Chicago is a city rich in history, a history that’s especially present in the buildings that line its streets.

"Seventy-five to 85 percent of housing on the south side of Chicago was built before World War II," says Clifford Crawford, a partner in Crawford Development Partners, LLC, a design and development firm, and in CDP Builders Inc., general contractor on the Woodlawns condo project in Chicago. History aside, Crawford sees the Woodlawns project as a much-needed addition to the city’s housing options. “Chicago homes are very traditional, built with small bathrooms and small kitchens, and not a lot of amenities that homeowners today take for granted. People who want to live in contemporary housing with an open floor plan, with a great room, kitchen-family room combination, walk-in closets and a Jacuzzi have been underserved.”

On the north side of the city, housing has been making strides toward revitalization for some time. Now builders’ and buyers’ attention has turned to the south side. Most of the improved building has been using brick and block or stick and brick for condos and town homes and a few single-family residences.

Crawford, who spent 20 years running business divisions, quit corporate work three years ago to pursue housing development and construction. He has been concentrating on building concrete homes for about a year and a half. There is a tremendous market in Chicago for concrete housing, according to Crawford. The concept behind the Woodlawns project was to develop contemporary, energy efficient, affordable housing that would beautify the community and still be something he could do profitably. After checking out various systems, he decided to build multifamily housing using a precast system.

Running the numbers

Crawford did considerable research, which led him to Dukane Precast Inc. There he learned how Dukane’s precast system works, how it is used in Europe and the various benefits of the double-wall panel construction with insulation.
Double-wall panels are form-finished wall segments that come together like a sandwich, but are the reverse of an ICF system. The finished panel is 8 inches in thickness from the outside face to the inside face. The outer wythe is 2 3/8 inches of concrete, separated from the 2 3/8-inch inner wythe by a gap of 3 1/4 inches, which can be filled with sprayed foam. That exterior face can be left smooth and finished with stucco or cast with a form liner to simulate brick, stone or wood. It also can be acid etched, sandblasted or have reveal stripes cast in it. Once the panel is on the job site, it can be stained or painted as well. For the interior wall, the surface is “steel form finish” smooth. The panels can be used for floors as well as walls. See the sidebar in this issue on how panels are manufactured in the plant.

“I was looking for the speed of construction to reduce my capital outlay. If I could build this project in four or five months versus what brick and block would take, I would have lower carrying costs and turn my capital faster. I started backing out my construction hard costs. What would it mean if we didn’t have to insulate or wall-board interior walls; if we didn’t have to frame-out interior or exterior of walls to finish; if the smooth concrete walls are ready to paint once they are dropped in; if we are able to span 20 feet without adding load-bearing walls; if we could get 17 condo units erected and under roof, weather-tight, in four weeks. What would the sound attenuation mean in terms of marketing—would that be favorable enough for potential buyers? Overall, precast seemed to make sense, so I decided to go forward.”

The Woodlawns project

Woodlawn lies directly south of Hyde Park. The typical lot in this area is 25 feet wide by 125 feet deep. The project lots are 25 feet by 164 feet, but Crawford was able to string two together, so he built six flats in one building with a footprint 50 feet wide by 164 feet deep. The deeper lot created more space at the rear and for parking.

“Within that footprint,” Crawford says, “using a narrow lot design, our units are approximately 20 feet wide by 80 feet long. Traditionally, you enter a flat directly into the living room. It is always up front. The kitchen is usually all the way back and the bedrooms are in the middle. In our design, you can walk up in the back from the parking area, entering into a great room about 20 feet wide by 35 feet long. It is all open—with the living room, kitchen and dining room all in the great room. From there, you can walk out onto a deck. The kitchen and fireplace are focal points, set opposite each other on a diagonal. It is great for entertaining.

“Each building has six condos, two per floor for three floors. Each unit is 1,600 square feet. There is a secure wrought iron gate all the way around, so visitors must buzz in. From the front, you have one right and one left unit on each floor. There is a central staircase up the middle. In the
back, you see six doors and another wrought iron staircase. All the units have the same floor plan."

The front of the buildings appear to have a brick and limestone finish, but it is actually concrete. The look is created using form liners with the look of brick and limestone block, which is painted appropriately on-site. This finish is wrapped around about 8 feet on each side. The rest of the sides and the rear of the building are given a smooth sandstone colored, stucco-looking finish. At the time of this interview, six of 21 units were complete.

**Upfront decisions**

The preplanning stage starts with the architect’s work on the design. He signs off on all the details and completes the mechanical, engineering and plooting. Once he has done that, the architectural is given electronically to Dukane’s architect, who converts them into shop drawings. These drawings are used during the building process.

“Next, the architect submits plans to the city for its approval,” Crawford says. “The precast shop drawings are attached. The key piece is getting your architect to work with the precast architect to convert to shop drawings. That is where the majority of the time needs to be spent. On traditional stick and brick, the architect relies on the general contractor to make decisions about the placement of a lot of the openings. In precast, you can’t just cut a hole. All plumbing, electrical and HVAC placements have to be clearly defined and laid out in shop drawings. The architect has to say where things are going and the GC has to tell his trades ‘that’s where the openings are; make it happen.’

“The key trade in working with precast is the erector. You have to have someone who understands precast, who knows how to set panels, weld plates, pole brace and grout. Dukane can do the erecting, but I had my own erector, who was experienced with Dukane. Preplanning took eight months working with our architect, and two to three months coordination.
with the precaster. The more than 100 panels only took a couple weeks to produce. All the utility boxes and ceiling fixtures were installed when the panels were manufactured."

**On-site assembly**

The two completed six-flat buildings occupy a 100-foot-wide lot cleared of brush and trees. The sandy soil compacts well, so it is good for building. Erection began with the pouring of 15-inch footings, but only on three sides. Once they cured, workers dropped in the first-story panels. Because the panels went down to the footing, they were about 12 feet high; the panels for the second and third stories were about 9 feet, 4 inches to create a ceiling height of 9 feet.

There is a weld plate every 16 feet on center. Once the panel is placed on top of the footing, the footing plates are welded to the wall plates. Workers completed the pole bracing with steel. In this process, wall panels are connected to each other in the same manner at the corners, as well as on the bottom, and grouted. Some of the largest panels weigh 24,000 pounds. The slab was added after the building was erected. There are little rectangular channels on the bottom of each precast panel, every several feet. When the slab was poured, the concrete filled the channels and locked the panels together. At each stage, Crawford checked for plumb and level, but because Dukane has strict quality control at the plant, he expected the panels to be dead on.
“We have to reach so far with the boom,” Crawford says, “so we walked the crane into the building and erected three of the four sides. We put up the three walls for all three stories. Floors, which use the same double-wall panels as the walls, were set in next. They are notched—cut in 8 inches or so—so they just sit right on top. It is kind of like Legos. After the three stories were up and the floors were in, we backed the crane out and poured the remaining footing. Once it was cured, we erected the back panels and attached them.”

The roof, which is flat (there is no attic), is made from a Dukane double-wall roof panel with insulation, completing the concrete envelope. Most of the units’ panels were insulated, but walls between units have a Styrofoam dam. The panels for demising walls don’t need the exterior insulation because they are not exposed to the outside weather.

Looking ahead

Precast is a good fit for Crawford as well as for Chicago’s housing market. “I will be using precast again on my next project, which is a 15-acre development in North Chicago,” he says. “It will have 90 units—some town homes, some single-family homes—priced in the middle range. Units will be about 1,800 square feet.”

“Does precast have a good future? Absolutely! It is environmentally the right thing to do, energy efficient and good business.” CII

Dukane Panel Production

Dukane Precast’s Naperville plant uses an adaptation of European technology to produce its Double-Wall panels. It has 60 steel tables that are 12 feet by 40 feet. Each table can complete 400 square feet of panel per shift—or about 24,000 square feet in a day.

Here’s an overview of the panel manufacturing process:

- CAD drawings with specific dimensions and door and window openings are sent to the robotic controls. Magnets and edge forms are placed, and inserts are plotted by the robot to specification.

- Electrical, cable, computer and phone conduits are placed, followed by textured liners if required.

- The casting table moves to the next station for insertion of reinforcing rebar transversely and shear trusses longitudinally, which will span the two wythes of concrete.

- The prepared panel is fed through a concrete placement station where the mixture is checked for accuracy.

- It advances to the next station for consolidation of concrete material within the section and further checks.

- The panel goes into a kiln for eight hours of curing to reach 3,000 psi compressive strength, completing side A of the double-wall construction. Next it will be connected to side B.

- As side B goes through the same process, side A gets placed on the overhead vacuum device, which flips side A upside-down and lowers it onto its side B mate.

- After consolidation of the joined panel, it goes to the kiln.

- After the cure, the ends are blocked off and the inner cavity is filled with rigid polyurethane foam with an R-value of 7 per inch.

- Finished panels can be stored or loaded on trailers and trucked to the job site. Floors are stacked flat; walls are stacked upright.

Source: Dukane Precast Inc. dukaneprecast.com