An Experimental on Un-Plasticized Poly Vinyl Chloride [UPVC] Encased Concrete Column

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***Abstract*- In un-plasticized poly vinyl chloride (UPVC) tubes filled with concrete are axially loaded until failure of the specimen to investigate their load carrying capacity. The systems are mainly assembled on site, hence simplifying the construction process and reducing the construction time as the removal procedure has been eliminated. The specimen of UPVC tubes of effective lengths of 500mm, 600mm & 700mm were cast. We take conventional column having 150mm diameter without UPVC column. The concrete mix design has been designed using IS code (10262-1982). M20 grade of concrete of two types of fine aggregate (River Sand & Manufactured Sand) was filled inside the tubes for casting of UPVC Concrete Filled Tubes (CFT) column specimen. The Conventional columns 150 mm without PVC confinement are failing by UPVC column should be tested in 14 and21 days curing. The columns specimens were tested for axial loading in the Universal Testing Machine (UTM) of capacity 400kN.Their load displacement curves and stress – strain curves were recorded.**

***Index Terms*- UPVC Tubes, Manufactured Sand (M-Sand), Fine Aggregates, Coarse Aggregate.**

I. INTRODUCTION

Columns occupy a vital place in structural system. Weakness or failure of a column destabilizes the entire structure. Columns are considered as critical members in moment-resisting structural systems. Their failure may lead to a partial or even a total collapse of the whole structure. Therefore, it is important to improve the ductile deformation capacity and energy dissipation capacity of columns so, that the entire structure can endure severe ground motions and dissipate a considerable amount of seismic energy.

Recently, composite columns are finding a lot of usage for seismic resistance. In order to prevent shear failure of RC columns resulting in storey collapse of building. UPVC tubes are readily available in market and it is cheaper than steel tubes and also provides durability reliability and integrity of the building. These tubes can be used as formwork during construction and their after as an integral part of column.

II. PRELIMINARY INVESTIGATION OF MATERIALS

MATERIALS USED

A. Cement

Portland Pozzolana cement of 43 grades is used for experimental work. Initial and final setting time of the cement was 30min and 360min.

B. Fine Aggregate

A concrete can be made from sand consisting of rounded grains as good as form that in which the grains are granular. River or pit sand should be used and not sea sand as it contains salt and other impurities which will affect the structure. The specific gravity is found to be 2.60 by experiment.

C. Manufactured Sand

It is well graded in the required proportion. It does not contain organic and soluble compound that affects the setting time and properties of cement, thus the required strength of concrete can be maintained. The manufactured using technology like High Carbon steel hit rock and then ROCK ON ROCK process which is synonymous to that of natural process undergoing in river sand information.

D. Coarse Aggregate

They must be clean, hard, strong, durable particles free of absorbed chemicals. Coatings of clay, and other fine materials in amounts that could affect hydration and bond of the cement paste. Aggregate particles that are friable or capable of being split are undesirable.

E. Figures

III. TARGET STRENGTH FOR MIX PROPORTIONING

$F^*_{ck} = f_{ck} + 1.65S$

F^*_{ck} = Target average compressive strength at 28 days

F_{ck} = Characteristic compressive strength at 28 days

S = Standard deviation

Can be using calculating the weight of cement ratio, weight of water, weight of a fine and coarse aggregates,

IV. COMPACTION FACTOR TEST

Figures and Table

Fig 1 - Compaction Factor Test

TABULATION FOR RIVER SAND:

Table no – 3.1 Compaction factor test for river sand

S. NO	WATER CEMENT RATIO	MASS WITH PARTIALLY COMPACTED CONCRETE (W2)	MASS WITH FULLY COMPACTED CONCRETE (W3)	MASS WITH PARTIALLY COMPACTED CONCRETE (W2-W1)	MASS WITH FULLY COMPACTED CONCRETE (W3-W1)	C.F= (W2-W1) /(W3-W
1	0.45	15.084	19.45	8	12.366	0.646
2	0.50	16.064	19.346	8.98	12.266	0.732

TABULATION FOR MANUFACTURED SAND:

Table no – 3.2 Compaction factor test for manufactured sand

S. NO	WATER CEMENT RATIO	MASS WITH PARTIALLY COMPACTED CONCRETE (W2)	MASS WITH FULLY COMPACTED CONCRETE (W3)	MASS WITH PARTIALLY COMPACTED CONCRETE (W2-W1)	MASS WITH FULLY COMPACTED CONCRETE (W3-W1)	C.F= (W2-W1) /(W3-W1)
1	0.45	15.58	19.83	8.496	12.746	0.666
2	0.50	16.258	19.886	9.174	12.802	0.712

IV. PUBLICATIONPRINCIPLES

RESULT AND COMPARISON

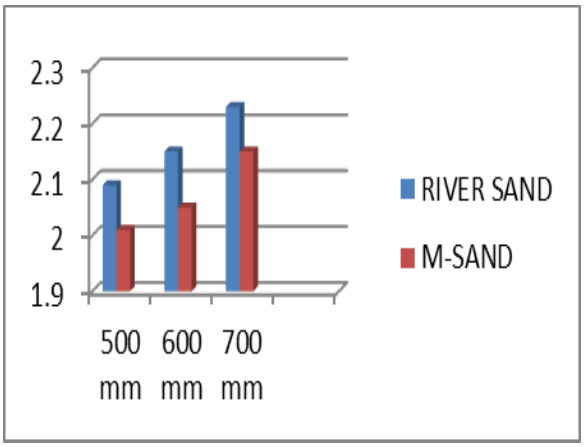
AFTER 14 DAYS CURING OF UPVC CFT

Table no – 4.1 14 Days curing

S.NO	SPECIMEN SIZE	RIVER SAND		MANUFACTURED SAND	
		LOAD AT FAILURE	COMPRESSIVE STRENGTH	LOAD AT FAILURE	COMPRESSIVE STRENGTH
1	500mm	410.5	2.09	394.3	2.01
2	600mm	422.6	2.15	402.9	2.05
3	700mm	439.3	2.23	422.3	2.15

GRAPHICAL REPRESENTATION

GRAPHICAL REPRESENTATION OF 14 DAYS CURING OF UPVC CFT



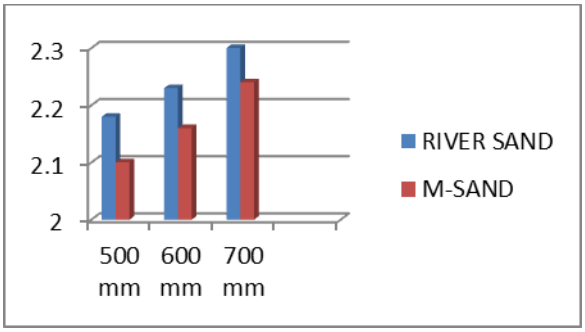
14 DAYS CURING FOR RIVER SAND Vs MANUFACTURED SAND

AFTER 21 DAYS CURING OF UPVC CFT

Table no – 4.2 21 Days curing

S. NO	SPECIMEN SIZE	RIVER SAND		MANUFACTURED SAND	
		LOAD AT FAILURE	COMPRESSIVE STRENGTH	LOAD AT FAILURE	COMPRESSIVE STRENGTH
1	500mm	428.5	2.18	412.9	2.10
2	600mm	439.3	2.23	425.8	2.16
3	700mm	451.6	2.30	438.3	2.24

GRAPHICAL REPRESENTATION OF 21 DAYS CURING OF UPVC CFT



21 DAYS CURING FOR RIVER SAND Vs MANUFACTURED SAND

VII. CONCLUSION

Confinement of concrete columns with UPVC tubes improves their compressive strength. The improvement in strength is dependent on the concrete strength and geometrical properties of the tubes.

As the length increases, the ultimate axial strength of the column increases. The slope of the onset section of the curves goes down with decrease in grade of concrete.

Higher compressive strength of UPVC column can be obtained by using smaller coarse aggregates. The higher compressive strength is

obtained with 6.3mm aggregate compared to 100mm size of coarse aggregates.

The tube diameter/thickness ratio affects the post-peak behavior of the curves.

Scope For Further Researches

- To reduce corrosion in reinforcement and plastering of a mortar
- To reduce cost wise problems.

REFERENCES

[1] Asisha Marry amen, Minu Antony (2017) "Experimental Study on FRP-PVC Confined Circular Columns", Journal of Research in engineering (IRET) e-ISSN: 2395-0056.

[2] AtriDave ,Poojan Nagar , Jay Parmar "Comparative Study of GFRP Laminated RC Column Using Experimental Results" eISSN: 2319-1163 pISSN: 2321-730.

[3] Errama, H. Madhukar, N.J (2015) "Experimental Investigation on PVC Encased

[4] Gathimba Naftary, K. Oyawa Walter, O. Manguriu Geoffrey, N "Compressive Strength

[5] Gopi, N. Sujitha, B (2017) "Behavior of Concrete Filled PVC Plastic Tubes (CFPT) Placed in Columns", International Conference on Emerging Trend in Engineering Science.

[6] Ozbakkaloglu, T. Lim, J.C. and Oehlers, D.J. (2007) "Concrete-Filled Square Frp Tubes Under Axial Compression" Asia-Pacific Conference on FRP in Structures.

[7] Pramod Kumar Gupta (2013) "Confinement of Concrete Columns with Unplasticized Poly - Vinyl Chloride Tubes", International Journal of Advanced Structural Engineering.

[8] Shenglan, M.A. Quan, U.N. Jiang Shaofe (2012) "Experimental Study on Flexural Behaviour of Circular Concrete-Filled FRP-PVC Tubular Members" Journal of Shenyang Jianzhu University.

[9] Usha, C.M. Dr.Eramma, H. (2017) "Experimental Study on Concrete Filled Unplasticised Poly Vinyl Chloride (UPVC) Tubes", International Journal of Advanced Technology in Engineering and Science (ISSN – 2348 - 7550).

[10] YunitaIdris and Togay Ozbakkaloglu (2013) "Seismic Behavior of High-Strength Concrete-FilledFRP Tube Columns" ASCE.