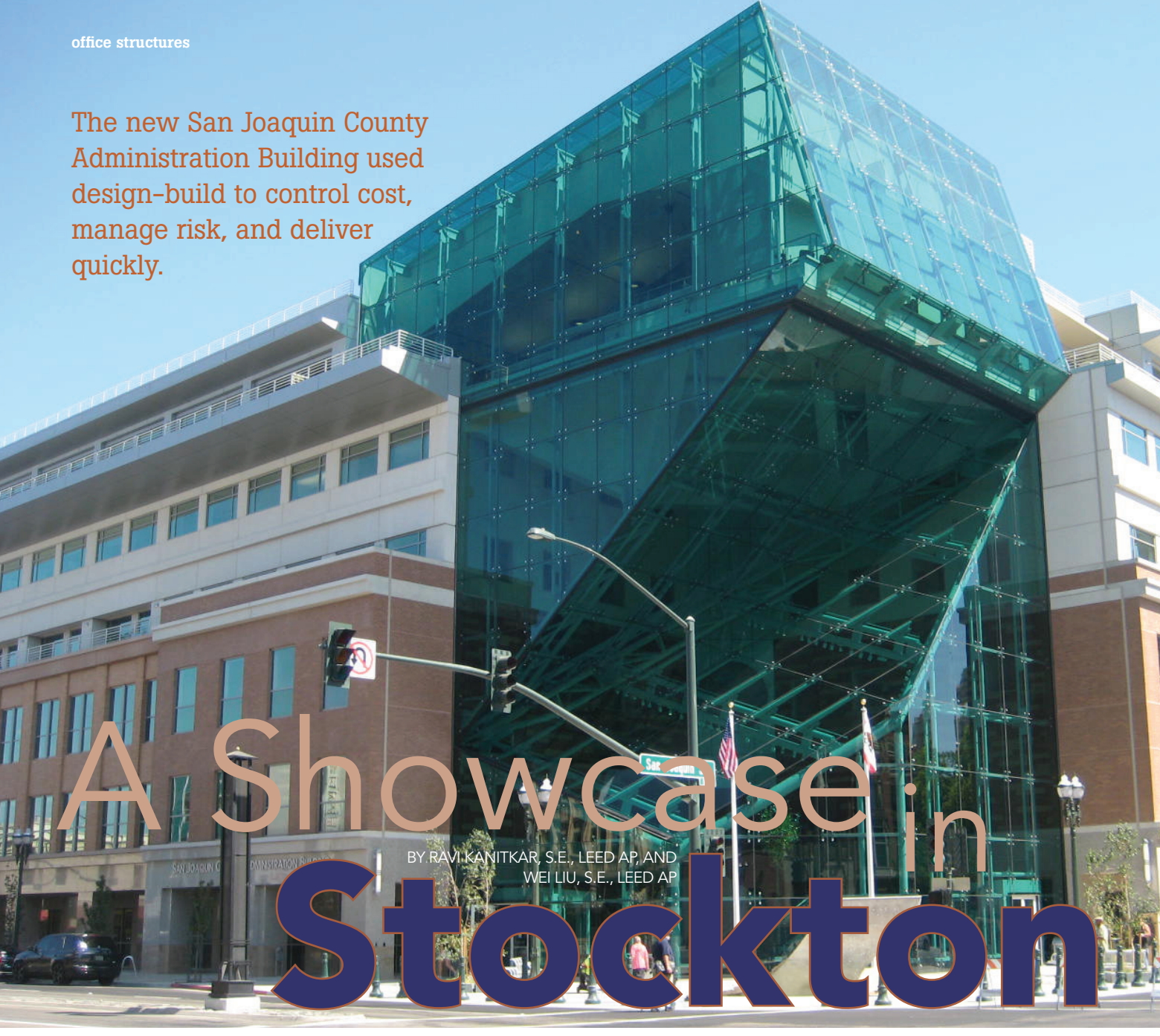
The new San Joaquin County Administration Building used design-build to control cost, manage risk, and deliver quickly.



A Showcase in Stockton

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IN THE HEART of downtown Stockton, Calif., standing six stories tall with sharply angled glass walls that invoke the ruggedness of Yosemite, the new San Joaquin County administration building houses 16 divisions of the county government and a wedding chapel. The glass-enclosed board chamber on the sixth floor, designed to represent transparency in government, is the meeting place for county board of supervisors. In addition, the building serves as a gallery to showcase local art as well as a display of the woolly mammoth bone fragments found during its construction.

The design-build contract was awarded in April 2007, and the building was completed and occupied in August 2009. It is the first LEED Gold project in Stockton and was named the 2009 Project of the Year by the American Public Works Association.

Structural Framing

The county program required that the project be designed and constructed within a very aggressive schedule of about 26 months. Steel was chosen as the ideal framing material to meet this schedule and to fast-track the construction. The typical framing bays were defined as 21 ft by 42 ft with W21 beams, W24 girders and W14 columns.

Because the building is located in California, seismic demands governed the structural design. To promote improved seismic performance of the structure, Buckling Restrained Braces (BRB) were used for lateral resistance. The ductility and energy dissipation capabilities of the BRB are generally expected to be comparable to that of steel Special Moment Frames (SMF). Unlike SMF, the energy dissipation capability does not come at the cost of damage (i.e., yielding and buckling) to the frame beams and columns. The BRB also has the valuable advantage of predicted seismic behavior when compared to standard steel Special Concentric Braces (SCB). This predicted behavior allowed the connections of the BRBs to the supporting steel frame to be more compact and ductile. Star Seismic braces were used in this project, ranging in force capacity from 240 kips to 780 kips.

The foundation system for the building was designed with large diameter piers located directly under the building columns with grade beams to tie together the top of the piers. This approach had the benefit of smaller pile caps and reductions in the associated

excavations. The basement was constructed with perimeter shotcrete retaining walls over anchored slurry walls.

One of the major structural design challenges was the cantilevered board chamber at the sixth floor. The total cantilevered distance of the sixth floor framing was nearly 60 ft. Because the area has no structural support from below, we designed a truss that is nearly a full story deep to span nearly 75 ft and across the diagonal of the cantilevered floor system. Two secondary trusses, with cantilevers of about 30 ft, were designed to bear on this girder truss and to frame into columns back at the building line (see inset photos, above).

In addition to the cantilever, the architects desired that the board chamber slope down from the building toward the cantilevered end, then rise up to a platform on which the board members would sit. The platform framing was

Opposite page and above: The new San Joaquin County Administration Building.

Inset: (above) Trusses reach out to create the cantilevered floor. (below) The cantilevered board chamber framing.

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required to further cantilever out nearly 8 ft to accommodate the dramatic shape of the glass system. We created a two-tiered framing system to accommodate this complicated framing (see photo below).

Another significant challenge was providing support for the glass atrium framing below and above the board chamber. The entire system for the atrium glass was designed and manufactured by Novum Systems, Inc. Structural steel was strategically located and designed to support the load demands from the atrium glass assembly. The glass system was self-standing, but laterally braced to the building below the sixth floor, while that above the board chamber was completely supported and braced on the main structure. Two photos on the next page show details of the steel framing used to support the glass atrium system.

Design-Build Delivery

The project was delivered to the client via the design-build method, with Hensel Phelps Construction Company serving as the builder, Fentress Architects serving as the prime designer and Crosby Group as the Engineer of Record. As a design-build project, the team focused on appropriately interconnecting the design, permit, and construction schedules in order to streamline the overall process. Instead of serially following the traditional steps of creating construction documents, acquiring building permits, and then constructing the building, the process combined all these different tracks in an overlapping fashion.

To facilitate that process, early partnering sessions were conducted between the design-build team and the client. In addition, detailed meetings were conducted with the building official and county inspectors to discuss the process and to work out stepwise approaches to handle phased submittals and permits, field changes, and the like.

The structural design started in early May 2007 with an emphasis on uniformity of structural steel layout and sizes. Within only three weeks nearly 80% of the gravity beams within the structure were sized and provided to the fabricator for procurement. The sizes for all gravity columns and lateral frames were provided in successive submittals.

To facilitate the connection design of the gravity framing, we conducted a detailed review of the fabricator's typical connections and calculations while the steel was still being procured. Shop drawing review was conducted in several two-day sessions wherein the architect and fabricator joined us to efficiently review and finalize the fabrication drawings. The building permit for the foundations was obtained and the construction of the foundation commenced in September 2007. Working in parallel with the construction, the design of the superstructure was finalized and the overall building permit was approved early January 2008. The erection of the steel superstructure started immediately after and was substantially completed in June 2008.

The design-build delivery method created an environment within which the client, the design team, the general contractor and the steel fabricator were able to work interactively and efficiently toward a common goal. Frequent and substantial communication with the steel fabricator made it possible to avoid costly field changes and the resulting delays.

Building Information Modeling

BIM proved to be a very valuable tool on this project. The building analysis was performed in ETABS. The ETABS model was used by the fabricator to develop a 3D fabrication model. In addition, the ETABS model formed the basis of the structural Revit model for eventual inclusion in the overall building model.

Due to the complicated geometry at the

Two-tiered framing above the trusses.

Crosby Group

cantilevered board chamber and the atrium, BIM was used extensively to ensure that the structural steel, the different architectural features, and the atrium glass system all fit correctly. Using the spatial relationships of different elements, we were able to identify conflicts at an early stage. A critical conflict between the main girder truss and the interior space truss for the atrium glass system was discovered during the design process and was mitigated by modifying the depth of the girder truss appropriately. BIM helped the design-build team prevent a show-stopping conflict in the field during construction.

Final Remarks

The collaborative process afforded by the design-build delivery method was crucial to the timely completion of the building. Steel was essential in enabling the fast-track construction and flexibility required of this project, and in allowing the team to fulfill the dramatic and artistic architectural design intent.

The new San Joaquin County Administration Building has been received to great acclaim by the residents of Stockton and the county. The building is fully occupied and the people of San Joaquin County have an architecturally striking, energy-efficient and user-friendly facility that will accommodate potential growth for the foreseeable future. MSC

Owner
San Joaquin County, Calif.

Architect
Fentress Architects, Denver, Colo.

Structural Engineer
Crosby Group, Redwood City, Calif. (AISC Member)

General Contractor
Hensel Phelps Construction Co., San Jose, Calif.

Steel Fabricator
Puma Steel, Cheyenne, Wyo. (AISC Member)

Steel Erector
Derr & Gruenewald, Henderson, Colo. (AISC Member)

Atrium Glass System
Novum Structures, Menomonee Falls, Wis. (AISC Member)

Construction Manager
URS Corporation, San Francisco, Calif.

Structural Software
ETABS, Revit


Crosby Group


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Two views of the special detailing used to support the glass atrium system.