



Renovating The Pentagon

A Monumental Task

Contractors reinforce and modernize
63-year-old DoD headquarters

BY LAUREN PINCH



A SOLID INFRASTRUCTURE

Even before renovation began, the Pentagon had structures in place to withstand collapse. The U.S. government planned to convert the building into a paper storage warehouse after World War II, and wanted a strong building to hold the weight of millions of documents. The chosen reservation site, however, was a swamp. As if building a bridge, workers drove enormous steel pilings into the soft mud, and then filled the swamp with sand and dirt for a foundation. Concrete surrounds the pilings inside the building—a design which, years later, helped slow the momentum of the hijacked airplane.

Being awarded a contract to rebuild the Pentagon is, without a doubt, a huge responsibility. It is the largest renovation ever undertaken in the United States. Approximately 25,000 people work within the Pentagon's thick walls—a population higher than most American cities. The Pentagon is the largest low-rise office building in the world, spanning more than 6.5 million square feet. Five U.S. Capitol buildings could fit in its place.

Construction began Sept. 11, 1941, and though now 63 years old, the Department of Defense (DoD) headquarters still commands respect. Its design is sturdy and practical—five rings of five floors each, divided into five wedges. But, despite its stature, the building has suffered from periods of neglect and disrepair.

Plans for brighter lighting, more efficient heating and cooling, enhanced privacy and security, state-of-the-art telecommunications, better traffic flow and structural reinforcement have been in the works since 1992, when the Pentagon first proposed a massive renovation plan valued at \$1.2 billion. Now, the project value exceeds \$2 billion.

The Pentagon Renovation and Construction Program (PENREN/C) manages the project along with its many contractors, some of which include Hensel Phelps Construction, Facchina Construction, Shirley Pentagon Contractors, Modern Continental Construction, Electronic Data Systems and General Dynamics Network Systems.

In 1998, PENREN/C began renovation of Wedge 1, providing the new sprinkler system and structural enhancements that eventually saved hundreds of lives when American Airlines Flight 77 crashed into the nearly complete construction in the Sept. 11, 2001 terrorist attack. The \$500-million rebuilding effort after

the attack, nicknamed the “Phoenix Project,” was completed in record time, with employees moving back into their offices as soon as August 2002.

The construction pace hasn't slowed much since. The DoD accelerated the PENREN/C completion deadline to December 2010, four years earlier than originally planned. The primary reason: protecting the men and women who work and visit the Pentagon reservation every day.

“The idea was that people would be safer if the renovation were completed sooner,” Mike Sullivan, PENREN/C director, says. Since the Phoenix Project completion, the pace has gone back to “normal aggressiveness” of being on schedule. According to Sullivan, the program is living up to its motto: “On Cost, On Schedule, Built for the Next 50 Years.”

This was not the case before Sullivan's predecessor Lee Evey took the helm; the Pentagon renovation suffered from mismanagement and was over-cost almost by 100 percent during the mid-1990s. “Now we're trying our hardest to keep the program on track and successful. At times, that is a 24-hours-a-day job,” Sullivan says.

PENREN/C has reason to brag about its recent milestones: a new \$25-million athletic center; a new, more secure Metro Entrance Facility, where up to 38,000 people, including many who do not work at the Pentagon, commute daily from the buses to the metro stop; completion of the Intake/Outfall water intake facility for the heating and cooling system; opening a more secure access lane for the Pentagon's delivery facility and rerouting Route 110 without any major headaches.

“At any given time, the program has anywhere from one to

20 projects working,” Sullivan says. Three of these projects are valued at more than \$200 million each, several are valued at more than \$25 million each and a number of smaller, ancillary projects total \$18 million.

SIX YEARS, FOUR WEDGES TO GO

The largest PENREN/C endeavor involves gutting and renovating Wedges 2-5, where employees are being relocated in groups of 5,000 at a time. Hensel Phelps Construction serves as the design-builder and was awarded the \$758-million contract to renovate those sections of the Pentagon.

“This is the biggest project I’ve ever been involved with,” says Thomas Miller, Hensel Phelps operations manager. Miller oversees 85 project managers. In Wedge 2, the contractor is making the work space more flexible, energy-efficient and sustainable, with better indoor air quality and a better overall work environment.

“We’ve had to completely demolish and abate back to structure,” Miller says. “Then we build it back with a new design, new infrastructure, HVAC, drywall and finishes.”

So far, Hensel Phelps has put in several new elevators, pedestrian bridges and half-corridors—all improvements that facilitate employee mobility. Other accomplishments will make the building more sustainable for the next 50 years. Sprinkler systems now have additional standpipe feeds. Photo luminescent strips run along finished hallways, requiring only 15 minutes of light exposure to glow for four hours. Outside, many of the brick-face walls are made of reinforced concrete rather than masonry.

In addition, when the renovation is completed, PENREN/C will have funded \$1 billion to enhance the survivability of the IT infrastructure throughout the Pentagon, including half that amount to build the Command Communication Survivability Program (CCSP). “The CCSP will ensure the networks, voice, mainframe and messaging systems are more survivable if another event like 9-11 were to occur,” John Lehman, IPT lead for the project, says. With the design phase complete, Electronic Data Systems, Lockheed Martin and General Dynamics contractors are building and implementing CCSP plans.

LONG HOURS, HEIGHTENED SECURITY

Accelerating the renovation poses some major challenges for PENREN/C contractors. “We’ve been working almost 24 hours a day,” Miller says of his Hensel Phelps team. Managing three shifts, six days a week has been tiring, especially after the contractor was forced to re-sequence and re-phase the entire project as a result of the terrorist attack on Sept. 11.



New half-corridors facilitate employee mobility.

Commemorating 184 Lives

Building the Pentagon Memorial Depends on Private Donations

Three years ago this month, 184 people died when American Airlines Flight 77 crashed into the western face of the Pentagon.

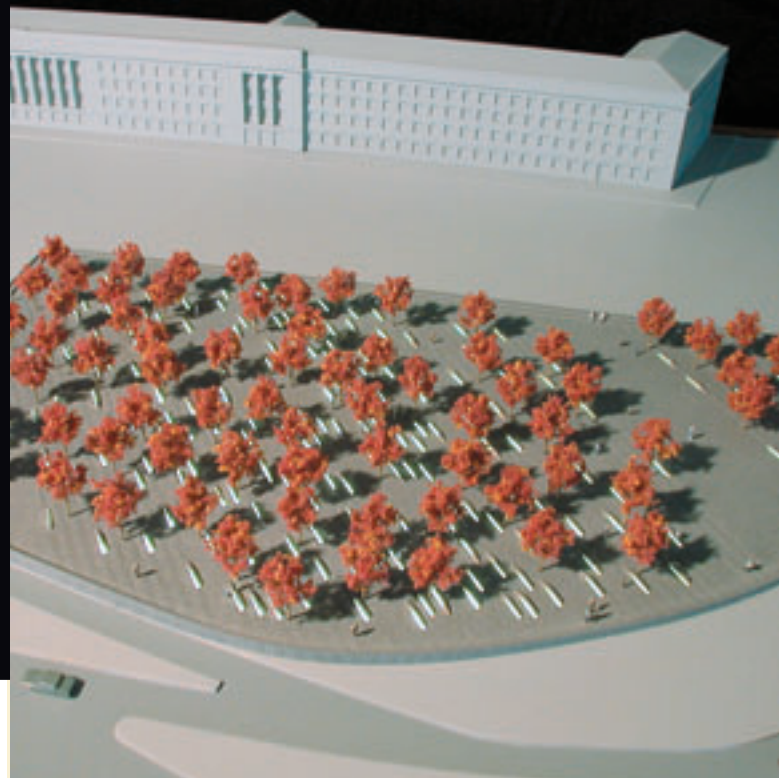
Almost immediately after the Sept. 11 terrorist attack, Congress authorized the Department of Defense to construct a memorial to honor the victims.

The U.S. Army Corps of Engineers conducted an open competition to select a design for the memorial and established a Family Steering Committee of victims’ family members who wanted to participate in the selection process.

After receiving more than 1,100 entries in the design competition, a jury of professional engineers, architects, artists and family members narrowed the submissions to six semi-finalists. The jury made its recommendation to the secretary of defense, and in March 2003, Pentagon officials announced the selection of a Memorial Park design by two New York architects, Keith Kaseman and Julie Beckman, of Kaseman Beckman Amsterdam Studio.

Last August, PENREN/C named Centex Lee, LLC, Fairfax, Va., the design-build contractor responsible for completing the Pentagon Memorial Project. Centex Construction Group, Dallas, serves as the general contractor, while Lee and Associates, Washington, D.C., serves as the design and landscape architect.

“The Pentagon Memorial has a significant feeling that we’re honored to be a part of, as are Lee and Associates and all of our contracting partners,” Mark Konchar, Centex





“The Pentagon Memorial sets out to permanently record and express the sheer magnitude of loss through an architectural experience of place radically different than what we encounter in our daily lives. In this light, the space itself serves as the memorial at all scales of experience and engagement—from within, driving by, and from above.”

—architect Kaseman Beckman Amsterdam Studio

Construction design-build manager for the project, says.

Currently, PENREN/C and Centex Lee are conducting site research and utility exploration outside the Pentagon. The project is paced by fund raising for the Pentagon Memorial Fund, Inc., a tax-exempt, nonprofit organization run by families of the victims that solicits donations from the public, corporations and foundations. Private contributions are the sole source of funding for the memorial’s construction.

At press time, the fund had raised more than \$2.2 million. The campaign goal is \$30 million. About \$17.5 million will go toward design and construction costs, and the rest will be used to create a permanent endowment for maintenance.

The design-build contractors, government officials and family members meet every month to discuss progress.

“One unique aspect, which is incredibly touching, is working with the families who are raising funds for the park,” Konchar says. “They are the ultimate client.”

An Intimate Place for Reflection

Kaseman Beckman Amsterdam Studio’s design encourages collective contemplation as well as individual remembrance. A two-acre Memorial Park will be built 165 feet from the Pentagon and adjacent to Route 27, the same site where the plane hit the building. One hundred eighty-four memorial units will be dedicated, one for each individual who lost his or her life.

Each self-supporting unit consists of a cantilevered bench with one victim’s name inscribed on its side, and a glowing light pool beneath it. The Pentagon design-build team chose to build the benches using a “Super Duplex” stainless steel alloy that can last more than 100 years. The alloy, which has been used in offshore oil and gas facilities and in the restoration of the Statue of Liberty, offers high strength and corrosion resistance.

The units will be arranged as a timeline of the victims’ ages, from 3-year-old Dana Falkenberg to 71-year-old John D.

Yamnicky. Fifty-nine name engravings will face toward the sky to represent the people on the plane, and 125 will face toward the Pentagon to represent those who worked in the building.

The design includes perimeter benches, trees and ornamental grasses to encourage serenity, provide shade and mark the boundary of the Memorial Park. The anticipated dedication date is Fall 2006.

For more information, visit www.memorial.pentagon.mil.

—Lauren Pinch

Centex Lee LLC partners include:

- M.C. Dean, Inc., Chantilly, Va. (electrical contractor)
- Southland Industries, Sterling, Va. (mechanical contractor)
- ValleyCrest, Sterling, Va. (landscape and hardscape installation)
- CMS Collaborative, Santa Cruz, Calif. (foundation design)
- Delon Hampton & Associates, Washington, D.C. (civil engineering)
- LID Center Inc., Beltsville, Md. (low impact development consulting)
- Light’n Up, Washington, D.C. (lighting design)
- Syska Hennessy, Fairfax, Va. (MEP and structural engineering)

Contributions

Anyone wishing to make a contribution to the building of the Pentagon Memorial may send donations to the Pentagon Memorial Fund, Inc., 1850 K Street NW, Suite 380, Washington, D.C. 20006. Or, visit www.PentagonMemorial.net.

The Department of Defense is also authorized to accept donations. Send a check payable to U.S. Treasury-Pentagon Memorial Account; mailing address: DoD, Washington Headquarters Services, Attn: Pentagon Memorial, Room 3B269, The Pentagon, Washington, D.C. 20301-1155.

RENOVATING THE PENTAGON

Contractors say the Pentagon is often an awkward worksite. Mobilization is tight, with the reservation bounded on three sides by highways. Below-ground utilities installed in the 1940s are inadequate and need replacement.

Getting materials through security presents another challenge. All incoming construction equipment must be cleared before it can be delivered and all staff must undergo background checks.

Miller adds, “There are political challenges in the sense that there are more than 800 tenant groups at the Pentagon that you have to satisfy. Plus, the government has asked us to accelerate and take four years off the contract, while at the same time make upgrades for security.”

Respecting the privacy of DoD employees is another factor when working at the Pentagon, explains Sullivan. Construction schedules are often subject to noise restrictions. “With the heightened situation in Iraq and Afghanistan, we have to be sensitive and willing to be flexible with scheduling in order to



Interior office spaces are being overhauled.

work around the Department of Defense,” Sullivan says. “If the secretary of defense is going to have a conference, and as much as he understands we have a job to do on a very tight schedule, he can’t cancel it just because we are renovating.”

Integrating information technology also becomes tricky when tenants are working full-time in the office space while upgrades occur. In dealing with an active network, an unscheduled outage would jeopardize the contractor’s relationship with the customer, Lehman says.

Current Projects:	Contractor
Wedges 2-5	Hensel Phelps Construction Company; Greeley, Colo.
Information Technology	General Dynamics Network Systems; Falls Church, Va.
Pentagon Memorial	Centex, Lee and Associates; Washington, D.C.
Communications Survivability (CCSP)	Electronic Data Systems; Plano, Texas
Pentagon Secure Bypass	Facchina Construction Company, Inc.; La Plata, Md.
Intake/Outfall Facility	Modern Continental Construction Co., Inc.; Cambridge, Mass.
Library and Conference Center	Coakley & Williams Construction; Gaithersburg, Md.
Completed Projects:	Contractor:
Pentagon Athletic Center	Turner Construction Company; New York
Phoenix Project	AMEC; Bethesda, Md., and many others
Wedge 1	AMEC; Bethesda, Md.
Metro Entrance Facility	Hensel Phelps Construction Company
Remote Delivery Facility Secure Access Lane	Shirley Pentagon Contractors, LLC; Arlington, Va.
Basement/ Mezzanine	Hensel Phelps Construction Company

‘EVERY DAY COUNTS’ DURING ROAD PROJECTS

Meanwhile, construction outside the Pentagon smooths the way for commuters rushing to-and-from the nation’s capital. Facchina Construction was awarded the contract for re-routing Route 110 eastward to increase the distance between the roadway and the Pentagon. The highway’s southbound lane opened to traffic in June, ending the bus and truck restriction in place since the terrorist attack and saving the DoD about \$3.6 million annually in additional costs to reimburse the State of Virginia for the state troopers who patrolled the roadway. The \$25-million project stayed unusually far ahead of schedule. Both lanes opened by mid-July of this year.

“It has been extremely fast-paced,” says Greg Henion, team leader for roads, grounds and security projects for PENREN/C. “For our project slogan, we chose ‘every day counts.’ It’s been a lot of long hours.”

Henion credits the Pentagon Force Protection Agency (the Pentagon’s police force) with keeping the site secure and reacting quickly to project needs. Weather frustrations, however, could not be avoided. Winter 2002-2003 brought heavy sleet and snow, and last summer saw heavy rainfall.

ON COST, AHEAD OF SCHEDULE

Despite any setbacks, the PENREN/C program remains a success. Facchina compensated for weather delays by putting in extra hours to complete work on time. The company installed a new vehicular bridge from Route 110 to Pentagon parking areas, as well as two new pedestrian bridges.

“Facchina’s work has been outstanding on the project, with costs 10 percent below what was expected,” Henion says. He notes that three contracting factors—quality, cost and sched-

ule—came together nicely for the road team.

Partnering among contractors and subcontractors, while often a construction stumbling block, has proven to be one of PENREN/C's strengths. "Everybody really embraced partnering from day one. Everybody put full faith in their counterparts, and I really think that's been a large part of why this project has been successful," Henion says. During the project, he coordinated road plans with the Virginia Department of Transportation and the federal government.

All PENREN/C contractors sign an Associate Contractor Agreement, a formalized agreement to work together in the same areas, Sullivan says. Contractors stay motivated with "award fee" incentives, wherein the amount of award fee, as their only form of profit, depends on quarterly evaluations and performance determination by the director of the program.

Sullivan explains that the contractors and their workers thoroughly understand the urgency of making the Pentagon safer. "Patriotism was a large motivation factor during the Phoenix Project and continues today," he says.

Miller says the Hensel Phelps team remains excited about its work, having turned over almost half of Wedge 2 to the DoD. "The size of the project has allowed us to put together a first-string team, full of very talented, motivated people. Our team is still very motivated. The acceleration really represents a challenge—and everyone gets pumped for a challenge," he says.

Because of the modular design of the Pentagon, designers can use Wedge 2 as a reference for work in Wedge 3, which is



nearly identical. Having been through the project cycle once, the group can "tweak" elements of what was done the first time, and ultimately work faster. "In construction, you don't often get a chance to do it over again and learn from your mistakes," Miller says. Construction in Wedge 3 will begin next July.

SMALL BUSINESS AND SAFETY

PENREN/C and Hensel Phelps have emphasized small business opportunities throughout the design and build process. Employing smaller subcontractor groups gives craftspeople an invaluable learning experience to take to future projects.

The CCSP took advantage of the technology integration experience of small business contractors. Gilford Corporation, Desbuild Incorporated and Ribeiro Construction, all based in Maryland, are assisting with electrical work and converting office space into technology equipment-suitable space. Facchina received support from numerous subcontractors for electrical, concrete and fence work.

Also, PENREN/C places high emphasis on safety. Every employee completes safety training during sessions held every Monday. Foremen participate in additional training once a month. As a result, Sullivan says, "The PENREN/C lost-time accident rate is approximately .4, a tenth of the industry standard of 3.8 lost-time accidents per 200,000 hours."

THE FUTURE OF PENREN/C

By 2010, Pentagon employees will be working in a building that is cleaner, quieter, more modern and more secure than ever before. In addition to the new athletic facility, off-duty employees will be able to take advantage of a fully renovated Pentagon Library and Conference Center. PENREN/C recently awarded the \$28 million library and conference center contract to Coakley & Williams Construction. PENREN/C also plans to build shops, restaurants and meeting space in the Pentagon Concourse mini-mall area.

Sullivan says that at any given time, new projects will arise to supplement the reservation master plan. "There's still more work to be done. There are going to be opportunities in the future," Sullivan says.

For more information about PENREN/C projects, visit www.renovation.pentagon.mil.

Pinch is a staff writer for Construction Executive.