

**PROJECT CONTROL MECHANISMS  
ON THE  
PENTAGON RENOVATION PROGRAM  
(EXPECTATIONS ARE HIGH—AND THE WORLD IS WATCHING)**

**BY LESTER M. HUNKELE III AND W. LEE EVEY**

**INTRODUCTION**

Four years ago, Lee Evey, Program Manager for the Pentagon Renovation Project, took on a project whose scope he could never have imagined at the time. Nor could he have imagined the events of Sept. 11 that destroyed so much of the four years of work he and his team poured into the Pentagon Renovation Project.

The article that follows was written well before the Sept. 11 unprecedented terrorist attacks against our nation. Most of the work completed in the Wedge 1 phase of the project was utterly destroyed—work that Evey and the members of his team had spent four years completing, at a cost of \$258 million.

Facts are now emerging on how the renovations withstood the inferno that resulted when a hijacked airliner slammed into the Pentagon. Steel framing that had been added gave extra support to the concrete, holding up the Pentagon's outer ring for approximately 30 minutes before it finally collapsed. This time allowed many personnel on the 3rd, 4th, and 5th floors—directly above the area of impact—to escape their offices unharmed. Blast-resistant windows—at \$10,000 apiece—limited razor-sharp flying glass; and Kevlar-like cloth, applied between steel beams, caught fragments that imploded.

While a significant portion of Wedge 1 is beyond repair, literally hundreds of people are working around the clock right now to make areas suitable for occupancy in the very near future. And although Wedge 1 suffered water damage that requires significant recovery and restoration efforts, many of the areas are salvageable after carpets and drywall are replaced.

Program Manager and the Defense Acquisition University do not consider this story overcome by events. Indeed, we believe it has a message for our readers—a message that those of us who work for the government would do well to remember. Here, it's a message DAU President Frank Anderson Jr., doesn't let us forget: It's about making a difference. And the Pentagon Renovation Program Team—in a place and time of history's choosing, where the day-to-day suddenly became the unthinkable—truly made a difference.

The Pentagon Renovation program—at \$1.8 billion, the largest renovation project in the United States—is certainly a complex undertaking. The program includes: “swing space” for roughly 20 percent of the building's occupants; move planning and execution for those going to and from swing space; master planning, budgeting, and replacement of all supporting utility lines into the building; some new facilities on the exterior of the building; relocation of some facilities away from the building; and the renovation of the entire building—all while keeping it roughly 80 percent occupied and in operation.

### **COMPLICATIONS? MANY...**

Laden with asbestos, lead, and other hazardous materials, the basic building is 6½ million gross square feet. The utilities are a patchwork of successive improvements to the building for over 50 years, resulting in many abandoned lines, and as-built drawings that were long ago out of date.

The Metro subway that runs adjacent to the building and currently empties into the building, further complicates construction on the site of this historic structure. Additional complications are rights of way for many commercial utilities, and physical restraints due to multiple adjacent highways. The site includes an active heliport and fire station, as well as its own power plant. Finally, parts of the building simply must be kept in operation 24 hours a day, 7 days a week.

Obviously, scheduling is difficult because of the coordination required for utility outages, access, swing space leases, moving contractors, and the expectations of the 25,000 occupants. The renovation necessarily has to respond (and take a back seat) to real-life situations related to our national defense, and other emergent requirements. And time is money in the construction business. Keeping the program within budget and schedule constraints requires the timely information, coordination, and cooperation of many entities, from government agencies to contractors. Balancing cost, schedule, and quality has been challenging on a program so large, so complex, and influenced by so many—from Congress and the Administration, to the State and County governments, to the occupying agencies, to design and construction contractors and a host of suppliers.

### **MIRED IN DETAILS**

The problems encountered during the first years of the renovation process were not unlike those experienced by many agencies attempting occupied renovations. The program was oftentimes contentious as various entities seemed to work toward different goals. It was neither fun—nor very effective—mismanaging the expectations of many of the participants. For the owner attempting to exert “control,” the program was both paper-intensive and staff-intensive. While the construction projects and program slipped increasingly behind schedule, at the same time the program began exceeding its budget. Even the size of the deficiency “punchlists” and the time to get them completed were indicators of the lack of sufficient quality.

Tenant changes and program changes alike were responsible for some of these problems, as were the contracting methodologies used. The low bid, design-bid-build

strategies gave predictable results in a complex renovation environment. These problems then led to lack of confidence in the ability of the program to be managed, or to meet any date for moving tenants.

In essence the “control” of the project by the owner was after-the-fact oversight and reporting of events. The control mechanisms were not pro-active and did not provide a road map for where the program was going, nor how it could and should be directed to achieve better results. These mechanisms mired the program managers in details they could not hope to manage effectively.

## STANDING BACK

Standing back from the fray, it is easier to see that owners set the rules (and manage the outcome) through the method of procurement they choose, and that the contractor is the entity assuring cost, schedule, and quality control. The owner is assured of project control through three important strategies: timely insight into the day-to-day operation of the contractor; necessary audits; and periodic reports against certain milestones and other metrics—not voluminous, detailed, frequent formal reports. This allows the program manager to more clearly see the big picture, while others manage the necessary details. The program manager can then succinctly assess the true progress and status of the program, effectively brief oversight agencies on a macro scale, influence the progress of the program on the macro level, and provide for effective introduction of new elements into the program as time goes on.

### Pentagon Renovation Program Significant Project Control/Related Provisions

**Milestone Schedules**, rolled up from detailed schedules on a monthly basis that includes milestones prescribed by the program manager.

**Progress Bars**, show work completed against a baseline in a bar format.

**Banana Curves** show work completed against the early and late finish dates.

**Earned Value** analyses of cost and schedule data, used in a trend for assessing current, and predicting future, schedule and cost status.

**Cost Loading**, vs. price loading, schedules.

**Contractors' Choice** of software for scheduling and document control, as well as for monthly reporting date.

**Metrics** for monthly status reviews.

**Market Basket** cost-escalation methodology for contracts being executed over a large number of years.

**Contractor's Option** to not exercise succeeding options with specified notice to the owner, to preclude prolonged failing relationships.

**Award Fee** in lieu of profit on proposals, to keep the contractor motivated to satisfy the owner throughout the contract.

**Incentive Fee** that shares cost savings and overruns, within limits, to motivate the contractor to reduce contingencies and costs, resulting in an overall lower project cost.

**Best Value** selection, to ensure only the best firms compete for the contract and improve the likelihood that the selected contractor has the management and technical capability, knowledge of the project, and motivation to be successful

Each of these project controls is included in the ongoing procurement of a single design-build entity to renovate the remaining 4½ million square feet in a single \$700-million contract, known as “Wedges 2-5.” The Pentagon Renovation program currently has five projects under construction and at least three in pre-construction. The most significant project control and related provisions affecting the management insight and partnering on the Pentagon Renovation Program are shown above. These elements are used in most of the construction contracts now being awarded on the Pentagon Renovation Program, and the government staff are trained or are continuing training in the implementation of these elements. Not all elements were introduced at the same time, but most have been implemented already. These contract provisions work synergistically; that is, the project control provisions work even better because of the environment created by the procurement provisions such as design-build and award fee. However, the project control provisions will work well even without the companion procurement provisions used in the Pentagon Renovation Project.

The remainder of this article will discuss the project control provisions only, not the companion procurement provisions. These project control provisions were a reaction to the unsatisfactory results brought about by more traditional approaches and provisions for project control. Each traditional provision and its unsatisfactory result will be explained, as well as a proposed improvement to the provision and our results to date. Some of these provisions have only recently been implemented, and substantive results will have to be documented further in the future.



Pentagon Renovation Manager Lee Evey points out that the Metro subway, which runs adjacent to the building and currently empties into the building, further complicates the historic building's site renovation.

**MILESTONE SCHEDULES**

Monthly updates of contractor schedules tended to be thick computer printouts of data relating to the early and late start and finish of all activities in the schedule. The schedules were often in the range of 30,000 activities. This is a rather unwieldy package to cart around, ineffective as a briefing tool, and unusable by anyone not steeped in translating such data into a “picture” of the project's status. Further, the reports were of little value in quickly determining the “big picture.” Although there were milestones identified in the schedule, there were so many milestones identified that they lost their value.



Evey (left) views progress at Metro Entrance Facility (MEF) work site from a cherry picker. With him is Fred Cobb, member of the MEF construction crew.

Milestones need to be identified—and hence coded—at several levels, depending upon

what is important at particular levels of management. This is similar to the number of activities in a schedule. The higher the level of management, the more attention to the big picture, and hence the less the level of detail of any specific project. For example, top-level program management may need only a few activities to be shown on each project, but several projects to show the big picture of a program.

To brief the Deputy Secretary of Defense or a Congressional Committee on the Renovation Program, our program manager looks closely at 30 construction milestones. That gives a fairly clear and understandable picture of the program, with some critical details about the component projects. Further detail is readily available, but that additional detail is hung on the framework of the 30 milestones shown at the top of the next page—making it more readily understandable to managers and oversight organizations that do not have day-to-day familiarity with the program and its substantial detail.

Inspection of these milestones reveals that they tend to show the start and end of a group of like activities that would be identified separately at the next lower level of management. While the successful ordering and delivery of each long-lead item (such as the steel frame of a building or the chilled water system compressors) is critical, only the identification of all long-lead items has been selected as a program manager milestone. This allows the program manager to query the next lower level of management about identification of long-lead items at monthly reviews or on an ad hoc basis until the milestone has been reached. It frees the program manager from wading through the detail of every long-lead item, and keeps the overall goal (all long-lead items identified) and its status readily determinable.



Evey (right) discusses progress on the Metro Entrance Facility work site with Brett Eaton, Information and Communications, Pentagon Renovation Program.

Inspection of the milestones also reveals that some of the program manager's milestones may well be

useful to some members of his staff, but not of any real consequence to other members who are more narrowly focused on their own responsibilities. For example, the acquisition staff is very interested in the release of the Request for Qualifications, but that activity is of little interest to the financial staff or even too many of the operations staff. On the other hand, final contract payment is of interest to not only the

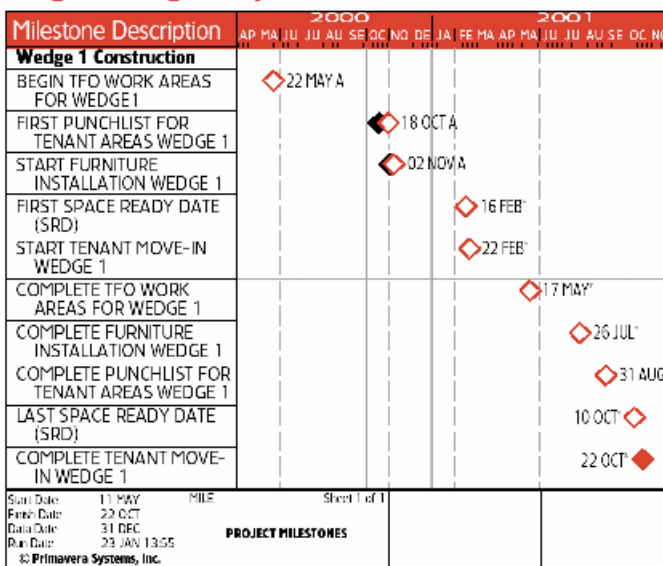
program manager, but also to the acquisition staff, the financial staff, and the operations staff.

By coding these 30 milestones as a unique grouping, they are included in the detailed network of say 30,000 activities, and the software manipulates them along with the other activities at every network updating. After the monthly schedule update of the project, a “roll up” report and a “roll up” graphic of only these 30 selected milestones is prepared. The data affiliated with these milestones have been updated, and the status of each milestone is reflected on this high-level management report, in both word and graphic formats, to support quick understanding and to facilitate current briefings. Once coded into the network, the updating and production of this report is almost effortless, yet its value is very high.

Figure 1 shows a portion of the program manager's report for notional projects. The dark line is the dateline—the date on which all of the data were updated. The diamonds represent milestones. Those milestones to the left of the dateline should be completed, and those to the right are scheduled to be completed. The first milestone is “BEGIN TFO WORK AREAS FOR WEDGE 1.” The milestone was reached on May 22, 2000, as shown by the “A” at the end of “22 MAYA,” where the “A” means actual.

The schedule also shows activities that have slipped but are already complete, such as the second milestone, “FIRST PUNCLIST FOR TENANT AREAS WEDGE 1.” The dark diamond shows the original scheduled date, and the open diamond shows the actual date, with the notation 18 OctA. Plotted on a graph (Figure 1), the slip in this milestone is easy to see.

**FIGURE 1. Portion of a 30-Milestone Chart (Program Manager's Report)**



The program manager's report is illustrative of the capability of the network scheduling tools available. While the program manager's report is a mainstay of the monthly program manager's review and useful to many of his staff members, a similar but somewhat more detailed report is also available. For example, the coding of each of the long-lead items' identification (rather than one for all long-lead items) would permit the generation of a report that would be very useful to subcontractors who order equipment, the owner's project management staff who control

submittals, and anyone involved in expediting materials. This project manager's coding would be different from the program manager's coding, so that the information is provided only to the respective report.

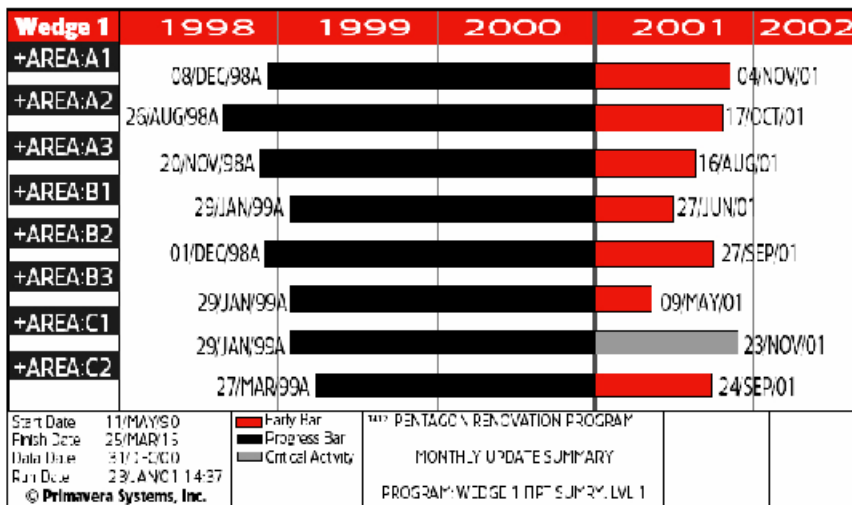
An alternative solution is to identify milestones for identifying each group of long-lead items by trade, such as all electrical long-lead items identified, all mechanical long-lead items identified, and all structural long-lead items identified. This would dramatically reduce the number of milestones for the project manager. At the same time, the project manager could use the electrical long-lead item identification as a means to follow up on the electrical trade contractor or the general contractor until the milestone had been reached. The idea is to create information out of the mass of data by using an appropriate level of detail for the specific level of management. This is definitely not “one size fits all.” However, with the power of the computer, the tailoring of reports is relatively quick, efficient, and painless once the network has been set up and the coding put in place at the start of the network—similar to the management principle of “starting with the end in mind.”

**ADJUSTMENT OF PROGRESS BARS TO BE INTUITIVE**

Primavera Project Planner (so-called “P3”) is one of the most commonly used scheduling software programs for complex scheduling. Typically, it shows updated progress in a bar chart format.

The problem with the typical display (Figure 2) is that the progress bars always appear to be “on schedule” because P3 automatically puts the right end of the progress bar on the data dateline, and extends the remaining portion of the bar to the right of the

**FIGURE 2. Progress Bars in Standard Display Format**



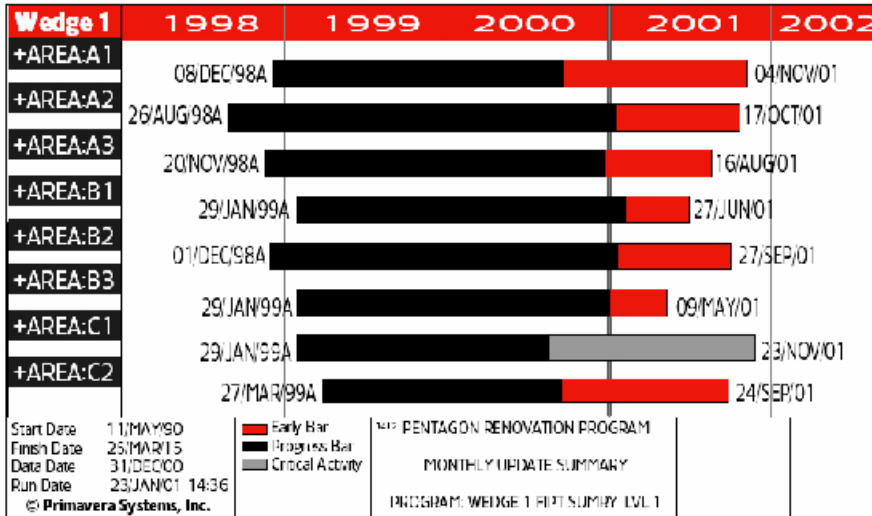
data dateline. Intuitively, it appears as though the progress is right where it ought to be—while in reality it might be behind, on, or ahead of schedule! Only by comparing the current version of the graph to the previous version of the graph would you notice whether the length of the bar to the right of the data date has changed or not.

Because the dark portion (to show progress) of all bars in Figure 2 is on the data dateline, they all appear to be on schedule.

Far more intuitive and useful to those not steeped in the intricacies of P3 is to make adjustments to standard P3 outputs. These adjustments result in the progress bar: ending to the left of the data dateline if the activity is behind schedule, to the right of the data dateline if the activity is ahead of schedule, and on the data dateline only if it is exactly

on schedule. Figure 3 shows progress for the same bars, using the same data as in Figure 2. Now their progress is readily determined.

**FIGURE 3. Progress Bars In Adjusted Display Format**



Those with the dark part of the bar:

— To the left of the dateline are behind schedule (Area: A1, Figure 3)

— On the dateline are on schedule (Area: B3, Figure 3)

— To the right of the dateline are ahead of schedule (example—Area: B1, Figure 3)

**BANANA CURVE**

Typically the contractor's progress is plotted against the early finish curve of a Computer Performance Measurement (CPM), as shown in Figure 4.

Because the progress line is almost always below the early finish line, the contractor almost always appears to be "behind schedule." This can be an unfair assessment—or it could be a valid assessment. There is insufficient information to judge! A better method of graphing the status is to plot both the early finish curve and the late finish curve together. As shown in Figure 5, this forms the so-called "banana curve."

**FIGURE 4. Progress Vs. Early Finish Only**

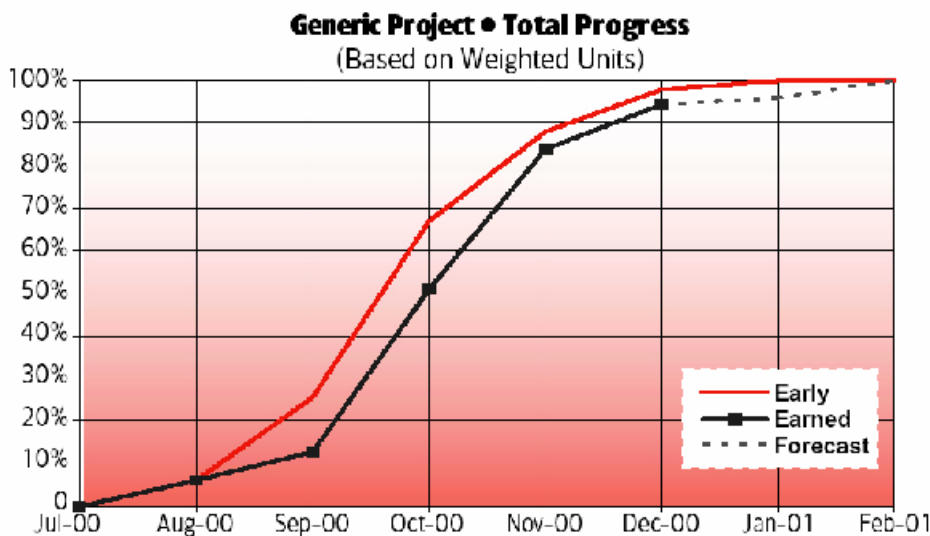
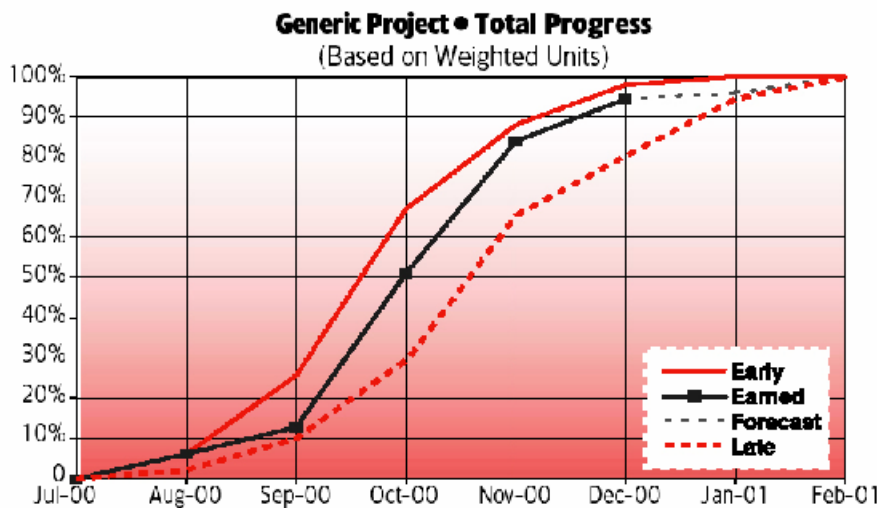


Figure 5 uses the same data as Figure 4. The two curves start and end at the same point. That is, they have the same start and finish dates. If contractors finish by the finish date, they are considered to have finished "on time." In fact, as long as



they are above the late finish curve (the bottom one), they are on schedule. They are “on schedule” as long as they are anywhere within the banana curve. However, if the contractors’ performance puts them below the late finish curve, they must improve their performance if they are to finish on schedule. This graphical representation is easy for everyone to understand, and it instantly communicates both the project’s current schedule status and the trend.

**FIGURE 5. Progress On a Banana Curve (Vs. Early and Late Finish Only)**



The data for the banana curve are readily available for the standard CPM database, and plotting the curves is relatively simple.

**EARNED VALUE ANALYSES**

Much of the analysis of a project using more traditional project controls is from the “rear view mirror.” The data are historical and do little to anticipate problems. It is

axiomatic that the past is prologue to the future, and those who ignore history are condemned to repeat it. However, managers need a better tool for early recognition of problems as well as a good sense of where the project is going, not merely where it has been. If only looking backward, problems are often of such a magnitude when discovered that little time remains to correct them, or they cannot be fully corrected.

Earned value analysis is useful as a “road map,” helping to provide early warning of problems in both cost and schedule. Earned value is essentially a methodology for achieving internal control. It can also be viewed as a performance measurement system. The cost portion of earned value analysis cannot be used on fixed price contracts, since the owner does not know the cost incurred by the contractor. However, in any type of incentive or cost contract, due to the auditing of contractor cost this parameter provides a valuable insight into the financial health of the project for the contractor.

An unhealthy financial status for the contractor is a harbinger of future problems, and the informed owner will want to identify the underlying problems and query the contractor about curing these problems before they lead to claims, work stoppages, and the like. To be effective as an early warning system, there must be regular reporting and periodic verification of the cost reports. Monthly reporting and semiannual or annual auditing are reasonably achievable, and should provide adequate protections.

The power of earned value analysis is in combining both cost and schedule. While a project may be 50 percent complete at the time it is scheduled to be 50 percent complete, still a problem exists if the contract has been overspent for that point in time. Critical path analyses are standard for CPM-scheduled projects. Tracking items on the critical path, as well as changes to the critical path between updates, is very important in understanding the schedule and project. However, these analyses tend to be quite tedious. Using the schedule information already provided, earned value analysis develops information that is readily understandable in ratio and graphic forms. A combination of the schedule and cost data permits the generation of expected cost over time that can be displayed as a curve, with current cost and schedule data plotted against that curve.

The earned value data can also be boiled down into ratios of the earned value divided by the resources expended, or the earned value divided by the scheduled performance. In either case, a ratio above 1.0 is good, and a ratio below 1.0 is bad. These ratios provide a way for the program manager to "triage" the projects, by focusing attention first on those projects that are most in need, without having to first go through a lengthy analysis just to identify the greatest need. Each of these methods permits data on the work completed and the work remaining to be used to predict the completion date and cost within a range of values, and permits management to highlight problems early.

### **COST LOADED (VS. PRICE LOADED) SCHEDULES**

Most of the so-called "cost loaded schedules" in construction are used on fixed price contracts, and cost loading is a misnomer, or at best a confusing term. These schedules are actually "price loaded" from the contractor's point of view, and cost loaded only from the owner's point of view.

With a contract approach that employs reporting of costs being incurred—such as one employing an incentive fee and award fee with no profit on the proposal—a schedule can be developed that truly reflects the cost of the work to the contractor and the owner. The total cost to the owner then is the cost from the cost loaded schedule plus the award fee that replaces proposed profit. The cost loaded schedule is useful in developing the earned value analysis already discussed, and in developing a cost curve over time. The cost curve is useful in predicting cash flow needed by the owner to pay the contractor, and in checking actual costs against budgeted costs.

Similarly, if the CPM is also resource loaded, then a graph of resources (such as manpower) through time can be readily generated and used as a control tool.

### **CONTRACTOR'S CHOICE OF CONTROLS SOFTWARE**

Contractors will react to any solicitation's provisions for a price based on their cost. Were the owner to specify some unusual type of control software, contractors might take a pass on the proposal. More likely they would determine their cost to acquire the new software and train their employees to use it, and pass along substantially all of this cost in their proposal. The specific type of controls software is not very important if it performs the software functions required by the contractor and owner.

The Pentagon Renovation Program team has told the potential proposers on Wedges 2-5 that the program currently uses both Primavera Project Planner and Expedition, which are compatible proprietary products of the same vendor. This software is very well known in the industry, but is not the only software in use by many of the companies of the size and quality that make them eligible to propose on this program.

To reduce unnecessary costs, however, the program permits the successful proposer to determine the type of software to be used by the contractor and program under two conditions. First, the software must perform the functions required. Second, the contractor must provide copies of the software and provide training on the software to the government staff. In this way, the contractor will use software it has already implemented, with which it is familiar and efficient, thereby avoiding delay in the start of project controls development.

In a related action, the contractor also determines what day the monthly reviews will be held. Although the program currently has a day designated for regular program reviews, in the case of the Wedges 2-5 project it will be the largest project in the program and set the pace in several areas. The day selected by the contractor will be a day that is supported by the contractor's existing systems such as corporate accounting.

Each of the potential proposers is a large, experienced constructor and designer. They already have corporate policies that require inputs from all of their projects on certain days each month, and the corporations have the staff to enforce those policies within the corporations. By allowing the contractor to select a date, the owner dramatically increases the probability of current, accurate data being reported monthly by the contractor. If the owner were to specify a date that fell slightly ahead of every other project in the design-build corporation, for example, it would always be an added burden within the corporate structure, and diminish both efficiency and effectiveness. The actual date is usually of no real consequence to the owner, yet can be of real benefit to the project if selected by the contractor.

### **Pentagon Renovation Program – 30 Key Construction Milestones**

The following 30 milestones have been personally selected by the Pentagon Renovation Program Manager as describing those activities key to ensuring success of the program:

- Temporary mechanical, electrical, plumbing complete
- Construction Barriers complete
- Temporary communications complete
- Long-lead items all identified
- Long-lead items all ordered
- Long-lead items all received
- Tenant move-out starts
- Demolition and abatement starts
- Demolition and abatement complete
- Contractor schedule complete
- Critical path analysis completed by contractor
- Tenant surveys start
- Commissioning plan complete
- All tenant requirements completed
- All move-in tenants identified
- All design intent drawings completed
- All furniture requirements identified
- Furniture deliveries start
- Furniture deliveries complete
- Punch list identified
- Punch list completed
- Tenant move-in starts
- All manuals received
- All manuals and operations booklets received
- All required training complete
- All Wedge work complete
- Final contract payment made
- Option exercise period for next Wedge begins
- Bilateral "option out" period ends for next Wedge

## MONTHLY METRICS

The program team has been identifying and tracking metrics for several years, and metrics have been quite useful for identifying trends and rules of thumb. Because of the award fee nature of the program's contracts, many criteria comprise the standards by which the contractor is judged each month and rewarded each quarter. The criteria are given to the contractor in advance. The weighting of the criteria (and sometimes the criteria themselves) change during the life of the project—again, with advance notice to the contractor.

These criteria naturally lend themselves to metrics. The program team attempts to gain insight into, rather than control of, the projects. Likewise, the program team seeks a level of confidence as the project progresses, that the intermediate goals are being met, that the trends are headed in the right direction, and that problems are identified and solved quickly. Hence, they prefer to see the metrics being identified and tracked by the contractor as a means of building confidence that the contractor is, in fact, tracking the critical items and managing the project effectively.

Consequently, the contractor participates in the development of metrics to be used jointly at program reviews. Tracking and graphing the same metrics each month provides useful displays of project trends and leads toward early problem identification. Trend data are far more useful and telling than a single data point.

## MARKET BASKET

The “market basket” approach is a means to handle inflation on a long-term contract—possibly 14 years—by developing an inflation factor through time. The market basket approach has several advantages:

- Precludes negotiations later.
- Fixes the methodology before contract award.
- Fixes the rate for the next option period, using the actual experience during the previous option period.
- Is a mix of labor and material indices that closely match the expected labor and materials to be used in the renovation?
- Uses independent, objective, well-recognized indices.
- Uniquely combines indices for the purpose of this project.

The market basket input, because of its independence, is not subject to manipulation by either side. One of the biggest benefits is avoiding what could be protracted negotiations before exercising the subsequent options due to the potential size of the inflation factor. We believe this approach will truly meet the standard of “fair and reasonable” to both sides. Wedges 2-5 will be proposed as a base plus three sequential options, each for about 3-½ years. The uninflated costs of all options are proposed at

the same time as the base. Once an option is exercised, the proposed cost for that option is increased using the market basket inflation factor.

### **CONTRACTOR OPTION OF NOT EXERCISING SUBSEQUENT OPTIONS**

While not a controls provision, per se, it is important to understand that on Wedges 2-5, as mentioned previously, the successful contractor will be awarded the base contract; three options are equal in scope to the base. Whereas the government usually has the sole right to exercise the options, in this contract the contractor has the right to notify the government, one year before the end of the base or current option period that it elects not to accept further options.

The benefits are twofold: first, a reduction in contingency by the contractor for unknowns over a very long period of time (roughly 14 years for the base plus options); and second, to provide a way out of a potentially adverse relationship over many years if the contractor realizes that it is financially untenable to continue. By providing one year's notice, the government can then go into a re-procurement mode to find a successor in an orderly fashion.

The contractor's reluctance to continue could be because the market basket for some reason is unsatisfactory, or it could be for a number of other reasons. Obviously, the program team would enter into discussions with the contractor to determine what the problems are—if they were not already apparent from the monthly reviews and earned value analyses—and determine if some other cure, short of truncating the contract, could be found. However, this mechanism does provide for a clean and orderly transition if things cannot be satisfactorily resolved with the current contractor.

### **BEST PRACTICES**

The program team has sought to introduce a large number of program control mechanisms, in conjunction with related contract provisions, which align with four important acquisition strategies:

- Provide "insight" rather than oversight.
- Require the contractor to maintain control.
- Give the government ongoing confidence in the contractor's management.
- Result in the lowest reasonable cost for this complex renovation project.

Many of the controls are developed from the same "database"—a cost-loaded and time-scaled CPM schedule—as well as cost reporting. Some of these provisions were implemented on other programs, while others were developed specifically for the Pentagon Renovation Program. This is probably the first project to use all of these tools simultaneously.

We believe that the practices described in this article represent the "best practices" available in the industry today to assist this program. We also believe that they

represent the best hope for bringing in this program, "On Cost, On Schedule, Built for the Next 50 Years."

## CONSTRUCTION UPDATE

Within one week of the Sept. 11 terrorist attacks, the Pentagon Renovation Program awarded three contracts to begin the reconstruction of the damaged areas and to move forward with the renovation program. A \$520-million contract was awarded to AMEC, the Wedge 1 contractor, to begin the immediate structural restoration of Wedge 1 and Wedge 2, including the tenant fit-out in Wedge 1. A \$758-million contract was awarded to Hensel Phelps (HP) Construction to begin design and construction of Wedges 2 through 5; the contract was later modified to allow HP to provide immediate site support during the rescue and recovery effort.

Other letter contracts were awarded to specialty contractors with expertise in historic reconstruction and structural analysis, including KCE, an internationally recognized firm specializing in structural restoration following blast incidents.

The first 40 people have already been moved back into Wedge 1, and the team plans to move many more personnel back in the coming months. Tom Fontana, Information and Communications Team Leader for the Pentagon Renovation Program told Program Manager, "At this point, we do not expect the events of Sept. 11 to impact our overall schedule for completion of the Pentagon in December 2012 our motivation is strong to get the damaged portions of the Pentagon up and running as soon as possible."

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