

Steel facilitates construction of distinctive structures at a Miami Beach supermarket and an Orlando theme park

# Shaped by **steel**

By Gordon Wright, Senior Editor

The adaptability of steel as a construction material is probably no better-illustrated than by two recently completed Florida projects. They range from the practical — a supermarket in Miami Beach — to the whimsical — a new theme park in Orlando.

Miami Beach is known as a city that requires architectural quality in its buildings. In response to the need for a major grocery store, the city purchased a 2-acre site and asked grocery operators to submit competing proposals. The most innovative feature of the store proposal selected — a 200-ft.-long, 50-ft.-tall, metal and glass screen wall — is supported by a steel structural

system. The top of the wall supports a sloped, curving, 50-ft. by 200-ft. cantilevered metal roof. The roof and screen wall enclose people movers that transport customers to and from the ground-level supermarket to the second- and third-level parking decks.

Located on a tight site in the South Beach area, the 150,000-sq.-ft. supermarket itself is constructed of concrete. Its parking deck is constructed of cast-in-place, post-tensioned concrete.

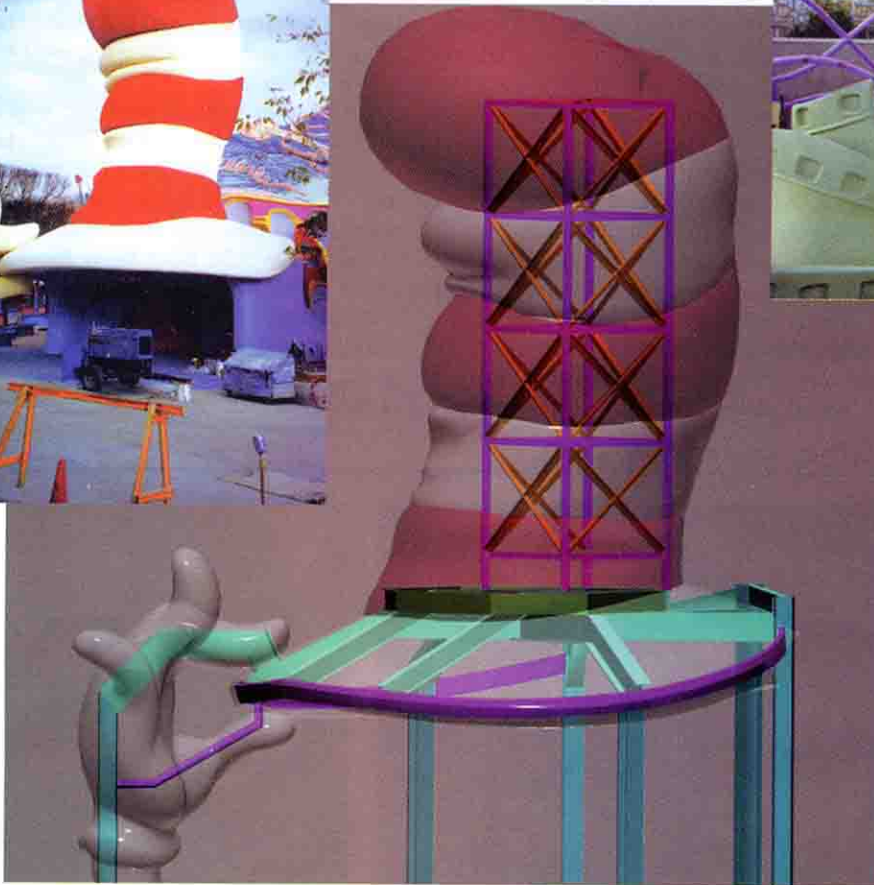
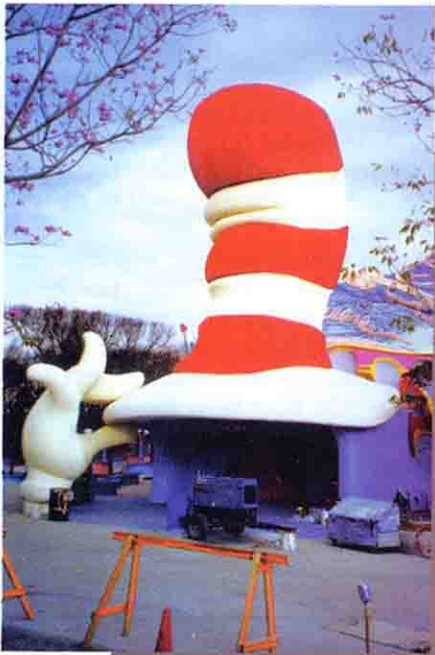
The store's architect is Carlos Zapata, a principal of the Boston-based firm of Wood and Zapata Inc. New York City-based Leslie E. Robertson Associates (LERA) is the structural engineer. Steelfab Steel Construction of Norcross, Ga., was the steel fabricator.

Zapata designed the roof as a free-floating structure that has no apparent connection to the building. The roof cantilevers from an elevator shaft, in two directions, for up to 60 feet. The back span of the cantilever is connected to the screen wall. Careful detailing was required to

The soaring roof on the front elevation (left) of this Publix supermarket is supported primarily by curved girders that cantilever in two directions, by as much as 60 feet, from the top of an elevator tower. The roof tapers to a depth of only 5 inches at its edge. People movers (right), which incorporate cogs that anchor the wheels of shopping carts, transport Publix customers to two rooftop parking levels. Aerial view (below) of the supermarket under construction shows the steel-framed escalator enclosure and soaring roof that distinguish this Miami Beach store from a typical supermarket. The 150,000-sq.-ft. facility is three times as large as the typical Publix store. Photos: (left)

Jeff Goldberg/Esto; (bottom) Aerial Photography Inc.





Riders enter "The Cat in the Hat" ride by passing beneath a 48-ft.-tall "hat" (top left) that is supported on one side by a building structure and on the other by the index finger of the cat's right hand. Structural steel W-sections were sculpted to fit inside the wrist, index finger and hat brim to support an X-braced tower inside the top of the hat (CADD schematic). Curved trusses support a fabric roof (above) that now covers the platform where riders wait to board the ride. The curved cross bracing provides stability for the trusses.

*Photos: Walter P. Moore and Associates*

create a roof edge that tapers to a depth of only 5 inches, said William Faschan, LERA's partner in charge for the project.

The screenwall was the most challenging part of the structural design, according to Faschan. In addition to being supported only at the top, the wall is curved and also tapers in two directions. It is framed by architecturally exposed, 6-in.-diameter pipe columns with specially designed stiffeners.

"Working with Zapata is a challenge because he's always looking to push things to the limit," said Faschan. Zapata responded: "The good thing about Faschan is that he never says no."

### Dr. Seuss throws a curve

In Orlando, structural steel was used to bring life to the curving, leaning, abstract world that Dr. Seuss, the beloved author of children's stories, describes in his books. Seuss Landing is one section of Universal Studios Islands of Adventure, which opens this month adjacent to Universal Studios Florida. It includes three rides and five other attractions.

In accordance with Seussian style, visible features in Seuss Landing do not have straight lines, said Brian Caudle, project manager with the project's Houston-based structural engineer,

Walter P. Moore and Associates (WPMA). The architect for Seuss Landing was Dallas-based HKS, and the contractor was Baltimore-based Whiting-Turner Contracting Co.

The design and construction of many abstract forms in Seuss Landing created numerous structural challenges. For example, to achieve the slender cross-sections that replicate Dr. Seuss' illustrations, structural steel was the only practical solution, according to Caudle. These features were initially created as half-inch = 1 foot models. They were then scanned, converting the profile of the "skin" into a 3D CADD model. It was often necessary to bend the steel segments on a radius to stay within the enclosed space. The design team then used the model to thread segmented structural steel inside the skin. Coordinates from the CADD model of the structural steel were given to the steel fabricator, Met-Con Inc. of Cocoa, Fla.

The Green Eggs and Ham Café is a ham-shaped, walk-up restaurant. It incorporates an exterior canopy that resembles a slice of ham. The canopy, which is segmented and curved, is essentially cantilevered.

The café's primary framing is fairly straightforward, according to Caudle. Metal studs were used to form its curved walls. Its second level

## Supporting structures had to be thin and light

contains equipment to remove restaurant grease from the air before it is exhausted.

Sylvester McMonkey McBean's Very Unusual Driving Machine is an elevated monorail ride that meanders through Seuss Landing. The ride track is supported in part by three buildings, including the Circus McGurkus Café, as well as by free-standing steel arches and curved columns.

The Circus McGurkus Café is a dining facility based on the Dr. Seuss book *If I ran the circus*. Guests dine inside a "big top" tent, which is not really a tent but a structural steel frame clad in foam that is carved into an abstract tent shape. Inside the structure, the "McMonkey" ride circles above diners' heads. The two main columns supporting the center of the big top are curved, round hollow structural sections (HSS)

that reduce in diameter and branch like trees as they reach up to support the roof. The big top is a large open space without any opportunities for installing conventional frames to resist lateral loads. Therefore, the tent stakes and tent "ropes" (which are curved HSS) were used as a lateral framing system.

The designs were driven largely by geometry. "The things Dr. Seuss drew don't stand up — they curve, lean and are kind of precarious looking," Caudle said. He also noted that the supporting structures had to be both thin and light. "Concrete would have been too bulky to fit inside the skins we designed for," he said.

As a result of his association with the project, Caudle has been steeped in Seuss lore for the past three years, and can practically recite most of the more well-known Dr. Seuss stories. ■

### STAGGERED-TRUSS SYSTEM



### Steel framing scores in a concrete market

The 2,600-room, 38-story Aladdin Hotel under construction in Las Vegas is the first steel-framed, staggered-truss hotel to be built in Nevada's gaming capital, where concrete frames are the norm.

As its name implies, a staggered-truss system incorporates trusses at alternate column lines on successive floors. Developed at the Massachusetts Institute of Technology, the concept has been used since the 1960s. The Aladdin's staggered trusses are 9 feet deep, with a 9-ft., 7-in. wide corridor opening in the center.

A concrete superstructure was originally contemplated, according to Robert Accardi, project executive with New York City-based Tishman Realty & Construction Co., the owner's repre-

sentative. But bids came in higher than anticipated, prompting the evaluation of alternative plans. The cost of a staggered-truss plan proposed by SMI-Owen Steel Co., Columbia, S.C., was more than 10 percent less than that of the concrete-framed plan, he said.

A shorter erection time will allow completion several months earlier than if the hotel had a concrete frame.

The Boston structural engineering firm of McNamara/Salvia Inc. was a consultant to SMI-Owen. Principal Robert McNamara said the staggered-truss system helped to integrate the hotel tower with its function areas, which are located below the sixth level. Steel framing also facilitated the addition of structural reinforcement that became necessary when a swimming

**The Aladdin Hotel, which will open next year, is the first Las Vegas hotel to have a staggered-truss system. Due to the hotel's unusual geometry, it was necessary to augment the staggered-truss system with a lateral framing system (left). Staggered trusses can be seen as the steel framing rises (above).** Photos: McNamara/Salvia Inc.

pool that was not part of the original design was placed on top of a low-rise section of the hotel.

McNamara said a staggered-truss system typically does not require augmentation with a lateral framing system. But due to the building's unusual geometry, a major lateral system was added.

Fluor Daniel Inc. is the project's at-risk construction manager. ■