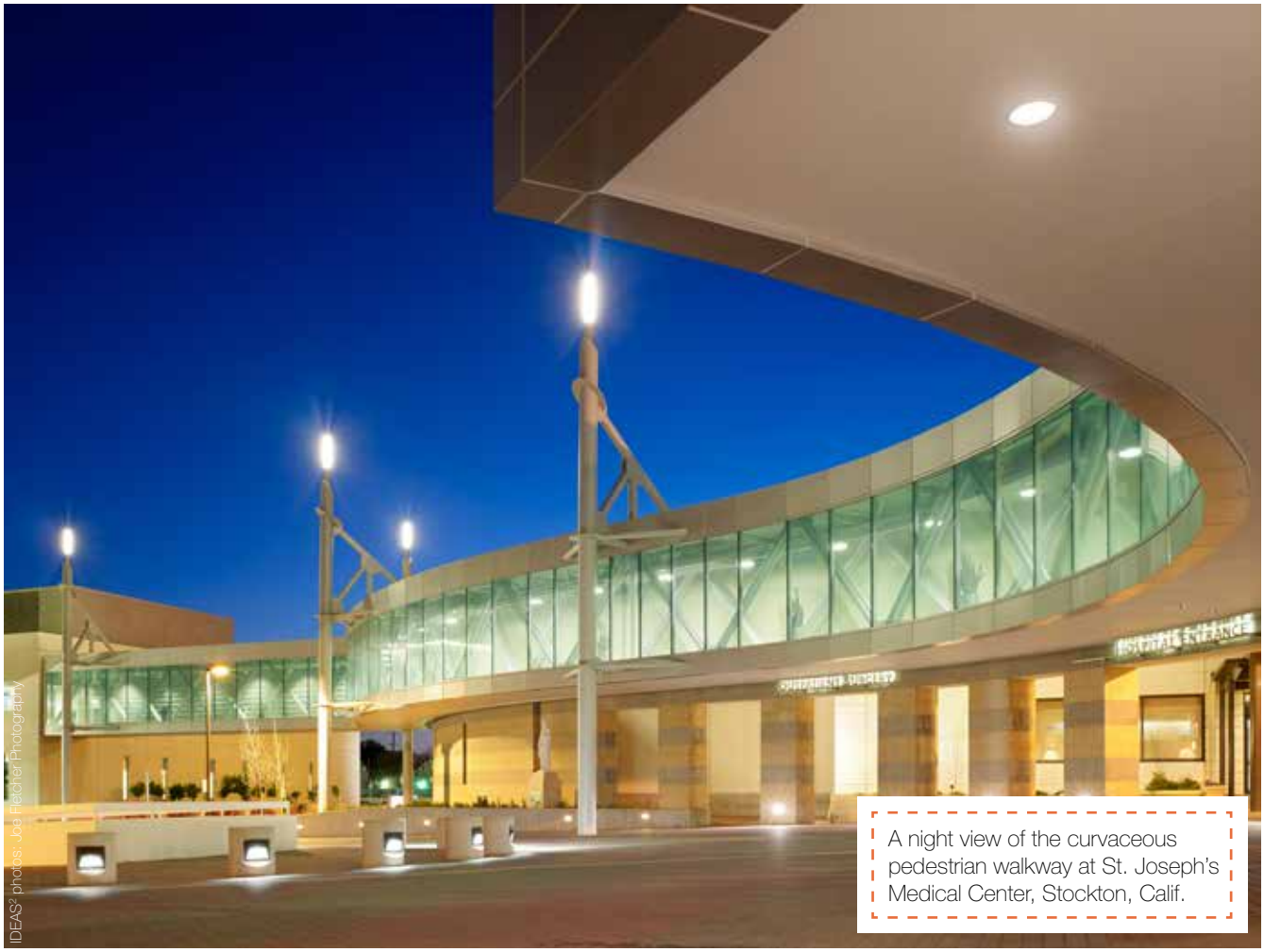
St. Joseph's Medical Center Pedestrian Walkway

Stockton, Calif.



IDEAS² photos: Joe Fletcher Photography

A night view of the curvaceous pedestrian walkway at St. Joseph's Medical Center, Stockton, Calif.

Project Team

Owner/Developer
St. Joseph's Medical Center, Stockton, Calif.

Architect
Anshen + Allen Architects, San Francisco (now Stantec)

Structural Engineer
ESE Consulting Engineers, Benicia, Calif.

General Contractor
Turner Construction Co., Sacramento, Calif.

Steel Fabricator, Detailer and Erector
Olson Steel, San Leandro, Calif.

Content provided by ESE Consulting Engineers

Sleek Exterior HSS Columns ‘Float’ Hospital Walkway on Air

Exterior Hollow Structural Section (HSS) columns provide structural and weight-saving efficiency to a medical center’s curvilinear pedestrian bridge while making it appear lighter than air.

The curvilinear pedestrian walkway connects the existing hospital to a new patient pavilion.

Joe Fletcher Photography

Linking the St. Joseph’s Medical Center in Stockton, Calif., with the hospital’s new Women’s and Children’s Pavilion, a dramatically curved 320-ft-long steel-framed covered-structure pedestrian walkway, suspended over the main arrival area and spanning a street, provides convenient and safe passage between buildings for both patients and medical staff.

The overall shape and swooping curve of the walkway and the slender supporting columns are not only appealing to the eye, but they give the bridge the appearance of “floating in space.” Existing geometric constraints of the site resulted in the final curvilinear shape of the walkway. Elevating the walkway and spanning the bridge over the hospital entrance road negated the need for modifications to the existing hospital buildings and minimized impact to existing plaza circulation, underground parking, and the hospital’s existing colonnade.

The walkway has five equal 60-ft main spans and one 20-ft span. But the focal point of the structure are the elegant and slender Hollow Structural Section (HSS) columns, which are 20 in. in diameter, are located 6 feet outside the walkway footprint, and extend 17 ft above the walkway roof. The cylindrical HSS columns were used to reduce the walkway’s profile and increase the number of connections, reducing the length and stress at the connection points.

The walkway is hung from the exterior columns with rigid diagonal tension/compression members. The main columns penetrate the existing lower level waffle structure and are supported by new footings at the basement level. Both ends of the walkway are separated from the existing and new hospital building by seismic expansion joints.

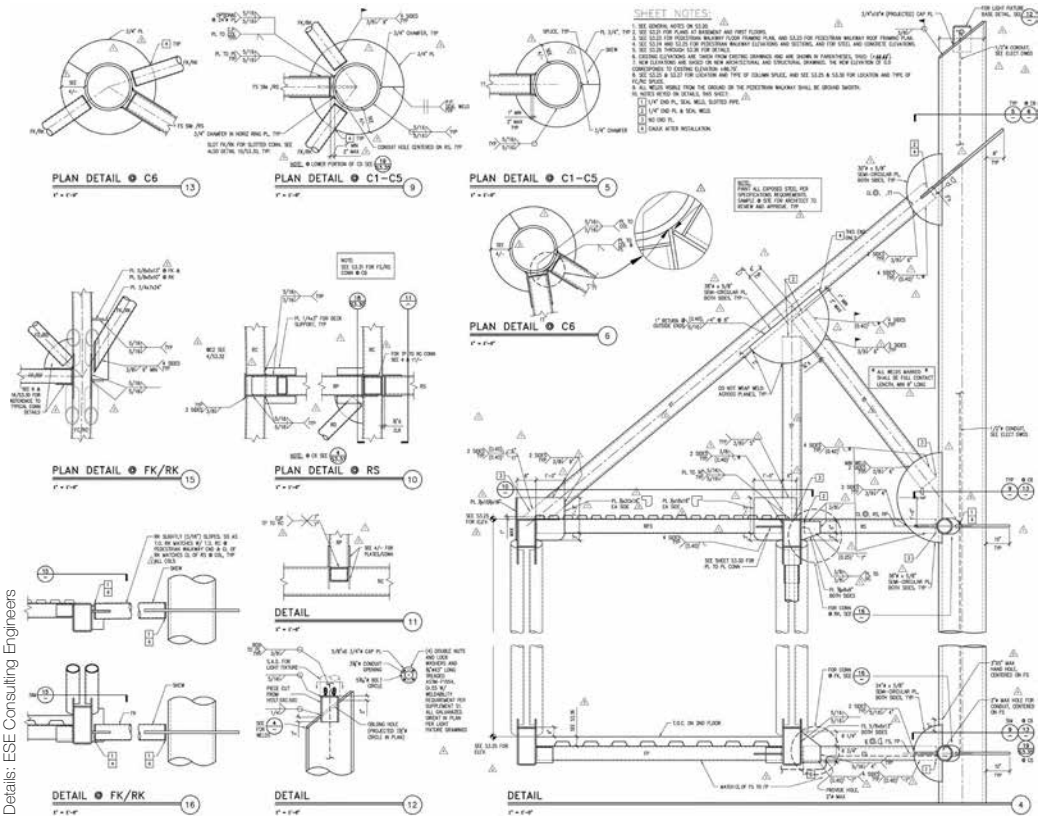
Columns on both sides of the walkway are placed so that the center of the mass of the overall bridge is located very close to the center of the rigidity of the columns. Internal redistribution of torsional forces is made possible by designing the walkway walls, floors and roof as full trusses. The resulting effective eccentricity in columns below the floor level is less than one foot, whereas the apparent eccentricity at each column is about 11 feet. The torsional strength and stiffness of the walkway effectively “fix” the top of all eccentrically placed columns in two horizontal directions.

The main columns and walkway longitudinal top and bottom chords are detailed and designed as continuous. The columns in this walkway act as though they are

Joe Fletcher Photography

Exterior Hollow Structural Section (HSS) columns were located outside of the walkway to minimize impact to underground parking and plaza-level circulation and avoid modifications to the existing hospital buildings. This also provided uninterrupted glass wall lines, made horizontal to vertical member connections easier to achieve, and by increasing the distance between the columns (perpendicular to the walkway), it greatly increased the global stiffness of the bridge to resist overturning forces.

The use of HSS columns and twin round braces increased the number of connections, which reduced the length and stress of connection points.



Details: ESE Consulting Engineers

fixed at top and bottom in both directions, all by using simple end connections of braces and beams to columns.

The final configuration has a steel weight of 830 pounds per lineal foot (plf) compared to an earlier design with cantilevered wide-flange columns under the bridge with an estimated steel weight of 1,090 plf, thereby reducing weight by 230 plf. The HSS members reduced the overall dimension and the twin round HSS members used for walls' diagonal braces effectively reduced the profile creating a floating-in-place walkway.

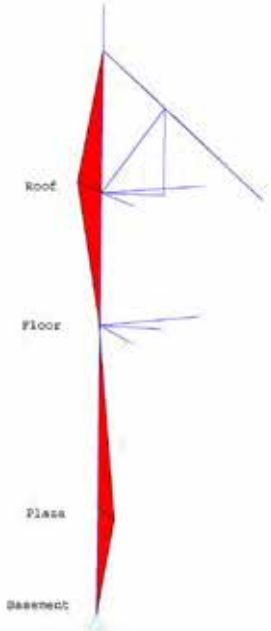
Plan details of the HSS column rigid diagonal tension/ compression members and connections.

The walkway walls, floor and roof were designed as full trusses with the shop-fabricated roof and floor segments assembled on the ground at the site. Wall elements were field-welded to the floor and roof segments and then erected.

While the configuration of the walkway was unusual, the construction process was straight forward. Columns were erected first. Then shop-fabricated roof and floor segments were delivered to the site. Walkways segments were then assembled on the ground at the site by field welding wall elements to the floor and roof segments. These walkway segments were then lifted onto shoring supports, welded together and then welded to the columns. The shoring was then removed and the floor and roof decks were constructed before the architectural walls and finish were applied.

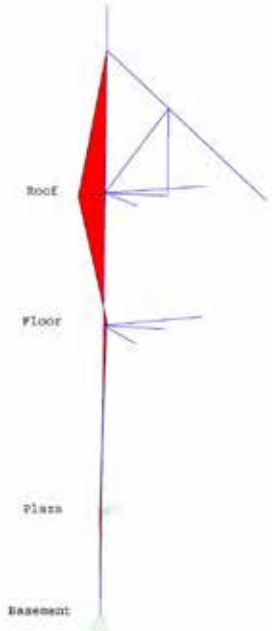
Details: ESE Consulting Engineers

Note the gradual and uniform column moment gradient and note that maximum moments occur at the Plaza and Roof levels, away from the column splice. Also, because all connections are simple connections, they are not subject to high seismic stresses.

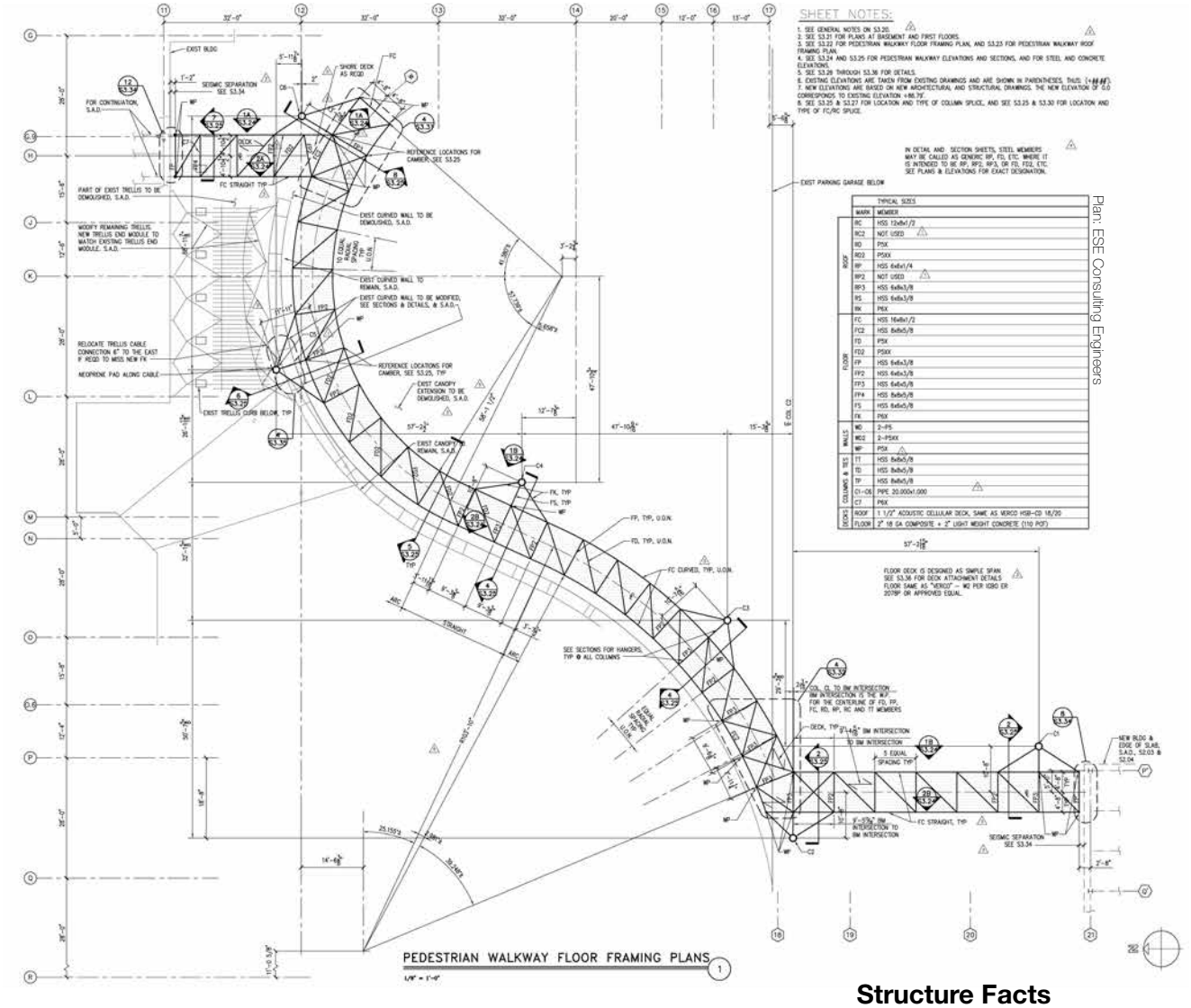


Moment diagram, lateral loads

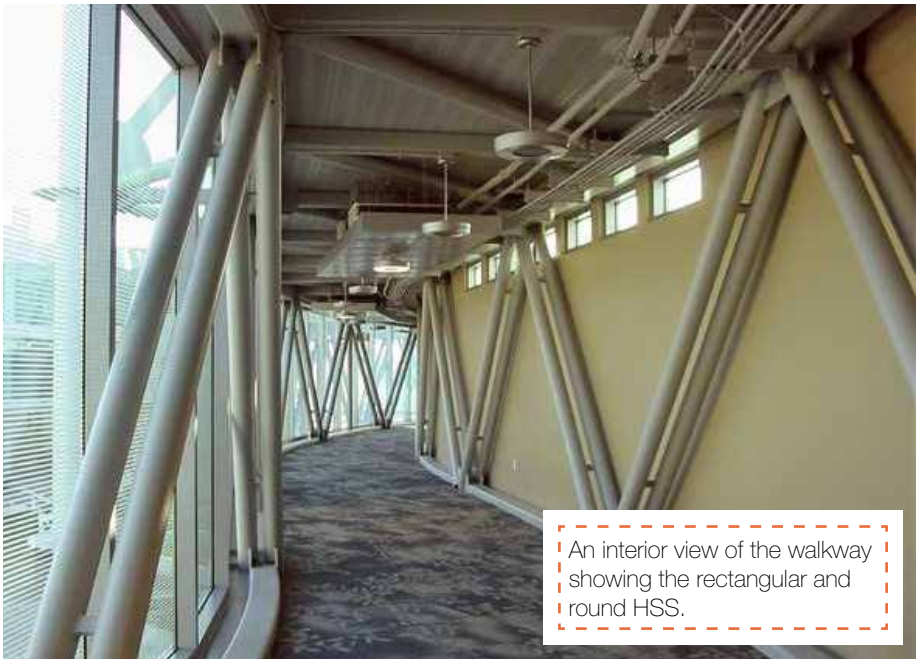
Note the gradual and uniform moment gradient in the column. Also note the slight moment due to eccentricity of gravity loads in the column below the Floor level.



Moment diagram, gravity loads



Plan: ESE Consulting Engineers



An interior view of the walkway showing the rectangular and round HSS.

Structure Facts

Dimension
Five 60-ft long spans and one 20-ft long span

Total Length
320 feet

Levels
One

Development Cost
$2.4 million

Structural System
Suspended Steel Bridge

Innovation Design
Suspended Walkway with Exterior Hollow Structural Section (HSS) Columns, and a moment frame lateral system using only simple beam to column connections.

Structural Steel
HSS Columns; structural steel trusses

Steel SolutionsCenter
Your connection to ideas + answers

California & Vicinity Steel Information Council

CVSIC

Funding provided by the California Field Iron Workers Administrative Trust

www.cvsic.org

There's always a solution in steel.

American Institute of Steel Construction
One East Wacker Drive, Suite 700
Chicago, IL 60601
312.670.2400 www.aisc.org

Item 124.v3