

A Review Paper on Study And Analysis of Panel Structure Vs Frame Structure

Shweta D.Tayade¹, Shrikant R.Bhuskade²

²Assistant Professor, Dept of Civil Engineering

^{1, 2}Prof. Ram Meghe Institute Of Technology And Research ,Badnera

Abstract- World population is growing at rapid-fire pace. Further 50,000 people are being added to its population daily in India itself. With such a population growth rate, there's a great demand of new houses. To achieve the dream of housing for all, further than 11 crore houses are needed in India by the year 2022. With the ever adding population and limited coffers there's a need of using alternate structure accoutrements. Sustainability is a global concern and hence the things of mortal kind should be to produce a sustainable world. In order to achieve sustainability, style that are to be employed are effective application of presently available coffers for a prolonged period of time, minimization of destruction of material, energy and controlling overuse, and icing that there are reserves kept for unborn generations without complete prostration. This paper projects a report on the results of an disquisition of application of precast RCC Wall Panels in construction and how it's done. It must be assured that it's an easy, stable, profitable, fast and a result to environmental imbalance caused due to inordinate use of accoutrements and energy. Therefore, we aim to conclude that by using Precast RCC Wall Panel in construction rather than conventional construction styles, we can achieve an easy, fast and cheap system of construction.

Keywords- precast, construction. review, comparison, prefabrication

I. INTRODUCTION

Precast concrete wall is one of the prefabricated factors of high demands in the construction assiduity especially in domestic structures as it combines the benefits of rapid-fire speed of construction, good quality control and minimal labour intensity at the construction point. In Malaysia, precast concrete structure using prefabricated factors has gained its fashionability because of several advantages similar as high quality of structural prefabricated factors, lower labour intensity at the construction point and shorter completion time of a design Still, the connection of precast wall is a crucial factor as it provides the structure integrity and robustness of the overall structural system. The conception of precast (known as “ prefabricated”) construction includes those structures where the maturity of

structural factors are formalized and produced in shops in a position down from the structure, and also transported to the point for assembly. These factors are manufactured by artificial styles grounded on mass product in order to make a large number of structures in a short time. Engineering precast concrete, like utmost other construction accoutrements, requires consideration of colorful conditions other than the final in- service condition. The developer needs to consider manufacturing, handling, transportation, and construction of the product in addition to analysis and design for in- service loads. It isn't uncommon for one of these temporary conditions to be the controlling factor in the design. Exercising a Precast Concrete system offers numerous implicit advantages over point casting of concrete. The product process for Precast Concrete is performed on ground position, which helps with safety throughout a design. There's a lesser control of the quality of accoutrements and workmanship in a precast factory rather than on a construction point.

II. LITERATURE REVIEW

2.1 Harsh R. Sanghvi1, Mazhar A. Dhankot2 (Feb 2015)they conducted research experimental program to design the study of various limit states behavior and the shear capacity of the multiple shear keys used in horizontal connections this paper represent the behavior and capacity of different connection configuration used for precast concrete load bearing shear wall panels subjected to monotonic shear loading and cyclic loading condition. The experimental study showed 3types of failure mode

- 1) sliding failure
- 2) grout failure.

It is observed that base connections and connections at horizontal joints in precast columns and wall panels, including shear walls, must be designed to transfer all design forces and moments. This paper tells us about the importance of the bottom face horizontal joints is important because of maximum stress generates at bottom face as the shear forces in the wall transfer to the structure through this junction. Important to analysis the joint behaviour for in plane and out plane forces due to earthquake. Different type of geometry for

horizontal connection gives the different type of shear resistance for the same grout property.

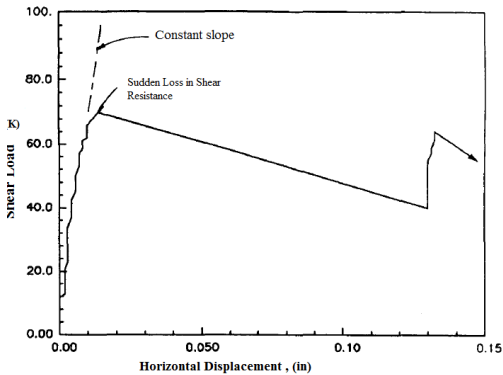


Fig 1 - Sliding failure of shear

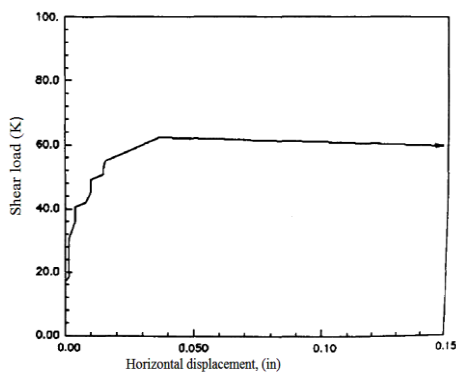


Fig 2- Grout failure

2.2 Siddhant Singhal¹, Bilal Siddiqui² (Apr 2019) the purpose of this paper focuses on the literature review of the prefabricated system of construction methodology. The author tries to bring out the merits and demerits of prefabricated construction to its readers. For this purpose, this paper presents the five major prefabrication system approved and promoted by BMTPC for the fast track construction in India. Aim of this paper also is to project building materials and technologies, which are less dependent on natural resources and labor and require less time in construction without compromising with the quality and esthetic value of the building. They also tells us the needs and importance of prefabricated construction. There are about 5types of prefabricated systems 1.Monolithic Concrete Construction Technology 2. Light Gauge Steel Framed Structure (LGSFS) 3. Precast Large Concrete Panel System. 4. SIP Panel - Building System using Steel Mesh, Polystyrene Core and Chipping Concrete (evaluated through PACS) 5. Glass Fiber Reinforced Gypsum (GFRG) Panel System. From all the types of construction technologies, GFRG prove to be giving most economic outcome by saving lots of building material, time and labor. GFRG panels had the thinnest wall space requirement, providing most usable space. Hence, GFRG panels were shortlisted and chosen for the comparison from

the prefabricated structures. Experimental researches and studies have shown that GFRG panels, when properly filled with reinforced concrete, acquires significant strength to act not only as load-bearing elements, but also as shear walls, able of resisting lateral forces due to earthquake and wind. It is possible to design such buildings up to ten storeys in low seismic zones (and to smaller elevation in high seismic zones). However, such building needs to be suitably calculated by a qualified structural engineer for safety.



Fig.1 – A Typical working of a Monolithic Concrete Construction Technology

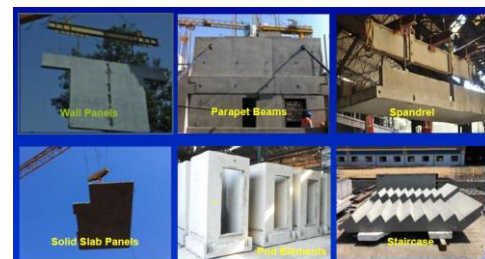


Fig.2 – A Typical working of a Precast Large Concrete Panel System

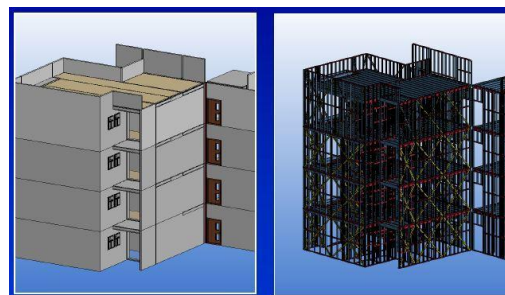


Fig.3 – A Perspective View and Framing View



Fig.4- A typical GRGF panel

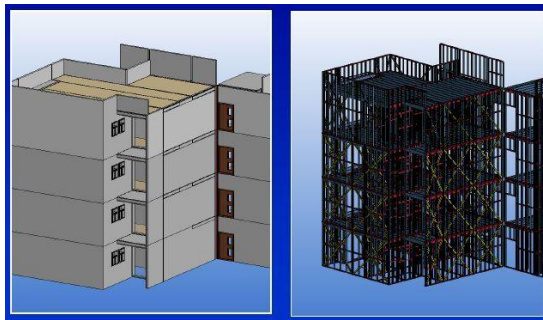


Fig.5 – A Perspective View and Framing View

2.3 Chandankumar Gupta¹, Santosh Kumar², Sajjan Kumar³ (Apr 2018) in this paper, the study is carried out on precast concrete wall panel which area sustainable building option, offering durability, reduced moisture and air infiltration, energy efficiency, recycled content, recyclability, light weight, and low maintenance. The connection between panels are very important since they provide the monolithic behaviour of the structure. It describe about the principle of precast wall panel construction ,material used for precast concrete construction , sustainability , speed installation : quick assembly and application of precast concrete. Precast concrete construction is considered to produce better productivity and reduce completion time, cost and dependency on work force. The precast concrete hollow wall and slab panels can be jointed vertically and horizontally to form a building frame which behave as completely monolithic. The monolithic action makes it of good strength, stiffness and durable to resist seismic loading. Precast concrete component are successful in both high and low rise building.



Figure 1: Precast wall panel and Installation of precast concrete wall panel



Figure 2 Precast non-composite concrete wall panel.

2.4 Mousa Abdullah Mohammed Hasan, Rahimah Muhamad (Nov 2019) this paper aims to describe and summarize types of precast wall-to-wall horizontal connection in terms structural behaviours such as embedded length, bonding stress, seismic behaviours and modes of failure. This paper investigated the structural behaviours of three types of precast wall to wall horizontal connection i.e. loop connection, wire rope and U-shape steel channel connection in terms of embedded length, bonding stress, seismic behaviours and modes of failure. The horizontal connection of precast concrete wall-to-wall is of significantly important as it ensures the continuity of load transfer of the connected wall panels. Thus, the connection is regarded an essential part of the structural system as the stability of the structure mainly relies on the performance of the connection. Loop shaped rebar is capable to transfer the stresses between the reinforcement bars and concrete over a shorter length. However, the loop connection is not capable to withstand lateral load action due to earthquake excitation as it has low ductility and insufficient shear capacity. However, wire rope has higher tensile capacity with relatively small diameter. For the developed U-shape steel channel, the connection is more flexible due to presence of U-shaped rubber between the U-shaped steel channels.

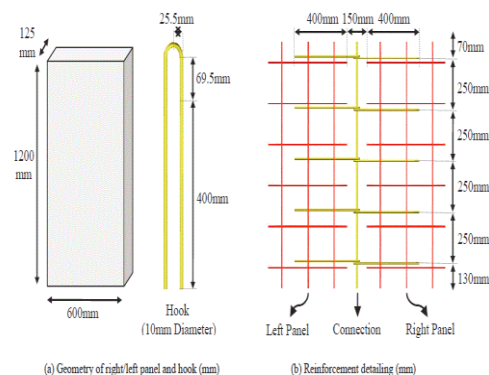


Figure 1: Wall to wall loop connection between two wall elements

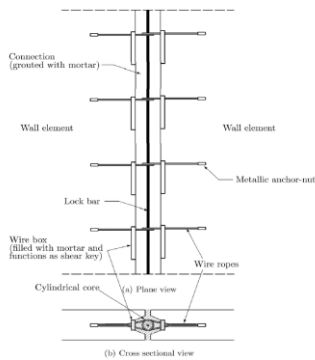


Figure 2: Wire loop connection

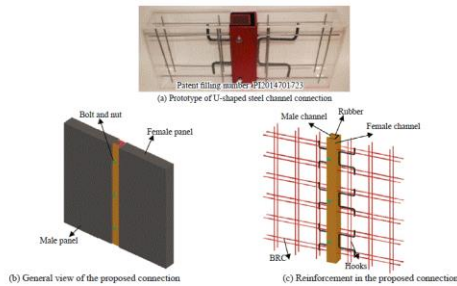


Figure 3: U-Shape steel channel connections (Vaghei et al, 2017)

2.5 Muhammad Ujianto, Ahmad ZurismanMohd Ali and MohamadSolikin (June 2019) in this study, the walls of precast concrete panels are made in half scale and given dynamic loads to simulate earthquake forces. The ability of precast concrete wall panel to experience large post-elastic deviations repeatedly, and back and forth, due to earthquakes causes the first melting. The ductility of the wall panel maintains the sufficient strength and stiffness, so that it remains standing, even though it almost collapsed. Precast concrete wall panel provides more accurate construction system in term of strength, quality control, timing speed, and construction efficiency. Therefore, it can be obtained ultimate effectiveness of reinforcement tensile strength that can be distributed for better performance of wall panel in restrain earthquake loads.

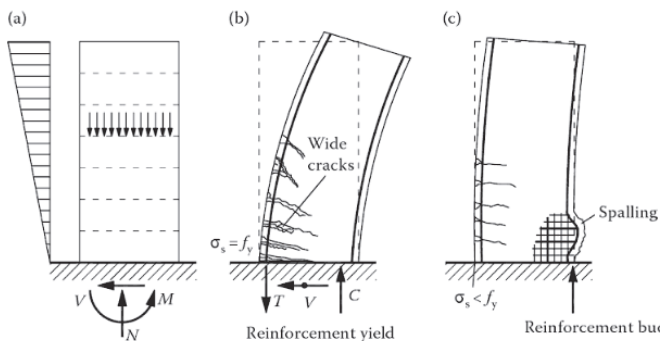


figure1. Failure mechanism of slender walls under flexure: (a) loading pattern; (b) ductile failure; (c) brittle failure.

2.6 Sidney Freedman (Sept-Oct 1999) the research is about loadbearing architectural precast concrete wall panels. The paper describes about different loadbearing structure and giving it's detail about wall to wall connections. The paper dicusses about the shape and size, design considerations, shear walls, connections, wall-to-foundation connections, slab-to-wall connections, application. Architectural load bearing wall panels can be used not only in all-precast structures but also in structural steel framed structures and cast-inplace concrete structures. Architectural precast concrete used innovatively for loadbearing walls makes possible a nearly unlimited range of aesthetic expression, new design concepts and more efficient and less costly construction.

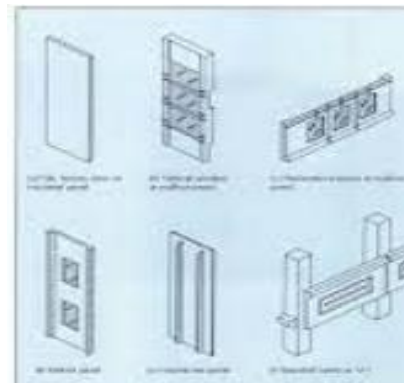


Fig. 1. Various types of architectural loadbearing wall panels bearing walls

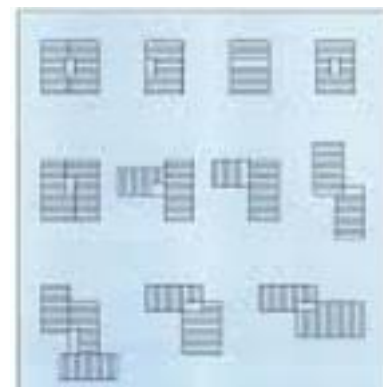


Fig. 2. Plan view of possible locations of vertical cores with respect to load

2.7 Pradeepa.S1 Anitha J 1, Lalit Soni2, Medha3 (Oct 2016) this paper projects a report on the results of an investigation of utilization of precast RCC wall panels in construction and how it is done. It must be assured that it is an easy, stable, economic, fast and a solution to environmental imbalance caused due to excessive use of materials and energy. They have carried different types of test such as compressive strength test, . slump test prove that precast RCC wall panel is better and time saving than conventional construction methods. Replacement of natural sand by M sand made the

reduction in the sand cost by 70%. Time analysis of construction is 56% faster than conventional construction and wall panel construction reduces the cost almost by 30 to 35%. Thus, they conclude that by using Precast RCC Wall Panel in construction rather than conventional construction methods, we can achieve an easy, fast and cheap method of construction

III. CONCLUSION

- It has been concluded that the precast wall panels provides better productivity, reduce the duration time of the design and cost and also the reliance of work force.
- Precast is a cost and time saving construction system which assures quality of concrete to its maximum extent.
- As precast wall panels are more fluently controlled, the quality and continuity is generally much better than cast-in-place concrete.
- A precast manufacturer is also more likely to admit lesser abatements on accoutrements due to the volume of purchases that can be made for multiple systems at a time.
- The main advantages of precast technology are quality, speed of construction, and a value-for- plutocrat product.
- • To avoid labor deficit, time detainments and with an end to deliver quality products, inventors and builders are now espousing precast technology.
- The main advantages of precast technology are quality, speed of construction, and a value-for- plutocrat product.
- The use of similar technology helps in saving up to 64 of the time taken for analogous systems using normal construction styles and technology.

The main objects of this paper are,

- 1) To create an understanding about concrete precast panels and frame structure and there significance.
- 2) To consider a model similar that both the ways can be compared and analysed with respect to each other.
- 3) To observe the goods on the structures under; natural, dead and side loads and numerous other parameters similar as cost effectiveness, ease of handeling, vacuity, workmanship challenges and so on.
- 4) To validate the findings and come up with a conclusion regarding the supiriority of the ways.

NOTE: Conlusion is based on the literature review

IV. ACKNOWLEDGEMENTS

I am highly grateful to thank my guide, Prof.Shrikant R.Bhuskade, Department of Civil Engineering (Structure),

Prof. Ram Meghe Institute Of Technology And Research ,Badnera- for their constant intellectual support in the form of innovative ideas and valuable guidance. Their expert suggestions and scholarly feedback had greatly enhanced the effectiveness of this work.

REFERENCES

- [1] Harsh R. Sanghvi¹, Mazhar A. Dhankot² (Feb 2015) 'Analysis Of Precast Shear Wall Connection-State Of The Art Review' *IJRET: International Journal of Research in Engineering and Technology* eISSN: 2319-1163 | pISSN: 2321-7308.
- [2] Siddhant Singhal¹, Bilal Siddiqui² (Apr 2019) 'Comparative Study between RCC Structures and Prefabricated Structures' *International Research Journal of Engineering and Technology (IRJET)* e-ISSN: 2395-0056 Volume: 06 Issue: 04 | Apr 2019 p-ISSN: 2395-0072
- [3] Chandankumar Gupta¹, Santosh Kumar², Sajjan Kumar³ (Apr 2018) 'Study On Precast Concrete Wall Panels: Quality, Strength, Speed, & Sustainability' *INTERNATIONAL JOURNAL OF ADVANCE RESEARCH IN SCIENCE AND ENGINEERING VOLUME NO.07, SPECIAL ISSUE NO.01, APRIL 2018.*
- [4] Mousa Abdullah Mohammed Hasan, Rahimah Muhamad (Nov 2019) 'WALL TO WALL HORIZONTAL CONNECTION FOR PRECAST CONCRETE STRUCTURE' *International Journal of Recent Technology and Engineering (IJRTE)* ISSN: 2277-3878, Volume-8 Issue-3S3, November 2019.
- [5] Muhammad Ujianto, Ahmad Zurisman Mohd Ali and Mohamad Solikin (June 2019) 'STRUCTURAL BEHAVIOUR OF PRECAST CONCRETE WALL PANELS DUE TO DYNAMIC LOAD' *AIP Conference Proceedings* 2114, 050013 (2019) Published Online: 26 June 2019.
- [6] Sidney Freedman (Sept-Oct 1999) 'Loadbearing Architectural Precast Concrete Wall Panels'
- [7] Pradeepa.S1 Anitha J 1, Lalit Soni², Medha³ (Oct 2016) 'An Introduction to Precast RCC Wall Panels' *International Journal of Research in Advent Technology, Vol.4, No.10, October 2016* E-ISSN: 2321-9637