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CAPITOL VISITOR CENTER

Update on Status of Project's Schedule and Cost As of September 21, 2006

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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) progress in achieving selected project milestones and in managing the project's schedule since the Subcommittee's August 2, 2006, hearing on the project; (2) our assessment of the project's currently scheduled completion date; and (3) an update on 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 we believe that AOC will need 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 consulting engineering 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. Our assessment was somewhat constrained because the CVC team is 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 security systems. The team expects to have firmer schedule and cost information around mid-October, at which time we may have to

¹GAO, *Capitol Visitor Center: Update on Status of Project's Schedule and Cost as of August 2, 2006*, [GAO-06-828T](#) (Washington, D.C.: Aug. 2, 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.

revise our estimates if this later information differs significantly from the current information.

In summary:

- Since the Subcommittee's August 2 CVC hearing, the CVC team has continued to move the project's construction forward, but the project's overall targeted completion date has slipped significantly. The schedule for the project's most critical activity—the fire protection system—has slipped about 4 months, bringing the new targeted overall completion date to mid-September 2007, and other important activities have also been significantly delayed. Unlike the previous CVC schedule, the new schedule (1) does not allow any time to address problems that may arise or to prepare for operations after a certificate of occupancy has been issued; (2) assumes that AOC will be able to bring exhibits into the CVC before a certificate of occupancy has been issued; and (3) provides for opening the CVC and the House and Senate expansion spaces at the same time. It is not yet clear to us whether the need for time to prepare for operations or for a certificate of occupancy to receive the exhibits will affect the facility's opening date, but these factors should not delay the completion of construction.
- During the past month, work on the project has progressed in a number of areas. For example, the sequence 2 contractor expects to have dehumidified air in the exhibit gallery by around mid-October. In addition, critical interior floor stone installation has continued, together with other interior and exterior construction work. Almost all of the interior wall stone for the CVC itself (excluding the East Front and the tunnels) is now installed.
- A number of problems have developed in connection with the CVC's fire protection system, which is the principal cause of the completion date's slippage and continues to be the single greatest source of risk to meeting the project's new scheduled completion dates. Although the CVC team has worked closely with AOC's Chief Fire Marshal and has made substantial progress in resolving issues, the resolution, along with necessary changes to certain security system-related components, has resulted in a need for significant additional work. The CVC team based its mid-September 2007 project completion date on its preliminary estimate of the time needed to do this additional work. Although the team believes that the time it added to the schedule should be sufficient, it will not make a definitive determination until it completes its analysis of the required changes, which it expects to do by mid-October.

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- Several other activities important to the CVC's completion, such as the HVAC system's installation and East Front work, have been delayed since the Subcommittee's last CVC hearing—an outcome anticipated by our assessment of the CVC team's performance against the indicators of progress that we and the Subcommittee have been tracking. For example, during the last 7 weeks, the sequence 2 contractor did not meet its overall target for interior floor stone installation and continued to experience delays in installing wall stone in the East Front. In addition, the sequence 2 contractor met only 2 of the 17 milestones that we have been tracking for this hearing. The project continues to face risks and uncertainties, such as getting its complex building systems to function together as well as separately and trade stacking.³

According to our assessment of the project's new schedule, the revised completion date is achievable if the CVC team confirms that it has added enough time to the schedule to make the necessary changes to the fire protection and security system components and **if, and only if, the team promptly makes significant improvements in its execution of the project and its schedule.** To facilitate such changes, we are recommending that AOC develop and submit to Congress an action plan as soon as possible, but no later than mid-October 2006, setting forth the specific steps it will take to meet its scheduled completion dates. We are identifying specific actions that we believe AOC should consider in developing this plan, including, for example, (1) making more aggressive, visible, and focused efforts to keep the work on schedule, with particular emphasis on critical and key near-critical activities; (2) making sure sufficient work is performed to meet the scheduled dates and quickly identifying and addressing problems that arise; and (3) promptly responding to design questions and concerns and requests for design instructions and clarifications. AOC generally agreed with our recommendation. AOC's prompt development and effective implementation of this action plan is critical because the construction work that has to be done in the next 3 to 4 months is a prerequisite to other work that is essential to the CVC's completion, including the CVC team's pretesting of the fire protection system and the Chief Fire Marshal final acceptance testing of the CVC. In addition, Congress can use this plan as a mechanism for holding AOC accountable for managing the project

³Trade 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.

and as a vehicle for working closely with AOC to ensure that the schedule implications of all proposed scope or design changes are quickly determined and considered by all appropriate stakeholders before final decisions on the proposed changes are made.

We previously estimated that the total cost to complete the entire CVC project would be about \$556 million without an allowance for risks and uncertainties and \$584 million with such an allowance. Our updated assessment indicates that the estimated cost of the entire CVC project at completion is 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. Delay-related costs (which AOC and its construction management contractor have estimated for budgetary purposes only) are the largest component of the increase, followed by the additional costs estimated by the CVC team for changes to the fire protection and security systems and additional contingency funds for future changes. Our estimate could change if the additional costs turn out to be significantly different from the preliminary estimates. To date, about \$531 million⁴ 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, some additional funds to pay for changes. Although AOC agrees that it will likely need additional funds, it does not believe that it will need as much as we have estimated. We believe our estimate is reasonable. In addition, AOC notes that it may be able to cover at least part of the increased costs from funding sources other than new appropriations after obtaining the necessary congressional approvals.

⁴Since we last updated information on the amount of funding provided for CVC construction, the House and Senate Committees on Appropriations approved an AOC request to reprogram about \$1 million from CVC operations funding to CVC construction.

Construction Has Progressed, but the Scheduled Completion Date Has Slipped Further, and Several Actions Are Needed to Meet the Current Schedule

Work on the CVC project has continued, but the scheduled completion date has slipped about 4 months beyond the date discussed at the Subcommittee's August 2 CVC hearing. At that hearing, we said that despite some improvement in the indicators of progress we have been tracking, we were losing confidence in the ability of the CVC team to meet its scheduled completion dates, given the delays experienced thus far and the risks and uncertainties facing the project. Unfortunately, our concerns materialized. For example, certain important work related to the CVC's fire protection and HVAC systems and the East Front was not completed on time, and further delays occurred in the schedules for these areas—all of which are important to the project's timely completion. Although AOC significantly enhanced its management control over the design of the CVC's fire protection system, as we had recommended, the team determined that it will take more time than previously expected to install certain components of the fire protection and security systems to meet life safety and security requirements. The CVC team is still determining the precise impact of this additional work on the schedule, but has developed preliminary time estimates that it believes it can achieve and may even be able to shorten after its analysis is done. Recognizing these uncertainties, the team has established a mid-September 2007 date for completion and possible occupancy for both the CVC and the House and Senate expansion spaces.⁵ Our discussions with CVC team managers and staff, analysis of the project's current schedule, and observations, together with the results of our mechanical consultant's work, indicate that this September 2007 time frame is reasonable and achievable, pending the completion of the team's analysis, if and only if meaningful and significant changes occur in the project's execution from this point forward. We will discuss the necessary actions shortly.

AOC's Scheduled Completion Dates Have Slipped

According to the June 2006 project schedule—the schedule in effect at the Subcommittee's last CVC hearing—the base CVC project was to be completed in May 2007 (except for the exhibit gallery), and the House and Senate expansion spaces were to be completed in August 2007, although their physical construction work was to be substantially completed in

⁵AOC's June and July schedules provided time between the base project's completion and the CVC facility's opening to prepare for operations and to install the exhibits in the exhibit gallery because the CVC team believed that a certificate of occupancy was required before the exhibits could be brought into the building. The team now believes that it may be able to fully prepare for opening and install the exhibits before it has a certificate of occupancy. As of September 15, it was not clear to us that these assumptions had been validated.

January 2007. The project's current schedule (August 2006) shows both the base CVC project and the expansion spaces completed on September 17, 2007, although the physical construction work in the expansion spaces is now scheduled to be substantially completed in March 2007. However, this schedule is based on a preliminary estimate and provides no time for additional delays. Specifically, the sequence 2 subcontractor responsible for the installation of certain fire protection and security system components is still analyzing the impact on the schedule of changes needed to meet life safety and security requirements. This subcontractor has made a preliminary estimate that it believes is reasonable and achievable pending the completion of its analysis, but it will not commit to a date until its analysis is completed, which it believes will be around mid-October. In addition, unlike the June and July schedules, the current schedule for completing the base project allows no time for additional delays, for starting up operations, and for delivering exhibits to the exhibit gallery after a certificate of occupancy is issued. Although the sequence 2 contractor believes it may be able to shorten the time in the current schedule for making changes to the fire protection and security system components, this possibility has not been confirmed, and it is uncertain whether the elimination of schedule time for the three items discussed above will be problematic.

As we have previously testified, most of the physical construction work in the CVC, the East Front, and the expansion spaces is scheduled to be completed by December 31, 2006; however, some work extends into 2007—as far as May 2007 for the exhibit gallery and certain East Front work, April 2007 for the gift shops, and March 2007 for the installation of wayfinding signage and turnover of audio-visual equipment in the orientation theaters. Certain other construction work, such as the completion of space for the Capitol guide service and the installation of seats in the auditorium, also extends into 2007. Neither the CVC nor the expansion spaces can be opened until the Chief Fire Marshal has completed acceptance testing for the fire protection and life safety systems, now scheduled for September 2007 for the CVC and the expansion spaces. However, unlike the previous project schedules, the current schedule shows that AOC's Chief Fire Marshal plans to begin testing the expansion spaces before he completes his testing of the base CVC building so that some of the testing will be done concurrently. Previous project schedules showed that the expansion space testing would not start until the base building testing was complete. According to the CVC team and the Chief Fire Marshal, this change should eliminate the need for temporary construction measures and a temporary certificate of occupancy for the base building and for limited retesting of the base

building after the expansion spaces have been tested. Also, according to AOC's Chief Fire Marshal, AOC may be able to open certain parts of the expansion spaces earlier than mid-September 2007. As we have discussed in previous CVC testimonies, AOC is continuing to explore this possibility.

Construction Work Is Progressing

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 August 31, the overall CVC project was about 86 percent complete and the sequence 2 work was about 77 percent complete—up from about 84 percent and 74 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, 9 of the CVC's 21 air-handling units were reportedly capable of providing cool air to certain parts of the building. In addition, the sequence 2 contractor is expecting to charge the CVC's entire HVAC system with chilled water this week and to start providing dehumidified air to the CVC soon. The sequence 2 contractor has also installed all of the floor stone in the exhibit gallery and inside the great hall. The installation of wood ceiling panels is essentially complete in one of the two orientation theaters; the installation of ceiling drywall is complete in the food service area; and ceiling framing has been ongoing in the assembly rooms, auditorium, and great hall lobby.
- *Surface work* continued, including the installation of stone pavers above the CVC and seat wall stone around the great hall skylights. Work on the House connector tunnel and on linking the Library of Congress tunnel with the Jefferson Building has also continued.
- *Wall stone* has now been fully installed in the food service area, upper level west lobby, East Front basement and ground levels, and atrium areas. As of last week, only about 130 pieces of wall stone had not been installed in the CVC itself, excluding the upper two levels of the East Front and the tunnels.
- *In the House and Senate* expansion spaces, preparations for wall and ceiling close-in inspections have continued.

Schedule Slippages in Critical and Key Near-Critical Paths Have Worsened, Significantly Extending the Project's Completion Dates and Complicating Project Management

During the Subcommittee's last CVC hearing, we expressed considerable concern about the risk of delay in work on the CVC's fire protection system, as well as on other important areas, such as the CVC's HVAC system, the East Front, and ceiling close-ins in the upper level security lobby. Together, delays in these areas, according to AOC's construction management contractor, have extended the CVC's completion date by 95 workdays, from May 2007, as projected for the Subcommittee's last CVC hearing, to September 2007, as shown in the project's August 2006 schedule. This delay was primarily driven by slippages in the schedule for completing the CVC's fire protection system, which constitutes the CVC project's critical path—the single longest path through the project's schedule, meaning that each day the system's completion is delayed, the CVC's completion could also be delayed. AOC has significantly improved its control over the design of the facility's fire protection system, and the CVC team has been working closely with AOC's Chief Fire Marshal and U.S. Capitol Police representatives. We believe that these steps have resulted in improved coordination and communication and facilitated quicker resolution of problems and issues than previously occurred. However, the changes that have to be made to certain fire protection and security system components to address life safety and security issues have added considerable time to the schedule. These include (1) changes to the fire alarm system's programming; (2) architectural changes in a number of locations to enhance their fire protection capability; (3) wiring changes associated with having to add a major new fire alarm system control panel, enhance the fire damper monitoring system, use a different testing method, and link a security system component with a fire protection system component; and (4) changes associated with adding fire alarm system control panels to meet security requirements. According to the CVC team, the amount of time added to the August schedule to make these changes reflects the team's best thinking but is preliminary pending the team's receipt of all the detailed information it needs to estimate the impact of these changes on the schedule. The team has received much of this information and expects to receive the rest within the next several days. The needed information consists largely of shop drawings being prepared by the sequence 2 fire alarm subcontractor, which reflect the changes required for life safety and security. The team believes that it will be able to make a firm estimate by around mid-October.

As we have pointed out in our previous CVC testimonies, this project has many near-critical paths that can also affect its completion date, some with relatively small slippages. Such a situation greatly complicates project management because problems arising in multiple areas can adversely affect the completion date, and the team must focus on a

number of important areas simultaneously to avoid delaying the project's overall completion. AOC's construction management contractor identified 21 near-critical paths in the August schedule, 5 of which the CVC team considers particularly important because of their potential impact on the project's completion. These are the CVC's HVAC system, ceiling close-ins in the upper level security lobby, and three East Front paths. According to the CVC team, further delays in these areas could postpone testing of the CVC's fire alarm system, which, in turn, could delay the project's completion. According to AOC's construction management contractor, these areas have slipped by 74, 68, and over 100 workdays, respectively, compared with the schedule in effect at the Subcommittee's last CVC hearing. According to this contractor, these slippages occurred because of an electrical problem and problems with steam condensate that affected the HVAC system; problematic sequence 1 and preceding work that complicated the ceiling close-ins; and multiple issues that limited progress on the 3 East Front near-critical paths, including lead abatement requirements; electrical, ductwork, and structural conflicts; competition for space for workers; and a need to redesign and order new stone for the archway above the stair and escalators on the East Front.

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 our mechanical engineering consultant to assess the status of the CVC's 21 air-handling units. He observed the status of the units on August 11, and September 6, 2006, and compared their actual and scheduled mechanical readiness to provide conditioned air to the CVC. On the basis of his observations at the CVC site on those 2 days, he reported the following:

- The units' actual and scheduled stage of completion did not always match; some units were ahead of and some were behind schedule.
- The scheduled completion dates for the units did not always match those for work in the spaces where the units have to be balanced or where the space has to be clean for the units to operate safely, suggesting a possible misalignment of priorities for finishing the spaces and finishing the units.
- Only limited progress was made between his visits to the site. Remaining work included insulating pipe, wiring control units, and cleaning the units and ducts.
- On both visits, he saw relatively few workers near the units, and little work was being performed on them.

We discussed these observations with AOC's sequence 2 and construction management contractors, as well as the sequence 2 subcontractor responsible for the work. The construction management contractor confirmed that efforts to finish the units had been limited, and the sequence 2 contractor and the subcontractor committed to completing all the work necessary for all 21 units be operational by December 31, 2006, except for the final commissioning of some units. The sequence 2 contractor said that it would ensure the alignment of the schedules and priorities for finishing the units and the spaces they are to serve. Last Friday, AOC's construction management contractor said that finishing the scheduled work for the CVC's air-handling units in a timely manner is important, and completing the work necessary to get steam and chilled water to all the units over the next 3 weeks is critical to meeting the project's revised completion schedule. Accordingly, we have arranged for our mechanical engineering consultant to reassess the status of this work in October.

The construction management contractor reported slippages in all of the remaining near-critical paths since the Subcommittee's last CVC hearing. In the 2-month period covered by the schedules between this hearing and the last one, 5 near-critical paths lost at least 100 workdays and 11 lost at least 40 workdays. For example, the exhibit gallery path slipped 105 workdays; the bronze door path slipped 43 workdays; the auditorium path slipped 98 workdays; and the orientation theater path slipped 85 workdays, as reported by AOC's construction management contractor. Slippages occurred for various reasons. For instance, according to the construction management contractor, the orientation theater path slipped because of slow progress in installing wood ceiling panels and in the sequence 2 contractor's resequencing of work; the exhibit gallery path slipped because of problems in finishing the ceiling and schedule logic changes; and the bronze door path slipped because of production problems at the fabricator's plant.

Several activities important to completing the House and Senate expansion spaces have also been delayed since the Subcommittee's last CVC hearing. For example, AOC's construction management contractor reported a 23-workday delay in completing the circular stairs in the atrium areas. This delay occurred because the spaces housing the stairs were not available while sequence 2-related work was being done in those areas. Also delayed were ceiling close-ins that had to wait for approval of the fire alarm system, a special fire suppression system that was not installed because it had not been approved, and millwork that was not installed in the Senate lower level because of delays in getting approved shop

drawings. Furthermore, the sequence 2 subcontractor doing the expansion work identified a number of concerns that could affect the project's completion. For example, the subcontractor reported that ceiling close-in delays could postpone testing and balancing of the HVAC system; a lack of conditioned air could adversely affect certain casework and ceiling tile work; and changes being considered in the design of the expansion spaces could delay their completion, including work that could affect the testing and balancing of the HVAC system.

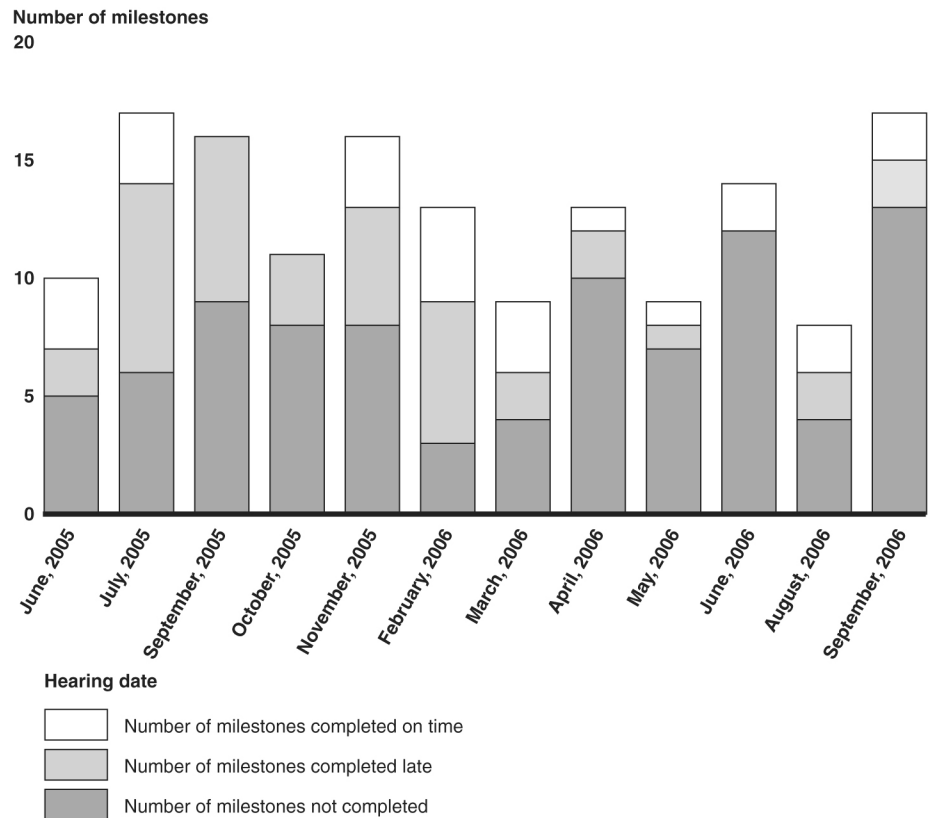
Finally, although not critical to the CVC's opening, work being done to connect the Library of Congress's Jefferson building to the tunnel linking it with the CVC has fallen about a month behind because of an asbestos problem. This delay was shorter than initially estimated. Overall, the project's schedule today, compared with the schedule in effect at the Subcommittee's September 15, 2005, CVC hearing, reflects an average loss of about 3 out of every 4 weeks due to schedule slippages.

Indicators of Construction Progress Do Not Instill Confidence in the CVC Team's Ability to Meet Scheduled Completion Dates

The four indicators of construction progress that we have been tracking for the Subcommittee support extension of the project's schedule and suggest that changes in the project's execution will be necessary to achieve the scheduled dates. 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 2 of the 17 milestones that were due to be completed, according to the project's June 2006 schedule, and for both, the work was completed ahead of schedule. However, the contractor was late in completing work for 2 other milestones and had not completed the work for the remaining 13 milestones as of September 15, 2006. (See app. I.) The sequence 2 contractor attributed the slippages to a number of factors, including the need to replace water-damaged insulation, necessary preceding work taking longer than expected, and a resequencing of work by the contractor.

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

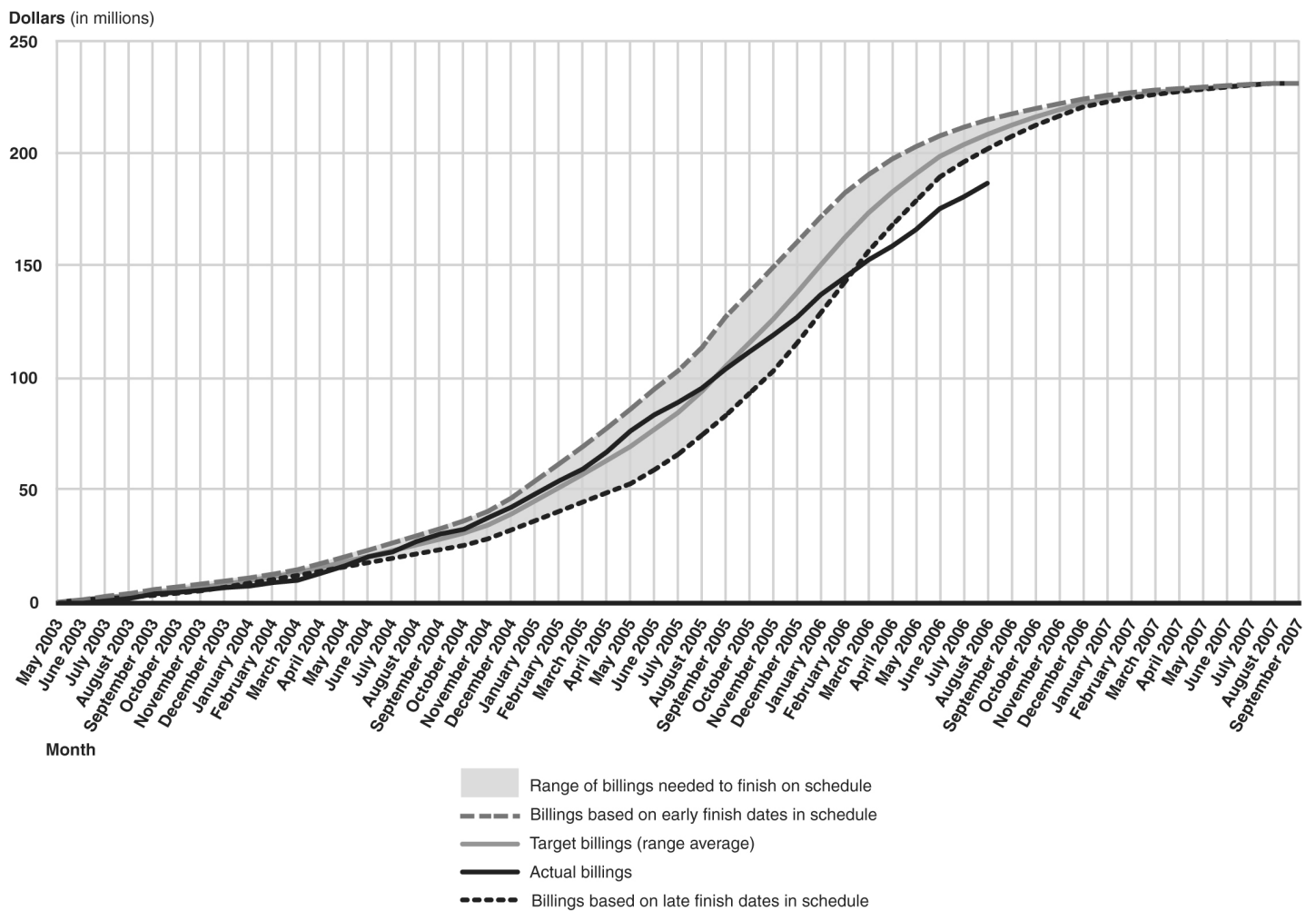


Source: Sequence 2 contractor, AOC and its construction management contractor, and GAO.

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 August 2006, indicate that AOC is more likely to finish closer to its new scheduled completion dates than its previously scheduled completion dates. 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 indicates that a late summer 2007 completion date is reasonable.

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 126 (\$232.5 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.

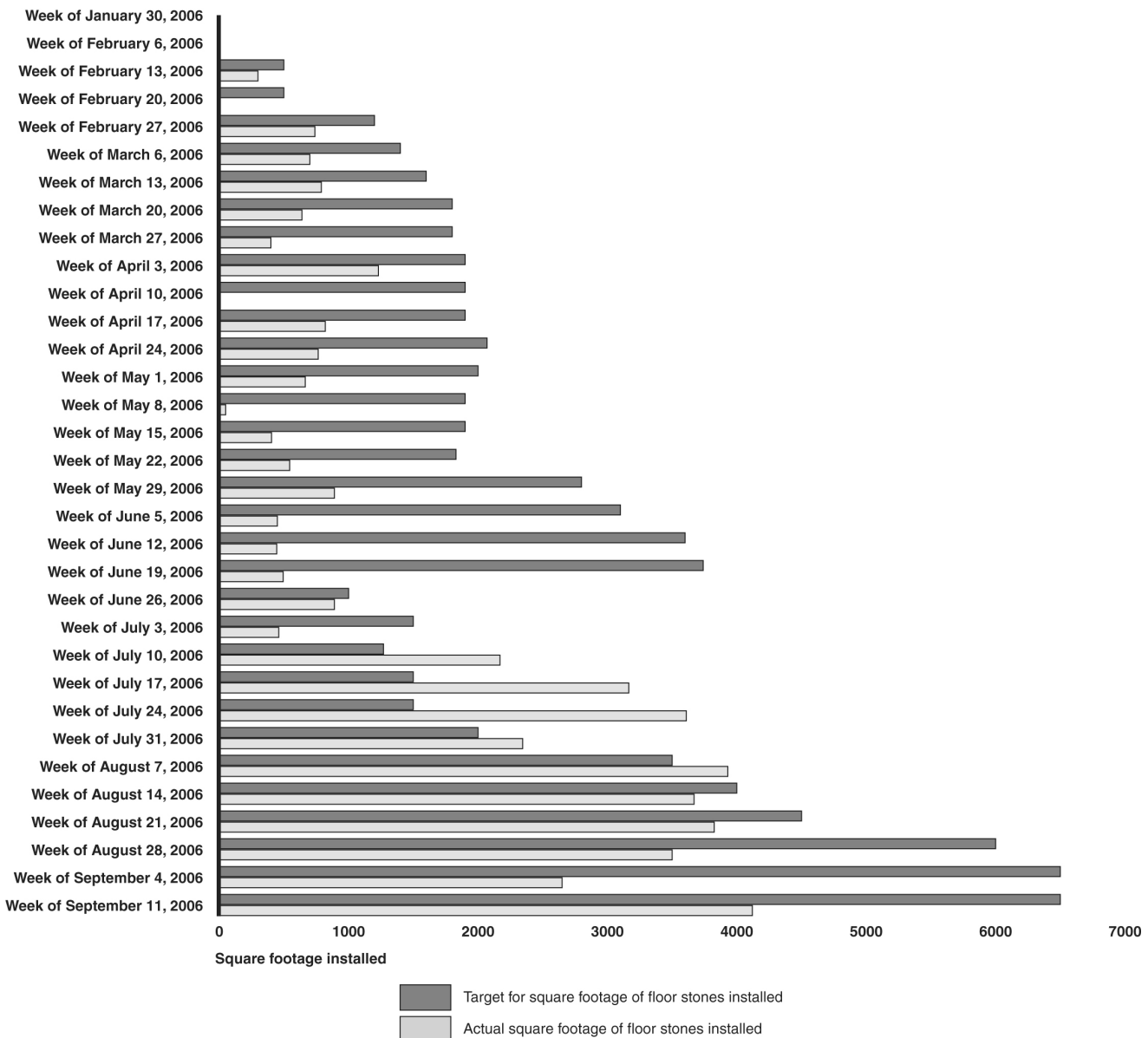
3. Although bills are typically submitted for payment after work is completed, it is often likely that construction work will be completed on schedule when the actual billing line falls between the early and the late lines in the figure. With respect to the CVC, the actual billing line has been trending below, and in March 2006 went below, the late finish line, where it remained through August 2006. Even with the lag in billings, this trend indicates that the amount of work being completed 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 1,325 pieces of interior wall stone during the last 7 weeks. 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 September 15, about 4,700 pieces of wall stone remained to be installed in the East Front. During the same 7-week period, the sequence 2 contractor installed about 24,040 square feet of interior floor stone, or about 73 percent of the 33,000 square feet specified in the floor stone installation plan that the contractor provided to AOC. According to the construction management contractor, the sequence 2 contractor installed the floor stone inside the great hall sooner than planned, but work has been impeded in other areas by the lack of available space.

Figure 3 shows the sequence 2 contractor's progress in installing interior floor stone since February 13, 2006.⁶

⁶We have discontinued presenting the figure we previously included in our testimonies 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



Source: AOC's construction management 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 completing the project. Given the project's history of delays, the difficulties the CVC team has encountered in resolving problems that arise quickly, and the large number of near-critical activities that can affect the project's overall completion, the CVC's efforts to identify potential problems early and resolve issues quickly will be even more important from this point forward, since AOC has left no "slack" in the schedule for contingencies. In our view, the remaining work associated with the fire protection system poses the greatest single risk to meeting AOC's mid-September 2007 completion date. The steps AOC has taken to mitigate this risk have been helpful, but much work remains to be done on the CVC's fire protection system and its 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 CVC's HVAC system, the East Front, and ceiling close-ins. AOC's current project schedule does not provide the 2 to 3 months that its previous schedule allowed for addressing the 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 system 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. Additional delays could occur if the team takes longer than expected to get approved shop drawings, if the proposed system does not meet the project's design specifications or the life safety code, or if the fire protection system does not work effectively with the security or other

building systems.⁷ Additionally, the Chief Fire Marshal noted that delays could occur if the CVC team does not adequately pretest the system and correct any problems found during the pretesting. On March 23, AOC's commissioning contractor submitted its plan to the CVC team for testing the performance of the CVC's smoke control system, which is a critical component of the CVC's fire protection system and must work properly before the CVC can be opened to the public. As of September 13, this plan had not yet been submitted to or approved by the Fire Marshal Division. Moreover, as we have previously noted, the Chief Fire Marshal's timely completion of the fire protection system's acceptance testing depends on his ability to obtain sufficient funding for a contractor to help perform the tests.

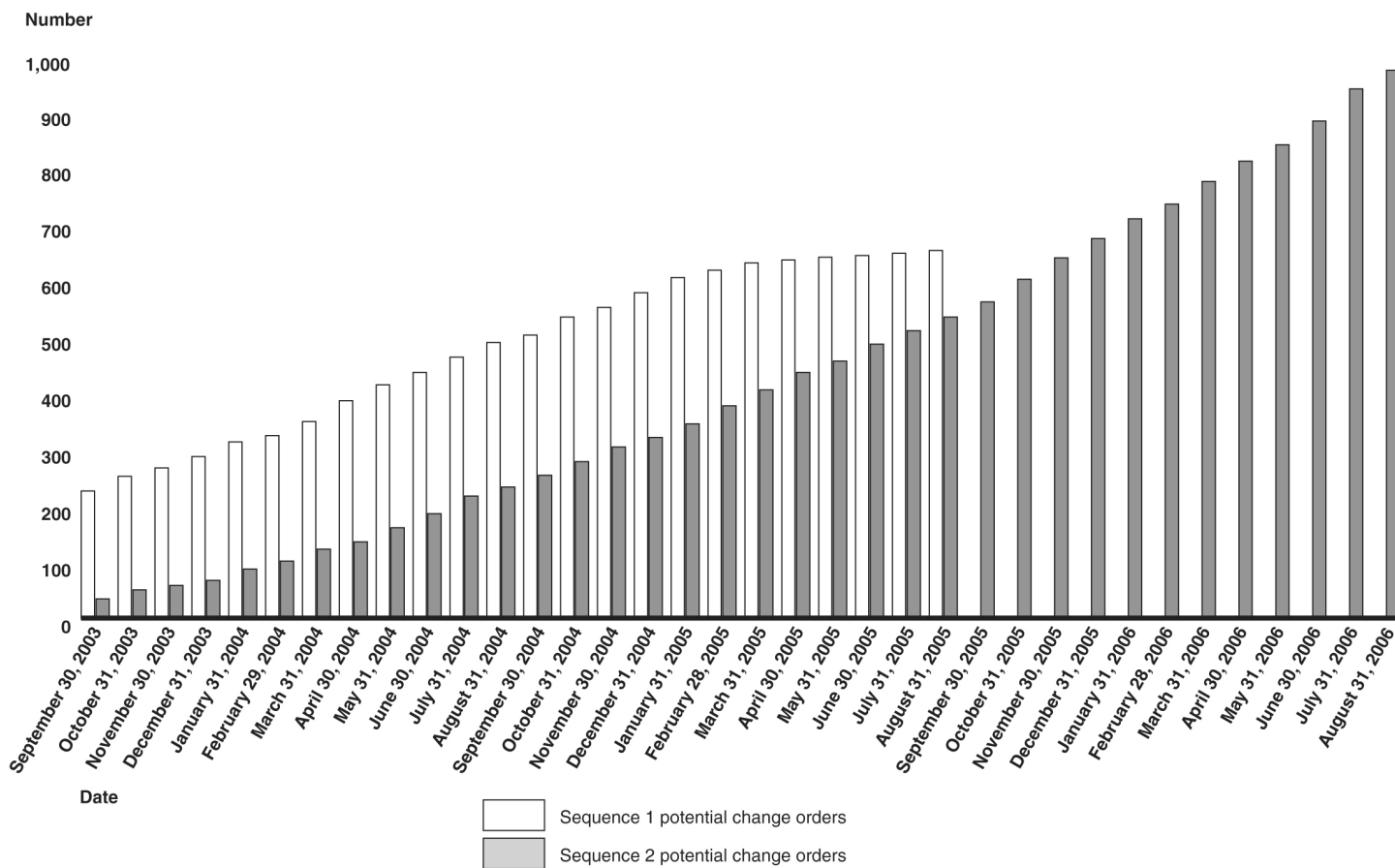
- *Trade stacking could delay completion.* As we discussed during the Subcommittee's previous CVC hearings, trade stacking could hold up finish work, such as drywall or ceiling installation, electrical and plumbing work, plastering, or floor stone installation. This work could be stacked because of delays 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 each area of the CVC except the East Front. According to the sequence 2 contractor, it intends to continue meeting regularly with its subcontractors to review and update the area plans. The CVC team identified one recent instance of trade stacking that occurred in an effort to expedite certain East Front work. In transmitting the team's monthly progress report for August, AOC noted that the compressed time frame for bringing all of the air-handling units on line will require bringing more technicians and mechanics to complete the work and may result in trade stacking.
- *Building design and work scope continue to evolve.* The CVC has undergone a number of design and work scope changes. Since the Subcommittee's August 2 CVC hearing, AOC's architectural contractor has issued nine design changes or clarifications. As of September 14, 2006, this

⁷According 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 completion schedule for the expansion spaces.

contractor reported, another six were in process. In addition, since the project began, AOC has executed over 100 sequence 2 contract modifications for work that was not anticipated.⁸ 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 except the fire protection system, according to AOC, further design or scope changes in various project elements are likely, given the project's experience to date. In fact, in reporting on the August schedule, AOC's construction management contractor noted that anticipated changes to the House expansion space could affect ceiling close-ins. 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.

⁸These 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 August 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.

Additional delays associated with the CVC's new utility tunnel have resulted, or could result, in additional work or slippages. As we have

previously testified, the delay in starting up the utility tunnel's operations has necessitated the use of temporary humidity control equipment for the orientation theaters to avoid damage to finish work and ceiling tile. Moreover, delays in getting conditioned air inside the CVC have resulted in the sequence 2 contractor's bringing additional temporary equipment into the auditorium area. Such delays may subject certain work to the risk of damage or 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 the specified levels. The CVC team has been providing cool air to the food service area and on the service level, but planned to turn off the chilled water supply to the CVC this week so that it can charge the entire CVC system with chilled water. At the Subcommittee's last CVC hearing, we reported that the CVC team had expected to have steam running to the CVC and to be providing dehumidified air to the exhibit gallery by mid-August. However, as we discussed earlier, the team experienced problems. The CVC began receiving steam earlier this week and now expects to be able to provide dehumidified air to the CVC by mid-October. Remaining risks involve having sufficient manpower to meet the scheduled dates for getting the HVAC system fully operational and being able to quickly overcome any problems that may arise in getting the system properly balanced, controlled, and commissioned.

- *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. Last week, AOC told the CVC team that starting October 1, the architectural contractor will be decreasing its staffing support to the project. In our opinion, this increases the risk of slow responses to design questions or requests for design instructions at a very critical time, particularly since 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.

- *Risks from insufficient stone deliveries appear to be diminishing.* Although wall stone shortages have caused delays in the past, they have not recently been a problem. All of the wall stone for the base project and atrium areas has been delivered, and AOC does not anticipate a problem with the remaining wall stone deliveries. According to the construction management contractor, about 2,400 pieces of wall stone for the East Front and all of the wall stone for the tunnels still have to be delivered. For a time, the sequence 2 contractor did have a problem with the delivery of floor stone for the exhibit gallery, but that problem has been resolved, and the contractor does not anticipate problems with floor stone deliveries for other areas. The sequence 2 subcontractor doing the House and Senate expansion space work said that some wall stone for the expansion spaces has been delivered and at this time he does not anticipate a delivery problem with the remaining wall stone.

Finally, as we have said in previous discussions with AOC, its construction management contractor, and the Subcommittee, it will be important for AOC to have adequate analysis and documentation of the reasons and responsibilities for delays.⁹ 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. As we have previously stated, we believe it is important for AOC to complete its analysis of delays expeditiously given the September 15, 2006, sequence 2 contract completion date and the impact this analysis is likely to have on delay-related costs. AOC has been working with the sequence 2 contractor to address this issue.

⁹See, for example, GAO, *Capitol Visitor Center: Effective Schedule Management and Updated Cost Information Are Important*, [GAO-05-811T](#) (Washington, D.C.: June 14, 2005).

New Project Schedule Appears Achievable Only under Certain Conditions

Last week, the CVC team completed the development of a new project schedule—the August 2006 schedule—that reflects the results of its preliminary analysis of the impact on the schedule of recent changes to certain components of the fire protection and security systems. While the team believes that its preliminary estimate is likely to provide sufficient time to accomplish the needed work, it does not believe it can make a definitive determination until after it has had a chance to fully analyze the changes to these systems. Although the team was striving to have all the necessary submittals approved by October 1, this is not likely. However, the sequence 2 contractor and its subcontractor responsible for most of the related work believe that they expect to have enough of the needed information in the next several days and will be able to make a definitive determination on the amount of time needed by around mid-October. The team plans to reflect any changes necessary in the September project schedule, which it expects to issue at about that same time.

The August project schedule shows that 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 of fire protection, life safety, and related systems for these areas will be carried out between then and mid-September 2007. The schedule reflects the amount of time that AOC's Chief Fire Marshal said he would need to perform his acceptance testing, although the team is working with him to see if certain aspects of the testing can be done differently to achieve some time savings. Unlike the previous project schedule, the new schedule does not allow any time for addressing problems, risks, or uncertainties or for preparing for operations; it also assumes that the exhibits can be delivered and set up before the final acceptance testing of the facility has been completed. The team assumes that it will be able to arrange for the delivery and set up of the exhibits and to prepare adequately for operations before it receives a certificate of occupancy, but had not confirmed this assumption as of September 15, 2006.

Accordingly, we are focusing the results of our schedule assessment on the completion of the CVC's construction, including the facility's acceptance testing but excluding preparations for operations and the delivery and setup of the exhibits. Although we would feel more comfortable if the schedule did contain some time for addressing problems, risks, and uncertainties, our analysis of the schedule; observations of the team's progress; discussions with CVC team managers and members, U.S. Capitol Police representatives, and AOC's Chief Fire Marshal; and the results of our mechanical engineering consultant's work

indicate that the mid-September time frame for completing the project is achievable subject to two conditions:

- The team's remaining analysis of the impact of the fire protection and security system changes shows that the team can finish the necessary work within the scheduled time.
- The team promptly makes significant changes in its execution of the schedule and project.

Recommendation

Given the magnitude of the recent schedule slippages and the consequences of the risks that have materialized, the time it has taken the team to identify and resolve problems, the team's performance relative to the indicators of progress that we and the Subcommittee have been tracking, and the risks and uncertainties that continue to face the project, we are convinced that the team will not be able to meet the new schedule or any schedule with completion dates close to mid-September 2007 unless it quickly and substantively changes its execution of the project and schedule. We are recommending that the Architect of the Capitol promptly develop an action plan setting forth specific steps that AOC and the CVC team will take to enhance AOC's execution of the schedule and project. Types of actions the team should consider are as follows:

- Make more visible, aggressive, and focused efforts to manage activities in the project's critical and key near-critical paths according to the schedule, making sure that priority activities receive priority attention.
- See that sufficient effort is applied to meet important dates. The CVC team may wish to consider including the use of targeted acceleration when it is justified and will save time without adversely affecting worker safety, work quality, or facility functionality or causing trade stacking. In addition, any consideration of acceleration should balance its impact on the schedule against its potential impact on cost.
- Ensure that mechanisms are in place to identify and quickly resolve problems, issues, risks, questions, and concerns raised by construction contractors or others; provide needed design guidance and instructions; and respond to submittals effectively and quickly, including closely monitoring the turnaround time for architectural support from this point forward.

-
- Continuously ensure the effective operation of mechanisms put in place to coordinate work among the many contractors and subcontractors constructing the building and to coordinate with AOC's Chief Fire Marshal, U.S. Capitol Police, and the Capitol Power Plant.
 - Continue to see that requests for discretionary changes to the project's scope or design are promptly brought to the attention of the Capitol Preservation Commission, along with the impact of such requested changes on the project's schedule.

AOC agreed that additional actions are needed to improve the extent to which the CVC team meets its scheduled dates and said that it would identify and take such actions. To help put the CVC team in a better position to meet the project's scheduled completion date, after considering the actions we have identified, the Architect of the Capitol should promptly provide the Capitol Preservation Commission, the House and Senate Committees on Appropriations, and the Senate Committee on Rules and Administration and the Committee on House Administration with a plan setting forth the actions it and the CVC team will take to enhance their execution of the project and its schedule — particularly to accomplish all of the critical work that needs to get done in the next 3 to 4 months. AOC should submit the plan as soon as possible, but no later than mid-October 2006. Congress can then use this plan to hold AOC accountable for managing the project and to work closely with AOC to ensure that the schedule implications of all proposed scope or design changes are quickly determined and considered by all appropriate stakeholders before final decisions on the proposed changes are made.

Project's Estimated Cost and Funding

Relying on cost estimates provided by AOC and its construction management contractor, we now estimate that the total cost to complete the entire CVC project will be about \$584 million without an allowance for risks and uncertainties and could be as much as about \$596 million with such an allowance. This updated \$584 million estimate is about \$28 million greater than our previous estimate of \$556 million, which did not include an allowance for risks and uncertainties, and matches our previous estimate of \$584 million, which did include an allowance for risks and uncertainties. The \$28 million increase consists of estimated costs related primarily to additional delays and, to a lesser extent, the recently identified changes to the CVC's fire protection and security systems and provision for future changes. (AOC estimated the additional delay-related costs for budgetary purposes only and did not provide for possible concurrent delays.) Moreover, with additional risks and uncertainties, we

believe the entire project could cost another \$12 million at completion (\$596 million minus \$584 million). The mounting costs of delays are a major reason for our emphasis on the need for AOC and its other CVC team members to make significant changes in their project management.

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 construction or operations¹⁰ and has been approved for CVC construction by the House and Senate Committees on Appropriations. Our previous cost-to-complete estimate showed that another \$26 million in construction funds would be necessary without an allowance for risks and uncertainties to reach the previous cost estimate of \$556 million. 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. Given the new cost-to-complete estimate, AOC will likely need some additional funding for changes during fiscal year 2007.

AOC agreed that it would likely need additional funds but did not believe it would need quite as much as we had estimated for future changes and contingencies. Given the project's experience with cost growth and the trends in the number of potential change orders submitted, we believe our estimate is reasonable. In addition, AOC noted that it could possibly use some funds that have been slated for covering sequence 2 delay-related costs for other CVC-related costs during fiscal year 2007, assuming that some of this delay-related funding may not be needed for some time. AOC recognized, however, that it may need additional funding for potential delay-related costs if it were to do this. AOC also noted that it may be able to cover some portion of the increased costs by reprogramming funds from other sources after obtaining the necessary congressional approvals.

¹⁰Public 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.

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

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

Activity	Location	Scheduled completion	Actual completion
Lower level - Hang VP drywall ceiling	Congressional auditorium	7/20/2006	9/9/2006a
Wall stone Area #6	Congressional auditorium	7/20/2006	9/11/2006a
Install AHU-EF-1/AHU-EF-2	Mechanical system	8/1/2006	^b
Install bronze doors	Food service	8/3/2006	^c
Grid for wood ceiling	Orientation theater	8/8/2006	^d
Pre FPT controls test	SF fans	8/15/2006	^e
Wood doors and frames	Food service	8/21/2006	^f
Finish paint	West lobby assembly	8/21/2006	
Install wood ceiling panels	Orientation theater	8/22/2006	^d
Wall stone Area #1	East Front principal	8/28/2006	^g
Ceiling fabric	Congressional auditorium	8/28/2006	
Install stone	Exhibit gallery	8/31/2006	^h
Plaster ceiling	East Front Basement	9/5/2006	
Controls Pt. to PT. check	AHU-01	9/8/2006	8/5/2006
Wall stone Area #2	East Front principal	9/12/2006	^g
Ceiling panels	Orientation lobby	9/12/2006	
Floor stone	Food service	9/19/2006	9/4/2006

Source: AOC's June 2006 CVC sequence 2 construction schedule for the scheduled completion dates, AOC and its construction management and sequence 2 contractors for the actual completion dates, and the sequence 2 contractor or subcontractors for reasons for delay

^aWork is substantially complete.

^bAssembly of the upper level air-handling units has been slowed during replacement of water-damaged insulation.

^cBronze door installation has been resequenced to make upper level security doors the highest priority.

^dInstallation has been slowed while coordinating with the audio-visual contractor on the installation of above-ceiling equipment.

^eTest could not be done because preceding work had not been completed.

^fInstallation of wood doors has been resequenced; a template was developed to prevent delays of follow-on work.

^gInstallation of principal level wall stone has been affected by ductwork revisions and metal stud design issues.

^hAspiration wall-stone installation has been delayed because preceding work took longer than expected.

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