

Contribution of Precast Technology to affordable green housing

In order to meet rising demand of housing infrastructure there is a need to redefine the approach towards construction. Instead of taking up conventional methods of construction, modern techniques which involve assembly line manufacturing process can be adopted to form a more integrated approach. Precast Construction is one such unique tool which has distinct advantages over conventional methods.

The process that Prestressed and Precast technology uses involves casting concrete in a reusable mould, which is then cured and transported to the construction site where it is lifted into place. The precise casting of concrete under controlled circumstances ensures adherence to the highest international standards of safety and production. The advantages associated with Prestressed and Precast Technology make it the most cost effective and sensible option for builders – thanks to the sound structures and longevity demonstrated. It is also an environment friendly method – evident in reduced energy consumption. The process of pre-casting also ensures a reduction in the creation of waste and dust on-site.

Prestressed and Precast Technology is now considered a revolutionary method in the construction industry; it has been widely used globally in the construction of residential and commercial projects, including bridges, flyovers, dams, canals and in manufacturing industries; and much more.

Precast advantages:

Quality Casting of the Precast structures is under controlled circumstances, adhere to the highest standards of quality control. Precast Structures enjoy high levels of quality unlike on-site pouring which is affected by dust, humidity, fluctuating temperatures, unreliable material quality and workmanship.

Speed & Strength Just-in-time inventory which enables direct erection from the transport vehicle on to the Precast Structure being constructed. Precast Structure covering an area of 10 sq.m. (~108 SFT) can be laid within minutes depending on the size and site conditions. Precast structures can be built in days and weeks as opposed to months and years.

Use of high grade concrete and steel results in an overall superior product.

Long Life (Durability) & Low Maintenance Structures Research has proven that Prestressed (Pre-tensioned) Concrete Precast Structures can ensure more than a 100-year lifecycle, thereby reducing the lifecycle costs of projects.

Constructions with Precast Structures possess uniform quality, eliminates problem of leakage and cracks, and reduces maintenance costs.

Cost Effective High quality of construction and extended the life span of a building can be achieved through cost effective solutions. Precast Structures have long life cycle and the overall lifecycle costs are also reduced.

Energy Efficient & Green Building Structures The thermal mass of a concrete Precast Structure absorbs and releases heat slowly by shifting air-conditioning and heating loads to smaller yet more efficient heating ventilation and air-conditioning solutions. The resultant savings are significant being up to 30% on heating and cooling costs. (an in-depth explanation attached)

Easy Installation The products are transported from the factory in final form and ready to install onsite. Installation of Precast Structures is quick and accurate, making the process more efficient and effective.

Minimal On-site Activity Precast Structures are essentially designed for easy installation and therefore require minimal on-site work. Precast Structures enables the installed parts of the structure to be allowed for simultaneous or immediate carrying out of other activities including finishes and interiors.

Acoustic Performance High thermal mass of the Prestressed (Pre-tensioned) Concrete Precast Structures high level of sound insulation and reduces noise and provides an effective sound barrier against roads & Urban noises.

Recyclable Precast Structure elements can be crushed and reused as aggregates for road bases or construction fill.

Comparison between Conventional and Technology driven techniques (Precast technology)

(via. Mr.G.Somasekhars. Cost effective technologies for affordable housing)

CRITERIA	CONVENTIONAL	PRECAST
Natural resource consumption	High	20% saving
Dependability on skilled labor	60%	High dependability
Time	Time consuming	Fast track construction
Initial investment	Low	High
Finishing	Normal	Excellent
Material wastage	High	Least
Productivity	Low	Excellent
Strength	Good	Excellent
Durability	Low	High

Contribution of Precast Technology to Green Standards

PRECAST is an environmental friendly construction method witnessed by the following characteristics

Energy Conservation Building Code, Ministry of Power, GoI: Ministry of Environment & Forests made ECBC adherence mandatory. As precast elements facilitate ECBC compliance, precast is fast emerging as the natural choice.

Environmental Clearance, Ministry of Environment & Forests, GoI: MoE&F suggested usage of Precast and particularly Hollow Core Slabs in their Manual on norms and standards for environmental clearance of large constructions.

Conservation of Natural Resources: Precast Construction conserves natural resources by reducing air pollution, water consumption & pollution, sound pollution, and impact on local communities & surroundings of the construction site.

Green Manufacturing Award: PRECA received award for its Good Manufacturing Practices and Green Category Precast Products.

LEED Rating

Precast Technology has significant green characteristics such as it:

- minimally disrupts the site (area and time)
- reduces damage to drainage paths and natural habitats
- reduces the heat-island effect because of concrete's light color
- improves energy efficiency and thermal comfort
- reuses and recycles formwork, keeping materials out of the landfill
- can be reused or recycled
- can use recycled materials such as steel or some forms of insulation
- is generally made from materials that are extracted and manufactured regionally
- does not need to be sealed or painted

The following table highlights the areas of contribution of precast technology to LEED Ratings:

LEED Category	Credit Reference	Credit Earning Factor	PRECAST advantage	Potential Points
Innovation & Design	Credit 1.1 to 1.4	Innovation in design	Precast designs are compatible for meeting the innovation requirement	2
	Credit 1.1 to 1.4	Use of Supplementary Cementitious Materials (SCM)	Precast products, do not involve fly ash, but uses less cement and hence are better match for SCM	1
	Credit 1.2	LEED Accredited Professional	Optional, although LEED aspiring Structures appoints a professional	1
Sustainable Sites	Credit 5.1	Site Development: Protect or Restore Habitat	Precast Products, because of JIT, help avoiding the disturbance to the surrounding habitats	1
	Credit 7.1	Heat Island Effect: Non - Roof	For relevant structures	1
Materials & Resources	Credit 2.1	Construction Waste Management: Divert 50% from disposal	Precast Products automatically reduce construction waste	1
	Credit 2.2	Construction Waste Management: Divert 75% from disposal	Precast Products automatically reduce construction waste	1
	Credit 4.1	Recycled content, use 5% post - consumer or 10% other	Precast Products are amenable to use recycled content	1
	Credit 4.2	Recycled content, use 5% post - consumer or 20% other	Precast Products are amenable to use recycled content	1
	Credit 5.1	Regional Materials: 10% Extracted, Processed &	Precast sources all the materials regionally after careful quality checks	1

LEED Category	Credit Reference	Credit Earning Factor	PRECAST advantage	Potential Points
		Manufactured Regionally		
	Credit 5.2	Regional Materials: 20% Extracted, Processed, & Manufactured Regionally	Precast sources all the materials regionally after careful quality checks	1
Indoor Environmental Quality	Credit 3.1	During Construction: Indoor Air Quality Management Plan	Precast products, subject to the design, facilitate indoor air quality	1
Energy & Atmosphere	Credit 6.1	Optimize Energy Performance	Precast products are naturally energy efficient	10
Total Potential points for Green Building LEED Certification				23

There is immense potential for precast construction in the affordable housing sector of our country as the above stated advantages can also be translated into the developing IGBC Green Affordable House Rating System.

In conclusion, we can surely say that integrated adaptation of precast technologies would lead to a sustainable and cost effective development in any housing project.

Precast model of construction is an effective way in conserving our environment. We have answered a few questions which show why Pre Cast elements are effective in developing green structures.

1. Is precast concrete a green building material?

Precast concrete contributes to green building practices in significant ways. The low water-cement ratios possible with precast concrete -0.36 to 0.38- mean it can be extremely durable.

2. What makes precast concrete so durable?

Unlike other construction materials that can rust, rot, or otherwise degrade when in the presence of moisture, concrete can actually get stronger if there are unhydrated cement particles available to react with the water.

3. Is precast concrete different from other types of concrete?

It is different because it is made in a factory by highly experienced personnel who apply stringent quality-control measures. In the factory environment, precasters are able to achieve consistency in temperature and moisture and low water to cement ratios that are not possible in field-fabricated concrete.

4. Is precast concrete energy-efficient?

The thermal mass of precast concrete absorbs and releases heat slowly, shifting air conditioning and heating loads to allow smaller, more efficient heating, ventilating, and air conditioning (HVAC) systems. The resulting savings are significant up to 25% on heating and cooling costs

5. Does precast concrete contain recycled materials?

Precast concretes fresh and in-place performance can improve when several common industrial byproducts are added. Fly ash, slag, and silica fume, which would otherwise go to landfills, can be incorporated into concrete as supplementary materials. These by-products can also reduce the amount of cement that is used in concrete. Reinforcement is typically made from recycled steel.

6. Can precast concrete members be reused?

Precast concrete members are unique in that they are individually engineered products that can be disassembled. Designers can easily plan future additions to buildings, because the precast concrete components can be rearranged. Once removed, precast concrete members may be reused in other applications. Precast concrete is also friendly to down cycling, in which building materials are broken down, because it comes apart with a minimum amount of energy and retains its original qualities.