of the tank and analyzing the displacement measurement devices with respect to the applied load intensity.

1.4.1 Load intensity versus settlement on M sand and Natural sand (Dense state) Dry M sand and natural sand sample are taken, the sample is filled in the tank with the help of vibration. The weight of the soil is noted down. The test is done in three states loose state, medium state, & dense state using square plate of different sizes. The tank is taken in the plate load test machine n which load is applied and

displacement is noted down.

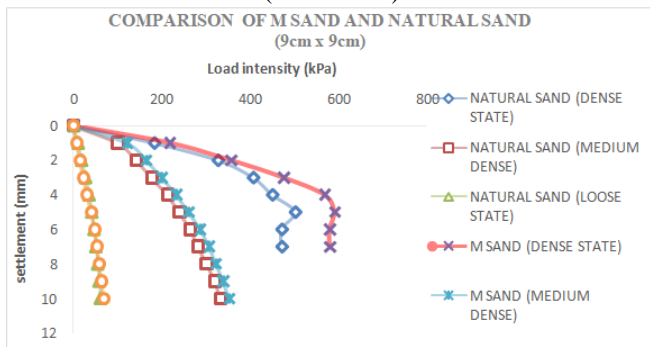
1.4.2 Load intensity versus settlement on M Sand and Natural sand (medium dense state) Dry M sand and natural sand sample are taken, the sample is filled in the tank with the weight of average of loose and dense condition. The weight of the sample of the soil is noted down. The test is performed in three states loose state, medium state, & dense state using square plate having different size. The tank is taken in the plate load test machine in which load is applied and displacement is noted down.

1.4.3 Load intensity versus settlement on M sand and Natural sand (loose state)

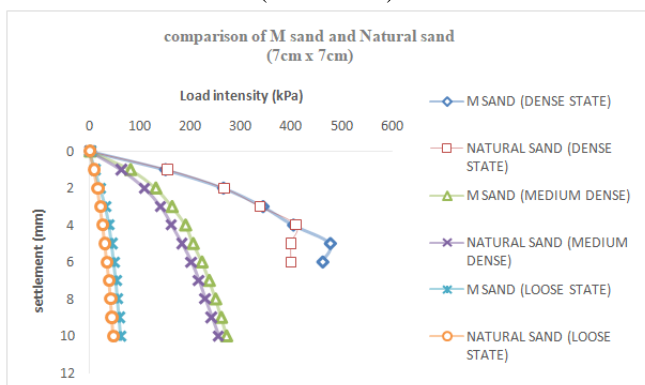
Dry M sand and natural sand sample are taken, the sample is filled in the tank with the help of funnel in loose state. The weight of the soil is noted down. The test is done in three states loose state, medium state & dense state using square plate having different sizes. The tank is taken in the plate load test machine in which load is applied and displacement is noted down.

The plate load test has been carried out in laboratory on a mild steel plate of sizes (9cm x 9cm), (7cm x 7cm) and (6cm x 6cm) and the settlement of m sand and natural sand with different relative densities (dense, medium dense and loose state) was measured under different stress levels. The relation between the load–settlement is figured from the load displacement curves where the slope of the curves of load displacement either first reaches zero or at minimum value becomes steady at.

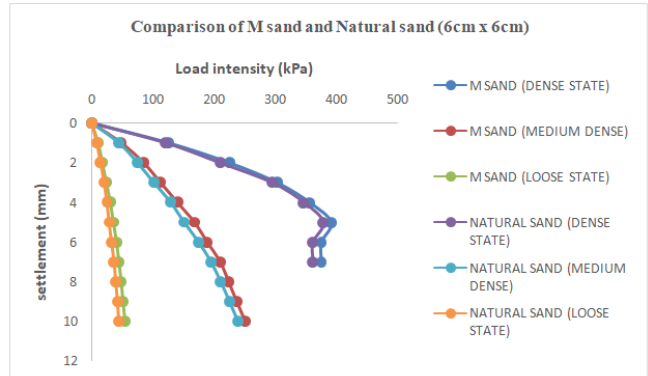
COMPARISON OF M SAND AND NATURAL SAND
 (9cm x 9cm)



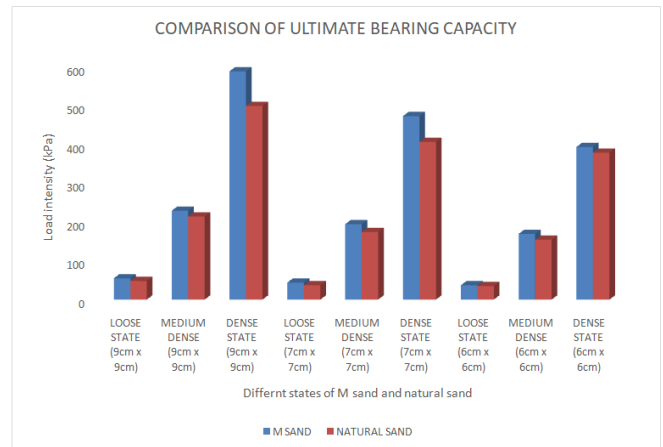
COMPARISON OF M SAND AND NATURAL SAND
 (7cm x 7cm)



COMPARISON OF M SAND AND NATURAL SAND
 (6cm x 6cm)



4.9 COMPARISON OF ULTIMATE BEARING CAPACITY



II. CONCLUSION AND FUTURE SCOPE:

From the laboratory investigations obtained by plate load tests carried out on M sand and Natural sand (dense, medium dense and loose state). The following conclusions are drawn

- M sand in loose medium and dense state stat has more ultimate bearing capacity as well as allowable bearing capacity than Natural sand.
- M sand does not carry impurities like clay, silt and other organic impurities and therefore it is stronger than riverbed sand. It is helping the environment (we don't have to tear up the landscape).

Base on the results of the current investigation following future research works can be suggested:

- Carry out experimental investigation on mixture of natural and M sand against natural sand and M sand
- Carry out test at plates of larger sizes and loads of higher intensity temperature.

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