

BUILDINGS

Miami High-Rise Designed to Repel Floodwaters

The sloping face and graceful parabolic arch of the Espirito Santo Plaza—a mixed-use Miami high-rise—are likely to make it a well-known feature of the local skyline. But the building is also notable for the strategy its designers employed to cope with floods.

The 35-story tower stands within Miami's financial district, close to the edge of Biscayne Bay. The 750,000 sq ft (70,000 m²) posttensioned-concrete structure is divided into office, hotel, and residential levels, respectively, from bottom to top, each with a different column layout, says Elias Matar, the project manager for structural engineer Leslie E. Robertson Associates, RLLP, of New York City.

Many high-rises in similar locations are built so that the walls of the ground floor will break away during a flood. The Espirito Santo Plaza, however, is designed to keep floodwaters out, even during a 100-year flood, when the water would be 14 ft (4.3 m) above sea level, or 7.5 ft (2.3 m) above the building's ground floor elevation. The curtain wall is reinforced to withstand water pressure on the exterior, much like an aquarium in reverse, says Jae Chang, an architect with Kohn Pederson Fox Associates, of New York City, which designed the building. The window assembly is 2 in. (50 mm) thick, or about twice the typical thickness, including a nearly 1 in. (25 mm) inner layer comprising two glass panels joined by a clear polycarbonate interlayer for added strength. In addition, the window mullions are reinforced with carbon steel.

The ground floor slab is reinforced and attached to the pile caps to resist upward hydrostatic pressures of up to 540 psf (25,860 Pa), says Matar. In addition, a concrete wave trip wall about 18 in. (460 mm) high will be constructed on the eastern edge of the property to dissipate wave energy during a flood. In this way, Matar says, the owners obtained a flood classification for the building that allowed them to use the ground floor for habitable space.



A reinforced curtain wall and ground floor slab are designed to repel floodwaters from the 35-story Espirito Santo Plaza building, under construction near Biscayne Bay in Miami.

Flat-plate construction was used for the hotel and residential floors, but slab-and-beam construction was used on the office level to achieve spans of up to 50 ft (15 m). Column transfers occur at the 16th and 25th floors. On the 23rd and 24th floors, two concrete outrigger walls about 30 ft (9 m) high and 28 in. (710 mm) thick extend from the building core to the perimeter to provide additional stiffness. Now under construction, the \$160-million project is scheduled for completion in the summer of 2003.

—Jeff L. Brown