# Music BOX

BY PETR VANCURA

Emilio Collavino

Steel-framed sails, clouds and pods define the inspiring interior of the center of music in South Beach.

**THE NEW WORLD** Center indeed creates a new world of music and light, and is right at home in South Beach.

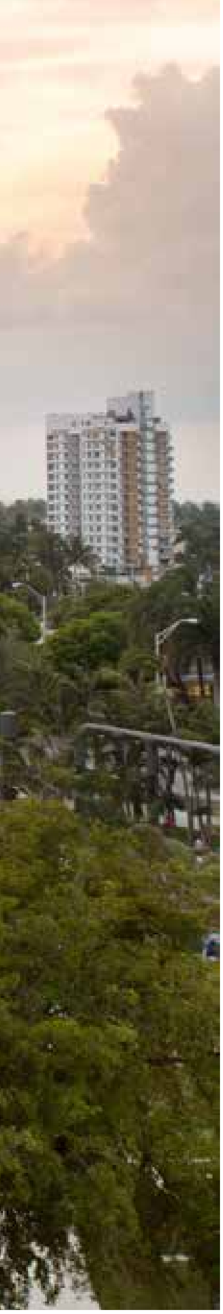
The 100,641-sq.-ft facility is the new state-of-the-art home of Miami's New World Symphony and was constructed as part of the City Center Redevelopment Project in a public/private partnership with Miami Dade County and the City of Miami Beach. New World Symphony conductor and founder, Michael Tilson Thomas, worked closely with renowned architect Frank Gehry to create a space that would provide a nurturing environment for performers, foster a relationship between the performers and the community and spark an interest in classical music from the public at large. The structural engineers, Gilsanz Murray Steficek, collaborated intensely with the designers to enable the architect to fully realize the vision of a new frontier in the public relationship with musical performance. Where the exterior looks to be a straightforward glass and concrete box, the interior holds the dynamic sculptural elements that are the signature of Gehry Partners.

The building is comprised of three sections: a 29,600-sq.-ft performance hall with seating for 756 and 14 distinct stage configurations; an atrium containing four freestanding structures that house 26 individual and six ensemble rehearsal rooms; and a five-story back-of-house office structure with practice studios and mechanical rooms, which provides an anchor at the south end of the building. The new facility also features a rooftop terrace that includes a garden, a music library and reception areas.

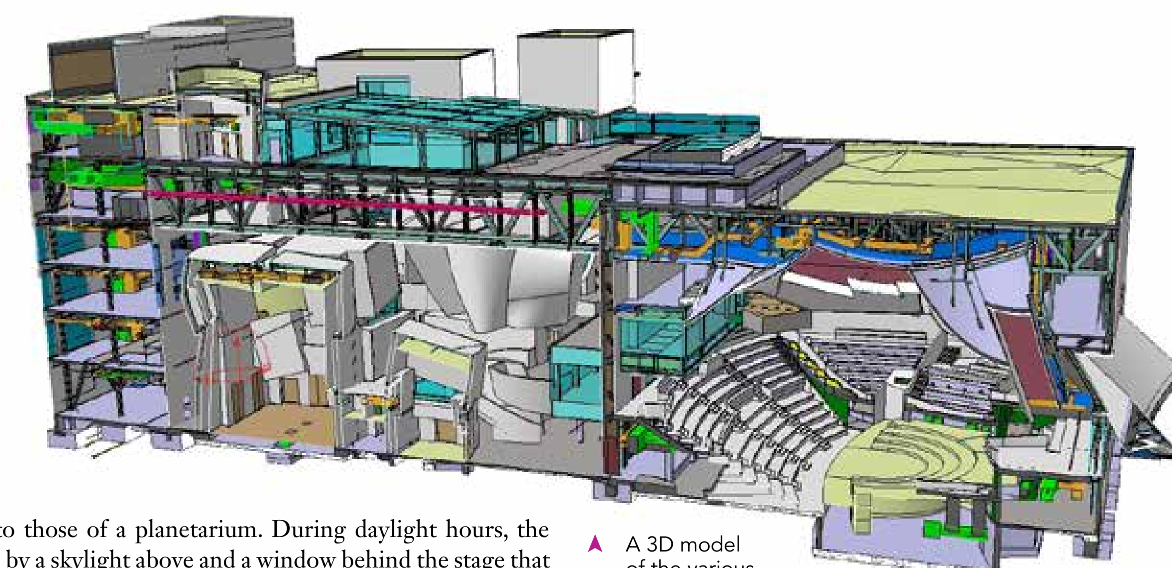
## Steel Stalactites

The configuration of the performance space can be "tuned" to accommodate full orchestras or solo performers. The concert hall ceiling uses 46 round HSS "stalactites" (4-in. OD) suspended from the roof framing to support a curviform collection of five "sails" represented as 40-ft by 65-ft acoustical walls and twelve acoustical ceiling faces—the "clouds." The sails and clouds are supported predominantly with 8-in. OD round HSS.

The curved light-gauge steel stud-and-track system for the clouds and sails, supported by the stalactites, frames into curved box beams shaped to acoustically specific curves. These surfaces dazzle the audience visually through projection and light shows and acoustically through engineered resonance; 44 programmable, multidirectional colored theatrical lighting fixtures and fourteen 30,000-lumen projectors make these light shows



The New World Center is comprised of three sections: a 29,600-sq.-ft performance hall, an atrium containing four freestanding steel-framed structures and a five-story back-of-house office structure.



A 3D model of the various building sections and structural elements.

Gehry Technologies

comparable to those of a planetarium. During daylight hours, the space is lit up by a skylight above and a window behind the stage that is enhanced and shaded by a knife-edge canopy structure.

Adjacent to the performance hall, the glass-clad atrium is a 135-ft by 180-ft expanse of open space across the building, from the east façade to the west façade, allowing ample light in the daytime and creating a dramatic effect on the cityscape when lit from within at night. To create the openness and transparency at the atrium, W18×258 columns spaced at 23 ft on center, with vertical spans of 80 ft, essentially work as massive mullions that support transparent glass walls. The horizontal elements for the curtain wall system are 10-in. by 8-in. and 14-in. by 10-in. rectangular HSS. The curtain wall was engineered to accommodate deflection due to wind loads on average of 1.5 in. in most locations and more than 2 in. in others. While the glass and joints could tolerate even higher deflections, the resistance was governed by the door framing, where movement was limited to approximately 0.5 in. so that doors would function correctly. The formidable lateral forces that result from the hurricanes of south Florida—the design was based on 146-mph winds—are resisted by steel braced frames that are tied to each other by the roof diaphragm.

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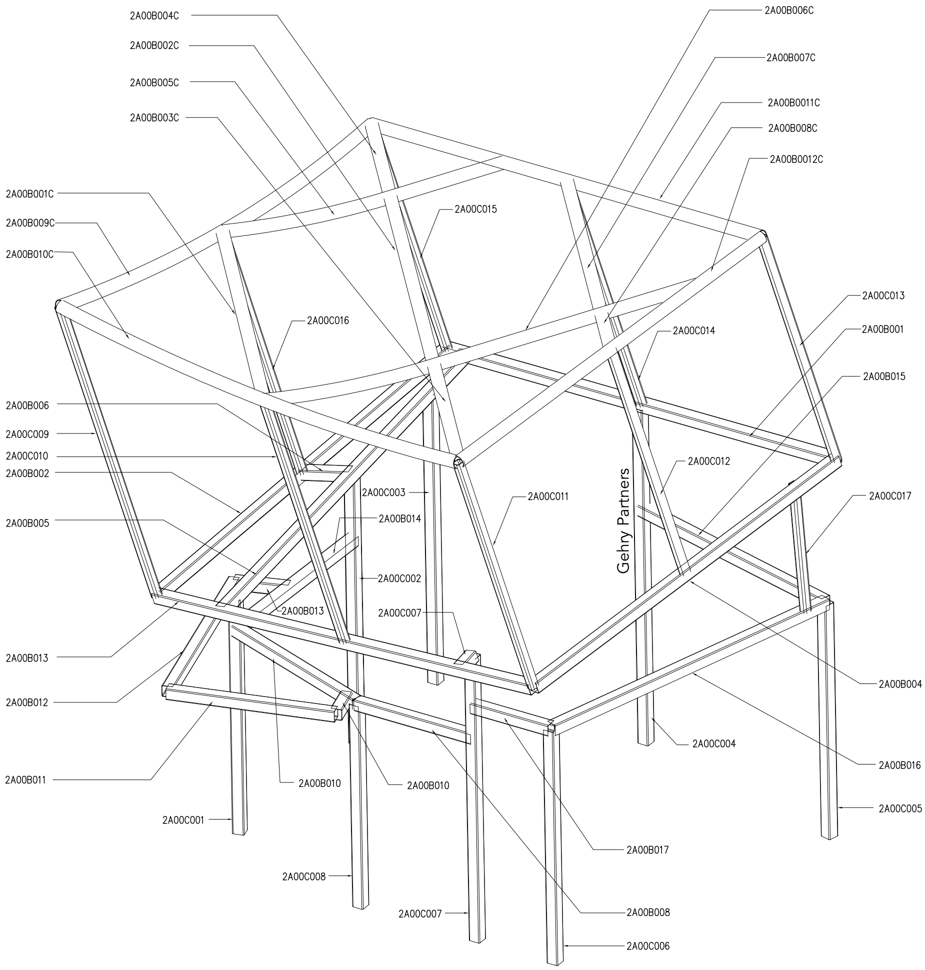



◄ Framing for one of the atrium pods.

► Steel "stalactites" in the concert hall.

▼ One of the roof box trusses.


## Top to Bottom

The building features interior clear heights of 83 ft in the concert hall and 90 ft in the atrium, and the roof framing of both the performance hall and the atrium is supported by two box trusses between the fifth and sixth floors that are up to 17 ft deep and span 130 ft (bottom lateral-horizontal members are typically W10×49 and the top members are W27×84). The first seating level is formed with cast-in-place concrete, as is the orchestra pit slab, which also serves as part of the building foundation (in addition to piles drilled into a sand stratum). The rest of the performance hall and the entire back of house structure use traditional steel framing with wide-flange sections supporting metal deck and concrete floors.

Structural engineer Gilsanz Murray Steficek value-engineered the design from the outset and reviewed various alternative approaches. Originally, a repetitive truss built up from angles was proposed. However, such a system works less well with isolated heavy loads, such as those found at the margins of the performance hall's skylight. Instead, wide-flange steel used for the 130-ft-long trusses, which not only provide the clear spans, but also support suspended footbridges that connect the southern office structure to the northern performance hall.

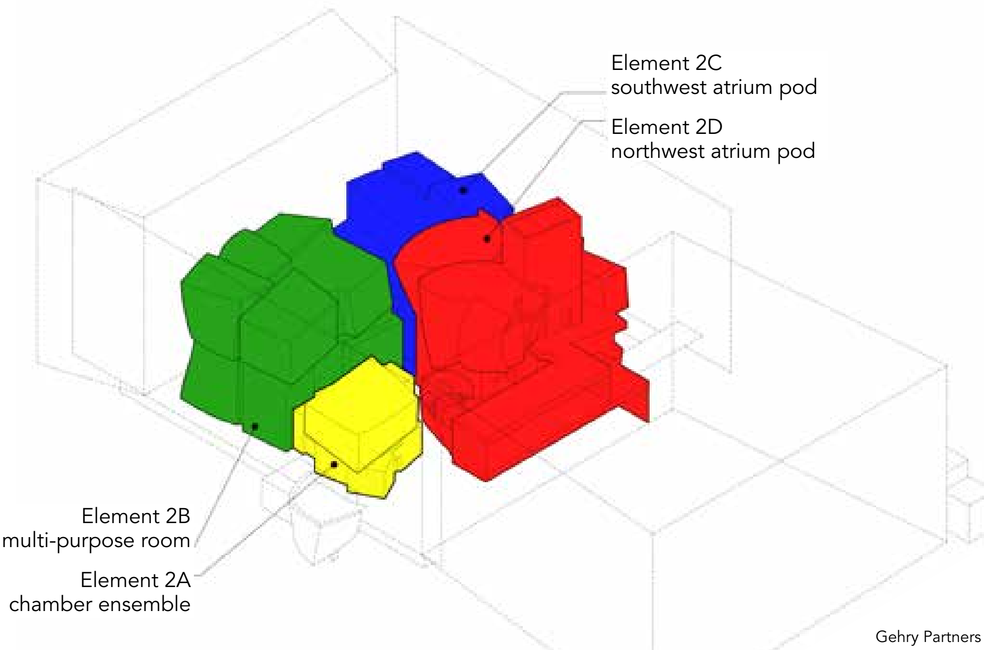
Inside the atrium is a village of four stand-alone, twisting and turning interior structures or "pods" that serve as classrooms, practice spaces and offices for the symphony. Single curvature, 8-in.-diameter HSS and wide-flange beams form the skeletons of the pods, the highest of which reaches 50 ft. These four structures accounted for 260 tons of the building's total 3,000 tons of steel.

Rather than erecting the freestanding pods first and then enclosing the rest of the building around them, the team decided to sequence construction so as to first close in the atrium against weather, which allowed for field welding within controlled interior conditions. This strategy also had a logistical advantage in that the site was unencumbered during the installation of the primary steel above. The more complex of the sculpted elements were shop assembled to survey and confirm their fit, then were dismantled, shipped to the site and reassembled using temporary bolted connections prior to welding. In all, the structural steel package represented a price tag of $13 million, but only about ten pieces required (minor) field alterations; the total project budget was $160 million.

## Distinctive Flair

Crucial to the success of the project was the use of BIM, which allowed GMS and Gehry Partners to develop and analyze the organic shapes that give the finished product its distinctive flair. To develop the layouts of the freestanding atrium structures, based on Gehry's steel centerlines, the designers, with GMS input, used Gehry Technologies' proprietary BIM program, "Digital Project," which is based on the French program CATIA (which was used for the design of the Boeing 777 in the 1990s but was adapted specifically for the building industry). These layouts were then imported into a structural analysis program for design of the steel and concrete structure. The results were imported back into Digital Project and were then sent, along with 2D construction documents of the more standard design elements, to the general contractor, Facchina Construction, for bid and construction.


Gilsanz Murray Steficek



Gehry Partners

◄ ► ▲ Inside the atrium is a village of four stand-alone twisting and turning interior structures or "pods" that serve as classrooms, practice spaces and offices.

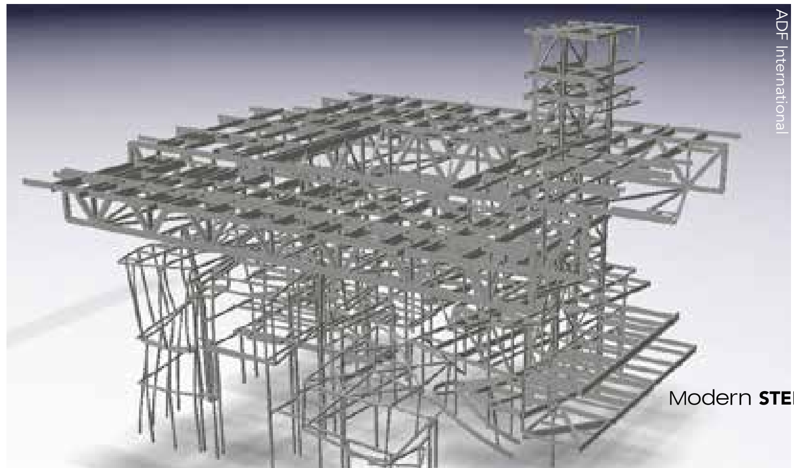

Claudia Uribe


Claudia Uribe

▲ The concert hall contains a curviform collection of five "sails," represented as 40-ft by 65-ft acoustical walls, as well as twelve acoustical ceiling "clouds."

▼ A framing model of the atrium.


Claudia Uribe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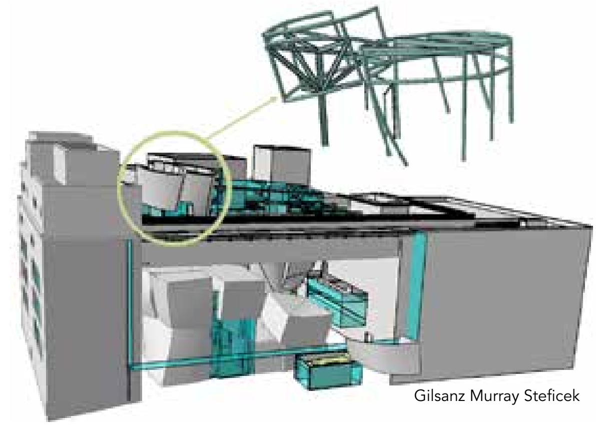
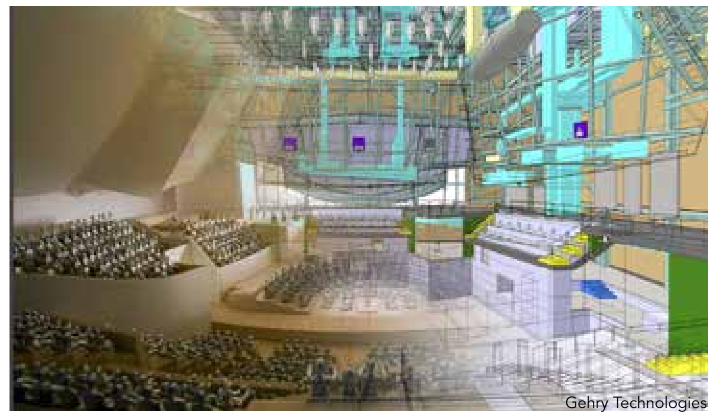
▲ Framing for one of the atrium "pods."



Gilsanz Murray Steficek

◄ ▲ A preassembled rooftop component.

▼ Behind the scenes in the concert hall.



Gehry Technologies

The modeling process helped communicate the design intent to all members of the project team. Throughout design development, a 2D drawing effort paralleled the Digital Project model. Illustrative isometric views were exported into the 2D issuances and shop drawings, with each structural element given a unique identification tag. The designers also had a team of programmers that translated the 3D models from Digital Project to Tekla. At build time, few open questions remained and the coordinate geometries of the dynamic irregular forms fit together well.

Outside the building, the performance hall's eastern exterior wall provides a 7,000-sq.-ft screen that faces the adjacent Miami Beach Soundscape Park, a 2.5-acre urban open space. This space lets music lovers spread out a blanket and enjoy the Wallcast concert series for free.

In addition to the classrooms and practice spaces within the structure, the theater is equipped with 17 miles of fiber-optic cable for use as an Internet2 classroom and transmission facility, enabling students to receive instruction from around the globe—and bringing a new meaning to the concept of new world music. ■

**Owner**
New World Symphony

**General Contractor**
Facchina Construction

**Development Manager**
Hines

**Architect**
Gehry Partners LLP

**Structural Engineer**
Gilsanz Murray Steficek LLP