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Review Paper on Retrofitting of RCC Beam Column Joint Using Ferro cement

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Abstract – *This paper represents the change of Reinforced concrete structural components which are found to exhibit distress, even before their service period is over due to several causes. Such unserviceable structures require immediate attention. And it was done by replacing reinforced concrete by Ferro cement. It was determined that load carrying capacity for beam-column joint retrofitted with Ferro cement was increased.*

Key Words: *Reinforced concrete, Ferro cement, Distress, Retrofitted, and beam-column joint.*

1. INTRODUCTION

Reinforced concrete is the commonly used material for the construction of structures which are designed in accordance to the specifications given in the standard codes to meet the service life. Based upon these specifications, the loads are taken into account for the design of the various elements of the structure like beams, columns and slabs. During the service life if the loading conditions change due to purpose of use of the structure, this can result in non-performance of the structural elements for which it was designed earlier. The structures are also susceptible to deterioration due to earthquake, flood, cyclone, carbonation, chloride attack, environmental pollution, deficiencies of the material used, inadequate design and faulty construction. The environmental stresses/factors like high humidity, air and water pollutants also cause corrosion and develop cracks leading to the failure of structural elements. Replacement of the damaged structural elements is very difficult and cost intensive process and the replacement of a particular structural element in the existing structure also creates risk to the integrity of other connecting members. To restore the required strength of the deteriorated structure, retrofitting is the solution. Retrofitting can be done in two ways:

1. Global Retrofitting
2. Local Retrofitting

In Global Retrofitting, the entire structure is retrofitted to fulfill the serviceability requirements. It involves the analysis and design of the entire structure as per the specifications given in standard codes. Whereas, in Local Retrofitting, only specific member of the structure is either strengthened or replaced. Jacketing construction is the most preferred method of retrofitting that can be applied by the following techniques:

1. Confinement with fiber reinforced polymers such as aramid fibers, carbon fibers and glass fiber polymers.
2. Confinement with external steel caging techniques.
3. Confinement with ferrocement.

In comparison to the above, retrofitting with ferrocement confinement is the oldest and cost effective technique used to strengthen the concrete structures. Ferrocement consists of closely-spaced and uniformly-distributed reinforcement which provides ductility to the otherwise brittle concrete. This inherent property makes the ferrocement a distinctive composite construction material. The unique properties of ferrocement such as water proof, fire resistant, durability, low self-weight and crack resistant makes it an ideal material for wider applications.

2. LITERATURE REVEIW

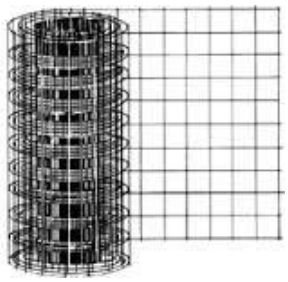
Kondraivendhan and Pradhan (2009) Studied effect of ferrocement confinement on behavior of concrete. The effect of different grades of concrete confined with ferrocement was studied by keeping all other parameters constant. It was found that with the increase in compressive strength of the concrete significantly improved in lower grades of concrete such as M25 which showed 78% increase as compared to higher grade of concrete M55 which resulted in an increase of 45.3%.

Turgay et. al. (2010) studied the effect and failure mechanisms of large-scale square/ rectangular columns wrapped with fiber reinforced polymer (FRP). The experimental research program studied the performance of large-scale square RC columns wrapped with carbon fiber reinforced polymer (CFRP) sheets. Moreover, the research was mainly focused on the investigation of the total effect of longitudinal and transverse reinforcement and FRP jackets on the behavior of concentrically loaded columns. A total of 20 large-scale RC columns were fabricated and tested to failure under axial loading in the structural laboratory.

Xiong et. al. (2011) studied the load carrying capacity and ductility of circular concrete columns confined by ferrocement including steel bars (FS) where they are proposed to increase the compressive strength along with the ductility. Due to ferrocement caging along with steel bars specimens showed higher ductility, compressive strength and energy absorbing capacity than BS or FRP strengthened circular columns.

Kaish et. al. (2012) studied the effect of ferrocement jacketing with some modifications. Three types of ferrocement jacketing techniques were used to confine the column specimens that are; square jacketing with single layer wire mesh and rounded column corners (RSL); square jacketing using single layer wire mesh with shear keys at the centre of each face of column (SKSL) and square jacketing with single layer wire mesh and two extra layers mesh at each corner (SLTL) are considered for this purpose.

R. Hafiza, S. Sameen, T. Rahman (2015) studied the column specimens for the ultimate load capacity and stressed samples confined with ferrocement using welded wire mesh as the confining material.



Welded wire mesh.

In case of pre-stressed specimens, the results showed that the confining increased the load carrying capacity to 33%. Ductility of the specimens also increased. In case of stressed samples to a value of 60% and 80% of the ultimate load capacity, the confinement enhanced the ultimate load capacity to 28% and 15% respectively. With the confinement the column specimens failed in a ductile manner as compared to brittle failure of the control specimens

Ornela Lalaj, Yavuz Yardım, Salih Yılmaz (2015) Stated that Ferrocement is the oldest form of the reinforced concrete, dating back two centuries. It is composed of mortar and galvanized steel wire mesh. It is used for a wide range of application including construction of boats, water tanks, slabs and roofs, and lining of tunnels. Nowadays, reinforced concrete is widely known and used material, whereas ferrocement has limited applications. Properties such as high strength/weight ratio and good resistance to cracking and impact loadings are bringing ferrocement under the spotlight again. New applications have been developed in the recent years, such as low cost dwelling buildings and strengthening of a wide variety of structural elements.

3. CONCLUSIONS

This experimental study is carried out to analyze the behavior of RCC columns with different of slenderness ratio and ferrocement confinement on the strength of the columns. Based on test results, the following conclusions are obtained:

1. Ferrocement confinement increased the ultimate load carrying capacity of columns.
2. It is essential to find out the specific areas where Ferro cement confinement can be used.
3. Economically Ferrocement technique is long lasting than other techniques.

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REFERENCES

[1]. B. Kondraivendhan and B. Pradhan, “Effect of ferrocement confinement on behavior of concrete”. Construction Build Material, vol. 23(3): pp 1218–22, 2009.

[2]. T. Turgay, Z. Polat, H.O. Koksal, B. Doran, C.Karakoç “Compressive behavior of large-scale square reinforced concrete columns confined with carbon fiber reinforced polymer jackets”. Materials and Design, vol. 31: pp 357–364, 2010.

[3]. G.J. Xiong, X.Y. Wu, F.F. Li, and Z. Yan, “Load carrying capacity and ductility of circular concrete columns confined by ferrocement including steel bars”. Construction and Building Materials, vol. 25: 2263–2268, 2011.

[4]. A.B.M.A. Kaish, M.R. Alam, M. Jamil M.F.M. Zain, and M.A. Wahed “Improved ferrocement jacketing for re- strengthening of square RC short column”. Construction and Building Materials, vol. 36: pp 228–237, 2012.

[5]. R. Hafiza, S. Sameen, T. Rahman “A Review on construction process of Ferrocement sandwich panel” Volume 3, Number 1 PP: 12-18, 2015.

[6]. O. Lalaj, Y. Yardım, and S. Yılmaz, Recent perspectives for ferrocement. Res. Eng. Struct. Mat., 2015.

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