Affordable Architectural Precast Concrete

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Understanding architectural precast concrete costs is essential to designing elaborate facades that enhance the overall building design while meeting the owner's budget. Understanding the precast manufacturing process can help achieve design goals and control costs. Many variables need to be considered to determine what a typical architectural precast project will cost. All engineering, production, delivery and installation costs must be compiled for each specific project to derive an applicable budget price.

During a project's conceptual stage, the designer has many things to consider: material selection, textures, surface geometry, unit repetition and erection methods. The custom, sculptured designs that are possible with precast concrete may be achieved within a limited budget by selecting economical aggregates and textures along with repetitive units and effective production and erection details. A local precast manufacturer can assist with preliminary design and budget estimating early in the project's design phase. During a project's preliminary design, a precast project can be budget "guess-timated" on a square foot basis. This is a good starting point, but designers should not rely on this method alone for several reasons:

- A project's square foot quantity take-off can differ between precasters, GC's and architects, depending on the estimating procedures used.
- Square foot prices are rough, educated guesses based on incomplete information.
- Scope of work is not complete in a project's early stages.
- Erection access and crane requirements are not defined early on.
- The necessity of back-forming and other detail manufacturing requirements cannot be predicted accurately at this early design stage.

Working with a local precast manufacturer on the specifics will help determine a final budget that is more accurate. A lump-sum budget price from the local precaster, submitted in writing (including assumptions), will minimize surprises on bid day.

Pricing accuracy depends on the information provided to the precaster's estimator. The key factors in designing with architectural precast are the average piece size, repetitiveness, and erection efficiency.

REPETITION

A key element to cost-effective production is to minimize the number of molds and mold changes to maximize the number of castings from each mold, particularly if the molds have shape. Efficiency is achieved by making it possible for similar, if not identical, shapes to be produced from the same master mold and by minimizing the time required to disassemble a mold and reassemble it for the next piece. Regardless of the material used, molds can be expensive to construct. An individual mold's complexity determines its cost. Simple reveals and rustications typically are considered a standard mold cost. Reveals and rustications must be placed in a repetitive pattern to minimize modification through a mold's life. Reveal, like all form features, must be designed with a small draft. Adding more intricate features introduces cost premium to a project. Only your local precaster can calculate these mold-cost premiums. Projecting cornices, bullnoses, form liners, bottom and/or top returns and curves are the most typical features added. The exact size, shape and locations are the designers' options. However, repetition must be considered when applying these design features. Considerable cost will be added if the location of these features within a mold will be changed frequently.

On the other hand, these intricate features can be added at a minimal overall cost if they are used repetitively in the overall design. The point behind designing repetitive pieces is to amortize engineering and mold costs effectively. As many pieces as possible should be designed to be cast in the same mold and produced from a single shop drawing. The practical goal should be to yield 20 to 30 pieces from each mold.

PANEL SIZE

Precast pricing is determined primarily by the size of the pieces and piece repetition. Also, precast pricing

is more dependent upon large pieces than upon a large project. For example, a 100-piece project of large panels can be less expensive per square foot than a 1,000 piece project of much smaller panels.
The reason piece size is so important is because most every labor function performed by an architectural precaster and erector is required due to the existence of the piece. The more pieces the project has, the more labor hours it will take to engineer, cast, strip, finish, load, deliver and install the panels. Therefore, it is more economical to cover a larger portion of the building's exterior with fewer precast panels.
For the sake of economy, it is best to make precast units as large as possible within normal manufacturing and shipping limitations. Handling and erection of precast components constitutes a significant portion of the total precast expense. The cost difference in handling and erecting a large unit versus a small unit is insignificant compared to the increased square footage of a large unit. To be economical a project's average piece size should be at least 125 square feet and ideally larger than that. Even though a panel's lump sum price increases, as the panel size increases, the square foot price decreases rapidly. One method of lowering a project's square-foot price is to add square footage without adding pieces.
There is no best size. Usually the optimum panel size is dictated by size and weight limitations imposed by transportation and site capacity. To determine the optimum size of architectural panels, a close collaboration between the designer and a local precaster is required during the early stages of building design.

Designing larger panels, even though they may carry a hauling premium, may be the most cost efficient. For example, an office building with 30- by 30-foot column spacing requires fewer columns, fewer precast panels, and yield more wide open interior than the same building with 20- or 25-foot column spacing. The cost premium (if any) to haul two 30-foot long panels versus three 20-foot long panels usually can be more than overcome by cost savings in other engineering, production, and installation areas. In addition to providing cost savings during erection, larger panels provide secondary benefits by shortening a project's schedule, reducing the amount of sealant needed, and requiring fewer connections. Thus large units are preferable unless they create significant cost premiums for transporting and erecting.
If a design requires the appearance of smaller units, the use of false joints (rustications or reveals) cast into the larger elements can give the illusion of smaller elements.

SUMMARY
Architectural precast concrete is custom cast. Seeing the process from the manufacturing perspective can help achieve design goals and control costs. Understanding the many variables involved can help designers determine what a typical architectural precast project will cost and whether it makes sense for their next project.