

New steel-composite wall sets standard in safe room security

PLASTICS IN
SECURITY
AND SAFETY

by Alan Johnson

In American embassies around the world, safe rooms securely store classified information and protect embassy personnel threatened by foreign attackers. Safe room walls normally include double layers of ballistic steel to protect against bullets and attack. However, these heavy steel wall layers are difficult to move during installation. Also, the weight of the walls makes it all but impossible to relocate a safe room without first tearing it down.

These weighty issues were on the minds of people at the U.S. State Department (DOS) when they tested a new wall design that weighs less than half as much as some conventional safe room walls. A combination of steel and a special high-strength composite material, the new wall aced the same tests passed by double-layer steel walls, repelling bullets and attackers wielding a variety of metal implements. As a result, the DOS certified that all safe rooms constructed with this new wall design meet the same standards for ballistic resistance and forced-entry protection as those constructed with double-layer steel wall designs.

A lighter design

Conventional safe room walls include 1/2" steel outer and inner layers with insulation between. The key to slashing

safe room weight was finding a way to significantly reduce the amount of steel in the walls.

The new steel-composite wall includes a steel outer layer that is just 1/4" thick. On the other side, the inner steel layer is replaced with a layer of 3/8" thick thermoset composite material. This special laminate consists of woven glass fabric impregnated with a high temperature phenolic resin. The fiberglass-reinforced composite is lighter than steel and stronger than polyester-based ballistic laminates. A Class 1-A fire-rated material, it provides good flexural, compressive, and impact strength even at high temperatures.

Ceramic comparisons

Unlike ceramics, the composite material can be machined with ordinary hand tools, making the wall sections relatively easy to install. This is crucial in cases where wall panels must be put in place quickly to protect personnel or property from unexpected ballistic threats.

By comparison, a ceramic wall panel, in addition to being difficult to machine, may shatter when hit by a bullet, leaving people and property inside a safe room unprotected if a second bullet is fired at the same wall panel. However, in the case of a composite, a bullet will not shatter the material, so it will stop the second bullet as well as the first.

Certification and testing

Despite its light weight, the steel-composite wall meets stringent standards for ballistic and forced-entry protection. One structure using steel-composite walls met the highest DOS certification standard (Level 7) for ballistic-resistant structures. Structures receiving this certification provide ballistic resistance to 5.56 mm and 7.62 mm NATO rifle ammunition. During ballistic testing, most bullets were stopped by the wall's outer steel layer. Those that were not, were stopped by the inner composite layer. No bullets penetrated both layers of the wall.

In another test, a marksman repeatedly

shot a wall sample with 7.62 mm ammunition. It took 11 shots in the exact location for the marksman to penetrate both layers of the wall.

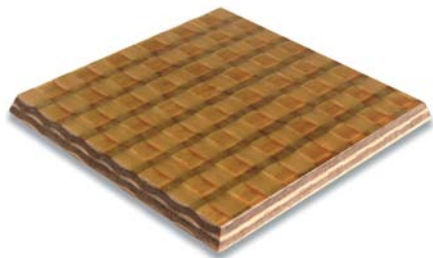
If a foreign embassy were under attack, personnel may have to withdraw to the safe room for protection until help arrives. Therefore, the DOS rates such rooms for the length of time they can provide forced-entry protection. In DOS testing, a structure built with steel-composite walls was subjected to a one-hour attack by a group of men armed with sledgehammers, crowbars and other metal implements. At the outset, the testers doubted the light structure could stop their concerted efforts to break into it. To their surprise, the structure repelled their attack for a full 60 minutes for each weapon used, earning one of the few forced-entry certifications issued by the DOS for safe rooms.

Weight advantage

Walls with double steel layers have earned the same ballistic and forced-entry certifications as those given to steel-composite walls, but the new steel-composite wall is easier to transport and install than its much heavier steel-steel counterparts. In fact, these walls are light enough that an assembled safe room can be carried by helicopter to its intended location. This minimizes on-site assembly work and eases installation, especially if the safe room is to be located on an upper floor of a building.

The light weight of a steel-composite wall also makes it possible for an existing safe room to be carried intact (again by helicopter) from one location to another. This means, for example, that entire safe rooms could be moved into and out of locations relatively quickly in response to emergencies. Safe rooms made with steel-steel walls, on the other hand, must be either (1) demolished when their job in one place is done, or (2) torn down, moved in pieces, and reassembled in a new location.

Steel-composite walls are ideal for a



When used as part of a steel-composite wall, this thermoset composite material by Norplex-Micarta meets stringent standards for ballistic and forced-entry protection despite its very light weight.

variety of applications in addition to safe rooms. For use against forced-entry and ballistics, applications include banks, courtrooms, guardhouses, postal facilities, forward command and control centers, and buildings that house communications equipment. The steel-composite walls can also be used on offshore platforms and elsewhere to provide protection from flying debris caused by explosions.

Conclusion

The weight of foreign embassy safe rooms may soon be slashed by a new wall design. Featuring less steel and a sturdy composite material, the new wall is strong enough to protect government documents and personnel, but also light enough to facilitate the installation, repair and relocation of safe rooms around the world. In addition, the wall can replace heavier alternatives and provide top-notch protection in a variety of applications, in both the public and private sectors. ■

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