Architectural Precast Concrete

by Monica Schultes

New developments in concrete, admixtures, manufacturing and erection procedures have expanded the role of Architectural Precast Concrete (APC) in the construction industry since its introduction in the United States in the 1920's.

APC combines maximum design freedom with the economies that result from mass production of repetitive precast concrete elements. It can replicate traditional shapes from classical architecture or produce the sleek contemporary look of today.

APC can be provided in almost any color, form, or texture, making it an extremely practical and aesthetically pleasing cladding material. It is compatible with all structural systems, and can be designed to harmonize with and complement all other materials.

Repetition and Mold Concept

The cost of a precast concrete design naturally increases as surface features become more extensive or intricate, and when panel cross-sections become more complex. However, the ability to cast many pieces from the same basic mold makes complex shapes economically feasible.

Molds typically are an expensive item and therefore the more elements that can be cast with any one given mold, the more economical a project becomes. Although every project will have some atypical conditions, the most cost-effective projects maximize the repetition of elements.

To achieve the benefits of precast concrete most cost-effectively, designers should discuss design concepts with the precaster in order to understand the inherent advantages of the material and to maximize its use.

By visiting the precaster's plant as well as projects under construction, architects can become familiar with elements such as the fabrication of molds, challenges to casting and finishing specific designs or shapes, handling methods at the plant and jobsite, and approaches for connecting panels to a structure.

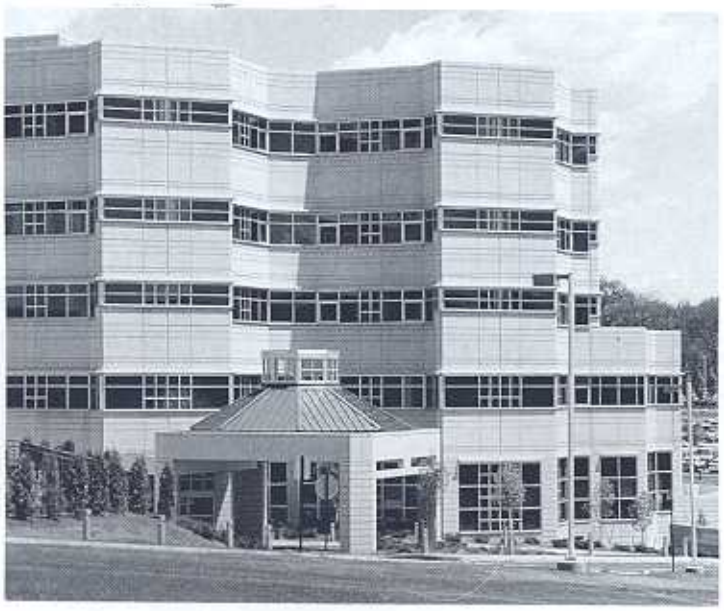
An architect can make a significant contribution to economical production by designing precast concrete panels with a knowledge of the "master mold" concept. This involves fabricating one master mold (with its appropriate additional tooling) that allows a maximum number of reuses per project.

Units cast in this mold need not be identical provided the changes in the units can be accomplished through variations to the basic master mold. These variations should be able to be achieved with a minimum changeover time and without jeopardizing the usefulness or quality of the original mold.

It is relatively easy to alter a mold if the variations can be contained within the total mold envelope by using bulkheads or blockouts rather than by cutting into the mold surface. The cost per square foot is most affordable when many precast concrete units can be produced from each mold.

A large number of panels (if not all of them) can be produced from a single mold built to accommodate the largest piece and then subdivided as needed to produce the other required sizes. Whenever possible, the largest pieces should be produced first to avoid casting on areas that have

The Janet Weiss Children's Research Center, Geisinger Medical Center, Danville, PA. Precast architectural cladding was designed to match existing buildings on the site.



become worn and damaged by placing and fastening side-form bulkheads.

The number of molds required for a job is determined by the time allowed for completing the job and the facilities available. Casting may proceed during the early part of the erection process if the panels have been manufactured in the correct sequence. However, this format may not coincide with the needs of the master mold concept.

Larger is Better

Most precasters, for reasons of economy, prefer to make precast units as large as possible within normal handling and shipping limitations. This is because the smaller the panel, the greater the number of pieces required for any given enclosure. While handling precast components constitutes a significant portion of the expense involved, the cost difference in handling a large rather than a small unit is insignificant compared to the increased square footage covered by the large unit.

In addition to providing labor cost savings during erection, larger panels provide secondary benefits by reducing the amount of caulking material needed, offering better dimensional controls and requiring fewer connections.

Moldability Advantages

The final design should take into account ease of removal from molds in addition to maximum mold reuse. This allows the precaster to meet schedules and budgets most efficiently without impacting the design aesthetics.

APC units are normally cast indoors in a horizontal or flat position with the exposed, textured or sculptured face down. Where the shape requires it, the form may be made in parts with removable sections (such as side rails and top forms) that must be assembled and disassembled with each day's pour. The optimum economy in production is attained if the panel can be separated from the mold without disassembling the mold. This is done by providing slope (draft) on the sides of all openings and edges.

A sufficient thickness of concrete is needed to develop insert capacity for handling and connections. The designer must visualize both the mold and the method of stripping. If this is ignored, it may be reflected in either the cost of the product or its quality. ■

This article is taken from the Designer's Notebook series compiled by the Architectural Precast Concrete Committee of the Precast /Prestressed Concrete Institute. For more information contact PCI's regional association: Mid-Atlantic Precast Association (MAPA), 800-453-4447. Monica Schultes is Executive Director of MAPA.

The Mitchell H. Cohen United States Courthouse in Camden, NJ is clad in simulated limestone precast concrete and granite accent panels.

(Photos courtesy of High Concrete Structures, Inc.).