

Fort Bragg barracks receives pioneering force protection retrofit

by Erin Barstow

An innovative technology being used on Warriors in Transition barracks at Fort Bragg, N.C., stands to revolutionize force protection for the installation.

In August 2008, work began on the former Old Nurses' Quarters to renovate the concrete-reinforced structure into a handicapped-accessible barracks for Soldiers recuperating from injuries sustained during duty. The building is being retrofitted with an innovative fiber-reinforced polymer product designed to strengthen the structure against earthquakes, terrorist attacks and other potential structural damage.

The new technology complies with Department of Defense design specifications UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings, and UFC 4-023-03, Design of Buildings to Resist Progressive Collapse, for facilities taller than two stories.

FRP is a very durable, lightweight composite material constructed from fiberglass or carbon fiber for the purpose of repairing and reinforcing concrete, masonry, wood and steel structures. The material, which resembles wallpaper, is flexible, versatile and easily adheres to most surfaces and shapes — including walls, beams, columns, slabs, steel girders, pipes and utility tunnels. FRP requires no special equipment to apply and, at only one-twentieth of an inch thick, can fit in tight or difficult-to-access areas or around columns without adding bulk.

FRP is also leak-proof, corrosion resistant and able to withstand the same temperature variance as conventional construction materials. When it comes to strength, however, the material is matchless. Nearly three times stronger than steel, a five-inch wide strip of carbon fiber FRP is designed to withstand 75,000 pounds of tensile force, comparable to a five-eighths inch diameter



FRP is a durable, wallpaper-like material nearly three times stronger than steel that fits easily around columns without adding bulk. Photo by Nathaniel Hermann

piece of rebar.

Retrofits on the Warriors in Transition barracks are being performed by QuakeWrap Inc.

In standard construction, a floor is designed to bear pressures pushing down on its surface, called gravity loads, but is extremely vulnerable to an upward exertion of force, such as those typical with blasts, said Mo Ehsani, founder of QuakeWrap.

"That was not a consideration in the original design, so most existing buildings do not have proper steel reinforcement in the right locations to take that type of upward pressure," Ehsani said. "It's just something nobody at the time these buildings were being designed had given any consideration."

To upgrade the structure to meet the new standards, FRP is being applied to the slab surface and underside of each of the barracks' three floors and attic. It is also being applied to the building's columns to improve their structural integrity in tension as well as compression.

While the material is designed to fortify a building in the event of a natural disaster or terrorist attack, Ehsani stressed that the ultimate goal is not to prevent structural damage but to limit any localized damage incurred from

causing an entire structural collapse.

"[If a building is compromised,] damage is going to occur and sometimes the building may not be usable afterwards, but the point of concern is human safety," he explained. "The attempt in all of these retrofits is to make sure that the building remains up so that people can get out safely."

While FRP retrofitting is a relatively new concept for Fort Bragg and North Carolina, the material's exceptional ability to inhibit progressive collapse is gaining widespread popularity in areas particularly prone to seismic activity or terrorist interest, such as federal buildings and courthouses, facilities in Washington, D.C., and U.S. embassies.

Because FRP retrofits do not require adjustments to a building's foundation, application is noninvasive and can typically be completed in fewer than 75 days. Thus, FRP retrofits stand to substantially reduce overall project costs and environmental impacts by circumventing the need for major demolition and reconstruction and its associated wastes. In addition, retrofits can be performed while the building is occupied, allowing operations to continue without interruption.

While the Warriors in Transition barracks are the first facility on Fort Bragg to receive FRP retrofits, the future implications of this method are many. As funding becomes available, similar retrofits may be considered for future projects, such as the Old Post District and the XVIII Airborne Corps Headquarters.

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Acronyms and Abbreviations

DoD	Department of Defense
FRP	fiber-reinforced polymer



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