

Project Management Institute
Case Studies in Project Management

**Project Phoenix:
Rebuilding an American Landmark**

Edited by:

Frank T. Anbari, PhD, PMP

The George Washington University

Project Phoenix: Rebuilding an American Landmark

By:

Frank T. Anbari, PhD, PMP

Anne Dutton, MSPM

Eric Holt, MSPM

Lisa King, MSPM

Leo Wilson, MSPM

Marie Zacharko, MSPM, PMP

Edited by:

Frank T. Anbari, PhD, PMP

The George Washington University

This case study was originally prepared as part of Project Management Applications, the capstone course of the Master of Science in Project Management in the Department of Management Science at The George Washington University, by the graduating students listed above with the supervision of Professor Anbari, during the Fall 2002 semester.

This case study was adapted to make it a learning resource and might not reflect all historical facts related to this project.

Case Study

Project Phoenix: Rebuilding an American Landmark

Table of Contents

Introduction	4
The Inception Phase	5
The Development Phase	10
The Implementation Phase	17
The Closeout Phase.....	24
Summary of Project Assessment and Analysis.....	27
References	28

Case Study

Project Phoenix: Rebuilding an American Landmark

Introduction

On September 11, 2001, a hijacked, fully fueled American Airlines® Boeing® 757 airplane traveling at 350 miles per hour was deliberately flown into the U.S. Pentagon (Pentagon) in Washington, DC. The plane struck the western face on the heliport side of the Pentagon low to the ground and entered wedge 1 (1,000,000 square feet [92,903 m²]), just to the north of corridor 4 on the first and second floors. At that time, the area was only five days from completion of its renovation.

The plane traveled through the Pentagon at roughly a 45° angle to the face of the building. It went through wedge 1 and into the unrenovated wedge 2 before exiting the C-ring, the third ring of offices, and into a roadway (A/E Drive) that circles the perimeter of the Pentagon between the B and C rings. Several concrete support columns on the first floor were completely sheared away as the plane penetrated the E-ring.

Three measures taken during the renovation of wedge 1 to reinforce the inner and outer walls served to dramatically slow the plane as it entered the building, and reduced the extent to which it penetrated the rings, thus preventing immediate collapse of the structure directly above the area of impact. Most of the new units remained intact, which prevented severe injuries and further loss of life (Tanner, 2001). Old window units in wedge 2, up to 200 feet (61 m) away, blew out during the initial impact and explosion of jet fuel.

The fire that burned for nearly three days after the impact left extensive damage on the wedge 2 side of the building. New sprinklers in wedge 1 extinguished the fire quickly where it was not directly fed by jet fuel, and minimized the spread of fire throughout the wedge. In addition to fire and smoke damage, water damage and mold caused by the thousands of gallons of water that flooded the building caused health concerns. Since the crash, air monitoring results have been analyzed for mold, asbestos, lead, and silicate on a daily basis.

Once the site was turned over by the Federal Bureau of Investigation (FBI) to the Pentagon Renovation (PENREN) project team, hazardous conditions were quickly brought under control and acceptable air quality levels were achieved, allowing rebuilding of the Pentagon to commence. This case study discusses Project Phoenix, which is the restoration of the U.S. Pentagon, and does not cover the Pentagon renovation activities that were under way before September 11, 2001.

This case study covers various Project Management Knowledge Areas (Project Management Institute, 2004) within four project phases: inception, development, implementation, and closeout. Within each project phase, the activities, accomplishments, and performance shortcomings in the processes of Initiating, Planning, Executing, Monitoring and Controlling, and Closing are discussed. The case study is structured to allow an evaluation of the appropriate processes of various Project Management Knowledge Areas at the end of each phase. An overall assessment of performance is then conducted, resulting in a numeric evaluation of the management of this project, including areas of strength, opportunities for improvement, and

lessons learned.

The Inception Phase

At 9:38 a.m. on September 11, 2001, the plane struck the Pentagon's western face at wedge 1. Of the 2,600 people in the immediate area of impact, 184 people (125 in the Pentagon and 59 passengers and crew aboard the plane) did not survive the attack. More than 100 people were seriously injured and 4,600 people were displaced from Pentagon offices. The number of casualties would likely have been higher if the PENREN program, which was in progress, had not taken extra measures to enhance the safety and security of wedge 1. This tragedy was the impetus in the creation of Project Phoenix—the rebuilding of both an American national resource and landmark.

Project Phoenix involved rebuilding the section of the Pentagon that was severely damaged in the September 11, 2001 disaster. All five floors of the outer three rings (E, D, and C) between corridors 4 and 5 required complete structural demolition down to slab on grade.

Approximately 400,000 square feet (37,161 m²) of space required complete structural demolition and reconstruction. Half of this area was in the newly renovated wedge 1 section of the Pentagon and the other half was in the unrenovated wedge 2. The scope of work included rebuilding the core and shell of wedge 1, as well as the shell of wedge 2.

The following list summarizes the damage and losses caused by the attack:

125	Pentagon casualties
59	Passengers on American Airlines® Flight 77
110	People seriously injured
2,600	People in the immediate area of the jet impact
4,600	People displaced from their Pentagon offices
3	Rings of offices penetrated by the airplane (Rings E, D, and C)
2	Wedges of the Pentagon damaged
5	Floors damaged
400,000	Square feet (37,161 m ²) of structurally damaged office space

“Project Phoenix” was the code name used for the reconstruction of the damaged area of the Pentagon. The Project Phoenix team adopted the image of the mythical bird rising from the ashes of the Pentagon as its logo. The emotion and spirit of this endeavor was captured in the words “From the ashes of the worst act of terrorism on American soil, a safer and stronger Pentagon will rise.”

The project's organizational structure included the Project Phoenix team leader, the project manager for wedge 1, and the deputy program manager responsible for the development and execution of budgets, acquisition strategies, planning, and programming. All of them reported to the program manager of the PENREN program office. The program manager had overall Project Phoenix responsibility, and was the key spokesperson for project implementation and communications. This leadership team structure was already in place from the PENREN project, which helped in the immediate implementation of Project Phoenix.

An estimated additional US\$740 million was required to recover the entire two million square feet (185,806 m²) damaged by the attack. Funding was sourced by emergency legislation. The PENREN program office awarded contracts amounting to US\$1.3 billion to begin the reconstruction of the damaged areas and to move forward with Project Phoenix. A not-to-exceed US\$520 million letter contract was awarded to the original wedge 1 renovation contractor, for rebuilding and restoration efforts in wedge 1. A US\$758 million contract for the renovation of wedges 2 through 5 was awarded to another construction company. All contractors agreed immediately to perform the work.

Key project stakeholders included the President of the United States, Department of Defense, government agencies, PENREN program office, Pentagon Building Management Office, Federal Facilities Division, various historical commissions, and other prominent U.S. national leaders and organizations.

Project Phoenix had the following key goals, constraints, and areas of strength:

- Wedge 1 (where the plane hit) to be operational and in working order by the one-year anniversary of the terrorist attack (September 11, 2002).
- All of the areas damaged by the attack to be completely restored by spring 2003.
- A shared sense of patriotism among stakeholders and contractors.
- The construction community took the attacks and the rebuilding process personally, and everyone involved wanted to be part of it. This was their way of responding to the terrorists.
- Contractors considered it a great honor to be part of the Phoenix project. As many as 1,000 workers worked 24 hours a day, 7 days a week until January 1, 2002. After that about 500 workers worked 6 days a week in two 10-hour shifts (Stone, 2002).
- People charged with renovating the United States' military headquarters were among the best and brightest in their respective fields, including acquisition, contracting, architecture, engineering, construction management, relocation planning, health and occupational safety, information management, telecommunications, logistics, scheduling, resource management, and project management.
- Leadership at high levels was fully committed to the success of the project.
- There were no significant budgetary constraints.

Based on the self-imposed one-year deadline, the following major milestones were established:

10/18/01	Commence full-scale demolition.
12/19/01	Complete demolition; commence reconstruction.
02/05/02	Install new blast-resistant windows on the first floor of the Pentagon.
09/11/02	Return Pentagon occupants to their E-ring offices at the point of impact.

Teamwork was extremely high at the onset of the project. The overwhelming feeling of patriotism was a key driver to organizing all project activities quickly. (Inglesby, 2002a). Management support was at the highest level in the organization, including levels up through and including the President of the United States.

Project risk was relatively low due to the following:

- Contractors were already on site due to the Pentagon renovation effort that was in progress.
- Contractors already had extensive knowledge of the areas to be rebuilt.

- Detailed planning was not a major concern because the project team already had a “blueprint” of the building’s design where it was damaged.

As a result of the project team infrastructure that was already in place and the low planning risk, project work could start almost immediately. Communication was broad-based, not only within the organization, but also to the public via the news media and a government Web site. Cost for the entire project was fully funded and contracts were secured early. The project team’s vision and goals were clearly understood by all team members. The project team’s motivation was a compelling factor in organizing work with high quality standards to achieve project completion by September 11, 2002.

The Development Phase

The goal of rebuilding the damaged area of the Pentagon by the one-year anniversary of the attack meant that the project team would have to collapse what would normally be a three-year project into one year. Fast-track scheduling of activities allowed the project team to collapse the schedule. According to the program manager, “In order to do this work in one year, we have quite a steep waterfall, and we do many work activities concurrently” (*News Transcript*, 2002). Planning for such an undertaking would have to be quick and precise, with little room for error. In the development phase, the project team defined and planned a project that would exceed anyone’s performance expectations in all project management areas. Planning in the areas of scope, time, cost, quality, procurement, risk, human resources, and communications laid the foundation for the implementation phase that would see the project completed ahead of schedule and under budget.

When developing the project plan for Project Phoenix, the program manager and project team were careful to limit the scope to just what was damaged on September 11, 2001, rebuilding the core and shell of wedge 1 and the shell of wedge 2. They focused all of their energies on making that portion of the Pentagon functional and occupied by September 11, 2002. Because renovation on wedge 1 was largely completed prior to the attack, the project team already had knowledge of the scope of the work.

There were, however, some new requirements for Project Phoenix pertaining to security enhancements. The team worked with the U.S. Army Corps of Engineers performing building analyses after the September 11 crash, and interviewing people who were in the immediate area of the crash for information on improving the building in the event of future attacks. The following items were added to the original scope of rebuilding the damaged areas right after Project Phoenix was initiated:

- More concrete masonry walls inside the building for durability
- Photo-luminescent lights—signage that does not require electricity
- Additional sand pipes
- Additional feeds for the water sprinkler system
- Five additional half-corridors to provide more building exit routes
- A remote delivery facility with a tunnel for inspecting packages and vehicles.

The team did an excellent job of scope planning to ensure that these improvements would make it into the renovation and improve the building’s integrity. The program manager “set clear goals and set forth the work in a very clear manner, so that people understand exactly what is required of them” (*News Transcript*, 2002).

To guard against scope creep, all formal program decisions would come through the deputy program manager to the program manager, and would include the following (Pentagon Renovation Program, 2002a):

- Subject
- Issue
- Background
- Assumptions
- Discussion: To include, as a minimum, current schedule, schedule implications, impact on

tenants, technical issues, performance tradeoffs, discussion of risks involved, risk mitigation considerations and/or approaches.

- Budgetary and/or schedule implications: To include requirement (existing or new), funds currently available, and tradeoffs within this year’s budget for new requirements.
- Recommendation: Unanimous recommendation or inclusion of dissenting opinions with request for further guidance and direction.
- Coordination: Budget, geographic, other(s) as needed
- Decision: Approved: ____ Disapproved: ____ Other: ____

Implementing this formal and controlled process provided the project management team with an effective tool to control scope changes.

In the development phase, the estimate for total project cost was US\$740 million, funded by emergency legislation. The team planned on using earned value analysis to track performance against project costs and schedule. They also planned on reducing costs by implementing various procedures such as contract incentives that would help drive down the cost. They planned on negotiating prices downward and clearly defined performance requirements for the contractors (Nutman, 2002). Additionally, this was the first time private donations would be allowed for U.S. government work, which added to the available funding.

Before the team would be in a position to negotiate decreased prices, the program management office had to change how it dealt with contractors. The team set out to become more organized and united. They also planned on giving the contractors more autonomy for making decisions, while making them feel part of the extended team. Much thought went into how to approach and manage contractor relations, and the result of this planning was drastically reduced costs coupled with increased contractor performance.

Collapsing a three-year project into a one-year project meant that the team would have to employ fast tracking on most of the tasks. They took the renovation sequence and were able to condense it into one year. The renovation sequence was planned as follows, with many of these sequences running concurrently:

Phase	Original Estimate	Project Phoenix Estimate
Demolition and abatement	2 years	1 month
Core and shell constructions	1 ½ years	5 months
Tenant fit-out	1 year	6 months
Information management	1 year	5 months
Telecommunications	1 year	5 months
Furniture	9 months	3 months
Move-in	1 month	2 weeks

The team was able to use historical data from the renovation work that was already completed on wedge 1 prior to the attack to develop the schedule, and to apply lessons learned from that effort to identify areas where fast tracking would work. Additionally, they were able to propose and support the aggressive schedule by coordinating with all the stakeholders. Stakeholders were invited to participate in various integrated project-planning efforts and, thus, were able to assist

in aligning the schedule to fit into the one-year goal. The team also planned for fast-track type work shifts (i.e., two 10-hour shifts, 6 days a week, to support the aggressive fast-track schedule).

The project management team used effective contracts to the advantage of this project. They were able to achieve good performance and high-quality construction by writing the contracts with a series of incentives. The contracts set clear goals and presented the work in a clear manner. Planning up-front for incentives and writing clear contracts helped the contractors later in the implementation phase, because they had a clear understanding of what was required of them, which, in turn, limited the amount of time lost due to rework. The team used the guidelines outlined in the *Award Fee Guide* for the processes and procedures used on PENREN contracts with award fee provisions. Additionally, contract change documentation policies were outlined in the contract change management documents. A configuration control board was created to oversee and coordinate changes that may impact on more than one contract or project. Finally, the team used contractor performance evaluation reporting to ensure that contractors were meeting expectations.

To support such a steep waterfall of concurrent activities, risk planning had to be thorough and meticulous. “That can be a risky way of doing business, because if you think wrong, plan wrong, guess wrong, then you get to do it over again. And if you let that process get out of control, you can do it over again and over again and over again” (*News Transcript*, 2002). The team relied heavily on historical data when generating risk management plans. They identified high-risk areas and planned for ways to mitigate those risks. Responsibilities were specified for tracking risk triggers and for recovery plans once risk events happened.

The damage to the already renovated wedge 1 after the impact on September 11 was significant. However, there were numerous examples of how the security enhancements made in wedge 1 saved many lives. The goal of quality planning for Project Phoenix was to look at what went right in the renovation of wedge 1 prior to the attack and what areas needed improvement to further secure the building from potential future attacks.

The team initiated a plan to gather information about the building’s performance immediately following the attack by talking to individuals who were in the immediate area of impact. The information learned was then integrated into a lessons learned document that would be provided to contractors and used to further improve building structures (Kozaryn, 2002a).

It was a unique environment in that every individual working on the project was highly motivated. The renovation program manager, Walker Lee Evey, attributed the project's speed to the workers' personal motivation and dedication. “People don't really pay that much attention to what their title is, what their job is, what they've been specifically told to do or what the normal constraints are in the way they operate. Everyone's there to make that project successful. They pitch in. They work. They help. They support one another and it's been very effective.” (Kozaryn, 2002b). The workers on Project Phoenix were highly motivated to work on the project. They imposed the one-year deadline on themselves and worked around the clock to make it happen.

Although the project team was fortunate to have highly motivated employees, the project management team also took specific actions that promoted teamwork. The project managers organized, coordinated, directed, and trained employees to do their jobs to the best of their abilities. The program manager emphasized leadership from the beginning, thus establishing a clear vision for all team members, establishing teams that could operate effectively, and challenging team members to be leaders. According to Evey “After the events of 9/11, to some degree the Pentagon—and especially the Phoenix Project—has taken on some symbolic importance in the American psyche. Our workers represent all ages, sexes, origins, religions; we are a potpourri of people—we are American. The general public sees people on TV that look just like them; and seeing workers doing a remarkable job resonates with the American public. That is the most important aspect of the project.” (Parkinson, 2002).

Management was able to provide inspiration and incentive to the team members and, in return, the team performance was excellent. There were plans for employee recognition and frequent luncheons in which the program manager participated. Visible top management support in addition to frequent site visits from top ranking officials, including the Secretary of Defense, contributed to enhanced employee morale.

Knowing that this would be a high-profile program in the eyes of the government and the public, the program management team planned for frequent and open communication with all stakeholders. This included special briefings on Pentagon reconstruction at three-month intervals, monthly press conferences at the site, and regular and ad hoc communication with project employees. In addition, project and construction team leads met every morning, starting at 3:00 a.m., to discuss the day’s activities and issues.

The communication plan was designed to keep all stakeholders aware of the progress the program was making. The project management team used traditional communication vehicles: a status report to Congress, press conferences, three-month status briefings, and formal communication documents, as well as unique communication vehicles such as the “Let’s Roll” billboard that counted down the days and minutes to September 11, 2002. The plan made sure that all stakeholders would have access to timely and accurate program status. It also helped to solidify the vision and goal of the program in the eyes of the public and the program team members.

There was not much additional planning associated with the program management office (PMO) because the PENREN program had been in existence for several years prior to the attack on September 11. Project Phoenix became a project in the overall renovation program. All of the policies and procedures that had been guiding the renovation program also applied to Project Phoenix. There were some modifications to policies and procedures, but, for the most part, there was no change to the PMO methodology as a result of Project Phoenix.

It is not often that a project performs at this level of excellence. The planning of Project Phoenix was the key to defining a program that far exceeded all stakeholders’ expectations. For the majority of the project duration, the earned value analysis measurements used in Project Phoenix showed that the project tracked very well to plans, demonstrating effective planning and extraordinary performance. This program could be considered an example of a high performing

project team that delivered a high quality output on time and under budget. It may be hard to find an area where meaningful recommendations for improvement could be made.

The Implementation Phase

“Let’s Roll.” These were the poignant words of a heroic passenger who led the revolt against hijackers of the passenger jet that crashed into a Pennsylvania field on September 11, 2001, the same day that American Airlines® Flight 77 plowed into the first floor of the Pentagon. This powerful mantra was an inspirational message that continually drove the Project Phoenix team forward to successful completion. The approach to rebuilding portions of the Pentagon destroyed by the attack was defined as follows:

1. *Stabilize*: The first step turned into an initial stage of stabilizing the floors in wedge 1 and wedge 2 of the Pentagon that were compromised by explosions and ensuing fires from the jet fuel.
2. *Analyze*: Extensive analysis and testing ensued to determine what areas of the Pentagon’s recently renovated wedge 1 and wedge 2 could be saved and what should be removed due to safety concerns.
3. *Demolish*: Construction teams were brought in to demolish and remove the damaged sections.
4. *Rebuild*: Project Phoenix moved into an aggressive rebuilding stage, which had the goals of restoring the exterior of the Pentagon to its pre-attack appearance while improving the overall safety and structural integrity of this historical building. Initial projections were that reconstruction of damaged portions of the Pentagon’s west wall would take several years.

One of the keys to success of Project Phoenix was an overall commitment of all the “stakeholders” to finish this project ahead of schedule and under budget. The dedication of the construction workers on this significant rebuilding effort was nothing short of miraculous. These people proudly worked 24 hours a day, 7 days per week to reach the self-imposed project deadline of one year from the date of the initial crash. Because of this aggressive deadline, Project Phoenix was characterized and managed as a super fast-tracked project. The project team and construction workers made many personal sacrifices, and supported one another bravely to be able to move some of the affected Pentagon workers back into their offices in wedge 1 in time for the dedication ceremony. Their sacrifices, dedication, and ultimate success were viewed as a testament to the strength of the American spirit. According to Douglas Ortiz, general manager of the firm keeping the construction site clean “We’re like a big machine working all together. We have a meeting every day at 7 a.m. If someone has a problem, others say, ‘We’ll take care of it.’” The unity of purpose comes in true American melting-pot style: At different phases of the project the number of immigrant workers has ranged from an estimated 25 percent to 80 percent (Tyson, 2002).

Project Phoenix key milestones and scope performance reflect and track the extraordinary progress and effort it took to overcome the damage. Key project milestones are presented in the following list (Sergent, 2002a and Sergent, 2002b):

- | | |
|----------|---|
| 9/11/01 | The hijacked plane was deliberately flown into the western facade of the Pentagon. |
| 10/18/01 | A 24-hour, 7-day-a-week demolition operation began with the goal of reoccupying the Pentagon’s E-ring at the point of impact by September 11, 2002. |
| 11/19/01 | Demolition was completed four weeks ahead of the most optimistic schedules. Reconstruction began on the same day. |
| 02/25/02 | The first piece of new Indiana limestone was placed on the reconstructed facade. |

- 04/05/02 A “topping-out” ceremony was held to celebrate the completion of all structural concrete work. All five floors and the roof were complete.
- 06/11/02 The last of approximately 4,000 pieces of new limestone was placed on the face of the Pentagon (U.S. Department of State, 2002). The last piece also marked the location of the dedication capsule.
- 08/15/02 The first E-ring tenants moved back into the Phoenix area on the fourth floor.

Scope performance highlights are presented in the following list:

- 6 Number of months initially estimated for demolition of the 400,000 square feet (37,161 m²) of Project Phoenix area. Demolition was actually completed in 32 days.
- 50,000 Tons of debris removed from the damage site.
- 1,000 Construction workers on-site daily at the peak of construction.
- 3,000 Total people involved in the rebuilding effort.
- 87 Different contractors and subcontractors involved in the rebuilding effort.
- 3,000,000 Total person-hours worked on Project Phoenix.
- 2 Lost-time accidents (both minor hand injuries).
- 4,000 New pieces of Indiana limestone added to the face of the Pentagon.
- 3,000 People moved back into wedge 1 by September 11, 2002.
- US\$740,000,000 Initial estimate and budget for reconstruction costs for two million square feet (185,806 m²). US\$501,000,000 is currently estimated as the actual construction cost for this portion of the reconstruction effort, which is significantly lower than the original estimate.

One of the goals of the Project Phoenix team was to restore the damaged portions of the Pentagon in a stronger and safer condition than before the destruction of September 11. Part of the Pentagon’s new strength comes from its newly designed roof system (TrusSteel, 2002). More than 250 pre-engineered steel roof trusses support 25,000 square feet (2,323 m²) of interlocking, fireproof, concrete deck units. The trusses, decking, and new slate roofing provide a strong, tough, fire-resistant roofing system, which the project design team was seeking. To make the rebuilt section even stronger, the original outer brick walls in the damaged perimeter were replaced with reinforced concrete.

Pentagon officials credit upgrades in the damaged wedges that were part of the original renovation project with saving lives. Features such as two-inch-thick blast-resistant windows, steel reinforcements, Kevlar mesh insulation, sprinkler systems, and automatic “smoke walls” helping to curtail the flow of smoke in hallways saved many lives (Forgey, 2002). These important safety features were implemented along with additional hallway exits, all stairwells were sheathed in concrete rather than plaster, no-exit signs were added to reduce confusion during emergencies, and bright exit signs and emergency lighting were placed low along the walls. The lighting systems and exit signs were designed to be seen easily through thick smoke, even when electric power was cut off.

The Project Phoenix team wanted to restore the exterior of the damaged wedges of the Pentagon to their original, pre-crash splendor. To this end, they contracted to purchase 4,000 blocks (2.1 million pounds) of Indiana limestone to replace the damaged outer facade of wedges 1 and 2

(Inglesby, 2002b). This decision was a significant motivational factor for the entire team because a high-quality American supplier of limestone was chosen. The supplier had a long history of supplying high-grade limestone to many federal, state, county, and community building projects. This project decision resulted in Project Phoenix winning the National Preservation Award. The following part of the award text highlights the significance and breadth of this award:

The Pentagon is a building of great significance in American history and architecture. This building and the people within it were tested by the terrorist attack of September 11, 2001. Out of this tragedy was born the Phoenix Project—an extraordinary effort to restore the Pentagon in a manner consistent with its status as a National Historic Landmark. The reconstruction of the damaged sections was undertaken using materials, design and craftsmanship that match the original 1941 construction. The reconstruction is only one part of the ongoing Pentagon Renovation Program, an exemplary effort by the Department of Defense to honor its proud past by preserving the building that is both a busy workplace to 25,000 and a world-famous symbol of the nation's military headquarters. (Pentagon Renovation Program, 2002b)

Despite the backdrop of the tragedy of September 11, Project Phoenix was a project manager's dream in terms of teamwork and commitment, specifically as follows:

- Project stakeholders were 100% supportive of this effort, including American people, the President of the United States, the Department of Defense, Congress, and Pentagon workers.
- Workers imposed the project deadline on themselves and finished ahead of schedule and under budget.
- Some of the project workers had family members who were killed in the terrorist attack, which resulted in greater worker determination and motivation (Morahan, 2002).
- The attacks of September 11 spurred a great sense of American pride that carried over to Project Phoenix.
- A tremendous outpouring of public support buoyed the Project Phoenix team throughout the reconstruction efforts. As an example, a Virginia elementary school raised money to buy pizza and sodas for hundreds of construction workers at the site.
- Every day during the rebuilding, a constant stream of visitors gathered on a nearby hillside to watch the construction progress and cheer on the efforts of the workers.

Due to the visibility and importance of this project to the nation, frequent and accurate communications were critical to its success. A fully supportive nation wanted to know the project's status, so that it could support the project and help out. Given the fact that as many as 87 contractors and subcontractors, and up to 1,000 construction workers worked on the project, communications management was no trivial feat. In addition to regular team and stakeholder meetings, Project Phoenix also utilized public news briefings, milestone reports to the President of the United States, the Department of Defense, and the U.S. Congress, updates to key Pentagon offices, press releases, and a Web page (<http://renovation.pentagon.mil/>).

Two years earlier, as part of the original PENREN project, the project team adopted new processes and techniques to accurately estimate the cost of each project phase and each bidder's submission. The idea was to ultimately reduce the total cost and long-term risks of inflation. These methodologies were carried over to Project Phoenix.

Instead of the traditional design-bid-build form of contract, which usually is awarded to the lowest bidder, the PENREN program managers proposed a contract that had not been used on this type of construction project before—a target-priced contract with an incentive fee and a cost-sharing provision. In the request for proposals, this target-priced contract identified the maximum spending limit for the project and challenged the bidder to provide a “best value within budget” response. The idea was that the Pentagon and successful contractor would share overruns and underruns through the cost-sharing provision to better share risk. The incentive fee was calculated based on the Pentagon’s satisfaction with the contractor’s performance of the contract according to predefined and pre-agreed criteria. This approach was responsible for the contract award to the winning contractor of the PENREN wedges 2 through 5, as well as bringing the project in at US\$200 million under the original budget estimate.

By September 15, 2001, just four days after the attack on the Pentagon, the PENREN office awarded contracts amounting to US\$1.3 billion to begin the reconstruction of the damaged areas and to move forward with the original renovation program. A not-to-exceed US\$520 million letter contract was awarded to the original wedge 1 contractor, for the rebuilding and restoration efforts in the wedge 1 areas.

A base US\$758 million contract for the renovation of wedges 2 through 5 was awarded to another construction company, which was the culmination of a yearlong competition. Several letter contracts were written to initiate immediate specialized recovery activities, including historic restoration of the damaged Pentagon facade.

Project Phoenix employed project management tools and a project management information system to manage the project schedule, leading to the success of the project. The project team was able to meet or exceed all key milestones and actually move some of the Pentagon workers back into their offices about four weeks ahead of schedule. This was an incredible accomplishment given the level of devastation. Completing Project Phoenix ahead of schedule was due partly to the total commitment of the stakeholders and all the workers involved. However, this success was also due to the efficient application of project management techniques such as proper workload, resource loading and leveling, schedule fast-tracking, super fast-tracking, and crashing of some activities, and effective application of the short interval production scheduling.

Contract terms were used to minimize financial exposure by the stakeholders and to reward contractors for exceptional performance. This worked well based on the final project cost data. Significant engineering and structural analysis was performed early by the U.S. Army Corps of Engineers to ensure worker safety. This resulted in only two minor injuries during 3,000,000 worker-hours of construction work. This is an incredible number for any construction project, and even more incredible for this project given its super fast-track schedule, because compressed work activities often lead to more accidents. The project team was effective in minimizing and mitigating project risks throughout the implementation phase.

The implementation phase of this project is an example of “doing it right the first time.” The project team had a clear-cut mission and an extremely well-designed plan to execute. The team executed the plan of rebuilding the damaged portion of the Pentagon flawlessly. It was helpful

that the entire team, contractors, and construction workers were totally motivated to succeed. It was also helpful that they had the total support of the President of the United States, the Department of Defense, Congress, and a country keen on restoring the damage and proving its strength and resolve in rebuilding a national landmark.

The Closeout Phase

As discussed earlier, Project Phoenix had a goal of completing and occupying the E-ring of the Pentagon by the one-year anniversary date of September 1, 2002. This aggressive date was not only met, but was exceeded. By August 15, 2002, some 3,000 Pentagon employees began moving back into the reconstructed offices. All major project milestones had been achieved.

A compressed schedule was instituted to allow completion of the remaining damaged areas of the Pentagon by January 2003, several months ahead of the original plans for spring, 2003. The remaining renovation plans to reinforce the entire building were accelerated by two years—so that completion is estimated in 2010, rather than the first estimate of 2012.

A memorial service was held on September 11, 2002 to honor those who perished and to celebrate the success of Project Phoenix. The celebration included Project Phoenix workers, military personnel and families who gathered outside the Pentagon (Gilmore, 2002). This celebration served as an announcement of American perseverance and determination to the country and the world, and was important to the project team's morale and inspiration.

September 11, 2002, also served as the deadline (or interim deadline) for supporting projects, including the proposal submission deadline for a design competition regarding a memorial to those who died. (A memorial to those who perished was planned to be built on nearly two acres under the flight path of the plane, west of the point where it struck the Pentagon.)

Project closeout documentation and reports covered the original contract, contract documentation, supporting schedules, recorded and implemented contract changes, performance reports, earned value analyses, financial documentation, invoices and payment records, inspections, certifications, and other contract-related documentation. Formal acceptance documents included certificates of occupancy, and formal letters of acceptance and completion notices from the applicable organizations. The scope of Project Phoenix was completed ahead of schedule, below budget, to high levels of quality, teamwork, communication, and effective project management integration.

As a result of the accomplishments of Project Phoenix, it is likely that its performance will be assessed and recorded to ensure learning, posterity, and historical reference in project management and academic publications. Through such project assessments, professionals and researchers in project management will have a better understanding of the specific actions that contributed to the achievements of what will serve as a benchmark in terms of overall success in project management.

Assessment and Analysis

1. Please complete your evaluation of project management during this phase, using the following grid:

Rating Scale: 5–Excellent, 4–Very Good, 3–Good, 2–Poor, 1–Very Poor

Project Management Area	Closeout Phase
Scope Management	
Time Management	
Cost Management	
Quality Management	
Human Resource Management	
Communications Management	
Risk Management	
Procurement Management	
Integration Management	

2. Please highlight the major areas of strength in the management of this phase of the project:

3. Please highlight the major opportunities for improvement in the management of this phase of the project:

Summary of Project Assessment and Analysis

1. Please complete your evaluation of project management for this project and calculate the average rating, using the following grid:

Rating Scale: 5–Excellent, 4–Very Good, 3–Good, 2–Poor, 1–Very Poor

Project Management Area	Inception Phase	Development Phase	Implementation Phase	Closeout Phase	Average
Scope Management					
Time Management					

Cost Management					
Quality Management					
Human Resource Management					
Communications Management					
Risk Management					
Procurement Management					
Integration Management					
Average					

2. Please highlight the major areas of strength in the management of this project:

3. Please highlight the major opportunities for improvement in the management of this project:

4. Please highlight the major project management lessons learned from this project:

References

- Forgey, B. (2002, September, 3). Reinforcing a powerful symbol. *The Washington Post*. Retrieved on July 17, 2005 from <http://www.mindcontrolforums.com/news/reinforcing-powerful-symbol.htm>
- Gilmore, G. J. (2002, September 11). Pentagon Phoenix project workers are heroes, Wolfowitz Says. *American Forces Information Service*. Retrieved on July 17, 2005 from http://www.defenselink.mil/news/Sep2002/n09112002_200209116.html
- Inglesby, T. (2002a, August 1). The human side: The Phoenix team. *Masonry: The Voice of the Mason Contractor*. Retrieved on July 17, 2005 from <http://www.masonrymagazine.com/8-02/phoenixteam.html>
- Inglesby, T. (2002b, August 1). Bybee stone—Material command center. *Masonry: The Voice of the Mason Contractor*. Retrieved on July 17, 2005 from <http://www.masonrymagazine.com/8-02/material.html>
- Kozaryn, L. D. (2002a, March 11). Pentagon reconstruction: Triumph over terrorism. *American Forces Information Service*. Retrieved on July 17, 2005 from http://www.defenselink.mil/news/Mar2002/n03112002_200203115.html
- Kozaryn, L. D. (2002b, June 11). Pentagon project: Under budget, ahead of schedule. *American Forces Information Service*. Retrieved on July 17, 2005 from http://www.defenselink.mil/news/Jun2002/n06112002_200206115.html
- Morahan, L. (2002, March 7). The Pentagon: Pentagon Reconstruction Is Ahead of Schedule. Retrieved on July 17, 2005 from <http://www.cnsnews.com/MainSearch/Search.html>
- News Transcript*. (2002, June). Special briefing on Pentagon reconstruction and memorial. *News Transcript*. Retrieved from <http://www.defenselink.mil/news/Jun2002/>
- Nutman, P. (2002, May 6). New costing methods aid Pentagon renovation. *Atlanta Business Chronicle*. Retrieved on July 17, 2005 from <http://triad.bizjournals.com/atlanta/stories/2002/05/06/focus9.html>
- Parkinson, J. (2002). Lee Evey: The man and his mission. *Today's Facility Manager*. Retrieved on July 17, 2005 from http://todaysfacilitymanager.com/tfm_02_09_news1.asp
- Project Management Institute. (2004). *A guide to the project management body of knowledge - third edition*. Newtown Square, PA: Project Management Institute.
- Pentagon Renovation Program. (2002a). Project Phoenix highlights, Project Information Forms. *Pentagon Renovation Program*. Retrieved from <http://renovation.pentagon.mil>
- Pentagon Renovation Program. (2002b). Pentagon renovation accepts Historic Preservation Award: Phoenix project efforts praised following terrorist attack. *Pentagon Renovation Program*. Retrieved from <http://renovation.pentagon.mil/archive3.htm?#hispres>
- Sergeant, J. (2002a, September 3). Highlights of the Pentagon's Phoenix project. *Scripps Howard News Service*. Retrieved on July 17, 2005 from http://www.shns.com/shns/g_index2.cfm?action=detail&pk=SEP11-PENTAGON1-09-03-02
- Sergeant, J. (2002b, September 11). One year later: Highlights of the Pentagon's Phoenix project. *Naples Daily News*. Retrieved on July 17, 2005 from <http://search.naplesnews.com/cgi-bin/htsearch>
- Stone, A. (2002, March 10). Pentagon crew imposes tight deadline on itself. *USA TODAY*. Retrieved on July 17, 2005 from <http://www.usatoday.com/news/sept11/2002/03/11/usat-pentagon.htm>
- Tanner, V. L. (2001, October 15). Pentagon shifts into higher gear. *McGraw Hill*

- Construction*. Retrieved on July 17, 2005 from <http://www.construction.com/NewsCenter/Headlines/DB/20011015h.asp>
- TrusSteel. (2002, Sep./Oct.). Stronger Pentagon rises from the ashes. *Structural Building Components magazine*. Retrieved on July 17, 2005 from <http://www.trussteel.com/projects.html?todo=item&id=9>
- Tyson, A. S. (2002, June 7). Block by block, Pentagon rises again. *The Christian Science Monitor*. Retrieved on July 17, 2005 from <http://www.csmonitor.com/2002/0607/p03s01-ussc.html>
- U.S. Department of State. (2002, August 15). Pentagon reconstruction: The Phoenix project. U.S. Department of State, International Information Programs. Retrieved on July 17, 2005 from http://usinfo.state.gov/is/Archive_Index/Pentagon_Reconstruction_The_Phoenix_Project.html

Although not cited, the following works were also consulted while preparing this document:

- Roberts, M. J. (2001). *Developing a teaching case (Abridged)*. Boston: Harvard Business School Publishing.
- Swiercz, P. M. (2003). *SWIF learning: A guide to student written-instructor facilitated case writing*. Unpublished manuscript. Washington, DC: The George Washington University.

**Project Management Institute
Case Studies in Project Management**

**Project Phoenix:
Rebuilding an American Landmark**

Teaching Note

Edited by:

Frank T. Anbari, PhD, PMP

The George Washington University

Project Phoenix: Rebuilding an American Landmark

Teaching Note

By:

Frank T. Anbari, PhD, PMP

Anne Dutton, MSPM

Eric Holt, MSPM

Lisa King, MSPM

Leo Wilson, MSPM

Marie Zacharko, MSPM, PMP

Edited by:

Frank T. Anbari, PhD, PMP

The George Washington University

This case study was originally prepared as part of Project Management Applications, the capstone course of the Master of Science in Project Management in the Department of Management Science at The George Washington University, by the graduating students listed above with the supervision of Professor Anbari, during the Fall 2002 semester.

This case study was adapted to make it a learning resource and might not reflect all historical facts related to this project.

Case Study
Project Phoenix: Rebuilding an American Landmark
Teaching Note

This case study is structured to allow the reader to evaluate the project management methods and processes used in this project. It covers a wide range of project management areas within four project phases: inception, development, implementation, and closeout. Discussion is provided within each project phase of specific activities, accomplishments, and performance shortcomings in applicable processes of the five project management Process Groups (Initiating, Planning, Executing, Monitoring and Controlling, and Closing). The reader is asked to perform an assessment of performance in terms of the appropriate processes of various Project Management Knowledge Areas at the end of each phase. At the end of the case, the reader is asked to summarize his or her assessments and to provide a list of lessons learned from the case study.

In this teaching note the following is provided:

1. Assessment of appropriate project management processes in terms of the Project Management Knowledge Areas. Suggested assessments are provided for each phase, and an average is calculated for each Knowledge Area.
2. A discussion of major areas of strength, opportunities for improvement, and lessons learned from the evaluation of the case study.
3. A brief description of project life cycle phases, Project Management Process Groups, and Project Management Knowledge Areas, based on *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*—Third Edition (Project Management Institute, 2004).

It is expected that the reader will reach somewhat similar conclusions to those provided in this teaching note. However, it is very possible that readers may conduct additional research, develop further insights, and reach other conclusions.

Assessment of Project Management

The following table summarizes the assessment of appropriate project management processes, in terms of key Project Management Knowledge Areas, by phase:

Rating Scale: 5–Excellent, 4–Very Good, 3–Good, 2–Poor, 1–Very Poor

Project Management Area	Inception Phase	Development Phase	Implementation Phase	Closeout Phase	Average
Scope Management	5.00	5.00	5.00	5.00	5.00
Time Management	4.00	5.00	5.00	5.00	4.75
Cost Management	4.00	5.00	5.00	5.00	4.75
Quality Management	4.00	5.00	5.00	5.00	4.75
Human Resource Management	5.00	4.00	5.00	5.00	4.75
Communications Management	5.00	4.00	5.00	5.00	4.75
Risk Management	3.00	4.00	4.00	4.00	3.75
Procurement Management	4.00	5.00	4.00	4.00	4.25
Integration Management	4.00	4.00	3.00	5.00	4.00
Average	4.22	4.56	4.56	4.78	4.53

Major Areas of Strength, Opportunities for Improvement, and Lessons Learned

As can be seen in the table, the successful areas of Project Phoenix are numerous and easily recognizable. The successful performance of Project Phoenix was apparent from the early phases of this project and was reflected in the overall project accomplishments. Project Phoenix could be considered an exemplary project, in which effective implementation of project management tools and techniques resulted in excellent project performance. The project is rife with valuable lessons learned including the following:

- Project ownership by the team played a large role in project success, because the reconstruction workers self-imposed a deadline of one year. This is significant because scheduling techniques generally support establishing a completion date once the scope of work, time required for completing it, and various dependencies have been determined. In Project Phoenix, workers determined the completion date and *then* determined how to get the work done to accomplish that date.
- High levels of teamwork and team motivation contributed significantly to project success. Workers and project leaders repeatedly reported on the positive impact of the spirit of teamwork, cooperation, and dedication. Many called the construction crews' efforts "heroic."
- Project Phoenix was a highly visible project that had the ultimate support of a nation and its top leaders. Active senior leadership, support, and visibility contributed to project success. Project Phoenix was obviously a strategically important project to the nation and, therefore, it received priority attention. This attention brought with it the budget, resources, and interest required for success. This attention also had a domino effect on the team and its workers, because the sense of importance and priority inspired duty, motivation, and accountability.
- Because of the level of commitment and motivation of all stakeholders, the Project Phoenix team had at its disposal an ego-less project team. This does not happen too often, especially

with construction projects. There is usually competition and infighting among contractors, unions, and workers on many construction projects. Hidden agendas and bickering are common in this industry. None of those petty distractions were present on this important project. Workers felt privileged to be part of such an important and visible project. A sense of patriotic duty was evident, which had not been witnessed since World War II. Contractors and workers were eager to help out one another. There were no problems, only opportunities to learn and help each other. This shining example could be considered as a promising practice.

- The Government's contracting policy helped provide the flexibility to compress and accomplish an aggressive schedule, and provide the structure and resources to complete the work.
- PENREN initiated an effort to gather information about the building's performance immediately following the attack. Personnel near the area of impact were asked to provide their observations, especially during their attempts to evacuate areas ravaged by explosion, fire, and smoke. These and other valuable insights provided important lessons learned to both the wedge 1 and wedges 2 through 5 contractors, and were used to further improve the building structures. These lessons learned were very useful for new designs to improve building operations and, in particular, fire and life safety systems.
- Worker safety systems and processes resulted in only two minor hand injuries on the job during the three million worker-hours. This rate of injuries is phenomenally low in the construction industry.
- The constant reminders of the "Let's Roll" sign and the running clock provided a daily visual reminder of the team's goal. These large visual tools motivated and focused the attention of the construction team and the public on the one-year anniversary goal.

Project Life-Cycle Phases, Project Management Process Groups, and Knowledge Areas

Project Life-Cycle Phases

Project managers or the organization can divide projects into phases to provide better management control with appropriate links to the ongoing operations of the performing organization. Collectively, these phases are known as the project life cycle. The project life cycle defines the phases that connect the beginning of a project to its end. Phases are generally sequential and are usually defined by some form of technical information transfer or technical component handoff. Although many project life cycles have similar phase names with similar deliverables, few life cycles are identical. Some can have four or five phases, but others may have nine or more. (Project Management Institute, 2004, pp. 19–22). In this case study, the following phase descriptions are used:

Inception

This phase may also be called initiation, conception, or preparation. It deals with project proposal, selection, and initiation. It considers alignment of the project with the organization's overall strategy, architecture, and priorities. It explores linkages of the project to other projects, initiatives, and operations. It addresses methods of identification of the opportunity or definition of the problem leading to the need for the project, and clarification of the project's general premises and basic assumptions. It considers the project concept, feasibility issues, and possible alternative solutions.

Development

This phase may also be called detailed planning, definition and design, formulation, the formal approach, preliminary engineering, and preliminary design. It covers project organizing, planning, scheduling, estimating, and budgeting. It addresses development of plans for various project parameters, such as risk, quality, resources, and so forth, as well as plan audits (possibly pre-execution). It considers development of a project baseline and establishment of the detailed project work breakdown structure and master plan. It discusses finalizing the project charter and obtaining approval to proceed with the project.

Execution

This phase may also be called implementation, implementing and controlling, adaptive implementation, and deployment. It examines directing, monitoring, forecasting, reporting, and controlling various project parameters, such as scope, time, cost, quality, risk, and resources. It considers appropriate methods for change management and configuration control in evolving conditions. It addresses resource assignment, problem solving, communications, leadership, and conflict resolution. It also looks at documentation, training, and planning for operations.

Closeout

This phase may also be called closing, termination, finish, conversion, cutover, conclusion, results, and final documentation. This last phase advises on finalizing and accepting the project, product, system, or facility. It addresses transferring the responsibility for operations, maintenance, and support to the appropriate organizational unit or individual. With reassignment or release of project resources, it considers closing and settling any open project items. It addresses post-project evaluation (audit), and preparation of lessons learned. It covers

documentation of areas of strength and opportunities for improvement. It frames the development of recommendations to support success in future projects.

Project Management Process Groups

Project management is accomplished through processes, using project management knowledge, skills, tools and techniques that receive inputs and generate outputs. These processes are divided into five groups, defined as the Project Management Process Groups: Initiating Process Group, Planning Process Group, Executing Process Group, Monitoring and Controlling Process Group, and Closing Process Group. Process Groups are seldom either discrete or one-time events; they are overlapping activities that occur at varying levels of intensity throughout the project. The Process Groups are not project phases. Where large or complex projects may be separated into distinct phases or subprojects, all of the Process Group processes would normally be repeated for each phase or subproject. The project manager and the project team are responsible for determining what processes from the Process Groups will be employed, by whom, and the degree of rigor that will be applied to the execution of those processes to achieve the desired project objective. (Project Management Institute, 2004, pp. 37–67). In this case study, the Project Management Process Group processes are imbedded within each phase, as appropriate.

Project Management Knowledge Areas

The Project Management Knowledge Areas organize the project management processes from the Project Management Process Groups into nine Knowledge Areas. These areas are: Project Integration Management, Project Scope Management, Project Time Management, Project Cost Management, Project Quality Management, Project Human Resource Management, Project Communications Management, Project Risk Management, and Project Procurement Management (Project Management Institute, 2004, pp. 9–10). In this case study, the Project Management Knowledge Areas are considered within each phase and are used for performance assessment, as appropriate.