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EFFECT OF STEEL FIBRES ON CONCRETE WITH M-SAND AS A REPLACEMENT OF NATURAL SAND

SHUBHAM ROY[1], SHIVAM GUPTA[2], AMBER YADAV[3], SHEKHAR SUMAN[4]

[1,2,3,4] (DEPARTMENT OF CIVIL ENGINEERING, NIET, UTTAR PRADESH, INDIA)

ABSTRACT

This paper describes the experimental study of fibre reinforced concrete with manufacturing sand (M-Sand) in addition of crimped steel fibres. Normally a huge quantity of concrete is required for the construction but we know that concrete is weak in tension and strong in compression and the fine aggregate that normally used for concrete is natural river sand but our aim is to replace the natural sand by artificial sand (manufactured sand) and to increase the compressive and tensile strength of the concrete by addition of steel fibre .To over-come the difficulties due to excessive sand mining, M-Sand is used as fine aggregate. M-Sand is uniformly in size, produced from gravel crushers.The main objective of this research is to investigate the effect of steel fibres on concrete manufactured by M-sand as fine aggregate and develop a high performance concrete. It is proposed to determine and compare compressive strength and tensile strength of the concrete grades M25 & M30 having different percentage of steel fibre (0%, 1%, 1.5% & 2%).The chemical admixtures is used to increase the workability of concrete. The investigation is carried out on a total no of 96 specimen by conducting compressive strength test and split tensile test.

KEYWORDS: Steel *fiber, M-sand, compression test and split tensile test.*

1. INTRODUCTION

Concrete generally uses natural sand as fine aggregate due this more amount of river sand is consumed for the construction this leads to depletion of natural resources in order to overcome such situation we planned to use M sand as fine aggregate m sand are nothing but cursed stone at the required gradation in order to attain its uniformity of gradation due to its uniformity the achieve the higher gradation level that means these falls at Zone 2 and these due to not have any impurities such like that natural sand due to the deposition of the clay and slit due to the low tensile strength of concrete its necessary to increase the strength by addition of reinforcement but this may increase the cost but by addition of steel fibre we can increase the strength at low cost. The micro cracks that are developed are arrested by this addition of steel fibre tensile strength is due to the propagation of such micro cracks, eventually leading to brittle fracture of the concrete. It has been recognized that the addition of small, closely spaced and uniformly dispersed fibres to the concrete would act as crack arrester and would substantially improve its Compressive and tensile strength. Fibre reinforced concrete (FRC) is concrete

containing fibrous material which increases its structural integrity. So we can define fibre reinforced concrete as a composite material of cement concrete or mortar and discontinuous discrete and uniformly dispersed fibre.

1.1Steel fiber

Steel fibers are normally added to concrete in low volume doses (regularly under 1%), and have been appeared to be successful in decreasing plastic shrinkage breaking. Steel fibers normally don't altogether adjust free shrinkage of cement, however at sufficiently high measurements they can expand the protection from splitting and diminishing break width. In most of the construction site the steel fibre has widely used and different types of steel fibers variable in the market. In this paper the steel fibre straight has been used. It improves several characterizes and properties of the concrete.

2. LITERATURE REVIEW

Mr. V. GOKULNATH.et al .(2018). In this paper we study about strength obtained by adding river sand and replacement of river sand with M sand in self compaction concrete with addition of steel fibers. The investigation derives the following conclusion. By adding steel fibers to fresh concrete compressive strength increases by resisting cracks and their by increasing the durability. Replacement of river sand with m sand gives a satisfactory strength and can be used as alternate material for river sand.

M.Adams joe et al.(2013) In this paper it is concluded that the M-Sand can be used as a replacement for fine aggregate. It is found that 50% replacement of fine aggregate by M-Sand give maximum result in strength and durability aspects than the conventional concrete. The results proved that the replacement of 50% of fine aggregate by M-Sand induced higher compressive strength, higher split tensile strength, higher flexural strength. Thus the environmental effects, illegal extraction of sand and cost of fine aggregate can be significantly reduced.

Shafeeq Ahmad .et al (2017). The comparison was between normal and FRC-MS (with 1% steel fibers and 50% replacement of natural sand to that of Manufacturing sand) and the test results proved that the inducing of the fibers of crimped steel and natural sand replaced by M-Sand has a greater values on all the aspect of the study made compared to the normal M30 grade design mix concrete.

Dinesh barad .et al. (2017). In this paper the following points are cocluded by them-. The M-sand is the best alternative for fine aggregate to the river sand which fulfil all the technical specification in IS CODES and also M-sand it does not contain any impurities. At 30% replacement of cement with GGBS, M-sand at 60%substitutionand Fibre with 1% replacement in concrete shows the optimum substitution percentage in compression strength. On further increment in percentage of GGBS lower the compression strength of the concrete.

The outcome of the split-tensile strength shows same trend as that of compressive strength, the maximum strength is at mix of30% GGBS. The concrete which is modified with M-sand performs better than conventional concrete.

The flexural test results was at 40% replacement of cement with GGBS , M-sand at 60% and 1% fibre all these combination shows increase in flexural strength. With increase of M-sand percentage decreases the workability. In durability test the compressive strength of acid effected concrete is reduced compared to conventional concrete but with increase in percentage of GGBS the effect of acid on concrete can be decreased. At 30% replacement of cement with GGBS the concrete is more resistant.

Vishal gadgihalli. et al. (2017). In this paper it can be observed that M20 and M30 grade concrete with steel fiber reinforcement admixture can with stand more compressive load that is 22.74 MPa and 30.83 MPa respectively for 28 days compared to normal concrete obtaining 19.71 and 27.72MPa for 28days. This shows great increment of 13.32% and 10.11% in compressive strength by M20 and M30 grade of concrete.

It is also observed that flexural strength development in concrete. Present study reveals that steel fiber reinforced concrete with stands 7.43 and 9.64 MPa comparatively to the normal concrete with standing 5.378 MPa and 8.17 MPa. Hence about 22.20% and 15.20% increment in flexural strength.

Hence by this it's clear that using steel fiber reinforcement admixture enhances the both compressive strength and flexural strength.

Saravanya.R .et al.(2018). Based on the experimental study, the following conclusions are made, The use of M-Sand,Metakaolin and steel fibres for strengthening of RC beams has been studied from the journals for initiating the work. The preliminary investigations were done for basic ingredients of concrete. From the material property results mix proportions arrived for controlled concrete of M30.The results were obtained for the flexural strength of concrete. The ultimate load carrying capacity of controlled concrete beam is found as 115 kN. The ultimate load carrying capacity of RC beam with M-Sand, MK and Steel fibres of aspect ratio 40 is found as 130 KN.

Shivang D Jayswal.et al. (2015). In this paper they have concluded results as following. Addition of crimped steel fibres, resulted insignificant improvement on the strength properties of concrete with M-Sand used as fine aggregate. Compared to plain concrete, the fibre addition resulted in better matrix strengthening and enhanced compressive & tensile properties of concrete. The reinforcing efficiency of fibre addition was dependent on the optimum dosage level of steel fibre up to 1% to 1.5 % of crimped steel fibres since increased fibre addition resulted in loss in workability. Unrestricted failure of plain concrete specimens was restricted with volumetric bulging due to presence of fibres and gradual release of fracture energy was anticipated. The maximum increase in compressive strength (34.09 & 43.46MPa) was observed of concrete grade M-25 & M-30 respectively at 1.5% of crimped steel fibres. In the case of 1.5% crimped steel fibre compressive strength was increased maximum up to 13.48% & 12.47% corresponding to both grade of concrete M-25 & M-30 at 7days

compared to the reference concrete (21.29 & 23.96 MPa) same as increase max compressive strength 8.63% & 12.48 % separately for both mixes with respect to0.0M-25 0.0M-30 at 28 days. Compressive strength was decreased of both concrete grade in the case of 2% steel fibre were used. Tensile strength is continuously increased with increasing the percentage of steel fibre and maximum tensile strength was achieved in the case of 2% steel fibre for both grade of concrete M-25 and M-30. These was occurred due to ultimately we provide the reinforcement to the concrete. A maximum split tensile strength of 3.723 & 4.329 MPa was observed with 2% steel fibre concrete(28 days) at maximum volume fraction of steel fibre which was compared to reference concrete and the roles of fibres in delaying the crack formation with subsequent increase in strength were realized. The compressive and split tensile strength for all mix proportions of fibre content showed a favourable improvement in the strength properties. due to crack arresting mechanism of fibres at different scales of cracking. Interaction of steel fibres with concrete were realized in fibre reinforced concrete which provided a maximum crack tie together and stress transfer mechanism to yield a superior performance.

K.Saravanan. et al. (2015). From the study it is seen that manufactured sand is the suitable alternative for the natural river sand in the concrete. The compressive strength and split tensile strength of the concrete increase simultaneously on the addition of steel fibre than the conventional concrete. On addition of 3% of crimpled shaped fibre the maximum compressive strength of 46.7 N/mm2 is achieved thus increase in compressive strength is 28.2% than the conventional concrete. The increase in split tensile strength is 16.81% than the conventional concrete. Thus we concluded that the optimum dosage of crimpled shape steel fibre that can be added in concrete is 3%. While in addition of cranked shaped steel fibre the maximum compressive strength of 39.7 N/mm2 is observed at 2% of addition of fibre and increase in compressive strength is 7.8% than the conventional concrete. Further addition of steel fiber tends to reduce the workability and compressive strength of concrete. The increase in split tensile strength is 13.86% than the conventional concrete at 2% addition of cranked shaped fibre. Thus the optimum dosage of cranked shaped fibre is 2% and we concluded that crimple shaped fibre is efficient than the cranked because it increase the strength by 14.84% than the cranked.

3. CONCLUSION

In this paper we study about strength obtained by natural sand and replacement of natural sand with M sand in concrete with addition of steel fibers. The investigation derives the following conclusion. By adding steel fibers to fresh concrete compressive strength increases by resisting cracks and their by increasing the durability. Replacement of river sand with m sand gives a satisfactory strength and can be used as alternate material for river sand. Using steel fiber reinforcement admixture enhances the both compressive strength and flexural strength.

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