



An Energy-Efficiency Workshop and Exposition
Orlando, Florida

Continuous Commissioning Initiatives at the Pentagon

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For the

Real Estate & Facilities Directorate,
Washington Headquarters Services





Pentagon at a Glance



- **Currently classified as the largest low-rise office building in the world**
- **Designated as National Historic Landmark in 1992**
- **6.8 million square feet with a 34 acre footprint**
- **Annual electric bill of \$6.5 million**
- **150 miles of ductwork**
- **25,000 HVAC hardware control points per million SF**
- **Participating in LEED for Existing Buildings Pilot Program**



Real Estate and Facilities Major Building Programs



- **Roads and grounds**
- **Repairs and minor alterations**
- **Custodial Services**
- **Integrated environmental management**
- **Continuous Commissioning**
- **Building operations and maintenance**
- **Energy management**



Roads and Grounds



- **EPP parking lot pilot project**
 - **Researched the market**
 - **Identified environmental attributes – baseline**
 - **Evaluated EPP plans in proposals**
 - **Provided contractor a price differential**
 - **Recycled content crack sealer**
 - **10% crumb rubber**
 - **Recycled content asphalt**
 - **Base course 25%**
 - **Surface course 20%**
 - **Asphalt recycling**





Repairs and Minor Alterations



- **Interior Renovation EPP Pilot Project**
 - **Researched the Market**
 - **Cited Environmental Attributes in Contract – baseline**
 - **Include EPP Factors in Performance Evaluations - continual improvement**
 - **Gypsum wall board – 100% recycled paper; 15% total weight**
 - **Suspended ceiling tile – 60% recycled**
 - **Energy efficient lighting**
 - **Steel – 28% recycled**
 - **Mineral wool insulation**
 - **Low VOC paints and sealants**





Repairs and Minor Alterations (continued)



- **Other Products included in Interior Pilot project**
 - **Wood from sustainable managed forests**
 - **Concrete Masonry Units - 50% recycled**
 - **Low water use plumbing fixtures**
 - **Ceramic Tile - 20% recycled**
 - **Construction Debris Recycling**
 - **Packaging, labeling and instructions made from recycled material**



For more information see: <http://www.epa.gov/opptintr/epp/>



Repairs and Minor Alterations (continued)



- 47,215 LF of millwork from sustainably managed forests
- 449 doors from sustainably managed forests
- 420,000 SF of gypsum wallboard (9 football fields)
- 273,222 Sf of recycled acoustical ceiling tiles (6 football fields)
- 3,279,000 SF of low VOC or recycled paint (11,000 gallons)
- 59,003 SF of recycled carpet tile
- 53,500 LF of 28% recycled steel wall studs (10 miles)
- 496,000 pounds of construction debris has been recycled instead of being sent to the landfill



Custodial Services



- **New custodial contract**
 - **Requires environmental stewardship plan which includes**
 - **Affirmative Procurement program for EPP and use of products specified in CPG**
 - **Waste minimization and recycling program**
- **Requires contractor to assist in Government recycling program**



New Custodial Contract



- **Requires the use of:**
 - **Bathroom tissue - contain at least 100% recovered materials and 50% post-consumer content**
 - **Toilet Seat Covers - contain at least 100% recovered materials and 50% post-consumer content**
 - **Paper Towels - contain at least 100% recovered materials and 40% post-consumer content**
 - **General Purpose Industrial Wipes - contain at least 100% recovered materials and 40% post-consumer content.**



New Custodial Contract (continued)



- **Plastic trash bags - contain at least 25% post-consumer content.**
- **Waste Collection Carts and Containers**
 - **noncombustible or flame resistant construction**
 - **constructed of environmentally-preferable materials**



Custodial Services



- **The award fee incentive for active stewardship program resulted in the following:**
 - **Continually monitors industry for best practices**
 - **Introduced 30% post-consumer waste can liners**
 - **Introduced 65-90% post consumer recycled content paper towels**
 - **Chemical Command Center – refills empty spray bottles reduces plastic waste**
 - **Introduced 37 *Green Seal* cleaning products**



Recycling Program



- **Education of building occupants through Earth Day and Recycling Week promotions**
- **Use of Custodial contract to assist in recycling program**
- **Development of Desk Guide for Building Managers**
- **Development of Metrics to trend data and improve program execution**



Contracting Initiatives



- **Initiate recycling program that diverts 50% of waste stream from landfills.**
- **Integration of EPP products into all contract materials**
- **Integrated Sustainable Design**
- **Meet or exceed EO 13101 & 13123**
- **Energy Budgets**
- **Life cycle cost analysis**
- **Construction Energy Plan**
- **Construction Debris recycling – 50%**
- **Use of EPP**
- **Building Commissioning**



Contracting Initiatives (continued) – Specific EPP Goals



- **No materials manufactured with ozone-depleting compounds**
- **No materials manufactured with, or that contain Polyvinyl Chloride (PVC) or other chlorine -based compounds**
- **No materials that contain Volatile Organic Compounds (VOC)**
- **Use building materials and products that reduce greenhouse gas emissions by specifying recycled-content, bio-based, and/or industrial by-products vs. virgin materials**
- **Use only dimensional wood and wood products certified as originating in certified well-managed forests, as identified by the Forest Stewardship Council (FSC)**
- **Use only materials that conserve resources to the largest extent practical and within the parameters of E.O. 13123**



Integrated Environmental Management System



- **Mirrors USGBC LEED™ for Existing Buildings program**
- **Areas of Functional expertise are:**
 - **Sustainable Sites**
 - **Water Efficiency**
 - **Energy and Atmosphere**
 - **Materials and Resources**
 - **Indoor Environmental Quality (IEQ)**
 - **Innovative and Professional Credits**



IEMS (continued)



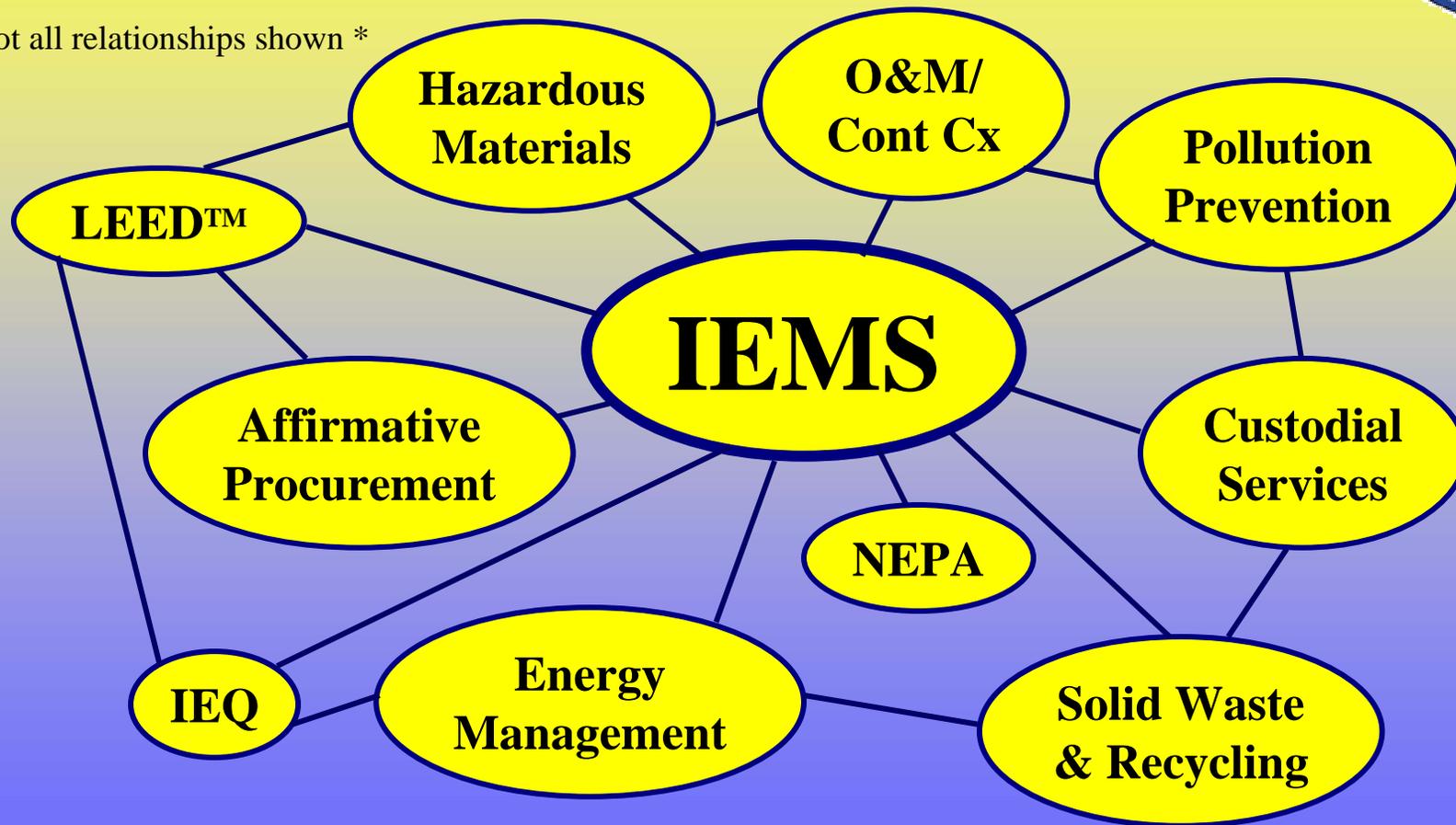
- Created a technical support team, which can influence all aspects of building operations, maintenance, and contract activities to enhance the quality of life for our building occupants, while minimizing the impacts on the environment.
- LEED is only a beginning benchmark. The team will be expected to reach far beyond the conventional approaches currently employed in facility management, to an integrated approach, blending the best practices from all operational areas.
- An important part of this process will be the development of metrics, which can be used as a model for other facilities throughout the government.



IEMS -- Program Integration



* Not all relationships shown *





Continuous Commissioning



- **Performance monitoring of indoor environmental parameters and building and system performance**
- **Standard Operating Procedures (SOP) for remedial actions**
- **Control strategies to improve IEQ and efficiencies**
- **Comprehensive measurement and verification (M&V) plan**
- **Comprehensive best practices and reliability centered maintenance (RCM)**
- **Cross-functional training program**
- **Performance measurement based appraisal system**
- **Performance indicators (metrics)**



Energy Management



- **Meet/exceed goals outlined in EO13123 and EO13101**
 - **Affirmative Procurement Program (EPP/Energy Star)**
 - **30% Greenhouse Gas Reduction**
 - **Selection of Equipment through LCCA**
 - **Energy Conservation**
 - **Water conservation**
- **Life cycle cost analyses**
- **Renewable energy projects**
 - **Solar thermal hot water system**
 - **Evacuated tube technology**
 - **100 kW Photovoltaic array**
- **Natural gas fueling station**





For More Information

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