United States Government Accountability Office

Report to Congressional Requesters

May 2018

FEDERAL BUILDINGS

More Consideration of Operations and Maintenance Costs Could Better Inform the Design Excellence Program

GAO-18-420

GAO Highlights

Highlights of GAO-18-420, a report to congressional requesters

May 2018

FEDERAL BUILDINGS

More Consideration of Operations and Maintenance Costs Could Better Inform the Design Excellence Program

Why GAO Did This Study

Since 1994, GSA has spent more than $8 billion to construct 78 new federal buildings through its Design Excellence program. Some design choices can affect a building's O&M costs and functionality.

GAO was asked to review GSA's ability to manage O&M costs under the Design Excellence program. This report assesses the extent to which: (1) GSA's design choices affect O&M costs; (2) GSA considers O&M costs and functionality when planning and designing buildings; and (3) GSA systematically collects and shares information on O&M costs.

GAO conducted a web-based survey of building managers for the 78 Design Excellence buildings. GAO also visited 10 Design Excellence buildings in three GSA regions selected based on several factors, including geographic and agency diversity. GAO reviewed GSA documents, and interviewed GSA officials and building tenants. Information obtained through site visits and interviews is not generalizable.

What GAO Recommends

GAO is making four recommendations to update existing GSA procedures for planning and designing new buildings to: (1) estimate full O&M costs; (2) obtain information from personnel responsible for addressing the O&M consequences of design decisions; (3) further consider how design choices may affect building functionality; and (4) systematically collect and share lessons from existing buildings. GSA agreed with these recommendations.

View GAO-18-420. For more information, contact Lori Rectanus at (202) 512-2834 or rectanusl@gao.gov.

What GAO Found

The goals of the General Services Administration's (GSA) Design Excellence Program are to creatively design federal buildings that meet federal agencies' functional needs and become public landmarks. Some design choices for Design Excellence buildings have decreased ongoing operations and maintenance (O&M) costs, but others have increased those costs. GSA's building managers and tenants told GAO that design choices that have reduced O&M costs include the use of durable materials and low maintenance landscaping. Other design choices have increased O&M costs. For example, according to GAO's survey of 78 building managers of Design Excellence buildings, multistory atriums often led to additional O&M costs, including the need to erect expensive scaffolding for maintenance.

Atriums That Increased Operations and Maintenance Costs in Buildings Constructed under GSA's Design Excellence Program, according to Respondents

(Left to right) First Street Federal Courthouse (Los Angeles, CA); Ronald Reagan Building and Trade Center (Washington, D.C.); James M. Carter & Judith N. Keep U.S. Courthouse (San Diego, CA)

Source: GAO. | GAO-18-420

While GSA aims to create Design Excellence buildings that are cost-effective and functional, it makes design choices without fully considering their effect on O&M costs and functionality. For example, GSA officials do not estimate the majority of O&M costs, such as the building maintenance associated with their design choices until the design is almost finalized. This outcome is partly because GSA procedures do not direct GSA officials to develop such estimates during the design and planning of Design Excellence buildings and because building and regional managers responsible for addressing the O&M consequences are also not involved in the design and planning process. As a result, important cost information that could help building project teams make the most cost-effective design choices is not available to help them. In addition, while building managers GAO surveyed reported that GSA's design choices generally support a building's functionality, they also reported that some design choices increased O&M costs without improving functionality. For example, they identified design choices related to material color and lighting that increased O&M costs but did not enhance the functionality of the building for the tenants.

Although GSA has developed some information on how design choices can affect O&M costs, it does not consistently collect and share such information. For example, GSA has evaluated the performance of only six Design Excellence buildings, and does not systematically collect information on how design choices have affected O&M costs in all existing buildings. Without a process to collect and share such information, future buildings may not benefit from these lessons, and problematic choices may be repeated.

Contents

Figures

Abbreviations

FRPP	Federal Real Property Profile
GSA	General Services Administration
HVAC	heating, ventilation, and air-conditioning
LED	light-emitting diode
O&M	operations and maintenance
OMB	Office of Management and Budget

U.S. GOVERNMENT ACCOUNTABILITY OFFICE
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May 22, 2018

The Honorable Ron Johnson
Chairman
The Honorable Claire McCaskill
Ranking Member
Committee on Homeland Security and Governmental Affairs
United States Senate

The Honorable James Lankford
Chairman
The Honorable Heidi Heitkamp
Ranking Member
Subcommittee on Regulatory Affairs and Federal Management
Committee on Homeland Security and Governmental Affairs
United States Senate

The Honorable Thomas R. Carper
United States Senate

Since 1994, the General Services Administration (GSA) has spent more than $8 billion to construct 78 new federal courthouses and office buildings through the Design Excellence Program. Under this program, GSA works with private-sector architects, interior designers, engineers, and construction firms to plan buildings that meet the needs of government agencies while also meeting certain design principles, such as visually representing the dignity of the federal government and avoiding uniformity. Beyond construction costs, some design choices, such as multistory atriums, can also affect how much the government spends for ongoing operations and maintenance (O&M) costs for the buildings. Design choices also can affect functionality of the building for government workers and the public.[1] Understanding how GSA considers the tradeoffs between aesthetics, costs, and functionality is important as the agency embarks on construction projects, including current plans to spend billions of dollars more to construct courthouses and other federal buildings.

[1]We define functionality as the extent to which a building allows the tenant to efficiently meet its mission.

You asked us to evaluate GSA's ability to manage O&M costs for federal buildings constructed under the Design Excellence Program. This report assesses the extent to which:

- GSA made design choices that affect O&M costs;
- GSA considers O&M costs and functionality when planning and designing buildings; and
- GSA systematically collects and shares information on O&M costs related to design choices in existing buildings.

Our review focused on the 78 federal buildings and courthouses that GSA has constructed under the Design Excellence Program—referred to as "Design Excellence buildings"—since the program started in 1994.[2] To address our objectives, we administered a web-based survey to the GSA building managers of these 78 Design Excellence buildings and achieved a response rate of 100 percent. The survey asked for information on the extent to which certain design choices affect O&M costs and building functionality. We also visited 10 Design Excellence buildings in three GSA regions to view design choices and O&M activities. We interviewed tenant agencies located in these buildings, GSA building managers responsible for managing these buildings, and officials from GSA regional offices with oversight responsibilities for these buildings. To ensure geographic and agency diversity, we selected our site-visit locations based on several factors, including location and the tenant agency. Although not generalizable to all Design Excellence buildings, information gathered from our site visits shows how O&M costs were considered in specific buildings and the effects of design choices.

To address our objectives, we also examined relevant GSA documents pertaining to all buildings included in our review, including those detailing investment needs for maintenance and repairs and evaluations commissioned by GSA on, for example, how well these buildings comply with building standards and their overall performance. We also reviewed applicable federal regulations and guidance, including GSA procedures, policies and standards for designing, constructing, and operating federal facilities; our prior work; and reports by other federal agencies and related industry associations on topics including the standard costs of operating

[2]Based on input from GSA officials indicating that large campuses were unlikely to have reliable O&M data, we excluded 9 buildings included on the White Oak Campus in Silver Spring, MD from our review. Therefore, when we refer to the 78 Design Excellence buildings in our review, this figure does not include these 9 buildings.

and maintaining office buildings. We collected information on the extent to which Design Excellence buildings are visible and accessible to the public and analyzed GSA data on project construction and O&M costs from 2000 to 2016.[3] We assessed the reliability of these data through electronic testing and a review of documentation on the data and determined that the data were reliable for the purpose of illustrating the extent to which O&M costs make up total building costs.

In addition, we interviewed GSA officials located in the Washington, D.C., headquarters office and in four of GSA's 11 regional offices. We selected regional offices based on the location of our site visits and included one additional regional office based on its having the highest total O&M-operating costs of the remaining eight regional offices. With GSA officials, we discussed several topics including how O&M costs were considered during planning and design and how information on design choices' O&M costs are shared. We compared GSA's efforts to consider O&M costs and functionality when planning and designing these buildings and their process for collecting and sharing O&M information across these buildings to the federal standards for internal control related to using complete and relevant information when making decisions and designing control activities and internal communications. We also compared GSA's efforts to consider O&M costs in the planning and design of these buildings to guidance from GSA and the Office of Management and Budget.[4] Further details on our scope and methodology can be found in appendix I.

We conducted this performance audit from May 2017 to May 2018 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain

[3]In addition to our analysis of GSA data on project construction and O&M costs from 2000 to 2016, we also analyzed GSA and Department of Labor data from 2014 to 2016 of buildings under GSA custody and control that were 40 years old or less, which indicated O&M costs can be explained by building size and differences in wages paid for O&M services across geographic locations. We were not able to draw statistically significant conclusions about whether Design Excellence buildings had higher O&M costs than similar non-Design Excellence buildings.

[4]GAO, *Standards for Internal Control in the Federal Government*, GAO-14-704G (Washington, D.C.: September 2014) and Office of Management and Budget, *OMB Circular A-123, Management's Responsibility for Internal Control*, (Washington DC: Dec. 21, 2004); Facilities Standards for the Public Buildings Service, PBS-P100 (April 2017); and OMB, *Capital Programming Guide V 3.0; Supplement to Office of Management and Budget Circular A-11: Planning, Budgeting, and Acquisition of Capital Assets*, 2017, (Washington, D.C.).

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.

Background

The federal government is the largest real property owner in the United States with a vast inventory costing billions of dollars annually to operate and maintain. Federally owned buildings include courthouses, offices, warehouses, schools, hospitals, housing, data centers, and laboratories, among other things. GSA acts as the federal government's landlord, and is responsible for designing, constructing, and managing federal buildings for other federal agencies and the judiciary to occupy.[5] There are currently approximately 1,600 federally owned buildings under GSA's custody and control.

According to the Office of Management and Budget (OMB), agencies, including GSA, should have accurate information on acquisition and "lifecycle" costs of current and proposed assets, including costs for designing and constructing the building, O&M, and disposal.[6] For example, when planning and designing new federal buildings, GSA must analyze building energy and water systems (e.g., for air conditioning and heating) to identify those with the lowest acquisition and operating costs.[7] In addition, once the building is constructed, GSA building managers and O&M contractors are responsible for maintaining the building, which includes tasks related to recurring maintenance and repair (e.g., on heating and cooling systems), maintaining the property's roads and grounds, cleaning and janitorial services, and paying for utilities.

[5]According to GSA officials, federal buildings, such as courthouses, must adhere to numerous, specific design guidelines for aesthetics, security, interior circulation, mechanical and electrical systems, and other things. GSA officials also stated that these guidelines make it difficult to compare construction and O&M costs of federal buildings to private sector buildings.

[6]OMB defines lifecycle costs as "all direct and indirect initial costs, including planning and other costs or procurement; all periodic or continuing costs of operations and maintenance; and costs of decommissioning and disposal." OMB, *Capital Programming Guide V 3.0; Supplement to Office of Management and Budget Circular A-11: Planning, Budgeting, and Acquisition of Capital Assets*, (Washington, D.C.: 2017).

[7]GSA, *Facilities Standards for the Public Buildings Service,* PBS-100 (Washington, D.C.: April 2017).

In 1994, GSA instituted the Design Excellence Program, a process for designing, constructing, renovating, altering, and repairing federal courthouses and office buildings. This program was developed in response to criticisms that federal buildings lacked architectural distinction. It stresses creativity in the design of buildings with the intent of constructing spaces that meet the tenant's functional needs while also becoming public landmarks. More specifically, the program aims to meet several guidelines—called the Guiding Principles for Federal Architecture— including designing spaces that:

- reflect the dignity, enterprise, vigor, and stability of the U.S. government;
- avoid uniformity; and
- are built in locations in which federal buildings can be incorporated into the existing public streets and landscape.[8]

According to GSA officials, the Design Excellence Program also streamlines how GSA selects and manages the private-sector architects and engineering firms it hires for new projects. The process consists of four primary stages:

- planning for the prospective tenant's needs and general project details (e.g., request for proposal announcement);
- selecting and working with an architectural and engineering firm to design the building;
- selecting a contractor to construct the building; and
- occupancy by the tenants.

The process is overseen by a GSA project team, consisting of a project manager, contracting officer, officials from GSA's Office of the Chief Architect, and additional subject matter experts, who work with the federal tenant that plans to occupy the space.

A large number of the federal courthouses and office buildings constructed and controlled by GSA in the last 20 years have been

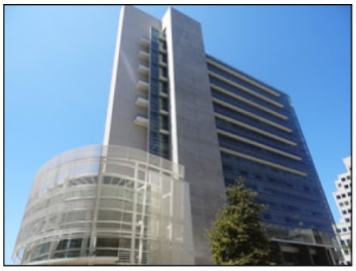
[8]U.S. House Committee on Public Works, *Report to the President by the Ad Hoc Committee on Federal Office Space* (Washington D.C.: June 1, 1962).

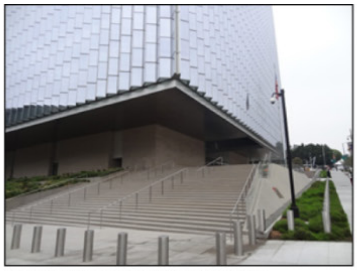
completed under the Design Excellence Program.[9] Under the program, GSA has constructed 78 facilities including 62 courthouses and 16 federal office buildings, including a data center and laboratories.[10] These buildings account for more than 36-million square feet of space, are located in 33 states and the District of Columbia, and many have won architecture and design awards. Figure 1 shows examples of federal courthouses and office buildings constructed under the Design Excellence Program.

[9]In the last 20 years GSA has constructed 34 facilities outside of the Design Excellence Program. Thirty of these facilities are relatively small (under 20,000 square feet) or modular structures that were not designed as permanent courthouses or federal buildings. The other four facilities—two courthouses and two federal buildings—were constructed more than 15 years ago and had completed substantial planning efforts before the Design Excellence Program was created. GSA has also constructed a number of land ports of entry, which are used to monitor trade and process citizens, visitors and immigrants.

[10]As noted above, we excluded nine buildings constructed under the Design Excellence Program from our review because they were unlikely to have reliable O&M data. See appendix II for the full list of buildings constructed under the Design Excellence Program that we included in our review.

Figure 1: Selected Courthouses and Federal Buildings Constructed under the General Services Administration's (GSA) Design Excellence Program


James M. Carter & Judith N. Keep U.S. Courthouse (San Diego, CA)


First Street Federal Courthouse (Los Angeles, CA)

Bakersfield Federal Courthouse (Bakersfield, CA)


Ronald Reagan Federal Building and Courthouse (Santa Ana, CA)


Albert Armendariz, Sr., U.S. Courthouse (El Paso, TX)


Las Cruces U.S. Courthouse (Las Cruces, NM)


Ronald Reagan Building and International Trade Center (Washington, D.C.)


Douglas A. Munro Coast Guard Headquarters Building (Washington, D.C.)


Ariel Rios Federal Building (Washington, D.C.)

National Oceanic and Atmospheric Administration Satellite Operations Facility (Suitland, MD)

Source: GAO. | GAO-18-420

GSA Made Design Choices That Decreased and Increased O&M Costs

Some GSA Design Choices Have Decreased O&M Costs

According to interviews with GSA officials and building tenants, GSA has made choices in some Design Excellence buildings intended to reduce long-term O&M costs. For example:

- *Increased natural light*. All 10 of the Design Excellence buildings we visited were designed to include interior natural light, which some building managers reported reduced energy costs. According to GSA officials, natural light is not only aesthetically pleasing; it also improves lighting quality for building tenants and reduces lighting costs. For example, the First Street Federal Courthouse (Los Angeles, California) has a light well as part of its atrium and a serrated glass façade that maximizes natural light. Building officials said that 22 of the 24 courtrooms in the building receive natural light from multiple sources, reducing energy usage and requiring less frequent replacement of lighting. In addition, building officials at the Albert Armendariz, Sr., U.S. Courthouse (El Paso, Texas) reported extensive natural light from a three story window wall and the front atrium; both features provide ample light for building tenants. (See fig. 2).
- *Durable and easily maintained materials and finishes*. In most of the 10 Design Excellence buildings we visited, GSA officials and building tenants reported selecting materials and finishes that (1) are highly durable and easy and inexpensive to clean; (2) are expected to last a long time; and (3) required little maintenance. For example, the lobby walls and floors of the Ronald Reagan Federal Building and Courthouse (Santa Ana, California) are made out of travertine, a very durable stone, which has lasted more than 15 years without the need for repairs or replacement. In addition, officials at a few buildings noted that the decision to install carpet tiles in lieu of large patches of carpet has made it very easy and relatively inexpensive to maintain and repair office spaces and courtrooms.
- *Low-maintenance landscaping*. Several of the 10 Design Excellence buildings we visited incorporated native flora into the landscape design, which can reduce energy and water costs. For example, officials planted native, drought resistant plants around the First Street Federal Courthouse (Los Angeles, California). Building officials at the Las Cruces U.S. Courthouse (Las Cruces, New Mexico), which is located in a desert environment, also reported most of the native landscape around the courthouse does not require watering.

Figure 2: Design Excellence Buildings with Durable and Easily Maintained Materials and Finishes, Low Maintenance Landscaping, and Increased Natural Light, according to Building Managers

Source: GAO. | GAO-18-420

Some GSA Design Choices Have Increased O&M Costs

According to our survey respondents—building managers at all 78 Design Excellence buildings included in our review—certain GSA design choices, such as multistory atriums and custom windows, have resulted in increased O&M costs compared to an average GSA building without

those features.[11] Almost all Design Excellence building managers (76 out of 78) reported that certain design choices resulted in increased O&M costs that would not have occurred had that design choice not been selected. For example, 67 out of 78 building managers for Design Excellence buildings stated that the effect of including multistory open spaces, like atriums, increased O&M costs due to the challenges associated with heating and cooling, making needed repairs, and cleaning these spaces. (See table 1). Building managers and tenants we spoke with confirmed our survey results, and provided examples of design choices that resulted in unexpected O&M cost increases. For example, officials noted increased O&M costs associated with separate structures and multistory atriums that were difficult to access for cleaning and repairs.

Table 1: Number of Design Excellence Buildings Where Building Managers Indicated That a Design Choice Increased Operations and Maintenance (O&M) Costs

Design choice	Number of buildings that included design choice	Number with increased O&M costs	Percentage of buildings in which design choice increased O&M costs
An attached, but separate structure (e.g., pavilion, rotunda)	21	19	90%
Vertical penetrations (e.g., multistory atriums, lobbies)	78	67	86%
Window choice	78	65	83%
Mission space design (e.g., courtrooms, control centers)	76	48	63%
Energy efficient elements (e.g., solar panels and green roofs)	31	19	61%
Courtyard design	49	28	57%
Flooring choice	78	41	53%
Circulation design (e.g., hallways, stairways, elevators)	78	40	51%

Source: Analysis of GAO survey results. | GAO-18-420

Note: We received responses from building managers at all 78 Design Excellence buildings included in our review. The results in this table do not include building managers who reported that design choices were not applicable to their building. For example, 49 of 78 building managers reported that a courtyard was included as a design choice in their building but 29 building managers indicated that a

[11]We asked survey respondents to use their judgement on whether a design choice increased, decreased, or had no impact on O&M costs. We did not ask them to quantify the size of the increase or decrease or to identify a baseline cost. See appendix I for more details on our survey methodology and appendix III for a copy of the survey and summarized responses.

courtyard was not an applicable design feature in their building. As a result, we did not include in this table responses from these 29 managers.

Separate Structures. Managers from only 21 of 78 Design Excellence buildings reported having an attached, but separate structure (e.g., pavilions, rotundas, restaurants, and other additional spaces connected to the building), but managers at 19 of those buildings stated that the effect of such design features increased O&M costs. For example, one federal building we visited had a rotunda with a domed roof that, according to building managers, has multiple gutter leaks that are not currently accessible due to the design of the space. As a result, maintenance staff continuously patch the ceiling without addressing the cause of the leaks (see fig. 3).

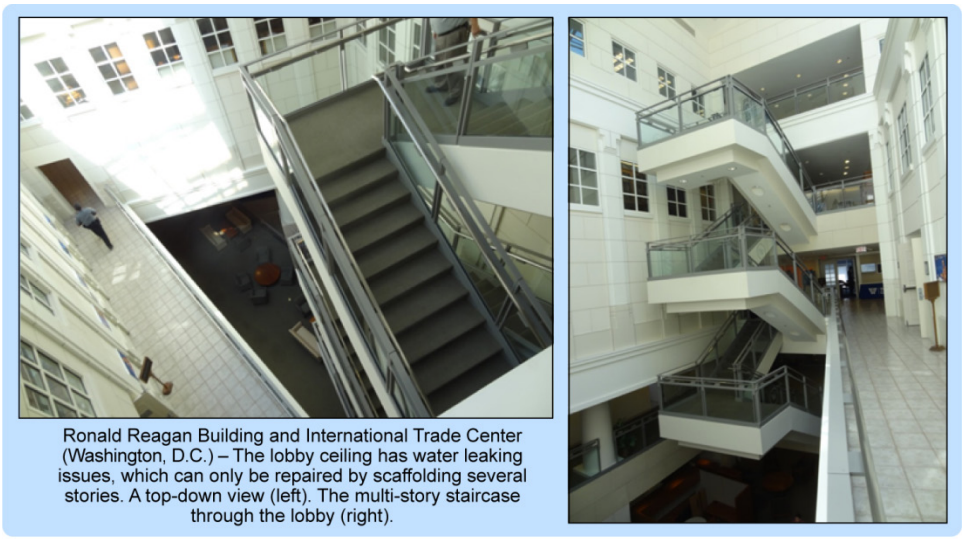
Figure 3: Separate Structure in a Design Excellence Building That Increased Operations and Maintenance Costs, according to Building Managers

Ronald Reagan Building and International Trade Center (Washington D.C.) rotunda – Leaking gutters on the roof create water stains in the ceiling. Specialists must be hired to fix gutters because the dome roof has no area to stand.

Source: GAO. | GAO-18-420

Atriums and Lobbies. Managers from 67 of 78 Design Excellence buildings reported their buildings' multistory atriums and lobbies increased O&M costs. Several GSA managers we interviewed identified additional costs to maintain a multistory atrium or lobby, including costs for renting expensive scaffolding or mechanical lifts. For example, one Design Excellence building we visited has water leaks in the lobby ceiling, which can only be reached by extensive and expensive scaffolding (see fig. 4).

Figure 4: Lobby in a Design Excellence Building That Increased Operations and Maintenance Costs, according to Building Managers



Ronald Reagan Building and International Trade Center (Washington, D.C.) – The lobby ceiling has water leaking issues, which can only be repaired by scaffolding several stories. A top-down view (left). The multi-story staircase through the lobby (right).

Source: GAO. | GAO-18-420

Large, Custom Windows. Managers from 65 of 78 Design Excellence buildings reported that the effect of design choices related to their buildings' windows increased O&M costs. In addition, several Design Excellence buildings we visited had custom or uniquely shaped windows, which occasionally increased the costs to replace, repair, or maintain them. For example, GSA officials at one courthouse reported repairing one two-story, custom-made window pane, which cost $80,000 to fabricate and $50,000 to install. The courthouse had eight of these windows, and a GSA official stated that the windows are an attractive feature of the building that introduced natural light, but a different window choice would have been cheaper to maintain (see fig. 5).

Figure 5: Large, Custom Windows in a Design Excellence Building That Increased Operations and Maintenance Costs, according to Building Managers

Source: GAO. | GAO-18-420

Mission Spaces. Managers from 48 Design Excellence buildings reported that the effect of design choices related to mission spaces (i.e., spaces in which federal employees conduct work) increased O&M costs. Specifically, managers from 32 buildings stated that design choices made in mission spaces increased repair costs, and managers from 30 buildings reported increased cleaning costs. GSA officials at several buildings we visited discussed challenges accessing and maintaining mechanical systems incorporated into tenant mission spaces. For example, one Design Excellence building includes a heating, ventilation, and air-conditioning (HVAC) system that is hidden under a raised floor within mission spaces. Because building managers cannot easily access the system, there are maintenance delays and challenges identifying and making necessary repairs, which ultimately result in higher O&M costs. Building officials reported they considered replacing the HVAC system, but doing so would cost approximately $55 million. (See fig. 6).

Figure 6: Design Choice in a Tenant Mission Space That Increased Operations and Maintenance Costs in a Design Excellence Building, according to Building Managers

Ariel Rios Federal Building (Washington, D.C.) –
The position of the building's heating, ventilation, and air-conditioning system leads to increased maintenance, repair, and energy costs. The air-supply in the raised floor (left). The air-return in the ceiling (right).

Source: GAO. | GAO-18-420

Other Design Choices. According to Design Excellence building managers that responded to our survey and at locations we visited, the effect of several other design choices including energy efficient elements (e.g., solar panels and green roofs), courtyards, floors, and circulation (e.g., hallways, stairways, and elevators) increased O&M costs. For example, according to these officials, (1) the design of green roofs led to water leaks; (2) the design of courtyards led to problems maintaining unique landscaping; (3) flooring choices, specifically selected materials, led to premature scuffing and cracking; and (4) the design of hallways and stairways made them difficult to maintain.

GSA Does Not Fully Consider O&M and Functionality Effects When Making Design Choices

With the Design Excellence Program, GSA aims to create buildings that are cost-effective and function well for tenants. However, GSA makes design choices for Design Excellence buildings during the planning and design stages of new projects without fully considering the effect of these choices on O&M costs and functionality.

GSA Does Not Fully Consider How Design Choices Affect O&M Costs

GSA does not estimate most O&M costs during planning and design. Specifically, according to GSA officials we interviewed and planning documents we reviewed, when planning and designing new buildings, officials estimate the costs of major energy systems, such as boilers and chillers. However, based on our review of GSA and industry data, these systems only account for about one-third of O&M costs in Design Excellence buildings. GSA officials stated that they do not estimate the remaining two-thirds of O&M costs—which include maintenance, cleaning, and landscaping—until late in the building's construction.[12] However, GSA officials also said that it would be costly to make significant design changes at that point in the process. In addition, the O&M estimates for maintenance, cleaning, and landscaping are for the purpose of selecting a contractor to provide these services, not as a means for addressing or reducing future O&M costs, according to officials.

GSA building and regional managers who are responsible for addressing the O&M consequences of design choices told us that they were not always integrated or asked to participate in planning and designing new Design Excellence buildings. Specifically, GSA building and regional managers at several of the buildings we visited stated that they were never, or seldom, consulted on O&M costs and issues during the design process, nor did they have an opportunity to review design documents. A few GSA building managers we spoke with stated that on rare occasions when they were consulted their input was rarely incorporated, or was requested too late in the construction stage to allow for necessary changes. According to these officials, if given the chance, they could have highlighted issues with certain design choices that would significantly increase O&M costs and could have offered potential solutions to reduce those costs. Officials responsible for overseeing the Design Excellence Program told us that other officials with an understanding of issues surrounding O&M are involved in the process for designing new buildings through, for example, subject matter reviews of the design concepts. Officials agreed, however, that more could be done to formally involve the perspective of facilities staff, such as building managers, who are responsible for the day-to-day management of O&M.

[12]These percentages are based on GSA's O&M data for Design Excellence buildings from 2000–2016. Industry data, which include information on federal and private-sector buildings, indicate that non-energy costs for large federal buildings are approximately 60 percent, i.e., almost two-thirds, of O&M costs. See Building Owners Management Association, *Office Experience Exchange Report* (Washington, DC: 2017).

We found that GSA's lack of consideration of how design choices may affect the O&M costs of Design Excellence buildings could be attributed to existing procedures that do not emphasize the need to consider such costs during the planning and design stage. Specifically, GSA's procedures for planning, designing, and constructing new Design Excellence buildings focus on design creativity, construction challenges, budget, and schedule and do not direct GSA to estimate O&M costs during planning and design.[13] While these procedures promote several factors to consider in a building's design—including aesthetics, functionality, and constructability—and generally require firms to submit documentation on budget and schedule, they do not call for information on expected O&M costs. In addition, these procedures do not include seeking input on design decisions from facilities personnel who will have responsibility for the ongoing O&M once the building is occupied.

Federal standards for internal control state that federal agencies should use complete and relevant information when making decisions and design control activities, including procedures, to achieve objectives.[14] These federal standards also state that federal agencies should ensure the communication of information internally, for example through procedures that allow management to receive quality information from personnel, to help achieve the entity's objectives. In addition, guidance from GSA and the Office of Management and Budget directs officials to consider and strive for the lowest possible costs, including O&M costs, when designing buildings.[15]

Information on how specific design choices could affect ongoing O&M costs would allow GSA to better understand the impact of those choices. Such information is critical as O&M accounts for a significant proportion of resources dedicated to federal buildings over the long-term. According to GSA and industry associations, O&M costs are significantly higher over

[13]GSA, *Design Excellence Policies and Procedures* (Washington DC: Jan. 1, 2005; updated Feb. 2016).

[14]GAO, *Standards for Internal Control in the Federal Government*, GAO-14-704G (Washington, D.C.: September 2014) and Office of Management and Budget, *Management's Responsibility for Internal Control*, *OMB Circular A-123* (Washington DC: Dec. 21, 2004).

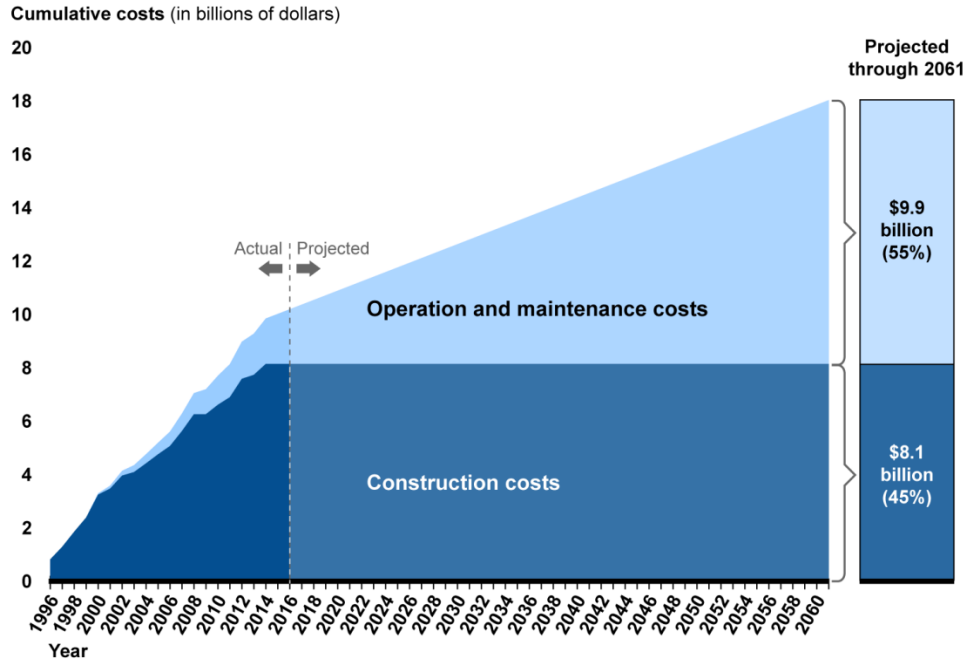
[15]Facilities Standards for the Public Buildings Service, PBS-P100 (April 2017); and OMB, *Capital Programming Guide V 3.0; Supplement to Office of Management and Budget Circular A-11: Planning, Budgeting, and Acquisition of Capital Assets*, (Washington, D.C.: 2017).

time than all other costs, including for construction, and typically account for between 60 and 80 percent of building lifecycle costs.[16] To illustrate this point, we analyzed GSA construction and O&M data for Design Excellence buildings. As figure 7 shows, we estimate that over an average building's age (60 years) the total construction and O&M costs for GSA's 78 existing Design Excellence buildings could be about $18 billion—$8.1 billion for construction (45 percent) and $9.9 billion for O&M (55 percent).[17] Because GSA's procedures do not direct officials to estimate about two-thirds of O&M costs or fully integrate officials with an understanding of the O&M consequences of design decisions, officials may not have been aware of how design choices would affect approximately $6.6 billion (two-thirds of $9.9 billion) in O&M costs. In addition, without procedures that clearly emphasize the need to more fully consider O&M costs in Design Excellence buildings during the planning and design stage, GSA and other stakeholders may not have a complete picture of all relevant information necessary to make informed decisions on how to best design future federal buildings.

[16]See GSA, *Facilities Standards for the Public Buildings Service,* PBS-100 (Washington, D.C.: April 2017); National Institute of Building Sciences, *Whole Building Design Guide*, December 5, 2017; and The Builder's Association, *Total Cost of Ownership*, Feb.1, 2013.

[17]Our projection aggregates construction costs (1996 to 2016), as well as O&M costs (2000 to 2016) in nominal terms, and assumes the annual O&M costs grow from 2017 to 2061 at 2016 levels. This simple analysis is for illustrative purpose and is not a lifecycle cost computation, which typically includes use of net present value. In addition, these data exclude construction and O&M costs for the First Street Federal Courthouse because it was recently constructed and there was insufficient O&M data. The data also exclude the Theodore Roosevelt U.S. Courthouse because GSA could not provide accurate construction cost data.

Figure 7: Cumulative Construction and Projected O&M Costs for the General Services Administration's (GSA) Design Excellence Buildings Constructed between 1996 and 2016



Sources: GSA data and GAO projection. | GAO-18-420

Notes: We projected O&M costs based on 2016 costs, and average GSA building age.

Our projection aggregates construction costs (1996 to 2016), as well as O&M costs (2000 to 2016) in nominal terms, and assumes the annual O&M costs grow from 2017 to 2061 at 2016 levels. This simple analysis is for illustrative purpose and is not a lifecycle cost computation, which typically includes use of net present value.

While several buildings were constructed in the late 1990s, GSA did not begin to collect O&M cost data in its current database until 2000 and, as a result, O&M costs in this figure are likely underreported.

This figure excludes construction and O&M costs for the First Street Federal Courthouse because it was recently constructed and there was insufficient O&M data. The figure also excludes the Theodore Roosevelt U.S. Courthouse because GSA could not provide accurate construction cost data.

GSA realizes that the focus of Design Excellence projects has been on design and construction, not O&M costs, and, in September 2017, initiated a process, called "Operational Excellence", to more fully consider O&M costs. This process includes considering ways to more fully consider O&M costs during planning and design, including developing a cost tool that would estimate future O&M costs. In addition, GSA is considering ways to update existing procedures for designing and constructing new buildings to include a more comprehensive evaluation of potential O&M costs, for example, by more fully integrating

knowledgeable personnel at key stages. However, according to GSA officials, they are still in the early stages of determining what needs to be done in part due to a small staff, which includes one full-time employee and one part-time employee. As of March 2018, GSA has not established a schedule for updating its procedures to require considering O&M during design.

Design Excellence Buildings Generally Function Well, but Some Costly Design Choices Did Not Improve Functionality

Most design choices made for Design Excellence buildings, including the shape and size of courtrooms and the lighting in hallways, have had a positive effect on overall building functionality (i.e., helped the tenant agency achieve its mission), according to officials we surveyed and interviewed. For example, GSA building managers we surveyed reported the functionality of at least one design choice in most buildings (72 of 78 buildings) as good or very good. Specifically, they reported that in most buildings, the overall functionality of design choices was good in many of the areas we asked them about. In addition, building managers reported that the functionality of the following design choices was also good or very good:

- selected material color (53 buildings) and lighting (58 buildings);
- shape and size of the space (61 buildings);
- pedestrian circulation (61 buildings); and
- temperature control in the areas critical for a building's operation, such as courtrooms or office space (46 buildings).

GSA and tenant agency officials whom we interviewed were also positive about how the design choices affected the functionality of their buildings, especially the use of windows and atriums to allow natural light. Tenants also reported they enjoyed other features of the new buildings, including commissioned artwork and the design of the interior and exterior. Tenants' satisfaction with the function of Design Excellence buildings may, in part, reflect the condition of their previous office space. For example, one tenant noted that moving from temporary trailers into a state-of-the-art courthouse was a substantial functional improvement.

However, we found that increased spending on certain design choices did not always provide improved functionality for the building tenant. For example, GSA building managers reported that in many buildings (67 of 78) atriums and lobbies (i.e., vertical penetrations) have increased O&M costs due to higher repair, cleaning, and energy costs. At the same time, building managers reported that in 51 of those 67 buildings, choices

made in the design of multistory atriums and lobbies, e.g., material color and lighting, did not have a positive effect on building functionality (see table 2).[18] Similarly, the decision to install solar panels and green roofs (e.g., energy efficient elements), increased O&M costs in several areas, particularly repair costs, but in over half of the buildings with these features, building managers did not report an improvement in functionality. For example, in two courthouses we visited solar panels installed with the intention of saving on energy costs are not supplying as much power as expected and, therefore, have not yet provided the expected energy benefits.

Table 2: Design Excellence Buildings Where Building Managers Indicated a Design Choice That Increased Operations and Maintenance (O&M) Costs and Did Not Further Improve Functionality

Design choice	Number with increased O&M cost	Increased cost and did not further improve functionality	Percentage of buildings in which design choice increased O&M cost and did not further improve functionality
Vertical penetrations (e.g., atriums, lobbies)	67	51	76%
Energy efficient elements (e.g., solar panels, green roofs)	19	12	63%
An attached, but separate structure (e.g., pavilion, rotunda)	19	12	63%
Mission space design (e.g., courtrooms, control centers)	48	28	58%
Circulation design (e.g., hallways, stairways, elevators)	40	22	55%
Courtyard design	28	14	50%

Source: Analysis of GAO survey results. | GAO-18-420

Notes: This table presents information on whether or not respondents indicated a design choice increased O&M costs and whether aspects of those choices, e.g. material color, lighting, and pedestrian circulation, also did not further improve functionality. These responses do not preclude that a specific design choice may be functional or have a functional benefit. For example, mission spaces, such as offices and courtrooms, are functional for conducting government business, and separate structures may serve key security functions, e.g., a place for security screening facilities that are physically located away from the main building.

[18]These are responses in which GSA building managers indicated a design choice increased O&M costs and whether aspects of those choices—e.g. material color, lighting, and pedestrian circulation—did not further improve functionality. These responses do not preclude that a specific design choice may be functional or have a functional benefit. For example, mission spaces, such as offices and courtrooms, are functional for conducting government business, and separate structures may serve key security functions, e.g., a place for security-screening facilities that are physically located away from the main building.

We received responses from building managers for all 78 Design Excellence buildings included in our review. The results in this table do not include building managers that reported certain design choices are not applicable to their building or did not increase O&M costs. For example, 48 out of 78 building managers reported that mission spaces increased O&M costs. We did not include responses on functional benefits from the 30 building managers who indicated that mission spaces did not increase O&M costs or this design choice was not applicable to their building.

Tenants we interviewed also noted that in some cases, design choices have not functioned well and are costly to maintain and operate. According to a tenant at one Design Excellence office building, while the decision to construct a multistory atrium has added aesthetic value for federal employees, it has also resulted in challenges balancing air pressure between the atrium and the adjacent office spaces. These differences in air pressure have resulted in uncomfortable working conditions, such as fluctuating temperatures, which have hampered productivity. Another tenant told us about design choices such as long hallways and elevators that do not stop at all floors, making it difficult for tenant employees to move efficiently through the building. Some of these design choices, such as elevators with mechanical systems at the bottom of the elevator shaft, have proven costly to maintain as they age more quickly. Other tenants noted that the selection of heating and cooling systems, which automatically adjust building temperatures based on time of day, for example, have not functioned as planned, resulting in variable temperatures and employee discomfort.

In addition, GSA has sometimes made design choices in buildings that do not apply to one of the primary functional goals of the Design Excellence Program—to serve as a landmark that positively represents the federal government to the public. Specifically, GSA does not consider that some buildings, due to their purpose or location, are unlikely to function as landmarks because they have limited interaction with or limited visibility by the public. In this regard, we found that most Design Excellence buildings (66 of 78) are visible and accessible to the general public, i.e., "public-facing".[19] Many of these buildings have succeeded in becoming public landmarks and several have won awards for their design. Specifically,

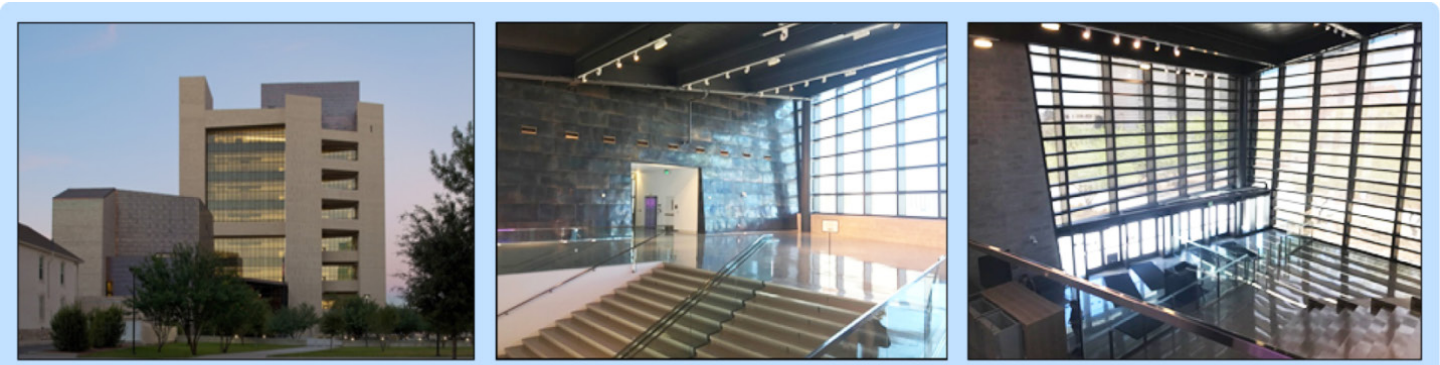
- 62 serve as courthouses, which are visible from public streets and people may enter to observe judicial proceedings or conduct personal

[19]GSA defines a public-facing building as one with a primary mission to serve and interact with the public.

business.[20] See figure 8 for an example of a Design Excellence courthouse with publicly visible exteriors and interiors.

- Four serve as office buildings for various federal agencies that are publicly accessible.[21]

Figure 8: Design Excellence Building with a Publicly Visible Exterior and Interior



Albert Armendariz, Sr., U.S. Courthouse – Exterior and interior (both publicly visible).

Source: GAO. | GAO-18-420

In contrast, we found that 12 Design Excellence office buildings restrict the public from accessing interior spaces. Specifically,

- Seven can be seen from public sidewalks or roads, even though the building is not open to the public, such as the U.S. Secret Service Headquarters and FBI field office buildings. As a result, these buildings' exteriors could be public landmarks that represent the federal government, but the interior design features are not publicly

[20]While courthouses do not limit public entry, there are areas of these buildings that will not be accessible to the public. For example, judges' chambers are not open to the public.

[21]These buildings are (1) the David Skaggs Federal Building in Boulder, Colorado; (2) the San Francisco Federal Building in San Francisco, California; (3) the Ronald Reagan Building and International Trade Center in Washington, D.C.; and (4) the Oklahoma City Federal Building in Oklahoma City, Oklahoma.

accessible.[22] For example, the Ronald H. Brown U.S. Mission to the United Nations Building in New York City has an impressive and publicly visible exterior façade but restricts public access to a multi-story rotunda and art space (see fig. 9).

Figure 9: Design Excellence Building with a Publicly Visible Exterior and Publicly Restricted Interior

Ronald H. Brown U.S. Mission to the United Nations Building (New York City, NY) – Exterior (publicly visible) and interior (not publicly visible).

Source: GSA. | GAO-18-420

- Five have obstructed views from public roads and sidewalks in addition to restricting public access to the interior.[23] Neither the exterior nor interior design choices, which can be expensive to operate and maintain, in these buildings can be seen or appreciated by the public. For example, according to the tenant agency and GSA officials, the visually impressive interior atrium and courtyard at the Ariel Rios Federal Building have proven logistically challenging and expensive to maintain and are not accessible to the public. In addition,

[22]These buildings are (1) the U.S. Secret Service Headquarters in Washington, D.C.; (2) the Benjamin P. Grogan and Jerry L. Dove Federal Building in Miramar, Florida; (3) the Harvey W. Wiley Federal Building in College Park, Maryland; (4) the FBI Houston Field Office in Houston, Texas; (5) the FBI Washington Field Office Memorial Building in Washington, D.C.; (6) the New Carrollton Federal Building in Lanham, Maryland; and (7) the Ronald H. Brown U.S. Mission to the United Nations Building in New York City, New York.

[23]These buildings are (1) the Ariel Rios Federal Building in Washington, D.C.; (2) the Douglas A. Munro Coast Guard Headquarters Building in Washington, DC; (3) the National Oceanic and Atmospheric Administration Satellite Operations Facility in Suitland, Maryland; (4) the U.S. Census Bureau Headquarters in Suitland, Maryland; and (5) the Federal Center South in Seattle, Washington.

the façade of the National Oceanic and Atmospheric Administration Satellite Operations Facility, which, according to GSA officials, is expensive to maintain and repair, is not accessible by the public. (See fig. 10).

Figure 10: Design Excellence Buildings with Obstructed Exterior Views and Publicly Restricted Interiors

Source: GAO. | GAO-18-420

According to GSA officials, when they carry out their planning and design for Design Excellence buildings, they do not differentiate between buildings that will be public-facing and those that will not. This approach may be in part due to the fact that GSA's procedures for planning and designing new Design Excellence buildings do not call for consideration of how design choices may have different functional benefits, including whether the interior and exterior of planned buildings would be accessible to the public. Federal standards for internal control state that federal agencies should use complete and relevant information when making decisions and designing control activities, including procedures to achieve

objectives.[24] By taking a "one size fits all" approach and not considering the functionality of design choices, such as how a building's location and intended use will affect the public's ability to see the exterior and interior, GSA may be selecting design choices that increase O&M costs without improving functionality.

GSA Does Not Systematically Collect and Share Information on Common O&M Cost Experiences That Could Affect Design Choices

According to GSA officials, GSA currently does not systematically collect and share information on how design choices made for previous Design Excellence projects have affected O&M costs with the project teams—consisting of a project manager, contracting officer, and other GSA officials—that are responsible for overseeing the planning and design of new buildings. GSA has evaluated what is and is not working effectively in some existing Design Excellence buildings and has on occasion shared these evaluations with project teams. For example, GSA has evaluated the performance of 6 out of 78 Design Excellence buildings. These evaluations included identifying design decisions that led to higher O&M costs and, on one occasion, developed a formal presentation to share these lessons with the team working on a new Design Excellence project.

According to officials, GSA requires agency personnel with subject matter expertise to review building design concepts provided by private-sector architects and engineers. GSA also fosters information sharing through procedures that encourage project teams to exchange ideas, lessons learned, and concerns. However, these processes either (1) are not done in a consistent or systematic way, or (2) require information sharing among a small group of officials, i.e., a project team, which might not have visibility over the extensive design choices made in all existing buildings. While all of these information-sharing initiatives offer benefits, GSA's procedures do not include a systematic collection and sharing of information with the project teams responsible for managing new Design Excellence projects on how design choices affected O&M costs in existing Design Excellence buildings. According to GSA officials, they are considering formalizing this sort of information collection and sharing as part of the Operational Excellence process, but as previously noted, GSA is in the early stages of setting up this initiative and has not established a schedule for completing its actions or updating its procedures.

[24] GAO-14-704G.

As discussed, some design choices in existing Design Excellence buildings have decreased or increased O&M costs. Since GSA does not systematically share how these types of design choices affected O&M costs with teams responsible for planning and designing new buildings, similar issues could occur in future buildings. For example, we previously mentioned that building managers indicated that using durable materials, low maintenance landscaping, and energy-efficient lighting can reduce long-term O&M costs.

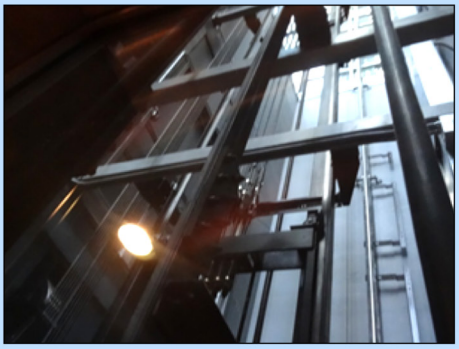
Building managers also reported common issues caused by design choices that led to increased costs including:

- *Inefficiently located mechanical systems*. Building managers reported the location of mechanical systems in Design Excellence buildings often led to increased cost. Specifically, building managers reported the location of these systems increased repair costs (41 out of 77 buildings) and energy costs (32 out of 77 buildings).[25] In the Design Excellence buildings we visited, building managers and tenants reported issues with the location of mechanical systems (4 buildings). For example, officials indicated that air-conditioning systems were placed in inefficient locations that required more energy usage because water had to be pumped unnecessarily far distances (see fig. 11).

[25]Numbers of buildings reported in this report are based on survey results from the building managers of 78 Design Excellence buildings in our review. Although all building managers responded to our survey, some did not respond to individual survey questions. Specifically, between 1 and 3 managers (of the 78) did not provide answers to several questions we used to compile results included in this report.

Figure 11: Design Excellence Buildings with Inefficiently Located Mechanical Systems, according to Building Managers

Albert Armendariz, Sr., U.S. Courthouse (El Paso, TX) – The heating, ventilation, and air conditioning chillers are located on the roof, which requires pumping water up 8 floors from the basement.



Douglas A. Munro Coast Guard Headquarters Building (Washington D.C.) – The mechanical bank for an elevator bank is located at the bottom of the shaft, which reduces the tension in the elevator wire rope and causes the elevator system to age faster.

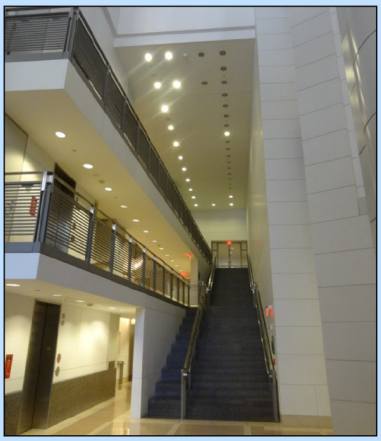
Bakersfield Federal Courthouse (Bakersfield, CA) – The mechanical systems are placed on the roof and exposed to extreme environmental conditions. Building managers have hung makeshift drapes in an attempt to protect these systems from overheating (left). Sand can clog the air intake fans for the building's air conditioning unit (right).

Source: GAO. | GAO-18-420

- *Difficult-to-access lights*. Building managers reported that design choices for the location of interior lights increased maintenance costs in the majority of Design Excellence buildings (55). In particular, managers reported that the location of lights in atriums and lobbies (38 buildings) and courtrooms and other mission spaces (33 buildings) increased costs. In addition, GSA officials at locations we visited said that lights above tall staircases, ceiling lights in atriums and auditoriums, and lights directly above permanent structures led to additional costs, including the need to use scaffolding or rent large equipment to maintain these lights. (See fig. 12). One way that a majority of GSA building managers (61) we surveyed are attempting

to mitigate high maintenance cost for lighting issues is to install energy efficient equipment, such as light-emitting diode (LED) lights.[26]

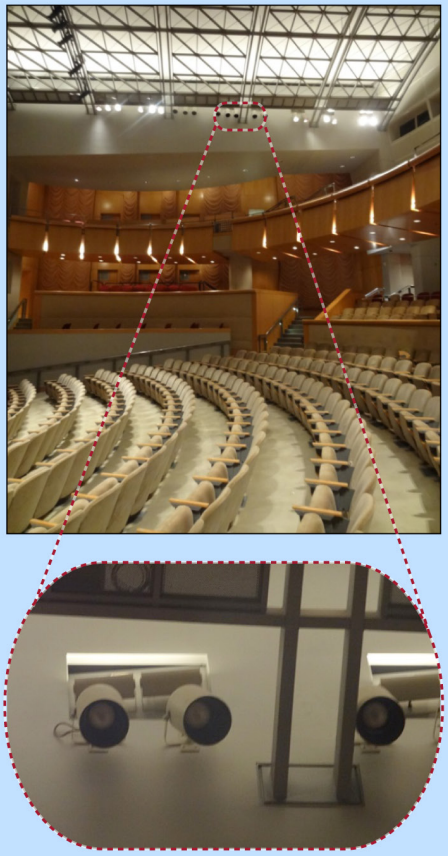
Figure 12: Design Excellence buildings with Difficult to Access Interior Lights, according to Building Managers



Ronald Reagan Building and International Trade Center (Washington, D.C.) – Lights over staircases are difficult to replace and require special equipment, such as scaffolds.

Ronald Reagan Federal Building and Courthouse (Santa Ana, CA) – Light bulbs in District Courtroom are difficult to replace due to room design and light placement.

Las Cruces U.S. Courthouse (Las Cruces, NM) – Special lift required to replace lights in the grand stairway. To minimize costs, lights are replaced once a year.



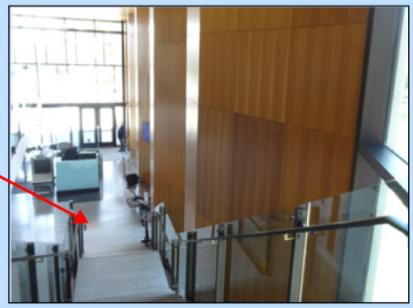
Ronald Reagan Federal Building and Courthouse (Santa Ana, CA) – Lights difficult to access and replace due to seating below and slope of floor. Requires a special equipment to replace.

Source: GAO. | GAO-18-420

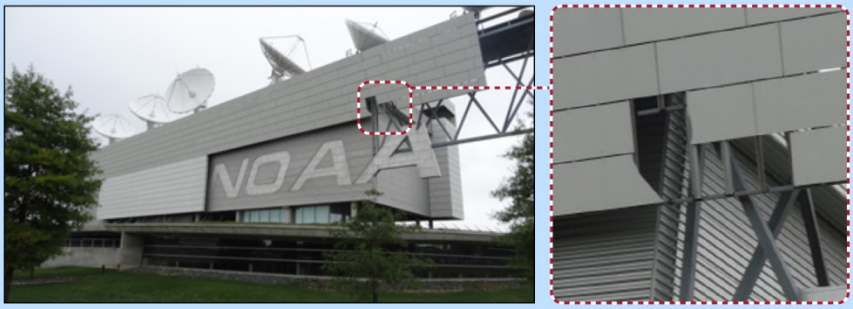
[26]LED lightbulbs last longer, are more durable, and offer comparable or better light quality than other types of lighting.

- *Difficult-to-maintain materials and finishes*. In 68 Design Excellence buildings, building managers reported that materials or finishes were chosen that are easily worn. Similarly, in buildings we visited (4 buildings), GSA officials reported that decisions on the materials used or configuration of exterior surfaces (e.g., the roof or façade) of a Design Excellence building led to repair and maintenance problems, particularly water leaks. (See fig. 13).

Figure 13: Design Excellence Buildings Using Unique, Difficult to Maintain Finishes and Exterior Surfaces, according to Building Managers

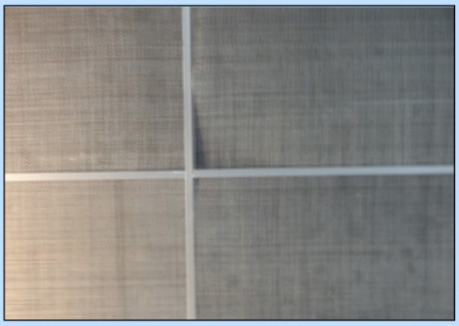


Bakersfield Federal Courthouse (Bakersfield, CA) – The lobby has radiant cooling in the floors, which, according to GSA officials, has never been used because the system is too expensive to operate and should not have been installed.

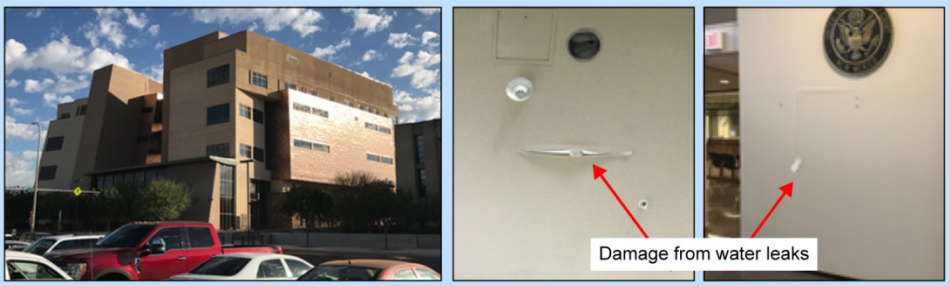


National Oceanic and Atmospheric Administration Satellite Operations Facility (Suitland, MD) – Several panels have fallen off the building's facade, but not been replaced because they are foreign-made and replacements have to be shipped internationally at a significant cost. The panels are also difficult to access for replacement due to the sloped exterior facade.

Ariel Rios Federal Building (Washington, D.C.) – The fabric ceiling tiles in office spaces collect dust and are in need of replacement.



National Oceanic and Atmospheric Administration Satellite Operations Facility (Suitland, MD) – The ceiling has custom tiles, which are difficult to service and result in increased time and cost to conduct certain maintenance and repair activities.



Las Cruces U.S. Courthouse (Las Cruces, NM) – The sloped facade has resulted in water leaks (left). Water damage in the hallways of the courthouse (right).

Douglas A. Munro Coast Guard Headquarters Building (Washington, D.C.) – The green roof does not have a sensory grid to detect leaks, which increases the amount of time and money needed to identify and address leaks.

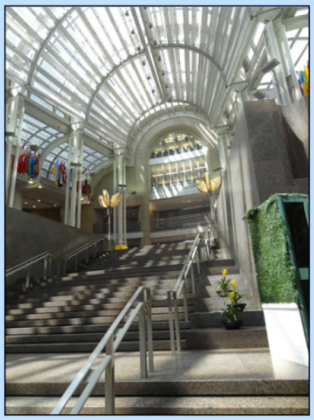
Source: GAO. | GAO-18-420

- *Hard to clean surfaces*. Cleaning surfaces, especially in atriums, can be a challenge for maintaining Design Excellence buildings. For example, building managers we surveyed reported that the decision to install certain types of window treatments increased cleaning costs (49 buildings). In three buildings we visited, building managers and tenants also said Design Excellence buildings required special equipment or scaffolding to clean windows or surfaces, which led to increased cleaning costs. (See fig. 14).

Figure 14: Design Excellence Buildings That Are Challenging to Clean Due to Chosen Windows and Surface Materials, according to Building Managers

Douglas A. Munro Coast Guard Headquarters Building (Washington D.C.) – The building façades incorporate multiple materials, including two types of stone (left), brick (right), and glass and steel (bottom), which are difficult to clean. Some sections require additional equipment, leading to expensive cleaning costs.

James M. Carter and Judith N. Keep U.S. Courthouse (San Diego, CA) – The atrium windows are difficult to clean due to their architectural features.



Ronald Reagan Building and International Trade Center (Washington D.C.) – The most efficient way to clean the atrium ceiling was using a two-man motorized chair, which was unusable for 10 years.

Source: GAO. | GAO-18-420

According to federal standards for internal control, agencies should use and communicate complete and relevant information when designing

control activities, including procedures to achieve objectives.[27] Without a formalized process for systematically collecting and sharing how design choices affected O&M costs in existing buildings, designs for future Design Excellence buildings may not benefit from the successful strategies used by others to reduce O&M costs or may continue to repeat problematic choices that may result in increased O&M costs.

Conclusions

Through the Design Excellence Program, GSA has achieved excellence in architecture and the design of federal buildings. Buildings constructed under the Design Excellence Program have created unique and aesthetically pleasing workspaces, have met the functional needs of tenant agencies, and have become public landmarks. However, because GSA does not have program procedures that call for consideration of how certain design features may affect O&M, it may not be fully aware of the costs of including these features in its building design and plans. Specifically, GSA does not estimate or gather all perspectives from building and regional managers on the full O&M costs of design choices, or consider the extent to which they will improve the functionality of the building for tenants and the public. For example, GSA's one-size fits all approach in designing these buildings does not consider whether non-public buildings need the same costly architectural elements as buildings intended to serve as public landmarks. Further, GSA is missing opportunities to improve future building designs by not systematically gathering and sharing information on the common design choices that had both positive and negative effects on O&M costs. Without a clear picture of the ongoing costs of these choices, GSA and other stakeholders are missing critical information to better inform the design and construction of new buildings. While GSA has just begun an Operational Excellence initiative to help identify future O&M costs, it is not clear what actions GSA will take to improve consideration of O&M costs during planning and design or when it will take those actions.

Recommendations for Executive Action

We are making the following four recommendations to GSA:

- The Administrator of the General Services Administration should update existing procedures to require GSA officials to estimate the full operations and maintenance costs of design choices in the planning

[27] GAO-14-704G.

and design process for new Design Excellence buildings. (Recommendation 1)

- The Administrator of the General Services Administration should update existing procedures to require GSA officials to obtain information from personnel responsible for addressing the operations and maintenance consequences of design choices at key decision points during the planning and design of new Design Excellence buildings. (Recommendation 2)
- The Administrator of the General Services Administration should update existing procedures to require GSA officials to further consider and document, during the planning and design of new Design Excellence buildings, how design choices may affect building functionality, such as whether a building is publicly visible and accessible. (Recommendation 3)
- The Administrator of the General Services Administration should update existing procedures to require GSA officials to systematically collect and share information with project teams responsible for overseeing the planning and design of new buildings on the positive and negative effects of common design choices on operations and maintenance costs in existing Design Excellence buildings. (Recommendation 4)

Agency Comments

We provided a draft of this report to GSA, the U.S. Administrative Office of Courts, the Department of Homeland Security, the Department of Justice, and the Department of Commerce for comment. In written comments, reproduced in appendix IV, GSA stated that it agreed with our recommendations and provided several technical comments. GSA clarified its policies for selecting and analyzing the lifecycle costs of building systems. In addition, GSA stated that table 2 in our report did not capture the full functional benefits and reasons for making certain design choices. As we noted in the report, this table does not preclude that a specific design choice may be functional or have functional benefits. We also included several of the examples GSA highlighted in their comments, such as the functional need for a separate structure, which may serve key security functions. GSA also stated that our conclusions did not indicate that most Design Excellence buildings functioned well. We added language to the conclusions to clarify this point.

The U.S. Administrative Office of Courts, the Department of Homeland Security, the Department of Justice, and the Department of Commerce did not provide comments.

We are sending copies of this report to the appropriate congressional committees, the Administrator of the General Services Administration, Director of the Administrative Office of U.S. Courts, Attorney General, and the Secretaries of Homeland Security and Commerce. In addition, the report is available at no charge on the GAO website at http://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-2834 or rectanusl@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix V.

Lori Rectanus
Director, Physical Infrastructure Issues

Appendix I: Objectives, Scope, and Methodology

This report assesses the extent to which: (1) the General Services Administration (GSA) made design choices that affect operations and maintenance (O&M) costs; (2) GSA considers O&M costs and functionality when planning and designing buildings; and (3) GSA systematically collects and shares information on O&M costs related to design choices in existing buildings.

To address all of our objectives, we reviewed applicable federal regulations; GSA procedures, policies, and standards for designing, constructing, and operating federal facilities, including specific policies and procedures for Design Excellence buildings;[1] our prior work;[2] and reports by other federal agencies and related professional organizations on topics, including the standard costs of operating and maintaining office buildings. Our review examined 78 federal buildings and courthouses that GSA constructed under the Design Excellence Program—referred to as "Design Excellence buildings"—since the program started in 1994.[3] At our request, GSA provided a list of all buildings under the agency's custody and control that were constructed under the Design Excellence Program. Based on input from GSA officials indicating that large campuses were unlikely to have reliable O&M data, we excluded nine buildings that are part of the White Oak Campus in Silver Spring, Maryland. We reviewed relevant GSA documents pertaining to the remaining 78 Design Excellence buildings, including the most recent Asset Business Plans detailing investment needs for maintenance and repairs, strategies for efficient operations, building use, and tenant satisfaction. We analyzed GSA-provided historical data on construction and O&M costs from 2000 to 2016 for the buildings in our review and projected O&M future costs. To calculate our projection, we made several assumptions, including (1) that annual O&M costs would increase at the same level as 2016 O&M costs ($174 million), and (2) that Design Excellence buildings will reach the average age of all current GSA buildings (60 years). We assessed the reliability of these data through electronic testing and reviewing

[1]In our review of GSA procedures, policies, and standards, we used *Facilities Standards for the Public Buildings Service, PBS-P100* (April 2017) and GSA's *Design Excellence: Policies and Procedures* (updated Feb. 2016).

[2]GAO, *Recovery Act: GSA's Courthouse Projects Illustrate Opportunities to Improve Management Practices and Analyze Environmental Outcomes*. GAO-15-307 (Washington, D.C.: Feb. 12, 2015); and GAO, *Embassy Construction: State Has Made Progress Constructing New Embassies, but Better Planning is Needed for Operations and Maintenance Requirements*, GAO-06-641 (Washington, D.C.: June 30, 2006).

[3]For the full list of Design Excellence buildings included in our review, see appendix II.

documentation on the data. We determined that the data provided were sufficiently reliable for the purpose of illustrating the extent to which O&M costs make up total building costs.

We also conducted a web-based survey of GSA building managers responsible for overseeing O&M for the 78 Design Excellence buildings included in our review. The survey addressed the extent to which certain design choices affect O&M costs and building functionality. We developed the survey based on our objectives, prior GAO work, and site visits to 10 Design Excellence buildings. We pretested the survey with GSA officials at three Design Excellence buildings, which were selected based on building age, location, total square feet, fiscal year 2016 O&M costs, and the building's primary use (e.g., office or courthouse). As part of our pretesting, we asked GSA building managers to explain their understanding of survey questions and made edits based on their comments. We conducted the survey from November 2017 to March 2018 and our response rate was 100 percent (78 out of 78). See appendix III for a copy of the survey and summarized responses.

We visited 10 Design Excellence buildings in three GSA regions to view design choices and O&M activities. As part of these site visits, we conducted interviews that included tenant agencies located in these buildings, GSA building managers responsible for managing these buildings and officials from GSA regional offices with oversight responsibilities for these buildings. To select our site visit locations and ensure geographic and agency diversity, we considered several factors including building operating costs, size, location, and the tenant agency. Based on these criteria we selected the buildings listed in table 3. The interviews and tours we conducted during our site visits do not allow us to generalize the findings to all Design Excellence buildings. Information gathered from our site visits did allow us to show how O&M costs were considered in specific Design Excellence buildings and the effects of design choices.

Table 3: Design Excellence Buildings Selected for GAO Site Visits

Building name	Location	Tenant agency
Ronald Reagan Federal Building and Courthouse	Santa Ana, CA	Administrative Office of the U.S. Courts
James M. Carter & Judith N. Keep U.S. Courthouse	San Diego, CA	Administrative Office of the U.S. Courts
Bakersfield Federal Courthouse	Bakersfield, CA	Administrative Office of the U.S. Courts
First Street Federal Courthouse	Los Angeles, CA	Administrative Office of the U.S. Courts
Ronald Reagan Building and International Trade Center	Washington, D.C.	General Services Administration

Building name	Location	Tenant agency
Ariel Rios Federal Building	Washington, D.C.	Department of Justice
Douglas A. Munro Coast Guard Headquarters Building	Washington, D.C.	Department of Homeland Security
National Oceanic and Atmospheric Administration Satellite Operations Facility	Suitland, MD	Department of Commerce
Las Cruces U.S. Courthouse	Las Cruces, NM	Administrative Office of the U.S. Courts
Albert Armendariz, Sr., U.S. Courthouse	El Paso, TX	Administrative Office of the U.S. Courts

Source: GAO analysis of GSA data. | GAO-18-420

We also interviewed GSA officials located in GSA Headquarters within the Office of Design and Construction, including the Chief Architect, and the Office of Facilities Management. We also interviewed GSA regional officials within the Office of Facilities Management in four of GSA's 11 regional offices: Greater Southwest Region, National Capital Region, Pacific Rim Region, and Southeast Sunbelt Region. We selected regional offices based on the location of our site visits and included one additional regional office based on it having the highest total O&M operating costs of the eight remaining regional offices. We discussed several topics with GSA officials, including how O&M costs were considered during planning and design and how information on the O&M costs of design choices are shared.

To determine the extent to which GSA considers O&M costs and functionality when planning and designing buildings, we analyzed Federal Real Property Profile (FRPP) data.[4] Our analysis of U.S. government-owned office buildings that are less than 40 years old, occupied, and needed for a tenant's mission, identified five potentially relevant variables to explain variation in the O&M costs: building type (i.e., whether a building was constructed under the Design Excellence Program), size, age, and condition of the building, as well as the median hourly wage of O&M services in the building's location. After controlling for these variables, we found that size and median hourly wage but not building type had a statistically significant relationship to O&M costs. We assessed the reliability of these data through electronic testing as well as a review of documentation for each federal data source. We determined that the data provided were sufficiently reliable for the purpose of describing our attempts to identify factors that influence O&M costs in federal buildings. We also requested and received additional information

[4]The Federal Real Property Profile is the building inventory database for federal agencies, including GSA, subject to the Chief Financial Officers (CFO) Act of 1990, as amended.

from the building managers of Design Excellence federal office buildings. Specifically we asked for information on the extent to which these federal office buildings are public-facing, have restrictions on public entry and are visible from public sidewalks or roads, and what the daily volume of public visitors was.

We compared GSA's efforts to consider O&M costs in the planning and design of Design Excellence buildings to pertinent Standards for Internal Control in the Federal Government on using complete and relevant information when making decisions and design control activities, including procedures, to achieve objectives, as well as on communicating information internally.[5] In addition, we compared GSA's efforts to consider these costs in the planning and design of Design Excellence buildings to guidance from GSA and the Office of Management and Budget that directs agency officials to consider and strive for the lowest possible costs, including O&M costs, when designing buildings.[6] We also compared GSA's efforts to consider functionality when planning and designing these buildings to pertinent Standards for Internal Control in the Federal Government on using complete and relevant information when making decisions and design control activities, including procedures, to achieve objectives.[7]

To assess the extent to which GSA systematically collects and shares information on O&M costs related to design choices in existing Design Excellence buildings, we reviewed Post Occupancy Evaluations commissioned by GSA on six Design Excellence buildings. These evaluations contain information, such as how GSA buildings are performing and the extent to which they comply with GSA's federal standards for public buildings. These evaluations can include reviews of operations and maintenance documentation, interviews and surveys with building occupants, and interviews with relevant GSA staff, architectural and engineering design team staff, and an on-site evaluation. We also

[5]GAO, *Standards for Internal Control in the Federal Government*, GAO-14-704G (Washington, D.C.: September 2014). These standards provide the overall framework for establishing and maintaining an effective internal control system for the federal government, including using quality information to achieve an entity's objectives.

[6]Facilities Standards for the Public Buildings Service, PBS-P100 (April 2017); and OMB, *Capital Programming Guide V 3.0; Supplement to Office of Management and Budget Circular A-11: Planning, Budgeting, and Acquisition of Capital Assets*, (Washington, D.C.: 2017).

[7]GAO-14-704G.

compared GSA's process for collecting and sharing how design choices affected O&M costs in existing buildings to pertinent Standards for Internal Control in the Federal Government on using and communicating complete and relevant information when designing control activities, including procedures, to achieve objectives.[8]

We conducted this performance audit from May 2017 to May 2018 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.

[8]GAO-14-704G.

Appendix II: Buildings Constructed under the General Services Administration's (GSA) Design Excellence Program

GSA created the Design Excellence Program in 1994. Under this program, GSA has constructed 78 buildings in 33 states and the District of Columbia, buildings that range in size from about 35,000- to over 3-million gross square feet (see table 4).[1]

Table 4: Information on Buildings Constructed under the General Services Administration's (GSA) Design Excellence Program

Building name	Location (city, state)	Size (gross square feet)	Year built
Frank M. Johnson, Jr., U.S. Courthouse Annex	Montgomery, Alabama	325,866	2001
Tuscaloosa Federal Building and U.S. Courthouse	Tuscaloosa, Alabama	126,531	2011
Richard Sheppard Arnold U.S. Courthouse Annex	Little Rock, Arkansas	254,911	2007
Sandra Day O'Connor U.S. Courthouse	Phoenix, Arizona	579,922	2000
Evo A. DeConcini Federal Building and U.S. Courthouse	Tucson, Arizona	432,591	2000
John M. Roll U.S. Courthouse	Yuma, Arizona	62,162	2013
Ronald Reagan Federal Building and Courthouse	Santa Ana, California	645,419	1999
San Francisco Federal Building	San Francisco, California	639,678	2007
Robert T. Matsui U.S. Courthouse	Sacramento, California	762,983	1999
Robert E. Coyle U.S. Courthouse	Fresno, California	481,785	2005
James M. Carter & Judith N. Keep U.S. Courthouse	San Diego, California	480,941	2012
First Street Federal Courthouse	Los Angeles, California	629,981	2016
Bakersfield Federal Courthouse	Bakersfield, California	35,468	2012
David Skaggs Federal Building	Boulder, Colorado	415,938	1999
Alfred A. Arraj U.S. Courthouse	Denver, Colorado	327,618	2002
Ronald Reagan Building and International Trade Center[a]	Washington, DC	3,029,360	1996
FBI, Washington Field Office Memorial Building	Washington, DC	537,586	1997
U.S. Secret Service Headquarters	Washington, DC	692,024	1999
Ariel Rios Federal Building	Washington, DC	460,889	2007
William B. Bryant Annex	Washington, DC	404,425	2005
Douglas A. Munro Coast Guard Headquarters Building	Washington, DC	1,292,749	2013
Tallahassee U.S. Courthouse Annex	Tallahassee, Florida	158,251	2000
Wilkie D. Ferguson, Jr. U.S. Courthouse	Miami, Florida	592,154	2008
Sam M. Gibbons U.S. Courthouse	Tampa, Florida	433,687	1998
John Milton Bryan Simpson U.S. Courthouse	Jacksonville, Florida	464,168	2002

[1]Based on input from GSA officials indicating that large campuses were unlikely to have reliable operations and maintenance (O&M) data, we excluded nine buildings included on the White Oak Campus in Silver Spring, Maryland from our review.

Building name	Location (city, state)	Size (gross square feet)	Year built
Orlando U.S. Courthouse Annex	Orlando, Florida	468,348	2007
Alto Lee Adams, Sr., U.S. Courthouse	Fort Pierce, Florida	145,742	2011
Benjamin P. Grogan and Jerry L. Dove Federal Building	Miramar, Florida	606,122	2014
C.B. King U.S. Courthouse	Albany, Georgia	82,448	2001
Cedar Rapids U.S. Courthouse	Cedar Rapids, Iowa	305,999	2012
Stanley J. Roszkowski U.S. Courthouse	Rockford, Illinois	211,320	2011
Hammond U.S. Courthouse	Hammond, Indiana	280,802	2002
London U.S. Courthouse Annex	London, Kentucky	89,664	2002
John Joseph Moakley U.S. Courthouse	Boston, Massachusetts	945,421	1998
Springfield U.S. Courthouse	Springfield, Massachusetts	176,054	2008
New Carrollton Federal Building	Lanham, Maryland	1,903,788	1997
Harvey W. Wiley Federal Building	College Park, Maryland	441,304	2001
National Oceanic and Atmospheric Administration Satellite Operations Facility	Suitland, Maryland	357,869	2006
U.S. Census Bureau Headquarters[b]	Suitland, Maryland	2,551,705	2006
Minneapolis U.S. Courthouse	Minneapolis, Minnesota	734,361	1997
Christopher S. Bond U.S. Courthouse	Jefferson City, Missouri	117,522	2011
Charles Evans Whittaker U.S. Courthouse	Kansas City, Missouri	674,508	1998
Thomas F. Eagleton U.S. Courthouse	St. Louis, Missouri	1,239,728	2000
Rush Hudson Limbaugh, Sr. U.S. Courthouse	Cape Girardeau, Missouri	173,395	2008
Judge Dan M. Russell, Jr. Federal Building and U.S. Courthouse	Gulfport, Mississippi	183,939	2003
Jackson U.S. Courthouse	Jackson, Mississippi	407,771	2010
James F. Battin U.S. Courthouse	Billings, Montana	146,669	2012
Quentin N. Burdick U.S. Courthouse Annex	Fargo, North Dakota	122,926	1998
Roman L. Hruska Federal Building and U.S. Courthouse	Omaha, Nebraska	364,173	2000
Pete V. Domenici U.S. Courthouse	Albuquerque, New Mexico	333,271	1998
Las Cruces U.S. Courthouse	Las Cruces, New Mexico	235,239	2010
Lloyd D. George U.S. Courthouse	Las Vegas, Nevada	454,893	2000
Alfonse M. D'Amato U.S. Courthouse	Central Islip, New York	995,807	2000
Ronald H. Brown U.S. Mission to the United Nations Building	New York, New York	165,637	2010
Robert H. Jackson U.S. Courthouse	Buffalo, New York	284,674	2008
Theodore Roosevelt U.S. Courthouse	Brooklyn, New York	669,413	2005
Carl B. Stokes U.S. Courthouse	Cleveland, Ohio	766,423	2002
Nathaniel R. Jones Federal Building and U.S. Courthouse	Youngstown, Ohio	52,255	2002
Oklahoma City Federal Building	Oklahoma City, Oklahoma	178,342	2003
Mark O. Hatfield U.S. Courthouse	Portland, Oregon	591,692	1997
Wayne Lyman Morse U.S. Courthouse	Eugene, Oregon	308,306	2006

Building name	Location (city, state)	Size (gross square feet)	Year built
William J. Nealon U.S. Courthouse Annex	Scranton, Pennsylvania	126,251	1999
Erie U.S. Courthouse Annex	Erie, Pennsylvania	64,499	2004
Matthew J. Perry, Jr. U.S. Courthouse	Columbia, South Carolina	213,305	2003
James H. Quillen U.S. Courthouse	Greeneville, Tennessee	154,897	2001
Laredo Federal Building and Courthouse	Laredo, Texas	152,681	2004
Corpus Christi Federal Courthouse	Corpus Christi, Texas	183,581	2001
Reynaldo G. Garza & Filemon B. Vela U.S. Courthouse	Brownsville, Texas	205,358	1999
Albert Armendariz, Sr., U.S. Courthouse	El Paso, Texas	277,634	2008
Austin Courthouse	Austin, Texas	250,995	2012
FBI Houston Field Office	Houston, Texas	305,438	2005
Utah U.S. District Courthouse	Salt Lake City, Utah	401,209	2014
Spottswood W. Robinson III & Robert R. Merhige, Jr., U.S. Courthouse	Richmond, Virginia	344,798	2008
Seattle U.S. Courthouse	Seattle, Washington	679,979	2004
Federal Center South	Seattle, Washington	190,521	2012
Robert C. Byrd Federal Building and U.S. Courthouse	Charleston, West Virginia	430,849	1998
Robert C. Byrd Federal Building and U.S. Courthouse	Beckley, West Virginia	179,853	1999
Wheeling U.S. Courthouse, Federal Building & Annex	Wheeling, West Virginia	92,413	2004

Source: GSA. | GAO-18-420

[a]The Ronald Reagan Building and International Trade Center includes a federal office building and an international trade center. We added the gross square feet of each facility to determine the gross square feet of the combined facility.

[b]The U.S. Census Bureau Headquarters includes two facilities, a North building and a South building. We added the gross square feet of each facility to determine the gross square feet of both facilities. The North building was built in 2006 and the South building was built in 2007.

Appendix III: Survey of General Services Administration (GSA) Building Managers and Summarized Results

This appendix provides a copy of the survey completed by managers for all 78 buildings constructed under GSA's Design Excellence Program included in our review.[1] The appendix also includes the responses received for each of the close-ended questions (1a, 1b, 1c, 1e, 2a, 3a, and 4a); it does not include information on open-ended responses (1d, 1f, 2b, 3b, 3c, 4b, and 5).[2] The purpose of this survey was to gather responses on how design choices affected operation and maintenance (O&M) costs and building function. See appendix I for additional information on our survey methodology.

[1]The letter in this appendix makes reference to 71 Design Excellence buildings. We initially sent our survey to GSA managers for 71 buildings, but were subsequently informed by GSA of seven additional Design Excellence buildings. We sent the survey to building managers responsible for these additional buildings for a total of 78 buildings included in our survey.

[2]Several building managers did not respond to every question, which resulted in fewer than 78 total responses to some of the questions listed in the appendix.

Federal O&M Facility Manager Survey

U.S. Government Accountability Office

United States Government Accountability Office
Washington, DC 20548

Physical Infrastructure Issues

November 6th, 2017

The U.S. Government Accountability Office's Web-based questionnaire on Operations and Maintenance (O&M) for federal buildings is ready for you to complete.

We are conducting the survey with officials responsible for the O&M of all buildings constructed under the General Services Administration's (GSA) Design Excellence Program. Since we are surveying officials from all Design Excellence buildings, some official may be asked to complete more than one survey. The results of the surveys, along with other information, will help us to develop a written report for the Congress.

Please complete this survey by Tuesday, November 21, 2017. In testing this survey, we found that it took approximately 60 minutes to complete. We may contact you to clarify responses as needed.

Thank you in advance for your time. If you have any questions or are not the appropriate person to complete this survey, please call or e-mail Colin Ashwood at (202) 512-6001 ashwoodc@gao.gov, or Matt Cook at (202) 512-6403 cookm@gao.gov.

Introduction

GAO is conducting a survey with all 71 Design Excellence buildings. The goal of this survey is to understand what factors affect O&M costs, efforts you have taken to reduce those costs, and the challenges you face. Feel free to ask other who maybe knowledgeable about O&M costs of the #BUILDING (#BUILD_ID) building for input.

We estimate that this survey will take about 60 minutes to complete. The survey does not need to be completed in one sitting. Your responses can be saved and accessed at a later date. To learn more about completing the survey, printing your responses, and whom to contact if you have questions, click here for help.

Question 1A: How do the following design elements included in the building's original design affect operational costs including custodial costs? *Some categories listed below will not apply to every design element. Please select "Not Applicable" for these categories*

Appendix III: Question 1a—Vertical Penetrations (e.g., atriums, lobbies)				
	Material Durability	Energy Efficiency	Repair	Cleaning
Increase	33	50	58	55
No Impact	39	21	16	20
Decrease	5	5	2	3
Not Applicable	1	2	2	0
Total	78	78	78	78

Appendix III: Question 1a—Circulation (e.g., hallways, stairways, elevators)				
	Material Durability	Energy Efficiency	Repair	Cleaning
Increase	13	20	21	18
No Impact	62	52	51	57
Decrease	3	4	5	3
Not Applicable	0	2	1	0
Total	78	78	78	78

Appendix III: Question 1a—Mission spaces (e.g., courtrooms, control centers)				
	Material Durability	Energy Efficiency	Repair	Cleaning
Increase	25	26	32	30
No Impact	46	45	42	44
Decrease	3	5	2	2
Not Applicable	4	2	2	2
Total	25	26	32	30

Appendix III: Question 1a—Cafeteria				
	Material Durability	Energy Efficiency	Repair	Cleaning
Increase	9	12	12	15
No Impact	28	25	25	24
Decrease	2	2	2	1
Not Applicable	39	39	39	36
Total	78	78	78	76

Appendix III: Question 1a—An attached, but separate structure (e.g., pavilion, rotunda)				
	Material Durability	Energy Efficiency	Repair	Cleaning
Increase	14	13	15	14
No Impact	6	7	5	6
Decrease	0	0	0	0
Not Applicable	58	58	58	57
Total	78	78	78	77

Appendix III: Question 1a—Energy Efficient Elements (e.g., solar panels, green roofs)				
	Material Durability	Energy Efficiency	Repair	Cleaning
Increase	13	4	14	10
No Impact	10	7	8	11
Decrease	4	16	4	3
Not Applicable	49	49	50	50
Total	76	76	76	74

Appendix III: Question 1a—Courtyard				
	Material Durability	Energy Efficiency	Repair	Cleaning
Increase	9	7	17	25
No Impact	33	34	27	20
Decrease	1	2	1	1
Not Applicable	34	34	32	29
Total	77	77	77	75

Appendix III: Question 1a—Arts in Architecture (e.g., sculptures and artwork)				
	Material Durability	Energy Efficiency	Repair	Cleaning
Increase	26	17	24	31
No Impact	40	49	43	36
Decrease	2	0	2	2
Not Applicable	7	10	7	7
Total	75	76	76	76

Appendix III: Question 1a—Windows				
	Material Durability	Energy Efficiency	Repair	Cleaning
Increase	37	40	52	49
No Impact	35	19	23	26
Decrease	6	19	3	3
Not Applicable	0	0	0	0
Total	78	78	78	78

Appendix III: Question 1a—Floors				
	Material Durability	Energy Efficiency	Repair	Cleaning
Increase	22	9	29	30
No Impact	47	60	47	41
Decrease	9	1	2	6
Not Applicable	0	8	0	0
Total	78	78	78	77

Question 1B: How do the following design elements included in the building's original design affect operational costs including custodial costs?

Appendix III: Question 1b—Vertical Penetrations (e.g., atriums, lobbies)		
	Material Color	Lighting
Increase	15	38
No Impact	58	22
Decrease	5	17
Not Applicable	0	1
Total	78	78

Appendix III: Question 1b—Circulation (e.g., hallways, stairways, elevators)		
	Material Color	Lighting
Increase	12	17
No Impact	62	51
Decrease	3	9
Not Applicable	1	1
Total	78	78

Appendix III: Question 1b—Mission spaces (e.g., courtrooms, control centers)		
	Material Color	Lighting
Increase	17	33
No Impact	58	36
Decrease	1	7
Not Applicable	2	2
Total	17	33

Appendix III: Question 1b—Cafeteria		
	Material Color	Lighting
Increase	6	11
No Impact	32	24
Decrease	0	3
Not Applicable	39	40
Total	77	78

Appendix III: Question 1b—An attached, but separate structure (e.g., pavilion, rotunda)		
	Material Color	Lighting
Increase	6	6
No Impact	12	10
Decrease	1	3
Not Applicable	59	59
Total	78	78

Appendix III: Question 1b—Energy Efficient Elements (e.g., solar panels, green roofs)		
	Material Color	Lighting
Increase	7	4
No Impact	19	14
Decrease	1	6
Not Applicable	51	54
Total	78	78

Appendix III: Question 1b—Courtyard		
	Material Color	Lighting
Increase	3	6
No Impact	37	31
Decrease	1	5
Not Applicable	37	35
Total	78	77

Appendix III: Question 1b—Arts in Architecture (e.g., sculptures and artwork)		
	Material Color	Lighting
Increase	12	21
No Impact	56	46
Decrease	1	2
Not Applicable	9	9
Total	78	78

Question 1c: How do the following design elements included in the building's original design affect operational costs including custodial costs? *Some categories listed below will not apply to every design element. Please select "Not Applicable" for these categories*

Appendix III: Question 1c—Mechanical Systems

	Material Durability	Energy Efficiency	Repair
Increase	30	32	41
No Impact	37	18	28
Decrease	9	27	8
Not Applicable	0	0	0
Total	76	77	77

Appendix III: Question 1c—Roof

	Material Durability	Energy Efficiency	Repair
Increase	23	11	28
No Impact	44	43	37
Decrease	10	22	9
Not Applicable	0	1	1
Total	77	77	75

Appendix III: Question 1c—Building Envelope (e.g., insulation, façade)

	Material Durability	Energy Efficiency	Repair
Increase	33	22	40
No Impact	35	38	28
Decrease	9	15	8
Not Applicable	0	0	0
Total	76	75	76

Question 1d: Are there additional features not listed that have resulted in a notable increase or decrease in operational costs?

Question 1e: How do the following design elements included in the building's original design affect operational functionality? We use the term operational functionality to refer to the tenant agency's ability to efficiently meet its mission. For example, if the hallways were designed to have very efficient traffic flow, you could rate Hallways as having "very good" Pedestrian circulation. Or, if the Atrium's temperature varies substantially, you could rate it as having "poor" Temperature control. Some ranking categories will not apply to every design element. Please select "Not Applicable" for these categories.

Appendix III: Question 1e—Vertical Penetrations (e.g., atriums, lobbies)

	Material Color	Lighting	Shape and Size	Pedestrian Circulation	Heating, Ventilation, Air-Conditioning
Very Poor	3	3	5	3	8
Poor	3	8	4	3	15
Neutral	26	19	18	15	25
Good	25	23	29	30	20
Very Good	19	23	20	26	9
Not Applicable	2	1	0	1	0
Total	78	77	76	78	77

Appendix III: Question 1e—Circulation

	Material Color	Lighting	Shape and Size	Pedestrian Circulation	Heating, Ventilation, Air-Conditioning
Very Poor	4	0	2	3	1
Poor	4	4	0	0	7
Neutral	17	12	14	11	18
Good	35	39	41	36	38
Very Good	17	22	20	27	13
Not Applicable	1	1	0	1	0
Total	78	78	77	78	77

Appendix III: Question 1e—Mission Spaces (e.g., courtrooms, control centers)					
	Material Color	Lighting	Shape and Size	Pedestrian Circulation	Heating, Ventilation, Air-Conditioning
Very Poor	2	2	1	1	2
Poor	1	3	2	0	12
Neutral	16	13	12	12	16
Good	36	40	42	40	33
Very Good	17	18	19	21	13
Not Applicable	5	1	1	2	1
Total	77	77	77	76	77

Appendix III: Question 1e—Cafeteria					
	Material Color	Lighting	Shape and Size	Pedestrian Circulation	Heating, Ventilation, Air-Conditioning
Very Poor	1	1	1	1	1
Poor	1	1	3	2	0
Neutral	12	8	8	11	10
Good	19	18	19	18	20
Very Good	5	10	7	6	7
Not Applicable	40	40	40	40	40
Total	78	78	78	78	78

Appendix III: Question 1e—An attached, but separate structure (e.g., pavilion, rotunda)					
	Material Color	Lighting	Shape and Size	Pedestrian Circulation	Heating, Ventilation, Air-Conditioning
Very Poor	1	1	2	1	3
Poor	0	0	1	1	1
Neutral	7	6	5	8	8
Good	11	11	10	8	7
Very Good	0	1	1	1	0
Not Applicable	59	59	58	59	58
Total	78	78	77	78	77

Appendix III: Question 1e—Energy Efficient Elements (e.g., solar panels, green roofs)					
	Material Color	Lighting	Shape and Size	Pedestrian Circulation	Heating, Ventilation, Air-Conditioning
Very Poor	1	0	2	1	0
Poor	0	0	1	2	2
Neutral	10	8	9	6	8
Good	10	8	12	8	6
Very Good	4	4	6	3	3
Not Applicable	53	58	48	58	59
Total	78	78	78	78	78

Appendix III: Question 1e—Courtyard					
	Material Color	Lighting	Shape and Size	Pedestrian Circulation	Heating, Ventilation, Air-Conditioning
Very Poor	1	2	1	1	2
Poor	2	1	1	1	0
Neutral	12	13	8	11	9
Good	20	19	25	17	7
Very Good	9	6	9	12	2
Not Applicable	34	37	34	35	57
Total	78	78	78	77	77

Appendix III: Question 1e—Arts in Architecture					
	Material Color	Lighting	Shape and Size	Pedestrian Circulation	Heating, Ventilation, Air-Conditioning
Very Poor	1	3	1	1	1
Poor	1	2	3	1	1
Neutral	27	19	23	17	20
Good	26	31	23	24	11
Very Good	15	10	16	11	6
Not Applicable	8	13	12	24	38
Total	78	78	78	78	77

Question 1f: Are there additional features not listed that notably help or undermine the operational functionality of your building?

Question 2a: Have any of the following energy savings measures or financing vehicles been added to your building after construction was completed?

Appendix III: Question 2a

	Energy Savings Performance Contracts	Utility Energy Service Contracts	Energy efficient elements installed—lighting, plumbing, insulation, etc.	Other
Yes	29	22	50	9
No	36	36	15	15
Don't Know	6	12	6	27
Total	29	22	50	9

Question 2b: What are the other energy savings measures or financing vehicles?

Question 3a: Were any elements of your vendor's most recent O&M contract changed to reduce cost e.g. preventative maintenance, repairs, or cleaning?

Appendix III: Question 3a

Yes	32
No	32
Don't Know	14
Total	78

Question 3b: Which elements of the contract were changed?

Question 3c: What were the short-term cost savings from these actions?

Question 4a: Has your building had any tenant-funded upgrades over a million dollars since construction?

Appendix III: Question 4a	
Yes	14
No	55
Don't Know	8
Total	77

Question 4b: If yes, what were the tenant-funded upgrades?

Question 5: If you have any additional comments regarding your building and O&M, please type them in the box below.

Appendix IV: Comments from the General Services Administration

The Administrator

May 7, 2018

The Honorable Gene L. Dodaro
Comptroller General of the United States
U.S. Government Accountability Office
Washington, DC 20548

Dear Mr. Dodaro:

The U.S. General Services Administration (GSA) appreciates the opportunity to review and comment on the U.S. Government Accountability Office (GAO) draft report, *FEDERAL BUILDINGS: More Consideration of Operations and Maintenance [O&M] Costs Could Better Inform the Design Excellence Program* (GAO-18-420).

GAO made the following recommendations in the draft report:

1. The Administrator of the General Services Administration should update existing procedures to require GSA officials to estimate the full O&M costs of design choices in the planning and design process for new Design Excellence buildings.

2. The Administrator of the General Services Administration should update existing procedures to require GSA officials to obtain information from personnel responsible for addressing O&M consequences of design choices at key decision points during the planning and design of new Design Excellence buildings.

3. The Administrator of the General Services Administration should update existing procedures to require GSA officials to further consider and document during the planning and design of new Design Excellence buildings how design choices may affect building functionality, such as whether a building is publicly visible and accessible.

4. The Administrator of the General Services Administration should update existing procedures to require GSA officials to systematically collect and share information with project teams responsible for overseeing the planning and design of new buildings on the positive and negative effects of common design choices on O&M costs in existing Design Excellence buildings.

GSA concurs with these recommendations and would like to provide the following clarifications.

1. GAO Language: Page 4, 2nd paragraph: "According to the Office of Management and Budget (OMB), agencies, including GSA, should have accurate information on

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acquisition and "lifecycle" costs of current and proposed assets, including costs for designing and constructing the building, O&M, and disposal."

GSA Comments: GSA establishes the quality and level of cost and schedule management services to be provided during the planning, design, and construction phases of projects as outlined in 1000.6 PBS P-120, Public Buildings Service Cost, and Schedule Management Policy. As described in this guidance, a project's design must comprehensively define reasonable scope and performance requirements within the authorized budget for design and construction. Consistent with these constraints, building systems and features must be analyzed and selected to achieve lowest lifecycle cost.

Additionally, GSA's Public Buildings Service is developing a Total Cost of Ownership (TCO) module to focus on the O&M cost of federally constructed buildings.

2. GAO Language: Page 17, Table 2

Table 2: Design Excellence Buildings Where Building Managers Indicated a Design Choice that Increased Operations and Maintenance (O&M) Costs Did Not Further Improve Functionality

Design choice	Number with increased O&M cost	Increased cost and did not further improve functionality	Percentage of buildings in which design choice increased O&M cost and did not further improve functionality
Vertical penetrations (e.g., atriums, lobbies)	67	51	76%
Energy efficient elements (e.g., solar panels, green roofs)	19	12	63%
An attached, but separate structure (e.g., pavilion, rotunda)	19	12	63%
Mission space design (e.g., courtrooms, control centers)	48	28	58%
Circulation design (e.g., hallways, stairways, elevators)	40	22	55%
Courtyard design	28	14	50%

Source: Analysis of GAO survey results. | GAO-18-420

Note:
- This table presents information on whether or not respondents indicated a design choice increased O&M costs and whether aspects of those choices, e.g. material color, lighting, and pedestrian circulation, also did not further

GSA Comments: As structured, the design choice table does not capture the reasons behind certain design choices and the full benefits of the choices that improve safety and overall tenant satisfaction. A few examples are provided below.

Example: Energy efficient elements (e.g., solar panels, green roofs): Green roofs have a longer lifespan than standard roofs because they offer better protection from ultraviolet radiation and fluctuations in temperature. The vegetation keeps the membrane cool during the summer as the plants and soil act as an insulation layer. They conserve energy because of this insulation value. Green roofs absorb storm water and release it slowly back into the environment, mitigate the urban heat island effect, and sequester the release of carbon. These roofs increase urban biodiversity and create habitats for wildlife. Overall, green roofs reduce O&M costs over the lifecycle of the building due to these many benefits. Compared to a black roof, a 3-inch to 6-inch green roof covering 10,000 feet has a net present value of $2.70 per square foot per year.

2

Example: An attached, but separate structure (e.g., pavilion, rotunda): These elements are designed to provide security screening or blast/force protection, or to create the required standoff distance to meet the security level of the facility. In the event of a catastrophe, entry pavilions are constructed so that the building maintains structural integrity to the maximum extent possible for occupancy safety. Therefore, this design choice is actually a design requirement that provides safety and security to building occupants.

Example: Mission space design (e.g., courtrooms, control centers): These are programmatic necessities of the facility that enable it to function and meet the requirements of the building tenants.

3. GAO Language: Conclusions paragraph, pages 27-28

GSA Comments: The conclusions of this report do not appear to summarize the results of the Federal O&M Facility Manager Survey Appendix III, Pages 47–52. For example, Question 1e. reads: "How do the following design elements included in the building's original design affect operational functionality?" Of the 78 building managers surveyed, the results were mostly considered "Good"; however, these results are not conveyed in the conclusion of this report.

If you have any questions or concerns, please contact me at (202) 501-0800 or Mr. Saul Japson, Office of Congressional and Intergovernmental Affairs, at (202) 501-0563.

Sincerely,

Emily W. Murphy

Emily W. Murphy
Administrator

cc: Ms. Lori Rectanus, Director, Physical Infrastructure, GAO

3

Appendix V: GAO Contact and Staff Acknowledgments

GAO Contact

Lori Rectanus, (202) 512-2834 or rectanusl@gao.gov.

Staff Acknowledgments

In addition to the contact named above, Keith Cunningham (Assistant Director); Matthew Cook (Analyst in Charge); Eli Albagli; Sarah Arnett; Colin Ashwood; Melissa Bodeau; Lacey Coppage; Caitlin Cusati; Terrence Lam; Joshua Ormond; Dae Park; Minette Richardson; Kelly Rubin; Ardith Spence; and Dave Wise made key contributions to this report.