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Lindemann Performing Arts Center

Brown University's Innovative New Venue

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The 101,000-sq.-ft. building is located on The Walk in the heart of the campus. Its fluted aluminum façade is intersected by a 13' horizontal glass "clearstory" (a play on "clerestory"), which reveals the interior and lets in natural light.

TRANSFORMER

Brown University's Lindemann Performing Arts Center is an innovative lab for the "creative Ivy"

By: David Barbour

Providence, Rhode Island's College Hill has added the startlingly modern Lindemann Performing Arts Center to its skyline. Designed to serve the Brown Arts Institute (BAI), which represents the performing, literary, and visual arts at Brown University, it transforms the surrounding area with a bright silver cube that seems to float above the landscape. Inside, the Main Performance Hall is a shape-shifting machine that morphs to meet the needs of various disciplines. The Lindemann is the product of a design team that includes architects REX/Joshua Ramus, the consulting firms Theatre Projects and Threshold Acoustics, and rigging specialists Tony Diemont and Barbara Pook whose firm, Pook Diemont & Ohl, is now part of Texas Scenic. (Sadly, Diemont died just as the Lindemann Center was opening.)

The 101,000-sq.-ft. building is located on The Walk in the heart of the campus, facing the Granoff Center for the Creative Arts, a visual and performing arts facility. The Lindemann's fluted aluminum façade is intersected by a 13' horizontal glass "clearstory" (a play on "clerestory"), which reveals the interior and lets in natural light. The clearstory cantilevers out to form the Diana Nelson and John Atwater Lobby; additional outdoor spaces can be used for events.

The central event, however, is the Main Performance Hall, which can transform into five configurations: a 625-seat symphony orchestra hall, 325-seat proscenium theatre, 450-seat recital hall, experimental media "cube," and a flat-floor configuration for events.

Flexibility is the key to the Lindemann. Ramus says the BAI "had clearly defined needs and it was reasonable for them to believe that those needs couldn't be resolved in the same structure. One was for a space that was highly reconfigurable for small ensemble work, theatre, dance, art installations, and so forth. But they have a very good orchestra and chorus, who, for years, have performed in Sayles Hall, which is, simply, a compromised environment. These were two diametrically opposed requirements."

Following a REX-mandated "thinking period," which included listening to various stakeholders, Ramus says, "We came to a conclusion that, I think, surprised everyone: Symphony spaces usually seat between 1,800 and 2,200 patrons; some are even larger. The sightline and acoustic demands are very sensitive given the large volume needed

Photo: Iwan Baan

to accommodate 1,800 people, which also relates to the volume you need for the acoustic energy of an orchestra. But Brown is a small institution and Providence is a small city; we realized that we could easily make the largest configuration between 500 and 600 seats. That was the watershed moment. We started with a conventional shoebox because we wanted to be sure the acoustics would be exceptional. And the building has an unusually vertical aspect because we pushed all that acoustic upward."

In the main performance hall

David Rosenburg, a director at Theatre Projects, says, "It was the vision of Christina Paxson, Brown's president, to have an arts incubation space, creating shows that would be seen nationally and internationally after starting at Brown. Our charge was to create a space that allows artists to be in residence for six to 12 weeks before taking the created performance piece on the road. One of the most insightful guiding statements came from the university architect at the time, who said, 'Here at Brown, we like to think of ourselves as 'the creative Ivy'."

Simplicity and efficiency were central to the theatre's design, says Michael Nishball, senior equipment designer and principal at Theatre Projects. "Our mantra was 'as few loose parts as practical.' While we integrated the stage machinery to achieve the five main arrangements, the potential for unique places of assembly is limitless."

Indeed, there was plenty of equipment to integrate. According to a statement from Brown, "To facilitate the five configurations, the design team invented a new performance typology where all six surfaces of the hall (floor, ceiling, and four walls) modulate physically and/or acoustically through automated and manually assisted performance equipment. These include five movable gantries, perimeter rings of retractable acoustic curtains, 40 adjustable acoustic reflector panels, seven utility battens, three moving lighting bridges, two stage transport lifts, three seat wagon equalizing lifts, three concert platform lifts, and numerous concert riser and seat wagons. All five configurations include access to two levels of technical/ighting galleries around the room and a central control and projection room. Technology is of the latest design, including professional touring-grade amplification, multi-channel 'ambisonic' audio, immersive video projection, scenic projection, and a full complement of fixed and moving lighting."

Virtually everything in the space is mobile. Massive suspended and mobile gantries track in and out—the largest of which travels 44' from the back of the house to the stage's edge. Walls recede. A projection screen rises from the floor. Drawbridges come down for technicians and patrons traveling behind the scenes. Nine-hundred-pound millwork ceiling reflectors fully articulate overhead to direct sound and allow for other performance equipment to fly in. Retractable seating tucks away or disappears down a level via a full-width transport lift. The main space's four sound-isolating glass walls with blackout panels embrace, hide,

Below street level are three spaces designed for music, theatre, and dance. The largest, used for orchestra, chorus, and other rehearsals, can double as a 165-seat performance venue for smaller musical and theatrical ensembles.

All surfaces of the hall (floor, ceiling, and four walls) modulate physically and/or acoustically through automated and manually assisted performance equipment. “The shaped glass for acoustic reflection on all sides of the space is unique,” Nishball says.

or control the abundance of daylight, depending on the needs of the performance.

Describing the tightly packed setup, Nishball says, “The gantries are multi-level, incorporating two seating balconies and two technical levels on three sides of the space. There are two suspended and tracking gantries on each side, 33' wide each. And one, 58' wide, at the rear, carries the control room suite. Not only do they roll on bogie wheel rails in and out, they also carry all the services that go with them. With the challenge of moving the control suite, you can see that there is a tremendous amount of high-voltage power, performance lighting, PSVC, sprinklers, fire detection, emergency lighting, and everything that goes along with machinery interlock devices for a safe system. We worked with IGUS, a global company with an office in East Providence, on the energy chain system and all of the wire and hose fill for moving the gantries. We also selected Serapid for the gantry motive system. Texas Scenic and Niscon monitored hundreds of interlocks, enables, and warden signals with the Raynok automation control system.” Creative Conners supplied specialized labor for testing the Niscon system.

“The shaped glass for acoustic reflection on all sides of the space is unique,” Nishball says. “The five gantries tracking in and out are completely suspended. So, the 5" thick multilayer glass panels that Carl [Giegold, of Threshold Acoustics] created to move with the gantries just skirt the floor. In consultation with Carl, the glass is great for supporting all the frequencies at the level of the orchestra.

“We also have a really well-organized grid over the entire space. You can walk around up there, which makes it a pleasure for the tech staff. In the grid is the machinery for the acoustic reflectors. When they have a program that doesn’t need them, they each can achieve a near-vertical position, so you can rig around them. We also have self-climbing trusses, located between the reflectors, that travel in and out with house lighting, concert lighting with moving lights, and conventional units for full room general coverage. The amount of coordination that we began at the earliest roof structural concepts was key to the theatrical function. We worked with Odeh Engineers and Magnusson Klemencic for an extraordinary level of tolerances.

“The seating is by Jezet, who created three retractable

Photos: Iwan Baan

Clockwise, beginning at top left: Renderings showing configurations for orchestral, experimental, recital, and end-stage theatrical presentations. A flat-floor configuration is available for special events.

systems positioned by their traction push units and deployed with Serapid rigid chain," Nishball adds. "All three can fit side-by-side and go down on a special stage transport lift for the flat-floor configuration." Gala Systems Inc. supplied the lifts plus the seating and orchestra wagons.

"The site is really constrained, so the building had to become very vertically oriented," Rosenburg says. "That was the only way to make everything fit. There's a storage level directly beneath the stage floor where the wagons, the cable racks, the dance floor, and the seats go. We did several versions of the storage map, showing how all this stuff would actually lay out. The three other rehearsal/performance spaces in the building are below the storage level."

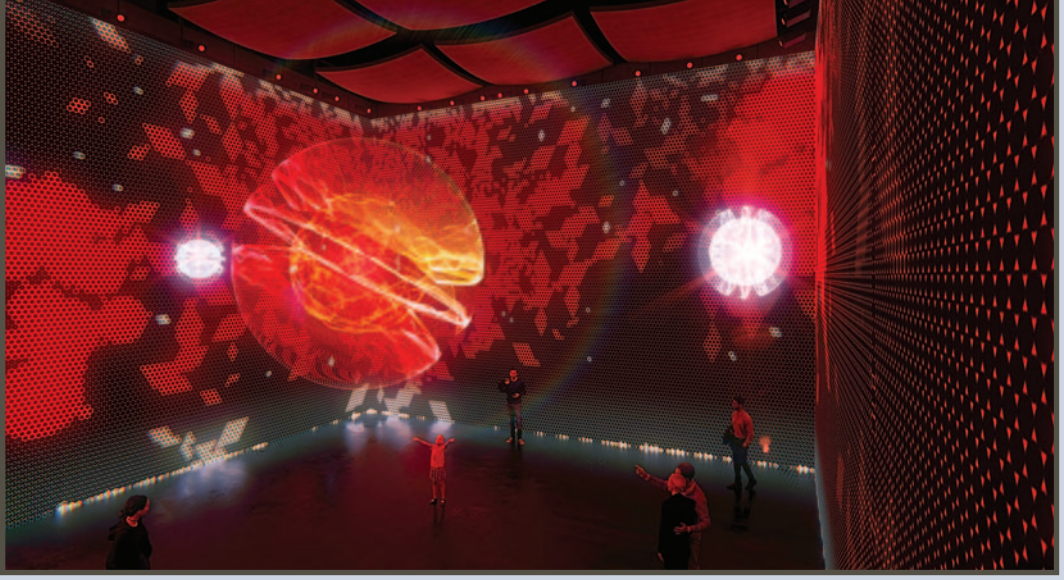
Rosenburg adds, "The lighting control package is by ETC, including an Apex 5 console; the other spaces in the building have Ions. There's a not-insignificant moving light package, consisting of High End SolaFrames, built into the trusses, which are the workhorses for the room. They're one of the ways they can quickly turn things around from one configuration to another. There's also a bunch of conventional units." The lighting inventory includes 120 ETC Source Four LED Series 3 units, four Chroma-Q Color Force IIs, 28 SolaFrames, and nine GLP impression X4 Ls. Gear was purchased from Supertech, Inc.; the consoles were obtained from Candela Controls.

Acoustics

Carl Giegold, owner of Threshold Acoustics, says that initial conversations with Ramus and the client focused on "varying the intimacy of the space and letting the acoustics derive from that. The gantries narrow the room from the side and reduce its length, making it the right size for what you want the performer-audience relationship to be. When you build a room that way, the acoustics follow along."

He adds that the BAI "was looking into the future in terms of interdisciplinary collaboration between experimental media, theatre, and music. We knew there was a strong need for a recital-sized room and a strong desire to have a dance and theatre-oriented venue as well. The typical model for designing a space like that is to make it enough for the biggest thing, and then put in movable reflectors and enough absorption to dry it up, so it works well enough for other uses. We talked about building the experience of the audience and performers around intimacy, and then varying it. That led to the idea of the gantries that narrow the room, making it the right size for each performance type.

"We did acoustic modeling to study the room in its various configurations," he continues. "We used MATLAB to study the diffusion of the sidewalls and the behavior of the ceiling reflectors as well as the behavior of sound wave fronts in the lower volume of the room. We also use Rhino and Grasshopper to analyze the coverage of the ceiling reflectors and the glass walls." Interestingly, he says, he was onboard with the use of glass. "It gives us variability. For example, in the recital hall configuration, there's enough acoustic communication with the remaining volume outside the recital setup that can keep the room much more reverberant than you would normally find. For a chorus program that might draw 300 or 400, it's possible



All images: Courtesy of REX

to keep the reverberance of the larger concert hall by not deploying any absorption and using the leftover volume beyond the recital hall." Sound locks are found in the four corners of the outer rectangular volume of the room.

Also, he notes, "There's a scrim on the inside that has very little acoustic effect and can be replaced by a heavy curtain to turn the glass off, visually and acoustically. That same curtain can be deployed on the other side of the glass; you still get the visual and acoustic reflections on the inside but no view to the exterior."

Overhead are the acoustic panels, a total of 40 in a five-by-eight grid, made of medium-density fiberboard. "They weigh about 900lb apiece; 16 are individually motorized to be adjusted for height and tilt. They can pan and tilt and roll for flexibility in configuring the ceiling. They can also lower down to 5' off the floor, for maintenance."

Rob James, also of Threshold, says, "The goal for the AV package was to be flexible to work in any of these given spaces and to be easy to use. One thing we worked on with Theatre Projects and Texas Scenic was to have loudspeakers on a track system that moves when the room shrinks, so the arrays don't have to be pulled down and rehung again for a new configuration. We also put in an ambisonic system with 45 channels of individually addressable loudspeakers that can be configured in a surround setup, creating an immersive audio experience. And we have infrastructure in place for an immersive video system."

The loudspeaker rig consists of d&b audiotechnik gear. "The main system is hung for the orchestra and recital configurations," James says. "The surround speakers are individually mounted point sources but the true ambisonic, spherical, individually assignable sound setup is in the experimental cube configuration."

The room's audio console is a Yamaha CL5. "They have a Yamaha-supported backbone, including Rio stage boxes, for the I/O that they need," James says. "The mix position is on a wagon system; once the seating comes up from the basement on a lift, the mix wagon is put into place. It can be one of three locations, or it can be in the booth," which is on the theatre's second level. Other gear includes a set of Shure ULX-D mics plus a set of room mics that can fly in as needed.

A digital projector is available for cinema-style presentations. "Because we couldn't choose a single projection location, we have rigging lines that come down and pick up the screen out of an in-floor location. You can position the screen wherever you want it." The AV installation was handled by Professional Audio Designs.

Rigging

The Lindemann was a massive installation project for the Texas Scenic Northeast office, the name of the former PDO. To wit: The company designed, engineered, and, with noted exceptions, fabricated the overstage rigging machinery, acoustic banners, and motorized wall equipment. There are 16 two-axis hoists and 32 three-axis hoists plus custom mule blocks and loft blocks for the acoustical panels. Three manually operated traveling light bridges (with extensions), manufactured by Hudson Scenic, are 59' 8" wide in their deployed position and 37' 6" wide when retracted. The utility batten and projection screen system features two 4-line hoists, custom loft blocks, custom battens, and line weights. A choir reflector

panel rigging system (with custom choir panel frame) features two 44" line shaft hoists (one for lighting and one for tilting), with custom loft blocks and an aluminum subframe, 58' 8" long by 2' 9" high, for the reflector's millwork. A utility truss system includes seven self-climbing hoists with 36'-long pre-rig trusses for moving lights and speakers and a truss-integrated track-and-trolley system for speaker chain hoists and cable reels for lighting power, data, and rigging control. The trusses are by XSF with cable reels by Gleason Reel. The grid system consists of 16 chain hoists, manufactured by EXE, and 16 custom chain hoist stands.

The acoustic banner system features 44 AcuRoll banners in heights ranging from 8' to 17' 7". The blackout curtain system, known as "the whoosh curtain," consists of four custom motorized curtain battens, which are 110' long on the north and south walls and 70' long on the east and west walls. Two curtains, supplied by Rose Brand, are mounted on each batten: one in black facing into the room and a custom-sewn gray version facing the exterior. Also, a system of curved tracks at all gantry balcony levels and gantry glass consists of 83 curtain panels, supplied, like the track, by Gerriets. The grid acoustics system features two 104'-long curtain tracks with curtains.

The motorized wall/seating gantry system is made up of ten custom steel carriages, or bogies, on rails to support five 330,000lb motorized gantries. The east wall travels 44' and the north and south walls travel 10'. The setup also includes custom trolleys and housings for the IGUS cable chains that provide power and control, as well as fire suppression, in the gantries. The bogies were manufactured by Benson Steel Fabricators with machinery by Serapid. The gantry pin-and-brace system includes eight motorized gantry pin devices, to lock gantries together in each configuration, and eight motorized gantry brace arms to dampen and resist gantry movement when in position.

The Texas Scenic team also integrated and installed a system of 14 drawbridges to allow access between gantries in each configuration; they were fabricated by Innovative Industries and designed by B2P2. A sophisticated Niscon custom automation system controls all the above moving elements, including Gala Systems stage and seat lifts.

The team also provided extensive electrical layout and coordination of 412 sensors: solenoid gate latches, guard rail sensors, fall hazard warnings lights, gate unlock buttons, gate lock indicators, light bridge detection, and klaxon lights. The devices were supplied by Niscon.

"Basically," Pook says, "the space has two cores at the east and west ends and the structure is suspended between, with clear glass all the way around. It's stunning but, because of it, the loads are tremendous. Then you've got the 330,000lb seating walls, one of which travels 44' to shift the size of the space from a rectangle to a cube.

"When Theatre Projects conceived the walls, they weighed 60,000lb. That's a no-brainer. By the time the architects and building engineers finished the design of the walls and the loads they had to carry, they were 330,000lb. That's train technology. We couldn't get anyone to design the bogie and track system for us. We were going into any industry we could find—railroad, airplane, aerospace. So, Tony designed it because he could; he was such a genius."

To move the walls, Pook says, "We have railroad tracks supporting pairs of bogies from which the walls are hung. We found Benson Steel Fabricators upstate, who introduced us to the heavy construction vendors from whom we bought the wheels, the bearings, the whole nine yards. Benson fabricated the bogies from ½" and 1" plate. Tony spent days with them, tightening their tolerances beyond their norm. Everything had to track perfectly, beyond what you can even imagine. Brian Fox, our senior installer, moved to Rhode Island and we started work even before the building topped out, leveling and shimming steel to bring it in line for our rigging equipment. He lived in Providence for two-and-a-half years."

The banner system, Pook adds, covers the various surfaces of the four walls. Regarding the "whoosh curtain" that covers the clearstory glass, she adds, "Josh Ramus' concept was to have beautiful gray curtains that resembled the pattern of the crenellation of the exterior's aluminum, all four sides traveling as one to expose the transparent main level."

And then, she adds, "There are traveling bridges that track the length of the space, with expandable platforms allowing access from all configurations, that meet up with interlocked gateways, so you can't walk off the edge of a wall and fall 40'."

Other spaces

Below street level are three spaces designed for music, theatre, and dance. Each includes a control room and customizable performance equipment, allowing it to function as a studio, classroom, or performance space. The largest, used for orchestra, chorus, and other rehearsals, can double as a 165-seat performance venue for smaller musical and theatrical ensembles. A movement lab—with sprung floors, a mirror and barre along one wall, and adjustable curtains—can seat up to 110 for performances. (A Harlequin dance floor is included.) The performance lab can be used as a 50-seat black-box theatre, with walls and floors made of sacrificial materials that can be painted, drilled into, and otherwise customized.

Interestingly, Ramus notes the rarity of working with an entity "that had so little hierarchy. We would meet with the university's president, the provost, the chancellor, and the board; we'd have discussions, and they'd approve or reject ideas on the spot or set them for review a couple of weeks hence." Adding that he expected to deal with a bureaucracy, he notes, "That sort of clarity and speed of decision-making was really a pleasure." Again, flexibility was the key, in more ways than one.