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AN INVESTIGATION ON STRENGTH PARAMETERS OF LIGHT WEIGHT CONCRETE USING FOUNDRY AND MANUFACTURED SAND REPLACING FINE AGGREGATE

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ABSTRACT

Light weight Concrete or formed concrete is a versatile material which consist primarily of a cement based mortar mix with 20 % of volume air. Lightweight concrete will be outlined as a kind of concrete which has associate increasing agent in this it will increase the quantity of the mixture whereas giving extra qualities such as nailbility and lessened the dead weight. It is lighter than the conventional concrete. An Investigation on strength parameters on light weight concrete using foundry and manufactured sand replacing fine aggregate

Manufactured sand differs from natural sea and river dredged sand in its physical and mineralogical properties. These will be each helpful and prejudicial to the recent and hardened properties of concrete. This paper presents the results of a laboratory study in which manufactured sand & Waste Foundry Sand produced in an industry & Industry waste sized crushing plant was characterized with respect to its physical and mineralogical properties. The influence of these characteristics on concrete work ability and strength, when manufactured sand completely replaced natural sand in concrete

Keywords: Light Weight Concrete, Manufactured Sand, Waste Foundry Sand, Conventional Concrete & Compressive & Flexural Strength.

I. INTRODUCTION

The main specialties of light-weight concrete area unit its denseness and thermal conduction. Its blessings area unit that there's a discount of burden, quicker building rates in construction and lower haul and handling prices. light-weight concrete maintains its massive voids and not forming laitance layers or cement films once placed on the wall. This analysis was supported the performance of light-weight concrete. However, sufficient water cement ratio is vital to produce adequate cohesion between cement and water. Insufficient water can cause lack of cohesion between particles, thus loss in strength of concrete. Likewise too much water can cause cement to run off aggregate to form laitance layers, subsequently weakens in strength. Construction and has an economical advantage foundry as a waste for disposal called Waste manufactory sand. In India, associate calculable two million plenty of waste manufactory sand is created each year. Use of waste manufactory sand as a partial or total replacement for fine mixture in concrete leads in production of economic, lightweight weight and high strength concrete. Concrete may be a material that consists of coarse mixture, fine mixture, cement, admixtures and water these every material in concrete contributes its strength. So, by partial or proportion substitution of fabric affects totally different properties of concrete. By mistreatment such waste that harms the surroundings will be used for the event of low value and eco-friendly building materials.. In this study an experimental investigation is carried out by varying percentage of fine aggregate with used foundry sand to produce low cost and eco-friendly concrete.

Manufactured sand is an alternate for river sand because of quick growing industry, the demand for sand has magnified enormously, inflicting deficiency of appropriate watercourse sand in most a part of the word. because of the depletion of fine quality watercourse sand for the employment of construction, the employment of factory-made sand has been magnified. another excuse to be used of M-Sand is its handiness and transportation value. Since factory-made sand will be crushed from onerous granite rocks, it will be promptly obtainable at the near place, reducing the price of transportation from far watercourse sand bed. Thus, the price of construction will be controlled by the employment of factory-made sand as an alternate material for construction. The other advantage of using M-Sand is, it can be dust free, the sizes of m-sand can be controlled easily so that it meets the required grading for the given construction.

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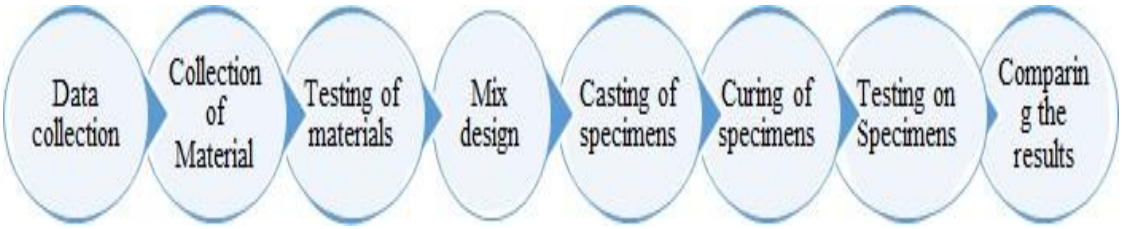
OBJECTIVES

- To find out the properties of replacement of M Sand & W.F. Sand with Fine Aggregate in light weight concrete.
- To prepare the mix design of light weight concrete using M Sand & W.F. Sand.
- To know the recommendable percentage of replacement of fine aggregate with M Sand & W.F. Sand to achieve a concrete of standard strength.
- To compare light weight concrete using M Sand & W.F. Sand with conventional concrete.
- To investigate the strength parameters (Compressive Strength and Flexural Test)

II. GAP FINDING

- M. Sand and WFS are not used in the making of light Weight concrete.
- M. Sand and WFS is not used in conventional concrete.
- For light weight concrete M-25 grade isn't the grade of research.
- M. Sand and WFS are not used as replacement material at a once.

III. METHODOLOGY



IV. MATERIAL PROPERTIES

- Cement – In this Project, the cement used as OPC 53 grade cement available from Ultra-Tech Cement Company & A cement is a binder, a substance used for construction that sets, hardens, and adheres to other materials to bind them together.

Name Of Testing	Result
1. Fineness modulus	7 %
2. Consistency test	32%
3. Initial and final setting time	in & 290 min

- Fine Aggregate - Aggregates for the concrete were obtained from approved suppliers conforming to the specifications of IS 383:1970 and were chemically inactive (inert), spotless and robust. The fine aggregate was tested as per the limits which is specified in IS: 2386 (Part-3):1963.

Name Of Testing	Result
1.Fineness modulus	2.52
2. Specific gravity	2.59
3.Silt Content	2%

- Coarse Aggregate - Course aggregates will be machine-crushed done of black trap or equivalent black tough stone and shall be stiff, robust, dense, durable, spotless or procured from quarries approved by the consultant.

Name Of Testing	Result
1.Fineness modulus	2.84
2. Specific gravity	2.78

- Manufactured Sand - Manufactured sand (M-Sand) is artificial sand produced from crushing hard stones into small sand sized angular shaped particles, washed and finely graded to be used as construction aggregate.

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Name Of Testing	Result
1. Fineness modulus	2.71
2. Specific gravity	2.56
3.Silt Content	2.4%

- Waste Foundry Sand - Foundry sand is one of such waste material produced from foundry industries speeded all over the country.

Name Of Testing	Result
1. Fineness modulus	2.96
2. Specific gravity	2.42
3.Silt Content	1%

- Foaming agent –

Aquatek – FOAM CON is a unique foam agent to produce lightweight concrete which is use as a roof insulation materials and for product of light weight precast block, the density varying between 320 – 2080 kg/m3 Aquatek–FOAM CON it is specially developed to provide the maximum thermal insulating effect in concrete. Foamed concrete is made from Aquatek–FOAM CON is light in weight does not increase the significantly the dead load on the Structure. It has good, mechanical stability and is excellent shock absorber.

V. MIX DESIGN OF M 25 GRADE

Material	M25Grade
Cement	404 kg/m3
Sand	659.41 kg/m3
Aggregate	1154.81 kg/m3
Water	211.9 lit.
w/c ratio	0.48

VI. RESULTS AND DISCUSSION

- **Compressive Strength**

The test was conducted on the cube specimen of size 150×150×150mm.

% of Mix.	Avg. Compressive Strength (N/MM2)			Avg. Density (KG/M3)
	7 Days	14 Days	28 Days	
Conventional Concrete	16.74	22.67	25.04	2526
5 % Mix (WFS & M – Sand)	13.78	17.33	19.41	2046
10 % Mix (WFS & M – Sand)	12.44	16.30	19.11	1985
15 % Mix (WFS & M – Sand)	12.00	15.85	18.37	1968
20 % Mix (WFS & M – Sand)	11.85	14.22	18.07	1926
25 % Mix (WFS & M – Sand)	11.11	14.52	17.93	1946

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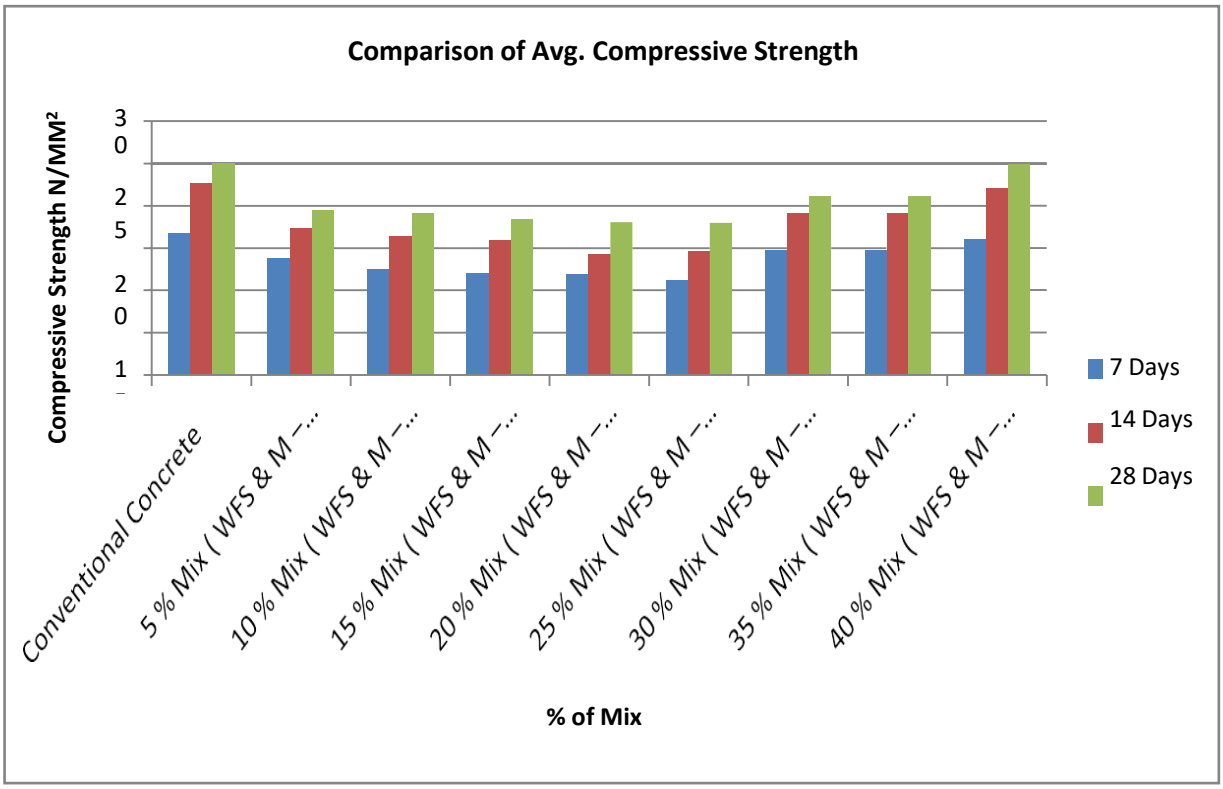
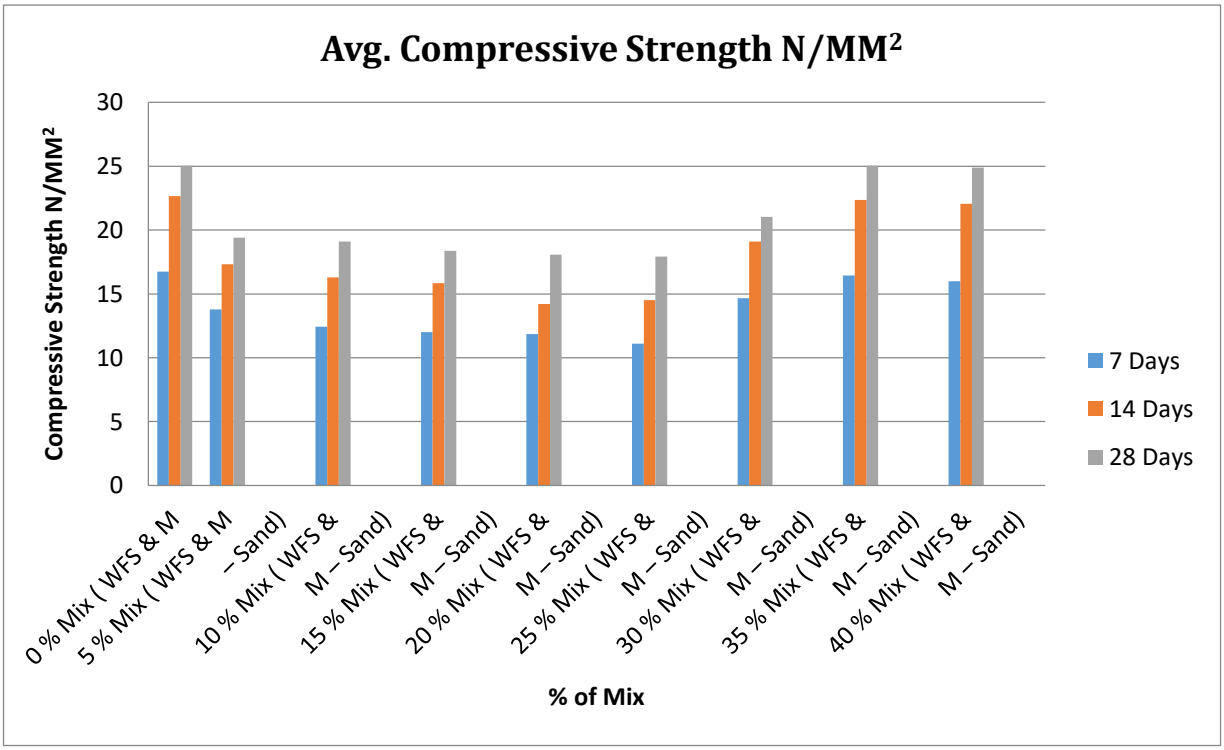
30 % Mix (WFS & M – Sand)	14.67	19.11	21.04	1939
35 % Mix (WFS & M – Sand)	16.44	22.37	25.04	1918
40 % Mix (WFS & M – Sand)	16.00	22.07	24.89	1920





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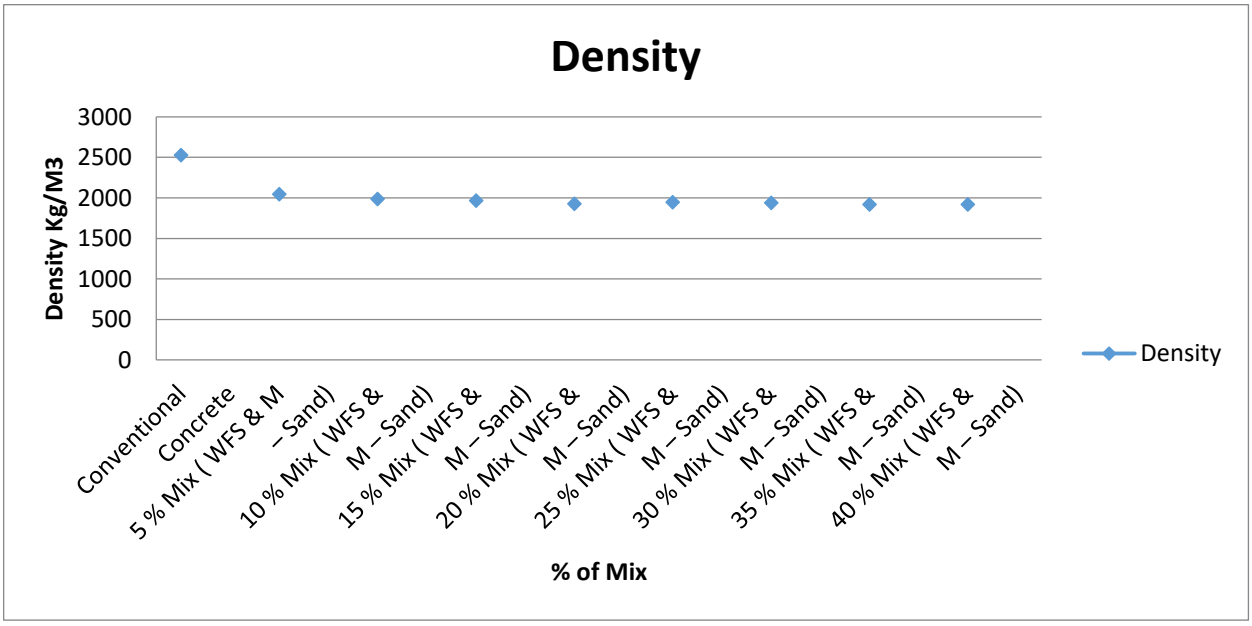
Comparison of Avg. Compressive Strength N/MM²

Observation: From this graph we can conclude that, the compressive strength of M25 Grade concrete for 35 % mix & 40 % Mix proportion found Equal Strength at 7, 14 & 28 days. The strength near about Equal as compare to normal/ Conventional Concrete.



Comparison of Avg. Density N/MM²

Observation: From this graph we can conclude that, the density of M25 Grade concrete for 35 % mix proportion found minimum Concrete Density at 7, 14 & 28 days. The Density decrease near about 26 % as compare to normal/Convectional concrete.

- **Flexural Strength**

% of Mix.	Avg. Flexural Strength (N/MM2)			Avg. Density (KG/M3)
	7 Days	14 Days	28 Days	
Conventional Concrete	2.67	3.14	3.85	2545
5 % Mix (WFS & M – Sand)	2.07	2.43	3.5	2024
10 % Mix (WFS & M – Sand)	1.9	2.31	3.14	2006
15 % Mix (WFS & M – Sand)	1.6	1.84	2.96	1976
20 % Mix (WFS & M – Sand)	1.42	1.66	2.67	1973
25 % Mix (WFS & M – Sand)	1.54	1.84	2.96	1963
30 % Mix (WFS & M – Sand)	1.78	2.19	3.44	1943
35 % Mix (WFS & M – Sand)	1.96	2.55	3.73	1933

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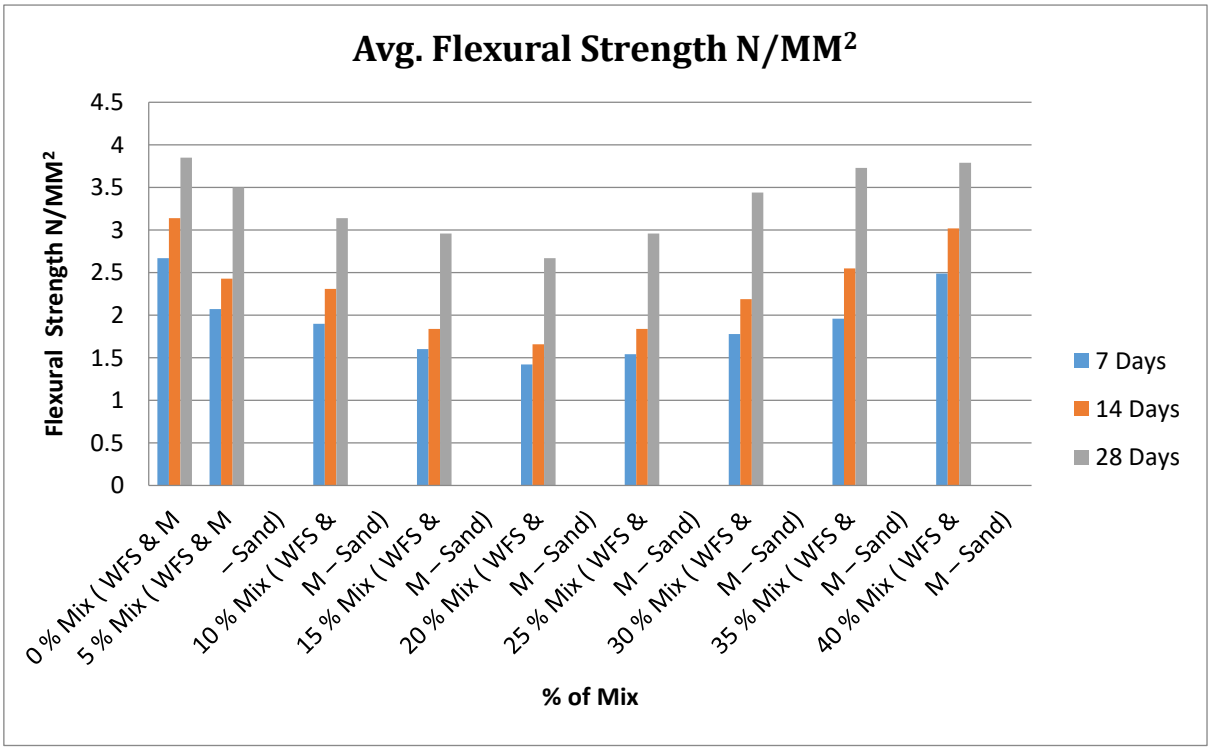
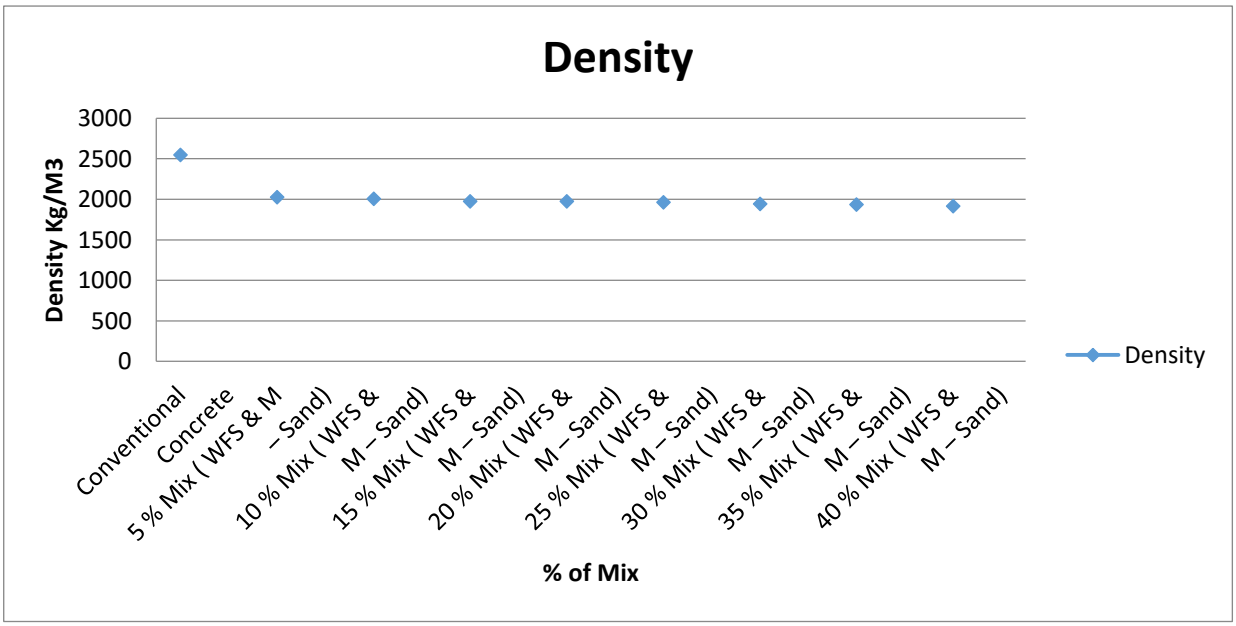
40 % Mix (WFS & M – Sand)	2.49	3.02	3.79	1914



Comparison of Avg. Flexural Strength N/MM²

Observation: From this graph we can conclude that, the Flexural strength of M25 Grade concrete is decrease for 5 to 30 % of Mix and then it is slightly equal to the conventional concrete for 35 % mix & 40 % Mix proportion at 7, 14 & 28 days.



Comparison of Avg. Density N/MM²

Observation: From this graph we can conclude that, the density of M25 Grade concrete for 40 % mix proportion found minimum Concrete Density at 7, 14 & 28 days. The Density decrease near about 25 % as compare to normal/ Convectional concrete.

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VII. CONCLUSION

- Foundry sand and m-sand can be used in Light Weight Concrete to achieve equal strength partial replacement of fine aggregate with waste foundry sand and m-sand is used to improve the strength.
- The 35 % & 40 % of replacement sand with WFS & M – Sand Equal Compressive & Flexural strength in 7, 14 & 28 days of curing. Use of m-sand reduce the damage cause to nature. Environmental effect from waste and disposal problem of waste can be reduced through this research.
- The above studies help to meet the construction Industry strategic goal of environmental study such that Manufactured sand (MS) & Waste Foundry sand can replace natural sand in concrete mix. Using less natural sand leads to a decrease in river dredging and the disruption of river environments.
- Use 30-40% replacement of fine aggregate with Manufactured sand & Waste foundry sand in which compressive & Flexural strength is slightly increased.
- For the above results is noted that concrete made with Manufactured sand & Waste foundry sand can be suitably used in making structural grade concrete.
- The compressive & Flexural strength is near about equal in 7, 14 & 28-day curing respectively for 35 % Mix & 40 % of Mix than conventional concrete & also decrease the density of concrete as per the conventional concrete.

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