



An Energy Efficiency Workshop & Exposition  
Palm Springs, California



## PENTAGON RENOVATION PROGRAM

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Program Manager

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<http://renovation.pentagon.mil>  
<http://www.energy2002.ee.doe.gov>



## The Pentagon - A Small City



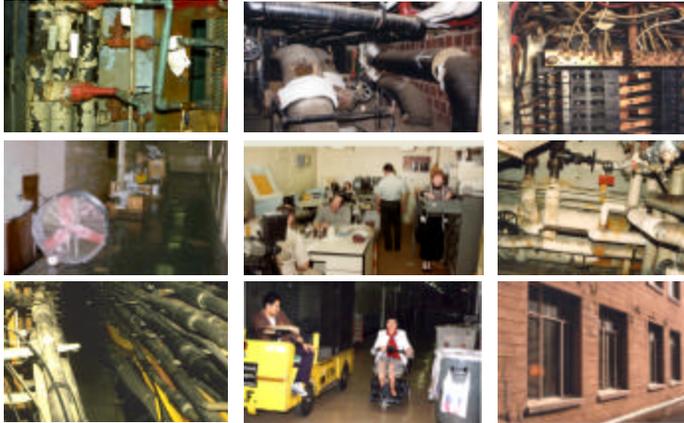
- 34 acres
- 6.5 million sq. ft.
- 3 Empire State Bldgs.
- 7,748 windows
- 17.5 miles of corridors
- 25,000 personnel
- 1,000,000 calls each day
- Police force
- Metro station
- Fire Station
- Health Facilities
- Post Office
- Mini-mall
- Heliport

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

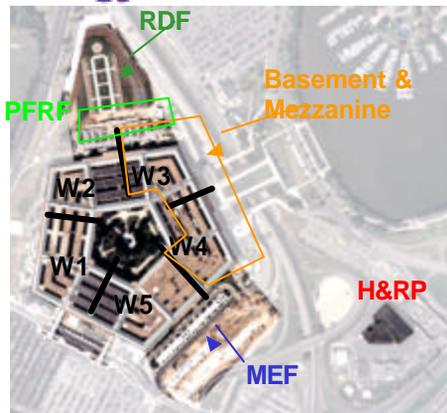


## The Need for Renovation

Major building systems beyond repair, non-compliant with modern building codes and ADA, hazardous materials present throughout, poor energy efficiency.



## The Renovation Program



### RENOVATION PLAN

Heating and Refrigeration Plant (H&RP)

Basement and Mezzanine

Wedge 1

Wedge 2

Wedge 3

Wedge 4

Wedge 5

### OTHER PROJECTS

Remote Delivery Facility (RDF)

Metro Entrance Facility (MEF)

Physical Fitness & Readiness Facility (PFRF)



## The Renovation Program



**Remote  
Delivery  
Facility**



Aug 2000 Phase 1 Complete  
Dec 2001 Phase 2 Complete  
Mar 2002 Phase 3 Complete



## The Renovation Program



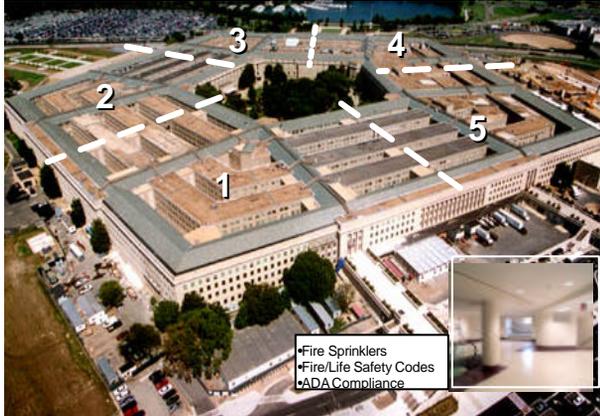
**Metro  
Entrance  
Facility  
Project**



Pentagon Transit Center Opened Dec. 16, 2001



## The Renovation Program




- Replacement of Exterior High Pressure Water Lines



- Monitoring & Control Systems
- Building Operations Command Center



- Automated Smoke Doors

- Fire Sprinklers
- Fire/Life Safety Codes
- ADA Compliance

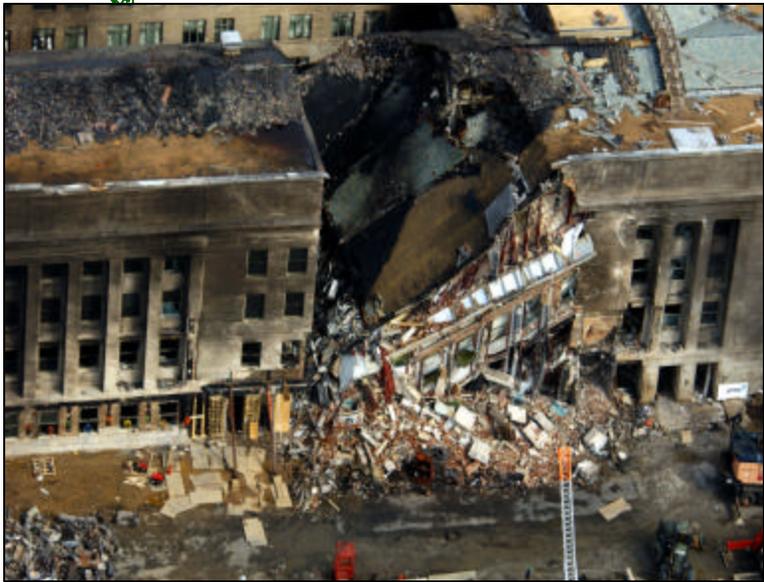


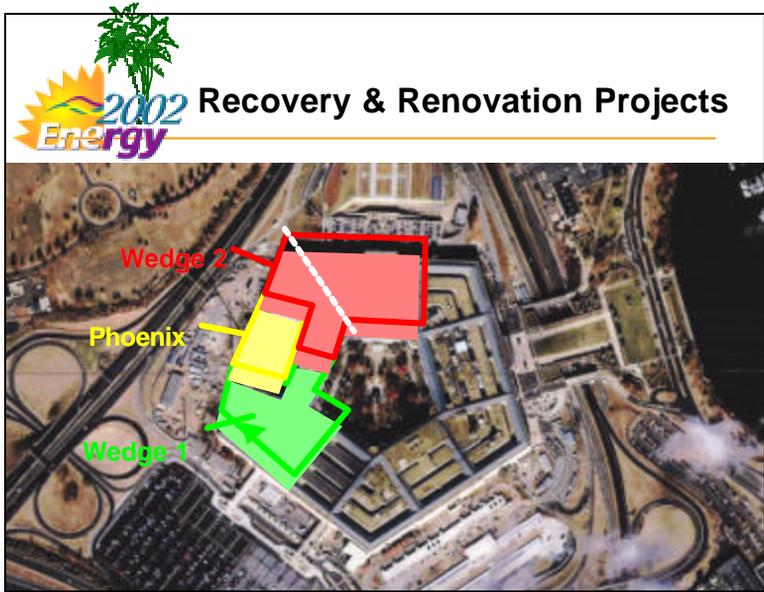
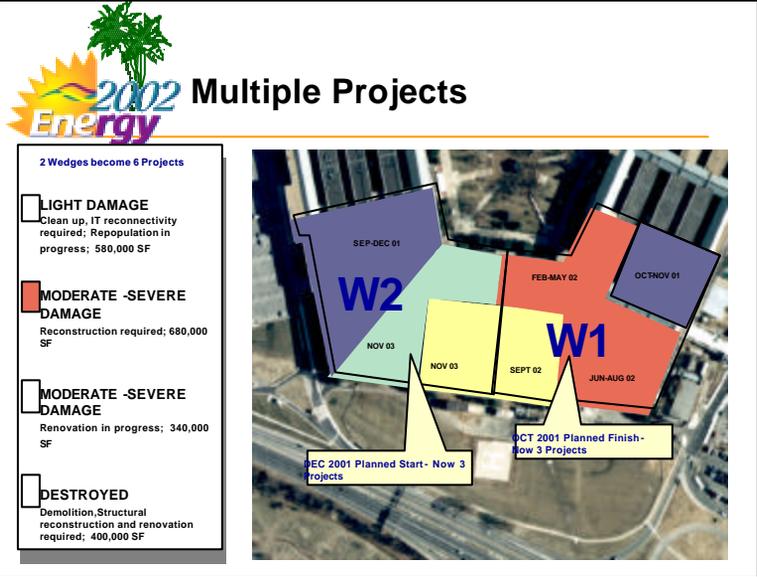
## The Renovation Program



- Blast Resistant Window Units
- Structural Steel Beams

© Chemical Fabric, similar to Kevlar



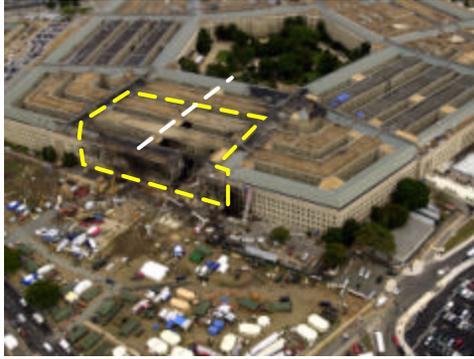




# The Phoenix Project

Stabilize, Demolish, Rebuild Structure

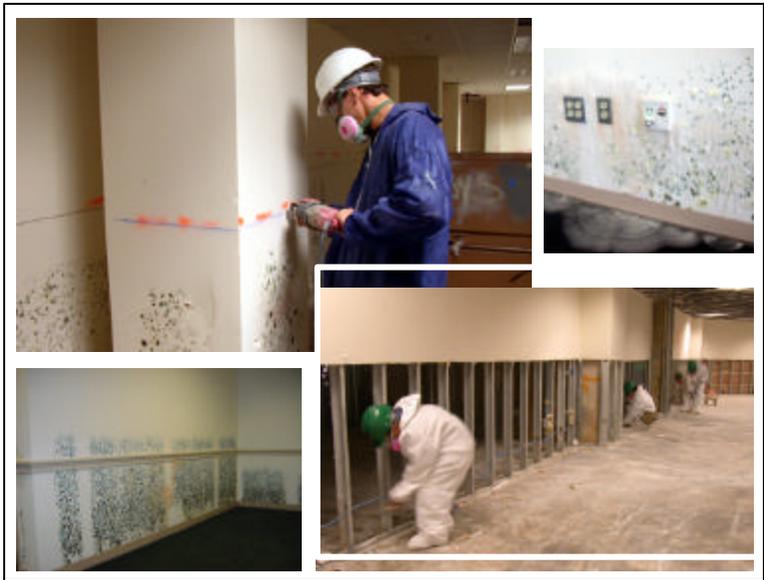
Note: Wedge 1 side = Core & Shell, Wedge 2 side = Shell only













**Demolition Began**  
**October 18, 2001**

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Photo Date:  
Nov. 5,  
2001



**Demolition Complete**  
**November 19, 2001**

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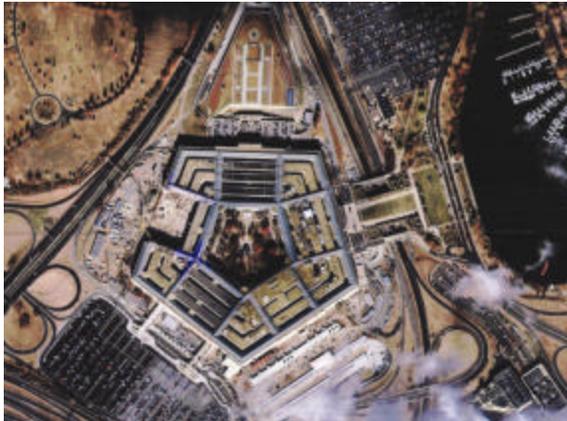


Photo Date:  
Nov. 20, 2001



 **2002 Energy** **Construction Progress**

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Photo Date:  
February 13, 2002  
Third floor deck is nearly finished, and work begins on support columns for the fourth floor.



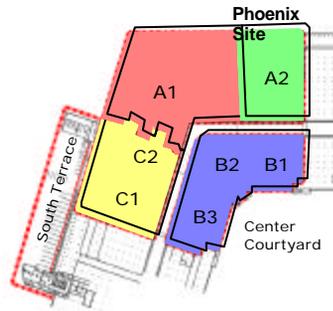






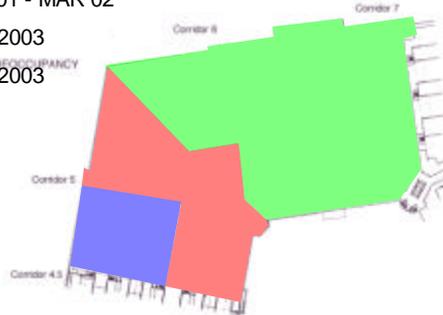
## Wedge 1 Move Milestones

Area	Projected Move-in
<input type="checkbox"/> C	OCT 01- MAR 02
<input type="checkbox"/> B1,2,3	FEB 02 - MAR 02
<input type="checkbox"/> A1	MAY 02- JUL 02
<input type="checkbox"/> A2	SEP 02- MAR 03



## Wedge 2 Move Milestones

Area	Projected Move-in
<input type="checkbox"/> Recovery	OCT 01 - MAR 02
<input type="checkbox"/> Renovation	NOV 2003
<input type="checkbox"/> Phoenix	NOV 2003

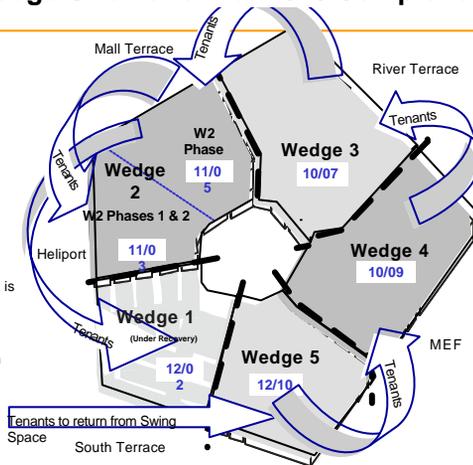




## Jump Start the Renovation Wedge Orientation for 2010 Completion

Congressional appropriation of \$300M+ to accelerate the renovation.

H.R. 3338-71  
Sec. 305  
"...the amount of \$300,000,000 is transferred to the Pentagon Reservation Maintenance Revolving Fund only to finance accelerated building renovation activities for military command centers...by up to 4 years."



## Pentagon Renovation Program Initiatives

- The US Green Building Council (USGBC) LEED 2.0 system (LEED for New Buildings) is organized according to environmental areas of concentration. It is a rating system that consists of four levels, with points being given for meeting requirements within each of the five areas of concentration
  - A total of 69 points are available , with point breakdown as follows:
    - LEED certification - basic - 26-32 points
    - Silver certification - 33-38 points
    - Gold certification - 39-51 points
    - Platinum certification - 52 + points



## “Greening” of the Pentagon Summary of Initiatives



- New Heating & Refrigeration Plant and utility distribution system
- State-of-the-art climate control system, tighter thermal building envelope
- Open bay environment improves energy efficiency: air flow, lighting
- Use of environmentally safe materials
- Improvements to pedestrian/vehicular traffic flow
- Greater flexibility for future changes
- Investments in new technology and alternative sources of energy



## Improve Energy Performance With Improved Contracting Methods



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



## Hire Better Contractors

Improve 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 Strategy

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



## Hire Better Contractors

Improve Acquisition Strategy

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





## Give them Incentives to Achieve Your 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



## Set Clear Goals

### Performance Requirements

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





## Set Clear Goals

### Performance Requirements

<b>OBJECTIVE:</b>	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).
<b>Detail:</b>	Provide the energy efficiency and other requirements for each building system. Provide the energy efficiency and other requirements for each building system. Provide the energy efficiency and other requirements for each building system.
<b>Measure:</b>	Provide the energy efficiency and other requirements for each building system. Provide the energy efficiency and other requirements for each building system. Provide the energy efficiency and other requirements for each building system.
<b>LOOK:</b>	Provide the energy efficiency and other requirements for each building system. Provide the energy efficiency and other requirements for each building system. Provide the energy efficiency and other requirements for each building system.
<b>LIFE CYCLE-ARCH:</b>	Provide the energy efficiency and other requirements for each building system. Provide the energy efficiency and other requirements for each building system. Provide the energy efficiency and other requirements for each building system.
<b>LIFE CYCLE-ENR:</b>	Provide the energy efficiency and other requirements for each building system. Provide the energy efficiency and other requirements for each building system. Provide the energy efficiency and other requirements for each building system.

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 GFM  
Cites applicable standards, i.e. ASRAE





## Set Clear Goals

### Integrated Sustainable Design

- Goals
- Waste prevention
- Energy efficient improvements
- Maintainable
- Enhanced indoor environmental quality (IEQ)
- Environmentally preferred products (EPP)
- Greenhouse gas reduction
- Waste management
- Water supply



*"A building that is not maintainable is not sustainable."*



## Set Clear Goals

### Integrated Sustainable Design Goals

- Energy efficient improvements
  - Improving energy efficiency as renovation progresses;  
Each wedge has specific energy budget (BTU's per sq. ft.) which lessens wedge by wedge
  - Contractor is required to submit energy reports with design submittals
- Enhanced indoor Environmental Quality (IEQ)
  - Materials cannot contain CFC's or HCFC's- submittals from subcontractors must indicate material composition
- Greenhouse gas reduction (GHG)
  - Must reduce GHG emissions 30% by 2010 (as compared to 1990 emission levels).  
Achieve compliance with Executive Order (E.O. 13123)
- Water supply
  - Minimize use of potable water by using low-flow toilets (1.6 gal/person/flush)



## Set Clear Goals

### Integrated Sustainable Design Goals

- Waste prevention/management
  - Contractor required to submit a construction and demolition recycling program that diverts 50% of all recyclable waste from landfill or incineration
- Maintainable
  - Commissioning assures maintainability- must balance sustainable, "green" design with operability and maintainability
  - Involves cost, durability and performance specifications; trade offs of products and systems
- Environmentally preferred products (EPP)
  - Use EPP as defined by EPA in the Comprehensive Procurement Guidelines (CPG)
    - Examples of percentages specified in CPG include- percent flyash in concrete, percent post-consumer waste recycled, percent post industrial waste recycled





## Operate as a Team

### Integrated Product Teams (IPTs)

- Integration of contractor personnel onto teams
  - Contractors working with us to write the RFP
- Design Teaming
- Integration of customers/maintainers onto teams
- Opens lines of communication



## Operate as a Team

### Integrated Product Teams (IPTs)

FUNCTIONAL IPTS	GEOGRAPHIC IPTS						
	WEDGE 1	WEDGE 2	WEDGE 3	BASEMENT 1	BASEMENT 2	BASEMENT 3	ETC.
REQUIREMENTS							
PLANNING & DESIGN							
ACQUISITION							
COMMISSIONING							
CONSTRUCTION							
SECURITY							
TENANT ACTIVITIES							
ETC.							

*Each person belongs to at least two teams*



## 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

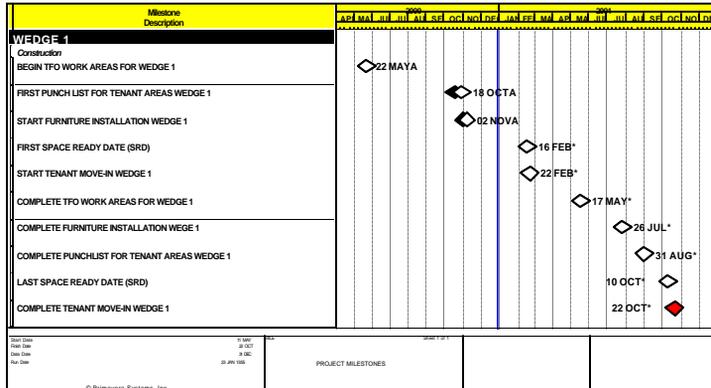
### Project Controls and Performance Measurements

- A new set of project controls developed with award and incentive schemes in place to ensure success
- 29 milestones that are key to the tracking of progress.
  - Temporary mechanical, electrical, plumbing complete
  - Construction barriers complete
  - Temporary communications complete
  - All long-lead items identified
  - All long-lead items ordered
  - All long-lead items received
  - Tenant move-out starts
  - Demolition and abatement starts
  - Demolition and abatement complete
  - Contractor schedule complete
  - Critical path analysis completed by the contractor
  - Unique milestones identified for project and entered into milestone schedule
  - Tenant survey starts
  - Commissioning plan complete
  - All tenant requirements completed
  - All move in tenants identified
  - Furniture deliveries start
  - Furniture deliveries complete
  - Punch list identified
  - Punch list completed
  - Tenant move-in starts
  - All manuals and operations booklets received
  - All required training complete
  - All wedge work complete
  - Final contract payment made
  - Option exercise period for next wedge begins
  - Bilateral "option out" period ends for next wedge



## Measure Progress Against Goals

### Milestones



## 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.

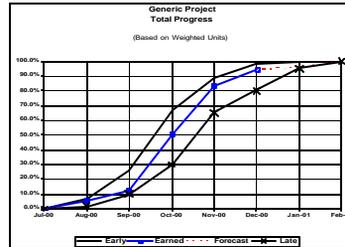


## Measure Progress Against Goals

### Monthly Metrics

- Useful for identifying trends and developing rules-of-thumb
- Award fee contracts produce many criteria to judge and reward contractor
- Criteria naturally lend themselves to metrics
- Provides confidence intermediate goals are being met
- Shows positive trends and identifies problems
- Contractor participates in development of the metrics

### Progress on a Banana Curve vs. Early & Late Finish



## 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





<http://renovation.pentagon.mil>

