

**GAO**

Testimony

Before the Subcommittee on the  
Legislative Branch, Committee on  
Appropriations, U.S. Senate

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For Release on Delivery  
Expected at 10:30 a.m. EDT  
Wednesday, August 2, 2006

# CAPITOL VISITOR CENTER

## Update on Status of Project's Schedule and Cost As of August 2, 2006

Statement of Terrell Dorn, Director  
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Physical Infrastructure Issues



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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 the Architect of the Capitol's (AOC) progress in achieving selected project milestones and in managing the project's schedule since the Subcommittee's June 28, 2006, hearing on the project.<sup>1</sup> 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 taken or plans to take to address these risks. In addition, we will discuss the status of the project's costs and funding.

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, the General Services Administration, and the Office of Compliance. We also reviewed AOC's construction management contractor's periodic schedule assessments and daily reports on the progress of interior wall and floor stonework.

In summary:

Since the Subcommittee's June 28 CVC hearing, the CVC team has continued to move the project's construction forward, and the project's overall targeted completion dates have remained about the same as we reported at that hearing. However, risks have materialized, especially in connection with the CVC's fire protection system, and a number of important activities have been delayed, lessening our confidence in the likelihood of the CVC team's meeting the targeted completion dates. We will reassess the project's schedule and monitor the team's progress in achieving effective management control over the CVC's fire protection system work during the next several weeks and report our results to the Subcommittee in September.

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<sup>1</sup>GAO, *Capitol Visitor Center: Update on Status of Project's Schedule and Cost as of June 28, 2006*, [GAO-06-827T](#) (Washington, D.C.: June 28, 2006).

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- During the past month, work on the project has progressed in a number of areas. For example, chilled water began flowing from the Capitol Power Plant to the CVC this week, and the sequence 2 contractor expects to have dehumidified air in the exhibit gallery by around mid-August. In addition, critical interior wall and 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 atrium areas, 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 we now consider to be the single greatest source of risk to meeting the project's scheduled completion dates. Although the overall schedule for completing this system has not slipped since the Subcommittee's last CVC hearing, some activities have been delayed, and the team continues to encounter new issues or "surprises" with the fire protection system. The CVC's fire protection system has not yet been fully approved, and a significant problem with the installation of one of the system's components was recently identified. Although this problem has been resolved, communication and management issues surfaced that could further affect work on the system if they are not effectively resolved quickly. In addition, critical building systems still have to be commissioned and tested, and certain design or work scope elements are still incomplete or are being clarified, refined, or changed, even though the project's overall design is essentially complete.
  - Several activities important to the CVC's completion, such as East Front work, have been delayed since the Subcommittee's last CVC hearing. During the last 5 weeks, the sequence 2 contractor exceeded its target for interior floor stone installation but again fell short of its target for interior wall stone installation. In addition, the sequence 2 contractor met only 2 of the 8 milestones we have been tracking for this hearing. Although this contractor's monthly billings were higher in June than in May, the trend in billings continues to indicate that construction work is more likely to be completed closer to AOC's new target dates than its previous ones.
  - AOC's schedule provides additional time to complete work after construction work is scheduled to be done. This additional time will give AOC some leeway, if necessary, to address risks and uncertainties such as those associated with complex building systems and trade stacking, should it occur. The CVC's complex heating, air conditioning, and ventilation (HVAC); fire protection; and security systems have to work together as well as separately, and uncertainties associated with each could affect the schedules for all. During the past month, the sequence 2 contractor has continued work on its area-by-area plans to prevent trade

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stacking<sup>2</sup> during finish work. In our reassessment of the project's schedule, we will determine whether the additional time AOC has scheduled is likely to be sufficient to address these and other risks and uncertainties. AOC's construction management contractor has not yet completed its reassessment of the schedule but expects to have it done shortly.

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. To date, about \$530 million<sup>3</sup> has been provided for CVC construction. AOC and its construction management contractor have completed their reassessments of the cost to complete the project and believe that sufficient funding will be available except for potential delay-related costs, assuming that AOC receives about \$26 million in fiscal year 2007 appropriations for CVC construction. This is the amount our previous cost-to-complete estimate showed would be necessary without provision for risks and uncertainties. We have not increased our \$556 million estimate (which includes this \$26 million) to reflect recent events. The results of our reassessment of the cost to complete the project, which we expect to have by mid-September, will include an assessment of the impact of these events. Although we anticipate that our \$556 million estimate is likely to increase, we have no specific indication at this time that the cost to complete the entire project will exceed our \$584 million estimate, which does include an allowance for risks and uncertainties, such as potential delay-related costs. In addition, as we have previously indicated, AOC preliminarily expects to need about \$950,000 in fiscal year 2007 AOC general administration appropriations to pay for the contractual support needed to complete acceptance testing of the facility's fire protection system in time to meet the project's schedule. AOC plans to determine if it can reduce the amount needed for this contractual support; we will keep the Subcommittee apprised of this situation.

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<sup>2</sup>Trade 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.

<sup>3</sup>Since our last CVC testimony, the House and Senate Committees on Appropriations approved an AOC request to reprogram about \$1 million from CVC operations funding to CVC construction. We have not reflected this reprogramming in our cost-to-complete estimates or funding figures above, but will include this change, as well any other changes we believe are appropriate, in our next CVC testimony.

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## Proposed Completion and Opening Dates Have Held Steady and Construction Has Progressed, but Risks and Delays Threaten the Project's Current Schedule

The proposed completion and opening dates in the CVC project's schedule have remained about the same since the Subcommittee's last CVC hearing, and work on the project has continued to progress, but risks have materialized, delaying several important activities and threatening the project's current schedule. Most important, a problem with a component of the fire protection system was identified and has now been resolved. At this time, the problem seems to have greater implications for the project's cost than for its schedule, but the underlying management control issues that it reveals could adversely affect the schedule, even though AOC has agreed to take actions that we suggested to enhance its management control over the design and completion of the fire protection system. In addition, risks have led to problems in a number of areas, such as the HVAC systems, the gift shops, and the exhibit gallery, causing delays in these activities and increasing the risk of delay for the project as a whole. For example, the proposed opening of the exhibit gallery was deferred about 3 months—to June 29, 2007—after the team learned that it must have a certificate of occupancy before the artifacts for display can be delivered and installed. The indicators of progress that we have been tracking for the Subcommittee showed mixed results during June, but the improvements in some are not sufficient to offset our concerns about the risks and uncertainties and delays. Overall, we have diminished confidence in the likelihood that the team will be able to meet its currently proposed opening dates. As noted, we plan to reassess the project's schedule and report our results to the Subcommittee in September.

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## AOC's Proposed Completion and Opening Dates Have Remained about the Same

According to the June 2006 project schedule, the base CVC project will be completed in May 2007 (except for the exhibit gallery) and the House and Senate expansion spaces will be completed in August 2007. These dates are about the same as those indicated in the May 2006 schedule. Moreover, according to both schedules, the base project will be opened in July 2007 and the expansion spaces will be opened in August 2007—time frames that AOC believes will accommodate possible additional delays and allow start-up time for operations.

According to the June 2006 schedule, most of the physical construction work in the CVC, the East Front, and the expansion spaces will be completed by December 31, 2006; however, some work extends into 2007—as far as April 2007 for the exhibit gallery and March 2007 for the gift shops, certain East Front mechanical work, and the installation of wayfinding signage. Certain other construction work, such as the completion of space for the Capitol guide service, East Front finish work, and seating installation in the auditorium, also extends into 2007. Neither

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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 May 2007 for the CVC and August 2007 for the expansion spaces. The Chief Fire Marshal plans to issue a temporary certificate of occupancy for the CVC's base building when he completes his testing of it and a final certificate after he completes his testing of the expansion spaces and limited retesting of the CVC's base building. AOC believes that it may be able to shorten some of the time scheduled for testing the fire protection system and that it may be able to open segments of the expansion spaces earlier than August 2007. As we have discussed in previous CVC testimonies, AOC is continuing to explore this possibility.

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## 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 June 30, the overall CVC project was about 84 percent complete and the sequence 2 work was about 74 percent complete—up from about 82 percent and 71 percent, respectively, as of May 31. 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 chilled water systems were flushed, and chilled water began flowing from the Capitol Power Plant to the CVC this week. The sequence 2 contractor expects to have dehumidified air in the exhibit gallery by around mid-August. In addition, the sequence 2 contractor has installed about 95 percent of the floor stone in the exhibit gallery and has installed about half of the floor stone in the great hall. Millwork in the south orientation theater has begun; bulkheads were being hung and finished; and the installation of kitchen wall and floor tile was substantially completed on the lower level. On the upper level and in the auditorium, mechanical, electrical, and plumbing rough-ins were substantially completed. Furthermore, the CVC team and AOC's Fire Marshal Division have continued resolving issues associated with the CVC's fire protection system.
- *Surface work* continued, including the installation of (1) stone pavers above the CVC, (2) stone steps on the concrete base slab between and around the trees planted alongside the auditorium, and (3) the skylight structure in the north opening above the great hall. Work on the House

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connector tunnel has also continued.

- *Wall stone installation* has now been fully completed in the food service area; all but four pieces have been installed in the great hall; and installation has progressed substantially in the East Front basement and plaza levels, atriums, and auditorium. As of last week, the sequence 2 contractor had installed 99 percent of the interior wall stone in the CVC itself, excluding the atrium areas, the East Front, and the tunnels.
- *On the East Front exterior*, AOC and its construction management contractor reported, the center steps have been reinstalled over new waterproofing material, and air-handling equipment has been placed on the East Front penthouse area.
- *In the House and Senate expansion spaces*, progress was made in installing and priming drywall; installing mechanical, electrical, and plumbing systems; and inspecting wall and ceiling close-ins.

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### Risks Associated with the Fire Protection System Pose the Greatest Challenge to the Project's Schedule

According to the project's June 2006 schedule, the completion date for the fire protection system has not changed, but for a variety of reasons, we are concerned that this system is at significant risk of delay. Moreover, delays in completing this system could directly affect the CVC's completion date. Specifically, the activities associated with the fire protection system now constitute 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.

Our analysis indicates that progress on the fire protection system has been affected by communication and management issues, despite the team's various efforts to coordinate activities and prevent problems, as well as identify and resolve problems. A number of issues or "surprises" have occurred, requiring unanticipated changes to the fire protection system, the interrelated security system, the schedule, or a combination of these elements. The changes include adding control panels for the fire alarm system in the expansion spaces, changing the specifications for the programming of the fire alarm system, adding activities to the schedule for the fire alarm system, and changing the sequence of activities associated with the fire alarm system. AOC and its construction management contractor have attempted to avoid problems such as these by such means as holding biweekly or weekly meetings with the CVC team and AOC's Fire Marshal Division and by meeting with representatives of the U.S. Capitol Police when specific security issues arise. In our opinion, these

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biweekly or weekly meetings—which started in early 2005 and are chaired by a senior engineer with AOC’s construction management contractor—have generally helped to identify and resolve the specific issues being addressed. AOC’s weekly risk management meetings have also been helpful in identifying and addressing specific risks. However, the U.S. Capitol Police, which is responsible for managing the CVC’s security system, has not always participated in the fire protection meetings and does not participate in the risk management meetings. As a result, representatives have not always been present to identify issues associated with the interface between the security and the fire protection systems. Furthermore, some issues have not been addressed because the issues have not been included in the meeting agendas or specifically raised. As we reported during the Subcommittee’s June 28, 2006, CVC hearing, the CVC team has not had a comprehensive, prioritized list of system designs that have to be approved by AOC’s Fire Marshal Division. In addition, although the team does address various parts of the fire protection system during its progress review, fire protection system, and risk management meetings the team is just now developing a comprehensive list of the system elements that can be used to (1) discuss their status or (2) systematically and effectively identify potential or actual problems with the design, installation, or testing of all of the system’s components. The team is working to develop such lists and expects to complete them shortly. The lists should be particularly useful in identifying potential issues, including those involving the interface between the security and the fire protection systems.

Notwithstanding the regular meetings between the CVC team and the Fire Marshal Division, a problem with a component of the CVC’s fire protection system recently arose. This component is being installed as an alternative to an approach that was originally planned to provide a level of protection specified in the life safety code. Designed to provide an equivalent level of protection, the alternative approach is necessary because the original one could not be accommodated within the CVC’s design. However, according to AOC’s Fire Marshal Division, the component—which the sequence 2 contractor has almost completely installed—would not provide an equivalent level of protection because it does not meet a survivability standard applicable to the original system. The CVC team and the Fire Marshal Division resolved this issue last week, but additional work is required and additional costs will be incurred. The exact impact of the additional work on the project’s schedule and cost is not yet clear, and AOC expects to have more information on both shortly. Moreover, although this issue has been resolved, other issues may arise and other changes may be required because the design of the fire protection system

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has not yet been fully approved; efforts to resolve open issues for some shop drawings have dragged on for several months; installation is still in progress; and pretesting and testing of the fire protection system have not yet begun.

We have not fully evaluated all of the circumstances surrounding the problem with this component of the CVC's fire protection system. However, according to the information we have gathered, issues in at least two areas—communication and management—contributed to the problem.

- Communication broke down because certain requirements were not stated explicitly in writing, assumptions varied, and information was conveyed largely through document exchanges rather than meetings, during which the unwritten requirements and differences in assumptions could have surfaced, leading to earlier resolution of the problem. According to both the CVC team and AOC's Chief Fire Marshal, much of the communication problem stemmed from the uniqueness of the CVC and the application of the component in question and the fact that the situation being addressed is not specifically covered in the life safety code and other project-related documents.
- Management issues also contributed to the problem with the component, despite all the efforts of the CVC team' and the Fire Marshal Division' to coordinate and successfully address the fire safety issues. The CVC team and the Fire Marshall Division have not been able to resolve all issues quickly. For example, resolution of the team's shop drawings and product specifications for the fire protection system component in question has dragged on for over 9 months and is still not complete. Resolution of the Fire Marshal Division's comments on some other fire protection system components is also taking several months, but a recent change in AOC's approach to resolving comments seems to have improved the situation. Notably, the Division's comments on the team's February 2006 submittal for another fire protection system component in the exhibit gallery had not yet been resolved as of last week. At the same time, though, the CVC team has been working aggressively to resolve the Division's comments on the drawings for the base project's fire alarm system, and recently, at the Architect of the Capitol's direction, the team and the Fire Marshal Division have been meeting (as well as exchanging documents) to discuss the Division's comments on the team's submittal for this system. This process appears to be working well.

During the last 2 weeks, we met with AOC to discuss our concerns about the fire protection system and suggested that AOC take immediate steps to

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enhance management control over the completion of the fire protection system as well as its interface with the CVC's security system. In particular, we believe it is important for AOC to determine immediately and on an ongoing basis whether other problems with the design, installation, or testing of the fire protection system and its interface with the security system could have significant adverse effects on life safety, functionality, or the project's schedule or cost. To complement the team's ongoing efforts, which we believe have been quite helpful, we suggested, and AOC agreed, to have weekly meetings with key CVC team members and representatives from AOC's Fire Marshal Division and the U.S. Capitol Police to discuss all elements of the fire protection system and to identify and resolve any concerns, problems, or issues associated with all aspects of the system's design, installation, pretesting, or final testing, including any quality, scheduling, or coordination matters, and to focus on expeditiously attaining fully approved designs for all aspects of the system. In addition, we asked AOC's Chief Fire Marshal if he could develop his plans for acceptance testing of the fire protection system in the next few weeks so that the CVC team could factor these plans into its work, scheduling, and resource planning. The Chief Fire Marshal agreed and said that he has proposed that (1) his Division meet with the CVC team and the U.S. Capitol Police to identify potential submission items; (2) all submission items be tracked in weekly meetings; and (3) the submission items be prioritized for review and resolution. In addition, both AOC and a U.S. Capitol Police representative agreed that participation by the U.S. Capitol Police in more of the team's weekly meetings should prove helpful. Although it may be impossible to prevent all problems or surprises, we believe that these steps, if effectively implemented by all parties, can reduce the risks associated with the fire protection system's completion and the system's interface with the CVC's security system and identify problems early enough to minimize their consequences.

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### Other Risks Have Materialized, Delaying Activities Important to the Project's Completion

Although the scheduled completion date for the CVC has remained about the same as we reported at the Subcommittee's June 28 hearing, problems in a number of areas have either delayed or could delay activities whose late completion could adversely affect the project's overall completion. For example, according to the construction management contractor, the date for the air-handling units to be mechanically ready slipped by 2 weeks because of further problems in completing tunnel pipe insulation work, and efforts to close in the ceiling in the upper-level orientation and security lobby slipped by 3 weeks because of problematic sequence 1 work that required remediation. According to the project's June schedule,

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additional delays in these activities of 15 and 25 workdays, respectively, could further delay the project's overall completion. In addition, a delay of as little as 2 workdays in completing the gift shops—whose design, AOC says, has now been agreed upon—could affect the project's overall completion date. As we will discuss later in our testimony, several other activities that are important to meeting the CVC's May 2007 scheduled completion date have also been delayed.

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 design-related delays of about a month each in activities involving a custom light fixture, a concrete ramp, and a special fire suppression system. Furthermore, the sequence 2 subcontractor doing the expansion work identified other concerns that could delay the completion of its work, some of which could affect the CVC's opening. For example, the subcontractor reported being instructed to stop certain work in the U.S. Capitol Police's command center pending the resolution of an issue involving the facility's fire protection system. The subcontractor also reported that a lack of humidity controls, caused by the delay in getting the air-handling units operational, could delay certain casework and ceiling tile installation.

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 may fall behind by as much as 53 calendar days because of an asbestos problem. However, the contractor believes that it may be able to recover some of this time after the asbestos abatement work is completed.

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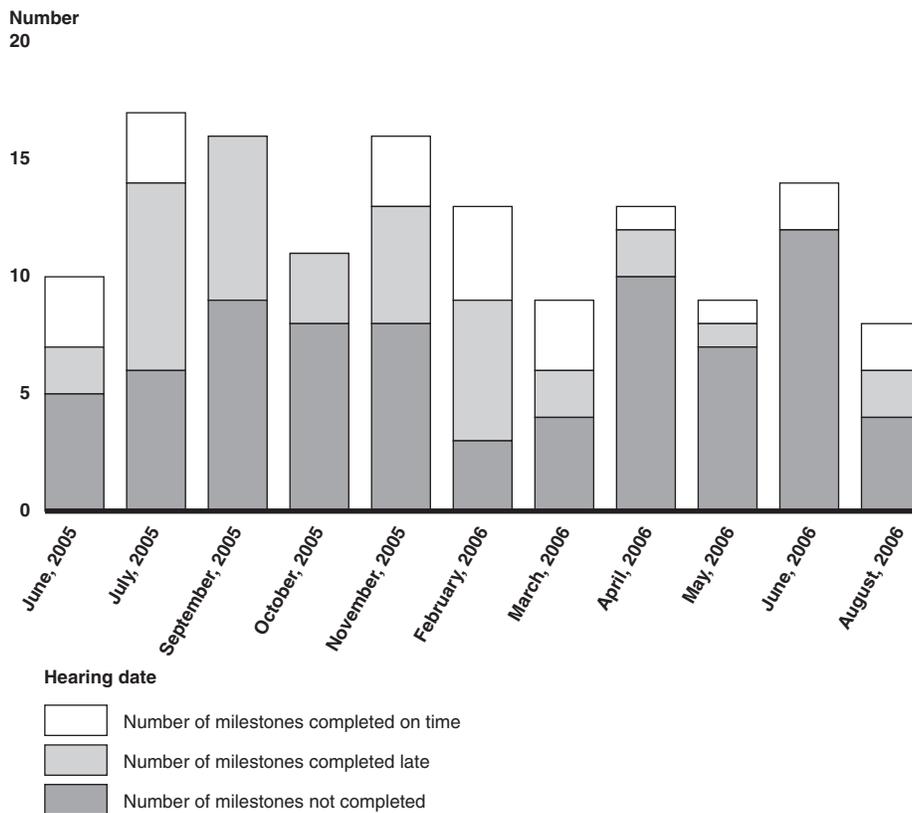
## Indicators of Construction Progress Show Mixed Results

The four indicators of construction progress that we have been tracking for the Subcommittee show mixed results since the Subcommittee's June 28 CVC hearing. 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 8

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 meeting 2 other milestones and had not met the remaining 4 milestones as of July 31. (See app. I.) The sequence 2 contractor attributed the slippages to a number of factors, including the need to do remedial or other work first, the work itself or 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.

In total, AOC's construction management contractor reported delays in 17 of 24 critical and near-critical paths that AOC's construction management contractor identified as important to meeting the base project's overall

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completion date.<sup>4</sup> According to AOC's construction management contractor, delays occurred in, but were not limited to, the utility tunnel, East Front, orientation theaters, exhibit gallery, certain elevator installations, the upper level assembly room, the atrium, and the Library of Congress tunnels. According to the CVC team, these other delays were attributable to such factors as water leaks, deficient sequence 1 work, changes in the sequence of work activities by the sequence 2 contractor, the need to do lead abatement work, and inaccessible work areas. Even more important than the individual delays themselves, however, is their likely impact on the CVC team's ability to complete construction work on schedule. So many activities have fallen behind schedule that relatively short additional delays could push the CVC's overall completion date further back. The number of critical and near-critical paths increased from 23 in the project's May schedule to 24 in the June schedule, and a number of the activities that slipped in June had also slipped in the May schedule.

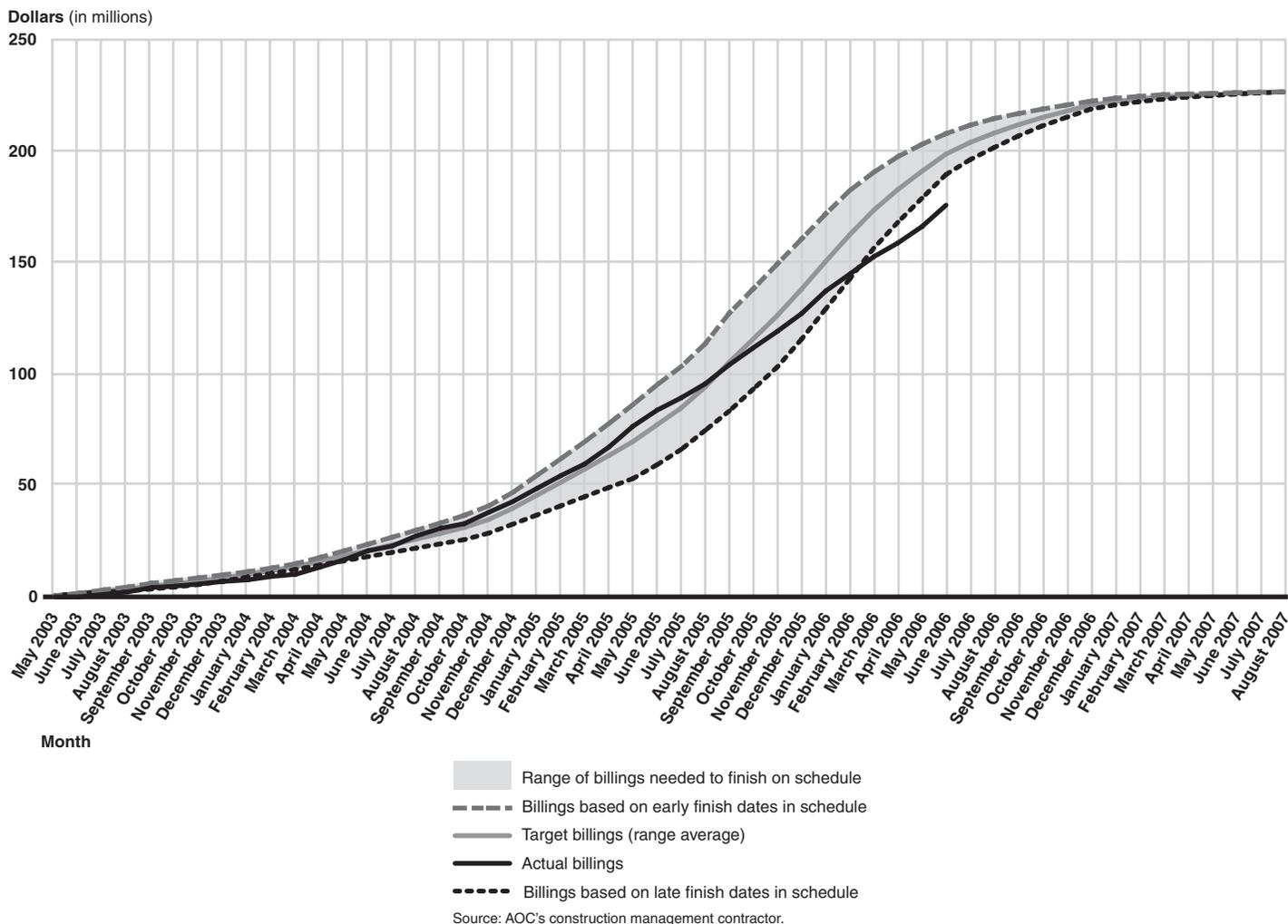
*Value of completed work increased in June, but trend continues to indicate completion in late spring or summer of 2007.* Another indicator of construction progress that we and AOC's construction management contractor have been tracking is the value of the completed construction work billed to the government each month. Although the sequence 2 contractor's billings for June were about \$2.2 million higher than for May, both we and the construction management contractor believe that, overall, the sequence 2 contractor's monthly billings, including the bills for March through June 2006, indicate that AOC is more likely to finish closer to its currently 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 the sequence 2 contractor is unlikely to finish

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<sup>4</sup>Construction projects typically have one critical path, which is the sequence of activities having the longest duration through the schedule. There is no slack time associated with these activities, meaning that a delay in a critical path activity will delay the entire project unless a way is found to reduce the time required for other activities along the critical path. Some projects have multiple critical paths simultaneously; in practice, the CVC had what essentially amounted to two concurrent critical paths in May—(1) acceptance testing of the fire protection system and (2) fit-out of the gift shops. In June, there was one critical path—acceptance testing of the fire protection system. Generally, the more critical and near-critical activities a project has, the greater is the risk of late completion because there are more opportunities for slight delays that can adversely affect the project's completion.

the project until at least late spring or summer 2007 unless the value of completed work increases significantly and is sustained at the increased level. We believe that such a significant increase will be difficult, given the limited number of areas that will be ready for finish work at any given time.

**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:

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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 110 (\$226.8 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.

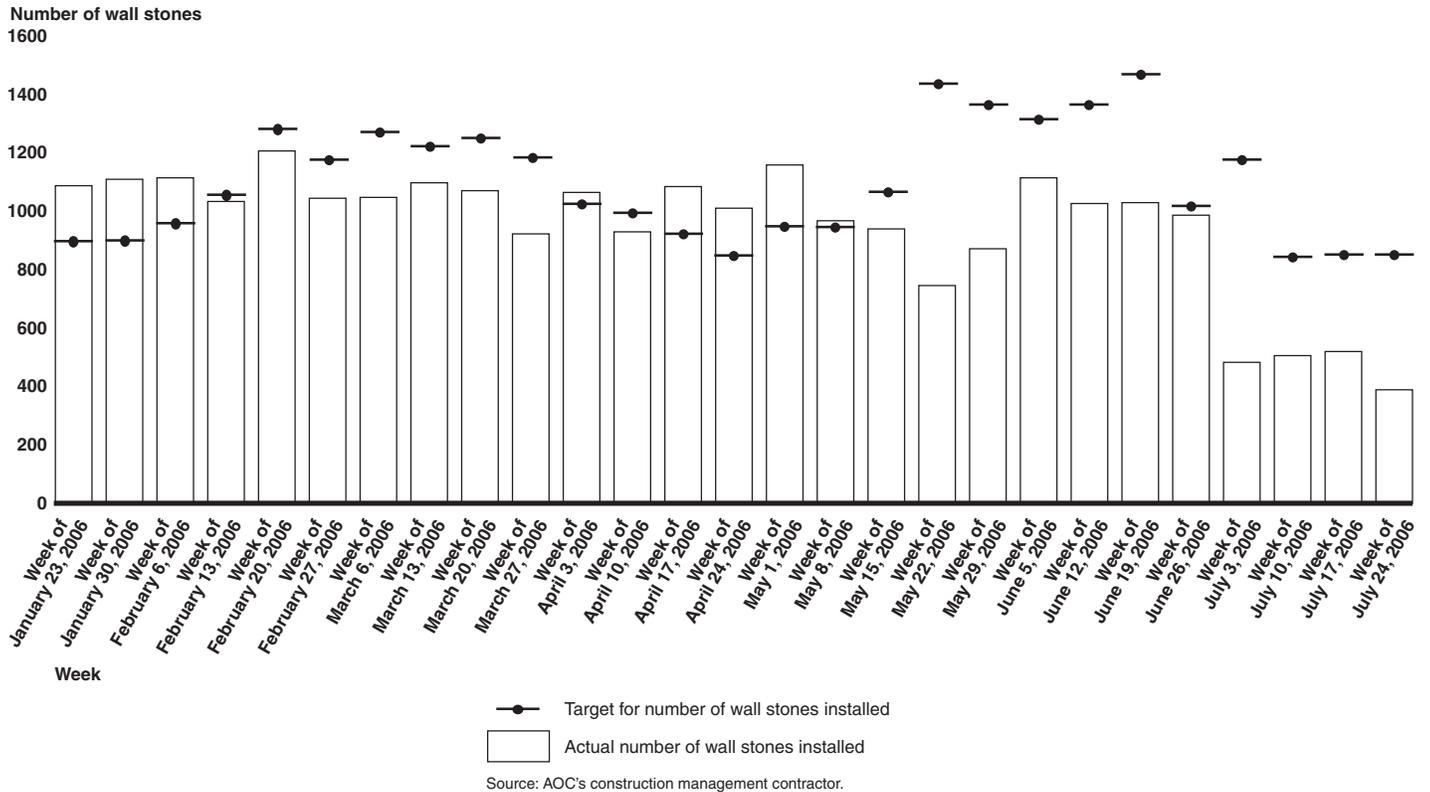
2. The actual line reflects the sequence 2 contractor's actual monthly billings.

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 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 June 2006. Even with the lag in billings, this trend indicates that the amount of work being completed each month is not sufficient to finish the project by the previously scheduled completion date.

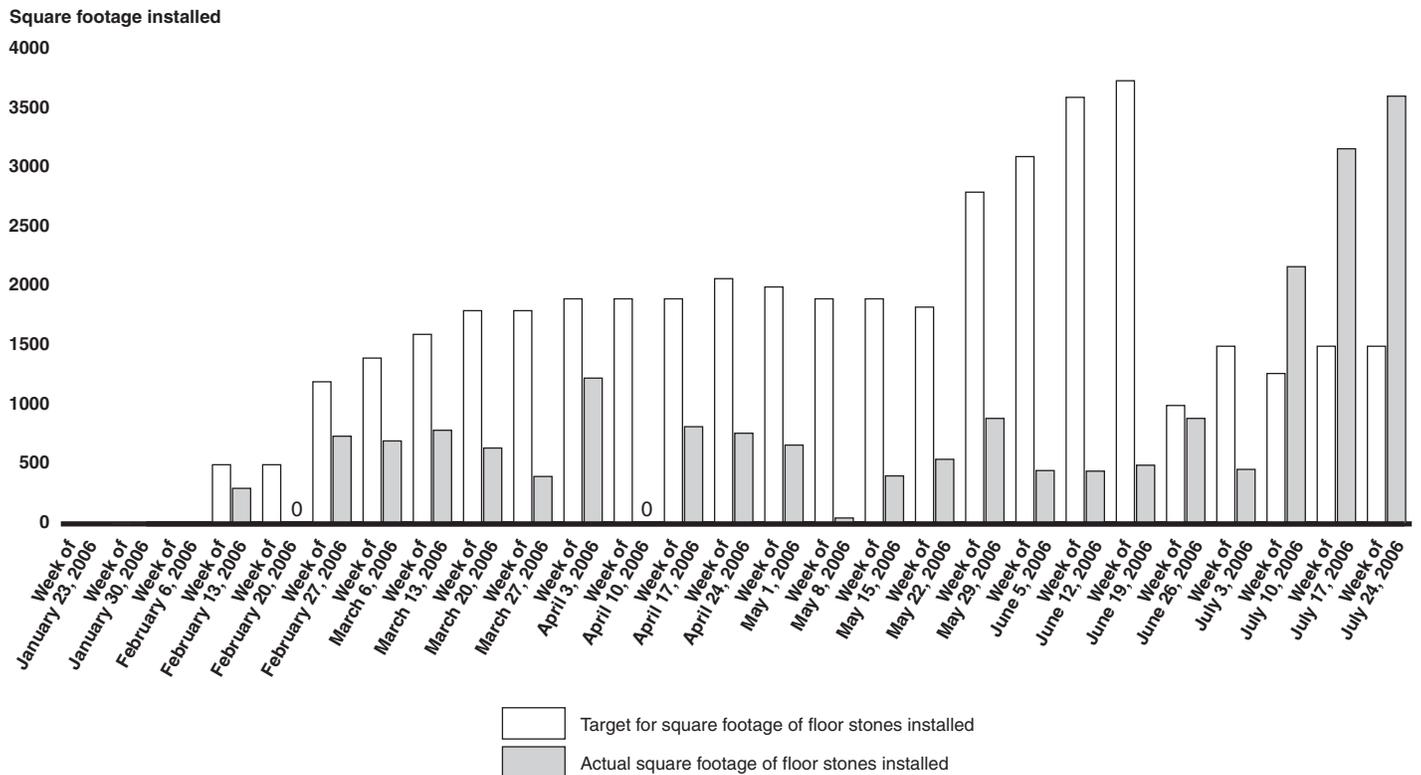
*Interior wall stone installation is taking longer than expected, but floor stone installation exceeded target.* Overall, about 84 percent of the CVC's interior wall stone has been installed (in the CVC, East Front, atrium areas, and tunnels), according to AOC's construction management contractor, and the sequence 2 contractor installed 2,890 pieces of interior wall stone during the last 5 weeks, about 61 percent of its 4,736 piece production target. During the same period, the sequence 2 contractor installed about 7,130 square feet of floor stone, or about 5 percent more than the 6,770 square feet specified in the floor stone installation plan that the contractor recently provided to AOC. In addition, 2 of the 8 schedule milestones that we and AOC have been tracking for the Subcommittee for today's hearing are related to interior wall stone installation, and the sequence 2 contractor completed work for one ahead of schedule, but has not yet completed the other one, according to AOC's construction management contractor. Although the sequence 2 contractor made good progress in installing interior wall stone in the base project, it encountered delays in installing wall stone in the East Front and atrium areas. According to the construction management contractor, the East Front delays were attributable to a need for remedial, preparatory, and lead abatement work, and the atrium delays were attributable to the need to do remedial work and a decision by the sequence 2 contractor to resequence work affecting those areas.

Figures 3 and 4 show the sequence 2 contractor's progress in installing interior wall and floor stone since January 23 and February 13, 2006, respectively.

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



**Figure 4: 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. In our view, the remaining work associated with the fire protection system poses the greatest single risk to meeting AOC's July and August 2007 proposed opening dates. At this time, we are uncertain whether the 2 to 3 months that AOC has added to the schedule for addressing the challenges, risks, and uncertainties that continue to face the project—including the fire protection system—will be sufficient, particularly given the project's history of delays, the difficulties the CVC team has encountered in getting effective control over the fire protection system, and the large number of near-critical activities that can affect the project's overall completion if they incur relatively short additional delays. Accordingly, we plan to monitor the actions taken by the

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CVC team to enhance its control over the completion of the fire protection system, reassess the project's schedule this summer, and report our results to the Subcommittee by mid-September 2006. 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 risks and uncertainties associated with the fire protection system are apparent: the shop drawings for some elements of the system have not yet been approved; installation has begun, and issues other than the problem we discussed earlier may require resolution. In addition, the process for testing the system is not yet clear; the time needed to complete these activities is uncertain, and the fire protection system must work in tandem with the security system. 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 system.<sup>5</sup> 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 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 July 27, 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.

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<sup>5</sup>According 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.

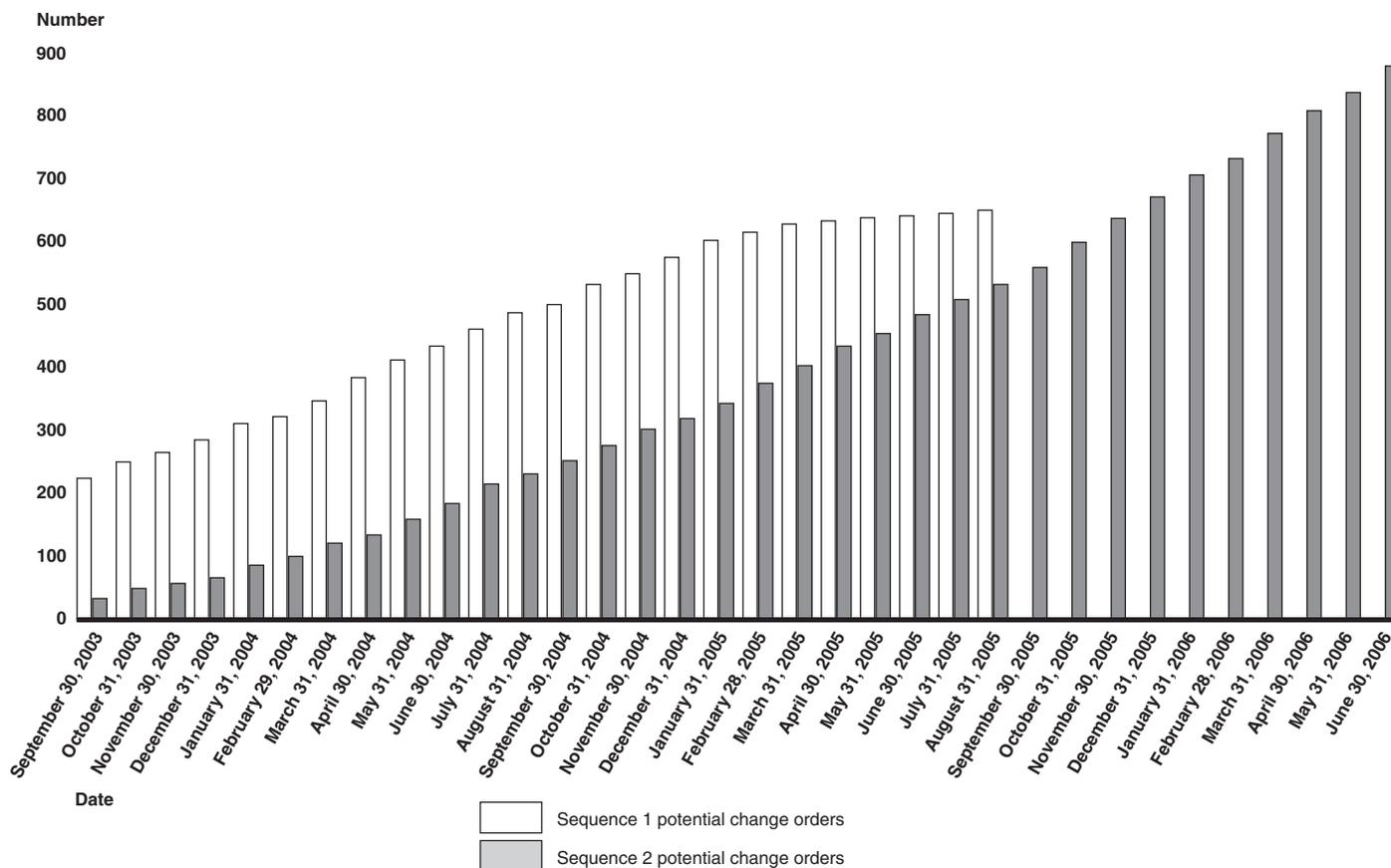
- 
- *Trade stacking could delay completion.* As we discussed during the Subcommittee's previous CVC hearings, trade stacking could hold up finish work, such as drywall or ceiling installation, electrical and plumbing work, plastering, or floor stone installation. This work could be stacked because of 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, which the sequence 2 contractor does not expect to be ready for finish work for several weeks. According to the sequence 2 contractor, it intends to continue meeting regularly with its subcontractors to review and update the area plans and to have the area plan for the East Front done before finish work begins there. According to the sequence 2 contractor, its area-by-area plans have prevented trade stacking to date.
  - *Building design and work scope continue to evolve.* The CVC has undergone a number of design and work scope changes. Since the Subcommittee's June 28 CVC hearing, AOC's architectural contractor has issued nine design changes or clarifications. As of July 27, 2006, this contractor reported, another eight were in process. In addition, since the project began, AOC has executed about 100 sequence 2 contract modifications for work that was not anticipated.<sup>6</sup> 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 June 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 5 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

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<sup>6</sup>These 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.

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. For example, changes in the design of the gift shops are likely to affect the project's schedule more adversely now than if the changes had been made several months ago.

**Figure 5: Cumulative Number of Potential Change Orders Submitted for CVC Sequences 1 and 2 between September 2003 and June 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

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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 are likely to 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, utility tunnel delays could require additional equipment in other areas, subject certain work to 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 were 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 completed the preparatory work necessary to begin running chilled water through the CVC utility tunnel and expects to have steam running through the tunnel by mid-August. The team expects to have the first air-handling unit—which serves the exhibit gallery—providing dehumidified air to the exhibit gallery by mid-August. To keep the CVC and expansion space finish work on schedule, the team will have to either get the other air-handling units operational within the necessary time frames or obtain temporary equipment to provide conditioned air, where feasible.

- *Opening the CVC and expansion spaces at different times is likely to result in a temporary cap on CVC occupancy and could increase costs.* AOC's current plan to open the CVC in July 2007 before the expansion spaces are scheduled for completion is likely to result in a temporary cap on CVC visitor occupancy and may necessitate the construction of temporary emergency exits for fire and life safety protection.<sup>7</sup> AOC is proposing this sequential approach because it believes that conducting acceptance testing for the fire protection system for the CVC and the expansion spaces concurrently would delay opening the CVC to the public. AOC's proposed July 2007 opening date for the CVC depends on the timely

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<sup>7</sup>According to AOC, the CVC's occupancy at any one time would be temporarily limited to 3,500, compared with about 4,200, the normal anticipated occupancy level, until acceptance testing of the fire protection system for the expansion spaces has been completed. Although AOC anticipates the need for some temporary work, it does not believe that the associated costs will be substantial.

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completion of work not only on the base project but also on the expansion spaces, since certain expansion space work must be completed before the CVC's opening. Because certain work on both the base project and the expansion spaces has been delayed during the last several months, we believe that it will be especially important to monitor the progress of construction to determine what additional work (and funding) may be needed to meet AOC's planned date for opening the CVC, including what temporary work may be required in the expansion spaces for the opening to occur before the expansion space work is completed. AOC's Chief Fire Marshal has not yet worked out the details of how he will conduct his acceptance testing for the CVC and the expansion spaces; so the order in which various CVC and expansion space areas will be available for opening is not yet clear. More information on this sequencing issue should be available by the Subcommittee's next CVC hearing because the Chief Fire Marshal expects to have his testing plan done soon.

- *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 3,700 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.<sup>8</sup> 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

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<sup>8</sup>See for example: GAO, *Capitol Visitor Center: Effective Schedule Management and Updated Cost Information Are Important*, [GAO-05-811T](#) (Washington, D.C.: June 14, 2005).

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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 current September 15, 2006, sequence 2 contract completion date and the impact this analysis is likely to have on delay-related costs.

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## Estimated Project Cost and Funding

Our most recent estimate of the cost to complete the CVC project was made several months ago. At that time, we estimated that the total cost to complete the entire CVC project would be about \$556 million without an allowance for risks and uncertainties and could be as much as about \$584 million with such an allowance. To date, about \$530 million<sup>9</sup> has been provided for CVC construction. This amount includes about \$3.6 million that was made available for either CVC construction or operations and has been approved for CVC construction by the House and Senate Committees on Appropriations.<sup>10</sup> AOC and its construction management contractor have completed their reassessments of the cost to complete the project and have concluded that the amount of funds provided to date plus the \$26 million that AOC hopes to receive in fiscal year 2007 CVC construction funds will be sufficient to complete the project except for possible delay-related costs. (This \$26 million in additional funds is the amount our previous cost-to-complete estimate showed would be necessary without provision for risks and uncertainties.) AOC and its construction management contractor acknowledged, however, that in drawing their conclusions, they assumed that some funds that have been slated for use for possible delay-related costs may have to be used for other purposes, thus possibly requiring additional funding for potential delay-related costs. As we testified during the Subcommittee's June 28 CVC hearing, recent events have raised questions about the sufficiency of the \$556 million cost-to-complete estimate, given that it does not provide an allowance for risks and uncertainties. Although recent events suggest to us that our previous \$556 million estimate may increase, we have not changed it yet pending

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<sup>9</sup>See footnote 3.

<sup>10</sup>Public 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 \$84,800) 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, which we will discuss further in our next CVC testimony.

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the results of our reassessment of the cost to complete the project, which we expect to have by mid-September. Notwithstanding our pending reassessment, we have no specific indication that the total cost to complete the project will exceed our \$584 million estimate, which does include an allowance for risks and uncertainties.

In addition, AOC has indicated that it plans to use about \$950,000 of the fiscal year 2007 general administration appropriations it has requested to provide contractual support for its Fire Marshal Division. As we stated in our last several CVC testimonies, AOC believes that it may be able to reduce the amount of funds it will need in fiscal year 2007 to provide contractual support for testing the CVC's fire protection system and is exploring ways to do so. We plan to monitor this situation and report to the Subcommittee as soon as AOC has a firmer estimate.

AOC currently has sufficient contingency funding available to cover anticipated possible delay-related costs associated with the asbestos problem identified in connection with the work being done to connect the tunnel running from the CVC to the Jefferson Building. Even after considering use of the contingency to address anticipated possible costs for the asbestos problem, AOC would have contingency funding available for some additional problems or changes related to the Jefferson Building work. We will continue to monitor this work and the use of the contingency funds for it.

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

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

# Appendix I: Capitol Visitor Center Critical Construction Milestones, June 29, 2006-August 2, 2006

| Activity                    | Location                              | Scheduled completion | Actual completion    |
|-----------------------------|---------------------------------------|----------------------|----------------------|
| Wall Stone Area 3           | East Front Ground                     | 7/17/06              | 7/15/06 <sup>a</sup> |
| Plaster Walls               | Orientation Lobby                     | 7/18/06              | 7/25/06 <sup>a</sup> |
| Plaster Ceilings            | West Lobby Assembly                   | 7/19/06              | 7/25/06 <sup>a</sup> |
| Hang VP Drywall Ceiling     | Congressional Auditorium, Lower Level | 7/20/06              | <sup>b</sup>         |
| Wall Stone Area 6           | Congressional Auditorium              | 7/20/06              | <sup>c</sup>         |
| Flush and Treat HVAC Piping | CVC                                   | 7/24/06              | 6/24/06              |
| Fire Alarm Record Submittal | CVC                                   | 7/31/06              | <sup>d</sup>         |
| Install AHU-EF-1            | Mechanical System                     | 8/01/06              | <sup>e</sup>         |

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

<sup>a</sup>Work noted as substantially complete by contractor.

<sup>b</sup>Preceding work took longer than expected.

<sup>c</sup>Work delayed by concrete tolerance issues related to sequence 1.

<sup>d</sup>Contractor needed to incorporate a revised sequence of operations specification recently received from AOC, and other issues took longer than expected to resolve.

<sup>e</sup>Work was resequenced after schedule was updated in June and is now expected to be done in late August.

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