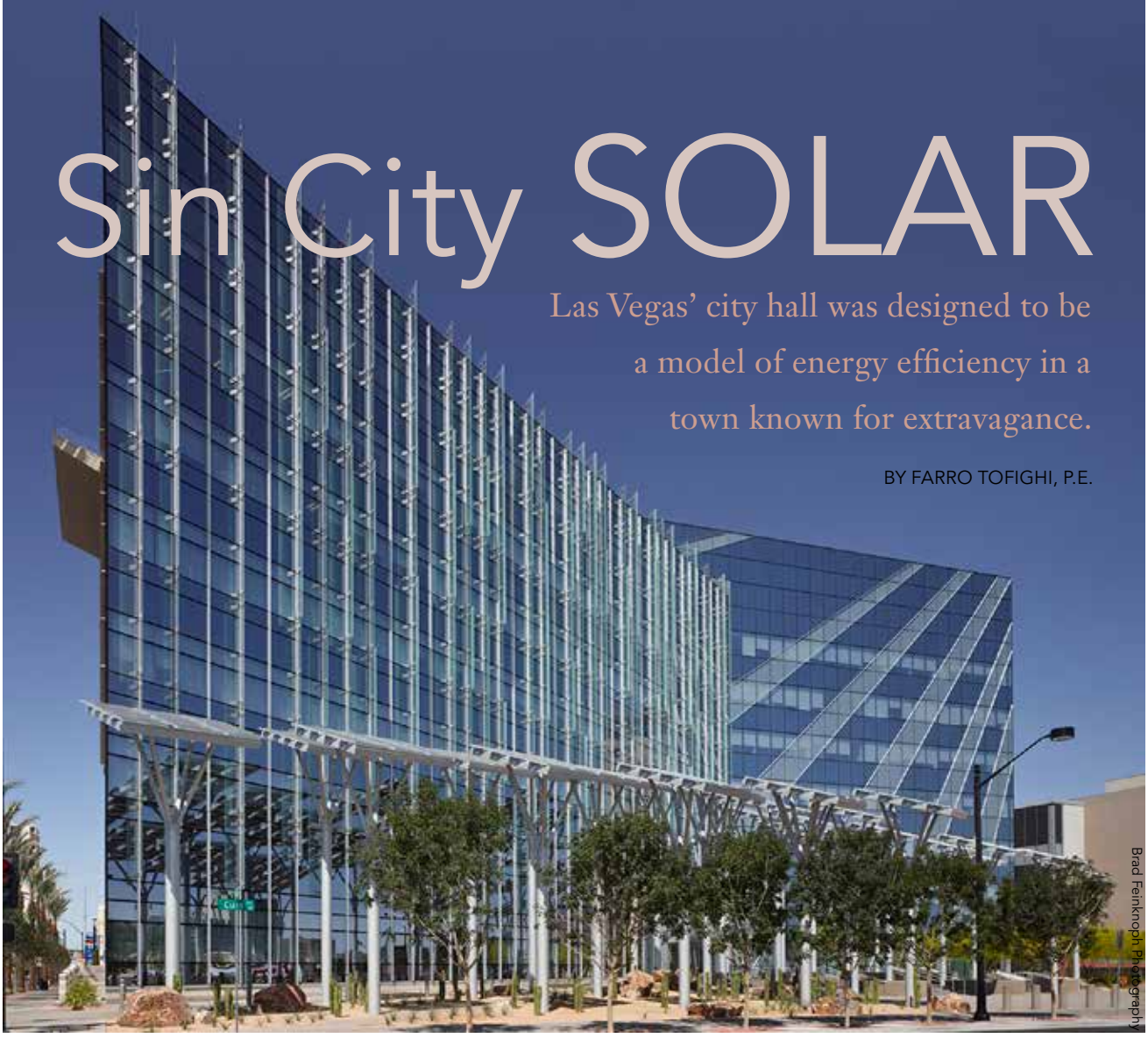
Sin City SOLAR

Las Vegas' city hall was designed to be a model of energy efficiency in a town known for extravagance.

BY FARRO TOFIGHI, P.E.



Brad Feinknopf Photography

WHAT COMES TO MIND when someone mentions Las Vegas?

Extravagant casinos? Fancy nightclubs? World-class restaurants and shops? None of these would be surprising, considering that Las Vegas is renowned for catering to the pleasures of the millions of tourists that descend upon Sin City every year.

Contrary to its reputation as a land of excess, however, Las Vegas has become home to a large number of LEED projects in the past decade. Its water utility pioneered water management practices to conserve and reduce its total water intake from Lake Mead and more recently, the city has become a hotbed for solar activity. So it should come as no surprise that when Las Vegas began planning a new city hall, the design team focused on creating a premier sustainable development to showcase Las Vegas in a new light.

Downtown Renewal

Located on Main Street between Bonneville and Clark Avenue, the seven-story building serves to anchor and build upon the urban renewal program seeking to revitalize the downtown Union Park neighborhood. The steel-and-glass City Hall facility boasts a modest area of approximately 300,000 sq. ft, which includes 70 underground parking spaces. The LEED Gold-rated facility houses a 500-seat council chamber, a public exhibit area and 250,000 sq. ft of governmental offices.

The primary structure is an angled, two-section seven-story tower immediately adjacent to a low-rise council chamber with a partial mezzanine, and there is one level of below grade parking under the entire plaza level. The plaza level floor framing, the perimeter basement walls and the supporting columns are constructed with cast-in-place reinforced concrete, but structural steel was selected for everything above grade to accommodate the architectural design intent, column grid irregularities long spans and speed of construction. The project used 2,900 tons of structural steel in all.

The tower's structural system is composed of wide-flange steel beams and girders supported by steel columns. To accommodate the building's open nature, typical moment frames were used in both directions for the lateral system. Slotted web (SW) moment connections designed by Seismic Structural Design Associates were chosen for the moment frame connections in an effort to provide maximum ductility under seismic loads; SW is a post-Northridge moment connection technology whose design allows for a ductile beam-column joint connection. In a capacity designed moment frame, it keeps the plastic hinge in the beam and away from the column joint, and tested SW moment connections have achieved rotations up to 5 and 6 radians while under very high shear demands. Perimeter spandrel beams were designed to receive the glass façade and window walls.

The primary structure is an angled, two-section seven-story tower immediately adjacent to a low-rise council chamber with a partial mezzanine. The project used 2,900 tons of structural steel in all.

The council chamber building, adjacent to the office tower, is also supported at the plaza level but separated from the tower with an seismic expansion joint above the plaza level near the skylight so that the two structures move independently above the plaza level. While the façade of this portion of the building is curved, it was achieved with straight steel assemblies. Long-span trusses were used for the council chamber's gravity and lateral system and support the high roof above the council chamber.

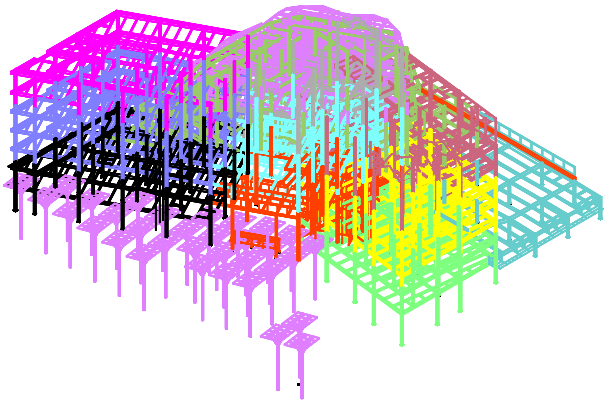
Solar Forest

One of the feature green elements of this highly sustainable building is also framed with steel: The 40,000-sq.-ft public plaza contains 33 energy-producing photovoltaic "trees" that also serve as pedestrian lights. The trees, which vary from 40 ft to 60 ft in height, are constructed from round hollow structural steel (HSS) sections. Each tree consists of four 8-in. HSS branches that sprout from a 12-in. HSS trunk and support a rectangular HSS grid frame that in turn supports the photovoltaic panels.

Using steel allowed for these structures to maintain a slim profile and create a look reminiscent of a hi-tech silicon forest. Each tree generates 50 kW of electricity, which, complemented by the 7,000-sq.-ft roof-mounted photovoltaic panel system, dramatically reduces the building's energy costs. The new city hall stands as a testament of Las Vegas' newfound environmental pragmatism and serves an expression of its commitment to a sustainable future. ■

The solar "trees" are made of round HSS.

A structural model of the courthouse.



Owner
City of Las Vegas

General Contractor
The Whiting-Turner Contracting Company

Architects
Elkus Manfredi
JMA Architecture Studios

Structural Engineer
DeSimone Consulting Engineers

Steel Fabricator, Erector and Detailer
SME Steel Contractors, Inc.

Farro Tofighi
(farro.tofighi@de-simone.com)
is a managing principal with DeSimone Consulting Engineers in Las Vegas.