



Environmentally Preferable Purchasing (EPP)

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Greening of the Pentagon

At a Glance

What began in 1998, as a much needed renovation project, developed into a monumental rebuilding of the Pentagon, after the September 11th tragedy.

Due to the lack of any major renovation since the Pentagon's construction in 1942, Congress allocated the initial funds for the Pentagon's renovation, by means of a \$1.2 billion Pentagon Reservation Maintenance Revolving Fund, supplied under the Defense Authorization Act of 1991. The Pentagon Renovation Program (PenRen) evolved as the organization to manage the Pentagon renovation and other construction projects on the Pentagon Reservation for the Deputy Secretary of Defense. Besides renovation, PenRen is managing the new construction of the Remote Delivery Facility, the Metro Entrance Facility, the Pentagon Athletic Club, and other projects located on and off the Reservation. To accomplish these projects in the most efficient and effective manner possible, PenRen created an acquisition process to effectively modernize the facility and build the new structures on the Reservation, while incorporating environmentally preferable building products and services. This acquisition process is not "business as usual" for the federal government, because it uses a design-build strategy with performance specifications built into the contract, along with incentives and awards fees for performance. The process has been hailed by the federal government as leading edge, innovative, and in consonance with sound business practices.

The renovation of the Pentagon is being accomplished in five sections, called "Wedges." The first renovation efforts in the section called "Wedge 1" included blast-resistant windows, removal of hazardous debris and materials (eg. asbestos), and energy-efficient infrastructure design. Some of this section, Wedge 1, of the Pentagon, was unfortunately destroyed on September 11th; however, because of the blast-resistant windows and other force protection measures, although horrific destruction was endured in the Wedge 1 area, studies have shown that the newly renovated and reinforced materials in Wedge 1 lessened the potential for greater destruction.

The Pentagon Renovation Office is organized into Integrated Product Teams (IPTs) that implement the various construction and renovation projects. After September 11, 2001, PenRen set up an Integrated Product Team within the organization, to rebuild and repair the

Environment Considerations:

- Removal of all hazardous materials (e.g. asbestos, lead paint)
- Procurement of energy efficient upgrades.
- Use and promotion of materials which contribute to good indoor environmental quality.
- Conservation of materials and resources.

Contract Language:

Key Players:

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 Pentagon Building Management Office
 responsible for operation and management.

Environmental Information Sources:

- EPA's Green Building Website
- EPA Database
- Building for Environmental and Economic Sustainability (BEES)
- United States Green Building Council (USGBC)
- [EXIT Disclaimer](#)

damage caused by the airplane's impact. This Phoenix IPT- justly named after the mythological bird, the Phoenix, symbolizing rebirth and immortality - rose to the challenge to rebuild the damaged Pentagon in one year. Despite the additional renovation challenges, new opportunities surfaced, and the procurement of environmentally preferable products gave hope for the continual success of the Pentagon reconstruction.

Reconstruction Process and Goals:

At the onset of the renovation process, PenRen developed prerequisites for environmentally preferable products and services they wanted to implement. Additional requirements and methods became more imperative after the terrorist attack, but added more diversity and flexibility to the effort. For example, innovative work space, energy efficient (and blast resistant) windows, new heating and cooling networks, new energy management control systems, improved indoor air quality (eg. low VOC paints) and the massive abatement of hazardous building materials (eg. asbestos) founded the PenRen's basis for environmentally preferable product procurement.

The Department of Defense created the Phoenix Project team for the specific procurement and reconstruction of the damage caused by the terror attack. An on-going betterment of these practices, has resulted in an increased importance of environmentally preferable product and service use. The PenRen team's short-term goal for the promotion of further innovative guidelines on environmental building standards, is to certify all Pentagon Renovation projects under the certification of the US Green Building Council's Leadership in Energy and Environmental Design (LEED). [EXIT Disclaimer](#)

A performance-based initiative for all acquisition has also been established, which not only specifies the environmentally preferable guidelines for contractors, but also gives them the flexibility in how to follow those guidelines and minimize the time and effort needed.

Environmentally Preferable Purchasing- A Summary of the PenRen Team's Accomplishments

The Pentagon Renovation Team worked from guidelines developed and supported by the EPA's Environmentally Preferable Purchasing (EPP) Program in creating its green building initiatives. The environmentally preferable products for the Interior Renovation of Wedge 1 included the use of wood from sustainable managed forests, low water use plumbing fixtures, low VOC paints and sealants, mineral wool insulation, energy efficient lighting, the use of recycled steel, ceiling tile, ceramic tile, concrete masonry units, including recycling construction debris, and using packaging, labeling and instructions made from recycled material. Future applications for incorporating EPP into the Pentagon renovation include the Department of Defense custodial, operations and maintenance, and recycling programs.

State-of-the-art Heating and Refrigeration Plant

The original heating and refrigeration plant was a coal-fired

Quantitative Outlook on Some Products included in Interior Renovation:

- 420,000 sq. feet of gypsum wallboard (dry wall) containing 100% recycled paper on face and 15% recycled material by weight. Enough to cover more than 9 football fields.
- 273,222 sq. feet of recycled acoustical ceiling tiles. Enough material to cover more than 6 football fields.
- 47,215 linear feet of wood millwork from sustainably managed forests. Laid end to end, the millwork would be 9 miles long.
- 449 doors from sustainably managed forests.
- 3,279,000 sq. feet of low VOC or recycled paint- roughly equivalent to nearly 11,000 gallons of paint.
- 59,003 sq. feet of recycled

unit, last operable in the mid-1980's. The Plant was not only obsolete, but also expensive--the boiler and chiller's lease cost a total of \$200K/month.

The new heating and refrigeration plant is:

- Computer-controlled
- Uses natural gas as its main fuel source.
- Improves reliability and redundancy- is 30% more efficient.
- And maintains the historical architectural features of the Pentagon.

Removal of all hazardous materials

Hazardous materials still present in the Pentagon posed a threat not only to Pentagon employees, but the renovation team as well. Therefore, removal was imperative before further renovation to occur.

- Removal of 25 million pounds of asbestos.
- Removal of lead paint, mercury, PCB's
- Contaminated soil cleaned.

Energy Efficient Material and Design

The extensive improvements in energy efficiency include everything from insulation to lighting.

- Tighter thermal envelopes:
- Mineral wool insulation
- New double pane energy efficient windows- conduct much less heat than the old single pane windows.
- Open bay environment improves air flow and lighting.
- Indoor environmental quality (low VOC, which leads to good indoor air quality; and sealants).

Construction Waste Reduction

The renovation team recycled 70% of all construction debris; including, steel, copper wire, aluminum, glass and concrete.

Cost Consideration

The consideration of cost is very important to the PenRen team because of the allotted quantity of funds already attributed to the project. Congress gave the Department of Defense a \$1.2 billion dollar budget, creating the Pentagon Reservation Maintenance Revolving Fund. In order to maximize these funds, cost-effective and sustainable materials were necessary. With the renovation team's implementation of environmentally preferable purchasing practices, the Pentagon Renovation project, thus far, has successfully maximized resources. In fact, head Pentagon Building and Management Officials first projected the repair costs of September 11th to be \$740 million. After the procurement and completion, for most of the project, current estimates place the figure around \$501 million. The entire Pentagon Renovation Project is expected to be four years ahead of schedule: 2010 rather than 2014. The Phoenix Project anticipates an impressive 'finished' date one year after the terrorist attacks- September 11, 2002.

In order to attain sustainable construction objectives, the Pentagon Renovation Program has formulated a plan of action to provide clear goal definition and metrics to measure achievement of progress. Earlier efforts to incorporate sustainable design into Pentagon

carpet tile.

- 53,500 linear feet of 28% recycled steel wall studs. Laid end to end, this is over 10 miles of studs.
- 496,000 pounds of construction debris recycled instead of being sent to the landfill

Results: The Pentagon renovation is an on-going project- anticipated to be completely finished by 2010.

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Renovation projects were sporadic, and lacked a clear focus and direction. Although many organizations stated their support for sustainable design and its precepts, PenRen realized that it needed more than mission statements and expressions of support. In August 2001, as a culmination of earlier efforts, the Integrated Sustainable Design and Constructability (ISDC) Team became a viable part of the organization at the Pentagon Renovation Office. Afterwards, in the wake of the terrorist attacks of September 11, the Pentagon Renovation Office and its ISDC Team shouldered the additional responsibility of integrating and balancing sustainable design issues with Force Protection measures necessary to protect the Pentagon.

Lessons Learned

As a result, the ISDC Team is an integral part of all construction projects on the Pentagon Reservation. The complex nature of the projects implemented by the Pentagon Renovation Program require that the ISDC Team incorporate sustainable design into the overall acquisition and management strategy of the Pentagon Renovation Program. The acquisition strategy includes two innovative concepts for government contracting, with respect to contract type and method of construction delivery: "performance-based" contracting, with the delivery method of "design-build" - not "business as usual" for the Government. In addition, the overall Pentagon Renovation Program management implementation strategy involves Integrated Product Teams (IPTs), composed of government and contractor personnel with various duties and responsibilities from many different organizations. Therefore, the Pentagon Renovation Program's ISDC Team is also responsible for integrating the principles and practices of sustainable design with a leading-edge acquisition strategy.

To illustrate the breadth and significance of the Pentagon Renovation Office commitment to excellence in sustainable design, the following projects, with over \$4 billion in construction and renovation, will be attempting to obtain Leadership in Energy and Environmental Design (LEED) certification from the US Green Building Council (USGBC) over the next ten years:

- 1) the Metro Entrance Facility (MEF);
- 2) the Renovation of Wedges 2-5;
- 3) the Remote Delivery Facility (RDF);
- 4) the Intake/Outfall project;
- 5) the Crash Recovery Site (aka "Phoenix");
- 6) the new Pentagon Physical Fitness and Readiness Facility (PPFRF).

The following is a specific example of the Pentagon Renovation Program's implementation of Sustainable Design on the Metro Entrance Facility (MEF).

The MEF, with an estimated total cost of \$40 million, is a Congressionally mandated project based on security assessments accomplished before September 11, 2001. These assessments required relocation of the existing Pentagon Metro bus facility and construction of a new entrance facility to protect the safety and security of the passengers using the Pentagon Metro station. The Pentagon Metro station is an intermodal facility, which serves over 30,000 passengers per day, and provides critical links to public transportation and transfer, including: subway, bus, car, taxi, van pools, bike, and pedestrian access. The Metro Entrance Facility project included a relocation and expansion of the Pentagon Metro Station bus transit facility. This transit facility opened in December 2001, and is fully operational. During the relocation and construction process, the Pentagon Renovation Program conducted recycling of existing site materials (asphalt, concrete, and soil) and recycling of construction waste. Contractual requirements included :

Compliance with 10 CFR 435 - Energy Performance Standards for New Buildings - Mandatory for Federal Buildings
http://www.epa.gov/epp/pubs/case/penren.htm
Compliance with Comprehensive Procurement Guidelines (CPG) - 40 CFR 247
Last updated on Thursday, August 6th, 2009.
Minimize polyvinyl chlorides (PVCs)
Achieve a 50% Diversion Rate
Use Forest Stewardship Council Certified Woods or Alternates
Maximize use of Greenhouse Gas reducing Materials
Plan for Erosion and Sediment Control from the construction site
Implement a Pollution Control Plan
Limit Air Pollution from the construction site
Control Debris - limit debris entry into drainage system
Comply with Executive Order 13123 to maximum extent possible - Sustainable Design and Development for Federal Agencies - categories similar to LEED criteria
Comply with Executive Order 13101 - Greening the Government
Comply with Affirmative Procurement Guidelines (42 USC 6962)

The MEF has been cited as an exemplary project by the National Capital Planning Commission and the Commission of Fine Arts. It has an outstanding public affairs program and communication with the Washington Area Metropolitan Transit Authority, Arlington County, the National Capital Planning Commission, and members of Congress.

The design-build team, under the management of the Pentagon Renovation Program and in partnership with Washington Headquarters Services and the Washington Metro Area Transit Authority, consists of: Hensel Phelps Construction, HDR Architects, MC Dean, Southland, and Johnson Controls, Incorporated. Together, these organizations built the MEF transit facility according to the principles of sustainable design, adding green space, recycling asphalt and concrete, conserving energy, and exercising responsible uses of natural resources. At the same time, the team conquered seemingly insurmountable problems caused by the terrorist attacks of September 11 that threatened to bring the project to a halt. Through their diligence, perseverance, and "sustainable" mindset, they have not only provided a beautiful, environmentally friendly Pentagon transit facility, but have been an excellent example and inspiration to the entire Pentagon Renovation Program.