


Formliners Blend Art & Science

— Craig A. Shutt

Designers often use form liners with precast concrete panels to replicate masonry appearances, such as brick, cut stone, and limestone. But as fabrication techniques expand, precasters' capabilities for creating unique touches offer a greater array of opportunities to personalize buildings.

The Command & Control Headquarters for the 101st Airborne (Air Assault) Division at Fort Campbell, Kentucky, offers a strong example of what can be achieved. To relate the structure directly to its purpose and the people who use it, designers at Mason & Hanger created a bas-relief sculpture of the unit's famous shoulder patch inset into precast panels used to clad a two-story cylindrical rotunda at the building's entry.

"The significance of the piece extends beyond a simple precast element," explains Aasiya M. McCoy, project architect. "It is the focal point of the building, which ties both wings together." The building is sited on a knoll, and the visitor's eyes are directed to the sloping roofs on each wing, which draw attention to the precast concrete rotunda, where the Airborne insignia is centered.



Dramatic sculptural techniques can be created with the highly technical skills that precasters bring to their craft



*Centralia High School, Centralia, Illinois.
Precaster: Gate Precast Co.
Photos: Max Rogers (main), Jim Lewis (inset).*



Formliner Techniques

An almost unlimited variety of attractive patterns, shapes, and surface textures can be achieved by casting against wood, steel, plaster, elastomeric, plastic, or polystyrene-foam formliners. They can be incorporated into or attached to the surface of a mold.

Ribbed or fluted panels demand considerable attention to detailing as panel sizes and distances between openings must be a multiple of the rib spacing. Panel joints should normally be in the bottom of a groove or valley.



Kohl Center, University of Wisconsin. Precaster: Gate Precast Co. Photo: Steve Brock.

Concrete can be produced with vertical ribs or striations in a range of sizes to suit a particular structure and the distance from which it will most often be seen. For large wall expanses, a texture such as fractured fin, with greater depth, may provide a more noticeable appearance with deeper shadowing. Shallow-flute, bushhammered, or subtle textures work better for relatively small areas.

The cost of liners depends upon the ease of use and the number of reuses obtained. Regardless of the form liner used, draft must be considered to prevent chipping or spalling, during stripping of the unit from the mold.

*Jefferson-Pilot
Corporate Headquarters.
Precaster: Gate Precast Co.
Photos: (top right and left)
Dean Gwin.*



*Photo:
Gabriel Benzur.*

These rules should be observed:

- Limit depth of design to $\frac{1}{2}$ to 1 in.
- Maintain a 1:8 draft on all indentation sides to prevent chipping and spalling during stripping of the panel from the mold.
- Keep all edges and corners rounded and chamfered.
- Relief may be more than 1 in. if the depressed area is sufficiently wide.

Liner size and characteristics may require that an architectural feature—in the form of a demarcation groove, recess, rib, or plain area—is detailed to hide joints between liners. Otherwise, their use should be limited to less than the available width of the liner, or the liner joints should be designed at form edges.

If the concrete is to be left as cast, without further treatment, its appearance will be determined by the surface characteristics of the liner material as well as by the chosen pattern or texture. Variations in the absorbency of the form surface will produce corresponding variations in the color of the concrete (darker colors are associated with water loss).

Sealed, sandblasted wood, textured plywood, and rough-sawn lumber are useful in creating rugged textures. Resultant surface texture may also be obtained by use of other liners reproducing this finish. When preformed plastic formliners are selected, the pattern should be described and a reference to the pattern and its manufacturer specification should be included.

Sculptural designs have been produced using sections of foamed polystyrene or polyurethane as form liners or inserts. Abstract patterns and deeply revealed designs with undercut edges can be shaped easily in these materials. However, these liners are typically single-use only. Computer-controlled, hot-wire cutting devices have made custom work available at moderate prices.

Elastomeric liners are useful for finely detailed textured or profiled surfaces with some undercuts (negative drafts), because they greatly facilitate stripping. If other materials were used for such detail, the forms would be virtually impossible to strip. Liner size and module should be coordinated with panel joints, rustication strips, and blockout size.

The application of lettering in concrete is no different from that of any other incised element. Appropriate draft or taper for stripping must be established for all lettering unless characters are flexible or destructible.

Thought should be given to the selection of the letter profile or cross section. Observing the principles of shades and shadows and selecting a profile will give sharp, smooth, and regular shadows. Raised letters are fragile and subject to chipping at traffic levels and significantly increase forming costs.

Introducing a contrast between the surface of the letter and the background will enhance the visibility of the letters through the use of contrasting precast finishes or staining the back of incised letters in a color contrasting with the surface wall. In addition, design elements smaller than $\frac{1}{300}$ th of the viewing distance are difficult to “read” and become visually lost.

This information was derived from the new Architectural Precast Concrete Manual, Third Edition, published this fall by the Precast/Prestressed Concrete Institute. The manual is available for \$102 for PCI Members and \$192 for non-Members. It can be ordered on-line at PCI's bookstore at www.pci.org or through PCI at (312) 786-0300 or info@pci.org.

The Command & Control Headquarters for the 101st Airborne (Air Assault) Division at Fort Campbell, Kentucky, features a dramatic bas-relief sculpture of the unit's insignia created in nine sections using form liners in precast concrete panels. Photo: .



'Clients are often surprised to find that buildings that they thought were constructed of brick veneer are actually precast concrete.'

Precast concrete was chosen for this element both because it could achieve this dramatic detail and because of the image of solidity and permanence it could project, McCoy says. The concept is symbolic of carving the insignia into rock during battle to "leave a mark" on the territory. "We wanted to find a way to allow them to 'leave their mark' on this building and make it appear as if it was carved in stone. Putting the insignia into relief symbolized the permanence of the building."

Value-Engineered To Precast

The design originated as a tilt-up design but was value-engineered to precast concrete. It was cast by Southeast Precast Corp. in Knoxville, Tennessee. The formliner, produced by Fitzgerald Formliners in Santa Ana, California, was molded in two segments, then the joint was filled and sanded. The logo panel was cast into the liner and erected as a single piece measuring about 10.5 by 17 ft. In all, the cylindrical rotunda was clad with nine precast concrete panels.

"This was the first time we had done something like this," says McCoy. Prior to creating the concept, the designers talked with engineers at Gate Precast Co. and visited the precaster's Lexington, Kentucky, plant, which was nearby, to reassure themselves that the piece could be manufactured.

"Everyone was very happy with the outcome," she says. "It was such a big hit that I definitely foresee us doing something like this again. There's a lot of potential for using formliners, and as we learn more and more about precast concrete techniques, we'll see more uses. That's the mindset we have to bring to it. For our clients, precast concrete offers a nice alternative to brick. They are often surprised to find that buildings that they thought were constructed of brick veneer are actually precast concrete with thin brick."

Formliner Versatility

The versatility that can be achieved using form liners can be seen in another project for the military, the Navy's Nimitz-MacArthur Pacific Command Headquarters in Oahu, Hawaii. The goal by designers at The Benham Group in Oklahoma City, Oklahoma, was to capture the Hawaiian architectural style as it related to natural elements, such as earth, water, mountains, and sky. To achieve that, the designers used seven different formliners to add texture and geometry to the architectural precast concrete panels used on the façade.

The designs pick up elements in different levels of the façade in the form of stone textures, waves, multilevel reveals, three-dimensional pineapple-leaf patterns, fluted mullions, heavy cornices, dentals, bullnoses, and ribs. Even the Navy's globe symbol was sculpted and integrated into the formwork.

"The original design contained slight differences in panel lengths, and consequently in the articulation from resulting re-entrant corners, outside corners, and various setbacks," explains Gerry Majkut Sr., vice president and general manager at



The Nimitz-MacArthur Pacific Command Headquarters in Oahu, Hawaii, used seven types of form liners to create unique patterns in the architectural precast concrete panels used to clad the structure. Photos: Gary Hofheimer Photography.

'The team took advantage of the economies of repetition in the architectural precast pieces.'

Dick Pacific Construction Co, in Honolulu, the general contractor. That would have required many costly form changes or the need for additional forms.

"By working through these situations early, the team was able to take advantage of the economies of repetition in the architectural precast pieces, with only minor modifications to the formwork." The project also maintained a full quality-control program, complemented by a government quality-assurance program, Majkut notes. "Quality control was a prime concern, not only for the design-builder but for the subcontractors and suppliers." Rocky Mountain Prestress in Kapolei, Hawaii, supplied the precast concrete components for the project.

The quality-control process for the concrete work began with concrete-material submittals and mix designs and ended with the last 28-day cylinder strength-break tests. In between were regular form inspections, verification of reinforcement placement, blockouts, and inserts. Close coordination was achieved for concrete placement, mix-design verification, admixture and water verification, finishing, curing, sealing, staining, and stamping.

Concrete colors were minimized by using different textures in the architectural precast to achieve the same result, which saved costs. Further modifications to panel joinery allowed nearly all of the panels to be cast in a single color, providing an overall building scheme of two distinct colors.

As these examples show, working closely with the precaster in advance of the design can ensure that the project achieves all of its goals not only for aesthetic accomplishments but for scheduling and budget control, too. ■