

AV with a View

Lakefront museum links communications technology and green design



Discovery World on Milwaukee's lakefront demonstrates innovative architectural and technology design

by Don Kreski, AV Technology Magazine, April 2009

With its beautiful white resin and glass structure, magnificent lakefront views, and absolutely cutting-edge systems, Discovery World in Milwaukee is a benchmark for many types of technology.

Structural innovations include an air conditioning system that cools the building by circulating cold water from Lake Michigan; floating docks and a foundation system that can adjust to a 6-foot historic variation in the water level of the lake; enormous sliding glass doors that convert an inside promenade to outdoors in warm weather; and a rooftop solar array and three wind turbines that power exhibits within the museum.

Discovery World is meant to connect innovation, science, technology, and the environment with exploration and learning through interactive exhibits and experiential learning programs. Chuck Aumann, senior systems administrator for Discovery World, says the technical team's goal was to build a facility that would not only showcase technology, but actually use the same technology and promote its use in the business and university communities. "We're trying to inspire young people and the community at large to see the possibilities of innovation."

Three presentation areas

The 120,000-square-foot project consists of two mid-sized buildings joined by a ground level glass breezeway. The Technology Building is a two-story structure housing museum exhibits, seven classrooms, the Innovation Theater, a high-definition TV studio, an indoor/outdoor promenade with restaurant and gift shop, and a 200-space parking garage built below. And there's the Aquarium Building, a round structure that houses the Great Lakes Future exhibit, fresh and saltwater aquariums, a two-story space for interactive marine and water-use exhibits, a Digital Theater, and the Pilot House, a third-floor banquet and meeting facility.

The Pilot House is a unique space with a 360-degree view of the lake and downtown Milwaukee that is able to seat up to 500 people. Henry Lewis of Waukesha, WI-based Lewis Sound & Video helped to design and install the presentation systems. He included two 6,000-lumen Christie DS+60 projectors with 9- x 16-foot tab-tensioned Draper screens and a distributed sound system with 41 JBL Control 26CT ceiling-mounted speakers hidden in the ceiling, which were integrated into fiber optic links to the other presentation rooms in the facility. All loudspeakers are powered by QSC CX204V amplifiers.

The Innovation Theater, located in the Technology Building, provides digital cinema and can be used for broadcast video production before a live audience. It has been used to produce science programming and to broadcast Wisconsin gubernatorial debates and an annual live radio production of War of the Worlds.

The Digital Theater, located on the first floor of the Aquarium Building, is used for digital cinema, lectures, and other purposes. The screen and curtains may be opened to reveal a stunning view of the city and lakefront to the south.

Both theaters include 18,000-lumen Christie CP2000-X digital cine-

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ma projectors, massive 15.1- x 27-foot and 12- x 21-foot tab tensioned projection screens, and 5.1-channel surround sound systems using Crestron C2N-DAP8 processors. The main video/audio source in each is a QuVIS Digital Cinema Player, which provides true 1080p output and 6-channel digital audio. Staff can load video from high-definition DVD, satellite, or the TV studio. (Discovery World can also take satellite feeds from PBS.) The Pilot House, the the-



The nearly 360 degrees of glass presented a major challenge with reverberation. "We positioned the loudspeakers to fire straight down," Lewis explains, "so that, given the carpeting and acoustical ceilings, amplified speech or music was not a problem. But if the room was filled with noisy people or if they brought in a band or piano, reflections from the glass became a big factor. We suggested a motorized curtaining system, which not only darkens the room, but absorbs excess sound energy."

While the overall designs for the two theaters were fairly straightforward, Lewis says that, "because of the intimate nature of the spaces, loudspeaker placement was critical. First of all, sightlines were not to be interfered with. The audiences are right to the back and side walls, so we had to very carefully place the EAW surround loudspeakers so they weren't too hot for those in the back row, but still reached out into the middle of the space."

The Pilot House presented acoustic challenges due to its nearly 360 degrees of glass wall surfaces

aters, and the studio are all linked by fiber optic cable and an Evertz hub. A program shown from a source in any of these spaces can be simulcast to the others as well.

Discovery World's TV studio is fully high definition, with 1080p HD cameras, editing capabilities, and three-dimensional green-screen technology. "One of our goals for the facility," Aumann says, "was to allow the students to create source material and then see it displayed in either of these beautiful digital theaters."

Innovative systems

With the management team's extremely high standards and the priority they placed on cutting-edge technology, the design for each AV system was revised several times during the year and a half prior to installation. Henry Lewis did extensive acoustical modeling using EASE and very detailed AutoCAD drawings, and he says those files were extremely useful in implementing requested changes. "We were able to look at sight lines, for example, in very fine detail," he explains. When new components made fiber optics and other innovations affordable, it was relatively simple to identify the pieces that needed upgrades and change them on the plans.

The fiber optic backbone allows the museum to send high definition video and audio back and forth throughout the building without compression. The museum is capable of connecting to their own ship (a 137-foot replica of a 19th century schooner) so they can stream video into the theaters or classrooms as it travels. They can also webcast or videoconference from anywhere in the facility using portable Sonic Foundry and Polycom systems.

The Pilot House was the most challenging venue acoustically and structurally. Design architect Jim Shields specified a ceiling of Barrisol 031 PVC membrane with a white satin finish, which is applied over a steel frame while the room is heated to 110 degrees, then stretched to a very smooth surface as it cools. Its use allowed Lewis Sound to hang the JBL loudspeakers above it and keep them invisible. "I brought the material in house, mocked it up, and did analysis and testing to verify that we could indeed punch the sound through it," explains Henry Lewis. "Acoustically, it is a very permeable fabric."

Implementation

"One of our goals was that the building be very accessible to the Milwaukee educational system and very open for discovery by young people," says Paula Verboom, one of two project architects for the facility. "You're meant to get involved, touch things, interact with things — even abuse them to some degree. It's very welcoming and very durable."

"A lot of people see us as a technology museum," Aumann explains, "where you'd come and see technology on exhibit. But if you look behind the scenes, you'll find an organization that actually runs on that same technology. We're showing corporate America how their conference rooms can link with two-way communications, whether they use it our facility themselves on a rental basis or watch us conference back to our ship, the Dennis Sullivan."

"We're also showcasing the ability to produce all of these communications, and all of the media shown in the museum, within our own building. We can inspire children to understand and learn about technology, help teach them to create it through the studios, then bring it out to other universities and the business community through the conference center and by offering our organization as a benchmark."

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