



*Presentation to Energy 2004
August 10, 2004*

Sustainability 101: Sustainability as an Applied Science



**PENTAGON
RENOVATION &
CONSTRUCTION**

*Dr. Teresa Pohlman, Team Leader
Safety, Sustainability & Environment IPT*

On Cost, On Schedule, Built for the Next 50 Years

<http://renovation.pentagon.mil>



Presentation Outline

Introduction: Setting the Context

- **Who we are**
- **The Need for Renovation - the Problem and the Solution**
- **Methodology for the Renovation**

Status Update from September 11 – Additional Challenges

PENREN/C Initiatives – Dealing with the Challenges

- **Force Protection**
- **Sustainable Design**

Accomplishing the Pentagon Renovation & Construction Program (PENREN/C)

- **Organization and Operation**
- **Acquisition Process**





ORIGINAL CONSTRUCTION

The Pentagon

30 Miles of Roads, Bridges, Access Ramps, Minimal use of structural steel



- *Built on swampland*
- *Site of old Hoover airport*
- *Low residential area: "Hell's Bottom"*



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ORIGINAL CONSTRUCTION

September 11, 1941 to January 15, 1943

Completed in 16 months by working three 5,000-man shifts around the clock



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ORIGINAL CONSTRUCTION



61 Years Old

16 Months to Build

435,000 CY of Reinforced Concrete

42,000 Columns



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The Pentagon: Original Construction

- 400 architects and engineers

- 15,000 workers

- Original cost: \$83 million



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The Early Years

Minimal electrical, communications and HVAC requirements/capacity; Open-bay office environment; Flooding conditions.



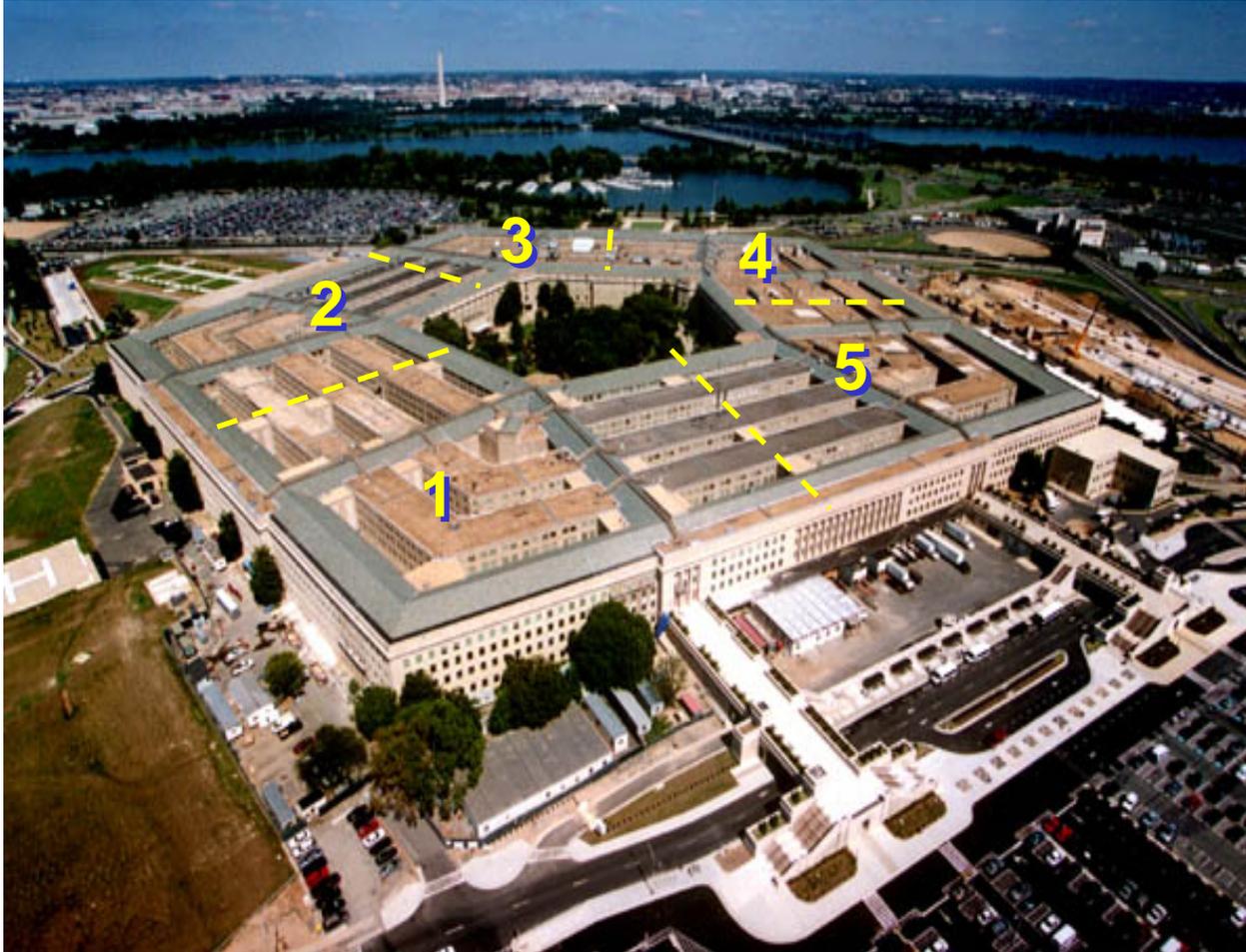
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The Pentagon – A Small City

The Pentagon has never undergone a major renovation in the past 60+ years!



- 34 acres
- 6.5 million sq. ft.
- 3 Empire State Bldgs.
- 7,748 windows
- 17.5 miles of corridors
- 25,000 personnel
- 1,000,000 calls each day
- Police force
- Metro station
- Fire Station
- Health Facilities
- Post Office
- Mini-mall
- Heliport





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THE PROBLEM: The Pentagon Has Never Undergone a Major Renovation in 61 Years



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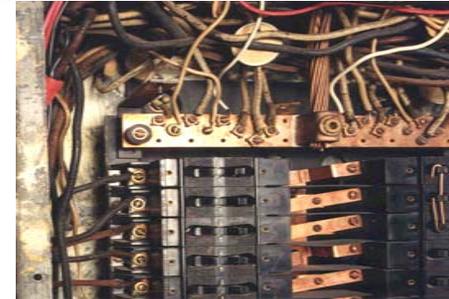
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The Need for Renovation

Major building systems beyond repair, non-compliant with current building codes, hazardous materials present throughout, poor energy efficiency



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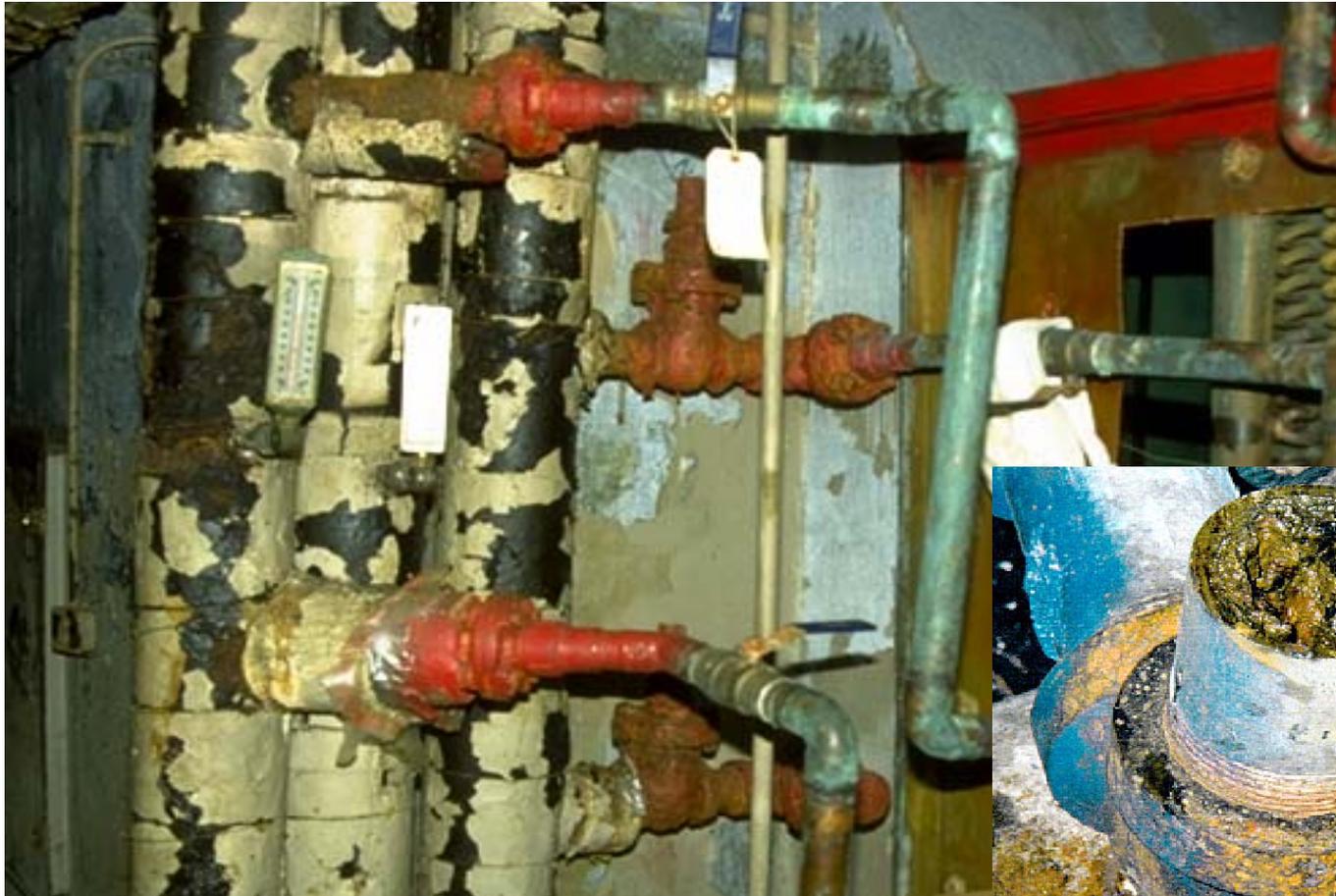
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All Building Systems Need Replacement:

Plumbing



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All Building Systems Need Replacement:

Ventilation



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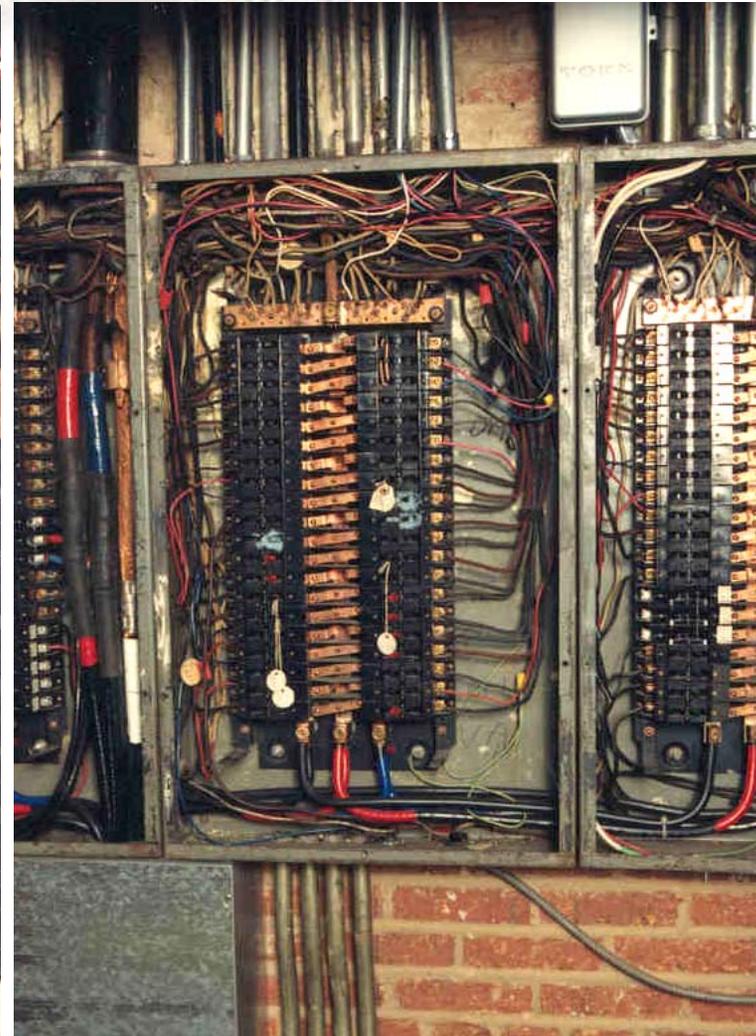
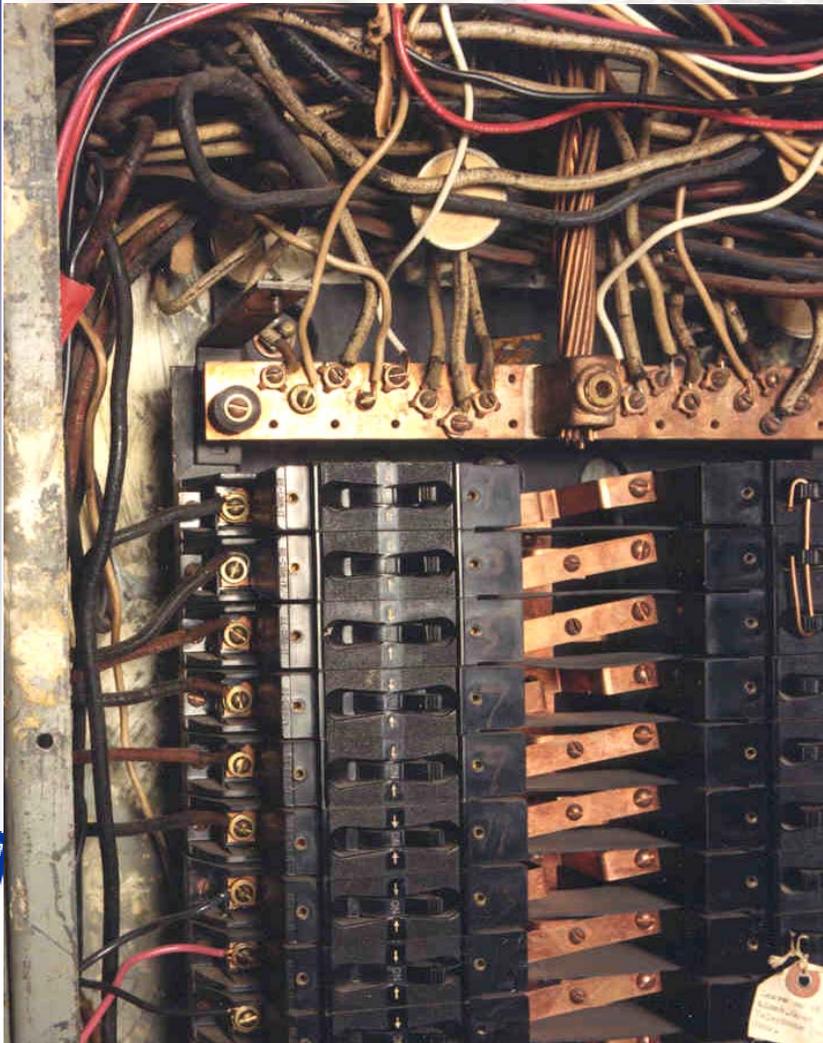
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Building Code Violations:

Electrical, Fire, Life Safety, ADA and Others

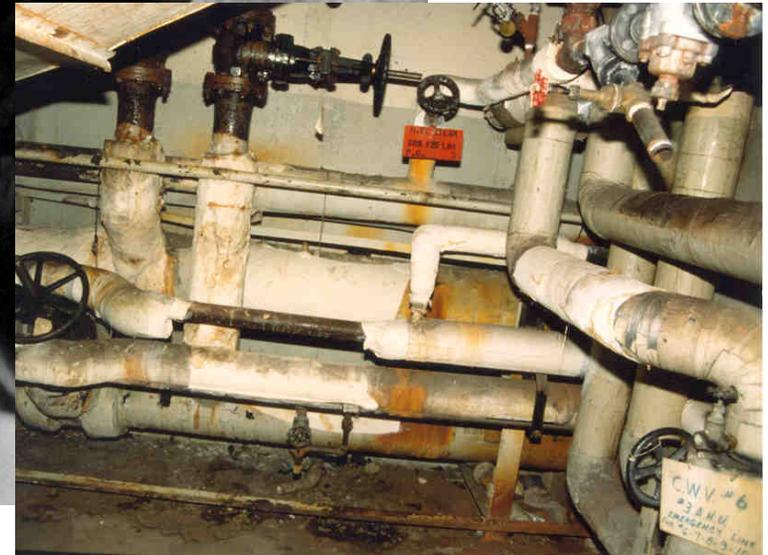




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Presence of Hazardous Materials

Asbestos, Lead Paint, Mercury, PCBs



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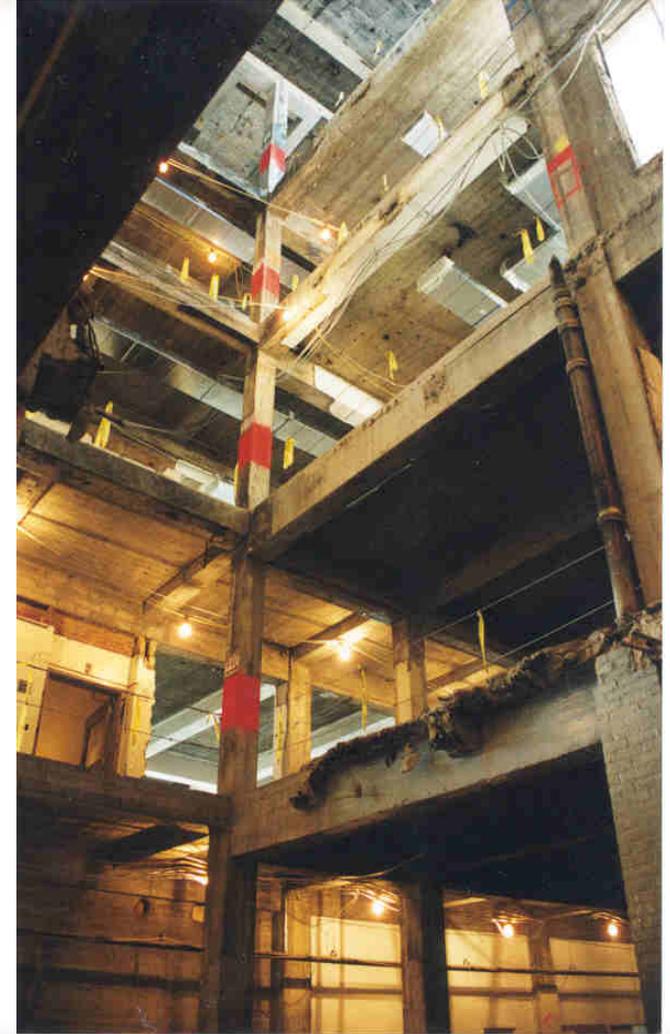
THE SOLUTION:

A COMPLETE RENOVATION “Ceiling to Slab”

- *Replace all building systems*
- *Remove all hazardous materials*
- *Improve energy efficiency*
- *Bring building up to code compliance*
- *Improve vertical mobility, comply with ADA*
- *Enhance security*
- *Improve pedestrian and vehicular traffic flow*
- *Preserve/Restore Historical Features*



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•Replacement of Exterior High Pressure Water Lines



•Monitoring & Control Systems
•Building Operations Command Center



•Fire Sprinklers
•Automatic Fire Doors
•Fire/Life Safety Codes
•ADA Compliance



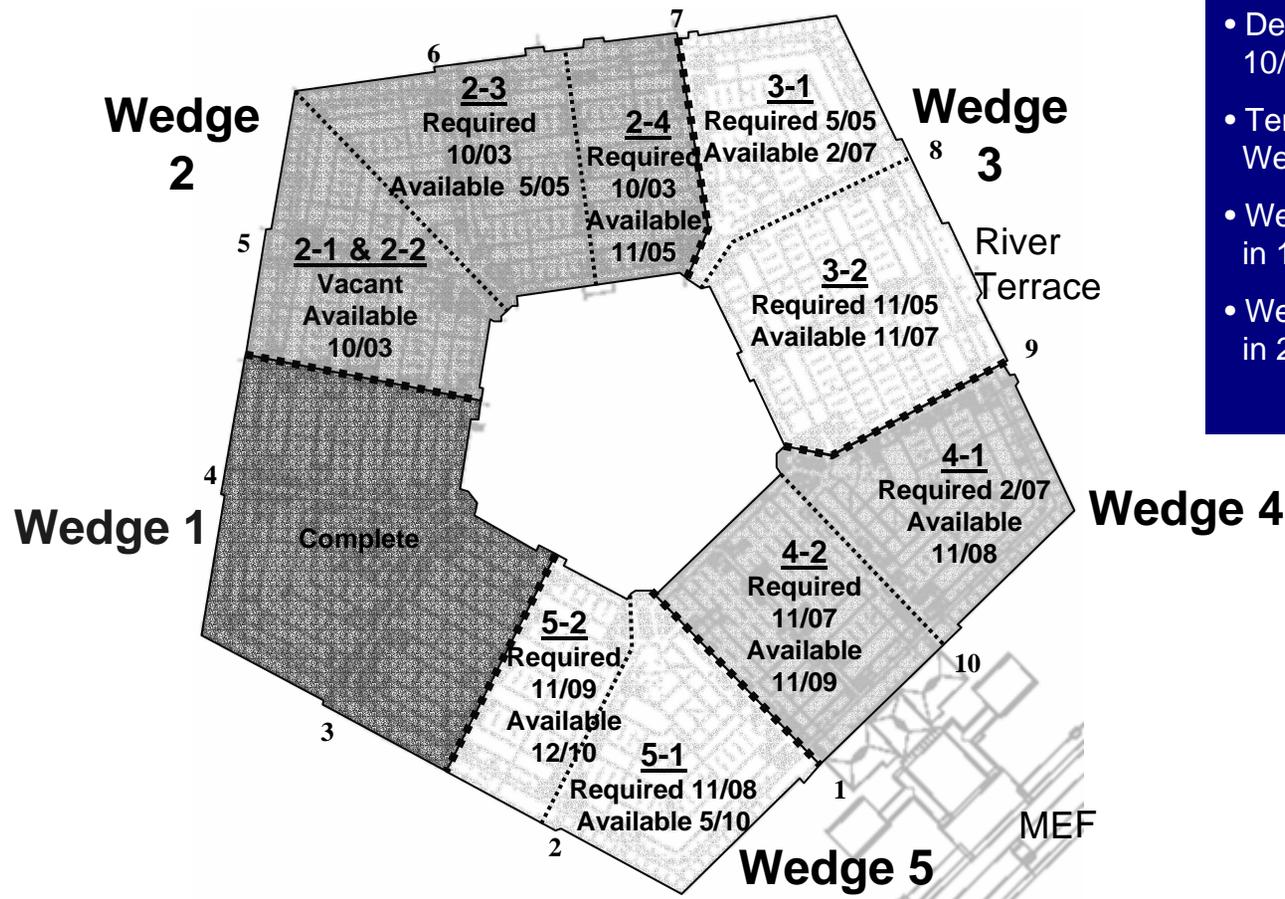
•Blast Resistant Windows
•Steel Reinforcement
•Geo-textile Mesh

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Wedges 2-5

- Renovation of the remaining 4.5 million square feet of above ground space.
- Universal Space Concept and Enhanced Universal Space Concept
- ITS - Backbone



- Milestones:**
- Demo & Abate began 10/2001
 - Tenants began move into Wedge 2 in July 2003
 - Wedge 2 final completion in 11/2005
 - Wedge 5 final completion in 2010





THE CHALLENGE: KEEP THE PENTAGON OPERATIONAL DURING RENOVATION

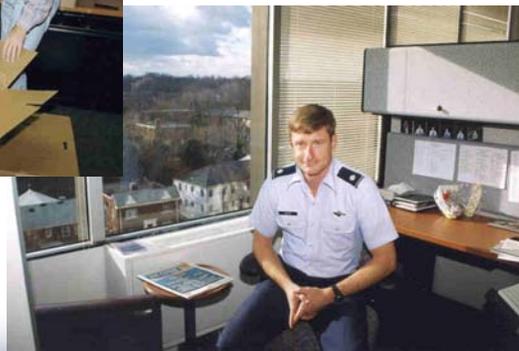
- ***Coordinate activities with all stakeholders***
- ***Relocate 25,000 people during course of renovation***
- ***Work around 20,000 people***
- ***Keep building systems operating***
- ***Minimize disruption***
- ***Maintain accessibility on all sides***
- ***Maintain security***
- ***Maintain accessibility for persons with disabilities***





The Renovation Process

- **Coordination with Tenants - Requirements**
- **Preparation of Swing Space**
- **Move Tenants Out of Pentagon**
- **Construction of Barrier Walls**
- **Demolition and Abatement of Vacated Space**
- **Construction of New Space**
- **Commissioning**
- **Move Tenants Into Renovated Space**





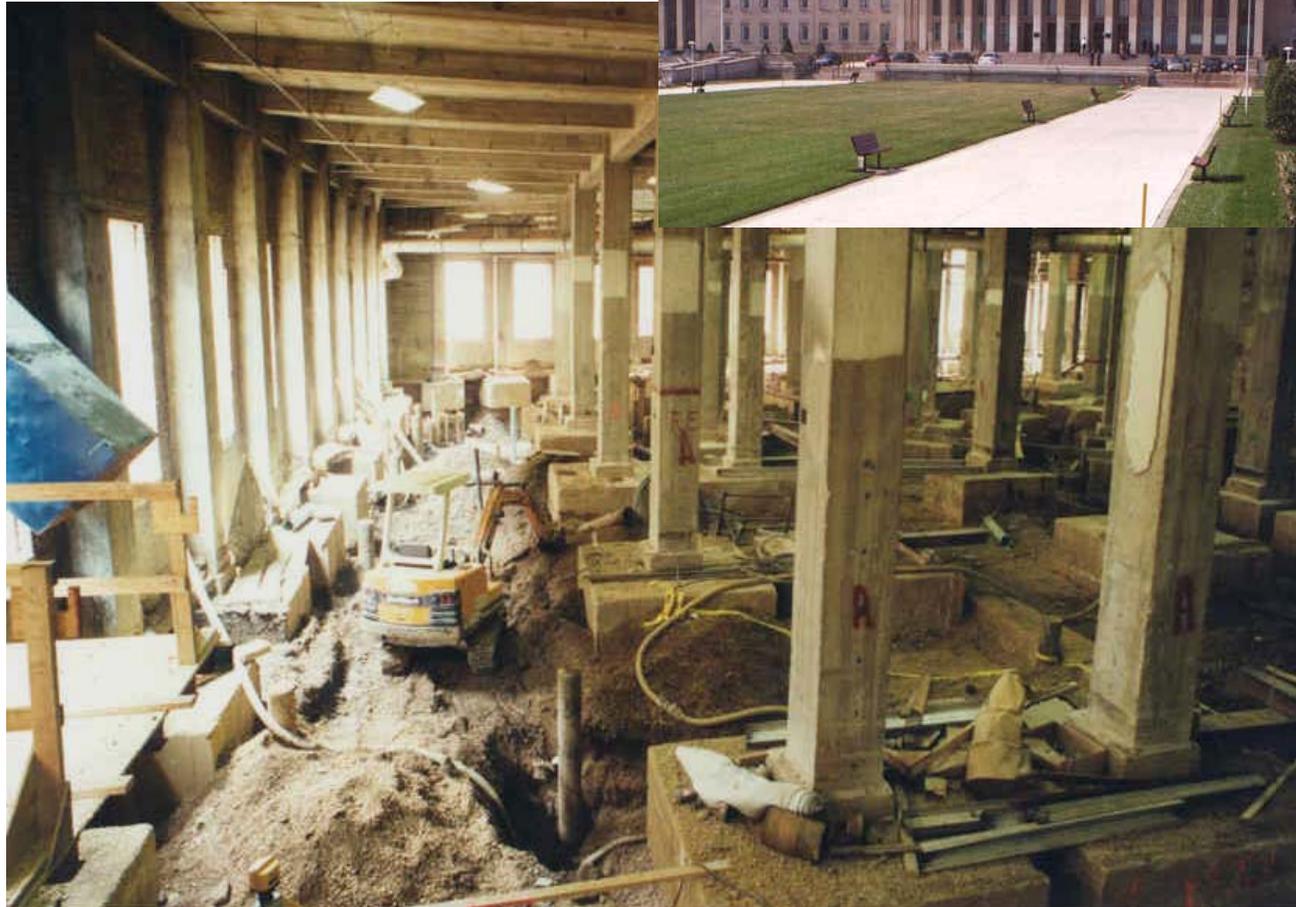
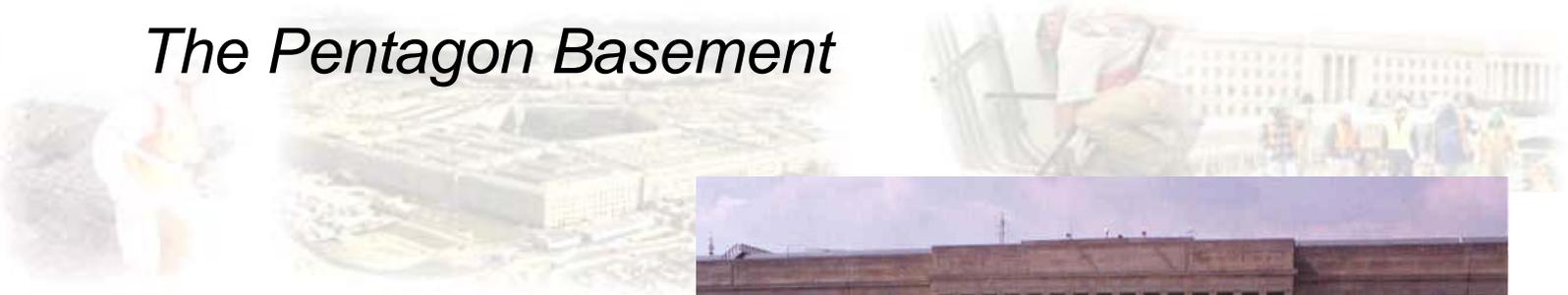
Renovation Begins in the Pentagon's Basement



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The Pentagon Basement



Below River Terrace
and Office of the
Secretary of
Defense

45,000 Cubic Yards Removed



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The Renovated Pentagon:

Modern Conference Rooms and Work Space



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The Renovated Pentagon:

Modern Work Space



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The Renovated Pentagon: Improved Lighting and Aesthetics



OLD

NEW



Corridor 8, Basement Segment One



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Structural steel, running through all five floors, reinforces the walls around the blast resistant window units on the E and A-rings. A geo-textile mesh and/or spray-on compound is applied between the steel reinforcement to prevent debris from becoming shrapnel in the event of an external explosion.





Pentagon Projects



RDF



Heliport

Wedge 2-5



PAC



Conference & Logistics Center

Pentagon Secure Bypass



Intake/Outfall



Ancillary Projects



MEF



RDF Secure Access Lane



Phoenix Project



Memorial Project



Wedge 1 Renovation



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Remote Delivery Facility

- Progressive business/acquisition approaches.
- Innovative project execution
- Aggressive cost controls



Remote Delivery Facility construction began May 17, 1999.

PENREN's first Design-Build Project

- Best-value
- Multi-phase source selection
- Stipends for Competing Design-Build Teams in Phase 2
- Most probable cost





Metro Entrance Facility

- Emphasis on internal/external communication
- Customer focused
- Constant review and application of lessons learned



Metro Entrance Facility Second Design-Build Project

- Finished on cost & on schedule despite a two week work stoppage after 9/11
- First LEED™-Certified Government Building in the National Capital Region

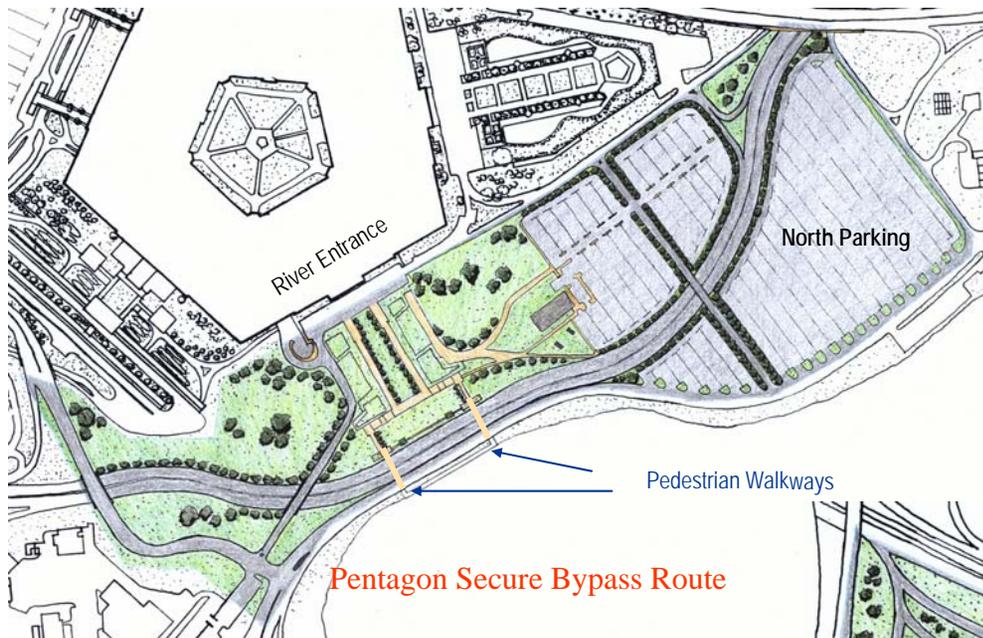




Roads, Grounds & Security

- Construction of the Pentagon Secure Bypass (PSB) – Route 110
- Construction of the RDF Secure Access Lane (SAL)
- Relocation of heliport to RDF Roof

- Milestones:**
- Construction start 1/2003
 - PSB complete 9/2004
 - SAL opened 10/2003
 - SAL complete 2/2004

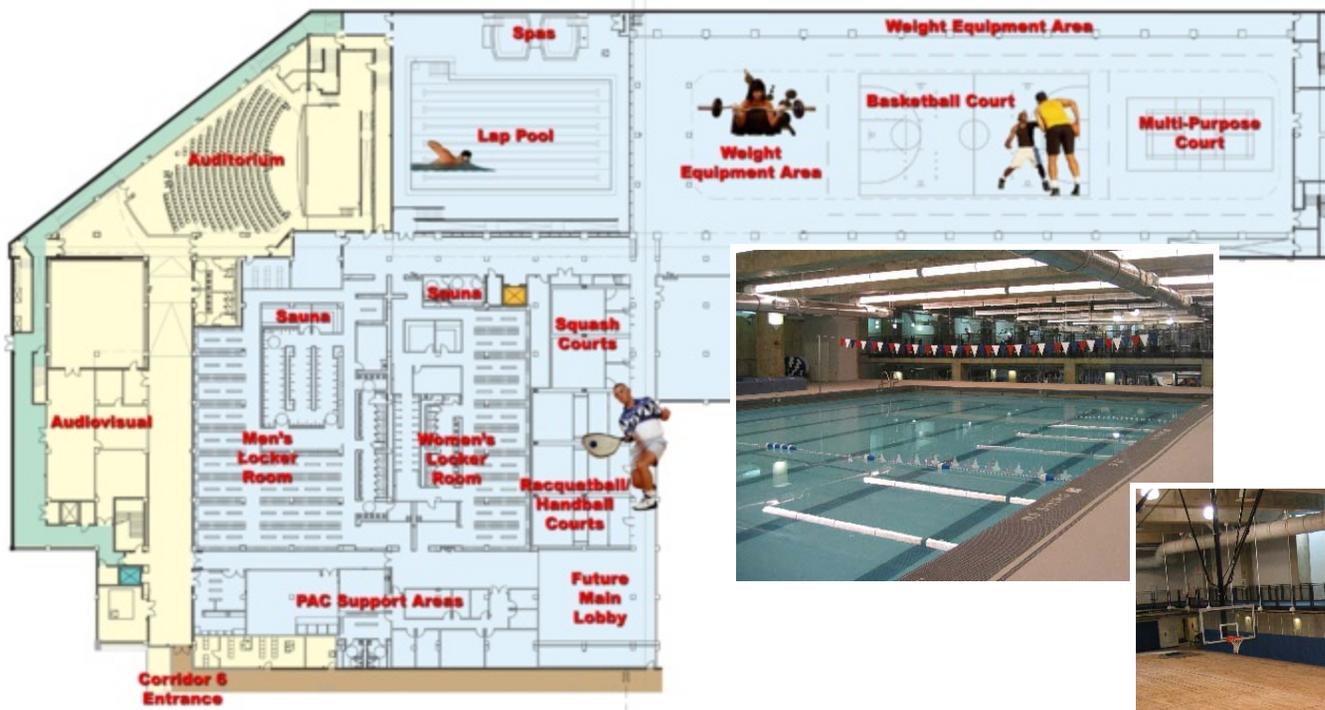




PENTAGON ATHLETIC CENTER

- New 120,000 sq. ft. athletic facility underneath the Mall Terrace
- Replaces 58-year-old, 78,000 sq. ft. POAC
- Plans include a new USAVIC TV studio and auditorium

- Milestones:**
- Demo and Abate began 5/2002
 - Grand Opening 3/29/2004



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H&RP Intake/Outfall

- Construction of a new condenser water system to provide additional condenser water to the H&RP chillers – currently operating at 50% capacity
- New intake structure located at Boundary Channel Lagoon.

Milestones:

- Construction start 4/02
- Micro-tunneling start 10/2002, completed 11/2002
- Project completion 6/2004





Pentagon Memorial

- Commemorates the 184 lives lost at the Pentagon on 9/11/2001
- Concept design selected from more than 1,100 entries in a world-wide competition
- Funded by private donations

Milestones:

- Design select 3/2003
- Design-build contract awarded 8/2003
- Construction start and completion based on funding

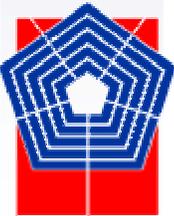


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CONFERENCE & LOGISTICS CENTER

- PFFPA Logistics Center
- Conference Center
- Pentagon Library



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 Early Planning Stages
<http://renovation.pentagon.mil>



PENTAGON ATTACKED

September 11, 2001 9:37 a.m.

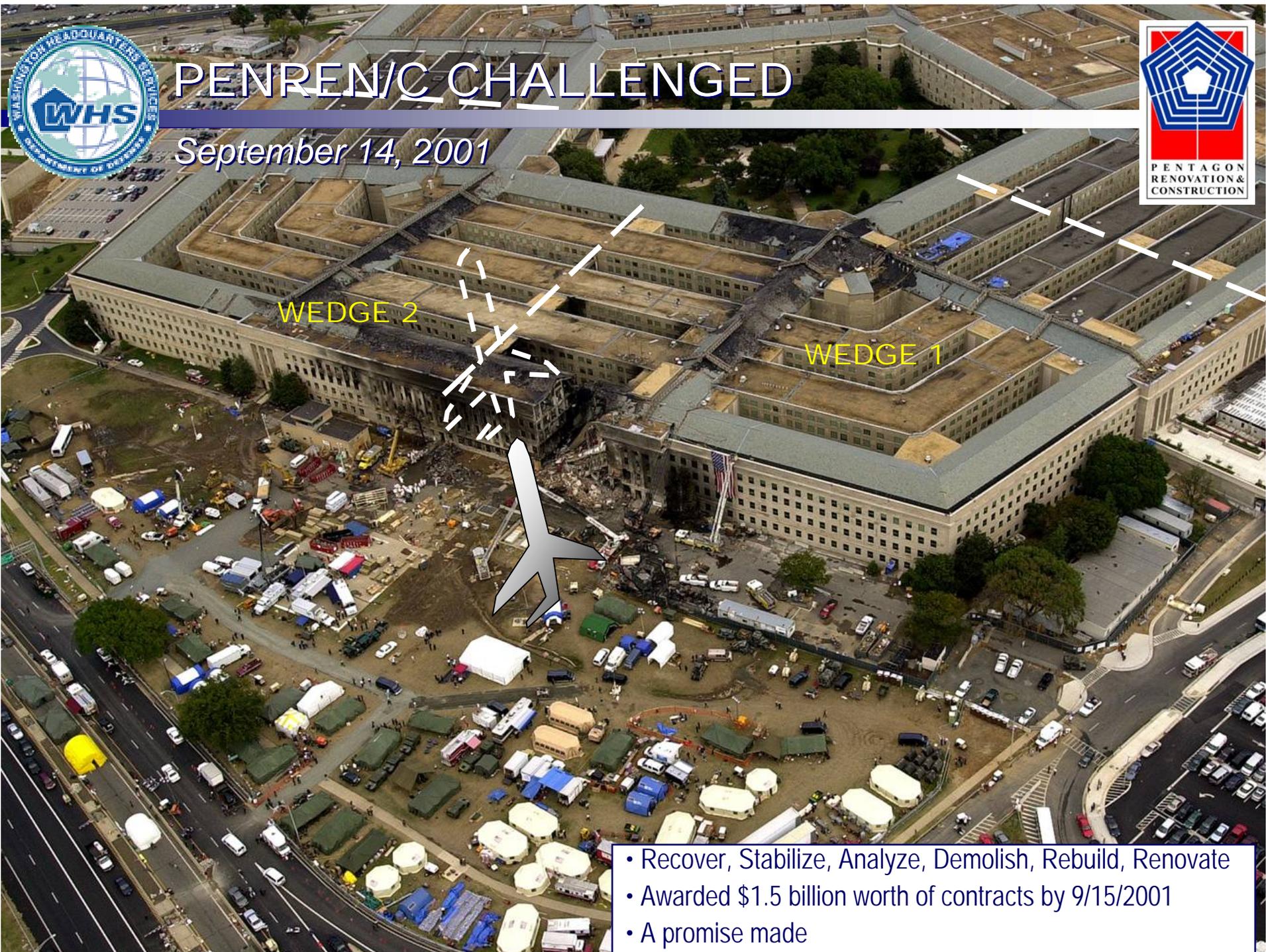
- 189 fatalities
- 110 people severely injured
- 2 million square feet of space destroyed or damaged





PENREN/C CHALLENGED

September 14, 2001



- Recover, Stabilize, Analyze, Demolish, Rebuild, Renovate
- Awarded \$1.5 billion worth of contracts by 9/15/2001
- A promise made

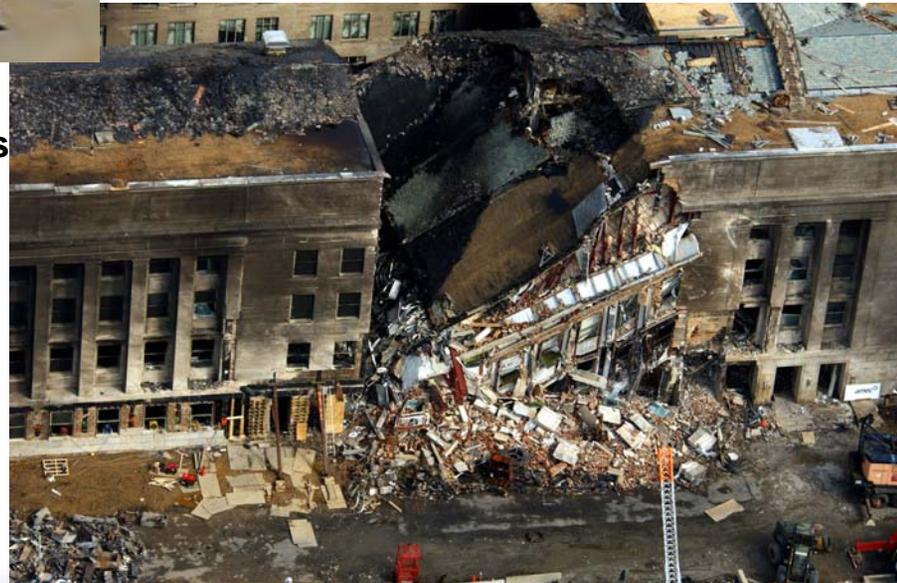


The Pentagon – 11 Sep 01

View from the RDF Entrance Gate at Rt. 27



Impact Area:	Wedges 1 & 2
Fatalities:	124 Building Occupants 64 People on AA 1 Hospital (woman)
Serious Injuries:	110
Minor Injuries:	Data Unavailable





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The Pentagon – 11 Sep 01



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The Pentagon – 11 Sep 01

View from the Pentagon North Parking Lot



On Cost, On Schedule, Built for the Next 50 Years

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The Pentagon – 11 Sep 01

View of the crash site (Pentagon Heliport) from Route 27



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The Pentagon – 11 Sep 01



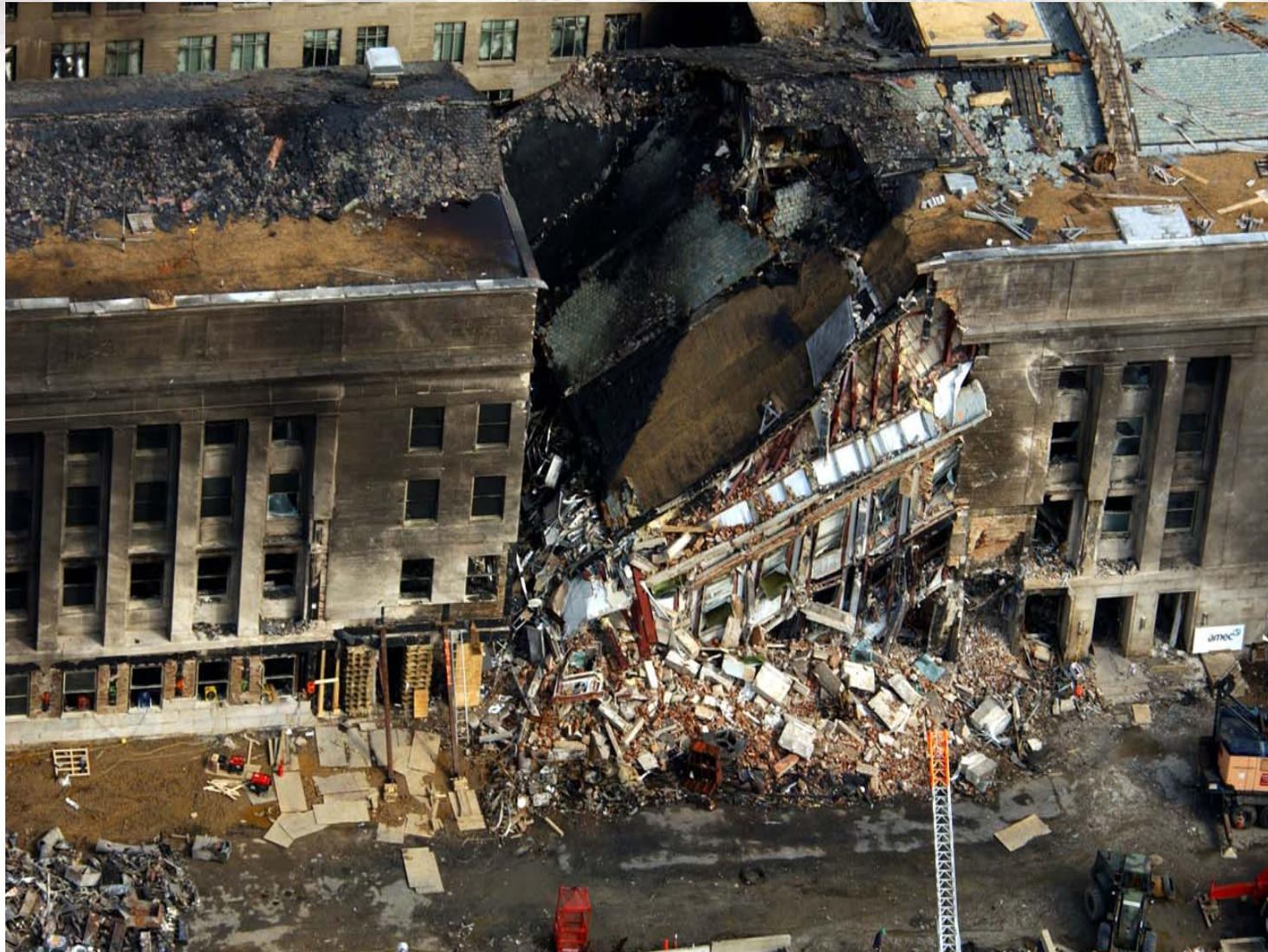
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The Pentagon – 11 Sep 01

Hole blown in the wall by the blast.





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Multiple Projects

2 Wedges become 6 Projects

LIGHT DAMAGE

Clean up, IT reconnectivity required; Repopulation in progress; 580,000 SF

MODERATE-SEVERE DAMAGE

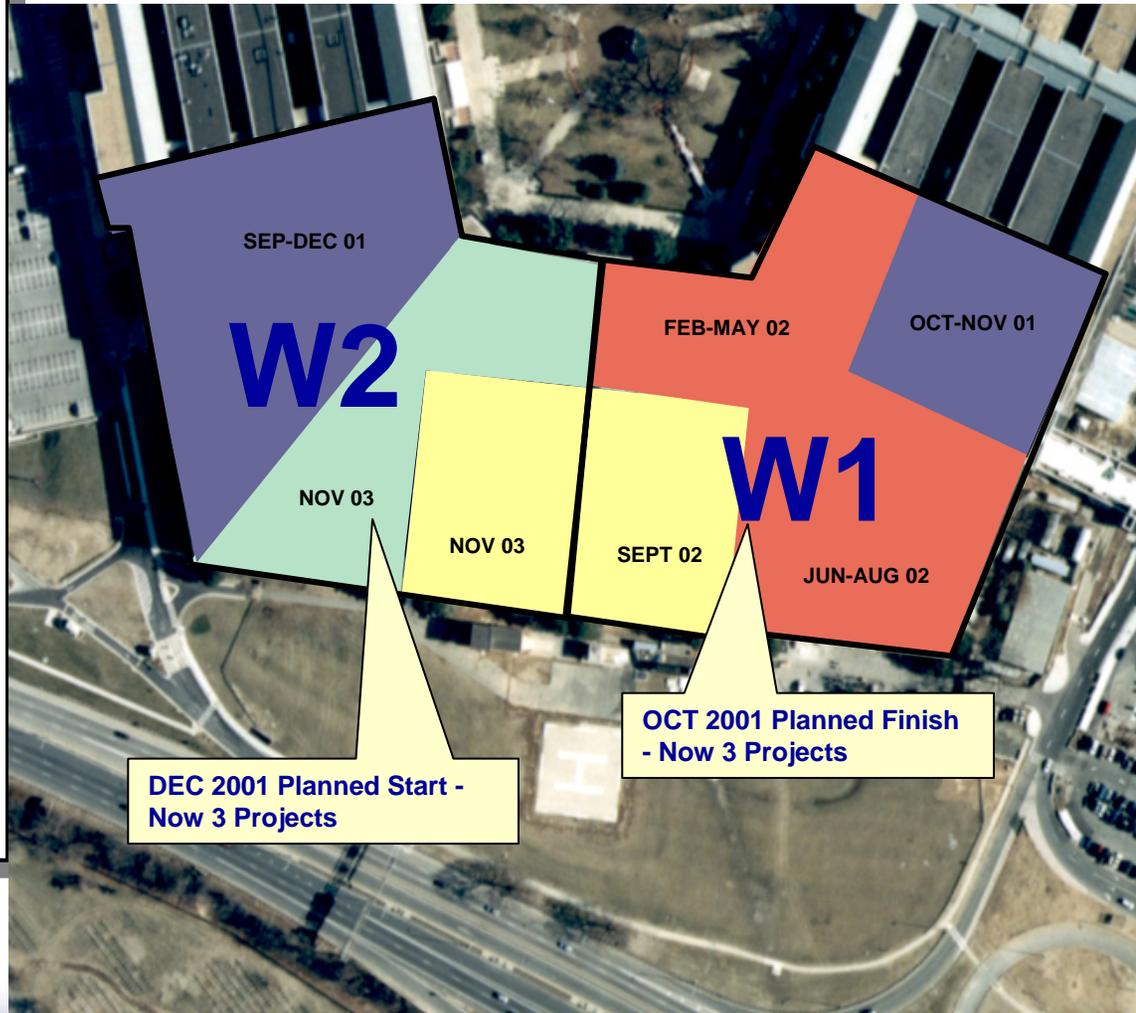
Reconstruction required; 680,000 SF

MODERATE-SEVERE DAMAGE

Renovation in progress; 340,000 SF

DESTROYED

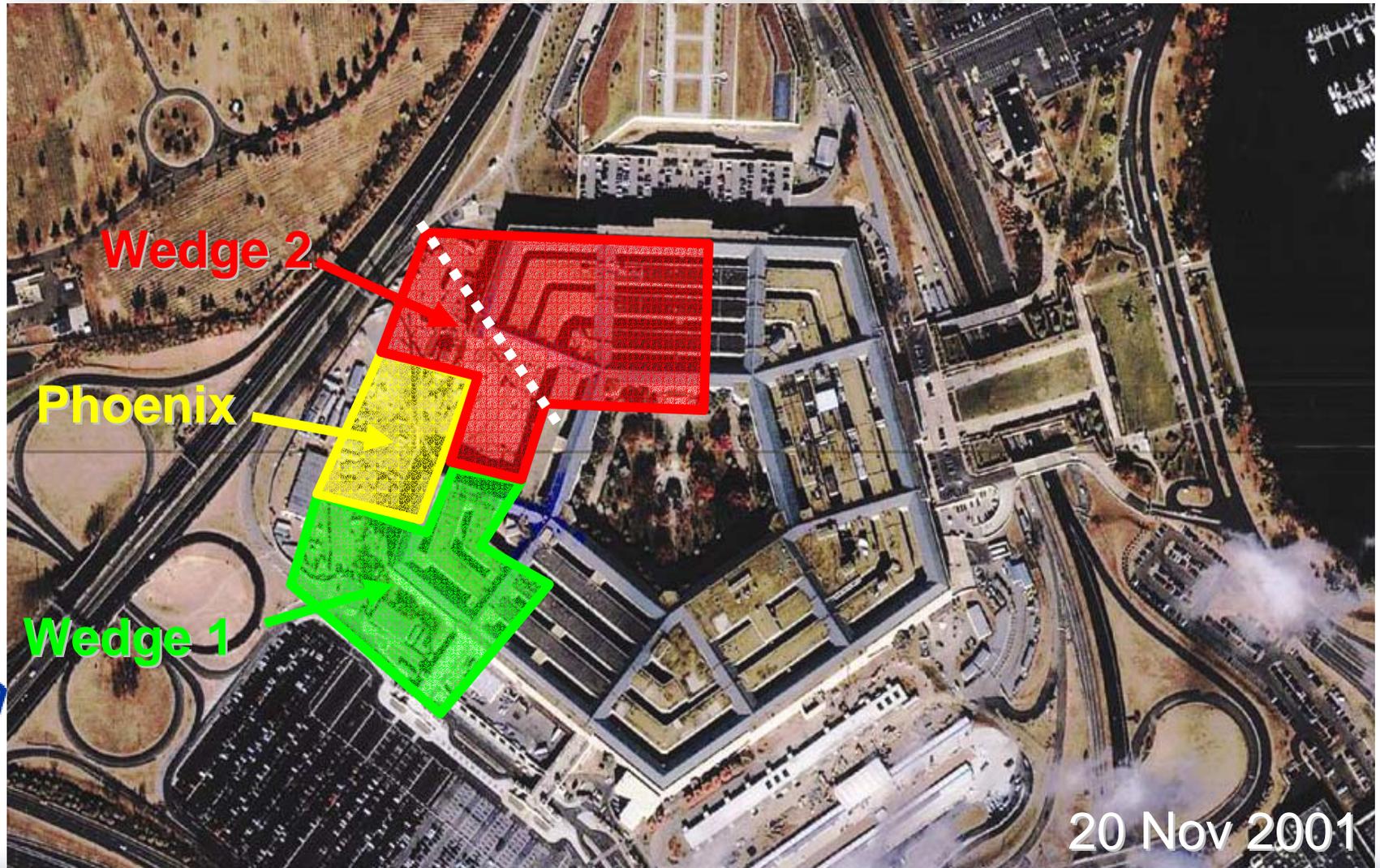
Demolition, Structural reconstruction and renovation required; 400,000 SF



PENTAGON RENOVATION & CONSTRUCTION



Recovery & Renovation Projects



20 Nov 2001

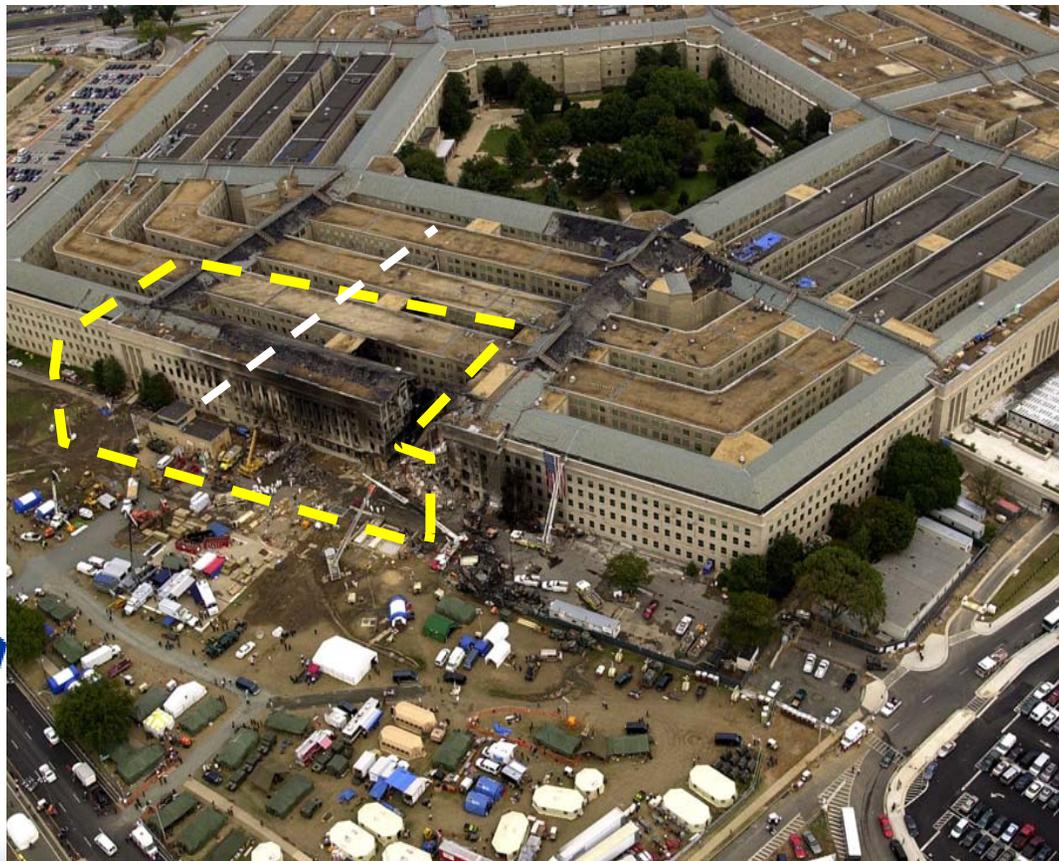


THE PHOENIX PROJECT

Focus:

Stabilize, Demolish, Rebuild Structure

Note: Wedge 1 side = Core & Shell, Wedge 2 side = Shell only





WEDGE 1

Focus:

- Renovation complete at time of impact
- Fire, Smoke, Water and Mold damage
- Recovery of tenant space



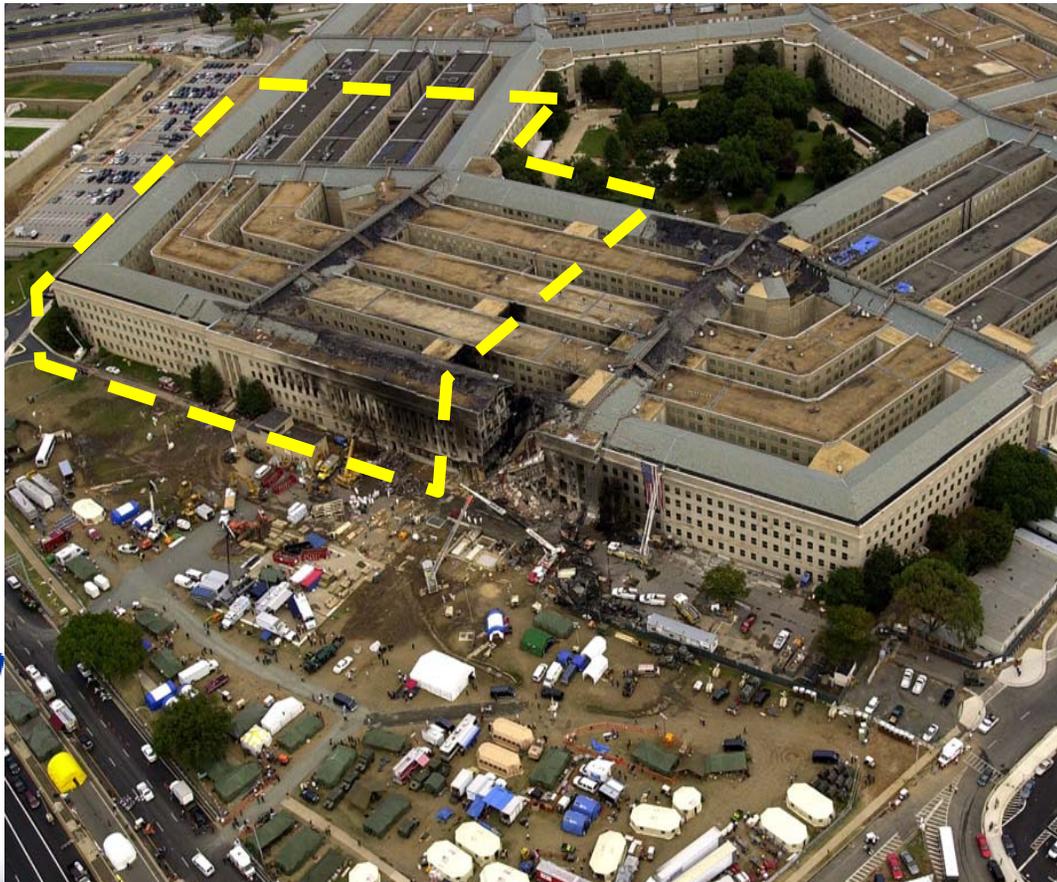
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WEDGE 2

Focus:

- Recover tenant space for war planning and execution
- Start renovation



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BEFORE & AFTER

September 11, 2001



September 11, 2002



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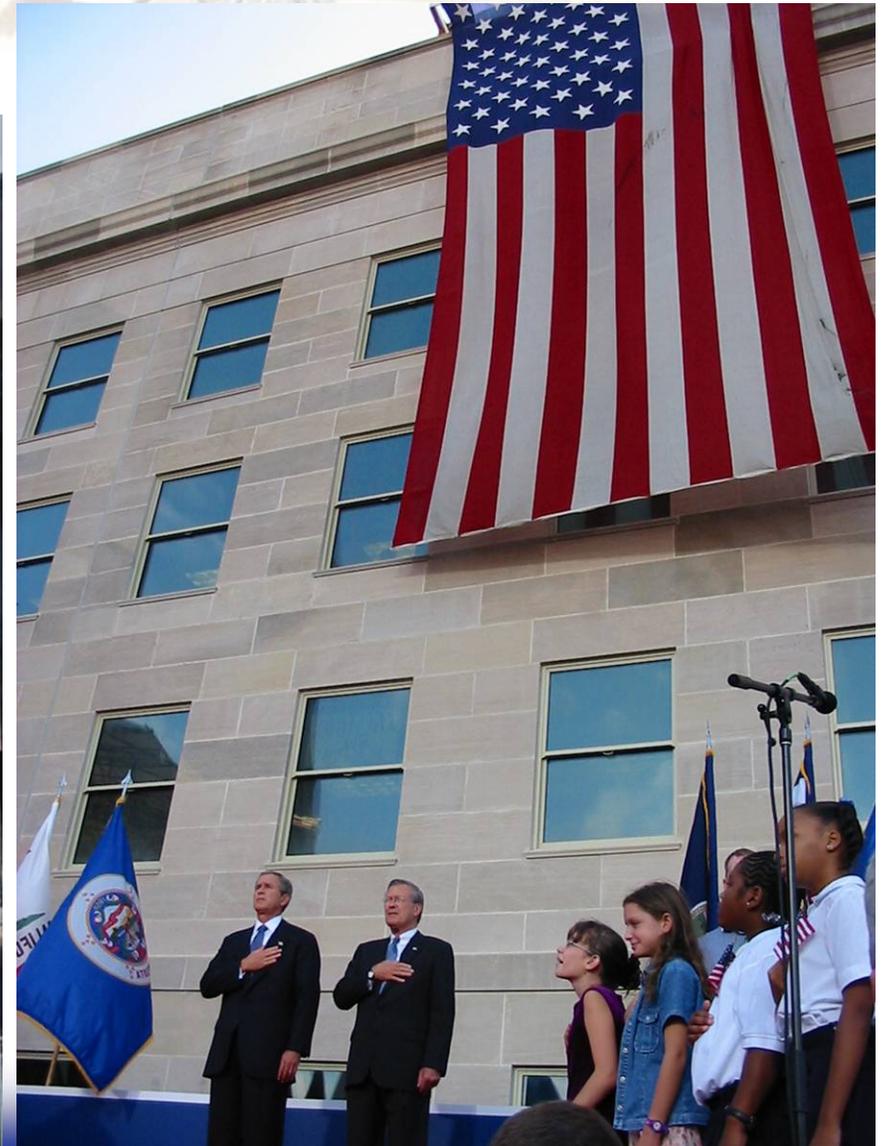


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BEFORE & AFTER

September 11, 2001

September 11, 2002





Pentagon Renovation Initiatives Force Protection

FOR OFFICIAL USE ONLY

Special Report
As of 13 November 2001

Pentagon Rebuild Retrofit Studies



US Army Engineer Research and Development Center
Vicksburg, Mississippi

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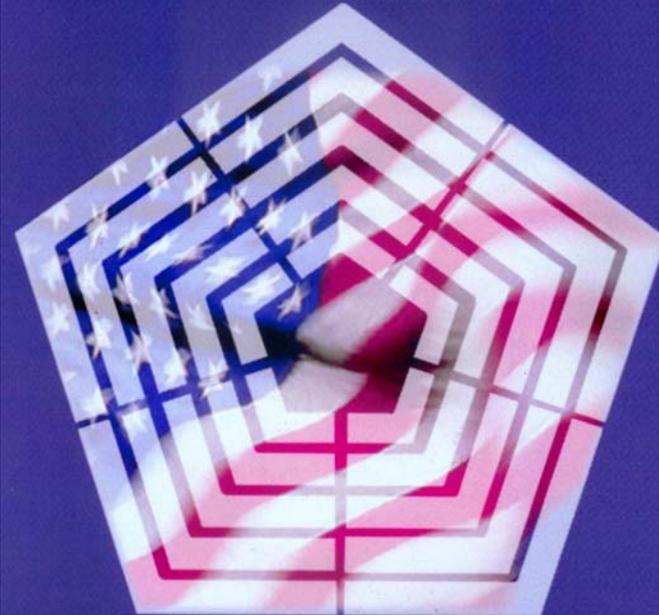


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INTERIM REPORT

BUILDING PERFORMANCE EVALUATION ON SEPTEMBER 11, 2001

November 11, 2001



Prepared by
BUILDING PERFORMANCE EVALUATION TASK FORCE



PENTAGON FORCE PROTECTION ENHANCEMENTS



- Rules of Engagement:
 - Preservation of Pentagon personnel and mission is paramount
 - Force Protection enhancements to Pentagon will be “Code Plus” - Life Safety Code, Building Industry Code, Fire Protection Standards, DOD Standards
 - Based on Criticality of Mission Compared to Commercial Facility
 - Pentagon is a “Target” for Terrorist Organizations
 - Symbolic Importance of the Building
 - Balance Force Protection modifications to Pentagon with funding considerations



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PENTAGON FORCE PROTECTION ENHANCEMENTS

- Pentagon Renovation Program (PENREN/C) serves as the Central Point of Contact (Implementation Agent) for this Pentagon Force Protection Effort
 - Reconstruction, Renovation, and Retrofit
 - Assures a “Holistic Approach” to renovation by consolidating recommendations and preventing “overlap” and conflicting requirements
- PENREN/C has hosted several meetings with representatives of Defense Agencies, Local Authorities, and Industry experts (see next slide)
- Recommendations based on several standards, documents and regulations





PENTAGON FORCE PROTECTION ENHANCEMENTS

- **References**

- **DEPSECDEF memo 26 Oct 2001**
- **Presidential Decision Directive 63 on Infrastructure Security**
- **DOD, Antiterrorism Construction Standards**
- **Pentagon Building Retrofit Studies, USA, ERDC**
- **Building Performance Evaluation, PENREN/C Task Force**
- **Life Safety Code**
- **National Fire Prevention Association (NFPA) Standards**
- **Building Occupancy Code (BOCA)**
- **Office of Safety and Health Administration (OSHA)**

- **Organizations Represented**

- **Pentagon Renovation Program**
- **US Army Engineer Research and Development Center**
- **HQ, US Army Corps of Engineers**
- **Washington Headquarters Service**
- **Defense Protective Service**
- **OSD / Biological and Chemical Joint Operations Cell**
- **Defense Threat Reduction Agency**
- **Arlington County Fire Department**
- **Hayes, Seay, Mattern and Mattern, Inc.**
- **Stanton Engineering**
- **Hensel Phelps**
- **Schirmer Engineering**
- **Weidlinger Associates**
- **KCE Structural Engineers**
- **Southland Industries**
- **Shalom Baranes**
- **Tadger Cohen Edelsorf**



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Pentagon Force Protection

Pentagon Force Protection Project Action Team

- DTRA
- PFPA
- Joint Staff
- WHS
- CBRN
- USACE
- PENREN/C
- Arlington County
- Industry Experts

POC -
Pentagon
Renovation
Program
(PENREN/C)

Protection
Against:

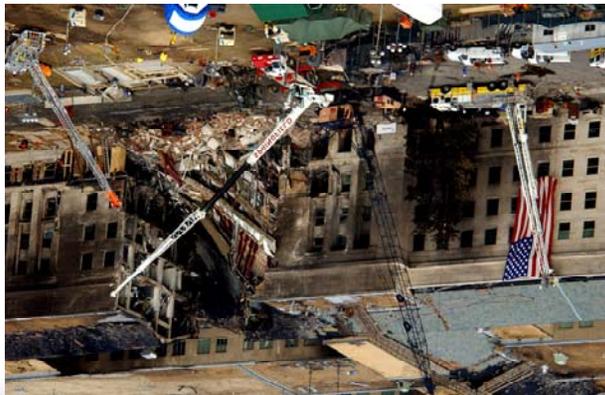
- Fire
- Blast
- CBRN

Implementers

- PFPA
- WHS
- PENREN/C

Short-Term
and Long-
Term
Projects

- Emergency Planning
- Security
- Utility
- Construction





Pentagon Force Protection Enhancements - Categories

- Fire
- Blast
- Chemical, Biological, Radiological, and Nuclear (CBRN)

Note: Each Category is addressed in Short Term Enhancements (within 1 year) and Long Term Enhancements (1 to 10 years). Some projects have been modified since the original list was formulated and various participants have received responsibility for implementing.



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Force Protection Infrastructure For the Pentagon Reservation

- CBRN protection is being incorporated
- Blast-resistant windows are being installed on exterior facades (i.e., “A” and “E” rings)
- Stairwells are being constructed of reinforced CMU
- Stairwells are being pressurized
- Smoke control study has been conducted
- Enhanced smoke-control doors are being installed
- Photo-luminescent emergency egress signage is being installed
- Walls supporting the lightwells and exterior windows are being structurally reinforced





Challenges :

- Force Protection of National Security Assets, Personnel
- Logistical and Organizational Challenges
- Diverse projects - Renovation, new Construction
- Re-build destroyed portion - from 9/11/01



- How to address these challenges and build sustainable facilities, in a fiscally responsible manner, on aggressive schedule?





Pentagon Initiatives

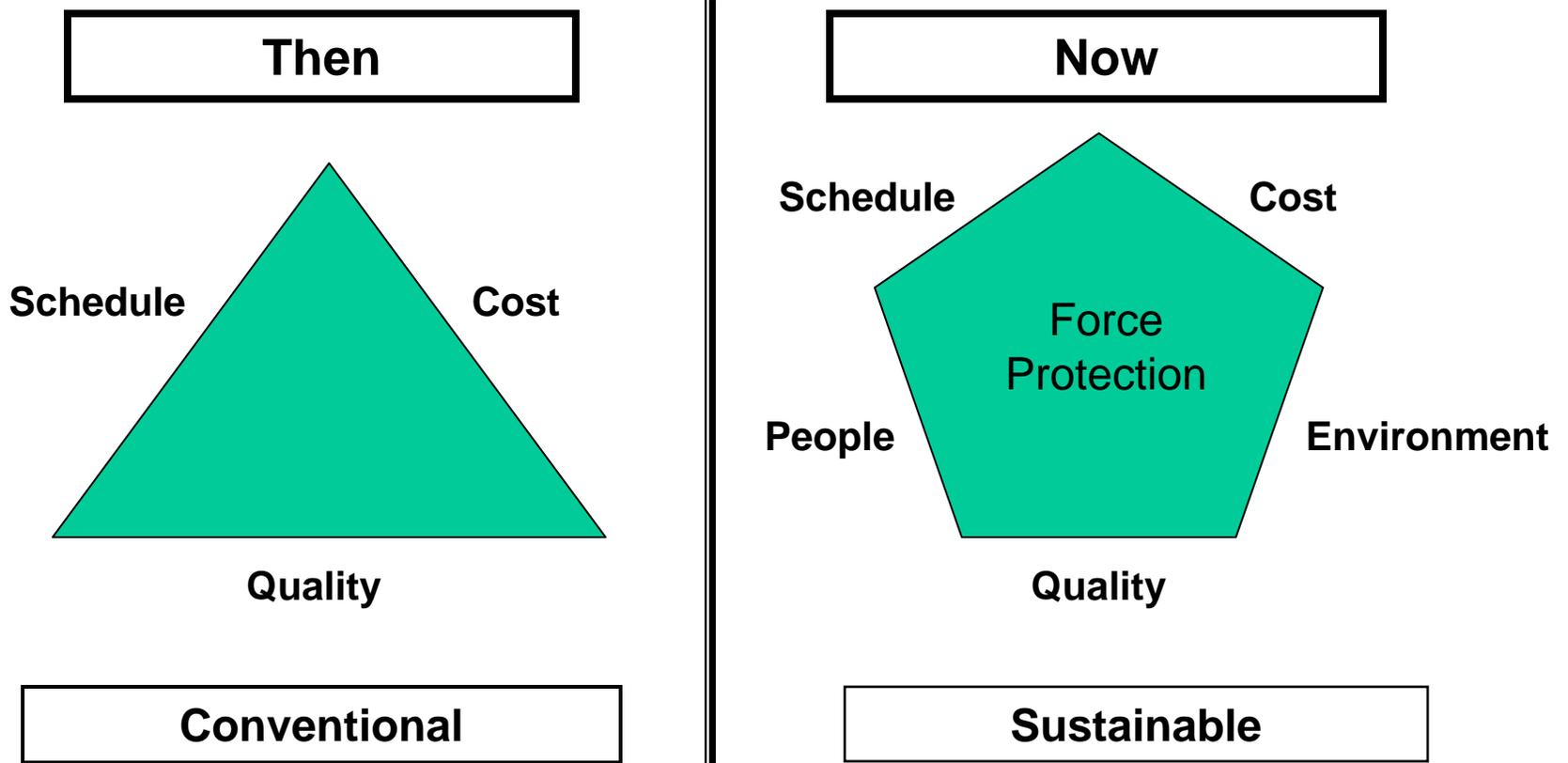
- **How does sustainable design incorporate environmental considerations, and why is it important to the Pentagon Renovation Program and “Greening the Government?” How does it relate to Force Protection?**
 - **Sustainable design encompasses and expands conventional facility construction/renovation process elements of schedule, cost, and product quality to incorporate “people” considerations and environmental impacts**
 - **Many of the Force Protection Enhancements complement sustainable design**





Sustainable Design & Constructability with Force Protection Enhancements

Relationship To Conventional Construction Process





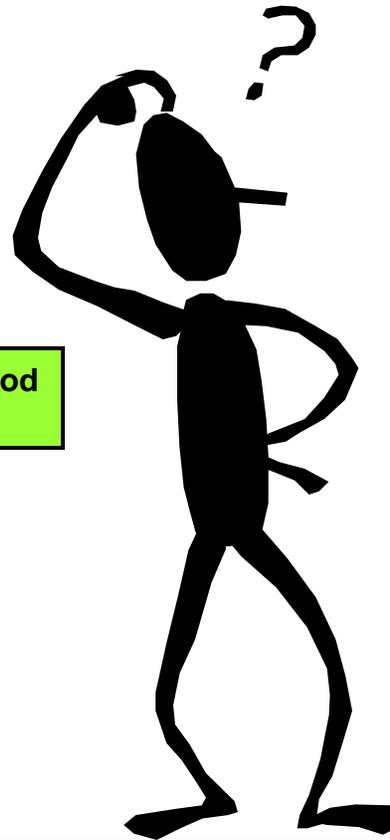
Pentagon Initiatives

- **Bottom line: *Sustainable design* includes not only environmental considerations, but how environment integrates with cost, schedule, operations, maintenance, and worker/employee considerations**
- ***Constructability* deals with the practical implementation of sustainable design- underpins all efforts - balance constructability with sustainability**
- ***Force Protection* deals with personnel safety and must be considered in all designs**





How Do we Organize our Sustainable, Constructible, and Force Protection Design Efforts for Construction Realities?



Sustainable design is good to do...

But how do we make it constructible?

And how do we balance sustainable design, constructability, and force protection?



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Considerations – “How-to” for Implementing Sustainability

- Organizational Integration
- Management and Peer “Buy-in”
- Training
- Tools
- Metrics
- Link Design and Construction
- Funding
- Quality Control and Quality Assurance
- Acquisition Process





Safety, Sustainability & Environment IPT

- SSE team was formed to be an “ongoing source of information, guidance and direction for the reasonable integration of sustainable design and construction for all Pentagon Renovation projects.”
- Develop manual for implementation, outline process for integration of sustainable design into **every** project, and develop metrics to measure program and project progress.





Pentagon Initiatives

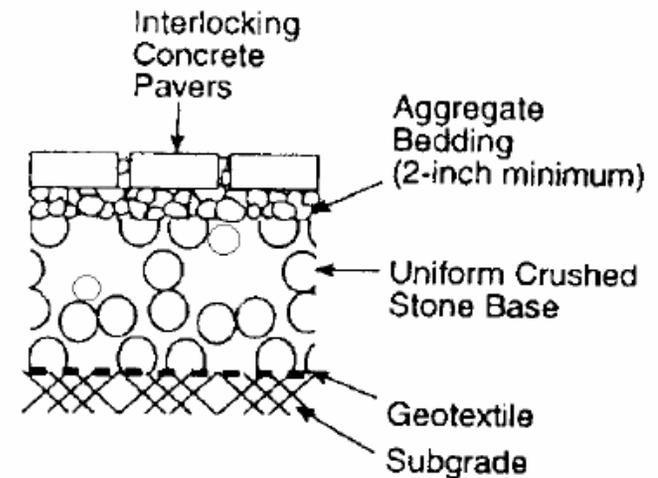
- **SSE Team actions include integration of sustainable design and constructability requirements into PENREN/C acquisition process, balanced with Force Protection Requirements**
 - **Standardized language in Statement of Work**
 - **PENREN/C manual for implementation of sustainable design and constructability in all PENREN/C contracts**
 - **Incorporation of sustainable requirements into Award Fee Plan**





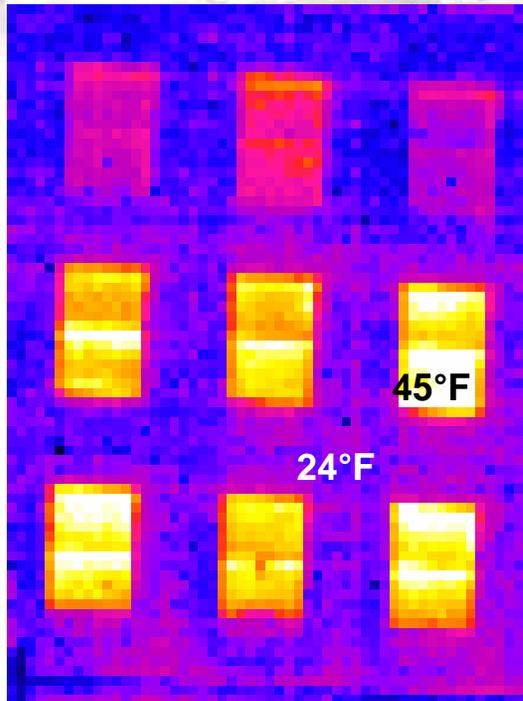
Sustainability Approach - Example

- Force Protection - Photo luminescent exit signs require no backup power supply, no conduit, no battery and allow for a very simple installation.
- Pervious bituminous paving systems allow water to pass through the pavement and be absorbed naturally by the ground. This reduces the need for storm water collection systems, catch basins, storm water piping and storm water detention ponds.

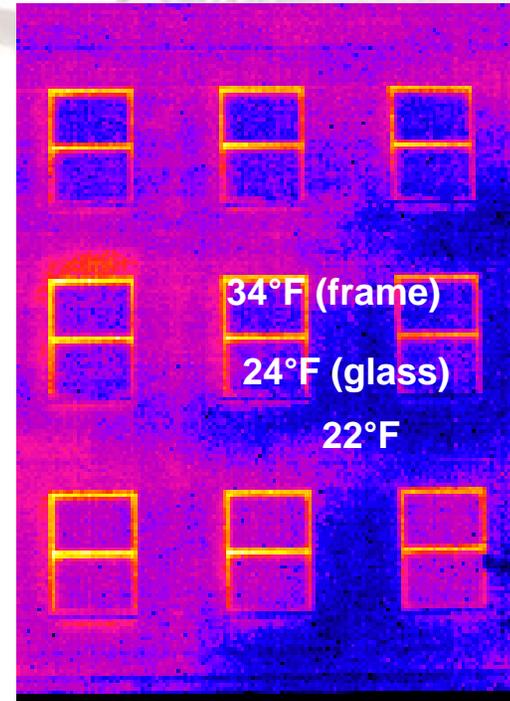




Improvements to Energy Efficiency



OLD WINDOWS



NEW WINDOWS

As you can see, the new double pane energy efficient windows conduct much less heat than the old single pane windows. Only the frames on the new windows are really conducting any heat.





Sustainability Complementary to Security and Force Protection - RDF

Sustainable Benefits

Vegetated Roof & Berm

- Better thermal performance
- Better acoustical attenuation
- Greater ratio of plantings to pavement - reduced heat island effect

Indoor Air Quality Monitoring

- Optimizes IEQ for occupant health

Siting

- Optimizes use of Brownfield site

Security Benefits

- Blast protection
- Inconspicuous low profile
- Provides aerial camouflage
- Monitors for airborne CBRN contaminants to help ensure survivability and continuation of mission/function
- Strategic location – away from the Pentagon building



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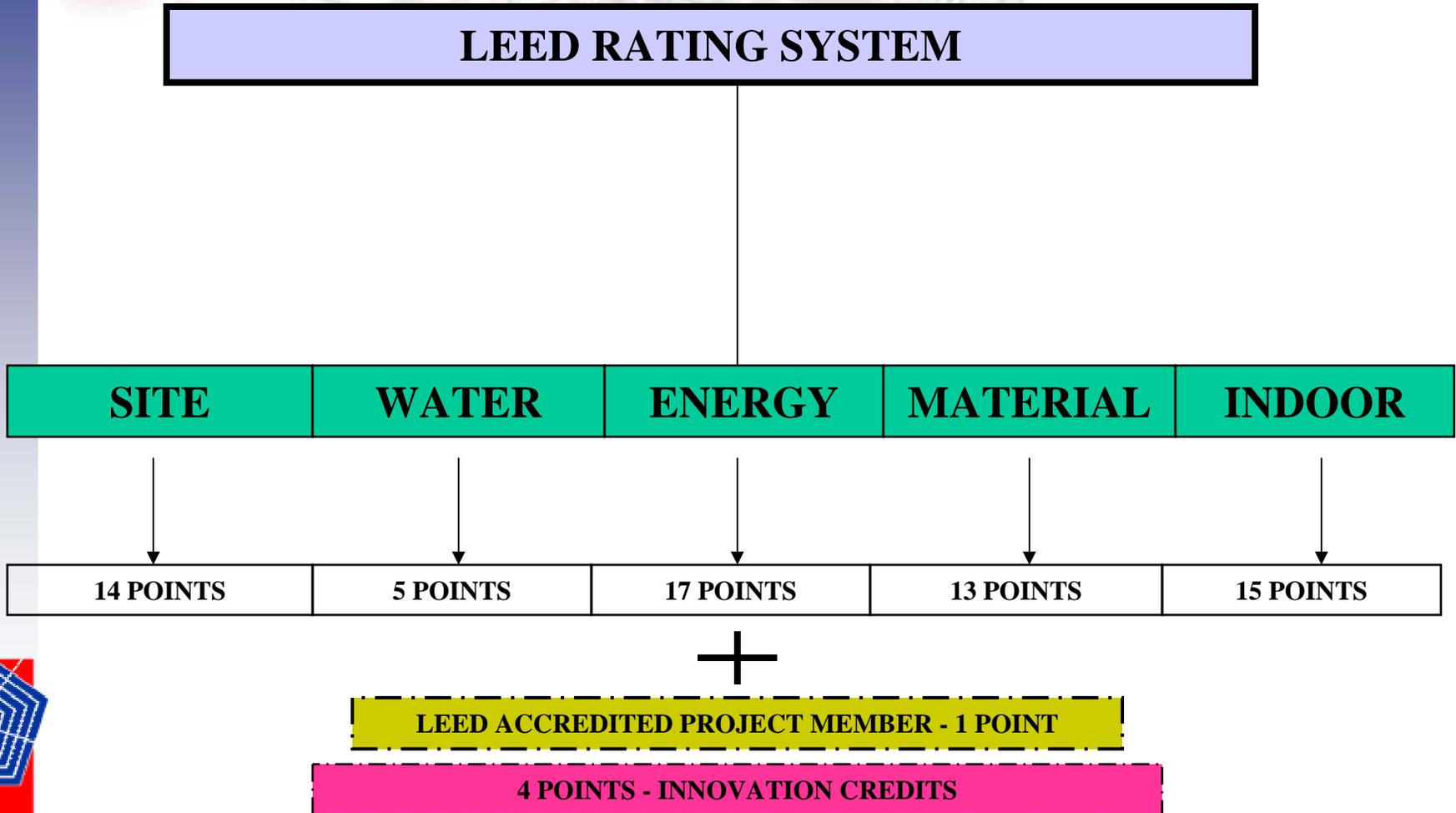
Sustainability Complementary to Security and Force Protection

1. RDF Vegetated Roof: Designed to be at same elevation as the adjacent Rt. 27 roadway. The vegetated roof and planted earth berm on East side of RDF also help ensure an inconspicuous low profile facility.
2. CBRN Protection – filtered air provides for better Indoor Air Quality
3. Comparison with Sustainable Design vs. Security Design
4. Location – Strategic for force-protection





Sustainability Metrics





Pentagon Initiatives

- PENREN/C is incorporating LEED into all projects
- LEED certification process ongoing in 4 projects
- Application for Pilot Project - LEED for Existing Buildings- Wedges 2-5 - \$800 million contract
- Metro Entrance Facility achieved LEED Certified rating
- Wedge 1 – Construction complete, currently preparing required LEED documentation
- Pentagon Athletic Center – Construction on-going, LEED documentation being prepared
- Remote Delivery Facility (RDF) - LEED certification process started after design phase
 - Application made under LEED 1.0 - anticipate Bronze certification. Difficulty encountered in documentation - chronicling past efforts





SSE Implementation

Four Projects registered with USGBC for LEED Certification



Wedge 2

Wedge 1

Metro Entrance Facility - Earned Certified Rating



Pentagon Athletic Center

Remote Delivery Facility

On Cost, On Schedule, Built for the Next 50 Years

<http://renovation.pentagon.mil>



"Green" Initiatives

- Removal of all hazardous materials
- Removal of 25 million pounds of asbestos
- Removal of lead paint mercury, PCBs
- Contaminated soil cleaned





"Green" Initiatives

- 70% of debris recycled



- Steel
- Copper wire
- Aluminum
- Glass
- Concrete



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"Green" Initiatives

- Tighter thermal envelope: windows, insulation





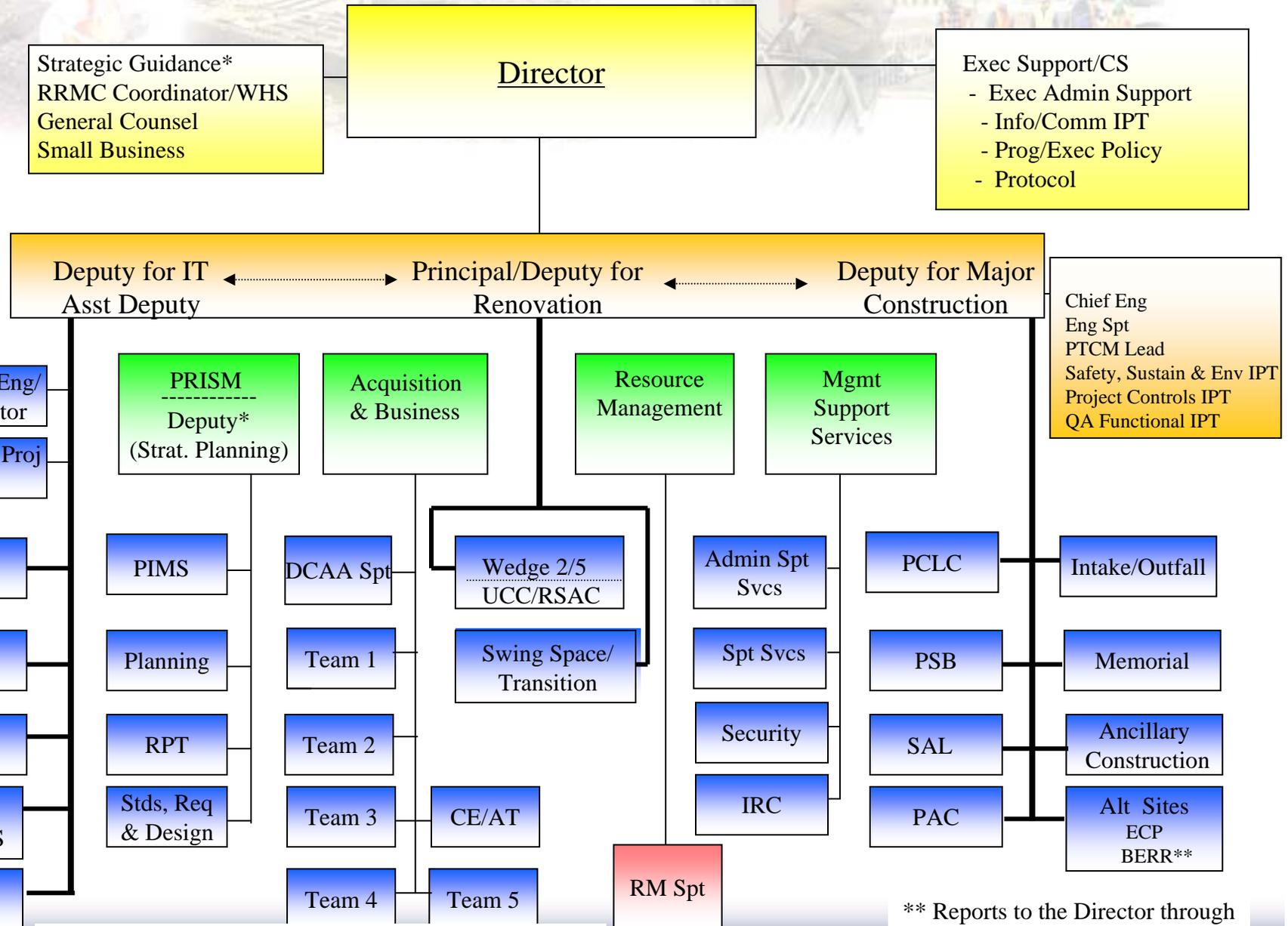
PENREN/C Plan for Success Operate as a Team

- Integration of contractor personnel onto teams
- Design Teaming
- Integration of customers/maintainers onto teams
- Opens lines of communication





Who We Are



* Supports the Director for Strategic Guidance Purposes

** Reports to the Director through the acquisition phase



What's Wrong with Construction Today?

- Contracts reward inappropriate behavior
 - Low bid awards drive away top performers
 - Bidding process drives bids below reasonable cost
 - Contractors enter process as enemies



- Driven to find problems to make profit
- Turmoil, confusion, problems and time delays increase profit
- Contractors play the game according to our rules



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The New Way of Doing Business in the PENREN/C Construction Projects

Performance Requirements

- Tell contractor what you want, **NOT how to get there!**



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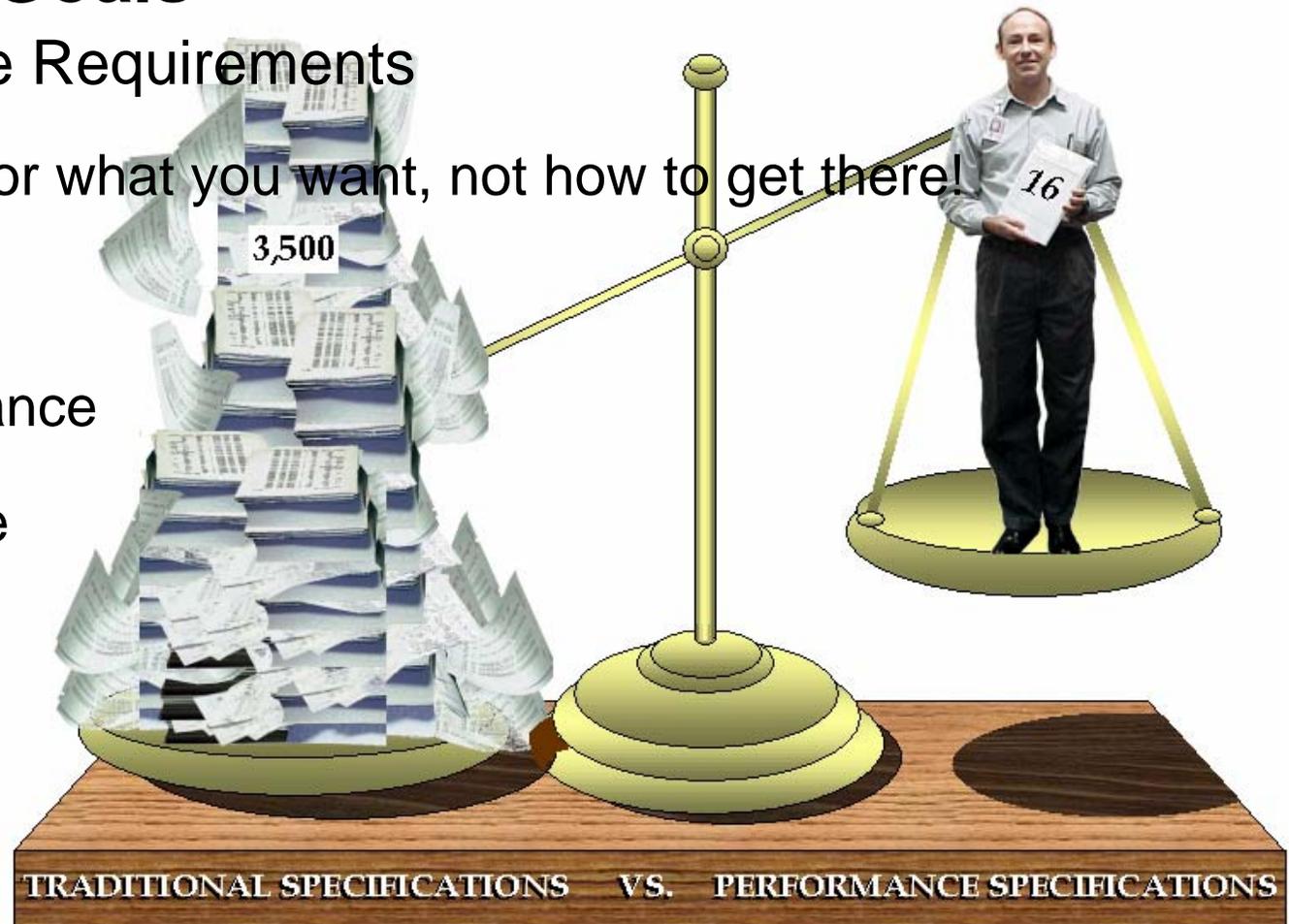
Reinvention Laboratory

Matrix Performance Criteria for W2-5

Set Clear Goals

Performance Requirements

- Tell contractor what you want, not how to get there!
 - Cost
 - Performance
 - Schedule





Acquisition Strategy

Key Objective:

Implement Approach that Rewards Behavior We Like



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Hire Better Contractors with Improved Acquisition Strategy

Traditional Strategy

- Low bid
 - Drives away top performers
 - Bids below reasonable cost
 - Liar's contest
- Design-Bid-Build
- Government caught between designer and constructor



PENREN/C Strategy

- Best-value
- Design-Build
- Multi-phase source selection
- Stipends for design
- Most probable cost
- Performance specifications





PENREN/C Plan for Success



- Hire better contractors
- Give them incentives to achieve your goals
- Set clear goals
- Operate as a team
- Measure progress against goals
- Reward Achievement





PENREN/C Plan for Success Hire Better Contractors

- **Phased source selection:**
 - **Phase 1 (Initial down-select)**
 - Typically 2-3 design-build teams selected
 - Selection based on past performance
 - Fast decision, minimum cost to offerors
 - **Phase 2 (Final Selection)**
 - Competition between down-selected teams from Phase 1
 - Results in conceptual design
 - Best value...cost, design, team, IMP/IMS
 - “Build to budget”
 - Stipend to offerors





Set Clear Goals Performance Requirements

ENERGY EFFICIENCY	
Architecture	With respect to architectural systems, pertains to industry-accepted practice for each system/product in terms of thermal resistance ("R" and "U") values, light transmittance and so forth. The A & E ring windows have a U value of 1.6 W/(Sq.M-°C). The building component U values (i.e. walls, roofs, etc.) shall be determined by the Design Build contractor and must comply with ASHRAE Standard 90.1-1999 (latest edition).
Electrical	Pertains to the energy efficiency of all electrical equipment installed meeting American National Standards Institute (ANSI) standard, National Electrical Manufacturers Association (NEMA) standard, and ASHRAE/IESNA 90.1 (latest edition).
Mechanical	All installed HVAC equipment/systems shall meet the requirements of Section 6 "ASHRAE/IESNA Standard 90.1-1999" (latest edition).
LCCA	
LIFE CYCLE-ARCH	Pertains to the total-cost-of-ownership reference covering the evaluation of costs involved in acquiring, installing, starting up, personnel training, operating, maintaining, and disposing of project assets over the various asset service lives. This reference judges lowest total-cost-of-ownership for an asset delivering expected function and reliable performance over the fifty-year intended life of the Pentagon renovation to be the preferred procurement choice. The total- cost-of-ownership evaluation includes considerations like whether or not the asset is reusable and/or capable of being reprocessed, reused, and renewable at a cost savings to the Program during its expected life cycle. This method contrasts with the more typical approach of only using lowest first costs for asset procurement.
LIFE CYCLE-ELEC	Pertains to the installed equipment/systems being the most effective over time in reducing costs from purchasing, installing, maintaining, operating, repairing, disposal, and replacing with regards to energy conservation and environmental impact (Refer to Performance Criteria-Master Matrix for mechanical equipment life expectancy). As it pertains to main HVAC distribution systems (i.e. main ductwork, dampers, fittings, etc.), to have an estimated useful life of 50 years. As it pertains to chilled and hot water piping, fittings, valves, electric/electronic control components, etc., to have an estimated useful service life of 30 years.

With respect to architectural systems, pertains to industry-accepted practice for each system/product in terms of thermal resistance ("R" and "U") values, light transmittance and so forth. The A & E ring windows have a U value of 1.6 W/(Sq.M-C). The building component U values (i.e. walls, roofs, etc.) shall be determined by the Design Build contractor and must comply with ASHRAE Standard 90.1-1999 (latest edition).

- Reflects Industry Practice
- Identifies measurement terms
- Provides existing values or capability for elements such as CFM
- Cites applicable standards: e.g., ASHRAE





PENREN/C Plan for Success Provide Incentives to Achieve Goals

Contracting Structure

- Fixed-price Incentive (Firm target) with an award fee
- Zero Target Profit
- Award fee up to 10% of contract price - Based on performance
- Contractor and the government split any savings
 - Savings splits have ranged from 50/50 to 70 percent to the government and 30 percent to the contractor
- Also split overruns 50/50 up to 120% of the contract price
- Gate between award fee and potential underrun earnings
 - Contractor must achieve at least 85% (average) on all award fee determinations to collect their share of any underrun
 - Keeps contractor focused on award fee (performance, customer satisfaction); prevents cutting corners and sacrificing quality





Measure Progress Against Goals

- Periodic Award Fee Determination
- Milestones
- Energy Measurement
- Earned Value
 - Budgeted Cost for Work Scheduled/Budget Cost for Work Performed
- Monthly feedback provided to contractor
- Award fee determined and paid on quarterly basis
- Contractor has input in determination process





Measure Progress Against Goals

Earned Value Analysis

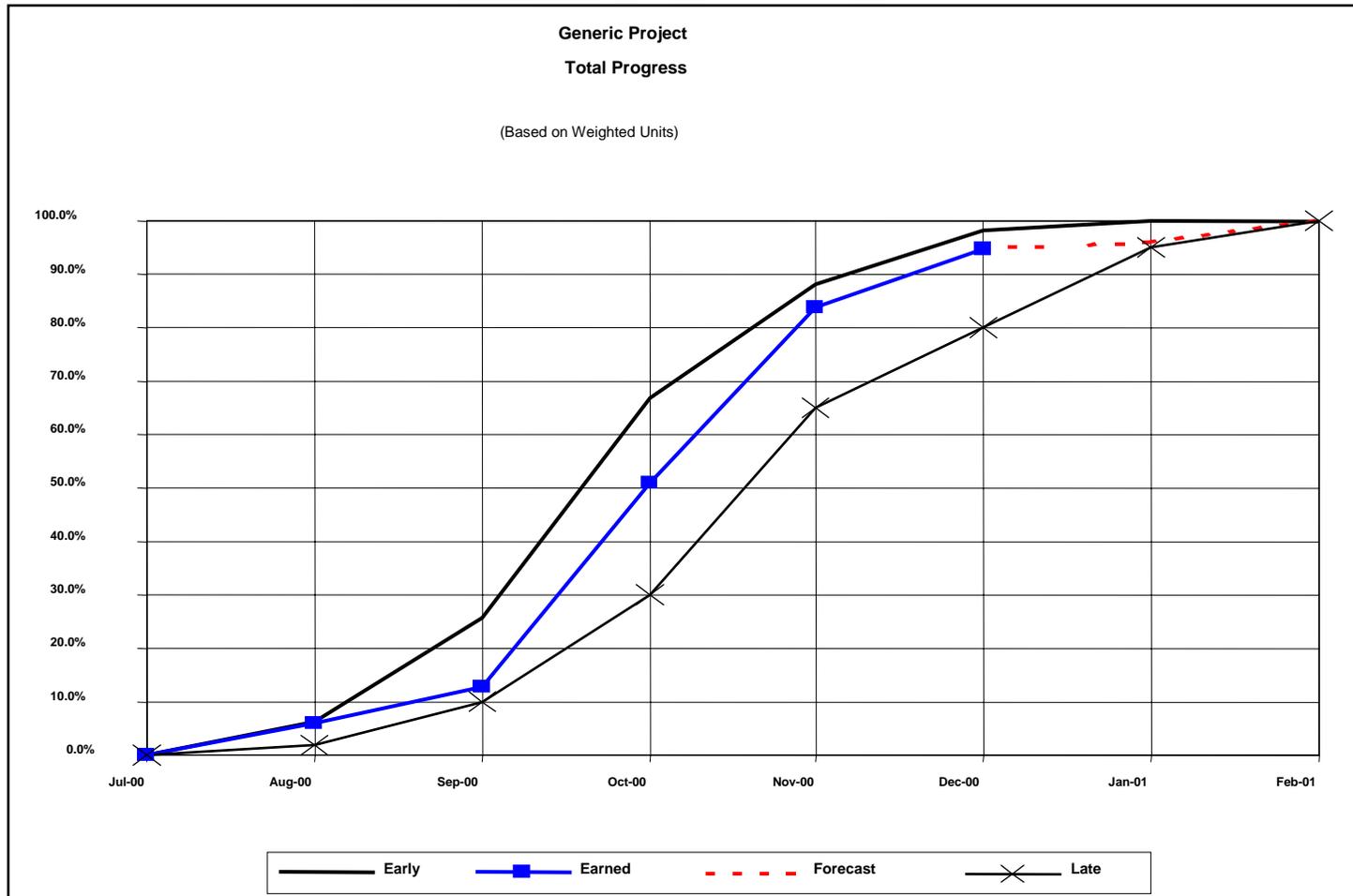
Analysis of cost and schedule data, used in a trend, for assessing current, and predicting future, schedule and cost status.

- Budgeted Cost for Work Scheduled/Budget Cost for Work Performed
- Provides early warning of problems in cost and schedule
- A methodology for achieving management control
- Performance measurement system
- Provides valuable insight to financial health of project for contractor
- Regular reporting and periodic verification of cost reports allows owner to identify problems before they lead to claims, work stoppages, etc.





Earned Value Metric





COMMISSIONING

COMMISSIONING GOALS

- Include Building Owner from beginning design process
- Identifying and documenting Owner needs and requirements of the facility
- Verifying that designed systems are commensurate with Owner needs
- Verifying that systems installed are operable



- Testing of systems to verify that they are performing optimally
- Verifying that design intent, installation, Operations and Maintenance requirements are well documented
- Training operators and facility staff to ensure maintainability



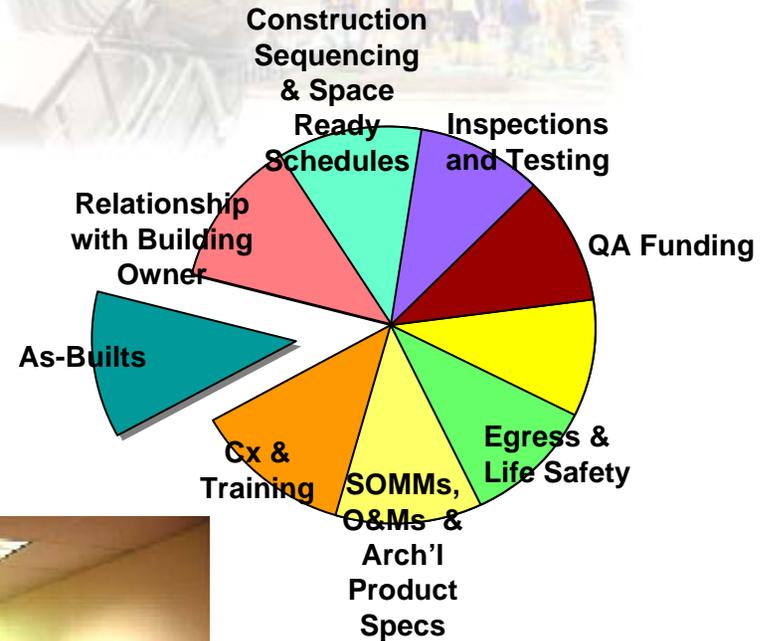


TRANSITION PROCESS

Renovation Program

Transition Process

- As-Builts
- Relationships with Building Owner
- Construction Sequencing & Space Ready Schedules
- Inspections and Testing
- QA Functions
- Punch list Development and Resolution
- Egress & Life Safety



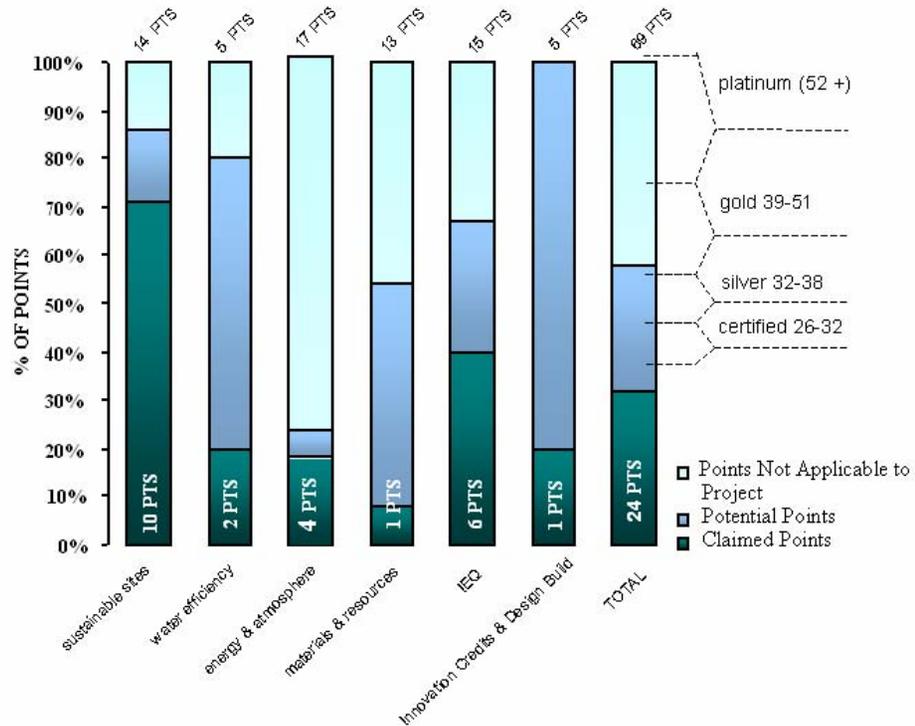


LEED Metric

Generic Project LEED Evaluation Chart

Action Items

- Sustainable Site**
 - Urban Redevelopment
 - Stormwater Management
- Water Efficiency**
 - Water Efficient Landscaping
- Energy & Atmosphere**
 - Commissioning Input from Team
- Materials & Resources**
 - Local and Regional Materials
 - Recycled Content Materials
- Indoor Environment Quality**
 - Confirmation of Low Emitting Materials
 - Construction IAQ Plan
- Innovation Credits**
 - Signage





Funding Obligation Rate Metric

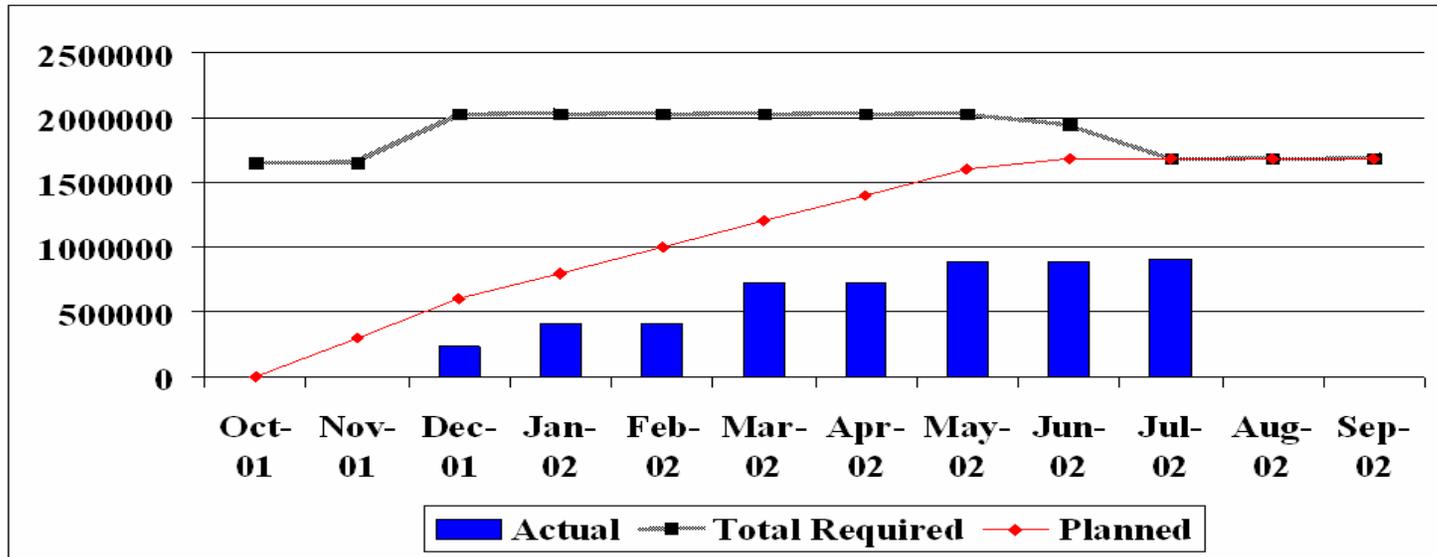
Resource Management Generic Project

Obligations: 45%

Total Required: \$1.7M

Planned Obs: \$1.7M

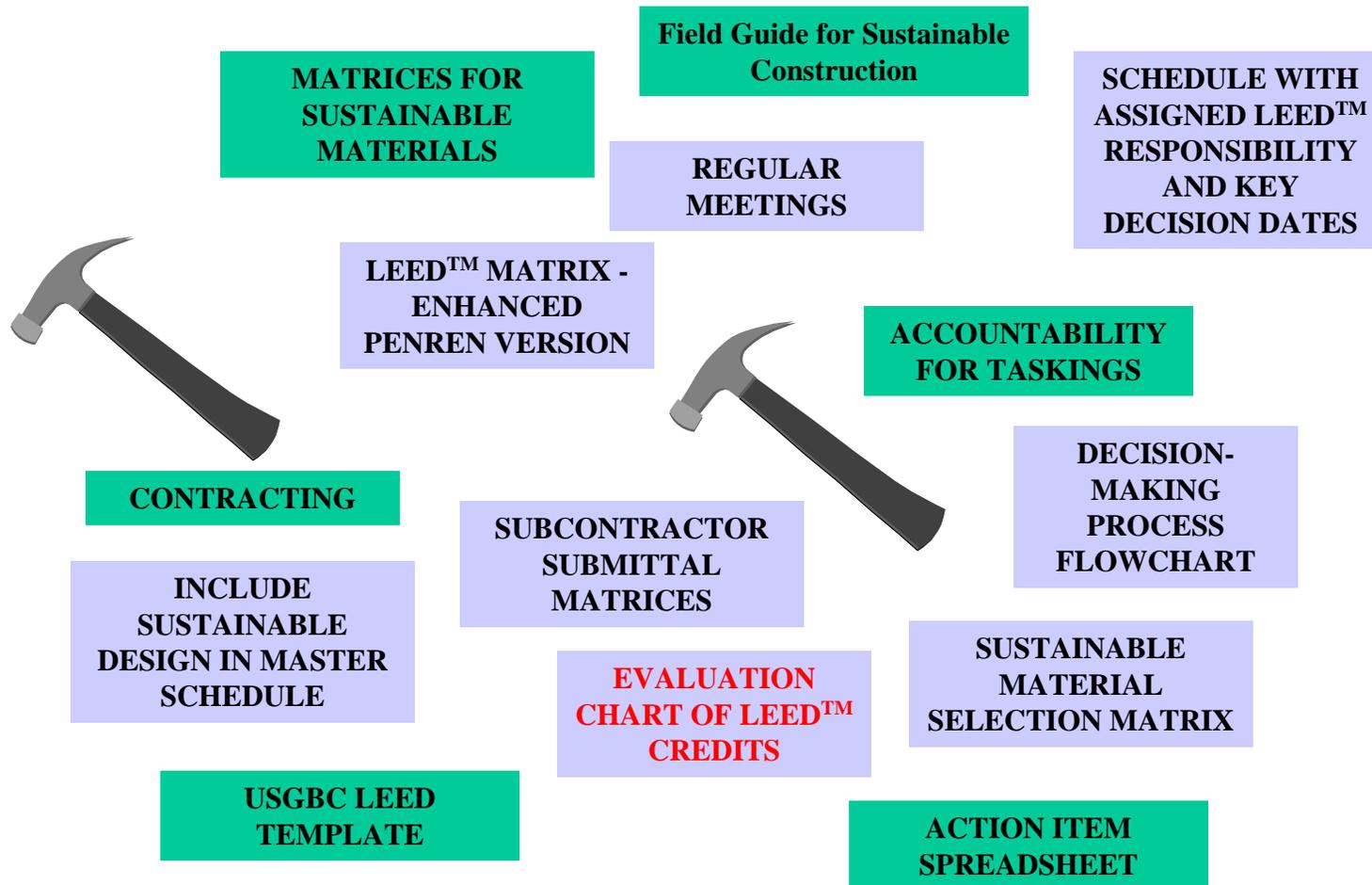
Actual Obs: \$.9M





Pentagon Renovation Program Initiatives

- **Tools in the Sustainable Design Toolkit:**





Pentagon Renovation & Construction Program Office

Field Guide for Sustainable Construction

June 2004

Pentagon Renovation and Construction Program Office

and

The Pennsylvania State University

PENNSTATE

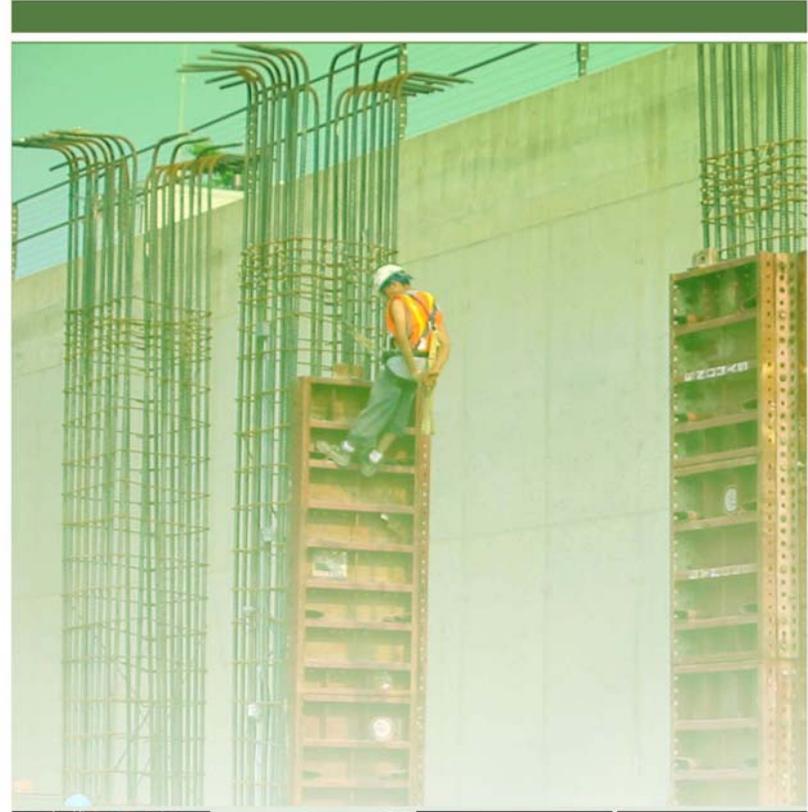


Dr. Teresa Pohlman
Safety, Sustainability & Environment IPT

Michael Pulaski,
Dr. Michael Horman &
Dr. David Riley



FIELD GUIDE FOR SUSTAINABLE CONSTRUCTION



On Cost, On Schedule, Built for the Next 50 Years

<http://renovation.pentagon.mil>



Approach to Sustainable Design and Construction

RFP/ Acquisition

- Performance based contracting
- LEED Certification is now a requirement in RFPs
- Sustainability
 - Award Fee factor
 - Source Selection Criteria
- Design-Build delivery method





Pentagon Renovation & Construction Program Office

Approach to Sustainable Design and Construction

Design and Construction

- Sustainable Material / Product Evaluation Process
- LEED Supplement
- QA/QC Involvement
- Provide LEED and LCCA Training
- Continuous Value Enhancement Process (CVEP)



On Cost, On Schedule, Built for the Next 50 Years

<http://renovation.pentagon.mil>



PENREN/C Experiences To Date

- On-site construction affects building sustainability
- Tap innovative research capability to make an impact





PENREN/C and Penn State

A partnership between the Federal Government and Academia

- Started in January 2002
- PENREN/C is a DoD Reinvention Laboratory
 - Incentivized to explore new construction innovations
 - Penn State's Architectural Engineering program is a leader in construction research



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Why we developed the Field Guide

- Sustainability is new and not completely understood
- Very little guidance on sustainable construction practices
- Opportunities exist to enhance sustainability at every phase of a project
- Minor decisions at the field level can have major impacts on sustainability goals
- Need practical field level information to understand the “why” as well as the “how”
 - Promotes buy-in to sustainability





Target Audience: Field-Level

- Requires targeted educational strategy
- Similar to on-site safety
 - Must create Attitude and Awareness
 - Large volume of information
 - Site-specific orientation required
 - Must be stand-alone chapters





Field Guide for Sustainable Construction

Purpose: Provide guidance and education to field-level supervisors, managers and construction workers

Strategy: Manual of sustainable construction practices with examples of good practice

Content: Trade-specific issues, mini-case studies, how-to examples, and references





Field Guide for Sustainable Construction

		Chapter 1	Chapter 2	Chapter 3	Chapter 4	Chapter 5	Chapter 6	Chapter 7	Chapter 8	Chapter 9	Chapter 10
		Procurement	Site/ Environment	Material Selection	Waste Prevention	Recycling	Energy	Building and Material Reuse	Construction Technologies	Health and Safety	Indoor Environmental Quality
Sections											
	Summary page	1	2	3	4	5	6	7	8	9	10
0	Planning	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
1	General Conditions	1.1	2.1	3.1	4.1	5.1	6.1	7.1	8.1	9.1	10.1
2	Demolition and Abatement	1.2	2.2	3.2	4.2	5.2	6.2	7.2	8.2	9.2	10.2
3	Sitework	1.3	2.3	3.3	4.3	5.3	6.3	7.3	8.3	9.3	10.3
4	Foundations	1.4	2.4	3.4	4.4	5.4	6.4	7.4	8.4	9.4	10.4
5	Substructure	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5
6	Superstructure	1.6	2.6	3.6	4.6	5.6	6.6	7.6	8.6	9.6	10.6
7	Exterior Enclosure	1.7	2.7	3.7	4.7	5.7	6.7	7.7	8.7	9.7	10.7
8	Roofing	1.8	2.8	3.8	4.8	5.8	6.8	7.8	8.8	9.8	10.8
9	Interior Constr	1.9	2.9	3.9	4.9	5.9	6.9	7.9	8.9	9.9	10.9
10	Conveying Systems	1.10	2.10	3.10	4.10	5.10	6.10	7.10	8.10	9.10	10.10
11	Mechanical	1.11	2.11	3.11	4.11	5.11	6.11	7.11	8.11	9.11	10.11
12	Electrical	1.12	2.12	3.12	4.12	5.12	6.12	7.12	8.12	9.12	10.12
13	Information Technology (IT)	1.13	2.13	3.13	4.13	5.13	6.13	7.13	8.13	9.13	10.13
14	Equipment	1.14	2.14	3.14	4.14	5.14	6.14	7.14	8.14	9.14	10.14
15	Finishes	1.15	2.15	3.15	4.15	5.15	6.15	7.15	8.15	9.15	10.15



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Organization of the Field Guide

Sections

- Summary
- Planning
- General Conditions
- Sitework
- Demolition and Abatement
- Foundations Substructure
- Superstructure
- Exterior Enclosure
- Roofing
- Interior Construction
- Conveying Systems
- Mechanical
- Electrical
- Information Technology
- Equipment
- Finishes

Chapters

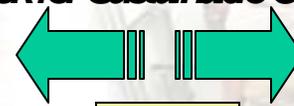
1. Procurement
2. Site/ Environment
3. Material Selection
4. Waste Reduction
5. Waste Recycling
6. Energy Use
7. Building and Material Reuse
8. Construction Technologies
9. Health and Safety
10. Indoor Env. Quality

	Chapter 1	Chapter 2	Chapter 3	Chapter 4	Chapter 5	Chapter 6	Chapter 7	Chapter 8	Chapter 9	Chapter 10
	Procurement	Site/ Environment	Material Selection	Waste Prevention	Recycling	Energy	Building and Material Reuse	Construction Technologies	Health and Safety	Indoor Environmental Quality
Sections										
Summary page	1	2	3	4	5	6	7	8	9	10
0 Planning	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
1 General Conditions	1.1	2.1	3.1	4.1	5.1	6.1	7.1	8.1	9.1	10.1
2 Demolition and Abatement	1.2	2.2	3.2	4.2	5.2	6.2	7.2	8.2	9.2	10.2
3 Sitework	1.3	2.3	3.3	4.3	5.3	6.3	7.3	8.3	9.3	10.3
4 Foundations	1.4	2.4	3.4	4.4	5.4	6.4	7.4	8.4	9.4	10.4
5 Substructure	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5
6 Superstructure	1.6	2.6	3.6	4.6	5.6	6.6	7.6	8.6	9.6	10.6
7 Exterior Enclosure	1.7	2.7	3.7	4.7	5.7	6.7	7.7	8.7	9.7	10.7
8 Roofing	1.8	2.8	3.8	4.8	5.8	6.8	7.8	8.8	9.8	10.8
9 Interior Constr	1.9	2.9	3.9	4.9	5.9	6.9	7.9	8.9	9.9	10.9
10 Conveying Systems	1.10	2.10	3.10	4.10	5.10	6.10	7.10	8.10	9.10	10.10
11 Mechanical	1.11	2.11	3.11	4.11	5.11	6.11	7.11	8.11	9.11	10.11
12 Electrical	1.12	2.12	3.12	4.12	5.12	6.12	7.12	8.12	9.12	10.12
13 Information Technology (IT)	1.13	2.13	3.13	4.13	5.13	6.13	7.13	8.13	9.13	10.13
14 Equipment	1.14	2.14	3.14	4.14	5.14	6.14	7.14	8.14	9.14	10.14
15 Finishes	1.15	2.15	3.15	4.15	5.15	6.15	7.15	8.15	9.15	10.15





Field Handbook for Sustainable Construction



Chapter 1	Chapter 2	Chapter 3	Chapter 4	Chapter 5	Chapter 6	Chapter 7	Chapter 8	Chapter 9
Procurement	Site/ Environment	Material Selection	Waste Reduction	Waste Recycling	Energy	Building and Material Reuse	Technologies	Health and Safety
Sections								

	Summary page
0	Planning
1	General Conditions
2	Sitework
3	Demolition and Abatement
4	Foundations
5	Substructure
6	Superstructure
7	Exterior Closure
8	Roofing
9	Interior Constr
10	Conveying Systems
11	Mechanical
12	Electrical
13	Information Technology
14	Equipment
15	Finishes

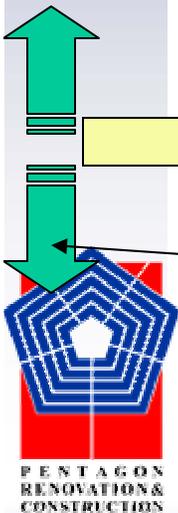
Chapter 5.8 Recycling of Roofing Materials

Each contains about 2 pages of content – images and text – for each chapter

Menu bars on the top and side would indicate what section you are looking at

Menu buttons to allow you to move one position vertically or horizontally in the matrix of information.

[Web-based Field Guide Manager](#)





Sample Section

Key concepts / message

Specific actions to take



PENTAGON RENOVATION & CONSTRUCTION

Chapter 4: Waste Prevention 4.7 Exterior Enclosure

Goal: Reduce or eliminate waste produced while enclosing the building.

Materials Associated with Waste:

- Brick
- Concrete Masonry Block (CMU)

Actions and Methods:

- Use large panel formwork systems to reduce concrete waste generated by losses due to damaged formwork.
- Eliminate excessive waste factors when doing take-offs.
- Strive to reduce excess material ordering.
- Save left-over masonry for a future job or return them to the supplier. Use damaged masonry block for site fill.
- Minimize waste of exterior cladding or exterior finish by ordering only the quantity needed.
- Develop efficient ordering systems to ensure minimal waste.
- Use panelized curtain wall systems to reduce material waste on-site. Consider using curtain walls, sheathing, light gauge steel framing & sheathing and precast units.

Reduce Packaging Waste:

- Seek suppliers who deliver materials using bulk packaging techniques or minimal packaging.
- Encourage alternative sustainable packaging techniques (e.g. metal strapping in preference to shrink-wrap, paper packaging as opposed to plastic, and shredded paper as opposed to foam).



1
2
3
4
5
6
7
8
9
10



Sample Section

Case study example

Sources of additional information



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Material Storage:

- Use reusable delivery and storage containers where possible.
- Store materials in a safe, dry, above ground location, and prevent contact with material that may cause corrosion, discoloration, or staining.
- Collect and stack bricks or other masonry materials scattered around the jobsite to keep them from getting lost or soiled.

10

9

Case Study:

Waste Reduction: Recycle masonry blocks

8



Piles of loose masonry material are a common occurrence on construction sites. Instead of throwing away loose or broken bricks, recycle them so they can be crushed for landscaping material or collect and stack them so they can be used or returned to the supplier.

7

6

References

5

"Low Waste Building Technologies and Practices." (2001). The Hong Kong Polytechnic University http://www.cse.polyu.edu.hk/~cecspoon/lwbt/Frame_Page/Frame_formwork.htm

O'Brein, K. "Best Management Practices and Tools for Job Site Recycling and Waste Reduction in Hawaii." The State of Hawaii.

4

Vleck, R. E. (2001). "Advanced Construction and Demolition Waste Management for Florida Builders." University of Florida.

3

2

1



Potential Benefits

- Achievement of sustainable goals and LEED™ credits
- Help trades develop competencies / achieve profitability goals
- Open door for improvement suggestions from the field





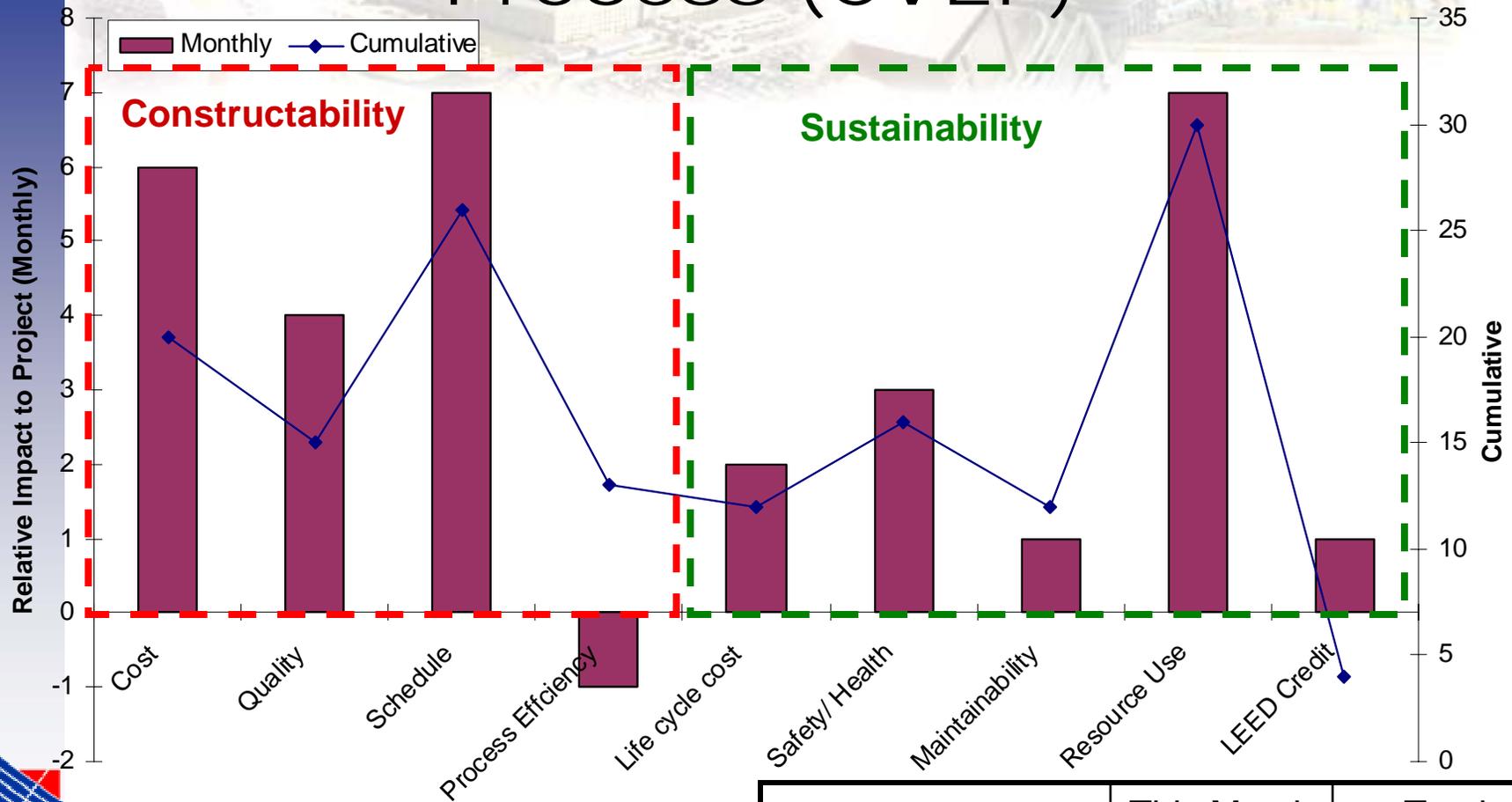
Future Plans for the Field Guide

- Web accessible version
- Trade / phase specific practices
- “Certification” of all field workers via project specific orientation
- DoD rights reserved





Continuous Value Enhancement Process (CVEP)



Number of PVEs generated: 7

Best VEs this month:

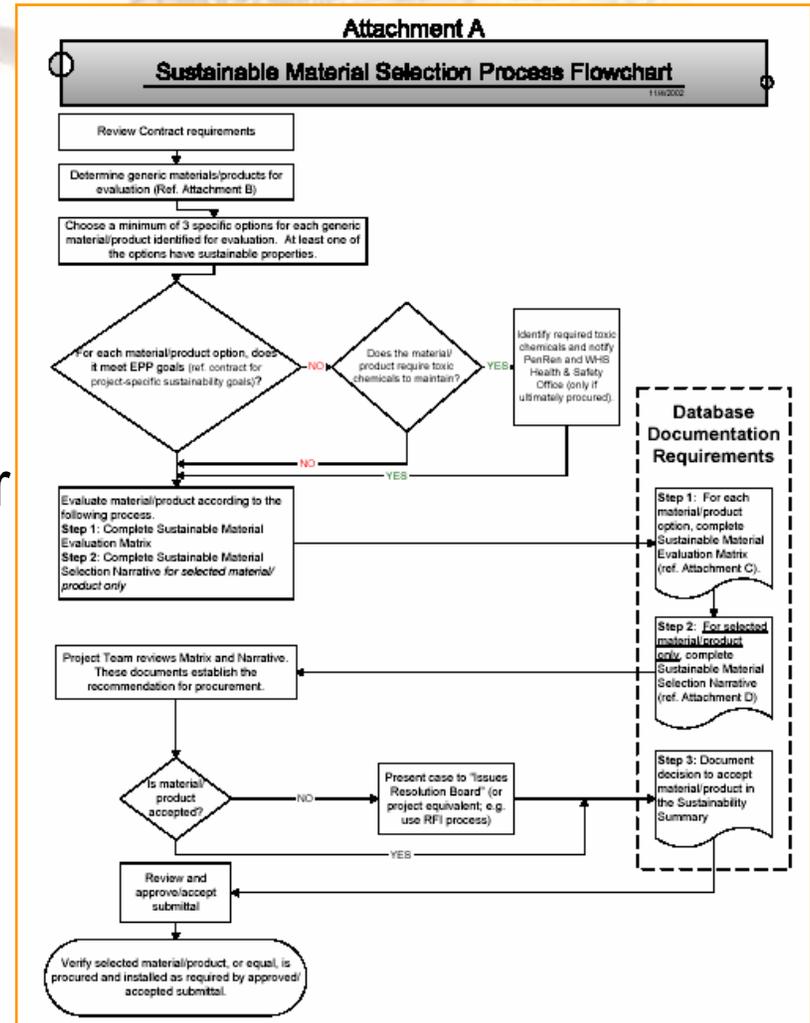
	This Month	Total
First Cost Savings		
Life Cycle Cost Savings		





Materials Evaluation Process

1. Identify the target materials (Attach. B)
2. Determine options
3. Complete Sustainable Material Evaluation Matrix for each option (Attach. C)
4. Conduct LCCA
5. Complete Sustainable Material Selection Narrative (Attach. D)





Why we developed the Material Selection Process

- PENREN/C, SSE IPT saw the need for a rigorous process for evaluating environmentally preferable materials
- Decisions left up to design-build team
 - D-B team material selection process driven primarily by schedule and first cost
- Performance specs add another level of complexity:
 - How much or how little to specify?





Complications with Design-Build

- Design-Build process creates multiple decision trees
- Decisions and changes can be made by D-B, Architect, subcontractor, PENREN/C
- Information is de-centralized
- Document substitutions and RFI changes relative to design decisions
- How do we know that the materials being specified are actually being installed?





Sustainable Material Selection Process: A Program Management Policy

Use EPA's Source Ranking Database (SRD),
"Product Details for Top 30 SRD Categories"

1

Determine the
Need

2

Identify
Target Areas

- High Health/Environmental Impact
- High Volume
- High Cost

3

Determine the
Options

- Minimum of three materials is preferred

4

Evaluate
Options

- Level 1: Complete EAI

- Level 2: Complete LCCA

5

Select Best
Material



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Step 2: Identify Target Areas

Divisions 2-12

- Carpet Tile
- Ceiling Tile
- GWB
- Paint
- Concrete Sealer
- Metal Studs
- Concrete Masonry Units
- Finish Carpentry
- Wood Doors
- Resilient Flooring
- Ceramic Tile
- Toilet Partitions

Divisions 15 &16

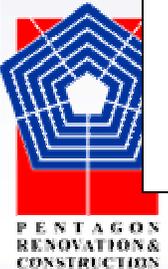
- HVAC
- Plumbing Fixtures
- Electrical Transformers
- Lighting Fixtures





Step 3: Determine the Options

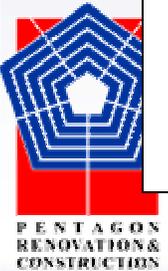
- Down-select specific materials and products to evaluate
- Minimum of 3 are required for the Environmental Attribute investigation





Step 4: Evaluate Options

- 2 Levels or steps when selecting environmentally preferable alternatives
- Level 1: Environmental Attribute Investigation (EAI) – using the Sustainable Materials Evaluation Matrix
- Level 2: Life Cycle Cost Analysis





Example



Appendix A

Table 1: Type of Analysis Agreed Upon

LCCA Materials	LCCA	EAI	Action/ Comment
Ceiling Tile*	Yes	Yes	Consider recyclability, durability, mold, maintainability
Carpet Tile	FenRen purchased carpet. No evaluation required for Wedge 2.		
CMU	No	Yes	Study is done, 20% bottom ash, consider local and recycled content.
Toilet Partitions	No	No	
Paint	No	Yes	LEED™ threshold (Green Seal) acceptable. If Green Seal met, no LCCA required.
Metal Studs	No	Yes	Consider local material, recycled content and env. Compliance manufacturing process
Gypsum Wallboard	No	Yes	Consider local material and recycled content
Concrete Sealer	No	Yes	
Finish Carpentry	No	Yes	
Rough Carpentry	No	Yes	Premium payment should be documented
Interior Doors*	Yes	Yes	
Resilient Floors	Yes	Yes	
Ceramic Tile	Yes	Yes	
HVAC*	Yes	No	Use loaded labor rates from GSA website.
Lighting/ Electrical*	Yes	No	High priority study





Level 1: Environmental Attribute Investigation

Purpose:

- Provide guidance for evaluating and selecting sustainable materials/products
- Document trade-off considerations pertaining to sustainability, first cost, life cycle cost, and schedule





Material Evaluation Matrix

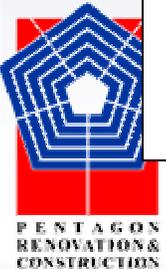
PRODUCT INFORMATION				RAW MATERIALS								MANUFACTURING								PROCUREMENT				
CSI Division/Section	Project	Manufacturer	Product	Applicable LEED™ credit/point	Reference(s)	Source/Extraction (Materials & Location)	% Post-Consumer Recycled	% Post-Industrial Recycled	Rapidly renewable	Ozone Depleting Compounds	PVC or other chlorine-based compounds	Transport to Manufacturing	Contribution to Global Warming	Total Energy Use	Total Water Use	Toxic Components/MSDS	Toxicity to workers	Waste Created	Environmental Justice	Corporate Environmental Policy and/or Certification, e.g., Green Seal, FSC, ISO	Transportation to Project Site	First Cost Product & Installation	Scheduling / Availability	Special Considerations
Contract Reference						2.5.4.1	2.5.4.2	2.5.4.2	2.5.4.2	2.5.4.2	2.5.4.2	2.5.4.2	2.5.4.2	2.5.4.2	2.5.1	2.5.4.1/2.5.3	2.5.4.1	2.5.4.1	2.5.1	2.5.4.2	2.5.4.2	2.5.1	2.5.1	
Identify products CSI Section	Identify by Project Name: e.g., Wedge 2, PAC, etc.	Name of Business Address Telephone / Fax/ Email Website Contact Name	Identify Product by Name & describe generically appropriate	Identify relevant points based on LEED™ document (e.g., 2.0, Cl, EB)	Minimum 3: Include name/contact information of individual(s) responsible for the purchase/use/maintenance of the product - exceptions provided for products specifically identified as demonstration - if so, identify terms of demonstration, monitoring/overs	Identify raw materials used and point of origin	by weight	by weight	defined as a bio-based product as per EO 13101, section 504(b)	Identify CFCs, HCFCs, bromine, halon	Identify whether product is manufactured with PVC (Vny) or other chlorine-based compound; e.g., neoprene	Distance between location of raw material feedstocks and manufacturer(s)	Calculation based on embodied energy as associated with fuel type/quantity including the manufacture, transportation & releases associated with chemical reactions, such as with calculation of portland cement (see Reference ???)	Calculate total energy per unit (mmmbtu). Identify % from renewable sources.	Calculate total water use per unit (kgal). Identify % recycled or reused.	Include from MSDS, most recent TRI report if available	Refer to MSDS	Include for solid (weight) & liquid (volume) per unit; identify disposition; identify whether waste is hazardous	Identify corporate environmental policy (if any) that addresses manufacturing impacts on host communities or other evidence of sensitivity to societal impacts associated with manufacturing practices, including facility location	Identify corporate policy and/or any certifications held by manufacturer indicating commitment to environmental / health goals	Identify distance between manufacturer and project site	Identify cost of product and installation	Identify ability to obtain product in desired quantity on schedule	Identify special handling, storage or other parameters





Sustainable Material Evaluation Matrix

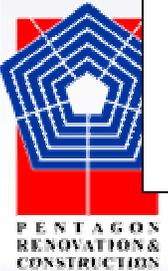
- 46 attributes to evaluate, not all applicable to each product.
- 8 Main Categories include:
 - Raw Materials
 - Manufacturing
 - Procurement
 - Installation
 - Use
 - Maintenance and Replacement
 - Post-Use
 - Cost





Challenges with the EAI

- Gathering information is time-consuming
- Not all information is readily available





Level 2: The LCCA

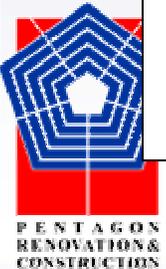
1. Define problem and identify alternatives
2. Establish common assumptions
3. Estimate Costs and occurrences
4. Discount future costs to the present
5. Compute and compare LCC
6. Assess uncertainty and take into account external effects
7. Make selection

define

estimate

assess

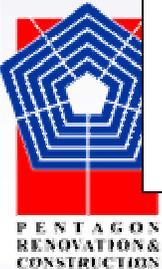
select





Write Evaluation Narrative

- | | | |
|-------------------|---|--|
| • Introduction | → | Describe physical attributes of the material |
| • Objective | → | Describe the effects on occupants and environment based on PENREN/C project goals |
| • Discussion | → | Illustrate main issues and pros/cons |
| • Recommendations | → | Justify the decision and list specific reasons for the specific application |
| • Schedule | → | Explain how the material could affect the project schedule |
| • Life-Cycle Cost | → | Discuss the LCC of the material and how this relates to the product selected |
| • LEED™ Notes | → | Reference any credits related to this product, and how the credits can be achieved |





Challenges associated with using LCCA

- Contractors need training
- Difficult to agree on common assumptions and process





Benefits associated with using LCCA

- Long-term costs known up-front
 - Enables more accurate funding
- Fewer “surprise costs” to O&M personnel





Supporting Tools

The screenshot shows a Microsoft Internet Explorer browser window with the address bar containing the URL: <https://reno-db4/Flint/LifeCycle/Wedge25-Main.asp?Action=Life>. The page content includes the Pentagon Renovation Program logo, the slogan "On Cost, On Schedule, Built For The Next 50 Years", and the title "Design Life Cycle Database". Below the title, it lists 16 categories of design requirements, each as a blue underlined link. At the bottom, there are links for "Project Selection Screen" and "System Maintenance", followed by contact information for IM&T - Information Management IPT.

Pentagon Renovation Program
On Cost, On Schedule, Built For The Next 50 Years

Design Life Cycle Database

One of the following:

01 - General Requirements	09 - Finishes
02 - Site Construction	10 - Specialties
03 - Concrete	11 - Equipment
04 - Masonry	12 - Furnishing
05 - Metals	13 - Special Construction
06 - Wood and Plastics	14 - Conveying Systems
07 - Thermal and Moisture Protection	15 - Mechanical
08 - Doors and Windows	16 - Electrical

[Project Selection Screen](#)
[System Maintenance](#)

IM&T - Information Management IPT
Information Integration Sub-IPT
Please send any comments regarding this page to molvella@army.pentagon.mil





Go back to: [Home](#)

Division Finishes

[Add Section](#)

Please select one of the following Sections:

- [09100 - METAL SUPPORT ASSEMBLIES](#) [Edit](#)
- [09230 - PLASTER FABRICATIONS \(GFRG\)](#) [Edit](#)
- [09250 - GYPSUM BOARD](#) [Edit](#)
- [09280 - PLASTER REPAIRS](#) [Edit](#)
- [09310 - TILE](#) [Edit](#)
- [09440 - PLASTIC MATRIX TERRAZZO](#) [Edit](#)
- [09510 - ACOUSTIC CEILINGS](#) [Edit](#)
- [09650 - RESILIENT FLOORING](#) [Edit](#)
- [09680 - CARPET](#) [Edit](#)
- [09682 - CARPET TILE](#) [Edit](#)
- [09840 - ACOUSTICAL WALL TREATMENT](#) [Edit](#)
- [09900 - PAINTING AND FINISHING](#) [Edit](#)
- [09980 - POLYMER MODIFIED MASONRY COATING](#) [Edit](#)





Pentagon Renovation Program - Microsoft Internet Explorer

File Edit View Favorites Tools Help

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Address <https://reno-db4/Flint/LifeCycle/LF-Section.asp?SectionCode=09510> Go Links >>

Section Information

- Specification
- Submittals Log
- Archive
- RFI
- Sustainability Summary
- Design Information
- Lessons Learned

Section 09510
ACOUSTIC CEILING

Selected Products:

- [09510 - ClimaPlus by USG](#)
-SubTitle
[Edit](#)
- [09510 - Eurostone by Chicago Metallic](#)
-SubTitle
[Edit](#)
- [09510 - Kemply by Kemlite](#)
-SubTitle
[Edit](#)

[Add a New Product](#)

Pentagon Renovation program
IM IPT - Information Management - Integrated Product Team
Please send any comments regarding this page to HeneghaT@army.pentagon.mil

Done Local intranet



PENTAGON
RENOVATION &
CONSTRUCTION



Section Information

- Specification
- Submittals Log
- Archive
- RFI
- Sustainability Summary
- Design Information
- Lessons Learned

Eclipse ClimaPlus

Features and Benefits

- Non-directional pattern ensures consistent appearance.
- Solid NRC performance of .70 meets general office acoustical needs for sound absorption.
- Available in popular standard colors offering endless solutions.
- Optional FIRECODE™ formulation designed to meet life safety codes.
- CLIMAPLUS™ Lifetime System Warranty to withstand conditions up to 104 F (40 °C)/95% relative humidity without visible sag when used with USG's DOW® Brand Suspension Systems.
- Panel used in REMEMIONS™ Face-Routed Ceiling Systems. (see IC327).

Applications

- Schools
- Hotels





The screenshot shows a Microsoft Internet Explorer browser window titled "Pentagon Renovation Program - Microsoft Internet Explorer". The address bar contains the URL: <https://reno-db4/Flint/LifeCycle/09510-090302.doc?Submit=Specification>. The browser's menu bar includes File, Edit, View, Insert, Format, Tools, Table, Go To, Favorites, and Help. The address bar also shows a search icon, a home icon, and a "Go" button. The main content area displays a document with the following text:

SECTION 09510
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to,

1. Acoustical panels for lay-in application.
2. Metal framing and suspension systems.
3. Trim and accessories.

B. Products Furnished but Not Installed Under This Section: Furnish inserts a trades well in advance of time needed for coordination with other Work.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. See DIVISION 15 for sprinkler heads and mechanical grilles and diffusers.

B. See DIVISION 16 for light fixtures, fire and smoke detectors and speakers.

The browser's status bar at the bottom shows "Unknown Zone" and "Local intranet".





Pentagon Renovation Program - Microsoft Internet Explorer

Address: <https://reno-db4/Flint/LifeCycle/09510%20SPEC%20SECTION%20-%20SHOP%20DRAWING%20LD...>

Section: AE10

	A	B	C	D	E
1	SHOP DRAWING AND SAMPLE RECORD - SPEC SECTION: 09510 (ACOUST				
2					
3	PROJECT:		PENTAGON WEDGE 2		
4	CONTRACTOR:		Hensel Phelps Construction Co.		
5					
6					
	DATE REC'D	SUBMITTAL PACKAGE ID#	SUBMITTAL #	TITLE	CONTRACTOR SUBCONTRACTOR TRADE
7					
8	06/18/02	0001	0	Product Data and Samples	P&P Contractors Inc.
9					
10	08/07/02	0002	0	Product Data, Tile Samples, Grid Samples	P&P Contractors Inc.
11					
12					
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18					
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20					
21					
22					
23					

Shop Drawings Sample

Unknown Zone

Local intranet





Pentagon Renovation Program - Microsoft Internet Explorer

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Address <https://reno-db4/Flint/LifeCycle/LF-Sustainability-Summary.asp> Go Links

Go back to: [Home](#) > [Finishes](#) > [ACOUSTIC CEILINGS PRODUCTS](#)

Section Information

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- RFI
- Sustainability Summary**
- Design Information
- Lessons Learned

Section 09510 Sustainability Summary

- Edit Sustainability Summary
- Sustainability Narrative
- Sustainability Matrix

Typical Office Ceilings: Eclipse ClimaPlus selected. It has significant recycled content and mold resistance. It was more competitive than Armstrong Cirrus.

Apex Ceilings: Eurostone Selected. While scoring highly for sustainability, the NRC does not meet office space criteria. It is the most costly product evaluated.

Exterior Soffits: Kemply Selected. This product was selected as an insulated panel suitable for exterior use. Not evaluated for sustainability.

For more detailed sustainability information, see Sustainability Narrative in each product.

Pentagon Renovation program
IM IPT - Information Management - Integrated Product Team

Done Local intranet





Go back to: [Home](#) > [Finishes](#) > [ACOUSTIC CEILING PRODUCTS](#)

Section Information

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Section 09510 Sustainability Narrative

[Printer-Friendly Version](#)

[Edit Sustainability Narrative](#)

[Introduction](#) [Objective](#)
[Discussion](#) [Recommendations](#)
[Schedule Impacts](#) [Cost Impacts](#)
[LEED™ Notes](#)

Introduction: Describe generic product attributes, assembly, options, sustainability concerns (i.e., extraction impacts, greenhouse gas emissions, manufacturing emissions, indoor environmental quality, ozone depletion).

Objective: Describe metrics used to establish environmental/health performance based on PenRen project goals, and as described under Discussion, below (i.e., greenhouse gas emissions associated with product manufacture reduced by %; VOCs eliminated/reduced by % for all interior materials and products; PVC and other chlorine-based compounds eliminated from all products).

The primary issues regarding ceiling tiles are the impacts to IAQ (mineral fiber content and mold/bacteria growth). No direct

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Pentagon Renovation Program - Microsoft Internet Explorer

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Address <https://reno-db4/Flint/LifeCycle/LF-Sustainability-Matrix.asp>

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Section 09510
Sustainability Matrix

[Edit Sustainability Matrix](#)

[SUSTAINABLE MATERIALS MATRIX](#) [RAW MATERIALS](#)
[MANUFACTURING](#) [PROCUREMENT](#)
[INSTALLATION](#) [USE](#)
[MAINTENANCE & REPLACEMENT](#) [POST-USE](#)
[COST](#)

SUSTAINABLE MATERIALS MATRIX

Project: Project [Back to top](#)

Manufacturer: USG [Back to top](#)

Section: 09510 [Back to top](#)

Applicable LEED™ credit/point: Materials Credit 4
Recycled Content (65-82%) [Back to top](#)

References: References

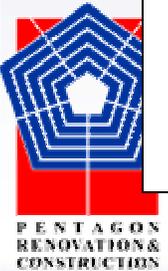
Local intranet





Lessons Learned

- A bulletin board for any user to post comments or ask questions
- Will be monitored monthly





Pentagon Renovation Program - Microsoft Internet Explorer

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Address <https://reno-db4/Flint/LifeCycle/LF-Lesson-Add.asp> Go Links >>

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Section 09510 ACOUSTIC CEILING Lessons Learned

You can enter data in the fields below and then press the **OK To Add** button to add a **new** lesson learned to the database.

OK To Add

Product: SECTION LESSON -

Lesson Learned:

Section Lesson

Originator: molye
Date: 11/22/02 11:16:00 AM
Lesson: this is a long lesson that should wrap around the field and have a couple of paragraphs to it, so we can see a paragraph break in the displayed text.

Done Local intranet





Challenges with Managing the Materials Selection Process

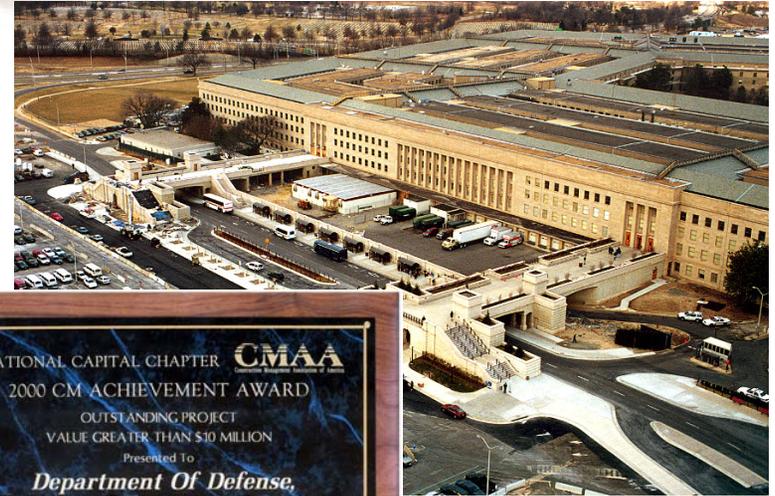
- Timing
- Expedited procurement schedule
- Constant updates require some dedicated time for data entry





Reward Achievement

- Award Fee Evaluations
 - W1 Avg 83%
 - RDF Average 95%
 - MEF Avg 99%
- Customer feedback
 - “The renovations saved my life.”
 - 9/11 Survivors
 - “Pleased beyond my expectations!”
 - Disabled user of the Pentagon Transit Center
- Awards won by the program
 - CMAA
 - DBIA





Sustainable Design Product and Process at the Pentagon Renovation Program

- Defines a consistent and coherent set of values and goals for all projects
- Stimulates innovation and design/construction excellence
- Facilitates value-based acquisition process and Design-Build Delivery
- Facilitates balancing sustainable factors with construction code, force protection, cost, and personnel





Conclusions

- **Challenges surrounding the Pentagon Renovation add to complexity**
 - **Maintaining Military Mission Readiness**
 - **Schedule Acceleration**
 - **Funding Limitations**
 - **Changing Requirements**
 - **Force Protection Considerations - Fire, Blast, CBRN**
- **Sustainability presents an opportunity to integrate all of these in an environmentally responsible manner**





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On Cost, On Schedule, Built for the Next 50 Years!



"For the Strength of the Pack is the Wolf, and the Strength of the Wolf is the Pack"

<http://renovation.pentagon.mil>