Hanging Gardens Inspire Awe

Market Segment:	Architecture
Composite Application:	Structural support system, chambers and tubes for a hanging garden
Resin:	Vipel® K022-AA bisphenol A epoxy vinyl ester
Manufacturing Process:	Hand Lay-up
Number of Tubes:	67
Tube Diameter:	18 inches
Tube Lengths:	28 to 51 feet
Installed:	2014
Location:	Miami, Florida

Even before visitors to the Pérez Art Museum Miami (PAMM) walk through its doors to admire more than 1,800 pieces of modern and contemporary art they are treated to an artistic masterpiece. The 200,000-square-foot museum, opened in downtown Miami in December 2013, features hanging gardens all around the building. JTI Companies Inc. fabricated a superstructure comprising seven chambers with 67 fiberglass tubes that descend from a canopy and hold 80 different plant species native to Florida. The lush, green flowering vertical gardens are breathtaking.

JTI was brought into the museum project by architect of record Handel Architects, whose primary concern was that the gardens could withstand hurricane winds. "When they approached us, they had a conceptual drawing with some lines coming down in a vertical garden, but they did not have any specific technology in place," says Jason Brough, president of JTI. "They were considering alloys and other materials that were

JTI Companies was one of five finalists in the "Products and Landscapes" category of the Architizer A+ Awards for the design and fabrication of the hanging gardens at the Pérez Art Museum Miami. The company won an A+ Popular Choice Award and a special mention in the typology category of Landscapes and Gardens.

Installation of the hanging gardens, featuring 67 fiberglass tubes like the one shown here.

cost-prohibitive. But the driving factors were selecting a material that could stand up to 146 mph winds and resist saltwater corrosion." As the delegated engineer for the museum project, JTI designed and fabricated a complete structural support system for all seven chambers of the vertical gardens. Each chamber featured eight to 11 custom fiberglass tubes that ranged in length from 28 to 51 feet. JTI devised a laminate structure that would bend, but not break, under hurricane strength winds. The tubes are constructed of matte woven roving and C-veil fiberglass, Hardwire® high-strength twisted steel wires and K022-AA epoxy vinyl ester resin from AOC.

Walter Brough, P.Eng., project manager for JTI, worked closely with AOC during the design and testing phase. AOC provided several resin samples, which JTI sent to a testing lab to obtain the physical properties of the combination of fiberglass, Hardwire and resin. The company ultimately selected K022-AA. "It had better physical properties than other resins," says Walter Brough. "It had an elongation acceptable for the strain that would be put on the fibers and fire and corrosion resistancy." The latter is critical because the museum is located in a coastal environment, where the hanging gardens are exposed to salt water and mist.

The team at JTI fabricated the tubes using hand lay-up, alternating layers of fiberglass and Hardwire in a sandwich construction to create the 3/8-inch thick tubes. JTI built custom 40-foot-long mandrels to accommodate the project. Even then, technicians had to slide the tubes out of the mandrels and continue making the ends of the longest ones on specially-created extensions.

One of the biggest production challenges was dealing with varied weather conditions. "This project spanned several months," says Jason Brough. "In our Alabama plant, we would find ourselves dealing with drastic temperature changes from one day to the next. AOC offered exemplary technical support to help us promote the resins based on environmental conditions and stay on schedule."

Once completed, JTI shipped the components of the inverted garden to Miami along with installation instructions written by Walter Brough. The seven chambers are attached to embeds in the walls and structural steel at the top of the building. The fiberglass tubes, which descend from those chambers, are covered

with felt that has pockets cut into it. The plants are placed in those pockets, and water is delivered into the felt through nozzles at the top of the tubes. The water works its way down the tubes, sustaining the plant roots in a soil-less system.

"This was a one-of-a-kind project that had to go off without a hitch for the general public," says Jason Brough. "There was no second chance. And there was no benchmark." JTI, in partnership with AOC, ensured it was a success.

About JTI Companies Inc.

JTI Companies Inc., based in Birmingham, Ala., designs and builds architectural marvels, working directly with architects, artists, developers and planners. Founded in 1990, JTI built its reputation fabricating a variety of materials for large construction projects. Driven by inquiry and inspiration from artists and architects, JTI has evolved to fulfill every aspect of making unexpected ideas tangible – design, engineering and fabrication.

About AOC

Headquartered in Collierville, Tennessee, AOC is a leading global supplier of resins, gel coats, colorants, additives and synergistic material systems for composites and cast polymers. AOC develops technology, lives quality and delivers service better than any other resin supplier. For more information, e-mail sales@aoc-resins.com, phone (901) 854-2800 or go www.AOC-RESINS.com.