Sustainable Projects Utilize Precast Concrete's Benefits

— Craig A. Shutt

Designers looking to create energy-saving, sustainable designs are incorporating precast concrete with other innovative concepts

2930 Eisenhower Offices
Alexandria, Va.
Davis Carter Scott Ltd., McLean, Va.

Photo: ©2005 Boris Feldblyum

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Navy League Building
Arlington, Va.
E.K. Fox & Associates Ltd., Fairfax, Va.

Pennington Street Garage
Tuscon, Ariz.
Dick & Fritsche Design Group, Phoenix

Building owners in every region are looking to enhance their projects' energy-saving methods, and they are encouraging designers to incorporate every aspect of sustainable design possible. In many cases, designers are finding that precast concrete components are helping them achieve the conservation goals owners are seeking, in conjunction with other innovative systems.

"We like precast concrete quite a bit," says Satish Bhide, project director for Davis Carter Scott Ltd. in McLean, Va., which recently designed the 2930 Eisenhower Avenue Office Building in Alexandria, Va. "It's an incredibly durable material that needs no maintenance. It will still look good in 20 years, which eliminates a lot of upkeep that saves money and labor. There also will be no moisture penetration, such as you would get by using brick, with its 10,000 joints."

Architectural precast concrete cladding was used on the structure, which also features an innovative geothermal HVAC system that will pay for itself in five years, Bhide says. The project recently received an award from the National Association of Industrial & Office Properties (NAIOP) for its architectural design.

Michael Schmitt, project designer for Dick & Fritsche Design Group in Phoenix, agrees that precast concrete can aid sustainable designs. "Precast concrete is a very sustainable product because you never have to change it or even maintain it. It will be there forever," he says. His firm recently designed a seven-level, 256,300-square-foot parking structure in Tucson, Ariz., featuring a total precast concrete structure.

To decrease its energy footprint, a creative 5,000-square-foot array of photovoltaic panels was added at roof level to both generate electricity and shade the roof from heat gain. Additional sustainable attributes also were incorporated throughout the project, which includes office space and retail on the first floor. "The owner is a forward-thinking organization, with a self-imposed responsibility to demonstrate the advantages of 'green architecture' and sustainability," Schmitt explains.

Even more sustainable features were incorporated into the Navy League Building in Arlington, Va., owing to that community's pilot program for offering density credits. Buildings that meet high sustainability goals can add density to their projects, explains James Wright, principal in charge and project designer at Page Southerland Page LLP in Arlington. Designing to achieve those credits created a high-stakes gamble, he notes, as the owner had to post a $250,000 bond and risked not receiving a certificate of occupancy if the sustainable aspects fell short and the density was too high without the credit.

But the project, which includes architectural precast concrete wall panels, spandrels and column covers, not only met the sustainable goals but achieved a high Silver LEED rating. Designers now are working with USGBC to review the building's

Fact Sheet

Project: *2930 Eisenhower Avenue Offices*

Type: *Class A office building*

Location: *Alexandria, Va.*

Designer: *Davis Carter Scott Ltd., McLean, Va.*

Engineer: *Fernandez & Associates, Falls Church, Va.*

Contractor: *Harvey-Cleary Engineers & Builders, Gaithersburg, Md.*

Precaster: *Gate Precast Co., Oxford, N.C.*

Project Size: *184,277 square feet (including 109,351 square feet of parking)*

Precast Components: *529 architectural precast panels*

Project Cost: *$17.67 million*

The 2930 Eisenhower Avenue Office Building in Alexandria, Va., features architectural precast concrete cladding to help it seamlessly integrate the latest in environmentally sustainable design into a Class A office building.

attributes to gain the additional point needed for a Gold rating. "When it came to deciding on the building's cladding, we never seriously considered anything else," Wright says.

2930 Eisenhower Avenue Offices

The office building at 2930 Eisenhower Avenue seamlessly integrates the latest in environmentally sustainable design into a Class A office building that offers nearly 75,000 square feet of office space and 285 parking spaces. The project went through several public hearings to finalize the design, Bhide notes, and faced a variety of site restrictions for construction crews. The ultimate design features one below-grade level of parking, three more parking levels above that and three levels of office space on top.

The designers also incorporated a geothermal HVAC system, the first to be used in Alexandria. "Being the first of its kind, the project went through a rigorous architectural-review process, which also included a separate Development & Special Use permitting process in the city," he explains.

A key concern was the three levels of above-grade parking. Officials were concerned that such a highly functional parking structure above ground level might detract from the aesthetics of the surrounding neighborhood, which featured more traditional designs. The designers used architectural precast concrete panels to achieve the look that was desired, creating a fenestration pattern that replicated the appearance of the higher office levels.

Translucent glass was used in the window openings on the parking levels to provide the look of finished office space both during the day and at night. The panels were erected onto post-tensioned concrete beams placed 20 feet on-center with mild steel slab infill with column-free space between the core and the skin.

The geothermal system required 48 holes to be dug 150 feet deep to create geo-wells. The system of wells provides an efficient way to absorb heat in the winter and reduce heat gain in the summer, because the Earth remains approximately 65 °F year-round at depths below the frost line, Bhide explains. This system allows the building to maintain optimal fluid temperatures for a heat-pump application.

Although the project was not LEED certified, it would have garnered many points, Bhide says. Precast would have helped with a number of those, including energy efficiency and locally manufactured products. "Transportation costs for the material were minimal," he says. Gate Precast Co. in Oxford, N.C., provided the 529 precast concrete components.

The project had a "rigorous" 13-month, fast-track construction schedule, he adds, which required close contact with owner, development manager, contractor, and precaster to keep the work on budget and on schedule. "By getting early input from all disciplines, revisions to the construction documents were kept to a minimum, preserving the aggressive construction schedule."

The project indicates that it isn't necessary to sacrifice economic and environmental sustainability to accommodate development and growth, Bhide stresses, even in existing, long-time neighborhoods with sensitive design needs.

Pennington Street Garage

Even parking structures can achieve sustainable design goals. That was the case with the Pennington Street Garage in Tucson, where designers looked at every aspect of the 750-car parking structure, which includes 12,000 square feet of first-floor space split evenly between offices and a restaurant.

A key factor in using precast concrete was the constraints of the site, says Schmitt. Surrounded by busy streets on three sides and a historic building on the other, there was little room to maneuver. "A cast-in-place concrete solution would have required room to stage formwork and do other things that we didn't have room for," he says. "To be able to manufacture the pieces off-site, truck them in and set them in place was a big benefit."

Tpac, a division of Kiewit Western Co. in Phoenix, manufactured and erected the precast components. The total comprised double tees, tee and

L beams, columns, wall panels, shear walls and ramp beams. The structure was set on 60-foot-deep, cast-in-place concrete drilled caisson foundations, with steel rooftop canopies providing shade on top.

Several structural systems were considered, Schmitt notes, but "it became apparent early in the process that precast, prestressed concrete would best serve the needs of the schedule and program." Key factors were that the design-build process allowed the design-builder to select and award the precast contract early in the design phase. This early award allowed the precaster to work closely with the design-build team through the design process, producing shop drawings concurrent with the architect's design schedule. "This alone shaved several months off the project schedule, allowing precast fabrication during the permit-review process," he says.

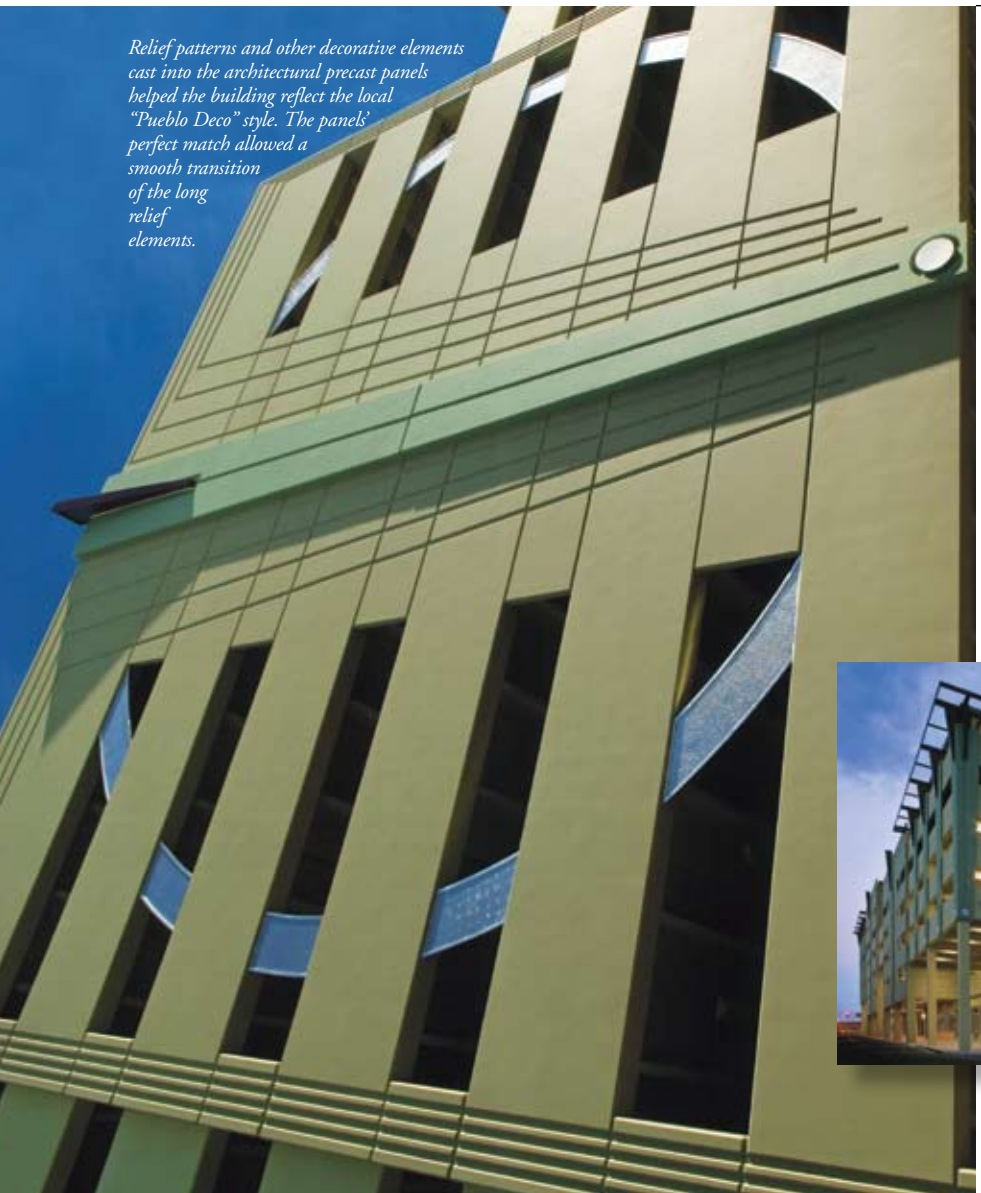
The neighborhood's distinctive style also played to precast concrete's benefits, he adds. The surrounding buildings feature a period look known locally as "Pueblo Deco," a stylized Southwestern interpretation of the 1930s Art Deco architecture.

The design features carefully coordinated reveals and articulation of columns and spandrel panels to create complex patterns on the building elevations that complement the Pueblo Deco styling. "The precision achieved through the precast-manufacturing process allowed reveals on various adjacent panels to align perfectly, forming the desired patterns," he says.

The precaster's plant, about 100 miles away, delivered components on a just-in-time basis to the congested site without difficulty, Schmitt notes. "Because the major structural components did not have to be stockpiled on-site, the contractor was able to work from within the very tight urban site, minimizing impact on the adjacent streets."

Precast aided with more than providing locally manufactured materials. The precast structure was designed to support the loads that will be imposed by overhead trolley power lines, which will be used with a proposed trolley system on the adjacent street. That will save future material use and maintenance needs. The elevator lobby at the center of the structure's north elevation was designed as a multimodal transit stop at the facility, allowing drivers to gain access to the trolley and bus system easily and avoid further driving.

The existing concrete building on the site was demolished to open up the site, and its concrete debris was crushed on-site and used as engineered fill material to fill in the former basement level. That saved



Relief patterns and other decorative elements cast into the architectural precast panels helped the building reflect the local "Pueblo Deco" style. The panels' perfect match allowed a smooth transition of the long relief elements.

Fact Sheet

Project: *Pennington Street Garage*

Type: *Mixed-use structure (parking with office and restaurant)*

Location: *Tucson, Ariz.*

Designer: *Dick & Fritsche Design Group, Phoenix*

Engineer: *Paul Koehler Structural Engineers, Scottsdale, Ariz.*

Contractor: *D.L. Withers Construction, Phoenix*

Owner: *City of Tucson*

Precaster: *T-PAC Inc., Phoenix*

Project Size: *256,300 square feet*

Precast Components: *771 pieces for total precast concrete structural system and façade*

Project Cost: *$10.35 million*

time, material and cost for both importing fill and exporting debris, Schmitt notes.

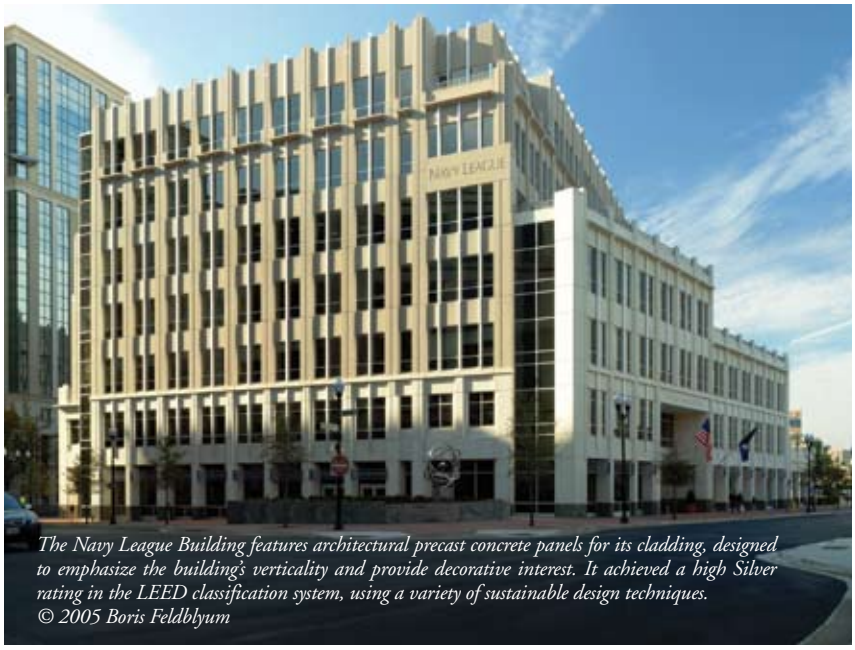
A key sustainable aspect focused on the inclusion of a 5,000-square-foot array of photovoltaic panels on the roof. With Arizona's abundance of clear, sunny days, these panels generate enough electricity to provide a majority of the power needed to light the facility. Mounted on an overhead steel framework, they also shade rooftop parking spaces.

Navy League Building

The seven-story Navy League Building provides 212,947 square feet of Class A office space, with extensive street-level retail space and four levels of underground parking. The owners use about 10% of the space, with other tenants using the remainder, making it a speculative office project.

Architectural precast concrete panels were chosen for cladding due to their inherent design flexibility and sense of dignity and permanence, he says. "It was necessary to give the building a great deal of architectural detail and character due to its extreme prominence within an active, energized community. We were admonished not to create 'flat' façades, because many of the buildings around us had taken that approach, and they wanted to avoid that. They really raised the bar on the façade design."

As a result, the design features a significant level of dimensional focus, including heavy vertical projections. Three mix designs were used with two finishes: white precast with embedded granite panels and a light acid-wash finish at the lower levels, with two buff-colored mixed with medium acid-wash finishes above.



The Navy League Building features architectural precast concrete panels for its cladding, designed to emphasize the building's verticality and provide decorative interest. It achieved a high Silver rating in the LEED classification system, using a variety of sustainable design techniques.
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Fact Sheet

Project: *Navy League Building*

Type: *Class A speculative office building*

Location: *Arlington, Va.*

Designer: *Page Southerland Page LLP, Arlington*

Engineer of Record: *E.K. Fox & Associates Ltd., Fairfax, Va.*

Structural Engineer: *ReStl Designers Inc., Gaithersburg, Md.*

Contractor: *James G. Davis Construction Corp., Rockville, Md.*

Owner: *Navy League Building LLC, Arlington*

Precaster: *Gate Precast Co., Oxford, N.C.*

Project Size: *212,947 square feet (including four levels of parking)*

Precast Components: *691 spandrel panels, wall panels and columns covers*

Project Cost: *$28.67 million*

Four spandrel panels have molded lettering showing the building name and address.

"Precast concrete offered the ability to create a rich architectural vocabulary of façade elements establishing the appropriate scale and image sought by the community, the local governing authorities and the owner," he says. The speed of construction also was a benefit, as the owners wanted to minimize construction time in this highly congested area. "We worked closely with the precaster to minimize the number of pieces that were needed, which sped up casting and erection, and saved money."

The precast also reinforced the project's sustainable strategy in a variety of ways, he says. In addition to offering locally manufactured materials, the precast panels worked in conjunction with windows outfitted with low-emissivity film to reduce energy costs. "Precast's thermal mass makes a fabulous insulator. The sun keeps it warm at night and maintains the heat to take load off the mechanical system." Analysis of the building showed that energy requirements will provide more than a 25% improvement over the standard represented in ASHRAE 90.1, "largely due to precast concrete's insulating properties." (For more on analyzing a building's energy signature, see the story on page 26.)

The project also features an innovative water-detention system that captures storm water and ground water for reuse in bathrooms and for landscaping. Potable water use for sewage conveyance was eliminated, and water-saving plumbing fixtures will reduce water usage by more than 77%.

All of those elements worked together to help the project achieve its high Silver—and possibly Gold—LEED rating and allow increased density in a congested area. "Precast concrete gave the project a sense of permanence, durability and dignity that was important in this area, as well as helping to meet LEED criteria," he says.

These projects show the creative ways that building owners are boosting the energy-saving and sustainable-design aspects of their projects. Precast concrete components are one element in those savings that can ensure the structure meets all of its functional, aesthetic and budgetary goals for today, as well as for generations to come. ■

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PENNINGTON STREET GARAGE

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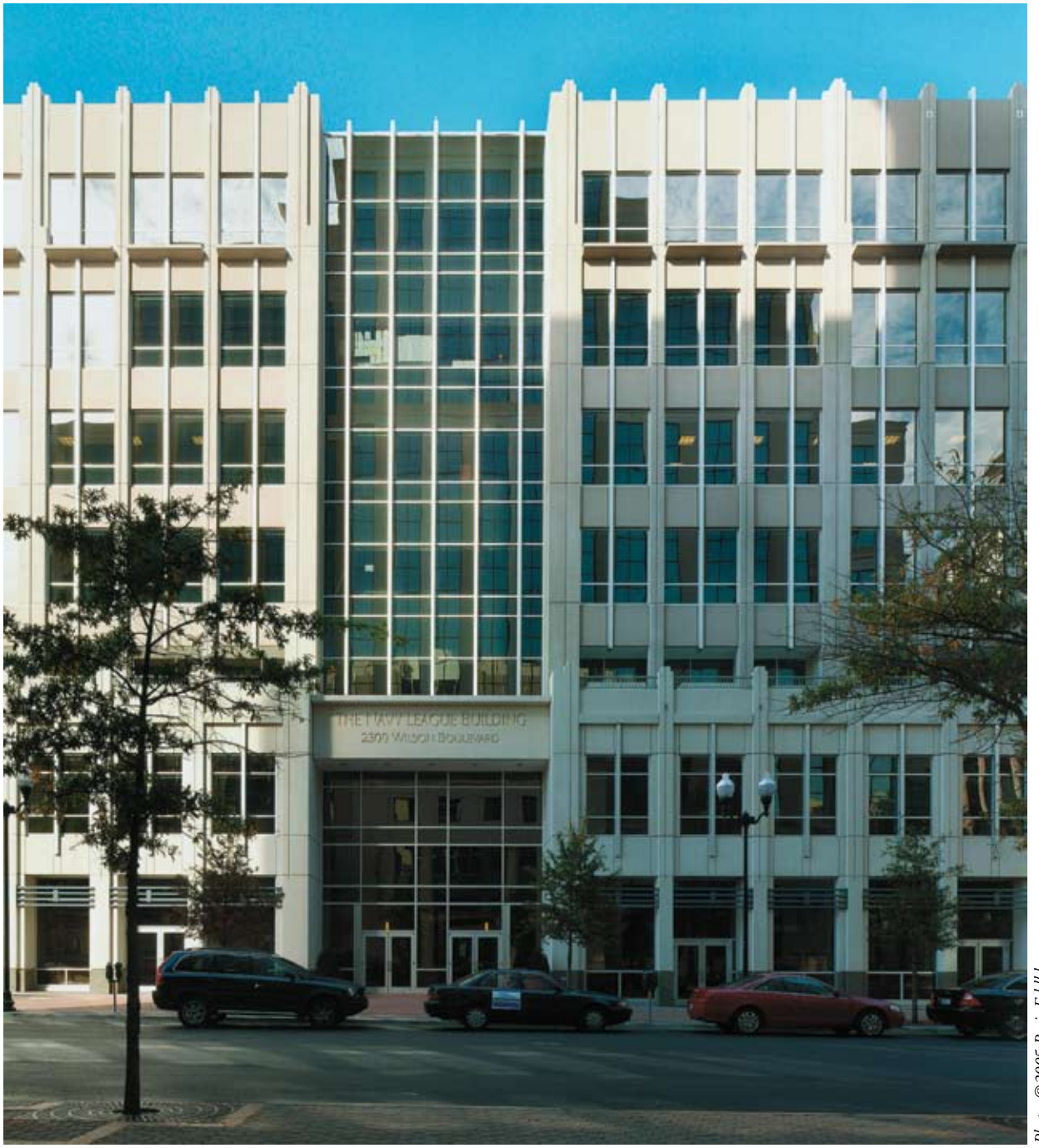

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NAVY LEAGUE BUILDING

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