ELEVATED STANDARD

A new training lab operated by the National Traffic Safety Board meets high-performance criteria, thanks to its concrete masonry construction.

When Paris-bound TWA Flight 800 exploded minutes after takeoff from New York's John F. Kennedy Airport on July 17, 1996, it took the lives of all 230 people aboard and set off speculation that the jet had been hit by a missile. In its final report on the crash four years later, the National Traffic Safety Board concluded that the probable cause of the explosion was faulty wiring that detonated a fuel tank.

During the investigation, the jumbo jet was nearly completely reconstructed from fragments rescued from the ocean floor. Parts of the plane are now the centerpiece of a new 31,000-ft2 (2,880-m2) National Transportation Safety Board (NTSB) labora-

PROJECT INFO:
Owner:
The George Washington University
Architect:
Esocoff and Associates, Washington, DC
Masonry Contractor:
J.D. Long Masonry, Lorton, Virginia
General Contractor:
Whiting Turner Construction, Baltimore, Maryland
Construction dates:
October 2002–August 2003
Building Cost:
$19.8 million
Masonry portion of cost:
$1+ million

tory on the northern Virginia campus of The George Washington University, outside Washington, DC. As part of the NTSB's training academy, Flight 800 is being used to train the investigators who will be sent to look into the causes of future crashes.

The lab, built at a cost of $19.8 million, had several design requirements:

- The space had to be open and large enough to hold airplane parts.
- The environment had to be comfortable and energy efficient.
- The exterior had to conform to certain aesthetic standards.

To meet those requirements, the designer chose a concrete masonry system that acts as an insulated double-wythe wall, but has the construction requirements of a single-wythe wall. In addition to having all the advantages of traditional concrete block—durability, structural strength, and the ability to be manufactured locally—the system offered the owner "the greatest insulating value economically available with a single-wythe construction," according to architect Peter Salter of Esocoff and Associates, the Washington, DC, firm that designed the facility.

The design also incorporated green elements, although the U.S. government did not require the facility to be certified according to the national standards of the Leadership in Energy and Environmental Design (LEED) program, says Roy Waldt, senior project manager for the training academy. Green elements or sustainable building materials were included in the facility's mechanical systems, water conservation and materials—in which concrete masonry was an integral part. (see sidebar—What Is a High Performance Building?)

The cavernous lab looks much like an airplane hangar. It is one leg of an L-shaped building, whose other leg houses classrooms for training NTSB faculty. The exterior of the classroom section is faced with clay brick, and a steel skeleton bears the load of the entire structure. "If you didn't have to take the wind into account, [the lab] would stand up on its own with just the concrete masonry walls," Salter says.

Inside, the ceiling, comprised of a curved aluminum roof system, rises just short of 62 feet (19 m) above the floor, ample room for a complete fuselage, or airplane engine, Waldt says. Six-foot (1.8 m) eaves were designed as part of the roof to keep water off of the concrete masonry walls, Salter says.

The structure sits on a concrete base built into a hillside. The rear of the lab building is cut 16 feet (5 m) into the hill, while the front end sits atop a 20-foot (6-m) high bush-hammered concrete retaining wall. "The first floor is on top of that wall," Salter says.

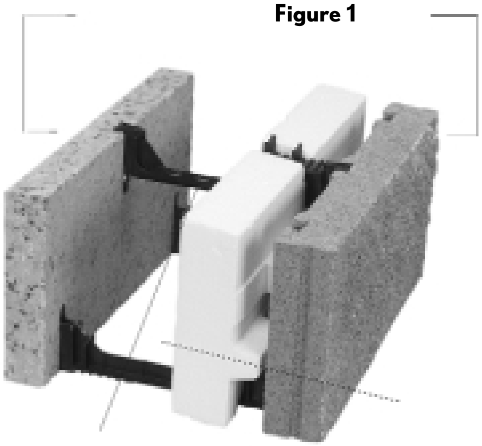
The system

In such a large and open building, two of the designers' main concerns were energy efficiency and thermal comfort. Would the place be stifling hot in the summer and freezing in the winter? "We wanted to bring it up to office conditions," Salter says. Yet they had to do it with single-wythe walls.

The hybrid CMU system Salter chose essentially is a double-wythe in a single unit, with three plastic webs connecting the two concrete face shells (Figure 1). For ease of carrying, the top connector is shaped like a handle.

The 12 ∞ 8 ∞ 16 in (305 ∞ 203 ∞ 406 mm) units are used in the NTSB building's envelope. A cross section of the lab

Figure 1



What Is a High Performance Building?

Sustainable buildings are high performance and contain three key characteristics:

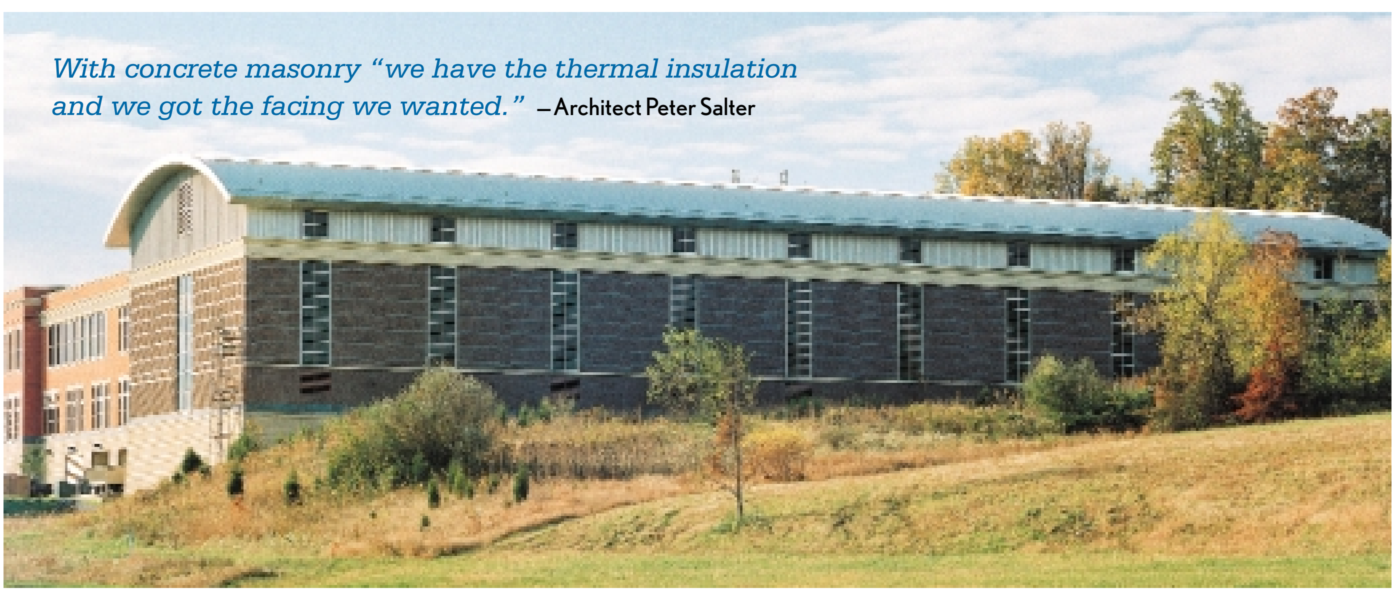
1. It is a healthy and productive for those using the building in that it provides
- high levels of acoustic, thermal and visual comfort,
- large amounts of natural daylight,
- superior indoor air quality, and
- a safe and secure environment.

2. It is cost effective to operate and maintain because the design
- employs energy analysis tools that optimize energy performance,
- uses a life-cycle cost approach that reduces the total costs of ownership,
- utilizes a commissioning process that ensures the facility will operate in a manner consistent with design intent.

3. It is sustainable because it integrates
- energy conservation and renewable energy strategies,
- high performance mechanical and lighting systems,
- environmentally responsive site planning
- environmentally preferable materials and products
- water-efficient design.

Creating a building with these characteristics requires an integrated, whole building approach to the design process. Key systems and technologies must be considered holistically, from the very beginning of the design process, and optimized throughout based on their combined impact on the comfort and productivity of students and teachers. At the conclusion of the process, the entire facility will be optimized to achieve long-term value and performance. The result will be a building that is an enduring asset to the community; one that enhances learning, reduces operating costs and protects the environment.

Adapted from *High Performance School Buildings,*
Sustainable Building Industry Council, 2001.



building's wall would show an exterior face shell 1.5 inches (38 mm) thick, a one-inch (25.4 mm) cavity for water drainage, two inches (50.8 mm) of rigid insulation for thermal performance and three inches of grout. Builders installed cabling and conduits in the cavity between the insulation panel and the 1.5-inch-thick interior face shell, then filled the remaining space with 3,000 psi concrete grout.

The result is a wall that resists both air and moisture penetration. "This way we have the thermal insulation and we got the facing we wanted," Salter says.

Requirements from both the university and the surrounding residential communities dictated certain limitations in how the building's exterior could look. "We had to blend in," Waldt says. The lab building's exterior is largely a split-face block that Salter describes as "an earthy purple." Stepped bands of honed block gird the outside walls at regular intervals. Both the split-face and honed block are the same color, but their textures create the illusion that they are different hues, adding interest to the building. The three lowest courses along the outside walls of both the lab and the adjacent teaching building are honed gray block, which are also referred to as ground-face and burnished block.

To reduce the building's visual mass, the designers set back the 20-foot (6-meter) high windows 4.5 inches (114 mm). "We wanted a sense of depth," Salter says. "And as the shell face is only 1.5 inches thick, a return block had to be created to bridge the insulation layer within the unit."

Inside the lab, the face shell is painted off-white. The other structural features include the olive-color steel frame, the terra cotta crane rail and a yellow crane.

A concrete masonry wall serves as a firewall between the lab and the teaching building. "We needed to obtain a two-hour rating between the two buildings. The CMU construction gave us this with ease," Salter says.

The concrete foundation and structural steel were in place when the masonry contractor crew from J.D. Long arrived to install the masonry. There were restrictions caused by the building site itself. "Because of the sloped concrete wall, we had to lay the block from the inside of the building on three sides through the structural steel," Bill Stynes, executive vice president of J.D. Long. "There was just enough room to put our scaffolding, but not enough room to put our equipment."

Green possibilities

The hybrid CMU system has some important "green" possibilities, which enhance the environmental effects of standard CMUs, according to the manufacturer.

One is thermal efficiency. "The low-conductivity plastic webs greatly reduce thermal bridging across the wall system," according to the July/August 2001 *Environmental Building News*.

In addition, the system is designed to use recycled products: The plastic connectors can be made from recycled plastic or recycled glass-reinforced nylon. Also, according to *Environmental Building News*, "Both post-industrial and post-consumer waste materials can be incorporated into the structural concrete grout." The units are lighter than a conventional CMU and are shaped to be handled easily by a mason.

The NTSB training lab was built as a secure facility, and the block doubles as both a building material and enhancement to the building's security, Waldt says. Add to that block's durability, low maintenance needs and energy efficiency, and the NTSB has a facility that elevates the standard of what a government building can be. ■