STUDY OF PRECAST CONSTRUCTION

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Abstract - Now a days conventional type of construction is fading up as compared to Precast construction . Precast concrete is a smart way to build any type of building, safely, affordably. It ensures fast construction time, high profitability and excellent quality . Precast concrete is an industrialized way to build. It means transfer of work from sites to factories. This improves productivity and quality and shoertens construction time of a building. Inshort, precast concrete lowers total construction costs considerably. This paper deals with the study of Precast technology and its advantages over Conventional construction.

Keywords - Precast , conventional.

I. INTRODUCTION

Precast concrete is a construction product produced by casting concrete in a reusable mold or form which is then cured in a controlled environment , transported to the construction site and erected into place. Indian realty majors are adopting precast technology in building their latest projects. The main advantages of precast technology are quality, speed of construction and a value for money product. To avoid lobour shortage, time delays and with an aim to deliver quality products, developers and builders are now adopting precast technology. The use of such technology helps in upto to 64% of the time taken for similar projects using normal construction methods and technology. In other words if normal brick and mortar method takes one year to complete a project, the precast method takes about four months. Precast technology has proved its worth by saving a lot of construction time in the Europe and the Middle East.The best part of the technology is that it best part of the technology is that it not only speeds up the construction work but also enhances the quality of final output.

History of Precast Technology

Ancient Roman builders made use of concrete and soon poured the material into moulds to build their complex network of aqueducts, culverts, and tunnels. Modern uses for pre-cast technology include a variety of architectural and structural applications — including individual parts, or even entire building systems.

In the modern world, precast panelled buildings were pioneered in Liverpool, England, in 1905. The process was invented by city engineer John Alexander Brodie, a creative genius who also invented the idea of the football goal net. The tram stables at Walton in Liverpool followed in 1906. The idea was not taken up extensively in Britain. However, it was adopted all over the world, particularly in Eastern Europe[4] and Scandinavia.

In the US, precast concrete has evolved as two sub-industries, each represented by a major association. The precast concrete products industry focuses on utility, underground and other non-prestressed products, and is represented primarily by the National Precast Concrete Association (NPCA). The precast concrete structures industry focuses on prestressed concrete elements and on other precast concrete elements used in above-ground structures such as buildings, parking structures, and bridges. This industry is represented primarily by of the Precast/Prestressed Concrete Institute (PCI).

II. COST FACTOR

The cost of construction with this technology is marginally higher than the conventional method, theoretically but on practical consideration when we consider the wastage control and speed of construction with best quality and with virtually no repair or reworking cost, it works out to the same value and eventually the clients will get much superior product on the same amount of investment.

III. TYPE OF PRECAST SYSTEM

Depending on the load bearing structure precast systems can be divided into the following categories:

(a) Large panel systems
(b) Frame systems
(c) Slab column systems with wall
(d) Mixed system

(a) Large Panel System : This system refers to multi storey structures composed of large walls and floor concrete panels connected in the vertical and horizontal directions so that the wall panels enclose appropriate spaces for the rooms with a building . These panels form abond like structure. Both horizontal and vertical panels resists gravity loads.

(b) Frame Structure: Precast frames can be constructed using either linear elements or spatial beam-column sub assemblages.Precast beam-column sub-assemblages have the advantages that the connecting faces between the sub-assemblages can be placed away from the critical frame regions;however linear elements are generally preferred because of the difficulties associated with forming, handling and erecting spatial elements.

(c) Slab-Column system with Shear wall: These systems rely on shear walls to sustain lateral load effects, where as the slab-column structure resists mainly gravity loads. There are two main systems in this category:

(i) Lift slab system with walls : In this system,the load bearing structure consists of precast reinforcement concrete columns and slabs.Precast columns are usually two stories high.All precast structural elements are assembled by means of special joints.

(ii) Pre stressed slab-column system: Inpresstressed slab-column system uses horizontal prestressing in two orthogonal directions to achieve continuity. The precast column elements are 1 to 3 stories high. The reinforcement concrete floor slabs fit the clear span between columns.

Following are some elements of Precast

(1) Precast Slabs
(2) Precast Beam and Girders
(3) Precast Columns
(4) Precast Walls
(5) Precast Stairs

IV. BASIC DESIGN CONCEPTS FOR PRECAST CONCRETE BUILDING

(1) In design of precast members and connections, all loading and restraint conditions from casting to end use of the structure should be considered. The stresses developed in precast elements during the period from casting to final connection may be more critical than the service load stresses. Special attention should be given to the methods of stripping, storing, transporting, and erecting precast elements.

(2) When precast members are incorporated into a structural system, the forces and deformations occurring in and adjacent to connections (in adjoining members and in the entire structure) should be considered. The structural behavior of precast elements may differ substantially from that of similar members that are monolithically cast in place. Design of connections to transmit forces due to shrinkage, creep, temperature change, elastic deformation, wind forces, and earthquake forces require special attention. Details of such connections are especially important to insure adequate performance of precast structures.

(3) Precast members and connections should be designed to meet tolerance requirements. The behavior of precast members and connections is sensitive to tolerances. Design should provide for the effects of adverse ccombinations of fabrication and erection tolerances. Tolerance requirements should be listed on contract documents, and may be specified by reference to accepted standards. Tolerances that deviate from accepted standards should be so indicated.

(4) All details of reinforcement, connections, bearing elements, inserts, anchors, concrete cover, openings and lifting devices, and specified strength of concrete at critical stages of fabrication and construction, should be shown on either the contract documents prepared by the architect/engineer ofrecord or on the shop drawings furnished by the contractor. Whether this information is to be shown on the contract documents or shop drawings depends on the provisions of the contract documents. The shop drawings should show, as a minimum, all details of the precast concrete members and embedded items. The contract documents may specify that portions of connections exterior to the member are also to be shown on the shop drawings. The contract documents may also require the contractor to provide designs for the members and/or connections. The contract documents should show the loads to be considered in design of the precast concrete elements of the structure, and they should indicate any special requirements or functions (for example: seismic loads, allowance for movements, etc.) that should be considered in design assigned to the contractor. In this case, the shop drawings should include complete details of the connections involved.

V. ADVANTAGES OF PRECAST CONSTRUCTION OVER CONVENTIONAL CONSTRUCTION

(1) Since precast is manufactured in a controlled casting environment it is easier to control the mix, placement and curing.

(2) Since a precaster can buy material for multiple projects quality discounts can lower cost.

(3) Quality can be controlled and monitored much more easily.

(4) Less labour is required and that labour can be less skilled.

CONCLUSION

(1) Precast has lower lifetime costs than any other building solution.

(2) Precast minimizes structural maintenance needs during years.

(3) Applications of precast concrete structural systems for the construction of low-cost apartments have gained vast progress worldwideand so to speak in Indonesia as well.This is due to the fact that precast concrete systems have several advantages compared to the conventional cast-in-situ concrete system.

(4) It was found that structural construction cost efficiency around 5-10% was generally obtained by replacing conventional structural system with precast concrete.

(5) It has also been proved that the construction speed was able to be increased significantly in-line with the achievement of better quality works and more eco-friendly construction projects.

(6) The use of precast concrete as structural components will definitely enhance in the future.

(7) The precast concrete technology has already arrived in India due to large size projects, need for quality construction with speed and reduced labour force.

All these advantages can be exploited to the maximum bycarefull planning and designing.

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