



Precast/Prestressed Concrete Institute

Sculptural Forms

PCI's Architectural Precast Concrete Services Committee explains the ease with which designers can add concrete sculptural forms to their projects



designer's notebook

Sculptural Forms Add Creativity, Visual Impact— Article XI

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Greater attention is being focused on surface in architecture, which plays to a key strength of precast concrete. Architectural precast concrete is an exciting medium for sculptural form and articulated structure. Its moldability offers the opportunity for innovation and individual character in its surface textures, patterns and shapes by casting against various types of form liners. Imagination and creativity are the only limits.

Form Liners Add Impact

A patterned form liner may be used for visual effect to enliven the surface of the concrete or simulate another material. Textured surfaces also disguise imperfections in concrete that would otherwise be obvious in a smooth surface.

Form liners can be used to replicate stone textures matching natural rock formations; fractured fins or flutes; wood board markings; trapezoidal, wave and rib textures; sandblasted or bushhammered looks; and stucco or masonry textures. The options with combination finishes, involving one or more basic finishing methods together with form liners, are almost infinite.

In general, the cost of liners depends on the ease of use and the number of reuses obtained. See Fig. 1 for the effects of form liners on mold costs. Regardless of the form liner used, draft must be considered to prevent chipping or spalling during stripping of the unit from the mold.

Virtually any design can be achieved with form liners when the following rules are observed:

- Limit depth of design to ½ inch to 1 inch.
- In most cases, maintain a 10 deg. draft on all indentation sides to prevent chipping and spalling during stripping of the panel from the mold.
- Keep all edges and corners rounded or chamfered.
- Relief may be more than 1 inch if the depressed area is sufficiently wide.

Because of the difficulty in matching joints between liners, this technique either should be limited to widths less than the available width of the liner, or the liner joints should be designed at form edges or be detailed as an architectural feature in the form of a demarcation groove, recess or rib.

Light and Shadow Effects of Sculpting

Sculptured panels can produce building façades with distinctive, strongly modeled elevations having flat interior wall surfaces. High and low relief, straight-line geometric patterns and practically any free-form shapes are possible. The light and shadow effects achieved by sculpting the exterior surface produces the major visual effect of the precast concrete units.

Textures and colors are of only secondary importance when a building is viewed in its entirety or from a distance. Sculpting precast concrete units will not create a cost premium if sufficient repetition of the unit is able to keep mold costs within reason and where the sculpting aids the unit's structural capacity. See **Figure 1** for the effects of sculpting on mold costs.

The use of precast concrete in public art applications is growing in popularity. A wall with creative images reduces the visual scale of the panels and turns the wall into a work of art. See **Figure 2** for examples of public art projects.

Lettering

The application of lettering in concrete is no different than 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. Letters may appear ragged or distorted because of the shadows cast on the letter or on the wall surface. Observing the principles of shades and shadows and selecting a profile that will give sharp, smooth, regular shadows can avoid this.

Several profiles for incised letters are shown and their merits analyzed in **Figure 3**. Raised letters are fragile and subject to chipping at traffic levels and significantly increase forming costs. See **Figure 1** for effects of lettering on mold costs.

The visibility of letters is to some extent determined by the background and the style of the letters, as seen in **Figure 4**. There should be a contrast between the surface of the letter and the background. Design elements

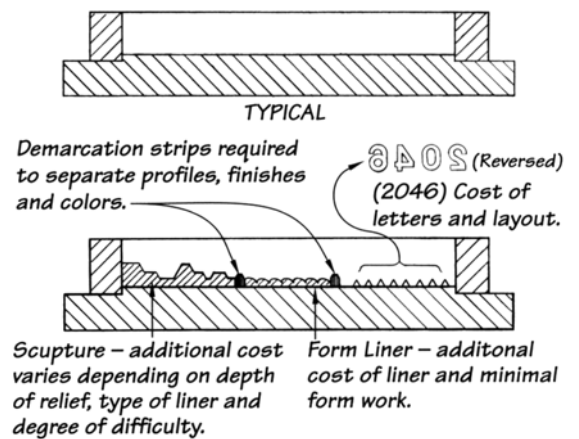
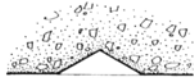


Figure 1 Molds—Sculpture, Form Liner, Lettering



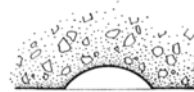
Figure 2 Public art.



The flatness of the ordinary V-incised letter makes it difficult to read. Light striking the angle causes it to fade, and the slight shadow cast does not produce enough contrast in surface shade to make adjoining surfaces apparent.



Square shoulders of the V-incised letter makes a sharp shadow, but the broken surface of the back causes an uneven shadow making the letter appear irregular.



Curved incised letters are a little better than the ordinary V-incised letters, because a stronger shadow is cast by the outer angle. But the shadow line is curved, producing a distorted appearance.



Incised letters with right angle shoulders and flat back stand out clearly, because the shadow cast by the outer angle against the flat back is strong and regular.

Figure 3 Several profiles for incised letters.

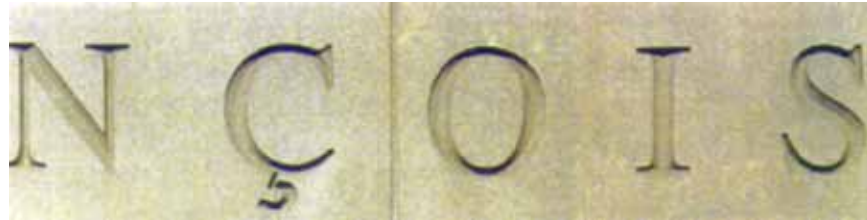


Figure 4 Close-up view of lettering on a precast concrete panel.

smaller than 1/300th of the viewing distance are difficult to “read” and tend to get visually lost.

By staining the back of incised letters in a color contrasting with the surface of the wall, they will be much more prominent than when left in the natural color, especially when the sun is not shining.

Considering the variety of sculpting options can ensure the full advantages available through precast concrete are used in designing a façade. These options not only add visual interest and visually reduce the building’s mass but they also can customize the building to add personality and personalization.

Midwest Urbanity in Precast

Steve Brubaker, design principal at HOK St. Louis, presents four projects showcasing precast's use in urban Midwest settings.

Precast concrete exterior panels have often been the material of choice on HOK projects. Sometimes we select it for its color potential, sometimes for its textural range, sometimes for its shape adaptability and sometimes for all three. The decision depends not only on cost, delivery, and client satisfaction, but on local and regional context as well.

The Midwest is Storm Country. The weather changes dramatically and creates a wide range of moody light conditions. Using precast on the large skyline dominating Thomas F. Eagleton United States Courthouse in St. Louis allowed us to enhance this regional light quality.

The precast color has an ambiguity that could not be achieved with a natural material. As the light conditions vary, the color of the building varies from warm, caramel tones to bright, light tones to deep rich tones. The color never goes "flat" or neutral even in the haze of summer and the grays of winter. This chameleon quality imparts a dynamism and changeability unusual in a building type of such serious nature.

This Midwest quality of light on tall buildings is also enhanced by the range of textures and shapes precast can economically create. Oversized round columns, heavily-textured brows and



The multi-color precast exterior of the 29-story Thomas F. Eagleton United States Courthouse, St. Louis, Mo., stands out as one of the most unique skyscraper dotting the skyline.



Recessed windows with columns, deep sills and soffits are used throughout.



Close-up of rock-faced precast panels and lettering.



Architectural precast panels articulated in an ashlar pattern clad Northwestern Memorial Hospital in Chicago, Ill.

walls and deep-set glazing returns allow forms normally “read” at 60 feet in the air to be understood at 600 feet in the air - again, under all light and atmosphere conditions. The building’s impact and intelligibility across its community and region is thus vastly extended.

Contrast of Textures

Up close these shapes and textures take on additional meaning. Cleft-stone textures are contrasted with smooth and intermediate textures in an over-scaled manner. Not only do these scaling devices make it clear that precast is not a natural material but they also respond to the “colossal” quality of the building (America has always built much bigger than Europe) befitting the largest courthouse the United States has ever constructed.

Additionally, the depth of the panels allowed considerable freedom in the size, relief and placement of lettering on the entry porticoes. The extent of incision and shadow thus created produces large scale, intricate typography that is simultaneously subtle yet readable at a great distance.

In a more dense urban context, the Northwestern Memorial Hospital project in Chicago treats precast to be seen primarily from the street as opposed to the skyline. Intricacy of plan profile creates a network of slender, rhythmic, closely-spaced verticals. A smooth surface finish, consistent in color, lets the eye follow each vertical quickly up the building. This also permits a dialogue with metal in the glazing system and as ornament to the precast itself. The high level of overall textural richness is unusual for a non-natural material.

Additionally, a sense of weight and solidity is imparted to the wall—again, befitting the serious nature of the building type—which would not have been possible had a metal system been used throughout. Nevertheless, the consistency of color and finish yields a machine-honed quality compatible with metal and in context with the sophisticated urban neighborhood location.

The high level of sophistication is echoed in the detailing. The variety of member sizes, depths and shapes—from slender sticks to flat panels—still possesses a level of flexibility for attachments that resulted in a direct and elegant expression of construction.

Color Harmonies


Again, the subtlety of color that precast permits achieves a chameleon-like quality although more in respect to surrounding buildings and materials than with the sky. The color is seen to “go with” the variety of adjacent stones and concrete and metal and glass even though it is identical to none of them. This ability to integrate with a system of rich subtle color harmonies is a unique and urban aspect of precast.

Finally, a note of caution. Without care and visual thoughtfulness—and an excellent precast manufacturer—the selection of color and finish of precast can lead to a “flat” or expressionless result.

Occasionally we only take advantage of the delivery and detailing inherent in large precast panels and bond natural stone directly to the face for the desired finish. Our design for the addition to the Federal Reserve Bank in Cleveland is such an example. We simply were not able to achieve a color and finish in precast compatible with the existing landmark building.

Precast lacks an inherent fractal quality of color and finish. Its uniformity is both its strength and its weakness. The intricate multiplicity of grain and vein and hue and cleft and layering that makes granite, marble, limestone, sandstone and brick so rich and desirable —particularly at close range—can be approximated in precast only with the addition of aggregates.

Our Federal Reserve Bank project in Minneapolis was faced with this dilemma. In a city redolent of the tones and textures of local Kasota stones, the building was located at the edge of the city with no immediate surroundings and was conceived as a modern flat-panel aesthetic.

However, by working carefully and patiently—and at early design stages—with the manufacturer, a mixture of pigment and aggregate was blended so that, even in large expanses of flat panels, the fractal richness of natural stone was achieved. Thus, as the eye and the mind move from the actual rough-hewn Kasota stone base to the precast panels above, the sense of material fulfillment is retained. The panels have a variety of tone and texture and nuance within the fractal coloring system established by the city as a whole. 

— **Steve Brubaker, Design Principal; Hellmuth, Obata & Kassabaum Inc.; St. Louis**



Precast cladding blended with the stone base of the Federal Reserve Bank in Minneapolis, Minn.



Precast provided flexibility in the sculptural expression.



Stone veneer-faced precast panels clad the Federal Reserve Bank in Cleveland, Ohio.



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