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A review on Effect of Infill walls in Reinforced Ferrocement frames subjected to lateral loads and application of Blockchain technology in civil Engineering

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Abstract - A large number of buildings in India are constructed with masonry infill's for functional and architectural reasons.In the paper, we present research on where and how this technology could be useful in the construction industry.This study first describes a review on the infill may be integral or non-integral depending on the connectivity of the infill to the frame. In case of buildings under consideration, integral connection is assumed. The composite behavior of an infilled frame imparts lateral stiffness and strength to the building. The thinking also underpins that block chain technology, outlining how it works in construction industry, and the potential limitations of the technology. Using case studyand reviews we make an attempt to apply block chain technology in construction industry such as in infill walls Reinforced with Ferrocement Frames subjected to lateral loads.

Key Words: Bitcoin, Block chain, Crypto currency, Infilled frames, Ferrocement,

1.INTRODUCTION

The term 'Infilled frame' is used to denote a composite structure formed by the combination of a moment resisting plane frame and infill walls. In-filled frame structures are commonly used in buildings, even in those located in seismically active regions. Present IS-codes and others unfortunately, do not have adequate guidance for treating the modeling, analysis and design of in-filled frame structures.

Blockchain technology enables distributed, encrypted and secure logging of digital transactions. It is the underlying technology of Bitcoin and other crypto currencies. Blockchain is expected to revolutionize computing in several areas, particularly where centralization was unnatural and privacy was important. Blockchain is a type of distributed ledger technology (DLT) which was first widely introduced almost ten years ago as the underlying technology of Bitcoin. A distributed ledger is a simple database, but with special properties. It is distributed, meaning that the database is scattered around multiple locations in a shared manner. It therefore shares some similarities with a typical cloud system or other shared stores on the internet. But instead of having only one source where the information is stored with multiple accesses, there are multiple stores (as ledgers) scattered which are simultaneously being updated. This direct exchange of information between the interacting parties is enabled by the highly resilient network protocol or consensus mechanism of the DLT without the need of any intermediaries. These interactions are then cryptographically secured and added in the case of a block chain system.

2. LITERATURE REVIEW

Arun Kumar Et Al.[10] Conducted A Work On "Experimental Study On Impact Resistance Of Geopolymer Ferrocement Flat Panel".

This paper deals with the study of impact resistance and energy absorption properties of Geopolymer Ferrocement Flat Panel under impact load. Prefabricated elements are used in construction industry as an alternative system to overcome the formwork problems in addition to getting better quality control. The prefabricated elements made of reinforced concrete are extremely heavy and difficult to transport, placing in position and to construct. Alternatively, Ferrocement panels are being used in construction industry due to its good structural performance and low cost. An experimental investigation on impact behavior of Ferrocement panels reinforced with skeletal steel and galvanized iron wire mesh is presented. These panels were subjected to impact loading by drop weight test method. It is concluded that Geopolymer Ferrocement Flat Panels with 10M NaOH solution using higher impact energy absorption capacity as compared other Geopolymer mixes.

Dr. H Sharada bai and N Jayaramappa [1]published a paper on "Behaviour of Ferrocement Panels Subjected to In Plane Lateral Load".

Ferrocement offers several advantages such as light weight, ductility, resilience toughness and crack resistance. Observing that studies on cantilever FC elements subjected to lateral load are limited, present study is aimed at determining the behavior of FC panel elements under lateral load 1000 mm X 2000 mm X 30 mm size FC elements for lateral load test containing single two, three and four layers of hexagonal chicken mesh and skeletal reinforcement were cast using cement mortar 1:3 (w/c 0.5) and cured for 28 days. The elements fixed at base were progressively tested under in-plane lateral load applied at top up to failure and their behaviors are compared. predict the inelastic behaviour of each type of infill. A linear (spectral) and non linear (step by step) analysis have been carried out on currently used prototype frames. The results obtained show that the infill has an effect on the seismic response of frame buildings and it should be considered in the analysis of such a type of structures.

Vincent P R [9] et al. conducted a project work on "Experimental Investigation on Flexural Behaviour of Folded Ferrocement Panels".

The study made by them described the result of testing folded Ferrocement panel reinforced with number of wire mesh layer. The main aim of these experimental tests is to study the effect of folded Ferrocement panel using different number of wire mesh layers on the flexural strength by varying the numbers of wire mesh layers on cracking, load deflection behaviour, ductility and ultimate flexural strength. This is useful to find solutions by searching new design techniques and method of constructions.

Dr.S.K. Kaushik[5] published a paper on "Effect of wire mesh orientation on Ferrocement element".

The experiment investigated the efficiency of mesh overlaps of Ferrocement elements by varying the length of overlap in square woven meshes with different wire diameter and mesh openings. The number of mesh layers has also been varied and tested under flexure Cement-sand mortar mixes of I: 1.5 and 1:2 were used for the above investigations. They developed an analytical expression for the lap length (Lp) based on the concept that the mesh overlap must be sufficient to develop full bond strength around the surface w that there is no slippage while taking the stress allowed to it. They cast 350 test specimens having 400x200 mm dimensions, with 5 mm cover on all the four sides, with w/c-0.4. All the specimens were tested under central point loading on a simply supported span of 300 Mm. Based on the above, they concluded that (i) the mortar strength, diameter of reinforcing wire and mesh opening influence the overlap length: (ii) bond failure occurs due to slippage at overlap, When length of mesh overlap is insufficient, with the cracking much lower than that of a continuous mesh reinforcement; (iii) a minimum overlap of 100 mm to be provided.

Y.Yardim[1] presented the paper on "Performance Of Precast Ferrocement Panel For Composite Masonry Slab System".

This study investigates the performance of inverted two-way ribs precast Ferrocement thin panel. The two-way inverted ribs in the Ferrocement panel enhanced its flexural stiffness, as well as providing link between the precast layer and the in situ elements Flexural behavior of two precast panels and two composite slabs are investigated under two line load and distributed load. Test results indicate that the thin panel with suitable ribs layout and support distance can be used as permanent formwork. Typical load from construction worker and in situ elements could be sustained by the panel. The panel also acts as good composite component with in situ brick and concrete. Composite full slab can sustain typical design loads for residential buildings and until ultimate load and no separation or any horizontal cracks between the layers were observed.

R Abasolo, C Bandivs, [1] discussed on "Utilization Of Ferrocement as Flexural Building Member".

This study focuses on the fabrication and the Maximum Moment Capacity of a Ferrocement beam. There were three batches with 3 specimens each. The beams were casted vertically by plastering. This study used a cement to sand ratio of 1:3 by volume and a water to cement ratio of 0.5:1 by weight. It also used two layers of # 16 gauge wire mesh kept constant on each batch. Tension bars of 8 mm dia. were used, the number of which increases by one on each batch. Nine specimens of 200mm x 200mm x 3000mm hollow box beam with a 25 mm thickness were casted. The Standards and Procedure for cach of the beams were based on the ASTM Standards and on the article by J.P. Hartog. The testing of the beam was done after the 28th curing day period, and was conducted to failure in order to determine the Actual Moment Capacity of the design beam. The results show that Maximum Moment Capacity or Flexural Strength of the fabricated Ferrocement beams did not go below the calculated ultimate moment capacity for office occupancy of 5.3792 KN-m. This means that the beams are safe for use as floor joist beams in residential and commercial structures

N. Jayaramappa [1] et al. carried an experiment on "Comparative Study on Strength of Ferrocement Panels and Normal Cement Mortar Panels".

The project reveals the results of flexural strength and compressive strength of Normal cement mortar (NCM) cubes, panels and Ferro cement (FC) cubes, Ferro

cement panels. The main objective of this experimental study is to determine the comparative strength of Ferro cement panels and cubes over Normal cement mortar panels and cubes. For each Ferro cement cubes, panels and normal cement mortar cubes, panels, nine specimens arecasted Gic. NCM cubes 9, NCM panels=9, FC cubes 9, FC panels=9) and three specimens from each are tested at age of 3days, 7days and 28days. The panels are of size (25cm X 25cm X 5cm) and cubes of standard size (7.06cm X 7.06cm X 7.06cm). Ferrocement cubes are reinforced with three layers of chicken mesh and the distance between two consecutive layers is 1.77cm. Ferro cement panels are reinforced with steel bars of diameter 8mm and chicken mesh at a height of 2.5cm. The experimental results show that Flexural strength of Ferro cement panels and compressive strength of Ferro cement cubes are increased when compared to the normal cement mortar panels and cubes due to presence of "CHICKEN MESH" reinforcement.

Kushal A [11] et al. presented a paper on "Comparative Study of Ferro-Cement Panel Using Welded Square Mesh and Expanded Mesh".

The aim of this research paper is to study the ultimate and service behavior of Ferrocement roof slab panels and the comparative study of panels via using welded square mesh and expanded mesh. The test results of four different panels of 20 mm thick having number of layers varying one to four presented. The parameters of study include: the effect of the percentage of wire mesh reinforcement by volume and the structural shape of the panels on the ultimate Flexural strength, first crack load, crack spacing and load deformation behavior. The results indicate that the use of monolithic shallow edge ferro-cement beams with the panels considerably improves the service and ultimate behavior of the panels, in respective of the number of steel layers used.

Al-Kubaisy et al Presented "A Study OnThe Flexural Behavior Of Ferrocement Tension Zone Cover".

The results of tests on 12 simply supported slabs are presented. The parameters considered in this study were percentage of wire mesh reinforcement in the Ferrocement cover layer, thickness of the Ferrocement layer and the type of connection between the Ferrocement layer and the reinforced concrete slab on the ultimate flexural load, first crack load, crack width and spacing, and the load-deflection relationship were examined. The results indicate that the use of Ferrocement cover slightly increases the ultimate flexural load and increases in the first crack load. The first crack load increased with the increase in the percentage of mesh reinforcement and the Ferrocement layer thickness. Considerable reduction in cracks width and spacing (64-84%) was observed for specimens with a Ferrocement layer. The presence of a cold joint between the reinforced concrete slab and the Ferrocement layer lowered the ultimate flexural load by 34%, however, cracks width and spacing were reduced. The author concluded that the Ferrocement layer thickness and the connection type influenced the reduction in defection.

M.Jeelani [1] et al carried a research on "Study of Response Spectrum and Time History analysis of an RC Structure for Different Soil Strata using SAP".

In this study various multi storey buildings are modeled, and analysis has been carried out in civil engineering software SAP 2000. Multi storied buildings were analyzed under different soil conditions such as hard, medium, soft. These buildings with different soil strata are taken and their corresponding responses are determined for 3 different zones such as zone 3, zone 4, and zone 5. This work involves selection of different building models and assigning material properties to frame sections and boundary conditions to analyze these structures with different storey height by response spectra and time history methods.

Ziga Turka and Robert Klincb[3] et al made a study on "Potentials of Blockchain Technology for Construction Management".

The work is based on the study of literature on open issues that exist in construction process management. These are than matched to the capabilities of Blockchain. The construction projects involve a dynamic grouping of several companies. a study was made on the degree to which the relationships among them are hierarchical or peer-to-peer and note that particularly in information intensive phases, centralization of information management was necessary because of technology. When using un-constraining technology, communication patterns among participants show a peer-to-peer nature of the relationships. In such environment, Blockchain can provide a trustworthy infrastructure for information management during all building life-cycle stages. Even if building information modeling (BIM) is used, which assumes a centralized building information model, there is a role for Blockchain to manage information on who did what and when and thus provide a basis for any legal arguments that might occur. On the construction site Blockchain can improve the reliability and trustworthiness of construction logbooks, works performed and material quantities recorded. In the facility maintenance phase, Blockchain's main potential is the secure storage of sensor data which are sensitive to privacy. We conclude that Blockchain provides solutions to many current problems in construction information management. However, it is more likely that it will be built into generic IT infrastructure on top of which construction applications are built, rather than used directly by

authors of construction related software. It has a potential to make construction processes less centralized which opens needs for research in that direction.

Michael Hultgren and Fredrik Pajala[4] made a study on"Blockchain Technology in Construction industry".

A study was focused on how a specific material is handled throughout a suppliers supply chain, from where it originates until final use by a contractor. A hypothetical supply chain has been set-up and analyzed in terms of transparency, traceability and the potential consequences of using the Blockchain technology. they specifically focused on how the Blockchain system could be set-up, who should own the Blockchain system and what are the sustainable aspects of using Blockchain.

The conclusion is that very less work has been done in civil Engineering field on Blockchain technology. This improve the transparency throughout the entire supply chain. However the need for a complementary technology is needed in order to handle all the problems with traceability. One example of this complementary technology is RFID tagging. Furthermore, some of the consequences that has been identified it improves the way to handle supply chain documentation, the reputation of the industry improves, the possibility to remove third party organs increases.

3. CONCLUSIONS

In this paper A review of behavior and strength of reinforced concrete (RC) structures strengthened with Ferrocement infilled frames is presented. The effect of different number of layers, angle of Ferrocement jacket with different grades of concrete is also discussed. The best solution for the number of layers and of the angle of Ferrocement jacket is also cited with the grades of concrete, wherever available. Various critical issues, related with Ferrocement jacket, based on literature review are presented. Ferrocement is commonly used as repairing & strengthening material, apart with this character errocement is found to be very good solution for fire protection because of its post fire flexural strength and toughness with plain mortar or concrete cover. We conclude that the increase in wire mesh content significantly improved the strength properties of Ferrocement.

Also we conclude that here is an increasing number of construction products that are manufactured globally through complex supply chains. The results of this is that quality requirements are increasing and the construction industry look towards ways to reassure the sustainability of the materials in their supply chains The aim of this study is to explore how the new Blockchain technology may be used to meet today´s and future requirements of the construction industry and analyze the potential consequences of using the technology. The work examined how the Blockchain technology can support supply chain transparency and material traceability. To explore and analyze how the technology may affect the supply chain of construction.

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