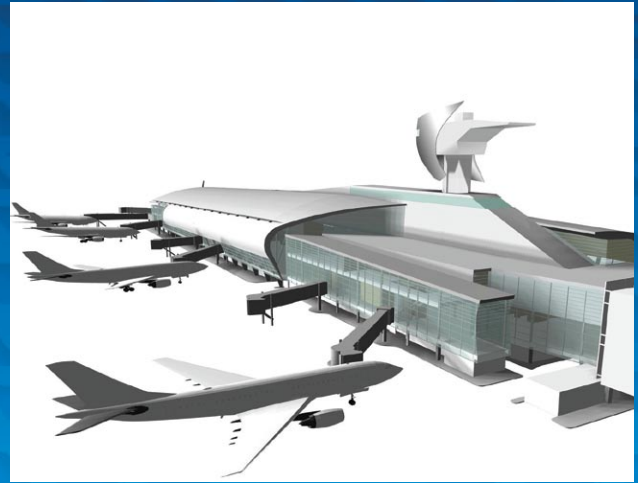


“The user-friendly interface of RISA is the real benefit. In very large models, it can be hard to pinpoint which members are overstressed or deflecting an unreasonable amount in other programs, but RISA’s visual graphics tools make this as simple as the click of a button.”



Project

Miami International Airport Concourse J

Challenges

- Complex geometry of the vaulted roof, which functions as both the roof and the walls of the terminal
- Beams of a 36-foot cantilever at the south end of the concourse needed to be designed for multiple load cases and uplifts caused by hurricane-strength winds
- Creating a model to get the cantilevered members to work as a continuous member pinned over the support beam

Solutions

The exterior of Miami International Airport’s Concourse J is sure to make an impression on first-time visitors. The vaulted steel structure, which encompasses both the roof and wall structures, has the sleek, curved, metallic look of an airplane wing.

The design elements that are a delight to the senses for airport passengers proved to be a challenge for the engineers at DMJM Design | AECOM.

The vaulted roof structure, which covers the entire structure and includes a 36-foot cantilevered section at the south end of the concourse, is comprised of tapered steel rib members and wide flange beams. Each steel rib has several different radii and no two ribs have the same geometry, which adds to the complexity of the structure.

Janelle Meagher, Project Engineer in charge of the modeling and analysis of

QUICK FACTS

Location

Miami-Dade County, Fla.

Design Team

Ara Petrossian (Lead Eng.)
Janelle Meagher (Proj. Eng.)
DMJM Design | AECOM,
Arlington, Va.

Completion

August 2007

Cost

\$100 million

Size

340,000 sq. ft. steel facility

Software

RISA-3D
RISAFloor

“RISA-3D combined by RISAFloor allowed us to do a complete building design and analysis within a single program”

Janelle Meagher, DMJM Design | AECOM

the airport terminal, turned to RISA-3D + RISAFloor to accomplish her goals.

She modeled the roof structure in RISA-3D and the composite floor slabs in RISAFloor.

Once the vaulted steel structure was modeled in RISA-3D, it was imported to RISAFloor so the loads of the curved roof structure could be transferred to the steel beams of the floors below.

The model was returned to RISA-3D to check the multiple load cases and complete the lateral analysis.

“RISA-3D combined with RISAFloor allowed us to do a complete building design and analysis within a single program,” Meagher says.

“The program makes it so easy to isolate members and check deflections and

bending stresses and provides the info in a variety of formats. In very large models it can be hard to pinpoint which members are overstressed or deflecting an unreasonable amount in other programs, but RISA’s visual graphics tools make this as simple as the click of a button.”

The entire structure of the 340,000 sq. ft facility was modeled in three segments using RISA. The final model included more than 12,000 members.

The 36-foot cantilever structure also provided its share of challenges. The wide flange beams cantilevered over steel beams supported by vertical bow truss supports.

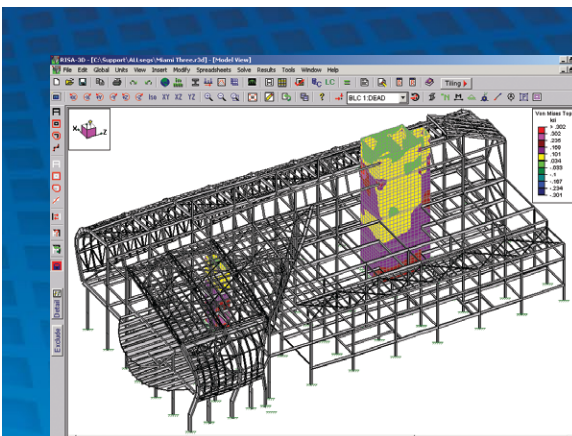
In order to get the cantilevered members to work as a continuous member pinned over the support beam, Meagher created a “false member” at the support to mimic

the condition. She did this by using a short rigid link between the cantilever beam and the support beam.

Additionally, the cantilevered beams had to be designed for multiple load cases and uplift because Miami is a hurricane region. RISA made checking the different load cases and load paths of the cantilevered section easy, Meagher says.

“With a model that has over 12,000 members and has so many curved and sloped members on different levels it is often very hard to isolate members and focus in on the member properties,” Meagher explains.

“The ability to turn certain members on and off made it easy to navigate the model and to verify that the members were modeled properly.”



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