

Outstanding International Project Award Recipient—Garden Valley Housing

The Garden Valley housing project is an ongoing residential housing project in the suburbs of Santiago, Chile. During 2007 and the first half of 2008 we executed the first three phases of the project consisting of single-family homes ranging in size from approximately 600 to 1100 ft² (56 to 100 m²). The homes were produced on a modular basis in a factory. The housing modules are fully finished in the factory and then trucked to the project site where they are assembled, or “stacked,” into finished homes. The in-factory portion of the entire production process requires approximately 9 days. The on-site stacking is accomplished in a matter of only hours.

We use shotcrete and our patented system of molds to create the five-sided monolithic housing modules that form the structure of the houses. These modules—which represent the entire structure of the house—are created in a single day at the beginning of the overall process cycle. Each module yields approximately 50 ft (15 m) of housing and an individual home is comprised of four to six such modules and one to three roof modules.

Before the concrete is shotcreted onto the five-sided mold, we place reinforcing bar and welded wire mesh. At the same time, we install electrical conduit and junction boxes onto the mold so that these features are built directly into the walls. Before shotcreting, we also install frames for the doors, windows, and other required openings so that once it is shotcreted, the module also has all of those features built-in, all with a minimum of labor to achieve it.

The roof modules are also made using shotcrete and our patent-pending system of moulds to create a monolithic pitched roof structure. Like the standard housing modules, reinforcing bar, welded wire mesh, window openings, electrical conduit, and electrical junction boxes are all placed onto the mold prior to shotcreting so that all of those features are built directly into the structure from the start. Because the roof does not require supporting rafters or trusses, the resulting attic space is very useful to the homeowner, including having light fixtures and electrical outlets. In Chile, where homes do not have basements, this extra space has proven to be a tremendous selling feature. The homeowner can use it for an office, an extra bedroom, a play area, or simply for storage.

We employ a steam-curing process to accelerate the curing of the concrete modules. The day after the modules are shotcreted, they are launched onto the production assembly line where they pass through seven stages until they are completely finished, including the installation of:

- Plumbing lines and fixtures, including sinks, and bathtubs
- Electrical wiring and fixtures
- Kitchen cabinets and closet organizers
- Flooring (ceramic, carpet)
- Interior demising walls
- Interior wall finishes (wallpaper or paint, with ceramic in the kitchen and bathrooms)
- Stippling of the ceilings
- Windows
- Doors
- Insulation
- Exterior stucco and paint
- Roofing shingles

Once all of the finishing processes have been completed and the modules arrive at the end of the assembly line, they are transported to the housing project site by means of a flatbed truck. There, they are assembled, or “stacked,” on site by means of a mobile crane.

We mix our own concrete in the factory using a state-of-the-art planetary batch mixer to ensure consistent results. We use a standard Putzmeister TK-40 shotcrete pump and accessories. Our nozzlemen are trained in-house. They use a scissor lift to move around the mold and to position themselves vertically while shotcreting.

While this project in Santiago is for the construction of single-family homes, we can use the same techniques to produce other types of structures such as apartment buildings, schools, and self-storage warehouses. Because the homes are well engineered and constructed entirely of reinforced concrete, they offer the following benefits:

- The engineered structure is exceptionally durable and long lasting; far outlasts comparable structures fabricated from wood, plastics, brick, and masonry blocks
- There is no structural wood to rot
- There are no squeaky floors or stairs—they, too, are solid concrete
- Water, sound, and seismic resistant
- The structures resist hurricane force winds (up to 186 mph [300 km/h]) thanks to the concrete roof module
- They are resistant to damage by fungus and insects
- They are fire resistant—important in locations where fire protection services are minimal, if present at all
- Concrete is the construction material of choice for home buyers in most countries outside of North America.

Shotcrete is the very essence of the project. The entire structures of the houses that we produce are created in our factory using shotcrete. The walls are shotcrete, the floors are shotcrete, the ceilings are shotcrete, and the roof is shotcrete.

Our use of shotcrete is in part what distinguishes our home from the competition. Shotcrete, and, more importantly, how we use shotcrete with our proprietary molding systems, enables us to build a high-quality home at a low cost, and better and much faster than those using traditional on-site construction methods and materials. Without shotcrete, our project would simply not exist.