An Experimental Study on Partial Replacement of Coarse Aggregat by Using Pebble Stone in Concrete

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ABSTRACT

This study is an experimental on the coarse aggregate element in concrete comprises 60%-75% of the total volume. In this experimental study the coarse aggregate was replaced by pebble stone in the range of 0%,10%, 20%, and 30%. This mix design of concrete for M30 grade is done. The partially replacement of coarse aggregate by pebble stone the strength parameters of concrete have been studied. The physical, mechanical and durability properties of concrete.

keyword:M30 Grade, Pebble stone, compressive strength, split tensile strength.

INTRODUCTION

General

Concrete is nothing but the mixture of cement, fine aggregate, coarse aggregate, water with required proportion. Pebble stone have long served as essential components in various construction and landscaping projects revered for their aesthetic structural support and drainage properties.

OBJECTIVE

Evaluate the fresh and hardened properties of concrete mixes containing varying percentages of pebble stone as a partial replacement for coarse aggregate. This includes assessing workability, compressive strength, flexural strength, and other relevant mechanical properties.

SCOPE

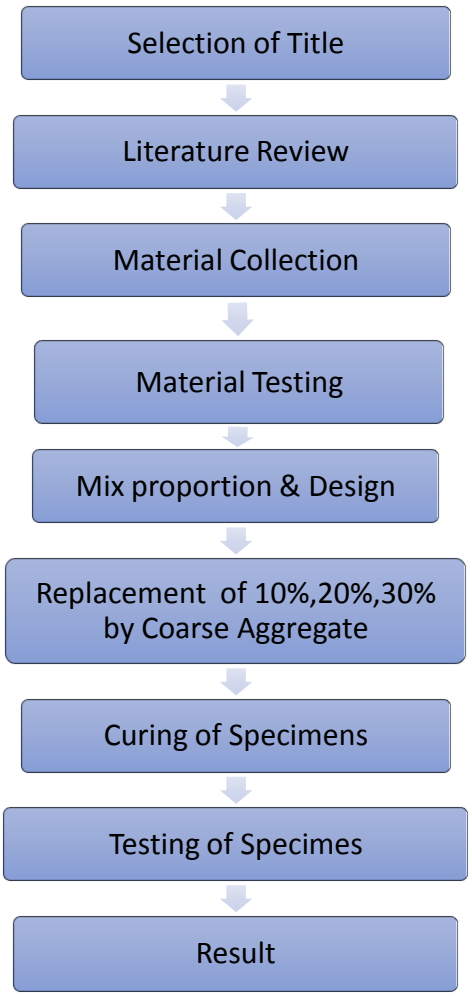
The scope of this project is consumption of coarse aggregate can be reduced significantly if Pebble stone is used as a partial replacement without compromising performance characteristics of concrete including durability. This may include replacement levels ranging from 10% to 30% by volume or weight.

ADVANTAGES

Itleadstoconsiderablereductionin coarse aggregate consumption.
Itgiveshighcompressivestrength and highflexuralstrength.
Itreducesthepermeabilityofconcretetoc hlorideandwaterintrusion considerably.

It is themosteco-friendly reducing carbon footprint associated with transportation andreducethepollution

METHODOLOGY



MATERIALS CHARACTERISTICS

Cement

Cement is a fine, soft powder used as a binder because it hardens after contact with water. It is produced from a mixture of limestone and clay. OPC cement are using 53 grade cement for concrete

M Sand

The full form of M sand is Manufactured Sand. This is an artificial type of sand formed by crushing rocks or granite. It is used as a substitute of river sand. M-sand can be used for construction of walls with a cement to sand ratio of 1:3.

Coarse aggregate

Coarse aggregates are a constructioncomponent made of rock quarried from ground deposits. The usual range employed is between 9.5mm and 37.5mm in diameter Typically the most common size of aggregate used in construction is 20mm.

PEBBLE STONE

Pebble stones are small, rounded rocks typically found near bodies of water such as rivers, beaches, or lakes. They come in various shapes, sizes, and colors, depending on the geological composition of the area where they are formed. People often use pebble stones for decorative purposes in landscaping, garden paths, or as a surface for driveways. Additionally, they are sometimes used in crafts or as part of aquarium or terrarium setups. The smooth, rounded texture of pebbles makes them pleasant to touch and visually appealing, adding a natural element to outdoor and indoor spaces.

Water

Water is the key ingredient, which when mixed with cement, forms a paste that binds the aggregate together.The water causes the hardening of concrete through a process called hydration.

CHARACTERISTICSOF MATERIALS

Cement

Characteristics	Value specified by IS
Specific Gravity	3.16
Consistency (%)	33%
Initial Setting Time	30 (minutes)
Final Setting Time	600 (minutes)

M Sand

Characteristics	Value specified by IS
Bulk density	1.75 Kg/m³
Fineness modulus	4.66
Specific gravity	2.67

Coarse Aggregate

Characteristics	Value specified by IS
Size	20mm
Shape	Angular
Specific Gravity	2.74

Pebble Stone

Characteristics	Value
Colour	Grey, brown, white, red
Size	20mm
Shape	Angular, smooth
SpecificGravity	2.74

TESTING

COMPRESSIVESTRENGTHFOR PEBBLE STONE

Compressive strength after 7 days for cube

S. No	MixDescription	Compressive strength(N/mm^2)	Average Compressive
1	ConventionalMix	15.11 17.88	16.3
2	10%	15.8 18.77	17.23
3	20%	20.56 17.83	19.195
4	30%	17.6 18.9	18.25

Compressive strength after 14 days for cube

S. No	MixDescription	Compressivestrength	Average
1	ConventionalMix	26.9 25.4	32.15

2	10%	30.4 31.7	32.05
3	20%	35.4 33.2	34.5
4	30%	31.78 33.8	32.65

SPLIT TENSILE STRENGTH FOR PEBBLE STONE

Splittensilestrengthofcylinderfor7days

S. No	MixDescription	Split tensilestrength	Average
1	ConventionalMix	1.3 1.9	1.6
2	10%	1.4 1.95	1.67
3	20%	2.2 1.8	1.9
4	30%	1.7 1.9	1.8

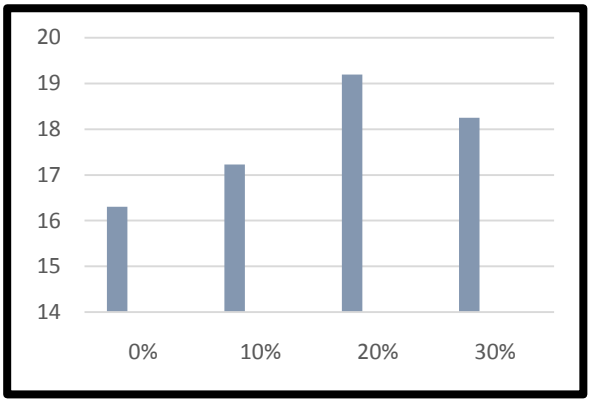
Splittensilestrengthofcylinderfor14 days

S. No	MixDescription	Splittensilestrength	Average
1	ConventionalMix	3.05 3.15	3.1
2	10%	3.25 3.46	3.36
3	20%	3.53 3.97	3.73
4	30%	3.75 3.34	3.58

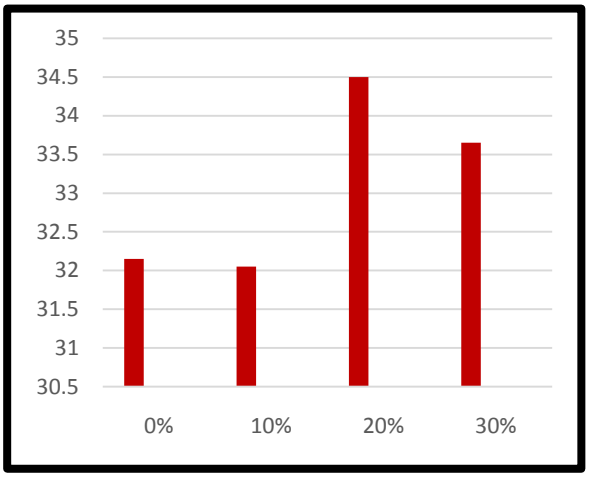
RESULT

COMPRESSIVESTRENGTHFOR PEBBLE STONE

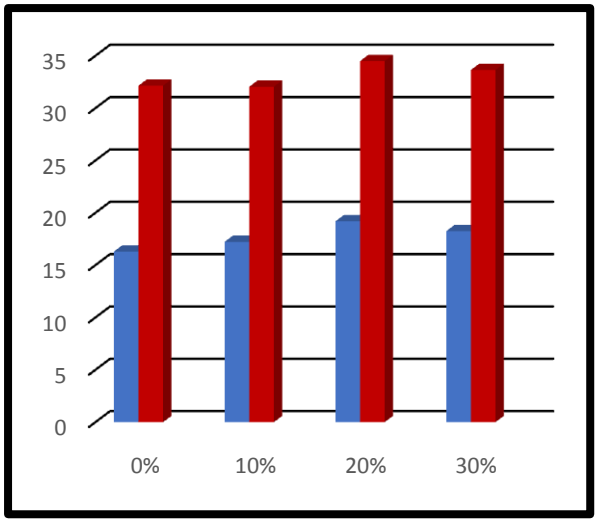
Compressive strength after 7 days for concrete



Compressive strength after 28 days for concrete

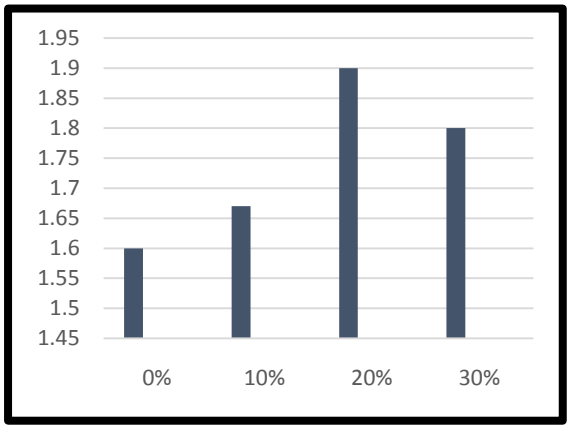


Comparisonbetweencubicstrengthaccordingto 7 days and 28 days

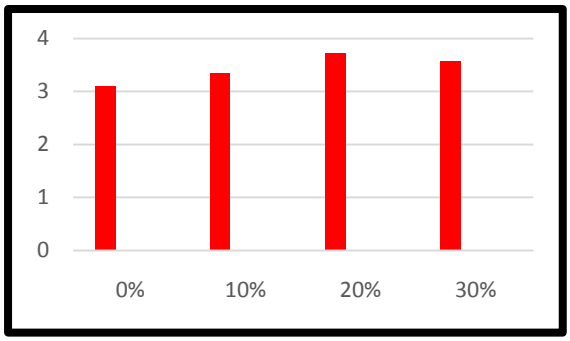


SPLIT TENSILE STRENGTH FOR PEBBLE STONE

Splittensilestrengthofcylinderfor7days



Splittensilestrengthofcylinderfor14 days



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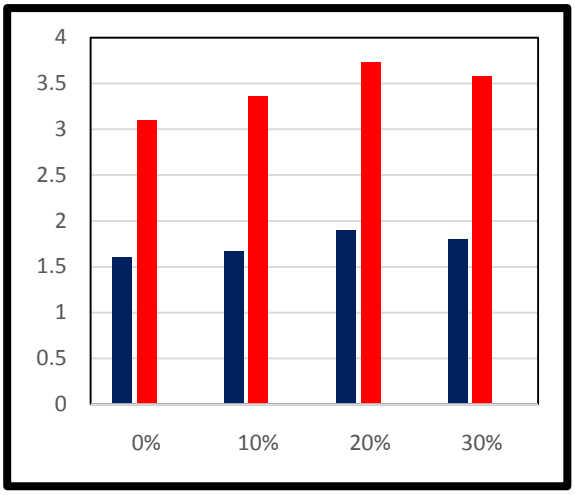

CONCLUSION

In this project, an experimental study has been conducted on concrete byvarying the percentage of pebble stone as 0%, 10%, 20% and 30% respectivelytostudythe increasein the compressivestrengthofconcrete.

- Thecompressivestrengthofconventionalconcreteat28daysis32.15MPa and20% pebble stone concrete is 34.05 MPa, it shows the 6.24 % improvementformconventionalconcrete.
- The split tensile strength of conventional concrete for 28 days is found to be 3.1MPa and that for 20% pebble stone concrete is 3.73 MPa. It shows the 16.89%improvement from conventional concrete. The optimum use of pebble stone is20%.

Finally, from the experimental analysis we have found that 20% replacement ofpeddlestonewith coarseaggregateinconcreteisbeneficialreplacement.

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