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Application of Precast Structures (A Review)

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Abstract – Most concrete for buildings are cast-in-place, that is, the wet mix is deposited and formed at the place where the finished concrete is desired. This is now generally referred to as site cast concrete, since the location is usually at a building site. This is compared to precast concrete, which refers to the process of casting elements and then moving them to the place they are to be used. Concrete for site cast construction is typically brought to the site by the familiar concrete–transporting mixer trucks with the large rotating barrels. The mix is prepared at a central batching plant, where controls of the materials may be carefully monitored. However, the transporting to the site, proper mixing in the truck, discharging from the truck and depositing in the forms, and handling for placement, finishing, and curing are all subject to the level of responsibility and craft exercised by the people involved. Site conditions in terms of accessibility and weather can be highly critical of the work, requiring extreme measure in some situations to control all the stages in the production process.

Keywords – Construction, Cast in Situ, Precast

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INTRODUCTION

A precast concrete structure is an assemblage of precast elements which, when suitably connected together, form a 3D framework capable of resisting gravitation and the wind (or even earthquake) loads. The framework is ideally suited to buildings such as offices, retail units, car parks, schools, stadia and other such buildings requiring minimal internal obstruction and multi-functional leasable space. The quantity of concrete in a precast framework is less than 4 percent of the gross volume of the building, and of this is on the floors. The precast concrete elements are columns, beams, floor slabs, staircases and diagonal bracing

LITEATURE REVIEW

Sui Pheng and Choong Joo Chuan 2016 "Just-In-Time Management of Precast Concrete Components"

The authors have provided important insight into the reasons why precast suppliers are reluctant to adopt just-in-time ~JIT! Delivery of components to site. They report that precasters and contractors lack confidence that JIT delivery can be implemented due to various factors such as site readiness and unreliable deliveries, and conclude the problem of mistrust should be solved by the site contractors. And they suggest that the solution will be found in better contracting and tighter adherence to the schedule prepared by the site contractor. Just-in-time JIT philosophy for receiving and installing precast concrete components on-site. JIT has potential to reduce the time required for movement of precast members from manufacturing site to construction site. It helps to smoothen the production process through the efficient handling of materials, i.e., by providing the right materials, in the right quantities and quality, just in time for production Both the manufacturing and construction industries require active movement of materials from the suppliers to the production area in both the factory and the worksite.

Presact Technology a future Michel Mouret 2018

The precast industry is booming. Due to its many advantages, such as reduction of building time, product selection, enhanced quality with certified performance levels, cost optimization and so on, it currently represents 20% of concrete production worldwide. In the precast industry, the use of SCC is increasing and it is expected to replace vibrated concrete in many applications because of its various advantages, including the reduction of harmful effects of noise in urban environments, the possibility of pouring in congested reinforced areas or Complex geometry, and a reduction in industrial process costs.

Connection between Precast Concrete Columns and Drilled Shafts" July 21- Alaska H.V.

The authors have provided use of cast-in-place columns in bridge construction requires long on-site construction times and large labor requirements in the field. Cast-in-place construction is particularly

disruptive in situation in which it exacerbates traffic congestion.

Using precast bridge elements is one solution for reducing on-site construction time, field labor requirements, and traffic delays. This strategy is widely applied for bridge girders. Although full bridges can be constructed off site, precasting is usually limited to the columns to make fabrication and transportation easier. Achieving good connections between precast column and footing, particularly column-to-drilled shaft connections, is challenging in seismically hazardous areas.This paper describes the concept, and seismic performance of the connection between a precast column and drilled shaft, and provides recommendations to ensure desirable performance.

Grouted Splice Sleeve Connection Alternatives for Precast Reinforced Concrete Bridge Piers in Moderate-To-High Seismic Regions" M.J. Ameli1, 2014

According to author recent advancements in bridge construction include innovative methodologies that bring about ease of construction and acceleration of the overall project delivery time. Prefabrication of bridge elements contributes to this construction method and facilitates the whole construction process, the bridge is new or a replacement. Connections between precast concrete bridges elements in the substructure are some of the most critical components in bridges constructed using accelerated bridge construction. Researchers are in the process of investigating the suitability of various connection configurations in moderate-tohigh seismic regions. Load capacity, ductility level, and reparability are three significant acceptance criteria for any connection considered in earthquake-prone regions.

The Use of Precast Concrete Systems In The construction of Low-Cost Apartments H.N. Nurjaman 2018

The research and applications of precast concrete structural systems are intended to support accelerated construction of one thousand low-cost apartment tower throughout large cities in Indonesia.The application of precast concrete structural systems has been attaining vast progress worldwide, particularly in Indonesia in the last few decades. This is due to the fact that the precast structural systems possess several advantages compared to monolithic systems, such as quality control, speedy construction, and suitable application to regularly modular systems. In the middle of 2006, the Indonesia Government launched massive and speedy construction of 1000 low-cost apartment towers nationwide. To cope with the enormous need, Indonesian prominent research workers have been developing several precast concrete structural systems. The paper deals with the research and the application of precast concrete structural systems in Indonesia. The paper also describes the vast development already achieved to date in the applications of the precast concrete structural systems in the constructions of low-cost apartments in Indonesia.

Gul Polat "Factors Affecting the Use of Precast Concrete Systems Gul Polat (2018)

This study aims to identify the current factors that affect the use of precast concrete systems, compare them with the ones that prevailed in 1995, and figure out what has changed through the last 11 years in the American precast concrete industry. The findings of an extensive survey indicate that most of the dominating barriers to the extensive use of precast concrete systems in 1995 are either eliminated or drastically reduced, while some of them still prevail. Practitioners should be well informed about the factors that affect the use of precast concrete systems if these systems are to be used more extensively. Precast concrete technology is recognized worldwide as offering significant advantages including easier and quicker erection of the building structure, lower project cost, achieving tighter control over quality, enhanced durability, less material waste, high levels of design flexibility, better sustainability, enhanced occupational health and safety, better architectural appearance, and improved standardization and modularization of reinforced concrete components compared to on-site produced components

Utilization of Precast Concrete Elements in Buildin Abraham Warszawski (2004)

According to Abraham Warszawski, Moshe Avraham, and David Carmel (1984), the information about how the benefits may be obtained from the use of Precast concrete components in building construction Saving in labor input, especially in the skilled trades like formwork, masonry, or plastering work, faster construction process; higher quality of building components, saving in design time and expenses (when applying a ready system), and potential cost savings. Each of these benefits was compared to the conventional system without precast elements prefabricated systems can very favorably complete economically with the conventional building The following criteria were used for the comparison of Precast concrete & conventional are: The labor requirement, the direct building cost (labor and materials), the construction time, and other considerations of more subjective nature. The findings of the study indicated that the utilization of precast elements might considerably reduce the labor requirement on site, and the project construction time. The direct building costs were almost unaffected by the alternative solutions. The utilization of precast elements of any type will most probably reduce the construction time of the

building. The saving in time due to employment of prefabricated elements.

Comparing the Use of Precast and Cast In-Situ Concretes in Construction Industr Ambrose, J. (2001)

According Ambrose, considering the transportation and erection requirements for precast units involve the following points: Traffic regulations limit the maximum length, weight, and size of individual units.The reach and capacity of cranes and hoists imposed separate limits.The load capacity of Lorries and trucks determine the weight and volumes which can be carried. When precast units are transported by road, typical maximum dimensions could be as follows: Height: 4–4½ m. Length: 22m. Transporting large box units by road can cause problem. The width of the box is generally limited to a maximum of 2.8m. In a case of housing unit, this restricts the room width of about 2.5m.

Comparing The Use of Precast And Cast In-Situ Concretes In Construction Industry Frederick Raina, (2001)

According to author one of the problems in prefabrication is that, it easily gives rise to monotony, especially when the units are used in repetitive series. This has lead to negative perceptions about the design and aesthetic possibilities. To avoid monotony while maintaining uniformity, especially in the case of box units, new architectural concepts are needed for both the interior and the exterior.

CONCLUDING REMARK

Breakeven formula is derived to preliminarily evaluating and selecting best alternative between two competing construction methods offered by two different contractors for the structural members, those of Cast-in-Place concrete vs. Precast concrete. The criterion for selection is based on the most economic solution. The quantities of works, i.e., concrete, are treated as an independent variable. The outcome of this research is, transportation & shifting cost of Precast members considerably affective on the total cost of construction which help to assist decision makers and engineers to compare both concrete construction methods early in the construction planning phase of a project.

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