

## GLOBAL JOURNAL OF ENGINEERING SCIENCE AND RESEARCHES ADVANTAGES OF PRECAST CONCRETE FOR BUILDINGS

S Radhakrishnan<sup>\*1</sup> & Dr K G Selvan<sup>2</sup>

<sup>\*1</sup>PhD Research Scholar, PRIST University, Thanjavur 613403

<sup>2</sup>Associate Dean, PRIST School of Business, PRIST University, Thanjavur 613403

### ABSTRACT

The Construction Industry is one of the major contributors to National Income and playing a crucial role in the economic development of India. The ambitious plans of the Government in Road Development, Port Development and Housing for All, besides a host of further more give a fillip to the Construction Industry, though it did have a major tremor after demonetisation.

It is also true that it did have a transitory setback after introduction of RERA (Real Estate Regulation Act). The Builders understood the importance of RERA and started wholeheartedly complying with the same.

After realigning itself post Demonetisation, RERA and GST, the Construction Industry is picking up now.

**Keywords:** *Precast Concrete, Compressive Strength, Structural Stability, Easy Installation.*

### I. INTRODUCTION

#### Scope of Research

Visit to the site, Observation and Discussion with personnel and from Secondary Data.

Contours	Details
No. of sites visited	1
No. of floors	12
Personnel Strength	More than 200 (200 to 225) at any point of time
Facilities	Covered Car Park, Convenient Stores, Gym, Swimming Pool, Indoor Play Area, CCTV Coverage, 24 hours power supply etc.,

#### What is Precast Concrete?

Precast Concrete is a construction product produced by casting concrete in a reusable mould, which is then cured in a controlled environment and transported to the sites and used, as per the requirements.

Precast concrete construction involves the mass production of repetitive and often standardised units. Columns, Beams, Floor and Roof elements and wall panels.

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This is largely being preferred for the excellent quality control and the higher concrete strength that are achievable under factory condition and greater independence of construction.

**(Source: Pages 631 – 632, Chapter 18.5 Precast Concrete for Buildings. Book Ref: Design of Concrete Structures by Arthur H Nilson, David Darwin and Charles W Dolan, 14<sup>th</sup> edition, published by McGraw-Hill, New York, NY 10020, ISBN 978-0-07-329349-3)**

[ 1 ]

### **Concept of Maturity**

Concrete is known for its compressive strength. The rate of gain of strength of concrete depends on the reaction rate of cement and additions with water (hydration).

It is a fact that the gaining strength of concrete depends on the temperature. Higher temperature gives higher rates of reaction, eg, the concrete gains strength more rapidly when its temperature is higher.

In the precast concrete, it is quite possible to have accelerated curing. Accelerated curing is the process by which the temperature of the concrete is raised artificially by applying external heat to speed up the rate of gain in strength.

Applying heat to concrete is an expensive option and therefore, it will only be applied in practice when benefits outweigh the cost.

**(Source: Pages 4/22 to 4/27 – Maturity and Accelerated Curing. Book Ref: Advanced Concrete Technology - Concrete Properties edited by John Newman and Ban Seng Choo, Butter Worth – Heinemann – An imprint of Elsevier Linacre House, Jordan Hill, Oxford OX2 8 DP, 200 Wheeler Road, Burlington, MA 01803, ISBN 0 – 7506 – 51040)**

[ 2 ]

### **Why Pre Stressed Concrete structures are preferred?**

The Site Engineer, during the discussion, said that considering the huge scale construction at various places concurrently taking place, it is always preferred to have pre stressed concrete structure as it helps go ahead with speedy construction. He further said the pre stressed concrete structures do not give place for cracks.

The factory made structures enjoy excellent quality and come in different sizes of requirements. He has strongly advocated for the wide spread use of pre stressed concrete structure at construction sites as this is going to occupy the front seat in the very near future.

It is also pertinent to note the following, here.

“Pre stressed structural elements can be much shallower than ordinary reinforced concrete elements for the same span and loading conditions, while still maintaining good span/deflection

ratios. The shallower depts., in turn result in lighter structural elements, thus providing considerable savings in the dead loads the structure must carry.

The savings extend to reduced floor to floor heights and lighter column and foundation loads as well.”

**(Source: Pages 465 – 469 – Overview of Pre-stressed Concrete. Book name: Concrete Structures. Authors: Mehdi Setarch, PhD, PE and Robert Darvas, SE, PE, Pearson – Prentice Hall Upper Saddle River, New Jersey, Columbus, Ohio, Copy right @ 2007, by Pearson Education Inc, Upper Saddle River, New Jersey 07458, ISBN 0 – 13 – 198827 – 1) [ 3 ]**

The Site Engineer said that if the requirement is in reasonable number, chances of getting trade discount is there. He also added that they have three reputed manufacturers of pre stressed concrete from whom they avail volume discount as well.

More number of entrepreneurs are venturing into pre stressed concrete business. This is found to be a promising one, given the spur in the construction activities again, particularly after the demonetisation.

Reputed builders who do construction of 8 – 10 floors and above, ideally prefer precast concrete for their construction projects.

The factory built pre stressed concrete is absolutely flawless and caters to all quality and design requirements. Perhaps, the transportation cost is a thing to be borne in mind. For the big builders, this is not found to be a deterrent.

From the point of view of service also, the precast concrete is found to be easier and more beneficial to the builders. This is also one among the many reasons for their preference of precast concrete.

In the manufacturing process, absolute care is taken with respect to pre stressing so that the concrete structure does not run into any kind of problem at the site. The durability, serviceability and performance are all ensured at the factory built pre stressed concrete.

The following emphasises the necessity for a total design and careful manufacture of the pre stressed concrete, though it is factory made.

“it is to be carefully done that pre-stressing applied to concrete too soon after casting, before it has gained strength and maturity will lead to excessive creep. Similarly, Pre-stress applied too late after concreting may result in extensive shrinkage cracks”.

(Source: Pages 11.1 to 11.4 Title: Construction of Pre Stressed Concrete by Ben C Gerwick, Jr PE, SE – Book Name: Concrete Construction Engineering Hand Book, Edward G Nawy, Editor In Chief, Second Edition, CRC Press, Taylor & Francis Group 6000, Broken Sound Parkway NW, Suite 300, Boca Raton, FC 33487 – 2742 @ 2008 by Taylor & Francis Group, LLC, ISBN 13: 978 – 0 – 8493 – 7492 – 0) [ 4 ]

### Preference of Builders for Pre Stressed Concrete

The demand in the housing sector is keenly felt now. The important reasons are increased wages to employees, easy availability of long term loans, accrual of IT benefits to the buyers, and the rapidly changing social life pattern of people – both the husband and wife should be employed for higher standard of living in the society. Post Marriage, the major thing the couple venture upon is purchase of an apartment for themselves.

It is also notably felt by the Builders that the sale of “Luxury Apartments” is also going on the higher side, now.

All these compel the builders to accelerate the construction activities and complete the projects on time and if possible ahead of schedule. As any delay in completion of the project is only mounting loss to the builders, they are more particular in “on time execution”.

One more thing widely opined by Major Builders is that however carefully they enter into labour contract with the Contractors, timely supply of skilled labour is always a matter of deep concern. They do not want to take the risk of going ahead with the work with “not adequately skilled” workers as they not only lead to wastage of materials and take excessive time for completion of activities, but also, more importantly leaving the quality of construction questionable.

This is the main reason that the Large Scale Builders are concentrating on the things that give them the benefit of lesser use of labour. Pre stressed Concrete is actively used by them for this as also, amongst the other benefits they get.

It is worthwhile knowing the following also of Pre stressed concrete, for the technical superiority.

“The cracks, deflections etc., can be totally avoided in pre stressed concrete. A Pre stressed concrete member can be defined as one in which there have been introduced internal stresses of such magnitude and distribution that the stress resulting from the given external loading are counteracted to a desired degree.

Pre stressing applies a pre compression to the member that reduces or eliminates undesirable tensile stresses that would otherwise be present. Cracking under service loads can be minimised or even avoided entirely”.

(Source: Pages 634 – 639, Chapter 19, Pre Stressed Concrete. Book Name: Design of Concrete Structures, 13<sup>th</sup> edition, Authors: Arthur H Nilson, David Darwin and Charles W Dolan, Tata McGraw Hill Education Private Limited, New Delhi, Tata McGraw Hill Edition 2005, Ninth Reprint 2010, ISBN: 13 – 978 – 0 – 07 -059854 – 6, ISBN: 10 – 0 – 07 – 059854 – 1)  
[ 5 ]

### **Premium Quality features of Precast Concrete**

Precast concrete is gaining popularity amongst builders now. It has many premium quality features over the conventional concrete. A few of them are as indicated below.

- Weather disturbance or labour shortage will not hit the work at site, as the precast concrete is factory made.
- Accelerated curing of the concrete is possible at factory, should there be a need.
- Excellent quality is ensured, as it is factory built
- It ensures faster building activities at the site.

### **Advantages of Precast Concrete**

- Top quality is ensured as it is factory built and undergoes professional supervision
- Durability is better compared to standard concrete
- Precast concrete is available in various colour choice as well
- Recyclability is the greatest advantage of precast concrete
- Multi storey buildings can be built with faster execution with the use of precast concrete
- Easy installation at the site is the overwhelming advantage in the precast concrete. Excessive dependence on labour can be avoided or eliminated, as well. With minimum labour, the installation can be completed.

### **Precast Concrete is the future of construction**

Going by the demand for urban housing properties in the country and also the thrust being given by the Government on “House for All”, the construction industry will be the major one needing massive investments, necessitating infrastructural development and a potential provider of employment opportunities.

A glimpse at the following chart will show the demand and supply situation of urban housing properties in the major 8 cities during 2016 – 2020.

### Demand and Supply of Urban Housing Properties

Cities	Cumulative Demand (units)	Cumulative Supply (units)
Delhi	1000000	253000
Mumbai	711000	128000
Kolkatta	361000	91000
Chennai	444000	97000
Ahmedabad	245000	50000
Bengaluru	686000	220000
Hyderabad	518000	75000
Pune	190000	108000
Total	4156000	1023000

(Net Source: Housing Demand across top 8 cities during 2016 – 2020 estimated at ...  
<https://economictimes.indiatimes.com>Wealth>Real Estate> [ 6 ]

#### The Precast Concrete will take the entire construction sector in its fold

The Precast Concrete is gaining laudable acceptance amongst builders. The Precast Concrete offers a host of benefits to the builders and the very important ones can be succinctly expressed as under:

- Cost Benefit
- Energy Efficient Construction
- Earth Quake Resistance
- Shorter construction time and less co-ordination at site
- Excellent quality features being factory made
- Lesser number of personnel at the site
- Aesthetic look and environment friendly
- With more number of firms entering this sector, it promotes healthy competition amongst themselves to excel each other in Quality and Price. This gives immense benefits to the builders who can command on price negotiations and demand in quality.

Here, it is necessary to echo the views of Portland Cement Association, Illinois 60077 – 1083, which state “the idea of total precast has become a buzzword in recent years and the practice is common in many metro areas, especially in residential applications”.

(Net Source: Precast Concrete – The Portland Cement Association ...  
[www.cement.org/cement-concrete-application/products/precast-concrete](http://www.cement.org/cement-concrete-application/products/precast-concrete) ) [ 7 ]

## II. CONCLUSION

The RERA has disciplined the Builders. Government is concentrating on “House for All”. The attitude of youngsters is to own an apartment immediately, especially after marriage.

The demand for Luxurious Apartments is also getting on the rise.

Price has been relegated and quality and comfort have occupied the front seat. Builders have also become quality conscious and started offering maximum comforts to the purchasers (some of them at no extra cost as well) to take them into their fold from going to competitors.

With the boom in the economy, construction industry is having hay days, once again.

The difficulty experienced in sourcing skilled manpower and also the need for accelerated construction / completion of the projects, almost, all the builders evince keen interest in precast concrete.

The Precast Concrete has a number of premium features and quality superiorities over the on-the-site concrete.

Hence, the Precast Concrete is only going to be the ideal one for construction sector in the years to come