

Glass fiber reinforced concrete (GFRC) helped the San Francisco Towers retirement community fit into its neighborhood.



Precast Concrete

Offers Many Housing Solutions

No matter the type of housing, from single-family to hotels and motels to assisted-living senior units, precast concrete components offer flexible, economical and aesthetic options.

Housing projects are booming. Residential units are being built at an impressive rate in all categories, including single- and multifamily residences, hotels and motels, healthcare and retirement facilities, and college dormitories. The reasons for this surge vary in each segment from changes in how we live to evolutions in the country's demographics to the general booming economy and growing consumer confidence. In all segments, however, one constant remains: Precast concrete components offer the design possibilities to achieve a successful project.

To be sure, that ability represents a change from past housing-construction booms, notes Tony Mazzeo, president of the Oldcastle Precast/Spancrete Group in South Bethlehem, N.Y., and chairperson of PCI's Housing Market Group. "The housing market always has been a large market, but precast concrete's role in it has been very small, especially in the single-family area," he says. "But today, the housing market is booming, thanks to a variety of factors, and designers are looking to new materials to help them meet the demand. In addition, the variety of natural disasters, from earthquakes to hurricanes and tornadoes, are making consumers take a harder look at the actual construction of their homes and how they can live in a sturdier structure. That fits well with precast concrete's position."



Special Housing Issue Helps Target Markets

By Tony Mazzeo, PCI Housing Structures Market Chairman

Welcome to ASCENT magazine's Special Housing Issue. This in-depth report provides the design team with a comprehensive look at precast trends occurring in housing construction. It also presents a number of projects across all housing markets that show the design possibilities of precast concrete.

This combination of trend information and recently completed projects provides food for thought on how housing construction is evolving. This market will continue to grow as population shifts in age, income and technology make people evaluate their new and changing housing requirements. As the market evolves, designers are learning new ways to use current materials such as precast concrete to better meet those needs.

Be sure to use the directory at the back of the issue to find your nearest precast concrete professional who can help with questions you have about designing for this market. And for additional examples of housing case histories, visit our newly revised World Wide Web site at www.pci.org. It features a host of ideas and project examples in all types of building segments to help you plan your own designs.

Hollowcore slabs have long been the solution of choice for flooring and ceiling units.

Hollowcore Popular

Certainly precast concrete hollowcore slabs have become the solution of choice for flooring and ceiling units in a variety of housing options. The plank typically comes in 8-inch thicknesses, although they can range up to 12 inches if desired. As the name suggests, they feature hollow cores running the length of the pieces that reduce their weight while retaining their structural stability and durability. These cores also provide access for mechanical and electrical systems, providing flexibility in design.



Serving as both floor and ceiling elements, the units eliminate the need for installing suspended ceilings and can cut the total height of the building by as much as 10 inches per floor. This helps meet maximum-height zoning restrictions on buildings and also cuts the amount of building material required for each floor without eliminating any head room. Used with precast concrete structural systems, hollowcore meets its full potential for resisting fire and maintaining durability for many years. And their ability to span as much as 30 feet helps to eliminate supporting columns.

“Structurally, there is no comparison in a wood frame to what hollowcore slabs can provide,” Mazzeo says. “They can be finished with a nice texture for ceilings, and a leveling coat can be poured to provide a finished floor. This offers a

better look than a suspended ceiling and cuts long-term maintenance costs. But other precast products offer strong benefits, too.”

The possibilities include columns and beams, balcony supports, stair and elevator systems, interior wall panels and architectural panels for exteriors. Exterior panels can provide a range of aesthetic finishes that match many types of surrounding neighborhoods, including brick and stucco.

Precast components in a wide range of permutations are providing owners and designers with more options and better solutions to the challenges they face in designing for the growing housing demand. These benefits provided include:

Fire Resistance. The key to creating a fire-resistant housing structure lies in using a balanced design that incorporates four primary elements. These four are compartmentalization, detection, suppression and education.

“Compartmentalization is the primary benefit that precast concrete can create that no other system can,” explains Mazzeo. The concept focuses on isolating the fire inside a contained precast concrete “compartment.” These units are created by using precast concrete hollowcore slabs, beams, columns and walls. If a fire breaks out, precast’s inherent non-combustible composition ensures the flames are contained and significantly reduces the weakness of structural supports that otherwise could cause upper levels to collapse.

Detection centers on ensuring that sensors and monitors, especially smoke detectors or built-in warning systems, are placed where appropriate during the

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John Jones

design stage. These ensure the danger is recognized as soon as possible and work with the compartmentalized design to prevent the fire from spreading and smoke from building up before residents can vacate the premises and fire fighters can arrive to put out the blaze.

Suppression includes the use of sprinkler systems, fire extinguishers, fire hoses and other properly located equipment designed to actively fight the blaze. These must work in conjunction with the other elements, not be the sole support, Mazzeo stresses. "Sprinklers are a great tool for fighting fires, but they don't satisfy all the needs alone." There often is the danger of the water supply being cut off as the fire burns through pipes or the structure, eliminating the sprinkler's value completely. "While sprinklers combined with the other elements create a strong system, they can't take the place of the other needs."

Education also is a vital tool that many overlook, and it is one designers can help reinforce, says Edward J. Gregory, president of Gregory Development Services Inc. in Tinley Park, Ill., and leader for PCI's Multifamily Housing team. "Occupants in multi-unit facilities must know how to evacuate the building," he asserts. Hotels and motels do a good job with their posted maps, but other types of buildings, including multifamily residences and dormitories, are not as vigilant. Residents in these structures also need reminders, as do their visitors, and these can be provided in large maps along corridors or in other conspicuous locations.

Safety concerns are key issues for assisted-living and healthcare facilities, and their construction is rising quickly as

the nation's population ages, notes John Jones, vice president of Oldcastle Precast Co. in South Bethlehem, N.Y. and team leader for PCI's Healthcare market group. And those concerns go beyond fire. "Precast structures can be designed to withstand high winds, hurricanes and earthquakes, making it a strong choice in areas where these are prevalent. The excellent performance of precast structures in such natural disasters supports their applications. Consumers are becoming aware of the value that such benefits add to their living units."



Certainly insurers have noticed the advantages precast concrete offers these structures. A recent study of average insurance rates in Cook County, Ill., (Chicago area) performed by one of the largest commercial insurers of multifamily buildings showed that rates for non-sprinklered buildings were about \$4.80 per \$1,000 of building value for frame construction, compared to \$3.06 for masonry projects. For sprinklered buildings, the comparative costs were \$3.84 for frame and \$2.45 for masonry. And for buildings with sprinklers and central station alarms, the costs were \$3.60 for frame and \$2.30 for masonry.

Acoustical Control. Precast concrete also aids designers in isolating living units for sound control. "Precast helps dampen sound transmitted through walls and

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Tinley Park Embraces Precast Concrete's Benefits

As with most municipalities, Tinley Park, Ill., incorporated a basic two-hour fire rating into its building code, which it upgraded to masonry walls in the late 1970s. But it wasn't convinced it was necessary until the mid-1980s, when two developers asked for variances for their subdivisions so they could meet the requirement by installing gypsum walls. One installed the walls correctly; the other didn't — creating a hazard that left the fire department concerned about safety and about the village's ability to properly supervise construction problems.

"Our fire department finally requested that we allow only masonry walls," says Ray Fessler, building commissioner for the Chicago suburb. That was done, with no variances allowed since the mid-1980s. "We had said that we wanted a two-hour rating no matter how they achieved it, but we found out that didn't meet our needs. We learned that if we don't watch closely and gypsum isn't installed correctly, there are voids that can be dangerous."

In fact, the village had to hire an extra inspector just to check drawings and conduct field inspections. "We were discouraged by the results and discontinued the variance," says Mayor Ed Zabrocki. Fessler says the move helped everyone. "Requiring a masonry exterior gives the buildings a classier look and offers more fire protection, which is our main concern."



The changes also extended to requiring masonry separation walls and precast concrete floors in all commercial and multifamily buildings more than one story tall. "We decided against wood or even poured concrete over bar joists. It's the most effective and the most economical."

The changes have not hurt the village's ability to attract industry and developers. In a five-year period, the village issued 4,100 building permits, including 1,600 multifamily projects. It also placed between 7th and 14th in the Top 20 Communities for multifamily permits. Within the last year, approximately 38 buildings have begun construction featuring precast concrete, covering about 1.75 million square feet. "Our experience has been very positive," Zabrocki says. "Quality attracts quality."

'The quicker a revenue-generating building can be brought on-line, the faster the owners recoup their investment.'

Edward J. Gregory

floors, and its durable structure minimizes vibrations," says Mazzeo. This is important in many types of multiresident housing structures due to the increasing popularity of large entertainment centers, surround-sound systems and home-exercise equipment that rattles, thuds and pounds against the home's perimeter.

Typical code requirements call for a minimum Sound Transmission Class (STC) of 45 and an Impact Insulation Class (IIC) of 50 between living units and between living units and public spaces. Precast concrete options meet these easily — a 6-inch hollowcore slab with carpet and pad provides a STC of 48 and an IIC of 69, while an 8-inch slab



provides ratings of 50 and 73 respectively, according to PCI member tests.

Designers in the hotel and motel industry have long used hollowcore slabs and other components to ensure guests aren't disturbed, notes Bob McCormack, executive vice president of Spancrete Industries in Waukasha, Wis., and leader of PCI's Hotel/Motel market team. "The hotel/motel market has experienced tremendous growth over the past few years, and precast is being used as a building solution of choice," he says. "It offers great benefits in regard to the transmission of sound and fire resistance by compartmentalizing units."

Speed of Construction. Precast concrete's ability to be cast at the factory while site preparation is underway ensures the structure is erected as quickly as possible. This minimizes maneuverability concerns, reduces on-site labor costs and encloses the building quickly so trades can begin working inside faster.

By casting in the factory under controlled conditions, the quality is higher and more consistent and work can continue even through harsh weather. The project also is speeded because inspection procedures by municipal authorities are shortened, because there are fewer components to inspect.

"The quicker a revenue-generating building such as housing units can be brought on-line, the faster the owners begin to recoup their investment and the less money is spent on interim financing and interest," says Gregory. In many cases, a small crew and crane can erect 7,000 to 8,000 square feet of hollowcore slab per day for a low-rise building.

Durability. Precast's durability provides extra protection against salt water, winter weather and extreme conditions such as hurricanes and tornadoes. With such disasters gaining great media attention, consumers around the country are considering new options for building their residences. Developers too are examining new options for buildings that undergo considerable wear from transient users.

Designers of college dormitories are giving precast a close look these days, says Harold Messenger, marketing manager for Rotondo Precast Co. in Rehoboth, Mass., and team leader for PCI's Dormitory market group. Drywall interiors give administrators real difficulties because stressed-out students sometimes abuse their temporary living quarters. "One school told us that when they took down a poster that was left behind by students, they found a huge hole in the wall where somebody had put a fist through both sides of the wall," Messenger says. "A concrete panel would have avoided that problem." And since it cuts sound transmission, study time is made easier.

Aesthetic Appeal. Precast concrete architectural panels can match a wide range of design styles, allowing new housing structures to fit seamlessly into the neighborhood. Panels can be created to resemble cut stone, limestone, stucco, brick and other masonry options, and the large mass of multifamily or high-rise options can be broken up with the inclusion of reveals, differing textures and other design techniques.

Precast panels even are being used to clad single-family homes, creating an economical and aesthetically pleasing look that fits into city neighborhoods. "Precast concrete can provide the look of old-time brick or limestone without the related cost and at considerably faster speed," explains Chris Newkirk, president of Prestress Engineering Corp. in Prairie Grove, Ill., and team leader for PCI's Single-Family Housing market group. The resulting façade will better stand up to harsh winter weather and won't need tuckpointing, reducing long-term maintenance costs while offering an attractive appearance.

Economy. The combination of benefits, such as speed of erection, inherent fire resistance and durability, help to minimize construction costs by lessening labor and material costs. These are enhanced by other benefits. The shallow cross-section that hollowcore provides with an 8- to 12-inch depth reduces building heights, cutting material costs further. The ability of the slabs to span up to 30 feet also can eliminate the need for a row of supporting columns in some designs. Precast panels also offer significant energy savings, especially if insulated sandwich wall panels are used.

"Precast slabs in particular can be installed in days, saving time — and time is money," says John E. Saccoman, vice president of sales and marketing for Molin Concrete Products Co. in Lino Lakes, Minn. and team leader for PCI's Retirement Housing market group. "Slabs also save space, because one slab becomes the ceiling for one story and the floor for the next, eliminating the need for drop ceilings."

Seismic Design. Precast concrete structures also offer strong seismic options, and those alternatives have expanded this year with the completion of testing on new ideas that use existing technology in innovative ways. The five systems that have been tested make it possible for those on the West Coast to design precast concrete high-rises that are structurally superior to existing formats, and they will allow designers in other parts of the country to meet the new stringent requirements incorporated into the International Building Code 2000, which is to be adopted by many municipalities.

Such dramatic applications for precast concrete components and connections not only show what may be possible in the future, but they show what is happening right now. The wide and varied ways designers are using precast concrete to meet developers' and consumers' housing needs makes it clear that across all types of housing, precast concrete is becoming the solution of choice. ■

