



Testimony  
Before the Committee on House  
Administration, House of  
Representatives

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# ARCHITECT OF THE CAPITOL

## Efforts Have Begun to Update Cannon House Office Building's Renovation Cost and Schedule Estimates

Statement of Terrell G. Dorn, Managing Director  
Infrastructure Operations

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Chairperson Lofgren, Ranking Member Davis, and Members of the Committee:

Thank you for the opportunity to discuss the Architect of the Capitol's (AOC) efforts to renovate the Cannon House Office Building (Cannon project). AOC intends to preserve the historic character of and address deterioration to components and systems in the 113 year-old Cannon Building, and improve the functionality of suites for members of the House of Representatives (Members). The Cannon project is nearing year 7 of its planned 10-year duration.

My statement today provides information on (1) the status of the Cannon project and (2) changes to the project's estimated cost at completion. It is based on our 2009 and 2014 assessments of AOC's planning and cost estimating for the Cannon project prior to the start of construction as well as our observations of the construction to support congressional oversight of the project.<sup>1</sup> Detailed information on the scope and methodologies for our 2009 and 2014 reports can be found in GAO's published products, which are cited throughout this testimony. Our ongoing observations of the construction have included reviews of AOC's project summary reports, construction contractor reports, and other project documentation and recurring discussions with AOC.

We conducted the work on which this statement is based in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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## Background

The Cannon Building, completed in 1908, is the oldest congressional office building and is occupied by Members and their staffs (see fig. 1.)

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<sup>1</sup>GAO, *Architect of the Capitol: Plans for Renovating the Cannon House Office Building and Garages*, [GAO-09-673T](#) (Washington, D. C.: May 6, 2009) and *Architect of the Capitol: Incorporating All Leading Practices Could Improve Accuracy and Credibility of Projects' Cost Estimates*, [GAO-14-333](#) (Washington, D. C.: Mar. 25, 2014). In our 2014 report, we found that AOC's cost estimating policies and guidance did not require a quantitative risk and uncertainty analysis nor the reporting of the resulting confidence level of the estimate. We made recommendations for AOC to incorporate leading practices into agency guidance and submit confidence levels of cost estimates to Congress. AOC implemented our recommendations. These leading practices are listed in GAO, *Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, [GAO-09-3SP](#) (Washington, D. C.: Mar. 2, 2009).

# GAO@100 Highlights

Highlights of [GAO-21-105363](#), a report to congressional requesters

## Why GAO Did This Study

In its Cannon project, the AOC intends to preserve the historic character while improving the functionality of the 113 year-old Cannon Building—the oldest congressional office building—as well as address deterioration to the building and its components. The project—nearing year 7 of its planned 10-year duration—is being implemented in five sequential phases with an initial phase (Phase 0) for utility work and four subsequent phases (Phases 1 through 4) to renovate the north-, south-, east-, and west-facing sides of the building. Each phase is scheduled around a 2-year congressional session.

This statement describes: (1) the status of the Cannon project and (2) changes to the project's estimated cost at completion. This statement is based on GAO's prior reports in 2009 and 2014 and ongoing monitoring of the project. To monitor the project, GAO has been observing the ongoing construction, attending project meetings, and analyzing AOC documents.

## What GAO Recommends

In 2014, GAO made recommendations pertaining to AOC's cost-estimating guidance and policies. AOC has implemented these recommendations.

View [GAO-21-105363](#). For more information, contact Terrell Dorn at (202) 512-6923 or [dort@gao.gov](mailto:dort@gao.gov)

August 2021

## ARCHITECT OF THE CAPITOL

### Efforts Have Begun to Update Cannon House Office Building's Renovation Cost and Schedule Estimates

#### What GAO Found

The Architect of the Capitol (AOC) has substantially completed three of five planned phases to renovate the Cannon House Office Building (Cannon project). AOC completed Phase 0 utility work; the Phase 1 work to renovate the building's west side, the Phase 2 work to renovate the building's north side; and work is underway on Phase 3 of the building's east side.

#### Cannon House Office Building, Washington, D. C.



Source: Architect of the Capitol. | GAO-21-105363

From 2009 to 2018, AOC consistently estimated the project cost at \$753 million. In 2014, GAO found that AOC's cost estimate of \$753 million reflected several of GAO's leading practices for high-quality, reliable cost estimates, including that AOC had conducted a risk and uncertainty analysis. GAO found that AOC's cost estimating policies and guidance did not require a quantitative risk and uncertainty analysis nor the reporting of the resulting confidence level of the estimate. GAO made recommendations for AOC to incorporate leading practices into agency guidance and submit confidence levels of cost estimates to Congress. AOC implemented our recommendations. In January 2018, AOC updated its analysis of risks by undertaking an integrated cost-schedule risk analysis. AOC's 2018 analysis arrived at the same conclusion as its earlier analysis—that the project's estimated \$753 million total cost was adequate to complete the project. However, AOC's 2018 analysis indicated that inaccurate estimates of costs for risk mitigations, unknown risks, and optimistic assumptions about the effect of risk mitigations on the project's cost and schedule could affect its total cost. AOC updated the analysis in December 2019 and estimated the project cost at \$890 million.

Two unknown risks materialized after the December 2019 estimate: the effect of COVID-19 and the January 2021 security events—their impact on the project is uncertain. In its March 2021 project summary, AOC reported that a revised budget would be formulated after the completion of an analysis in December 2021. Toward this end, in May 2021, AOC began updating its integrated cost-schedule risk analysis, with the aim of more accurately determining the extent to which the project's costs are increasing and its estimated cost at completion.

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The Cannon Building houses 142 office suites, five conference rooms, four hearing rooms, and the Caucus Room, which can accommodate large meetings. The building also includes a library, food servery, and a health unit.

**Figure 1: Cannon House Office Building, Washington, D. C.**



Source: Architect of the Capitol. | GAO-21-105363

AOC began developing the scope for the Cannon project in approximately 2004 when its consultant conducted a facility condition assessment that identified the building's deficiencies. This condition assessment identified, for example, that the hot water heating and air-handling systems had components dating back to the 1930s that are in need of replacement. In addition, the assessment identified deficiencies such as an outdated fire alarm system for which repair parts were difficult to obtain, worn and damaged marble tile in corridors, and original windows that were damaged and often nonfunctional.

AOC continued its planning and design work through 2014 to establish the final scope of the Cannon project, which entailed correcting most of the identified deficiencies and addressing current requirements such as for energy conservation, physical security, hazardous materials abatement, and historic preservation. Key components of the project, among other things, include:

- substantial reconfiguration of member suites and the reconstruction of the building's top floor to convert storage space into new suites,
- refurbishment of windows and installation of a new roof,
- preservation of the building's stone exterior,

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- replacement of all plumbing, heating and cooling, fire protection, electrical, and alarm systems, and
  - refurbishment of restrooms to make them more accessible to people with disabilities.

As part of the development process for the Cannon project, AOC established a budget of approximately \$753 million. Key components of the budget include costs for the construction contract; architect and engineering (A/E) design services; construction management support; security; furniture and fixtures; swing space design and construction; contractor incentive bonuses; and contingency.<sup>2</sup>

AOC is using the Construction Manager as Constructor (CMc) delivery method to implement the Cannon project. Under this approach, AOC:

- contracted with a construction contractor that consulted on the project's design, and
- negotiated with the construction contractor to set a "guaranteed maximum price" for the construction work based on the completed design.<sup>3</sup>

AOC also contracted with an A/E firm, which produced the design for the project and is providing consultation during construction, and with a Construction Manager as Agent (CMa), that provides administrative and technical support to AOC in managing the construction work.

AOC scheduled the Cannon project's construction in five sequential phases with an initial phase (Phase 0) for utility work and four subsequent phases (Phases 1 through 4) to renovate the north-, south-, east-, and west-facing sides of the building. Each phase is scheduled around a 2-year congressional session. As the project progresses, tenants displaced during construction (Phases 1 through 4) are to move to temporary offices while other occupants are to remain in the building sections not affected by construction.

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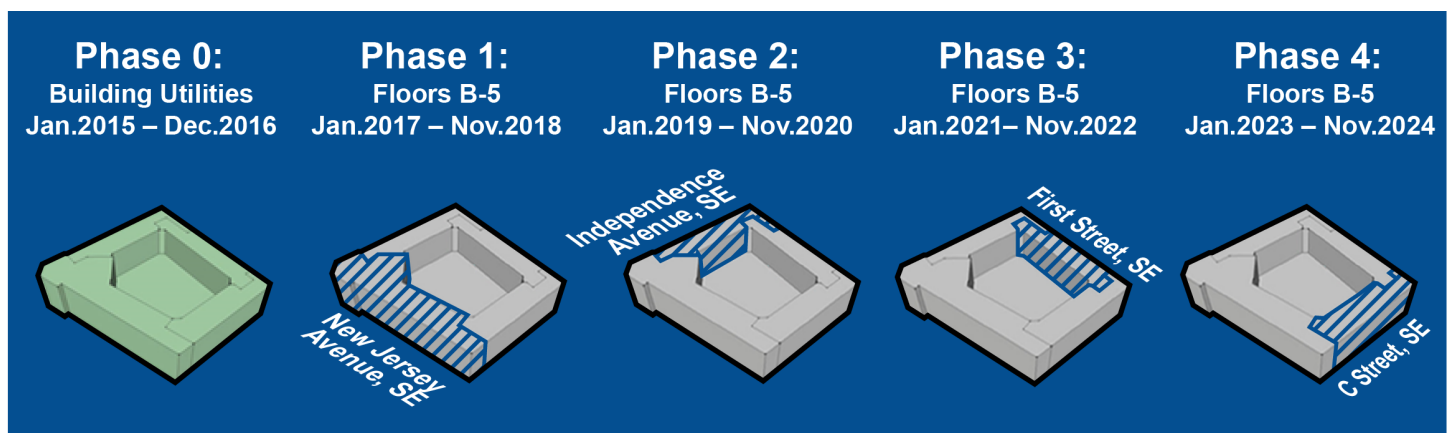
<sup>2</sup>We are not providing details on project costs because some costs relate to open contracts, and information about contract costs is procurement sensitive.

<sup>3</sup>A guaranteed-maximum-price contract sets the maximum price (GMP) that the AOC will pay the CMc for work associated with the Cannon project. The GMP does not include changes to the project's scope that require modifications to the design and an upward or downward price adjustment. For example, if the A/E modifies the design, the AOC negotiates the cost of changes in the project's scope with the CMc.

## AOC Has Completed Three of Five Phases of the 10-Year Cannon Project

Currently, AOC has substantially completed Phase 0, Phase 1 and Phase 2 of the five phases planned for the Cannon project and work is underway on Phase 3, which it expects to complete in November 2022. (See fig. 2.)

**Figure 2: Planned Cannon Office Building Project Phases**



Source: GAO. | GAO-21-105363

AOC completed Phase 0, as planned and under its budget estimate, from January 2015 through December 2016. This work primarily included the construction contractor's replacement of the utility infrastructure and distribution systems in the basement, garage, and courtyard. During this time, AOC also managed the work of its Construction Division to build 31 additional Member Suites to offset the suites that would be inaccessible when sections of the building were under construction.

From January 2017 through December 2018, AOC managed the renovation of the first of four building sections, consisting of the building's west side (facing New Jersey Avenue) and Rotunda (Phase 1). AOC substantially completed Phase 1 to enable occupancy of the building section, as planned, on January 3, 2019, at the start of the 116th Congress.

Likewise, from January 2019 to May 2021, AOC substantially completed the renovation of the north side of the building (facing Independence Avenue), which is the second of the four building sections to be renovated (Phase 2). In its June 2021 update, AOC reported that:

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- some interior items such as elevator fronts and trim and items in controlled access areas are on schedule for completion during the August recess,
  - the exterior site is scheduled to be completed in mid–September, and
  - the Rotunda Roof repair and stair 7 will be transferred to Phase 3 this summer.

Since January 2021, AOC is progressing in renovating the east side of the building facing First Street (Phase 3) and has benefited from its application of lessons learned. For example, AOC reported that its construction contractor experienced challenges installing the temporary roof enclosure that it used in Phase 1. Based on this experience, AOC officials previously told us that the contractor developed a new design for the temporary roof enclosure that the contractor expected to install more rapidly in the project’s remaining phases than in Phase 1.<sup>4</sup> AOC recently reported that the temporary roof enclosure for Phase 3 is nearly completed and work to remove the old roof is ongoing.

However, AOC reports that both Phase 2 and Phase 3 have experienced unexpected costs and schedule delays due to COVID-19 and the January 2021 security events.

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### AOC Increased Its Previous Cost Estimate from \$753 Million to \$890 Million in 2019

In 2009, we reported that AOC expected to request approximately \$753 million for the Cannon project.<sup>5</sup> At the time, AOC expected the project to be in five phases over 5 years. Because the project was in an early development stage at that time, we said:

- that AOC’s estimate should not be considered sufficiently accurate for funding purposes,
- that the cost and scope were likely to change, and

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<sup>4</sup>In Phase 1 of the Cannon project, the contractor’s approach was to anchor the temporary roof enclosure to the building, a process that necessitated a lengthy engineering analysis to determine the amount and location of anchor points. In Phase 2 of the project, the contractor intends to anchor the temporary roof enclosure to the scaffolding placed adjacent to the building. The contractor expects that the engineering analysis to determine how to anchor the roof enclosure to the scaffolding will be comparatively simpler and take less time.

<sup>5</sup>[GAO-09-673T](#).

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- that it would be important for AOC to continue to refine the project's scope and cost estimate to provide Congress with the information it needed to make decisions about the project.

When we next reported on the Cannon project in 2014, AOC had completed most of the planning and design and was preparing to award the contract for construction, which was to begin in January 2015.<sup>6</sup> As part of our 2014 review of AOC's cost estimating policies and guidance, we compared AOC's cost estimate for the Cannon project—still \$753 million—to our leading practices for developing high-quality, reliable cost estimates.<sup>7</sup> We found the AOC's cost estimate reflected several, but not all, of our leading practices. In particular, we found that AOC's estimate included ground rules and assumptions; provided a reasonable explanation of the basic estimation methodologies; and integrated separately produced estimates from AOC's architect, construction manager, and construction contractor to enable a reasonably accurate assessment of estimated costs. Further, we found AOC had conducted a cost risk and uncertainty analysis in accordance with a key leading practice.<sup>8</sup> This analysis concluded that based on AOC's inputs and assumptions, there was a high probability (over 90 percent) that actual costs would be equal to or less than AOC's \$753 million estimate.<sup>9</sup>

This estimate included contingency factors to account for risks and uncertainties. However, our review of AOC's guidance for developing cost estimates found that the guidance did not provide documented reasons explaining how the actual contingency amounts were developed. In addition, we found that the method AOC used to model the project's risks in its cost risk and uncertainty analysis (1) resulted in an unusually narrow range of estimated costs and (2) provided managers limited ability to understand the effects of individual risks. We recommended that AOC

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<sup>6</sup>[GAO-14-333](#).

<sup>7</sup>[GAO-09-3SP](#).

<sup>8</sup>AOC, *Cannon House Office Building Renewal: Cost Risk and Uncertainty Analysis; Sensitivity Analysis* (Jan. 17, 2014 Draft).

<sup>9</sup>The probability of an estimate's likelihood of occurrence can be used to establish confidence levels for budgeting purposes. While no specific confidence level is considered a best practice, experts agree that cost estimates should be budgeted to at least the 50 percent confidence level, but budgeting to a higher level (for example, 70 percent to 80 percent, or the mean) is common practice. Moreover, experts stress that contingency reserves are necessary to cover increased costs resulting from unexpected design complexity and incomplete requirements, among other factors. (See [GAO-09-3SP](#)).



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take steps to improve its cost-estimating process, such as incorporating leading practices we identified as lacking for cost estimating into its cost-estimating guidance and policies. AOC has since implemented our recommendations.

In January 2018, while Phase 1 of the Cannon project was in progress, AOC updated its analysis of risks by undertaking a study (termed an integrated cost-schedule risk analysis) to determine the potential effects of these risks on the project's cost and schedule.<sup>10</sup> Updating risk analyses and their effect on project cost estimates is consistent with leading practices for developing both a high-quality, reliable cost estimate and schedule.<sup>11</sup> AOC's 2018 analysis arrived at the same conclusion as its 2014 analysis—that the estimated \$753 million total project cost was adequate and that there was a high probability (over 80 percent) that actual costs would be equal to or less than the \$753 million estimate. However, this analysis was qualified on the assumption that AOC and project stakeholders are able to mitigate risks identified through the analysis. Additionally, the analysis indicated that inaccurate estimates of costs for risk mitigations, currently unknown risks, and optimistic assumptions about the impact of risk mitigations on the project's cost and schedule could affect the project's total cost.

In June 2019, AOC reported that it expected that the cost to complete the Cannon project will increase by 10 to 15 percent over its initial estimate of \$753 million, resulting in a final cost between approximately \$828 million and \$866 million.<sup>12</sup>

In August 2019, AOC began updating its integrated cost-schedule risk analysis, with the aim of more accurately determining the extent to which the project's costs are increasing and its estimated cost at completion. By December 2019, AOC determined that the estimated project cost at completion had a high probability (about 80%) of \$928 million.<sup>13</sup> AOC conducted a risk mitigation analysis that identified "known risks" and

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<sup>10</sup>AOC, *Cannon House Office Building Renewal: Integrated Cost-Schedule Risk Analysis 2017* (Jan. 2018 Prefinal Draft).

<sup>11</sup>GAO-09-3SP and GAO, *Schedule Assessment Guide: Best Practices for Project Schedules*, GAO-16-89G (Washington, D. C.: Dec. 22, 2015).

<sup>12</sup>AOC, *Program Budget Review* (June 30, 2019 Draft).

<sup>13</sup>MBP-AECOM, Hulett & Associates, *Cannon House Office Building Renewal Project: Integrated Cost-Schedule Risk Analysis 2019 Final Report, Risk Analysis Results and Mitigation Action Plan*, Dec. 20, 2019

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strategies to mitigate them. The result of this process produced a cost estimate with a high probability (about 90%) of \$890.2 million. The assessment noted that the success of the project depended on the continued implementation of mitigation strategies developed, and ongoing monitoring and control of the risks during the life of the project in each phase.

However, there were unknown risks that materialized after the December 2019 estimate: the effect of COVID-19 and the January 2021 security events.

- In a project summary dated March 2020, AOC reported that COVID-19 was the primary risk to the execution of the project, and AOC expected cost and schedule impacts due to supply chain issues, workforce availability, site access, and enhanced protection measures.
- In a project summary dated January 2021, AOC reported that the security event at the Capitol and the Inauguration had caused schedule delays due to limited access to the site.
- In a project summary dated March 2021, AOC reported that the Phase 3 budget was at risk due to COVID and security impacts and a revised budget would be formulated after the completion of an integrated cost-schedule risk analysis in December 2021.

AOC reported that the cost and schedule analysis began in May 2021 and the process for risk assessment analysis began in July 2021. By updating these analyses, AOC should be better able to make informed decisions as construction progresses. Further, updating the analysis should enable AOC to more precisely estimate the Cannon project's cost at completion and better position AOC to make a more accurate budget request to Congress for remaining costs.

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Chairperson Lofgren, Ranking Member Davis, and Members of the Committee, this concludes my prepared statement. I would be pleased to respond to any questions that you may have at this time.

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## GAO Contacts and Staff Acknowledgments

If you or your staff has any questions concerning this testimony, please contact Terrell Dorn at (202) 512-6923 or [dornt@gao.gov](mailto:dornt@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement.

GAO staff who made key contributions to this testimony are Michael Armes (Assistant Director) and George Depaoli (Analyst-in-Charge).

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Other staff who made contributions to the reports cited in the testimony are identified in the source products.

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