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CAPITOL VISITOR CENTER

Update on Status of Project's Schedule and Cost As of November 15, 2006

Statement of Bernard L. Ungar, Director
Bradley M. James, Assistant Director
Physical Infrastructure Issues



Mr. Chairman and Members of the Subcommittee:

We are pleased to be here today to assist the Subcommittee in monitoring progress on the Capitol Visitor Center (CVC) project. Our remarks will focus on (1) the Architect of the Capitol's (AOC) construction progress and problems since the Subcommittee's September 21, 2006, hearing and their impact on the project's schedule; and (2) the project's expected cost at completion and funding situation.¹ As part of this discussion, we will address a number of key challenges and risks that continue to face the project as well as actions AOC has recently taken, and plans or needs to take, to meet its currently scheduled completion date.

Our remarks today are based on our review of schedules and financial reports for the CVC project and related records maintained by AOC and its construction management contractor, Gilbane Building Company; our observations on the progress of work at the CVC construction site; and our discussions with the CVC team (AOC and its major CVC contractors), AOC's Chief Fire Marshal, and representatives from the U.S. Capitol Police. We also reviewed AOC's construction management contractor's periodic schedule assessments, potential change order log, and daily reports on the progress of interior wall and floor stonework. We retained a mechanical engineering consulting firm (Kincaid/Bryant) to help us assess the CVC team's progress in completing the project's heating, ventilation, and air-conditioning (HVAC) system. In addition, we reviewed the contract modifications made to date and the estimates of cost increases provided by AOC and its construction management contractor, including their estimates of the costs related to delays,² and their preliminary cost estimates for recent changes to the CVC's fire protection and security systems.

At the Subcommittee's September 21 CVC hearing, we reported that our assessment of the project's schedule and expected cost at completion was somewhat constrained because the CVC team was still analyzing the impact on the project's schedule and cost of the recently identified changes required for certain components of the fire protection and

¹GAO, *Capitol Visitor Center: Update on Status of Project's Schedule and Cost As of September 21, 2006*, [GAO-06-1058T](#) (Washington, D.C.: Sept. 21, 2006).

²The estimates for most of the delay-related costs were provided by AOC and its construction management contractor for budgetary purposes only and do not reflect any judgments by GAO of the validity of any potential contractor claims.

security systems. We also noted that the team expected to have firmer schedule and cost information around mid-October. However, the CVC team did not receive firmer information on the impact of the recent fire alarm system changes on the schedule until late last week, noted some remaining uncertainty about how long the pretesting of the fire alarm system would take, and recently learned of significant changes that would be needed in the security system and in the sequence for bringing the CVC's air handling units online. In addition, the impact of these changes on the project's cost is not yet fully known. Therefore, we could not thoroughly assess the project's schedule or estimated cost at completion and are basing our views on the information available as of November 9, 2006, recognizing that our views could change as more information on the impact of these changes becomes available.

In summary:

Since the Subcommittee's September 21 CVC hearing, the CVC team has continued to move the project's construction forward, but the project's scheduled completion date has slipped by 6 weeks, to October 26, 2007,³ and further delays are possible. The 6-week delay was attributable to problems with the project's most critical activity—the fire protection system. Under the current schedule, the construction of the House and Senate expansions spaces will be completed before the CVC's construction, but both the CVC and the expansion spaces will be available for occupancy at the same time because final acceptance testing of both is slated to be done concurrently.

- During the past month, the CVC team has made progress on the project's HVAC system, interior floor stone and ceiling installation, and other interior and exterior construction work. In addition, AOC sent Congress an action plan for improving its execution of the project and the project's schedule, as the Subcommittee requested and we had recommended, and this plan is responsive to our recommendations. AOC is also considering other action not discussed in this plan.

³This date does not allow time for installing artifacts in the exhibit gallery, preparing for operations, or addressing risks and uncertainties. AOC has allowed another 5 weeks, until November 30, 2007, for installing the artifacts and has not estimated a time frame for operations preparations.

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- Despite this progress, problems have occurred in many important activities besides the CVC's fire protection system, according to AOC's construction management contractor. Although these delays did not add time to the project's schedule this month, additional delays could do so in the future. For example, the completion date for wall stone installation in the East Front basement slipped by 38 workdays since the Subcommittee's last CVC hearing, and an additional 17-workday slippage could delay the CVC project's scheduled completion date. Similarly, work on the HVAC system slipped 19 workdays, and an additional slippage of 46 workdays could delay the project's scheduled completion date. Recently identified issues associated with the CVC's HVAC system, fire protection system, and security system—including issues associated with their coordination and testing—also pose risks to the project's scheduled completion date. In addition, concerns have arisen about AOC's ability to achieve a high-quality, complete, and usable facility within the current estimated time frame and cost now that the contractual date for completing sequence 2 construction work—September 15, 2006—has passed. In particular, there is a risk that, without negative consequences, the resolve of some major stakeholders to complete the project in a timely and efficient manner could be adversely affected. Finally, all the indicators of progress that we have been tracking for the Subcommittee, together with other risks and uncertainties, suggest that the project is likely to finish later than October 2007.

As we said at the Subcommittee's September 21 CVC hearing, AOC will be able to meet or come close to meeting its scheduled project completion date only if the CVC team promptly makes significant improvements in its execution of the project and the project's schedule. It is too early to tell whether the actions identified in AOC's November 2006 action plan will be effective in curtailing additional schedule slippages. Furthermore, the concerns identified since the Subcommittee's last CVC hearing, particularly those related to the CVC's HVAC system, if not quickly addressed, could adversely affect the project's schedule. Thus, until it is clear that AOC's actions are effective in curtailing additional schedule slippages, we believe that the facility is more likely to be completed in early 2008 than in the fall of 2007. To improve AOC's ability to meet its schedule and to reduce the risks to the project's schedule and cost facing AOC now that the contract completion date is past, we are recommending that AOC (1) promptly work with the CVC team to address the concerns associated with the CVC's HVAC system and (2) carefully consider the existing contractual remedies available to achieve completion of all necessary work within the current estimated time frame and cost without otherwise compromising any of the government's contractual rights or remedies.

Since the Subcommittee's September 21 CVC hearing, we have increased our estimate of the total cost to complete the entire CVC project by about \$8 million to account for the delays and changes identified during this period,⁴ but our estimate is rough because we have not had the information or the time needed to fully assess the impact of these delays and changes on the projects' cost. With this \$8 million increase, we now estimate that the total cost of the entire CVC project at completion is likely to be about \$592 million without an allowance for risks and uncertainties, recognizing, however, that the extent of AOC's responsibility for the delay-related costs is uncertain. To date, about \$531 million has been provided for CVC construction. For fiscal year 2007, AOC has requested \$26 million in CVC construction appropriations, plus \$950,000 in AOC general administration appropriations for contractual support to complete acceptance testing of the CVC's fire protection system on schedule. During fiscal year 2007, AOC is also likely to need, but has not yet requested, additional funds to pay for changes. At the Subcommittee's last CVC hearing, we roughly estimated that AOC would need an additional \$5 million to \$10 million in fiscal year 2007 over and above what it had already requested for changes unless it decided to use funds slated for other purposes, after obtaining the necessary congressional approvals. AOC agrees with this rough estimate at this time and notes that it will likely need additional money in fiscal year 2008 to replenish these funds and to cover other costs if they materialize.

Construction Progress Has Not Been Sufficient to Offset Impact of Changes and Delays on the Project's Schedule and Completion

Work on the CVC project has progressed in many areas, but the project completion date has slipped to October 26, 2007, about 6 weeks beyond the September 17, 2007, completion date discussed at the Subcommittee's last CVC hearing. This 6-week slippage is due to continuing problems associated with the CVC's fire protection system, but many other important activities, including those associated with the HVAC system, East Front, and security system, have been delayed as well. Last week, at the request of the Subcommittee and as we had recommended, AOC completed and sent to Congress an action plan for improving management execution of the project and its schedule. The action plan was responsive to our recommendation. However, it is too early to tell whether implementing the plan will curtail the types of schedule slippages that

⁴Our estimate includes delay-related costs that AOC and its construction management contractor estimated for budgetary purposes only. Our inclusion of these costs in our estimate does not reflect any judgments by GAO of the validity of any potential contractor claims.

have occurred since the Subcommittee's last CVC hearing and throughout the project. Moreover, although the CVC team and AOC's Fire Marshal Division have agreed on a number of important elements of the CVC's fire protection system, they have not yet agreed on all important elements. Additionally, as noted, concerns have emerged regarding the CVC's HVAC system, as well as the impact of the passage of the sequence 2 September 15, 2006, contract completion date. Accordingly, priority should be given to accomplishing all of the identified critical tasks so that pretesting of the facility's fire protection system can begin in the spring of 2007. Additionally, to ensure that AOC gets a high-quality, fully functional facility, it is essential that AOC effectively implement the actions it has identified and give careful consideration to existing contractual remedies available to it to achieve completion of all necessary work within the current estimated time frame at a reasonable cost without otherwise compromising any of the government's contractual rights or remedies.

Progress: CVC Team Has Advanced Interior CVC and Other Construction Work and Has Begun to Implement an Action Plan for Strengthening Its Project Management

According to information provided by AOC and its construction management contractor and our observations, work on the project has advanced, in terms of both the dollar value of the work in place and individual project elements. In dollar terms, AOC's construction management contractor reported that, as of October 31, the overall CVC project was about 88 percent complete and the sequence 2 work was about 84 percent complete—up from about 86 percent and 77 percent, respectively, as of the Subcommittee's last CVC hearing. Progress on individual project elements includes the following:

- *Interior CVC work* has moved forward, according to AOC's construction management and sequence 2 contractors. For example, the CVC team and AOC's Fire Marshal Division have reached or nearly reached agreement on the design for several critical elements of the facility's fire protection system. Agreement on these elements is necessary for the system's installation to proceed. In addition, the mechanical subcontractor has completed certain preparations for operating the CVC's air handling units,⁵ all but two of which passed a required test for leaks as of Monday, and the CVC team expects conditioned air to begin flowing to certain parts of the facility later this month. The sequence 2 contractor has also installed about 65 percent of the CVC's floor stone, up from about 43 percent at the time of the Subcommittee's last CVC hearing, and ceiling installation is

⁵Chilled water balancing.

complete or essentially complete in the great hall, south side corridor (lower level), both orientation theaters, and the food service area. (AOC notes that blistered ceiling tile in the orientation theaters will have to be repaired or replaced.)

- *Surface work continued*, including paving and brick gutter work on the Senate plaza. Work on the House connector tunnel and on linking the Library of Congress tunnel with the Jefferson Building has also continued.
- *East Front work continued*, including completion of stone installation on the redesigned archway above the main central staircase from the CVC to the East Front and installation of ductwork and metal stud framework to support wall stone at the rotunda and gallery levels.
- *In the House and Senate expansion spaces*, ceiling close-in inspections, ceiling panel installation, and stone work have continued, and installation of the circular staircase that will connect all three levels of the Senate expansion space has begun.

On November 7, 2006, AOC sent Congress an action plan setting forth a number of steps it has taken, plans to take, or is considering to ensure that the CVC is ready for occupancy in the fall of 2007. AOC developed this plan at the Subcommittee's request in response to recommendations we made to AOC at the Subcommittee's September 21 CVC hearing. These recommendations were aimed at enhancing AOC's execution of the schedule and project and at facilitating the Subcommittee's efforts to (1) hold AOC accountable for managing the project and (2) work with AOC to ensure that the schedule implications of proposed scope or design changes are quickly determined and considered by all appropriate stakeholders before final decisions on the proposed changes are made. AOC's actions included

- meeting weekly with the CVC team to deal exclusively with schedule issues;
- having its construction management contractor identify areas needed to meet the project's schedule that the contractor believes are understaffed or face obstacles to progress;
- identifying sequence 2 and construction management personnel who are responsible for meeting key schedule dates and resolving identified problems;

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- basing the sequence 2 contractor's future award fee on meeting schedule milestones;
 - reassessing the scope, depth, and time frames associated with the pretesting and final testing of the facility's fire and life-safety protection systems;
 - increasing communication among the CVC team, AOC's Fire Marshal Division, and the U.S. Capitol Police; and
 - discussing proposed significant scope or design changes with Capitol Preservation Commission representatives before such proposed changes are adopted and getting the congressional leadership's approval for discretionary changes requested by the Senate or House.

The actions AOC has identified are generally responsive to our recommendations and, if implemented effectively and quickly, should help AOC improve its project and schedule management as well as help ensure that the schedule and cost implications of proposed discretionary design or scope changes are appropriately considered before final decisions on them are made. However, we have concerns about the usefulness of one step AOC is considering—the possible establishment of a CVC peer review panel to assess the approaches planned for the fire protection system's pretesting and final testing. We have expressed our concerns to AOC, and it has agreed to consider them.

Besides the actions it identified in its November 2006 action plan, AOC has been considering how to deal with the impact of passing the sequence 2 contract completion date, September 15, 2006. This is a complex issue, in part because its resolution potentially involves preliminary determinations about the causes of, and responsibility for, project delays during sequence 2 up to September 15. AOC has also been considering other factors, such as the need to instill a sense of urgency and responsibility to meet the contractor's currently established fall 2007 completion time frame; the possibility of setting a specific date as the new contract completion date and the implications associated with alternative dates; the constructive manner in which the sequence 2 contractor has worked with AOC and the rest of the CVC team to accomplish work and resolve problems; and the need to ensure that the work necessary to get the facility completed is done expeditiously at a reasonable cost. We have discussed these issues with AOC and pointed out that it needs to decide how it intends to proceed as quickly as possible and also consider the risks that various options pose. In view of additional schedule slippages that have occurred

and issues that have arisen since the Subcommittee's last CVC hearing, we are making additional recommendations to AOC, which we will discuss later in this testimony.

In addition to the actions identified by AOC, the sequence 2 contractor has reported adding five superintendents to its CVC staff in the last several months to help achieve the schedule. Given the number and magnitude of the changes that have occurred to the sequence 2 contract since it was initially awarded and the extent to which problems have constrained progress, we believe that this additional supervision should put the team in a better position to meet schedule dates and address problems quickly.

Problems: Required Changes to Fire Protection System and Continued Slippages in Other Important Activities Have Extended the Project's Schedule and Completion Date

The additional time needed to make design changes to the CVC's fire protection system has extended the project's completion date by about 6 weeks since the Subcommittee's September 21 CVC hearing—from September 17, 2007, according to the schedule in effect at that time, to October 26, 2007, according to the October 2006 schedule issued last week. In addition, AOC's construction management contractor reported slippages in construction work for all of the 20 near-critical activity paths it identified in its schedule report for October 2006. For many of these activity paths, the schedule slipped at least 4 weeks. For example, the contractor reported a 65-workday delay for two East Front elevators due to late completion of necessary preceding work, a 66-workday delay for fabrication and installation of bronze doors because of fabrication problems experienced by the supplier, a 38-workday delay in ceiling close-ins in the upper level security lobby needed to resolve unexpected ceiling problems, and a 38-workday delay in completing wall stone work in the East Front basement area attributable to unanticipated design issues. The contractor also reported a 130-workday delay in the delivery of custom light fixtures, apparently the result of contractual issues between the sequence 2 contractor and its supplier. According to the construction management contractor, there are now five near-critical activity paths—including the HVAC system, East Front work, and work in the upper level security lobby and assembly rooms, for which additional slippages of 17 to 53 workdays could further delay the CVC's completion date.

Neither the September 17, 2007, nor the October 26, 2007, project completion dates included any time for (1) installing artifacts in the exhibit gallery after a certificate of occupancy has been issued, (2) preparing for operations, or (3) dealing with risks and uncertainties. AOC's October 2006 schedule shows the artifacts installed in the exhibit gallery by November 30, 2007, but does not allow any time for dealing with risks

Problems with the HVAC System

or uncertainties associated with completing the work necessary for a certificate of occupancy, and it is not clear whether the additional time provided for installing the artifacts will be sufficient to prepare for operations.

In work on the CVC's HVAC system, AOC's construction management contractor reported a 19-workday slippage, which the contractor attributed to a steam pipe support problem and a problem at the Capitol Power Plant. As we indicated at the Subcommittee's last CVC hearing, we asked our mechanical engineering consultant to reassess the status of the CVC's air handling units in early November 2006 because the CVC's HVAC system affects many activities, has had a number of problems, and poses significant risks to the project's successful completion. We asked the consultant to compare the units' mechanical readiness to provide conditioned air to the CVC as of November 1 with their readiness as of his previous assessment, on September 6, 2006. On November 1, he found that the installation of controls for the air handling units was nearing completion, substantial work had been done to insulate 7 of the units, and all of the units could be ready on schedule with committed effort by the sequence 2 mechanical subcontractor. He noted, however, that except for pressure and leak testing and controls installation, little visible work had been done on 12 of the units to address the issues he had identified during his September visit. He said he did not see a large number of workers in the air handling unit areas and the work that was being done appeared to be on pipe insulation. Moreover, he saw little coordination between work on completing the air handling units and on the spaces they are to serve, and he noted a number of concerns about the operational readiness of both, indicating that delays in providing conditioned air to the facility and in balancing of the air handling units could potentially delay the project's schedule.

Even though the HVAC system's installation and associated work are progressing, a number of issues besides those observed by our mechanical engineering consultant have arisen since the Subcommittee's last CVC hearing, heightening our concerns about the CVC team's ability to meet its schedule for completing and commissioning the system. Because some of the spaces to be served by the air handling units were not yet ready, the sequence 2 contractor recently decided to change the sequence in which some of the air handling units would be placed in service. However, as of last week, the technical implications of this change had not been fully determined. The commissioning contractor has questioned whether enough people will be available to support the commissioning process

within the scheduled time frames, and, as noted, our mechanical engineering consultant has raised operational readiness concerns. AOC's construction management contractor has also expressed concerns about these issues, and we have raised the issues in a number of CVC team meetings, but the responses have not given us confidence that (1) all the work associated with bringing the air handling units on line and commissioning them has been sufficiently coordinated among the team members; (2) all technical issues and risks associated with fully operating the units have been adequately addressed; and (3) that sufficient staff will be available to meet the scheduled dates.

According to sequence 2 contractor personnel, these types of problems and ongoing schedule adjustments to address day-to-day events are not uncommon in large, complex construction projects. Not all the problems with the air handling units have to be resolved fully before commissioning work can proceed, they said, and air handling units are typically turned on before other work is completed to provide conditioned air for materials that need it. The sequence 2 contractor said it would work with the mechanical subcontractor and other parties to ensure that the HVAC system issues are resolved in a timely manner. Furthermore, according to the contractor personnel, contractual provisions are in place to address providing conditioned air to the CVC while construction work is underway. We understand these points and recognize the progress that has been made. However, in light of the recurring slippages in the HVAC system's schedule, the system's importance to the pretesting and final testing of the facility's fire protection system, and the concerns expressed by AOC's construction management contractor and the commissioning contractor, we believe prompt action is needed to resolve the concerns and ensure that the schedule for completing the HVAC system work is realistic and will be met.

Delays in Completing the Expansion Spaces and the Library of Congress Tunnel

The schedule for essentially completing the construction of the House and Senate expansion spaces (currently scheduled for April 23, 2007) has slipped about 6 weeks since the Subcommittee's last CVC hearing, and several activities important to completing these spaces have also been delayed. For example, AOC's construction management contractor reported another 14-workday delay in completing the circular stairs in the atrium areas. Delays have also occurred in, for example, the installation of the stone arch in the House lower level, because the work is taking longer than expected, and in the installation of millwork in the House lower level, because of fabrication delays. In addition, a special fire suppression system was not installed because it had not been approved. Furthermore, the sequence 2 subcontractor doing the expansion space work identified a

number of concerns that could affect the project's completion. For example, the subcontractor reported that its schedule could be adversely affected if significant scope or design changes continue. Assuming that scope and design changes are controlled, the sequence 2 subcontractor responsible for the expansion space work hopes to recover some of the lost time and essentially complete its construction work in March 2007. In addition, the project's schedule shows that the construction activity (excluding testing) remaining after the April 2007 essential completion date is primarily related to work necessary to complete the circular stair in the House atrium. AOC anticipates that a design change will enable the circular stairs in both the House and the Senate atriums to be completed sooner than currently scheduled.

Finally, although not critical to the CVC's opening, work being done to connect the Library of Congress's Jefferson building to the tunnel linking it with the CVC has fallen more than 3 weeks behind since the Subcommittee's last CVC hearing, according to the construction management contractor, at least in part, because certain stone work has taken longer to install than anticipated. The subcontractor responsible for this work, which is currently scheduled for completion on April 24, 2007, expects to recover lost time and complete the work in March 2007. Furthermore, the construction management and sequence 2 contractors report that, for a number of reasons, the work on the tunnel itself has slipped about 9 ½ weeks beyond the completion date in effect at the Subcommittee's last CVC hearing.

Indicators of Construction Progress Point to Further Delays unless AOC's Project Execution Significantly Improves

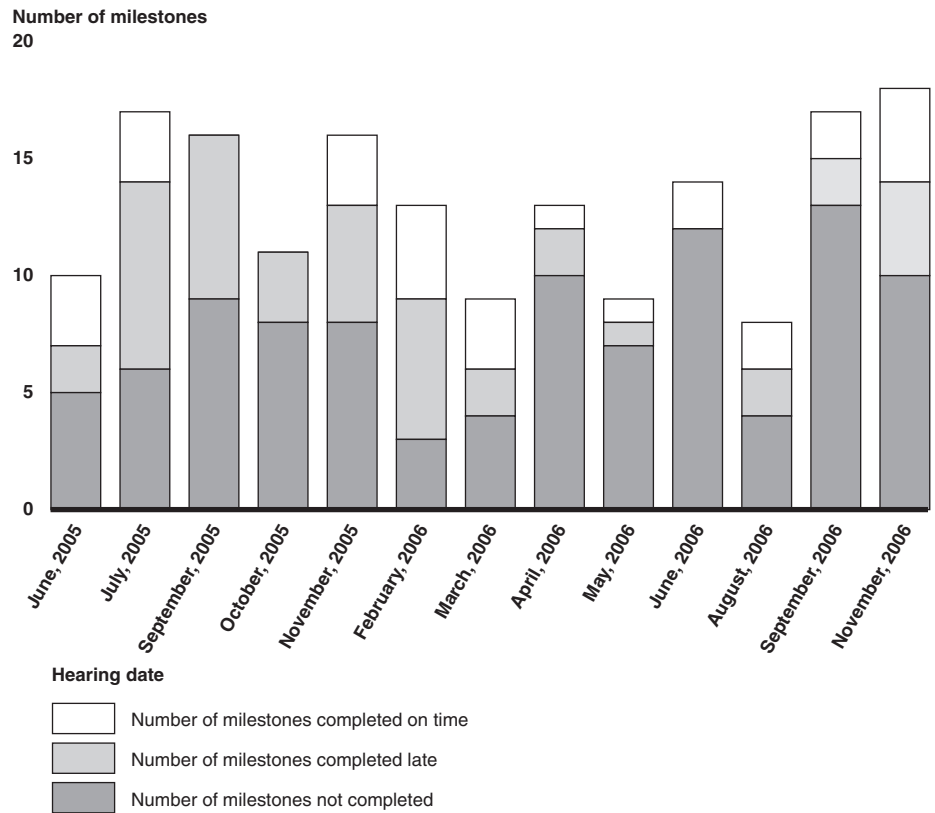
The four indicators of construction progress that we have been tracking for the Subcommittee, together with the risks and uncertainties that continue to face the project—which we will discuss shortly—demonstrate to us that AOC will be unlikely to meet its fall 2007 project completion date unless it significantly improves its project execution. An update on these indicators follows:

Sequence 2 contractor has continued to miss most milestones. Starting with the Subcommittee's June 2005 CVC hearing, at the Subcommittee's request, we and AOC have been selecting and tracking sequence 2 milestones to help the Subcommittee monitor construction progress. These milestones include activities that were either on the project's critical path or that we and AOC believe are critical to the project's timely completion. As figure 1 shows, the sequence 2 contractor has generally missed these milestones. For today's hearing, the contractor met or was expected to meet 4 of the 18 milestones that were due to be completed,

according to the project's September 2006 schedule, and for 1 of these 4, the work was completed ahead of schedule.⁶ However, the contractor was late in completing work for 4 other milestones and had not completed or was not expected to complete the work for the remaining 10 milestones by November 15, 2006. (See app. I.) The sequence 2 contractor attributed the slippages to a number of factors, including design issues and a need to relocate ductwork, add steel support for wall stone, and resequence work.

⁶As of November 14, AOC's sequence 2 and construction management contractors expected that work associated with three tracked milestones would be completed today. We therefore counted them as completed today. We did not have the opportunity to verify the completion of these activities before we submitted our prepared statement to the Subcommittee for today's hearing. We did not count as completed activities that the sequence 2 contractor believed were completed that were not confirmed as such by the construction management contractor.

Figure 1: Sequence 2 Contractor's Progress in Meeting Selected Milestones as of CVC Hearing Dates

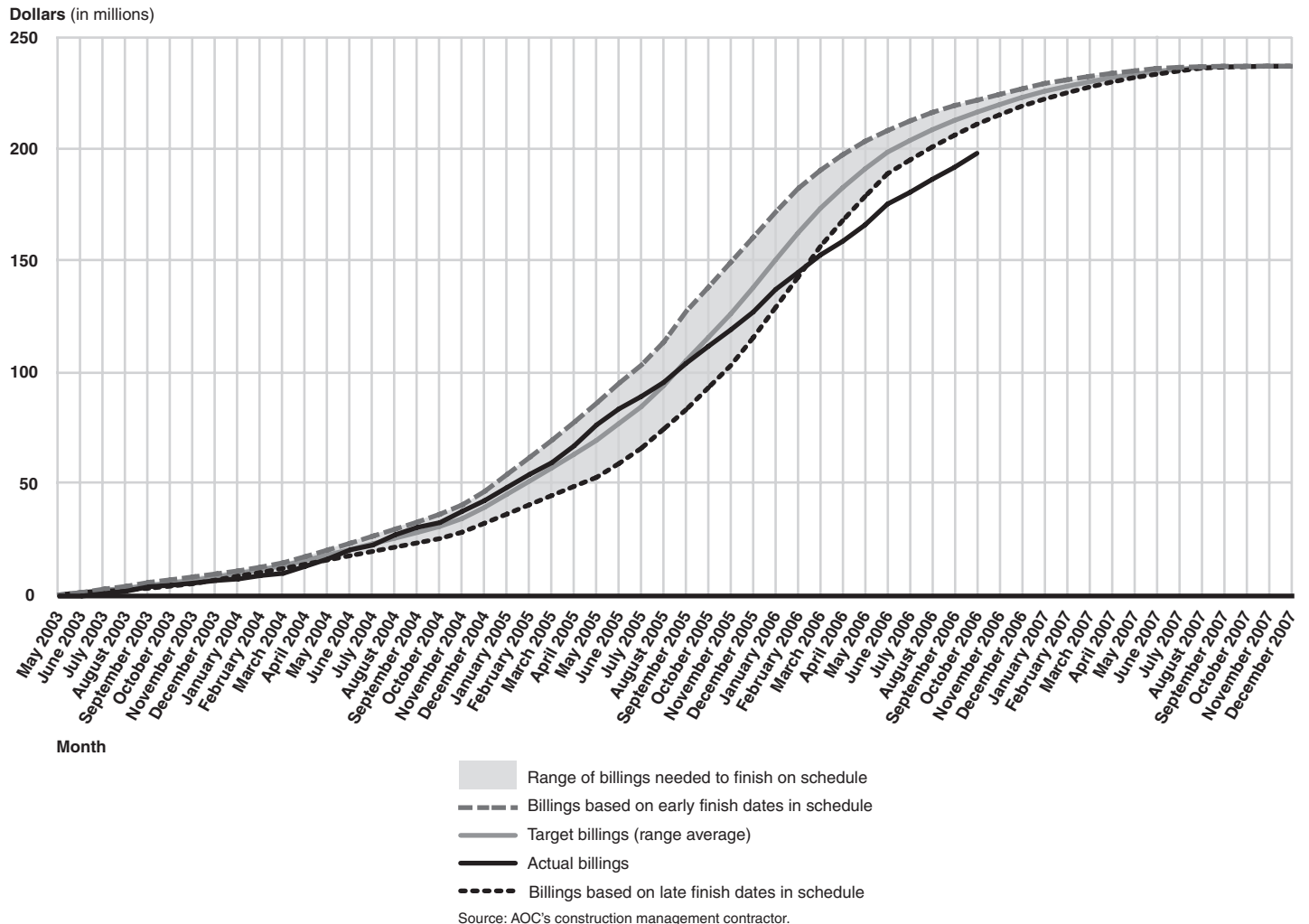


Source: Sequence 2 contractor, AOC and its construction management contractor, and GAO.

Value of completed work has increased since the last hearing, but trend reflects the sequence 2 contractor's difficulties in meeting scheduled completion dates. Another indicator of construction progress that we and AOC's construction management contractor have been tracking is the value of the completed construction work billed to the government each month. Overall, the sequence 2 contractor's monthly billings, including the bills for March through October 2006, indicate that construction work is about 2 months behind the late finish curve, which indicates completion around November 2007. While this indicator has some limitations (for example, billings lag behind construction), it is generally regarded in the construction industry as a useful measure of how likely a project is to be completed on time. Figure 2 compares the sequence 2 contractor's billings since May 2003 with the billings needed to complete construction work on

schedule and suggests that AOC faces challenges in meeting its fall 2007 completion date and is more likely to complete the facility later than its current schedule shows.

Figure 2: Total Billings by the Sequence 2 Contractor for the Entire CVC Project Compared with the Billings Needed to Finish Construction Work on Schedule



Notes:

1. The early and late lines on this figure reflect the cumulative billings that would be required to complete the project through contract modification number 144 (\$237.5 million total contact value) by the early and late finish dates shown in the sequence 2 contractor's schedule, which is based on the September 2006 contractual completion date.
2. The actual line reflects the sequence 2 contractor's actual monthly billings.

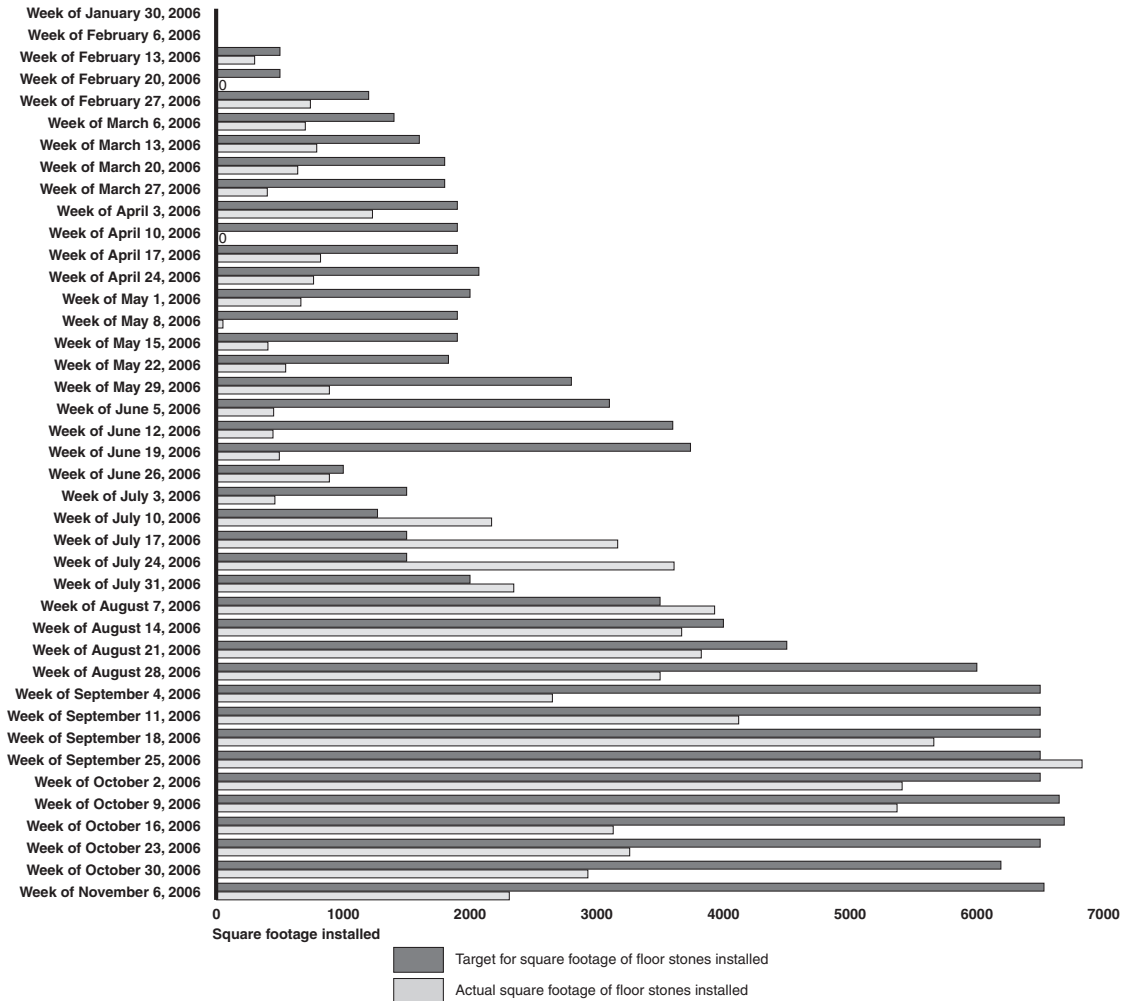
3. Although bills are typically submitted for payment after work is completed, it is often likely that construction work will be completed on schedule when the actual billing line falls between the early and the late lines in the figure. For the CVC, the actual billing line has been trending below, and in March 2006 went below, the late finish line, where it remained through October 2006. Even with the lag in billings, this trend indicates that the amount of work being completed and billed each month is not sufficient to keep the project on schedule.

Installation of interior wall and floor stone is taking longer than expected. Overall, about 86 percent of the CVC's interior wall stone has been installed (in the CVC, East Front, atrium areas, and tunnels), according to AOC's construction management contractor, and the sequence 2 contractor installed nearly 85,000 of the 129,780 square feet of interior floor stone required as of November 9. Although the sequence 2 contractor has installed almost all of the wall stone in the CVC itself and all of the wall stone in the atrium areas, wall stone installation in the East Front is significantly behind schedule. According to the sequence 2 contractor's January 2006 wall stone installation schedule, the East Front wall stone was to be completely installed by July 10, 2006. As of November 10, about 4,700 pieces of wall stone remained to be installed in the East Front—the same quantity as we reported at the Subcommittee's last CVC hearing. During the 8 weeks since that hearing, the sequence 2 contractor installed about 34,900 square feet of interior floor stone, or about 65 percent of the 52,060 square feet specified in the floor stone installation plan that the contractor had previously provided to AOC. According to the construction management contractor, the sequence 2 contractor's installation of interior floor stone has been impeded by a lack of available space and by some work taking longer than expected.

Figure 3 shows the sequence 2 contractor's progress in installing interior floor stone since February 13, 2006.⁷

⁷Our statement no longer includes a figure comparing actual to targeted wall stone installation because all targeted quantities were to have been installed by August 7, 2006, according to the sequence 2 contractor's January 2006 installation plan.

Figure 3: Progress of CVC Interior Floor Stone Installation Compared with Preliminary Targets Set by the Sequence 2 Contractor



Project's Schedule Remains Vulnerable to Challenges, Risks, and Uncertainties

As we have indicated during the Subcommittee's previous CVC hearings, we believe that the CVC team continues to face challenges, risks, and uncertainties in quickly completing the project. Given the project's history of delays, the difficulties the CVC team has encountered in quickly resolving problems that arise, and the large number of near-critical activities that can affect the project's overall completion, the CVC team's efforts to identify potential problems early and resolve issues quickly will

be even more important from this point forward, because AOC has left no “slack” in the schedule for contingencies. In our view, the remaining work associated with the fire protection and HVAC systems poses the greatest risks to meeting AOC’s fall 2007 project completion date. The steps AOC has taken to mitigate these risks have been helpful, but much work remains to be done on these systems and on their linkages with other building systems. In addition, the project continues to face risks and uncertainties associated with other work important to its completion, such as the East Front, and additional design or scope changes. The project’s current schedule does not provide the 2 to 3 months that a previous schedule allowed for addressing ongoing challenges, risks, and uncertainties. Accordingly, we plan to continue to monitor the CVC team’s efforts to meet its schedule for the fire protection, HVAC, security, and other building systems and other key near-critical activities as well as the timeliness of the actions taken by the CVC team to address problems, concerns, and questions that arise. A brief update follows on the challenges, risks, and uncertainties the CVC team continues to face and the team’s plans for addressing them:

- *Complex building systems remain a significant risk.* The CVC will house complex building systems, including HVAC, fire protection, and security systems. These systems not only have to perform well individually, but their operation also has to be integrated. If the CVC team encounters any significant problems with them, either separately or together, during the resolution of design issues, installation, commissioning, or testing, the project could be seriously delayed. The unanticipated problems that emerged in reviewing the design of the fire alarm system and in programming it illustrate the impact such problems can have on the project’s schedule. AOC’s Fire Marshal Division and the CVC team have recently made considerable progress in reaching agreement on the design of a number of important elements of the CVC’s fire protection system that are important to the purchasing and installation of wiring and equipment. As of November 13, the Fire Marshal Division had approved or essentially agreed to the designs of the sprinkler, smoke control, and emergency public address systems as well as most aspects of the CVC’s and East Front’s fire alarm systems that are related to the ordering and installation of wiring and equipment. According to the Fire Marshal Division, any outstanding comments on these system elements are minor. On the other hand, agreement has not yet been reached on a number of other system elements, including the sequence of operations for the CVC fire alarm system, the design for the special fire protection system in the exhibit gallery, and the plan for final acceptance testing of the facility’s fire protection system. A sequence 2 subcontractor has identified dates by which certain elements must be approved to avoid further delays. Thus,

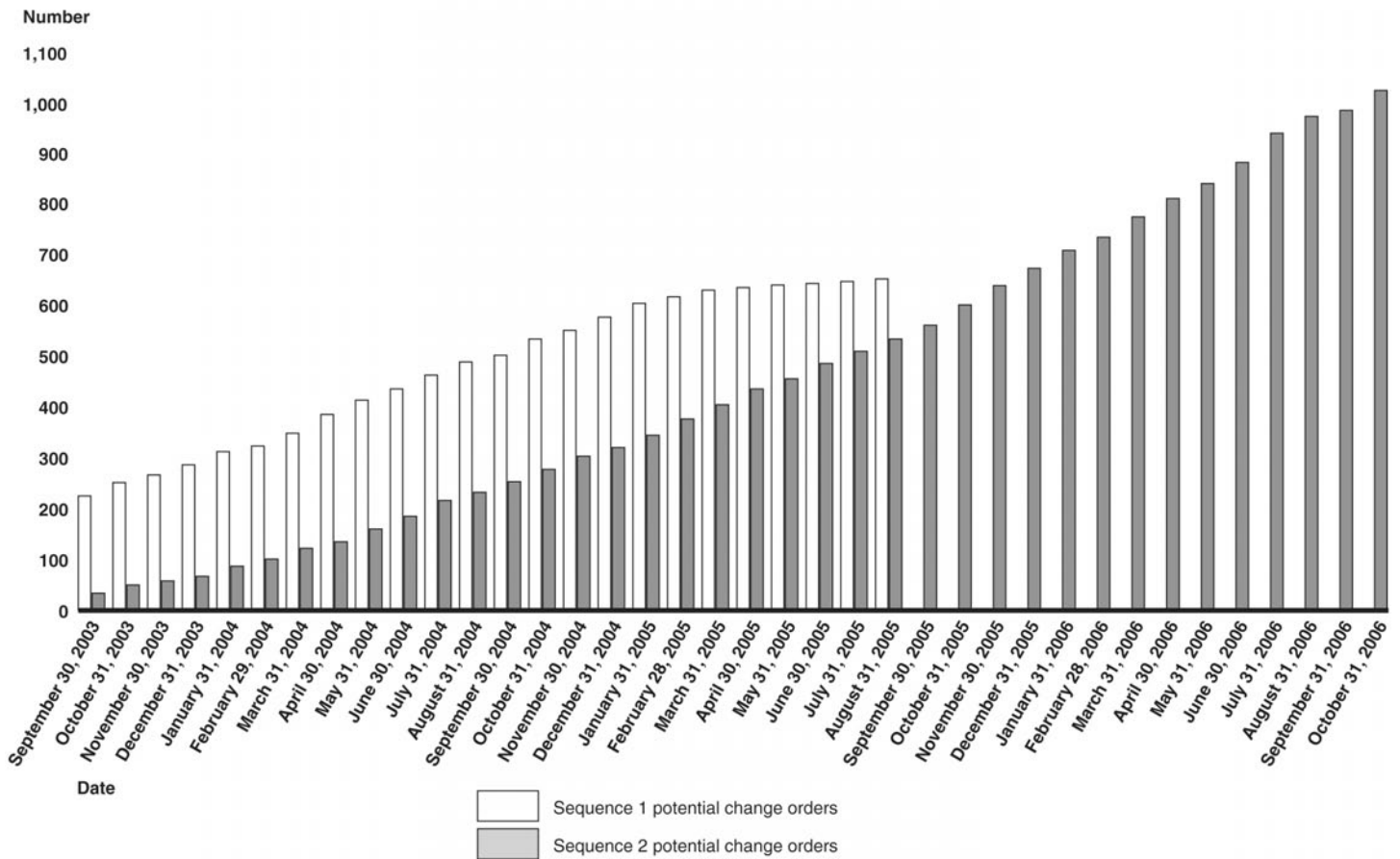
additional delays could occur if the team takes longer than expected to get necessary remaining approvals or if the fire protection system does not work effectively individually or in concert with the security or other building systems.⁸ It is because of constraints such as these that we believe it is so important to address open issues associated with the HVAC system and to continue coordination with the U.S. Capitol Police on the security system. Since the Subcommittee's last CVC hearing, the Capitol Police have identified another security problem that will require additional work. The impact of this work, if any, had not been determined as of November 9.

- *Building design and work scope continue to evolve.* The CVC has undergone a number of design and work scope changes. Since September 15, 2006, AOC's architectural contractor has issued five design changes or clarifications. As of November 8, 2006, this contractor reported, another four were in process. In addition, since the project began, AOC has executed over 100 sequence 2 contract modifications for work that was not anticipated.⁹ Some of these changes, such as changes in the exhibit gallery and in the East Front, have resulted in delays. Furthermore, although shop drawings have been approved for almost all project elements, according to AOC, further design or scope changes in various project elements are likely, given the project's experience to date. Project design and scope changes are typically reflected in the development of potential change orders (PCO), many of which result in contract modifications. Figure 4 shows the PCOs submitted for consideration for sequences 1 and 2 since September 2003. Although PCOs are not always approved, they are often regarded as a reasonably good indicator of likely future design or scope changes that can affect a project's cost and schedule. Even more important, the adverse impact of scope and design changes on a project's schedule is likely to increase as the project moves toward completion.

⁸According to the sequence 2 subcontractor that is fitting out the House and Senate expansion spaces, the delays in getting approved shop drawings for the fire protection system have already postponed ceiling close-ins in the expansion spaces, and AOC believes that further such delays, along with possible requests for design changes, pose the greatest risks to the schedule for completing the expansion spaces.

⁹These data exclude sequence 2 contract modifications for work that was planned but not included in the sequence 2 base contract. Examples include the fit-out of the House and Senate expansion spaces, the construction of the utility tunnel, and the purchase and installation of food service equipment.

Figure 4: Cumulative Number of Potential Change Orders Submitted for CVC Sequences 1 and 2 between September 2003 and November 2006



Source: AOC's construction management contractor.

As the figure indicates, new PCOs for sequence 1 were submitted until shortly before, and even for several months after, November 2004, when AOC determined that the sequence 1 contract work was substantially complete. Similarly, PCOs for sequence 2 are still being submitted, and we have seen no indication that their submission is likely to stop soon. It therefore appears likely to us that some of the design or scope changes indicated in PCOs could lead to contract modifications that will affect the project's schedule. AOC agrees that it is important to minimize the impact of proposed design and scope changes.

-
- *Trade stacking could delay completion.*¹⁰ As we discussed during the Subcommittee's previous CVC hearings, trade stacking could hold up finish work, such as drywall or ceiling installation, electrical and plumbing work, plastering, or floor stone installation. This work could be stacked because of delays in wall stone installation. Trade stacking could also increase the risk of accidents and injuries. Hence, it remains important, as we said at previous CVC hearings, for the CVC team to closely monitor construction to identify potential trade stacking and promptly take steps to address it. The CVC team has also identified trade stacking as a high risk. The sequence 2 contractor has developed plans that show when various subcontractors will be working in various areas of the CVC. According to the sequence 2 contractor, it has been continuing to meet regularly with its subcontractors to identify and resolve potential issues. The CVC team identified instances of trade stacking that occurred in an effort to expedite certain East Front work and in doing millwork and stone work in the orientation theaters. AOC's construction management contractor has noted trade stacking as a potential issue associated with the compressed time frame for bringing all of the air handling units on line.
 - *Additional delays associated with the CVC's new utility tunnel have resulted, or could result, in additional work or slippages.* The delay in starting up the utility tunnel's operations has necessitated the use of temporary humidity control equipment for several areas to avoid damage to finish work and ceiling tile. Such delays may subject certain work to the risk of damage or may delay finish or ceiling work in areas not suitable for the use of temporary humidity and temperature control equipment. For example, the CVC team installed ceiling tile in portions of the great hall to take advantage of the scaffolding in place, even though neither the temperature nor the humidity was controlled in that area. According to the CVC team, the installed tile could be damaged if the temperature or humidity is not within specified levels, and certain exhibit gallery woodwork has been delayed because conditioned air has not been available. Although the CVC team expected in early August to be providing dehumidified air to the exhibit gallery by mid-August, the sequence 2 contractor now expects to begin providing conditioned air to the CVC later this month. However, as noted, the contractor has resequenced the order for bringing some air handling units on line because some spaces—

¹⁰Trade stacking can occur when workers from different trades, such as stone masons, electricians, plumbers, or plasterers, have to work in the same area at the same time to meet a schedule, sometimes making it difficult to ensure sufficient space and resources for concurrent work.

including the exhibit gallery, which was slated to receive conditioned air first—were not clean enough for the units to operate. The air handling unit serving the exhibit gallery is now expected to come on line early in December. Remaining risks include having sufficient manpower to meet the scheduled dates for getting the HVAC system fully operational, having sufficiently clean spaces, and being able to quickly overcome any problems that may arise in getting the system properly balanced, controlled, and commissioned, including providing enough manpower without causing trade stacking.

- *Late identification or slow resolution of problems or issues could delay completion.* Historically, the project has experienced or been at risk of experiencing some delays resulting from slow decision-making. In addition, some CVC team members believe that some of the problems that have resulted in delays, such as certain problems associated with the East Front or with problematic sequence 1 concrete work could have been identified and addressed earlier than they were. In responding to these comments, the sequence 2 contractor said that although earlier identification of these types of problems is conceptually possible, it is difficult in practice. Looking forward, we do not believe that the team will be able to meet its scheduled completion date if it does not quickly decide on issues; respond to concerns, questions, and submittals; or resolve problems. In September 2006, AOC told the CVC team that starting October 1, the architectural contractor would be decreasing its staff support to the project. In our opinion, this change increased the risk of slow responses to design questions or requests for design instructions at a very critical time, particularly because we have not seen evidence of a decrease in potential change orders. AOC believes that it will be able to provide its CVC construction contractors with sufficient architectural support to respond to appropriate questions or requests in time to avoid delays. We believe that this situation needs close monitoring as well as corrective action if problems arise. AOC has not reported any problems in this area since the last CVC hearing, and has identified steps in its November 2006 action plan aimed at identifying and resolving design problems quickly.

Finally, as we noted earlier in our testimony today, AOC's delay analysis is even more critical given the passage of the sequence 2 September 15, 2006, contract completion date and the need to obtain a complete facility without further delays and unreasonable costs, including delay-related costs. On April 11, 2006, AOC executed a contract modification authorizing its construction management contractor to have one of its managers who has not been involved in the CVC project assess the adequacy of this type of information. The manager submitted his report to AOC in early June. He

reported generally positive findings but also identified desired improvements. He made several recommendations to AOC, which AOC has generally agreed with and plans to implement consistent with the availability of resources.

Project's New Schedule Appears Achievable Only under Certain Conditions

The October project schedule shows that almost all physical construction work on the CVC, the East Front, and the expansion spaces will be completed by spring 2007 and that the pretesting and final testing of all fire protection, life safety, and related systems for these areas will be carried out between then and late October 2007. This schedule reflects the amount of time that AOC's Chief Fire Marshal said he would need to perform his acceptance testing, although the CVC team is working to see if certain aspects of the testing can be done differently to save some time. The October 2006 schedule also calls for completing the installation of artifacts in the exhibit gallery by November 30, 2007. However, this schedule does not allow any time for addressing problems, risks, or uncertainties associated with obtaining a certificate of occupancy or for preparing for operations.

Given the uncertainty about how much time will be needed to pretest the fire protection system, the concerns associated with the HVAC system, the unknown effectiveness of AOC's recently identified actions to curtail future schedule slippages, and the limited amount of time we had to assess the October project schedule, we do not feel that we are in position to suggest a definitive project completion date. However, in light of the work we have done, we do not believe AOC will be able to complete the project by fall 2007 if the actions it has identified are not effective in curtailing future schedule slippages. Thus, until we see that AOC has satisfactorily addressed our schedule-related concerns, we believe that the project is more likely to be completed in early 2008 rather than in the fall of 2007.

Recommendations

To minimize the risks associated with the CVC's HVAC system and the government's ability to get the CVC completed within the current schedule and cost estimates and to give Congress and us greater confidence in the CVC team's project schedules from this point forward, we recommend that the Architect of the Capitol promptly take the following two actions:

- Work with the rest of the CVC team to ensure that the schedule for completing and commissioning the HVAC system is realistic, that all the work necessary for the proper and safe functioning of the HVAC system—including work in the spaces the air handling units are to serve—is

completed in a timely, well-coordinated manner, and that sufficient resources will be available to meet the schedule without creating a trade-stacking problem.

- Carefully consider the contractual remedies available to AOC to complete all tasks that must precede the start and completion of final acceptance testing of the CVC's fire protection and life safety systems within the time necessary to meet the estimated fall 2007 project completion time frame.

AOC generally agreed with our recommendations.

Project's Estimated Cost and Funding

Since the Subcommittee's September 21 CVC hearing, we have added about \$8 million to our estimate of the total cost of the CVC project at completion.¹¹ This increase reflects a rough estimate of the impact on the project's cost of the 6-week delay associated with the fire protection system and other scope and design changes identified during the past 8 weeks; however, the actual costs for changes are not yet known, and we have not had sufficient time to fully assess the CVC team's cost estimates incorporated in our estimate.¹² With this approximately \$8 million increase, we now estimate, on the basis of our limited review, that the total cost of the entire CVC project at completion is likely to be about \$592 million without an allowance for risks and uncertainties. We nevertheless recognize that the project continues to face a number of uncertainties, including uncertainty over the extent of AOC's responsibility for the delay-related costs. (We have not updated our estimate of the project's cost at completion with an allowance for risks and uncertainties.)

To date, about \$531 million has been provided for CVC construction. This amount includes about \$3.9 million that was made available for either CVC

¹¹At the Subcommittee's September 21 CVC hearing, we estimated that the total cost of the entire CVC project at completion was likely to be about \$584 million without an allowance for risks and uncertainties and about \$596 million with such an allowance—increases of \$28 million and \$12 million, respectively, over our previous estimates. We also pointed out that a number of uncertainties, such as the possibility of further delays associated with the CVC's fire alarm system, could affect our estimates.

¹²AOC estimated the additional delay-related costs for budgetary purposes only and did not provide for possible concurrent delays.

construction or operations¹³ and has been approved for CVC construction by the House and Senate Committees on Appropriations. An earlier cost-to-complete estimate, prepared for the Subcommittee's March 2006 CVC hearing, showed that another \$26 million in construction funds would be necessary to reach the previous cost estimate of \$556 million, which did not include an allowance for risks and uncertainties. AOC has requested this additional \$26 million in its fiscal year 2007 budget for CVC construction. AOC has also requested \$950,000 in fiscal year 2007 general administration appropriation funds to provide contractual support for the Chief Fire Marshal's final acceptance testing of the CVC. During fiscal year 2007, AOC is also likely to need, but has not yet requested, additional funds to pay for changes. At the Subcommittee's last CVC hearing, we roughly estimated that AOC would need an additional \$5 million to \$10 million in fiscal year 2007 for changes unless it decides to use funds slated for other purposes, after obtaining the necessary congressional approvals. AOC agrees with this rough estimate at this time and notes that it would likely need additional funding in fiscal year 2008 to replenish these funds and to cover certain additional costs if they materialize.

Mr. Chairman, this completes our prepared statement. We would be pleased to answer any questions that you or Members of the Subcommittee may have.

Contacts and Acknowledgments

For further information about this testimony, please contact Bernard Ungar at (202) 512-4232 or Terrell Dorn at (202) 512-6923. Other key contributors to this testimony include Shirley Abel, John Craig, Maria

¹³Public Law 108-447, enacted on December 8, 2004, provided that up to \$10.6 million (reduced to \$10.5 million by a subsequent budget rescission of \$84,000) could be transferred from AOC's Capitol Building appropriation account for the use of the CVC project. The use of the amount transferred is subject to the approval of the House and Senate Committees on Appropriations. AOC has now received approval to obligate the entire \$10.5 million.

Edelstein, Elizabeth Eisenstadt, Jeanette Franzel, Jackie Hamilton,
Bradley James, Joshua Ormond, and Scott Riback.

Appendix I: Capitol Visitor Center Critical Construction Milestones September-November 2006

Activity	Location	Scheduled completion	Actual completion
Install wood ceiling panels	Orientation Theater	10/13/2006	10/24/2006 ^a
CONOP matrix	Fire alarm system	10/30/2006	^b
Flush steam piping	HVAC Steam	10/23/2006	10/31/2006
Relocate kitchen exhaust duct	Food Service	10/23/2006	^c
Set cab shell/ control panel	Elevator VC # 17 East Front	10/25/2006	^d
Dismantle scaffold	Orientation Theater	10/27/2006	10/24/2006 ^e
Finish paint	Food Service	10/30/2006	11/6/2006 ^f
Ceiling fabric	Congressional Auditorium	10/30/2006	11/15/2006 ^g
Plaster Ceilings	West Lobby & Assembly	10/31/2006	^h
Install marble wall stone 1st Third	Exhibit Gallery	11/7/2006	ⁱ
Resubmit Riser Diagram	Fire alarm system	11/9/2006	11/9/2006
Wall stone Area #1	East Front Principal	11/10/2006	^j
Interior cab finishes	Elevator VC # 12 Orientation Theater	11/10/2006	^d
Fabric Ceiling Panels	West Lobby & Assembly	11/14/2006	^k
Hang Drywall Bulkheads	Orientation Lobby	11/14/2006	^l
Mechanically Ready	Great Hall AHU # 3 & 16	11/15/2006	11/15/2006 ^m
Floor stone	Orientation Lobby	11/15/2006	11/15/2006 ⁿ
Wood wall panels	Congressional Auditorium	11/15/2006	^o

Source: AOC's September 2006 CVC sequence 2 construction schedule for the scheduled completion dates and AOC and its construction management contractor for the actual completion dates.

Note: Reasons for delay, as provided by the sequence 2 contractor, and explanations, as provided by the sequence 2 contractor and GAO, are listed in the following notes:

^aWhile the ceiling has been completed, the blistered panels will need to be repaired or replaced.

^bContinuing efforts are being made to understand and develop the sequence of operations (CONOP) matrix requirements. The matrix must be approved by December 8, 2006, to avoid an impact on the critical path.

^cEnough of the ductwork has been relocated to allow hood installation to begin. Currently three of the six hoods have been installed. The balance of hood installation is scheduled to be complete by November 24, 2006.

^dControl panels are set and operational. This activity included setting cab shells without finishes. The cab vendor decided to prefinish the cabs rather than to finish the shells on site. Finished cabs are on site and preparations are being made for installation this week.

^eWhile the scaffold for ceiling installation has been removed, scaffolding has been erected along the walls in the south theater to install wood panels. This scaffolding will affect installation of the stone stair steps.

^fThis work is essentially completed.

^gCeiling panel installation began on November 9, 2006.

^hPlaster ceilings have been completed in the main lobby area and south assembly room. Hanging of the north assembly room ceiling began on November 7, 2006.

^lInstallation of the unistrut framing was delayed because of structural design concerns. Additional cross bracing was added to stiffen the assembly. Wall stone installation is to begin this week.

^jThe work has been delayed because structural steel was added to support the metal stud wall at the east side of stair #37. Upon the completion of metal stud wall, the stone work is scheduled to begin. The revised start date for wall stone on the principal level is November 30, 2006.

^kFabric ceiling panel installation has been delayed because of delays in necessary preceding East Front work—completion of the East Front archway stone, ceilings, and escalator installation. Installation of the fabric panel currently cannot be completed until the escalator trusses are set to clear the floor area. Setting of the trusses is currently projected to be completed by the end of January 2007.

^lBecause of above-ceiling conflicts, the work was resequenced to allow the floor stone installation to proceed ahead of the ceiling work. Hanging of bulkheads started in the south screening area on November 2, 2006 and is expected to be completed in November 2006.

^mMechanically ready priorities have been resequenced. AHU #1 has been switched with AHUs #3 and 16, which are now scheduled for November 15, 2006. AOC's construction management contractor believes that this activity is essentially complete. AHU #1 is now scheduled for December 6, 2006.

ⁿThe sequence 2 and construction management contractors expect this work to be essentially completed by close of business today.

^oThe start of wood panel installation is pending humidity control within the space.

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