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Study of Stilt Plus 4 Residential Apartment

P. Muthaiyan[1], T. Nithya[2], M.B.H. Prabandha[2], N. Sandhiya[2], S. Sivaranjani[2]

[1]Assistant professor: Civil Engineering Department, Prathyusha Engineering College, Thiruvallur, Tamil Nadu.
[2]U.G Student: Civil Engineering Department, Prathyusha Engineering College, Thiruvallur, Tamil Nadu.

Abstract – *Stilt houses or buildings are often called open ground storey buildings which rest on piles over the surface of soil or a body of water. These houses can be built in flood prone areas. The aim of this project is to compare the strength of SCC and SCC with Polypropylene fiber and to make use polypropylene fiber in the field of construction. The main target is to find the quantity of Polypropylene fibers that can be used in SCC and the replacement of cement with flyash is also done. The replacement is done with 30% of flyash. An experimental study on the hardened properties of concrete was done which include compressive and tensile strength. The cubes are casted with 2% and 4% of Polypropylene fiber and to determine its properties.*

Key Words: **Stilt houses, Polypropylene fiber, Flyash.**

I. Introduction

A Stilt house is a raised structure that is most commonly built above water, although it is also may be built over dirt or sand. These buildings are rest over piles that can be made of bamboo or any other water resistant timber or concrete. These houses can be implemented in flood prone areas. These houses are rest on piles of height about 10-12 feet (3.5 - 4 meters) from the ground level so that severe damage due to flood can be reduced. This type of house must be built on land or waste that is free from rocks or metallic debris. When possible, deep holes are dug and are filled with concrete mixture to offer additional weight and reinforcement before sturdy posts are added. Self compacting concrete (SCC) is a flowing concrete mixture that do not require any type of compaction. As the SSC concrete is able to consolidates by its own weight it helps to minimize the damage on the worksite due to vibration of concrete. The use of Polypropylene fiber in concrete has various advantages in the field of construction. It helps to reduce the microcracks in concrete and significant improvement in freeze-thaw cycle resistance. As the Polypropylene fiber has the ability to resist the freeze-thaw cycle our project involves in the use of Polypropylene fiber in the field of constructions particularly in the flood-prone areas and the buildings raised on piles over the surface of soil or body of water.

II. Material and properties

The following ingredients are used in the concretespecimens throughout this study

A. Cement

Cement is the basic binding material in concrete and this is commonly used binder in concrete. The required properties of cement are given in the following Indian Standards. IS:12269-1987(53 grade), IS: 8112-1989(43 grade), IS:269-989(33 grade), for our study we have used Ordinary portland cement of 53 grade as binding material.

B. Fine Aggregate

The fine aggregate used in the concrete is M-Sand. Fine aggregate plays a major role in the concrete as it forms uniformity in the concrete mixure and helps the binding material to hold the coarse aggregate particle in suspension. The physical properties of fine aggregates are tested and the results are given below

Table 1: Physical properties of Fine Aggregate.

S.NO	PARTICULARS	VALUES
1	Specific gravity	2.578
2	Finess test	2.55
3	Bulk density (kg/m^3)	1593.33

C. Coarse Aggregate

Coarse aggregate is the basic building material in concrete which available in various sizes. The general size of coarse aggregate is 10mm and 20mm which is widely use in the field of constructions. The maximum size of aggregate is limited too 20mm.The strength of concrete is based on the size of coarse aggregates used. We have used 20 mm coarse aggregate in the

concrete. It is important to check the physical properties of coarse aggregate before using it and so we have tested the physical properties of coarse aggregate before casting the cube. The physical properties of coarse aggregate is given below

Table -2: Physical properties of Coarse Aggregate

S.NO	PARTICULARS	VALUES
1	Specific gravity	2.717
2	Bulk density (kg/m^3)	1133.65

D. Chemical Admixtures

Here we have used superplasticizer as chemical admixture. The use of superplasticizer in concrete reduces water cement ratio and increases the workability of concrete. We have used 1.5% of superplasticizer in concrete while mixing.

E. Mineral Admixtures

Flyash is the good mineral admixture and important filler in the concrete mix. Flyash also improves the workability of the concrete. We have used flyash not only to reduce the quantity of cement but also to increase the flexibility in SCC as well. We have used 30% of flyash in the concrete mix to that of the weight of cement.

F. Polypropylene fibers

Polypropylene plays a major role in improving the tensile strength of the concrete . As the concrete is weak in tension, the weakness of concrete can be overcome by the use of polypropylene fibers in cement concrete. Formation of micro cracks in the concrete can be prevented by using Polypropylene fibers.

G. Water

Water used in the mixing of concrete is of high quality drining water. It hydrates cement and also makes concrete more workable. The quality of water must be checked before using it in mixing of concrete.

III. Mix Design

A concrete grade 30 mixture was designed in laboratory according to IS method of mix design IS 10262 assuming a good quality control with severe exposure for designing a mix.

Designed compressive strength = 30 Mpa Size of aggregate used = 20mm Superplasticizer dosage = 1.5%

Specific gravity of Cement =3.05

Specific gravity of Coarse Aggregate= 2.717 Specific gravity of Fine Aggregate = 2.578

Bulk modulus of Fine Aggregate = 1207.3 Kg/m^3 Bulk modulus of Coarse Aggregate= 1207.3 Kg/m^3

Polypropylene fibers = 2% and 4% of the weight of cement

Table 3: Mix proportions Quantity of materials used in m^3

Cement	4.79 Kg
Coarse Aggregate	9.69 Kg
Fine Aggregate	15.143 Kg
Flyash	2.052 Kg
Superplasticizer in %	1.5%

IV. Result and Discussion

Compressive strength

Compressive strength of concrete is one of the most important and useful hardened properties of concrete. We have tested the compressive strength of concrete after 7 days and 28 days using compression testing machine.

Table 4: Compressive strength of concrete

S.NO	% OF FIBER ADDED	7 days (N/mm^2)	28 days (N/mm^2)
1	0 %	21.42	29.05
2	2 %	24.50	36.80
3	4 %	20.02	34.32

Tensile strength

Tensile strength is an important property of concrete, as the concrete is weak in tension. Inorder to overcome its weakness and to improve its tensile strength we have used Polypropylene fiber and the test results are given below.

Table 5: Tensile strength of concrete

S.NO	% OF FIBER ADDED	7 days (N/mm^2)	28 days (N/mm^2)
1	0%	2.72	3.036
2	2%	3	4.8
3	4%	2.4	4.66

Comparison between SCC and Fiber added SCC

Fig no: 1

Fig no: 2

The above two figures shows the formation of cracks and failure of concrete in the absence of fiber (Fig no: 1) and in presence of fiber (Fig no: 2). From testing, we came to know that in SCC, there is large amount of debris when comparing it with fiber added SCC.

V. Conclusion

The main objective for the study of stilt apartment is to prevent damage in the building and to protect the people from flood. Our role is complete study of stilt house and suggest better concrete. The implementation of Polypropylene fiber in SCC has shown better results in its Tensile strength and Compressive strength. By adding Polypropylene fiber in SCC, the formation of micro cracks in concrete can be prevented and increases its aesthetic view. It is adaptable to all weather conditions. The only drawback in Polypropylene fiber is, more the addition of fiber in concrete reduces its tensile and compressive strength.

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