A Status Report to Congress on

# Renovation of the Pentagon

*Prepared by*
**The Office of the Secretary of Defense**

March 1, 1999

**Figure 1**
**River Terrace Entrance Historic Facade**

## EXECUTIVE SUMMARY

As required by Section 2674 of Title 10, United States Code, the attached status report to the Congress on the Renovation of the Pentagon is presented annually and this is the ninth Report. This Report is a synopsis of where we are in the overall program, the work that has been completed during the past fiscal year and the work that is anticipated to be completed during the next fiscal year. In addition this Report reviews the design and construction costs to date within the framework of the overall certified summary. The report reviews seven categories as follows:

I. **Purpose:** A brief description for the reason of the report.

II. **Overview:** A general description of the development of the program since the initial Pentagon Renovation Concept Plan was prepared in 1989.

III. **Program Status:** This section defines the primary activities, the activity status of completed projects, projects under construction and projects under design. The primary activities involve the Design Guidelines and Criteria for the overall project and the design and construction for the basement and the wedges. The completed projects are the Basement/Mezzanine Segment 1 core and shell, the barrier walls and temporary mechanical, electrical and plumbing systems, and other related projects.

IV. **Fiscal Year 1999 Program:** This section lists the activities that are included in fiscal year 1999. These activities include Basement/Mezzanine Renovation, Wedge #1 Renovation and other related activities.

V. **Work Accomplished:** This section describes all of the work accomplished since the Heating and Refrigeration plant was awarded in 1992. The completed projects include Basement/Mezzanine Segment I core and shell, Heating and Refrigeration Plant, Center Courtyard Utilities Tunnel, Classified Waste Incinerator Plant, Sewage Lift Station, River Terrace Renovation, River Terrace Handicapped Access, Mug Handle Infill, Corridor 8 Entrance Renovation, Wedge #1 Temporary Construction and Swing Spaces. Projects under construction include Segment 2.A.2 Core and Shell and Tenant Fit Out, TRICARE Health Clinic, Wedge #1 Demolition and Abatement and South Terrace Pedestrian Bridges.

VI. **Budget:** This section describes the source of funds with a certification summary of what has been expended to date and what is programmed for the future. The total obligated funds through FY 1998 for design and construction are $348,700,000.00. Budgeted funds for FY 1999 to the end of the program for design and construction are $507,200,000.00.

VII. **Appendix:** This section includes a history of the Pentagon and a description of the deterioration of the building wide components and systems; a description of how the program was developed; a current program schedule; and past FY 1991 Legislative Authorization and Department of Defense Appropriations Act, FY 1999, with Certification.

# I. PURPOSE

# I. Purpose

This report is provided to the Congress in compliance with Title 10 United States Code, Section 2674, which requires the Secretary of Defense to submit an annual report on the status of the renovation of the Pentagon Reservation, and a plan for the renovation work to be conducted in the fiscal year beginning in the year in which the report is transmitted.

This is the ninth annual report submitted in compliance with 10 U.S.C. 2674. The report covers accomplishments to date and actions proposed for FY 1999. In addition, this report includes information on several related projects which support the overall objectives of operations and maintenance of the Pentagon Reservation.

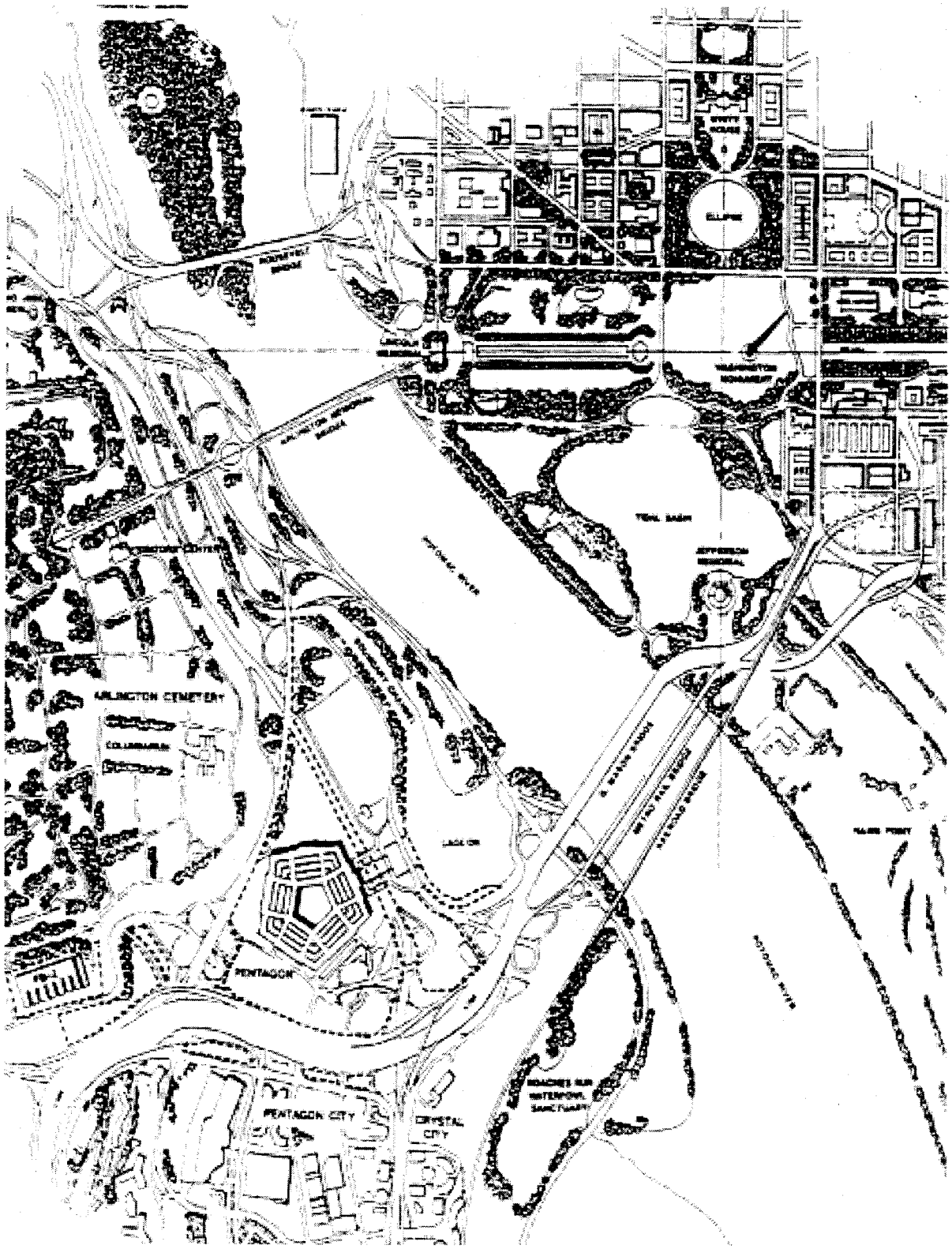



**Figure 2**
**Pentagon Location Map**

# II. OVERVIEW

**General**
**Reservation Master Plan**
**Concept Plan**
**Environmental/Energy Improvements**
**Renovation Conponents**
**Information Management & Telecommunications**
**Other Related Projects**

# II Overview

***General*** As the headquarters of the National Defense Establishment and the nerve center for the Department of Defense command and control, the Pentagon needs to be maintained in superior operational condition. However, over the Pentagon's 56 year lifetime, repairs and renovations have been undertaken on a piecemeal basis. Consequently, today the Pentagon, with many of its original systems still in place, has deteriorated to the point where distribution outages, plumbing leaks, water supply failures, and heating, ventilation, and air conditioning (HVAC) failures occur on a daily basis. The building fails to comply with current building, fire protection, and life safety codes, and accessibility standards.

These antiquated systems cannot provide adequate services to support a modern and flexible office environment. Computers, copy machines, and other heat-generating, power-consuming equipment normal in today's administrative offices, did not exist when the Pentagon was designed in 1943. The HVAC systems were never designed or intended to accommodate today's loads. The plumbing services, although adequately sized, have simply worn out. New demands have been placed on the structure's telecommunications and security systems that the original architects never could have anticipated. The tremendous increase in sophisticated computer equipment requires new, efficient, and integrated HVAC systems as well as additional power distribution sources.

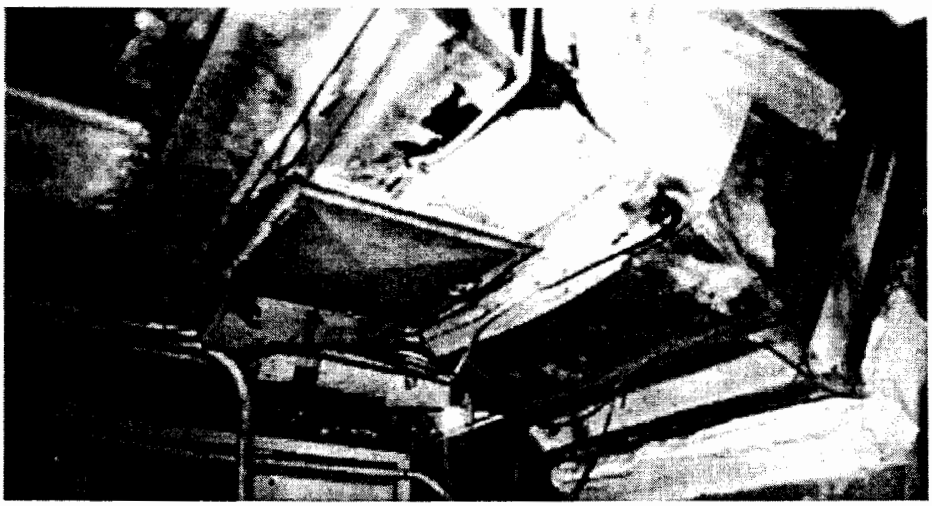


**Figure 3**
**Deteriorating Heating, Ventilation, and Air Conditioning (HVAC) Ductwork**

A key consideration in planning the renovation is that the Pentagon was constructed with plaster-finish ceilings which conceal the mechanical, electrical, and plumbing systems. Therefore, in order to replace or install the mechanical, electrical, and life safety systems, all asbestos-laden plaster ceilings, ducts, pipes and tile flooring must be removed from the building. Such demolition work will require the removal of the majority of obsolete full-height office partitions.

These steps, in turn, make possible the reconfiguration of space to provide modern flexible office space (many associated offices are not contiguous and are not efficiently housed). Current health and life safety requirements and the physical constraints of the building will not accommodate "piece-meal" renovation that would stop and start arbitrarily.

A complete renovation is necessary to provide a modern, flexible, efficient operating environment well into the 21st century. Without a major renovation, the building will continue to deteriorate, ultimately rendering it unable to serve its mission. These conditions require a plan of comprehensive scope to provide the benefits of a comprehensive building renovation.

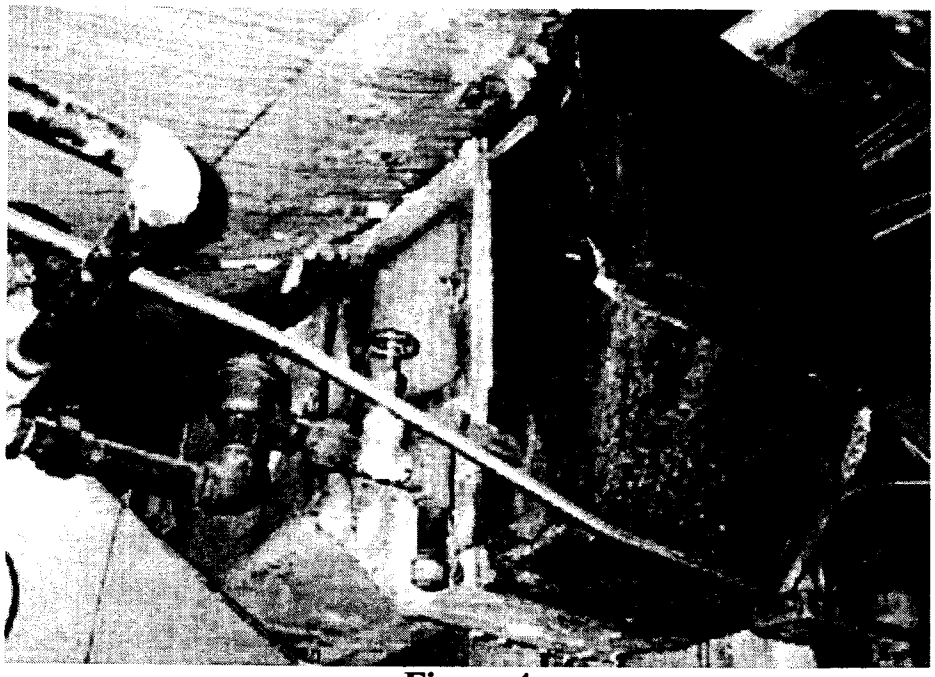


**Figure 4**
**Typical Ductwork Surrounded by Asbestos Insulation**

***Reservation Master Plan***

A Pentagon Reservation Master Plan and an associated Environmental Assessment have been approved by the National Capital Planning Commission and the Commission of Fine Arts. This plan defines how existing elements will be integrated with new construction and site improvements. Objectives of the Master Plan for the Pentagon Reservation are to:

- Establish an integrated program for renovation, demolition, and construction of structures and facilities on the Reservation.
- Recommend improvements in transportation, traffic flow, and parking, giving priority to transit, ride sharing, and multiple-occupant modes.
- Recommend improvements in the quality of the human environment while minimizing potential adverse impacts.
- Describe improvements necessary to reinforce the symbolic nature of the Pentagon Reservation as part of a major gateway to the Nation's Capital.
- Ensure that site development and new construction are compatible with existing buildings and surrounding features.
- Provide a sense of unity and identity for the entire Reservation.

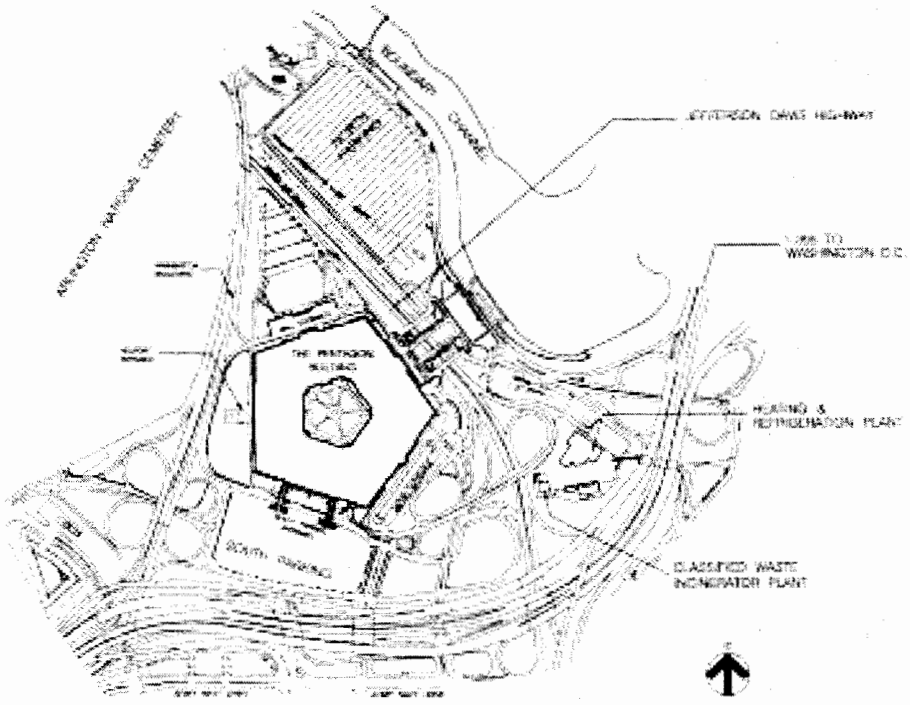


**Figure 5**
**Pentagon Reservation Site Plan**

***Concept Plan***

A Concept Plan, upon which the renovation plan was initially based, was completed in December 1989, refined in 1990, and forms the basis for planning the renovation of the world's largest low-rise office building.

In developing the Concept Plan, conceptual approaches to renovating the 6,500,000-gross-square-foot (603,900 $m^2$) Pentagon in phases were examined.

1. Smallest Increment — 150 increments of 44,000 sq. ft. (4090 $m^2$).
2. One tenth of a floor horizontal — 50 increments of 132,000 sq. ft. (12,268 $m^2$).
3. Vertical sections — 17 increments of 388,000 sq. ft.; sections divided along building seams, through all floors.
4. By tenants — more than six increments of less than 1,100,000 sq. ft. (102,230 $m^2$).
5. Five vertical sections — five increments (wedges) of 1,100,000 sq. ft. (102,230 $m^2$); divided along building seams, relocating tenants sequentially in each section.
6. Rings and vertical sections — five increments of 1,100,000 sq. ft. (102,230 $m^2$) (Renovate A-B Rings first, then C-E Rings).
7. One quarter of building — four increments of 1,625,000 sq. ft. (151,022 $m^2$).
8. All of the building — one increment of 6,500,000 sq. ft. (603,900 $m^2$).

Following an extensive evaluation, three of these conceptual approaches were selected for further study.

The three approaches selected for additional study were:

1. Seventeen vertical sections of building; sections divided along building seams, each part through all floors.
2. Five vertical building sections divided along building seams (wedges), relocating tenants in each section.
3. Rings and vertical building sections divided along building seams, renovate A Ring first, then five vertical sections.

Additional investigation was performed on each of these concepts. Evaluation factors included: maintaining support services; managing areas of construction; availability of construction staging areas; minimizing materials procurement lead times; minimizing asbestos removal impact; maintaining user operations; construction access to site/building; compatibility with utilities/building systems; maintaining physical security; minimizing construction time frame; availability of required construction personnel; and minimizing total project costs.

Renovating in five vertical sections (wedges) emerged as the best fit with the evaluation criteria and the option most likely to be successful. Therefore, the Concept Plan divided the Pentagon into five major phases of work plus the Basement and further identified five improvement alternatives to enhance the overall operation of the building:

1. Foyer/vertical circulation modifications.
2. New public access to the second floor.
3. Services corridor network.
4. Additional Mezzanine space.
5. Pentagon Maintenance Facility (formerly Logistics Support Extension).

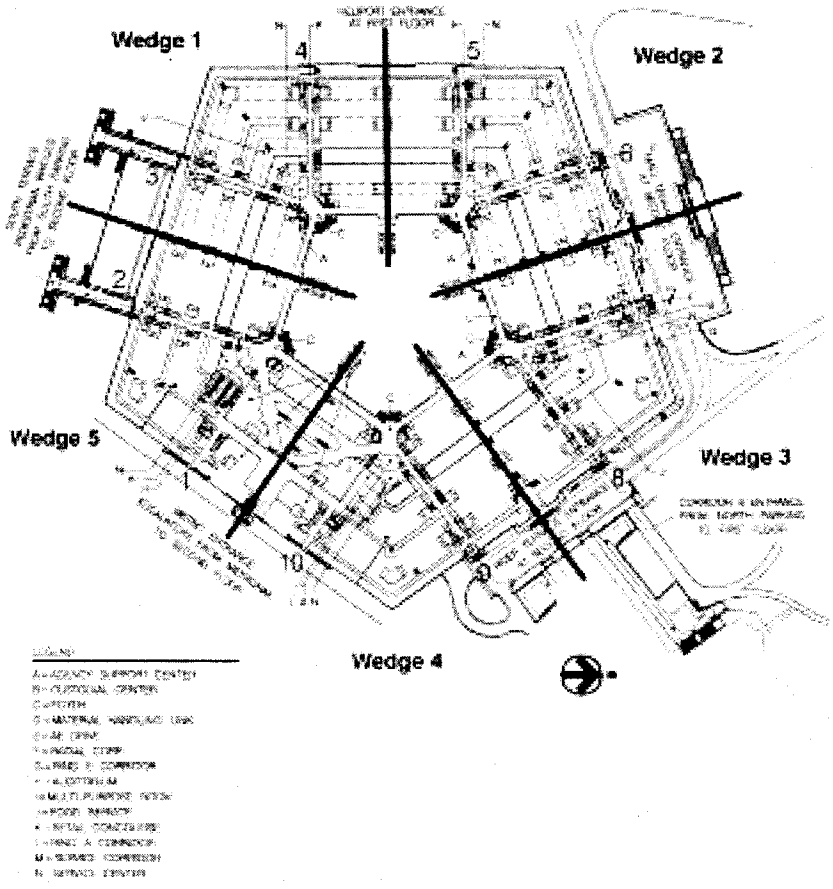



**Figure 6**
**Pentagon Building Master Plan—Second Floor Plan**

Incorporation of the improvement alternatives increases the building's efficiency and improves the internal organization of space and building systems. Key changes planned include:

- Modification of internal circulation patterns to allow better vertical integration of space. This will be accomplished through the introduction of passenger elevator services and additional escalators to replace current ramps and to augment stairwells.
- Re-orientation of public entrances to channel visitors to the second floor. This will isolate sensitive areas; improve internal security; and separate personnel from mechanized traffic (e.g. whenever possible, mechanized traffic, with the exception of ambulances, will be constrained to the first floor).
- Addition of first floor service corridors and service elevators that could reduce the intermingling of mechanized delivery vehicles from pedestrians in the main corridors. This increases the safety of building occupants and reduces damage to corridor floors and walls.
- Creation of flexible, expandable, mechanical, electrical, plumbing, and communications cabling systems to ensure that future demands for maintenance and new services can be met economically and efficiently.

Because the renovation includes asbestos removal and associated containment procedures, it will be necessary to completely vacate the areas under renovation while work is in progress. Temporary "swing space" must be obtained to house displaced activities. Activities displaced from or within the Pentagon will typically use swing space on a temporary basis until their renovated space is completed.

Renovation of the Pentagon involves the coordinated implementation of multiple related actions that will collectively address the building's condition. Since a major renovation has never been undertaken at the Pentagon, this project involves extensive demolition and reconstruction. Significant construction activities include replacement and upgrade of mechanical, electrical, plumbing, and all building support systems to modern standards. Interior spaces are being re-configured, and vertical transportation systems will be installed. New space will be added, both through the conversion of ramp and corridor space to office and support space, and through the expansion of the Mezzanine areas.

The Pentagon Renovation will enable organizations to be aligned vertically, and to be served with elevators and escalators, significantly improving circulation efficiency. Although the Commandant of the Marine Corps has already been accommodated with space in the Pentagon, the remainder of the Marine Corps Headquarters staff will be relocated to the Pentagon over the duration of the renovation program. The Department of the Navy will provide the location of the Marine Corps within its allocation of space in the Pentagon.

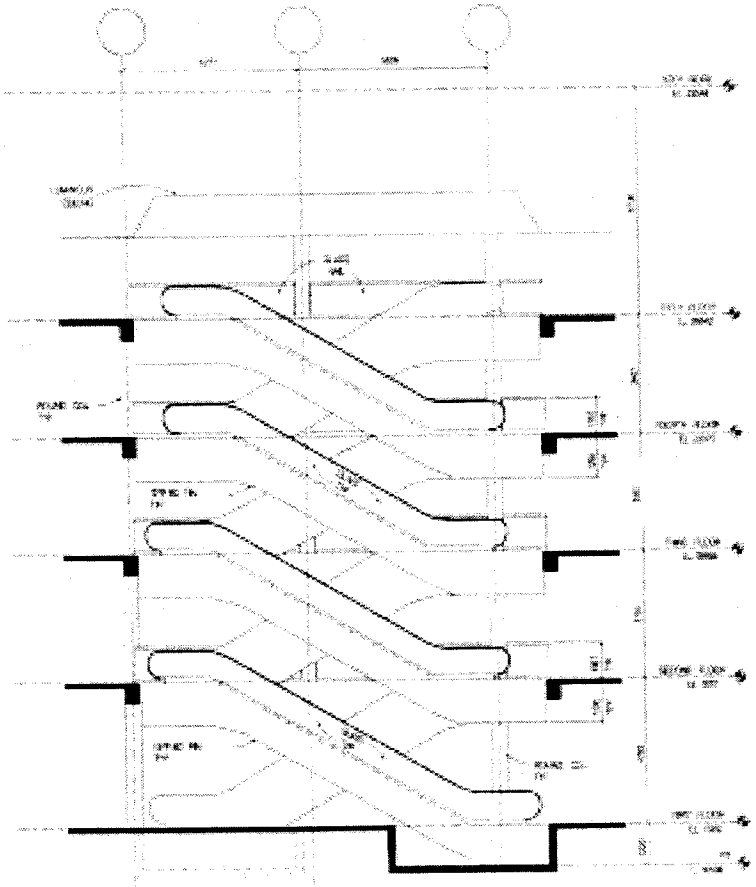


**Figure 7**
**Section Through Proposed Typical Foyer at Apex with New Escalators**

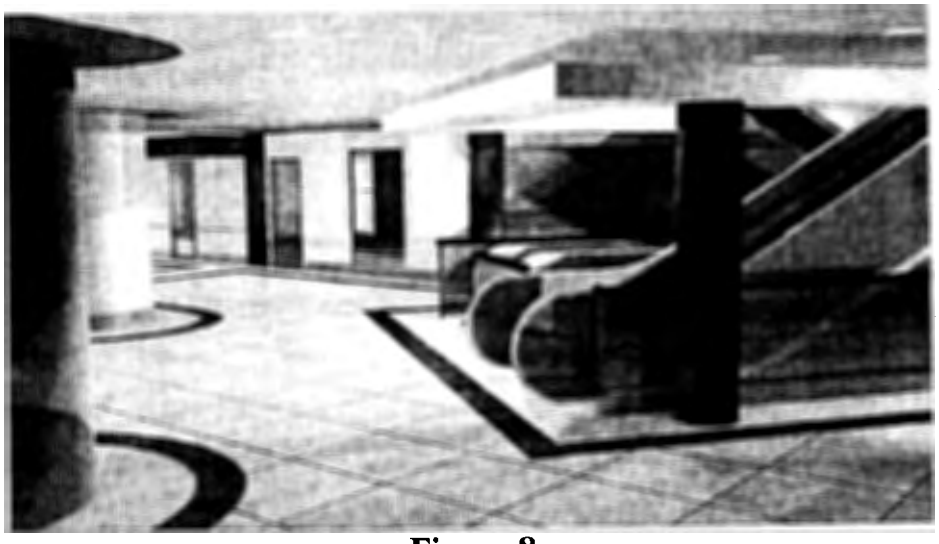


**Figure 8**
**Proposed Apex Foyer**

***Environmental/ Energy Improvements***

The Pentagon Renovation affords the opportunity to increase energy efficiency and reduce waste. Selected recommendations made during the Energy Efficient, Environmentally Sensitive DoD Showcase Facility Session held in the first quarter FY 1995 are being implemented. Through the Renovation, the Pentagon will obtain a healthy indoor environment by increasing air changes per hour and removing asbestos. The renovation of the Pentagon includes improving energy efficiency through:

- Double-glazed windows.
- Economizer cycles for heating, ventilating, and air condition equipment.
- Energy efficient mechanical and electrical equipment.
- Reduced overall lighting load and increased use of task lighting.
- Automated energy management systems.
- Increased use of insulation

The Pentagon Reservation will continue to comply with environmental regulations by testing soils and ground water for contamination, and by using appropriate soil erosion and sediment management. The Pentagon is now complying with the Clean Air Act by reduced emissions from the Heating & Refrigeration Plant and the Classified Waste Incinerator Plant, projects already completed during earlier phases of the renovation.

In summary, the renovated Pentagon will benefit from quality indoor air, a new, high-efficiency Heating & Refrigeration Plant, automated energy systems management, energy-efficient lighting, and an improved thermal building envelope.

***Renovation Components***

The Pentagon Renovation Program includes the following distinct components:

- Basement and Mezzanine Renovation.
- Above-grade building renovations of Wedges #1-#5.

The overall renovation of the Basement/Mezzanine is being accomplished in multiple increments, and began with the area centered around Corridor 8.

The deflected Basement floor slabs were demolished, the floor level of the basement slabs were lowered, the slabs replaced, and foundations have been modified for the revised structural conditions.

The Mezzanine space in the two-story-high Basement areas is being extended, and its completion will provide about 278,000 sq. ft. (25,826

$m^2$) of additional occupiable space.

The Army Motor Pool, previously located in the Mezzanine, has been permanently relocated off-site. Correction of severe structural deficiencies has been completed and this former motor pool area is being converted into the DiLorenzo TRICARE Health Clinic which consolidates the separate Army, Civilian, and Air Force clinics.

A construction contract was awarded on February 16, 1994, for the Basement Segment 1 Temporary Mechanical, Electrical, and Plumbing. This work has been completed.

A construction contract was awarded on September 30, 1994, for the Basement Segment 1. The construction of the core and shell has been completed. Tenant fit-out is well underway, with several tenants already relocated. Final tenant fit-out work is scheduled for completion in FY 1999. The construction of the remainder of the basement will proceed in multiple increments which started in FY 1998.

To eliminate the need for the undesirable existing sewage ejectors in the basement, a construction contract was awarded September 29, 1995, for the Sewage Lift Station. This work was completed in January 1997.

*Above-grade Renovation of Wedges #1 - #5*

The construction of the above-grade renovation of Wedges #1-#5 will be completed in five sequential, separate wedges based on isolation of building systems and minimum disruption to tenants.

To provide the environment and physical infrastructure to support the mission of our national defense establishment headquarters all antiquated internal building systems will be replaced and brought up to current building, fire protection, and life safety codes, and accessibility standards. The renovation work involves the demolition and removal of all partitions; ceilings; floor finishes; and mechanical, electrical, plumbing, fire protection and communications systems. Where sound, the basic structural system, as well as the stairwells and their enclosing walls will remain.

This renovation work will facilitate the reconfiguration of space to provide modern, flexible, office space, readily adaptable to accommodate future organizational changes as well as technological advances in office equipment and work space environments. This configuration will also allow for the consolidation of organizations which are now fragmented.

Support facilities, including food service, communications, control centers, a library, recreational areas and retail stores will be renovated as the wedges in which they are located are scheduled for construction.

New primary and secondary electrical service and distribution systems, including a cable management system, will be installed. Emergency lighting,

**Figure 9**
**Proposed Renovated Tenant Space**

fire protection, and uninterruptible power supplies and panels will be installed as well.

The heating, ventilating, and air conditioning systems will be replaced. A dual feed loop system will be installed to provide chilled water service 24 hours daily for off-hours operations (thereby eliminating numerous package systems within the building). Toilet rooms will be relocated and brought up to current standards (including requirements for the disabled). All new waste and supply piping will be installed.

The building will be equipped throughout with a sprinkler system and a reconfigured fire alarm system.

The completion of the South Terrace Pedestrian Bridges will provide improved public access at the second floor level. Internal circulation will be enhanced by the installation of escalators and personnel elevators. In addition, these changes will improve security by isolating sensitive spaces on or below the first floor.

An independent service corridor network serving the vertical transportation elements will be constructed on the first floor to improve efficiency of distribution. The massive floor area of the Pentagon necessitates initial support distribution via motorized carts at this floor level. Decentralization of support activities will allow for reduced use of all vehicles other than emergency medical vehicles above the first floor. Existing freight elevators will be replaced, and new service elevators will be installed at additional decentralized locations, along with trash removal facilities.

To gain additional occupiable space, excessively wide corridors will be

narrowed and all ramps will be removed and replaced with structural floors. Auditorium and conference spaces will be expanded. Roof, roof gutters, down spouts, and flashing will be repaired/replaced where deterioration is encountered in the renovation work. Existing steel casement and double-hung windows will be replaced with new, energy-efficient and appropriately secure units in accordance with historical agency requirements. Modifications will be made to outer perimeter monumental windows to improve weather-tightness and security. All exterior masonry and concrete finishes and waterproofing elements will be restored to sound condition.

The intersections of radial corridors at the innermost ring corridor (Ring A) are not efficiently used at present. These areas will be renovated to provide vertical transportation for improved passage throughout the building. The introduction of vertical transportation will facilitate the consolidation and assignment of organizations vertically throughout the building. The current excess areas at these intersections will be developed to provide conference and training facilities, briefing centers, snack bars, and other multi-purpose support functions. The previous and following renderings and drawings illustrate the planned development of the above-grade renovations:

- Pentagon Building Master Plan Second Floor Plan. (Figure 6)
- Plan of Proposed Typical Foyer at Apex with New Elevators and Escalators. (Figure 11)
- Section of Proposed Typical Foyer at Apex with New Escalators. (Figure 7)
- Proposed Apex Foyer. (Figure 8)
- Proposed South Terrace Pedestrian Bridges. (Figure 10)

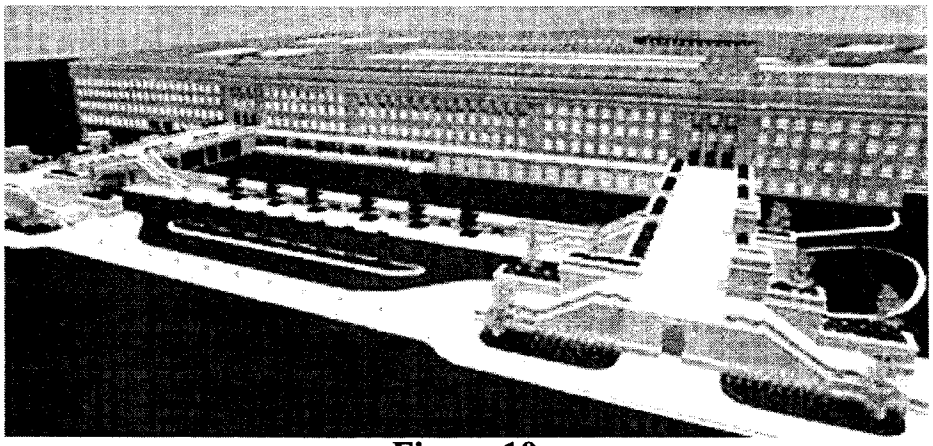


**Figure 10**
**Proposed South Terrace Pedestrian Bridges**
**(Currently Under Construction)**

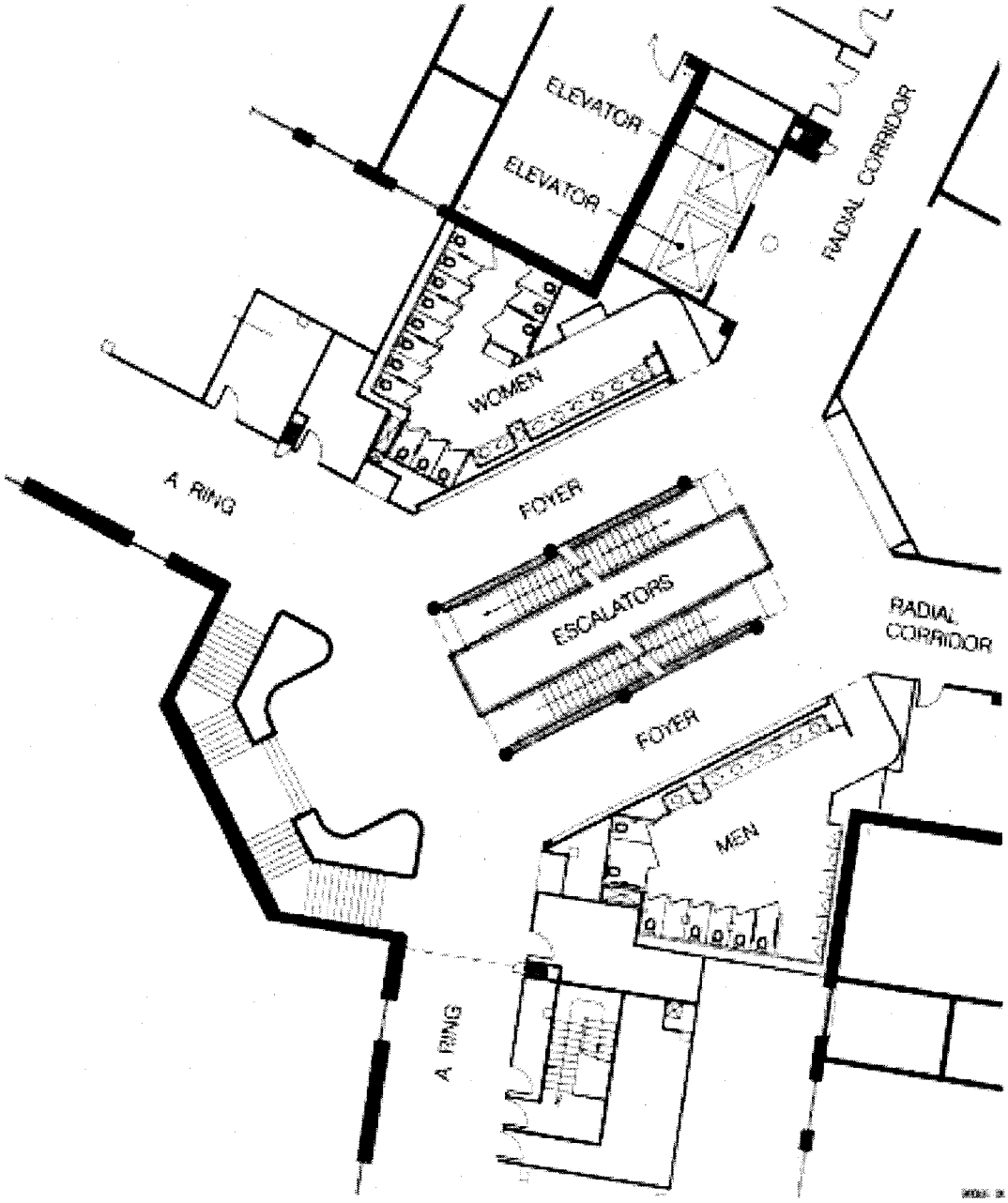



**Figure 11**
**Plan of Proposed Typical Foyer at Apex with New Escalators and Elevators**

***Information Management & Telecommunications***

Separate but related to the Pentagon Renovation Program will be an update of building information management and telecommunications. The basic information system infrastructure in the Pentagon was installed long before the advent of personal computers, facsimile machines, video teleconferencing, and digital telephone service, and has evolved without design or plan. As requirements emerged, facilities and systems were added with little or no regard to existing capabilities or long term requirements. The individual military departments and agencies engineered and installed equipment and cables to meet their specific requirements.

Many of the existing information systems in the Pentagon are now outdated, non-interoperable, duplicative, inefficient and expensive to operate and maintain. Systems and cables no longer needed have been abandoned in place. The Pentagon is seriously deficient in the information technology infrastructure necessary to function efficiently and to comply with maximum effectiveness.

The IM&T project will provide:

- Modern telecommunications and information management service throughout the Pentagon and access to global networks. Backbone communications will support voice, video, data, and other user requirements, such as Local Area Networks.
- Define, procure, integrate, and test hardware and software items required to meet functional requirements of the Network Systems Management Center (NSMC).
- Modernize the telecommunications infrastructure and consolidate the functions and responsibilities of the seven Technical Control Facilities in the Pentagon.
- Relocate the Defense Information Systems Agency (DISA) Joint Staff Support Center (JSSC) Command and Control (C2) Automated Data Processing (ADP) centers from existing facilities into one new facility located in the renovated Pentagon space.

Paralleling the C2 ADP efforts, the Business ADP Center will provide a modernized data processing facility for the Army and Air Force Systems. The ADP Center will be used primarily to house mainframe processors and their peripheral equipment, including storage devices and network processors. These systems are currently operating in multiple centers within the Pentagon.

In addition, IM&T will:

- Provide the renovated Pentagon with voice communications currently provided by multiple Command and Control, Tactical, and Administrative telephone switched located in multiple facilities.
- Refurbish and install the primary red and black Command and Control (C2) switches.
- Install the Main Distribution Frame in the General Purpose Switch Room (GPSR) and reduce the total switch architecture.
- Provide infrastructure and replicate user capabilities at temporary Swing Space locations as approved by WHS to locations both internal and external to the Pentagon.

## *Other Related Projects*

A number of initiatives ongoing at the Pentagon Reservation are separate from, but related to, the Renovation Program. The related initiatives which coincide with the Renovation effort reflect the fact that the Pentagon remains the fully operational headquarters of our Military Establishments while it is undergoing renovation. Thus, a number of other facilities projects are being closely coordinated with, and sometimes performed by, the Renovation Office.

*Heating & Refrigeration Plant*

Replacement of the Heating & Refrigeration Plant (H&RP) began the initial work on the Pentagon Reservation because the original plant was nearly inoperative, relying on rented boilers and chillers to provide the necessary services. The original H&RP, which served the Pentagon Reservation for over 55 years, was so deteriorated that it was more cost-effective to replace it than to renovate the existing facility and equipment. The new facility has been sized to provide steam and chilled water to the Pentagon and to Federal Building #2 (FB2) and steam only to Henderson Hall. Services are provided through new underground utilities distribution systems in a new utilities tunnel from the H&RP to FB2.The new H&RP is now completed and is now fully operational.

The facility has approximately 106,200 SF (9,900 m5) of floor area. The primary elements of the plant are six multi-fuel boilers (oil/gas), ten chillers, two 250,000 gallon (947,500 liters) fuel oil storage tanks, and office and maintenance areas. The Plant can provide 200,000 pounds per hour (25.25 kilograms per second) of steam heating capacity and 37,500 tons (131,900 kw) of cooling.

**Figure 12**
**Aerial View of New Heating & Refrigeration Plant**

The new facility has been built adjacent to the former Heating & Refrigeration Plant. Demolition of the original facility was completed in February 1998.

*Remote Delivery Facility*

In response to a comprehensive vulnerability assessment of the Pentagon, the Department of Defense has programmed for the construction of a Remote Delivery Facility (RDF) to move the shipping and receiving activities from the main Pentagon building to a secure, off-site screening facility at the Mall parking area of the Pentagon Reservation. This initiative is being done via a Design-Build contract. This is part of a systemized force protection program designed to protect sensitive Defense facilities. This security initiative eliminates the intrusion of over 200 daily delivery trucks that would otherwise breech the Pentagon security perimeter. Some industrial maintenance type activities are also being moved from the Pentagon building to the RDF. This project will integrate some force protection systems and facilities similar to those in place at the White House, U.S. Capitol, and the State Department. Congress provided design funding of $3 million for this fast-track security project as part of the FY 1998 Omnibus reprogramming. By letter of July 16, 1998, the Deputy Secretary of Defense outlined for Congress the Department of Defense's plan for completion of this initiative. The Pentagon Renovation Program Office has been directed to execute this requirement in coordination with the on-going Pentagon Renovation Program. This project is scheduled to begin in April 1999, with a final completion by December 2000.

*Site*

Site improvements include the continued operation, repair, maintenance, restoration and replacement or upgrading of landscaping, roads, walks, pavement, high pressure water mains, bridges, storm drain repair and relocation, transportation facilities, fences, modifications to meet current security and safety requirements, as well as realignment and improvement of vehicular traffic patterns.

*Swing Space*

Renovation of each wedge of the Pentagon requires the relocation of over 5,000 employees. As of January 1999, 5000 tenants in Wedge 1 have been relocated to external or internal swing space. "Swing Space" refers to office space outside the Pentagon that tenants will occupy during renovation, or temporary office space configured within the Pentagon for short term use.

Swing Space accommodations are critical to keeping the renovation program on schedule. Presently, three office buildings in Arlington, Virginia, have been leased to accommodate 4,120 Army, Navy, Air Force and OSD personnel for the duration of the renovation. Two office towers

in Rosslyn house 2,390 employees while an office tower in Crystal City is home to another 1,730 employees. Other employees will be relocated elsewhere on the Pentagon Reservation. All swing space facilities must maintain full connectivity to the Pentagon through classified and unclassified LANs, phone lines and electronic mail. All three buildings have been renovated for DoD tenants, and feature modern offices with professional workstations, state-of-the-art voice/data communication systems and sophisticated security systems. Communications with the Pentagon will be maintained.

# III. PROGRAM STATUS

**Primary Activities**
**Activity Status—Projects Completed**
**Activity Status—Projects Under Construction**
**Projects In Design**

# III Program Status

The program projects an overall completion of the renovation in FY 2010. The primary activities in the program include:

***Primary Activities***

- Development of Design Guidelines and Criteria for the overall project—***completed.*** (May be updated as needed.)
- Development of Information Management & Telecommunications (IM&T) Architecture—***completed.***
- Design and Construction of Basement/Mezzanine Segment 1—***underway.***
- Design and Construction of Basement/Mezzanine Segment 2—***underway.***
- Design and Construction of Basement/Mezzanine Segment 3—***underway.***
- Design and Construction of Wedge #1—***underway.***
- Design and Construction of Wedge #2—***underway.***
- Design and Construction of Wedge #3.
- Design and Construction of Wedge #4.
- Design and Construction of Wedge #5.

***Activity Status Projects Completed***

*Basement/Mezzanine*

- River Terrace Renovation—***completed.***
- Handicap Access Ramps and Handicap Access Lift—***completed.***
- Mug Handle Infill Project—***completed.***
- Corridor 8 Entrance Renovation—***completed.***
- Segment 2.A.2 Demolition and Abatement—***completed.***
- Construction Entrance for Segment 2.A.2—***completed.***
- Segment 2.A.2 Core & Shell—***completed.***
- Initial Tenant move into Basement Segment 1—***completed.***

*Wedge #1*

- Barrier Walls and Temporary Mechanical, Electrical and Plumbing Systems–***completed.***
- Vacating 5000 tenants—***completed.***
- Award of Core & Shell construction project—***completed.***

*Other Related Projects*

- Heating & Refrigeration Plant–***completed.***
- Center Courtyard Utilities Tunnel–***completed.***
- Classified Waste Incinerator Plant–***completed.***
- Sewage Lift Station–***completed.***
- New Site Security Checkpoints–***completed.***
- Ramp and Bridge from North Parking to Corridor 8 Entrance–***completed.***
- River Terrace Vehicular Bridge–***completed.***
- Build-out and occupancy of "Swing Spaces"–***completed.***

## *Activity Status Projects Under Construction*

*Basement/Mezzanine*

- Remaining tenant move into Basment Segment 1.
- DiLorenzo TRICARE Health Clinic.

*Wedge #1*

- South Terrace Pedestrian Bridges.
- Abatement.
- Core & Shell.

## *IM&T Renovation Projects*

*Above-ground Telecommunications*

- Above-ground Telecommunications Backbone awarded on 19 August 1998.
- Final Above-ground Telecommunications Backbone Architecture approved in January 1999.

*Basement/Mezzanine*

- Total Switch Architecture Primary command and Control (C2) Switch Room in the renovated space was properly accredited as a Sensitive Compartmented Information Facility (SCIF) by the Defense Intelligence Agency.
- Air Force Operations Group Facility fully operational and accredited.
- Began installation of equipment and upgrades for Business ADP #1.
- Installation of Basement/Mezzanine Segment 1 Backbone—***underway***.
- Design and installation of Segments 2 & 3 Backbone—***underway.***

*Wedge #1*

- Swing Space design, build-out, and move efforts—***completed.***

## *Projects in Design*

*Basement*

- Segments 2 & 3 Core & Shell.

*Remote Delivery Facility*

- Core & Shell

*Wedge #1*

- Tenant Fit-out.

*Other Related Projects*

- New Intake Piping and Structures for Heating & Refrigeration Plant (H&RP).

# IV. Fiscal Year 1999 Program

## Activities

# IV Fiscal Year 1999 Program

The FY 1999 program includes the following activities:

***Activities***

*Basement/Mezzanine Renovation*

- Complete construction of DiLorenzo TRICARE Health Clinic.
- Complete design of Segments 2 & 3 Core & Shell.
- Complete design of Tenant Fit-Out of Segments 2 & 3.
- Start construction of Segments 2 and 3.
- Cut-over of Business ADP #1 Facility.
- Cut-over of Network and Systems Management Center (NSMC).
- Cut-over of Pentagon Consolidated Technical Control Facility (PCTCF).
- Complete IM&T installation in Segment 1 & 2.

*Wedge #1 Renovation*

- Complete construction of South Terrace Pedestrian Bridge at Corridor 2.
- Begin construction of South Terrace Pedestrian Bridge at Corridor 3.
- Begin design of Tenant Fit-Out.
- Complete demolition and abatement activities.
- Begin installation of IM&T Backbone.
- Begin Core & Shell construction.

*Other Related Activities*

- Continue with Swing Space Moves.
- Complete design of H&RP Intake and Outfall Piping and Structures.
- Store historical displays and artifacts.

# V. Work Accomplished

## Completed Projects

**Basement/Mezzanine Segment 1**
**Heating & Refrigeration Plant**
**Center Courtyard Utilities Tunnel**
**Classified Waste Incinerator Plant**
**Sewage Lift Station**
**River Terrace Renovation**
**River Terrace Handicapped Access**
**River Terrace Vehicle Bridge**
**Mug Handle Infill**
**Corridor 8 Entrance Renovation**
**Wedge #1 Temporary Construction**
**Swing Spaces**

## Projects Under Construction

**2.A.2 Core & Shell**
**2.A.2 Tenant Fit-out**
**DiLorenzo TRICARE Health Clinic**
**Wedge #1Demolition & Abatement**
**South Terrace Pedestrian Bridges**

# Completed Projects

***Basement/ Mezzanine Segment 1***

The renovation of the Basement and Mezzanine Segment #1, under construction since March 1994, is now complete with the exception of a few areas yet to be occupied. The photographs below are representative of the some of the newly constructed areas.

**Figure 13**
**Ribbon-cutting Ceremony for Air Force Council Room**

**Figure 14**
**Air Force Watch Area**

# Completed Projects

***Basement/ Mezzanine Segment 1***

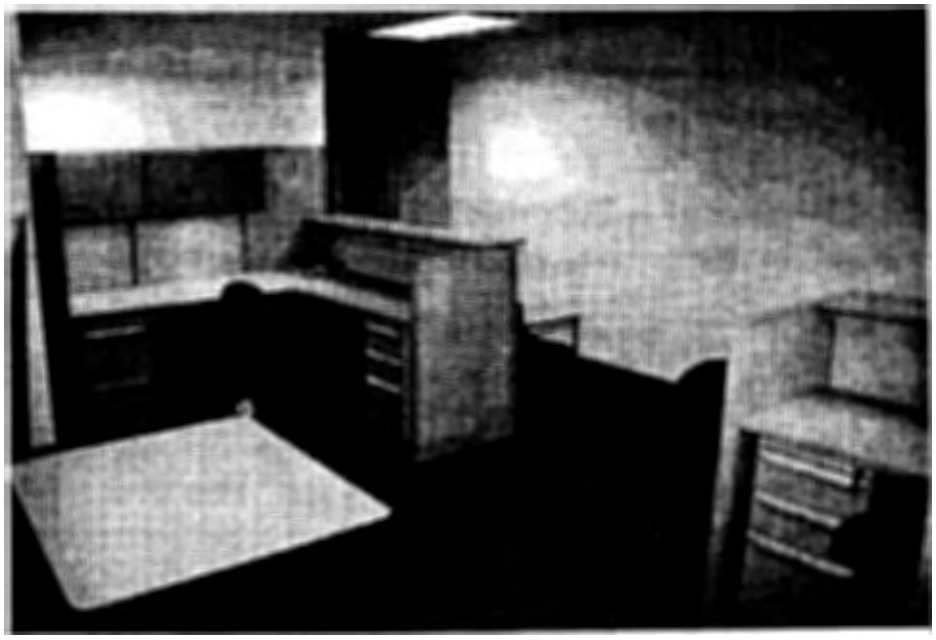


**Figure 15**
**New Modular Systems Furniture Adds Flexibility to Basement Office Space.**

**Figure 16**
**Lower Partition Walls Improve Air Flow and Light Dispersion**

***Basement/ Mezzanine Segment 1***

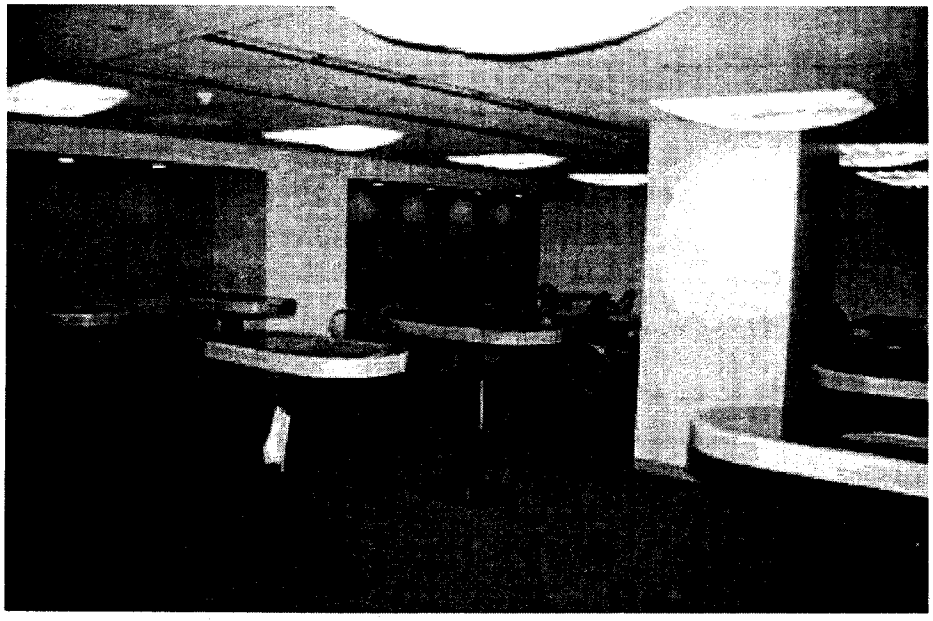


**Figure 17**
**Seating in the Basement's New 24-hour Snack Bar**

**Figure 18**
**Equipment Installation Is Complete in the Basement's New 24-hour Snack Bar**

# Completed Projects

***IM&T Basement/ Mezzanine Segment 1***

The Information Management and Telecommunications (IM&T) efforts in Basement/Mezzanine Segment 1 have been underway since FY 1995.

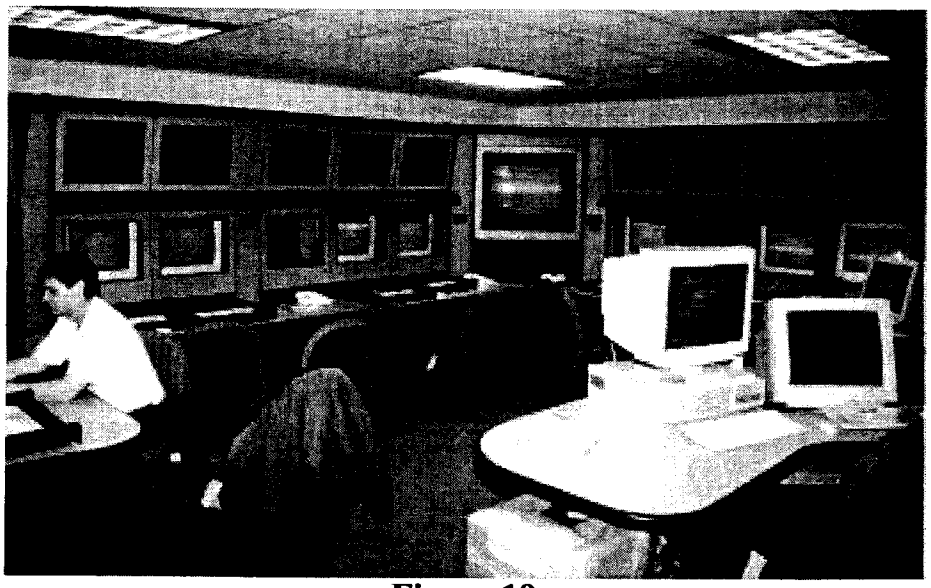


**Figure 19**
**Control Room in the New Network Systems Management Center**
**(Construction Complete, IM&T Installation Underway)**

**Figure 20**
**Technicians Test New Equipment in the Network Systems Management Center**

***IM&T Basement/ Mezzanine Segment 1***

**Figure 21**
**The Main Distribution Frame in the General Purpose Switch Room**
**(Construction Complete, IM&T Installation Underway)**

**Figure 22**
**Information Management and Telecommunications Personnel Review Fiber Installation Plans**
**(Construction Complete, IM&T Installation Underway)**

# Completed Projects

***IM&T Basement/ Mezzanine Segment 1***

**Figure 23**
**The New Technical Control Facility Will Be Home to All Pentagon Circuits**
**(Construction Complete, IM&T Installation Underway)**

**Figure 24**
**New Equipment in the Technical Control Facility**
**(Construction Complete, IM&T Installation Underway)**

***Heating & Refrigeration Plant***

The construction contract for the Heating & Refrigeration Plant (H&RP) was awarded on December 30, 1992, and construction began in February 1993. Construction is now complete and the plant is operational. The old H&RP building has been demolished.

**Figure 25**
**New Heating and Refrigeration Plant**

**Figure 26**
**New Heating and Refrigeration Plant (Chillers)**

# Completed Projects

***Center Courtyard Utilities Tunnel***

The Center Courtyard Utilities Tunnel provides utility lines that are efficient, reliable and easily maintained. The new utility lines are designed as a loop system that can continue to service other portions of the building while specific areas are shut down for localized maintenance. The roof of the tunnel serves as the access driveway for service and emergency vehicles in the Center Courtyard. Contract for design and construction of the Center Courtyard Utility Tunnel was awarded on February 25, 1994, and construction was completed in the Summer of 1997. The Center Courtyard utilities are not yet hooked up to the Wedges. Under the current plan, they will be hooked up on a Wedge by Wedge basis.

**Figure 27**
**Center Courtyard Utilities Tunnel**

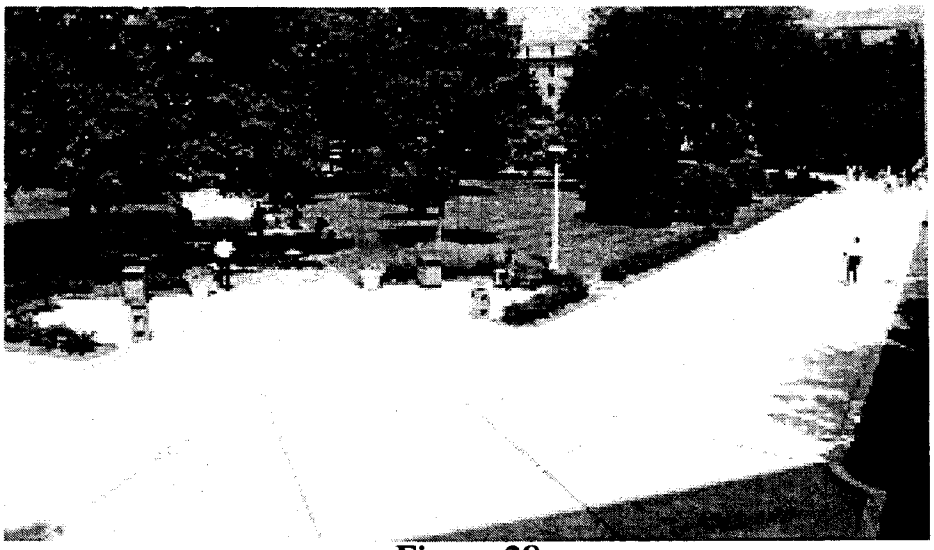


**Figure 28**
**Access Driveways over Tunnel Restored to the Original Condition**

***Classified Waste Incinerator Plant***

Renovation of the Classified Waste Incinerator Plant, located near the Heating & Refrigeration Plant, included a refurbishment of the existing plant and the replacement of the two existing incinerators. This work was completed while maintaining continuous operations. The new incinerators increase the classified waste burning capacity from 6,000 pounds per hour to 8,000 pounds per hour. The new incinerators are fully automated and their emissions are well under requirements set by the State of Virginia and the U.S. Environmental Protection Agency. The project was completed in 1997.

Figure 29
**Classified Waste Incinerator Plant**

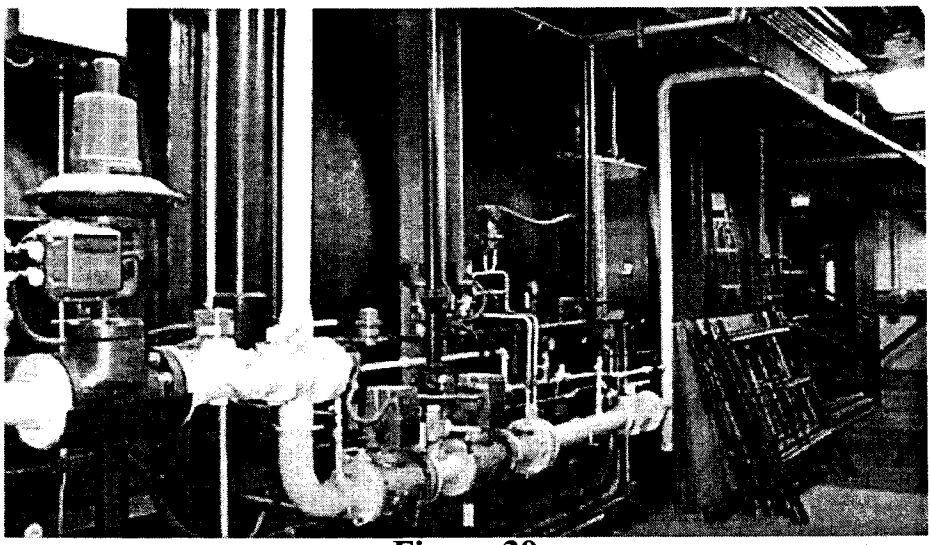


**Figure 30**
**Classified Waste Incinerator Plant**

# Completed Projects

***Sewage Lift Station***

The new Sewage Lift Station, which replaces the old Sewage Lift Station and the internal sewage ejectors in the Pentagon, is located along the walkway adjoining the North Parking area. The new Sewage Lift Station utilizes gravity flow for the waste from the Pentagon Basement, and the Pentagon Renovation and Planning Office. As the gravity lines carry sewage to the new lift station, a force main pumps sewage away from the new station to the Arlington Lift Station located in Crystal City. The new Sewage Lift Station is connected to the old sewage lift station which remains in place as a backup facility.

**Figure 31**
**Interior View of Sewage Lift Station**

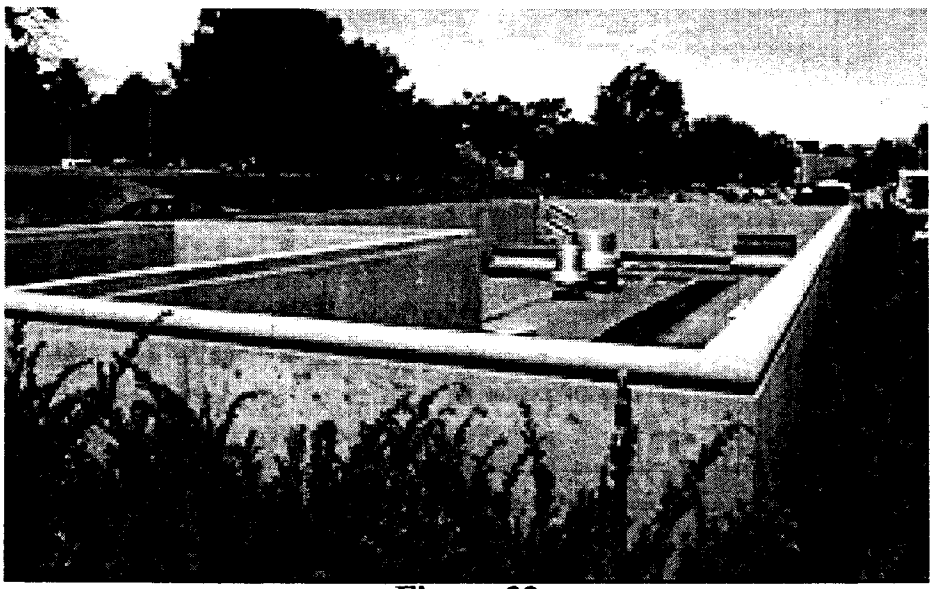


**Figure 32**
**Sewage Lift Station with Landscaping**

***River Terrace Renovation***

The renovation of the River Terrace corrected water proofing problems and repaired the time-ravaged steps, walkways, retaining walls, and planting areas. Waterproofing of this area was critical since the area directly below the River Terrace will be home to the DiLorenzo TRICARE Health Clinic and other occupied spaces under construction. The River Terrace renovations also included modifications to bring the area into compliance with the requirements of the Americans with Disabilities Act within the guidelines of the National Register of Historic Places.

**Figure 33**
**River Terrace Steps, Walkway, and Planters**

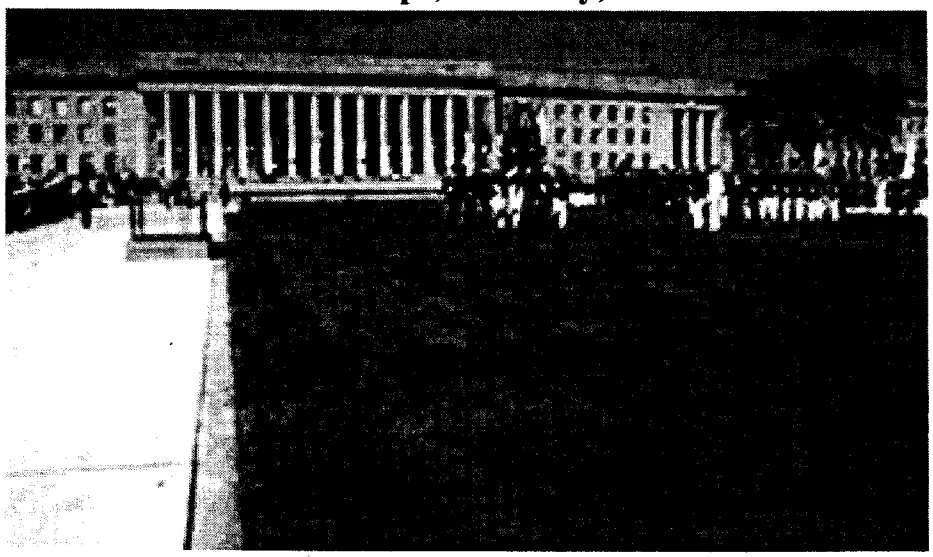


**Figure 34**
**Parade Grounds and Walkways**

# Completed Projects

***River Terrace Renovation Handicapped Access***

The renovation program must meet the congressionally mandated requirements of the Americans with Disabilities Act. Examples of work accomplished in compliance with these requirements include the handicapped access ramps on the River Terrace and the handicapped access lift at the River Terrace entrance.

**Figure 35**
**Handicapped Access Lift**

**Figure 36**
**Handicapped Access Ramp**

***River Terrace Renovation Vehicle Bridge***

Tests conducted on the River Terrace Vehicular Bridge over Route 110 revealed serious structural problems that required total replacement of the bridge. The construction contract was awarded on September 30, 1996, and construction was completed in October 1997.

**Figure 37**
**New River Terrace Vehicular Bridge**

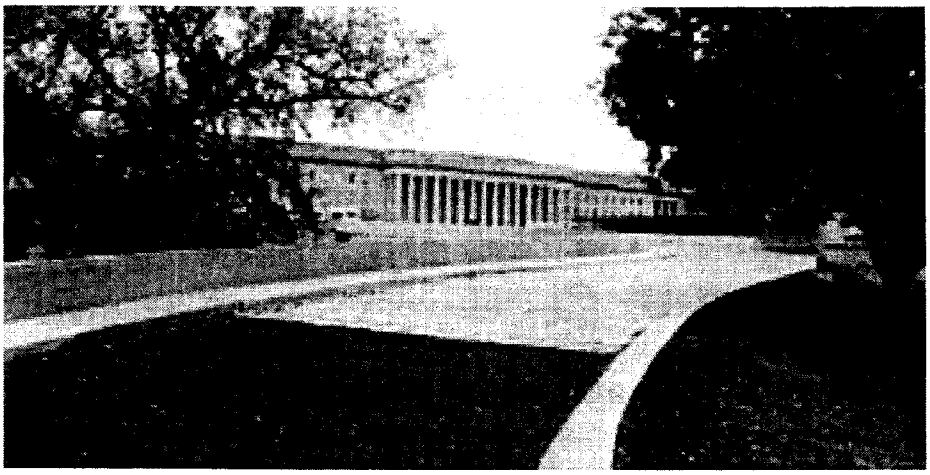


**Figure 38**
**Restored River Terrace Driveway**

# Completed Projects

***Mug Handle Infill***

The Mug Handle Infill Core & Shell project included excavation, pile foundations, and new slabs, for the space between the southern edge of the River Terrace and the curved entry to the former motor pool (now the DiLorenzo TRICARE Health Clinic entrance). The construction contract was awarded on October 15, 1997 was completed in FY 1998. The tenant fit-out, IM&T, and furniture work is to be completed in FY 1999.

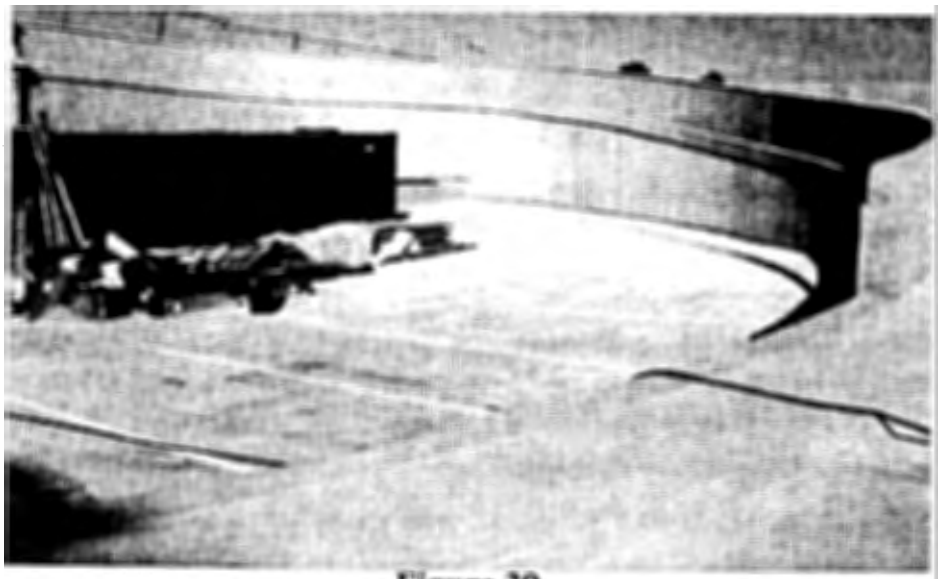


**Figure 39**
**Exterior View of Mug Handle In-fill**

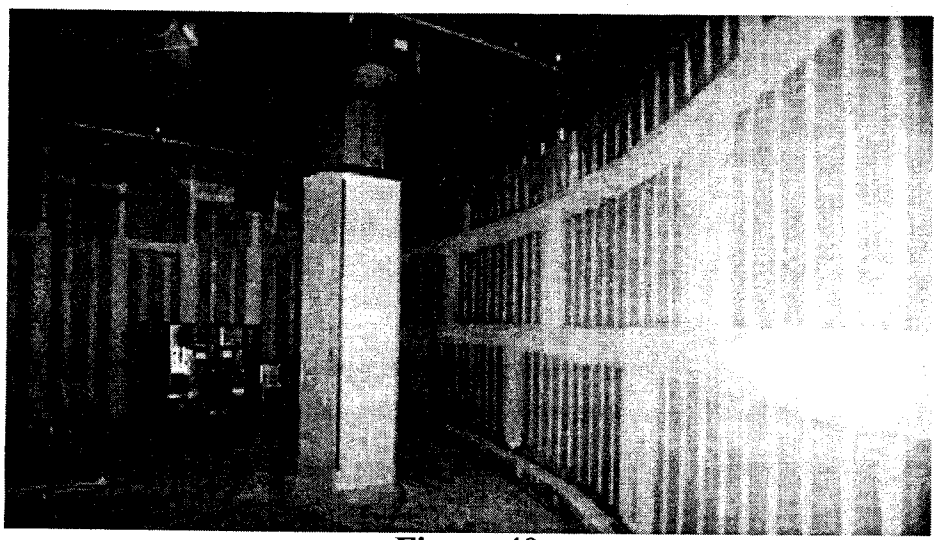


**Figure 40**
**View of Interior Mug Handle In-fill**
**(Construction Core & Shell Complete, Tenant Fit-Out Underway)**

*Corridor 8 Entrance Renovation*

The Corridor 8 Entrance renovation upgrades the entry security and handicapped access at one of the most heavily used entrances in the Pentagon. Renovation of this entrance was given priority over other entrances because it provides secure access to the DiLorenzo TRICARE Health Clinic under construction. The construction contract was awarded in July 1997, and was completed in FY 1998.

Figure 41
**New Turnstiles Enhance Security at Corridor 8**

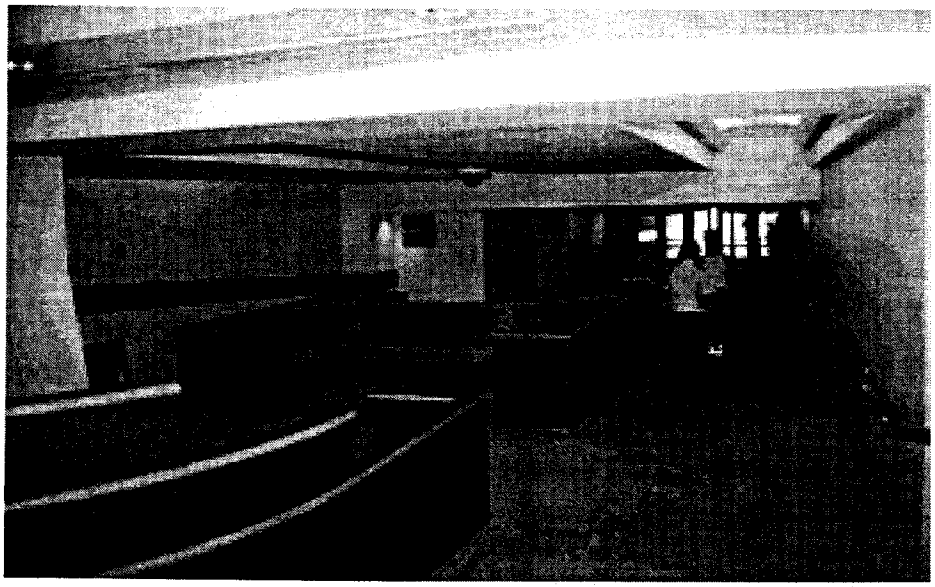


**Figure 42**
**New Corridor 8 Entrance**

# Completed Projects

***Wedge #1 Temporary Construction***

The Wedge #1 Temporary Construction contract included barrier walls to separate Wedge #1 construction from Wedges #2 and #5. It also included temporary adjustments to the mechanical, electrical, plumbing, fire alarm, communications, and security systems to facilitate future construction. The contract was awarded on July 17, 1997, and was completed in FY

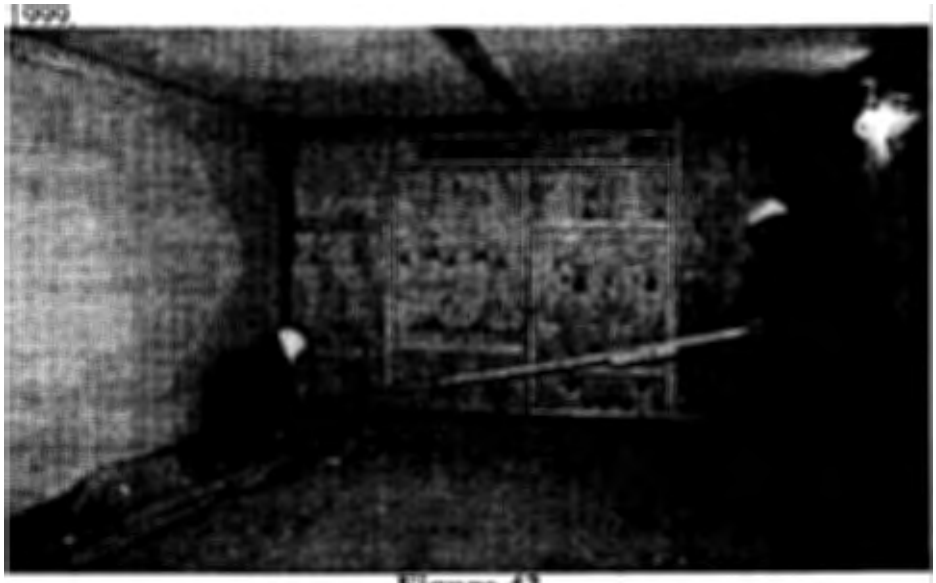


Figure 43

**Wedge 1—Barrier Walls Minimize Noise and Dust Infiltration to Occupied Areas**

Figure 44

**Construction of Barrier Wall**

***Swing Spaces***

To permit Wedge #1 to be renovated, approximately 6,000 personnel were relocated from Wedge #1 and elsewhere within the Pentagon. Of the approximately 6,000 personnel within Wedge #1, approximately 1,000 were relocated within the Pentagon and approximately 5,000 were relocated to swing space in off-site locations.

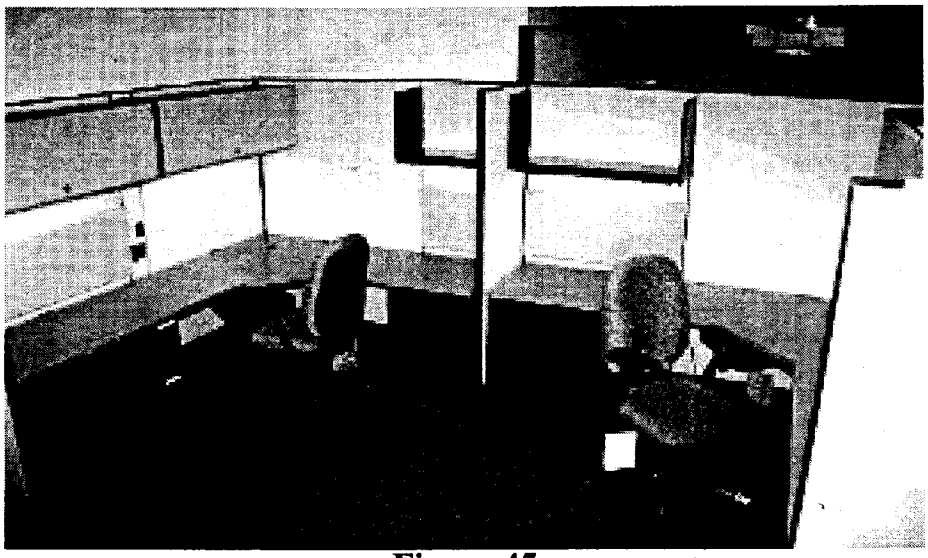


**Figure 45**
**Typical Swing Space Workstations**

**Figure 46**
**Typical Swing Space Work Area**

# Projects Under Construction

***Segment 2.A.2 Core & Shell***

The Segment 2.A.2 Core & Shell contract included lowering the Basement floor and constructing new foundations, slabs, utilities, mechanical, electrical and control systems, together with barrier walls. The contract was awarded on January 27, 1998, and was completed in FY 1999. The tenant fit-out, IM&T, and furniture work will be completed in FY 1999.

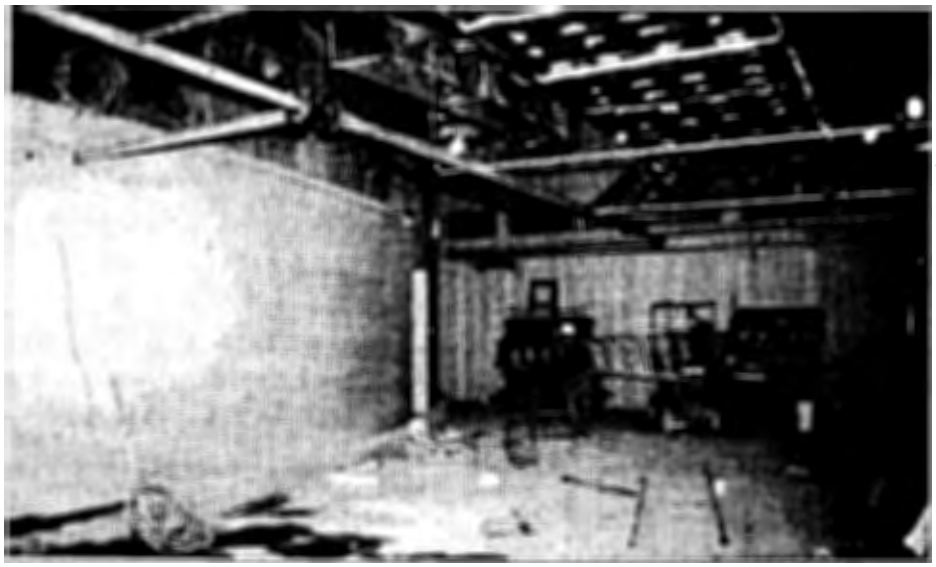


**Figure 47**
**2.A.2. Core & Shell Work**

**Figure 48**
**2.A.2. Core & Shell Work**

***Segment 2.A.2 Tenant Fit-Out***

Tenant partitions, ceilings and finishes, raised floor treatments, and installation of new mechanical, electrical and controls distribution are underway and scheduled for completion in FY 1999.

**Figure 49**
**2.A.2. Tenant Fit-Out Work**

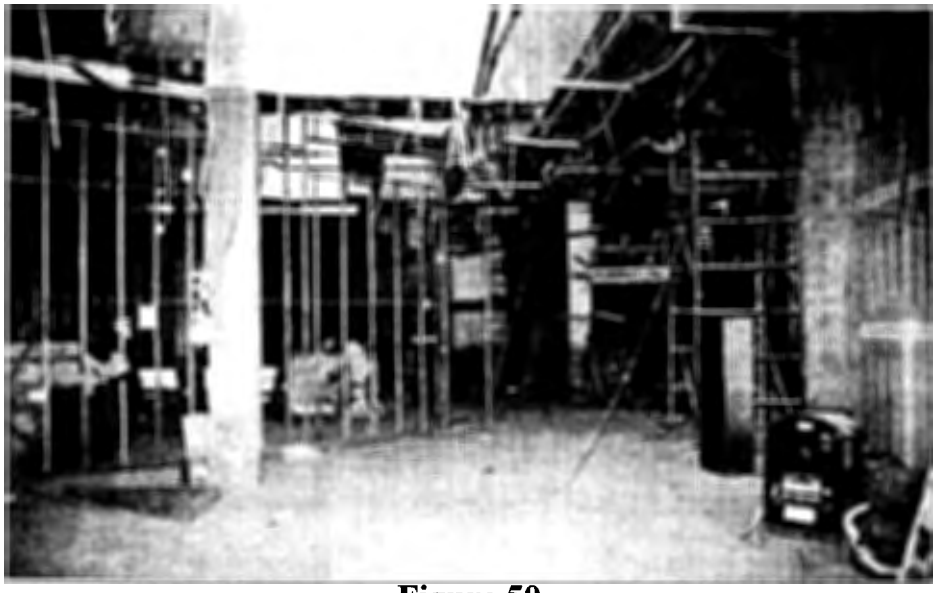


**Figure 50**
**2.A.2. Tenant Fit-Out Work**

# Projects Under Construction

***DiLorenzo TRICARE Health Clinic***

The DiLorenzo TRICARE Health Clinic is being constructed in the Basement. This new state-of-the-art health care facility will replace the Army, Air Force, and Civilian health clinics. This consolidation will eliminate redundancy of services, including pharmacies, radiology suites, file centers, and other ancillary support functions while saving valuable personnel time. The construction contract for the clinic was awarded on August 21, 1997, and is scheduled to be completed in FY 1999.

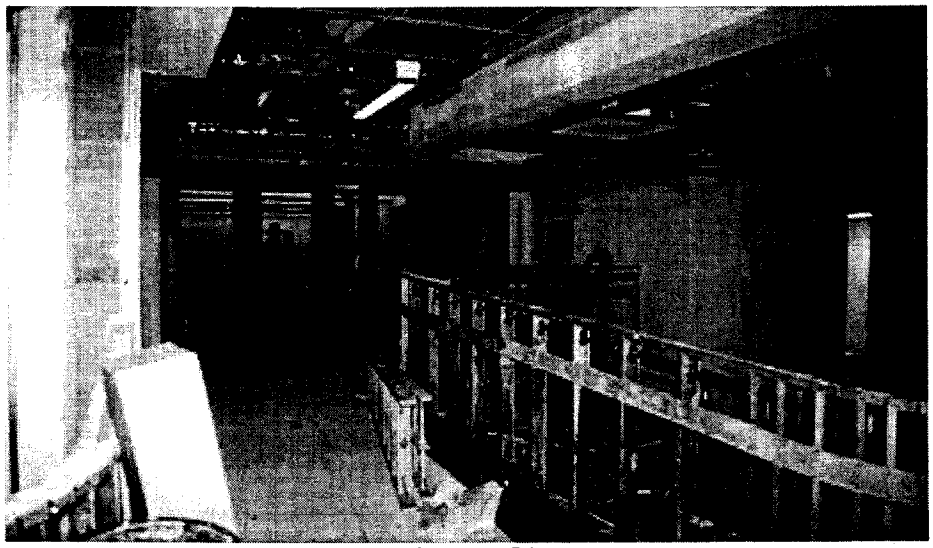


**Figure 51**
**View of DiLorenzo TRICARE Health Clinic Entrance from Corridor 8**

**Figure 52**
**Completed Guardrails Will Protect Walls from Gurneys**

***Wedge #1 Demolition & Abatement***

The contractor completed abatement and is nearing completion on the demolition of Fourth Floor Area A-2. Proper ventilation systems remain throughout both asbestos abatement and demolition.

**Figure 53**
**Wedge #1 "Wall Bashing" Ceremony Kicks-Off the Start of Demolition & Abatement**

**Figure 54**
**Wedge #1 Demolition and Abatement**

# Projects Under Construction

***Wedge #1 Demolition & Abatement***

**Figure 55**
**Trash Chutes Installed on A/E Drive for Top Four Floors**

**Figure 56**
**Wedge 1—An External Hoist Allows for the Safe Removal of Hazardous Materials**

***Wedge #1 Demolition & Abatement***

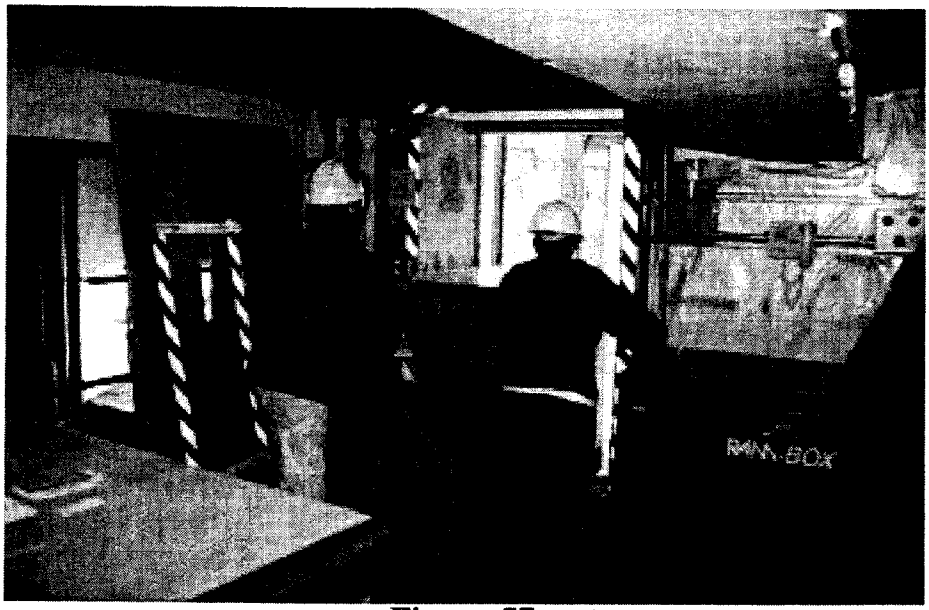


**Figure 57**
**Wedge 1—Employees Push Hazardous Materials Onto An External Hoist**

**Figure 58**
**Wedge 1—Air Filtration Units Ensure Safe Air Quality for Demolition Crews**

# Projects Under Construction

***Wedge #1 Demolition & Abatement***

**Figure 59**
**15 Million Pounds of Debris Will Be Removed From Each Wedge**

**Figure 60**
**Steel, Aluminum and Other Recyclable Materials Are Separated In Piles**

***Wedge #1 Demolition & Abatement***

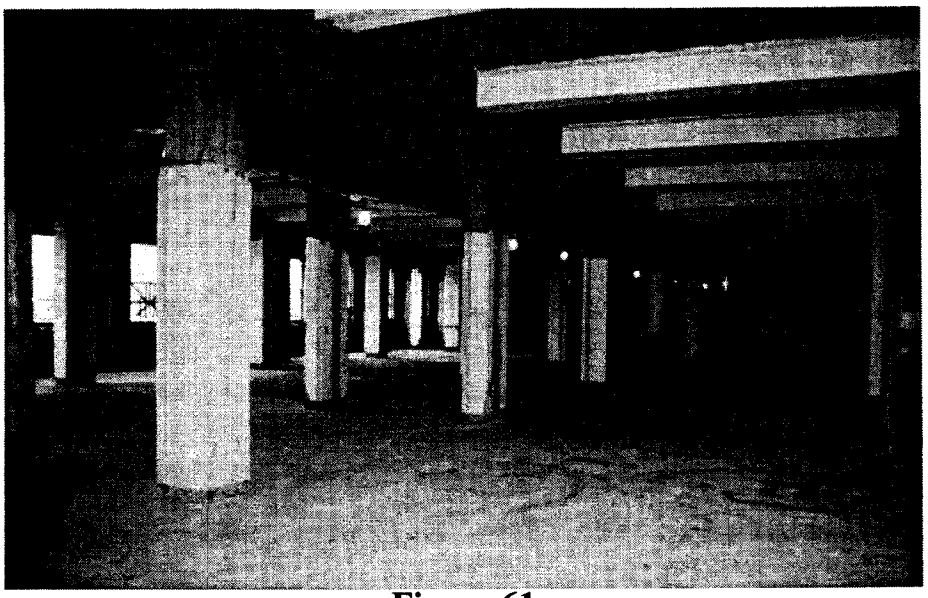


**Figure 61**
**Wedge 1—Demolition and Abatement Have Been Completed In This Area On the Second Floor**

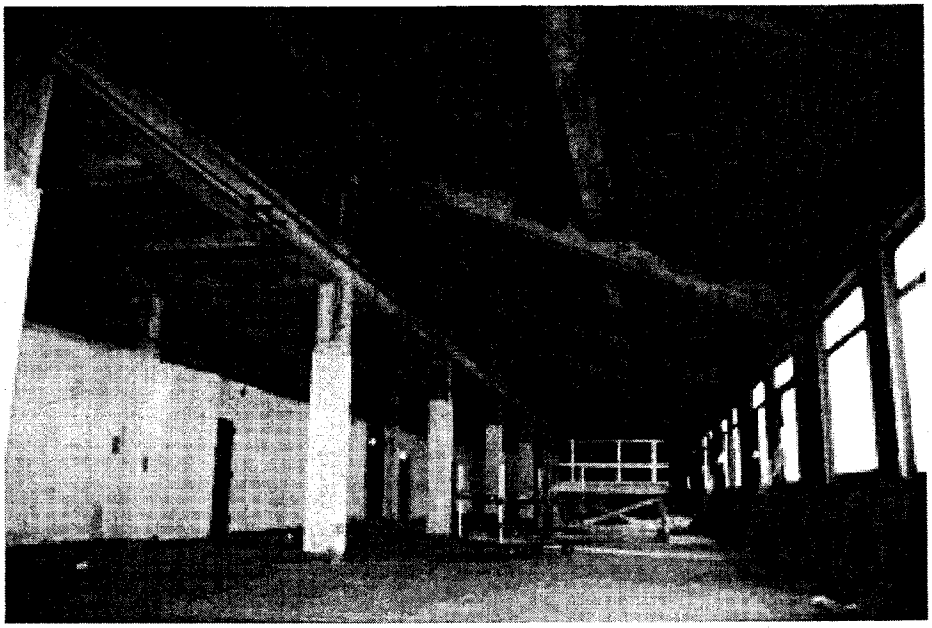


**Figure 62**
**Wedge 1—Cleared Area On the Fifth Floor Reveals the Pentagon's Pitched Roof**

# Projects Under Construction

***South Terrace Pedestrian Bridges***

The South Terrace Pedestrian Bridges over Rotary Road will link the South Parking and the Pentagon at Corridors 2 and 3 on the second floor. These bridges are to provide safe access for pedestrians from South Parking to Corridors 2 and 3 on the second floor; to resolve the conflicts with automobiles, busses, delivery vehicles, and taxis; to increase security at the entrance to the existing loading dock and A-E Drive; and to reduce the need for the police to serve as traffic officers. Elevators will provide handicapped access in compliance with the requirements of the Americans with Disabilities Act. The bridges, scheduled for completion in FY 1999, will be constructed in phases to allow access to the Pentagon from South Parking throughout construction. Corridor 2 bridge construction is underway and Corridor 3

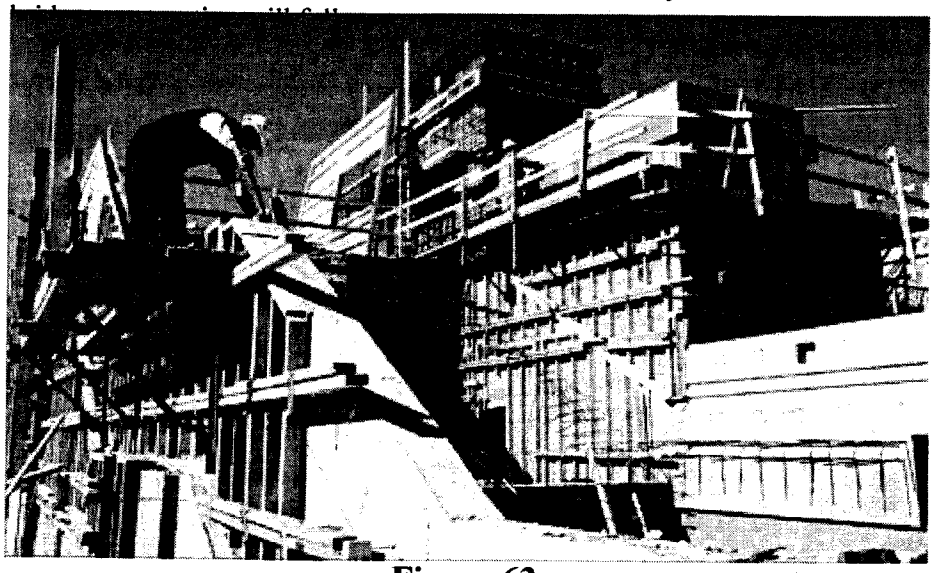


**Figure 63**
**South Terrace Pedestrian Bridges Under Construction**

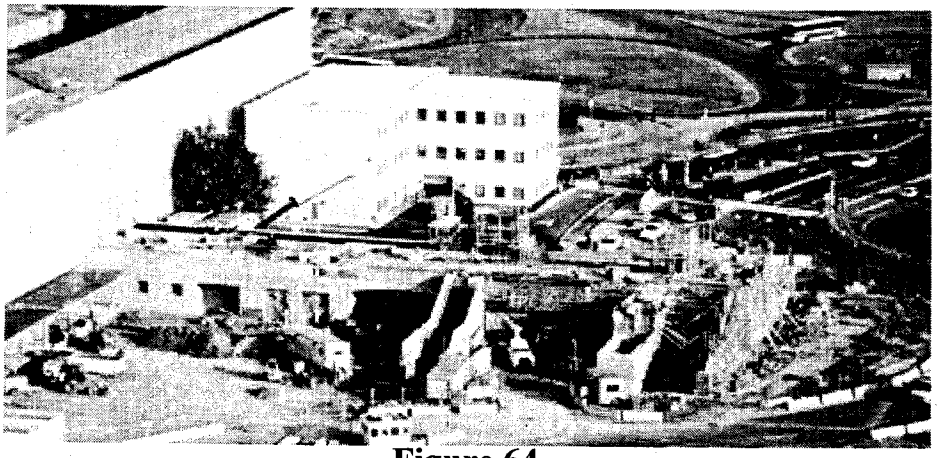


**Figure 64**
**Aerial View of South Terrace Pedestrian Bridges Under Construction**

# VI. BUDGET

**Sources of Funds**
**Certification of Cost**

# VI Budget

***Source of Funds***

Section 2804 of the Department of Defense Authorization Act, 1991 (Public Law 101-510, see Appendix), established the The Pentagon Reservation Maintenance Revolving Fund (PRMRF). The Act transferred responsibility for the operation, maintenance, protection, repair, and renovation of the Pentagon Reservation from the General Services Administration to the Secretary of Defense. The PRMRF is the funding source for the Pentagon Renovation Project. In addition, it finances a full range of building services for DoD components, including the Military Departments, and other activities housed within the Pentagon Reservation.

The renovation was designed to be budget-neutral to the Department of Defense in that the Department could operate, maintain, protect, and renovate the Pentagon for the rent the Department would have paid to the General Services Administration over a 12- to 14- year period.

Accordingly, the PRMRF has been designed to operate on a break-even basis over the long term. Revenue to the PRMRF may be generated from various sources; however, the Fund depends primarily upon monies collected from a user charge for space and building services. These charges are paid by the DoD components and other tenants using Pentagon Reservation facilities or land, with rates corresponding to six categories of space: office, storage, special, joint use, commercial support, and outside parking. The rates are established to recover the cost of day-to-day operations, maintenance, protection of the Reservation, and essential capital improvements including all costs associated with the Pentagon Renovation Project.

***Certification of Cost***

Based on early estimates of the costs to be incurred, the Defense Appropriations Acts for FY 1995 and FY 1996 required that the Secretary of Defense certify that the total cost for the planning, design, construction, and installation of equipment for the renovation of the Pentagon Reservation will not exceed $1,218,000,000.

Subsequently, the Department of Defense Appropriations Act for FY 1997 reduced the cost certification for the renovation to $1,118,000,000. This certification requirement is now $100,000,000 less than the certification ceiling initially supported by the Department and the Congress.

In order to continue critical programs, the Department will endeavor to constrain the cost of project design and construction to within the current limitation through increased efficiency.

Fundamental changes have been made to meet the challenge. These have included restructuring the three responsible organizations supporting the renovation program into Geographic and Functional Integrated Product

teams. Each Geographic project within the program has a Geographic Integrated Product Team responsible for the entire renovation activity within that Geographic area. Coupled with these internal management changes are procurement changes which have streamlined the whole process. Construction awards, previously based on firm fixed priced price low bids, resulted in continuous conflicts during the performance between the general contractor and the Renovation Program. These conflicts included multiple claims, contract changes, increased costs, and delays.

Contract awards, negotiated between the government and the contractor offerers, are now based on best value to the taxpayer and the government (not necessarily the lowest proposed cost). Best value determination is typically based on analysis of factors including past performance, management approach, technical approach, probable cost, and small and disadvantaged business support. Oral proposals and page limits on proposals reduce time and help the departments gain additional insight into contractor capabilities.

Active partnering is being used with general contractor offerers in multiphase source selections. The most promising offerers are brought on board to team with architect/engineers (A/E) in the design and development of areas to be constructed. Sophisticated contracting vehicles are being used to reinforce team partnering; savings incentives reward efficient contract performance, and award fees reward creativity and efficiency on the part of contractors. The intention is to secure superlative contract performance at reasonable cost by fundamentally changing the relationship between the government and the contractor. The Program is working hard to form partnerships with industry which will improve contractor performance, reduce cost, and meet schedule parameters.

At this early stage in the construction process, it is difficult to determine the full negative impact of the $100 million reduction on the ultimate design of the renovated Pentagon. Total Program cost will depend heavily on inflation of construction costs over the next 10 to 12 years and the effectiveness of management and contracting initiatives undertaken by the Program. Costs and estimates will be monitored closely and the Department will seek adjustment of the certification ceiling as appropriate.

Consistent with cost estimates for projects in a Military Construction Program, under the timing and delineation for the certification, this estimate does not include the cost of: 1) design and construction of the Heating & Refrigeration Plant, the Classified Waste Incinerator Plant, and the Remote Delivery Facility; 2) purchase and installation of Information Management and Telecommunications (IM&T) equipment; 3) rental and operation of leased swing space; 4) purchase and installation of furniture; and 5) recently required security enhancements; and 6) costs prior to FY 1994. The Department of Defense Appropriations Act for FY 1999 and the required certification are enclosed as Appendix B.

**Pentagon Renovation Certification Summary**

| Fiscal Year | Design & Construction | Cumulative Totals | Item |
|---|---|---|---|
| 1994 | $77,900,000 | $77,900,000 | Obligations |
| 1995 | $50,200,000 | $128,100,000 | Obligations |
| 1996 | $64,500,000 | $192,600,000 | Obligations |
| 1997 | $59,000,000 | $251,600,000 | Obligations |
| 1998 | $97,100,000 | $348,700,000 | Obligations |
| 1999 | $158,500,000 | $507,200,000 | Budgeted |
| 2000 | $145,900,00 | $658,100,000 | Budgeted |
| 2001-2010 | $610,800,000 | $1,118,000,000 | Program |
| **Total** | **$1,118,000,000** | **$1,118,000,000** | |

# VII. APPENDIX

**History**
**Program Development**
**Program Schedule**
**FY 1991—Legislative Authorization**
**FY 1999—Department of Defense Appropriations Act with Certification**

# HISTORY

**Congressional Approach**

**The Design**

**The Pentagon Building**

**Size**

**Exterior**

**Materials Shortage**

**The Site**

**Terraces**

**Access**

**Lagoon**

**Building Condition**

**Failure To Keep Pace With Changing Standards for Health, Fire, and Life Safety**

**Materials Failure**

**Engineering System Failure**

**Changing Technology Requirements**

# History

The Pentagon is one of the most recognizable buildings in the world. It has been inseparably linked with the United States Military since its construction during World War II.

During the first half of 1941 the War Department found it increasingly difficult to provide space for the headquarters staff of an expanding army. In May, the Public Buildings Administration proposed erecting temporary structures for various agencies on the outskirts of the city. In July 1941, 24,000 personnel were scattered among seventeen buildings in Washington, D.C., with others in Fort Myer and Alexandria, Virginia. By the beginning of 1942, the number of personnel was expected to reach 30,000. The President, therefore, asked Congress for authority to construct additional buildings within or near the District of Columbia. The War Department's Chief of Construction, Brigadier General Brehon B. Somervell, had a better idea, a scheme to house the entire War Department under one roof. He talked to General Moore, Deputy Chief of Staff, and to U.S. Representative Woodrum (D-Virginia) about the idea.

***Congressional Approval***

At a Thursday, July 17, 1941, hearing on construction projects before the House Subcommittee on Appropriations, the Chairman, Mr. Woodrum of Virginia, suggested to Brigadier General Eugene Reybold and Brigadier General Somervell that the War Department find an overall solution to its space problem rather than the partial solution proposed by the Public Buildings Administration. Somervell directed Architect G. Edwin Bergstrom to place on his desk, by 9 o'clock Monday morning, basic plans and architectural perspectives for an office building to house 40,000 people. Five days later, on Tuesday, July 22, 1941, Reybold and Somervell presented the plan to the Subcommittee. The plan was approved by the House on July 28, 1941 and by the Senate on August 14, 1941.

On August 25, 1941, President Roosevelt signed the bill appropriating funds for construction. However, because of considerable controversy over the proposed location at the foot of Arlington National Cemetery, he reserved the right to pick the site. The following day, the President directed that the construction site be moved south to the Pentagon's present location.

***The Design***

The Pentagon's unusual five-sided configuration was dictated by the site originally proposed (adjacent to Memorial Drive, about three-fourths of a mile north of where the building was actually constructed). An early plan called for a square structure with one corner cut off to accommodate an existing road. This resulted in a skewed Pentagon shape from the Archives of U.S. Army Corps of Engineers, Fort Belvoir, Virginia.

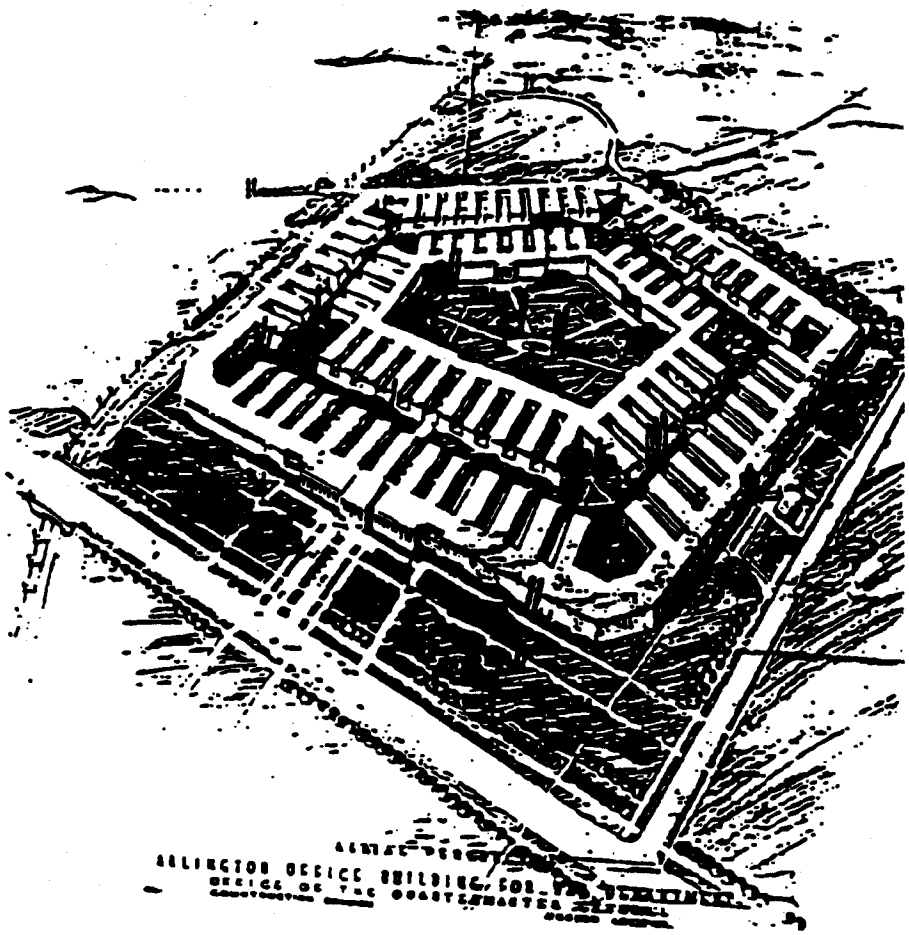


**Figure 65**
**Original Concept of Pentagon, July 21, 1941**

Serious objections were raised to locating the building on open land directly between Arlington Cemetery and Washington's Monumental Core, and discussions ensued regarding selection of a building site resulting in less visual and physical impact from the project. During the debate on the site, the project's chief architects, George Edwin Bergstrom and David J. Witmer continued to refine the design. The final design retained the five sides, in the form of a regular pentagon, which gave rise to the building's name. That shape resulted in the most efficient use of available space. The concept of using several concentric rings to contain the space evolved during further refinement of design. Preliminary design and drafting took just 34 days. A project of this magnitude and urgency demanded the rapid assembly of an unprecedented design and production effort. The office of the chief architect rapidly grew to 327 architects and engineers who were supported by 117 field inspectors. The weekly output of prints ranged from 12,000 to 30,000 with reproduction machines run-

ning on a 24-hour basis. For periods of time, new drawings were issued nightly. The reproduction effort consumed 15,000 yards (13,700 m) of print paper per week.

Construction began on September 11, 1941, and was completed on January 15, 1943. At one stage of construction, 15,000 people were employed on the job working three shifts, 24 hours a day. At night, they worked under floodlights. Construction took just 16 months, a remarkable feat of engineering and management effort.

## *The Pentagon Building*

The Pentagon building, at 6,500,000 square feet (603,900m²), provides approximately 3,800,000 square feet (353,000 m²) of occupiable space. At the peak of World War II, 33,000 people were provided working space in the building. The Pentagon is the Headquarters of the Department of Defense (DoD) and the national defense establishment. It houses the Offices of the Secretary of Defense, the Joint Chiefs of Staff, and the Secretaries of the three Military Departments.

### *Size*

The Pentagon building is composed of five concentric pentagonal rings connected by ten radial corridors. Each of its outer walls is 921.6 feet (280 m) long. The building covers 29 acres (12 hectares), the largest ground area of any office building in the world. A five-acre (2 hectares) pentagonal courtyard is located in the building's center. The building and its central courtyard cover 34 acres (14 hectares). There are 17.5 miles (28.2 km) of corridors in the building. The structure is three times the size of the Empire State Building and 50 percent larger than Chicago's Merchandise Mart. The building rests on 41,492 concrete piles which, if placed end to end, would stretch 200 miles (322 km). The five concentric pentagonal rings are separated by interior courts which serve as light wells. This design feature increases the number of windows allowing in natural light. Each ring has five stories. The Mall and River sides of the building have a Basement area which includes a partial Mezzanine. The innermost and outermost rings have sloping slate roofs, while the other three rings have flat, built-up roofs. The rings are connected at each floor level by a series of ten radial corridors extending from "A" ring (innermost) to "E" ring (outermost).

### *Exterior*

Exterior walls of the concentric rings and the interior courtyard are exposed concrete. They appear to have a wood-grain texture because they were poured into wooden forms made of 8-inch (232 mm) boards. A gap was left between boards enabling concrete to ooze and form a slight ridge. From a distance this gives an appearance of limestone.

Clockwise from its northern point, the Pentagon's five facades are the Mall Terrace Entrance facade, the River Terrace Entrance (or North Parking lot) facade, the Concourse Entrance (or Metro Station) facade, the South Parking Entrance facade, and the Heliport facade. The outer facades of the Pentagon

are simple, with a minimum of ornamental embellishment. Although the ornamentation style is classical in origin, it has been greatly simplified. The outer walls are limestone, as a direct result of a restriction by President Roosevelt that there be no marble in the building.

***Material Shortages***

The shortages of materials required for war production raised many design and construction problems. The use of reinforced concrete in lieu of structural steel for the building made possible a saving of 43,000 tons (39,000,000 kg) of steel, more than enough to build a battleship. The use of concrete ramps rather than elevators reduced steel requirements still further. Drainage pipes were concrete; ducts were fiber, interior doors were wood. An unusual wall design - concrete spandrells carried to window sill level - eliminated many miles of through-wall copper flashing. When Somervell was asked to make still more drastic reductions, he agreed to "striptease" the entire structure. Bronze doors, copper ornamentation, and metal partitions in rest rooms were among the first to go. The stripping process continued throughout construction.

***The Site***

The Pentagon Reservation is located in southeastern Arlington County, Virginia, and is situated between a large man-made lagoon (the Pentagon Lagoon, formed during construction) and the southeastern corner of Arlington National Cemetery. The northeastern and eastern facades have unobstructed vistas of the Monumental Core of the Nation's Capital across the Potomac River. The Pentagon's relatively low profile also permits clear vistas of Washington from the highlands of Arlington National Cemetery.

***Terraces***

There are large ceremonial terraces in front of the Pentagon's Mall and River Entrances. The River Entrance terrace extends 900 feet (274 m) to the Pentagon Lagoon bounded by a ceremonial landing dock and two monumental stairways. The maximum width of the River Terrace is 450 feet (137 m). The terrace in front of the Mall Entrance is smaller, measuring 600 feet (183 m) by 125 feet (38 m).

***Access***

The Pentagon site originally contained three cloverleaf interchanges that were among the earliest such structures constructed in the United States. These freeway-scale interchanges were necessary to handle traffic associated with the large number of people working in the building.

***Lagoon***

The Pentagon Lagoon was created during construction of the building as a result of dredging sand and gravel for concrete, and to obtain fill for landscaping. The lagoon is also the location of the water intake for the Pentagon's Heating & Refrigeration Plant. The Roaches Run Waterfowl Sanctuary lagoon, created during construction of the George Washington Parkway in the early 1930's is used for the Heating & Refrigeration Plant's water discharge outfall.

***Building Condition***

The Pentagon Reservation has been altered over the years. A heliport was added; Shirley Highway (now I-395), a limited access Interstate Highway and interchange, infringed on the Pentagon site on the south side; a major Metro station and transfer point was added, and underbuilding bus/taxi tunnels were converted to offices. See Existing Site Plan of the Pentagon Reservation.

The circa 1943 Pentagon has suffered from decades of neglect and

underfunded maintenance and repair programs. Many of the building systems have deteriorated beyond economical repair and require complete replacement. Building code violations and unsafe conditions are rampant, which have been brought about by the Pentagon's non-compliance with the fire protection and life safety standards established over the last 50-plus years. Structural deficiencies also need to be corrected. Some areas of the Basement have settled as much as 12 inches (305 mm) due to the poor load bearing capacity of soils under the floor slab.

*Interior Space Layout*

The Pentagon's original interior space layout has been modified over the years. Walkways and service corridors have been closed and converted to office and storage space. Original office areas that were large open spaces have been chopped up and enclosed with full height partitions that make the building functionally inefficient. This adversely affects heating, ventilating, and air conditioning system controls and distribution.

*Building Systems*

Before the renovation program began, none of the original major building systems had ever been replaced nor had they been significantly upgraded. The changing office environment with the advent of computers and modern technology has outstripped the capacity of deteriorated building systems. Electrical, plumbing, heating, ventilation, and air conditioning (HVAC) systems need to be replaced and modernized to accommodate added loads and designed to be more efficient and flexible. The building has individual packaged air conditioning units providing cooling for special use areas in addition to the chilled water provided by the Pentagon Heating & Refrigeration Plant. The overloaded secondary electrical circuits result in as many as 20 localized power outages every day, which increases to between 30-40 a day in the winter when people bring unauthorized space heaters into the building to compensate for the deteriorated HVAC system. Regular plumbing failures occur as a result of the deteriorating piping systems which are 55 years old. Of the 691 drinking fountains in the Pentagon, approximately 30 are out of service on a daily basis.

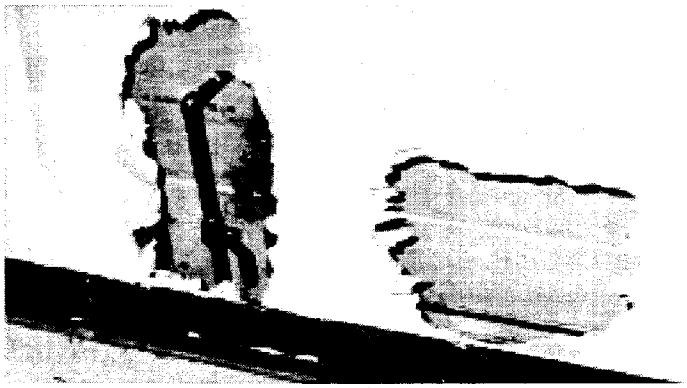


**Figure 66**

During Desert Shield/Desert Storm, a fire broke out in the JCS area of the Pentagon. Arlington County, which provides fire protection to the Pentagon, pressurized a standpipe and consequently, blew out a four foot section of ten inch pipe. Water flooded approximately 350,000 SF of the Pentagon basement, nearly causing the Army and Air Force Operations Centers to shut down. The water flowed through a steam tunnel to the Heating & Refrigeration Plant basement, where the water reached a height of seven feet. Shown is the steam room at Corridors 9/10 where water reached a height of 20 inches.

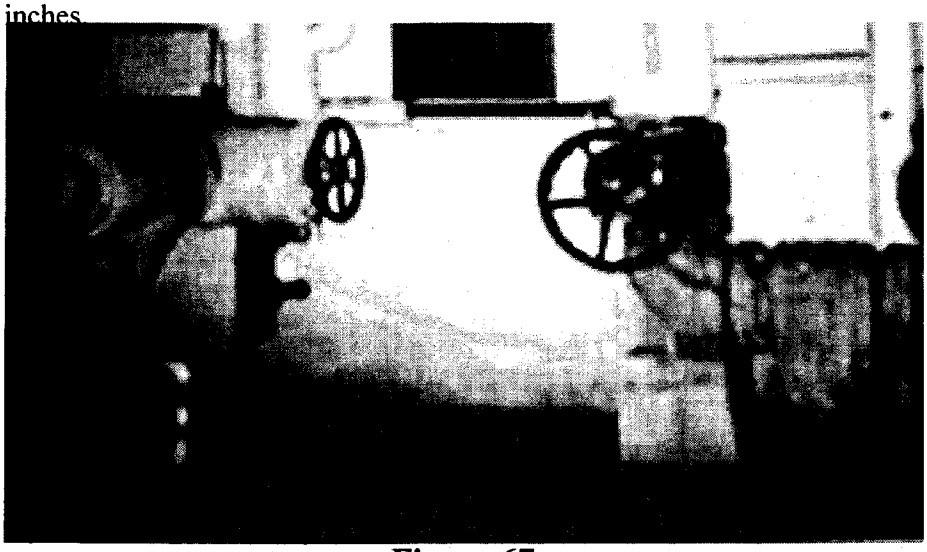


**Figure 67**
**The Steam Room at Corridors 9/10**

Frequent leaks, breaks in pipes and clogged pipes not only escalated the operation and maintenance costs but also created potential health hazards.

**Figure 68**
**Vertical Sanitary Pipe Split from First to Fourth Floor**

Figure 69

**Typical Example of Drain Pipe, Clogged After Years of Deposits and Deterioration.**

The Basement has been flooded as the result of condensate leakage, inoperable sump pumps that were unable to accommodate rising ground water and rusted and corroded valves. Only valves that have been replaced are operable.

**Figure 70**
**Typical Rusted and Corroded Valve**

The HVAC systems are original and in need of r lacement. Approximately 17.5 miles of the Pentagon's ductwork are made from asbestos, typical of the time when the Pentagon was built. The Pentagon has approximately 150 miles of ductwork, a substantial portion of which is surrounded by asbestos insulation.

The electrical system was designed for a manual office and does not support the demands of today's high-tech office environment. Approximately 20 (30-40 in winter) localized power outages occur daily, with at least 30 minutes downtime per outage. Obsolete components make maintenance/ repair difficult. Panel boards are loaded beyond maximum capacity and do

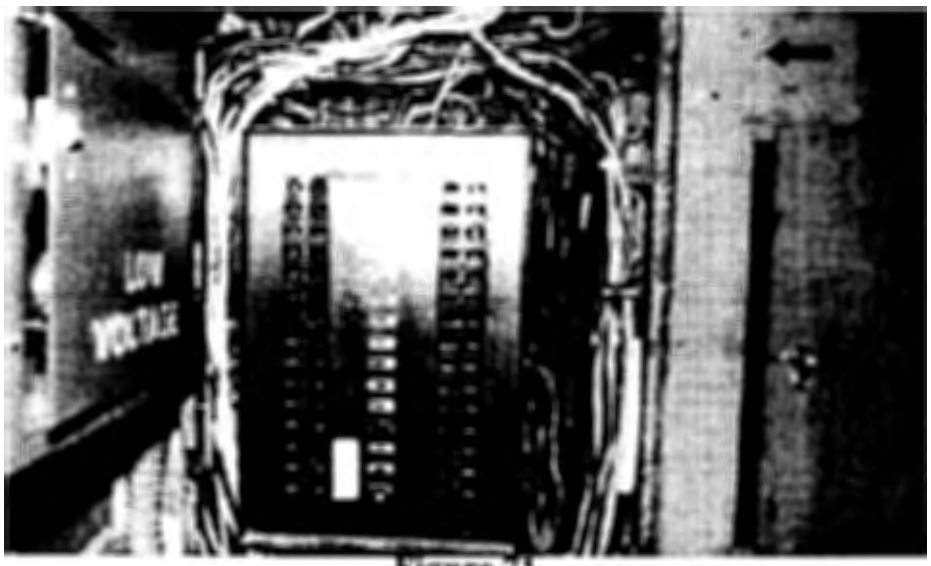


Figure 71
**Original Electrical Panel Still Used in Pentagon**

not meet code, thereby creating a fire and safety hazard.

The information systems that were installed in the Pentagon are plagued with abandoned cabling and an unverifiable backbone for the building. Consequently, there are numerous LANs that are operated independently of one another which causes problems.

**Figure 72**
**Typical Information and Telecommunications Cable/Wiring**

*Windows*

There are 7,748 windows in the building. They are of two types: steel casements located in the perimeter walls of the concentric, inner courts, and steel double-hung units in the outermost perimeter and in the Center Courtyard walls. The double-hung units in the central pavilions of the Mall and River Entrances are steel. The casements are rusted and corroded at joints, racked out of shape, and cannot be properly closed. Casement windows are inefficient even when properly maintained. In the present state of disrepair, the energy loss, summer and winter, is a serious problem. Some windows have security alarm tapes. Other windows are closed with tempered hardboard or plywood, or are filled with masonry block or with equipment. Many of these ad-hoc modifications were not properly sealed and are now leaking. Failure to replace casement windows and double-hung units will result in continued energy loss and damage from water penetration.

*Exterior Walls*

Architectural and structural elements of exterior walls have shifted and settled. Joints are open and moisture has penetrated causing damage. Cracking and evidence of movement is apparent at all five exterior perimeter parapet corners. In some instances these cracks extend below the parapet wall. The exterior walls are not thermally efficient and the stone facing is in need of cleaning and repair to insure its weather tightness.

There are two types of courtyards at the Pentagon: (1) interior courts (light wells) between concentric rings of the building and, (2) the Center Courtyard.

All courtyards walls are of concrete with surface conditions ranging from fair to failing. Concrete is spalling, particularly where rusting reinforcing bars are exposed; patch material is failing; cracks, efflorescence, and water stains are evident everywhere. In addition to problems cited in the courtyards walls, cornices are disintegrating, especially between Corridors 7 and 10. There are also problems due to use of non-conforming materials and poor construction. In the Center Courtyard, the asphalt paving at the peripheral

**Figure 73**
**Typical Exterior Walls in Light Wells Needing Repair**

walkways is extensively cracked and the concrete curbs at these walkways are damaged or missing.

Access bridges span several interior courts at the approximate mid-point of the court length. Originally, these bridges were open, crossing the court at each floor level. A number of the bridges have been enclosed and incorporated into secondary corridor systems while others open directly from individual offices. All of these bridges show evidence of deterioration with present conditions ranging from fair to failing. Attempts made to control leaks at the interior spaces have been unsuccessful. At a minimum, replacement of the roof/bridge drainage system will be required at each bridge. Concrete surfaces and waterproofing will have to be repaired and interior surfaces will also have to be restored.

*Basement Floor*

The Basement floor of the Pentagon was constructed as a slab on grade, and designed to serve as a light storage area. A 1983 report on the stabilization of the depressed floors states that the basement floor slab was placed directly on the underlying soil fill, which consists of surface fill materials overlying compressible organic soil. The subsidence has been gradual over the years and was aggravated by voids under the slab, leaking utility lines, and at times by the dewatering during the construction of Metrorail. These subsurface conditions along with the assignment (and re-assignment) of special purpose activities and the storage of heavy loads of material and equipment, the Basement slab has settled up to 12 inches (305 mm) in some areas causing severe damage to critical communication centers. Repairs were made to correct the distressed areas by pumping concrete under the floor, or by adding leveling slabs, but these repairs were unsuccessful. The only recourse is to remove entirely some 300,000 to 500,000 square feet (27,900 $m^2$ to 46,500 $m^2$) of slab and reframe the floor as an independent floor slab bearing on new and existing pile caps. Lowering the Basement slab in some areas will allow maximum expansion of the Mezzanine space.

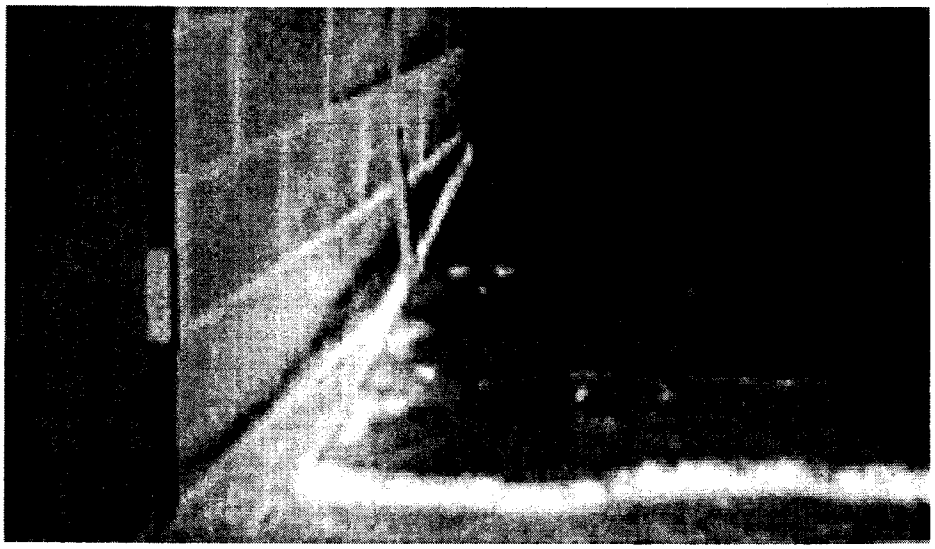


**Figure 74**
**Basement Slab Deflection**

*River and Mall Terraces*

The River and Mall terraces extend beyond the exterior perimeter of the building and the occupied areas beneath have experienced considerable damage from water intrusion. Extensive reworking of expansion joints, deteriorated waterproofing and concrete elements is required to make these areas watertight.

**Figure 75**
**Typical Deterioration of River Terrace Stairs**

*Ramp and Bridge from North Parking*

The ramp, bridge and railing leading into the Corridor 8 Entrance from the North Parking lot has undergone serious deterioration as noted by the out-of-plumb support wall along the bridge.

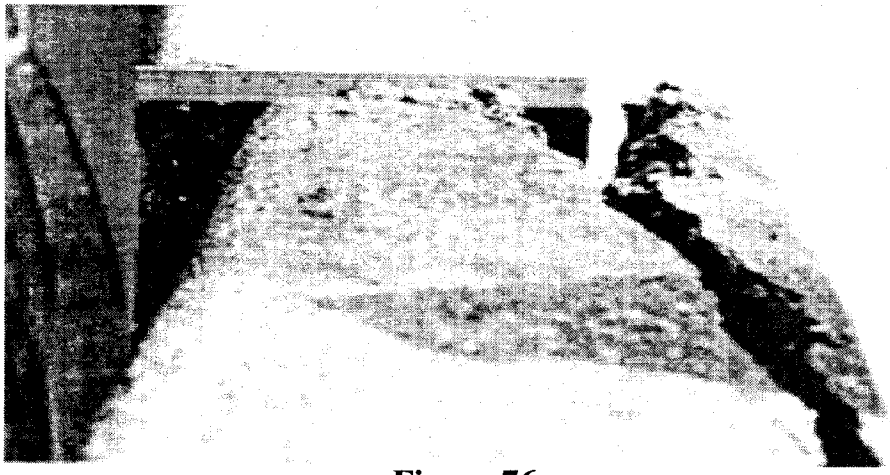


**Figure 76**
**Deterioration at North Parking Pedestrian Ramp Leading to the Corridor 8 Entrance**

Exposed reinforcing bars underneath the River Terrace parade field and parking lot resulted from the failure of waterproofing, which allowed water and chemical damage to the structure below. This created the potential for failure of the terrace above, along with the threat to persons both above and below the structure. Temporary jacks were installed as an emergency measure to support this failing structure.

**Figure 77**
**Deteriorated River Terrace Structural Conditions**

Figure 78
**Temporary Jacks Supporting Failing Ramp**

*Asbestos*

The finish coat in the Pentagon's plaster ceilings contains asbestos and the resilient flooring is vinyl asbestos. Even minor alteration projects require extensive and expensive containment procedures. Under-the-window induction heating and cooling units have asbestos insulation on the pipes and asbestos insulation material was used on many of the plumbing lines and air conditioning ducts. These materials represent health hazards.

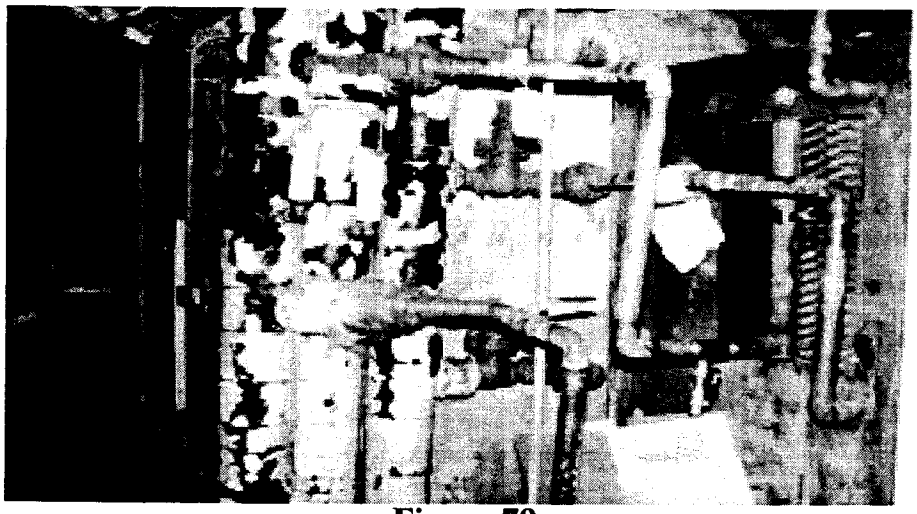


**Figure 79**
**Typical Existing Asbestos Piping Insulation**

*Heating & Refrigeration Plant*

The Heating & Refrigeration Plant that was built in 1943, provided utility services (heating steam and chilled water) to the Pentagon as well as to other parts of the Pentagon Reservation. The plant became obsolete and was no longer efficient and serviceable. Temporary chillers and boilers were being rented to support the needs of the Pentagon, Federal Building #2 (Navy Annex), and Henderson Hall (Marine base). Three rental boilers and six rental chillers were used from 1989 to 1996 for a cost of over $2,000,000 per year.

**Figure 80**
**Portable Rental Boilers Used in Old HR&P**

*Information Management & Telecommunications*

The current Pentagon information and telecommunications infrastructure is an accumulation of systems and networks, which have been installed, in a piecemeal fashion since 1943. There are multiple deficiencies specific to the information management and telecommunications posture of the Pentagon. These include outdated and overworked communications systems, an enormous number of single user-oriented and user-unique data systems, inadequate wiring systems, obsolete and congested wire closets, risers, cable pathways, and protected distributed systems, poor quality grounding systems, and limited wiring system access due to asbestos hazards. As information management requirements and technology changed throughout the years, new telecommunications systems were added in an ad hoc manner, often over existing wiring. This has produced a collection of independent and largely non-interoperable systems and networks, many of which are poorly documented.

*Sitework*

Traffic conditions, especially in the South Parking areas, are very hazardous. Reconfiguration of roadways, bus, and truck access areas and parking is necessary to provide safety for pedestrians. Parking lots are in poor condition with minimal landscaping. Roads, walks, fences, bridges, and other structures and elements exhibit significant deterioration. Bridge abutments are clearly out-of-plumb and the stonework is crushed and spalled. Exterior steps and terraces are spalled, joints are open, and the occupied areas below these elements have experienced water leakage on a continuous basis.

*Summary*

Generally, the Pentagon's problems requiring a full scale renovation can be grouped into five categories:

1. Changing requirements for fire and life safety.
2. Materials failure.
3. Engineering systems failure.
4. Changing technology with an increased demand for services.
5. Security.

***Failure to Keep Pace with Changing Standards for Health, Fire, and Life Safety***

- Pervasive asbestos contamination of interior surfaces and pipe insulation requires the use of asbestos containment procedures for even minor repairs to avoid possible health risks to building occupants when these materials are disturbed. This is a significant time and cost restraint to the maintenance and repair program.
- Inadequate sprinkler systems to protect the entire building.
- Numerous emergency diesel generators are currently located inside the Pentagon presenting a potential fire and carbon monoxide gas hazard.
- Excessively long fire egress routes in the building.
- Vehicle/pedestrian conflicts exist throughout the reservation.

***Materials Failure***

Problems related to materials failure include:

- Rusted and corroded casement window frames in most of the 7,748 windows.
- Shifting of architectural and structural elements causing opening of joints, cracking of building elements, and water penetration.
- Spalling of concrete, rusting reinforcement bars in the concrete, and deteriorating cornices.
- Deterioration of roof/bridge connections and bridge drainage systems.
- Deflection of the basement floor due to lack of stable ground support.
- Intrusion of water through expansion joints and deteriorated waterproofing.
- Deterioration of roadway bridges.
- Deteriorated plumbing and domestic water supply pipes and fixtures.
- Deteriorated chilled and heated water supply piping and fixtures.
- Deteriorated and non-code compliant electrical wiring.

***Engineering Systems Failure***

***Pentagon***

- Severely undersized, inflexible and unreliable, heating, ventilation, and air conditioning (HVAC) systems.
- Unreliability of current building HVAC systems has resulted in independent air conditioning (A/C) units having been installed in certain areas.
- Overloaded secondary electrical circuits result in daily failures of electrical systems.
- Undersized electrical closets prohibit proper wiring and management of electrical systems.
- Deteriorated plumbing, chilled and hot water, domestic water and other systems.

*Heating & Refrigeration Plant*

- The original coal boilers installed during construction of the Pentagon were beyond repair. Existing refrigeration equipment, some nearly 30 years old, was unreliable and often out of service. Rented package units were being used to supply heating and cooling services to building.

***Changing Technology Requirements***

- Increased electrical and HVAC loads due to office equipment such as computers and copier machines, and special equipment such as video and graphics production equipment.
- Current wire chases cannot accommodate cabling systems for telephones, computer networks, and audio/video information systems.
- Inflexible and inefficient space arrangements limit the continued utility of the Pentagon office and support space.

*Security*

- Metro escalators penetrate into the building envelope forcing the security perimeter inward.
- The dispersed loading docks are difficult to secure.
- Numerous delivery vehicles penetrate the building security perimeter daily.
- Limited approach ways hinder security control at loading docks and delivery entrances (distance from non-control to control areas is so short that guards have no response time before vehicle has reached the guard position).

The Pentagon is a building of interest to local, state, federal, and architectural historians for the following reasons:

- It is associated with events that have made a significant contribution to the geo-political role of the United States as a superpower during the period from World War II to the present.
- It is associated with the lives of persons who are significant in American history from the time of construction in 1941 to the present day.
- It embodies the distinctive characteristics of the "stripped classical" variant of architectural classicism. This stylistic mode flourished during the second quarter of the 20th century, and was a major theme in federal architecture.
- It is classified currently as the largest low-rise office building in the world.
- It was constructed during an important historical period.
- It was built in 16 months which required a monumental effort in design and construction.
- It is located adjacent to Arlington National Cemetery.
- It is in proximity to the Nation's Monumental Core.
- It is situated along a major gateway to the Nation's Capital.

The Secretary of Defense, the Honorable Richard Cheney, was notified by the Secretary of the Interior, the Honorable Bruce Babbit, that the Pentagon had been designated as a National Historical Landmark on October 5, 1992. This designation also automatically places the Pentagon in the National Register of Historic Places.

There are five historic elements of the Pentagon that are cited for special attention:

- The five outer facades of the Pentagon.
- The Center Courtyard and surrounding facades.
- The Terrace fronting the Mall Entrance.
- The Terrace fronting the River Entrance.
- The Pentagon's distinctive five-sided shape.

A ceremony celebrating the 50th Anniversary of the Pentagon in May 1993 included presentation of a bronze plaque stating "THIS PROPERTY POSSESSES NATIONAL SIGNIFICANCE IN COMMEMORATING THE HISTORY OF THE UNITED STATES OF AMERICA." This ceremony was hosted by Les Aspin, the Secretary of Defense, and General Colin Powell, Chairman of the Joint Chiefs of Staff.

# PROGRAM DEVELOPMENT

**Design Development**

**Basement Renovation**

**Wedge #1**

**Wedge #2**

**Wedge #3**

**Wedge #4**

**Wedge#5**

# Program Development

***Design Development***

Control of the design process over the life of the project requires the development of design guidelines and criteria. This control is necessary because of the size and duration of the project, the multi-acquisition approach, and design activities occurring throughout the project as each increment is renovated. The revised Pentagon Renovation Plan must be translated into appropriate design guidelines and criteria that will establish design parameters.

A Management Support Architect-Engineer (MSAE), has prepared design guidelines and criteria; has prepared the Reservation Master Plan which addresses environmental issues; has prepared the Pentagon Building Master Plan; has developed prototypical designs for architectural standards, heating, ventilating and air conditioning systems, plumbing systems, fire protective systems, electrical systems, and security systems; is developing programming and swing space requirements; is developing schedules and cost estimates; is providing technical and management support; and is completing Computer-Aided Design Documents (CADD) for record drawings and shop drawings and shop drawing reviews. Broad-scale design criteria, which is equivalent to a concept stage, will ensure that each individual increment will be compatible with the rest of the work. The goal is to achieve a completed project that has uniform and compatible materials and systems that are economic to maintain.

Design development activities have been intensive during the early stages of the project, and will continue at a less intensive level throughout the duration of the renovation.

In the mid-1990's the importance of information management and telecommunications (IM&T) within the Pentagon was recognized and the United States Army was tasked with establishing a project management office for Information Management and Telecommunications, renovation related tasks. The Pentagon IM&T project office was established in 1991. The mission of the Project Manager (PM) IM&T, working in concert with the Resident PM, USACE, Pentagon Renovation Program is as follows:

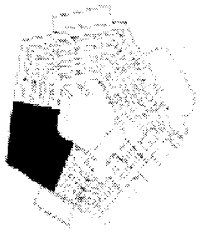
"Management of planning, programming, systems design/development, acquisition, installation, integrations, and testing of all IM&T-related efforts involved with the Pentagon Renovation Program. The objective is to provide cost-effective IM&T services/capabilities that will best serve the needs of the DoD Senior Leadership by leveraging technology advancements and designing/developing integrated systems, well into the 21st Century.

***Basement Renovation***

Renovation of the Basement includes the reconstruction of the floor slab which has settled in many areas due to the low soil bearing capacity. In addition, the build-out of the Mezzanine, one of the improvements recommended in the Concept Plan, provides the opportunity to co-locate all command and control functions of the National Military Establishment to the Basement and Mezzanine. The renovation of the Basement will be completed in multiple phases.

The design of the Segment 1 renovation of the Basement was completed in mid-FY 1994 with the construction beginning October 1994. The construction of Segment 1 of the Basement, preceded by the temporary re-routing of utilities, will be completed in FY 1998. The design of the remaining segments began in FY 1997. The Services Operations Centers will be relocated as the construction proceeds.

### *Wedge #1*



In December 1996, the Deputy Secretary of Defense directed that Wedge #1 be vacated by December 1997, and the construction of Wedge #1 to start by FY 1998. Renovation of above-ground areas of the Pentagon begins with Wedge #1. Work is centered around corridors 3 and 4.

The renovation work involves the demolition and removal work includes all partitions, ceilings, floor finishes, mechanical, electrical, plumbing, fire protection, and communications systems. The basic structural system, as well as the stairwells and their enclosing walls, will remain. All electrical, mechanical, and plumbing services will be replaced and a modernized telecommunication back-bone infrastructure will be installed. Utility connections will be made through the new Center Courtyard Utilities Tunnel without affecting the rest of the building. Wedge #1 will have a new food service facility, new vertical transportation service and enhanced foyers. Much of the renovated space will be configured as "open office" space consistent with the Concept Plan. The improvements include the new South Terrace Pedestrian Bridges which will connect South Parking to Corridors 2 and 3. This work incorporates some of the security improvements by re-routing public access to the second floor and improves safety by separating pedestrians from the vehicular traffic on the very busy Rotary Road in South Parking. The South Terrace structure consists of two bridges accommodating pedestrian traffic entering the Pentagon at the second floor at Corridors 2 and 3.

The design of Wedge #1 began in January 1994, and was completed in FY 1997. Construction activity began in January 1998, with a "wall bashing" ceremony in February 1998, to symbolically signify the start of the above ground work activity. Construction is scheduled for completion in FY 2001.

### *Wedge #2*

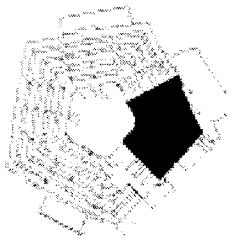
Wedge #2 is also a complete slab-to-slab reconstruction of the space. Replacement of all electrical, mechanical, and plumbing services will occur in accordance with the new design and a modernized telecommunication back-bone infrastructure will be installed. As discussed previously,

***Wedge #3***

Wedge #3 includes a complete slab-to-slab reconstruction of the space. All electrical, mechanical, and plumbing services will be replaced in accordance with the new design and a modernized telecommunication infrastructure will be installed. The removal of non-masonry partitions will open the space to an "open office" concept. The work will be centered around Corridors 7 and 8.

This work also incorporates some of the security improvements by re-orienting public access to the 2nd floor.

***Wedge #4***



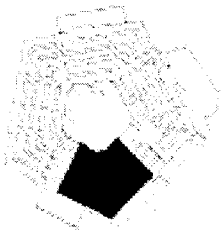
the removal of non-masonry partitions will open the space to an "open office" concept. The work is centered around Corridors 5 and 6.

A slab-to-slab reconstruction of the space in Wedge #4 is programmed. All electrical, mechanical, and plumbing services will be replaced and a modernized telecommunication infrastructure will be installed. The removal of non-masonry partitions will open the space to an "open office" concept. The work will be centered around Corridors 9 and 10.

This incremental area houses portions of the cafeteria facilities, the Concourse, and the Metro entrance.

This area also incorporates some of the security improvements by re-

***Wedge #5***



orienting public access to the 2nd floor. Existing ramp space to upper floors will be redistributed to incorporate expanded multi-purpose facilities as well as additional office space.

This last area will also undergo a slab-to-slab reconstruction. All electrical, mechanical, and plumbing services will be replaced and a modernized telecommunication infrastructure will be installed. The removal of non-masonry partitions will open the space to an "open office" concept. This last incremental area is centered around Corridors 1 and 2.

The area houses the remaining portions of the cafeteria facilities and the Concourse. Existing ramp space to upper floors will be redistributed to incorporate auditorium facilities.

# PROGRAM SCHEDULE

# The Pentagon Renovation Program
# Monthly Update Vs. Baseline Schedule
## February 1, 1999

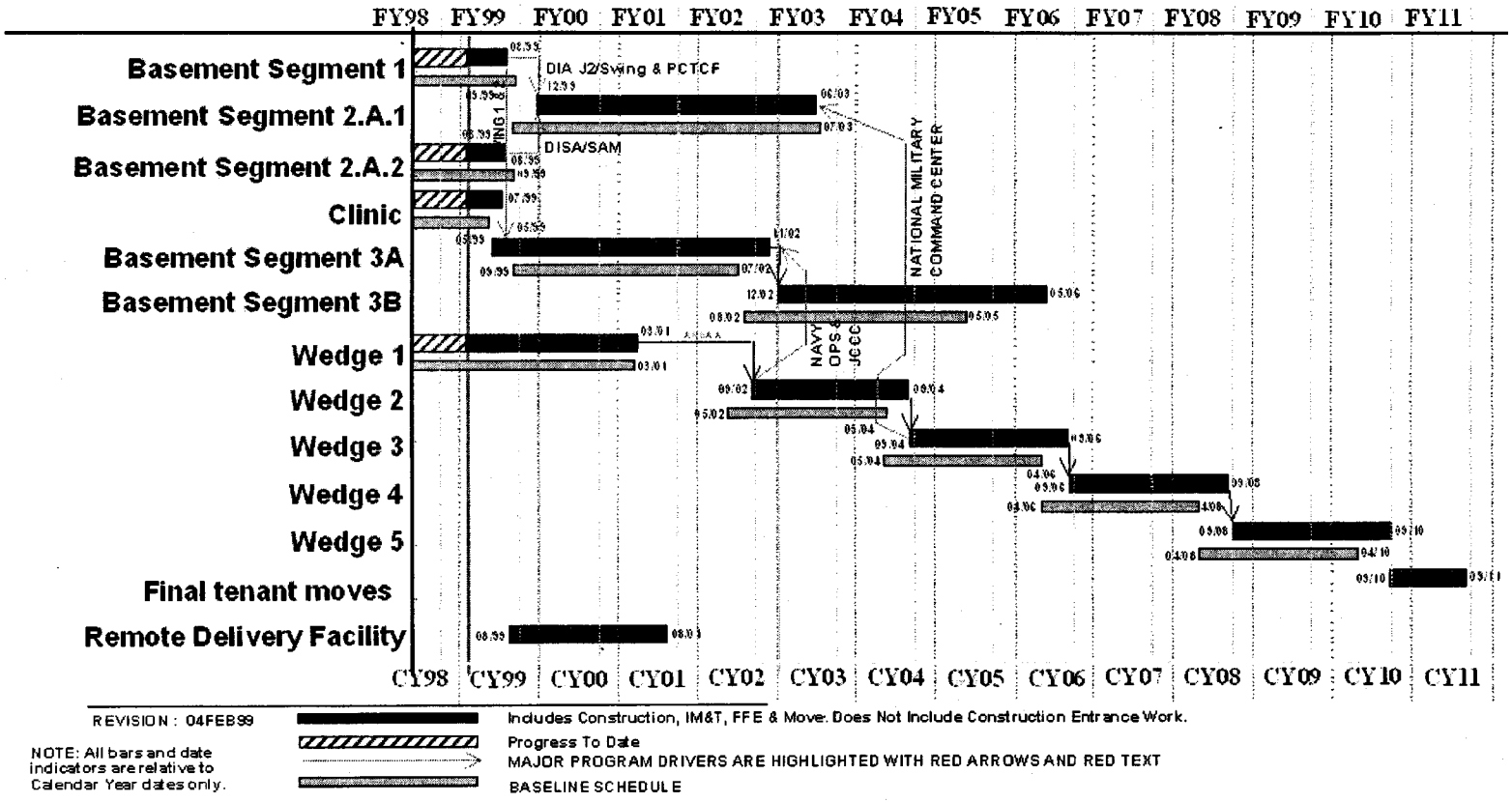



**Figure 81**

# FY 1991 Legislative Authorization

SEC 2804. OPERATION AND CONTROL OF THE PENTAGON RESERVATION

(a) IN GENERAL - (1) Chapter 159 of title 10, United States Code, is amended by inserting after section 2673 the following new section:

"§2674. Operation and control of the Pentagon Reservation

"(a)(1) Jurisdiction, custody, and control over, and responsibility for, the operation, maintenance, and management of the Pentagon Reservation is transferred to the Secretary of Defense.

"(2) Before March 1 of each year, the Secretary of Defense shall transmit to the Committees on Armed Services of the Senate and the House of Representatives, the Committee on Environment and Public Works of the Senate and the Committee on Public Works and Transportation of the House of Representatives a report on the state of the renovation of the Pentagon Reservation and a plan for the renovation work to be conducted in the fiscal year beginning in the year in which the report is transmitted.

"(b) The Secretary may appoint military or civilian personnel or contract personnel to perform law enforcement and security functions for property occupied by, or under the jurisdiction, custody,

Nov. 5 DEFENSE AUTHORIZATION ACT P.L. 101-510

Sec. 2804 and control of the Department of Defense, and located at the Pentagon Reservation. Such individuals—

"(1) may be armed with appropriate firearms required for

personal safety and for the proper execution of their duties,

whether on Department of Defense property or in travel status; and

"(2) shall have the same powers as sheriffs and constables to

enforce the laws, rules, or regulations enacted for the protection of persons and property.

"(c)(1) The Secretary may prescribe such rules and regulations as the Secretary considers appropriate to ensure the safe, efficient, and secure operation of the Pentagon Reservation, including rules and regulations necessary to govern the operation and parking of motor vehicles on the Pentagon Reservation.

"(2) Any person who violates a rule or regulation prescribed under this subsection is liable to the United States for a civil penalty of not more than $1000.

"(3) Any person who willfully violates any rule or regulation prescribed pursuant to this subsection commits as Class B misdemeanor.

"(d) The Secretary of Defense may establish rates and collect charges for space, services, protection, maintenance, construction, repairs, alterations, or facilities provided at the Pentagon Reservation-

"(e)(1) There is established in the Treasury of the United States a revolving fund to

be known as the Pentagon Reservation Maintenance Revolving Fund (hereafter in this section referred to as the'Fund'). There shall be deposited into the Fund funds collected by the Secretary of space and services and other items provided an organization or entity using any facility or land on the Pentagon Reservation pursuant to subsection (d).

"(2) Monies deposited into the Fund shall be available, without fiscal year limitation, for expenditure for real property management, operation, protection, construction, repair, alteration, and related activities for the Pentagon Reservation.

"(f) In this section:

"(1) The term 'Pentagon Reservation' means that area of land (consisting of approximately 280 acres) and improvements thereon, located in Arlington, Virginia, on which the Pentagon Office Building, Federal Building Number 2, the Pentagon heating and sewage treatment plants, and other related facilities are located, including various areas designated for the parking of vehicles.

"(2) The term 'National Capital Region' means the geographic area located within the boundaries of (A) District of Columbia, (B) Montgomery and Prince Georges Counties in the State of Maryland, (C) Arlington, Fairfax, Loudoun, and Prince William Counties and the City of Alexandria in the Commonwealth of Virginia, and (D) all cities and other units of government within the geographic areas of such District, Counties, and City."

(2) The table of sections at the beginning of such chapter is amended by inserting after the item relating to section 2673 the following new item:

"2674. Operation and control of the Pentagon Reservation."

P.L. 101-510 LAWS OF 101st CONG.—2nd SESS. Nov. 5 Sec. 2804

(b) TRANSFER OF FUNDS FOR FISCAL YEAR, 1991.—For fiscal year 1991, the Secretary of Defense may transfer into the Pentagon Reservation Maintenance Revolving Fund (established by section 2674(e) of title 10, United States Code), from funds appropriated to the military departments and the Defense Agencies, amounts equal to the amounts that would otherwise be paid by the military departments and the Defense Agencies to the General Services Administration for the use of the Pentagon Reservation.

A Status Report to Congress on

# Renovation of the Pentagon

*Prepared by*
**The Office of the Secretary of Defense**

March 1, 1999

**Figure 1**
**River Terrace Entrance Historic Facade**

## EXECUTIVE SUMMARY

As required by Section 2674 of Title 10, United States Code, the attached status report to the Congress on the Renovation of the Pentagon is presented annually and this is the ninth Report. This Report is a synopsis of where we are in the overall program, the work that has been completed during the past fiscal year and the work that is anticipated to be completed during the next fiscal year. In addition this Report reviews the design and construction costs to date within the framework of the overall certified summary. The report reviews seven categories as follows:

I. **Purpose:** A brief description for the reason of the report.

II. **Overview:** A general description of the development of the program since the initial Pentagon Renovation Concept Plan was prepared in 1989.

III. **Program Status:** This section defines the primary activities, the activity status of completed projects, projects under construction and projects under design. The primary activities involve the Design Guidelines and Criteria for the overall project and the design and construction for the basement and the wedges. The completed projects are the Basement/Mezzanine Segment 1 core and shell, the barrier walls and temporary mechanical, electrical and plumbing systems, and other related projects.

IV. **Fiscal Year 1999 Program:** This section lists the activities that are included in fiscal year 1999. These activities include Basement/Mezzanine Renovation, Wedge #1 Renovation and other related activities.

V. **Work Accomplished:** This section describes all of the work accomplished since the Heating and Refrigeration plant was awarded in 1992. The completed projects include Basement/Mezzanine Segment I core and shell, Heating and Refrigeration Plant, Center Courtyard Utilities Tunnel, Classified Waste Incinerator Plant, Sewage Lift Station, River Terrace Renovation, River Terrace Handicapped Access, Mug Handle Infill, Corridor 8 Entrance Renovation, Wedge #1 Temporary Construction and Swing Spaces. Projects under construction include Segment 2.A.2 Core and Shell and Tenant Fit Out, TRICARE Health Clinic, Wedge #1 Demolition and Abatement and South Terrace Pedestrian Bridges.

VI. **Budget:** This section describes the source of funds with a certification summary of what has been expended to date and what is programmed for the future. The total obligated funds through FY 1998 for design and construction are $348,700,000.00. Budgeted funds for FY 1999 to the end of the program for design and construction are $507,200,000.00.

VII. **Appendix:** This section includes a history of the Pentagon and a description of the deterioration of the building wide components and systems; a description of how the program was developed; a current program schedule; and past FY 1991 Legislative Authorization and Department of Defense Appropriations Act, FY 1999, with Certification.

# I. PURPOSE

# I. Purpose

This report is provided to the Congress in compliance with Title 10 United States Code, Section 2674, which requires the Secretary of Defense to submit an annual report on the status of the renovation of the Pentagon Reservation, and a plan for the renovation work to be conducted in the fiscal year beginning in the year in which the report is transmitted.

This is the ninth annual report submitted in compliance with 10 U.S.C. 2674. The report covers accomplishments to date and actions proposed for FY 1999. In addition, this report includes information on several related projects which support the overall objectives of operations and maintenance of the Pentagon Reservation.

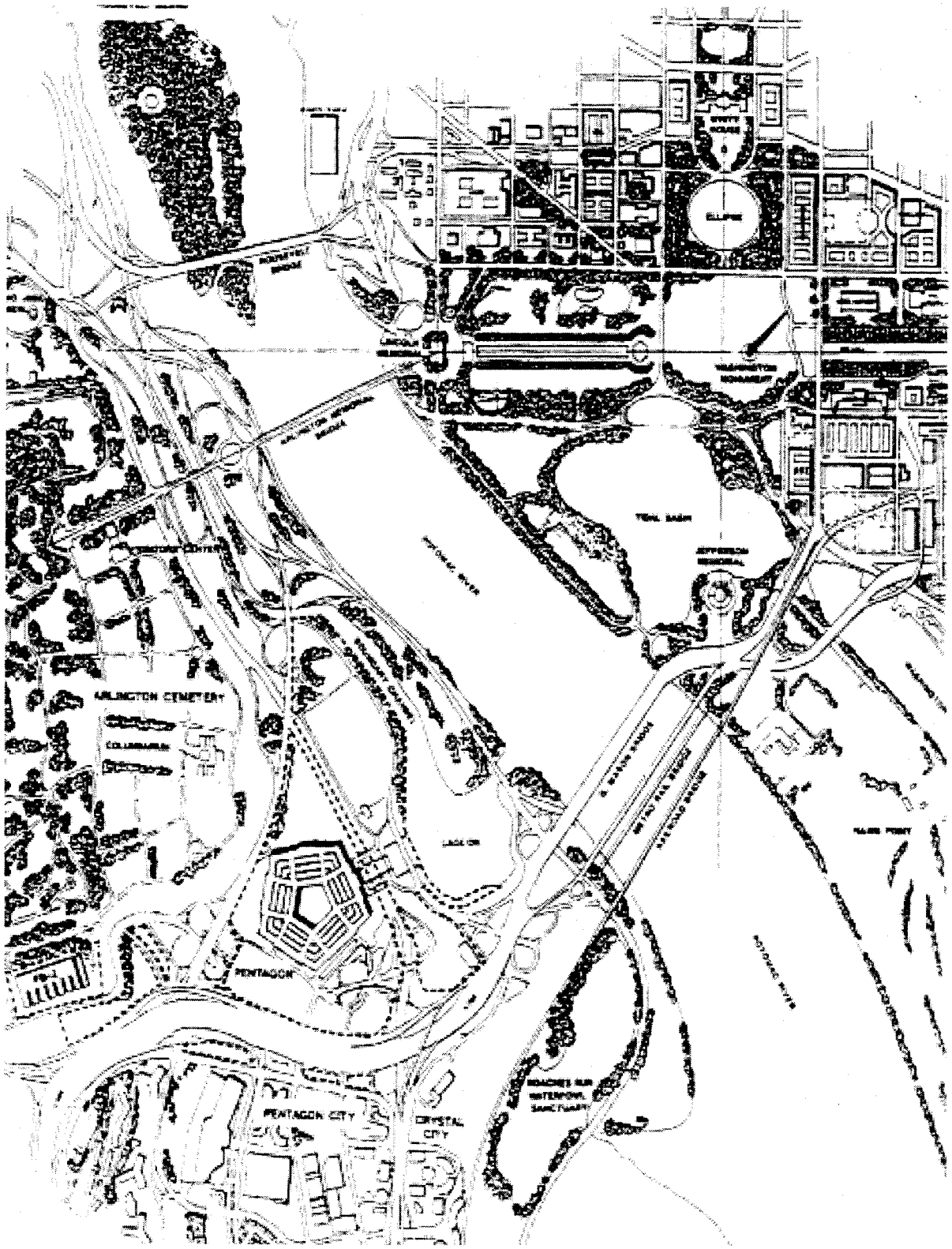



**Figure 2**
**Pentagon Location Map**

# II. OVERVIEW

**General**
**Reservation Master Plan**
**Concept Plan**
**Environmental/Energy Improvements**
**Renovation Conponents**
**Information Management & Telecommunications**
**Other Related Projects**

# II Overview

***General*** As the headquarters of the National Defense Establishment and the nerve center for the Department of Defense command and control, the Pentagon needs to be maintained in superior operational condition. However, over the Pentagon's 56 year lifetime, repairs and renovations have been undertaken on a piecemeal basis. Consequently, today the Pentagon, with many of its original systems still in place, has deteriorated to the point where distribution outages, plumbing leaks, water supply failures, and heating, ventilation, and air conditioning (HVAC) failures occur on a daily basis. The building fails to comply with current building, fire protection, and life safety codes, and accessibility standards.

These antiquated systems cannot provide adequate services to support a modern and flexible office environment. Computers, copy machines, and other heat-generating, power-consuming equipment normal in today's administrative offices, did not exist when the Pentagon was designed in 1943. The HVAC systems were never designed or intended to accommodate today's loads. The plumbing services, although adequately sized, have simply worn out. New demands have been placed on the structure's telecommunications and security systems that the original architects never could have anticipated. The tremendous increase in sophisticated computer equipment requires new, efficient, and integrated HVAC systems as well as additional power distribution sources.

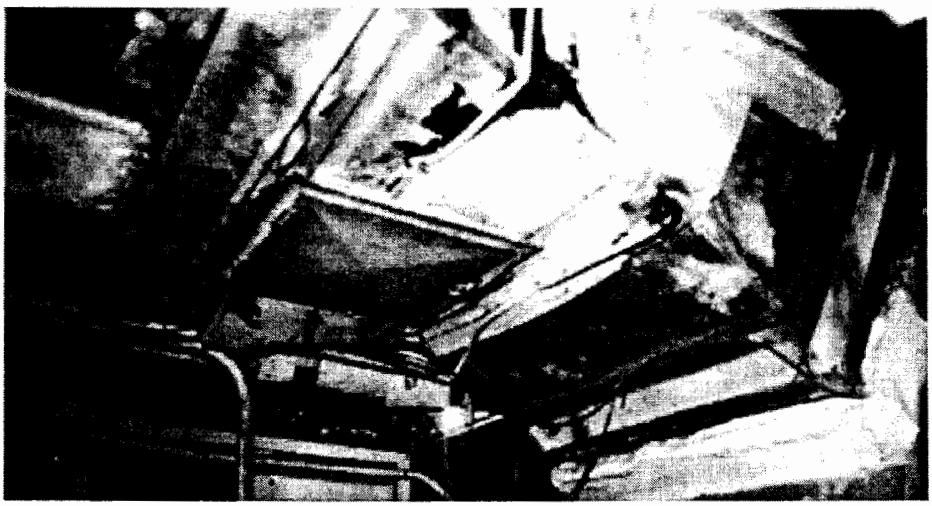


**Figure 3**
**Deteriorating Heating, Ventilation, and Air Conditioning (HVAC) Ductwork**

A key consideration in planning the renovation is that the Pentagon was constructed with plaster-finish ceilings which conceal the mechanical, electrical, and plumbing systems. Therefore, in order to replace or install the mechanical, electrical, and life safety systems, all asbestos-laden plaster ceilings, ducts, pipes and tile flooring must be removed from the building. Such demolition work will require the removal of the majority of obsolete full-height office partitions.

These steps, in turn, make possible the reconfiguration of space to provide modern flexible office space (many associated offices are not contiguous and are not efficiently housed). Current health and life safety requirements and the physical constraints of the building will not accommodate "piece-meal" renovation that would stop and start arbitrarily.

A complete renovation is necessary to provide a modern, flexible, efficient operating environment well into the 21st century. Without a major renovation, the building will continue to deteriorate, ultimately rendering it unable to serve its mission. These conditions require a plan of comprehensive scope to provide the benefits of a comprehensive building renovation.

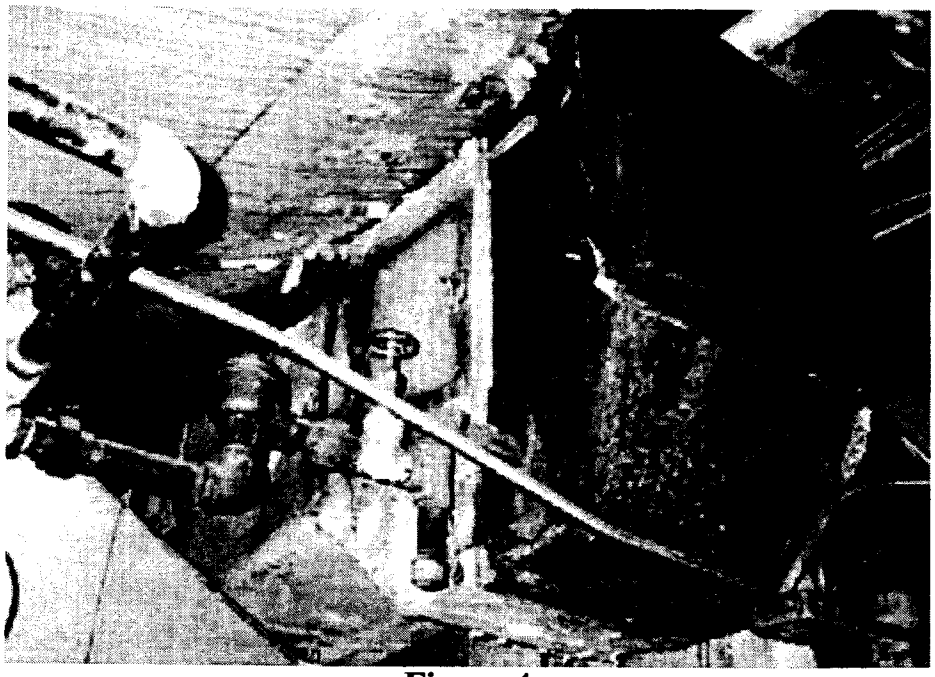


**Figure 4**
**Typical Ductwork Surrounded by Asbestos Insulation**

***Reservation Master Plan***

A Pentagon Reservation Master Plan and an associated Environmental Assessment have been approved by the National Capital Planning Commission and the Commission of Fine Arts. This plan defines how existing elements will be integrated with new construction and site improvements. Objectives of the Master Plan for the Pentagon Reservation are to:

- Establish an integrated program for renovation, demolition, and construction of structures and facilities on the Reservation.
- Recommend improvements in transportation, traffic flow, and parking, giving priority to transit, ride sharing, and multiple-occupant modes.
- Recommend improvements in the quality of the human environment while minimizing potential adverse impacts.
- Describe improvements necessary to reinforce the symbolic nature of the Pentagon Reservation as part of a major gateway to the Nation's Capital.
- Ensure that site development and new construction are compatible with existing buildings and surrounding features.
- Provide a sense of unity and identity for the entire Reservation.

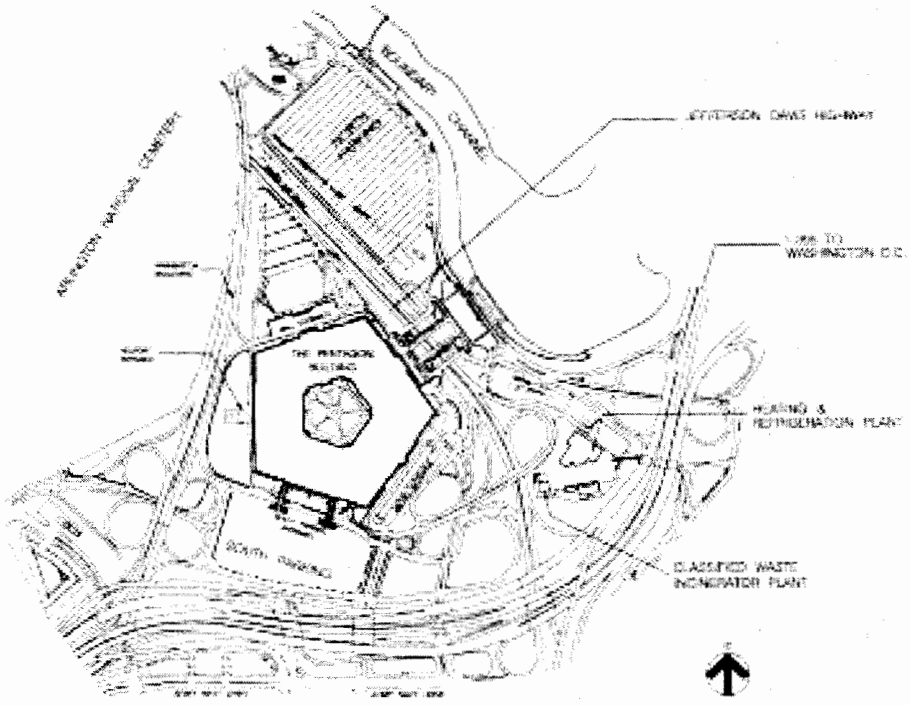


**Figure 5**
**Pentagon Reservation Site Plan**

***Concept Plan***

A Concept Plan, upon which the renovation plan was initially based, was completed in December 1989, refined in 1990, and forms the basis for planning the renovation of the world's largest low-rise office building.

In developing the Concept Plan, conceptual approaches to renovating the 6,500,000-gross-square-foot (603,900 $m^2$) Pentagon in phases were examined.

1. Smallest Increment — 150 increments of 44,000 sq. ft. (4090 $m^2$).
2. One tenth of a floor horizontal — 50 increments of 132,000 sq. ft. (12,268 $m^2$).
3. Vertical sections — 17 increments of 388,000 sq. ft.; sections divided along building seams, through all floors.
4. By tenants — more than six increments of less than 1,100,000 sq. ft. (102,230 $m^2$).
5. Five vertical sections — five increments (wedges) of 1,100,000 sq. ft. (102,230 $m^2$); divided along building seams, relocating tenants sequentially in each section.
6. Rings and vertical sections — five increments of 1,100,000 sq. ft. (102,230 $m^2$) (Renovate A-B Rings first, then C-E Rings).
7. One quarter of building — four increments of 1,625,000 sq. ft. (151,022 $m^2$).
8. All of the building — one increment of 6,500,000 sq. ft. (603,900 $m^2$).

Following an extensive evaluation, three of these conceptual approaches were selected for further study.

The three approaches selected for additional study were:

1. Seventeen vertical sections of building; sections divided along building seams, each part through all floors.
2. Five vertical building sections divided along building seams (wedges), relocating tenants in each section.
3. Rings and vertical building sections divided along building seams, renovate A Ring first, then five vertical sections.

Additional investigation was performed on each of these concepts. Evaluation factors included: maintaining support services; managing areas of construction; availability of construction staging areas; minimizing materials procurement lead times; minimizing asbestos removal impact; maintaining user operations; construction access to site/building; compatibility with utilities/building systems; maintaining physical security; minimizing construction time frame; availability of required construction personnel; and minimizing total project costs.

Renovating in five vertical sections (wedges) emerged as the best fit with the evaluation criteria and the option most likely to be successful. Therefore, the Concept Plan divided the Pentagon into five major phases of work plus the Basement and further identified five improvement alternatives to enhance the overall operation of the building:

1. Foyer/vertical circulation modifications.
2. New public access to the second floor.
3. Services corridor network.
4. Additional Mezzanine space.
5. Pentagon Maintenance Facility (formerly Logistics Support Extension).

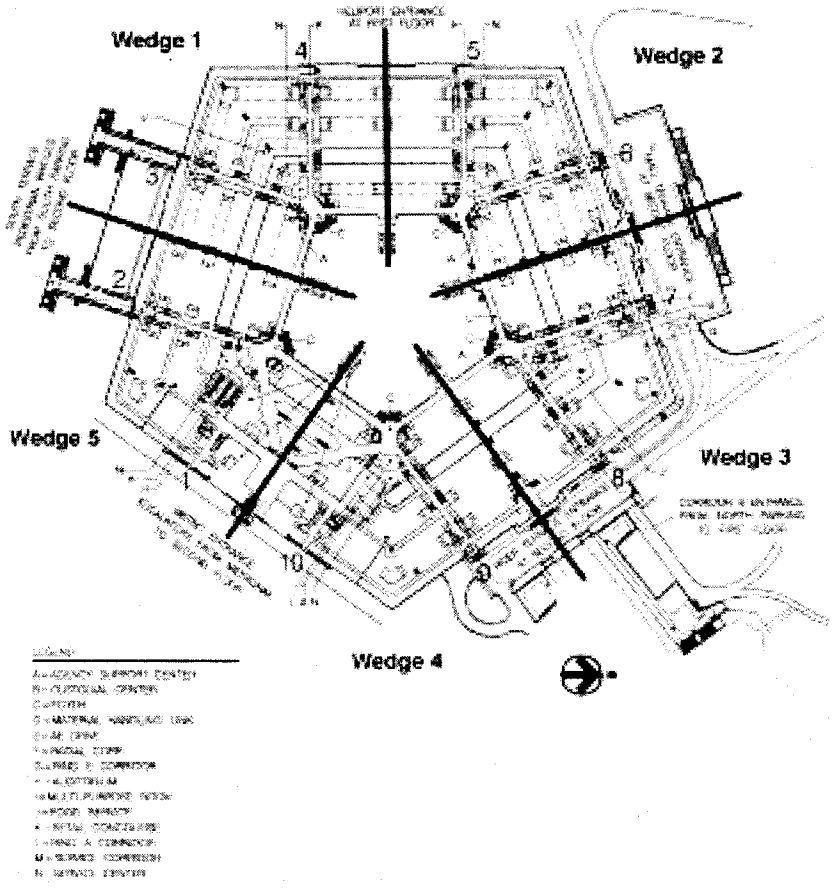



**Figure 6**
**Pentagon Building Master Plan—Second Floor Plan**

Incorporation of the improvement alternatives increases the building's efficiency and improves the internal organization of space and building systems. Key changes planned include:

- Modification of internal circulation patterns to allow better vertical integration of space. This will be accomplished through the introduction of passenger elevator services and additional escalators to replace current ramps and to augment stairwells.
- Re-orientation of public entrances to channel visitors to the second floor. This will isolate sensitive areas; improve internal security; and separate personnel from mechanized traffic (e.g. whenever possible, mechanized traffic, with the exception of ambulances, will be constrained to the first floor).
- Addition of first floor service corridors and service elevators that could reduce the intermingling of mechanized delivery vehicles from pedestrians in the main corridors. This increases the safety of building occupants and reduces damage to corridor floors and walls.
- Creation of flexible, expandable, mechanical, electrical, plumbing, and communications cabling systems to ensure that future demands for maintenance and new services can be met economically and efficiently.

Because the renovation includes asbestos removal and associated containment procedures, it will be necessary to completely vacate the areas under renovation while work is in progress. Temporary "swing space" must be obtained to house displaced activities. Activities displaced from or within the Pentagon will typically use swing space on a temporary basis until their renovated space is completed.

Renovation of the Pentagon involves the coordinated implementation of multiple related actions that will collectively address the building's condition. Since a major renovation has never been undertaken at the Pentagon, this project involves extensive demolition and reconstruction. Significant construction activities include replacement and upgrade of mechanical, electrical, plumbing, and all building support systems to modern standards. Interior spaces are being re-configured, and vertical transportation systems will be installed. New space will be added, both through the conversion of ramp and corridor space to office and support space, and through the expansion of the Mezzanine areas.

The Pentagon Renovation will enable organizations to be aligned vertically, and to be served with elevators and escalators, significantly improving circulation efficiency. Although the Commandant of the Marine Corps has already been accommodated with space in the Pentagon, the remainder of the Marine Corps Headquarters staff will be relocated to the Pentagon over the duration of the renovation program. The Department of the Navy will provide the location of the Marine Corps within its allocation of space in the Pentagon.

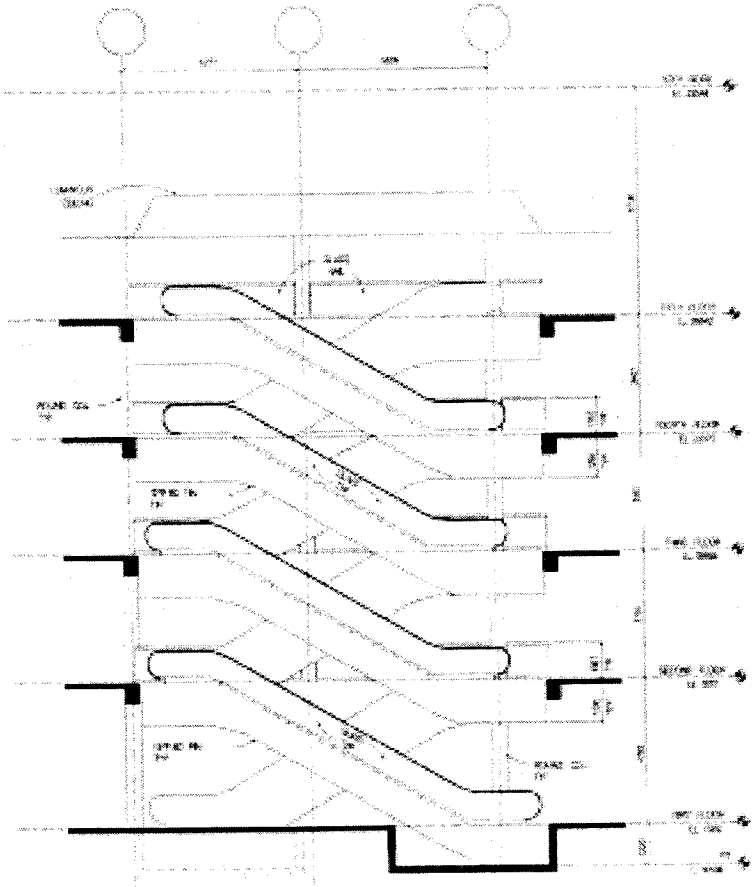


**Figure 7**
**Section Through Proposed Typical Foyer at Apex with New Escalators**

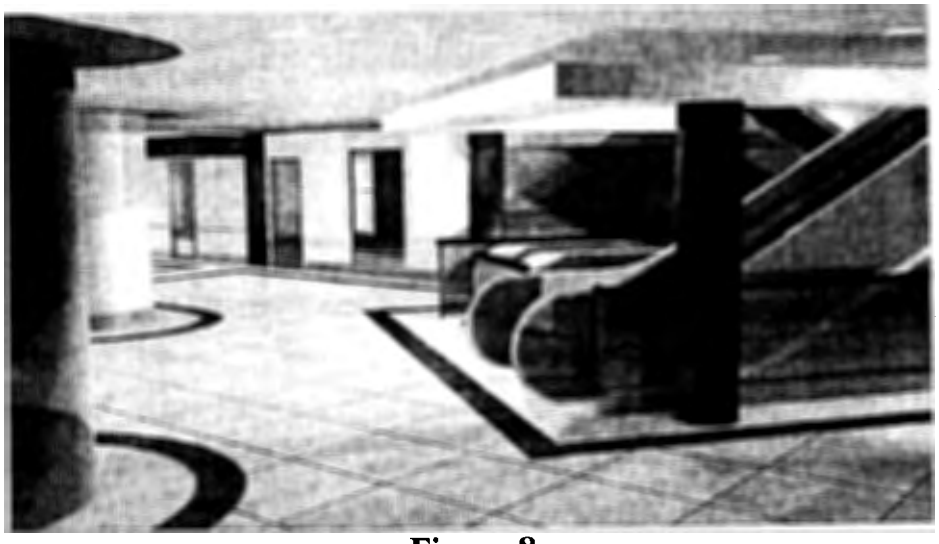


**Figure 8**
**Proposed Apex Foyer**

***Environmental/ Energy Improvements***

The Pentagon Renovation affords the opportunity to increase energy efficiency and reduce waste. Selected recommendations made during the Energy Efficient, Environmentally Sensitive DoD Showcase Facility Session held in the first quarter FY 1995 are being implemented. Through the Renovation, the Pentagon will obtain a healthy indoor environment by increasing air changes per hour and removing asbestos. The renovation of the Pentagon includes improving energy efficiency through:

- Double-glazed windows.
- Economizer cycles for heating, ventilating, and air condition equipment.
- Energy efficient mechanical and electrical equipment.
- Reduced overall lighting load and increased use of task lighting.
- Automated energy management systems.
- Increased use of insulation

The Pentagon Reservation will continue to comply with environmental regulations by testing soils and ground water for contamination, and by using appropriate soil erosion and sediment management. The Pentagon is now complying with the Clean Air Act by reduced emissions from the Heating & Refrigeration Plant and the Classified Waste Incinerator Plant, projects already completed during earlier phases of the renovation.

In summary, the renovated Pentagon will benefit from quality indoor air, a new, high-efficiency Heating & Refrigeration Plant, automated energy systems management, energy-efficient lighting, and an improved thermal building envelope.

***Renovation Components***

The Pentagon Renovation Program includes the following distinct components:

- Basement and Mezzanine Renovation.
- Above-grade building renovations of Wedges #1-#5.

The overall renovation of the Basement/Mezzanine is being accomplished in multiple increments, and began with the area centered around Corridor 8.

The deflected Basement floor slabs were demolished, the floor level of the basement slabs were lowered, the slabs replaced, and foundations have been modified for the revised structural conditions.

The Mezzanine space in the two-story-high Basement areas is being extended, and its completion will provide about 278,000 sq. ft. (25,826

$m^2$) of additional occupiable space.

The Army Motor Pool, previously located in the Mezzanine, has been permanently relocated off-site. Correction of severe structural deficiencies has been completed and this former motor pool area is being converted into the DiLorenzo TRICARE Health Clinic which consolidates the separate Army, Civilian, and Air Force clinics.

A construction contract was awarded on February 16, 1994, for the Basement Segment 1 Temporary Mechanical, Electrical, and Plumbing. This work has been completed.

A construction contract was awarded on September 30, 1994, for the Basement Segment 1. The construction of the core and shell has been completed. Tenant fit-out is well underway, with several tenants already relocated. Final tenant fit-out work is scheduled for completion in FY 1999. The construction of the remainder of the basement will proceed in multiple increments which started in FY 1998.

To eliminate the need for the undesirable existing sewage ejectors in the basement, a construction contract was awarded September 29, 1995, for the Sewage Lift Station. This work was completed in January 1997.

*Above-grade Renovation of Wedges #1 - #5*

The construction of the above-grade renovation of Wedges #1-#5 will be completed in five sequential, separate wedges based on isolation of building systems and minimum disruption to tenants.

To provide the environment and physical infrastructure to support the mission of our national defense establishment headquarters all antiquated internal building systems will be replaced and brought up to current building, fire protection, and life safety codes, and accessibility standards. The renovation work involves the demolition and removal of all partitions; ceilings; floor finishes; and mechanical, electrical, plumbing, fire protection and communications systems. Where sound, the basic structural system, as well as the stairwells and their enclosing walls will remain.

This renovation work will facilitate the reconfiguration of space to provide modern, flexible, office space, readily adaptable to accommodate future organizational changes as well as technological advances in office equipment and work space environments. This configuration will also allow for the consolidation of organizations which are now fragmented.

Support facilities, including food service, communications, control centers, a library, recreational areas and retail stores will be renovated as the wedges in which they are located are scheduled for construction.

New primary and secondary electrical service and distribution systems, including a cable management system, will be installed. Emergency lighting,

**Figure 9**
**Proposed Renovated Tenant Space**

fire protection, and uninterruptible power supplies and panels will be installed as well.

The heating, ventilating, and air conditioning systems will be replaced. A dual feed loop system will be installed to provide chilled water service 24 hours daily for off-hours operations (thereby eliminating numerous package systems within the building). Toilet rooms will be relocated and brought up to current standards (including requirements for the disabled). All new waste and supply piping will be installed.

The building will be equipped throughout with a sprinkler system and a reconfigured fire alarm system.

The completion of the South Terrace Pedestrian Bridges will provide improved public access at the second floor level. Internal circulation will be enhanced by the installation of escalators and personnel elevators. In addition, these changes will improve security by isolating sensitive spaces on or below the first floor.

An independent service corridor network serving the vertical transportation elements will be constructed on the first floor to improve efficiency of distribution. The massive floor area of the Pentagon necessitates initial support distribution via motorized carts at this floor level. Decentralization of support activities will allow for reduced use of all vehicles other than emergency medical vehicles above the first floor. Existing freight elevators will be replaced, and new service elevators will be installed at additional decentralized locations, along with trash removal facilities.

To gain additional occupiable space, excessively wide corridors will be

narrowed and all ramps will be removed and replaced with structural floors. Auditorium and conference spaces will be expanded. Roof, roof gutters, down spouts, and flashing will be repaired/replaced where deterioration is encountered in the renovation work. Existing steel casement and double-hung windows will be replaced with new, energy-efficient and appropriately secure units in accordance with historical agency requirements. Modifications will be made to outer perimeter monumental windows to improve weather-tightness and security. All exterior masonry and concrete finishes and waterproofing elements will be restored to sound condition.

The intersections of radial corridors at the innermost ring corridor (Ring A) are not efficiently used at present. These areas will be renovated to provide vertical transportation for improved passage throughout the building. The introduction of vertical transportation will facilitate the consolidation and assignment of organizations vertically throughout the building. The current excess areas at these intersections will be developed to provide conference and training facilities, briefing centers, snack bars, and other multi-purpose support functions. The previous and following renderings and drawings illustrate the planned development of the above-grade renovations:

- Pentagon Building Master Plan Second Floor Plan. (Figure 6)
- Plan of Proposed Typical Foyer at Apex with New Elevators and Escalators. (Figure 11)
- Section of Proposed Typical Foyer at Apex with New Escalators. (Figure 7)
- Proposed Apex Foyer. (Figure 8)
- Proposed South Terrace Pedestrian Bridges. (Figure 10)

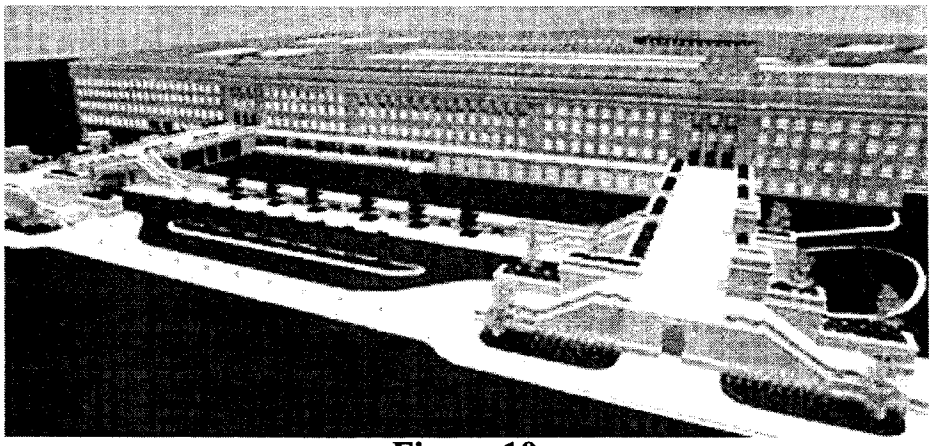


**Figure 10**
**Proposed South Terrace Pedestrian Bridges**
**(Currently Under Construction)**

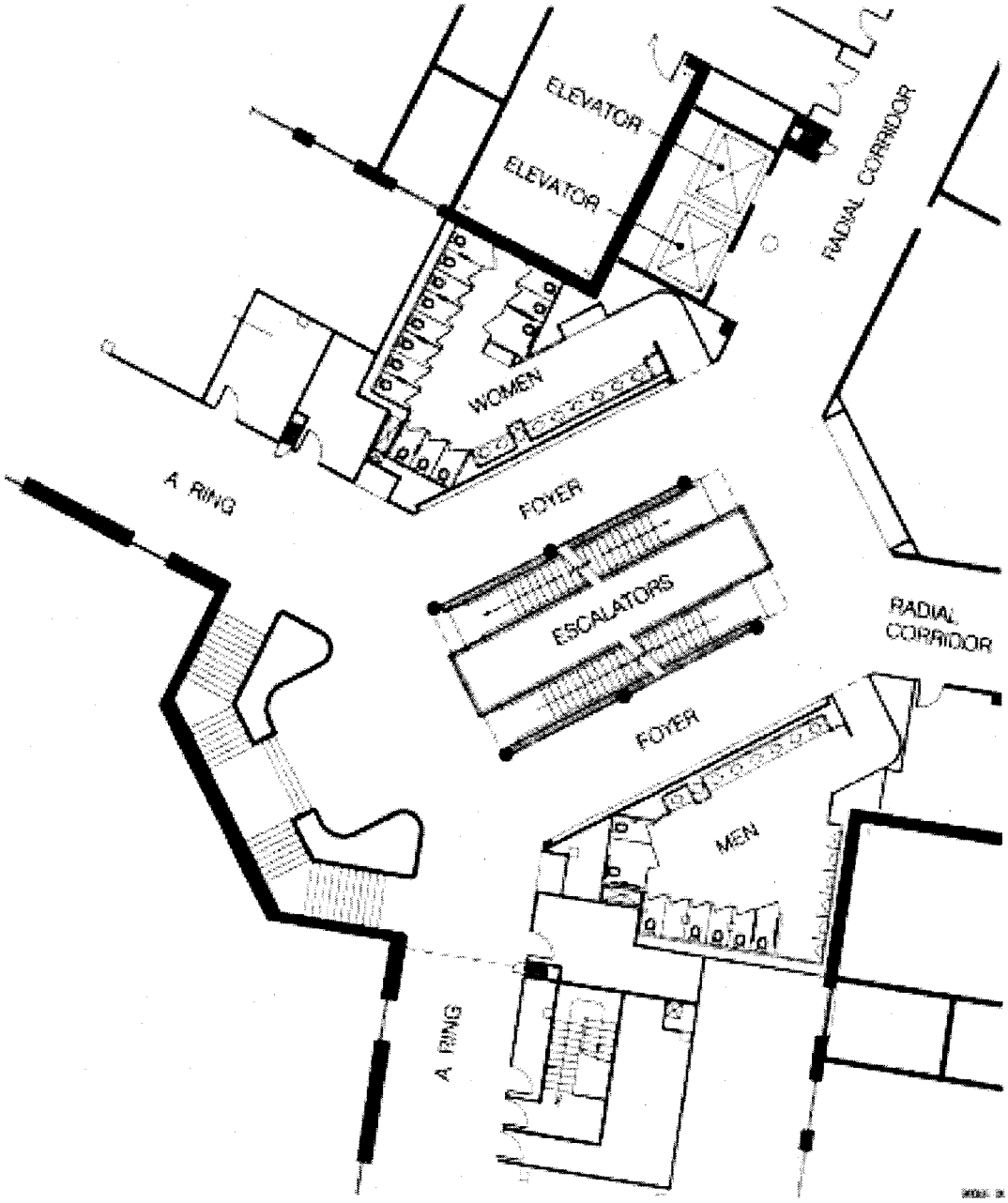



**Figure 11**
**Plan of Proposed Typical Foyer at Apex with New Escalators and Elevators**

***Information Management & Telecommunications***

Separate but related to the Pentagon Renovation Program will be an update of building information management and telecommunications. The basic information system infrastructure in the Pentagon was installed long before the advent of personal computers, facsimile machines, video teleconferencing, and digital telephone service, and has evolved without design or plan. As requirements emerged, facilities and systems were added with little or no regard to existing capabilities or long term requirements. The individual military departments and agencies engineered and installed equipment and cables to meet their specific requirements.

Many of the existing information systems in the Pentagon are now outdated, non-interoperable, duplicative, inefficient and expensive to operate and maintain. Systems and cables no longer needed have been abandoned in place. The Pentagon is seriously deficient in the information technology infrastructure necessary to function efficiently and to comply with maximum effectiveness.

The IM&T project will provide:

- Modern telecommunications and information management service throughout the Pentagon and access to global networks. Backbone communications will support voice, video, data, and other user requirements, such as Local Area Networks.
- Define, procure, integrate, and test hardware and software items required to meet functional requirements of the Network Systems Management Center (NSMC).
- Modernize the telecommunications infrastructure and consolidate the functions and responsibilities of the seven Technical Control Facilities in the Pentagon.
- Relocate the Defense Information Systems Agency (DISA) Joint Staff Support Center (JSSC) Command and Control (C2) Automated Data Processing (ADP) centers from existing facilities into one new facility located in the renovated Pentagon space.

Paralleling the C2 ADP efforts, the Business ADP Center will provide a modernized data processing facility for the Army and Air Force Systems. The ADP Center will be used primarily to house mainframe processors and their peripheral equipment, including storage devices and network processors. These systems are currently operating in multiple centers within the Pentagon.

In addition, IM&T will:

- Provide the renovated Pentagon with voice communications currently provided by multiple Command and Control, Tactical, and Administrative telephone switched located in multiple facilities.
- Refurbish and install the primary red and black Command and Control (C2) switches.
- Install the Main Distribution Frame in the General Purpose Switch Room (GPSR) and reduce the total switch architecture.
- Provide infrastructure and replicate user capabilities at temporary Swing Space locations as approved by WHS to locations both internal and external to the Pentagon.

## *Other Related Projects*

A number of initiatives ongoing at the Pentagon Reservation are separate from, but related to, the Renovation Program. The related initiatives which coincide with the Renovation effort reflect the fact that the Pentagon remains the fully operational headquarters of our Military Establishments while it is undergoing renovation. Thus, a number of other facilities projects are being closely coordinated with, and sometimes performed by, the Renovation Office.

*Heating & Refrigeration Plant*

Replacement of the Heating & Refrigeration Plant (H&RP) began the initial work on the Pentagon Reservation because the original plant was nearly inoperative, relying on rented boilers and chillers to provide the necessary services. The original H&RP, which served the Pentagon Reservation for over 55 years, was so deteriorated that it was more cost-effective to replace it than to renovate the existing facility and equipment. The new facility has been sized to provide steam and chilled water to the Pentagon and to Federal Building #2 (FB2) and steam only to Henderson Hall. Services are provided through new underground utilities distribution systems in a new utilities tunnel from the H&RP to FB2.The new H&RP is now completed and is now fully operational.

The facility has approximately 106,200 SF (9,900 m5) of floor area. The primary elements of the plant are six multi-fuel boilers (oil/gas), ten chillers, two 250,000 gallon (947,500 liters) fuel oil storage tanks, and office and maintenance areas. The Plant can provide 200,000 pounds per hour (25.25 kilograms per second) of steam heating capacity and 37,500 tons (131,900 kw) of cooling.

**Figure 12**
**Aerial View of New Heating & Refrigeration Plant**

The new facility has been built adjacent to the former Heating & Refrigeration Plant. Demolition of the original facility was completed in February 1998.

*Remote Delivery Facility*

In response to a comprehensive vulnerability assessment of the Pentagon, the Department of Defense has programmed for the construction of a Remote Delivery Facility (RDF) to move the shipping and receiving activities from the main Pentagon building to a secure, off-site screening facility at the Mall parking area of the Pentagon Reservation. This initiative is being done via a Design-Build contract. This is part of a systemized force protection program designed to protect sensitive Defense facilities. This security initiative eliminates the intrusion of over 200 daily delivery trucks that would otherwise breech the Pentagon security perimeter. Some industrial maintenance type activities are also being moved from the Pentagon building to the RDF. This project will integrate some force protection systems and facilities similar to those in place at the White House, U.S. Capitol, and the State Department. Congress provided design funding of $3 million for this fast-track security project as part of the FY 1998 Omnibus reprogramming. By letter of July 16, 1998, the Deputy Secretary of Defense outlined for Congress the Department of Defense's plan for completion of this initiative. The Pentagon Renovation Program Office has been directed to execute this requirement in coordination with the on-going Pentagon Renovation Program. This project is scheduled to begin in April 1999, with a final completion by December 2000.

*Site*

Site improvements include the continued operation, repair, maintenance, restoration and replacement or upgrading of landscaping, roads, walks, pavement, high pressure water mains, bridges, storm drain repair and relocation, transportation facilities, fences, modifications to meet current security and safety requirements, as well as realignment and improvement of vehicular traffic patterns.

*Swing Space*

Renovation of each wedge of the Pentagon requires the relocation of over 5,000 employees. As of January 1999, 5000 tenants in Wedge 1 have been relocated to external or internal swing space. "Swing Space" refers to office space outside the Pentagon that tenants will occupy during renovation, or temporary office space configured within the Pentagon for short term use.

Swing Space accommodations are critical to keeping the renovation program on schedule. Presently, three office buildings in Arlington, Virginia, have been leased to accommodate 4,120 Army, Navy, Air Force and OSD personnel for the duration of the renovation. Two office towers

in Rosslyn house 2,390 employees while an office tower in Crystal City is home to another 1,730 employees. Other employees will be relocated elsewhere on the Pentagon Reservation. All swing space facilities must maintain full connectivity to the Pentagon through classified and unclassified LANs, phone lines and electronic mail. All three buildings have been renovated for DoD tenants, and feature modern offices with professional workstations, state-of-the-art voice/data communication systems and sophisticated security systems. Communications with the Pentagon will be maintained.

# III. PROGRAM STATUS

**Primary Activities**
**Activity Status—Projects Completed**
**Activity Status—Projects Under Construction**
**Projects In Design**

# III Program Status

The program projects an overall completion of the renovation in FY 2010. The primary activities in the program include:

***Primary Activities***

- Development of Design Guidelines and Criteria for the overall project—***completed.*** (May be updated as needed.)
- Development of Information Management & Telecommunications (IM&T) Architecture—***completed.***
- Design and Construction of Basement/Mezzanine Segment 1—***underway.***
- Design and Construction of Basement/Mezzanine Segment 2—***underway.***
- Design and Construction of Basement/Mezzanine Segment 3—***underway.***
- Design and Construction of Wedge #1—***underway.***
- Design and Construction of Wedge #2—***underway.***
- Design and Construction of Wedge #3.
- Design and Construction of Wedge #4.
- Design and Construction of Wedge #5.

***Activity Status Projects Completed***

*Basement/Mezzanine*

- River Terrace Renovation—***completed.***
- Handicap Access Ramps and Handicap Access Lift—***completed.***
- Mug Handle Infill Project—***completed.***
- Corridor 8 Entrance Renovation—***completed.***
- Segment 2.A.2 Demolition and Abatement—***completed.***
- Construction Entrance for Segment 2.A.2—***completed.***
- Segment 2.A.2 Core & Shell—***completed.***
- Initial Tenant move into Basement Segment 1—***completed.***

*Wedge #1*

- Barrier Walls and Temporary Mechanical, Electrical and Plumbing Systems–***completed.***
- Vacating 5000 tenants—***completed.***
- Award of Core & Shell construction project—***completed.***

*Other Related Projects*

- Heating & Refrigeration Plant–***completed.***
- Center Courtyard Utilities Tunnel–***completed.***
- Classified Waste Incinerator Plant–***completed.***
- Sewage Lift Station–***completed.***
- New Site Security Checkpoints–***completed.***
- Ramp and Bridge from North Parking to Corridor 8 Entrance–***completed.***
- River Terrace Vehicular Bridge–***completed.***
- Build-out and occupancy of "Swing Spaces"–***completed.***

## *Activity Status Projects Under Construction*

*Basement/Mezzanine*

- Remaining tenant move into Basment Segment 1.
- DiLorenzo TRICARE Health Clinic.

*Wedge #1*

- South Terrace Pedestrian Bridges.
- Abatement.
- Core & Shell.

## *IM&T Renovation Projects*

*Above-ground Telecommunications*

- Above-ground Telecommunications Backbone awarded on 19 August 1998.
- Final Above-ground Telecommunications Backbone Architecture approved in January 1999.

*Basement/Mezzanine*

- Total Switch Architecture Primary command and Control (C2) Switch Room in the renovated space was properly accredited as a Sensitive Compartmented Information Facility (SCIF) by the Defense Intelligence Agency.
- Air Force Operations Group Facility fully operational and accredited.
- Began installation of equipment and upgrades for Business ADP #1.
- Installation of Basement/Mezzanine Segment 1 Backbone—***underway***.
- Design and installation of Segments 2 & 3 Backbone—***underway.***

*Wedge #1*

- Swing Space design, build-out, and move efforts—***completed.***

## *Projects in Design*

*Basement*

- Segments 2 & 3 Core & Shell.

*Remote Delivery Facility*

- Core & Shell

*Wedge #1*

- Tenant Fit-out.

*Other Related Projects*

- New Intake Piping and Structures for Heating & Refrigeration Plant (H&RP).

# IV. Fiscal Year 1999 Program

## Activities

# IV Fiscal Year 1999 Program

The FY 1999 program includes the following activities:

***Activities***

*Basement/Mezzanine Renovation*

- Complete construction of DiLorenzo TRICARE Health Clinic.
- Complete design of Segments 2 & 3 Core & Shell.
- Complete design of Tenant Fit-Out of Segments 2 & 3.
- Start construction of Segments 2 and 3.
- Cut-over of Business ADP #1 Facility.
- Cut-over of Network and Systems Management Center (NSMC).
- Cut-over of Pentagon Consolidated Technical Control Facility (PCTCF).
- Complete IM&T installation in Segment 1 & 2.

*Wedge #1 Renovation*

- Complete construction of South Terrace Pedestrian Bridge at Corridor 2.
- Begin construction of South Terrace Pedestrian Bridge at Corridor 3.
- Begin design of Tenant Fit-Out.
- Complete demolition and abatement activities.
- Begin installation of IM&T Backbone.
- Begin Core & Shell construction.

*Other Related Activities*

- Continue with Swing Space Moves.
- Complete design of H&RP Intake and Outfall Piping and Structures.
- Store historical displays and artifacts.

# V. Work Accomplished

## Completed Projects

**Basement/Mezzanine Segment 1**
**Heating & Refrigeration Plant**
**Center Courtyard Utilities Tunnel**
**Classified Waste Incinerator Plant**
**Sewage Lift Station**
**River Terrace Renovation**
**River Terrace Handicapped Access**
**River Terrace Vehicle Bridge**
**Mug Handle Infill**
**Corridor 8 Entrance Renovation**
**Wedge #1 Temporary Construction**
**Swing Spaces**

## Projects Under Construction

**2.A.2 Core & Shell**
**2.A.2 Tenant Fit-out**
**DiLorenzo TRICARE Health Clinic**
**Wedge #1Demolition & Abatement**
**South Terrace Pedestrian Bridges**

# Completed Projects

***Basement/ Mezzanine Segment 1***

The renovation of the Basement and Mezzanine Segment #1, under construction since March 1994, is now complete with the exception of a few areas yet to be occupied. The photographs below are representative of the some of the newly constructed areas.

**Figure 13**
**Ribbon-cutting Ceremony for Air Force Council Room**

**Figure 14**
**Air Force Watch Area**

# Completed Projects

***Basement/ Mezzanine Segment 1***

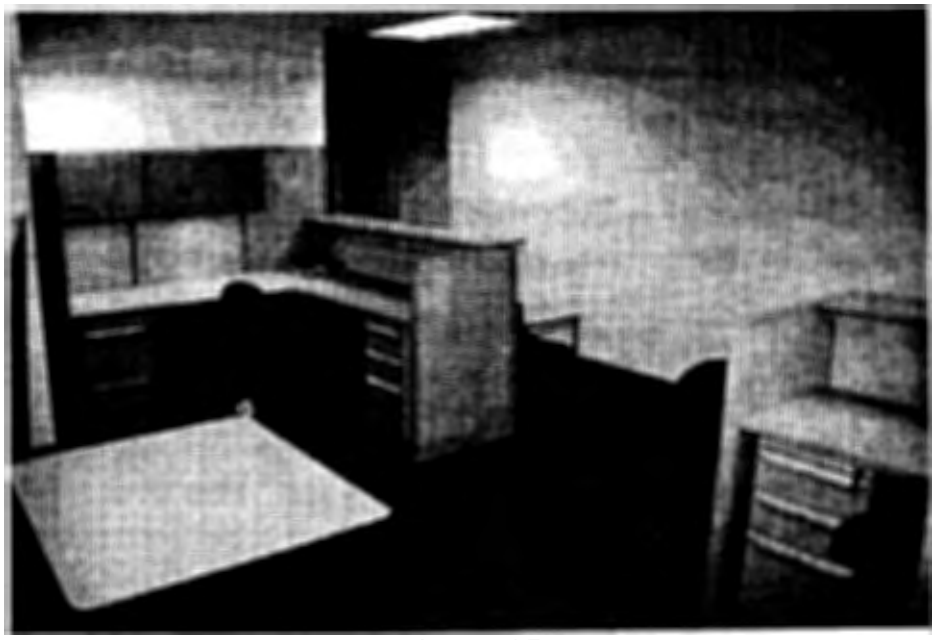


**Figure 15**
**New Modular Systems Furniture Adds Flexibility to Basement Office Space.**

**Figure 16**
**Lower Partition Walls Improve Air Flow and Light Dispersion**

***Basement/ Mezzanine Segment 1***

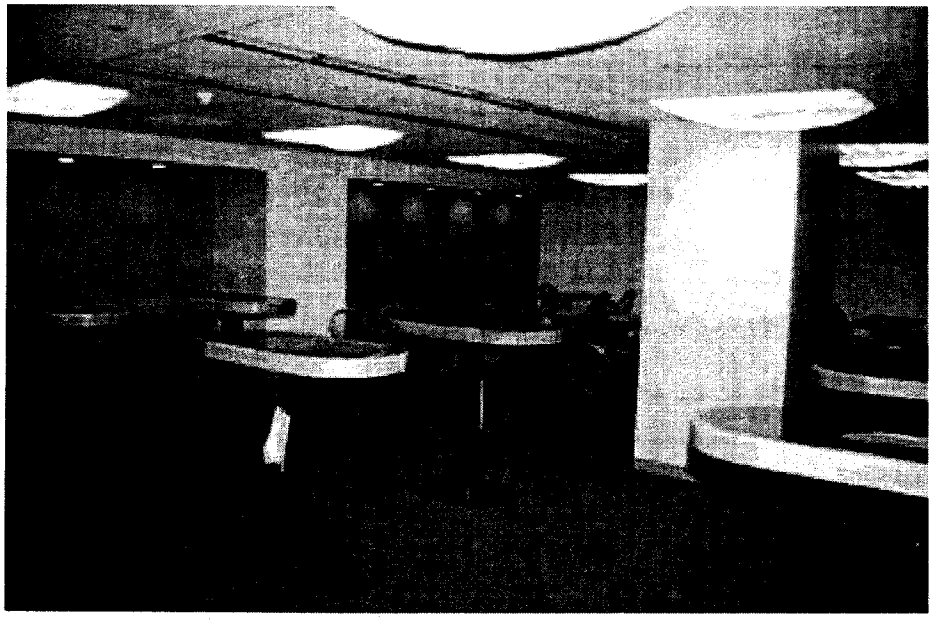


**Figure 17**
**Seating in the Basement's New 24-hour Snack Bar**

**Figure 18**
**Equipment Installation Is Complete in the Basement's New 24-hour Snack Bar**

# Completed Projects

***IM&T Basement/ Mezzanine Segment 1***

The Information Management and Telecommunications (IM&T) efforts in Basement/Mezzanine Segment 1 have been underway since FY 1995.

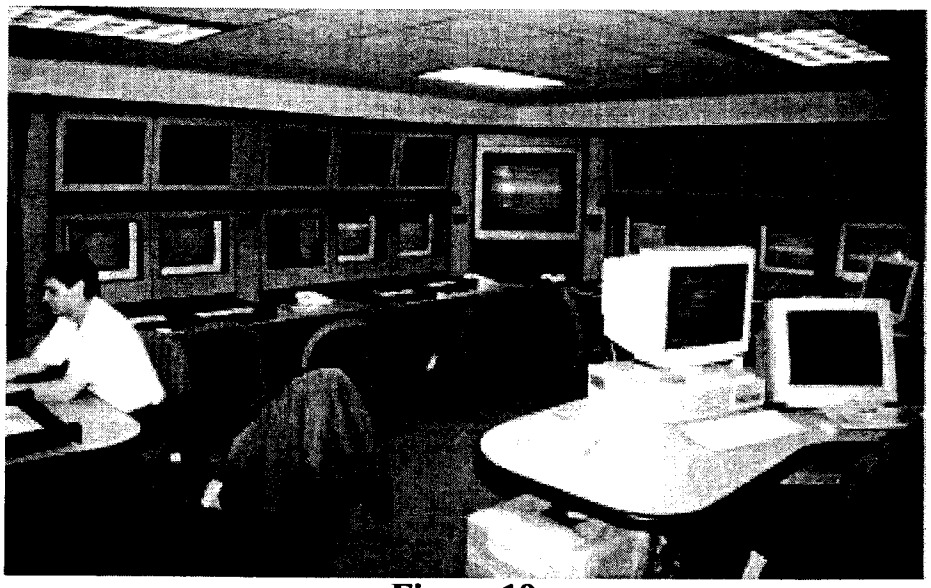


**Figure 19**
**Control Room in the New Network Systems Management Center**
**(Construction Complete, IM&T Installation Underway)**

**Figure 20**
**Technicians Test New Equipment in the Network Systems Management Center**

***IM&T Basement/ Mezzanine Segment 1***

**Figure 21**
**The Main Distribution Frame in the General Purpose Switch Room**
**(Construction Complete, IM&T Installation Underway)**

**Figure 22**
**Information Management and Telecommunications Personnel Review Fiber Installation Plans**
**(Construction Complete, IM&T Installation Underway)**

# Completed Projects

***IM&T Basement/ Mezzanine Segment 1***

**Figure 23**
**The New Technical Control Facility Will Be Home to All Pentagon Circuits**
**(Construction Complete, IM&T Installation Underway)**

**Figure 24**
**New Equipment in the Technical Control Facility**
**(Construction Complete, IM&T Installation Underway)**

***Heating & Refrigeration Plant***

The construction contract for the Heating & Refrigeration Plant (H&RP) was awarded on December 30, 1992, and construction began in February 1993. Construction is now complete and the plant is operational. The old H&RP building has been demolished.

**Figure 25**
**New Heating and Refrigeration Plant**

**Figure 26**
**New Heating and Refrigeration Plant (Chillers)**

# Completed Projects

***Center Courtyard Utilities Tunnel***

The Center Courtyard Utilities Tunnel provides utility lines that are efficient, reliable and easily maintained. The new utility lines are designed as a loop system that can continue to service other portions of the building while specific areas are shut down for localized maintenance. The roof of the tunnel serves as the access driveway for service and emergency vehicles in the Center Courtyard. Contract for design and construction of the Center Courtyard Utility Tunnel was awarded on February 25, 1994, and construction was completed in the Summer of 1997. The Center Courtyard utilities are not yet hooked up to the Wedges. Under the current plan, they will be hooked up on a Wedge by Wedge basis.

**Figure 27**
**Center Courtyard Utilities Tunnel**

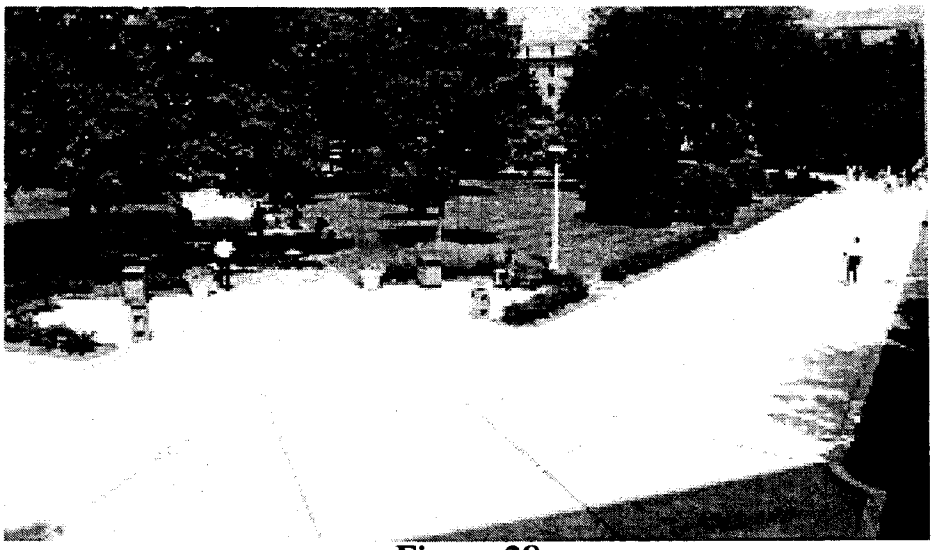


**Figure 28**
**Access Driveways over Tunnel Restored to the Original Condition**

***Classified Waste Incinerator Plant***

Renovation of the Classified Waste Incinerator Plant, located near the Heating & Refrigeration Plant, included a refurbishment of the existing plant and the replacement of the two existing incinerators. This work was completed while maintaining continuous operations. The new incinerators increase the classified waste burning capacity from 6,000 pounds per hour to 8,000 pounds per hour. The new incinerators are fully automated and their emissions are well under requirements set by the State of Virginia and the U.S. Environmental Protection Agency. The project was completed in 1997.

Figure 29
**Classified Waste Incinerator Plant**

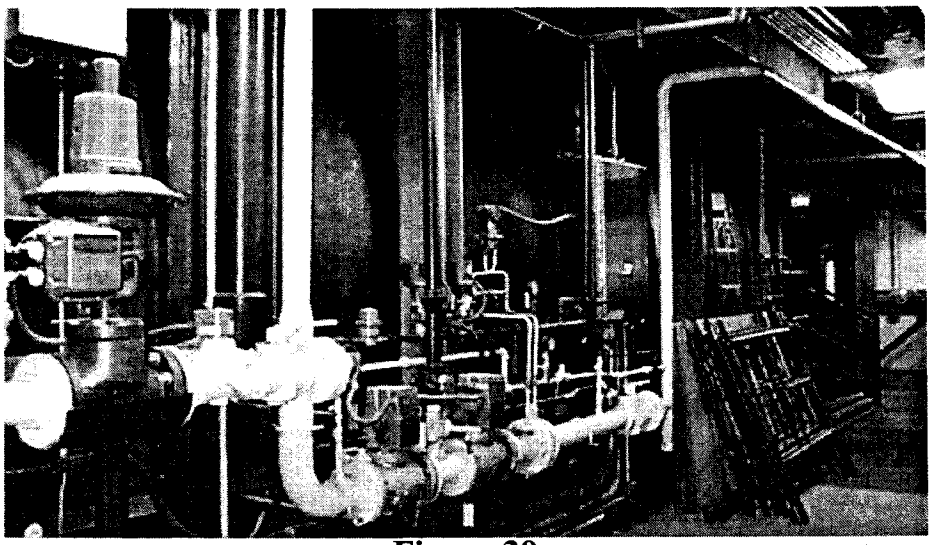


**Figure 30**
**Classified Waste Incinerator Plant**

# Completed Projects

***Sewage Lift Station***

The new Sewage Lift Station, which replaces the old Sewage Lift Station and the internal sewage ejectors in the Pentagon, is located along the walkway adjoining the North Parking area. The new Sewage Lift Station utilizes gravity flow for the waste from the Pentagon Basement, and the Pentagon Renovation and Planning Office. As the gravity lines carry sewage to the new lift station, a force main pumps sewage away from the new station to the Arlington Lift Station located in Crystal City. The new Sewage Lift Station is connected to the old sewage lift station which remains in place as a backup facility.

**Figure 31**
**Interior View of Sewage Lift Station**

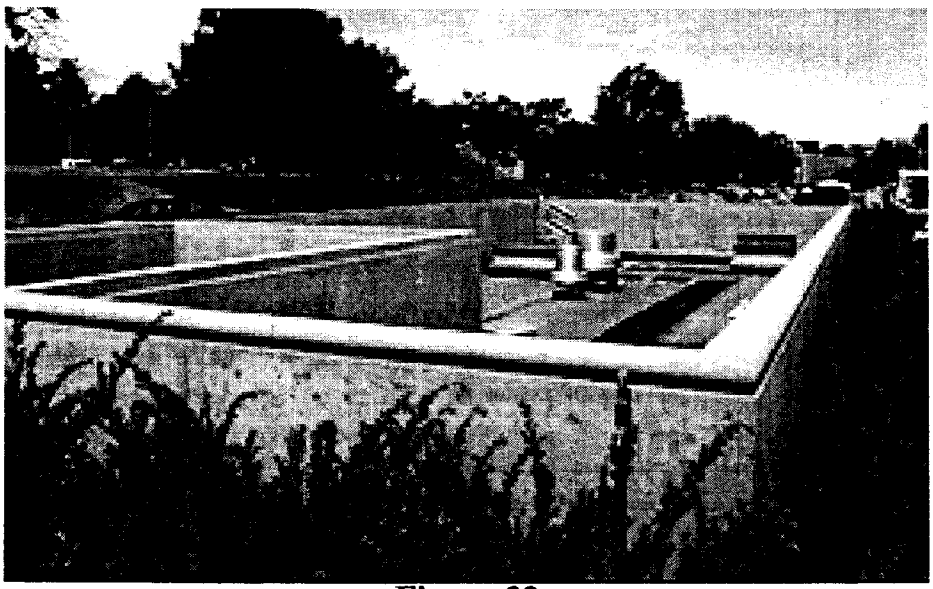


**Figure 32**
**Sewage Lift Station with Landscaping**

***River Terrace Renovation***

The renovation of the River Terrace corrected water proofing problems and repaired the time-ravaged steps, walkways, retaining walls, and planting areas. Waterproofing of this area was critical since the area directly below the River Terrace will be home to the DiLorenzo TRICARE Health Clinic and other occupied spaces under construction. The River Terrace renovations also included modifications to bring the area into compliance with the requirements of the Americans with Disabilities Act within the guidelines of the National Register of Historic Places.

**Figure 33**
**River Terrace Steps, Walkway, and Planters**

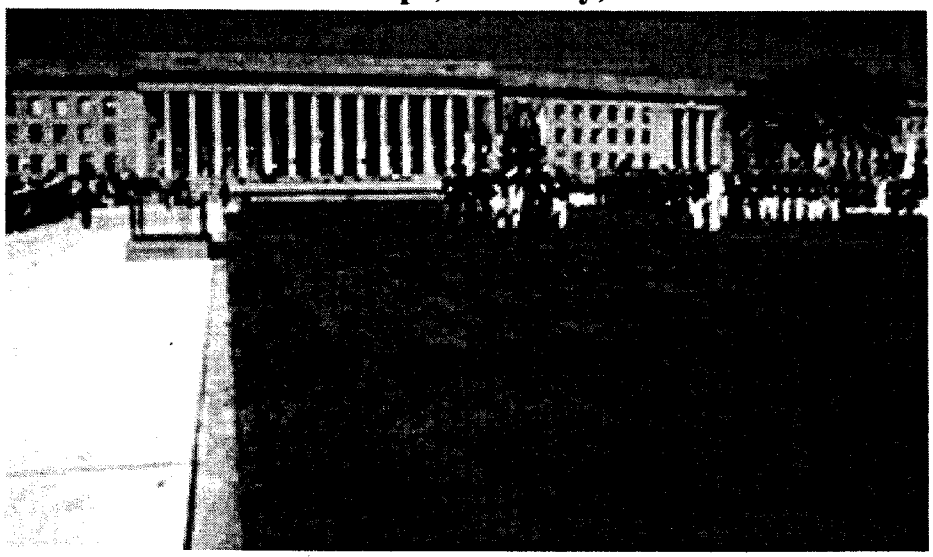


**Figure 34**
**Parade Grounds and Walkways**

# Completed Projects

***River Terrace Renovation Handicapped Access***

The renovation program must meet the congressionally mandated requirements of the Americans with Disabilities Act. Examples of work accomplished in compliance with these requirements include the handicapped access ramps on the River Terrace and the handicapped access lift at the River Terrace entrance.

**Figure 35**
**Handicapped Access Lift**

**Figure 36**
**Handicapped Access Ramp**

***River Terrace Renovation Vehicle Bridge***

Tests conducted on the River Terrace Vehicular Bridge over Route 110 revealed serious structural problems that required total replacement of the bridge. The construction contract was awarded on September 30, 1996, and construction was completed in October 1997.

**Figure 37**
**New River Terrace Vehicular Bridge**

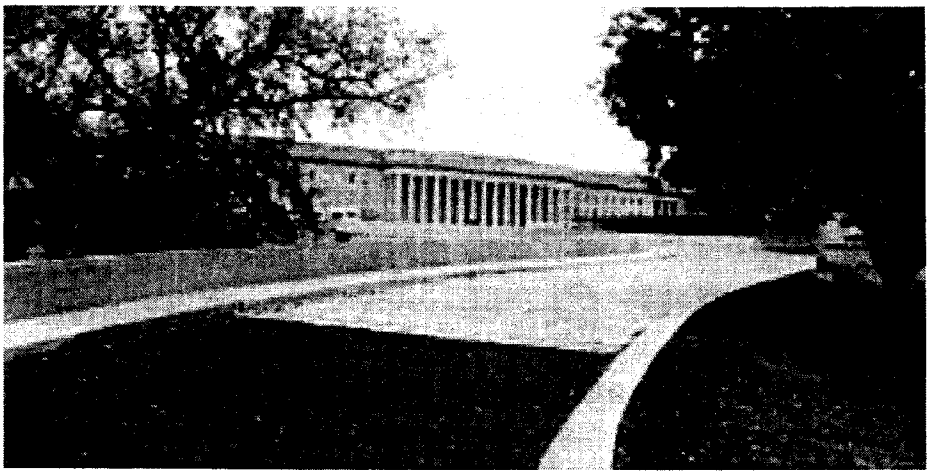


**Figure 38**
**Restored River Terrace Driveway**

# Completed Projects

***Mug Handle Infill***

The Mug Handle Infill Core & Shell project included excavation, pile foundations, and new slabs, for the space between the southern edge of the River Terrace and the curved entry to the former motor pool (now the DiLorenzo TRICARE Health Clinic entrance). The construction contract was awarded on October 15, 1997 was completed in FY 1998. The tenant fit-out, IM&T, and furniture work is to be completed in FY 1999.

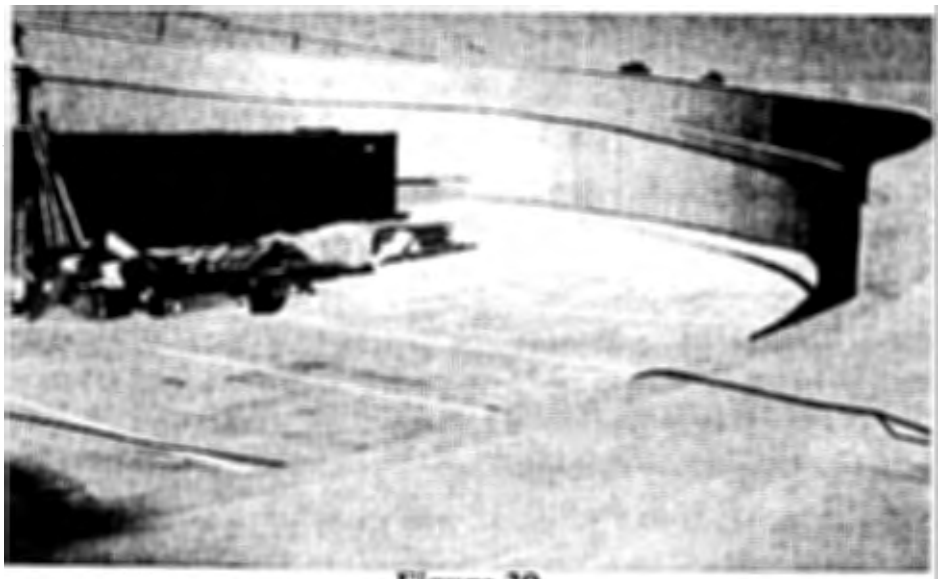


**Figure 39**
**Exterior View of Mug Handle In-fill**

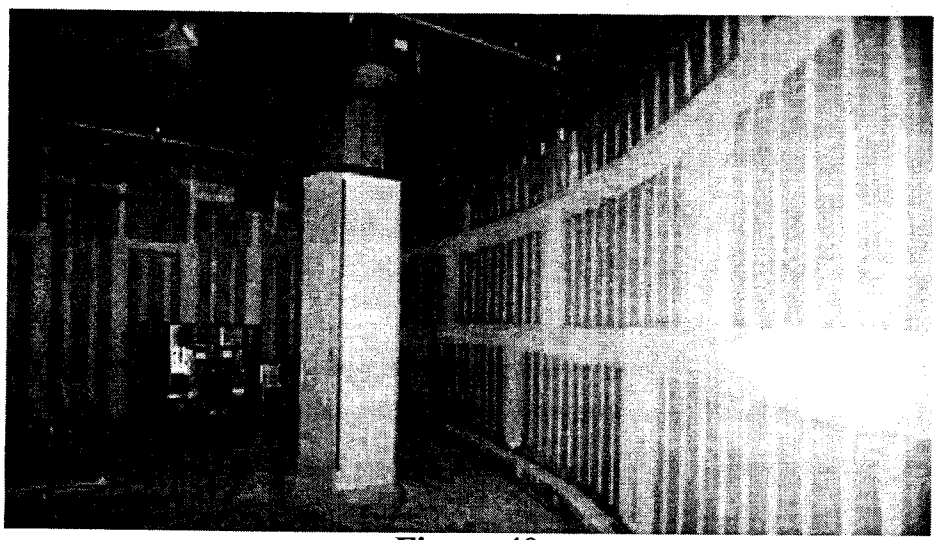


**Figure 40**
**View of Interior Mug Handle In-fill**
**(Construction Core & Shell Complete, Tenant Fit-Out Underway)**

*Corridor 8 Entrance Renovation*

The Corridor 8 Entrance renovation upgrades the entry security and handicapped access at one of the most heavily used entrances in the Pentagon. Renovation of this entrance was given priority over other entrances because it provides secure access to the DiLorenzo TRICARE Health Clinic under construction. The construction contract was awarded in July 1997, and was completed in FY 1998.

Figure 41
**New Turnstiles Enhance Security at Corridor 8**

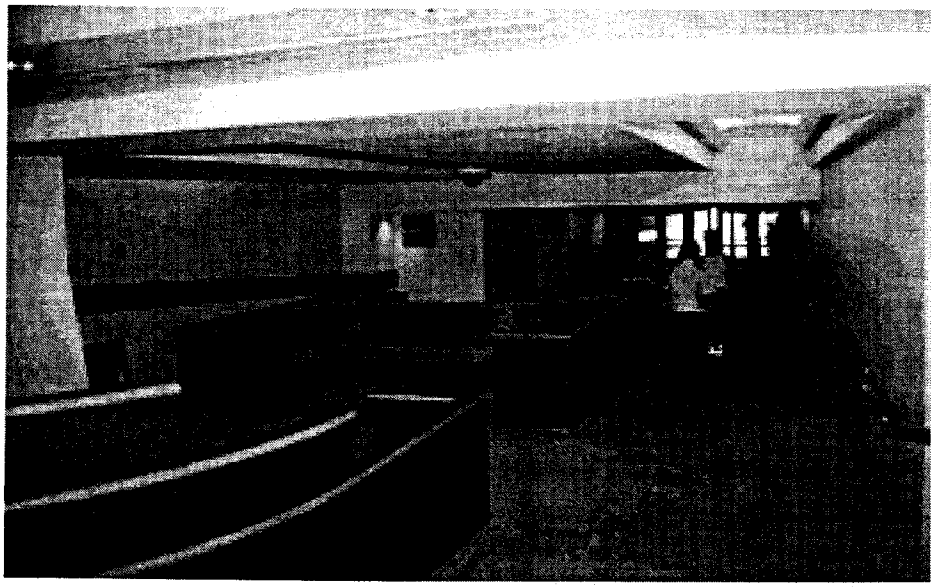


**Figure 42**
**New Corridor 8 Entrance**

# Completed Projects

***Wedge #1 Temporary Construction***

The Wedge #1 Temporary Construction contract included barrier walls to separate Wedge #1 construction from Wedges #2 and #5. It also included temporary adjustments to the mechanical, electrical, plumbing, fire alarm, communications, and security systems to facilitate future construction. The contract was awarded on July 17, 1997, and was completed in FY

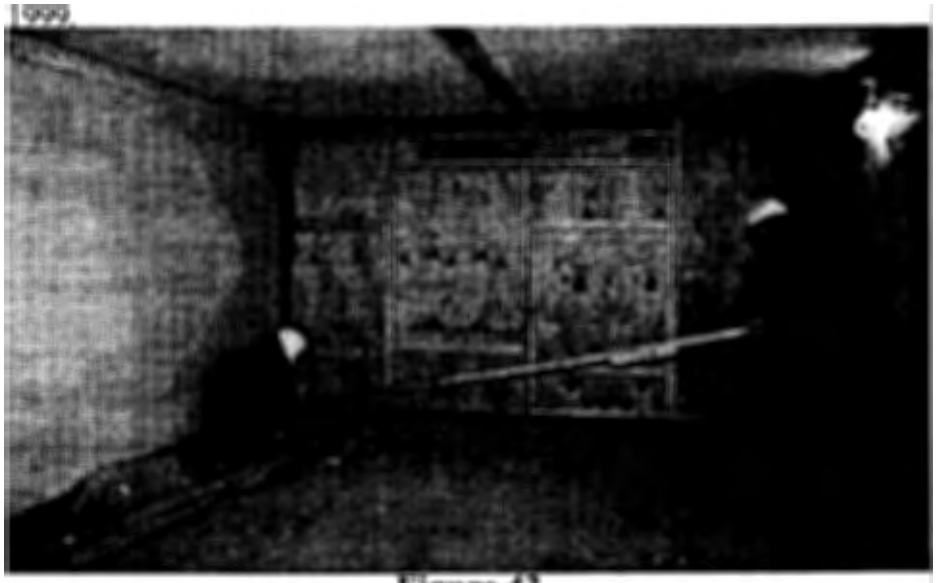


Figure 43

**Wedge 1—Barrier Walls Minimize Noise and Dust Infiltration to Occupied Areas**

Figure 44

**Construction of Barrier Wall**

***Swing Spaces***

To permit Wedge #1 to be renovated, approximately 6,000 personnel were relocated from Wedge #1 and elsewhere within the Pentagon. Of the approximately 6,000 personnel within Wedge #1, approximately 1,000 were relocated within the Pentagon and approximately 5,000 were relocated to swing space in off-site locations.

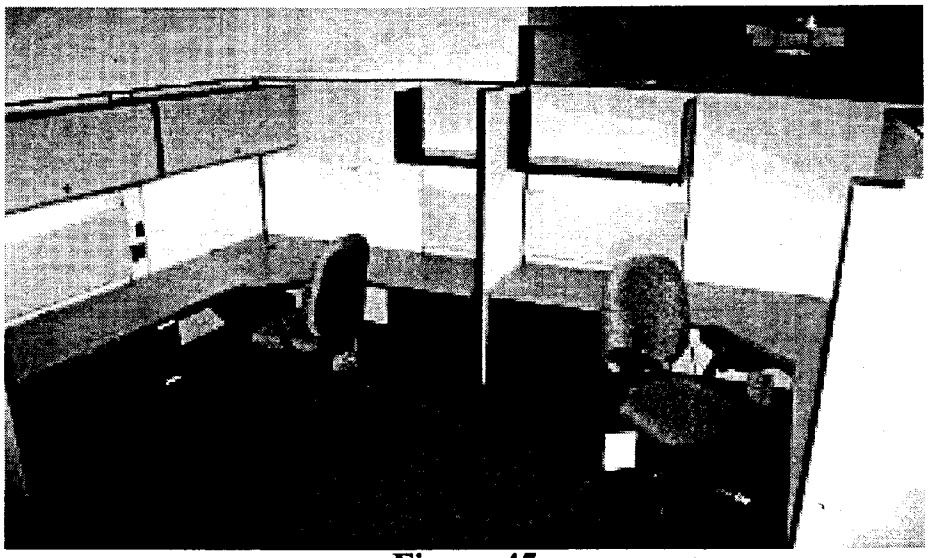


**Figure 45**
**Typical Swing Space Workstations**

**Figure 46**
**Typical Swing Space Work Area**

# Projects Under Construction

***Segment 2.A.2 Core & Shell***

The Segment 2.A.2 Core & Shell contract included lowering the Basement floor and constructing new foundations, slabs, utilities, mechanical, electrical and control systems, together with barrier walls. The contract was awarded on January 27, 1998, and was completed in FY 1999. The tenant fit-out, IM&T, and furniture work will be completed in FY 1999.

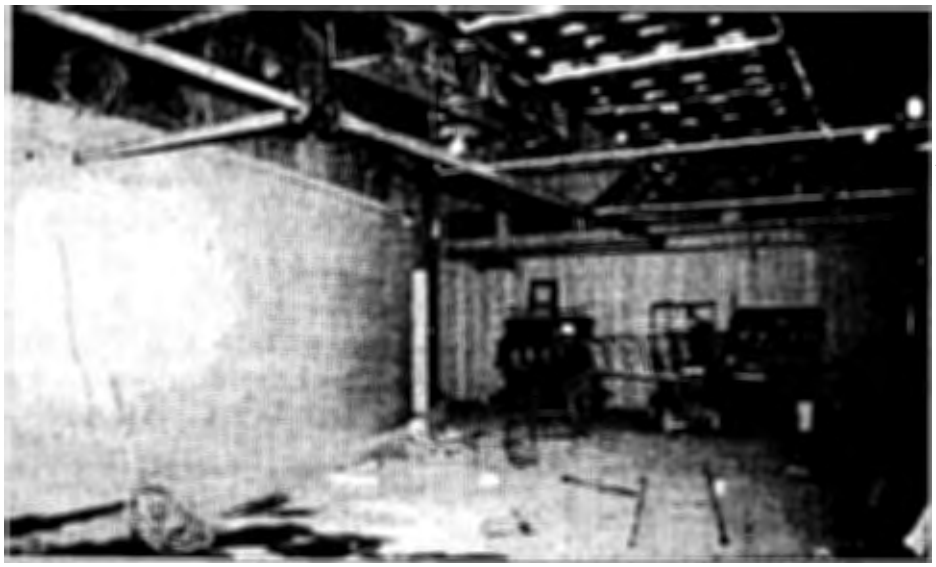


**Figure 47**
**2.A.2. Core & Shell Work**

**Figure 48**
**2.A.2. Core & Shell Work**

***Segment 2.A.2 Tenant Fit-Out***

Tenant partitions, ceilings and finishes, raised floor treatments, and installation of new mechanical, electrical and controls distribution are underway and scheduled for completion in FY 1999.

**Figure 49**
**2.A.2. Tenant Fit-Out Work**

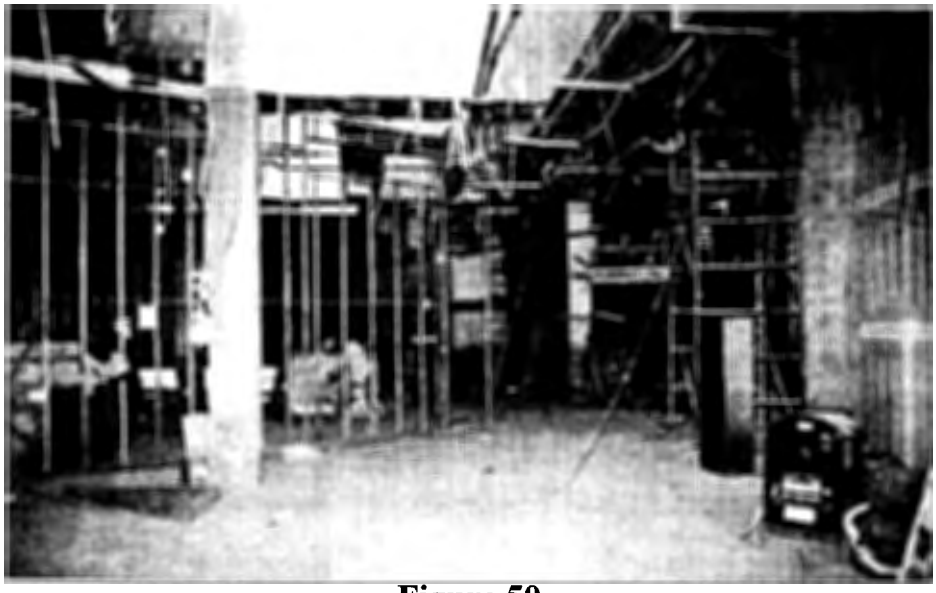


**Figure 50**
**2.A.2. Tenant Fit-Out Work**

# Projects Under Construction

***DiLorenzo TRICARE Health Clinic***

The DiLorenzo TRICARE Health Clinic is being constructed in the Basement. This new state-of-the-art health care facility will replace the Army, Air Force, and Civilian health clinics. This consolidation will eliminate redundancy of services, including pharmacies, radiology suites, file centers, and other ancillary support functions while saving valuable personnel time. The construction contract for the clinic was awarded on August 21, 1997, and is scheduled to be completed in FY 1999.

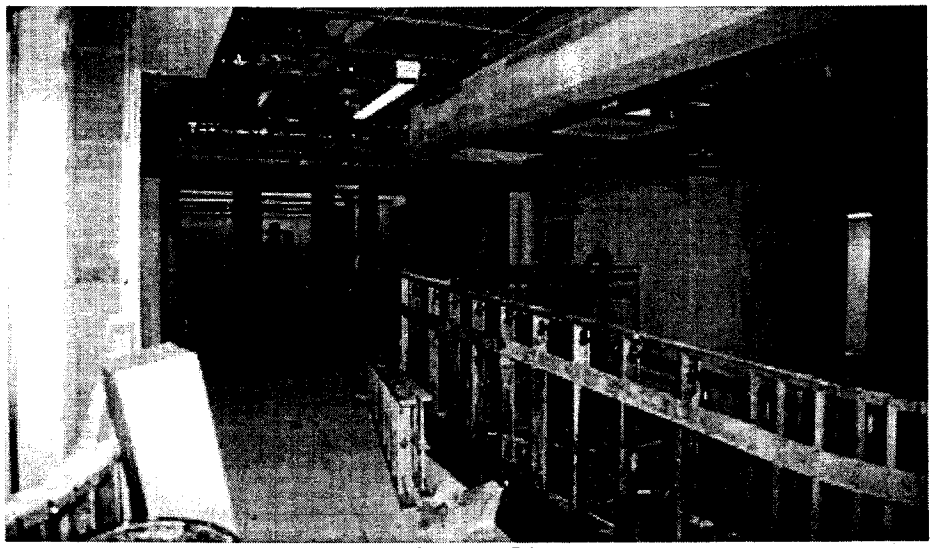


**Figure 51**
**View of DiLorenzo TRICARE Health Clinic Entrance from Corridor 8**

**Figure 52**
**Completed Guardrails Will Protect Walls from Gurneys**

***Wedge #1 Demolition & Abatement***

The contractor completed abatement and is nearing completion on the demolition of Fourth Floor Area A-2. Proper ventilation systems remain throughout both asbestos abatement and demolition.

**Figure 53**
**Wedge #1 "Wall Bashing" Ceremony Kicks-Off the Start of Demolition & Abatement**

**Figure 54**
**Wedge #1 Demolition and Abatement**

# Projects Under Construction

***Wedge #1 Demolition & Abatement***

**Figure 55**
**Trash Chutes Installed on A/E Drive for Top Four Floors**

**Figure 56**
**Wedge 1—An External Hoist Allows for the Safe Removal of Hazardous Materials**

***Wedge #1 Demolition & Abatement***

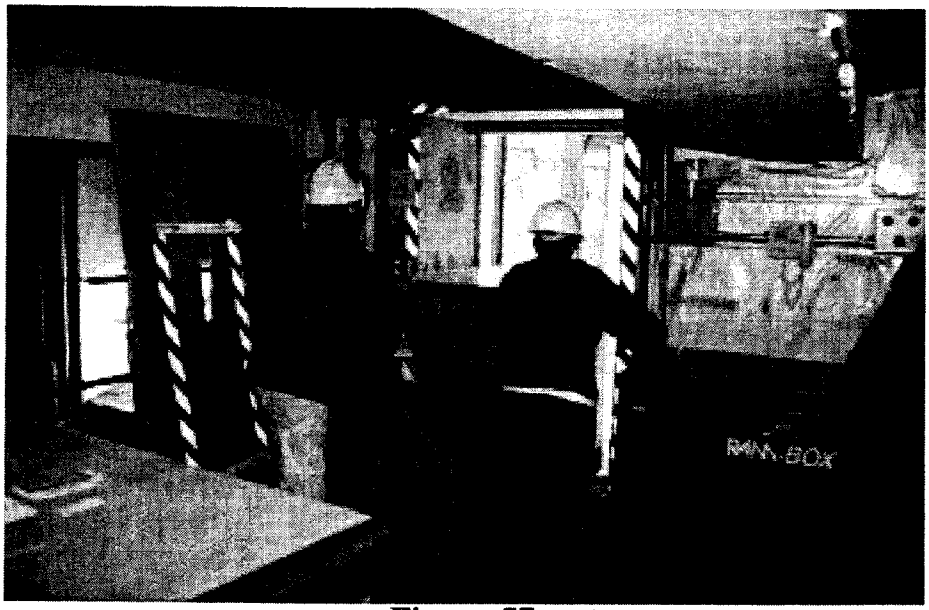


**Figure 57**
**Wedge 1—Employees Push Hazardous Materials Onto An External Hoist**

**Figure 58**
**Wedge 1—Air Filtration Units Ensure Safe Air Quality for Demolition Crews**

# Projects Under Construction

***Wedge #1 Demolition & Abatement***

**Figure 59**
**15 Million Pounds of Debris Will Be Removed From Each Wedge**

**Figure 60**
**Steel, Aluminum and Other Recyclable Materials Are Separated In Piles**

***Wedge #1 Demolition & Abatement***

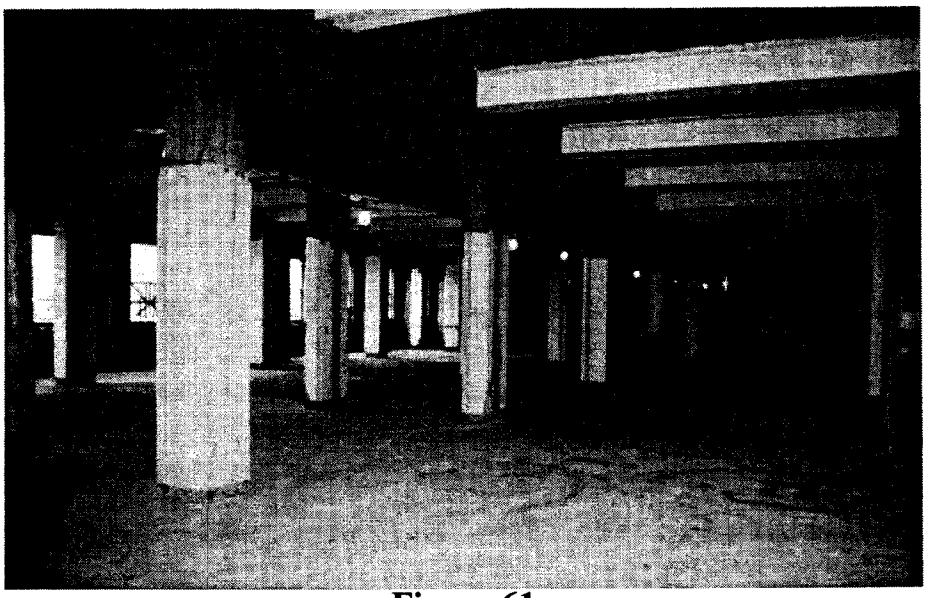


**Figure 61**
**Wedge 1—Demolition and Abatement Have Been Completed In This Area On the Second Floor**

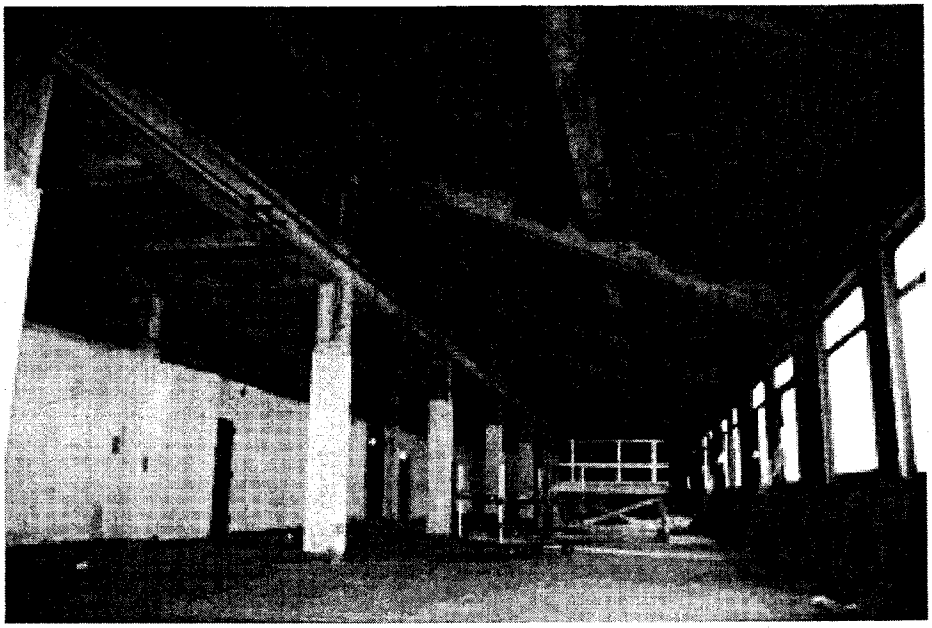


**Figure 62**
**Wedge 1—Cleared Area On the Fifth Floor Reveals the Pentagon's Pitched Roof**

# Projects Under Construction

***South Terrace Pedestrian Bridges***

The South Terrace Pedestrian Bridges over Rotary Road will link the South Parking and the Pentagon at Corridors 2 and 3 on the second floor. These bridges are to provide safe access for pedestrians from South Parking to Corridors 2 and 3 on the second floor; to resolve the conflicts with automobiles, busses, delivery vehicles, and taxis; to increase security at the entrance to the existing loading dock and A-E Drive; and to reduce the need for the police to serve as traffic officers. Elevators will provide handicapped access in compliance with the requirements of the Americans with Disabilities Act. The bridges, scheduled for completion in FY 1999, will be constructed in phases to allow access to the Pentagon from South Parking throughout construction. Corridor 2 bridge construction is underway and Corridor 3

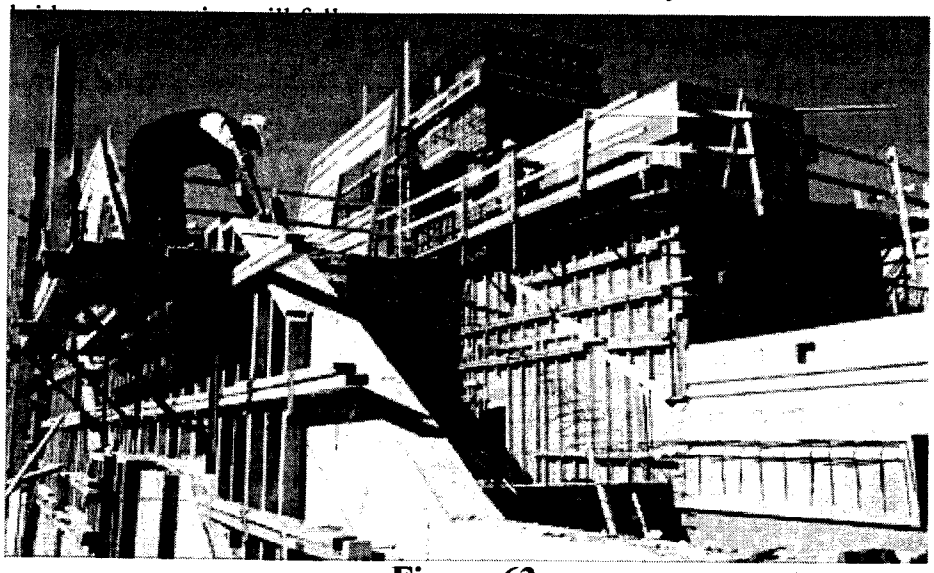


**Figure 63**
**South Terrace Pedestrian Bridges Under Construction**

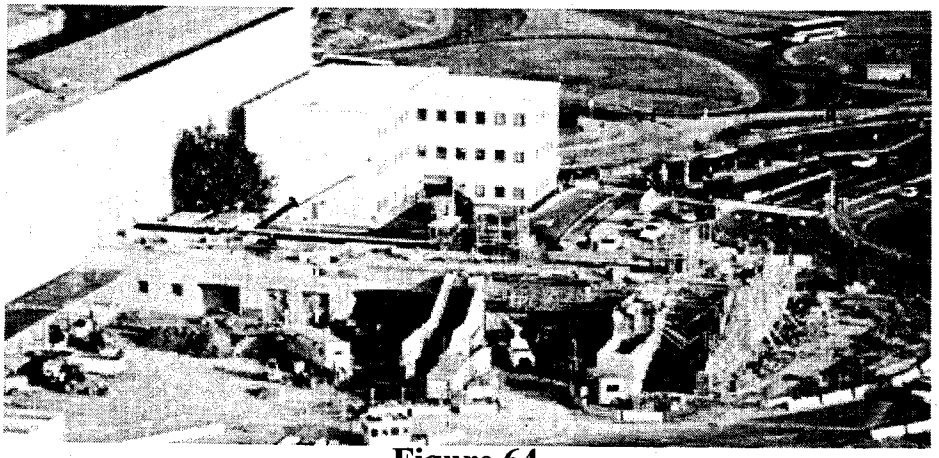


**Figure 64**
**Aerial View of South Terrace Pedestrian Bridges Under Construction**

# VI. BUDGET

**Sources of Funds**
**Certification of Cost**

# VI Budget

***Source of Funds***

Section 2804 of the Department of Defense Authorization Act, 1991 (Public Law 101-510, see Appendix), established the The Pentagon Reservation Maintenance Revolving Fund (PRMRF). The Act transferred responsibility for the operation, maintenance, protection, repair, and renovation of the Pentagon Reservation from the General Services Administration to the Secretary of Defense. The PRMRF is the funding source for the Pentagon Renovation Project. In addition, it finances a full range of building services for DoD components, including the Military Departments, and other activities housed within the Pentagon Reservation.

The renovation was designed to be budget-neutral to the Department of Defense in that the Department could operate, maintain, protect, and renovate the Pentagon for the rent the Department would have paid to the General Services Administration over a 12- to 14- year period.

Accordingly, the PRMRF has been designed to operate on a break-even basis over the long term. Revenue to the PRMRF may be generated from various sources; however, the Fund depends primarily upon monies collected from a user charge for space and building services. These charges are paid by the DoD components and other tenants using Pentagon Reservation facilities or land, with rates corresponding to six categories of space: office, storage, special, joint use, commercial support, and outside parking. The rates are established to recover the cost of day-to-day operations, maintenance, protection of the Reservation, and essential capital improvements including all costs associated with the Pentagon Renovation Project.

***Certification of Cost***

Based on early estimates of the costs to be incurred, the Defense Appropriations Acts for FY 1995 and FY 1996 required that the Secretary of Defense certify that the total cost for the planning, design, construction, and installation of equipment for the renovation of the Pentagon Reservation will not exceed $1,218,000,000.

Subsequently, the Department of Defense Appropriations Act for FY 1997 reduced the cost certification for the renovation to $1,118,000,000. This certification requirement is now $100,000,000 less than the certification ceiling initially supported by the Department and the Congress.

In order to continue critical programs, the Department will endeavor to constrain the cost of project design and construction to within the current limitation through increased efficiency.

Fundamental changes have been made to meet the challenge. These have included restructuring the three responsible organizations supporting the renovation program into Geographic and Functional Integrated Product

teams. Each Geographic project within the program has a Geographic Integrated Product Team responsible for the entire renovation activity within that Geographic area. Coupled with these internal management changes are procurement changes which have streamlined the whole process. Construction awards, previously based on firm fixed priced price low bids, resulted in continuous conflicts during the performance between the general contractor and the Renovation Program. These conflicts included multiple claims, contract changes, increased costs, and delays.

Contract awards, negotiated between the government and the contractor offerers, are now based on best value to the taxpayer and the government (not necessarily the lowest proposed cost). Best value determination is typically based on analysis of factors including past performance, management approach, technical approach, probable cost, and small and disadvantaged business support. Oral proposals and page limits on proposals reduce time and help the departments gain additional insight into contractor capabilities.

Active partnering is being used with general contractor offerers in multiphase source selections. The most promising offerers are brought on board to team with architect/engineers (A/E) in the design and development of areas to be constructed. Sophisticated contracting vehicles are being used to reinforce team partnering; savings incentives reward efficient contract performance, and award fees reward creativity and efficiency on the part of contractors. The intention is to secure superlative contract performance at reasonable cost by fundamentally changing the relationship between the government and the contractor. The Program is working hard to form partnerships with industry which will improve contractor performance, reduce cost, and meet schedule parameters.

At this early stage in the construction process, it is difficult to determine the full negative impact of the $100 million reduction on the ultimate design of the renovated Pentagon. Total Program cost will depend heavily on inflation of construction costs over the next 10 to 12 years and the effectiveness of management and contracting initiatives undertaken by the Program. Costs and estimates will be monitored closely and the Department will seek adjustment of the certification ceiling as appropriate.

Consistent with cost estimates for projects in a Military Construction Program, under the timing and delineation for the certification, this estimate does not include the cost of: 1) design and construction of the Heating & Refrigeration Plant, the Classified Waste Incinerator Plant, and the Remote Delivery Facility; 2) purchase and installation of Information Management and Telecommunications (IM&T) equipment; 3) rental and operation of leased swing space; 4) purchase and installation of furniture; and 5) recently required security enhancements; and 6) costs prior to FY 1994. The Department of Defense Appropriations Act for FY 1999 and the required certification are enclosed as Appendix B.

**Pentagon Renovation Certification Summary**

| Fiscal Year | Design & Construction | Cumulative Totals | Item |
|---|---|---|---|
| 1994 | $77,900,000 | $77,900,000 | Obligations |
| 1995 | $50,200,000 | $128,100,000 | Obligations |
| 1996 | $64,500,000 | $192,600,000 | Obligations |
| 1997 | $59,000,000 | $251,600,000 | Obligations |
| 1998 | $97,100,000 | $348,700,000 | Obligations |
| 1999 | $158,500,000 | $507,200,000 | Budgeted |
| 2000 | $145,900,00 | $658,100,000 | Budgeted |
| 2001-2010 | $610,800,000 | $1,118,000,000 | Program |
| **Total** | **$1,118,000,000** | **$1,118,000,000** | |

# VII. APPENDIX

**History**
**Program Development**
**Program Schedule**
**FY 1991—Legislative Authorization**
**FY 1999—Department of Defense Appropriations Act with Certification**

# HISTORY

**Congressional Approach**

**The Design**

**The Pentagon Building**

**Size**

**Exterior**

**Materials Shortage**

**The Site**

**Terraces**

**Access**

**Lagoon**

**Building Condition**

**Failure To Keep Pace With Changing Standards for Health, Fire, and Life Safety**

**Materials Failure**

**Engineering System Failure**

**Changing Technology Requirements**

# History

The Pentagon is one of the most recognizable buildings in the world. It has been inseparably linked with the United States Military since its construction during World War II.

During the first half of 1941 the War Department found it increasingly difficult to provide space for the headquarters staff of an expanding army. In May, the Public Buildings Administration proposed erecting temporary structures for various agencies on the outskirts of the city. In July 1941, 24,000 personnel were scattered among seventeen buildings in Washington, D.C., with others in Fort Myer and Alexandria, Virginia. By the beginning of 1942, the number of personnel was expected to reach 30,000. The President, therefore, asked Congress for authority to construct additional buildings within or near the District of Columbia. The War Department's Chief of Construction, Brigadier General Brehon B. Somervell, had a better idea, a scheme to house the entire War Department under one roof. He talked to General Moore, Deputy Chief of Staff, and to U.S. Representative Woodrum (D-Virginia) about the idea.

***Congressional Approval***

At a Thursday, July 17, 1941, hearing on construction projects before the House Subcommittee on Appropriations, the Chairman, Mr. Woodrum of Virginia, suggested to Brigadier General Eugene Reybold and Brigadier General Somervell that the War Department find an overall solution to its space problem rather than the partial solution proposed by the Public Buildings Administration. Somervell directed Architect G. Edwin Bergstrom to place on his desk, by 9 o'clock Monday morning, basic plans and architectural perspectives for an office building to house 40,000 people. Five days later, on Tuesday, July 22, 1941, Reybold and Somervell presented the plan to the Subcommittee. The plan was approved by the House on July 28, 1941 and by the Senate on August 14, 1941.

On August 25, 1941, President Roosevelt signed the bill appropriating funds for construction. However, because of considerable controversy over the proposed location at the foot of Arlington National Cemetery, he reserved the right to pick the site. The following day, the President directed that the construction site be moved south to the Pentagon's present location.

***The Design***

The Pentagon's unusual five-sided configuration was dictated by the site originally proposed (adjacent to Memorial Drive, about three-fourths of a mile north of where the building was actually constructed). An early plan called for a square structure with one corner cut off to accommodate an existing road. This resulted in a skewed Pentagon shape from the Archives of U.S. Army Corps of Engineers, Fort Belvoir, Virginia.

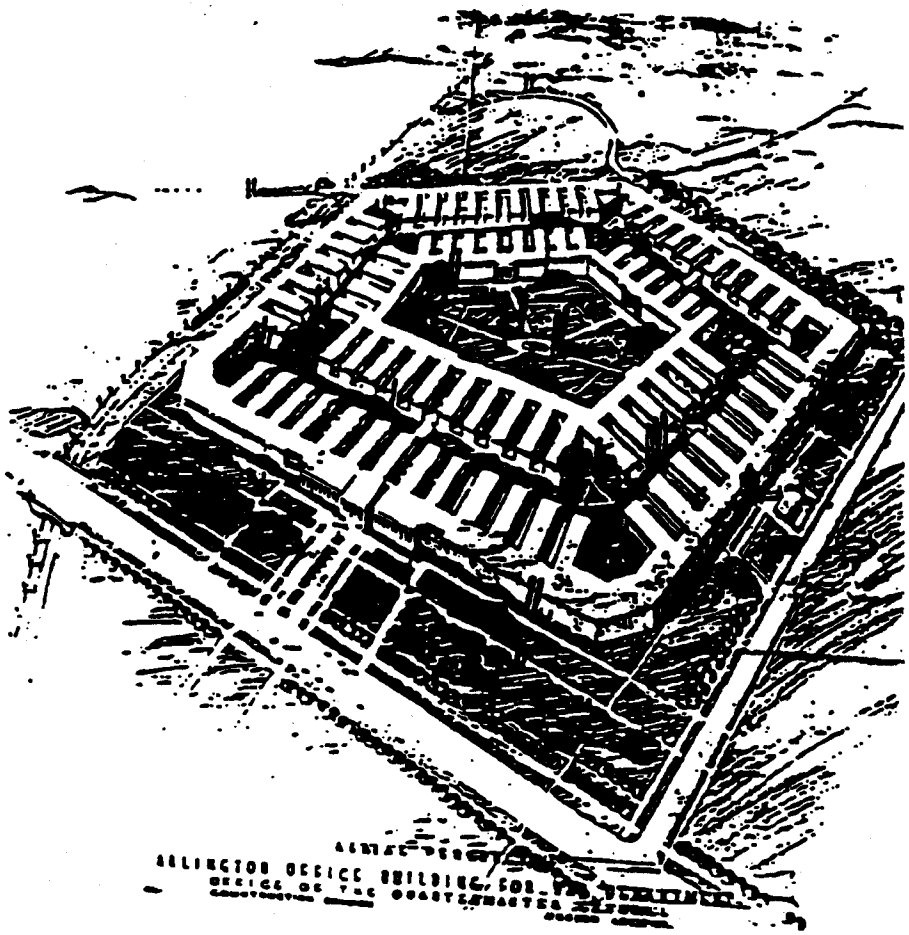


**Figure 65**
**Original Concept of Pentagon, July 21, 1941**

Serious objections were raised to locating the building on open land directly between Arlington Cemetery and Washington's Monumental Core, and discussions ensued regarding selection of a building site resulting in less visual and physical impact from the project. During the debate on the site, the project's chief architects, George Edwin Bergstrom and David J. Witmer continued to refine the design. The final design retained the five sides, in the form of a regular pentagon, which gave rise to the building's name. That shape resulted in the most efficient use of available space. The concept of using several concentric rings to contain the space evolved during further refinement of design. Preliminary design and drafting took just 34 days. A project of this magnitude and urgency demanded the rapid assembly of an unprecedented design and production effort. The office of the chief architect rapidly grew to 327 architects and engineers who were supported by 117 field inspectors. The weekly output of prints ranged from 12,000 to 30,000 with reproduction machines run-

ning on a 24-hour basis. For periods of time, new drawings were issued nightly. The reproduction effort consumed 15,000 yards (13,700 m) of print paper per week.

Construction began on September 11, 1941, and was completed on January 15, 1943. At one stage of construction, 15,000 people were employed on the job working three shifts, 24 hours a day. At night, they worked under floodlights. Construction took just 16 months, a remarkable feat of engineering and management effort.

## *The Pentagon Building*

The Pentagon building, at 6,500,000 square feet (603,900m²), provides approximately 3,800,000 square feet (353,000 m²) of occupiable space. At the peak of World War II, 33,000 people were provided working space in the building. The Pentagon is the Headquarters of the Department of Defense (DoD) and the national defense establishment. It houses the Offices of the Secretary of Defense, the Joint Chiefs of Staff, and the Secretaries of the three Military Departments.

### *Size*

The Pentagon building is composed of five concentric pentagonal rings connected by ten radial corridors. Each of its outer walls is 921.6 feet (280 m) long. The building covers 29 acres (12 hectares), the largest ground area of any office building in the world. A five-acre (2 hectares) pentagonal courtyard is located in the building's center. The building and its central courtyard cover 34 acres (14 hectares). There are 17.5 miles (28.2 km) of corridors in the building. The structure is three times the size of the Empire State Building and 50 percent larger than Chicago's Merchandise Mart. The building rests on 41,492 concrete piles which, if placed end to end, would stretch 200 miles (322 km). The five concentric pentagonal rings are separated by interior courts which serve as light wells. This design feature increases the number of windows allowing in natural light. Each ring has five stories. The Mall and River sides of the building have a Basement area which includes a partial Mezzanine. The innermost and outermost rings have sloping slate roofs, while the other three rings have flat, built-up roofs. The rings are connected at each floor level by a series of ten radial corridors extending from "A" ring (innermost) to "E" ring (outermost).

### *Exterior*

Exterior walls of the concentric rings and the interior courtyard are exposed concrete. They appear to have a wood-grain texture because they were poured into wooden forms made of 8-inch (232 mm) boards. A gap was left between boards enabling concrete to ooze and form a slight ridge. From a distance this gives an appearance of limestone.

Clockwise from its northern point, the Pentagon's five facades are the Mall Terrace Entrance facade, the River Terrace Entrance (or North Parking lot) facade, the Concourse Entrance (or Metro Station) facade, the South Parking Entrance facade, and the Heliport facade. The outer facades of the Pentagon

are simple, with a minimum of ornamental embellishment. Although the ornamentation style is classical in origin, it has been greatly simplified. The outer walls are limestone, as a direct result of a restriction by President Roosevelt that there be no marble in the building.

***Material Shortages***

The shortages of materials required for war production raised many design and construction problems. The use of reinforced concrete in lieu of structural steel for the building made possible a saving of 43,000 tons (39,000,000 kg) of steel, more than enough to build a battleship. The use of concrete ramps rather than elevators reduced steel requirements still further. Drainage pipes were concrete; ducts were fiber, interior doors were wood. An unusual wall design - concrete spandrells carried to window sill level - eliminated many miles of through-wall copper flashing. When Somervell was asked to make still more drastic reductions, he agreed to "striptease" the entire structure. Bronze doors, copper ornamentation, and metal partitions in rest rooms were among the first to go. The stripping process continued throughout construction.

***The Site***

The Pentagon Reservation is located in southeastern Arlington County, Virginia, and is situated between a large man-made lagoon (the Pentagon Lagoon, formed during construction) and the southeastern corner of Arlington National Cemetery. The northeastern and eastern facades have unobstructed vistas of the Monumental Core of the Nation's Capital across the Potomac River. The Pentagon's relatively low profile also permits clear vistas of Washington from the highlands of Arlington National Cemetery.

***Terraces***

There are large ceremonial terraces in front of the Pentagon's Mall and River Entrances. The River Entrance terrace extends 900 feet (274 m) to the Pentagon Lagoon bounded by a ceremonial landing dock and two monumental stairways. The maximum width of the River Terrace is 450 feet (137 m). The terrace in front of the Mall Entrance is smaller, measuring 600 feet (183 m) by 125 feet (38 m).

***Access***

The Pentagon site originally contained three cloverleaf interchanges that were among the earliest such structures constructed in the United States. These freeway-scale interchanges were necessary to handle traffic associated with the large number of people working in the building.

***Lagoon***

The Pentagon Lagoon was created during construction of the building as a result of dredging sand and gravel for concrete, and to obtain fill for landscaping. The lagoon is also the location of the water intake for the Pentagon's Heating & Refrigeration Plant. The Roaches Run Waterfowl Sanctuary lagoon, created during construction of the George Washington Parkway in the early 1930's is used for the Heating & Refrigeration Plant's water discharge outfall.

***Building Condition***

The Pentagon Reservation has been altered over the years. A heliport was added; Shirley Highway (now I-395), a limited access Interstate Highway and interchange, infringed on the Pentagon site on the south side; a major Metro station and transfer point was added, and underbuilding bus/taxi tunnels were converted to offices. See Existing Site Plan of the Pentagon Reservation.

The circa 1943 Pentagon has suffered from decades of neglect and

underfunded maintenance and repair programs. Many of the building systems have deteriorated beyond economical repair and require complete replacement. Building code violations and unsafe conditions are rampant, which have been brought about by the Pentagon's non-compliance with the fire protection and life safety standards established over the last 50-plus years. Structural deficiencies also need to be corrected. Some areas of the Basement have settled as much as 12 inches (305 mm) due to the poor load bearing capacity of soils under the floor slab.

*Interior Space Layout*

The Pentagon's original interior space layout has been modified over the years. Walkways and service corridors have been closed and converted to office and storage space. Original office areas that were large open spaces have been chopped up and enclosed with full height partitions that make the building functionally inefficient. This adversely affects heating, ventilating, and air conditioning system controls and distribution.

*Building Systems*

Before the renovation program began, none of the original major building systems had ever been replaced nor had they been significantly upgraded. The changing office environment with the advent of computers and modern technology has outstripped the capacity of deteriorated building systems. Electrical, plumbing, heating, ventilation, and air conditioning (HVAC) systems need to be replaced and modernized to accommodate added loads and designed to be more efficient and flexible. The building has individual packaged air conditioning units providing cooling for special use areas in addition to the chilled water provided by the Pentagon Heating & Refrigeration Plant. The overloaded secondary electrical circuits result in as many as 20 localized power outages every day, which increases to between 30-40 a day in the winter when people bring unauthorized space heaters into the building to compensate for the deteriorated HVAC system. Regular plumbing failures occur as a result of the deteriorating piping systems which are 55 years old. Of the 691 drinking fountains in the Pentagon, approximately 30 are out of service on a daily basis.

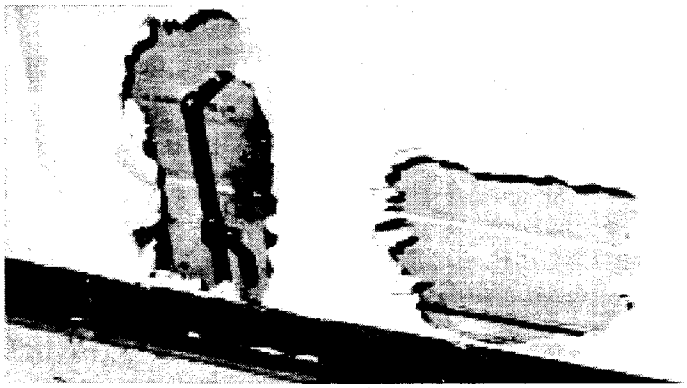


**Figure 66**

During Desert Shield/Desert Storm, a fire broke out in the JCS area of the Pentagon. Arlington County, which provides fire protection to the Pentagon, pressurized a standpipe and consequently, blew out a four foot section of ten inch pipe. Water flooded approximately 350,000 SF of the Pentagon basement, nearly causing the Army and Air Force Operations Centers to shut down. The water flowed through a steam tunnel to the Heating & Refrigeration Plant basement, where the water reached a height of seven feet. Shown is the steam room at Corridors 9/10 where water reached a height of 20 inches.

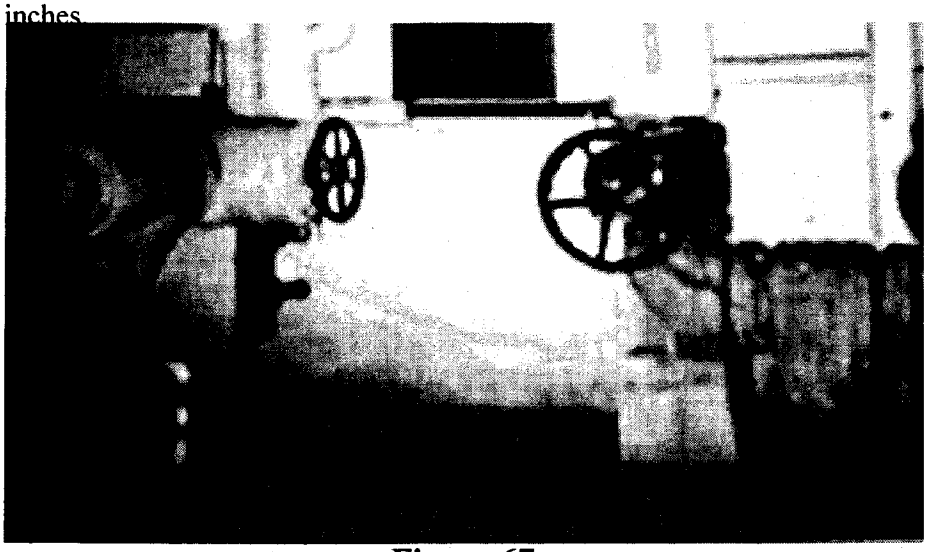


**Figure 67**
**The Steam Room at Corridors 9/10**

Frequent leaks, breaks in pipes and clogged pipes not only escalated the operation and maintenance costs but also created potential health hazards.

**Figure 68**
**Vertical Sanitary Pipe Split from First to Fourth Floor**

Figure 69

**Typical Example of Drain Pipe, Clogged After Years of Deposits and Deterioration.**

The Basement has been flooded as the result of condensate leakage, inoperable sump pumps that were unable to accommodate rising ground water and rusted and corroded valves. Only valves that have been replaced are operable.

**Figure 70**
**Typical Rusted and Corroded Valve**

The HVAC systems are original and in need of r lacement. Approximately 17.5 miles of the Pentagon's ductwork are made from asbestos, typical of the time when the Pentagon was built. The Pentagon has approximately 150 miles of ductwork, a substantial portion of which is surrounded by asbestos insulation.

The electrical system was designed for a manual office and does not support the demands of today's high-tech office environment. Approximately 20 (30-40 in winter) localized power outages occur daily, with at least 30 minutes downtime per outage. Obsolete components make maintenance/ repair difficult. Panel boards are loaded beyond maximum capacity and do

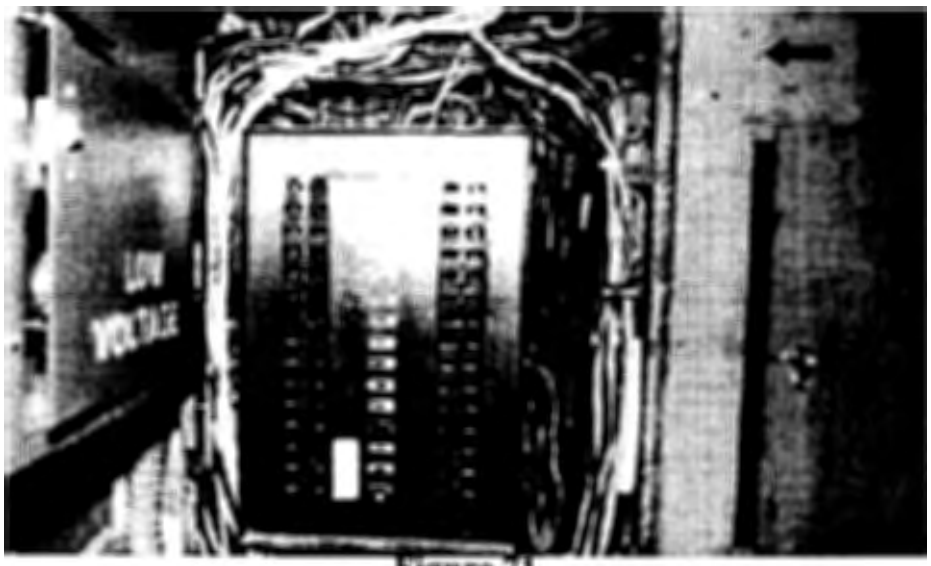


Figure 71
**Original Electrical Panel Still Used in Pentagon**

not meet code, thereby creating a fire and safety hazard.

The information systems that were installed in the Pentagon are plagued with abandoned cabling and an unverifiable backbone for the building. Consequently, there are numerous LANs that are operated independently of one another which causes problems.

**Figure 72**
**Typical Information and Telecommunications Cable/Wiring**

*Windows*

There are 7,748 windows in the building. They are of two types: steel casements located in the perimeter walls of the concentric, inner courts, and steel double-hung units in the outermost perimeter and in the Center Courtyard walls. The double-hung units in the central pavilions of the Mall and River Entrances are steel. The casements are rusted and corroded at joints, racked out of shape, and cannot be properly closed. Casement windows are inefficient even when properly maintained. In the present state of disrepair, the energy loss, summer and winter, is a serious problem. Some windows have security alarm tapes. Other windows are closed with tempered hardboard or plywood, or are filled with masonry block or with equipment. Many of these ad-hoc modifications were not properly sealed and are now leaking. Failure to replace casement windows and double-hung units will result in continued energy loss and damage from water penetration.

*Exterior Walls*

Architectural and structural elements of exterior walls have shifted and settled. Joints are open and moisture has penetrated causing damage. Cracking and evidence of movement is apparent at all five exterior perimeter parapet corners. In some instances these cracks extend below the parapet wall. The exterior walls are not thermally efficient and the stone facing is in need of cleaning and repair to insure its weather tightness.

There are two types of courtyards at the Pentagon: (1) interior courts (light wells) between concentric rings of the building and, (2) the Center Courtyard.

All courtyards walls are of concrete with surface conditions ranging from fair to failing. Concrete is spalling, particularly where rusting reinforcing bars are exposed; patch material is failing; cracks, efflorescence, and water stains are evident everywhere. In addition to problems cited in the courtyards walls, cornices are disintegrating, especially between Corridors 7 and 10. There are also problems due to use of non-conforming materials and poor construction. In the Center Courtyard, the asphalt paving at the peripheral

**Figure 73**
**Typical Exterior Walls in Light Wells Needing Repair**

walkways is extensively cracked and the concrete curbs at these walkways are damaged or missing.

Access bridges span several interior courts at the approximate mid-point of the court length. Originally, these bridges were open, crossing the court at each floor level. A number of the bridges have been enclosed and incorporated into secondary corridor systems while others open directly from individual offices. All of these bridges show evidence of deterioration with present conditions ranging from fair to failing. Attempts made to control leaks at the interior spaces have been unsuccessful. At a minimum, replacement of the roof/bridge drainage system will be required at each bridge. Concrete surfaces and waterproofing will have to be repaired and interior surfaces will also have to be restored.

*Basement Floor*

The Basement floor of the Pentagon was constructed as a slab on grade, and designed to serve as a light storage area. A 1983 report on the stabilization of the depressed floors states that the basement floor slab was placed directly on the underlying soil fill, which consists of surface fill materials overlying compressible organic soil. The subsidence has been gradual over the years and was aggravated by voids under the slab, leaking utility lines, and at times by the dewatering during the construction of Metrorail. These subsurface conditions along with the assignment (and re-assignment) of special purpose activities and the storage of heavy loads of material and equipment, the Basement slab has settled up to 12 inches (305 mm) in some areas causing severe damage to critical communication centers. Repairs were made to correct the distressed areas by pumping concrete under the floor, or by adding leveling slabs, but these repairs were unsuccessful. The only recourse is to remove entirely some 300,000 to 500,000 square feet (27,900 $m^2$ to 46,500 $m^2$) of slab and reframe the floor as an independent floor slab bearing on new and existing pile caps. Lowering the Basement slab in some areas will allow maximum expansion of the Mezzanine space.

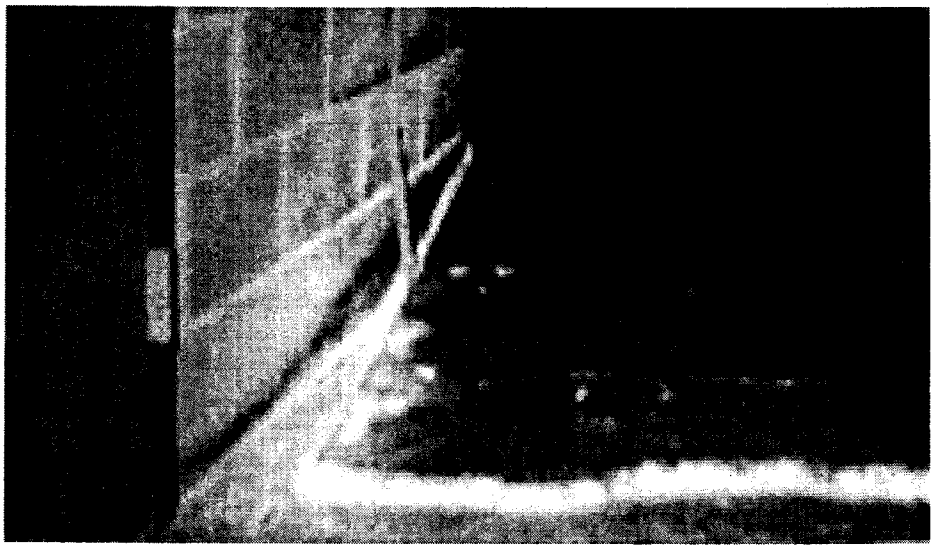


**Figure 74**
**Basement Slab Deflection**

*River and Mall Terraces*

The River and Mall terraces extend beyond the exterior perimeter of the building and the occupied areas beneath have experienced considerable damage from water intrusion. Extensive reworking of expansion joints, deteriorated waterproofing and concrete elements is required to make these areas watertight.

**Figure 75**
**Typical Deterioration of River Terrace Stairs**

*Ramp and Bridge from North Parking*

The ramp, bridge and railing leading into the Corridor 8 Entrance from the North Parking lot has undergone serious deterioration as noted by the out-of-plumb support wall along the bridge.

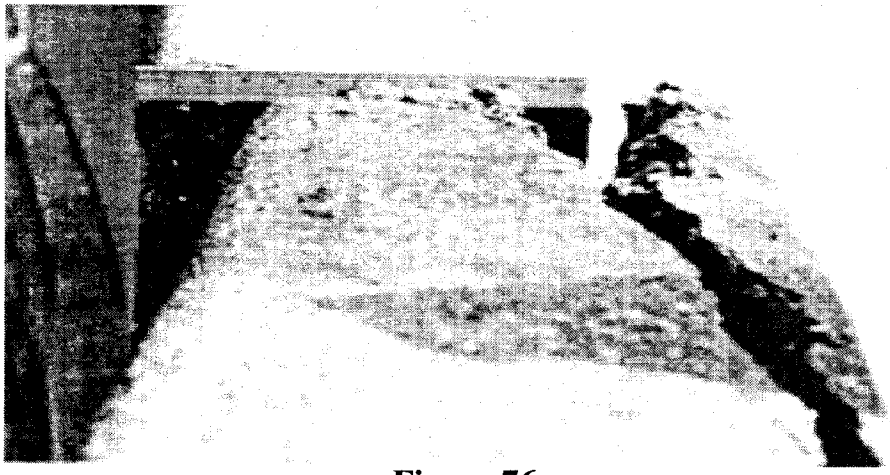


**Figure 76**
**Deterioration at North Parking Pedestrian Ramp Leading to the Corridor 8 Entrance**

Exposed reinforcing bars underneath the River Terrace parade field and parking lot resulted from the failure of waterproofing, which allowed water and chemical damage to the structure below. This created the potential for failure of the terrace above, along with the threat to persons both above and below the structure. Temporary jacks were installed as an emergency measure to support this failing structure.

**Figure 77**
**Deteriorated River Terrace Structural Conditions**

Figure 78
**Temporary Jacks Supporting Failing Ramp**

*Asbestos*

The finish coat in the Pentagon's plaster ceilings contains asbestos and the resilient flooring is vinyl asbestos. Even minor alteration projects require extensive and expensive containment procedures. Under-the-window induction heating and cooling units have asbestos insulation on the pipes and asbestos insulation material was used on many of the plumbing lines and air conditioning ducts. These materials represent health hazards.

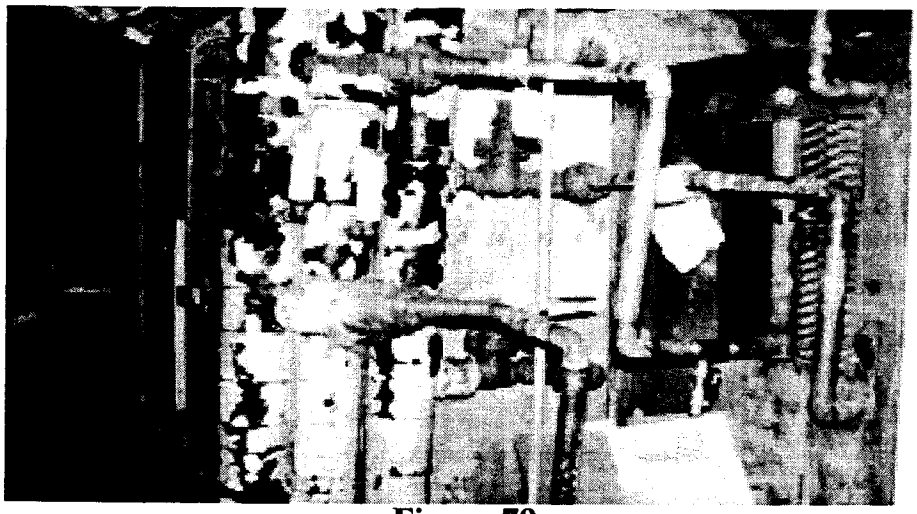


**Figure 79**
**Typical Existing Asbestos Piping Insulation**

*Heating & Refrigeration Plant*

The Heating & Refrigeration Plant that was built in 1943, provided utility services (heating steam and chilled water) to the Pentagon as well as to other parts of the Pentagon Reservation. The plant became obsolete and was no longer efficient and serviceable. Temporary chillers and boilers were being rented to support the needs of the Pentagon, Federal Building #2 (Navy Annex), and Henderson Hall (Marine base). Three rental boilers and six rental chillers were used from 1989 to 1996 for a cost of over $2,000,000 per year.

**Figure 80**
**Portable Rental Boilers Used in Old HR&P**

*Information Management & Telecommunications*

The current Pentagon information and telecommunications infrastructure is an accumulation of systems and networks, which have been installed, in a piecemeal fashion since 1943. There are multiple deficiencies specific to the information management and telecommunications posture of the Pentagon. These include outdated and overworked communications systems, an enormous number of single user-oriented and user-unique data systems, inadequate wiring systems, obsolete and congested wire closets, risers, cable pathways, and protected distributed systems, poor quality grounding systems, and limited wiring system access due to asbestos hazards. As information management requirements and technology changed throughout the years, new telecommunications systems were added in an ad hoc manner, often over existing wiring. This has produced a collection of independent and largely non-interoperable systems and networks, many of which are poorly documented.

*Sitework*

Traffic conditions, especially in the South Parking areas, are very hazardous. Reconfiguration of roadways, bus, and truck access areas and parking is necessary to provide safety for pedestrians. Parking lots are in poor condition with minimal landscaping. Roads, walks, fences, bridges, and other structures and elements exhibit significant deterioration. Bridge abutments are clearly out-of-plumb and the stonework is crushed and spalled. Exterior steps and terraces are spalled, joints are open, and the occupied areas below these elements have experienced water leakage on a continuous basis.

*Summary*

Generally, the Pentagon's problems requiring a full scale renovation can be grouped into five categories:

1. Changing requirements for fire and life safety.
2. Materials failure.
3. Engineering systems failure.
4. Changing technology with an increased demand for services.
5. Security.

***Failure to Keep Pace with Changing Standards for Health, Fire, and Life Safety***

- Pervasive asbestos contamination of interior surfaces and pipe insulation requires the use of asbestos containment procedures for even minor repairs to avoid possible health risks to building occupants when these materials are disturbed. This is a significant time and cost restraint to the maintenance and repair program.
- Inadequate sprinkler systems to protect the entire building.
- Numerous emergency diesel generators are currently located inside the Pentagon presenting a potential fire and carbon monoxide gas hazard.
- Excessively long fire egress routes in the building.
- Vehicle/pedestrian conflicts exist throughout the reservation.

***Materials Failure***

Problems related to materials failure include:

- Rusted and corroded casement window frames in most of the 7,748 windows.
- Shifting of architectural and structural elements causing opening of joints, cracking of building elements, and water penetration.
- Spalling of concrete, rusting reinforcement bars in the concrete, and deteriorating cornices.
- Deterioration of roof/bridge connections and bridge drainage systems.
- Deflection of the basement floor due to lack of stable ground support.
- Intrusion of water through expansion joints and deteriorated waterproofing.
- Deterioration of roadway bridges.
- Deteriorated plumbing and domestic water supply pipes and fixtures.
- Deteriorated chilled and heated water supply piping and fixtures.
- Deteriorated and non-code compliant electrical wiring.

***Engineering Systems Failure***

***Pentagon***

- Severely undersized, inflexible and unreliable, heating, ventilation, and air conditioning (HVAC) systems.
- Unreliability of current building HVAC systems has resulted in independent air conditioning (A/C) units having been installed in certain areas.
- Overloaded secondary electrical circuits result in daily failures of electrical systems.
- Undersized electrical closets prohibit proper wiring and management of electrical systems.
- Deteriorated plumbing, chilled and hot water, domestic water and other systems.

*Heating & Refrigeration Plant*

- The original coal boilers installed during construction of the Pentagon were beyond repair. Existing refrigeration equipment, some nearly 30 years old, was unreliable and often out of service. Rented package units were being used to supply heating and cooling services to building.

***Changing Technology Requirements***

- Increased electrical and HVAC loads due to office equipment such as computers and copier machines, and special equipment such as video and graphics production equipment.
- Current wire chases cannot accommodate cabling systems for telephones, computer networks, and audio/video information systems.
- Inflexible and inefficient space arrangements limit the continued utility of the Pentagon office and support space.

*Security*

- Metro escalators penetrate into the building envelope forcing the security perimeter inward.
- The dispersed loading docks are difficult to secure.
- Numerous delivery vehicles penetrate the building security perimeter daily.
- Limited approach ways hinder security control at loading docks and delivery entrances (distance from non-control to control areas is so short that guards have no response time before vehicle has reached the guard position).

The Pentagon is a building of interest to local, state, federal, and architectural historians for the following reasons:

- It is associated with events that have made a significant contribution to the geo-political role of the United States as a superpower during the period from World War II to the present.
- It is associated with the lives of persons who are significant in American history from the time of construction in 1941 to the present day.
- It embodies the distinctive characteristics of the "stripped classical" variant of architectural classicism. This stylistic mode flourished during the second quarter of the 20th century, and was a major theme in federal architecture.
- It is classified currently as the largest low-rise office building in the world.
- It was constructed during an important historical period.
- It was built in 16 months which required a monumental effort in design and construction.
- It is located adjacent to Arlington National Cemetery.
- It is in proximity to the Nation's Monumental Core.
- It is situated along a major gateway to the Nation's Capital.

The Secretary of Defense, the Honorable Richard Cheney, was notified by the Secretary of the Interior, the Honorable Bruce Babbit, that the Pentagon had been designated as a National Historical Landmark on October 5, 1992. This designation also automatically places the Pentagon in the National Register of Historic Places.

There are five historic elements of the Pentagon that are cited for special attention:

- The five outer facades of the Pentagon.
- The Center Courtyard and surrounding facades.
- The Terrace fronting the Mall Entrance.
- The Terrace fronting the River Entrance.
- The Pentagon's distinctive five-sided shape.

A ceremony celebrating the 50th Anniversary of the Pentagon in May 1993 included presentation of a bronze plaque stating "THIS PROPERTY POSSESSES NATIONAL SIGNIFICANCE IN COMMEMORATING THE HISTORY OF THE UNITED STATES OF AMERICA." This ceremony was hosted by Les Aspin, the Secretary of Defense, and General Colin Powell, Chairman of the Joint Chiefs of Staff.

# PROGRAM DEVELOPMENT

**Design Development**

**Basement Renovation**

**Wedge #1**

**Wedge #2**

**Wedge #3**

**Wedge #4**

**Wedge#5**

# Program Development

***Design Development***

Control of the design process over the life of the project requires the development of design guidelines and criteria. This control is necessary because of the size and duration of the project, the multi-acquisition approach, and design activities occurring throughout the project as each increment is renovated. The revised Pentagon Renovation Plan must be translated into appropriate design guidelines and criteria that will establish design parameters.

A Management Support Architect-Engineer (MSAE), has prepared design guidelines and criteria; has prepared the Reservation Master Plan which addresses environmental issues; has prepared the Pentagon Building Master Plan; has developed prototypical designs for architectural standards, heating, ventilating and air conditioning systems, plumbing systems, fire protective systems, electrical systems, and security systems; is developing programming and swing space requirements; is developing schedules and cost estimates; is providing technical and management support; and is completing Computer-Aided Design Documents (CADD) for record drawings and shop drawings and shop drawing reviews. Broad-scale design criteria, which is equivalent to a concept stage, will ensure that each individual increment will be compatible with the rest of the work. The goal is to achieve a completed project that has uniform and compatible materials and systems that are economic to maintain.

Design development activities have been intensive during the early stages of the project, and will continue at a less intensive level throughout the duration of the renovation.

In the mid-1990's the importance of information management and telecommunications (IM&T) within the Pentagon was recognized and the United States Army was tasked with establishing a project management office for Information Management and Telecommunications, renovation related tasks. The Pentagon IM&T project office was established in 1991. The mission of the Project Manager (PM) IM&T, working in concert with the Resident PM, USACE, Pentagon Renovation Program is as follows:

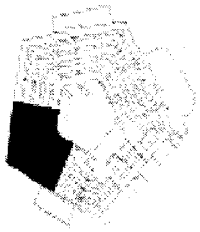
"Management of planning, programming, systems design/development, acquisition, installation, integrations, and testing of all IM&T-related efforts involved with the Pentagon Renovation Program. The objective is to provide cost-effective IM&T services/capabilities that will best serve the needs of the DoD Senior Leadership by leveraging technology advancements and designing/developing integrated systems, well into the 21st Century.

***Basement Renovation***

Renovation of the Basement includes the reconstruction of the floor slab which has settled in many areas due to the low soil bearing capacity. In addition, the build-out of the Mezzanine, one of the improvements recommended in the Concept Plan, provides the opportunity to co-locate all command and control functions of the National Military Establishment to the Basement and Mezzanine. The renovation of the Basement will be completed in multiple phases.

The design of the Segment 1 renovation of the Basement was completed in mid-FY 1994 with the construction beginning October 1994. The construction of Segment 1 of the Basement, preceded by the temporary re-routing of utilities, will be completed in FY 1998. The design of the remaining segments began in FY 1997. The Services Operations Centers will be relocated as the construction proceeds.

### *Wedge #1*



In December 1996, the Deputy Secretary of Defense directed that Wedge #1 be vacated by December 1997, and the construction of Wedge #1 to start by FY 1998. Renovation of above-ground areas of the Pentagon begins with Wedge #1. Work is centered around corridors 3 and 4.

The renovation work involves the demolition and removal work includes all partitions, ceilings, floor finishes, mechanical, electrical, plumbing, fire protection, and communications systems. The basic structural system, as well as the stairwells and their enclosing walls, will remain. All electrical, mechanical, and plumbing services will be replaced and a modernized telecommunication back-bone infrastructure will be installed. Utility connections will be made through the new Center Courtyard Utilities Tunnel without affecting the rest of the building. Wedge #1 will have a new food service facility, new vertical transportation service and enhanced foyers. Much of the renovated space will be configured as "open office" space consistent with the Concept Plan. The improvements include the new South Terrace Pedestrian Bridges which will connect South Parking to Corridors 2 and 3. This work incorporates some of the security improvements by re-routing public access to the second floor and improves safety by separating pedestrians from the vehicular traffic on the very busy Rotary Road in South Parking. The South Terrace structure consists of two bridges accommodating pedestrian traffic entering the Pentagon at the second floor at Corridors 2 and 3.

The design of Wedge #1 began in January 1994, and was completed in FY 1997. Construction activity began in January 1998, with a "wall bashing" ceremony in February 1998, to symbolically signify the start of the above ground work activity. Construction is scheduled for completion in FY 2001.

### *Wedge #2*

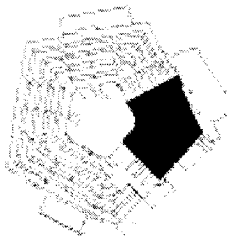
Wedge #2 is also a complete slab-to-slab reconstruction of the space. Replacement of all electrical, mechanical, and plumbing services will occur in accordance with the new design and a modernized telecommunication back-bone infrastructure will be installed. As discussed previously,

***Wedge #3***

Wedge #3 includes a complete slab-to-slab reconstruction of the space. All electrical, mechanical, and plumbing services will be replaced in accordance with the new design and a modernized telecommunication infrastructure will be installed. The removal of non-masonry partitions will open the space to an "open office" concept. The work will be centered around Corridors 7 and 8.

This work also incorporates some of the security improvements by re-orienting public access to the 2nd floor.

***Wedge #4***



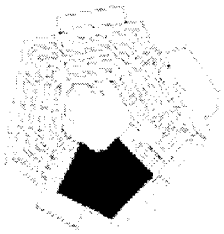
the removal of non-masonry partitions will open the space to an "open office" concept. The work is centered around Corridors 5 and 6.

A slab-to-slab reconstruction of the space in Wedge #4 is programmed. All electrical, mechanical, and plumbing services will be replaced and a modernized telecommunication infrastructure will be installed. The removal of non-masonry partitions will open the space to an "open office" concept. The work will be centered around Corridors 9 and 10.

This incremental area houses portions of the cafeteria facilities, the Concourse, and the Metro entrance.

This area also incorporates some of the security improvements by re-

***Wedge #5***



orienting public access to the 2nd floor. Existing ramp space to upper floors will be redistributed to incorporate expanded multi-purpose facilities as well as additional office space.

This last area will also undergo a slab-to-slab reconstruction. All electrical, mechanical, and plumbing services will be replaced and a modernized telecommunication infrastructure will be installed. The removal of non-masonry partitions will open the space to an "open office" concept. This last incremental area is centered around Corridors 1 and 2.

The area houses the remaining portions of the cafeteria facilities and the Concourse. Existing ramp space to upper floors will be redistributed to incorporate auditorium facilities.

# PROGRAM SCHEDULE

# The Pentagon Renovation Program
# Monthly Update Vs. Baseline Schedule
## February 1, 1999

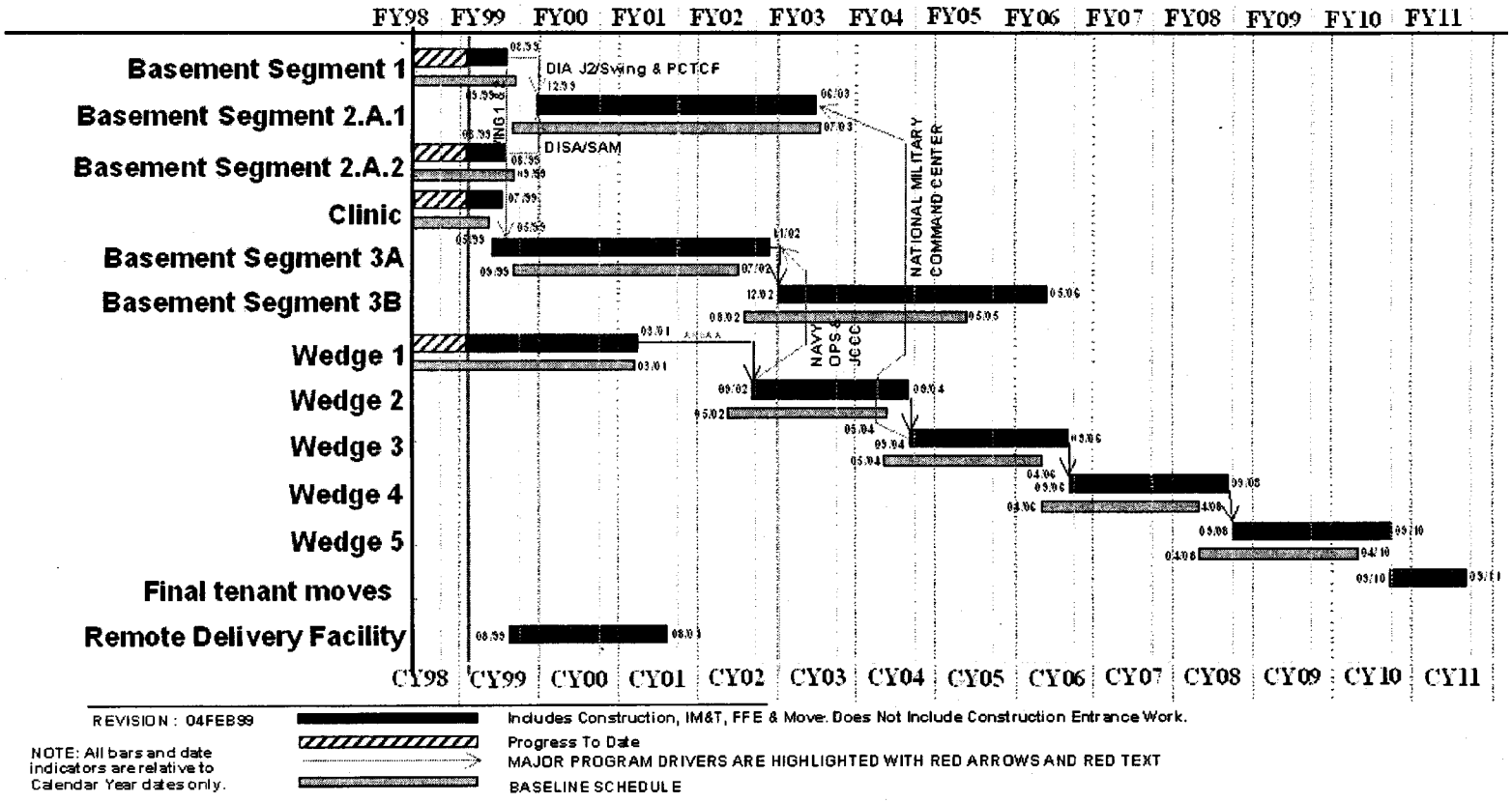



**Figure 81**

# FY 1991 Legislative Authorization

SEC 2804. OPERATION AND CONTROL OF THE PENTAGON RESERVATION

(a) IN GENERAL - (1) Chapter 159 of title 10, United States Code, is amended by inserting after section 2673 the following new section:

"§2674. Operation and control of the Pentagon Reservation

"(a)(1) Jurisdiction, custody, and control over, and responsibility for, the operation, maintenance, and management of the Pentagon Reservation is transferred to the Secretary of Defense.

"(2) Before March 1 of each year, the Secretary of Defense shall transmit to the Committees on Armed Services of the Senate and the House of Representatives, the Committee on Environment and Public Works of the Senate and the Committee on Public Works and Transportation of the House of Representatives a report on the state of the renovation of the Pentagon Reservation and a plan for the renovation work to be conducted in the fiscal year beginning in the year in which the report is transmitted.

"(b) The Secretary may appoint military or civilian personnel or contract personnel to perform law enforcement and security functions for property occupied by, or under the jurisdiction, custody,

Nov. 5 DEFENSE AUTHORIZATION ACT P.L. 101-510

Sec. 2804 and control of the Department of Defense, and located at the Pentagon Reservation. Such individuals—

"(1) may be armed with appropriate firearms required for

personal safety and for the proper execution of their duties,

whether on Department of Defense property or in travel status; and

"(2) shall have the same powers as sheriffs and constables to

enforce the laws, rules, or regulations enacted for the protection of persons and property.

"(c)(1) The Secretary may prescribe such rules and regulations as the Secretary considers appropriate to ensure the safe, efficient, and secure operation of the Pentagon Reservation, including rules and regulations necessary to govern the operation and parking of motor vehicles on the Pentagon Reservation.

"(2) Any person who violates a rule or regulation prescribed under this subsection is liable to the United States for a civil penalty of not more than $1000.

"(3) Any person who willfully violates any rule or regulation prescribed pursuant to this subsection commits as Class B misdemeanor.

"(d) The Secretary of Defense may establish rates and collect charges for space, services, protection, maintenance, construction, repairs, alterations, or facilities provided at the Pentagon Reservation-

"(e)(1) There is established in the Treasury of the United States a revolving fund to

be known as the Pentagon Reservation Maintenance Revolving Fund (hereafter in this section referred to as the'Fund'). There shall be deposited into the Fund funds collected by the Secretary of space and services and other items provided an organization or entity using any facility or land on the Pentagon Reservation pursuant to subsection (d).

"(2) Monies deposited into the Fund shall be available, without fiscal year limitation, for expenditure for real property management, operation, protection, construction, repair, alteration, and related activities for the Pentagon Reservation.

"(f) In this section:

"(1) The term 'Pentagon Reservation' means that area of land (consisting of approximately 280 acres) and improvements thereon, located in Arlington, Virginia, on which the Pentagon Office Building, Federal Building Number 2, the Pentagon heating and sewage treatment plants, and other related facilities are located, including various areas designated for the parking of vehicles.

"(2) The term 'National Capital Region' means the geographic area located within the boundaries of (A) District of Columbia, (B) Montgomery and Prince Georges Counties in the State of Maryland, (C) Arlington, Fairfax, Loudoun, and Prince William Counties and the City of Alexandria in the Commonwealth of Virginia, and (D) all cities and other units of government within the geographic areas of such District, Counties, and City."

(2) The table of sections at the beginning of such chapter is amended by inserting after the item relating to section 2673 the following new item:

"2674. Operation and control of the Pentagon Reservation."

P.L. 101-510 LAWS OF 101st CONG.—2nd SESS. Nov. 5 Sec. 2804

(b) TRANSFER OF FUNDS FOR FISCAL YEAR, 1991.—For fiscal year 1991, the Secretary of Defense may transfer into the Pentagon Reservation Maintenance Revolving Fund (established by section 2674(e) of title 10, United States Code), from funds appropriated to the military departments and the Defense Agencies, amounts equal to the amounts that would otherwise be paid by the military departments and the Defense Agencies to the General Services Administration for the use of the Pentagon Reservation.

A Status Report to Congress on

# Renovation of the Pentagon

*Prepared by*
**The Office of the Secretary of Defense**

March 1, 1999

**Figure 1**
**River Terrace Entrance Historic Facade**

## EXECUTIVE SUMMARY

As required by Section 2674 of Title 10, United States Code, the attached status report to the Congress on the Renovation of the Pentagon is presented annually and this is the ninth Report. This Report is a synopsis of where we are in the overall program, the work that has been completed during the past fiscal year and the work that is anticipated to be completed during the next fiscal year. In addition this Report reviews the design and construction costs to date within the framework of the overall certified summary. The report reviews seven categories as follows:

I. **Purpose:** A brief description for the reason of the report.

II. **Overview:** A general description of the development of the program since the initial Pentagon Renovation Concept Plan was prepared in 1989.

III. **Program Status:** This section defines the primary activities, the activity status of completed projects, projects under construction and projects under design. The primary activities involve the Design Guidelines and Criteria for the overall project and the design and construction for the basement and the wedges. The completed projects are the Basement/Mezzanine Segment 1 core and shell, the barrier walls and temporary mechanical, electrical and plumbing systems, and other related projects.

IV. **Fiscal Year 1999 Program:** This section lists the activities that are included in fiscal year 1999. These activities include Basement/Mezzanine Renovation, Wedge #1 Renovation and other related activities.

V. **Work Accomplished:** This section describes all of the work accomplished since the Heating and Refrigeration plant was awarded in 1992. The completed projects include Basement/Mezzanine Segment I core and shell, Heating and Refrigeration Plant, Center Courtyard Utilities Tunnel, Classified Waste Incinerator Plant, Sewage Lift Station, River Terrace Renovation, River Terrace Handicapped Access, Mug Handle Infill, Corridor 8 Entrance Renovation, Wedge #1 Temporary Construction and Swing Spaces. Projects under construction include Segment 2.A.2 Core and Shell and Tenant Fit Out, TRICARE Health Clinic, Wedge #1 Demolition and Abatement and South Terrace Pedestrian Bridges.

VI. **Budget:** This section describes the source of funds with a certification summary of what has been expended to date and what is programmed for the future. The total obligated funds through FY 1998 for design and construction are $348,700,000.00. Budgeted funds for FY 1999 to the end of the program for design and construction are $507,200,000.00.

VII. **Appendix:** This section includes a history of the Pentagon and a description of the deterioration of the building wide components and systems; a description of how the program was developed; a current program schedule; and past FY 1991 Legislative Authorization and Department of Defense Appropriations Act, FY 1999, with Certification.

# I. PURPOSE

# I. Purpose

This report is provided to the Congress in compliance with Title 10 United States Code, Section 2674, which requires the Secretary of Defense to submit an annual report on the status of the renovation of the Pentagon Reservation, and a plan for the renovation work to be conducted in the fiscal year beginning in the year in which the report is transmitted.

This is the ninth annual report submitted in compliance with 10 U.S.C. 2674. The report covers accomplishments to date and actions proposed for FY 1999. In addition, this report includes information on several related projects which support the overall objectives of operations and maintenance of the Pentagon Reservation.

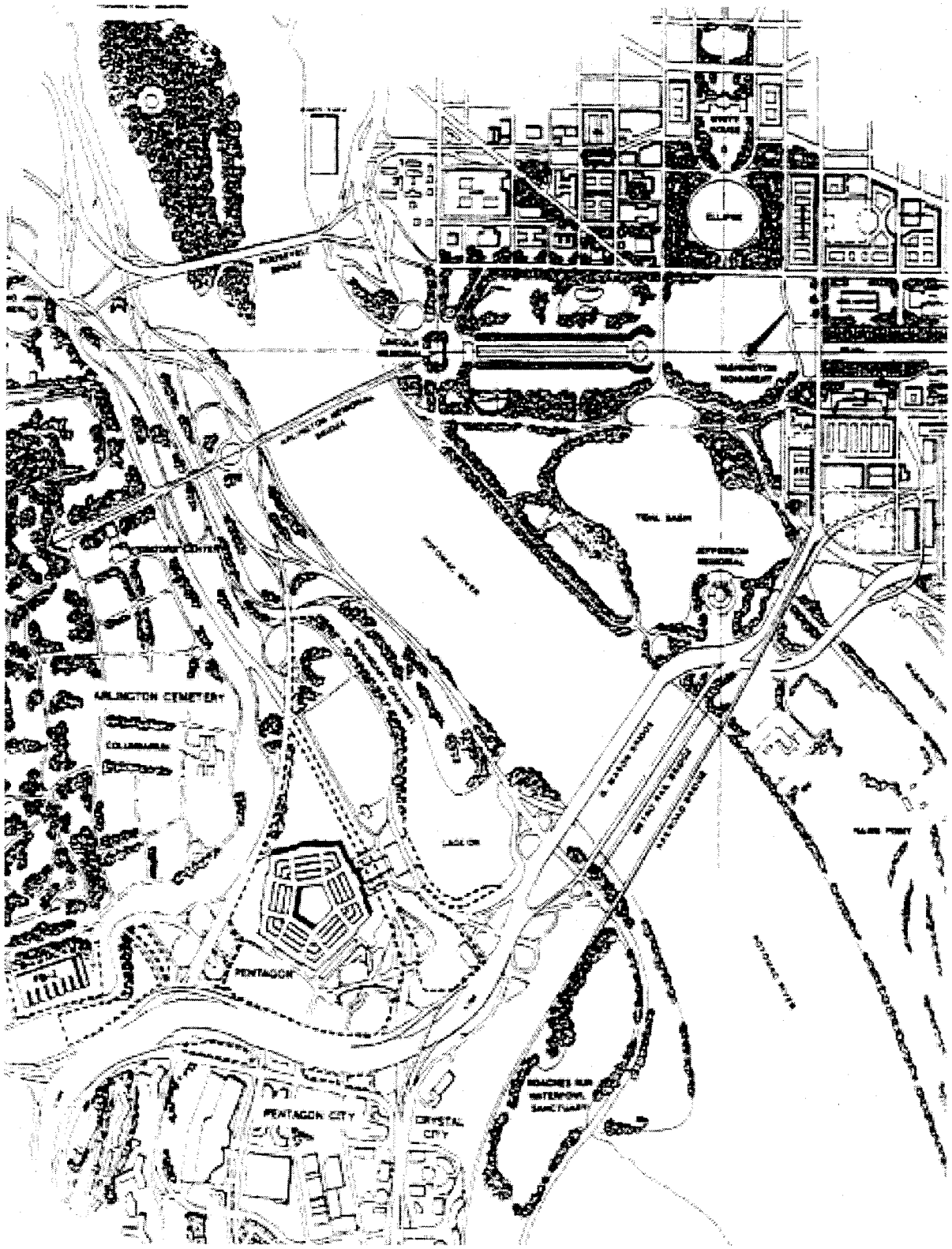



**Figure 2**
**Pentagon Location Map**

# II. OVERVIEW

**General**
**Reservation Master Plan**
**Concept Plan**
**Environmental/Energy Improvements**
**Renovation Conponents**
**Information Management & Telecommunications**
**Other Related Projects**

# II Overview

***General*** As the headquarters of the National Defense Establishment and the nerve center for the Department of Defense command and control, the Pentagon needs to be maintained in superior operational condition. However, over the Pentagon's 56 year lifetime, repairs and renovations have been undertaken on a piecemeal basis. Consequently, today the Pentagon, with many of its original systems still in place, has deteriorated to the point where distribution outages, plumbing leaks, water supply failures, and heating, ventilation, and air conditioning (HVAC) failures occur on a daily basis. The building fails to comply with current building, fire protection, and life safety codes, and accessibility standards.

These antiquated systems cannot provide adequate services to support a modern and flexible office environment. Computers, copy machines, and other heat-generating, power-consuming equipment normal in today's administrative offices, did not exist when the Pentagon was designed in 1943. The HVAC systems were never designed or intended to accommodate today's loads. The plumbing services, although adequately sized, have simply worn out. New demands have been placed on the structure's telecommunications and security systems that the original architects never could have anticipated. The tremendous increase in sophisticated computer equipment requires new, efficient, and integrated HVAC systems as well as additional power distribution sources.

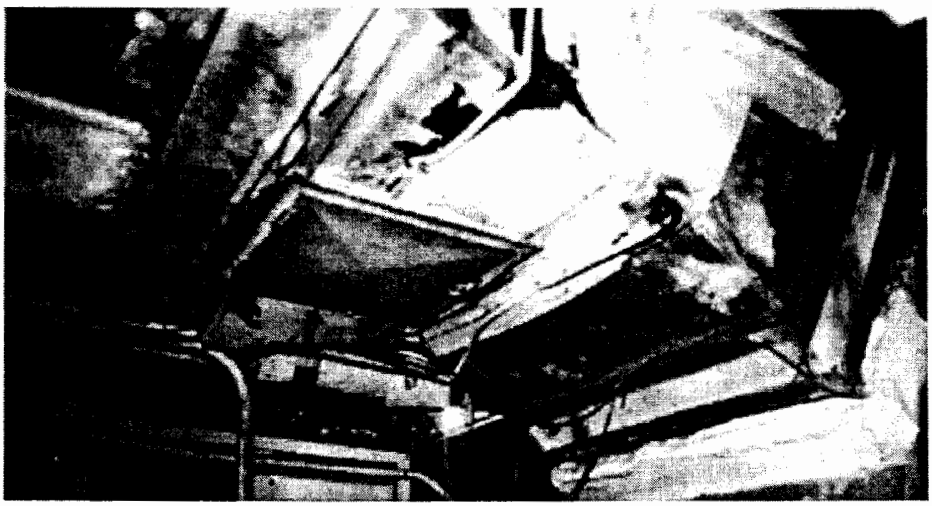


**Figure 3**
**Deteriorating Heating, Ventilation, and Air Conditioning (HVAC) Ductwork**

A key consideration in planning the renovation is that the Pentagon was constructed with plaster-finish ceilings which conceal the mechanical, electrical, and plumbing systems. Therefore, in order to replace or install the mechanical, electrical, and life safety systems, all asbestos-laden plaster ceilings, ducts, pipes and tile flooring must be removed from the building. Such demolition work will require the removal of the majority of obsolete full-height office partitions.

These steps, in turn, make possible the reconfiguration of space to provide modern flexible office space (many associated offices are not contiguous and are not efficiently housed). Current health and life safety requirements and the physical constraints of the building will not accommodate "piece-meal" renovation that would stop and start arbitrarily.

A complete renovation is necessary to provide a modern, flexible, efficient operating environment well into the 21st century. Without a major renovation, the building will continue to deteriorate, ultimately rendering it unable to serve its mission. These conditions require a plan of comprehensive scope to provide the benefits of a comprehensive building renovation.

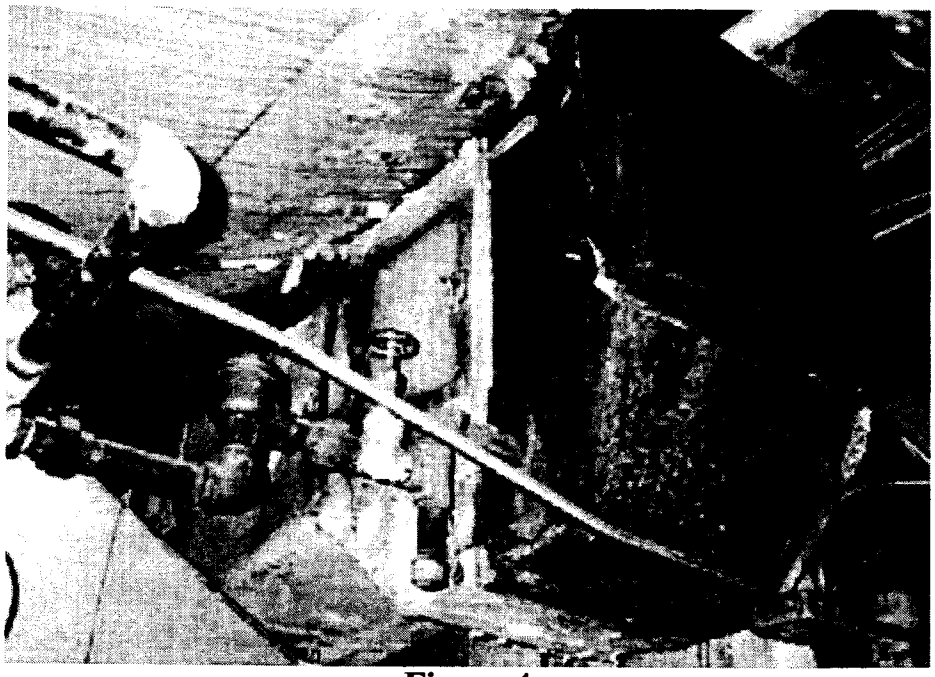


**Figure 4**
**Typical Ductwork Surrounded by Asbestos Insulation**

***Reservation Master Plan***

A Pentagon Reservation Master Plan and an associated Environmental Assessment have been approved by the National Capital Planning Commission and the Commission of Fine Arts. This plan defines how existing elements will be integrated with new construction and site improvements. Objectives of the Master Plan for the Pentagon Reservation are to:

- Establish an integrated program for renovation, demolition, and construction of structures and facilities on the Reservation.
- Recommend improvements in transportation, traffic flow, and parking, giving priority to transit, ride sharing, and multiple-occupant modes.
- Recommend improvements in the quality of the human environment while minimizing potential adverse impacts.
- Describe improvements necessary to reinforce the symbolic nature of the Pentagon Reservation as part of a major gateway to the Nation's Capital.
- Ensure that site development and new construction are compatible with existing buildings and surrounding features.
- Provide a sense of unity and identity for the entire Reservation.

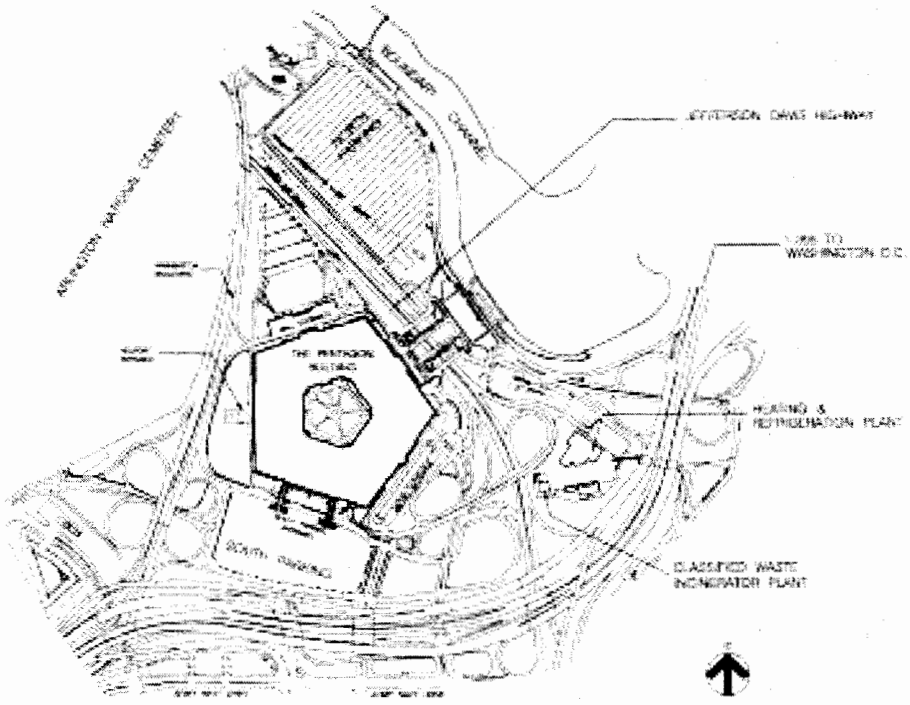


**Figure 5**
**Pentagon Reservation Site Plan**

***Concept Plan***

A Concept Plan, upon which the renovation plan was initially based, was completed in December 1989, refined in 1990, and forms the basis for planning the renovation of the world's largest low-rise office building.

In developing the Concept Plan, conceptual approaches to renovating the 6,500,000-gross-square-foot (603,900 $m^2$) Pentagon in phases were examined.

1. Smallest Increment — 150 increments of 44,000 sq. ft. (4090 $m^2$).
2. One tenth of a floor horizontal — 50 increments of 132,000 sq. ft. (12,268 $m^2$).
3. Vertical sections — 17 increments of 388,000 sq. ft.; sections divided along building seams, through all floors.
4. By tenants — more than six increments of less than 1,100,000 sq. ft. (102,230 $m^2$).
5. Five vertical sections — five increments (wedges) of 1,100,000 sq. ft. (102,230 $m^2$); divided along building seams, relocating tenants sequentially in each section.
6. Rings and vertical sections — five increments of 1,100,000 sq. ft. (102,230 $m^2$) (Renovate A-B Rings first, then C-E Rings).
7. One quarter of building — four increments of 1,625,000 sq. ft. (151,022 $m^2$).
8. All of the building — one increment of 6,500,000 sq. ft. (603,900 $m^2$).

Following an extensive evaluation, three of these conceptual approaches were selected for further study.

The three approaches selected for additional study were:

1. Seventeen vertical sections of building; sections divided along building seams, each part through all floors.
2. Five vertical building sections divided along building seams (wedges), relocating tenants in each section.
3. Rings and vertical building sections divided along building seams, renovate A Ring first, then five vertical sections.

Additional investigation was performed on each of these concepts. Evaluation factors included: maintaining support services; managing areas of construction; availability of construction staging areas; minimizing materials procurement lead times; minimizing asbestos removal impact; maintaining user operations; construction access to site/building; compatibility with utilities/building systems; maintaining physical security; minimizing construction time frame; availability of required construction personnel; and minimizing total project costs.

Renovating in five vertical sections (wedges) emerged as the best fit with the evaluation criteria and the option most likely to be successful. Therefore, the Concept Plan divided the Pentagon into five major phases of work plus the Basement and further identified five improvement alternatives to enhance the overall operation of the building:

1. Foyer/vertical circulation modifications.
2. New public access to the second floor.
3. Services corridor network.
4. Additional Mezzanine space.
5. Pentagon Maintenance Facility (formerly Logistics Support Extension).

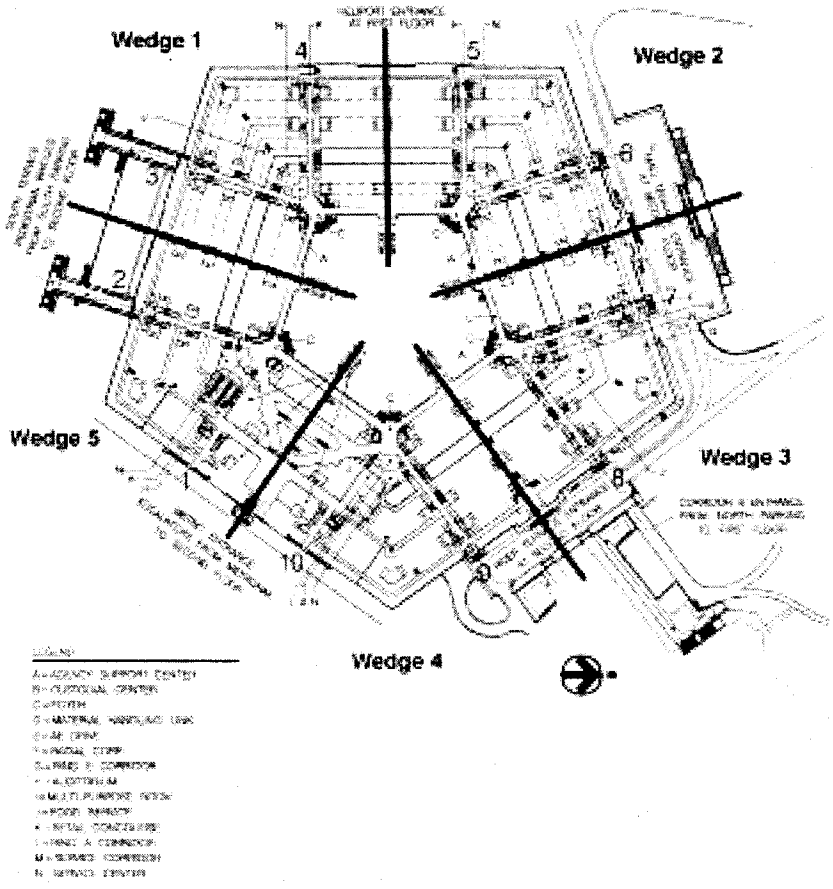



**Figure 6**
**Pentagon Building Master Plan—Second Floor Plan**

Incorporation of the improvement alternatives increases the building's efficiency and improves the internal organization of space and building systems. Key changes planned include:

- Modification of internal circulation patterns to allow better vertical integration of space. This will be accomplished through the introduction of passenger elevator services and additional escalators to replace current ramps and to augment stairwells.
- Re-orientation of public entrances to channel visitors to the second floor. This will isolate sensitive areas; improve internal security; and separate personnel from mechanized traffic (e.g. whenever possible, mechanized traffic, with the exception of ambulances, will be constrained to the first floor).
- Addition of first floor service corridors and service elevators that could reduce the intermingling of mechanized delivery vehicles from pedestrians in the main corridors. This increases the safety of building occupants and reduces damage to corridor floors and walls.
- Creation of flexible, expandable, mechanical, electrical, plumbing, and communications cabling systems to ensure that future demands for maintenance and new services can be met economically and efficiently.

Because the renovation includes asbestos removal and associated containment procedures, it will be necessary to completely vacate the areas under renovation while work is in progress. Temporary "swing space" must be obtained to house displaced activities. Activities displaced from or within the Pentagon will typically use swing space on a temporary basis until their renovated space is completed.

Renovation of the Pentagon involves the coordinated implementation of multiple related actions that will collectively address the building's condition. Since a major renovation has never been undertaken at the Pentagon, this project involves extensive demolition and reconstruction. Significant construction activities include replacement and upgrade of mechanical, electrical, plumbing, and all building support systems to modern standards. Interior spaces are being re-configured, and vertical transportation systems will be installed. New space will be added, both through the conversion of ramp and corridor space to office and support space, and through the expansion of the Mezzanine areas.

The Pentagon Renovation will enable organizations to be aligned vertically, and to be served with elevators and escalators, significantly improving circulation efficiency. Although the Commandant of the Marine Corps has already been accommodated with space in the Pentagon, the remainder of the Marine Corps Headquarters staff will be relocated to the Pentagon over the duration of the renovation program. The Department of the Navy will provide the location of the Marine Corps within its allocation of space in the Pentagon.

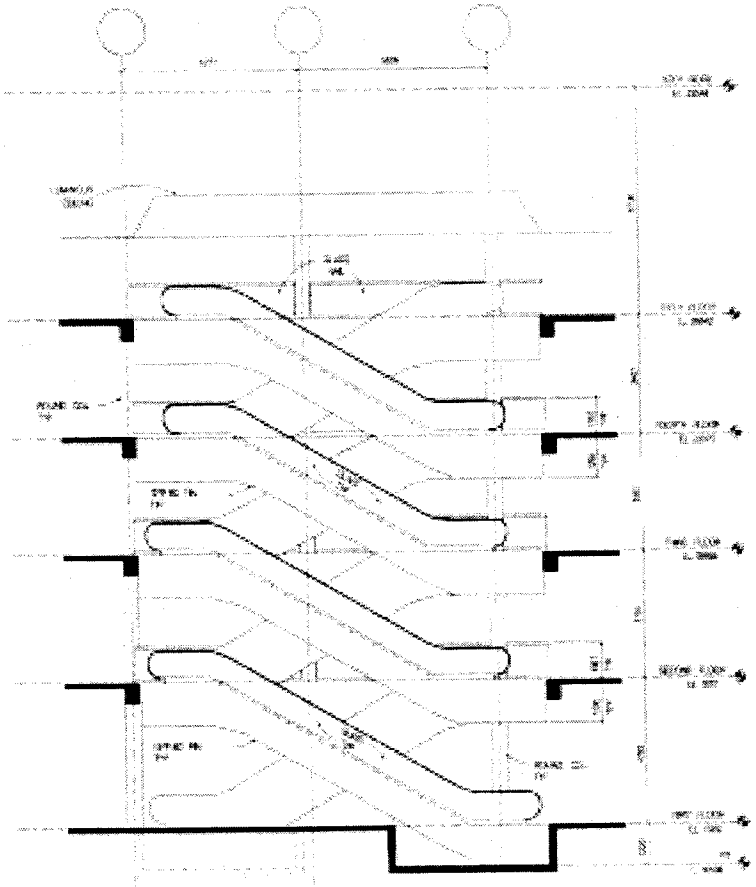


**Figure 7**
**Section Through Proposed Typical Foyer at Apex with New Escalators**

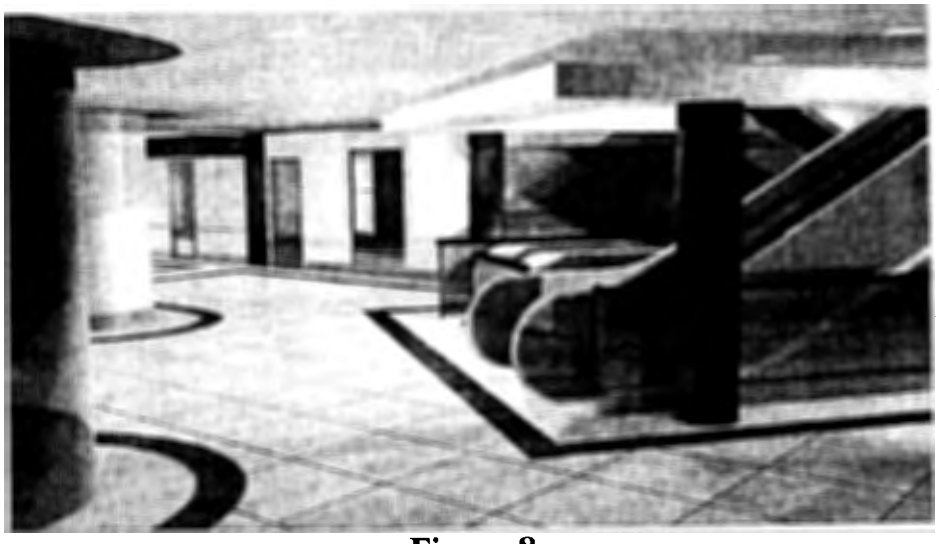


**Figure 8**
**Proposed Apex Foyer**

***Environmental/ Energy Improvements***

The Pentagon Renovation affords the opportunity to increase energy efficiency and reduce waste. Selected recommendations made during the Energy Efficient, Environmentally Sensitive DoD Showcase Facility Session held in the first quarter FY 1995 are being implemented. Through the Renovation, the Pentagon will obtain a healthy indoor environment by increasing air changes per hour and removing asbestos. The renovation of the Pentagon includes improving energy efficiency through:

- Double-glazed windows.
- Economizer cycles for heating, ventilating, and air condition equipment.
- Energy efficient mechanical and electrical equipment.
- Reduced overall lighting load and increased use of task lighting.
- Automated energy management systems.
- Increased use of insulation

The Pentagon Reservation will continue to comply with environmental regulations by testing soils and ground water for contamination, and by using appropriate soil erosion and sediment management. The Pentagon is now complying with the Clean Air Act by reduced emissions from the Heating & Refrigeration Plant and the Classified Waste Incinerator Plant, projects already completed during earlier phases of the renovation.

In summary, the renovated Pentagon will benefit from quality indoor air, a new, high-efficiency Heating & Refrigeration Plant, automated energy systems management, energy-efficient lighting, and an improved thermal building envelope.

***Renovation Components***

The Pentagon Renovation Program includes the following distinct components:

- Basement and Mezzanine Renovation.
- Above-grade building renovations of Wedges #1-#5.

The overall renovation of the Basement/Mezzanine is being accomplished in multiple increments, and began with the area centered around Corridor 8.

The deflected Basement floor slabs were demolished, the floor level of the basement slabs were lowered, the slabs replaced, and foundations have been modified for the revised structural conditions.

The Mezzanine space in the two-story-high Basement areas is being extended, and its completion will provide about 278,000 sq. ft. (25,826

$m^2$) of additional occupiable space.

The Army Motor Pool, previously located in the Mezzanine, has been permanently relocated off-site. Correction of severe structural deficiencies has been completed and this former motor pool area is being converted into the DiLorenzo TRICARE Health Clinic which consolidates the separate Army, Civilian, and Air Force clinics.

A construction contract was awarded on February 16, 1994, for the Basement Segment 1 Temporary Mechanical, Electrical, and Plumbing. This work has been completed.

A construction contract was awarded on September 30, 1994, for the Basement Segment 1. The construction of the core and shell has been completed. Tenant fit-out is well underway, with several tenants already relocated. Final tenant fit-out work is scheduled for completion in FY 1999. The construction of the remainder of the basement will proceed in multiple increments which started in FY 1998.

To eliminate the need for the undesirable existing sewage ejectors in the basement, a construction contract was awarded September 29, 1995, for the Sewage Lift Station. This work was completed in January 1997.

*Above-grade Renovation of Wedges #1 - #5*

The construction of the above-grade renovation of Wedges #1-#5 will be completed in five sequential, separate wedges based on isolation of building systems and minimum disruption to tenants.

To provide the environment and physical infrastructure to support the mission of our national defense establishment headquarters all antiquated internal building systems will be replaced and brought up to current building, fire protection, and life safety codes, and accessibility standards. The renovation work involves the demolition and removal of all partitions; ceilings; floor finishes; and mechanical, electrical, plumbing, fire protection and communications systems. Where sound, the basic structural system, as well as the stairwells and their enclosing walls will remain.

This renovation work will facilitate the reconfiguration of space to provide modern, flexible, office space, readily adaptable to accommodate future organizational changes as well as technological advances in office equipment and work space environments. This configuration will also allow for the consolidation of organizations which are now fragmented.

Support facilities, including food service, communications, control centers, a library, recreational areas and retail stores will be renovated as the wedges in which they are located are scheduled for construction.

New primary and secondary electrical service and distribution systems, including a cable management system, will be installed. Emergency lighting,

**Figure 9**
**Proposed Renovated Tenant Space**

fire protection, and uninterruptible power supplies and panels will be installed as well.

The heating, ventilating, and air conditioning systems will be replaced. A dual feed loop system will be installed to provide chilled water service 24 hours daily for off-hours operations (thereby eliminating numerous package systems within the building). Toilet rooms will be relocated and brought up to current standards (including requirements for the disabled). All new waste and supply piping will be installed.

The building will be equipped throughout with a sprinkler system and a reconfigured fire alarm system.

The completion of the South Terrace Pedestrian Bridges will provide improved public access at the second floor level. Internal circulation will be enhanced by the installation of escalators and personnel elevators. In addition, these changes will improve security by isolating sensitive spaces on or below the first floor.

An independent service corridor network serving the vertical transportation elements will be constructed on the first floor to improve efficiency of distribution. The massive floor area of the Pentagon necessitates initial support distribution via motorized carts at this floor level. Decentralization of support activities will allow for reduced use of all vehicles other than emergency medical vehicles above the first floor. Existing freight elevators will be replaced, and new service elevators will be installed at additional decentralized locations, along with trash removal facilities.

To gain additional occupiable space, excessively wide corridors will be

narrowed and all ramps will be removed and replaced with structural floors. Auditorium and conference spaces will be expanded. Roof, roof gutters, down spouts, and flashing will be repaired/replaced where deterioration is encountered in the renovation work. Existing steel casement and double-hung windows will be replaced with new, energy-efficient and appropriately secure units in accordance with historical agency requirements. Modifications will be made to outer perimeter monumental windows to improve weather-tightness and security. All exterior masonry and concrete finishes and waterproofing elements will be restored to sound condition.

The intersections of radial corridors at the innermost ring corridor (Ring A) are not efficiently used at present. These areas will be renovated to provide vertical transportation for improved passage throughout the building. The introduction of vertical transportation will facilitate the consolidation and assignment of organizations vertically throughout the building. The current excess areas at these intersections will be developed to provide conference and training facilities, briefing centers, snack bars, and other multi-purpose support functions. The previous and following renderings and drawings illustrate the planned development of the above-grade renovations:

- Pentagon Building Master Plan Second Floor Plan. (Figure 6)
- Plan of Proposed Typical Foyer at Apex with New Elevators and Escalators. (Figure 11)
- Section of Proposed Typical Foyer at Apex with New Escalators. (Figure 7)
- Proposed Apex Foyer. (Figure 8)
- Proposed South Terrace Pedestrian Bridges. (Figure 10)

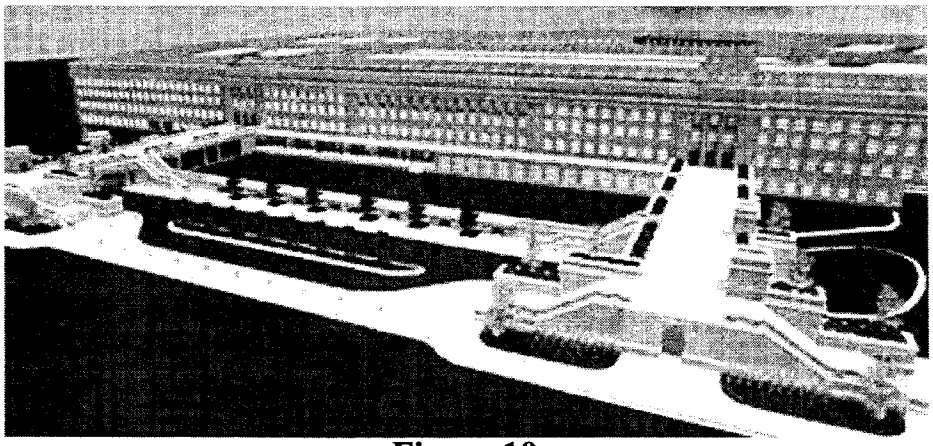


**Figure 10**
**Proposed South Terrace Pedestrian Bridges**
**(Currently Under Construction)**

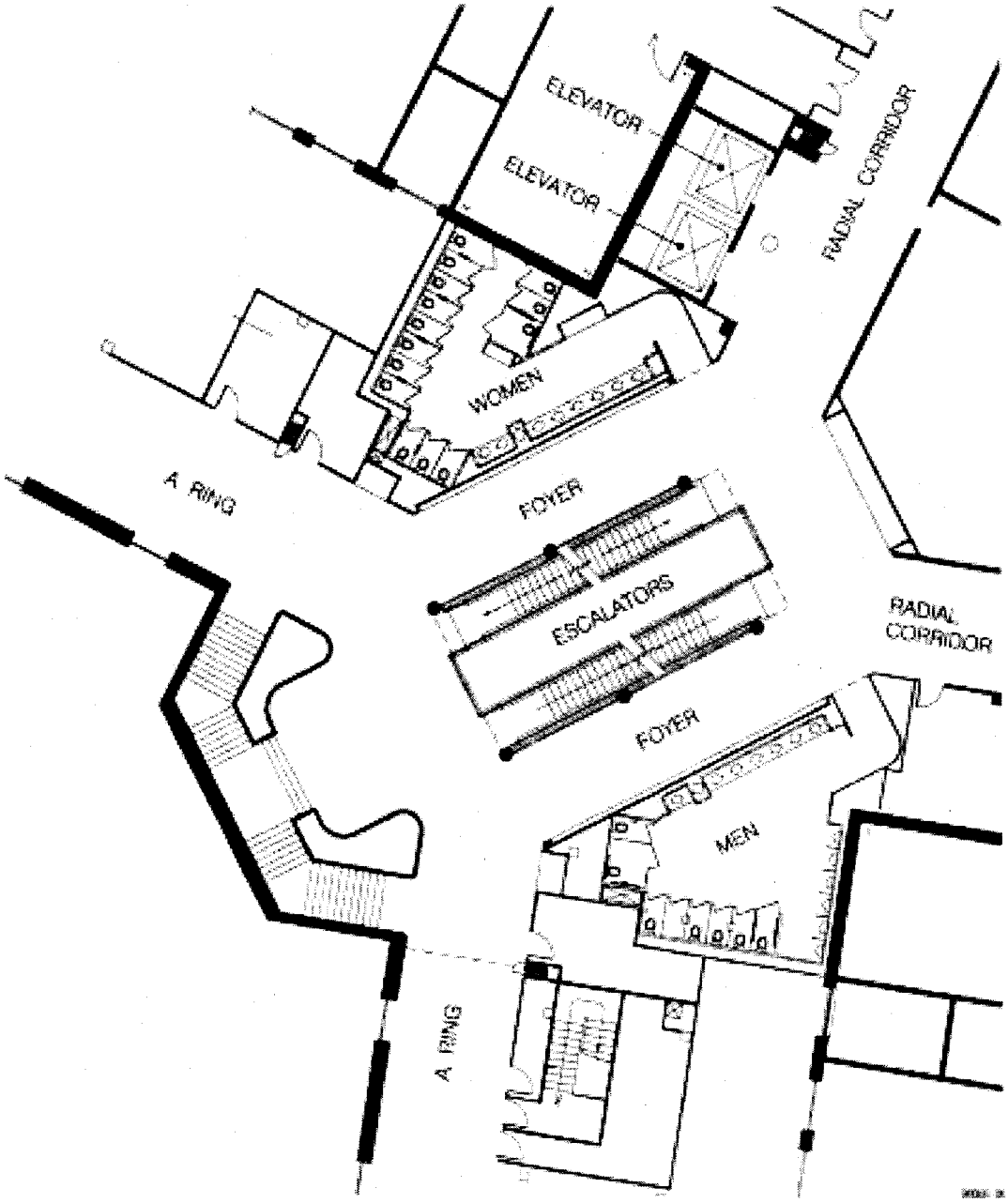



**Figure 11**
**Plan of Proposed Typical Foyer at Apex with New Escalators and Elevators**

***Information Management & Telecommunications***

Separate but related to the Pentagon Renovation Program will be an update of building information management and telecommunications. The basic information system infrastructure in the Pentagon was installed long before the advent of personal computers, facsimile machines, video teleconferencing, and digital telephone service, and has evolved without design or plan. As requirements emerged, facilities and systems were added with little or no regard to existing capabilities or long term requirements. The individual military departments and agencies engineered and installed equipment and cables to meet their specific requirements.

Many of the existing information systems in the Pentagon are now outdated, non-interoperable, duplicative, inefficient and expensive to operate and maintain. Systems and cables no longer needed have been abandoned in place. The Pentagon is seriously deficient in the information technology infrastructure necessary to function efficiently and to comply with maximum effectiveness.

The IM&T project will provide:

- Modern telecommunications and information management service throughout the Pentagon and access to global networks. Backbone communications will support voice, video, data, and other user requirements, such as Local Area Networks.
- Define, procure, integrate, and test hardware and software items required to meet functional requirements of the Network Systems Management Center (NSMC).
- Modernize the telecommunications infrastructure and consolidate the functions and responsibilities of the seven Technical Control Facilities in the Pentagon.
- Relocate the Defense Information Systems Agency (DISA) Joint Staff Support Center (JSSC) Command and Control (C2) Automated Data Processing (ADP) centers from existing facilities into one new facility located in the renovated Pentagon space.

Paralleling the C2 ADP efforts, the Business ADP Center will provide a modernized data processing facility for the Army and Air Force Systems. The ADP Center will be used primarily to house mainframe processors and their peripheral equipment, including storage devices and network processors. These systems are currently operating in multiple centers within the Pentagon.

In addition, IM&T will:

- Provide the renovated Pentagon with voice communications currently provided by multiple Command and Control, Tactical, and Administrative telephone switched located in multiple facilities.
- Refurbish and install the primary red and black Command and Control (C2) switches.
- Install the Main Distribution Frame in the General Purpose Switch Room (GPSR) and reduce the total switch architecture.
- Provide infrastructure and replicate user capabilities at temporary Swing Space locations as approved by WHS to locations both internal and external to the Pentagon.

## *Other Related Projects*

A number of initiatives ongoing at the Pentagon Reservation are separate from, but related to, the Renovation Program. The related initiatives which coincide with the Renovation effort reflect the fact that the Pentagon remains the fully operational headquarters of our Military Establishments while it is undergoing renovation. Thus, a number of other facilities projects are being closely coordinated with, and sometimes performed by, the Renovation Office.

*Heating & Refrigeration Plant*

Replacement of the Heating & Refrigeration Plant (H&RP) began the initial work on the Pentagon Reservation because the original plant was nearly inoperative, relying on rented boilers and chillers to provide the necessary services. The original H&RP, which served the Pentagon Reservation for over 55 years, was so deteriorated that it was more cost-effective to replace it than to renovate the existing facility and equipment. The new facility has been sized to provide steam and chilled water to the Pentagon and to Federal Building #2 (FB2) and steam only to Henderson Hall. Services are provided through new underground utilities distribution systems in a new utilities tunnel from the H&RP to FB2.The new H&RP is now completed and is now fully operational.

The facility has approximately 106,200 SF (9,900 m5) of floor area. The primary elements of the plant are six multi-fuel boilers (oil/gas), ten chillers, two 250,000 gallon (947,500 liters) fuel oil storage tanks, and office and maintenance areas. The Plant can provide 200,000 pounds per hour (25.25 kilograms per second) of steam heating capacity and 37,500 tons (131,900 kw) of cooling.

**Figure 12**
**Aerial View of New Heating & Refrigeration Plant**

The new facility has been built adjacent to the former Heating & Refrigeration Plant. Demolition of the original facility was completed in February 1998.

*Remote Delivery Facility*

In response to a comprehensive vulnerability assessment of the Pentagon, the Department of Defense has programmed for the construction of a Remote Delivery Facility (RDF) to move the shipping and receiving activities from the main Pentagon building to a secure, off-site screening facility at the Mall parking area of the Pentagon Reservation. This initiative is being done via a Design-Build contract. This is part of a systemized force protection program designed to protect sensitive Defense facilities. This security initiative eliminates the intrusion of over 200 daily delivery trucks that would otherwise breech the Pentagon security perimeter. Some industrial maintenance type activities are also being moved from the Pentagon building to the RDF. This project will integrate some force protection systems and facilities similar to those in place at the White House, U.S. Capitol, and the State Department. Congress provided design funding of $3 million for this fast-track security project as part of the FY 1998 Omnibus reprogramming. By letter of July 16, 1998, the Deputy Secretary of Defense outlined for Congress the Department of Defense's plan for completion of this initiative. The Pentagon Renovation Program Office has been directed to execute this requirement in coordination with the on-going Pentagon Renovation Program. This project is scheduled to begin in April 1999, with a final completion by December 2000.

*Site*

Site improvements include the continued operation, repair, maintenance, restoration and replacement or upgrading of landscaping, roads, walks, pavement, high pressure water mains, bridges, storm drain repair and relocation, transportation facilities, fences, modifications to meet current security and safety requirements, as well as realignment and improvement of vehicular traffic patterns.

*Swing Space*

Renovation of each wedge of the Pentagon requires the relocation of over 5,000 employees. As of January 1999, 5000 tenants in Wedge 1 have been relocated to external or internal swing space. "Swing Space" refers to office space outside the Pentagon that tenants will occupy during renovation, or temporary office space configured within the Pentagon for short term use.

Swing Space accommodations are critical to keeping the renovation program on schedule. Presently, three office buildings in Arlington, Virginia, have been leased to accommodate 4,120 Army, Navy, Air Force and OSD personnel for the duration of the renovation. Two office towers

in Rosslyn house 2,390 employees while an office tower in Crystal City is home to another 1,730 employees. Other employees will be relocated elsewhere on the Pentagon Reservation. All swing space facilities must maintain full connectivity to the Pentagon through classified and unclassified LANs, phone lines and electronic mail. All three buildings have been renovated for DoD tenants, and feature modern offices with professional workstations, state-of-the-art voice/data communication systems and sophisticated security systems. Communications with the Pentagon will be maintained.

# III. PROGRAM STATUS

**Primary Activities**
**Activity Status—Projects Completed**
**Activity Status—Projects Under Construction**
**Projects In Design**

# III Program Status

The program projects an overall completion of the renovation in FY 2010. The primary activities in the program include:

***Primary Activities***

- Development of Design Guidelines and Criteria for the overall project—***completed.*** (May be updated as needed.)
- Development of Information Management & Telecommunications (IM&T) Architecture—***completed.***
- Design and Construction of Basement/Mezzanine Segment 1—***underway.***
- Design and Construction of Basement/Mezzanine Segment 2—***underway.***
- Design and Construction of Basement/Mezzanine Segment 3—***underway.***
- Design and Construction of Wedge #1—***underway.***
- Design and Construction of Wedge #2—***underway.***
- Design and Construction of Wedge #3.
- Design and Construction of Wedge #4.
- Design and Construction of Wedge #5.

***Activity Status Projects Completed***

*Basement/Mezzanine*

- River Terrace Renovation—***completed.***
- Handicap Access Ramps and Handicap Access Lift—***completed.***
- Mug Handle Infill Project—***completed.***
- Corridor 8 Entrance Renovation—***completed.***
- Segment 2.A.2 Demolition and Abatement—***completed.***
- Construction Entrance for Segment 2.A.2—***completed.***
- Segment 2.A.2 Core & Shell—***completed.***
- Initial Tenant move into Basement Segment 1—***completed.***

*Wedge #1*

- Barrier Walls and Temporary Mechanical, Electrical and Plumbing Systems–***completed.***
- Vacating 5000 tenants—***completed.***
- Award of Core & Shell construction project—***completed.***

*Other Related Projects*

- Heating & Refrigeration Plant–***completed.***
- Center Courtyard Utilities Tunnel–***completed.***
- Classified Waste Incinerator Plant–***completed.***
- Sewage Lift Station–***completed.***
- New Site Security Checkpoints–***completed.***
- Ramp and Bridge from North Parking to Corridor 8 Entrance–***completed.***
- River Terrace Vehicular Bridge–***completed.***
- Build-out and occupancy of "Swing Spaces"–***completed.***

## *Activity Status Projects Under Construction*

*Basement/Mezzanine*

- Remaining tenant move into Basment Segment 1.
- DiLorenzo TRICARE Health Clinic.

*Wedge #1*

- South Terrace Pedestrian Bridges.
- Abatement.
- Core & Shell.

## *IM&T Renovation Projects*

*Above-ground Telecommunications*

- Above-ground Telecommunications Backbone awarded on 19 August 1998.
- Final Above-ground Telecommunications Backbone Architecture approved in January 1999.

*Basement/Mezzanine*

- Total Switch Architecture Primary command and Control (C2) Switch Room in the renovated space was properly accredited as a Sensitive Compartmented Information Facility (SCIF) by the Defense Intelligence Agency.
- Air Force Operations Group Facility fully operational and accredited.
- Began installation of equipment and upgrades for Business ADP #1.
- Installation of Basement/Mezzanine Segment 1 Backbone—***underway***.
- Design and installation of Segments 2 & 3 Backbone—***underway.***

*Wedge #1*

- Swing Space design, build-out, and move efforts—***completed.***

## *Projects in Design*

*Basement*

- Segments 2 & 3 Core & Shell.

*Remote Delivery Facility*

- Core & Shell

*Wedge #1*

- Tenant Fit-out.

*Other Related Projects*

- New Intake Piping and Structures for Heating & Refrigeration Plant (H&RP).

# IV. Fiscal Year 1999 Program

## Activities

# IV Fiscal Year 1999 Program

The FY 1999 program includes the following activities:

***Activities***

*Basement/Mezzanine Renovation*

- Complete construction of DiLorenzo TRICARE Health Clinic.
- Complete design of Segments 2 & 3 Core & Shell.
- Complete design of Tenant Fit-Out of Segments 2 & 3.
- Start construction of Segments 2 and 3.
- Cut-over of Business ADP #1 Facility.
- Cut-over of Network and Systems Management Center (NSMC).
- Cut-over of Pentagon Consolidated Technical Control Facility (PCTCF).
- Complete IM&T installation in Segment 1 & 2.

*Wedge #1 Renovation*

- Complete construction of South Terrace Pedestrian Bridge at Corridor 2.
- Begin construction of South Terrace Pedestrian Bridge at Corridor 3.
- Begin design of Tenant Fit-Out.
- Complete demolition and abatement activities.
- Begin installation of IM&T Backbone.
- Begin Core & Shell construction.

*Other Related Activities*

- Continue with Swing Space Moves.
- Complete design of H&RP Intake and Outfall Piping and Structures.
- Store historical displays and artifacts.

# V. Work Accomplished

## Completed Projects

**Basement/Mezzanine Segment 1**
**Heating & Refrigeration Plant**
**Center Courtyard Utilities Tunnel**
**Classified Waste Incinerator Plant**
**Sewage Lift Station**
**River Terrace Renovation**
**River Terrace Handicapped Access**
**River Terrace Vehicle Bridge**
**Mug Handle Infill**
**Corridor 8 Entrance Renovation**
**Wedge #1 Temporary Construction**
**Swing Spaces**

## Projects Under Construction

**2.A.2 Core & Shell**
**2.A.2 Tenant Fit-out**
**DiLorenzo TRICARE Health Clinic**
**Wedge #1Demolition & Abatement**
**South Terrace Pedestrian Bridges**

# Completed Projects

***Basement/ Mezzanine Segment 1***

The renovation of the Basement and Mezzanine Segment #1, under construction since March 1994, is now complete with the exception of a few areas yet to be occupied. The photographs below are representative of the some of the newly constructed areas.

**Figure 13**
**Ribbon-cutting Ceremony for Air Force Council Room**

**Figure 14**
**Air Force Watch Area**

# Completed Projects

***Basement/ Mezzanine Segment 1***

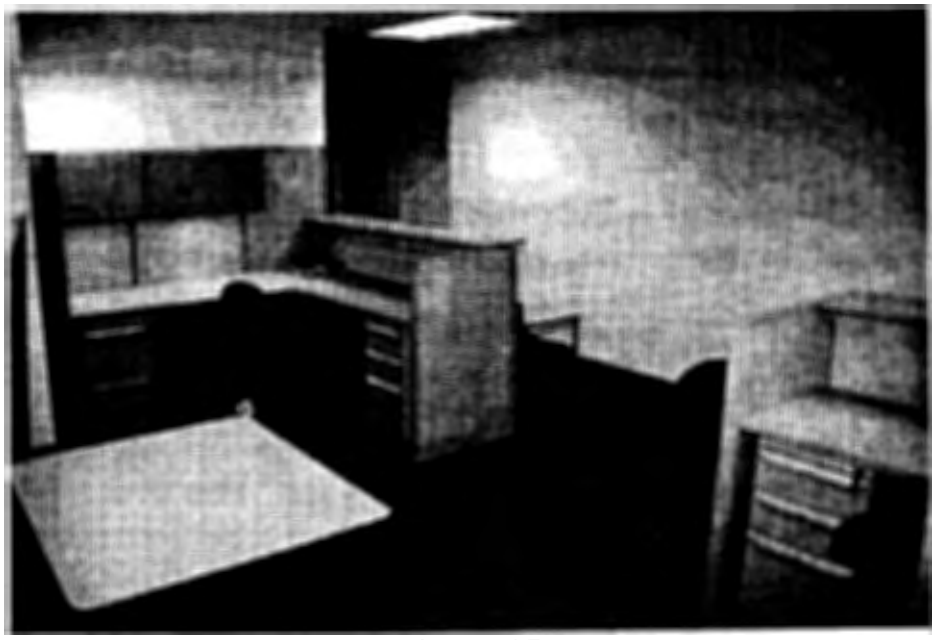


**Figure 15**
**New Modular Systems Furniture Adds Flexibility to Basement Office Space.**

**Figure 16**
**Lower Partition Walls Improve Air Flow and Light Dispersion**

***Basement/ Mezzanine Segment 1***

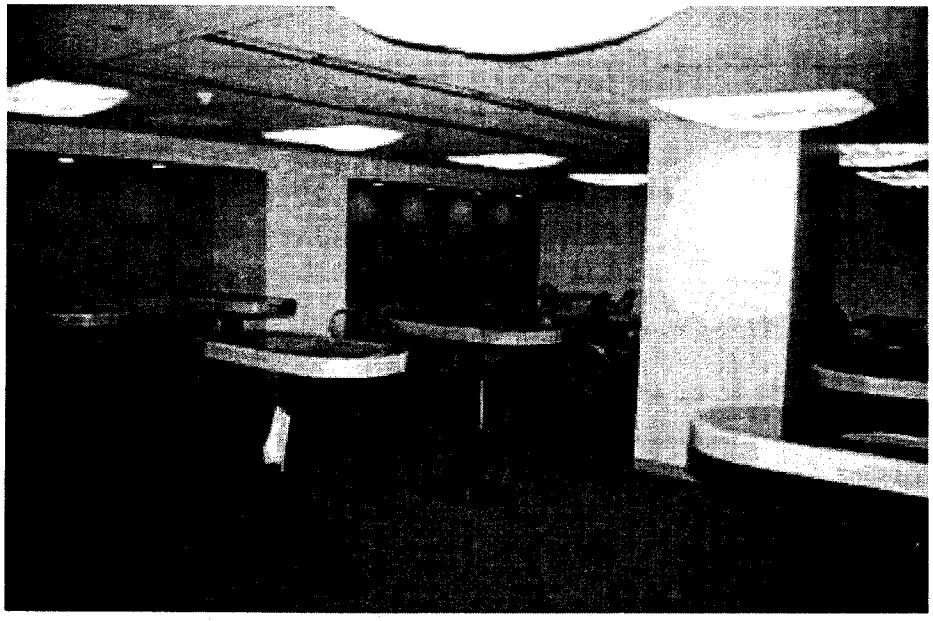


**Figure 17**
**Seating in the Basement's New 24-hour Snack Bar**

**Figure 18**
**Equipment Installation Is Complete in the Basement's New 24-hour Snack Bar**

# Completed Projects

***IM&T Basement/ Mezzanine Segment 1***

The Information Management and Telecommunications (IM&T) efforts in Basement/Mezzanine Segment 1 have been underway since FY 1995.

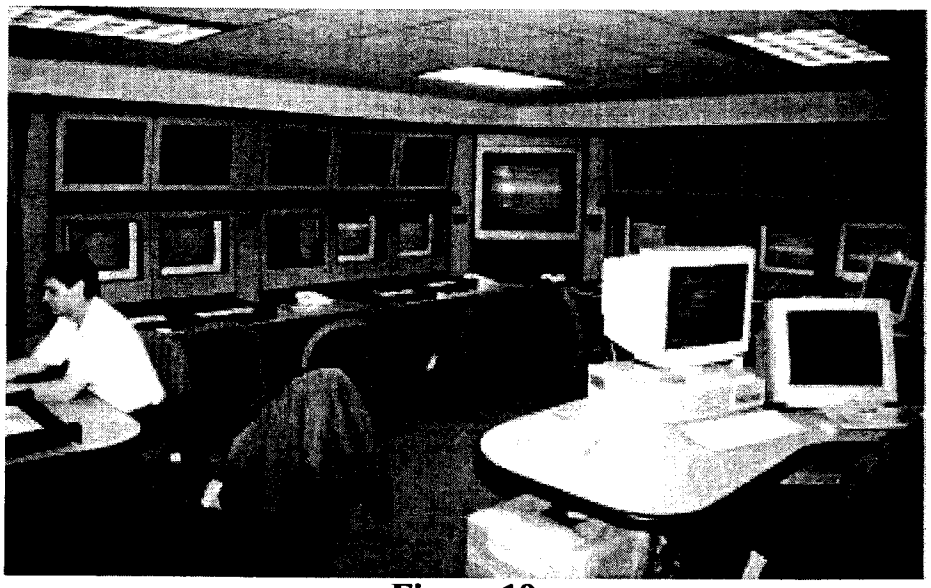


**Figure 19**
**Control Room in the New Network Systems Management Center**
**(Construction Complete, IM&T Installation Underway)**

**Figure 20**
**Technicians Test New Equipment in the Network Systems Management Center**

***IM&T Basement/ Mezzanine Segment 1***

**Figure 21**
**The Main Distribution Frame in the General Purpose Switch Room**
**(Construction Complete, IM&T Installation Underway)**

**Figure 22**
**Information Management and Telecommunications Personnel Review Fiber Installation Plans**
**(Construction Complete, IM&T Installation Underway)**

# Completed Projects

***IM&T Basement/ Mezzanine Segment 1***

**Figure 23**
**The New Technical Control Facility Will Be Home to All Pentagon Circuits**
**(Construction Complete, IM&T Installation Underway)**

**Figure 24**
**New Equipment in the Technical Control Facility**
**(Construction Complete, IM&T Installation Underway)**

***Heating & Refrigeration Plant***

The construction contract for the Heating & Refrigeration Plant (H&RP) was awarded on December 30, 1992, and construction began in February 1993. Construction is now complete and the plant is operational. The old H&RP building has been demolished.

**Figure 25**
**New Heating and Refrigeration Plant**

**Figure 26**
**New Heating and Refrigeration Plant (Chillers)**

# Completed Projects

***Center Courtyard Utilities Tunnel***

The Center Courtyard Utilities Tunnel provides utility lines that are efficient, reliable and easily maintained. The new utility lines are designed as a loop system that can continue to service other portions of the building while specific areas are shut down for localized maintenance. The roof of the tunnel serves as the access driveway for service and emergency vehicles in the Center Courtyard. Contract for design and construction of the Center Courtyard Utility Tunnel was awarded on February 25, 1994, and construction was completed in the Summer of 1997. The Center Courtyard utilities are not yet hooked up to the Wedges. Under the current plan, they will be hooked up on a Wedge by Wedge basis.

**Figure 27**
**Center Courtyard Utilities Tunnel**

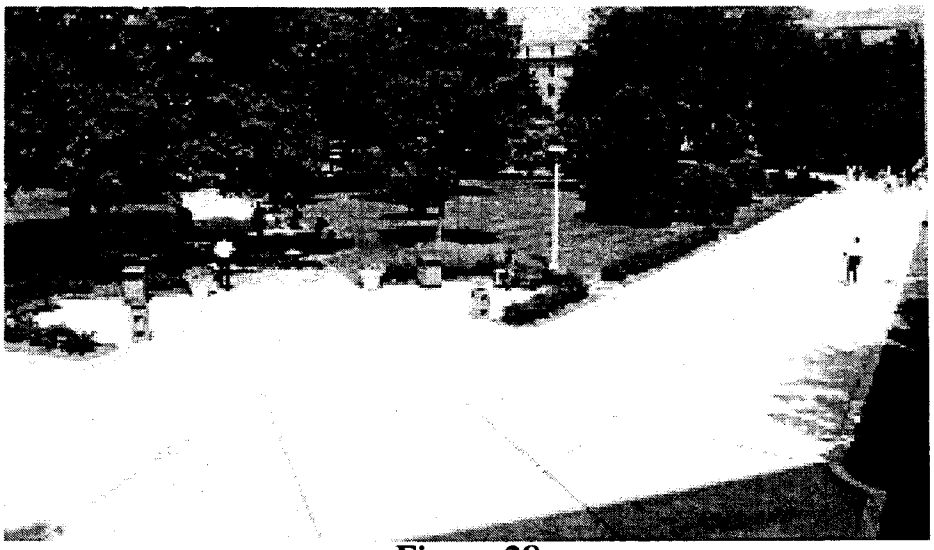


**Figure 28**
**Access Driveways over Tunnel Restored to the Original Condition**

***Classified Waste Incinerator Plant***

Renovation of the Classified Waste Incinerator Plant, located near the Heating & Refrigeration Plant, included a refurbishment of the existing plant and the replacement of the two existing incinerators. This work was completed while maintaining continuous operations. The new incinerators increase the classified waste burning capacity from 6,000 pounds per hour to 8,000 pounds per hour. The new incinerators are fully automated and their emissions are well under requirements set by the State of Virginia and the U.S. Environmental Protection Agency. The project was completed in 1997.

Figure 29
**Classified Waste Incinerator Plant**

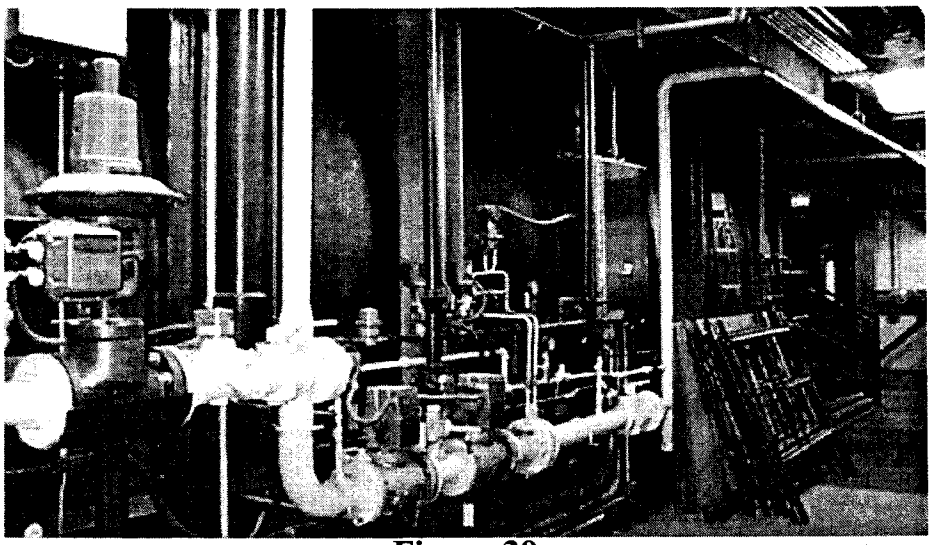


**Figure 30**
**Classified Waste Incinerator Plant**

# Completed Projects

***Sewage Lift Station***

The new Sewage Lift Station, which replaces the old Sewage Lift Station and the internal sewage ejectors in the Pentagon, is located along the walkway adjoining the North Parking area. The new Sewage Lift Station utilizes gravity flow for the waste from the Pentagon Basement, and the Pentagon Renovation and Planning Office. As the gravity lines carry sewage to the new lift station, a force main pumps sewage away from the new station to the Arlington Lift Station located in Crystal City. The new Sewage Lift Station is connected to the old sewage lift station which remains in place as a backup facility.

**Figure 31**
**Interior View of Sewage Lift Station**

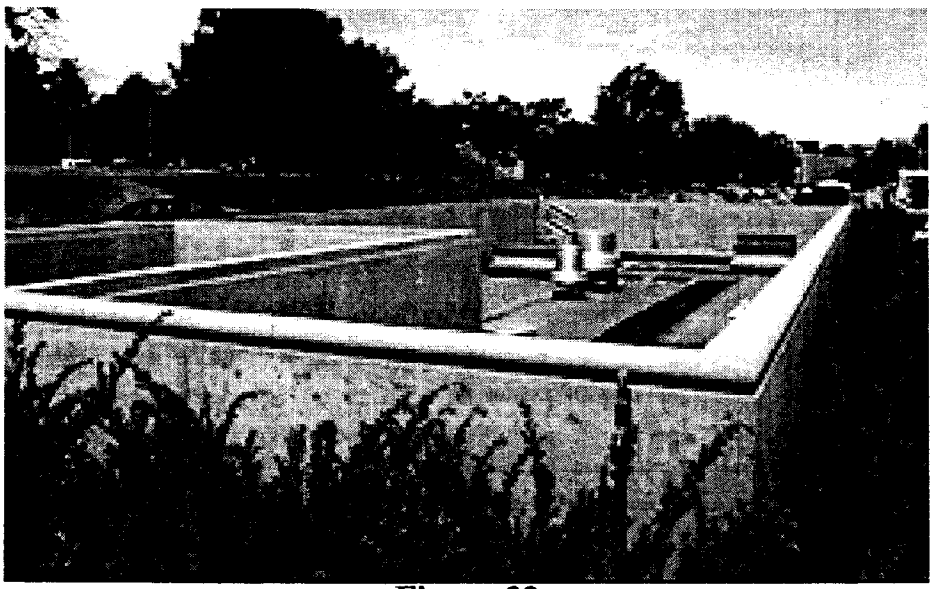


**Figure 32**
**Sewage Lift Station with Landscaping**

***River Terrace Renovation***

The renovation of the River Terrace corrected water proofing problems and repaired the time-ravaged steps, walkways, retaining walls, and planting areas. Waterproofing of this area was critical since the area directly below the River Terrace will be home to the DiLorenzo TRICARE Health Clinic and other occupied spaces under construction. The River Terrace renovations also included modifications to bring the area into compliance with the requirements of the Americans with Disabilities Act within the guidelines of the National Register of Historic Places.

**Figure 33**
**River Terrace Steps, Walkway, and Planters**

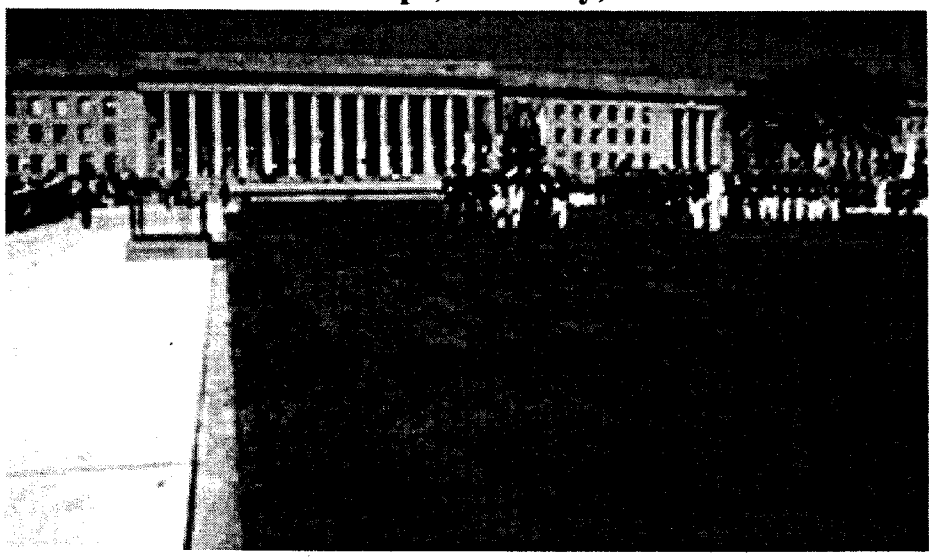


**Figure 34**
**Parade Grounds and Walkways**

# Completed Projects

***River Terrace Renovation Handicapped Access***

The renovation program must meet the congressionally mandated requirements of the Americans with Disabilities Act. Examples of work accomplished in compliance with these requirements include the handicapped access ramps on the River Terrace and the handicapped access lift at the River Terrace entrance.

**Figure 35**
**Handicapped Access Lift**

**Figure 36**
**Handicapped Access Ramp**

***River Terrace Renovation Vehicle Bridge***

Tests conducted on the River Terrace Vehicular Bridge over Route 110 revealed serious structural problems that required total replacement of the bridge. The construction contract was awarded on September 30, 1996, and construction was completed in October 1997.

**Figure 37**
**New River Terrace Vehicular Bridge**

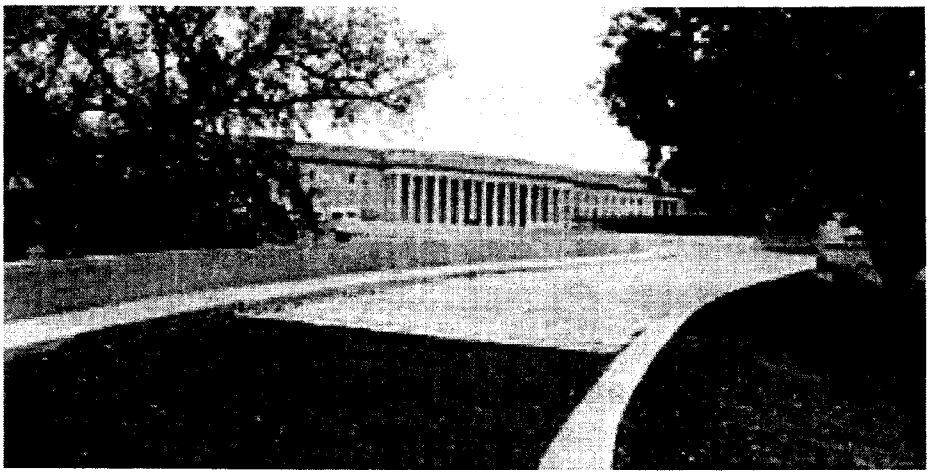


**Figure 38**
**Restored River Terrace Driveway**

# Completed Projects

***Mug Handle Infill***

The Mug Handle Infill Core & Shell project included excavation, pile foundations, and new slabs, for the space between the southern edge of the River Terrace and the curved entry to the former motor pool (now the DiLorenzo TRICARE Health Clinic entrance). The construction contract was awarded on October 15, 1997 was completed in FY 1998. The tenant fit-out, IM&T, and furniture work is to be completed in FY 1999.

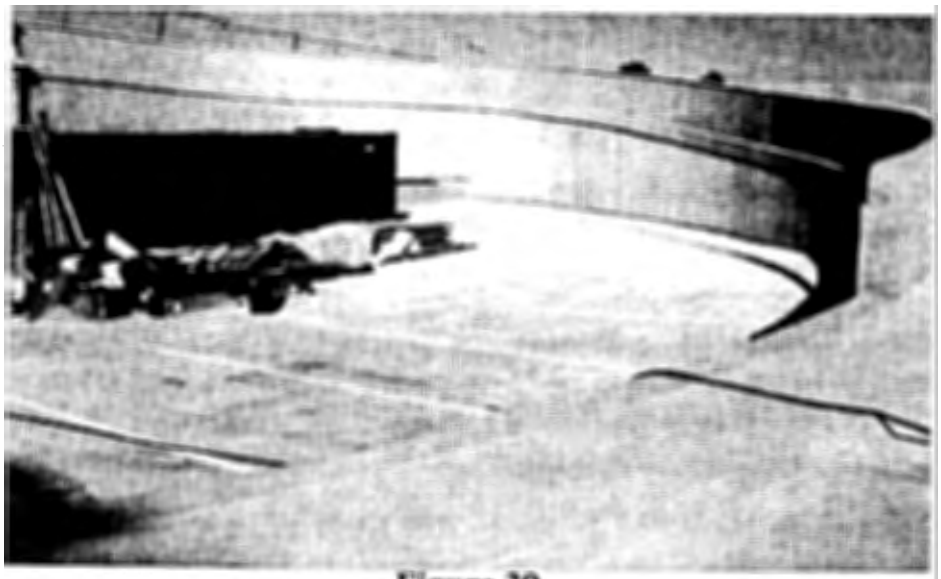


**Figure 39**
**Exterior View of Mug Handle In-fill**

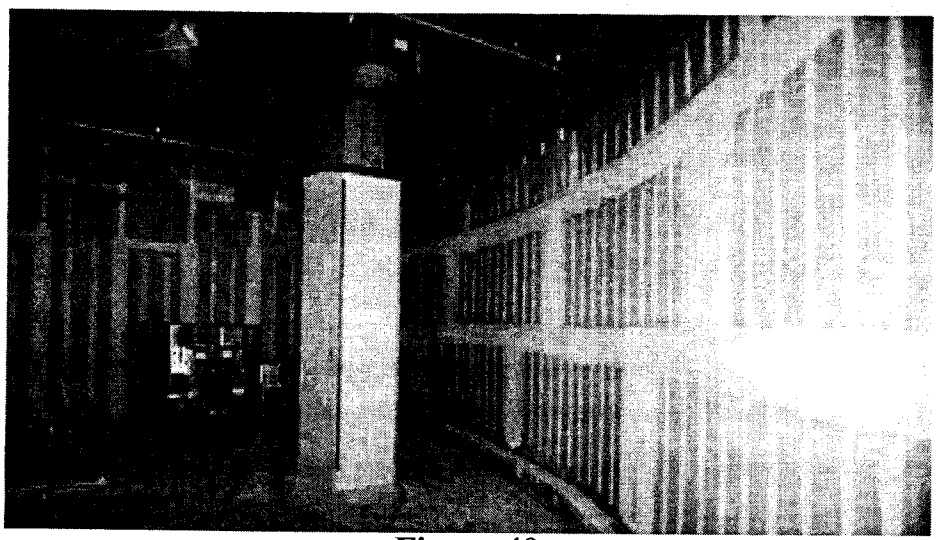


**Figure 40**
**View of Interior Mug Handle In-fill**
**(Construction Core & Shell Complete, Tenant Fit-Out Underway)**

*Corridor 8 Entrance Renovation*

The Corridor 8 Entrance renovation upgrades the entry security and handicapped access at one of the most heavily used entrances in the Pentagon. Renovation of this entrance was given priority over other entrances because it provides secure access to the DiLorenzo TRICARE Health Clinic under construction. The construction contract was awarded in July 1997, and was completed in FY 1998.

Figure 41
**New Turnstiles Enhance Security at Corridor 8**

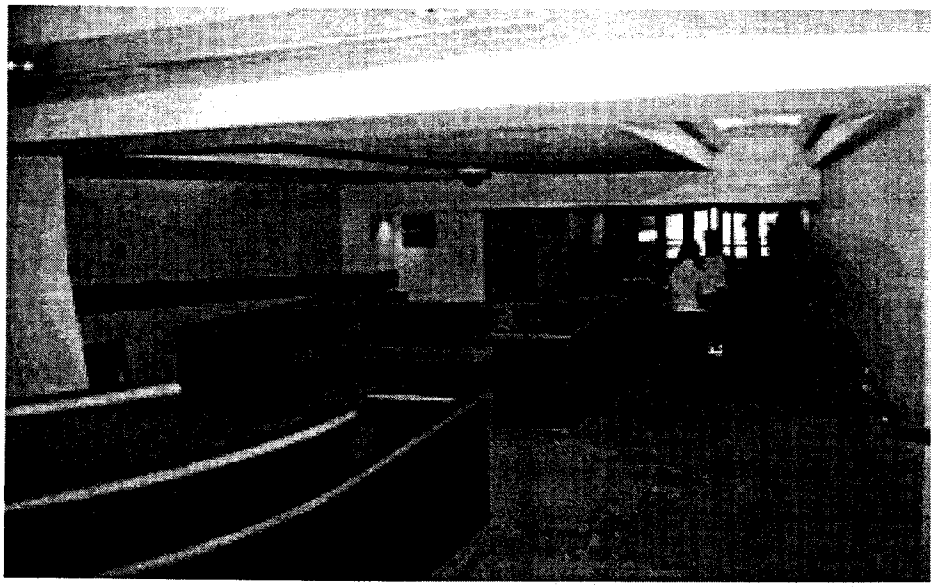


**Figure 42**
**New Corridor 8 Entrance**

# Completed Projects

***Wedge #1 Temporary Construction***

The Wedge #1 Temporary Construction contract included barrier walls to separate Wedge #1 construction from Wedges #2 and #5. It also included temporary adjustments to the mechanical, electrical, plumbing, fire alarm, communications, and security systems to facilitate future construction. The contract was awarded on July 17, 1997, and was completed in FY

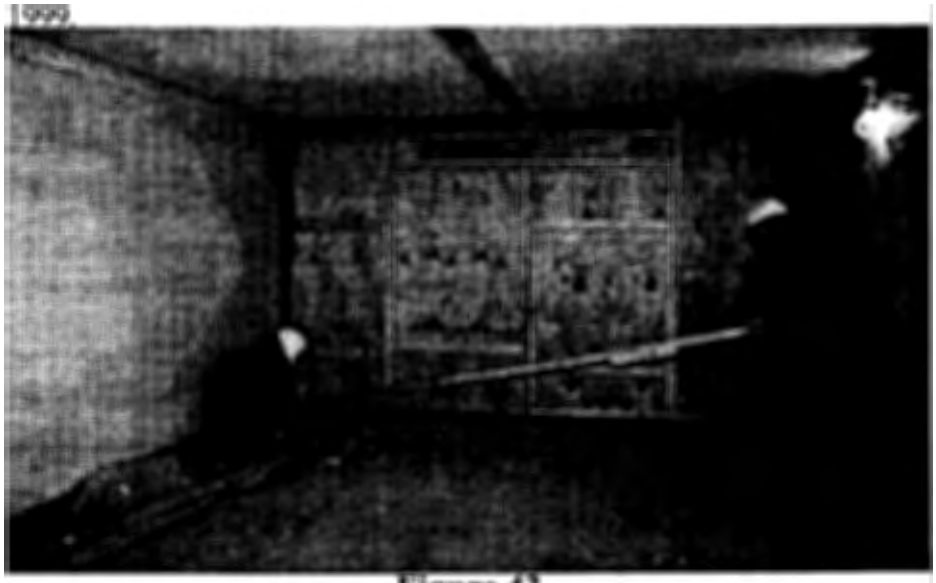


Figure 43

**Wedge 1—Barrier Walls Minimize Noise and Dust Infiltration to Occupied Areas**

Figure 44

**Construction of Barrier Wall**

***Swing Spaces***

To permit Wedge #1 to be renovated, approximately 6,000 personnel were relocated from Wedge #1 and elsewhere within the Pentagon. Of the approximately 6,000 personnel within Wedge #1, approximately 1,000 were relocated within the Pentagon and approximately 5,000 were relocated to swing space in off-site locations.

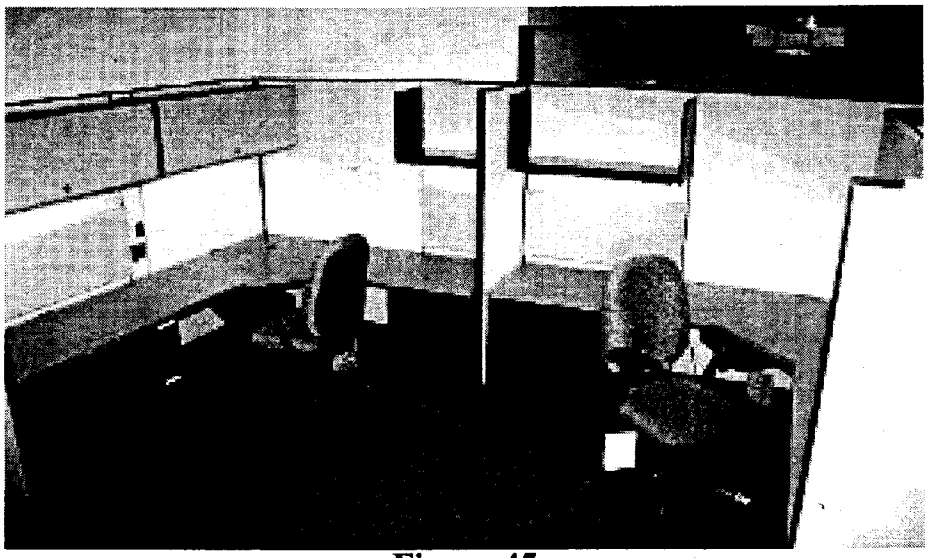


**Figure 45**
**Typical Swing Space Workstations**

**Figure 46**
**Typical Swing Space Work Area**

# Projects Under Construction

***Segment 2.A.2 Core & Shell***

The Segment 2.A.2 Core & Shell contract included lowering the Basement floor and constructing new foundations, slabs, utilities, mechanical, electrical and control systems, together with barrier walls. The contract was awarded on January 27, 1998, and was completed in FY 1999. The tenant fit-out, IM&T, and furniture work will be completed in FY 1999.

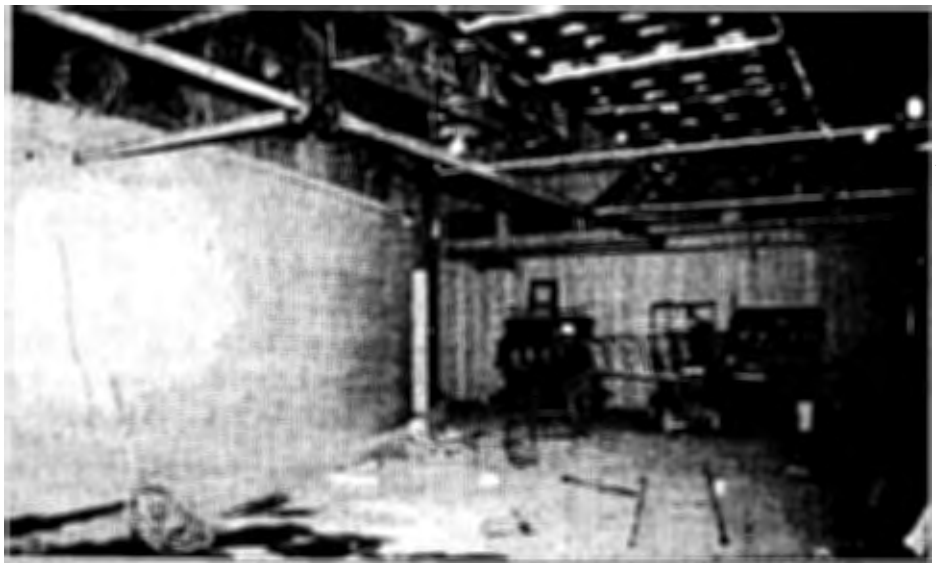


**Figure 47**
**2.A.2. Core & Shell Work**

**Figure 48**
**2.A.2. Core & Shell Work**

***Segment 2.A.2 Tenant Fit-Out***

Tenant partitions, ceilings and finishes, raised floor treatments, and installation of new mechanical, electrical and controls distribution are underway and scheduled for completion in FY 1999.

**Figure 49**
**2.A.2. Tenant Fit-Out Work**

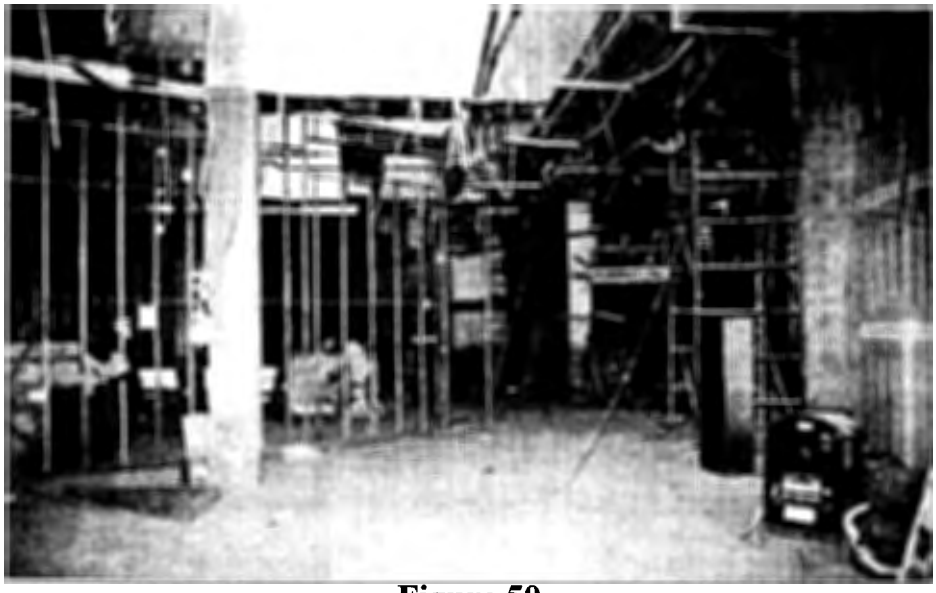


**Figure 50**
**2.A.2. Tenant Fit-Out Work**

# Projects Under Construction

***DiLorenzo TRICARE Health Clinic***

The DiLorenzo TRICARE Health Clinic is being constructed in the Basement. This new state-of-the-art health care facility will replace the Army, Air Force, and Civilian health clinics. This consolidation will eliminate redundancy of services, including pharmacies, radiology suites, file centers, and other ancillary support functions while saving valuable personnel time. The construction contract for the clinic was awarded on August 21, 1997, and is scheduled to be completed in FY 1999.

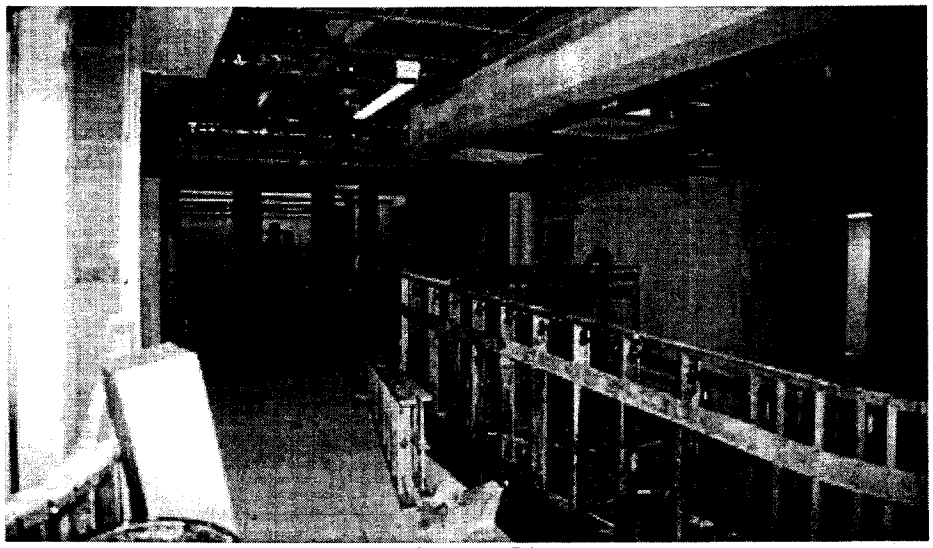


**Figure 51**
**View of DiLorenzo TRICARE Health Clinic Entrance from Corridor 8**

**Figure 52**
**Completed Guardrails Will Protect Walls from Gurneys**

***Wedge #1 Demolition & Abatement***

The contractor completed abatement and is nearing completion on the demolition of Fourth Floor Area A-2. Proper ventilation systems remain throughout both asbestos abatement and demolition.

**Figure 53**
**Wedge #1 "Wall Bashing" Ceremony Kicks-Off the Start of Demolition & Abatement**

**Figure 54**
**Wedge #1 Demolition and Abatement**

# Projects Under Construction

***Wedge #1 Demolition & Abatement***

**Figure 55**
**Trash Chutes Installed on A/E Drive for Top Four Floors**

**Figure 56**
**Wedge 1—An External Hoist Allows for the Safe Removal of Hazardous Materials**

***Wedge #1 Demolition & Abatement***

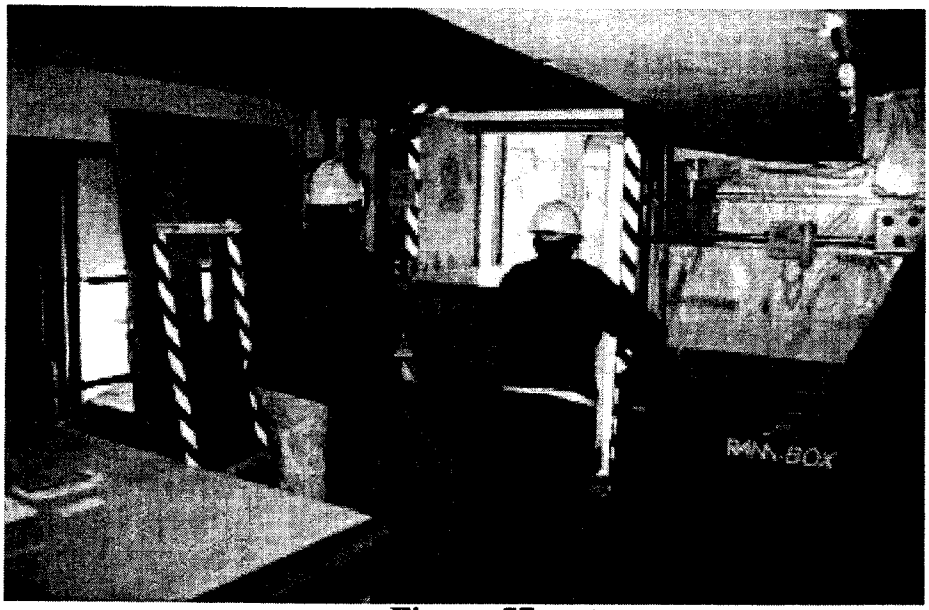


**Figure 57**
**Wedge 1—Employees Push Hazardous Materials Onto An External Hoist**

**Figure 58**
**Wedge 1—Air Filtration Units Ensure Safe Air Quality for Demolition Crews**

# Projects Under Construction

***Wedge #1 Demolition & Abatement***

**Figure 59**
**15 Million Pounds of Debris Will Be Removed From Each Wedge**

**Figure 60**
**Steel, Aluminum and Other Recyclable Materials Are Separated In Piles**

***Wedge #1 Demolition & Abatement***

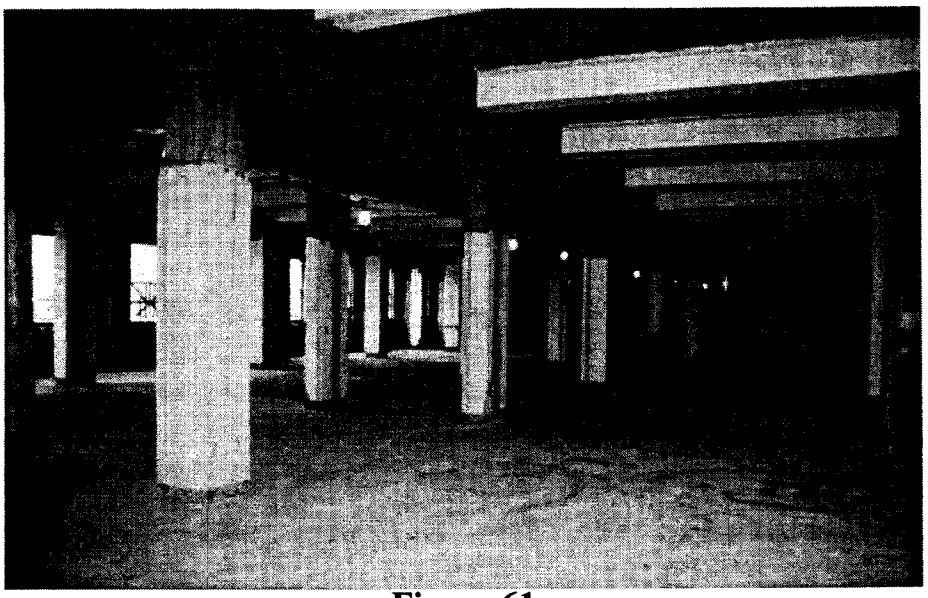


**Figure 61**
**Wedge 1—Demolition and Abatement Have Been Completed In This Area On the Second Floor**

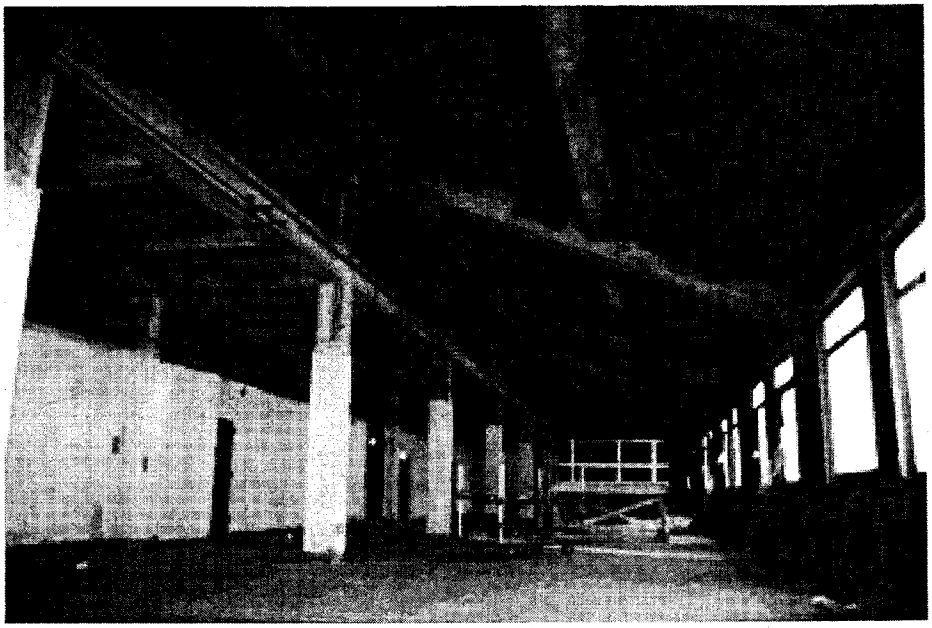


**Figure 62**
**Wedge 1—Cleared Area On the Fifth Floor Reveals the Pentagon's Pitched Roof**

# Projects Under Construction

***South Terrace Pedestrian Bridges***

The South Terrace Pedestrian Bridges over Rotary Road will link the South Parking and the Pentagon at Corridors 2 and 3 on the second floor. These bridges are to provide safe access for pedestrians from South Parking to Corridors 2 and 3 on the second floor; to resolve the conflicts with automobiles, busses, delivery vehicles, and taxis; to increase security at the entrance to the existing loading dock and A-E Drive; and to reduce the need for the police to serve as traffic officers. Elevators will provide handicapped access in compliance with the requirements of the Americans with Disabilities Act. The bridges, scheduled for completion in FY 1999, will be constructed in phases to allow access to the Pentagon from South Parking throughout construction. Corridor 2 bridge construction is underway and Corridor 3

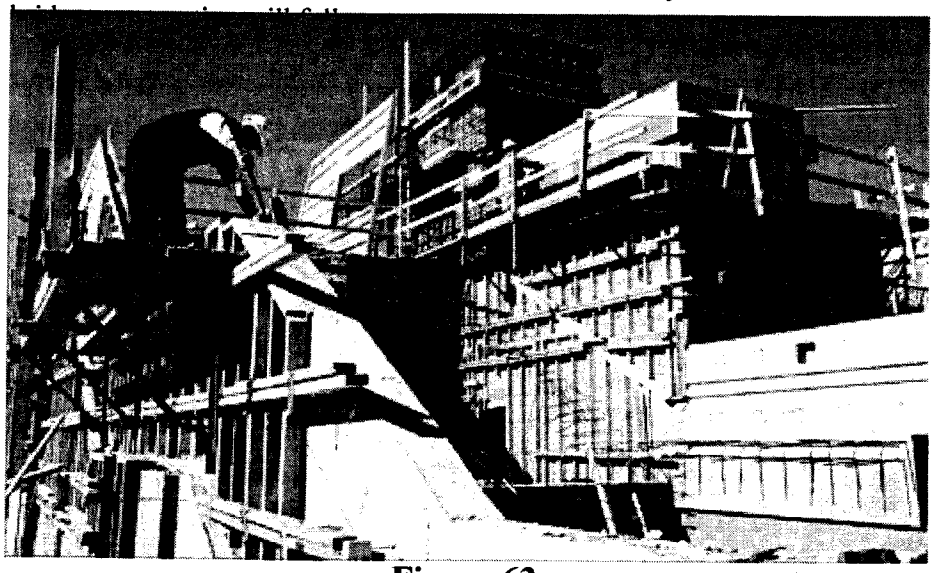


**Figure 63**
**South Terrace Pedestrian Bridges Under Construction**

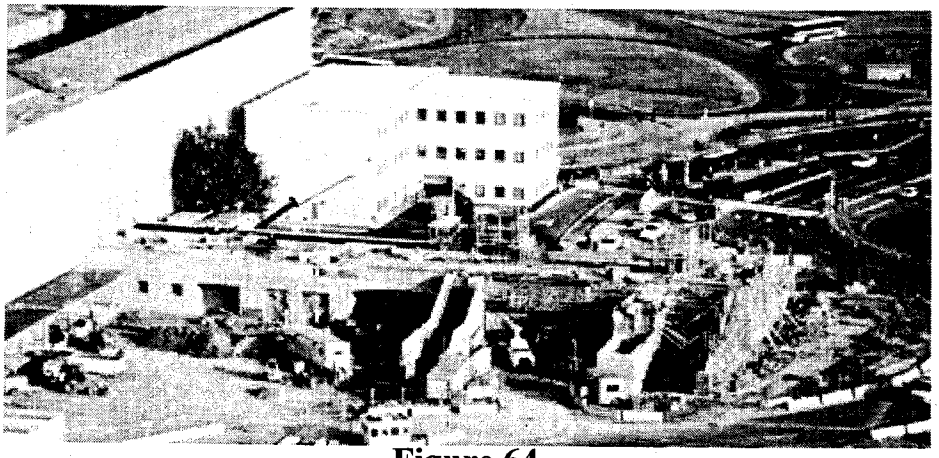


**Figure 64**
**Aerial View of South Terrace Pedestrian Bridges Under Construction**

# VI. BUDGET

**Sources of Funds**
**Certification of Cost**

# VI Budget

***Source of Funds***

Section 2804 of the Department of Defense Authorization Act, 1991 (Public Law 101-510, see Appendix), established the The Pentagon Reservation Maintenance Revolving Fund (PRMRF). The Act transferred responsibility for the operation, maintenance, protection, repair, and renovation of the Pentagon Reservation from the General Services Administration to the Secretary of Defense. The PRMRF is the funding source for the Pentagon Renovation Project. In addition, it finances a full range of building services for DoD components, including the Military Departments, and other activities housed within the Pentagon Reservation.

The renovation was designed to be budget-neutral to the Department of Defense in that the Department could operate, maintain, protect, and renovate the Pentagon for the rent the Department would have paid to the General Services Administration over a 12- to 14- year period.

Accordingly, the PRMRF has been designed to operate on a break-even basis over the long term. Revenue to the PRMRF may be generated from various sources; however, the Fund depends primarily upon monies collected from a user charge for space and building services. These charges are paid by the DoD components and other tenants using Pentagon Reservation facilities or land, with rates corresponding to six categories of space: office, storage, special, joint use, commercial support, and outside parking. The rates are established to recover the cost of day-to-day operations, maintenance, protection of the Reservation, and essential capital improvements including all costs associated with the Pentagon Renovation Project.

***Certification of Cost***

Based on early estimates of the costs to be incurred, the Defense Appropriations Acts for FY 1995 and FY 1996 required that the Secretary of Defense certify that the total cost for the planning, design, construction, and installation of equipment for the renovation of the Pentagon Reservation will not exceed $1,218,000,000.

Subsequently, the Department of Defense Appropriations Act for FY 1997 reduced the cost certification for the renovation to $1,118,000,000. This certification requirement is now $100,000,000 less than the certification ceiling initially supported by the Department and the Congress.

In order to continue critical programs, the Department will endeavor to constrain the cost of project design and construction to within the current limitation through increased efficiency.

Fundamental changes have been made to meet the challenge. These have included restructuring the three responsible organizations supporting the renovation program into Geographic and Functional Integrated Product

teams. Each Geographic project within the program has a Geographic Integrated Product Team responsible for the entire renovation activity within that Geographic area. Coupled with these internal management changes are procurement changes which have streamlined the whole process. Construction awards, previously based on firm fixed priced price low bids, resulted in continuous conflicts during the performance between the general contractor and the Renovation Program. These conflicts included multiple claims, contract changes, increased costs, and delays.

Contract awards, negotiated between the government and the contractor offerers, are now based on best value to the taxpayer and the government (not necessarily the lowest proposed cost). Best value determination is typically based on analysis of factors including past performance, management approach, technical approach, probable cost, and small and disadvantaged business support. Oral proposals and page limits on proposals reduce time and help the departments gain additional insight into contractor capabilities.

Active partnering is being used with general contractor offerers in multiphase source selections. The most promising offerers are brought on board to team with architect/engineers (A/E) in the design and development of areas to be constructed. Sophisticated contracting vehicles are being used to reinforce team partnering; savings incentives reward efficient contract performance, and award fees reward creativity and efficiency on the part of contractors. The intention is to secure superlative contract performance at reasonable cost by fundamentally changing the relationship between the government and the contractor. The Program is working hard to form partnerships with industry which will improve contractor performance, reduce cost, and meet schedule parameters.

At this early stage in the construction process, it is difficult to determine the full negative impact of the $100 million reduction on the ultimate design of the renovated Pentagon. Total Program cost will depend heavily on inflation of construction costs over the next 10 to 12 years and the effectiveness of management and contracting initiatives undertaken by the Program. Costs and estimates will be monitored closely and the Department will seek adjustment of the certification ceiling as appropriate.

Consistent with cost estimates for projects in a Military Construction Program, under the timing and delineation for the certification, this estimate does not include the cost of: 1) design and construction of the Heating & Refrigeration Plant, the Classified Waste Incinerator Plant, and the Remote Delivery Facility; 2) purchase and installation of Information Management and Telecommunications (IM&T) equipment; 3) rental and operation of leased swing space; 4) purchase and installation of furniture; and 5) recently required security enhancements; and 6) costs prior to FY 1994. The Department of Defense Appropriations Act for FY 1999 and the required certification are enclosed as Appendix B.

**Pentagon Renovation Certification Summary**

| Fiscal Year | Design & Construction | Cumulative Totals | Item |
|---|---|---|---|
| 1994 | $77,900,000 | $77,900,000 | Obligations |
| 1995 | $50,200,000 | $128,100,000 | Obligations |
| 1996 | $64,500,000 | $192,600,000 | Obligations |
| 1997 | $59,000,000 | $251,600,000 | Obligations |
| 1998 | $97,100,000 | $348,700,000 | Obligations |
| 1999 | $158,500,000 | $507,200,000 | Budgeted |
| 2000 | $145,900,00 | $658,100,000 | Budgeted |
| 2001-2010 | $610,800,000 | $1,118,000,000 | Program |
| **Total** | **$1,118,000,000** | **$1,118,000,000** | |

# VII. APPENDIX

**History**
**Program Development**
**Program Schedule**
**FY 1991—Legislative Authorization**
**FY 1999—Department of Defense Appropriations Act with Certification**

# HISTORY

**Congressional Approach**

**The Design**

**The Pentagon Building**

**Size**

**Exterior**

**Materials Shortage**

**The Site**

**Terraces**

**Access**

**Lagoon**

**Building Condition**

**Failure To Keep Pace With Changing Standards for Health, Fire, and Life Safety**

**Materials Failure**

**Engineering System Failure**

**Changing Technology Requirements**

# History

The Pentagon is one of the most recognizable buildings in the world. It has been inseparably linked with the United States Military since its construction during World War II.

During the first half of 1941 the War Department found it increasingly difficult to provide space for the headquarters staff of an expanding army. In May, the Public Buildings Administration proposed erecting temporary structures for various agencies on the outskirts of the city. In July 1941, 24,000 personnel were scattered among seventeen buildings in Washington, D.C., with others in Fort Myer and Alexandria, Virginia. By the beginning of 1942, the number of personnel was expected to reach 30,000. The President, therefore, asked Congress for authority to construct additional buildings within or near the District of Columbia. The War Department's Chief of Construction, Brigadier General Brehon B. Somervell, had a better idea, a scheme to house the entire War Department under one roof. He talked to General Moore, Deputy Chief of Staff, and to U.S. Representative Woodrum (D-Virginia) about the idea.

***Congressional Approval***

At a Thursday, July 17, 1941, hearing on construction projects before the House Subcommittee on Appropriations, the Chairman, Mr. Woodrum of Virginia, suggested to Brigadier General Eugene Reybold and Brigadier General Somervell that the War Department find an overall solution to its space problem rather than the partial solution proposed by the Public Buildings Administration. Somervell directed Architect G. Edwin Bergstrom to place on his desk, by 9 o'clock Monday morning, basic plans and architectural perspectives for an office building to house 40,000 people. Five days later, on Tuesday, July 22, 1941, Reybold and Somervell presented the plan to the Subcommittee. The plan was approved by the House on July 28, 1941 and by the Senate on August 14, 1941.

On August 25, 1941, President Roosevelt signed the bill appropriating funds for construction. However, because of considerable controversy over the proposed location at the foot of Arlington National Cemetery, he reserved the right to pick the site. The following day, the President directed that the construction site be moved south to the Pentagon's present location.

***The Design***

The Pentagon's unusual five-sided configuration was dictated by the site originally proposed (adjacent to Memorial Drive, about three-fourths of a mile north of where the building was actually constructed). An early plan called for a square structure with one corner cut off to accommodate an existing road. This resulted in a skewed Pentagon shape from the Archives of U.S. Army Corps of Engineers, Fort Belvoir, Virginia.

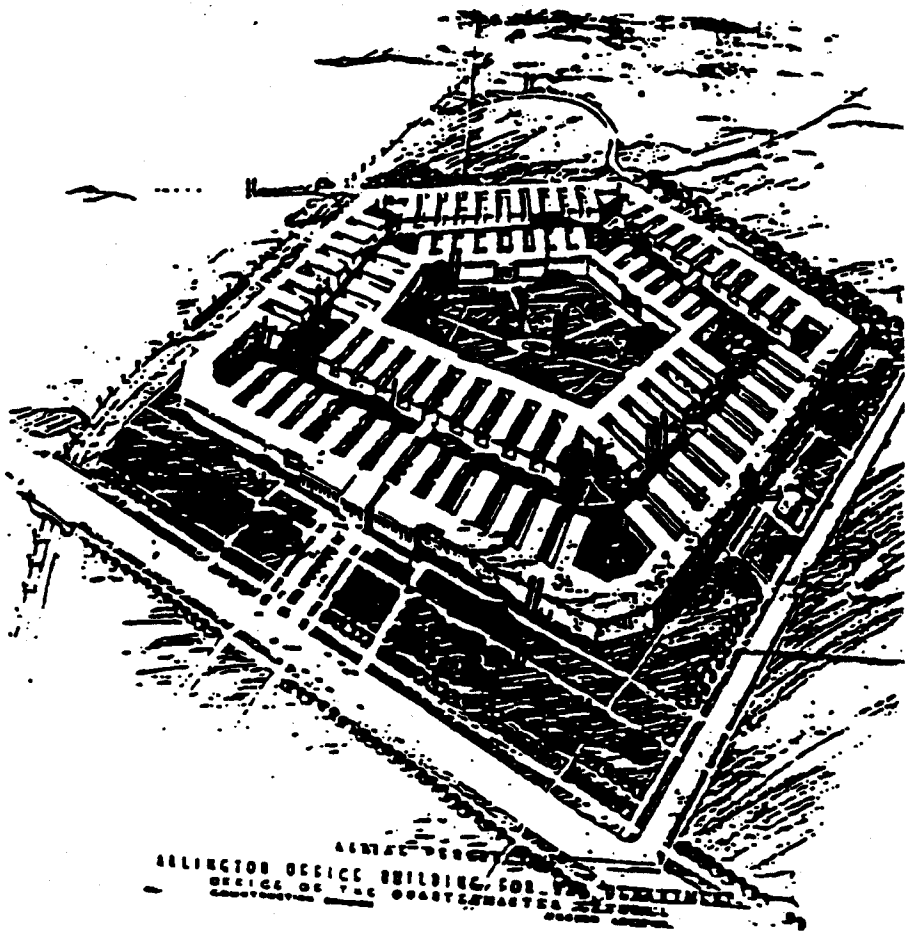


**Figure 65**
**Original Concept of Pentagon, July 21, 1941**

Serious objections were raised to locating the building on open land directly between Arlington Cemetery and Washington's Monumental Core, and discussions ensued regarding selection of a building site resulting in less visual and physical impact from the project. During the debate on the site, the project's chief architects, George Edwin Bergstrom and David J. Witmer continued to refine the design. The final design retained the five sides, in the form of a regular pentagon, which gave rise to the building's name. That shape resulted in the most efficient use of available space. The concept of using several concentric rings to contain the space evolved during further refinement of design. Preliminary design and drafting took just 34 days. A project of this magnitude and urgency demanded the rapid assembly of an unprecedented design and production effort. The office of the chief architect rapidly grew to 327 architects and engineers who were supported by 117 field inspectors. The weekly output of prints ranged from 12,000 to 30,000 with reproduction machines run-

ning on a 24-hour basis. For periods of time, new drawings were issued nightly. The reproduction effort consumed 15,000 yards (13,700 m) of print paper per week.

Construction began on September 11, 1941, and was completed on January 15, 1943. At one stage of construction, 15,000 people were employed on the job working three shifts, 24 hours a day. At night, they worked under floodlights. Construction took just 16 months, a remarkable feat of engineering and management effort.

## *The Pentagon Building*

The Pentagon building, at 6,500,000 square feet (603,900m²), provides approximately 3,800,000 square feet (353,000 m²) of occupiable space. At the peak of World War II, 33,000 people were provided working space in the building. The Pentagon is the Headquarters of the Department of Defense (DoD) and the national defense establishment. It houses the Offices of the Secretary of Defense, the Joint Chiefs of Staff, and the Secretaries of the three Military Departments.

### *Size*

The Pentagon building is composed of five concentric pentagonal rings connected by ten radial corridors. Each of its outer walls is 921.6 feet (280 m) long. The building covers 29 acres (12 hectares), the largest ground area of any office building in the world. A five-acre (2 hectares) pentagonal courtyard is located in the building's center. The building and its central courtyard cover 34 acres (14 hectares). There are 17.5 miles (28.2 km) of corridors in the building. The structure is three times the size of the Empire State Building and 50 percent larger than Chicago's Merchandise Mart. The building rests on 41,492 concrete piles which, if placed end to end, would stretch 200 miles (322 km). The five concentric pentagonal rings are separated by interior courts which serve as light wells. This design feature increases the number of windows allowing in natural light. Each ring has five stories. The Mall and River sides of the building have a Basement area which includes a partial Mezzanine. The innermost and outermost rings have sloping slate roofs, while the other three rings have flat, built-up roofs. The rings are connected at each floor level by a series of ten radial corridors extending from "A" ring (innermost) to "E" ring (outermost).

### *Exterior*

Exterior walls of the concentric rings and the interior courtyard are exposed concrete. They appear to have a wood-grain texture because they were poured into wooden forms made of 8-inch (232 mm) boards. A gap was left between boards enabling concrete to ooze and form a slight ridge. From a distance this gives an appearance of limestone.

Clockwise from its northern point, the Pentagon's five facades are the Mall Terrace Entrance facade, the River Terrace Entrance (or North Parking lot) facade, the Concourse Entrance (or Metro Station) facade, the South Parking Entrance facade, and the Heliport facade. The outer facades of the Pentagon

are simple, with a minimum of ornamental embellishment. Although the ornamentation style is classical in origin, it has been greatly simplified. The outer walls are limestone, as a direct result of a restriction by President Roosevelt that there be no marble in the building.

***Material Shortages***

The shortages of materials required for war production raised many design and construction problems. The use of reinforced concrete in lieu of structural steel for the building made possible a saving of 43,000 tons (39,000,000 kg) of steel, more than enough to build a battleship. The use of concrete ramps rather than elevators reduced steel requirements still further. Drainage pipes were concrete; ducts were fiber, interior doors were wood. An unusual wall design - concrete spandrells carried to window sill level - eliminated many miles of through-wall copper flashing. When Somervell was asked to make still more drastic reductions, he agreed to "striptease" the entire structure. Bronze doors, copper ornamentation, and metal partitions in rest rooms were among the first to go. The stripping process continued throughout construction.

***The Site***

The Pentagon Reservation is located in southeastern Arlington County, Virginia, and is situated between a large man-made lagoon (the Pentagon Lagoon, formed during construction) and the southeastern corner of Arlington National Cemetery. The northeastern and eastern facades have unobstructed vistas of the Monumental Core of the Nation's Capital across the Potomac River. The Pentagon's relatively low profile also permits clear vistas of Washington from the highlands of Arlington National Cemetery.

***Terraces***

There are large ceremonial terraces in front of the Pentagon's Mall and River Entrances. The River Entrance terrace extends 900 feet (274 m) to the Pentagon Lagoon bounded by a ceremonial landing dock and two monumental stairways. The maximum width of the River Terrace is 450 feet (137 m). The terrace in front of the Mall Entrance is smaller, measuring 600 feet (183 m) by 125 feet (38 m).

***Access***

The Pentagon site originally contained three cloverleaf interchanges that were among the earliest such structures constructed in the United States. These freeway-scale interchanges were necessary to handle traffic associated with the large number of people working in the building.

***Lagoon***

The Pentagon Lagoon was created during construction of the building as a result of dredging sand and gravel for concrete, and to obtain fill for landscaping. The lagoon is also the location of the water intake for the Pentagon's Heating & Refrigeration Plant. The Roaches Run Waterfowl Sanctuary lagoon, created during construction of the George Washington Parkway in the early 1930's is used for the Heating & Refrigeration Plant's water discharge outfall.

***Building Condition***

The Pentagon Reservation has been altered over the years. A heliport was added; Shirley Highway (now I-395), a limited access Interstate Highway and interchange, infringed on the Pentagon site on the south side; a major Metro station and transfer point was added, and underbuilding bus/taxi tunnels were converted to offices. See Existing Site Plan of the Pentagon Reservation.

The circa 1943 Pentagon has suffered from decades of neglect and

underfunded maintenance and repair programs. Many of the building systems have deteriorated beyond economical repair and require complete replacement. Building code violations and unsafe conditions are rampant, which have been brought about by the Pentagon's non-compliance with the fire protection and life safety standards established over the last 50-plus years. Structural deficiencies also need to be corrected. Some areas of the Basement have settled as much as 12 inches (305 mm) due to the poor load bearing capacity of soils under the floor slab.

*Interior Space Layout*

The Pentagon's original interior space layout has been modified over the years. Walkways and service corridors have been closed and converted to office and storage space. Original office areas that were large open spaces have been chopped up and enclosed with full height partitions that make the building functionally inefficient. This adversely affects heating, ventilating, and air conditioning system controls and distribution.

*Building Systems*

Before the renovation program began, none of the original major building systems had ever been replaced nor had they been significantly upgraded. The changing office environment with the advent of computers and modern technology has outstripped the capacity of deteriorated building systems. Electrical, plumbing, heating, ventilation, and air conditioning (HVAC) systems need to be replaced and modernized to accommodate added loads and designed to be more efficient and flexible. The building has individual packaged air conditioning units providing cooling for special use areas in addition to the chilled water provided by the Pentagon Heating & Refrigeration Plant. The overloaded secondary electrical circuits result in as many as 20 localized power outages every day, which increases to between 30-40 a day in the winter when people bring unauthorized space heaters into the building to compensate for the deteriorated HVAC system. Regular plumbing failures occur as a result of the deteriorating piping systems which are 55 years old. Of the 691 drinking fountains in the Pentagon, approximately 30 are out of service on a daily basis.

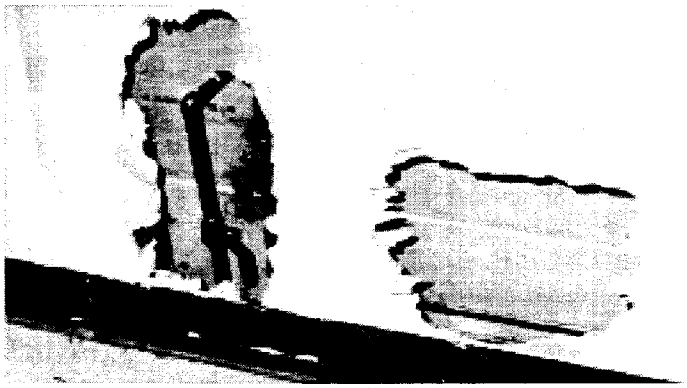


**Figure 66**

During Desert Shield/Desert Storm, a fire broke out in the JCS area of the Pentagon. Arlington County, which provides fire protection to the Pentagon, pressurized a standpipe and consequently, blew out a four foot section of ten inch pipe. Water flooded approximately 350,000 SF of the Pentagon basement, nearly causing the Army and Air Force Operations Centers to shut down. The water flowed through a steam tunnel to the Heating & Refrigeration Plant basement, where the water reached a height of seven feet. Shown is the steam room at Corridors 9/10 where water reached a height of 20 inches.

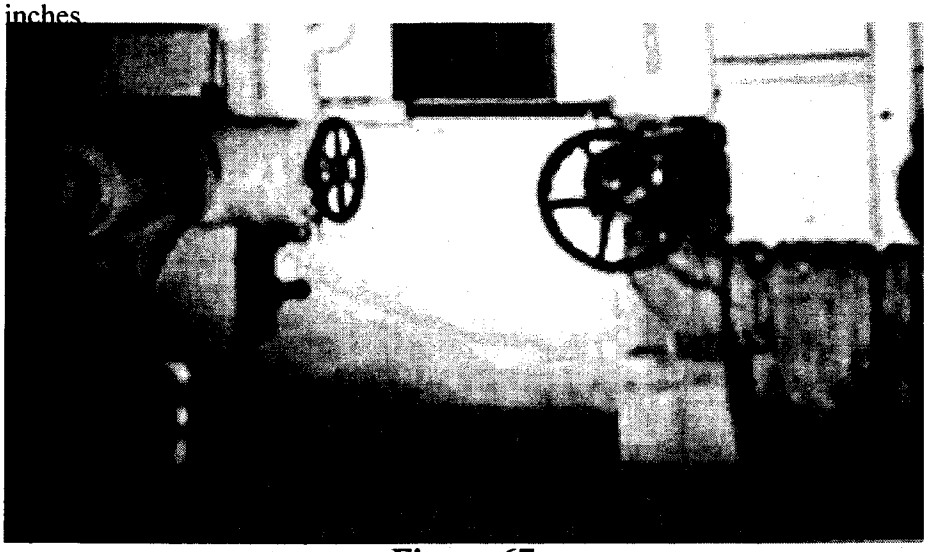


**Figure 67**
**The Steam Room at Corridors 9/10**

Frequent leaks, breaks in pipes and clogged pipes not only escalated the operation and maintenance costs but also created potential health hazards.

**Figure 68**
**Vertical Sanitary Pipe Split from First to Fourth Floor**

Figure 69

**Typical Example of Drain Pipe, Clogged After Years of Deposits and Deterioration.**

The Basement has been flooded as the result of condensate leakage, inoperable sump pumps that were unable to accommodate rising ground water and rusted and corroded valves. Only valves that have been replaced are operable.

**Figure 70**
**Typical Rusted and Corroded Valve**

The HVAC systems are original and in need of r lacement. Approximately 17.5 miles of the Pentagon's ductwork are made from asbestos, typical of the time when the Pentagon was built. The Pentagon has approximately 150 miles of ductwork, a substantial portion of which is surrounded by asbestos insulation.

The electrical system was designed for a manual office and does not support the demands of today's high-tech office environment. Approximately 20 (30-40 in winter) localized power outages occur daily, with at least 30 minutes downtime per outage. Obsolete components make maintenance/ repair difficult. Panel boards are loaded beyond maximum capacity and do

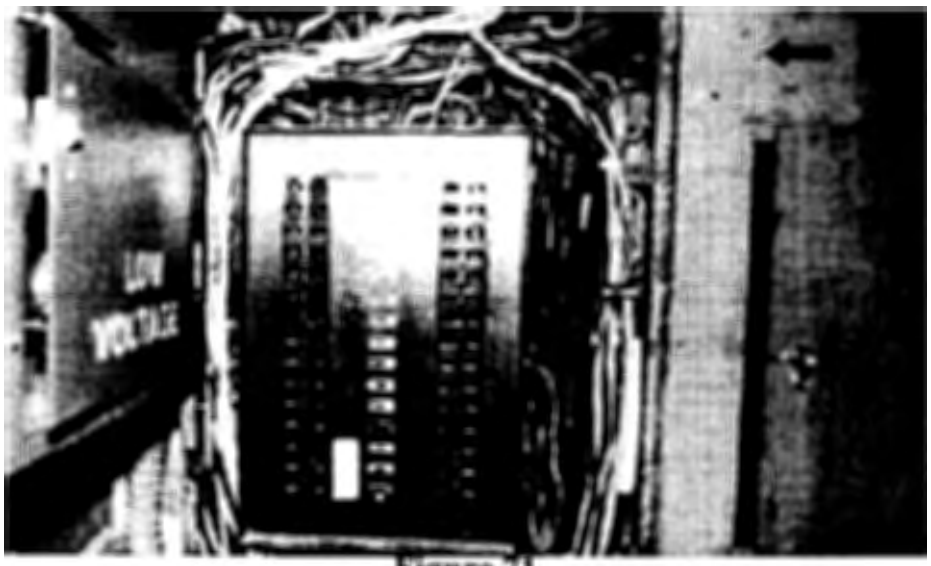


Figure 71
**Original Electrical Panel Still Used in Pentagon**

not meet code, thereby creating a fire and safety hazard.

The information systems that were installed in the Pentagon are plagued with abandoned cabling and an unverifiable backbone for the building. Consequently, there are numerous LANs that are operated independently of one another which causes problems.

**Figure 72**
**Typical Information and Telecommunications Cable/Wiring**

*Windows*

There are 7,748 windows in the building. They are of two types: steel casements located in the perimeter walls of the concentric, inner courts, and steel double-hung units in the outermost perimeter and in the Center Courtyard walls. The double-hung units in the central pavilions of the Mall and River Entrances are steel. The casements are rusted and corroded at joints, racked out of shape, and cannot be properly closed. Casement windows are inefficient even when properly maintained. In the present state of disrepair, the energy loss, summer and winter, is a serious problem. Some windows have security alarm tapes. Other windows are closed with tempered hardboard or plywood, or are filled with masonry block or with equipment. Many of these ad-hoc modifications were not properly sealed and are now leaking. Failure to replace casement windows and double-hung units will result in continued energy loss and damage from water penetration.

*Exterior Walls*

Architectural and structural elements of exterior walls have shifted and settled. Joints are open and moisture has penetrated causing damage. Cracking and evidence of movement is apparent at all five exterior perimeter parapet corners. In some instances these cracks extend below the parapet wall. The exterior walls are not thermally efficient and the stone facing is in need of cleaning and repair to insure its weather tightness.

There are two types of courtyards at the Pentagon: (1) interior courts (light wells) between concentric rings of the building and, (2) the Center Courtyard.

All courtyards walls are of concrete with surface conditions ranging from fair to failing. Concrete is spalling, particularly where rusting reinforcing bars are exposed; patch material is failing; cracks, efflorescence, and water stains are evident everywhere. In addition to problems cited in the courtyards walls, cornices are disintegrating, especially between Corridors 7 and 10. There are also problems due to use of non-conforming materials and poor construction. In the Center Courtyard, the asphalt paving at the peripheral

**Figure 73**
**Typical Exterior Walls in Light Wells Needing Repair**

walkways is extensively cracked and the concrete curbs at these walkways are damaged or missing.

Access bridges span several interior courts at the approximate mid-point of the court length. Originally, these bridges were open, crossing the court at each floor level. A number of the bridges have been enclosed and incorporated into secondary corridor systems while others open directly from individual offices. All of these bridges show evidence of deterioration with present conditions ranging from fair to failing. Attempts made to control leaks at the interior spaces have been unsuccessful. At a minimum, replacement of the roof/bridge drainage system will be required at each bridge. Concrete surfaces and waterproofing will have to be repaired and interior surfaces will also have to be restored.

*Basement Floor*

The Basement floor of the Pentagon was constructed as a slab on grade, and designed to serve as a light storage area. A 1983 report on the stabilization of the depressed floors states that the basement floor slab was placed directly on the underlying soil fill, which consists of surface fill materials overlying compressible organic soil. The subsidence has been gradual over the years and was aggravated by voids under the slab, leaking utility lines, and at times by the dewatering during the construction of Metrorail. These subsurface conditions along with the assignment (and re-assignment) of special purpose activities and the storage of heavy loads of material and equipment, the Basement slab has settled up to 12 inches (305 mm) in some areas causing severe damage to critical communication centers. Repairs were made to correct the distressed areas by pumping concrete under the floor, or by adding leveling slabs, but these repairs were unsuccessful. The only recourse is to remove entirely some 300,000 to 500,000 square feet (27,900 $m^2$ to 46,500 $m^2$) of slab and reframe the floor as an independent floor slab bearing on new and existing pile caps. Lowering the Basement slab in some areas will allow maximum expansion of the Mezzanine space.

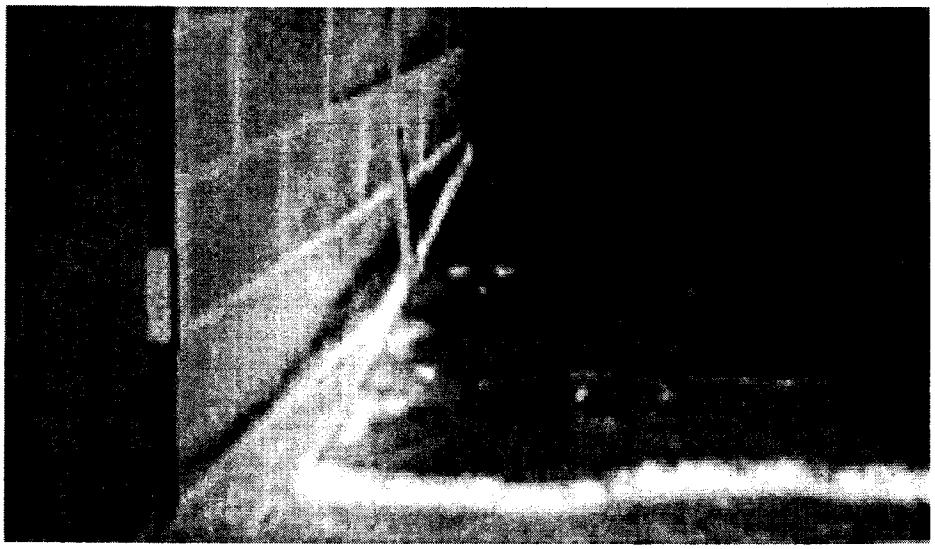


**Figure 74**
**Basement Slab Deflection**

*River and Mall Terraces*

The River and Mall terraces extend beyond the exterior perimeter of the building and the occupied areas beneath have experienced considerable damage from water intrusion. Extensive reworking of expansion joints, deteriorated waterproofing and concrete elements is required to make these areas watertight.

**Figure 75**
**Typical Deterioration of River Terrace Stairs**

*Ramp and Bridge from North Parking*

The ramp, bridge and railing leading into the Corridor 8 Entrance from the North Parking lot has undergone serious deterioration as noted by the out-of-plumb support wall along the bridge.

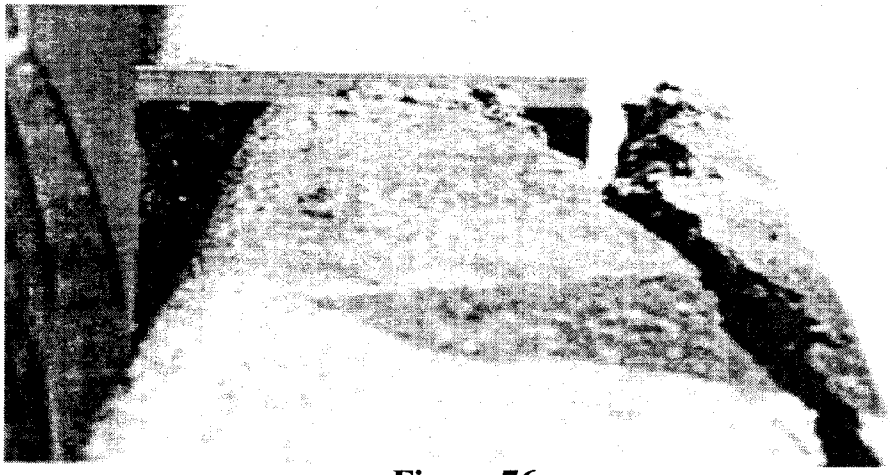


**Figure 76**
**Deterioration at North Parking Pedestrian Ramp Leading to the Corridor 8 Entrance**

Exposed reinforcing bars underneath the River Terrace parade field and parking lot resulted from the failure of waterproofing, which allowed water and chemical damage to the structure below. This created the potential for failure of the terrace above, along with the threat to persons both above and below the structure. Temporary jacks were installed as an emergency measure to support this failing structure.

**Figure 77**
**Deteriorated River Terrace Structural Conditions**

Figure 78
**Temporary Jacks Supporting Failing Ramp**

*Asbestos*

The finish coat in the Pentagon's plaster ceilings contains asbestos and the resilient flooring is vinyl asbestos. Even minor alteration projects require extensive and expensive containment procedures. Under-the-window induction heating and cooling units have asbestos insulation on the pipes and asbestos insulation material was used on many of the plumbing lines and air conditioning ducts. These materials represent health hazards.

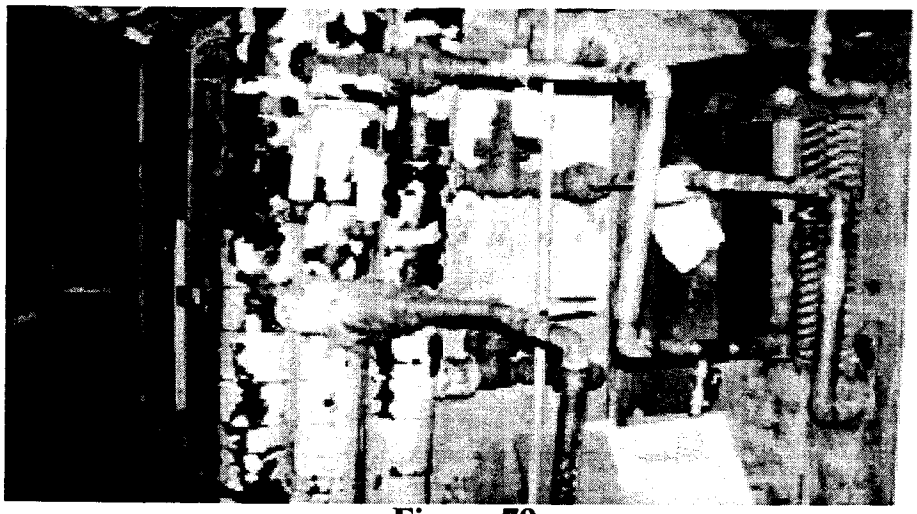


**Figure 79**
**Typical Existing Asbestos Piping Insulation**

*Heating & Refrigeration Plant*

The Heating & Refrigeration Plant that was built in 1943, provided utility services (heating steam and chilled water) to the Pentagon as well as to other parts of the Pentagon Reservation. The plant became obsolete and was no longer efficient and serviceable. Temporary chillers and boilers were being rented to support the needs of the Pentagon, Federal Building #2 (Navy Annex), and Henderson Hall (Marine base). Three rental boilers and six rental chillers were used from 1989 to 1996 for a cost of over $2,000,000 per year.

**Figure 80**
**Portable Rental Boilers Used in Old HR&P**

*Information Management & Telecommunications*

The current Pentagon information and telecommunications infrastructure is an accumulation of systems and networks, which have been installed, in a piecemeal fashion since 1943. There are multiple deficiencies specific to the information management and telecommunications posture of the Pentagon. These include outdated and overworked communications systems, an enormous number of single user-oriented and user-unique data systems, inadequate wiring systems, obsolete and congested wire closets, risers, cable pathways, and protected distributed systems, poor quality grounding systems, and limited wiring system access due to asbestos hazards. As information management requirements and technology changed throughout the years, new telecommunications systems were added in an ad hoc manner, often over existing wiring. This has produced a collection of independent and largely non-interoperable systems and networks, many of which are poorly documented.

*Sitework*

Traffic conditions, especially in the South Parking areas, are very hazardous. Reconfiguration of roadways, bus, and truck access areas and parking is necessary to provide safety for pedestrians. Parking lots are in poor condition with minimal landscaping. Roads, walks, fences, bridges, and other structures and elements exhibit significant deterioration. Bridge abutments are clearly out-of-plumb and the stonework is crushed and spalled. Exterior steps and terraces are spalled, joints are open, and the occupied areas below these elements have experienced water leakage on a continuous basis.

*Summary*

Generally, the Pentagon's problems requiring a full scale renovation can be grouped into five categories:

1. Changing requirements for fire and life safety.
2. Materials failure.
3. Engineering systems failure.
4. Changing technology with an increased demand for services.
5. Security.

***Failure to Keep Pace with Changing Standards for Health, Fire, and Life Safety***

- Pervasive asbestos contamination of interior surfaces and pipe insulation requires the use of asbestos containment procedures for even minor repairs to avoid possible health risks to building occupants when these materials are disturbed. This is a significant time and cost restraint to the maintenance and repair program.
- Inadequate sprinkler systems to protect the entire building.
- Numerous emergency diesel generators are currently located inside the Pentagon presenting a potential fire and carbon monoxide gas hazard.
- Excessively long fire egress routes in the building.
- Vehicle/pedestrian conflicts exist throughout the reservation.

***Materials Failure***

Problems related to materials failure include:

- Rusted and corroded casement window frames in most of the 7,748 windows.
- Shifting of architectural and structural elements causing opening of joints, cracking of building elements, and water penetration.
- Spalling of concrete, rusting reinforcement bars in the concrete, and deteriorating cornices.
- Deterioration of roof/bridge connections and bridge drainage systems.
- Deflection of the basement floor due to lack of stable ground support.
- Intrusion of water through expansion joints and deteriorated waterproofing.
- Deterioration of roadway bridges.
- Deteriorated plumbing and domestic water supply pipes and fixtures.
- Deteriorated chilled and heated water supply piping and fixtures.
- Deteriorated and non-code compliant electrical wiring.

***Engineering Systems Failure***

***Pentagon***

- Severely undersized, inflexible and unreliable, heating, ventilation, and air conditioning (HVAC) systems.
- Unreliability of current building HVAC systems has resulted in independent air conditioning (A/C) units having been installed in certain areas.
- Overloaded secondary electrical circuits result in daily failures of electrical systems.
- Undersized electrical closets prohibit proper wiring and management of electrical systems.
- Deteriorated plumbing, chilled and hot water, domestic water and other systems.

*Heating & Refrigeration Plant*

- The original coal boilers installed during construction of the Pentagon were beyond repair. Existing refrigeration equipment, some nearly 30 years old, was unreliable and often out of service. Rented package units were being used to supply heating and cooling services to building.

***Changing Technology Requirements***

- Increased electrical and HVAC loads due to office equipment such as computers and copier machines, and special equipment such as video and graphics production equipment.
- Current wire chases cannot accommodate cabling systems for telephones, computer networks, and audio/video information systems.
- Inflexible and inefficient space arrangements limit the continued utility of the Pentagon office and support space.

*Security*

- Metro escalators penetrate into the building envelope forcing the security perimeter inward.
- The dispersed loading docks are difficult to secure.
- Numerous delivery vehicles penetrate the building security perimeter daily.
- Limited approach ways hinder security control at loading docks and delivery entrances (distance from non-control to control areas is so short that guards have no response time before vehicle has reached the guard position).

The Pentagon is a building of interest to local, state, federal, and architectural historians for the following reasons:

- It is associated with events that have made a significant contribution to the geo-political role of the United States as a superpower during the period from World War II to the present.
- It is associated with the lives of persons who are significant in American history from the time of construction in 1941 to the present day.
- It embodies the distinctive characteristics of the "stripped classical" variant of architectural classicism. This stylistic mode flourished during the second quarter of the 20th century, and was a major theme in federal architecture.
- It is classified currently as the largest low-rise office building in the world.
- It was constructed during an important historical period.
- It was built in 16 months which required a monumental effort in design and construction.
- It is located adjacent to Arlington National Cemetery.
- It is in proximity to the Nation's Monumental Core.
- It is situated along a major gateway to the Nation's Capital.

The Secretary of Defense, the Honorable Richard Cheney, was notified by the Secretary of the Interior, the Honorable Bruce Babbit, that the Pentagon had been designated as a National Historical Landmark on October 5, 1992. This designation also automatically places the Pentagon in the National Register of Historic Places.

There are five historic elements of the Pentagon that are cited for special attention:

- The five outer facades of the Pentagon.
- The Center Courtyard and surrounding facades.
- The Terrace fronting the Mall Entrance.
- The Terrace fronting the River Entrance.
- The Pentagon's distinctive five-sided shape.

A ceremony celebrating the 50th Anniversary of the Pentagon in May 1993 included presentation of a bronze plaque stating "THIS PROPERTY POSSESSES NATIONAL SIGNIFICANCE IN COMMEMORATING THE HISTORY OF THE UNITED STATES OF AMERICA." This ceremony was hosted by Les Aspin, the Secretary of Defense, and General Colin Powell, Chairman of the Joint Chiefs of Staff.

# PROGRAM DEVELOPMENT

**Design Development**

**Basement Renovation**

**Wedge #1**

**Wedge #2**

**Wedge #3**

**Wedge #4**

**Wedge#5**

# Program Development

***Design Development***

Control of the design process over the life of the project requires the development of design guidelines and criteria. This control is necessary because of the size and duration of the project, the multi-acquisition approach, and design activities occurring throughout the project as each increment is renovated. The revised Pentagon Renovation Plan must be translated into appropriate design guidelines and criteria that will establish design parameters.

A Management Support Architect-Engineer (MSAE), has prepared design guidelines and criteria; has prepared the Reservation Master Plan which addresses environmental issues; has prepared the Pentagon Building Master Plan; has developed prototypical designs for architectural standards, heating, ventilating and air conditioning systems, plumbing systems, fire protective systems, electrical systems, and security systems; is developing programming and swing space requirements; is developing schedules and cost estimates; is providing technical and management support; and is completing Computer-Aided Design Documents (CADD) for record drawings and shop drawings and shop drawing reviews. Broad-scale design criteria, which is equivalent to a concept stage, will ensure that each individual increment will be compatible with the rest of the work. The goal is to achieve a completed project that has uniform and compatible materials and systems that are economic to maintain.

Design development activities have been intensive during the early stages of the project, and will continue at a less intensive level throughout the duration of the renovation.

In the mid-1990's the importance of information management and telecommunications (IM&T) within the Pentagon was recognized and the United States Army was tasked with establishing a project management office for Information Management and Telecommunications, renovation related tasks. The Pentagon IM&T project office was established in 1991. The mission of the Project Manager (PM) IM&T, working in concert with the Resident PM, USACE, Pentagon Renovation Program is as follows:

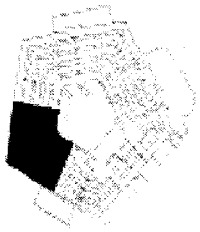
"Management of planning, programming, systems design/development, acquisition, installation, integrations, and testing of all IM&T-related efforts involved with the Pentagon Renovation Program. The objective is to provide cost-effective IM&T services/capabilities that will best serve the needs of the DoD Senior Leadership by leveraging technology advancements and designing/developing integrated systems, well into the 21st Century.

***Basement Renovation***

Renovation of the Basement includes the reconstruction of the floor slab which has settled in many areas due to the low soil bearing capacity. In addition, the build-out of the Mezzanine, one of the improvements recommended in the Concept Plan, provides the opportunity to co-locate all command and control functions of the National Military Establishment to the Basement and Mezzanine. The renovation of the Basement will be completed in multiple phases.

The design of the Segment 1 renovation of the Basement was completed in mid-FY 1994 with the construction beginning October 1994. The construction of Segment 1 of the Basement, preceded by the temporary re-routing of utilities, will be completed in FY 1998. The design of the remaining segments began in FY 1997. The Services Operations Centers will be relocated as the construction proceeds.

### *Wedge #1*



In December 1996, the Deputy Secretary of Defense directed that Wedge #1 be vacated by December 1997, and the construction of Wedge #1 to start by FY 1998. Renovation of above-ground areas of the Pentagon begins with Wedge #1. Work is centered around corridors 3 and 4.

The renovation work involves the demolition and removal work includes all partitions, ceilings, floor finishes, mechanical, electrical, plumbing, fire protection, and communications systems. The basic structural system, as well as the stairwells and their enclosing walls, will remain. All electrical, mechanical, and plumbing services will be replaced and a modernized telecommunication back-bone infrastructure will be installed. Utility connections will be made through the new Center Courtyard Utilities Tunnel without affecting the rest of the building. Wedge #1 will have a new food service facility, new vertical transportation service and enhanced foyers. Much of the renovated space will be configured as "open office" space consistent with the Concept Plan. The improvements include the new South Terrace Pedestrian Bridges which will connect South Parking to Corridors 2 and 3. This work incorporates some of the security improvements by re-routing public access to the second floor and improves safety by separating pedestrians from the vehicular traffic on the very busy Rotary Road in South Parking. The South Terrace structure consists of two bridges accommodating pedestrian traffic entering the Pentagon at the second floor at Corridors 2 and 3.

The design of Wedge #1 began in January 1994, and was completed in FY 1997. Construction activity began in January 1998, with a "wall bashing" ceremony in February 1998, to symbolically signify the start of the above ground work activity. Construction is scheduled for completion in FY 2001.

### *Wedge #2*

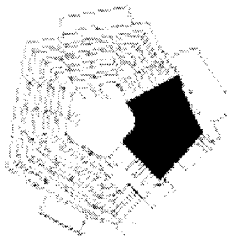
Wedge #2 is also a complete slab-to-slab reconstruction of the space. Replacement of all electrical, mechanical, and plumbing services will occur in accordance with the new design and a modernized telecommunication back-bone infrastructure will be installed. As discussed previously,

***Wedge #3***

Wedge #3 includes a complete slab-to-slab reconstruction of the space. All electrical, mechanical, and plumbing services will be replaced in accordance with the new design and a modernized telecommunication infrastructure will be installed. The removal of non-masonry partitions will open the space to an "open office" concept. The work will be centered around Corridors 7 and 8.

This work also incorporates some of the security improvements by re-orienting public access to the 2nd floor.

***Wedge #4***



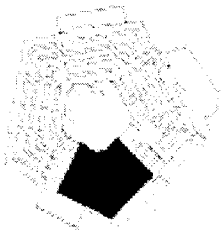
the removal of non-masonry partitions will open the space to an "open office" concept. The work is centered around Corridors 5 and 6.

A slab-to-slab reconstruction of the space in Wedge #4 is programmed. All electrical, mechanical, and plumbing services will be replaced and a modernized telecommunication infrastructure will be installed. The removal of non-masonry partitions will open the space to an "open office" concept. The work will be centered around Corridors 9 and 10.

This incremental area houses portions of the cafeteria facilities, the Concourse, and the Metro entrance.

This area also incorporates some of the security improvements by re-

***Wedge #5***



orienting public access to the 2nd floor. Existing ramp space to upper floors will be redistributed to incorporate expanded multi-purpose facilities as well as additional office space.

This last area will also undergo a slab-to-slab reconstruction. All electrical, mechanical, and plumbing services will be replaced and a modernized telecommunication infrastructure will be installed. The removal of non-masonry partitions will open the space to an "open office" concept. This last incremental area is centered around Corridors 1 and 2.

The area houses the remaining portions of the cafeteria facilities and the Concourse. Existing ramp space to upper floors will be redistributed to incorporate auditorium facilities.

# PROGRAM SCHEDULE

# The Pentagon Renovation Program
# Monthly Update Vs. Baseline Schedule
## February 1, 1999

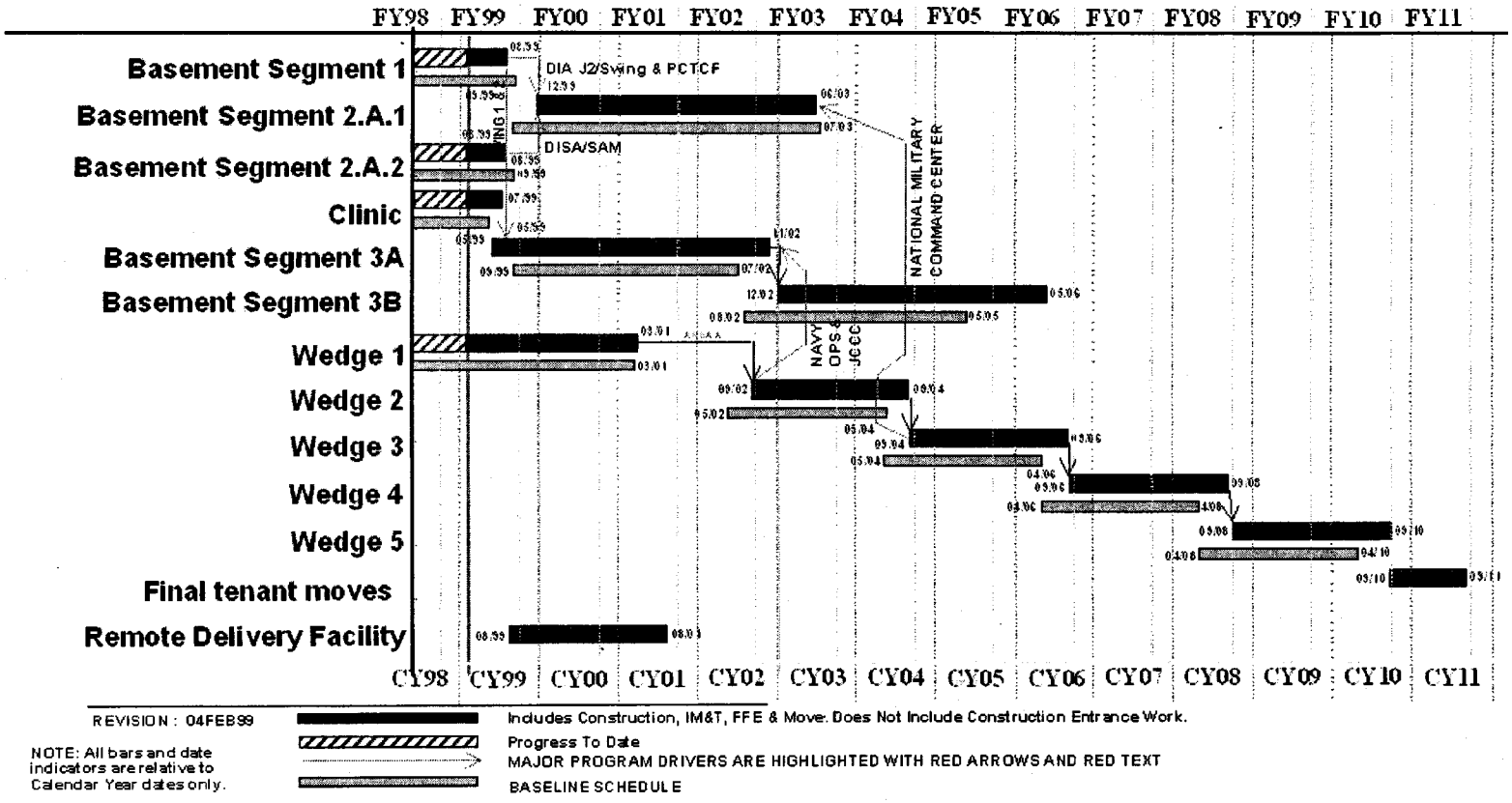



**Figure 81**

# FY 1991 Legislative Authorization

SEC 2804. OPERATION AND CONTROL OF THE PENTAGON RESERVATION

(a) IN GENERAL - (1) Chapter 159 of title 10, United States Code, is amended by inserting after section 2673 the following new section:

"§2674. Operation and control of the Pentagon Reservation

"(a)(1) Jurisdiction, custody, and control over, and responsibility for, the operation, maintenance, and management of the Pentagon Reservation is transferred to the Secretary of Defense.

"(2) Before March 1 of each year, the Secretary of Defense shall transmit to the Committees on Armed Services of the Senate and the House of Representatives, the Committee on Environment and Public Works of the Senate and the Committee on Public Works and Transportation of the House of Representatives a report on the state of the renovation of the Pentagon Reservation and a plan for the renovation work to be conducted in the fiscal year beginning in the year in which the report is transmitted.

"(b) The Secretary may appoint military or civilian personnel or contract personnel to perform law enforcement and security functions for property occupied by, or under the jurisdiction, custody,

Nov. 5 DEFENSE AUTHORIZATION ACT P.L. 101-510

Sec. 2804 and control of the Department of Defense, and located at the Pentagon Reservation. Such individuals—

"(1) may be armed with appropriate firearms required for

personal safety and for the proper execution of their duties,

whether on Department of Defense property or in travel status; and

"(2) shall have the same powers as sheriffs and constables to

enforce the laws, rules, or regulations enacted for the protection of persons and property.

"(c)(1) The Secretary may prescribe such rules and regulations as the Secretary considers appropriate to ensure the safe, efficient, and secure operation of the Pentagon Reservation, including rules and regulations necessary to govern the operation and parking of motor vehicles on the Pentagon Reservation.

"(2) Any person who violates a rule or regulation prescribed under this subsection is liable to the United States for a civil penalty of not more than $1000.

"(3) Any person who willfully violates any rule or regulation prescribed pursuant to this subsection commits as Class B misdemeanor.

"(d) The Secretary of Defense may establish rates and collect charges for space, services, protection, maintenance, construction, repairs, alterations, or facilities provided at the Pentagon Reservation-

"(e)(1) There is established in the Treasury of the United States a revolving fund to

be known as the Pentagon Reservation Maintenance Revolving Fund (hereafter in this section referred to as the'Fund'). There shall be deposited into the Fund funds collected by the Secretary of space and services and other items provided an organization or entity using any facility or land on the Pentagon Reservation pursuant to subsection (d).

"(2) Monies deposited into the Fund shall be available, without fiscal year limitation, for expenditure for real property management, operation, protection, construction, repair, alteration, and related activities for the Pentagon Reservation.

"(f) In this section:

"(1) The term 'Pentagon Reservation' means that area of land (consisting of approximately 280 acres) and improvements thereon, located in Arlington, Virginia, on which the Pentagon Office Building, Federal Building Number 2, the Pentagon heating and sewage treatment plants, and other related facilities are located, including various areas designated for the parking of vehicles.

"(2) The term 'National Capital Region' means the geographic area located within the boundaries of (A) District of Columbia, (B) Montgomery and Prince Georges Counties in the State of Maryland, (C) Arlington, Fairfax, Loudoun, and Prince William Counties and the City of Alexandria in the Commonwealth of Virginia, and (D) all cities and other units of government within the geographic areas of such District, Counties, and City."

(2) The table of sections at the beginning of such chapter is amended by inserting after the item relating to section 2673 the following new item:

"2674. Operation and control of the Pentagon Reservation."

P.L. 101-510 LAWS OF 101st CONG.—2nd SESS. Nov. 5 Sec. 2804

(b) TRANSFER OF FUNDS FOR FISCAL YEAR, 1991.—For fiscal year 1991, the Secretary of Defense may transfer into the Pentagon Reservation Maintenance Revolving Fund (established by section 2674(e) of title 10, United States Code), from funds appropriated to the military departments and the Defense Agencies, amounts equal to the amounts that would otherwise be paid by the military departments and the Defense Agencies to the General Services Administration for the use of the Pentagon Reservation.