Long View in Long Beach

A new state courthouse in Long Beach, California, is believed to be the first civic building in the United States in which design, construction, operation, and maintenance are being carried out by an innovative public-private delivery method known as performance-based infrastructure. For the design team, the approach meant taking a new and much longer view of the project's life cycle. **By Robert L. Reid**

In Long Beach, California, the design of the new Governor George Deukmejian Courthouse, used by the state's superior court system, provides a modern take on the traditional aesthetics of the American courthouse. The 531,000 sq ft, state-of-the art facility currently features 31 courtrooms, and space is available for additional courtrooms if needed. The new courthouse can be described as forward looking in both form and functionality given that it was completed through an innovative public-private delivery method that will carefully track the building's performance over the next 35 years.

Known as performance-based infrastructure (PBI), the delivery method is unique in that the public-sector owner contracted with a private consortium, the latter designated the project company, to finance, design, build, operate, and maintain the new court building under detailed guidelines from the state for the aforementioned 35-year period. The owner here is the Judicial Council's Administrative Office of the Courts. (By virtue of a name change in late July of this year, both the Judicial Council and the Administrative Office of the Courts are now referred to as the Judicial Council of California.) In return, the state will pay an annual service fee to the project company to cover the costs of operations, utilities, maintenance, and "life-cycle renewal of building elements as they reach the end of their useful service life," according to the website of the Judicial Branch of California.

The Governor George Deukmejian Courthouse features 31 courtrooms, *left*, but more can be added if necessary. The full-height glazed curtain walls on its eastern and western facades, *opposite*, are formed from cable-supported glass panels and are the largest such systems in Southern California.

For the Governor George Deukmejian Courthouse, the project company is Long Beach Judicial Partners, LLC, part of the global investment firm Meridiam. Long Beach Judicial Partners retained Clark Design/Build of California, Inc., a wholly owned subsidiary

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0885-7024/14-0010-0050/$30.00 PER ARTICLE

of Clark Construction Group, LLC, of Bethesda, Maryland, as the design/build firm for the project. Johnson Controls, of Milwaukee, was selected as the operating service provider.

Clark Design/Build selected the international engineering firm AECOM to serve as the courthouse's architect and engineer of record. Drawing on staff and resources from multiple offices, AECOM was also responsible for the project's civil engineering, sustainability initiatives, landscape architecture, and other services, including the renovation of an adjacent parking structure. AECOM selected Los Angeles–based Nabih Youssef Associates as the project's structural engineer.

Although the PBI approach has been used on civic building projects in Australia, Canada, and the United Kingdom, its use in this country has been largely confined to highway and bridge construction, according to an August 2013 document on the project prepared by the body now known as the Judicial Council of California. But the PBI delivery method had much to recommend it on the $347-million Long Beach courthouse project because, as the document explained, California would not have to pay out any money until the building was occupied. Occupation was to begin in September 2013, although the facility would not be complete until December of that year. Moreover, the annual service fee would be dependent on the building performing as expected, "meaning that deductions can be made when court space or functionality are unavailable or other predetermined performance criteria are not met," the document noted.

THE ANNUAL SERVICE FEE WOULD BE DEPENDENT ON THE BUILDING PERFORMING AS EXPECTED.

For example, there will be a $5,000 charge every time that certain elevators are inoperable for two or more hours and a penalty of $2 million if the courthouse building fails to achieve silver certification in the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) program. (The application for LEED certification of the project is still under review.)

The new courthouse replaces an aging facility constructed in 1959 that "was functionally and physically deficient, ranking among the worst in the state in terms of security and overcrowding," according to *Governor George Deukmejian Courthouse: Evaluation of Cost-Effectiveness,* a report prepared by the Judicial Council of California for the California legislature and released in June of this year. Although the state initially considered renovating and expanding the existing courthouse, which was located on a valuable downtown site on Ocean Boulevard, that plan "was determined to be infeasible" because of the age and poor physical condition of the outdated

facility, the report concluded. A renovation would also have required gutting the structure and therefore temporarily relocating the entire court staff and all of the judicial officers, a measure that the report saw as "prohibitively expensive."

Instead, the State of California and the City of Long Beach worked out a deal by which the state would exchange the existing courthouse building and its approximately 3-acre site for a $7-million payment from the city and a roughly 6-acre site nearby along Magnolia Avenue that was owned by the city's redevelopment agency.

A tall masonry core is nestled just between the courthouse portion of the complex and the Great Room, a five-story glazed atrium.

ON THE EASTERN FACADE A LARGE CANTILEVERED ROOF CANOPY TOWERS 85 FT ABOVE GRADE.

The Magnolia Avenue site is bordered by a series of structures of varying height, which helped influence the design of the different portions of the courthouse, notes Henry Pittner, AIA, who served as AECOM's project manager on the Deukmejian courthouse but has since left the firm. For example, the complex features a five-story courthouse building, which is the main structure, as well as a four-story county office building, both facing Magnolia on the east side of the property; the five-story structure extends along West Broadway to the south, creating "an urban pedestrian promenade . . . with a rhythmic repetition of architectural and landscape elements," according to an AECOM design document entitled "Long Beach Court Building."

On the eastern facade a large cantilevered roof canopy towers 85 ft above grade, and a wide expanse of low steps at the base of the building helps to create a sort of "front porch" to the facility, an element "rooted in the idea that the civic experience is inseparable from the pedestrian experience," explained the design document. A series of tall (65 ft) cylindrical elements referred to as air columns line the building's monumental entrance, which leads into a five-story glazed atrium known as the Great Room. These elements evoke the traditional columned aesthetics of courthouses in the United States, which "have historically been focal points of the American town, often creating public spaces or 'civic front porches' central to the daily life of the community served," noted the design document.

Large, tall buildings frame the site on its eastern and southern sides. One is a 399,000 sq ft parking garage structure that AECOM renovated and seismically upgraded as part of the project, Pittner notes. But to the west and north of the courthouse site the surrounding buildings are smaller

Cylindrical elements roughly 65 ft tall that are referred to as air columns line the building's monumental entrance, *left.* The complex features a five-story courthouse building and a four-story county office building, *above.*

and include an elementary school and residential buildings of just two to three stories. Thus, the scale of the new construction declined accordingly, resulting in low structures, some just a single story, along the western facade and portions of the northern facade, especially around an open-air courtyard space. Furthermore, a 50 ft setback was established along the western edge of the property to ensure that the courthouse would not unduly shade the school, Pittner says.

The main courthouse building houses the 31 courtrooms, as well as the court administrative offices, and this space is leased by Los Angeles County judicial agencies. There is also space that can be leased to retail businesses. In the building's basement level are detention facilities for inmates that can be accessed by a secure sally port capable of accommodating several inmate buses simultaneously, as well as a secure parking area for the judges. There are also three separate elevator systems, one for inmates, another for judges and jurors, and a third for members of the public. Some of the space within the five-story court building is leased by the County of Los Angeles Probation Department, and space is available for up to six additional courtrooms should the state later decide it needs to expand the facility, Pittner notes. The prospective courtroom spaces are located strategically above the underground detention facilities, he adds.

The underground portion of the facility features reinforced-concrete framing, whereas the five-story courthouse above grade features a steel moment-resisting frame system, explains Nabih Youssef, P.E., S.E., F.ASCE, the president of Nabih Youssef Associates. The moment-resisting frame structure, which has secondary beams at 10 ft intervals, is formed from elements ranging from W30 to W36 members with nominal depths of up to 36 in., Youssef says. The columns include heavy W27 and W30 members. A moment-resisting frame system was selected for its seismic performance capabilities, Youssef says, although that decision also proved challenging because the seismic drift was limited to 1 percent, in contrast to the 2 percent typical for similar buildings. This requirement is intended to provide enhanced seismic performance of the building, facade, and service systems, Youssef notes. The moment-resisting frame system also offered the smallest footprint, "which gives you the maximum

IN THE LARGE, OPEN VOLUME OF THE GREAT ROOM, A SERIES OF ELEVATED AND ENCLOSED BRIDGES ARE SUSPENDED FROM THE ROOF TRUSSES AND AT SEVERAL LEVELS PROVIDE A SECURE PATHWAY BETWEEN DIFFERENT PARTS OF THE FACILITY.

efficiency and flexibility for use of the floor space now and many years later for potential modifications," he notes.

The five-story Great Room, which serves as the entrance to the complex, is seismically connected to the courthouse structure. It features full-height glazed curtain walls on both its eastern and western facades formed from cable-supported glass panels, and these are the largest such systems in Southern California, according to a description on Clark Construction Group's website. A tall masonry core is nestled just between the courthouse portion of the complex and the Great Room.

The courthouse portion and the Great Room are covered by conventional roof structures that house mechanical systems; above those spaces, however, is a massive overhanging and slightly sloping upper roof structure referred to as the hat, Youssef says. A steel-framed structure formed from a series of roof trusses that vary in depth from 6 ft to 7 ft because of the tapering and slope of the roof, the hat cantilevers as much as 50 ft at its diagonal ends and is adorned with ipe (Brazilian walnut) for durability and aesthetics, Youssef notes. The courthouse facade also features a series of balconies that cantilever 13 ft along the public corridors and 17.5 ft in areas reserved for the judges.

In the large, open volume of the Great Room, a series of elevated and enclosed bridges are suspended from the roof trusses and at several levels provide a secure pathway between different parts of the facility. The bridges are oriented north–south, and each has a seismic joint at its northern end to separate the courthouse spaces from the adjoining four-story county office building, notes Youssef. The bridges are seismically cantilevered 80 ft horizontally out of plane from the courthouse diaphragm at each floor, Youssef adds, and the seismic joint can accommodate up to 1 ft of movement in any direction. The curtain wall on the north side of the atrium is suspended from the roof hat structure and features a sliding joint connection to the roof of the office building.

The office building also features a steel moment-resisting frame structure and a roof that supports large planters and an outdoor assembly deck.

Because the site's geotechnical conditions are such that liquefaction could occur during a seismic event, the courthouse and the Great Room are founded on a large mat foundation between 2.5 and 3.5 ft thick. Since the four-story office building and the two-story structures that enclose the open courtyard have no basement levels, they are founded on cast-in-place piles of reinforced concrete installed through continuous flight augering and extending roughly 60 ft below grade, Youssef adds.

Within the courthouse portion of the complex, the courtrooms themselves have been designed as column-free spaces to offer the best possible sight lines. Each courtroom is 36 ft wide and more than 100 ft long and is flanked by detainee holding areas that are 22 ft wide but feature a lower floor-to-ceiling height than the adjoining courtroom to accommodate the courtroom's mechanical systems. Thus the ceilings in the courtrooms are 12 ft high, whereas those in holding areas are 9 ft, Youssef notes.

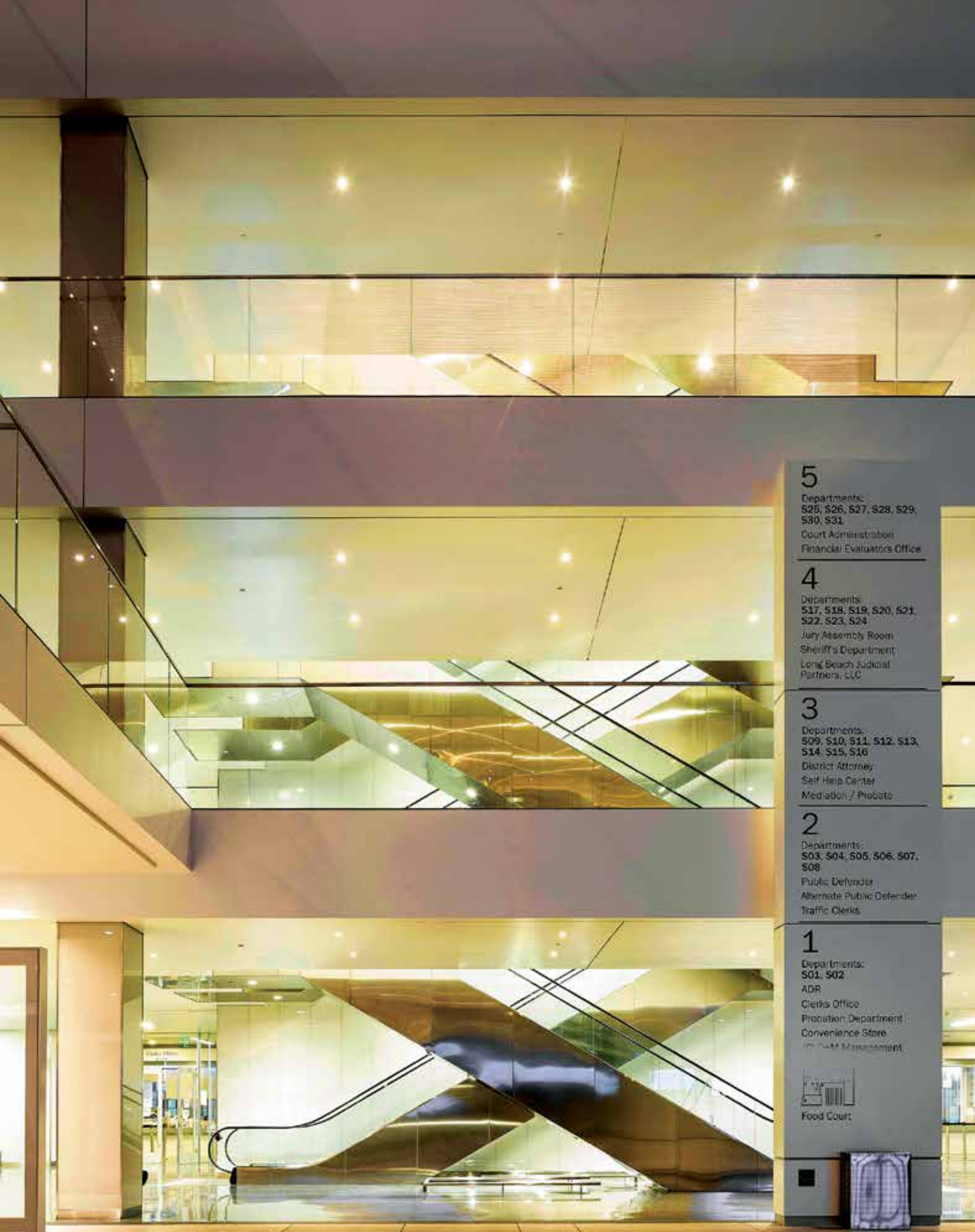
A visitor to the courthouse can reach the enclosed courtyard through the Great Room after passing through the security systems. In addition to its large open-air garden, the courtyard offers individual and group seating, shade trees, and grass, as well as water features that are meant to be "a place of comfort and connection to the community," while harking back "to historic American courthouses that occupied town centers, anchoring the civic green," according to the AECOM design document.

The "air columns" at the entrance to the courthouse are fixed to the basement level of the complex via concrete piers that are 42 in. diameter and 15 ft deep. Designed by the artist Ned Kahn, the four lightweight structures feature hundreds of anodized aluminum vanes that rotate in the wind within frames that resemble columns but do not actually connect to the cantilevering roof. Their 16 in. diameter is designed to control lateral movement, Youssef adds. Several columns inside and outside of the building, including one near the air columns, do in fact support the structure of the overhanging roof.

A series of models and even full-scale mock-ups of the new courtrooms were constructed to help the design team and the contractors, as well as the judges, attorneys, juror representatives, and others, make decisions regarding configurations, sight lines, detailing, and constructability. According to the Judicial Council of California's report *Governor George Deukmejian Courthouse: Evaluation of Cost-Effectiveness,* such mock-ups "allowed the actual in-building construction to proceed with few quality problems."

In evaluating the cost-effectiveness of the PBI delivery method itself, the Judicial Council of California compared its experience with the Deukmejian courthouse with that on three other recent courthouse projects in California. Although two of the earlier projects were much smaller, the "most valuable comparison" was between the Deukmejian building and the San Bernardino Justice Center, which was "of a similar quality and scale, with 35 courtrooms," according to the cost-effectiveness report.

As the report explained, the Deukmejian courthouse was designed and constructed "nearly two years faster than the San Bernardino Justice Center." There were two main



A series of escalators and balconies overlook the five-story atrium.

The PBI approach "maximizes partnership in the design, construction, and

The performance-based infrastructure delivery method will focus attention on the building's life cycle over the next 35 years.

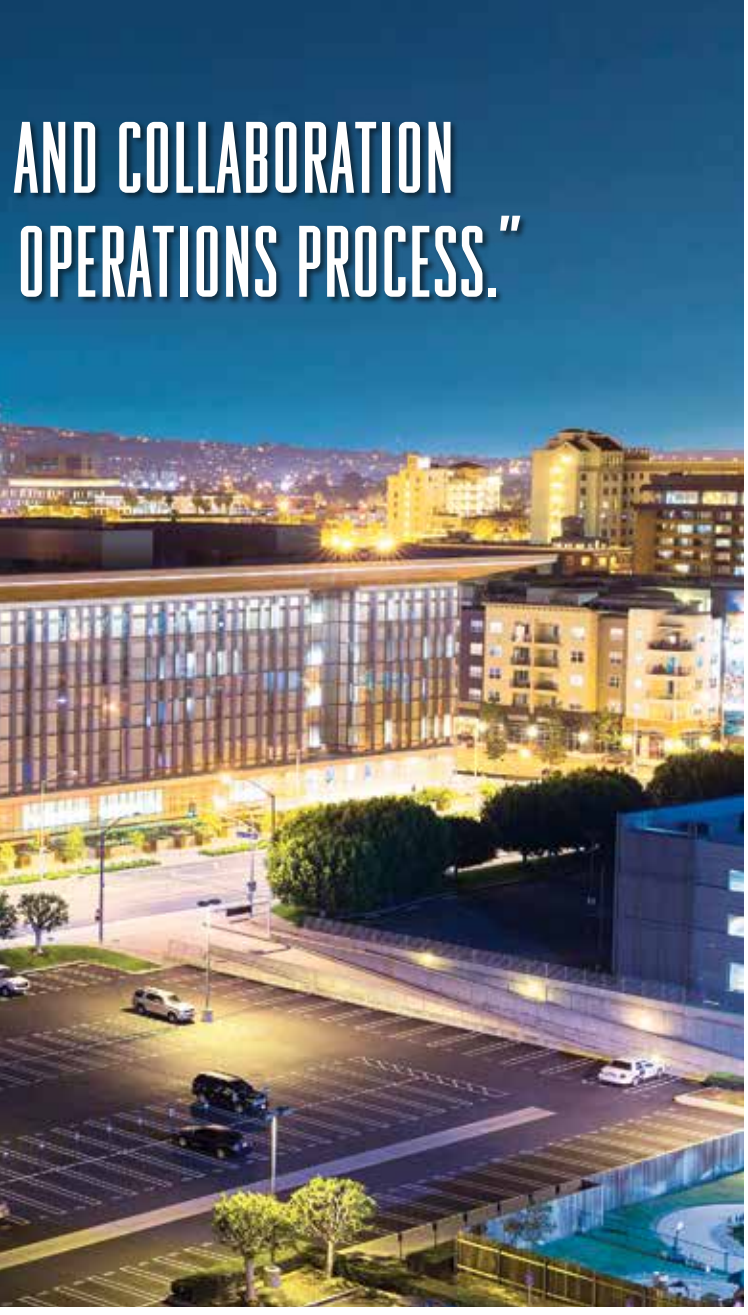
reasons for this speed, both related to the PBI delivery method: first, the fast-tracked design/build delivery method "used as part of the PBI process allowed for design and construction phases to overlap," the report noted. By contrast, the San Bernardino project was completed under a traditional "construction manager at risk" delivery method that involved separate approvals for design, drawings, bidding, and construction and thus took more time. Second, the PBI method used "readily available private financing, which is not subject to the timing of state bond sales," the report noted. By contrast, the start of construction on the San Bernardino project "was delayed by nine months because of a canceled bond sale," the report stated.

Although the direct construction costs of the Deukmejian courthouse were almost identical to those of the San Bernardino Justice Center, the expenditures on the Deukmejian project added more value because with the PBI delivery method the configuration of the mechanical and electrical systems was "designed to alleviate failure and avoid service payment deductions," the infrastructure was "designed for future conversion of leased office space" to additional courtrooms, and "significantly more holding cells" were included in the Deukmejian building to accommodate those future courtrooms, the report concluded.

Moreover, while the report noted that the construction manager at risk delivery method "is considered more effective than less collaborative forms of procurement," the PBI approach "maximizes partnership and collaboration in the design, construction, and operations process." What is more, a "focus on predictable operations and maintenance over the building life span is an inherent quality of the PBI approach and is required because the project company not only must base its design on the needs of the public agency, but is also accountable to meet standards of maintenance, repair, and replacement over an extended period of time," the report concluded.

The PBI delivery method led to an "aggressive project

AND COLLABORATION OPERATIONS PROCESS."



schedule," noted Elie-Issa El-Khoury, S.E., a senior project engineer at Nabih Youssef Associates. This meant that shop drawings were released for development before the design was complete. "To ensure the design was coordinated for fabrication, the design team tracked design developments for several weeks and incorporated impacts to structural shop drawings while providing an accelerated review," El-Khoury explained in a written statement.

For both AECOM and Nabih Youssef Associates, work on the Deukmejian courthouse was essentially concluded when the building was completed and occupied; thus they will not be directly affected by the 35-year term of the PBI agreement. Neither firm will face any of the deductions or penalties that the state can impose on the project company, Long Beach Judicial Partners, that will operate and maintain the building. But the life-cycle focus of the PBI method, together with the goal of keeping the building as fully operational as possible at all times, did add unique challenges for the design team.

For example, the air-handling systems were designed with both improved sound isolation and redundancy in mind. As Pittner explains, the air handlers and their ductwork were sized and configured with the capacity to accommodate two courtrooms at once. So if one air handler fails and takes longer to repair than is allowed under the PBI agreement, another handler can simply be switched over to serve both courtrooms throughout the repairs, thereby avoiding any PBI-related deductions. Likewise, the steel moment-resisting frame system was selected and designed to that strict 1 percent seismic drift limit in part because this was seen as providing the best performance with regard to the building's life cycle, Youssef notes. The system will move and deform in response to seismic forces, but during a moderate earthquake the building will not sustain damage of the type that might require repairs and thus interrupt the business of the court, Youssef adds.

The PBI method's emphasis on the building's life cycle also means that higher-quality materials were selected than would have been the case on a project primarily concerned with the first costs, Pittner says. For example, terrazzo rather than carpeting was installed in the public hallways because carpeting would have to be replaced several times over the 35 years of the PBI contract. And while this process also required the design team and the contractors to make decisions about certain aspects of the design and even about the materials for the building's finishes earlier in the process than usual, even that possible disadvantage "turns into an advantage because now we can get information earlier and be smarter about the decisions we make," Pittner explains. **CE**

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PROJECT CREDITS **Owner:** Judicial Council of California **Performance-based infrastructure project company:** Long Beach Judicial Partners, LLC, part of the global investment firm Meridiam **Architect and engineer of record with responsibility for civil engineering, sustainability, parking structure renovation, paleontology, landscape architecture, and other services:** AECOM offices in Los Angeles; San Francisco; Orange, California; Colorado Springs, Colorado; and Phoenix **Structural engineer of record:** Nabih Youssef Associates, Los Angeles **Design/build firm:** Clark Design/Build of California, Inc., a wholly owned subsidiary of Clark Construction Group, LLC, Bethesda, Maryland **Operating service provider:** Johnson Controls, Milwaukee **Independent building experts:** TTG, Pasadena, California (structural review), and Development Industries, Inc., El Segundo, California (quality management review) **Mechanical, electrical, and plumbing engineer, fire protection consultant, and data telecommunications consultant:** Syska Hennessy Group, Inc., New York City **Fire and life safety engineer:** Rolf Jensen & Associates, Inc., Chicago **Acoustics and audiovisual consultant:** McKay Conant Hoover, Inc., Westlake Village, California