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Study on Modulus of Elasticity with Incremental Replacement of Natural Sand with Manufactured Sand

Pradeepa.S[1] and R.L. Sreenivasa[2]

[1]Assistant professor, Department of Civil Engineering, SIR MVIT, Karnataka, India.

[2]Professor, Department of Civil Engineering, B.M.S.C.E, Karnataka, India.

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ABSTRACT

The present investigation makes an attempt to study the modulus of elasticity of concrete, concrete in which M-sand is used as a partial and full replacement for natural sand. E is an important parameter reflecting the ability of concrete to deform elastically.M20 and M25 grade of concrete was investigated by replacing natural sand by M-sand at replacement levels of 25%, 50%, 75%, sand 100%. The results revealed that there is an increase in the value modulus of elasticity of concrete as the percentage of m sand increases also it is observed that the stress-strain behavior exhibits non-linear variation

Introduction

Concrete a versatile material is composed of cement, fine aggregates, coarse aggregates and water. Its durability, sustainability, and economy has made it the world's most consumed man made material. Decline in the availability of natural sand, environmental issues pressures to reduce extraction of sand from rivers has made the use of manufactured sand a replacement to river sand. Manufactured sand has been widely accepted as a viable construction material, as the results of the investigation revealed that concrete exhibits excellent strength.

Rheological properties, one of the important parameter in the design of structures and Concrete being heterogeneous and multi phase material is influenced by elastic property and gel structure. Design accuracy is dependent upon the value of modulus of elasticity of concrete as modulus of elasticity of steel is almost a definite value. It is assumed that when reinforced concrete designed by elastic theory a perfect bond strength exsists.

Modulus of elasticity is one of the most important mechanical properties of concrete. It is defined as the ratio of normal stress to strain. It is a key factor influencing the structural performance of reinforced concrete structures and is particularly important as a design parameter in predicting the deformation of tall buildings.

In the present study the modulus of elasticity for t grades of concrete M20, M25 w/c 0.5, is calculated using M-sand and compared for the similar grades concrete with natural sand. The M-sand is fully replaced for fine aggregate. For the present investigation, concrete cylinders 150mm diameter and 300 mm height were casted and tested after 28 days of curing.

Materials and Methodology

Materials

Cement

Ordinary Portland cement of grade 53 confirming to IS12269-1987 is used for all mixes.

Water

As a general rule, potable water is considered satisfactory for mixing concrete (IS 456-2000), was used in the present investigation.

Aggregates

Crushed granite stone coarse aggregates, which are locally available was used. Locally available M-sand and river sand was used as fine aggregate. River sand and M-sand, both having particles sizes of 4.75 mm to 75 micron was used in this investigation.

Methodology

Batching and mixing of materials

Batching of materials is done by weight. The percentage of replacement of fine aggregates by manufactured sand will be 0%, 25%, 50%, 75% and 100%. The 0% replacement will be to serve as control for other specimen.

Concrete mix design

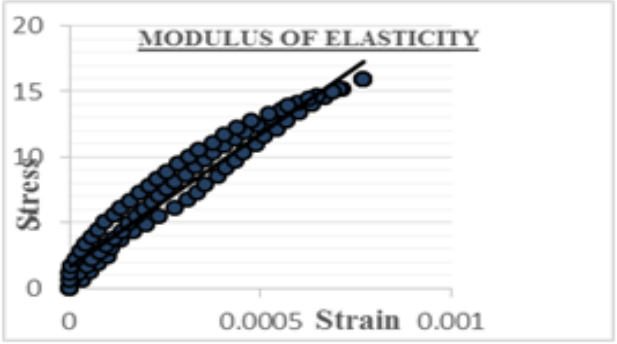
Concrete mix is designed for 20MPa and M25 MPa using existing IS code provisions of river sand concrete. The design basically involve the determination of water binder ratio, selection of water content, cement content, coarse aggregate content and fine aggregate content. The mix proportions obtained on the above procedure will be finalized with minor adjustments on the quantities of constituent materials.

Results and Discussions

Results on modulus of elasticity foe M20 grade concrete

Replacement 0% River sand with M san

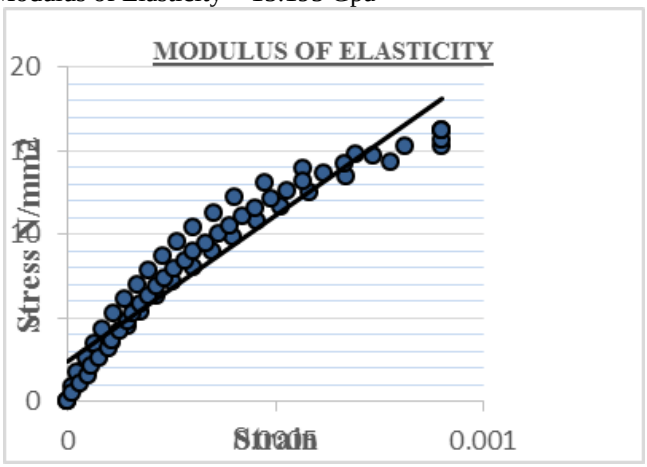
Modulus of Elasticity = 20.294 GPa



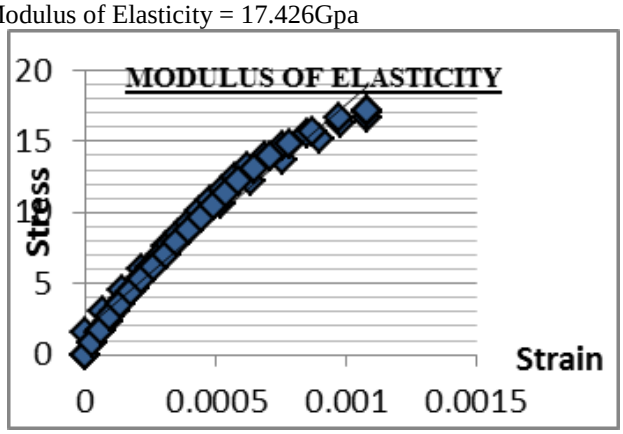
Tele:

E-mail address: pradeepasai1980@gmail.com

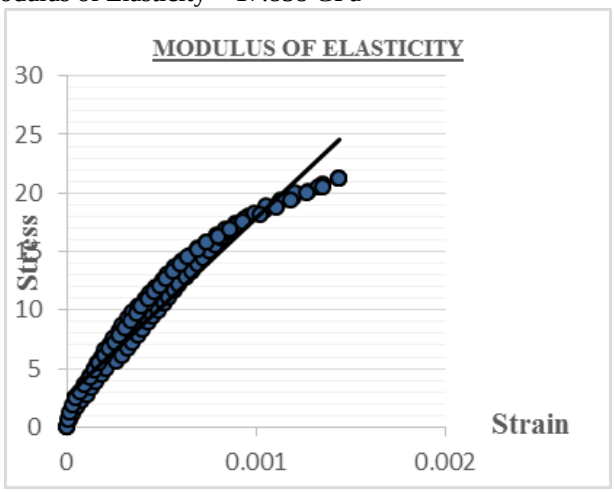
Replacement 25% River sand with M sand
Modulus of Elasticity = 15.195 Gpa



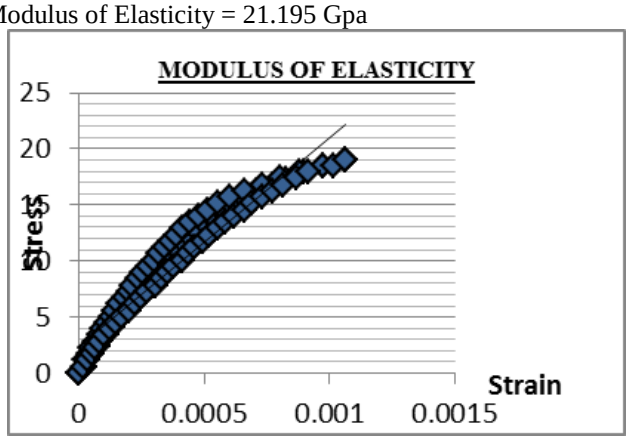
Replacement by 50% of River sand with M Sand
Modulus of Elasticity = 17.426Gpa



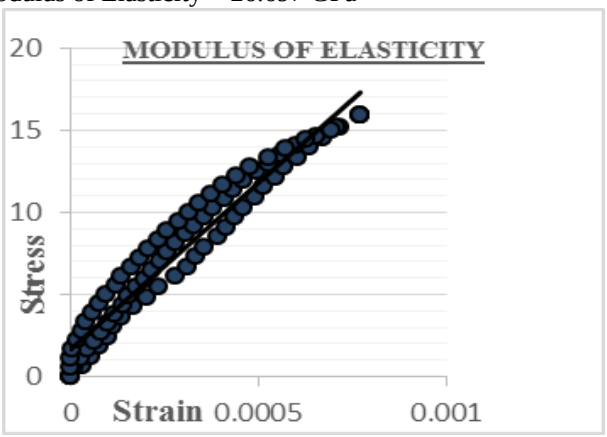
Replacement by 75% of M Sand
Modulus of Elasticity = 17.858 GPa



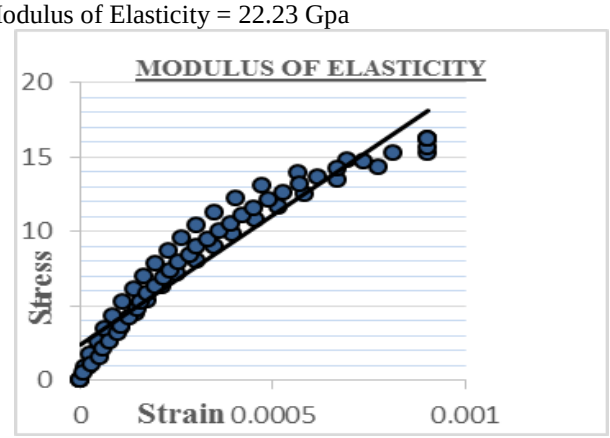
Replacement by 100% of M Sand
Modulus of Elasticity = 21.195 Gpa



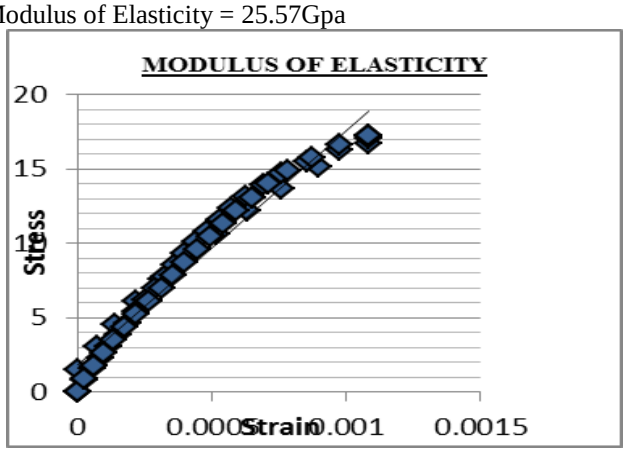
Results on modulus of elasticity foe M25 grade concrete
Replacement 0% River sand with M sand
Modulus of Elasticity = 26.697 GPa



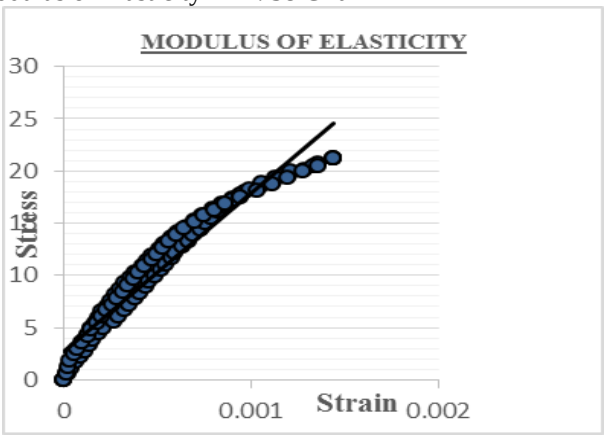
Replacement 25% River sand with M sand
Modulus of Elasticity = 22.23 Gpa



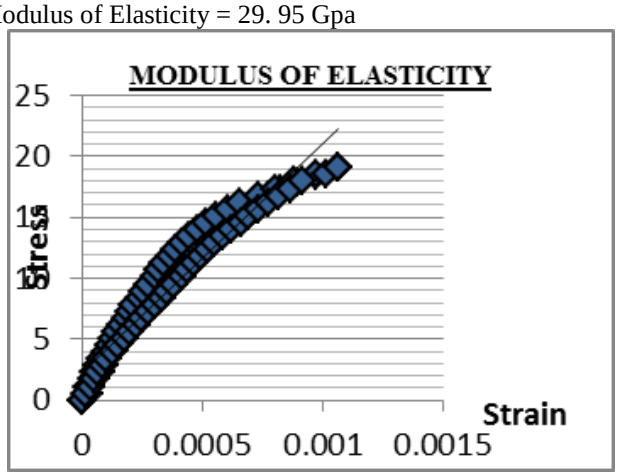
Replacement by 50% of River sand with M Sand
Modulus of Elasticity = 25.57Gpa



Replacement by 75% of M San
Modulus of Elasticity = 27. 58 GPa



Modulus of Elasticity = 29. 95 Gpa



Replacement by 100% of M Sand

Conclusions and Discussions

Based on the investigation, the following conclusions are drawn:

- Modulus of elasticity increases with % replacement of natural sand with m sand.
- Linear stress strain behavior is found in all replacements.
- It is also observed that the load carrying capacity also increases with the increase with percentage of m sand.
- Use of msand in concrete can save the environment from degradation and produce a 'greener' Concrete for construction.

This research concludes that m sand can be used as Construction material.

References

1. Priyanka A. Jadhav, Dilip K Kulkarni (2012) "An experimental investigation on the properties of concrete containing manufactured sand", International Journal of Advanced Engineering Technology,Volume III, Issue II, April-June, E-ISSN 0976-3945
2. Dr.S.Elavenil, B. Vijaya, (2013)" Manufactured sand, a solution an alternative to river sand in concrete manufacturing",*Journal of Engineering, Computers & Applied Sciences (JEC&AS) Volume 2, No.2, ,February 2013, ISSN No: 2319-5606*
3. Nimitha. Vijayaraghavan, Dr. A.S. Wayal(2013) "Effect of ManufacturedSand on Durability Properties of Concrete",American Journal of Engineering Research (AJER), Volume-02, Issue-12, pp-437-440, p-ISSN : 2320-0936.
4. Prof. B.V. Venkatarama Reddy (2012) "Suitability of manufactured sand (M-sand) as fine aggregate in mortars and concrete, CSIC project: CP 6597/0505/11-330 dated 5th july 2011.
5. Kulkarni D., and Jadhav P., (2009), Role of manufactured sand on the strength properties of concrete, New Building Materials & Construction World (NBM & CW), pp 202-206.
6. P.M.Shanmugavadivu and R.Malathy (2011)"Durability Properties of Concrete with Natural sand and Manufactured sand" International Conference on Science and Engineering
7. M. G. Shaikh and S. A. Daimi (2011) "Durability studies of concrete made by using artificial sand with dust and natural sand" International Journal of Earth Sciences and Engineering Volume 04, pp 823-825
8. Praveen Kumar K, Radhakrishna (2015) "strength and workability of cement mortar with manufactured sand "International Journal of Research in Engineering and Technology eISSN: 2319-1163 | pISSN: 2321-7308
9. Yajurved Reddy M ,D.V. Swetha ,S. K. Dhani (2015) "study on properties of concrete with manufactured sand as replacement to natural sand" . International Journal of Civil Engineering and Technology (IJCIET) Volume 6, Issue 8, Aug 2015, pp. 29-42, Article ID: IJCIET-06-08-004
10. Christina Mary V. and Kishore CH(2015) experimental investigation on strength and durability characteristics of high performance concrete using ggbs and msand arpn Journal of Engineering and Applied Sciences VOL. 10, NO. 11, JUNE 2015 ISSN 1819-6608