PCI
Precast/Prestressed Concrete Institute

LEED SILVER CRITERIA

PARRIS ISLAND BARRACKS

Project Type:	Recruit Training Battalion Complex
Location:	Parris Island, S.C.
Owner:	Naval Facilities Engineering Command, Department of Defense
Architect:	VOA, Orlando, Fla.
Engineer:	Allan & Conrad Inc., Winter Park, Fla.
Contractor:	Walton Construction Co., Pensacola, Fla.
Precaster:	Metromont Corp., Greenville, S.C.

OVERVIEW

Designers faced multiple challenges in creating a new barracks complex at the Marine Corps' facility at Parris Island, S.C. The buildings had to provide housing space for recruits; meet hurricane, seismic and anti-terrorist standards; provide durable, hardened structures; and meet the government's required LEED Silver rating. At the same time, the structures had to fit into the existing appearance and aesthetic specifications for the complex, which predominated with red-brick buildings. All of this had to be accomplished on a tight schedule to ensure the facilities were ready when recruits arrived.

To achieve these goals, designers specified a total-precast concrete structural system with double-tees for the floors and roof base, and vertical insulated load-bearing wall panels for the exterior shell. The walls had a field-applied waterproof coating added to it as well as insulation and full-bed depth, field-applied brick to match the existing structures. Precast concrete flat slabs also were used for the breezeways and covered corridors that connect the portions of each two-module building.

The project consists of three 95,000-square-foot, three-story connected barracks. The barracks are connected by breezeway corridors. There is a crawl space under the first floor of each building.

Interiors of the concrete wall panels feature a smooth, steel-form finish, with no interior partitions and little drywall, mostly around mechanical rooms. Some areas were painted, while others had a ceramic-tile wainscot applied. The design is durable but remains attractive from both the exterior and interior.

The $80-million facility will house operations of the 3rd Recruit Training Battalion.

The design is austere and utilitarian. The structures are long and open with few interior partitions, little drywall, and emphasis on hard materials. Built on concrete piles, the precast concrete buildings feature brick exteriors and metal roofs.

Precast concrete construction contributed significantly to both the security and sustainability requirements.

Precast components include 265,000 sq. ft of load-bearing exterior walls; 275,000 sq. ft. of 12-ft-wide double-tees for floors and roofs. There is a steel truss and metal roof above the top level of double-tees. In addition, there is 22,000 sq. ft of precast concrete flat slabs used for the breezeways/covered corridors.

The double-tees were designed with a 24-in.-deep profile to reduce material needs while providing sufficient clearance on each floor. A crawl space was provided under the first floor. Flooring was adjusted with the use of topping to offset the camber in the slabs.

1 SOURCE

Key to the fast track schedule was the single-source supplier for the full structural system

3 STORY

Full height precast panels designed to span from building base to roof

100 PERCENT

Amount of precast components sourced from within the region

A total-precast concrete system is used to construct three Marine barracks at Parris Island.

Photo: Metromont Corp.

All precast concrete components were erected with a 300-ton crane.

Photo: Metromont Corp.

Interiors feature long, clear spans made possible with the use of 24-in.-deep double-tees.

Photo: Metromont Corp.

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Once the walls were erected, mastic was applied to the concrete, with insulation laid over the panels. Then the brick veneer was placed. The brick matches the brick used on nearby buildings.

Interiors feature long clear spans to aid the efficient bunking of recruits. Drywall below the shallow depth of the precast concrete double-tees provides a finished ceiling on each level.

The driving force in the project, according to Tom Matzke, associate principal with VOA, was the schedule. The project had a tight timetable that was complicated by the need to establish MEP requirements early to complete the foundation plan.

The project initially was designed with hollow-core planks and masonry blocks, but Metromont teamed with VOA to create a precast design that offered a better approach with thermally efficient walls and a fast construction schedule. A key reason for that efficiency was the single-source supplier for the full structural system. Precast concrete provides the entire structure, including a cavity with a rain-bearing system.

"Allowing us to create a total-precast concrete system for this installation was a huge move for the Marines," says Jay Cariveau, director of business development and marketing for Metromont. "Precast concrete was not the designated material in the design specifications but they allowed us to improve on the existing design while meeting the performance specifications. The scope was for the use of 'hardened materials,' and we could work with that to create a better environment."

PRECAST CONCRETE'S CONTRIBUTION TO SECURE CONSTRUCTION PRACTICES

Security was a major concern for the recruit training complex. Antiterrorism/force protection, standoff requirement, progressive-collapse, hurricane resistance, and seismic code requirements had to be addressed. It was also required that the structures be designed for a minimum 50-year life span.

The precast concrete structure helped engineers meet the restrictive Anti-Terrorism/Force Protection (AT/FP) requirements for government projects. Typically, prestressed concrete components are reinforced for gravity loads, notes Steve Shelt, vice president, Allan & Conrad Inc. "They're designed to be heavy in the bottom portion, especially double-tee beams. But when planning for blast protection, we also have to design for uplift." The force of a blast on a lower floor could push the overhead framing upward, causing it to collapse as it falls back again. On the Parris Island project, designers accounted for this effect by adding 1 1/2 times the typical topping.

The easiest way to allow for progressive-collapse, Shelt adds, is to use the tie-force method, which defines the perimeter and internal forces that need to be considered. "The building has to be reinforced for these considerations with enough robustness to distribute the loads in case of the loss of a column or wall."

The contractor initially intended to use the precast concrete panels in a horizontal position, with each level essentially framed separately. However, Metromont provided a 12-ft-wide, three-story-tall panel that could span the entire building height and that matched the double-tee configuration used for flooring. That created narrower walls but reduced options for tying together the panels.

To avoid uplift at the ends of the panels, the precaster supplied a bar with a plate on its end to fit into foundation excavations. The foundation pour included a metal sleeve that was grouted and filled after the walls were erected. The bar was threaded into the precast concrete wall and dropped into the hole, after which the hole was closed. This provided some tolerance for setting the precast, because it could be secured at varying depths.

PRECAST CONCRETE'S CONTRIBUTION TO SUSTAINABLE CONSTRUCTION PRACTICES

The precast concrete design helped the project meet the LEED Silver requirements demanded of military projects.

All precast components were sourced from within the region and contained recycled materials, including recycled steel reinforcement. Precast concrete wall panels include integral insulation for high thermal efficiency and the large panel size minimizes air infiltration. Interior concrete finish of the panels was paint ready, requiring no furring or drywall.

Off-site manufacturing of the precast concrete components resulted in less than 2% waste in manufacturing, which was recycled. Over 20,000 gallons of reclaimed water was used to produce the precast components.

The project features a number of other sustainable-design concepts, including a full solar photovoltaic system to aid with operational electrical needs and a full solar hot-water system to ensure there is always hot water for showers. The solar panels are installed adjacent to the buildings to provide maximum exposure. Lighting occupancy sensors are used throughout.

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