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STRENGTH CHARECTERISTICS OF CONCRETE BY REPLACING NATURAL SAND BY M-SAND FOR M20 AND M30 GRADE CONCRETE

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Abstract:- The most widely used material in this world is concrete. After water, concrete is placed in second position. The use of natural sand in conventional concrete has become of vital importance which is scarce to obtain. Sand is basic concrete making construction material required in large quantities. Manufactured sand is one among such materials to replace river sand which can be used as an alternative fine aggregate in mortars and concrete. In general concrete is a combination of cement, fine and course aggregate. These days, natural river sand is difficult to acquire and extraction of sand from river has represented an awesome threat to environment. In addition, government has connected limitation on extraction of sand from riverbed. Subsequently, insufficiency of natural river sand and increase in demand contemplate research seek towards alternate fine aggregate. This seek turns the research intention towards effective utilization of Manufactured sand (M-sand) for commercial purpose.

An attempt had been made in the present investigation to discuss the properties of concrete such as workability, strength and durability of concrete which is prepared by replacing natural sand with M-sand at different replacement levels (0%, 10%, 20%, 30%, 40% and 50%) for M25 and M30 Grade of concrete. Durability of the concrete is also tested by immersing the cubes in 5% hydrochloric acid, 5%sodium hydroxide, 5% of sodium sulphate (Na2SO4) and 5% of magnesium sulphate (MgSO4).

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I INTRODUCTION

Concrete has been around for a long time, the main known utilization of a material taking after concrete was by the Minoan progress around 2000 BC. Amid the beginning times of the Roman Empire around 300 BC the Romans found that blending a sandy volcanic ash with lime mortar made a hard water obstruction substance which we presently know as concrete. The overwhelming sort of cement utilized in present day concrete is Portland cement, different kinds of cement accessible incorporate; Blended cement, which is like Portland cement however may contain materials, for example, fly fiery remains slag or silica seethe; High early quality bonds, which as the name recommends picks up quality a great deal faster then Portland or mixed cement; Low warmth bonds, utilized when limits are put on the warmth of hydration of the concrete; Shrinkage constrained cements; Colored cements ; Masonry cement.

Manufactured sands are made by pulverizing aggregates to a size suitable for use as a fine aggregates (<2.36mm). The devastating procedure anyway creates a lot of materials <75microns and also making the fabricated sand have an unpredictable molecule shape. These fine particles and sporadic state of the total effectsly affect the usefulness and complete of the concrete. These negative impacts have given fabricated sands a poor notoriety in the development industry. Anyway ongoing investigations demonstrate that these fine particles might have the capacity to be used to expand the compressive and flexural properties of concrete.

Objectives of the study

1. Determine the workability, the overall strength, and the rate of strength pick up for differing water bond proportions of cement containing made sand.
2. Compare the consequences of the fabricated sand cement to an ordinary mix containing common sand.
3. From the information gathered in the past target pick a water bond proportion with poor usefulness and decide the required measure of superplasticiser to accomplish a decent functionality.
4. Also decide the overall strength , and also the rate of quality pick up of the solid after the expansion of a super-plasticiser

5. Determine compressive strength, split and flexural strength and Durability of cement containing produced sand.

II LITERATURE REVIEW

Evertsson (2000) reported that information picked up from research ought to be utilized by quarry administrators to streamline the execution of their gear and to accomplish bring down amounts of quarry fines.

Jeffrey et al (2003) discovered that the age of quarry fines is because of the extraction and handling tasks in a quarry. There are a few parameters that impact the creation of fines, which are important to the stone qualities and the included procedures. Be that as it may, cautious outline and advancement of extraction and preparing could limit the fines generation.

Petavratzi (2006) researched that the huge measure of residue part underneath 75 m created from different metals and found that the distinctive sorts of shake delivered diverse measures of fines with various physical properties.

III MATERIALS AND METHODOLOGY

Cement

The raw materials required for make of Portland cementare calcareous materials, for example, limestone or chalk, and argillaceous material, for example, shale or clay. There are two procedures known as wet and dry procedures relying on whether the blending and crushing of crude materials is done in wet or dry condition.

Aggregates

Aggregates are the main constituents in concrete. They offer body to the concrete, diminish shrinkage and impact economy. Aggregates are inactive granular materials, for example, sand, rock or smashed stone that are a final result in their own crude materials. They are additionally the crude materials that are a fundamental fixing in concrete.

Aggregates are divided into two categories from the consideration of size.

i).Coarse aggregate ii) Fine aggregate

Coarse aggregates

Coarse aggregates are particles more note less that 4.75mm however for the most part run between 9.5mm to 37.5mm in measurement. They can either be from essential, auxiliary or reused sources. Essential or virgin aggregates are either land or marine-won. Rock is a coarse marine-won total, arrive won coarse aggregates incorporate rock and smashed shake. Rock constitute the dominant part of coarse aggregate utilized in concrete with pulverized stone making up the greater part of the rest of.

Fine aggregate

Fine aggregates are fundamentally sands won from the land or the marine condition. Fine aggregates by and large comprise of normal sand or smashed stone with most particles going through a 4.75mm sieve.

Water

Water is a vital element of concrete as it effectively takes an interest in the compound response with bond. Since it shapes the strengthen giving concrete gel, in the amount and nature of water is required to be investigated deliberately. C3S requires 24% of water by weight and C2S requires 21%. It has additionally been evaluated that on a normal 23% of water by weight of bond is required for substance response with Portland concrete intensifies .This 23% of water synthetically joins with bond and, consequently, it is called bound water. It has been additionally evaluated that 15% by weight of concrete is required to top off the gel-pores.

Manufactured sand

Made sand (M-Sand) is a substitute of stream sand for concrete development. Manufactured sand is delivered from hard rock stone by pulverizing.

The Manufactured sand is of cubical shape with grounded edges, washed and reviewed to as a development material. The span of produced sand (M-Sand) is under 4.75mm.

M sand is an option for stream sand. Because of quickly developing development industry, the interest for sand has expanded enormously, causing lack of reasonable waterway sand in most piece of the word.

Superplasticizers

Superplasticizers constitute a generally new classification and enhanced variant of plasticizer, the utilization of which was created in Japan and Germany amid 1960 and 1970 separately. They are artificially unique in relation to typical plasticizers. Utilization of superplasticizers allows the decrease of water to the degree upto 30% without lessening usefulness as opposed to the conceivable decrease up to 15% if there should be an occurrence of plasticizers.

Mix Design of Concrete

Final mix for M25 grade concrete is 1:2.30:3.58 at w/c of 0.60.

Final trial mix for M30 grade concrete is 1:1.86:2.89 at w/c of 0.50.

IV EXPERIMENTAL INVESTIGATION

Casting of cubes and cylinders

Throwing of concrete shapes and barrels as improved the situation M25 and M30 review concrete, the blend extent is for which we are cubes, cylinders and prisms for ordinary cement, with the incomplete substitution.

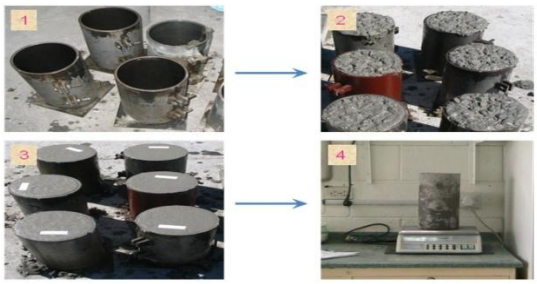
Filling the mould (for 150 mm cube 3 equal layers)

Compacting with compacting bar

150 mm molds ought to be filled in three around break even with layers (50 mm profound). A compacting bar is accommodated compacting the solid. It is a 380 mm long steel bar, weighs 1.8 kg and has a 25 mm square end for smashing. Amid the compaction of each layer with the compacting bar, the strokes ought to be disseminated in a uniform way finished the surface of the solid and each layer ought to be compacted to its full profundity.

Compacting the concrete in the cube mould (For 150 mm cube at least 35 tamps per layer)

Finishing



Cylindrical moulds

Curing

The solid samples were restored utilizing six unique procedures until when their compressive strengths were resolved at ages 7, 28 days and 56 days.

Curing of cubes and cylinders

Tests to be conducted on concrete

Tests to be conducted on fresh concrete

1. Slump cone test
2. Compaction factor test

Tests to be conducted on Hardened concrete

1. Compressive strength of concrete
2. Split tensile strength of concrete
3. Flexural strength of concrete
4. Durability of concrete

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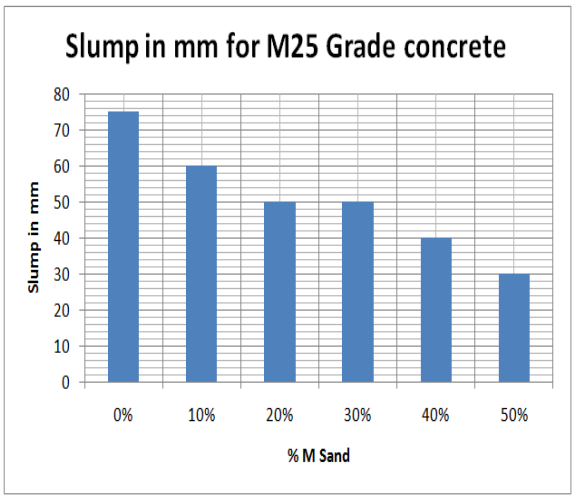
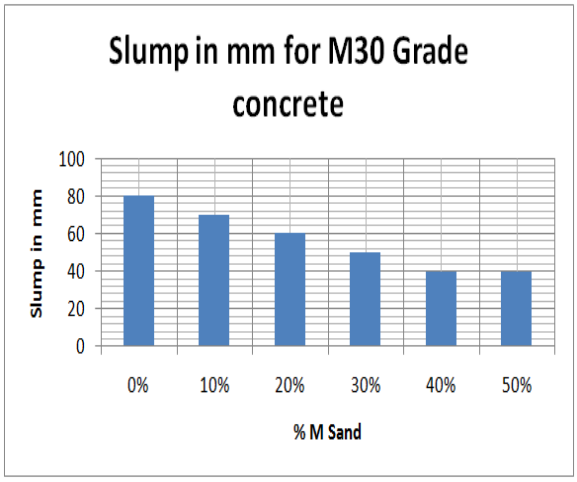
V RESULTS AND ANALYSIS

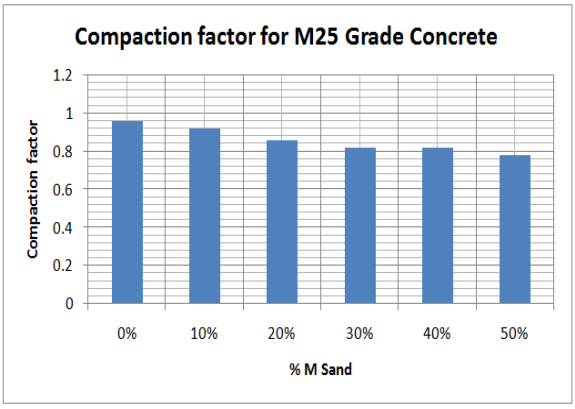
Slump cone test for M25 Grade concrete



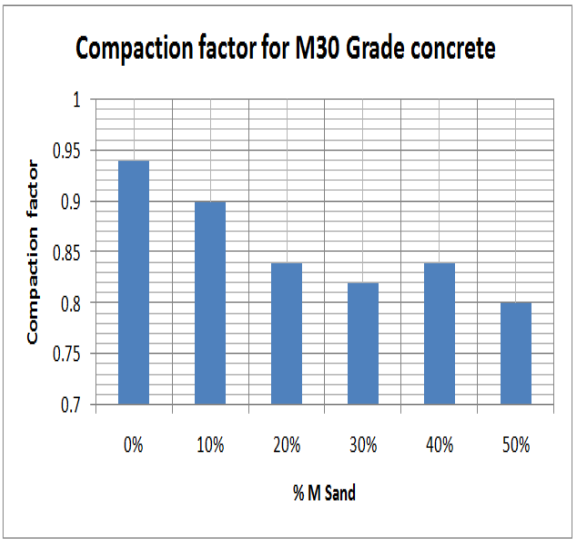
Slump cone test for M25 Grade concrete



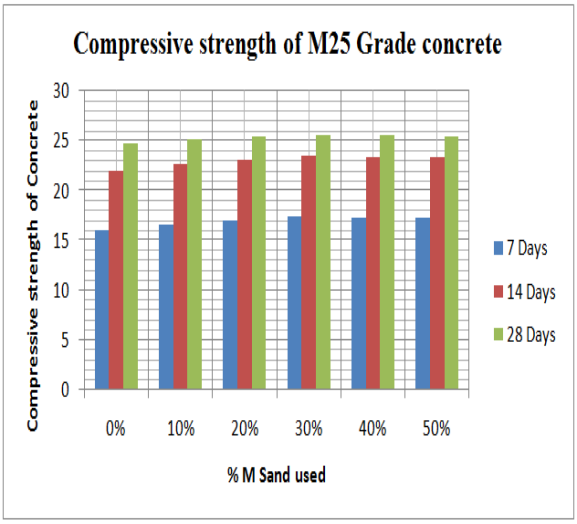
Compaction factor test for M25 Grade concrete



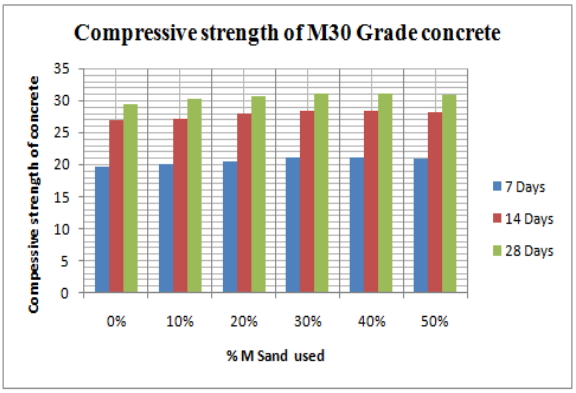
Compaction factor test for M30 Grade concrete



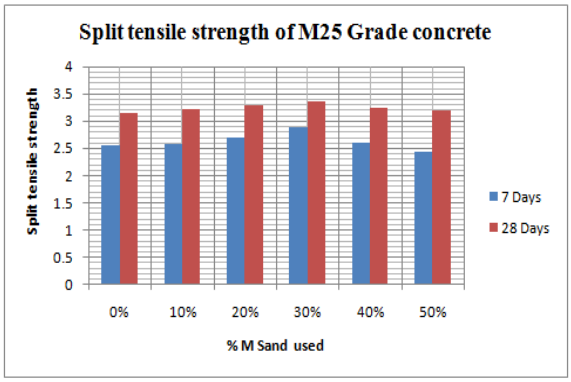
Compressive strength of M25 Grade concrete



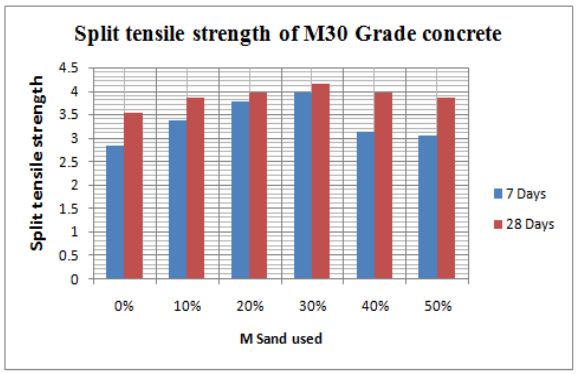
Compressive strength of M30 Grade concrete



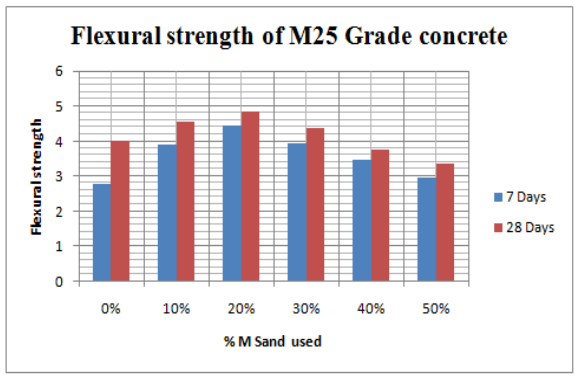
Split tensile strength of M25 Grade concrete



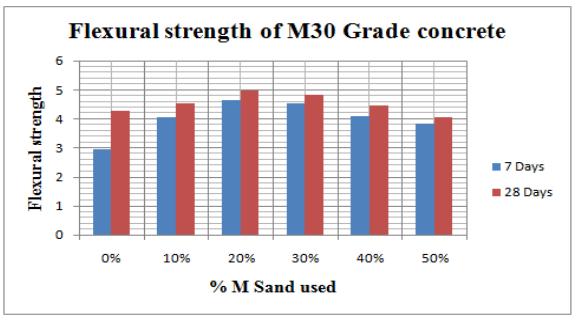
Split tensile strength of M30 Grade concrete



Flexural strength of M25 Grade concrete



Flexural strength of M30 Grade concrete

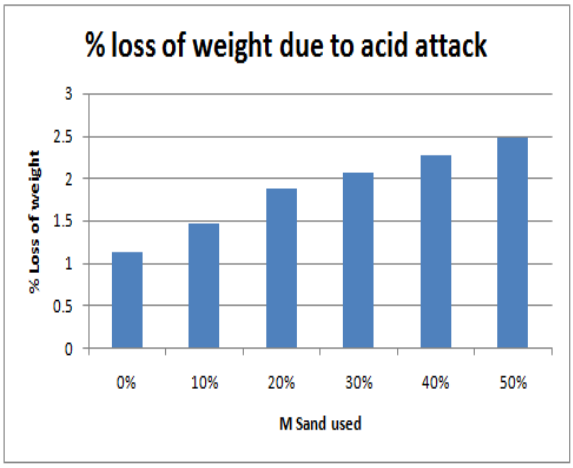


Durability of Concrete

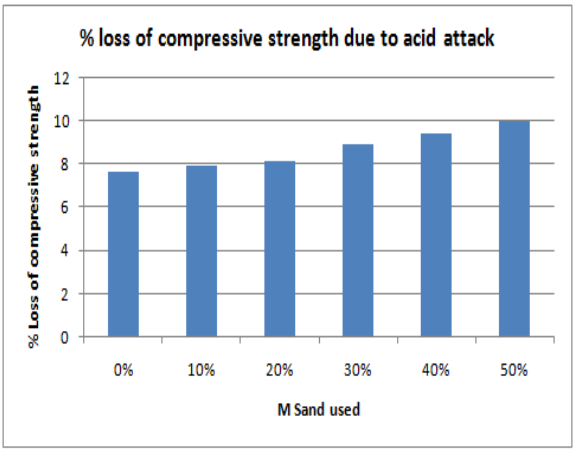
For M25 Grade concrete

Acid attack

Percentage Loss weight

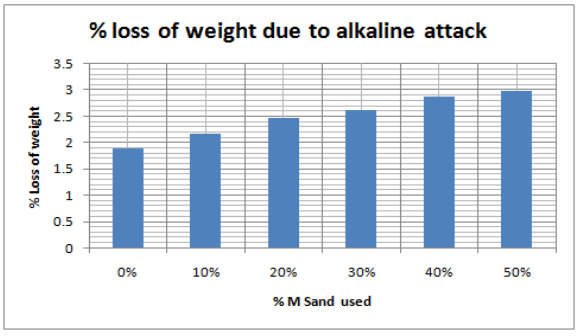


Percentage Loss of Compressive strength

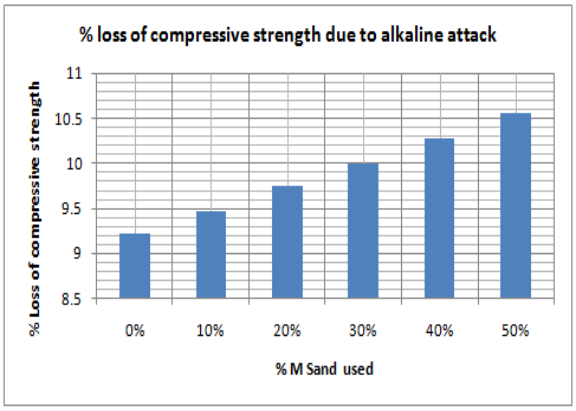


Alkaline attack

Percentage Loss weight

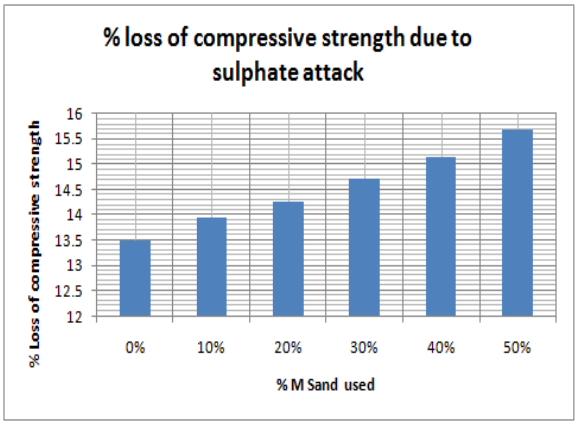


Percentage Loss of Compressive strength



Sulphate attack

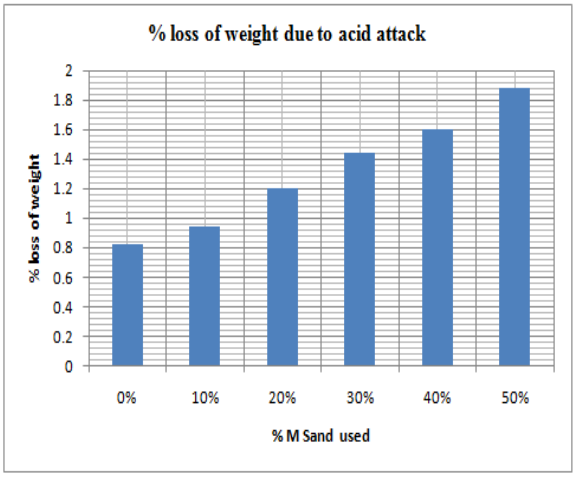
Percentage Loss of Compressive strength



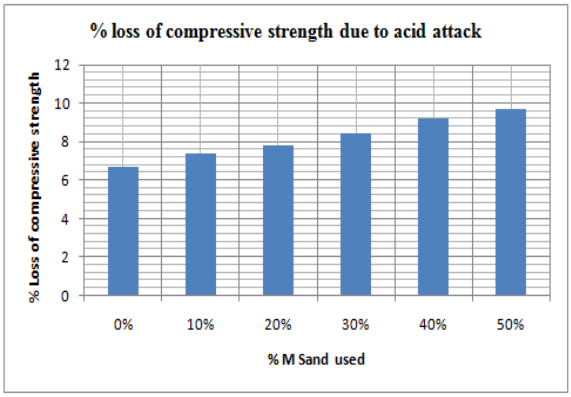
For M30 Grade concrete

Acid attack

Percentage Loss weight

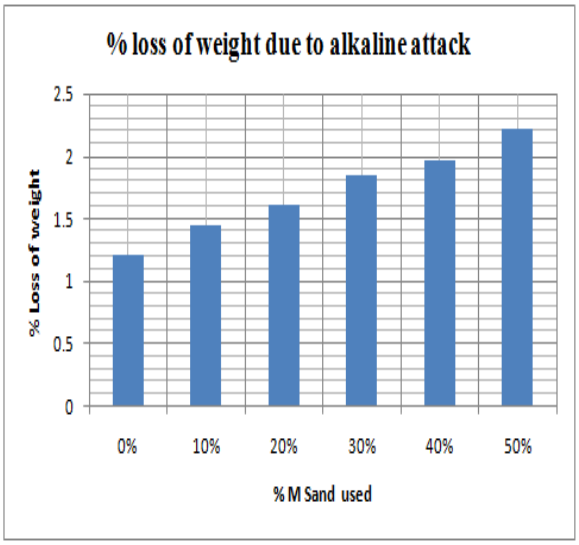


Percentage Loss of Compressive strength

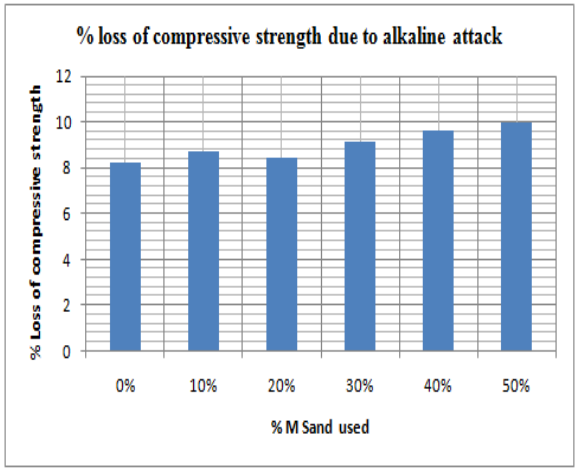


Alkaline attack

Percentage Loss weight

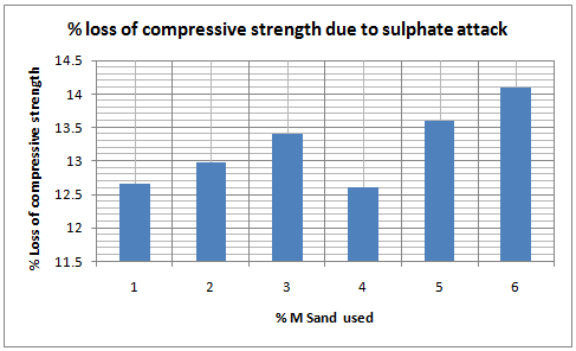


Percentage Loss of Compressive strength



Sulphate attack

Percentage Loss of Compressive strength



VI CONCLUSIONS

From the above study the following conclusions were made

1. The value of slump for the concrete decreases with increasing the percentage of M Sand for both M25 and M30 Grade concrete. The value of compaction factor for the concrete decreases with increasing the percentage of M Sand for both M25 and M30 Grade concrete.
2. Compressive strength for 7days, 14days, 28days for the concrete increases initially up to 30% M Sand than decreases with increasing the percentage of M Sand. The optimum value for the compressive strength was obtained at 30% M Sand.
3. Split tensile strength and flexural strength for 7days, and 28days for the concrete increases initially up to 30% M Sand than decreases with increasing the percentage of M Sand. The optimum value for the compressive strength was obtained at 30% M Sand.
4. The addition of M-sand significantly increased the compressive, tensile and flexural strengths of concrete with maximum strengths in each case being achieved at 30% M-sand.
5. The percentage loss of weight and percentage loss of compressive strength is increases with in increasing the percentages in all cases in durability studies in M Sand concrete. So, the concrete is durable up to 30% replacement.

So the replacement of 30% of M Sand is generally useful for better strength values in M25 and M30 grade of concrete.

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