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STUDY THE DIFFERENT TYPES OF EFFECTIVE CONFINING MATERIAL ON RC RECTANGULAR COLUMN

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ABSTRACT

In this paper presents a comparative investigation based on various types of effective confining material, like (stapled stirrups, WWM, welded spot stirrups, ferrocement,FRP).The transverse reinforcement plays an important role in the ductility of the column. The preparedness for the formation of the plastic hinges in column, it requires confinement of concrete by transverse reinforcement.

To study the effectiveness of the Confinement reinforcement, its quantity, working out the optimum combination of the confinement reinforcement and also the load carrying capacity of the rectangular column. The study of rectangular column is significant as it is used mostly in the practical building construction. This project is high lighting the study of" study the different types of effective confining material on RC rectangular column"by improving the confining quality. It also adds thedifferent properties of reinforced concrete column.

KEYWORDS: WWM, FRP ,confinement

INTRODUCTION

Columns are more important structural element in any structure that transfers the entire loads to the foundation because of this it is necessary to confined column with external confining material. It improves the properties of concrete by confining it. In most of the damaged structures it can be seen that in several failure of the entire structure was occurred by the failure of columns by chain action. Traditional steel ties reinforcement cannot provide better confinement for reinforced concrete (RC)column, due to the spacing between two ties and disturbance of concrete continuity. Since, effectiveness of the design approach involving strong column weak beam concept is still controversial matter, it will be dangerous to design the structures without considering the formation of plastic hinges in columns. It is taken into consideration the failure of structures due to sudden loading like earthquake, flood attack and consequently the loss of lives, the design on the premise that plastic hinge may occur in the column may be eventually more economical, even though the initial cost of detailing will be higher.

Transverse reinforcements in columns in the form of hoops, cross-ties, or spirals which play an important role in protect the columns, especially when they are subjected to strong lateral loads. The environmental effect like pollutants, high humidity which causes corrosion and develops cracks which occurs failure of structural element. Replacement of damaged structural element is very costly and difficult process so, by providing external confinement across periphery of column is more effective process for confinement.

There are two ways for confinement:

- Global retrofitting
- Local retrofitting

In Global retroffiting,overall specimen is replaced and designed as per IS specified, over in local retrofitting only specific member of the structure is either strengthen or replaced. They are required in any column-whether they are parts of a moment resistant frame or the gravity system in order for them to deform laterally and provide the required ductility. The current equations for confinement reinforcement in IS 13920 code do not

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provide consistent level of safety against deformation and damage associated with flexural yielding during earthquakes. Hence an equation for the design of confinement reinforcement for ductile earthquake resistant rectangular and circular columns is suggested for inclusion in the next revision of the code. These equations take into account the various parameters that affect the performance of confining reinforcement, such as effective confining pressure or ratio of concrete strength to tie strength, unconfined cover concrete thickness, longitudinal reinforcement and spacing, and curvature ductility factor, load bearing elements, axial load level of any structure. Column support the beams and slabs and transfer the loads to the foundations. Hence column has to be designed and detailed adequately to resist both gravity and lateral loads. In our country columns are more misused than other structural elements; minimum size as per codes not provided, rebar are bend for better alignment, they are made porous due to the difficulty of concreting and vibrating in narrow, tall formwork, they are not cured properly, due to the difficulty of curing vertical elements, only minimum transverse reinforcement are provided and only 90^0 hooks are provided. We do not witness many failures because the working loads are only about 67% of the failure loads and also due to the partial safety factors of materials. However, during earthquakes or accidental lateral loading, plastic hinges will form in columns and beams. With inadequate design, detailing or construction, the columns are bound to fail, as we have witnessed in several earthquakes (e.g., like the ones in Bhuj, and Haiti). Hence it is important to design the transverse reinforcement of columns and detail them to provide external confinement with required amount of ductility.

Confined Concrete

In recent years high rise reinforced concrete buildings more than 20 storey high have began to be constructed using strength concrete and transverse reinforcement with high strength steel. When columns with high strength concrete are subjected to severe seismic loading with high axial load, ductility demand for columns at yield zones may be satisfied only by providing the core concrete with intensive confinement achieved by using high strength transverse reinforcement. Thus, the importance of profound knowledge about the characteristics of confined concrete is increasing with increase of material strength used. Confinement of Concrete is to bind the concrete or to prevent the concrete from spalling. Due to this ductility is imparted to the column so as to resist the axial load, buckling of column, vibrations due to the Earthquake induced inertial forces, also formation of plastic hinges due to excess loading etc. If the area of the confined core is increased the correspondingly the ductility of the column increases. By the provision of the confinement reinforcement the area of the confined core increases. By the provision of the transverse reinforcement in the column in the form of spirals, cross ties etc. , the area of confined core achieved is insufficient to dissipate the earthquake induced inertial forces. So it is necessary to provide extra reinforcement than the nominal.

Objective

- To study the effectiveness or the efficiency of confinement used in the rectangular cross section of column.
- To compare different types of confining material (stapled stirrups, WWM, welded spot stirrups, ferrocement,FRP) based on its cost strength,durability,load caring capacity etc.

Methodology

1. Material information

We select five types of confinements are given in table 1, which gives good results in a previous research papers.

Table 1 :Details of confinement

Sr.no	**Types of confinement**	Research paper	Remark
1	Welded wire mesh	Improved confinement of reinforced concrete column.(Ahmed M.El-Kholy)	Increase ultimate load capacity, better ductility, and larger energy dissipation.
2	Welded spot stirrups	Ductility of RCC column with various reinforcing arrangements.(D.Kato)	increased the ultimate load carrying capacity,
3	Stapled stirrups	Ductility of RCC confined with stapled strips.	Ductility ratio is more ,load carrying capacity

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		(M.F.Tahir)	is more.
4	Ferro cement	Behavior of RCC Column Confined with ferro cement.(JatinderMalhotra)	increased the ultimate load carrying capacity, increased the strength up to 92%, Lateral deflections are significantly minimized.
5	FRP	Compressive behavior of concrete confined by CFRP and transverse spiral reinforcement.(PengYin)	Increase ultimate loading capacity

Experimental Program

Columns are failed in a plastic region in a excessive loading conditions like earthquake ect,it is necessary to strengthen or retrofit the column. To improve the strength, durability, reducespalling of concrete by providing external confinement to the column. Toachieve the required aim, the experimental program has been made. Columnspecimens werecast. These specimens are classified into different groups. This groups are based on different types of confining material to be used. There are three specimen were casted for each material. This experimental result gives various load-deflection graphs. Based on their load carrying capacity, deflection of column, costratio,durability,strength compare this confining material and gives a effective material to the confinement purposes which is, economical and effective.

UTM testing machine were used, a dial gauges are mounted on a four sides of specimen.

CONCLUSION

In a previous research paper results are observed, this can be proved that a confinement materials which are chosen are improve strength and durability. Validate experimental results with SAP software.

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REFERENCES

[1] N. Subramanian, “design of confinement reinforcement” Indian Concrete Journal.
[2] S Watson, “confining reinforcement concrete column” ASCE.
[3] Georges, Stathis, “experimental study of effect of confinement on the RC column”.
[4] Confinement reinforcement design for reinforced concrete columns p. Paultre, m.ASCE1; and F. Légeron, m.ASCE2.
[5] Watson S., Zahn, F. A., and Park, R., “Confining Reinforcement for Concrete Columns,” Journal of Structural Engineering, Vol. 120, No. 6, June 1994, pp. 1798-1824.
[6] Abdullah and Takiguchi, K. (2003), “An investigation into the behavior and strength of reinforced concrete columns strengthened with Ferro cement jackets”. Cement & Concrete Composites, vol. 25: pp 233–242.
[7] Shetty R.K. and Jain A.K., “Special confinement reinforcement in RC Columns and shear walls”, The Indian Concrete Journal, Vol. 85, No.6, June 2011, pp. 19-29.
[8] Mander, J. B., Priestley, M. J. N., and Park, R. (1988a). “Theoretical stress strain model of confined concrete.” J. Structural. Engineering., 114(8), 1804– 1826.
[9] Ilki, A., Kumbasar, N., Ozdemir, P., and Fukuta, T. (2004). “A trilinear stress-strain model for confined concrete.” Struct. Eng. Mech., 18(5), 541–563.
[10] Sheikh, S. A., and Uzumeri, S. M. (1980). “Strength and ductility of tied concrete columns.” J. Struct. Div., 106(5), 1079–1102.

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[11] Abdullah and Takiguchi, K. (2003), "An investigation into the behavior and strength of reinforced concrete columns strengthened with ferrocement jackets". Cement & Concrete Composites, vol. 25: pp 233–242.
[12] Desai, J.A. (2011), "Corrosion and Ferrocement, Proceedings of the National Conference on Ferrocement". FS 2011, 13-14 May 2011, Pune, India, pp 45-52.
[13] Divekar, B.N. (2011), "Cost-effective Construction using Precast Ferrocement Panels, Proceedings of the National Conference on Ferrocement". FS 2011, 13-14 May 2011, Pune, India, pp 129-134.
[14] Divekar, B.N. (2011), "Revolutionary Ideas and Innovative Structures in Ferrocement, Proceedings of the National Conference on Ferrocement". FS 2011, 13-14 May 2011, Pune, India, pp 15-23.
[15] Divekar, B.N. (2011), "All-in-One – A Unique Method of Construction, Proceedings of the National Conference on Ferrocement". FS 2011, 13-14 May 2011, Pune, India, pp 135-141.