



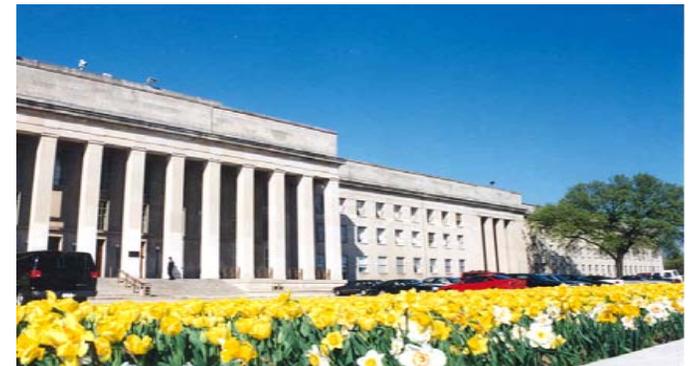
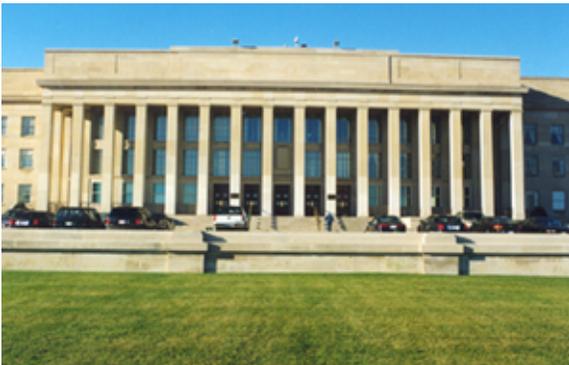
# Incorporating Sustainable Design in Federal Installations - the Pentagon Renovation Program

**Energy 2003 Conference**

**Sustainable Building Design Track**

**August 20**

Dr. Teresa R. Pohlman  
Team Leader,  
Integrated Sustainable Design  
and Constructability  
Pentagon Renovation Program





# The Pentagon - A Small City



**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**

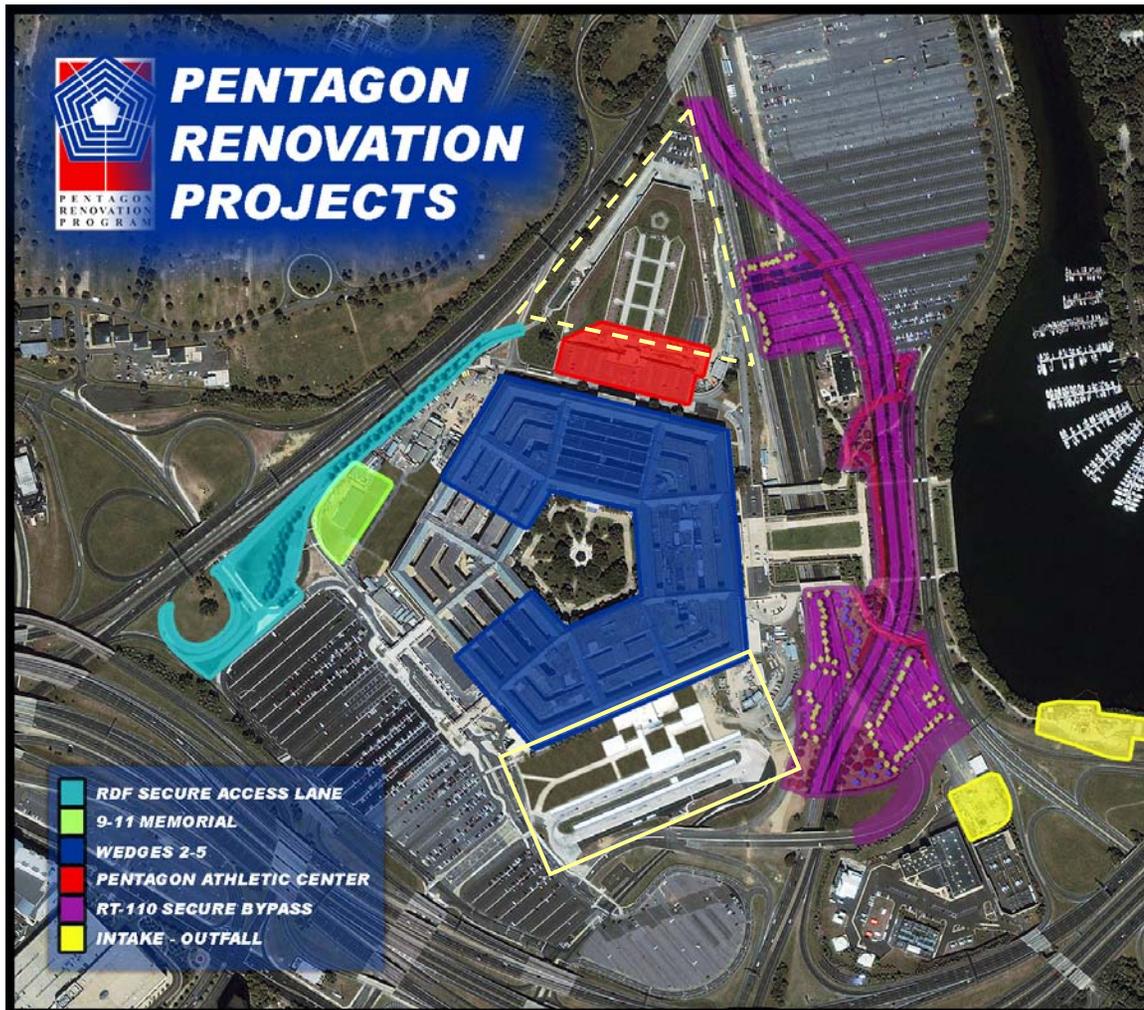
**Mini-mall**

**Heliport**

**Has never undergone a major renovation in its 60-year history.**



# The Renovation Program - Manages New Construction and Pentagon Renovation



Heating and Refrigeration Plant  
(H&RP)

Basement and Mezzanine

Wedge 1

Wedge 2

Wedge 3

Wedge 4

Wedge 5

Wedges  
1-5

Remote Delivery Facility (RDF)

Metro Entrance Facility (MEF)

Pentagon Athletic Center (PAC)



# Challenges at the Pentagon Renovation Program:

- Re-build destroyed portion - from 9/11/01
- Major building systems beyond repair, non-compliant with modern building codes and ADA, hazardous materials present throughout, poor energy efficiency



# Challenges at the Pentagon Renovation Program:



- Force Protection of National Security Assets, Personnel
- Logistical and Organizational Challenges
- Diverse projects - Renovation, new Construction



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

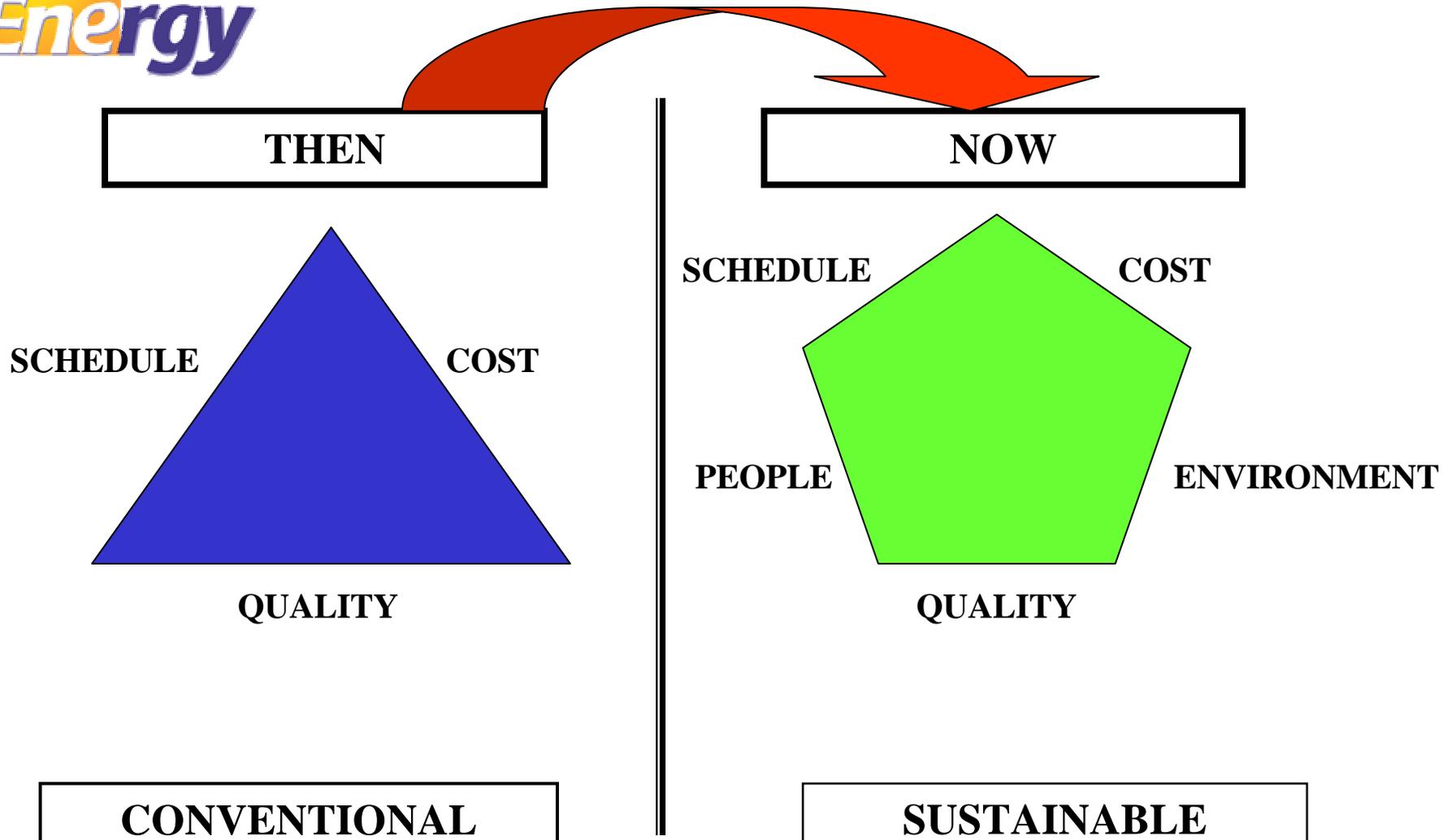


# Integrated Sustainable Design and Constructability (ISDC) Team

- ISDC 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.

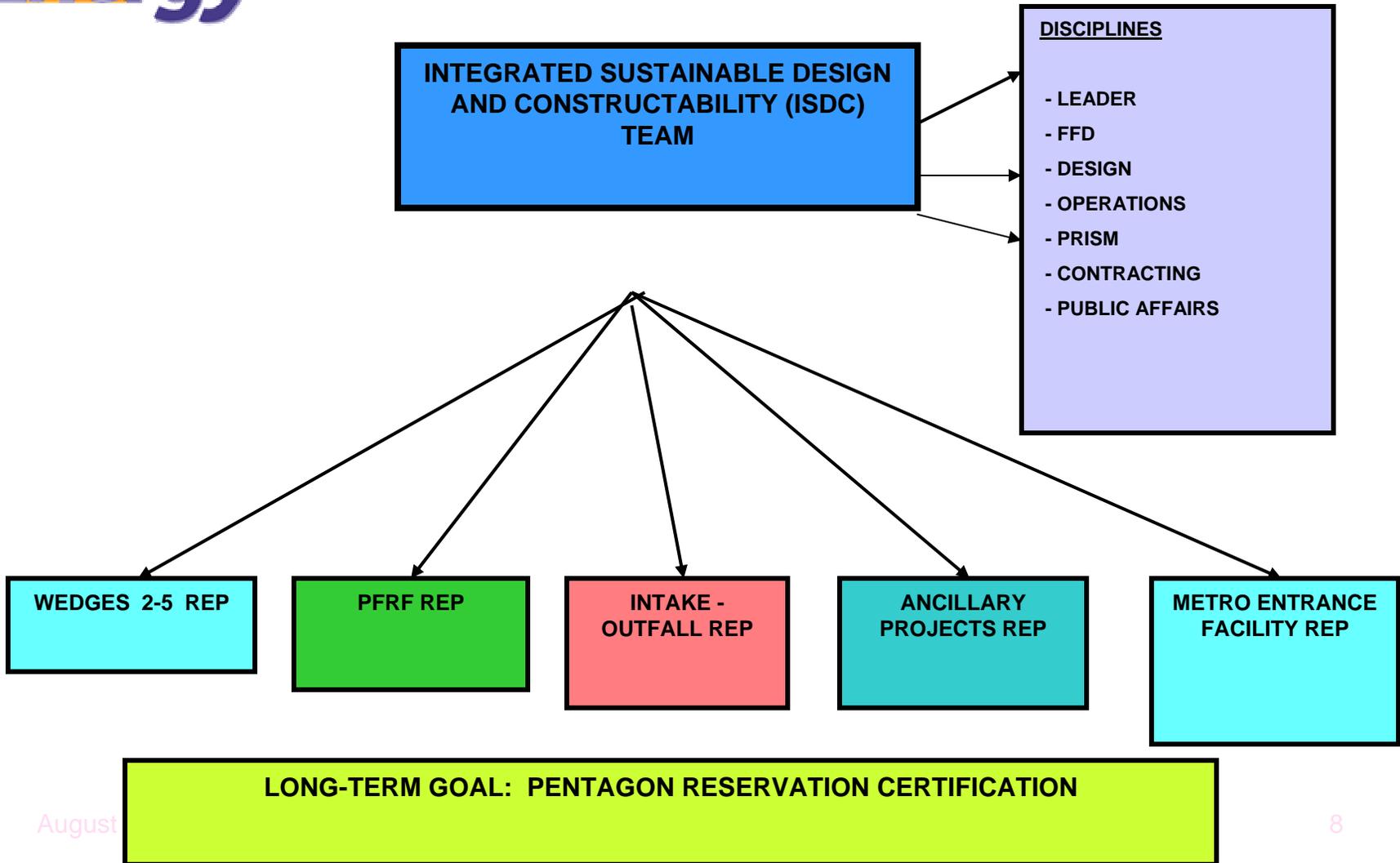


# SUSTAINABLE DESIGN AND CONSTRUCTABILITY: RELATIONSHIP TO CONVENTIONAL PROCESS





# PENTAGON RENOVATION PROGRAM SUSTAINABLE DESIGN IMPLEMENTATION





## **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**



## Strong Synergies among projects

- **Four Projects registered with USGBC for LEED Certification:**

- **Remote Delivery Facility**
- **Metro Entrance Facility**
- **Pentagon Athletic Facility**

August 1 - **Wedge 2**

[www.energy](http://www.energy)



Remote Delivery Facility



Metro Entrance Facility



# Approach to Sustainable Design and Construction

- **RFP/ Acquisition**
  - Performance based contracting
  - RFP states LEED Certification as a goal (future)
  - Integrated sustainable design requirements (Section 2.5)
  - EPP Project/ Program goals
  - Award Fee based on compliance with Sustainable Goals

## EPP Project/ Program Goals

- No ozone depleting compounds (including CFC's and HCFC's)
- NO PVC
- Low VOC products
- Reduce greenhouse gas emissions by specifying recycled materials (35% target), bio-based, and/or industrial by-products vs. virgin materials.
- Use FSC wood



# Approach to Sustainable Design and Construction

## Design

- PenRen/ LEED Matrix
- Cx Agent involvement
- Materials Selection Process
- Product Database

## • Construction

- ISDC Team/project counterparts
- Quality Control/Assurance Involvement



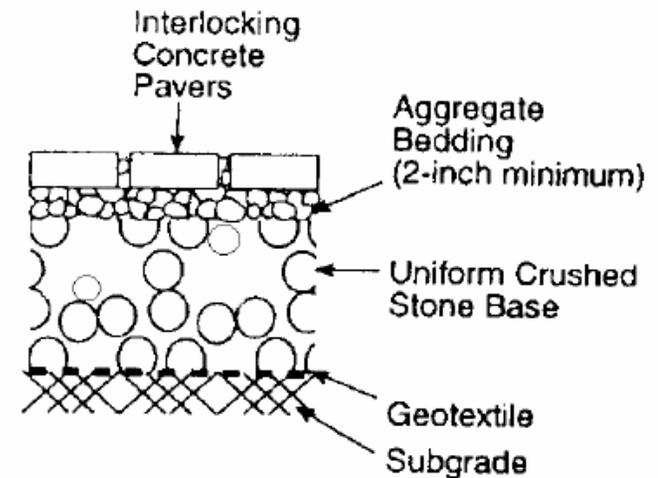
# Approach to Sustainable Design and Construction - Example - LEED matrix

LEED EXISTING BUILDINGS EVALUATION- PENTAGON WEDGE 2								
LEED EB PREREQUISITES/ CREDITS	Possible Points	LEED EB Requirement	Project Compliance			Documentation Requirement	Responsibility	Comments
			Yes	No	Maybe			
<b>SUSTAINABLE SITES</b>								
Prerequisite 1: Erosion and Sedimentation Control		Develop and implement as policy a site sedimentation and erosion plan that conforms to best management practices in the EPA's Storm Water Management for Construction Activities, EPA Document No. EPA-833-R-92-001, Chapter 3, OR local Erosion and Sedimentation Control standards and codes, whichever is more stringent. The plan shall meet the following objective: Prevent loss of soil by stormwater runoff and/or wind erosion during any landscaping or building improvements that disturb the site.	x			For any construction projects carried out at the building over the last year: 1. Declare whether the project follows local erosion and sedimentation control standards or the referenced EPA standards and provide a brief listing of the measures implemented. If local standards and codes are followed, describe how they meet or exceed the EPA best management practices. 2. Provide the erosion control plan (or drawings and specifications) with the sediment and erosion control measures highlighted. Provide a copy of the site and erosion control policy that specifies inclusion of these erosion and sediment control requirements in contract documents for any construction projects for the building.	HP	Eben Hamilton will obtain a copy of the Erosion and Sedimentation Control Plan for Wedge 2. FFD will supply a copy of the reservation policy.
Credit 1: Site Selection	1	Continue to occupy an existing building.	1			Provide a signed written statement that your organization continues to occupy the existing building for which certification is being requested.	PenRen/FFD	PenRen to obtain a letter per documentation requirements.



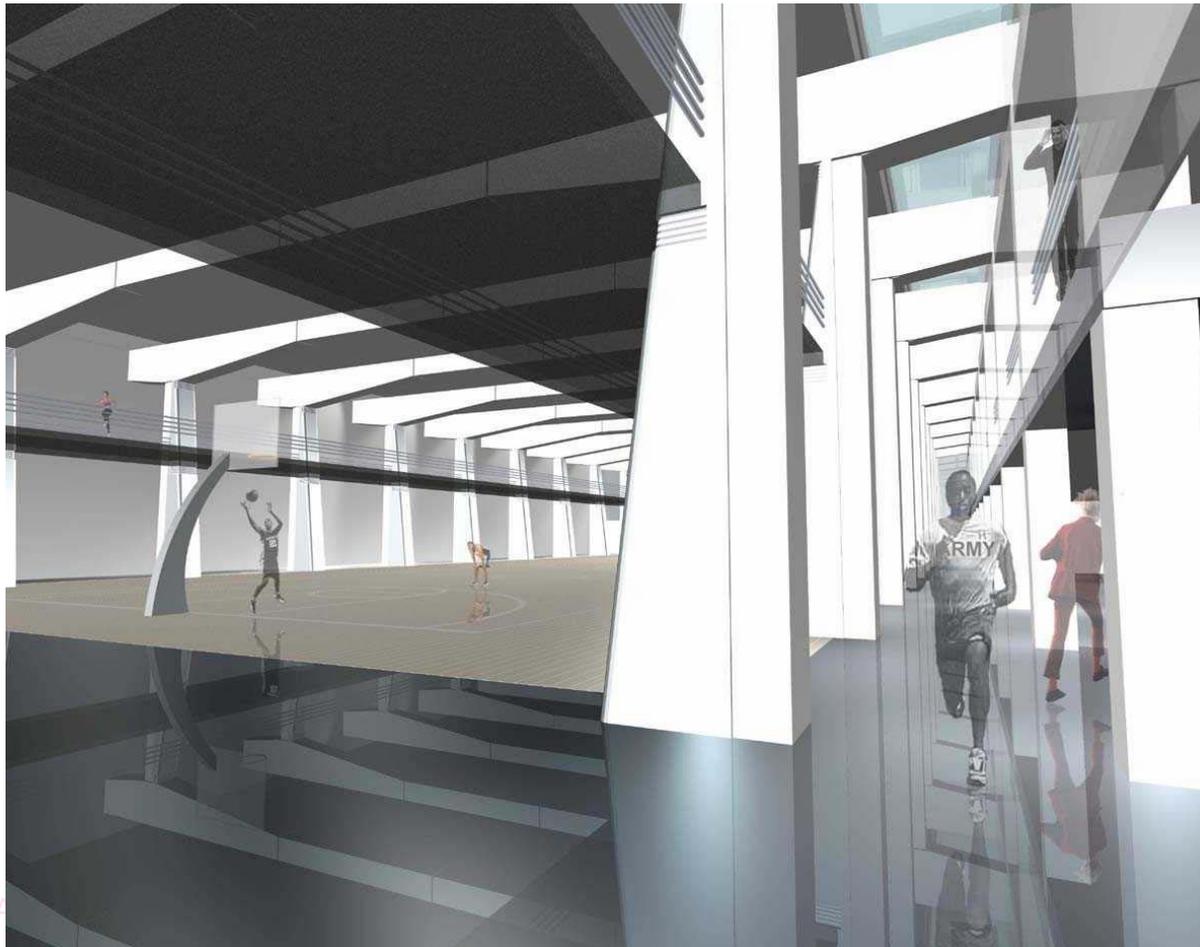
## Sustainable Examples

- **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.**





# Pentagon Athletic Center Sustainable Highlights

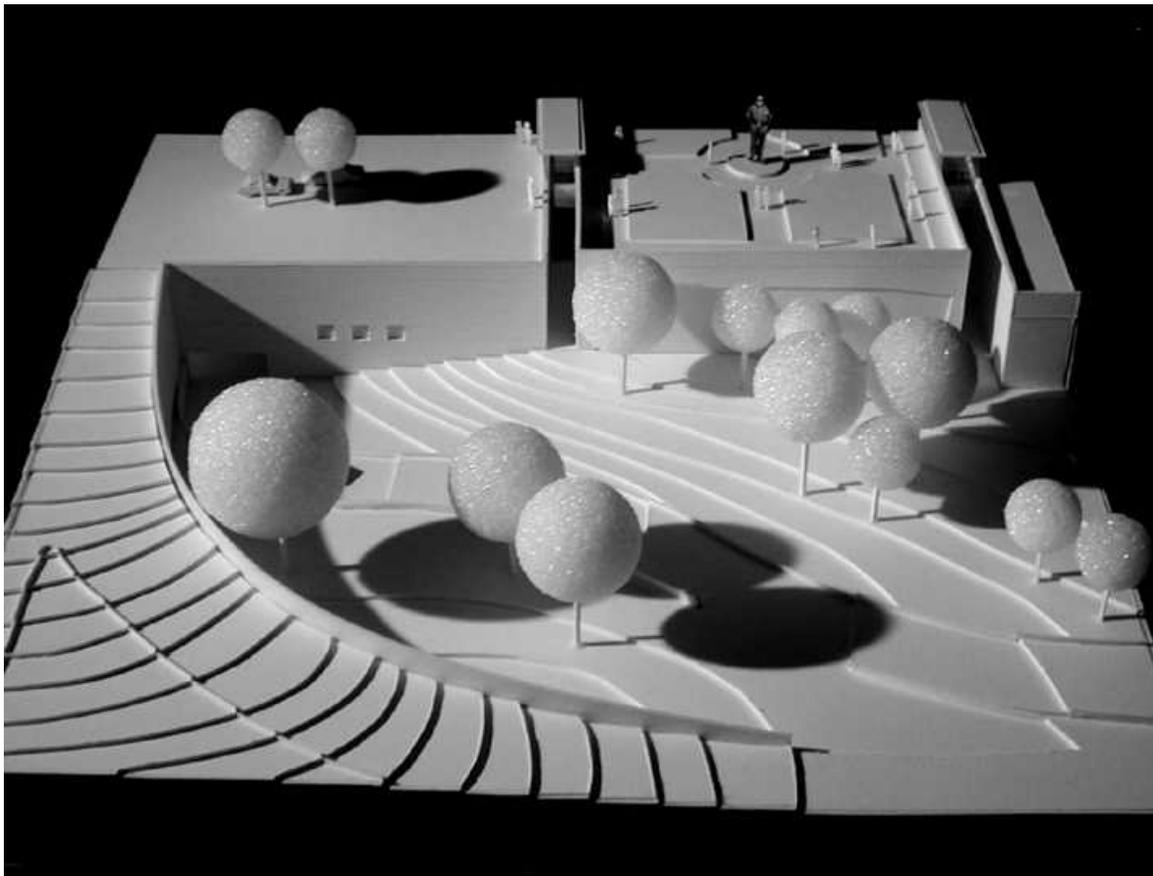


- **Indoor Air Quality - Subterranean facility, outside air and light will be directed into the interior spaces through clerestory window system.**



# Pentagon Athletic Center Sustainable Highlights

- **Green Roof** - outdoor garden space, improved insulation  
- natural water filtration system, reduced storm water runoff



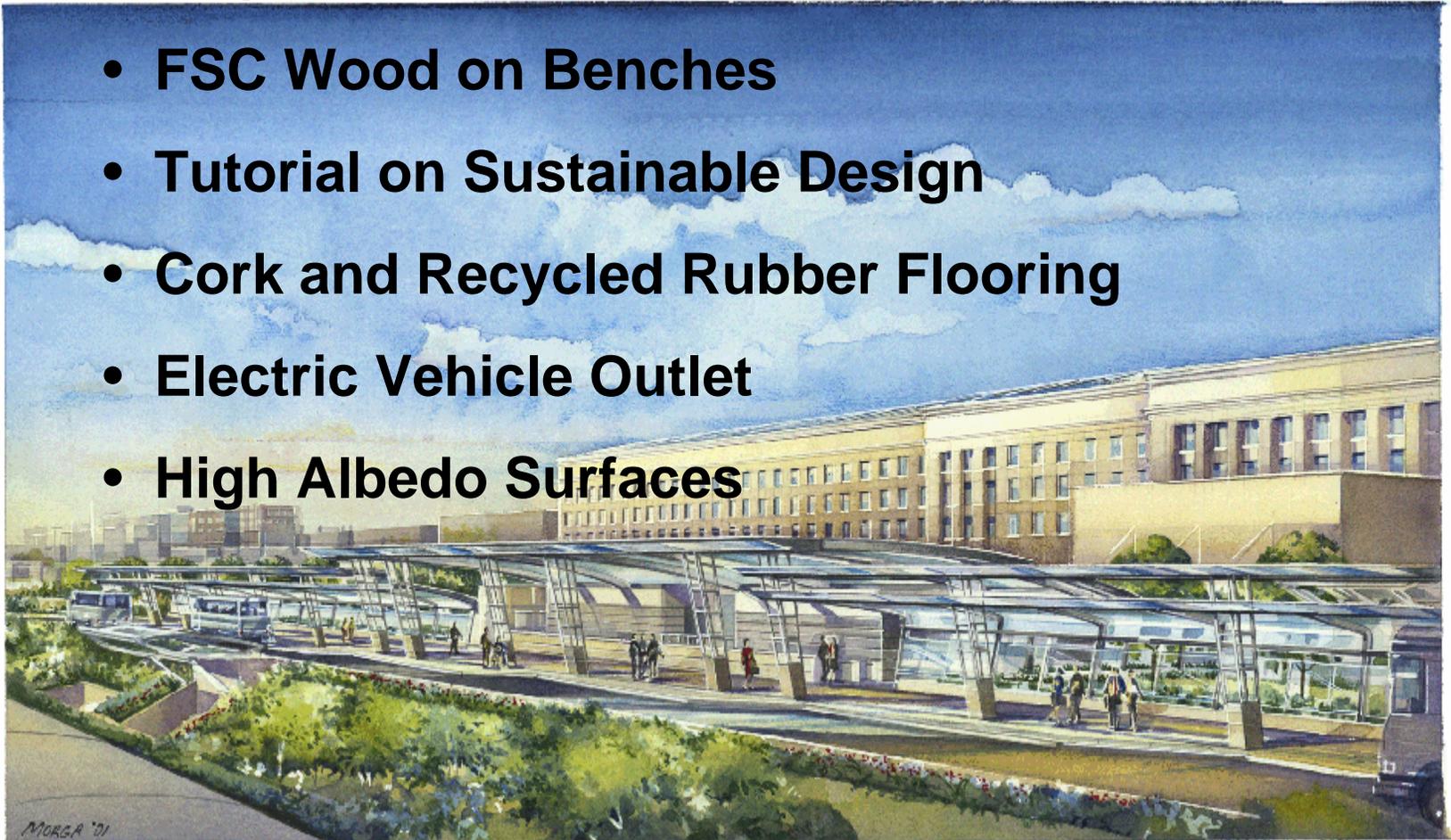
- **Building materials** - low VOC emission, recycled content, regional manufacture
- **Open Floor Plan** - Fewer walls - ease in circulation, require less finish material



# Metro Entrance Facility and Bus Station

## Sustainable Highlights

- Irrigation well - non-potable water
- FSC Wood on Benches
- Tutorial on Sustainable Design
- Cork and Recycled Rubber Flooring
- Electric Vehicle Outlet
- High Albedo Surfaces



MORGA '01

# ***Pentagon Renovation***

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



[\*http://renovation.pentagon.mil\*](http://renovation.pentagon.mil)

