MAUSOLEUM CONSTRUCTION:

How do 'precast' systems compare with 'poured-in-place' crypts?

By John A. Baer, AIA, and Ed Czorniak

Through the years, the cemetery industry has seen many improvements in the construction of mausoleums. The variations of theme, style, size and form in these projects have generated exciting new meaning to the technology of above-ground burial.

No longer need a cemetery be burdened with constraints of lengthy periods of construction or delays in crypt erection due to severe weather or material/labor shortages. Due to advance construction techniques and state-of-the-art materials, the science of creating better quality buildings is definitely upon us. The combination of quality workmanship and durable materials has promoted "longevity," the key word for these monumental structures.

Since the turn of the century, poured-in-place concrete crypts have been a common ingredient in the development of mausoleums. Concrete has always been popular, not only because of its durability, but because of the abundance of its basic ingredients (aggregate and cement) nationwide.

The formula for making concrete has improved through the years. Extensive research and testing has unfolded new design parameters. When the basic capabilities of concrete within a controlled environment were expanded, the production of precast concrete building components became a competitive alternative in the construction industry.

Within the past several decades, precast products for all types of buildings have been developed; not-too-recent examples include floors, walls and roof systems. The evolution of a self-supporting, modular precast crypt system that has become a popular element in mausoleum construction is further evidence of the evolution the concrete industry has made. The potential application of this product has created new opportunities for construction of garden and chapel mausoleums. Precast concrete modular crypt systems have taken on all the dimensions of a typical poured-in-place mausoleum, while fostering a more competitive environment. This factor has stimulated new design concepts, thereby allowing the cemetery more alternatives in the market place.

Similarities between methods

The basic requirements of a poured-in-place system versus a precast system are really quite similar. Let's review what both systems have in common:

- Respectively, each system must follow a specified concrete design mixture directly related to its own application. Various tests are taken and recorded pertaining to the workability, strength, temperature and air content of concrete.
- Both systems contain steel reinforcing. Steel reinforcing not only stabilizes, but increases the tension capabilities, thereby minimizing the thickness of concrete required within each system.
- Both systems are required to have smooth finish. Therefore, quality control factors involving the placement procedures of concrete, vibration, and troweling techniques are carefully monitored.
- A stable foundation system is required for either crypt system to be successful. Existing soil conditions vary from one project to another, and may even differ within several construction areas of a given site. The engineered design of individual foundation systems are consequently contingent upon soil investigation reports.
- Both systems are required to be

large enough to accommodate the standard sized caskets.

- Proper entombment procedures and ventilation are required for both systems in order to minimize the potential problems of leakage, odors, and insects.
- Both types of construction require preventative maintenance to insure an expanded life span of the facility.

Comparison of differences

There are, however, significant differences between the two systems that may or may not play an important role in deciding which type of system to use. Geographical location, construction techniques, construction time tables and overall finished dimensions of each system have a definite impact upon the overall budget of a mausoleum development. Let's now look at how well precast compares to poured-in-place crypts.

Severe weather has always been a major concern in maintaining predetermined construction schedules. In most cases, work on poured-in-place crypts during the winter must be avoided until the mean daily temperature can be reasonably anticipated to remain above 40 degrees fahrenheit. In the event that construction must continue through periods of lower temperature, additional expenses for temporary heated enclosures will be incurred.

On the other hand, extremely hot weather presents its own unique problems. Precautions must be taken to avoid shrinkage cracking due to rapid drying. Here again, extra steps are required to protect the freshly poured concrete product in a poured-in-place crypt system.

Use of precast crypts, on the other hand, permits the allowable construction period to be extended well into the winter months. Manufacturing of precast crypts is not subject to the natural elements, and erection of the crypt units will only be affected by the most severe weather conditions. Grouting of crypt joints should, however, be accomplished during temperate periods.

Quality control factors

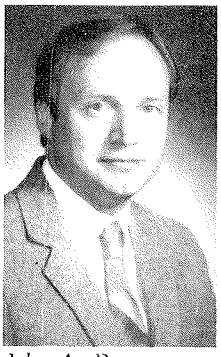
Let's turn our attention to the quality control factors that are involved in both systems. As previously mentioned, both systems require their concrete to be tested on a periodic basis. One disadvantage of the poured-in-place system is that the contractor is at the mercy of the local ready mix company to provide quality concrete on a day-to-day basis.

As a rule, three test cylinders are taken from a batch of concrete. The cylinders are used to test the strength of concrete after curing for 7, 14, and 28 days, respectively. If the concrete cylinder tests should fail, it would mean that all the crypts poured from that particular batch of concrete may have to be redone, or face the risk that structural problems may surface in the future.

Precast modular crypts are produced under factory controlled environmental conditions year around. Precasters have the advantage of producing their product weeks, even months, ahead of construction schedules. This allows the precaster to properly test the product to insure specified concrete strength requirements are met *before* delivering the product to the job site. Considering 28 days as the accepted curing time for concrete, precast units have already been cured, reaching ultimate strengths by delivery time. On the construction site, a full-scale mausoleum can be immediately erected, along with all the other building components of a mausoleum.

Another major quality control factor is the difference in time of "placing" a batch of concrete. Once a batch of concrete has been mixed in the precast plant, the placement of that concrete will normally be completed in less than 10 minutes, a procedure that cannot be duplicated in the field using the poured-in-place concrete crypt system. Once again, the contractor must rely on the ready

The precast system is incorporated easily at the design stage because its modular components are uniformly standardized.



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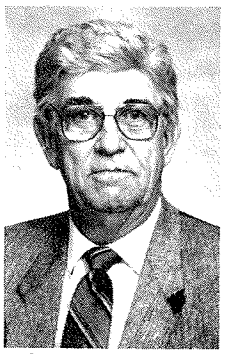

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The time required to build a mausoleum incorporating precast crypt construction is less than that of poured-in-place construction.

mix truck to deliver the concrete on schedule at the site. If there are any delays, this could have an effect on the "workability" of the concrete.

We should also point out that there are two major systems, "wet batch" and "dry batch," used by ready mix concrete plants. "Wet batch" is the system whereby all the ingredients of concrete are premixed before being placed in ready mix trucks. "Dry batch" refers to the system where all the ingredients of concrete are placed in the ready mix trucks and mixed by the trucks on the way to the site. In either situation, industry standards for ready mix concrete delivery time usually permits 1.5 hours from the time of batching to the time of discharging the concrete on the job. Obviously, this allowance factor by no means stands up to the disciplined schedule of a precast product.

Advantages of precast

We also must consider the technical advantages that an established precast manufacturer has to offer.

- Depending on the specific manufacturer, precast modular crypts are poured in steel molds with tolerance factors as low as plus or minus 1/16-inch.
- The vibration methods of consolidating the concrete in the crypt mold is balanced to maintain uniformity.
- The atmosphere within a precast facility is constant, in order to insure proper curing techniques.

These three elements are critical to the strength, appearance and erection tolerances of the precast unit. It should be noted, however, that not all precast manufacturers use these technical advantages and it is, therefore, important to select a precaster who does. Plant inspections of various precasters by the owner and architect are recommended to verify that some or all of these techniques are being employed.

Precast offers cost savings

There are several instances where a precast modular crypt system offers many cost-saving opportunities over the poured-in-place system, as are shown in the following examples.

A. The overall size of the precast unit, in comparison to the poured-in-place system, is approximately 10-percent smaller in area because of the difference in wall thicknesses. Yet, the precast modular crypt system still is large enough to accommodate all but the very largest of caskets on the market. This amenity allows for direct savings on square footage costs of marble and granite used for crypt fronts.

B. The weight of the precast crypt unit is approximately 35 percent less than that of a poured-in-place crypt. In the event that a mausoleum should have to be built on a structural slab, due to poor soil conditions, the overall weight of the entire structure will become a critical design factor. The foundation system for a precast system under such circumstances, therefore, would be less expensive than a slab that would have to carry the additional load of a poured-in-place system.

C. Most architects, engineers and designers find the precast crypt system easier to incorporate in their designs since the system is preengineered. All of the modular components are uniformly standardized, thus saving on design costs.

D. The amount of traffic on existing cemetery roads is a major concern for many cemetery owners. The maximum weight capacity, by standard highway regulations, is 40 tons. These limits are the same for a 10-cubic yard ready mix truck as for a fully loaded semi-trailer unit of precast crypts. On a crypt per crypt basis, it has been observed that precast construction will eliminate 35 to 40 percent of traffic at the cemetery construction site.

E. A major concern that inevitably surfaces with any construction project is availability of resources, mainly materials and labor. At one time, only a handful of dedicated contractors were proficient in expediting the construction of a poured-in-place mausoleum and were willing to make an investment in forms. The precast system precludes any such investment and can be erected by most skilled labor contractors.

Construction time, an important factor

Obviously, the period of time required to construct a mausoleum incorporating the use of precast crypts is substantially less than that of poured-in-place construction. What this means to the owner is less restricted use of facilities (roads, storage areas, etc.) for shorter periods of time, less need for temporary entombments, less anxiety from concerned families and less disruption of normal cemetery activities.

Within the last two decades, advances have been made in the design and manufacture of precast modular crypts. The precast crypt system has come of age, not only because it is an economically viable alternative, but because in many ways it offers superior structural, engineering and overall "use" qualities as opposed to its alternative, the poured-in-place system.

Master Planning

Today's cemeteries need to consider the future through long-range land use planning. A Master Plan study explores the potential and economic values of a cemetery. The final result of a Master Plan illustrates expansion possibilities into phased developments, whereby the owner maintains flexibility to stay in control of future investments.

Conceptual Design

Initial design drawings are provided based on information and requirements specified by the cemetery owner. The schemes reveal the overall size and scaled proportions of the proposed project. Based on further information from the owner, alternative approaches to design and construction are reviewed until the initial schemes are mutually agreed upon. Construction costs and timetables are then estimated.

Design Development

Once preliminary design parameters have been established, including construction budgets and any adjustments authorized by the owner, we then proceed with design development documents. These drawings describe the size and characteristics of the project involving architectural, structural, mechanical and electrical systems.

Construction Documents

Based on the approval of design development schemes and cost estimates, detailed drawings and performance specifications are produced for bidding and construction purposes. These documents provide thorough information about the building project to various prime contractors and material suppliers.

Project Bidding and Contracts

Construction documents are sent out for bidding to contractors who are chosen on the basis of experience and quality. Bid results are reviewed with the owner, and approved contractors chosen. Contract agreements are then made between the owner and contractor.

Construction Administration

We, representing the owner, visit the building site regularly and provide written reports on the progress of the construction. Job meetings are held with all prime contractors to insure proper coordination in all areas throughout the project. We review and approve contractor payment requests prior to submission to the owner. Owner review and approval at the close-out of the project is required prior to final payment being issued to all contractors.

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