



Precast/Prestressed Concrete Institute

Radiused Precast Concrete

PCI's Architectural Precast Concrete Services Committee illustrates how radiused precast can be designed creatively and cost effectively



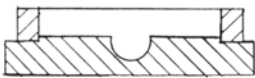
designer's notebook

Radiused Precast Concrete Add Interest at Low Cost— Article X

PCI's Architectural Precast Concrete Services Committee illustrates how radiused precast can be designed creatively and cost effectively



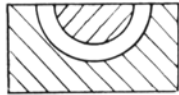
A: TYPICAL FLAT MOLD



B: BULLNOSE
Some additional form costs.



C: INVERTED ARRISE
Additional formwork plus additional labor to daily remove and replace back pans.



D: COLUMN COVER
More complex formwork plus additional labor daily to remove and replace the back pan.



E: & F: GRADUAL RADIUS
Additional forming and additional labor to back finish.



G: & H: EXTREME RADIUS
More complex formwork with sequential back pans that must be removed and replaced daily. Also, casting time takes longer and some back finishing is required.



...Soften a building return; partial Mold C.

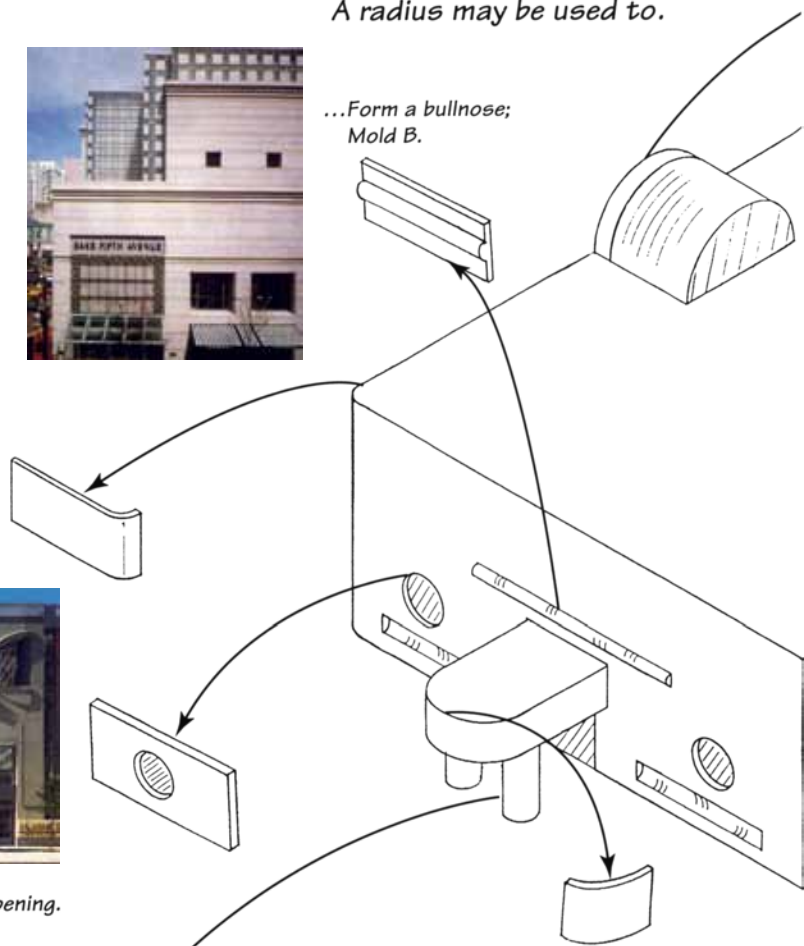


opening.



A radius may be used to.

...Form a bullnose; Mold B.



...Create a building extension; Molds E & G.

...Enclose a structural member; Mold D.





...Create a combination such as an arched roof member including a beam surround.



...Form a concave building corner; Molds F & H.



...Create an undulating surface using a combination of Molds E & G; Molds F & H.

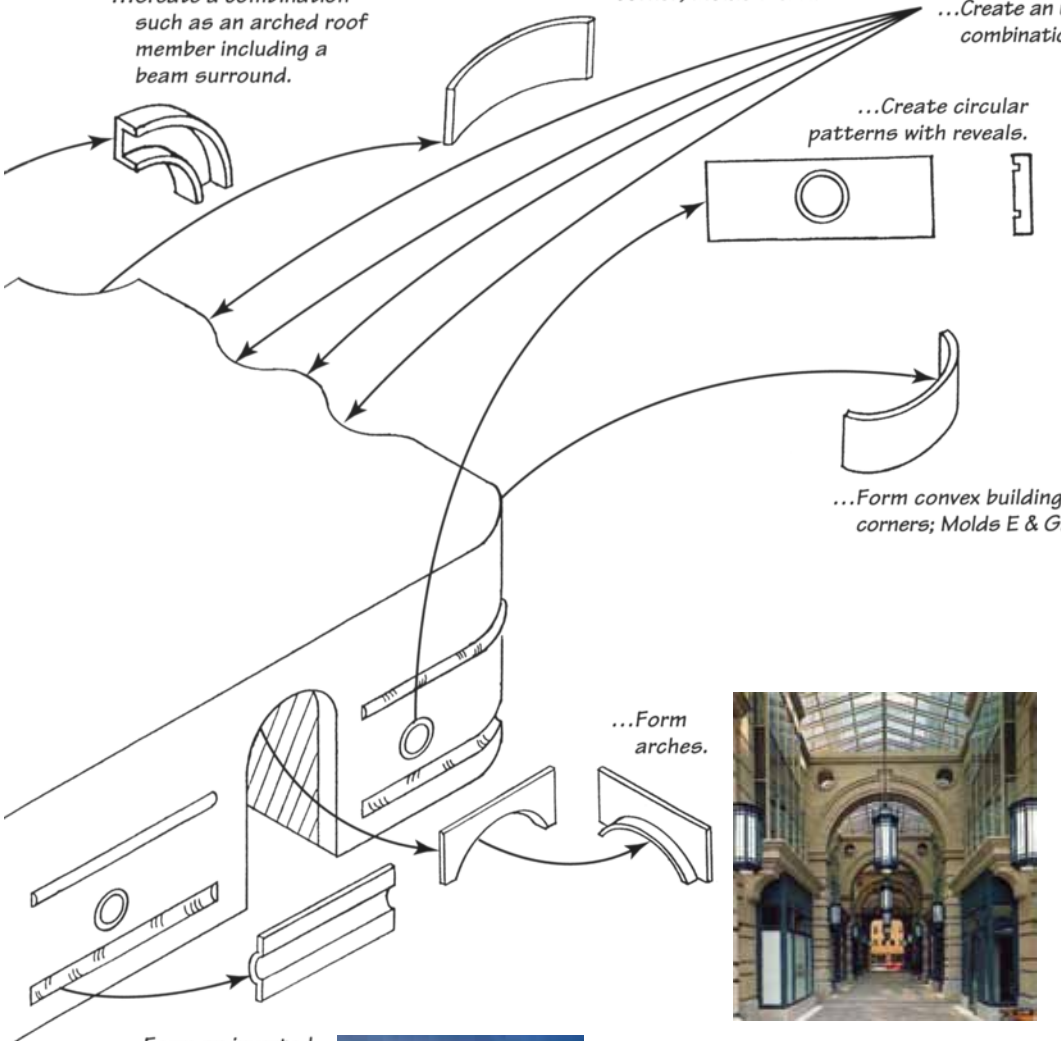


Figure 1 Molds

Today we are seeing buildings which are more sculptural in form along with a trend towards more organic expressions. What is most striking in the concept of new buildings, compared to 20 years ago, is the much greater freedom in the design of the façade. Volumes, surfaces, lines and differences in planes are becoming increasingly important in providing architectural interest. Designers are conceiving of form organically, generating fluid surfaces in place of rigid structures. Design focuses on space, structure, and proportion. Architectural precast concrete provides the designer with virtually total sculptural freedom and flexibility in shaping concrete into structure and architecture. It is adaptable to a variety of building configurations.

One of the most important properties of concrete is its moldability. Concrete is really like sculptor's clay in an architect's hands. A wide range of shapes is possible. Concrete shapes are not limited to volumes enclosed within plane surfaces: they may also be radiused or rounded.

Curved shapes are generally a little more costly than plane shapes, because of the additional work required to manufacture the mold and to place the reinforcement, connection hardware and concrete.

Complex shapes and configurations of wall units will not constitute a cost premium where sufficient repetition of the unit minimizes the mold costs and where sculpturing of the shape aids the unit's structural capacity. (For more on the value of repetition, see Article 1 in the Designer's Notebook series in the Winter 1998 *ASCENT*.) See **Figure 1** for a discussion of factors affecting production costs for radiused units.



At the Jefferson County District Attorney's Office Building at Golden, Colo., the use of curved precast panels allowed the designers to repeat the radiused building corner with a curved open pergola at the entry. (Courtesy Jun Xia, Gensler)

How Gensler Uses Precast Radiused Units

Jun Xia, vice president at Gensler, presents four Denver projects that show how the firm uses precast radiused units to make a project stand out

Four recent buildings in two separate projects designed by Gensler's Denver office indicate how we can use precast concrete radius panels as an important part of the buildings' design. Precast concrete was a natural choice for each of these projects because of its flexibility, design possibilities and strength. Gensler entered a design competition in 1994 to renovate an existing structure to house the First Judicial District Attorney in Jefferson County, Colo. After consideration, the county chose to build a new facility, and Gensler began design late in 1994.

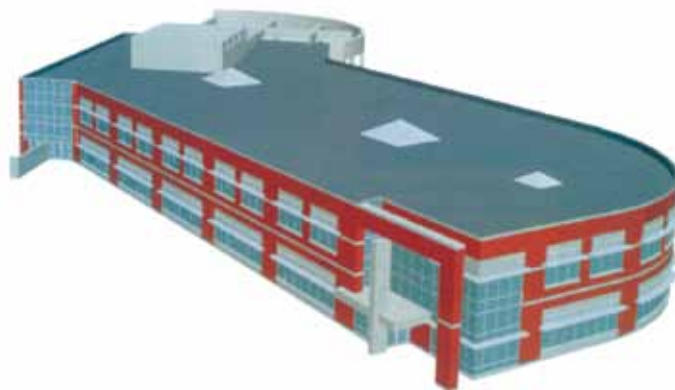
Jefferson County District Attorney's Office

The context of the government-center campus called for a masonry building. However, the client's schedule and the need for winter construction made this impossible. Precast concrete offered a perfect solution. Masonry units cast into curved precast panels provided the required appearance with the added benefit of being able to erect the panels throughout the winter season.

The Jefferson County District Attorney's Office Building, completed in 1997, uses a variety of precast concrete details and brick panels in the two-story, 52,000-square-foot structure. The design features a sweeping radius that is found on two corners of the building.

This radius is first expressed in an open pergola at the entrance of the building, forming an entry terrace and soaring open space for visitors. Constructed of precast concrete panels, the pure rounded form of the pergola features an acid-washed smooth finish in a warm gray color that accents the brick. Both simple and striking, the pergola sets the tone for the overall structure.

The opposite corner of the building is also rounded, echoing the theme established at the building's entry. Both at this rounded corner and along each of the building's façades, precast concrete window frames and lintels are in place, utilizing the same smooth texture and warm tones of the pergola. The same radius form was used for both of the building's radius areas, allowing a more cost-effective and time-efficient design and construction process.



The Use of 3-D CADD modeling allowed the designers to study the introduction of various curved precast panels at the Jefferson County District Attorney's Office Building in Golden, Colo.



At the Jefferson County District Attorney's Office Building, masonry units cast into the precast panels provided a combination of brick and precast detailing. (Courtesy Jun Xia, Gensler)

The design team chose precast concrete for this project for a variety of reasons:

- It provided a wide range of flexibility in designing the articulation of details in both the pergola and the façade.
- Because this was a fast-track project, precast concrete allowed the team to both maintain the schedule and keep costs contained.
- Design and construction of this project overlapped, so the ability to have a short delivery time between design documents and placement on the construction site was crucial.
- One form was used for both the pergola details and the window details, saving money and providing an efficient radius element for use throughout the building's design .
- Precast concrete gave the design team the freedom to design curved details that became the building's signature look.

Prime West Campus

Gensler also chose a radius design for three distinctive buildings in a masterplanned speculative office park in Broomfield, Colo. The client, development firm Prime West, requested a series of Class A buildings to attract the top 20 percent of the market. The target tenants were corporations for whom a Class A environment was part of their corporate culture and who were seeking a high-profile image for their companies.

Gensler began design with 370 Interlocken Blvd., a 150,000-square-foot building. The project used a team approach for design and pricing, bringing all team members together at the front end of the project. The architect, general contractor and major subcontractors, including the precaster, all participated in the design process.



The use of curved precast panels allowed the designers to "break out of the box" at the 370 Interlocken Boulevard project in Broomfield, Colorado. (Courtesy Ed Lacasse)


Precast concrete was chosen early in the process for its flexibility, cost-effectiveness and the ability of the contractor to meet the project's fast-track schedule. While the buildings all were included in the original master plan, the developer requested a distinctive look for each building. Precast allowed designers to choose different aggregates, color tones and textures for each building while maintaining cost efficiencies across the projects.

Designers chose to explore the possibilities of radius corners on each of the buildings to gain greater visibility from the highway and "break out of the box" of traditional speculative office design. The original design called for these curved corners to be glass curtain wall. However, budget considerations made this impossible.

The use of curved precast structural spandrels allowed the use of a much less expen-

sive glazing system, while successfully expressing the curved volumes. Precast concrete was used not only as the cladding but also as part of the structural system in supporting the precast floors. This provided large areas of glass because beams could be very thin, taking up a minimum amount of space while providing maximum strength. The simplicity of this construction also provided time and labor savings for these fast-track projects.

The curved surfaces of each building allowed for more detailed articulation, providing a high quality of finish detail and visual richness. While curved forms were used throughout the three-building project, different aggregates, colors and profiles were designed for each building to differentiate them.

In each of these projects, precast concrete provided an economical framework for maximum design freedom, a wide variety of possibilities for articulation and detail, a range of color and texture for both radius shapes and more traditional forms incorporated in the buildings, and tensile strength without corresponding mass for a broader range of design solutions. 

— Jun Xia, vice president, Gensler, Denver



The combination of different colors and textures of precast structural spandrel panels, including radius panels, creates a highly articulated but very cost-effective façade at the 370 Interlocken Blvd. project.)



Three-dimensional CADD models were used to study the profile of curved panels at the 390 Interlocken Crescent project in Broomfield, Colo. These drawings then were converted to shop drawings.



At 390 Interlocken Crescent, curved precast panels accentuated the building corners, and similar curved panels were introduced to the building's main façade.



The combination of radiused structural precast panels and storefront glazing allowed designers to express a curved "glass" volume without the additional cost of the curtain wall at the 380 Interlocken Crescent project in Broomfield, Colo.

(Courtesy Blake Mourer, Gensler)



designer's notebook



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