A Comparative Study on Precast / Prefabricated Structures and Cast Insitu Structures

Suraj Kumar
M. Tech - Structure, Maharishi University of Information Technology, Lucknow, India

Abstract: My project report is on precast and merits of precast structure where my part is to identify various factors which gives signification importance to precast fabrication with respect to cast in situ. i.e. the importance of precast in today is world in especially with reference to speedy, safe cost effective construction for developing nation like over India.

Keywords: Estimation and costing, excel, auto cad, case study

1. Introduction

There are 5 basic topics covered in this project with each having its own constraints
1) Cost comparison b/w conventional and prefab units
2) Present housing approach in India and it’s extension to prefab housing
3) Sustainability of prefab housing units
4) Implementation of prefab housing unit in major disaster prone areas
5) Futuristic housing

2. Literature Review

Elias IssaSaqan (1995) studied the evaluation of ductile beam-column connections for use in seismic-resistant precast frames. Four types of ductile connections were considered in this study. Four half-scale models of prototype precast beam-column connections subjected to reversed cyclic loads have been constructed and tested. The experimental study demonstrated that it is possible to design and construct precast beam column connections, where beams and columns are joined with ductile connecting elements, to withstand severe inelastic deformations resulting from earthquake forces.


R. Vidjeeapriya and K.P. Jaya(2011), Behaviour of Precast Beam-Column Mechanical Connections under cyclic loading, ASIAN JOURNAL OF CIVIL ENGINEERING (BUILDING AND HOUSING) VOL. 13, NO. 2 (2012), 2011: Experiments were conducted on 1/3 scale models of two types of precast beam-column connections and a monolithic connection. The precast connections considered are the beam-column a connection in which beam is connected to column with corbel using (i) J-bolt and (ii) cleat angle. The specimens were subjected to reverse cyclic loading. The experimental results of the precast specimens were compared with those of the monolithic connection.

P. K. Aninthaneniand R. P. Dhakal (2014), Conceptual development: low Loss Precast Concrete Frame Building System with Steel Connections, 2014 NZSEE Conference, New Zealand, 2014, Schematic development of a sustainable demountable precast RC frame system, in which the precast members are connected with steel angles/plates, steel tubes/plates and high strength friction grip (HSFG) bolts, is discussed. The concept of this system allows a mechanical pin to be used in the gravity frame connections such that only the seismic frames share the lateral force imposed by earthquakes and the gravity frames do not damage at all in earthquakes. In the proposed precast structural system, damaged structural elements in seismic frames can be easily replaced with new ones; thereby rendering it a definitely repairable and low loss system, despite not being a damage avoidance solution.

3. Methodology

Prefabrication in India

Prefabrication in India began with the emergence of the Hindustan Housing Factory. The company was developed by the first Prime Minister of India, Pandit Jawaharlal Nehru, as a solution to the housing crisis that resulted from the influx of refugees from West Pakistan in the 1950s. The Hindustan Housing Factory pioneered the production of pre-stressed concrete railway sleepers to replace dilapidated wooden sleepers on Indian Railways. The company changed its name shortly thereafter to reflect the diversity of its operations. It is now known as the Hindustan Prefab Limited or HPL. Located in Delhi, today the government run company prefabricates primarily precast concrete for architectural and civil projects throughout greater India.

4. Cost Analysis of Building

For any construction project cost is an important factor. Total cost of a project can be determined by determining the individual cost of materials used in the construction process. Various cost reduction techniques have been employed for developing effective strategies in order to reduce overall cost of the project. This article specifically deals with the cost of the material employed during the construction of a 1400 sq.
ft. residential apartment, by conventional methods as well as construction through prefabrication.

Prefabrication and precast techniques have been developed to offer speed and economy to the construction process. In civil engineering, time is money and consequently time saving is the key to save as much funds as possible without compromising the market demand

1) In prefabricated construction, as the components are readymade, self supporting, shuttering and scaffolding is eliminated with a saving in shuttering cost.

2) In traditional construction, the repetitive use of shuttering is limited, as it gets damaged due to frequent cutting, nailing etc. On the other hand, the mould for the precast components can be used for large number of repetitions thereby reducing, the cost of the mould per unit.

3) In prefabricated housing system, there is saving of time as the elements can be casted before hand during the course of foundations being laid and even after laying slab, the finishes and services can be done below the slab immediately. While in the conventional in-situ RCC slabs, due to props and shuttering, the work cannot be done, till they are removed. Saving of time means saving of money.

### 5. Cost Estimation For Pre-Cast Structure

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate (INR)</th>
<th>Amount (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Plaster coat</td>
<td>sq.m</td>
<td>30.00</td>
<td>3000.00</td>
<td>90000.00</td>
</tr>
<tr>
<td>2</td>
<td>Class II brick units</td>
<td>120.00</td>
<td>2000.00</td>
<td>240000.00</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Concrete blocks</td>
<td>10.00</td>
<td>1500.00</td>
<td>15000.00</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>RCC work on one floor</td>
<td>20.00</td>
<td>1000.00</td>
<td>20000.00</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Reinforcement</td>
<td>1.25</td>
<td>50.00</td>
<td>150.00</td>
<td>7500.00</td>
</tr>
<tr>
<td>6</td>
<td>Precast elements</td>
<td>1.25</td>
<td>50.00</td>
<td>150.00</td>
<td>7500.00</td>
</tr>
<tr>
<td>7</td>
<td>Painting on walls</td>
<td>1.25</td>
<td>50.00</td>
<td>150.00</td>
<td>7500.00</td>
</tr>
<tr>
<td>8</td>
<td>Precast elements</td>
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<td>50.00</td>
<td>150.00</td>
<td>7500.00</td>
</tr>
<tr>
<td>9</td>
<td>RCC work on two floors</td>
<td>20.00</td>
<td>1000.00</td>
<td>20000.00</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Reinforcement</td>
<td>1.25</td>
<td>50.00</td>
<td>150.00</td>
<td>7500.00</td>
</tr>
<tr>
<td>11</td>
<td>Painting on walls</td>
<td>1.25</td>
<td>50.00</td>
<td>150.00</td>
<td>7500.00</td>
</tr>
</tbody>
</table>

**Objective**

**Present Housing Approach in India and It’s Extension to Prefab Housing**

The Indian realty and infrastructure sectors are booming. The demands for these products have risen exponentially within these few years. Yet the construction industry is not able to meet the current demand of infrastructure required. India faces a crucial shortage of houses and current technology is reliable but it takes lots of time and money, so the need of the hour is the construction at a greater speed and lesser cost.

In spite of Best & Sincerest efforts by Government, there still exists a huge gap between the number of houses required and the number of houses still in categories of Economic Weaker Section (EWS), Lower Income Group (LIG) and Lower Middle Income Group (LMIG). The overall shortage in EWS and LIG housing in India has been estimated at close to 2.65 Crores (26.5 Million) dwelling units as per report published by government and is expected to touch 3.8 Crores (38 Million) by the year 2030. Out of
current shortage of 2.65 Crores (26.5 Million) Units EWS alone has a requirement of 2.3 Crores (23 Million) Units.

6. Conclusions

In this project an extensive study is to be done on the precast structures in India. The concept of prefabrication/ partial prefabrication which are adopted for speedy construction, better quality components and saving in material quantities and costs are to be studied. The major emphasis is to be given on the cost comparison between precast/ prefabricated structures and cast in-situ structures. Thereafter, it will represent the present housing approach in India and its extension to prefabricated housing. This project will also highlight the sustainability of prefabricated housing units and the implementation of prefabricated housing units in major disaster prone areas. Futuristic housing techniques using precast units and their advantages related to time and economy will also be discussed using certain case studies of major precast structures. The reduction of waste due to use of precast structural units and utilisation of energy using prefab structures will be studied and represented.

References

[3] ACI 318:08 2008. Building Code Requirements for Structural Concrete and Commentary, American Concrete Institute, USA.