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# Auditoria

Annual 2018

Also inside:

**Shaped by sound**

Voxman Music Building

**Middle Eastern promise**

Dubai Opera House

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Copenhagen's Royal Arena

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## Art in Athens

Stavros Niarchos Foundation Cultural Center



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## foreword

Every now and again, usually around press week, I like to kid myself that my job is frightfully important and terribly stressful. However, in the past year I've been talking to a number of CEOs and managing directors at performing arts venues and opera houses about overseeing the opening of new buildings, or managing extensive renovation projects. Let's just say that it's been something of a humbling experience.

One particular exchange that, sadly, we didn't have space for in the resultant feature took place during a conversation I had with Louise Herron, the chief executive officer of the Sydney Opera House. This world-famous building – one of the most iconic opera houses on the planet – is undergoing a renovation project of epic proportions, and as the person charged with managing the process, you'd expect Herron to be feeling the pressure. "I feel a massive sense of responsibility to not let this devolve into another drama," Herron admitted when we spoke – after all, it's fair to say that the Sydney Opera House has had its detractors over the years. "We have 26 million stakeholders in Australia because it's the national symbol of our country."

The renovation, which will cause substantial upheaval to the venue itself and will affect the artistic, touristic and local communities, won't be quick either. Herron, however, in what I quickly realized during our interview was typical fashion for her, sees the positive side. "It's a massive privilege," she said. "We say that the opera house is the body, and everything that goes on here is the beating heart. If you look at our World Heritage listing, it says that we're a masterpiece of human creative genius. Last week we had Joshua Bell here playing Tchaikovsky on a Stradivarius – so you have a genius using a genius's violin to play a genius's music. You have all these geniuses unifying under one roof – the magic is immense. That's the responsibility I feel. How do we do all of these renovations so that the opera house hasn't yet seen its finest days?" You can read more from Herron and several of her peers in our feature on page 26.

Elsewhere in this issue, you'll find fascinating articles on the Voxman Music Building in Iowa, the Royal Arena in Copenhagen and the Dubai Opera House, plus we've looked at the sophisticated simulation and modeling tools helping designers, acousticians and lighting specialists to realize evermore ambitious new projects. If that wasn't enough, you'll also find a host of case studies from leading companies in the industry, demonstrating everything from multifunctional acoustic design, complex stage machinery and venue lighting upgrades, to multidisciplinary architecture, new appointments and innovative theater seating. Enjoy the issue.

Matt Ross, Editor

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The newly opened Concert Hall of the **Voxman Music Building** at the **University of Iowa** features a suspended "theatroacoustic" ceiling that unifies acoustics, lighting and life-safety into a dramatic, multi-functional architectural expression.

© Tim Griffith

## CELEBRATING INNOVATION, COLLABORATION AND ACOUSTIC EXCELLENCE

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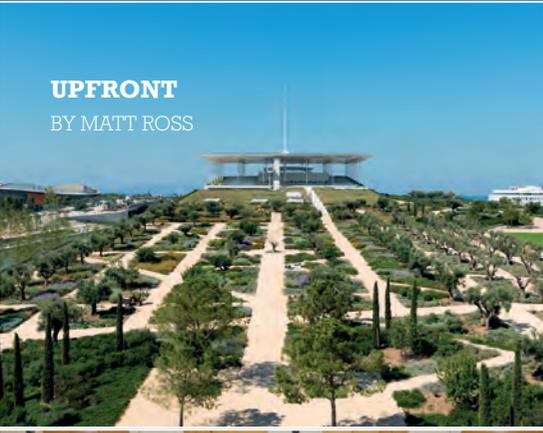
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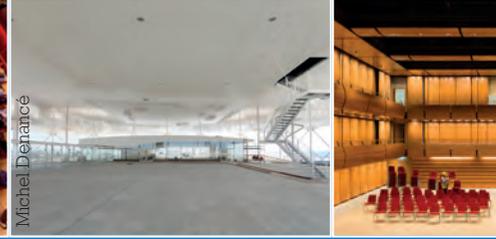
**UPFRONT**  
BY MATT ROSS



Michel Denancé



SNFC/George Dimitrakopoulos



Michel Denancé



Michel Denancé

Images: SNFC/Yiorgis Yerolymbos unless otherwise stated

# Auditoria loves...

...the Stavros Niarchos Foundation Cultural Center – the new home for the National Library of Greece and the Greek National Opera

**L**ocated in Kallithea, 2.5 miles south of central Athens, the new Stavros Niarchos Cultural Center serves as a striking example of successful redevelopment. Formerly the site of a parking lot from the 2004 Summer Olympic Games, and once the home of a racetrack, the project now houses the National Library of Greece and the Greek National Opera. The two institutions are combined into a single building, which sits in a landscaped park of almost 1,830,000ft<sup>2</sup>.

One of Athens' earliest seaports, Kallithea has always had a strong relationship with the water. Prior to the construction of the Cultural Center, however, views of the sea had been lost. To counter this, a hill was created at the southern end of the site, with a sloping park leading up to the new building. The project was designed by international architecture practice Renzo Piano Building Workshop.

The opera wing of the building features two auditoria – a 300,000ft<sup>2</sup>, 1,400-seat venue for staging classical ballet, symphonic music and traditional opera; and a smaller, 400-capacity space for experimental performance, ballet, children's opera, theater and music. The smaller auditorium has no fixed seating, providing an extremely flexible layout. The opera house will play an important role in the organization's educational and outreach programs, and will host lectures, seminars and other events.

The exterior design of the Stavros Niarchos Cultural Center is dominated by the large canopy roof, under which sits the glass-walled library reading room. Concrete walls, six stories high, dominate the design of the lobby – intended to create the sensation of being inside a quarry – and the main opera block features several suspended light balconies, enabling daylight to penetrate into the structure. ■

**In 2009, the Stavros Niarchos Foundation – the charity set up after the death of Greek shipping magnate Stavros Niarchos – agreed to cover the cost of building and equipping the Cultural Center. The total project cost was €630m, and the SNF's donation is the largest single outlay in the foundation's history**

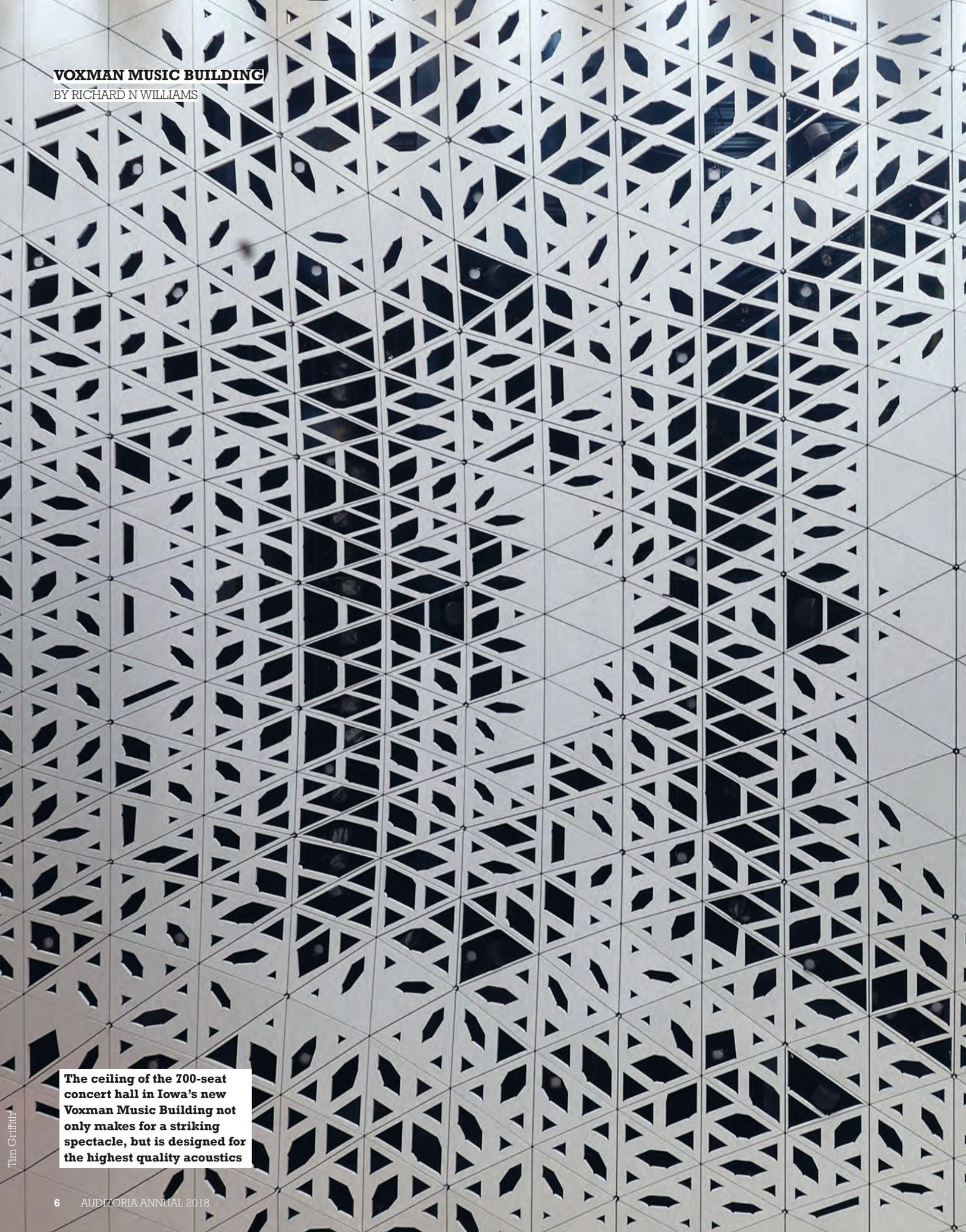


Michel Desjarncé



SNFCC/George Dimitrakopoulos





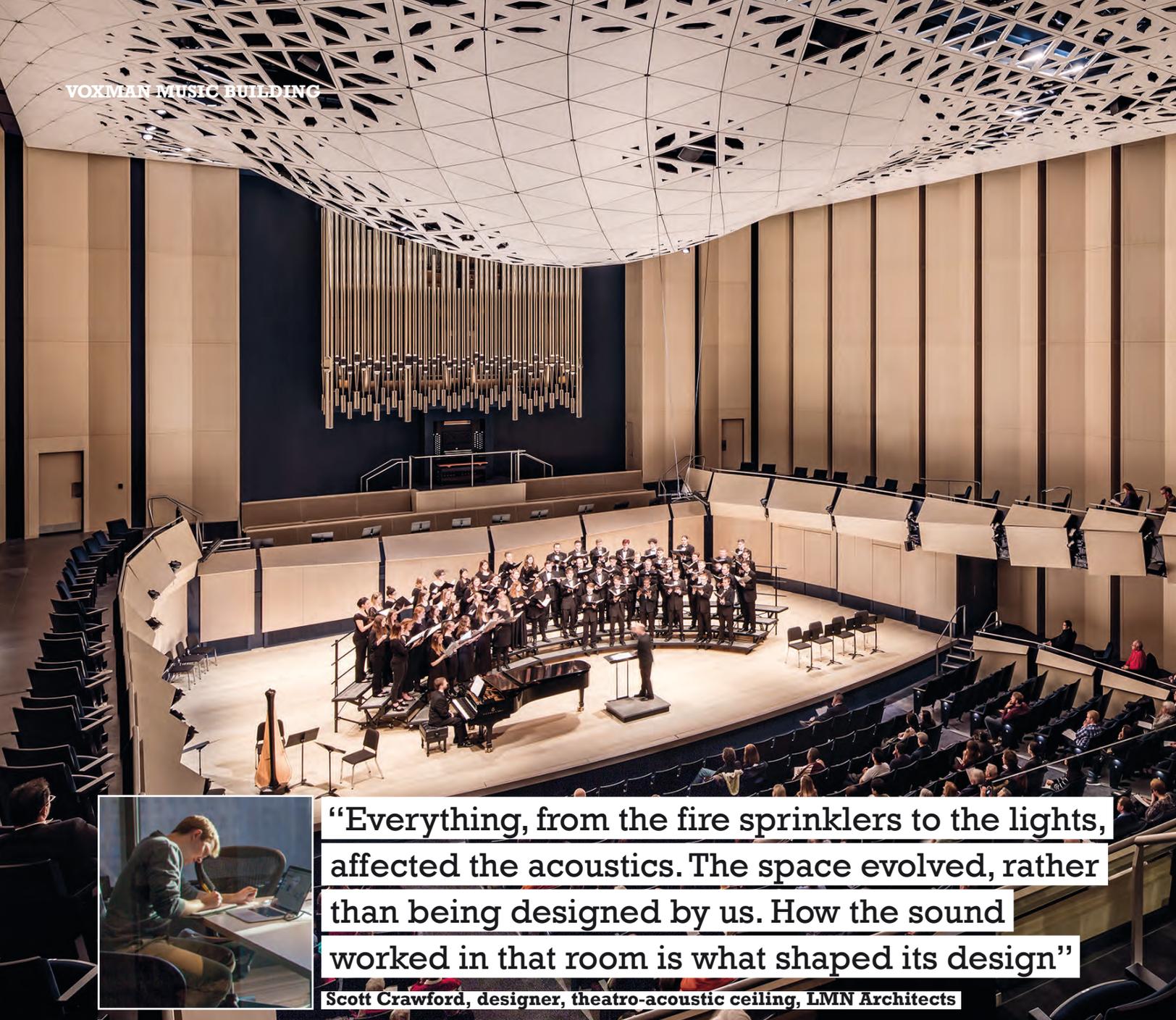
**VOXMAN MUSIC BUILDING**

BY RICHARD N WILLIAMS

**The ceiling of the 700-seat concert hall in Iowa's new Voxman Music Building not only makes for a striking spectacle, but is designed for the highest quality acoustics**

shaped  
by  
sound

A new music building in Iowa kept acoustics at the forefront of design decisions



**“Everything, from the fire sprinklers to the lights, affected the acoustics. The space evolved, rather than being designed by us. How the sound worked in that room is what shaped its design”**

**Scott Crawford, designer, teatro-acoustic ceiling, LMN Architects**



**Above: The ceiling of the concert hall at the Voxman is completely covered with an acoustic reflector. This meant that every input into the space had an effect on the sound**

Sitting proudly in downtown Iowa City, the University of Iowa’s new school of music was built to provide a connection with the students and the city, but the building’s design is as much shaped by the acoustic requirements and needs of the musicians as it is the architect’s pen.

The University of Iowa has had a renowned school of music for over a century, but in recent years the institution has not had a building to match its reputation for training musicians.

“We used to be in a big, brutish structure close to the waterfront, but in 2008 we had a flood and it completely destroyed most of the structures in the arts campus including our school of music,”

says David Gier, director at the University of Iowa’s School of Music.

“Between 2008 and 2016 we were scattered around the campus in up to 17 locations. These spaces were okay in themselves, but we needed to have everything together under one roof, and we also needed to have proper acoustic spaces, especially for our concert hall.”

The school – which teaches 450 music majors each year, with a further 2,000 students taking various music subjects – hosts more than 300 public events annually. So the decision was taken to build a specific building for the music school.

“Through 2008 and 2009 we were deciding on the direction we wanted to go,” recalls Gier.



Photos: Tim Griffith

VOXMAN MUSIC BUILDING

LMN Architects

“We decided that, rather than go back to the same area, we wanted to place the school of music downtown. We could see the potential of connecting the school with the community and city life, because connecting with your audience is critical for musicians.”

The whole process, Gier notes, took six years, but first they had to find the right architects.

“LMN came on board in late 2009, early 2010,” he explains. “We chose them because they could see exactly the vision we had for the building.”

**Connected to the city**

“They wanted a building that would be much more connected to the community,” recalls

Stephen van Dyck, project designer for LMN Architects. “That was great for us because we are used to building in urban areas. But that was it. There was no aesthetic brief. No expectations as to what it should look like. That’s pretty unique. So for us they were the perfect clients.”

The building, which was to be named after Himie Voxman (the school’s director of music from 1954 to 1980), was to cost US\$152m and would take three years to design and three years to build.

The resulting Voxman Music Building is a striking glass-cornered structure with a second floor – home to the school’s two major performance venues: the 700-seat concert

Clockwise from top right: **The practice room; The Voxman was to cost US\$152m; the school teaches 450 music majors and 2,000 other students each year**

Below: **Parts of the building overhang the street outside**



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“To get all the spaces we needed together on the same level, namely the concert hall and rehearsal hall, we came up with this cantilevered second floor”

Stephen van Dyck, project designer, LMN Architects

hall and a 200-seat recital hall – that partially overhangs the South Clinton Street sidewalk. That overhang is wrapped in a unique, shingled-glass wall system.

### Street smart

“We decided early on that we needed to include a high level of transparency,” explains van Dyck. “It is actually something we do a lot with our buildings, and in this case it was critical for people inside to have a sense of place and for people on the outside to feel connected to what is going on inside.”

The biggest challenge, van Dyck explains, was to get 186,000ft<sup>2</sup> of spaces into this urban site. “To get all the spaces we needed together on the same level, namely the concert hall and rehearsal hall, we knew straight away that we would not have the capacity with the footprint we had, so that is why we came up with this cantilevered second floor.”

Extending beyond the boundary of a building’s footprint, as van Dyck explains, isn’t an approach suited to every project. But in the case of the

## Cast list

**Design Architect:** LMN Architects

**Associate Architect:** Neumann Monson Architects

**Construction Management:** Mortenson

**Acoustic and AV Design:** Jaffe Holden

**Theater Planning:** Fisher Dachs Associates

**Lighting Design:** Horton Lees Brogden

**Structural Engineering:** Magnusson Klemencic Associates

**Mechanical/Electrical/Plumbing Engineering:** Design Engineers

**Energy Analysis:** The Weidt Group

**Civil Engineering:** Shive-Hattery

**Landscape:** Confluence

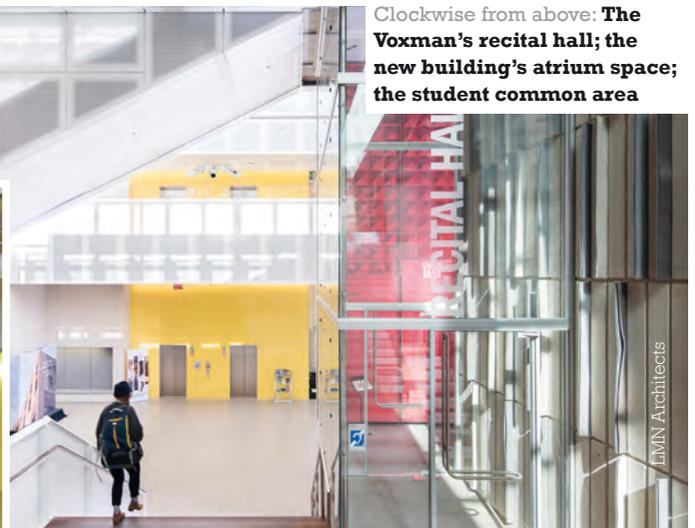
**Graphics:** Pentagram

**Vertical Transportation:** Lerch Bates

**Life Safety/Code:** T.A. Kinsman

**Cost Estimating:** Rider Levett Bucknall

Clockwise from above: **The Voxman’s recital hall; the new building’s atrium space; the student common area**



## VOXMAN MUSIC BUILDING



Voxman, the cantilevered design benefits the building as a whole.

“If this were a commercial building then I think we would have to have stayed within the confines of our footprint. As it is, the overhang now provides shelter for those on the sidewalk and allows the building to project itself. It gives it more presence.”

### Acoustic isolation

The project, van Dyck admits, also presented a myriad of other challenges, not least creating the right acoustic isolation – a design element that would push the architects significantly.

“The construction topology was a challenge. To isolate acoustics, we knew this building would have to have a lot of mass. That meant it would have to be built using concrete,” van Dyck recalls. “There were also a bunch of conditions for the different spaces. We wanted a lot of natural light in the concert hall on the second floor, but we didn’t want the sound of 18-wheelers running up and down the street to be heard inside.”

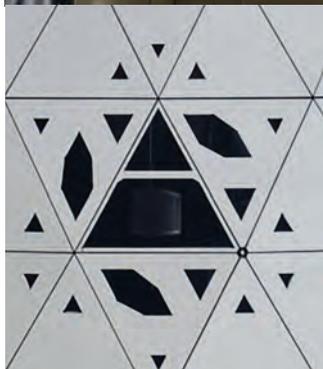
LMN overcame this hurdle by using very tall, but narrow, windows – up to 45ft high, but only 1ft across. This enabled the glass panels to be stiffer, and required less overall glass to make the panes soundproof.

Another impressive feature of the Voxman Music Building is the way it is lit, not least in the case of the 200-seat rehearsal room – and there were acoustic challenges there too.

**Above: The Voxman building also features an organ hall**

**Below: A mock-up of the venue’s concert hall ceiling**

**Bottom: Aspects of the venue house and stage lighting, fire safety, speakers and acoustic transparency have informed the concert hall ceiling design**



“With the rehearsal room, we wanted it to be more connected to the community, to give the musicians a sense of an audience. So we now have this glowing red room that you can see from the sidewalk,” explains van Dyck. To create this effect for passers-by, the room did require a large window, which created other challenges.

“It has a huge window, 40ft tall, 40-45ft wide, made up of 12ft panes,” continues van Dyck. “But this wasn’t conducive to the acoustics, so we got around that by building a diffuse wall opposite.”

The acoustic challenges, recalls LMN’s Scott Crawford (the designer of the teatro-acoustic ceiling), didn’t end there.

“It was very difficult to isolate all the rooms on the same floor. One of the challenges was that the people constructing this building were not used to building acoustically isolated structures, so they did not know about the different building aspects like pouring in second slabs of concrete or layering gypsum board,” Crawford explains. “It was very tricky to draw but even harder to relay all this to the people building it, so we crated videos and virtual and physical mock-ups so that all the subcontractors and craftspeople knew how and why these things had to be done.”

Crawford is particularly proud of the Voxman’s concert hall, which features a ceiling completely covered in an acoustic reflector – something that is rarely done – which meant every input into the building altered the way the sound behaved.

“Everything that we installed, from the fire sprinklers to the lights, affected the acoustics, so it all changed the design,” explains Crawford. “In other words, the space evolved, rather than being designed by us. How the sound worked in that room is what shaped its design.”

The Voxman Music Building opened in 2016, and Gier couldn’t be happier with the result.

“It has exceeded our expectations,” he says. “From the point of view of acoustics, the isolation is magnificent. Hundreds of musicians can now operate in complete acoustic isolation. The generous public spaces and social areas really support our engagement with audiences, and are places where faculty and students can interact.

“The light in the building is excellent, both the natural light and the way it is lit inside. Many music buildings are too dark, as the architects just focused on sound. But our architects created a very light-filled building.” ■

### Author

Richard N Williams is a UK-based freelance journalist who contributes to a number of titles

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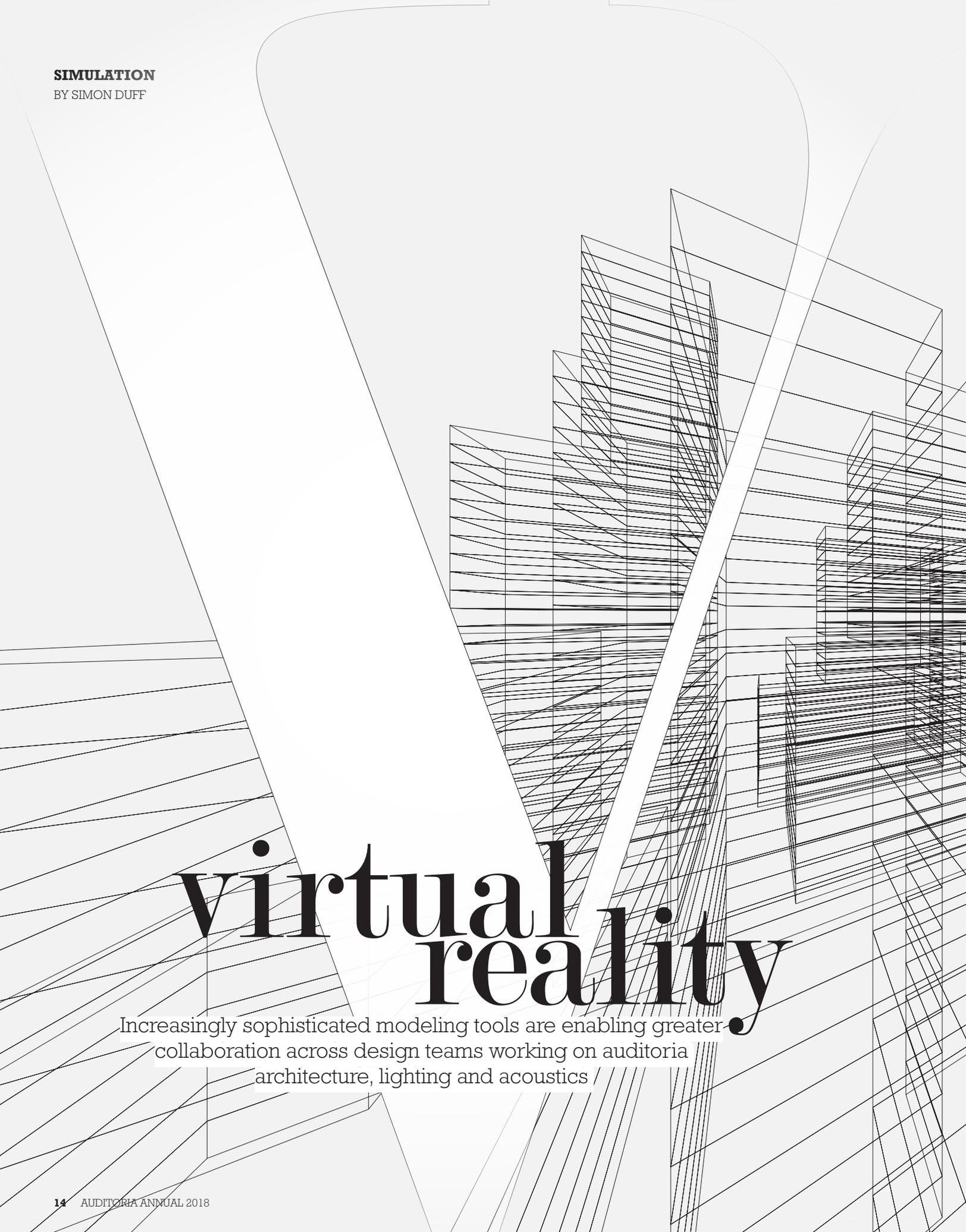
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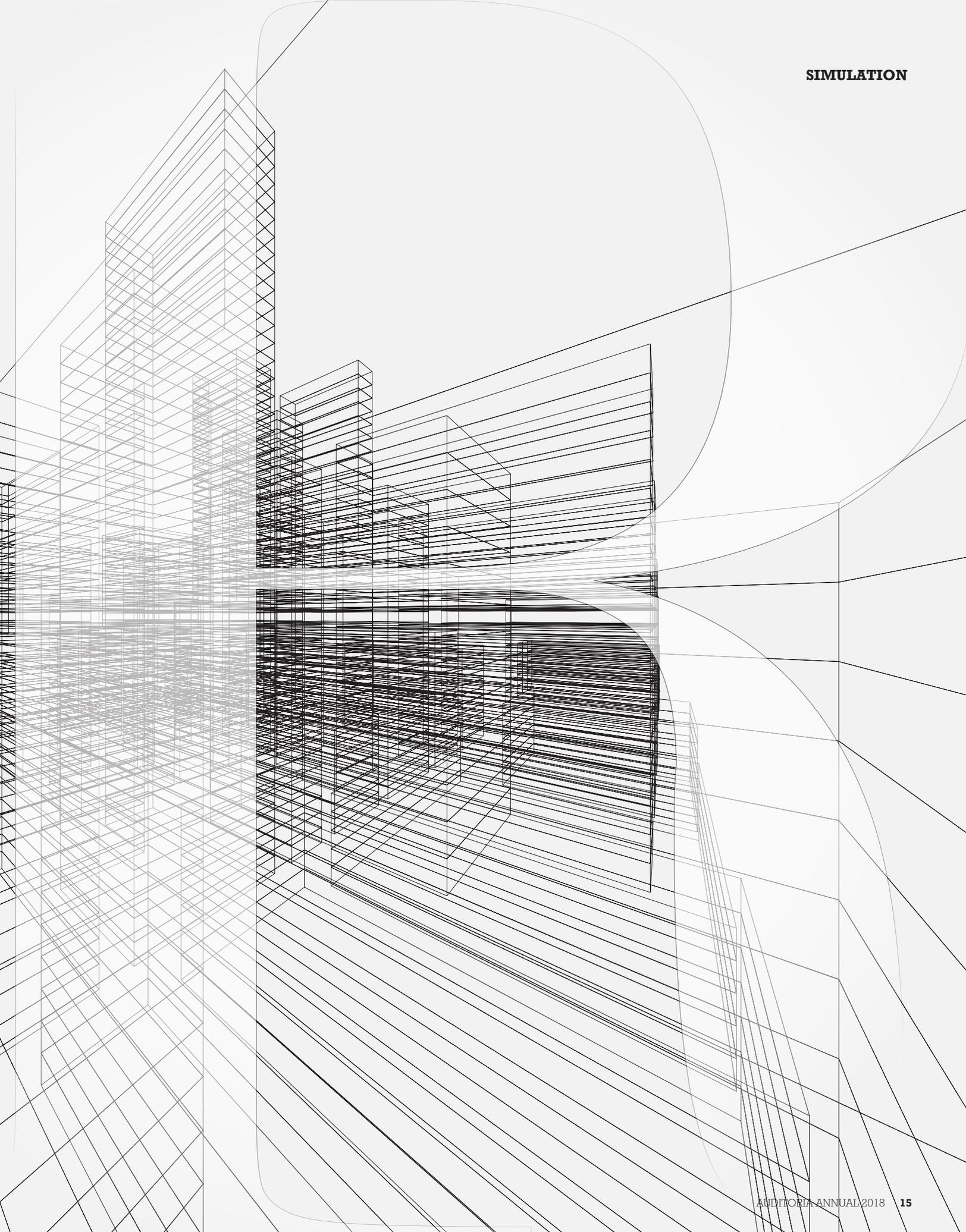
**SIMULATION**

BY SIMON DUFF



# virtual reality

Increasingly sophisticated modeling tools are enabling greater collaboration across design teams working on auditoria architecture, lighting and acoustics /





This page: **The modernization of the Martin Luther King Jr Memorial Library benefited from collaboration made possible by a shared platform. Images: Martinez+Johnson Architecture/Mecanoo**

**T**he introduction of Autodesk's AutoCAD in 1982 transformed modern architecture. The program still dominates design, not just for architects, but also across a range of industries, from moviemaking to product and show design. The cutting edge in 2017, for modeling, lies both in the development of building information modeling (BIM) and the rise in virtual reality – technologies that are fast becoming essential for evaluating how buildings will function, and as risk factor analysis tools.

#### **An ideal platform**

Washington DC-based architects Martinez + Johnson specializes in performing arts buildings, and uses Autodesk's Revit as its primary design tool, with the software supporting workflow from concept through to construction. One of the firm's current projects is the modernization of the Martin Luther King Jr Memorial Library (MLKML) in Washington DC. The 400,000ft<sup>2</sup> steel and glass structure, designed by famed modernist Ludwig Mies van der Rohe, is a rare example of modern architecture in the US capital and was designated a historic landmark in 2007.

Martinez + Johnson and Netherlands-based architects Mecanoo, which also uses Revit, are design partners on the US\$208m project, due for completion in 2020. Joint ventures such as the library are common for Martinez + Johnson, and require a collaborative design platform. "Collaboration using Revit was like a dream come true," says Kal Houhou, director of technology at Martinez + Johnson. "As soon as we began using it, we knew it was going to revolutionize our collaborative design process. Our distributed design team, as well as staff working remotely, need 24-hour access to Revit design models."

In mid-2014, Martinez + Johnson began investigating cloud collaboration strategies for the MLKML project – in particular, ways to provide shared access to Revit models without a heavy IT cost and burden. Around this time, Autodesk announced a new cloud-based collaboration service – Autodesk A360 Collaboration for Revit. Martinez + Johnson became one of its first users.

#### **The rise of VR**

As immersive technology becomes increasingly popular at the design stage, a number of new

**"AGI gives foot-candle readings, so it can be very helpful, especially in a theater where you are dealing with a variety of ceiling and floor elevations in the same room"**

**Paul Whitaker**, senior lighting designer, senior theater consultant, Schuler Shook





companies are creating virtual reality software tools for the architect. One such company is IrisVR, based in New York, which has created software intended to empower end users to experience depth and scale. Two IrisVR software solutions are available – a desktop app, Prospect, and a mobile app, Scope. On both platforms, users simply import their 3D files into the software and get quick results, using a head-mounted display such as the Oculus Rift or HTC Vive. IrisVR currently supports Revit, OBJ, Rhino and SketchUp file formats.

Arup is another company making big strides in the use of VR, and has developed its own virtual reality headsets, used to help clients see, hear and move around virtual architectural and infrastructure environments. The in-house headset integrates high-resolution 360° viewing and noise-cancelling headphones, and uses a Leap Motion sensor. This scans users' hands, making it possible for them to interact with objects in virtual environments. Arup's visualization team uses these headsets alongside green screen image technology, 3D CAD models, panoramic visual recordings and audio techniques to create immersive design models.

### Lighting the way

Architectural lighting has also been transformed by increasingly sophisticated modeling at the design phase. Schuler Shook is a theater consultancy and architectural lighting designer based in Chicago and Minneapolis, and makes use of a range of programs. For drafting and layouts, either AutoCAD or Revit are used, depending on the architect's choice and the electrical engineer's preference. Schuler Shook

## AVOIDING COMPROMISE

Diamond Schmitt Architects (DSA) is currently working on the design of The Buddy Holly Hall of Performing Arts and Sciences in Lubbock, Texas. There are two major design challenges. First, the extreme climate in West Texas, which ranges from snow and ice to dust storms, floods and tornadoes. Second, acoustic requirements for the 2,300-seat room, which must accommodate unamplified classical and band music, as well as amplified pop and Broadway musicals.

Multipurpose halls are typically a 'jack of all trades, master of none' in the theater world, adequate for a range of presentations but typically lackluster in any one form. The DSA team, led by principal and project architect Matthew Lella, decided this wasn't good enough to showcase the depth and diversity of the arts scene in Lubbock. He comments, "We wanted no compromises in any of the modes. On the one hand, the symphony hall deserves a top tier natural acoustic, and on the other, the venue should also feel natural as an amplified 'house of blues' room with a flat floor."

DSA's team adopted this 'no compromise' ethos to its work tools, and a collaborative, shared Revit model in AutoCAD A360 enables a geographically separated design team to benefit from a BIM setup that integrates all disciplines.



## SIMULATION



Clockwise from above: **The Smart Financial Centre in Houston, Texas; Arup has made significant advances in simulating acoustic setups; SoundLab facilities make it possible to preview sound setups before construction has begun; The future of acoustic modeling could enable teams to listen to acoustic behaviors even as spaces are being designed; L-Acoustics' Soundvision software makes it possible to trial different speaker placements within 3D space**



**“We started off with eight loudspeakers and one subwoofer. We now use 18 loudspeakers plus four subwoofers, currently all Genelec studio monitors”**

**Raj Patel, principal and global leader of acoustics, Arup**

uses Lighting Analysts' AGI program to help determine the spacing and layout of general lighting, as Paul Whitaker, senior lighting designer and senior theater consultant explains.

“AGI gives foot-candle readings, so it can be very helpful, especially in a theater where you are dealing with a variety of ceiling and floor elevations in the same room. Being able to model the lighting and foot-candle levels for, say, the balcony and the main floor allows us to balance the levels by choosing appropriate lumen packages for different ceiling heights.”

“AGI also has a visual modeling component,” Whitaker continues. “It is very helpful to see how the lighting will look in the room. Is there scalloping on the walls? Are we not washing the walls well enough? AGI provides a simple way to see this. We occasionally use this for final renderings. For more advanced modeling and finished rendering, we are using Thea Render. It takes a Sketchup model, or other 3D model, and enables us to integrate with lighting. It seems to provide the most accurate renditions of lighting and is easy to manipulate.”

A recent Schuler Shook project – a collaboration with Martinez + Johnson – is the Smart Financial Centre in Houston, Texas, which opened in January 2017. “We used many of the programs

above to determine the layout of the architectural lighting,” says Whitaker. “We provided some early renderings and visualizations of our own to communicate the lighting to both the architects and the owners. This was done with Revit, Thea and Photoshop. For the finished renderings, created by Martinez + Johnson, we worked with them to make sure they had the right types of fixtures in their model, and that the renderings accurately illustrated what we thought the lighting would look like.”

### Hearing things

In the past 60 years, acoustic design has grown in prominence – on many new concert hall projects, the acoustician is appointed ahead of the architect. Raj Patel, principal and global leader of acoustics at Arup and based in New York, has helped the practice's acoustics division gain a reputation as one of the largest and best-respected consultancies in the industry, employing over 100 acousticians in 13 offices around the world. Recent projects include Stormen Kulturkvarteret in Bodø, Norway; National Sawdust in Brooklyn, New York; Northrop Auditorium at the University of Minnesota in Minneapolis; and the San Francisco Museum of Modern Art and the Diane B Wilsey Center for Opera in San Francisco, California.

A major part of Arup Acoustics' current practice is the pioneering use of auralization (the sound equivalent of visualization) as a design and demonstration tool. Arup's SoundLabs in New York, London, Glasgow, Melbourne, Hong Kong and Singapore are enabling clients and designers to 'listen' to rooms and other aural environments before they are constructed. The purpose-built labs are all acoustically isolated floated rooms, with acoustic treatment, a large projector and

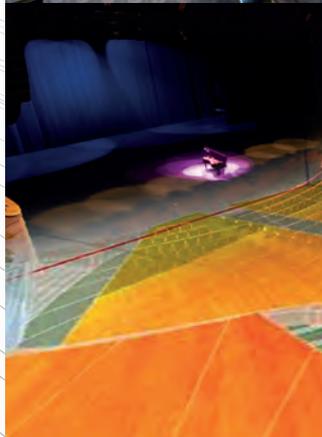


screen, and client facilities. They feature an Ambisonics surround-sound system – a series of loudspeakers arranged on a sphere – to replay calibrated simulations. Over time, Patel and his team have increased the number and quality of loudspeakers used, enabling higher spatial resolution of the reproduced sound field.

“We started off with eight loudspeakers and one subwoofer,” Patel explains. “We now use 18 loudspeakers plus four subwoofers, currently all Genelec studio monitors. VR, using Oculus Rift, and AR technologies are also available in each SoundLab, offering a greater level of immersion into multidisciplinary environments. In terms of software, we use Odeon for acoustic modeling and EASE for loudspeaker prediction. CATT is used for room acoustics prediction and auralization and Arup has also developed a number of in-house modeling tools. We have also undertaken a series of recordings, both of speech and music, in the anechoic chamber at Eero Saarinen’s Bell Labs building in Holmdel, New Jersey, for use in the SoundLabs.”

The New York SoundLab includes a wave field synthesis (WFS) system. A rapidly developing technology that enables immersive and accurate sound field reproduction, it will soon be replicated in all the SoundLabs. Separate to the Ambisonics system, WFS uses 32 JBL loudspeakers in a continuous horizontal line on all four sides of the room plus four subwoofers.

Once an acoustic has been designed, choosing the right loudspeaker system can be the first step even before construction begins. This too can be modeled, and many leading loudspeaker developers have their own software packages to model how their products will perform. One of the leaders in the field is L-Acoustics,



whose Soundvision application is dedicated to the acoustic and mechanical simulation of the company’s systems. Soundvision enables the prediction of direct SPL and audio coverage quality of any space in 3D. The customizable user interface features drag-and-drop speaker placement, which makes it simple to try out different design solutions. The software gives free field mapping of a wide bandwidth, including low frequencies. This means designers can sample a range of system uses, from speech through to dynamic music. Each design is accompanied by a detailed mechanical report, complete with rigging and safety information.

In the future, Patel believes acoustic modeling tools will become faster and more compatible with 3D design software. “Already in a version we have created you can hear the results of changes instantaneously. So very soon anyone working in 3D or BIM environments, will be able to listen to spaces in real time as they are designing. While that will be a great plus, it will also require great diligence from all parties. Accurate information on acoustic performance of materials will have to be in the models at the earliest stages.”

Simulation and modeling present opportunities for ever more ambitious architecture, lighting and acoustic design, enabling multiple parties to interface via compatible platforms. On large projects, agencies that are able to bring all the models together, to ensure accurate flow, will be the ones that will find themselves increasingly sought after. These players will be able to coordinate extensive projects in which design changes can be implemented across the board as quickly as possible. ■

#### Author

Simon Duff is a music and architecture journalist and broadcaster

**DUBAI OPERA HOUSE**  
BY ADAM GRUNDEY



The story behind Dubai Opera House, the emirate's shape-shifting cultural hub



Photos: Dubai Opera unless otherwise stated

## DUBAI OPERA HOUSE



**The Dubai Opera House, which opened in 2016, represents an important milestone in the cultural development of the emirate as a truly global destination**



Over the past 45 years, since the formation of the United Arab Emirates, few places have made such a concerted effort to establish themselves in the ‘great global city’ category as Dubai. It holds – or has held – records for the world’s tallest hotel, the world’s highest hotel, the world’s tallest building and the world’s largest shopping mall, among a host of others. But, according to Jasper Hope, chief executive of Dubai Opera, some people look for more than ‘just’ great hotels, beaches and shopping malls. “My personal view,” he explains, “is that you cannot be a truly great global city if you don’t have a cultural offering.

“If you look at what has been built and what’s been achieved [in Dubai], it’s quite phenomenal,” Hope continues. “But cultural buildings have not – probably quite rightly – been at the forefront of the plan of what is needed. But after 45 years, with around two million people living here, a huge range of incredible businesses, and as a destination for millions of tourists a year, you need to start to have places that represent culture.”

This also explains why Hope believes that the eight-month-old building in which we’re meeting – Dubai Opera House – is such an important milestone in the emirate’s development. And it’s important not just because of what it is, but also where it is. The building sits in the center of what is reportedly the most visited space on the planet: beside Dubai Mall and Burj Khalifa in Downtown Dubai – the signature project of local developer Emaar – which claims to attract more visitors per year than London’s Covent Garden or New York’s Times Square.

“There’s no difficulty getting people interested in coming to Dubai – it’s a fascinating, amazing

city – but if you want to get them to come professionally, rather than on holiday, you’ve got to say, ‘We have this facility for you to perform in,’” Hope explains. “The tech people on the shows I’ve got are the best, the artists are the best, the producers... everybody. They’ve been around the block a few times, and you can’t fob them off.

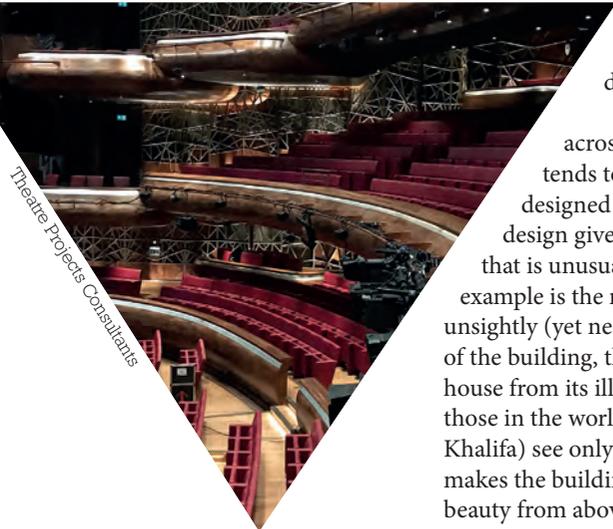
“So, I think Dubai needed this,” he adds. “And it had to be slap-bang in the middle. It just had to be, given the importance that so many people put on culture and art and music within their lives.”

### Dhow business

The man charged with designing Dubai’s new cultural center was Danish architect Janus Rostock of Atkins. His graceful, sleek design is based on the dhow – the wooden boat that first helped transform Dubai into a trading hub, and an important part of the city’s heritage. The curved, mainly glass exterior – which consists of 1,710 individual façade and mullion sections, 1,270 glass panels and more than five miles of shading louvers – allows passers-by to look in to the 360° lobby and, particularly in the evenings, creates a sense that there is no border between the building and the public area surrounding it (known as the Opera District).

As Rostock explained in a 2016 article, “Guests will make a processional walk across the plaza to the lobby doors, creating a ‘theater of people’ surrounding the building.” Once inside, in keeping with that theme, the audience “become performers for residents and visitors of the neighborhood”. Rostock also stressed the fact that his design kept the building to a human scale – an important facet of Scandinavian architecture that is “based on the idea that people are able to better interact with the urban environment when





Theatre Projects Consultants

This page and opposite:  
**The Dubai Opera House is capable of hosting a wide range of performance types, thanks to the venue's multipurpose design and adaptable stage technology**

it is based on their own physical dimensions and capabilities”. This human scale isn’t common across the Dubai landscape, which tends to feature monolithic structures designed to dwarf onlookers. Rostock’s design gives Dubai Opera House a subtlety that is unusual for the region in general. One example is the roof. Rather than keeping any unsightly (yet necessary) machinery on the top of the building, those looking down on the opera house from its illustrious neighbors (including those in the world’s tallest building, the Burj Khalifa) see only a smooth façade – a ‘skin’ that makes the building, as Hope puts it, “a thing of beauty from above as well as from the sides”.

**Multiple modes**

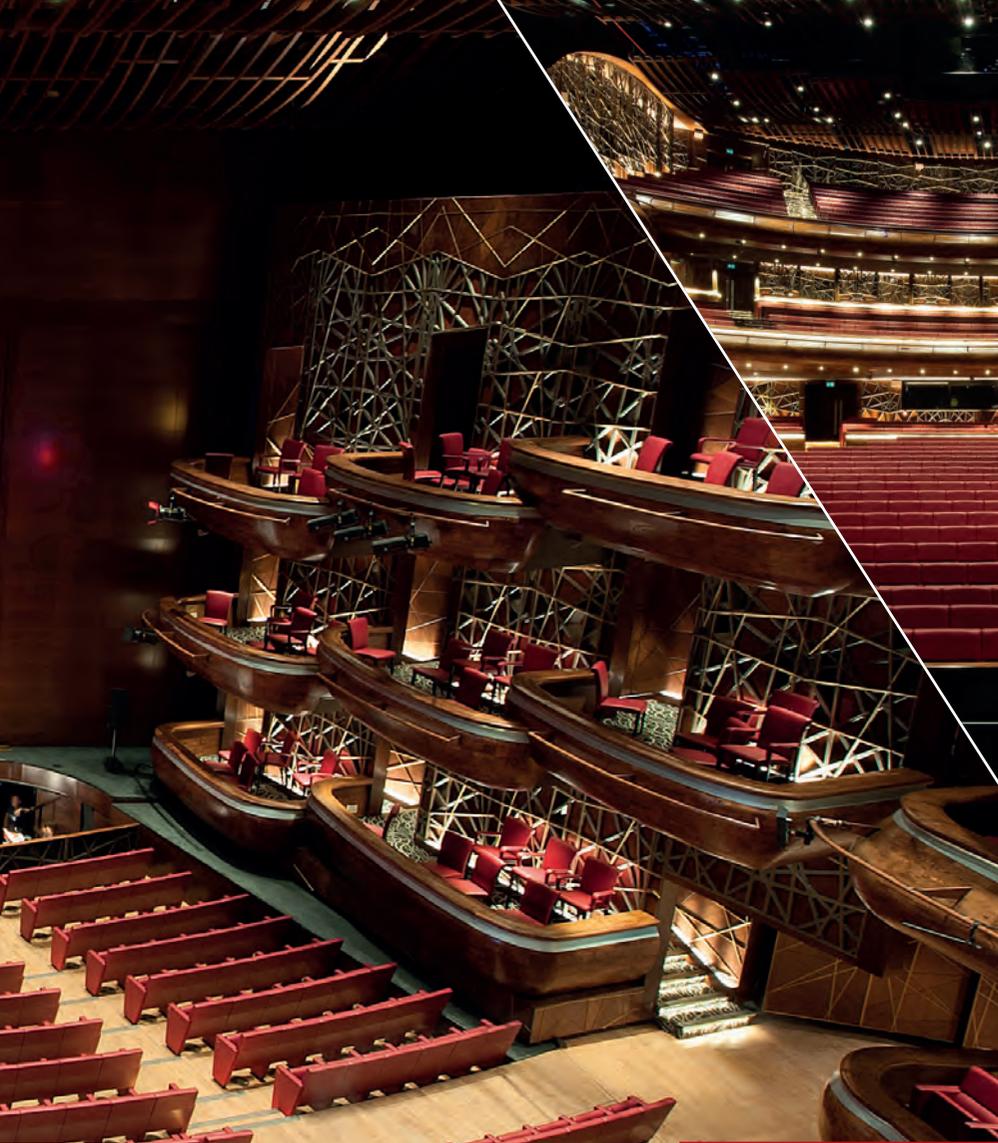
In keeping with that subtlety, the truly innovative aspects of the opera house’s design are hidden away – mechanisms that provide the freedom to reshape the interior space to suit whatever performance is taking place. This adaptability was a crucial part of Emaar’s brief to Atkins.

And since Rostock had not previously designed an auditorium, Theatre Projects Consultants was brought in as theater and acoustic expert.

“Eventually Dubai might develop specialist buildings for different types of performance,” says David Staples, principal consultant at Theatre Projects. “But in the short- to mid-term, the Dubai Opera, as the pre-eminent building, will have to house a wide range of events. This presented a considerable design challenge.”

To stage as wide a range of events as possible, Dubai Opera House needed to operate in three modes: theater mode for plays, operas, ballets and musicals; concert mode for amplified pop or rock gigs, or non-amplified classical recitals; and flat-floor mode for banquets, weddings, exhibitions and even sporting events (during Ramadan, Dubai Opera will stage a squash tournament, for example). And all three had to provide a world-class venue for the world-class performers Hope has successfully attracted.

“Historically, flexible rooms did suffer from compromises in acoustics, form, functionality or architecture,” says Staples. “But developments over



completely flexible; the stage aperture can be set to the width and height required (or made to disappear completely). Hinged boxes on the walls mean that, in concert mode, around 50 extra seats can be added as the arrangement is transformed from the horseshoe shape of theater mode, and an acoustic shell can be put in place around the stage so that the sound is projected toward the audience instead of escaping into theater mode's fly tower.

The truly remarkable feat of engineering, though, comes with the transformation into flat-floor mode. Hope was previously COO of London's Royal Albert Hall, and says that there were occasions when that venerable auditorium required a flat floor.

"We used to build a floor from the top of the rake, all the way across, braced underneath," he says. "It took a couple of days, hundreds of people..." So he's understandably enthusiastic about the ease with which Dubai Opera House can be reconfigured. The seating (designed by Italian company Poltrona Frau) is not set on a fixed rake. Instead, all 900-plus seats in the stalls are built on 34 motorized wagons. So, when necessary, those wagons can be moved onto a large transport elevator and relocated to the storage floors beneath the auditorium. That elevator, the two orchestra pit elevators and an equalizing elevator are then raised to stage level.

"And those eight boxes on the side that were hinged for when we need theater or concert mode? They rotate 180° on a central pivot and go back into the wall when we go into flat-floor mode," Hope explains, meaning the whole auditorium is transformed into a smooth rectangular box measuring almost 21,500ft<sup>2</sup> – a typically elegant solution for an extremely elegant building. A building that, Hope says, gives him limitless scope for future events.

"It's whatever you want it to be. Whatever I want, the building should be able to cope with it. That's what's special about it. You're only limited by your imagination, not by the building." ■

the past 20-30 years have led to techniques and approaches that can overcome those problems."

To ensure excellent acoustics in all three modes, Staples explains that "a combination of banners and curtains have been concealed within the side and rear wall design of the room. Additional absorption for the [flat-floor] mode is provided by a series of inflatable baffles. The RT range required was 1.9 to 2.3 seconds for concert mode with no absorption in the room and from 0.9 to 1.3 seconds in theater mode with the absorption in place." Both Staples and Hope stress that feedback from artists has been good.

"Is it dealing with everything we're throwing at it and coming out at an incredibly high level? Yeah, absolutely," says Hope. "I'm delighted."

### Setting the stage

Further multifunctionality without compromise was achieved through machinery and the skills of German company ThyssenKrupp. The building's sleek exterior gives way to a shape-shifting interior. The proscenium arch and the towers on either side of it that are necessary for theater mode are

## ROLE CALL

### Location:

Downtown Dubai, UAE

**Maximum capacity:**  
2,000

### Opening date:

August 2016

### Developer:

Emaar

### Architect:

Janus Rostock, Atkins

### Stage engineering:

ThyssenKrupp

### MEP contractor:

BK Gulf

### Theater consultants:

Theatre Projects

### Stage lifts:

Serapid

### Seating:

Poltrona Frau

### Author

Adam Grundey is a freelance journalist based in Dubai

# Power to the people

Looking after audiences and staff during the opening of a new venue, or a major renovation project, requires careful leadership

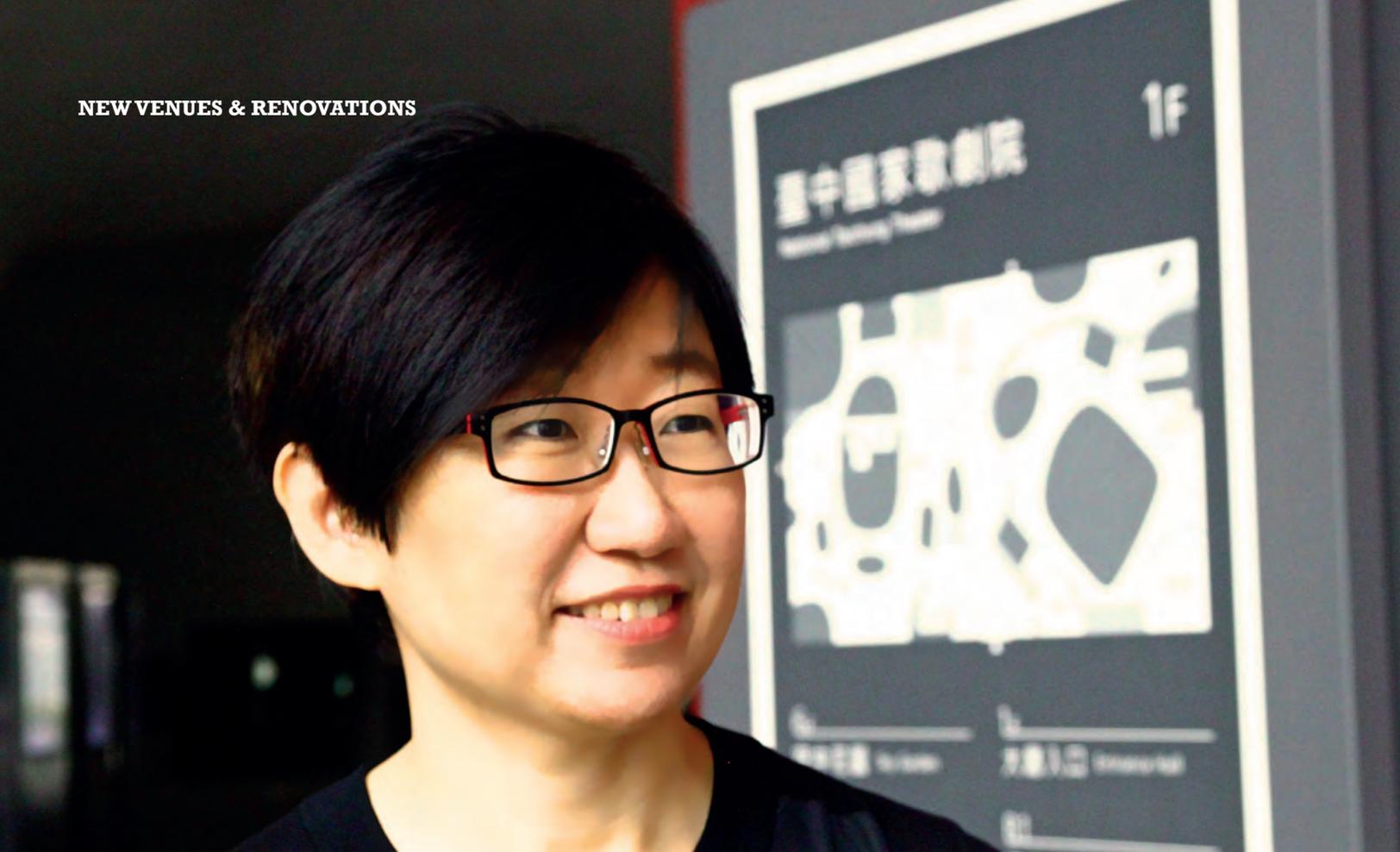
**F**ew would argue that running a performing arts venue can be a rewarding, yet extremely challenging, job. But ensuring an arts facility has all the right technology is only part of the task – connecting with audiences and the local communities, and maintaining a high-performing workforce, is a high-stakes juggling act. On top of that, overseeing the opening of a new venue, or a major renovation project on an existing facility, is an even greater challenge. Taking on such a challenge, explains David Baile – CEO of the International Society for the Performing Arts (ISPA) – calls for a special kind of person, and a special type of leadership. “First and foremost, you need someone who is entrepreneurial. There are so many stakeholders involved – funders, the community, audiences, your staff, the artists – that you need someone who can really manage those different interests.

“They have to be a fundraiser, obviously, and someone who has a sense of the broader role that the organization and the venue play in their community. So many of these venues were built back in the 1960s and 1970s and the concept of what a performance venue is today has changed so much. They’re no longer these monoliths – they are community centers.”

Managing the relationship between a venue and its community – not to mention the staff that are working there – during the upheaval caused by a renovation is also key. “What you do with your role in the community during that period, when you’re not inviting people into the building, is a really important aspect of the planning,” adds Baile. “Do you present in other people’s venues, but try to maintain a sense of audience loyalty to your venue and to the work you’re doing? That’s a really important thing that you have to plan for – and perhaps one that not everybody thinks through fully.”



**David Baile believes that venue managers at new facilities, as well as those overseeing major renovations, must balance the specific requirements of numerous parties**



## VICTORIA WANG

Artistic and executive director, National Taichung Theater, Taiwan

The National Taichung Theater, a new Taiwanese venue that is the latest step in a national commitment to the performing arts, opened in 2016. Featuring the 2,007-seat Grand Theater, the 600- to 800-seat Playhouse and the 200-capacity Black Box, the facility offers a wide range of programming – from traditional oriental and western productions, to contemporary music and local community performances. The new venue forms the latest link in a nationwide arts ‘chain’ – connected to the National Theater and Concert Hall in Taipei, in the north of the country, and the Wei-Wu-Ying Performing Arts Center, due to open in the next two years, in the south.

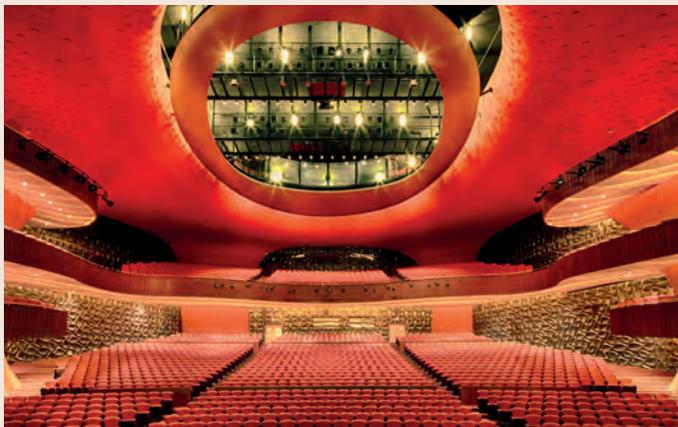
For executive and artistic director Victoria Wang, this countrywide chain is fundamental to the development

of the arts in Taiwan. “We are connected in terms of programming and sharing resources, including co-productions and touring invitation programs from the south to the north [of the country]. We have this supply chain to support the development of the performing arts in Taiwan.”

The mix of programming is key to developing the venue’s relationship with the community – and Wang has plans to expand the team at the National Taichung Theater, from the current level of 125 to a staff of 180, which will help the theater engage with its audiences still further.

On top of four seasons of major productions that Wang and her team program each year, the National Taichung Theater also hosts national arts festivals, open-house productions, summer camps, free concerts, educational programs, architectural tours (for fans of Pritzker Prize winner, designer Toyo Ito), and even invites children in to play the theater’s Steinway. Shops, bookstores, cafés and gardens are open throughout the day and remain that way until late, encouraging people to visit the theater for more than just a two-hour performance.

“With this kind of participation, we are developing the relationship with the community,” explains Wang. “The city of Taichung is a new market for us, and for performing arts companies in Taiwan, but I feel like we are really building it up. The mutual trust developed with the audience and the citizens of the city is getting better – people like to learn what we recommend, and are interested in hearing about our programs.”



All photos: National Taichung Theater



Stephan Rumpf



NEW VENUES & RENOVATIONS

Andrea Huber

## MAX WAGNER

Managing director, Gasteig, Munich, Germany

A major renovation of the technical infrastructure at the Gasteig in Munich will bring the 32-year-old venue up to date – but will mean a period of upheaval for the facility, its staff and the local community. “It’s not like a normal renovation that you might have at an opera house,” explains managing director Max Wagner. “The scale is extremely large, we can’t do one part, followed by another – we have to close the whole building.”

The €450m (US\$500m) project was approved by the town council in April 2017 and will now move to the design competition stage, with construction expected to begin at the end of 2020. This gives Wagner and his team only a short time to prepare for a four- to five-year closure.

“We have to find other buildings or space for all the people and institutions that are based here,” he explains. “That’s not easy, because we have a hall for almost 2,500 spectators. We are looking for a hall of around 1,800, but that doesn’t exist here in Munich, so we have to build a temporary venue somewhere.”

Wagner hopes to find a venue that will enable much of the Gasteig’s institutions and staff to be temporarily relocated en masse, but he is also considering other options. “The other possibility could be that we have, say, five locations. That would be really difficult to manage, and it would be tough to maintain the identity. What we have here [at Gasteig] is very special, and if you don’t have that for four or five years, what happens when we come back here?”

Communication lies at the heart of a successful renovation. “We’ve already had the first big meeting with the people that work at Gasteig,” explains Wagner. “It’s very important to establish trust between the management and our co-workers so that they know they are very well informed.

“It’s also important that we are transparent with the construction process, informing the public what will happen, having tours of the construction site, telling them the successes, and the failures during the process.

We have to make sure people know what we are doing and why, but most importantly, that it will be worth it.”



Anna Kucera

Scott Kelby

**LOUISE HERRON**  
Chief executive officer, Sydney Opera House, Australia

In 2016 it was announced that the Sydney Opera House – perhaps one of the most recognizable arts venues in the world – was to undergo a massive renovation project. The huge undertaking, which will include major work to the Concert Hall and the Joan Sutherland Theatre, will address several technical limitations that have affected the venue for decades, and will have a noticeable effect on both the venue and the people who frequent it.

“For the Joan Sutherland Theatre, there will be a hoarding around the podium for six or seven months,” explains Louise Herron, Sydney Opera House’s CEO. “For the Concert Hall, there will be a hoarding for 18 months. Not having a concert hall for 18 months is a major thing for us. It has a significant impact, not just because the Sydney Symphony Orchestra will need to find an alternative home, but because, if we’re not programming a 2,500-seater, it has a big impact on the marketing and programming [for the venue].

“The public – we have almost half a million people per year who pay to take a tour, a number that has

increased by more than 50% in the last couple of years – want to come and see the Concert Hall, so there will be an impact.”

Herron and her team, however, are ensuring that the closure of the opera house’s venues will be countered by a host of alternative attractions. For example, as the JST closes, a series of nightly screenings will begin, projecting animated arts films onto the inside of the famous sails. And Herron is already coming up with more ideas for other ways to let audiences know that the building is still open for business.

“The big challenge for us is to show that we’re open, despite all of this,” Herron explains. “It’s also a brilliant opportunity. All of these renewal works will be a shot in the arm. What are we going to do while the opera house is closed? And afterwards, when it reopens, what will we have changed?”

“Am I worried? Yes, of course. But is the opera house a magical place? Yes, absolutely. It has a special spirit and magic, so people will still come. It’s our job to make sure that there are still things for people to do.” ■

# ISPA

# International Society for the Performing Arts

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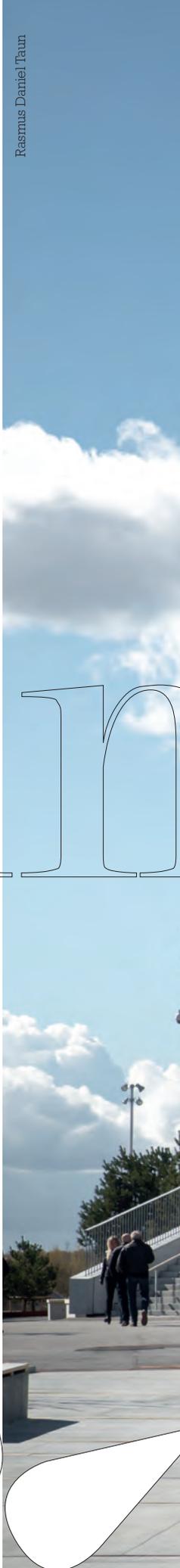
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**ROYAL ARENA**  
BY SCOTT LANG

# Scale or scale.

The winning design for Copenhagen's multipurpose Royal Arena redefines the typology with an efficient and compact scheme that showcases sustainability over scale

Rasmus Daniel Taun





# ROYAL ARENA

os



The new Royal Arena was designed to integrate into its community, and to be very compact and efficient

**D**anish architecture practice 3XN beat a prestigious field of front-runners to design Copenhagen's new Royal Arena with a simple proposal that radically rethinks the arena typology.

In an effort to readdress the human scale and integrate the building into the community, 3XN proposed a design that was more compact and subsequently more efficient than those put forward by the competition, explains 3XN senior partner Jan Ammundsen.

"Our design was smaller in volume than the ones we were up against because we didn't want to use more space than was needed, which not only reduced the cost but also waste, which in turn made the scheme more sustainable."

The Royal Arena is located in Ørestad on the Danish isle of Amager, approximately three miles from the center of Copenhagen. It is a central transport hub that is serviced by the city metro, overground railway and E20 motorway that crosses the Øresund Bridge to Sweden in minutes.

In recent years, the area has turned into a southern corridor for architectural excellence, with notable projects from some of the world's leading starchitects – including Bjarke Ingels Group's (BIG) 8 House and John Nouvel's DR Concert Hall.

However, Ørestad has also drawn its fair share of criticism as a result of its modernist masterplanning, which has resulted in large isolated urban blocks and wide, open spaces that are devoid of human activity.

To redress this balance between Ørestad's sparse urban fabric and the human scale, 3XN delivered a clever scheme – one that is seated within the residential community, but also creates a central hub of activity for community interaction.

"Our greatest design challenge was balancing opposing forces and demands," explains Ammundsen. "The project looks both inward and outward, embraces the monumental and human scales, is hard and soft, playful and efficient. It accommodates large sports and entertainment events, yet

also meets the neighborhood at a human scale and makes the visitor experience both intimate and welcoming.”

The 35,000m<sup>2</sup> (376,737ft<sup>2</sup>) multipurpose arena is designed to accommodate a capacity of up to 16,000 seated/standing spectators for music concerts and 12,500 spectators for sporting events.

“The lowest rows can be reconfigured so you can change the size of the bowl. There is partitioning so you can lower the capacity from 15,000 down to 3,500 people. The space can be made more and more intimate in different ways, so it is very flexible,” explains 3XN founder and creative director Kim Herforth Nielsen.

The Royal Arena has been designed with two distinct primary elements: a lower section that connects to the ground, comprising a concrete plinth; and an oval-shaped bowl, dubbed the engine of the project.

“Creating two elements and treating them separately was key to the design as it allowed us to bring the scale down and maximize the space available,” Ammundsen explains.

The plinth is 16ft high and absorbs the movement of spectators through a variety of small plazas, pockets, stairs and gathering areas that have been carved from the concrete plinth’s perimeter.

Conversely, the bowl is 98ft high and is purposefully stepped back from the plinth to disguise its height, with a recessed lower tier to further reduce the scale of the arena.

### **Love thy neighbor**

From the outset, it was clear from the client – Realdania and the City of Copenhagen, which both contributed Dkr325m (US\$47.9m) to the project – that integrating the building into the community was paramount to the success of this venture, explains Peter Swift, managing partner of Planit Intelligent Environments (P-IE), the landscape architect on the project.

“Often, auditoria and arenas are not very good neighbors, they are usually surrounded by a sea of tarmac – car parking mainly. At the Royal Arena however, there are quite a few residential uses that come very close to

**The Royal Arena will host up to 100 events per year, including sports, music and theater productions**

## ROYAL ARENA

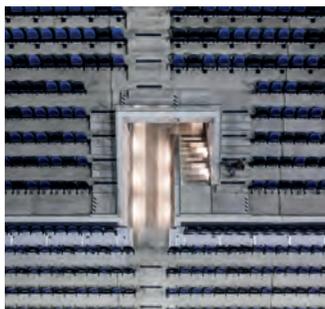
### FOREST OF FINS

The arena's external façade features 8,830ft<sup>3</sup> of high-performance modified Accoya wood, arranged in fins around its perimeter and echoing trees in the forest. The varying length of fins – some up to 115ft long – creates a refined, undulating rhythm that lifts slightly at the entry points of the arena, making wayfinding easy and logical. The Accoya wood is carbon negative over its full lifespan, and is fully reusable and recyclable.

"Durability and aesthetics were key issues driving the material selection for the fins, and the Accoya product not only adds a warm and natural quality to the façade, it's also maintenance-free for 40 years," explains Ammundsen.



Photos: Adam Mørk



## CAST LIST

**Location:**

Ørestad, Copenhagen

**Construction cost:**

Dkr1bn (US\$147.5m)

**Opening date:**

February 2017

**Owner:**

Realdania, City of Copenhagen

**Operator:**

Live Nation

**Architects:**

3XN, HKS

**Landscape:**

Planit-IE

**Structural engineers:**

Arup, ME Engineers

**Capacity:**

16,000 seated/standing for concerts;

12,500 for sporting events

**Above: The acoustic design of the building is intended to minimize noise pollution**

**Left: The multipurpose arena can be configured to offer a maximum capacity of 16,000**

the perimeter and so it was essential to bring the building up to the edge of the landscape.”

In order to be a good neighbor, it was essential to minimize the potential for noise pollution.

As a result, the building’s design features sound-insulating concrete,

outer walls with insulated panels, and open lobby areas that act as sound locks with absorbent ceilings, which further reduces the cost.

“The acoustic boundary is inside the bowl,” says Ammundsen. “We have a lobby to prevent sound from escaping the inner layer, which reduces the cost of materials as it’s easier to control sound closer to the source.”

The design team – which also included HKS and structural engineers Arup and ME Engineers – went to great lengths to ensure the highest-quality acoustics within the arena. Sound-reflective coatings were used on all surfaces, in addition to high-performance acoustic wall coverings and upholstered seating to mitigate reflected sound.

The initial design proposal included wooden chairs in the main arena, although this was partly rejected by venue operator Live Nation, due to the potential for empty seats to be bright and highly visible from the stage.

This efficiency of acoustic programming permeates throughout the arena – for example, the venue’s loading bay is fully covered, sound locked and enclosed. Such attention to detail enables trucks to load – 12 articulated lorries at a time through six full-height doors – at any time of the day or night, and during events, without disturbing the surrounding neighborhood.

The Royal Arena is expected to host up to 100 events per year, ranging from music and sports to ice hockey, swimming and theater productions. The design team spent many

hours simulating different event scenarios using computer modeling and material testing to resolve the effects that each event would have on the building and its users.

“Our philosophy was to test and solve the most extreme condition, which was ice hockey,” says Ammundsen. “This turned out to provide crowning guidelines in terms of seating placement, as the lowest tiers had to have sightlines into the rink and the ventilation system had to be able to mitigate the change in temperatures.”

### Damage control

The arena’s designers also went to great lengths to consider every aspect of the venue – from the artistic right the way through to the starkly practical. Large facilities are increasingly viewed as higher-risk targets for terrorist attacks, and it is becoming essential to implement landscaping elements to deter attacks.

“The police were concerned about trucks with explosives, although we have a curved wall system that operates as a directional device for users that simply makes it impossible to approach in this way,” explains Ammundsen.

Avoiding the undesirable situation of counter-terrorism measures ruining the way the buildings sit in the landscape, explains Swift, was also a priority: “We were able to embed softer elements and a considerable amount of tree planting within the envelope of the scheme, which is far better and less intrusive than bollards.”

This subtle technique chimes with the Scandinavian approach to design, continues Ammundsen, and has also influenced the way technology was integrated into the venue.

“We didn’t like the narrative of visible security, so we built cameras into the venue where possible. In the end of the wooden fins that clad the external bowl, and along the edge of the plinth, there is a line of lights, cameras and loudspeakers all embedded into the building envelope.”

The success of the new arena, concludes Ammundsen, is largely down to its Nordic expression and the fact that it’s designed in a way that you couldn’t replicate anywhere else.

“The Royal Arena has a sense of place and simplicity that is unique. It uses warm and soft elements in a compact design that you don’t usually see in arenas of this scale.” ■

### Author

Scott Lang is a freelance journalist and practicing architect with experience on a number of international projects

## SEATING

KOTOBUKI GROUP

# Group dynamics

A wide-ranging portfolio of projects has granted a family of seating companies a wealth of experience

The family of specialist seating companies that make up the Kotobuki Group is growing. Headquartered in Japan, the group now contains some of the best-known names in the seating industry. As well as Kotobuki itself, the group includes Quinette Gallay Renaissance of France, UK-based Audience Systems, Ferco Seating in the UK and Malaysia, and Interkal from the USA. Each boasting their own areas of expertise, the companies have created auditoria in some of the most diverse and challenging of venues.

### Sea change

With 70 years of expertise and commercial success in first-class projects, Quinette Gallay has assisted a host of international clients. The Harmony of the Seas is the world's largest cruise ship, built at Europe's largest shipyard at St Nazaire, France.

The ship's Royal Theatre can seat 1,400 guests in style. Quinette Gallay worked with Royal Caribbean Cruise Liners and the American architect Wilson Butler to create a unique seat design that could fulfill a multitude of requirements: the chair had to be lightweight, robust and flame retardant, but also beautiful.

To meet these demanding criteria, Quinette Gallay Renaissance designed a unique seat model – the eponymous Harmony – featuring lustrous velvet and custom-molded casings lined with high-end vinyl. Three variations of the seat are used, creating three distinct but harmonious zones in the auditorium. The overall visual effect is unusual but extremely successful.





For this project, Quinette Gallay drew not just on the company's flair for design, but also on its considerable installation experience. Installing seating in a shipyard environment is demanding – deliveries must be precisely timed, storage and working space are at a minimum, and rigorous health and safety procedures must be strictly adhered to. In addition, the elegant but complex curves of the auditorium, while creating a stunning space, made precise planning and installation of the seating an absolute necessity.

What's more, the project involved a second auditorium on board the ship. In the 656-seat

ice arena, luxurious but space-saving Espace 628 seats by fellow Kotobuki Group company Audience Systems were chosen. Audience Systems and Quinette worked together to deliver this second major venue.

After this first success, Quinette Gallay Renaissance is proud to have been entrusted with the supply of seating for the equally impressive ship, Symphony of the Seas. This magnificent vessel will be inaugurated in early 2018, and will be followed by her little brother, the yet-to-be-christened 'C34', which has been scheduled to set sail in 2020.

**Main: The Royal Theatre on board Harmony of the Seas, with its three complementary seating designs. Photo: Bernard Biger, STX France**

**Left: Studio B Ice Arena. Photo: Bernard Biger, STX France**

**Inset: The Harmony of the Seas**

## SEATING



### Creating versatility

Located in the heart of the campus at the UK's Southampton University, the Cube is certainly one of the most well-used and diverse auditoria Audience Systems has come across.

Used as a lecture theater, cinema, Zumba studio, conference venue, circus training arena and nightclub among other things, the space is reconfigured on a daily basis – and sometimes even twice a day.

The Cube was fitted with a retractable seating system 15 years ago, featuring a basic upholstered chair. The challenge for Audience Systems was to replace this with a new system that packed a whole lot more punch. The chairs needed to offer a great deal, combining the comfort of a cinema chair with the practicality of a lecture theater chair. Given its heavy use, the retractable system had to be incredibly reliable and resilient.

Audience Systems' solution was to adapt its flagship multipurpose chair – the Recital – by adding a foldaway writing tablet. The resulting chair is smart, supportive and multifunctional. The distinctive design features elegant dove gray timber on the seat back, arms and writing tablets, which contrasts perfectly with the claret color of the upholstery.

Unusually, the retractable system is finished with steel fascias in gray to match the seats, giving the system a contemporary edge even when closed. The fascias are also specially designed to nest together to form an unbroken façade, protecting the seats from flying sticky drinks when the space becomes a nightclub.

With the retractable platforms opening and closing at the touch of a button, the room can be quickly turned around by one person – essential given the busy nature of the space – who describes the new system as “100 times better” than the old.



**Top: With writing tablets in use, The Cube auditorium serves as a lecture theater**

**Above: With seating retracted, The Cube can accommodate fitness classes and club nights**

**Below: FT10 Wrimatic seats with tablets folded in the Dr Chau Chak Wing Building**

**Bottom: The view of the completed lecture theater**



### Complementing aesthetics

To say that the Dr Chau Chak Wing Building at the University of Technology Sydney is a marvel is something of an understatement. Designed by the legendary architect Frank Gehry – known for the use of fluid shapes in his buildings, which include the Walt Disney Concert Hall and the Guggenheim Bilbao – the sandstone-colored building was created with 320,000 custom-designed bricks to form its curvy structure.

Although some have compared the building's design to that of a crumpled paper bag, Australia's governor general Peter Cosgrove described it as certainly “the most beautiful squashed brown bag I've ever seen”, and Gehry himself commented, “Maybe it's a brown paper bag, but it's flexible on the inside. There's a lot of room for changes or movement.”

Ferco Seating's challenge was to fit out the lecture theater in a way that chimed with the flexibility of the building, complemented its modern aesthetic, but also fulfilled a score of practical requirements.

The FT10 Wrimatic seat chosen for the project combines a high-specification, executive style lecture theater seat with integrated A3 Wrimatic tablet. Specified with a luxurious high back, the seat ticked all the boxes for this venue, delivering a combination of outstanding ergonomic and posture support, versatility and contemporary styling. From a practical point of view, the FT10 Wrimatic is versatile, making it easy to install in curved auditoria such as this.

The integrated A3 Wrimatic is the most robust tablet on the market, having been tested to a load bearing of 240kg. It stows neatly when not in use and operates in a continuous opening movement thanks to its unique triangular prismoid swivel joint – a feature designed using advanced aeronautical and engineering technology.

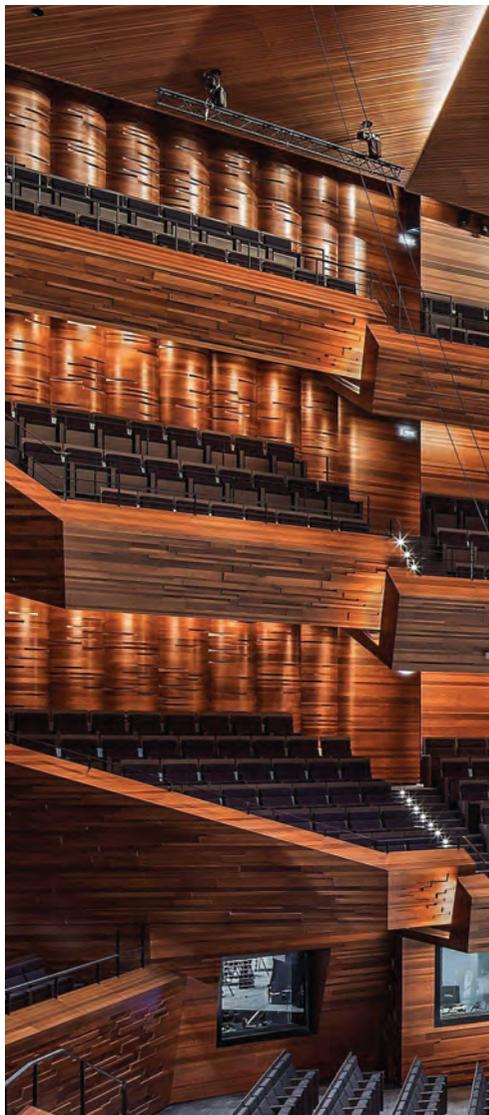
Ferco Seating is immensely proud of its contribution to this extraordinary project, with a seat that can only enhance the experience of the building for students and owners alike.

Whatever challenges an auditorium brings, the companies of the Kotobuki Group have the expertise and knowledge to overcome them. ■

[www.quinette.com](http://www.quinette.com), [www.audiencesystems.com](http://www.audiencesystems.com),  
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# NEW territory

A renovation project in Taipei presented a major test for a stage technology provider



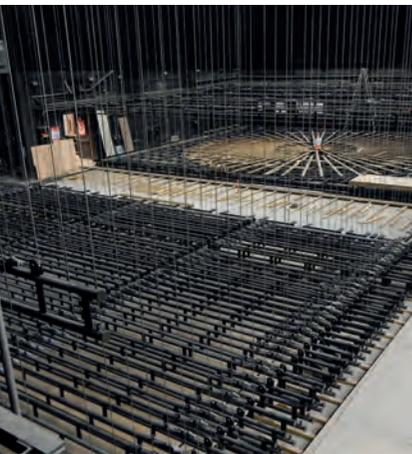
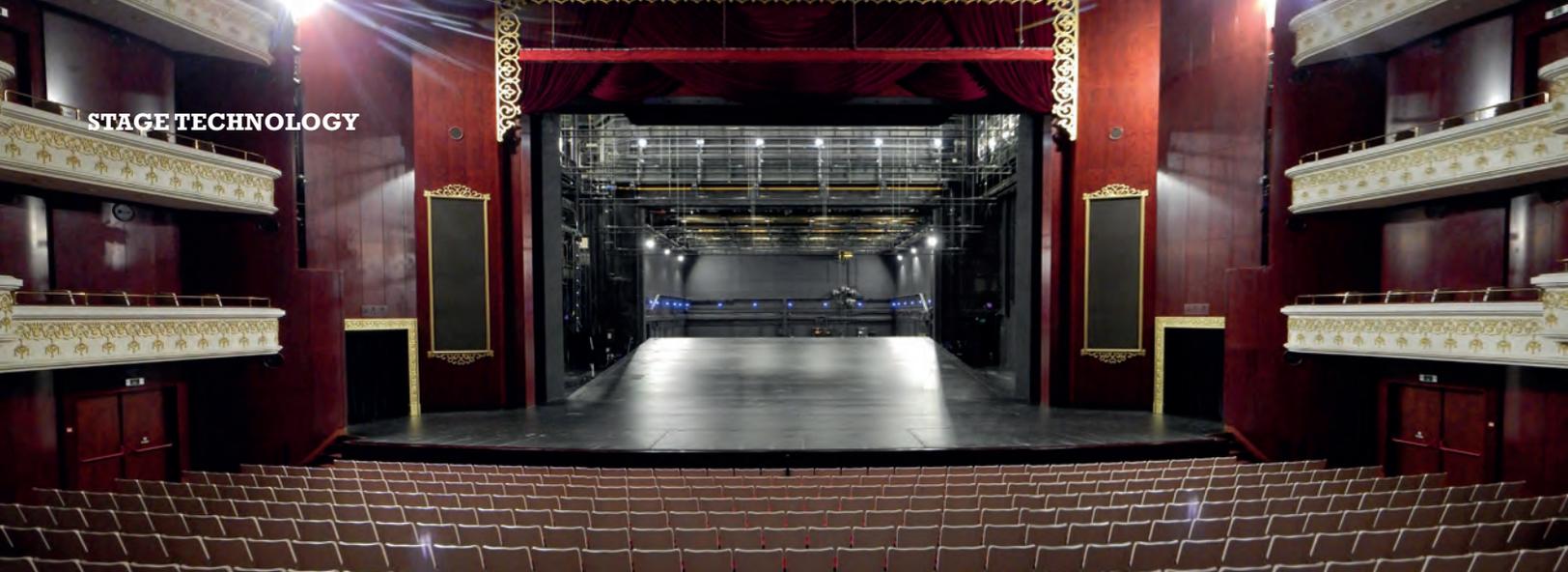
**R**ight from the very outset, the extensive renovation project on the Taipei National Theater demanded special attention from SBS Bühnentechnik. The biggest and most prestigious theater in Taiwan forms part of the Chiang Kai-Shek Memorial Park, which extends over 61 acres and was constructed after the death of Chiang Kai-Shek in 1975. On the outside, the theater takes architectural cues from the Tai-He Hall at the Imperial Palace in Beijing – complete with curved roofs and colonnades of red columns. The theater was opened in 1987.

The building also enjoys an outstanding international reputation, not least because of its commitment to preserving classical Chinese theater arts.

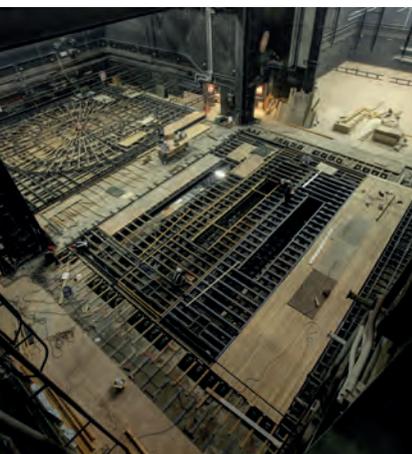
Back in 2005, discussions started about the renovation of the National Theater. The machinery that was originally installed in 1986 no longer met applicable guidelines in terms of safety. In 2015 the decision was finally taken that the building should undergo extensive renovation. The installation of new stage machinery, including control systems, was put out to tender internationally and SBS secured the project. For the company, in addition to the challenging range of services involved, the special attraction of the project was the associated tight schedule and the unknown local peculiarities.

Taipei represented uncharted territory for a number of reasons: the region and administrative processes were unknown, as was the local situation regarding resources. Taiwanese labor market policies clearly favor local employees, thus restricting the employment of SBS's own skilled workers. As a result, the search for qualified personnel for the construction site in Taipei was the first and most important activity on-site. There were also language barriers to overcome – particularly when it came to communicating technical issues and processes.

SBS was also surprised by the building structure, and the conditions on-site did not match the plans on which the planning and scheduling were based – a classic problem for renovation projects. This resulted in the need to reinforce the foundations to support the increased loads from the new machinery. It took four weeks to resolve this problem – time that SBS had to make up for.



**The installation of new stage machinery, including control systems, was a challenging project for SBS, not least due to the tight schedule and the opportunity to work in a market that had a number of unknown local requirements**



### A real test

The building site was opened on June 28, 2016, from when SBS had eight months to finish the project. Disassembly and re-installation within that time was a tough challenge.

SBS deployed one of its most experienced project managers for the Taipei project: Olaf Ulrich. He had already managed the installation of the complete stage machinery in the newly built Mariinsky II opera house in St Petersburg – a project with similar complexity and a venue of comparable significance.

From day one, the renovation of the Taipei National Theater was a very tightly run project. Within just six weeks the existing stage machinery and corresponding steel structures all the way up to the roof trusses were removed, and every bolt was taken out. Installation of the new machinery began immediately afterward.

From mid-August onward, the fly loft for the overstage machinery was installed with a grid covering, and this also included a rail system for moveable cable drums and relocatable beams for the chain hoist system.

Just eight weeks later, work commenced on the understage machinery. Supports were provided for the elevators, and access for the lower levels was installed. As the next step, 96 hoists of the overstage machinery were installed.

In the last stage of installation, the understage machinery was equipped with four stage elevators, which were designed as double-deck elevators with a separately moveable upper platform, a revolve wagon and a compensation platform.

The arrangement of the drives in the elevator pit was a particular challenge. The elevators of the old system did not allow the bottom platform to be run down to the supports in the understage area. The entire drive technology for the elevators was relocated from the center of the pit to the edge area, thus enabling every cubic centimeter of available space to be used. The space that was

previously taken up with the drives in the pit is now available for deeper elevator travel, and the continuous lower platform can now be used for scene appearances.

All 138 drives are controlled by SBS's tried-and-tested computer control system CostacoWin. This system, which has already been successfully used in almost 100 theaters in over 20 countries, is certified in accordance with safety integration level SIL 3 as per DIN EN 61508, thus adhering to the highest safety standards in this sector.

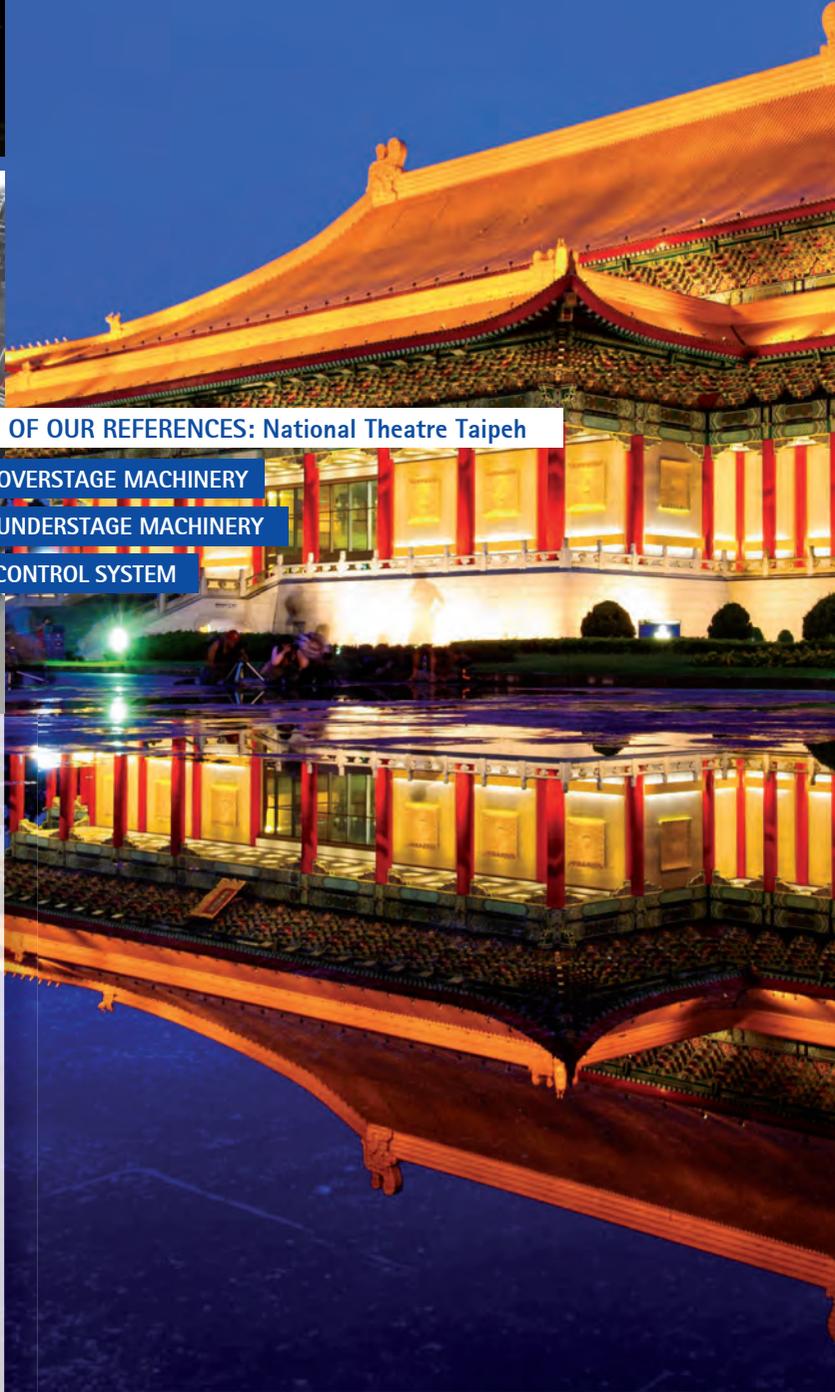
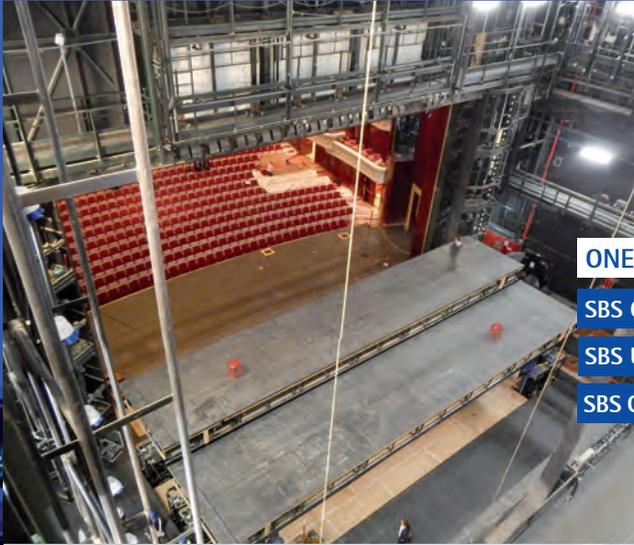
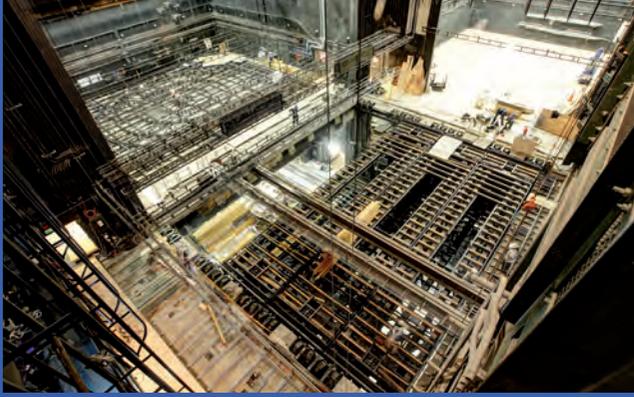
The project was also a challenge in terms of logistics. A total of 174 deliveries were made from Germany to the construction site. The heaviest single items were the preassembled elevator drives, each of which weighed 5.5 tons. This meant that special installation technology that was tailored to the on-site conditions was also necessary. In order to transport the heavy parts to their installation locations, a rail system was installed from the unloading zone to the edge of the stage pit. From there, the components were picked up by a gantry crane.

### On time and within budget

On March 3, 2017, the Taipei National Theater project was handed over by SBS and the theater opened its doors again for regular performances and events. Guest ensembles from countries as far as Latvia, Spain, Germany and Switzerland have since put on shows at the venue. For Taiwan, this was the first major theater project in 10 years to be completed on-time and within budget.

SBS is particularly grateful to the customer and its representatives, with whom a good, goal-oriented cooperation was established. SBS's local Taiwanese project partners for on-site realization also played a major role in this successful team effort. The reopening of the theater was a joint success for all involved. ■

[www.sbs-buehrentechnik.de](http://www.sbs-buehrentechnik.de)



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SBS BÜHNENTECHNIK GMBH



October 2016 marked the opening night of Bochum's 950-seat concert hall, and a performance from the Bochumer Symphoniker conducted by Steven Sloane

# investment

The Anneliese Brost Musikforum  
Bochum demonstrates that excellent  
acoustics can come at a moderate cost

**F**ounded in 1919, the Bochum Symphony Orchestra is in the top league of German orchestras, yet the ensemble had never had a home concert hall. Since its inception, the orchestra had performed on the stage of the local theater (the Schauspielhaus), in the Audimax lecture hall at the University of Bochum, and in the converted factories and warehouses of the Jahrhunderthalle in Bochum.

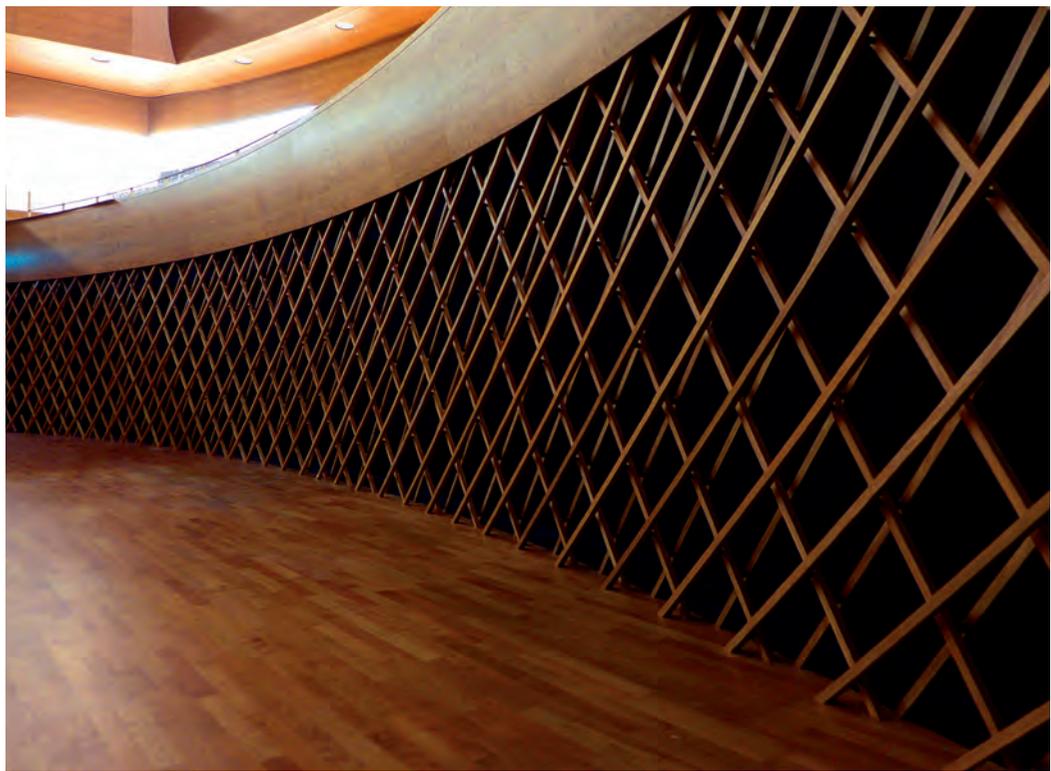
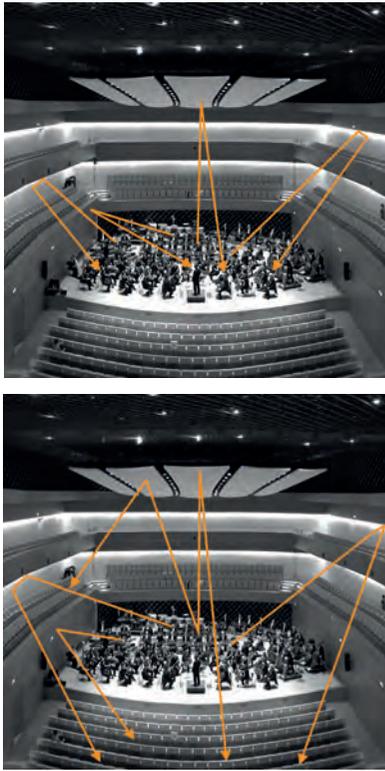
### Pushing forward

After decades of failed attempts to identify an appropriate site and secure funding, the appointment of music director Steven Sloane in 1994, and the resulting increase in audience numbers, generated the impetus to push forward for a purpose-built hall. In spite of the fact that the city was officially bankrupt, the Federal State of North Rhein Westphalia and the European Union promised sufficient backing for the project as long as stringent criteria were met –

facilities for the local music school had to be included, and the project had to have a maximum cost of €33.2m (US\$36.3m), of which €14.3m (US\$15.6m) would come from private donors. An architectural competition in 2011 sought designs for a 900-seat concert hall and a 300-seat multipurpose performance venue on the land surrounding the deconsecrated St Mary's church in the city center (which also dated from 1919). The winning design – from Bez + Kock of Stuttgart with acoustics from Müller BBM – went against the brief to place the multipurpose venue in the church and instead brought the church into the heart of the scheme as the foyer, flanked on both sides by the performance venues.

During the early discussions between the client, design team and client acoustician Kahle Acoustics, Sloane expressed a wish for a more intimate room, with the audience surrounding the musicians, rather than the strict, straight-lined shoebox that had been proposed in

## ACOUSTICS



Top left and above: **A visual illustration of the early acoustic reflections created to the orchestra (top) and the audience area (above)**

Above right: **The upstage wall is an open surface made out of wooden slats behind which a sound absorbing curtain can be installed to adjust orchestral balance**

Opposite page: **The venue's art deco-inspired canopy was acoustically optimized. Each element is curved in 3D to distribute the reflected sound evenly over the venue stage and audience stalls**

the competition submission. The architects responded with a more rounded seating layout and room shape incorporating concave-curved forms. This, however, created significant acoustic challenges. During these early meetings, the exchange of ideas between Kahle Acoustics and Müller BBM had been so successful that it was ultimately decided that the project should progress with both acousticians collaborating as equal design partners.

The curved forms in the plan were all based on two center points: one at the conductor's position governing the curves in front of the stage, the other in the middle of the parterre for the curves behind the stage – a shape that would theoretically lead to sound being significantly intensified at those two locations, resulting in echoes and uneven sound coverage. In order to maintain the architectural concept, Kahle Acoustics used Rhino/Grasshopper acoustic simulation programs, developed in-house, to adjust the geometry in real time. The potentially problematic focusing was converted into beneficial sound reflections by splitting the architectural curves into segments and by optimizing the curvature of each segment in section and plan, as well as by optimizing the vertical tilt. The shaping of the balcony fronts around the stage provides

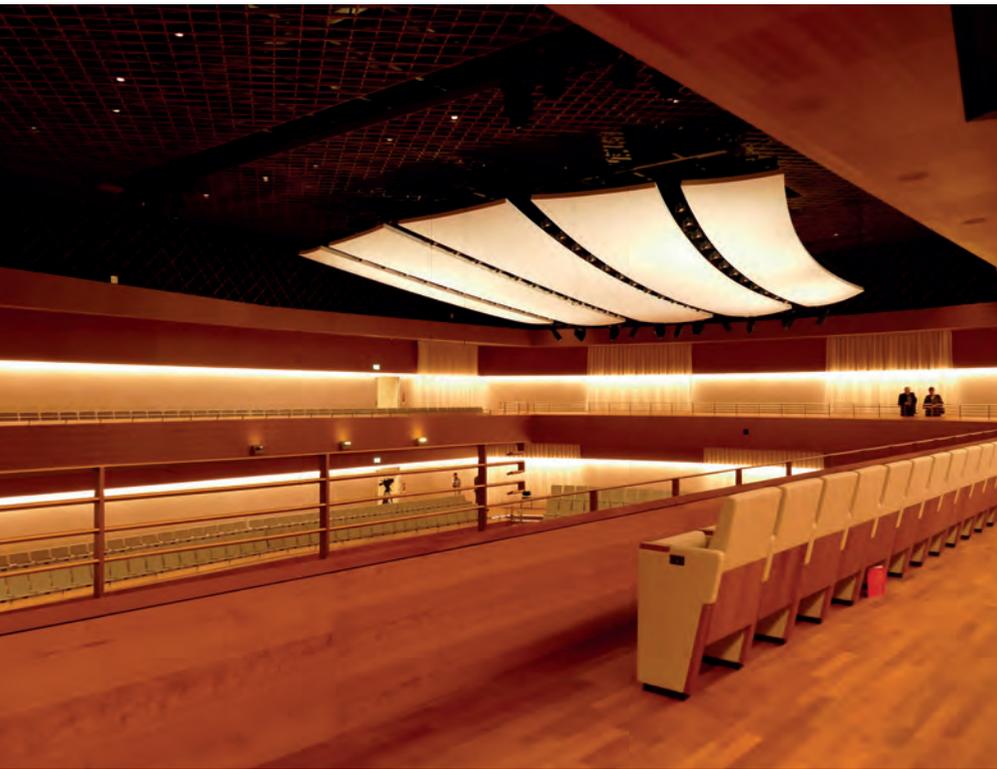
musical communication on stage and acoustic envelopment and clarity in the stalls. The cross-communication on stage works so well that even patrons in the first rows comment that they can hear the distant instruments very clearly, as well as an excellent balance of all the instruments.

### **Making savings**

As one of many cost optimizations to bring the project in under €33.2m, it was decided that the canopy should not initially be motorized. Temporary winches were used to optimize the height and angle of the canopy during acoustic tests and listening sessions with the orchestra.

A further cost optimization was the inclusion of the roof structure and technical catwalks into the concert hall acoustic volume. In this way, the volume necessary for a symphony orchestra was obtained while saving a story in building height and associated costs. The issues of ugly exposed equipment and structure were mitigated through careful design and coordination: an acoustically transparent grid was developed to visually occlude the structure, and the technical equipment was carefully planned to minimize the incidental absorption in the top of the room, maximizing beneficial reverberation from above.

Even during a time of financial difficulty for the city of Bochum, commitment to supporting



and expanding cultural activities was considered to be an investment priority for the city and the state. Now named the Anneliese Brost Musikforum Bochum, the new performing arts center finally cost a total of €38m (US\$41.6m) – a relatively small overspend for a public project of this kind, and exceptionally good value for the delivery of a new concert hall venue of such exceptional quality.

The key to achieving such value for money was the simple idea that good acoustics and beautiful buildings do not require expensive finishes and high-tech equipment, but are the result of careful design, detailing and construction. When this is achieved, the result is a concert hall that the orchestra and local audiences can be proud of, and one that is flexible enough to adapt in the coming years and decades. In a city of 365,000 inhabitants, the Musikforum Bochum received more than 20,000 individual donations and more than 37,000 visitors during the opening weekend – one tenth of the population! ■

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# Style & substance

Collaboration with architects and acousticians informed the design of an elegant seat for a new theater in Argentina

**I**naugurated at the end of 2016, the Teatro del Bicentenario in the city of San Juan, Argentina, has already become one of the most important cultural references in the country – a center open to all artistic genres that stimulates innovation and cutting-edge cultural creation. Following the model of the famous Colón Theatre in Buenos Aires, and thanks to its modern design and exceptional technological and acoustic features, it rivals the best stages in the world. Architecturally, the Teatro del Bicentenario is a monumental work, designed by architects Marco Pasinato and Sergio Bianchi Bolzán and constructed by Panedile.

The building has the appearance of a solid block. The imposing main hall, in the shape of a horseshoe and clad in corten steel, stands out with its earthy color reminiscent of the San Juan Mountains. The building's main façade has a large arch – the 'Bicentenary portal' – measuring 207ft across and nearly 20ft high to let in light, which forms the grandiose main entrance to the theater. This large concrete arch is clad with 9,000 marble travertine tiles from San Juan.

The project is a masterpiece of taste, fine detail, and the quality of construction and materials used. With high standards of design, engineering and execution, the Teatro del Bicentenario can claim to be the new jewel of the performing arts in Latin America. Figueras provided almost all the seating for the main floor and presidential suite in the main theater, and all seating for the secondary theater.

## Project challenges

The main hall of the theater, designed in Italian Renaissance style, can host a symphony orchestra of approximately 100 musicians, and 1,129 spectators distributed over three levels. This enables the Teatro del Bicentenario to produce and hold events such as lyric performances, ballets, symphonies, choirs, chamber music, recitals, prose theater and other cultural events.

The staging area of the Teatro del Bicentenario is equipped with the latest technology and includes a rotating stage – capable of holding up to three scenes at the same time and changing them in 30 seconds – as well as an orchestra pit with a Spiralift system. The entire hall is covered in wood and is positioned above a metal structure that acts as a sound box – comparable to a musical instrument that can be tuned. This is achieved by covering the fronts of boxes with wooden blinds and curtains that are adjusted according to the acoustic requirements.

This monumental project – and the building's acoustic, safety, aesthetic and technological requirements – made it imperative to have the best seating installed, capable of responding to each of these challenges without exception. Figueras provided its experience gained during installations at numerous theaters and first-class symphonic halls, creating a special chair for both the main and the secondary halls.

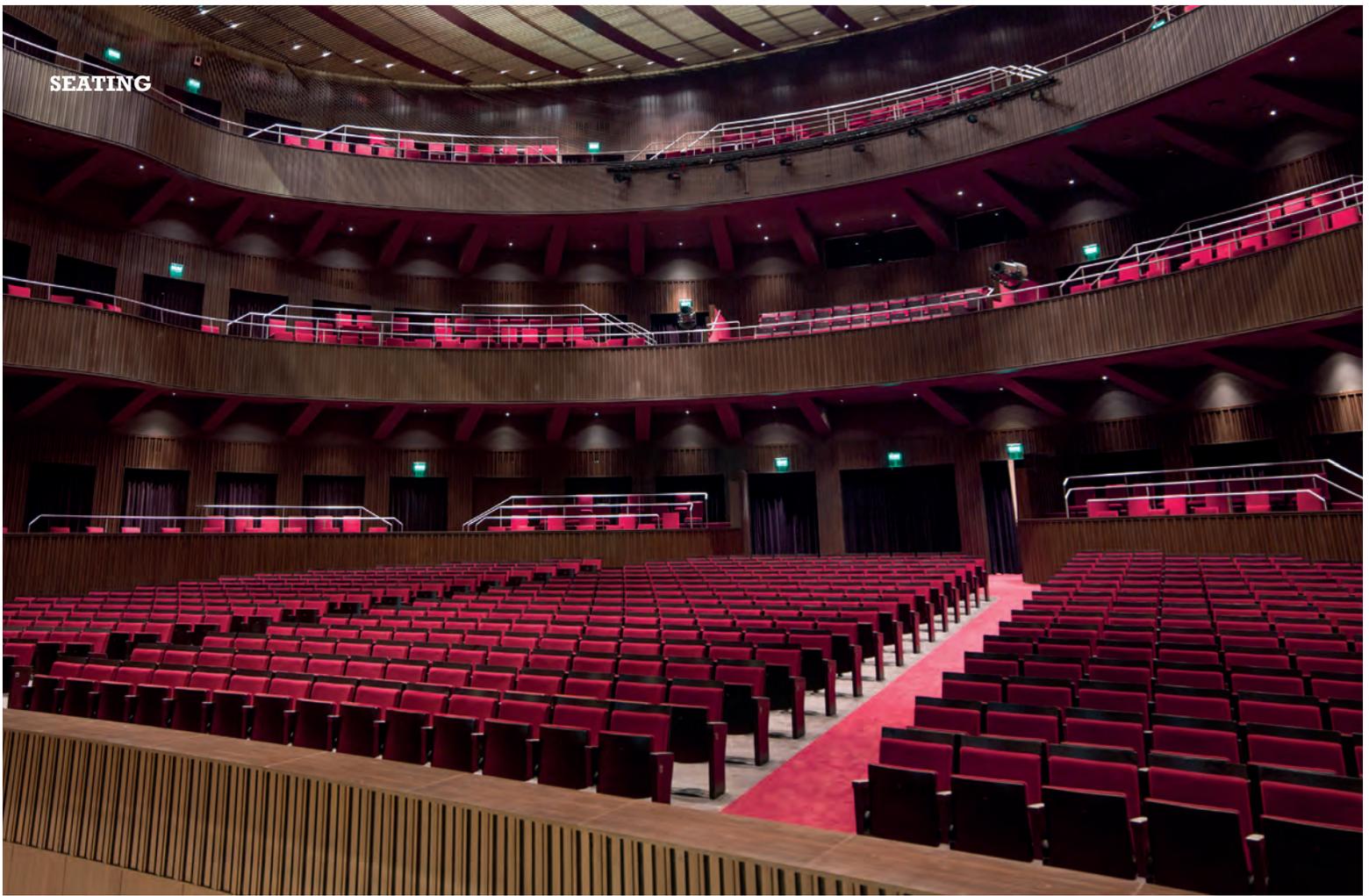
## A customized solution

The construction company responsible for the project, together with the architects and acoustic



**The customized seating for the Teatro del Bicentenario in San Juan was developed in collaboration with the venue's architects and acousticians**

## SEATING



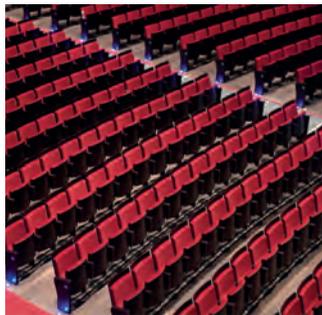
engineers, worked with Figueras to design a customized seat, providing a perfect acoustic response in the hall, as well as complying with the exceptional safety requirements – thanks to the incorporation of flame-retardant materials.

The model offers an elegantly designed sitting experience, which is extremely comfortable due to its 21.7in inter-axes, giving priority to comfort and sight lines. Made with first-class materials and combining a wenge color in the main hall (and a guatambu-like color in the smaller hall) with the burgundy red of the upholstery, the Teatro del Bicentenario seat also has special drawer-type side panels, which provide acoustic elements. All the seats include Soft System control-rise technology, so when the chair is vacated, the seats return silently to their upright position without interrupting the performance.

The position of the seats was readjusted by Figueras's CAD experts several times during the planning stage for viewing and acoustic perfection, with each seat's position adjusted perfectly for its dedicated space.

### Pursuing excellence

Early in 2017, Figueras International Seating, which specializes in the design, manufacture



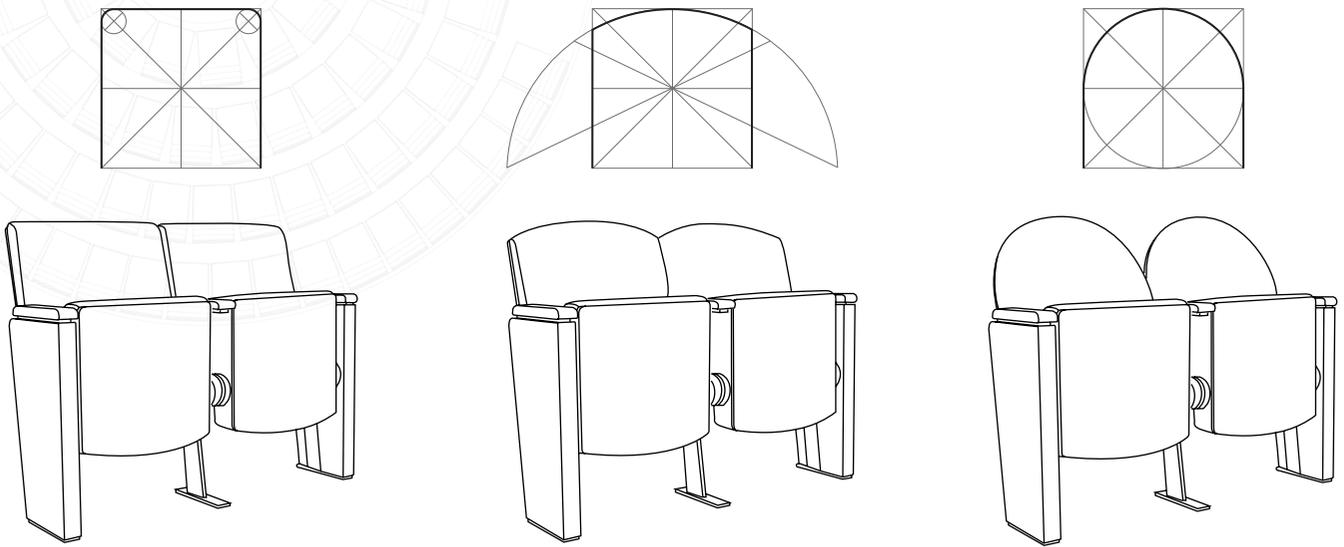
**The layout of the seats was adjusted by Figueras's CAD experts so that each was in the optimal location within the new venue's main hall**

and installation of seats and mobile seating technologies for public spaces, presented its new corporate image, which aims to update its identity, mission and values. As part of the new image, Figueras presents its new manifesto – the company's public declaration of its future intentions and objectives.

The central tenet of the new theme is to convert the brand into a partner for the creation of spaces that awake emotions. The company's new claim is a statement of principle: 'Let's make it happen.' Figueras strives to be regarded as a committed partner for all types of projects, capable of implementing its clients' ideas and strategies – the design and manufacture of a new model of a seat or a movable seating solution, and the installation of seats in any type of space (whatever the requirements and adapting to architectural, spatial, acoustic and viewing needs).

As a part of the company DNA, Figueras adopts business values such as excellence, the culture of hard work, creativity and flexibility, all of which are developed through know-how and intelligent design. ■

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# Testing times

Factory acceptance tests require careful application of expertise, but can result in multiple benefits during the project construction

**Factory acceptance tests can be hard work to organize, but can streamline many elements of machinery production and installation, particularly for venues far away from the manufacturing facilities**



**M**anaging an average of 30 concurrent projects, in various phases, brings new challenges every single day for Waagner-Biro. However, three extensive factory acceptance tests (FATs) in less than a year is a challenge of its own.

Unless requested by the client, Waagner-Biro runs FATs only for special and novel design requirements. An excellent example is the winch refurbishment FAT at the Esplanade in Singapore, which involved a 90-minute full-load run of the prototypes at Waagner-Biro's winch testing facility. After passing this FAT, the company's meticulously designed prototypes went into serial production of 100 units.

Extensive FATs, such as those that were recently requested for understage machineries for the Sydney Opera House and La Monnaie/De Munt (the Belgian Royal Opera House) are an organizational challenge. They call for additional installation work, test specifications, very early integration of the control system, and a spacious and heavily equipped production site.

Even while tendering for the four platforms at La Monnaie/De Munt, Waagner-Biro involved its design engineers in FAT planning. As a result, a practicable FAT was already part of the company's offer. Even during the contract

negotiations it became clear that the tight time schedule would not allow inclusion of the final drive components into the FAT. Hence, the design engineers had to put in an extra effort to provide makeshift drives for a timely FAT of the mechanical system.

During the 1.5-month assembly (each of the platforms weighed 30 tons, measured 47.2 x 8.5ft, and had a travel height of 9.8ft), FATs were carried out in blocks of two weeks. The highly satisfied client, who attended the first platform's test at Waagner-Biro's facility, requested only minor technical changes. The 1.5 months invested in factory assembly expedited on-site installation substantially, not least because of the installation manager's early improvements to installation and alignment.

This FAT was particularly exciting because it was planned from the beginning to bring the platforms fully assembled and tested to the venue. Detailed specifications with sketches and images were required from Waagner-Biro because platforms needed to be rotated to fit through the wall opening. Transport frames and lifting beams had to be tailored to rotate and insert the bulky platforms at the site. This meant anticipating and calculating every single movement to help the specialist transport contractor avoid deformations of the construction during transit.

## STAGE TECHNOLOGY



### The engineer's report

FATs require more complicated preparation, but at the end of the day, a high degree of pre-assembly makes for a faster, yet more relaxed, construction. FATs make it possible to identify and correct construction faults much sooner, and at the manufacturer's facility rather than on a distant construction site. The client benefits not only from this scrutiny but also from an earlier project closure – as platforms reach the installation site fully assembled.

When submitting tender requirements for the Sydney Opera House, UK theater consultant Theatreplan included FATs for overstage winches and understage machinery, primarily to minimize interruptions. For an opera house such as Sydney's iconic venue, punctual and flawless resumption of business is imperative. The rear lifts in particular – the only route for scenery exchange – must meet stringent local codes.

"Although we can be sure Waagner-Biro will produce it to a very high standard, the understage equipment is unique, designed specifically for this venue, as with nearly every project we design," explains Clive Odom, director of Theatreplan. "No other theater has exactly the same equipment and therefore this project will be a one-off. It is very important for us and for the client to know that the understage equipment will function as intended when it arrives in Australia. We undertook many tests in the factory, including load tests, duty cycle tests, position accuracy and speed tests, general functional tests and failure mode tests to ensure that all the redundant systems performed exactly as expected."



**Top: Ensuring that new stage machinery will function as intended is just one of the many reasons why FATs are important to venue projects**

**Above: Adherence to local codes and ensuring that components will physically fit inside the building upon delivery can be ensured thanks to factory acceptance tests. Photo: Anne-Sophie Noël**

Even overstage winches were made-to-fit for the confined space, so it was useful to fully test each design before manufacturing all the stage hoists. The entire understage equipment was subjected to a FAT before shipment – including both platforms (each weighing 18 tons, measuring 37.4 x 11.8ft with 11.5ft of travel and an operational range of 34.8ft), two equalizer platforms (with the same dimensions and 4.9ft of travel), four telescopic barriers (with 7.9ft of travel) to run on the platforms, and a barrier at stage level. FAT construction started in October 2016 and took two months, including three weeks of commissioning.

A designated installation manager supervised the entire construction works. After the FAT, the equipment – including drives and major platform components – remained partially assembled. The installation manager also safeguarded optimal packing of the components for swift reassembly at the site. The seven containers were shipped in due time in January 2017. All this was achieved in the demanding time schedule of only 5.5 months for installation and commissioning.

### Saving time

FATs are hard to organize, but it pays off. More than 40 individually programmed tests involved a great deal of reconciliation with clients and consultants. Then again, the time required for the compulsory FAT assemblies was compensated for several-fold by faster installation on-site. In particular, long distances and time differences would have made possible defects much harder to remedy on-site. Accordingly, FATs included the entirety of the control modes, many of which are usually screened only upon final acceptance. The FAT allowed Waagner-Biro to easily respond to client requests without compromising the project schedule.

For the extremely satisfied client, the FAT was an early demonstration of reliability, despite the demanding schedule. Construction started while the last drawings were still being finished. Waagner-Biro is as prepared as possible for the start of on-site works later in 2017, confident that the equipment will fit and perform as specified.

With the upcoming third FAT, this time a local test for a project in China, Waagner-Biro's next major challenge is almost upon it. With the expertise gained in the earlier tests, the Waagner-Biro team will master this challenge too. ■

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# Smart decisions

A multipurpose indoor performance venue called on cutting-edge technology for a customizable sound system

As the biggest city in Texas, and the fourth-biggest city in the USA, Houston and the greater Houston area is one of the fastest growing metropolises in the country. Just a few miles southwest of Houston lies Sugar Land, one of Houston's largest suburbs, and home to the headquarters and refineries of now-defunct Imperial Sugar. One of the most affluent and fastest-growing cities in Texas, the city of Sugar Land realized there was a demand from residents for culture and entertainment facilities in the town proper, without having to go into Houston's downtown.

Sugar Land made the decision to build the area's first state-of-the-art, indoor performance venue, and the recently opened Smart Financial Centre at Sugar Land is everything you'd expect of a performing arts center in Texas: big, bright and bold. The US\$84m venue, which officially opened in January 2016, comprises 200,000ft<sup>2</sup> that combines the programs of concert hall, civic center and theatrical center in a single shape-adjusting venue.

The space is dedicated to performing arts of all kinds. Jerry Seinfeld opened the Centre in January and was quickly followed by a strong line-up of events that included Don Henley, Dave Matthews, Reba McEntire, Sting and the touring production of *Dirty Dancing*. Upcoming artists due to perform include Bastille, The Lumineers and The Avett Brothers.

To accommodate the most diverse range of acts, the Smart Financial Centre at Sugar Land is designed for flexibility. The venue incorporates innovative moveable walls that can expand and



Above: **Smart Financial Centre at Sugar Land opened in 2016, and includes a state-of-the-art audio system featuring L-Acoustics technology**

contract to create three different seating capacities, ranging from an intimate setting of 3,000 seats to a maximum of 6,400.

## Sound thinking

To ensure the best possible entertainment experience, the Smart Financial Centre called on the expertise of renowned acoustician and sport center AV designer Wrightson, Johnson, Haddon & Williams (WJHW) to design a sound system that would help to attract the industry's biggest performers, while also being flexible enough to address the different room configurations and styles of music.

WJHW design consultant Scott Bray designed a system around L-Acoustics K2 and Kara line arrays, which was installed by Houston-based LD Systems. "This is a premier performance venue for the entire region, so they wanted the absolute best sound possible, and they got it," says LD Systems sales engineer Kevin Broussard.





**The Centre's new audio system has been carefully designed to adapt to the venue's flexible space configurations, delivering high-quality sound whatever performance is being staged**



**Advanced software was used to create accurate models for each configuration before a single speaker was installed**

The new venue's sound system uses a theatrical LCR design: 13 K2 enclosures make up the left and right array hangs, while the center cluster is made up of 12 Kara enclosures. In a bold move, there are no subs on the ground – eight SB28 subs are flown behind each of the LR arrays, leaving a clear proscenium and unhindered sightlines from every seat in the house. In addition, there are five delay arrays of six Kara enclosures each suspended over the balcony. A flexible Kara front fill system uses up to eight Kara enclosures along the stage lip for front fill coverage. All of these are powered by 22 LA8 and four LA4X amplified controllers housed in LA-RAK racks.

At its largest configuration, the Centre seats 6,400 – perfect for national touring acts – but it can be adjusted down to 4,600 seats for smaller shows and civic events. When configured for 3,000 seats, the hall offers an elegant theatrical experience for the patrons of Broadway shows and extravagant holiday spectacles.

The K2/Kara system was the perfect choice for the facility's variable seating design, notes WJHW's Bray. Using L-Acoustics' Soundvision predictive 3D system design software and LA Network Manager, the WJHW team was able to calibrate the system based on the position of the Centre's movable walls and curtains, as well as automatically move delay speakers in and out of the system on chain hoists, all at the push of a button.

### **Predicting the future**

Furthermore, L-Acoustics' Soundvision software gave WJHW a highly accurate model of what each configuration would need in terms of EQ

and delays before the first speaker was put in place; the system was then fine-tuned on-site.

"We felt confident that what we saw in Soundvision is what we'd hear in the venue, and that's exactly what happened," says Bray. "We needed highly accurate pattern control, to keep the sound on the seating no matter what the configuration was. We were able to get hold of Soundvision 3.0, the latest version, and we were able to map out perfect coverage patterns."

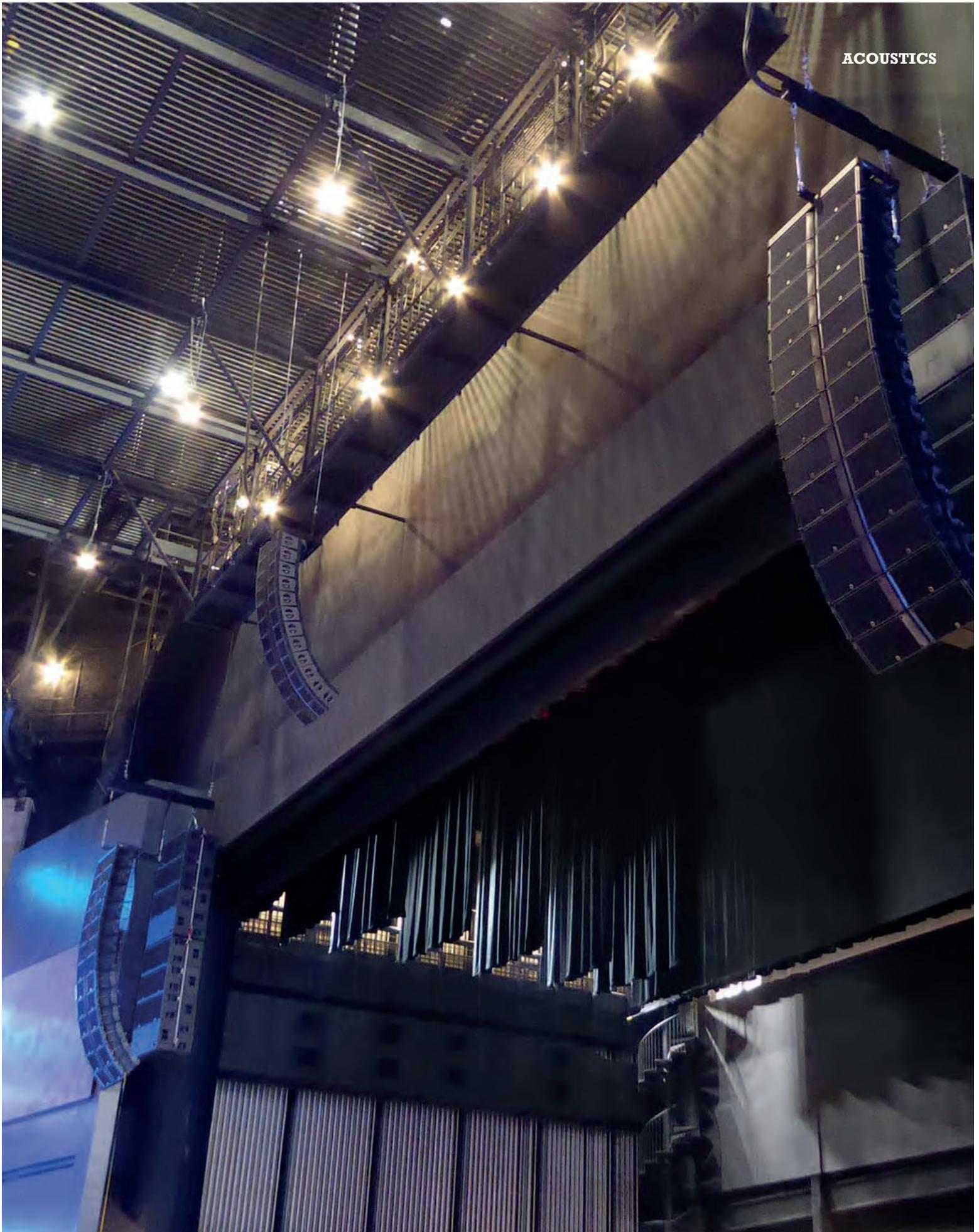
L-Acoustics' André Pichette, head of applications, install, and Dan Palmer, head of integration, provided support to WJHW right from the outset of the project, from the construction documents and ensuring specifications through to the installation. They were on hand to calibrate the system and set up three different presets for each room configuration so that the sound can be perfectly adjusted at the touch of a button.

WJHW had worked with L-Acoustics on previous installation projects at the NBA Houston Rockets Toyota Center, the NBA San Antonio Spurs AT&T Center and the NBA Minnesota Timberwolves Target Center, among others. Bray notes that the K2's rider friendliness had a huge impact on their decision to use L-Acoustics at the Smart Financial Centre. "Artists know the L-Acoustics K2," he says. "You'd have a hard time finding an engineer who wasn't familiar with the system."

LD Systems' Broussard points out that, while the K2 is designed as a touring rig, it also works exceptionally well as an installed sound system – one with the advantage of being able to be hoisted by a dedicated winch for maintenance. "The arrays can be flown and then lowered or raised as necessary," he says. "That's another level of flexibility for this system."

But both Broussard and Bray – and everyone else who has heard the system – have first and foremost praised its sound quality. "It just sounds incredible," Broussard explains. "Very punchy but never losing articulation." Bray agrees: "It's just fantastic sounding," he says, adding the ultimate sound-system compliment: "It's like listening to a really good stereo system." ■

[www.l-acoustics.com](http://www.l-acoustics.com)





# Character study

Updating the acoustics of a beloved Nashville venue had to respect the hall's original charm

**The Laura Turner Concert Hall in the Schermerhorn Symphony Center, Nashville**

**A**t the heart of Nashville's famous Schermerhorn Symphony Center is the Laura Turner Concert Hall, an 1,800-capacity room renowned for its warmth and clarity. But with an increase in popular music shows, the Nashville Symphony has learned that sound reinforcement can itself be a challenge in such a responsive acoustic environment.

"This is a fine symphony hall, and that's what we are first and foremost," says Steve Brosvik, the venue's chief operating officer. "But we also want a comparable reputation for concerts involving amplified sound – to be the best at both.

"We went to a sound convention here in Nashville and listened to 12 manufacturers' systems. From that experience, reinforced by our other research and discussions, we selected a shortlist and asked them to give a demonstration in the hall. For the whole team – musicians, technicians and myself included – there was no question: the d&b boxes were the ones. They just sounded extremely natural.

The flexibility of the d&b system, Brosvik says, has enabled the venue to prevent sound energy being reflected back to the stage. "We want our

musicians to have to focus only on making music. When the environment on stage feels uncomfortable, even oppressive, they resort to ear protection and are not able to focus as well.

"We know from our regular discussions with the musicians that they are now playing in a much more comfortable environment, and one that they can enjoy."

## **Retaining character**

"We apply d&b's ArrayProcessing to hit the front row without disturbing the performers on stage," explains resident FoH engineer Mark Dahlen. "These seats and the ones to the side now have a completely different listening experience, almost like being in a different room.

"Most importantly, the essential character of the Laura Turner Concert Hall remains thoroughly intact – an important consideration, given the venue's reputation and its loyal audience. The room hasn't changed; it still responds the same way, but we're able to address it much more efficiently and everyone, audience and orchestra alike, is able to enjoy that." ■

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**More art  
less noise.**

# Human resources

The appointment of a new chief marketing officer presents opportunities for a leading audio developer

**W**ith a background as a sound engineer and music producer, David Claringbold was the perfect choice for audio supervisor at Sydney Opera House. Appointed in 1996, over the next two decades he would play a central role in the venue's transformation from merely world famous to truly world class, in the process becoming a thought leader in the relationship between art and technology.

"I think the secret in the transformation, which I was fortunate to be a part of, is that I didn't just see things purely technically," says Claringbold. "I saw things from an artistic, an audience and a business perspective."

He developed a skillset that included not just venue technology, but the psychology of people management and motivation, developing work culture, and molding teams and resources to meet artistic and business ambitions of arts organizations striving to be multipurpose – or, as Claringbold prefers to say, "multidimensional".

"The opera house is just one example of a venue that asked bigger questions about its role in the community, in providing value, in making connections with people and art and thinking," he continues. "And I believe – and I think it has been absolutely proved – that technology is a key part of enabling that to happen."

Claringbold is a polymath with a passion for the arts and audio. "We are beings of frequency. When we sit in a concert, we're all essentially vibrating with the same frequency. It's a very visceral, powerful and emotive force."

## Looking to the future

In his role as chief marketing officer at d&b, Claringbold presents a seminar called Sound

Futures. This, he explains, is "part of a thought platform within d&b" – a cultural methodology for being open to the trends that influence the needs of the market. "I don't mention products," he says, "I talk about society, art, anthropology, how our senses respond, the marriage between those senses, and what the opportunities might be in a technology solution, based on what society is telling us we need."

Note the distinction: technology serves the creative vision. "Great technology responds to society's and art's needs," says Claringbold. "If you make a piece of technology and no one wants it, it's useless. Sound Futures is about understanding society and art, to inform what we do around solutions and technology."

This 'thought platform' helps d&b to engage with a shifting cultural landscape, Claringbold adds: "The model is no longer linear. Art is sport and sport is art. Retail is leisure and leisure is retail. I explain this to people to give them a sense that audio plays such an important part in defining our sense of place and our connection to our ceremonies, our art and ideas.

"So where have we, as an industry, positioned that in the thinking of the people that matter? Architects, artists, directors, designers, city planners? We need a very different conversation with these people to understand what they require, so that we can conceive the solutions."

Sound Futures continues d&b's long-held commitment to audio education. "We're invested in bringing people in, whether they're using our systems or not, and connecting them to how to get the most out of the system, and what we call 'system reality', the power that can bring your show or presentation to life," explains Claringbold. "This is a really important part



Adrian Cook

of our education program and we continue to grow it.”

The company also continues to grow its technology capability. In recent years, d&b has developed a suite of powerful software-based tools – ArrayCalc, ArrayProcessing and NoizCalc, for example. Then there is the forthcoming Soundscape system, which will bring multidimensional source placement, acoustic room simulation and signal matrix processor capability to the technology table. These tools provide fast and comprehensive control over system setup, parameters and optimization – forming a formidable toolkit with relevance to a wide range of applications.

“Our unique position is that we will provide a system solution from start to finish, whereby you can do your calculations and configurations, matrixing, source processing and room simulation, all within one box,” says Claringbold.

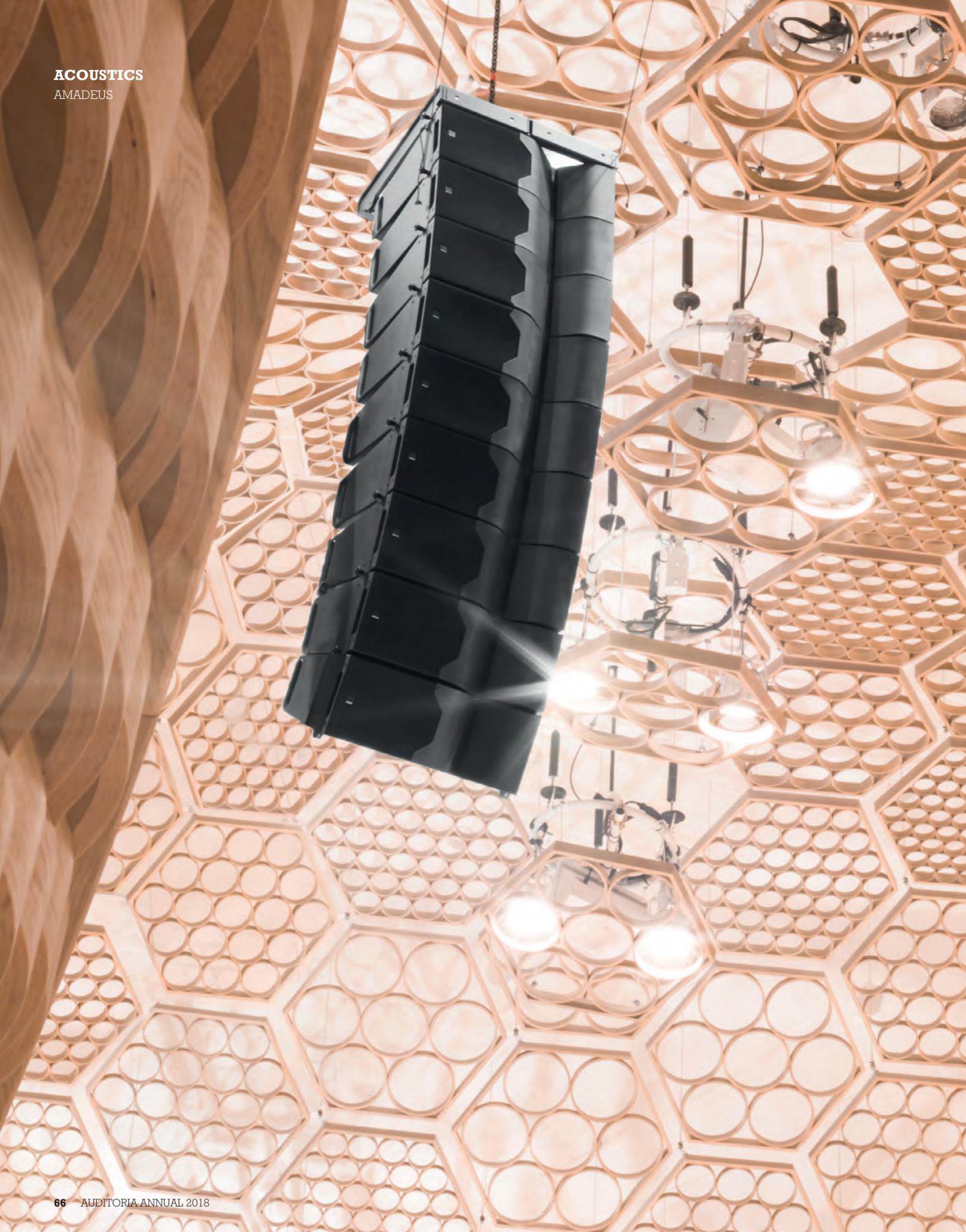
The company’s mission, then, is to bring the benefits of high-quality sound reproduction to a wider range of places and spaces, to enable the delivery of artistic content in ways, and in locations, not previously possible, and to open two-way communications with a broader range of stakeholders to help deliver new solutions for a new world of creative possibility.

“I want d&b to be the brand people think of when they want to be inspired and find the right audio solution to help them grow their business and their audience,” says Claringbold.

For those who would like to know more, Claringbold will be presenting Sound Futures in numerous cities during his world tour. ■

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# Speaking OUT

A new Parisian venue showcases innovative speaker technologies

**T**he recently opened La Seine Musicale, just outside the center of Paris, France, is a marvel of performance spaces. “The location was not picked by chance. It is an island amid the Seine, the center, the beating heart of the Hauts-de-Seine Culture Valley,” explains Patrick Devedjian, president of the Hauts-de-Seine Departmental Council. “Thanks to La Seine Musicale, the Seguin Island becomes its lighthouse. Beyond the symbol, it is a reality. In order to materialize, the La Seine Musicale project needed to gather skills, commitment and ambition.”

The design of La Seine Musicale was undertaken by Japanese architect Shigeru Ban, who partnered with Jean de Gastines. The 393,000ft<sup>2</sup> venue is part of the public cultural infrastructure and can host a wide range of musical performances.

The Seine Musicale complex houses two main concert halls, five recording studios and several rehearsal spaces. The 1,150-seat Auditorium is the signature space of the building, and boasts excellent acoustics designed by Nagata Acoustics and Jean-Paul Lamoureux. From the outside, the space’s rounded shape evokes an egg and inside, the vineyard-style concert hall seats the audience on several levels surrounding the stage, creating a feeling of proximity between listeners and musicians. The surfaces on which the seats are banked create early reflections radiating from the orchestra to the audience, enhancing the intimacy.

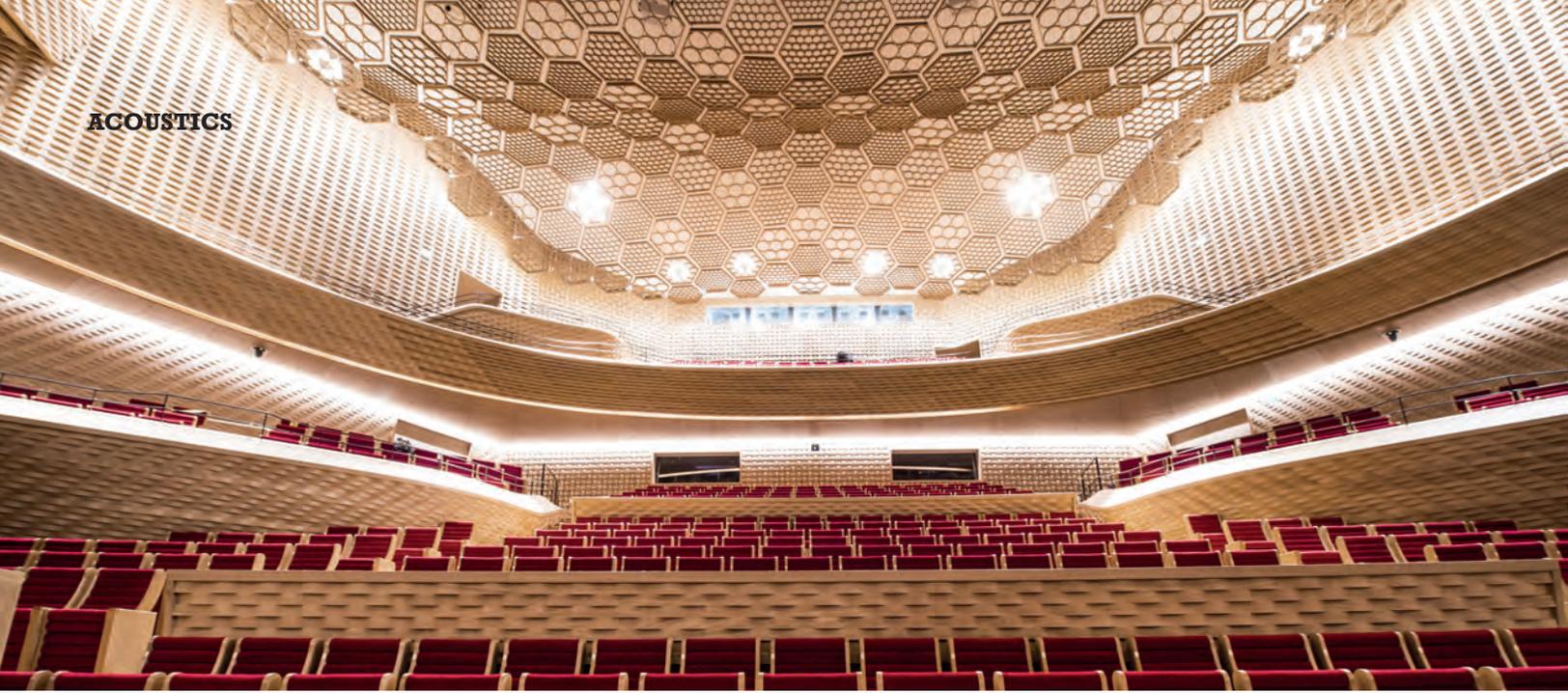
Designed with the same precision used for a music instrument, and with painstaking work on the materials, the Auditorium evokes the art of craftsmanship. The rounded shell of the Auditorium is protected by an outer envelope made of a lattice of glued laminated spruce.

La Seine Musicale can host a wide range of shows in addition to those in the Auditorium, which is dedicated to acoustic music. The Grande Seine performance space was designed to be simple and versatile, and features every type of equipment needed for concerts, musicals, live shows and corporate events. Equipped with three stages and retractable tiers, the Grande Seine has a capacity of 4,000 seats, or up to 6,000 with sitting and standing.

## Solo performer

Paris-based Amadeus, a leading manufacturer of high-end sound reinforcement systems, was chosen to equip the two main concert halls of the Seine Musicale building complex with its specially developed speaker systems. As the sole speaker manufacturer chosen for the project, Amadeus also installed the speakers in multiple rehearsal spaces within the new music center.

Mickael Dinant, head of the scenography department and concert halls construction at Bouygues Construction, elaborates on the particular electroacoustic challenges of the new sound system installation: “We attached great importance to the equipment reliability, performance and flexibility for the Auditorium and the Grande Seine. These aspects were very challenging, as was the modularity, because we had to be able to change from one configuration to another, very quickly and easily.”



Dinant adds, “In this sense, the manufacturer’s involvement, as well as its professional integrity, were key aspects to guaranteeing a final result matching the goal of both prestige and ambition for La Seine Musicale.”

Overcoming these challenges, Dinant explains, was only possible due “to the professionalism of Videlio, which was in charge of the audiovisual integration, and to Amadeus, which designed, developed and built the speaker systems. They have been completely involved in the project for the past three years. With Amadeus’s inventiveness and expertise, they developed new speaker array enclosures perfectly adapted to our needs and played a major role in the success of this magical venue.”

### Technology revolution

Amadeus completely redesigned its middle format Diva speaker array series, which is currently installed in a number of major musical, theatrical and public institutions – both nationally and internationally – including the Philharmonie de Paris, La Gaité Lyrique, the National Assembly of South Korea and the National Theatre of Brittany. La Seine Musicale is the first installation in the world to feature the new Diva M<sup>2</sup> array speakers.

As Gaetan Byk, Amadeus’s marketing manager, explains, “The Diva M<sup>2</sup> is not a simple evolution of the Diva M speaker series created in 2006. It is a revolution, a total and radical reinvention. This new version raises the bar much higher. Its new design incorporates a dramatic collection of over 100 major changes to the previous model.

“The structure of the low-, medium-, and high-frequency transducers, the geometry of the cabinets, their internal and external structures, the active filtering design and more – basically



**Amadeus redesigned the Diva speaker series for use in La Seine Musicale, incorporating more than 100 major changes to the previous model, which is favored by many venues**

all major acoustic, electroacoustic, electronic and mechanical components, have been completely rethought and reinvented,” he adds.

The Diva M<sup>2</sup> has a three-way enclosure and bi-amplified design, with two active drivers. The enclosure features one direct radiating 8in neodymium LF transducer, mounted in a bass-reflex enclosure, and two neodymium diaphragm compression HF drivers, coaxially mounted with a single acoustic output and coupled to an individual proprietary waveguide. Its unique diffraction horn has been optimized to get a vertical dispersion of 10° and a horizontal dispersion of 100°.

“Achieving a perfectly uniform coverage and an excellent spectral quality throughout the whole listening area was especially challenging within the Auditorium, because of the space’s 360° configuration, and within the Grande Seine too,” explains Dinant. “The Grande Seine bleachers are segmented subspaces, each with different slopes, and to top it off they are asymmetrical. The bleachers’ curvature is almost exponential and the distance from the stage to the last spectator is almost 50m [164ft].”

The Diva M<sup>2</sup> speaker offers a revolutionary HF ensemble tweeter featuring a unique combination of extended frequency response, high efficiency and wide dispersion pattern.

In order to obtain optimal full-spectrum sound quality in the La Seine Musicale’s live event spaces, the new Diva M<sup>2</sup> SUB is paired with the Diva M<sup>2</sup> speakers. Each subwoofer is equipped with two 12in transducers, mounted in a bass-reflex enclosure to reproduce the lowest sonic sounds. ■

[www.amadeusaudio.fr](http://www.amadeusaudio.fr)



# DIVA [M]<sup>2</sup>

Amadeus sound, squared.



*« Almost every aspect of each DIVA M<sup>2</sup> has been entirely redesigned, reinvented. The new DIVA M<sup>2</sup> is not a simple evolution. It is a revolution, a total and radical reinvention. »*

Bernard BYK, CEO

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# Into the future

After more than 75 years, significant investment in an Arkansas venue has resulted in a new lease of life

**A major investment project has addressed a number of venue deficiencies, while maintaining the building's architectural integrity**

Timothy Hursley

**B**uilt in downtown Little Rock as a part of the WPA New Deal campaign, the Joseph Taylor Robinson Memorial Auditorium opened in 1939 with the vision of providing visitors, from within and outside of Arkansas, with a world-class, multipurpose performance hall.

More than 75 years later, the same vision remained in focus as Robinson Center faced extensive renovations that would carry the iconic landmark into the 21<sup>st</sup> century.

### In the beginning

For decades, Robinson Center served as a performance, exhibition and convention space. Designed by Eugene Stern of the architecture firm Wittenberg & Delony, the magnificent structure featured bold art deco elements of its time. The original auditorium included a top-level performance hall with a theater, stage and balcony, a bottom-level arena, as well as convention halls and committee rooms.

Season after season, audiences experienced a wide range of performances – from symphony and ballet to traveling Broadway shows, concerts and more. It's often remembered as the place where, in 1956, Elvis Presley made his first live recording of one of the bestselling singles of all time, *Hound Dog*.

Other famous stars have lit up the Robinson Center stage, such as Ella Fitzgerald, The Beach Boys, Mikhail Baryshnikov and Jerry Seinfeld. The hall has hosted Dwight D Eisenhower and Eleanor Roosevelt, plus major productions such as *Wicked*, *La bohème*, *Beauty and the Beast* and *Jersey Boys*.

Over the years, the productions have grown larger and more complex. After operating the Robinson Center for many years, the Little Rock Convention and Visitors Bureau (LRCVB) knew that to accommodate the biggest Broadway shows and concerts, facility deficiencies had to be addressed. Simple repairs wouldn't suffice. A major investment had to be made to, yet again, create a top-level, multipurpose venue.

The project started out in 2011 when a concept study was presented to the city's A&P Commission by Wittenberg Delony & Davidson Architects, Jaffe Holden Acoustics and theater planner Schuler Shook. Voters gave bond funding approval in 2013, and on July 14, 2014, Robinson Center closed for a 28-month intermission. The project cost was US\$70.5m.



## THEATER PLANNING

Robinson Center was added to the National Register of Historic Places in 2007, so it was important to preserve the original architectural integrity while transforming the building into a modern, innovative structure. The design team included Polk Stanley Wilcox Architects of Little Rock and Ennead Architects of New York; Jaffe Holden Acoustics; and Schuler Shook. The owner's representative was SCM Architects.

The LRCVB and Schuler Shook had worked together twice before. Schuler Shook designed a complete renovation of the stage rigging system 10 years earlier, prior to the concept study. As LRCVB president and CEO Gretchen Hall says, "I knew that we had a relationship with them, so to reform that relationship was great because we had comfort in their ability to provide a real, multipurpose facility."

### Moving forward

The performance hall took center stage as the design team developed concepts that increased production capabilities, enriched theater intimacy, improved sightlines and enhanced acoustical quality. One of the first major decisions was to gut the inside of the hall, then lower the stage down to the former arena level, which created more volume in the audience chamber.

"We dropped the stage roughly 36ft for several reasons," explains Jack Hagler, Schuler Shook's partner-in-charge. "The three primary reasons were to enable us to reshape the audience chamber to a more intimate scale, to increase the room's volume for improved acoustics for the Arkansas Symphony Orchestra, and to get the loading dock and stage at the same level."

The back of the hall was moved forward, 30ft closer to the stage, to help further enhance the intimate feel and create fabulous sightlines for audience members. The expanded, multipurpose stage, and the new addition of a forestage grid, now accommodates larger orchestras with chorus and the biggest Broadway shows. The improved orchestra pit and new lift enable the symphony orchestra to move further downstage onto the extended apron, providing a better acoustic coupling of the stage with the audience chamber.

The new performance hall contains 2,214 seats with two balcony levels. The seating plan has been optimized so every seat delivers a world-class experience. New boxes, all with excellent sightlines, line the side walls, their angular shape paying tribute to the building's



original art deco style. The design also ensures acoustical quality and enriches the room's intimate atmosphere.

A substantially expanded stage wing, new backstage crossover, new system of catwalks, forestage rigging grid, control positions, and followspot booth ensure the best standards of production functionality for the most complex shows. The theatrical lighting system was greatly improved, with an advanced technology infrastructure facilitating transition to full LED lighting. Adjustable acoustical drapes deliver the ability to adjust the reverberation of the room by up to 0.7 seconds.

The back-of-house now offers increased support for larger Broadway productions. The previous on-truck loading dock required a lift to haul equipment up 12ft to the original stage level. Now at the same level as the new stage, the nearby three-truck dock provides easy access to the stage and back-of-house areas for quicker loading. New performer facilities include four chorus dressing rooms, four private dressing rooms with shower facilities, and a performers' lounge that welcomes the most demanding artists.

The restored lobby delivers a stunning reinterpretation of its original art deco elements. Other renovations, such as expanded restrooms, a permanent on-site box office, increased ADA accessibility, and a built-in concession and merchandise area, provide amenities that measure up to the grandeur of the new facility.

In addition to the updated performance hall, Robinson Center now includes a two-story conference center with access to a 5,477ft<sup>2</sup> terrace, overlooking the Arkansas River and the new Broadway Street Bridge.

Renovations for the newly named Robinson Center were completed in 2016. Now a sustainable, LEED-certified building, the state-of-the-art venue is the home of the Arkansas Symphony Orchestra, Ballet Arkansas, and the Celebrity Attractions Broadway Series. It recently hosted *The Phantom of the Opera* and will host *The Lion King* next year — two of the most spectacular shows on Broadway.

"It's phenomenal the number of people that are coming to shows, and the convention groups we're booking," remarks Hall. "We promised the community, if we build it, they will come. And they really are." ■

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# Take a seat

Designed by the Elbphilharmonie's architect, a new seat model was customized for a futuristic concert hall

**D**esigned by Swiss architectural firm Herzog & de Meuron, the Elbphilharmonie in Hamburg opened in January 2017 and looks set to become one of the city's cultural landmarks. Poltrona Frau Contract supplied and installed 2,100 seats in the Grand Hall, the venue's main concert hall space, which is situated 50m from the ground, in the middle of the building.

The new complex, built on a site that previously housed an industrial building, will include three auditoria, a hotel and 45 private residential units. Externally, two contrasting architectural styles are visible, with old and new brought together to create

a striking impact. The brick 1960s building is topped with a glass construction that reflects the Elbe River, the sky, the port and the upper part of the city with its changing lights.

The Grand Hall is the very heart of this project. The design of this concert hall places the orchestra in the center, acting as the fulcrum around which the entire space is then organized, with the seats in the stalls laid out in parallel lines on the same level as the orchestra and in the gallery. This layout offers an excellent concert experience from any seat in terms of view and acoustics. With no seat in the Elbphilharmonie further than 30m from center stage, the overall sound effect is surprisingly engaging.



**The project architects for the Elbphilharmonie also designed the seating for the Grand Hall**

## SEATING



**The seat and back of the HAM offer constant support for perfect posture during concerts, and every aspect of the design has been specified for the Elbphilharmonie**

Placing the orchestra and conductor in the middle of the audience is a well-known venue design model. Nor is it uncommon for concert hall architecture to put the audience on various levels to make it easier to hear and see the performance. The combination of these two principles in the Elbphilharmonie is at the heart of the venue's design. The levels and stairs that fill the hall, together with the walls and the ceiling, form the shape of the building – the Grand Hall was not created to fit into an external shell, but was designed to impose its own architecture.

### **Best seat in the house**

Herzog & de Meuron, responsible for every detail of the venue project, also studied and developed the design of the seats in the Grand Hall. The shape and size of the new seats, called the HAM, integrate perfectly with the logic and architecture of this concert hall, helping to make it unique.

The HAM seat, which will be added to Poltrona Frau's collection of auditorium and theater seating, is a welcoming, comfy armchair in a dynamic style. Its rigid polyurethane supporting frame is in an unusual shell shape. The seat and back are crush-proof polyurethane foam offering constant support, for perfect posture during concerts. The back of the seat is unusual, in curved black lacquered wood, a material that helps to achieve the required acoustics. HAM also stands out for its no-frills lines and careful construction, with all the joints between the various elements hidden from view. The fabric is also tailor-made, created specifically for the Elbphilharmonie – a gray weave with a special moiré effect.

Taking part in a project as complex as this with such competent partners represented huge growth for Poltrona Frau in terms of experience. While engineering the HAM seat, the dedicated project team showed great technical skills as well as strong problem-solving abilities. Indeed, during the various design stages, the seat had to be rethought in order to best meet the needs of the designers and the visual and acoustic restrictions. The result of months of work can be summarized in figures: 1,200 hours of design and 1,544 drawings; 2,100 seats installed with over 50,000 screws and three different sloping levels at various heights; 2,688 hours of assembly and more than 23,600 miles of coverings installed.

The craftsmanship and expertise of Poltrona Frau, built up over a century, has once again been combined with cutting-edge technologies, the strictest of regulations, and the study of ergonomics and acoustics. This continually evolving industry experience is always available to creative designers for projects that will become icons of the international architectural scene. ■

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# System upgrade

An iconic German auditorium and concert hall was vastly improved with the installation of a powerful new audio system

**T**he Haus der Kulturen der Welt (House of World Cultures) in Berlin is one of the German capital's most iconic buildings. Designed by renowned American architect Hugh Stubbins and completed in 1957, the Congress Hall (as it was then) was a gift from the USA as part of the Interbau international building exhibition. From the beginning the building was conceived as an international meeting place and forum for cultural exchange. Stubbins's soaring architecture, with its graceful curved roof, serves as a symbol of freedom that was deliberately designed to be visible from the former East Berlin.

Renamed the Haus der Kulturen der Welt (HKW) in 1989, the venue is now one of Europe's leading centers for contemporary art, performance and discussion of world cultures, with a special focus on non-European cultures and societies. Along with two exhibition halls, HKW features a 1,024-seat auditorium and concert hall, a 300-seat theater and several other meeting rooms and multifunctional spaces. In 2016 HKW embarked on an extensive upgrade and refurbishment of the auditorium, including brand-new acoustic treatment and the installation of a powerful Kling & Freitag Sequenza 10 line array system. The auditorium is now well into the new season and enjoying the benefits of the new system, which was commissioned in early 2017.

## Highlighting issues

André Schulz, head of audio and video engineering at HKW, explains that there were several issues that needed to be addressed: "We had problems with the

room acoustics," he says. "The room was very resonant with lots of reflections, which resulted in poor speech intelligibility and sometimes 'muddy' sound. The second problem was that our existing sound reinforcement system was quite old and didn't provide sufficient coverage across all the seats in the auditorium. We clearly needed a more modern solution."

HKW engaged the services of leading engineering consultancy firm Müller-BBM, experts in the field of room and building acoustics, to take the room measurements, create the computer models and specify the necessary acoustic treatment. Audio consultant Gunter Lühder of Avissplan was retained for sound design services.

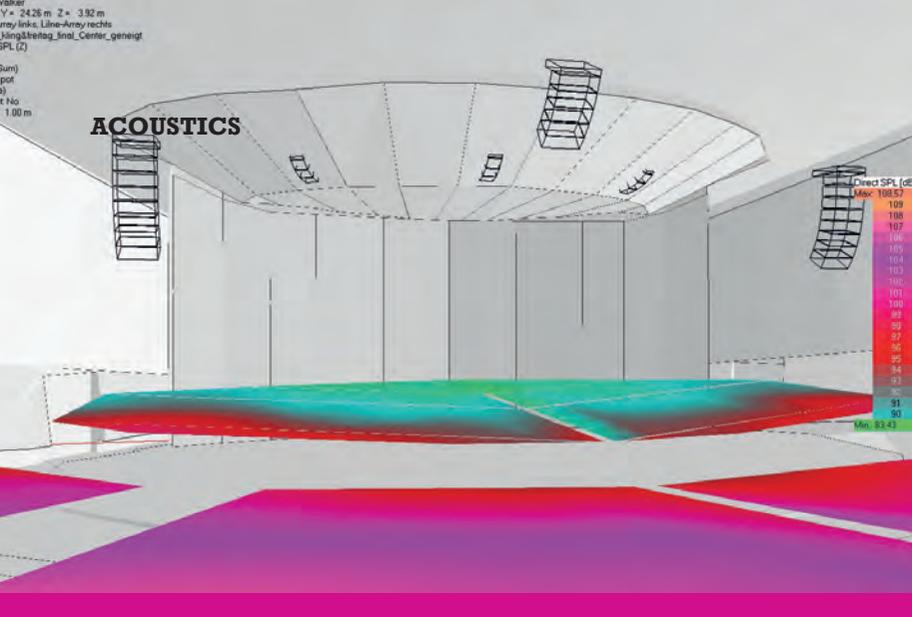
However, as Lühder points out, since the room needed full acoustic treatment and there were deadlines that had to be respected, it was impossible for him to measure the acoustic behavior of the room with the new treatment and still deliver the project on time. The only option available was to predict the measurements using 3D computer modeling.

"Fortunately we had an excellent collaboration with Müller-BBM, who gave us their computer model as the basis for our own simulations," notes Lühder. "We used EASE software to simulate the results of a range of systems using different types and sizes of loudspeakers. After we had taken into account a number of factors, we concluded that a 10in line array system would be the best solution."

Among the elements that influenced the final choice was the fact that the auditorium has several stage sizes depending on the type of performance, and therefore

An extensive upgrade and refurbishment at Berlin's Haus der Kulturen der Welt included the installation of a Kling & Freitag system





### Size matters

Another significant project consideration was the physical size of the new system. “The loudspeaker system has an important impact on the architectural appearance of the auditorium,” states Lühder. “Due to the sheer size of the venue, virtually every performance is amplified, be it jazz, pop, classical music or speech, meaning that the PA is pretty much a permanent fixture and needs to blend in well. It also has to be capable of handling a wide variety of performance types. The client wanted the system to be as visually discreet as possible, but at the same time it had to be big enough to deliver enough power to reach the back seats without straining. The danger of going too small is that you lose directionality in the low frequencies, which increases the risk of feedback in this frequency area – but too big and it’s intrusive, so we had to find a compromise. After analysis of our computer simulation and the test suspension of a life-sized facsimile to verify the visual impact, we decided with the client that a 10in line array

**Meeting the project’s tight deadlines required the use of 3D computer modeling**

different audience configurations, all of which require the same coverage. Furthermore, the possible loudspeaker flying points were limited by the existing holes in the ceiling for lighting, which made it impossible to vary the distance between the speakers and the back wall of the stage. Lühder got around this by using three additional ultra-compact arrays in the ceiling above the stage, which are deployed in small-stage configurations to serve the front rows of the audience.

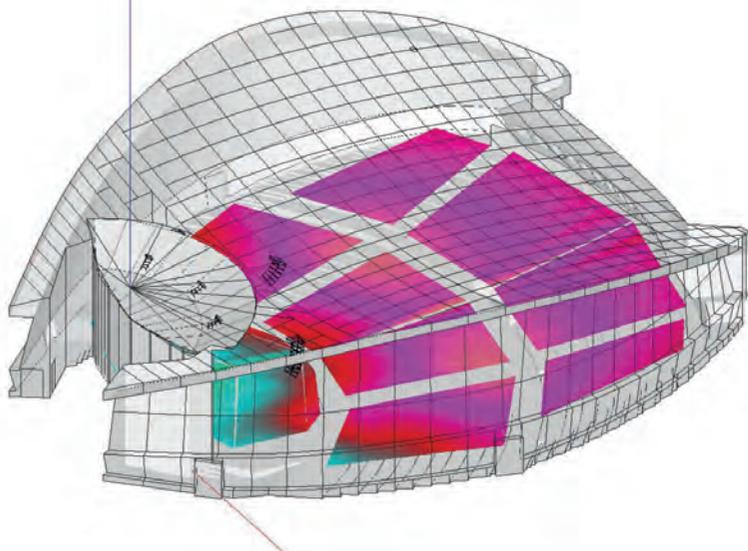
# PASSION

## BUILT IN

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system offered the best compromise between size and low frequency directivity.”

Having initially reviewed four options, a blind shoot-out was finally organized between two loudspeaker manufacturers to determine the best-sounding 10in line array for the auditorium. The K&F Sequenza 10 emerged as the clear winner.

The final system, which was installed by Elektroakustik Neuenhagen, comprises three hangs (L/C/R) of eight, five and eight K&F Sequenza 10 N and 10 W cabinets respectively,

**Analysis of the computer simulation and life-sized test suspension also helped to inform the physical size of the system**

supplemented by a further six mobile ground stacked Sequenza 10 W (three per side for optional extra reinforcement) and 12 mobile Nomos XLS subwoofers. The system is powered by a total of seven K&F SystemAmps based on D-Series amplifiers from Lab.gruppen. The K&F SystemAmps have been designed to work with the K&F library thanks to specially developed firmware.

“I confess that we were very surprised by the results of the shoot-out,” admits Schulz. “The other manufacturer, in addition to being very well known, is also the manufacturer whose old system we had just removed after 14 years of loyal service. We were fully expecting that their new system would perform better than anyone else’s offer, but it wasn’t the case. The Kling & Freitag Sequenza 10 was measurably superior in every area of the audio spectrum and provided excellent coverage for every seat in the house. It has been performing impeccably since it was commissioned in January.” ■

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# Unparalleled flexibility



The concert hall at Liberty University is a multipurpose space, suitable to stage any type of arts performance

events to a less reverberant space that embraces amplification and the ever-expanding possibilities of digital music making.

The design intent for the concert hall was twofold – to design a grand campus room ideally configured to support a wide variety of university performances, and also to create a welcoming and intimate home for large community and regional celebrations.

As Vernon Whaley, Dean of the School of Music, explains: “The diversity of the hall as a multipurpose space provides the opportunity to use the room in practical teaching application and professional presentation on a daily basis.” With the ability to support different performance types within one dynamic space, the concert hall at Liberty University creates a ‘concert hall for all’ – imbuing the arts with a new sense of allure on campus while providing a much needed, high-caliber performance space in central Virginia and the greater mid-Atlantic region.

**Engaging the audience**

The sculptural form of the concert hall diverges from a conventional shoebox shape by deploying an expressive language of sinuous walls, balconies and wraparound seating – all housed within an iconic semicircular shell. “The design helps to connect the audience and performers by using a centripetal composition focusing on the stage and orchestra pit,” explains designer Jim Kovach of VMDO Architects. “By placing audience members in high-quality seats closer to the action, the intimate arrangement encourages participation rather than observation.” A 300-seat loft embraces three sides of the stage and, when not being used by the choir, further augments the sense that the audience is directly engaged in the performance.

“In another challenge to convention, the concert hall reverses the typical arrival sequence,” explains Theatre Consultants Collaborative designer Athos Zaghi. “The lobby is located behind the stage at the upper choral loft level. A patron enters the lobby and is presented with a wonderful and unexpected view of the audience seating – providing an immediate sense of anticipation analogous to a performer’s experience upon entering the stage platform.”

For the design team, the opportunity to create a signature room uniquely tailored for performances and communal experiences prompted reflection about how design can enhance connection. “Ultimately, the design of the concert hall is about making the intangible

With the ability to support acoustic and amplified performances within one dynamic setting, a university concert hall serves as the centerpiece of a burgeoning arts community

The 1,600-seat concert hall at Liberty University (Virginia, USA) is unique in its ability to accommodate every conceivable form of musical presentation – ranging from intimate natural acoustic concerts to large amplified events. The client’s desire to showcase the broad range of ways music resides within the campus setting sparked the design of a multimodal concert hall that integrates room design acoustics, adjustable acoustics and digital acoustics, making it the first of its kind in the USA. This ‘phygital’ space, which can be physically and digitally altered to support any type of performance, can be transformed from a wood-lined room designed for acoustic

## DESIGN



Above (left and right): **The concert hall's innovative, flexible design components in different modes**  
Right: **At the touch of a button, the performance space can be visually and acoustically transformed**

tangible,” says architect Drew Fleming of VMDO Architects. “By combining certain technical and aesthetic elements in unique ways, even a brief encounter can be powerfully lived, shared and remembered. The project team designed the hall to enliven this dialog between space and experience through proximity, views, light, beauty and variability.”

Daylighting and perimeter glazing attempt to break down the introverted nature of this often-closed space type. Complementing the interior's emphasis on audience participation, the lobby opens up performances to public view – inviting students and visitors to peer into the concert hall through a series of tall windows with sliding wood shutters. A series of radially located windows perforate the hall's curved exterior wall, bathing the stage and chamber with daylight and conveying an ambiance of warmth and wellness.

A generous multilevel promenade stitches together the main building's public spaces and academic programs – engaging visitors and students in the greater life of the building and in the campus and community setting beyond.

### Flexible configuration

At the heart of the concert hall's flexible and community-oriented design is a revolutionary approach to acoustics. “Never before has the paradigm of the pure concert hall (designed for a wide range of flexible natural acoustics) also been equipped with an electronic architecture system whose variable, adaptive reverberation settings can be used separately or in synchronicity with the physical acoustic room,” explains acoustician David Greenberg of Creative Acoustics.

The baseline state of the room is a hickory-clad chamber that supports a wide range of natural acoustical performances – from soloists and small chamber groups to a full choir with orchestra. By deploying acoustic banners and drapes, the hall can physically mask its hard surfaces and transform into a space for amplified

music. A layer of digital architecture supports the adjustment of reverberation with the assistance of hundreds of small microphones, speakers and an array of digital signal processors. “What is gained by all three acoustic moves, and what makes this venue unique,” says Greenberg, “is the comprehensive, push-button control over both the purely natural and electronically controlled acoustic dynamics of the space.”

### Building connections

“The technology in the venue is designed to extend the boundaries of the traditional concert hall,” explains Theatre Consultants Collaborative principal Jason Prichard. “A conductor can, with the push of a button, transform the space visually and acoustically to support a broad range of music-making experiences. The audience chamber and stage serve as a teaching laboratory by day, offering ease of operation, and provide state-of-the-art technology to support large touring and televised special events for the community.”

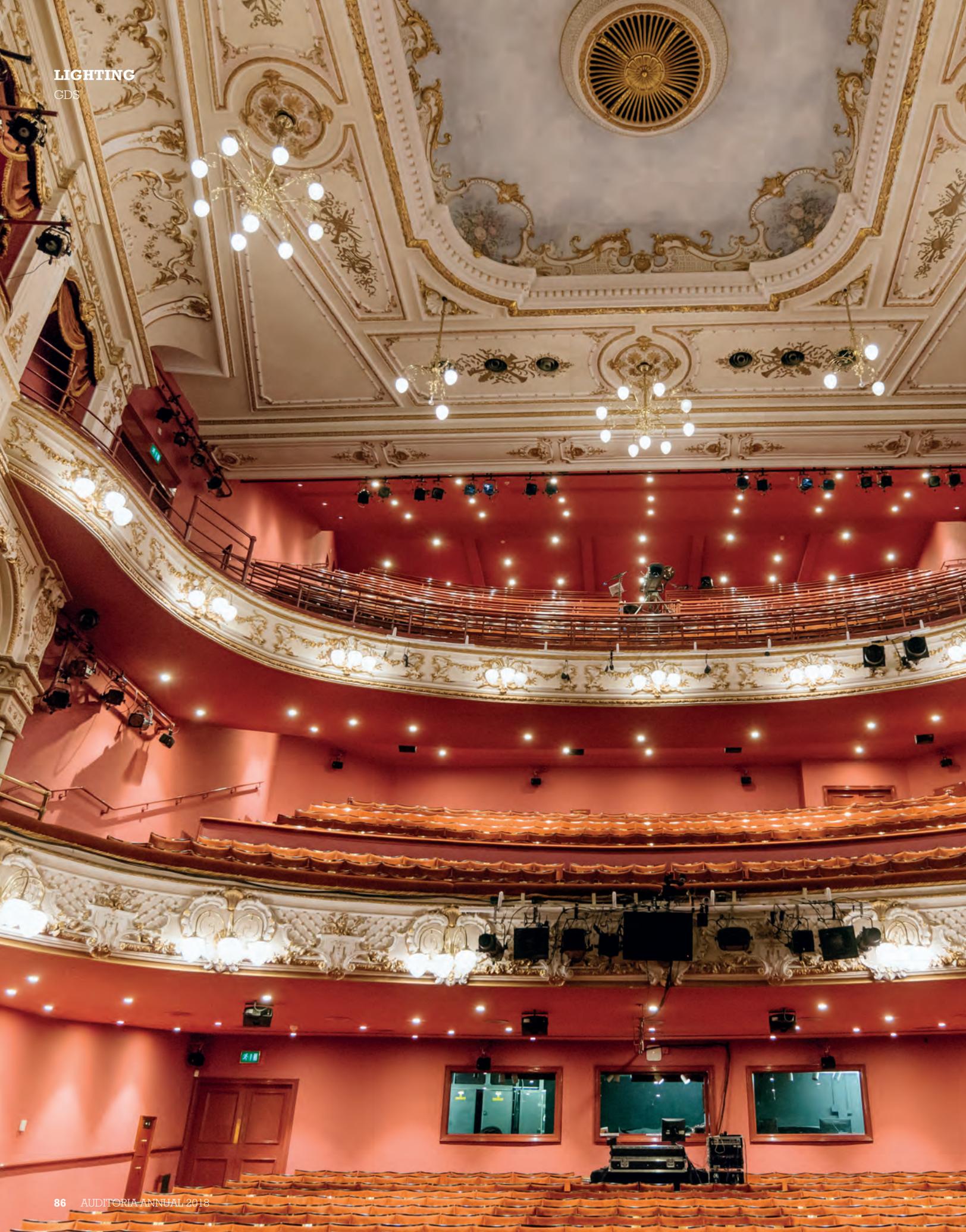
“Within a setting that feels more like it seats 400 than 1,600, the concert hall offers inspirational surroundings, comfortable seating, lighting and acoustics that seamlessly support ballet as well as orchestral performances,” explains Lynchburg Symphony Orchestra president Linda Edwards. “Nothing else in the region compares.”

Such flexibility serves as a mechanism for connection – between the audience and the performers, between art and architecture – within the context of a larger campus and regional setting. The transformational nature of the concert hall enables these connections to flourish and assemble/disassemble with relative ease – spurring innovation alongside everyday experience for the burgeoning arts community of central and surrounding Virginia. ■

[www.theatrecc.com](http://www.theatrecc.com), [www.vmdo.com](http://www.vmdo.com),  
[www.creative-acoustics.com](http://www.creative-acoustics.com)







# New lease of light

The Lyceum Theatre, Sheffield's Edwardian treasure, has enjoyed a house light makeover that loses none of its charm while dramatically reducing energy consumption

**T**he Sheffield Lyceum, built in 1897, was designed by the famous theater architect W G R Sprague and is the city's only surviving Edwardian auditorium. On the venue's opening night, an enthusiastic audience witnessed a performance of *Carmen*, after which John Hart, the theater's managing director, proclaimed that its magnificent architecture rivaled the best in the country. He declared, to loud applause, that it was truly a first-class theater, possessing as it did a superb and clear view of the stage from every part of the house. Sprague himself appeared on the stage and took a bow; he was forced to return for another when the house refused to let him leave. Such a resounding launch would stand the Lyceum in good stead for many years to come and it was graced by the nation's leading talents for more than 70 years, until the theater shared the less illustrious fate befallen by so many of its kind by becoming a bingo hall in 1968. A year later, the building closed.

By 1972, although it was protected by Grade II Listed status, planning permission was sought for the building's demolition and only the campaigning of the Hallamshire Historic Buildings Society saved the day. Bingo returned, then rock music, but by the 1980s, the formerly beautiful interior was dilapidated and in desperate need of the spirit that had once propelled it to greatness. As the specter of car lots and nightclubs circled, a small group of theatergoers won the most important battle of all and, with the help of Sheffield City Council, the old place made a spectacular comeback. A complete restoration took place between

1988 and 1990 (at a cost of US\$15.5m) and the Lyceum was back in business.

Since its fortunes were restored more than 25 years ago, the famed auditorium has sustained its status with a variety of theater, including touring West End productions, opera and contemporary dance shows.

## New beginnings

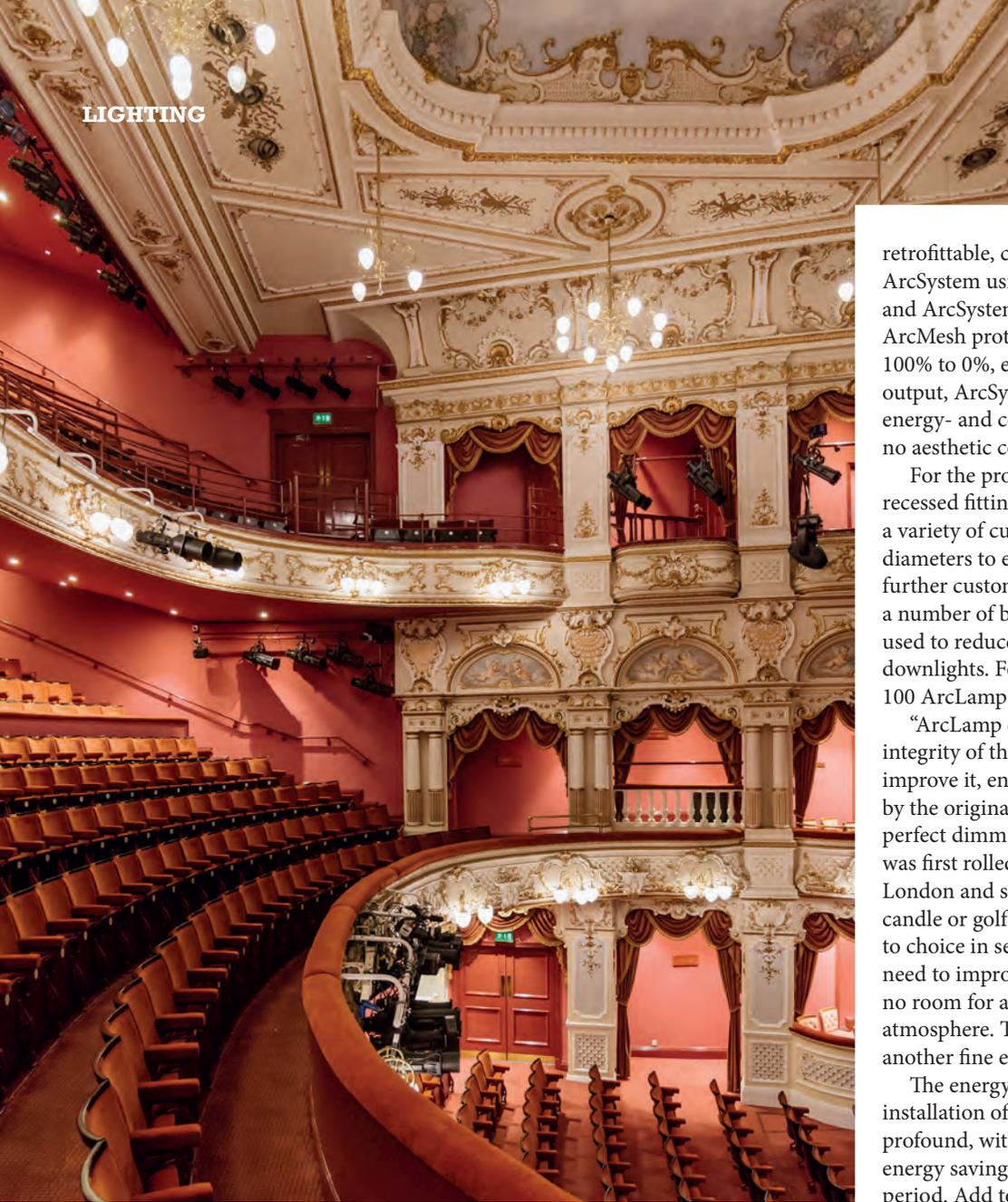
The Lyceum recently closed its doors again for altogether happier reasons than on previous occasions. Over a 10-week period, the venue was transformed to create a more comfortable experience for audiences and improve its technical and operational equipment. This time, a campaign spearheaded by Dan Bates, chief executive of Sheffield Theatres, secured funding from Arts Council England, Sheffield City Council, several trusts and foundations, the local business community and audiences, for the program of improvements.

Theater consultant Theatre Projects was brought in to carry out the renovation project – part of the brief for which included a completely new house light system. Bristol-based lighting manufacturer Global Design Solutions (GDS) was engaged to supply the venue with an LED lighting system, installed by specialist integrator Stage Electrics. The project team's aim was to take full advantage of GDS's groundbreaking products to improve the sustainability and aesthetics of the theater without in any way compromising its Edwardian charm.

"Modern commitments to environmental and economic sustainability are no respecter of grand old buildings like the Lyceum and meeting



## LIGHTING



contemporary standards is now considered more of a fundamental requirement than a mere stated aim,” explains GDS managing director Matt Lloyd. “Fortunately, for those charged with simultaneously reducing costs and environmental impact at the same time as improving customer experience, GDS has the tools to meet the most demanding requirements.”

### Respecting tradition

At the Lyceum, the new system was to be as close to its predecessor in appearance as possible, it was to be installed with minimal impact on the fabric of the interior, and was to require little or no maintenance – since regular access to fittings and fixtures is expensive, particularly in such settings. The project team settled upon a fully

**The new house lighting system at the Lyceum employed the latest technology, but was carefully designed and implemented to minimize the impact on the historic venue**

retrofitable, completely wirelessly driven GDS ArcSystem using a combination of ArcLamp and ArcSystem Pro fixtures, controlled by GDS’s ArcMesh protocol. With perfect dimming from 100% to 0%, excellent color rendering and bright output, ArcSystem luminaires provide all the energy- and cost-saving benefits of LEDs, with no aesthetic compromise.

For the project, 171 ArcSystem Pro Fixture recessed fittings were retrofitted. GDS supplied a variety of custom-made bezels in different diameters to ensure a perfect fit for each. A further customized element was the creation of a number of black ‘honeycomb’ centered inserts, used to reduce potential glare from some of the downlights. For the chandeliers and sconces, 100 ArcLamp Golfball Frosted fittings were used.

“ArcLamp enables us not only to retain the integrity of the feature-lighting but actually improve it, enhancing the outcomes sought by the original designers, while still enjoying perfect dimming,” continues Lloyd. “ArcLamp was first rolled out at The Savoy Theatre in London and since then, its clear or frosted, candle or golfball variants have become a go-to choice in settings where there is an obvious need to improve sustainability, but simply no room for any compromise of the heritage atmosphere. The Sheffield Lyceum constitutes another fine example of its application.”

The energy savings associated with the installation of ArcSystem at Sheffield Lyceum are profound, with the new system expected to yield energy savings of around 90% over a five-year period. Add to that a reduction in maintenance costs underwritten by lamps rated for 35,000 hours of continuous use and the case is made. GDS continues to go from strength to strength, but as Sheffield Lyceum illustrates, thoughts of a one-style-fits-all solution never surface. Auditoria, particularly of the Lyceum’s vintage, are all different and GDS’s ever-developing range of products enables designers and integrators to sympathetically address each individual project to obtain the best possible outcomes.

Sheffield Theatres, the group responsible for the Lyceum, is delighted with the houselights at the Lyceum and has described the results variously as “magnificent”, “impressive” and “spectacular” – a fitting range of superlatives to crown another GDS job well done. ■

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# Collaborate and Listen

A series of flexible venues have been designed to encourage artistic cross-pollination

**N**ew York University (NYU) Abu Dhabi is a new paradigm in higher education for a global world. Located on Saadiyat Island – a 2,700ha natural island 0.3 miles from the coast of Abu Dhabi, the capital of the United Arab Emirates – the university is a product of the partnership between NYU and the Abu Dhabi government’s Executive Affairs Authority, and functions as part of NYU’s global network of campuses. The university’s campus, designed by Rafael Viñoly Architects, is a split-level, pedestrian-oriented network of 29 academic, arts, residential, student life and research buildings that integrate regional and western planning typologies to create a comfortable climate of intellectualism in the heart of the Middle East.

The university’s arts and humanities program encompasses fields of central importance to human culture and creativity. Students explore

fundamental questions of human thought, cultural values and modes of expression, and develop their own creative capacities as scholars, writers and artists in a variety of media. Additionally, the university’s programming strives to attract the public and act as a community space for Abu Dhabi and the UAE. The Arts Center at NYU Abu Dhabi supports these goals by serving as an education center for a variety of media, and as a vibrant performing arts center that presents student, faculty and community productions alongside those by professional artists from around the world – fostering an interactive relationship between the arts, scholarship and the community. The Arts Center complex includes a 700-seat main theater (the Red Theater), a 150-seat concert hall (the Blue Hall), the 150-seat Black Box theater, a project space gallery, a lobby space for pre- and post-performance receptions, screening rooms, rehearsals rooms, film editing studios, classrooms and workshops.



### Leading through collaboration

Rafael Viñoly Architects led the programming of the Arts Center through an iterative and collaborative process that developed the space plan for the building by relying on facility tours and interactive sessions with multiple departments and schools at NYU. The methodology for confirming exact venue capacities, classroom utilization, building efficiency and building support was developed with deep user input as well as guidance from facilities managers, university leadership, development managers and cost advisors prior to approval for use as the basis of the building designs. Throughout all stages of work, regular presentations of design concepts and materials were developed and coordinated by Rafael Viñoly Architects with a design review committee consisting of faculty, facility managers, development and construction managers.

An overarching concept incorporated into the design of the Abu Dhabi Arts Center was the

cross-pollination between the arts and artists of different genres and media. The encouragement of artistic expression and interaction that crosses multiple forms and media is integrated into the layout of the traffic flow within the building and each performance space's extreme flexibility.

Achieving the required flexibility in each of the three major performance spaces placed considerable demands on the acoustic, audiovisual and technical theater design. Although each of the major spaces – Black Box, Red Theater and Blue Hall – have a traditional primary function that is visually apparent from the design, they also are designed (in collaboration with Shen Milsom & Wilke) acoustically and audiovisually to host classical music, amplified music, theater, film, dance and academic functions. The range of performances, often within the same event, is particularly challenging in terms of acoustics. Each of the performance spaces incorporates adjustability of the acoustic response.

**The Red Theater at NYU Abu Dhabi is a multipurpose, 700-seat venue with a unique acoustic design that makes use of reflective, absorptive and diffusive surfaces to tailor the response according to the required performance type**

Tom Rossiter

All images: Will Pryce unless otherwise stated

## DESIGN



### Tailored response

The university's Theater Program is an academic and artistic laboratory that is dedicated to theater research, scholarship and practice. The Red Theater – a multipurpose hall organized on two floors (480 seats on the main floor, 220 seats on the balcony) – engages students in the practice and study of theater and performance to enact plays and performances that transform all its participants. As the Art Center's largest venue, the hall is suitable for a wide variety of purposes including music, dance, theater and film, as well as for lectures or presentations to the general student body, and also accommodates one full undergraduate class of students. The back-of-house area serves as the program's educational space, as well as scene shops.

The unique acoustical design uses custom wood triangular facets of three different types – reflective, absorptive and diffusive – to tailor the acoustic response. Extensive acoustical modeling dictated the placement of each panel. The adjustable acoustics system in the large multipurpose theater is a custom-designed system of mechanically actuated panels which, when opened, expose additional acoustical absorption to modulate the acoustic response of the space. The audio system comes from Meyer Sound and includes surround sound and a full cinema system with flown baffle wall and screen. A full acoustical shell and orchestra pit further expands the range of performances that the Red Theater can successfully accommodate.

### Encouraging perspective

The university's Music Program is committed to educating a new generation of musicians capable of making and thinking about music from transnational and interdisciplinary perspectives.

**Above left: The flexible Black Box space has been designed to support arts performances beyond traditional theater use**

**Above right: The Blue Hall is an intimate venue that features digital projection and complete audio- and video-recording capabilities**

**Below: The new venue's back-of-house areas provide educational and shop space**



The Blue Hall is an intimate concert hall with a series of single raked seats facing a sprung wood-floor stage, and is the ideal setting for students majoring in music to perform concerts. The hall features digital projection for film and video, and serves as an appropriate space for small-scale dance performances and readings. The audiovisual system in the Blue Hall features Meyer speakers for reinforcement and includes complete audio- and video-recording capabilities.

### Breaking new ground

Emphasizing interdisciplinary and global approaches to film and new media, NYU's Film and New Media program integrates the creation of those media with the study of their histories, conventions and practices. Supporting the program's intermingling of studies and practice is the Black Box, a flexible space with grid audience configuration and production arrangements, full lighting and PA capabilities. The Black Box can accommodate a wide range of configurations for music, dance, theater and multidisciplinary performance, with capacity varying depending on layout. The metal mesh minimalist expression in the Black Box theater visually masks a highly acoustically diffuse wall construction and variable absorption system. The diffusive and variable absorptive components, along with a system of adjustable acoustically reflective and diffusive ceiling panels, expand the range of performances beyond traditional experimental theater use.

The Arts Center has become an extraordinary addition to the local and international arts landscapes since its opening in 2015. With a world-class environment and a wide variety of artistic programs, the venue is a laboratory for performance that creates a lively interface between the university's faculty, students and the community – animating and enriching cultural life in Abu Dhabi and the region. ■

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**Kimmel Center for the Performing Arts, Philadelphia**



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Rafael Viñoly Architects, founded in 1983 and based in New York City, with branch offices in London, Manchester, Shenzhen, and Buenos Aires, is an internationally renowned architectural firm with projects spanning six continents. Over the past thirty-four years, the firm's work is marked by a sustained structural originality that transcends the passing fads of architectural movements, and is consistently driven by the belief that the essential responsibility of architecture is to generate the most elegant solution within the economy of each project. The firm has completed many critically acclaimed civic projects as well as private and institutional commissions, including performing arts centers: The Tokyo International Forum, The Kimmel Center for the Performing Arts in Philadelphia, Jazz at Lincoln Center in New York City, Curve Theatre in Leicester, UK, and The Arts Center at New York University Abu Dhabi.

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**CONSULTING**  
SOUND SPACE VISION

# Community support

A pair of venue projects demonstrate a consultancy's desire to consider performers, operators and audiences

Sound Space Vision's work on London's Fairfield Halls will improve the venue's amplified sound and bring the operational and stage flexibility into the 21<sup>st</sup> century



Rick Mather Architects

**T**heatrical and acoustic consultant Sound Space Vision (SSV) stands up for performers, audiences and venue operators in many ways. This year the company is working on two projects that demonstrate the breadth of its remit and the common aims it has, irrespective of the size or type of project.

### Support system

The first project is Fairfield Halls, a 1960s performing arts center in Croydon, London, which has served the local community with theater, concerts, conferences, dinners and other activities. There have been several attempts to find the funding to refurbish the halls. The current scheme has benefited from becoming the first stage in a phased urban regeneration scheme by Croydon Council, including a Croydon-wide arts program. Throughout the many schemes and procurements, it has been SSV's role to support the needs of performers, operators and audiences.

The land surrounding the venue is being developed for a housing-led mixed-use scheme, while a relocated local college will be linked by a new public space with a performance area alongside Fairfield Halls. This resetting of the halls on the site has enabled architect Rick Mather Architects and engineer Mott MacDonald to site a gallery and cloister in the new landscape and reorient the flow of on-site visitors to the side entrance, expanding the accessibility of the halls.

The Fairfield Concert Hall has a very good reputation for orchestral sound. As theater consultant on the project, SSV's main priority has been to retain this reputation and improve the sound for amplified performers by enabling variable acoustic mechanisms within the architecture of the hall.

Over the stage, the original reflective canopy had become festooned with technical equipment for amplified events. The new design will reveal the form of the original canopy and store all the technical equipment – including speaker clusters – above the canopy when not required for performance. This is achieved with easily operated opening flaps and lifting devices through the canopy, a solution that improves the appearance and operation.

The existing permanent choir stalls are being removed and replaced with mechanized choir platforms, which flatten to stage level to increase the area of the stage for larger productions and banquets, and to facilitate a better get-in from backstage for large events. For choral concerts and standard orchestral concerts, the choir stalls can be raised out of the floor. This is stage flexibility in the service of artists and operators.

The Ashcroft Theatre audience area will be improved for disabled access and sightlines, and the ceiling will be rebuilt with improved lighting positions. The Arnhem Gallery, which is currently used for dinners, conferences and community events, will be replaced by two spaces, both able to serve a similar number of people, but with good acoustic isolation between them and to the neighboring homes.

Croydon looks forward to the reopening of Fairfield Halls, and to enabling the artistic and community reputation to grow with the venue's new operators, while reducing operating costs.





Hayes Davidson

**Royal approval**

In 2018, the Royal Academy of Arts, an independent charity promoting the practice, appreciation and understanding art, led by artists, will celebrate its 250<sup>th</sup> anniversary with a brand-new meeting place. It hosts many of the UK’s top art exhibitions and occupies a prime site in central London within the expensive shopping area of Mayfair. Behind the main RA building is Burlington Gardens, previously occupied by the Museum of Mankind.

Within David Chipperfield’s plans for the site, the original Lecture Theatre space is being transformed into a room where people will want to be together, to debate, to learn more about art and to hear a music recital. SSV has been advising on both the audience form, the acoustics and the technical infrastructure needed to create a framework for the latest technology with which to illustrate the practice of painting and sculpture.

The original lecture theater was three stories high and featured low-rising semi-circular tiers.

By removing the lowest story of the theater for an entrance sequence, toilets and so on, the architects have enabled a lower height, two-story space to be more appropriately proportioned for speech acoustics.

The main 19<sup>th</sup> century architectural features of the Lecture Theatre that remain are the ornate paneled ceiling and the clerestory windows to the north and east. The new entry level is below these windows and the lower part of the room is a contrasting contemporary form of horseshoe theater with steeply raked benches focusing down to the stage they encircle.

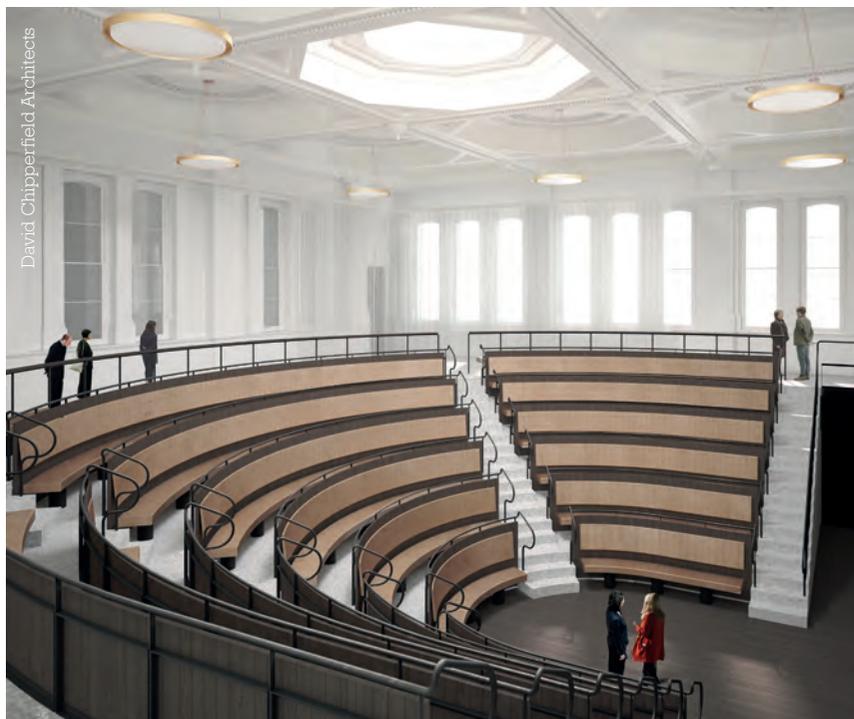
The distances within the new space are small to ensure good communication between people. In the center of the front wall, a projection screen can be lowered for illustrated discussions, and digital loudspeakers are set into the architecture. When technology is fast-changing and historic buildings take time to refurbish, the challenge is to provide the appropriate technical support. As well as venue technical infrastructure, SSV updated the equipment specification during the life of the design and the construction period, making provisions for improvements in screen technology, projector types, color rendition, lighting and sound needs. The technical infrastructure has been carefully thought through, with lights and speakers blending into the historic fabric without damaging the more valuable details. Acoustically, the surfaces of the room have been specified to improve clarity of speech, and the seats detailed to contribute to the sound absorption in the room.

The venue’s AV system has been designed in collaboration with the acoustics, including a system to record and/or transmit speech from individuals in the audience.

In this project, SSV has ensured that the needs and requirements of different parties have been carefully considered – including visiting lecturers and performers, and the technicians who will be running the theater (as well as the exhibitions) – giving them a space that is easy to operate. ■

Above: A cross section of the Royal Academy of Arts site in 2018, showing the designs for the new Lecture Theatre

Below: The Lecture Theatre space will be transformed, with SSV advising on audience form, acoustics and technical infrastructure requirements



David Chipperfield Architects

[www.soundspacevision.com](http://www.soundspacevision.com)



# SOUND SPACE VISION

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Images (clockwise from top left): ACCA, University of Sussex; Multi-Story Orchestra; Artist Square, Dallas; Temerty Theatre, RCM, Toronto; The Light, Friends House, Euston

Photo: Agnese Sanvito



# A welcome change

The evolution of flexible space in theater buildings has called for breakthroughs in stage technology

In the latter part of the 20<sup>th</sup> century, a major shift saw theater buildings progressively move from being bastions of culture to urban connective centers, drawing more attendees on a daily basis. These more sophisticated performing art centers (PAC) are no longer expected to offer just live performances, but to play a far greater economic, social and educational role – the performance environment had to be reimaged with more versatility.

Flexible halls are nothing new – records from the 19<sup>th</sup> century show theaters with removable flooring, in which a temporary floor would be manually mounted on top of fixed wooden seating backrests to create a flat floor space at

stage height. Today, however, audiences are looking for spaces that are specifically suited for the type of event being presented, and which will satisfy their expectations of comfort, acoustics, sightlines and overall surroundings.

## **Traditional conversion**

There are many ways in which specialized equipment has been used to offer versatility. For decades, two prevailing methods have been employed to afford spectators at least basic comfort, and organizers a minimum of effort – telescope and chair wagon. The former – consisting of drawer-like units in the back of the room, which can be telescoped forward to create a stepped raked surface – is the least expensive



and most common. But even when built very carefully, telescope systems still have well known major inconveniences, especially for premium PACs. The tiers must be stored either in the back of the hall or transported along an appropriate route to a separate storage area when they are not being used. More importantly, once deployed, with riser heights between rows ranging from 300-400mm (11.8-15.7in) they create a very steep rake unsuitable for most PACs. The system's light structure also creates an atmosphere reminiscent of gymnasium bleachers and imposes serious constraints on acoustics. The acoustical qualities of telescopic auditoria are not suitable for concerts and symphonies. Finally, the relatively small recess for chairs severely restricts the choice of seat and often prevents the installation of theater-style chairs.

In contrast, the chair wagon system was developed to be compatible with venues offering a high-quality feel and appearance. Here, the tiers consist of rostrums set up on movable units, usually tailor-made for a specific architectural layout. As a result, and because wagons must include storage space expenditure, costs vary considerably but are generally higher than those for telescope seating.

The transformation process for these systems is often extremely cumbersome, labor-intensive and time-consuming. For example, in a 2006 article for *ArchNewsNow*, expert acoustician Paul Scarbrough outlines how the use of wagons at the Nashville Schermerhorn Symphony Center enables the concert hall to be transformed from

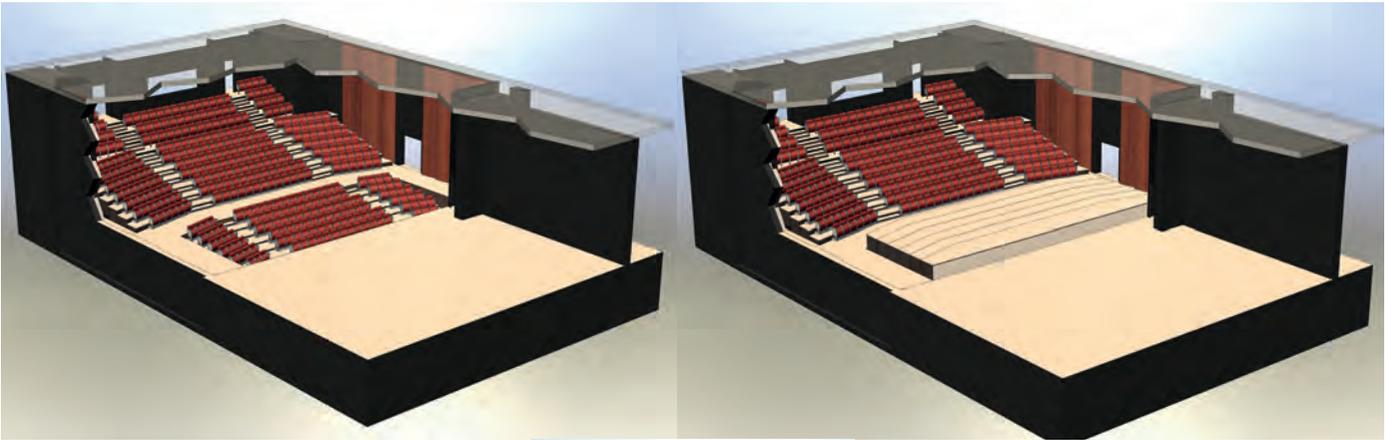


raked seating to a flat floor within approximately two hours with a crew of five people. This is not an optimal process if the goal is to achieve same-day successive uses of a hall with different layouts. In fact, some larger wagon systems require a full-day conversion.

In most cases, the number of configurations made possible by a chair wagon system is limited to just two: flat floor and seated tiers. But the requirements imposed for ancillary space are significant – 130% of the square footage of the entire parterre area. Therefore, wagons often need to be stored on multiple levels using high travel lift systems.

**Top left and right: The multipurpose Swisstech Convention Center, located in Lausanne, Switzerland, relies on innovative technology provided by Gala Systems**

**Above: Chair wagon systems are well suited for theater venues with a high-quality appearance and experience, but storage requirements involve additional costs and the transformation process is typically cumbersome and time-consuming**



### A novel solution

In 2002, Gala Systems, a full-scale engineering and manufacturing company specialized in understage lifting equipment, first addressed these issues by introducing an independent row/lift system. This novel type of conversion method – in which theater-style chairs may be raised to variable heights or concealed underneath the floor structure – was an architectural breakthrough in auditorium design at the time. Since then, many architectural firms, consultants and performing arts clients have adopted this solution because of its numerous advantages.

To begin with, such systems ensure quick and automatic hall transformation to any configuration – such as symphony, cabaret, rock concert, opera, dinner theater, conference and gala. Each of these looks and feels as seamless and robust as a permanent fixed venue because structural stability, high-quality seats, and floor finish are not jeopardized. In addition, row/lift systems suit all audience types and sizes, while always offering optimal sightlines and acoustics. Their unique features also keep a hall's back and sidewall clear since seating elements require no above-floor storage.

Although more costly than telescopic or chair wagon options – approximately 5-10% of the total building costs – these row/lift systems ensure a much higher level of programmatic and operational flexibility. Making space flat, tiered or anything in between within minutes, they allow PACs to achieve higher occupancy rates, generate more income and better fulfill their mission.

These systems do involve more understage mechanical equipment than traditional options, which has been a legitimate source of concern for managers. In the Gala Venue Seating System's case, mechanical reliability has been well proven. Key to motion is the factory tested Spiralift – a

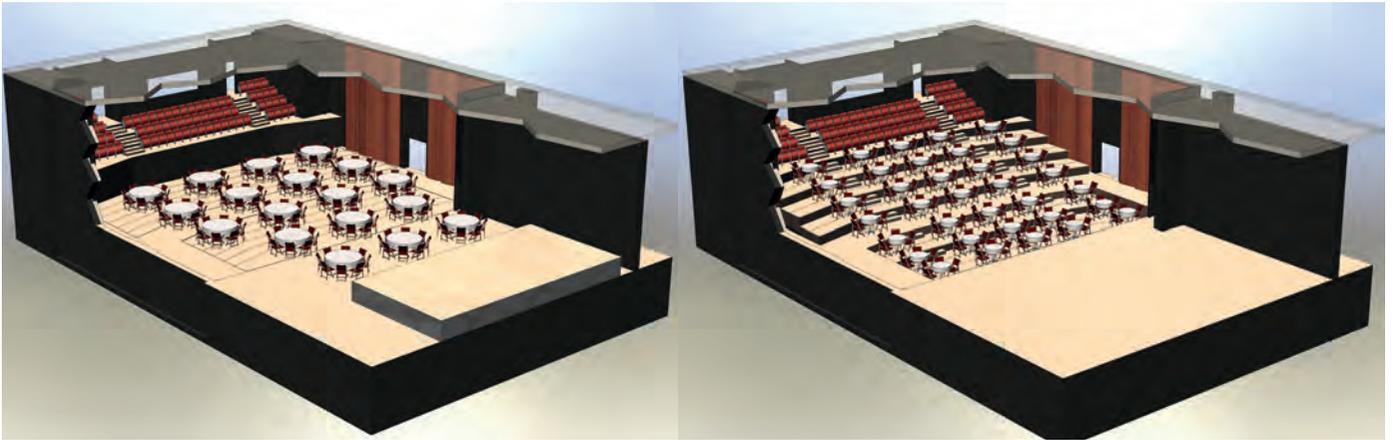


This page and opposite:  
**The Gala Venue Seating technology makes it possible for venues to switch between multiple configurations in just minutes. Here you can see the same space in auditorium, rear auditorium, raised forestage, banquet and cabaret configurations**

compact and powerful lifting actuator designed to ensure continuous performance in stringent applications, such as the automotive industry. But the Spiralift units integrated in multipurpose venues, even when kept extremely active with daily changeovers, do not come close to experiencing the level of use they are designed to endure. Suffice it to say, they will last longer than the life of the venue – it's no wonder that no Spiralift unit has ever been replaced in any multipurpose hall to date and no event has ever been canceled due to technical problems!

At the Tobin Center for the Performing Arts in San Antonio, Texas, a Gala Venue Seating System was chosen over a chair wagon option. Early in the design process, it became evident that only an independent row/lift system could: ensure the flexibility needed to suit various event types, including symphony, cabaret, rock concert, opera, dinner theater, conference and gala; offer fully automated, quick and simple changeovers within 10-20 minutes at the push of a button; minimize the pit's depth below the floor, a necessity due to the high water table and the location of the center next to a river walk canal; reduce the costs involved in building the storage spaces required if seats were mounted on wagons; and easily adapt seating capacity to the expected number of attendees.

When capacity exceeds demand, it has a negative effect on users, who may be deterred by a venue with too many empty seats. Many of today's auditoria have seating capacities in excess of 2,000, a necessity to offset the costs of presenting touring shows or symphonies. Halls that are much larger than required for the audience present create a problem for managers. Independent row/lift systems can precisely match fluctuating audience sizes so that nearly every performance appears full.



### Best of both worlds

Today, many performing art centers are multifaceted enterprises, homes for traditional performing arts as well as gathering places for communities. Part of their success lies in aligned physical spaces capable of hosting various types of events, all with different space layouts. This is when conversion methods are so important. How full a hall appears to be and how closely it is tailored to each unique event may determine how festive, shared and compelling a live experience will be. Ultimately, built-in flexibility should not prevent a venue from serving its constituents as well as a fixed single-purpose venue in terms of acoustics, sightlines and comfort.

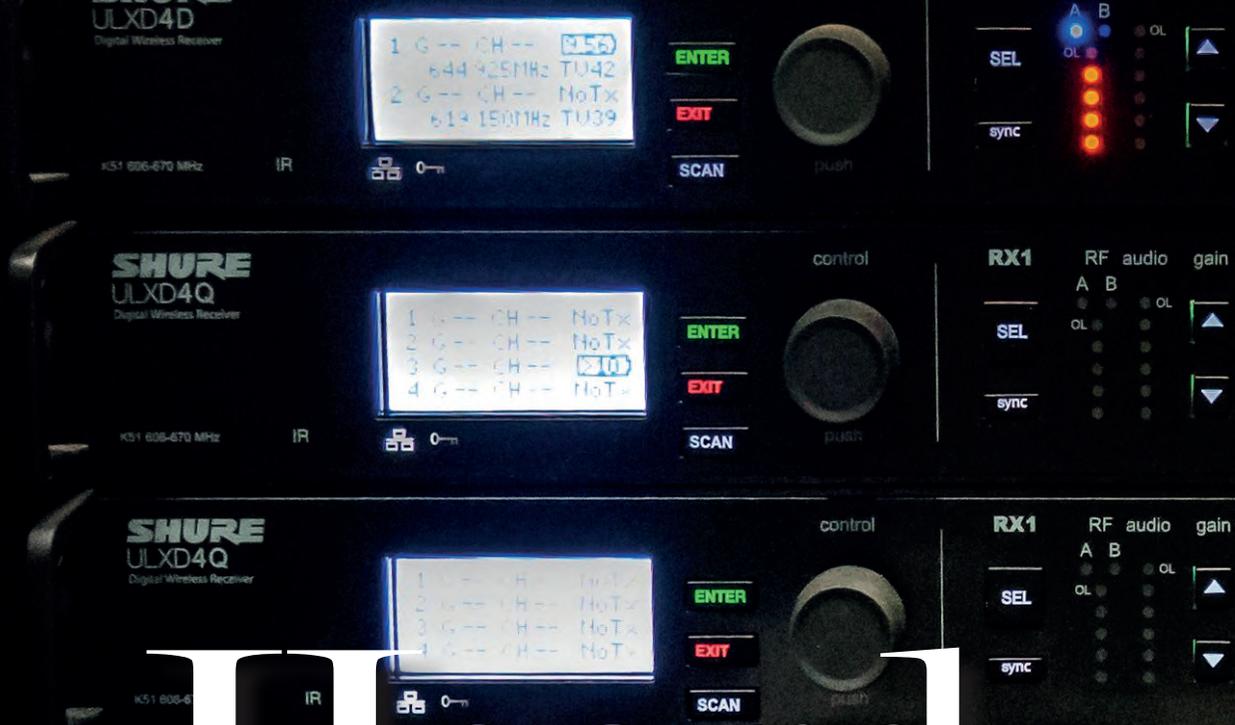
Conversion methods capable of quick and simple reconfiguration, such as individual row/lift systems, also offer new revenue opportunities. Halls fit for a variety of audiences and events, available for use many hours a day, and with quick turnaround times, can support the economic challenges of performing arts centers' long-term sustainability. This flexibility prevents these venues from becoming outdated too quickly, ensuring that they remain relevant and valuable to their communities. Dating back hundreds of years, built-in flexibility is a trend that's built to last. ■

[www.galasystems.com](http://www.galasystems.com)

**Gala Systems has developed innovative, independent row/lift technology that can provide venues with essential flexibility by enabling quick and simple reconfiguration**



**AUDIO TECHNOLOGY**  
SHURE



# Heard but not seen

A range of high-quality wireless systems can meet the requirements of professional theater productions





**I**t was back in 1953 that Shure launched its very first wireless microphone. The Vagabond was powered by two hearing-aid batteries and could transmit to a then-impressive 15ft. At that time, wireless systems were a sensation. Well, times change.

Today, theaters and opera houses rely heavily on wireless transmission. As recently as a few years ago, theaters still used room microphones (such as boundary mics) on the edge of the stage, or goosenecks as overheads. Nowadays, a mic-free stage design dominates in modern theaters around the world.

A microphone-free stage setup is relatively straightforward. Backstage will be the wireless receivers, while the actors get a compact or (even better) micro-bodypack transmitter plus a lavalier or headset. And that's it – no distracting cables or the like. However, the requirements a wireless system must fulfill are manifold. It must be able to work within the available frequency spectrum (which is increasingly limited as a result of country-specific regulations), provide signal stability free from any interferences or dropouts, seamlessly integrate into existing hardware via Dante, deliver advanced rechargeability and – most importantly – deliver the clearest, best possible audio quality. To quote the French writer and aviator Antoine de Saint-Exupéry, “What is essential is invisible to the eye.”

Shure offers a variety of high-quality digital wireless systems meeting all these diverse demands. The systems – QLX-D for smaller venues, ULX-D for larger stages, and Axient Digital for high-profile theater and opera production – have been used in various

renowned theater settings, inside as well as in the open air.

### Festival functionality

Equipping world-famous open-air festivals such as Bregenz and Salzburg is very challenging, even for the most advanced wireless systems. You have to tackle unpredictable weather conditions and the RF environment is barely manageable as it is imperative to consider local TV stations, press coverage, as well as thousands of spectators constantly checking their mobile devices.

The Bregenz Festival in Austria is one of a kind, featuring a gigantic floating stage in Lake Constance. It is situated close to the borders with Germany and Switzerland, and all three countries use frequencies in different and often conflicting ways. For an audience-drawing event such as Bregenz, no interference could be tolerated, so the Axient system – with its interference detection and avoidance feature – was the ideal choice.

At the Salzburg Festival, which has also been relying on Shure wireless (and which has made increasing use of wireless microphone technology) over the past years, the situation is similar. The five-week open-air spectacle, taking place annually in Mozart's birthplace, hosts events all over the city. Prior to the 2013 switch to the Shure Axient, the festival's head of sound and acoustics, Edwin Pfanzagl-Cardone, and his audio crew “had to cope with the spectrum limitations, but the Axient simply switches around problems like that. The interference detection and avoidance is great – it moves to a clear frequency within milliseconds of interference occurring.”





Another particularly challenging open-air theater production is the Schlossfestspiele in the German city of Schwerin. In the past few years the production has been counting on Shure's ULX-D systems for high signal stability and extended RF performance. Something the sound engineers really appreciate is the ability to use wireless microphones with their Yamaha consoles due to the interoperability with Dante Audio-over-Ethernet. "Due to ULX-D's Dante ability, the setup and patching is very smooth," explains Erwin Liebscher, sound engineer at Neumann&Müller Event Technology. "Plus, you don't have the cable mess you had in the past."

**Powerful performance**

A great plus for all theater and opera productions is the advanced rechargeability offered by the Shure wireless systems. Using modern lithium-ion technology, the transmitters enable up to 12 hours of use. Furthermore, transmitters and receivers both display the remaining battery life in hours and minutes, accurate to within 15 minutes. This enables a more flexible operation, even during longer shows. "If we're putting Wagner on, each production can be five or six hours long," explains Stefan Raebel, head of video and audio at the Baden State Theatre in Karlsruhe, Germany. "If you add time in make-up, it can

**Above: Interference detection and avoidance was vital to the success of The Salzburg Festival, which was held in venues spread across the city**

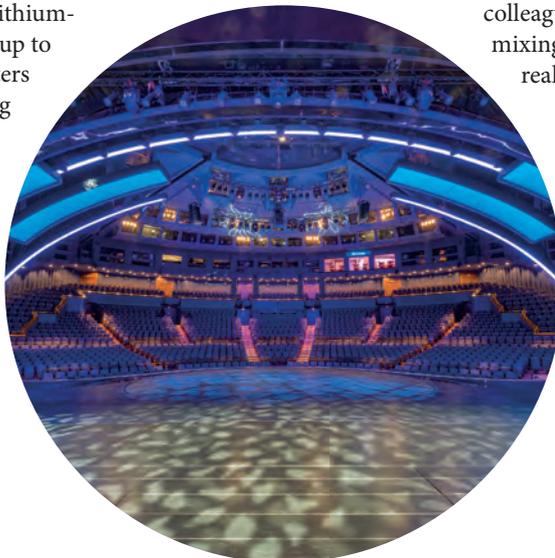
**Below: Shure provides venues with the freedom to operate wireless microphone systems, and the technology to ensure that those systems perform to the high standards that are required. Photo: Soenne**

easily be seven or eight hours. With these batteries we've never had a problem."

The wireless Shure microphone systems offer easy monitoring and control via the Wireless Workbench Software. Teams at theaters including the Thalia in Munich, the Friedrichstadtpalast in Berlin, and Munich's Prinzregententheater, appreciate the benefits the Wireless Workbench offers for their work with systems such as ULX-D, as it greatly simplifies their daily business.

"Frequency coordination via Wireless Workbench is a huge advantage for us, especially for performances where other Munich theaters are involved," says Miriam Reinhardt, head of sound at the Prinzregententheater's Academy Theatre. "This starts with programming the system and extends to the comprehensive remote control of all transmitters during the show. One colleague takes care of the wireless setup and the mixing console, so it's extremely important to really have everything under control. Always."

The QLX-D, ULX-D and Axient Digital wireless systems from Shure combine high sound quality with maximum spectrum efficiency and various advanced technical features, making the technologies the first choice for all theaters that would like to count on more than the obligatory "Toi toi toi." ■



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# Remaking history

Installation of the latest technologies must be expertly carried out to preserve the integrity of historic venues

**E**ach historical theater is a physical record of its time, place and use. Each has its own challenges, with distinctive materials, features and spaces, all tied to the building's historical and cultural significance. Serapid has had the honor of working with award-winning architects and consultants on some of the most distinguished venues in the world. Modern audiences have high technical expectations, and the task of blending state-of-the-art technologies with old aesthetics is challenging, but is ultimately a source of pride for those involved.

## A respectful renovation

French author Stendahl described Naples' Teatro di San Carlo as "the most beautiful theater in the world" after attending a performance in 1817. The San Carlo Opera House, a five-level, lavishly decorated horseshoe of boxes, was the largest opera house in the world when it opened in 1737, and is the oldest in continuous use in Europe. In 2008, the Campania regional government funded a US\$85m renovation, headed up by architect Elisabetta Fabbri, to include the introduction of modern stage technology. Serapid's reputation for its work in historic venues made it the top choice to bring San Carlo to state-of-the-art levels.

To modernize without changing the pitch of the original stage, five moveable synchronized bridges were built to allow level and inclination variations ranging from 0-10% of the whole area. These bridges were installed in the center area, parallel to the proscenium line. To free up the ground area for movement of scenic equipment, the typical Serapid LinkLift installation was turned upside down – the LinkLift columns push down



**Above: The typical installation of Serapid's LinkLifts was turned upside down at the San Carlo Opera House in Naples**

**Main: The interior of the San Carlo Opera House following the major restoration project**

**Right: The original 18<sup>th</sup> century plans for the opera house**

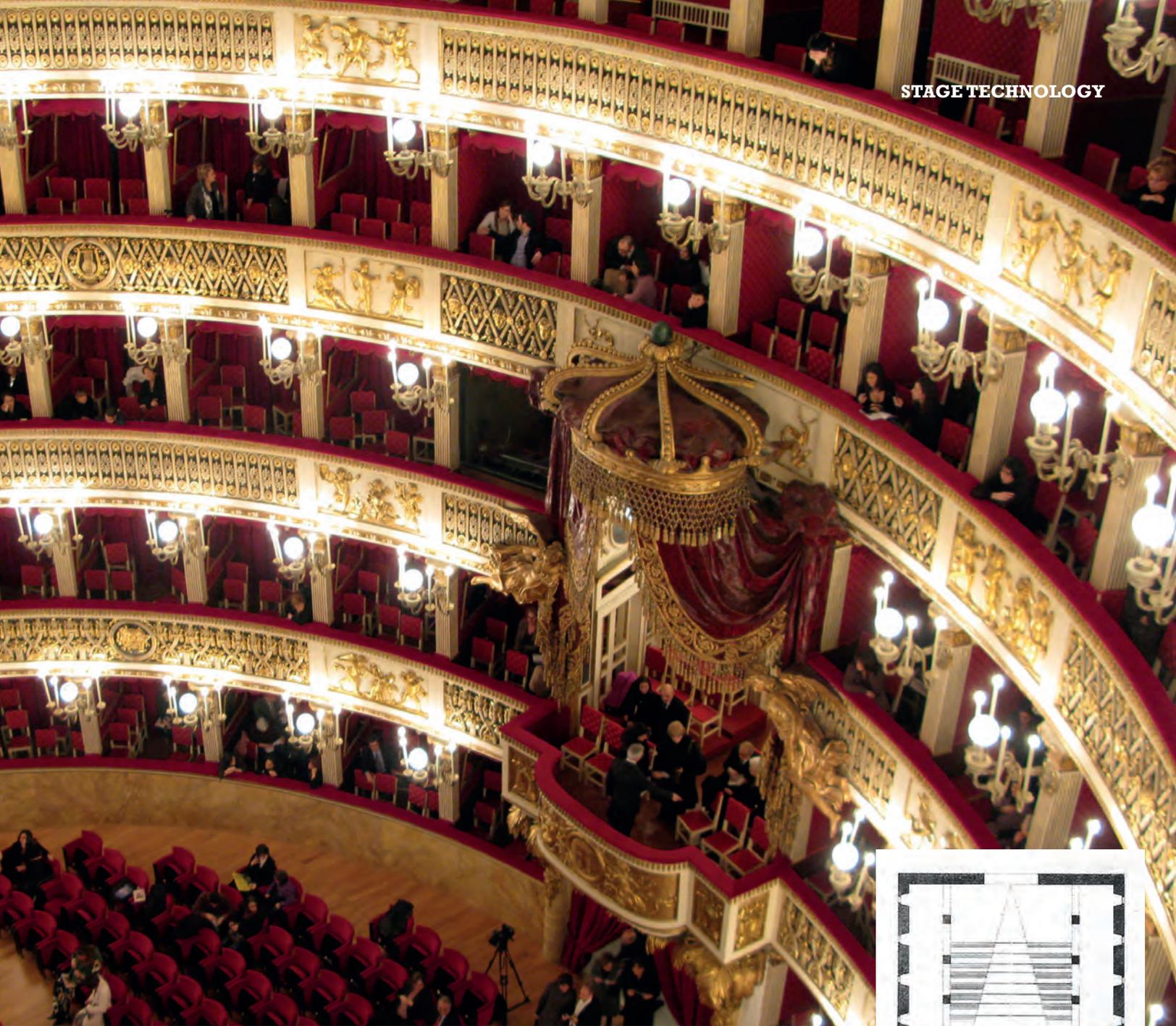
from the understage instead of pushing up from the pit floor. This configuration can also be used in venues that have issues with water entering the pit.

Serapid's stage equipment was designed, manufactured and installed in just months, and was produced in full compliance with the new Italian technical standards for building construction (NTC 2008) with a verification of the structures against seismic loadings. The San Carlo reopened on January 27, 2010.

## Rebuilt to last

Built in just 40 days during 1827, and designed to last only seven years, the Kamennooostrovsky



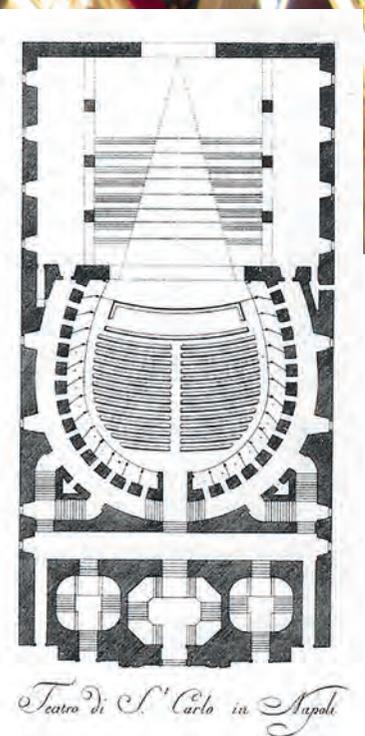


Theatre's neo-classical wooden structure has instead outlasted all other wooden theaters in Russia. The Kamennostrovsky is situated on Kammeny, a picturesque isle in St Petersburg's Neva delta – the island and its buildings, along with the historic center of St Petersburg, constitute a UNESCO World Heritage Site.

Major renovations were required to bring the functionality of this 300-seat theater up to modern standards. To relocate the technical equipment and to allow for more modern technology without altering the historical features, a two-level underground space was developed. The second level accommodates stage property, actors' rooms and cloakrooms, while

the first level provides space for the building's engineering and utilities. At ground level, the existing space underwent a total renovation, including a complex stage lift system, produced by Serapid.

The stage was designed as a flexible venue, to serve as auditorium, performance space or concert hall. TDM Stage Equipment, working with ACR as an integrator, selected Serapid to provide the stage motion equipment. Serapid designed a LinkLift system that involves 13 independently operating stage platforms equipped with double scissors and intermediate frame. This gives an excellent lateral stability of the platforms relative to each other, whatever the



## STAGE TECHNOLOGY



Above left: A cutaway view of the renovation project for the Kamennooostrovsky Theatre

Above right: The independently operating Serapid platforms at the Kamennooostrovsky

Below left: An exterior view of the Paramount in Cedar Rapids. Image: The Gazette, Cedar Rapids, Iowa, 2017

Below right: The interior of The Paramount after restoration



position. Crossing or passing of the platforms with each other is quite possible at 300mm/s (59ft/min), regardless of the load position.

An added benefit is a low noise level.

The renovation, including the excavation and soil stabilization for the underground space, was accomplished in six years. The Kamennooostrovsky won the 2010 gold medal of Denkmal – Europe's leading trade fair for conservation, restoration and old building renovation – for Outstanding Achievements in Heritage Conservation. The Kamennooostrovsky Theatre reopened in 2012.

### Sound structure

The Paramount, originally known as the Capitol Theatre, was built in 1928 during the last days of Vaudeville. The theater was built for both cinema and live performance, and possessed a 'Mighty Wurlitzer' organ to create the soundtrack for silent films.

In December 1975, the aging building was gifted to the city of Cedar Rapids in Iowa, and within five months the application for historic status was submitted and quickly approved. Soon after, the theater underwent a restoration project to return the structure to its original state. In 2003, a renovation that included major modernizations to the building infrastructure, as well as an increase in seating capacity, was completed. In June of 2008, a record-breaking city-wide flood devastated the community.

More than 8ft of flood water entered the theater, causing severe damage to the interior and leaving the Wurlitzer a near-total loss.

Despite the damage from the flood, the building's structure was still sound. The flood event evolved into an opportunity to integrate upgrades and improvements that were required to bring the venue up to current technical theatrical standards. As part of this restoration project, Serapid designed an organ lift and an orchestra lift. The orchestra lift is comprised of three LinkLift 80 columns, guided by captured rail guides, capable of lifting a dynamic load of 18,700 lb with speeds up to 5ft/min, and operated by a handheld pendant controller. The stage platform is 30ft wide and 9ft deep, for a total surface area of 220ft<sup>2</sup>.

With remarkable luck, a Wurlitzer organ that was numbered next in production to the organ in the theater was found in a private collection. Parts of both instruments were combined and the restored Wurlitzer was readied for placement on the Serapid organ lift. The organ lift is comprised of three LinkLift 50 columns, with a surface area of 80ft<sup>2</sup> and a dynamic load capacity of 7,200 lb. The organ lift can be used separately, and when used together the two lifts create a complete proscenium lift system. The theater officially reopened in October 2012.

### Specialist expertise

The Serapid Group is a global leader in stage movement technology for both new theater construction and historic venues, specializing in orchestra lifts, stage lifts, auditoria, get-ins and scenery movement systems. Serapid products are made with Rigid Chain, a unique linear motion product that provides steady, precise movement. Each system is designed by Serapid's creative engineering team for the specific venue, in response to the unique demands of the space. ■

[www.serapid.com](http://www.serapid.com)



## THE ART OF MOTION

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STAGE AND ORCHESTRA LIFTS - MULTI-PURPOSE VENUES - TELESCOPIC MASTS

# Adapt and prosper

It's no secret that we live in a time of disruption. New technologies, shifting tastes and patterns of consumption are leaving no industry untouched, and the world of live entertainment is no exception.

From eSports to holographic vocaloids, the 'next big thing' to pack out auditoria can be surprising and unforeseen. As audiences continue to become more sophisticated and demanding, even traditional live entertainments such as the circus and musical theater make increasing use of the latest technologies.

As live entertainments continue to evolve, so do the venues that host them. In the face of accelerating change, one key design feature helps venue operators future-proof their investments: flexible, multipurpose facilities. Enabled by adaptable floorplans and programmable staging and multimedia elements, a flexible venue can host a gala event on Thursday, a boxing match on Friday, and a rock concert on Saturday. This increased programming density also helps venue operators generate faster returns on their significant investment, making flexible venues increasingly sought-after for today's high-end entertainment destinations.

A trio of new theater projects showcases the future of flexible venue design

"Once upon a time, you would build an opera house for operas, a banquet hall for events, and so on," explains Patrick Bergé, the co-founder and president of Scéno Plus. "These days, we have the capability to create a single space that can not only do it all, but can do it better than anywhere else."

Scéno Plus is at the forefront of this important industry trend. Founded in 1985, the company



Tracy Brown/The Theater at MGM National Harbor



Al Powers/Park Theater

is an award-winning, full-service international design firm based in Montreal, Quebec, that specializes in theaters and entertainment venues. Scéno Plus is renowned for its visionary, holistic approach to projects, incorporating architecture, engineering, interior design, acoustics, lighting, multimedia and serviceability into a single design process that ensures a seamless and immersive experience for audiences and operators alike.

### National treasure

Results speak for themselves. In December 2016 the US\$1.4bn MGM National Harbor resort opened to the public. Nestled on the banks of the Potomac River in Maryland, the resort serves as a major entertainment hub for the Washington DC area and features a 24-story hotel, conference center, a 27,000ft<sup>2</sup> spa and a 125,000ft<sup>2</sup> casino.

At the heart of this development resides its crown jewel: The Theater at MGM National Harbor, designed by Scéno Plus. Hosting A-list acts since opening day, the Theater demonstrates what a truly flexible venue can deliver – at the push of a button, a fully automated telescopic seating system alternately retracts or deploys 950 orchestra seats across 13,000ft<sup>2</sup> of center floor.

This grants the theater five unique floorplans, ranging from fully seated (2,798 capacity) to full-standing (4,213 capacity), each suited for a particular type of event. And for the final touch, Scéno Plus built the telescopic center risers onto a lift that can disappear into the floor to reveal a stunning center entrance direct from the main lobby.

### Park life

Las Vegas, Nevada, is synonymous with live entertainment. When MGM wanted to redevelop its Monte Carlo property and expand its non-gaming offerings, it called upon Scéno Plus once again. The US\$90m, 5,200-seat Park Theater is the centerpiece of MGM's new Park Avenue dining and entertainment district. Its spectacular 70ft-tall curved glass façade opens the lobby's view out onto the plaza, making it an instant icon on the strip. To accommodate concurrent openings on the avenue, Scéno Plus oversaw a fast 12-month construction that ensured the building's one-of-a-kind exterior was photo-ready for nearby ribbon cuttings.

The venue's numerous cutting-edge features include an 80ft on-stage LED screen and a custom-built, oversized proscenium arch,

**Above: The MGM Park Theater, located in Las Vegas, Nevada**

**Opposite page: The Theater at MGM National Harbor**



Al Powers/Park Theater

Photos by Al Powers for Park Theater

**The US\$90m Park Theater boasts a range of cutting-edge technologies, enabling the venue to host a wide variety of entertainment events**

concealing the sound system and doubling as a 7,839ft<sup>2</sup> projection wall for immersive visuals. Another prime example of a flexible venue, Park Theater features multiple sections of telescopic retractable seating; automatically deploying 1,052 seats across 14,000ft<sup>2</sup>, enabling floorplans from fully seated (5,200 capacity) to full-standing (6,318 capacity), half-standing, banquet and sports event configurations. The benefits of this flexibility are universally recognized.

“The lower section bowl will actually push back for smaller shows,” says Bill Hornbuckle, the president of MGM Resorts International. “The theater allows us to host performers we previously haven’t had a home for, broadening our entertainment offerings and providing the opportunity to expand those relationships to our other properties around the globe.”

### Pushing boundaries

Also known as the Jewelry Box of Cotai, the MGM Cotai is located in one of Asia’s hottest investment hubs, and will present some of the most innovative and advanced forms of resort entertainment technology in the region. The US\$3.1bn MGM Cotai is scheduled to open in the fourth quarter of 2017, offering approximately 1,400 hotel rooms and suites, meeting space, a high-end spa, retail offerings, food and beverage outlets, as well as the first

international Mansion at MGM for the ultimate luxury experience.

Entertainment is at the very heart of MGM. MGM Cotai will offer the Asia’s first dynamic theater to wow every guest who steps foot in the resort. The MGM Theater at Cotai will present one of the most advanced, immersive and flexible venues for world-class interactive live performances and events. An engineering and architectural masterpiece, this dynamic theater will mesmerize audiences with a giant 9,690ft<sup>2</sup> 4K LED wall and state-of-the-art technology, offering seating for up to 2,000 people in more than 10 different configurations, and hosting various resident shows, concerts, international celebrity DJs and more.

Scéno Plus is now taking its unified, audience-focused approach one step further. Through a new division christened Scéno Plus Production, top-tier craftspeople from Montreal’s creative industries have been developing three all-original live shows to open the Cotai theater in the fourth quarter of 2017. Bold in artistic and technical ambition, these shows have been specially crafted for the Chinese audience and to fully demonstrate the immersive capabilities of the new theater. With baited breath we await what the fourth quarter of 2017 has in store. ■

[www.scenoplus.com](http://www.scenoplus.com)



Photos by Al Powers for Park Theater

# TECHNOLOGY | ART | PASSION

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”



# In control

A new cultural center in Kuwait required an array of stage technology equipment and control systems

**Above: A selection of the A/V, lighting, machinery and control systems that Svetlost Teatar installed at the state-of-the-art Sheikh Jaber Al Ahmad Cultural Centre in Kuwait**

The Sheikh Jaber Al Ahmad Cultural Centre, which was opened by the current Ruler of Kuwait, HH Emir Sheikh Sabah Al-Ahmad Al-Jaber Al-Sabah, on October 31, 2016, includes: a state-of-the-art national theater with a main auditorium seating 2,000, a drama theater seating 700, and a studio theater with seating for 300; a music center with a 1,500-seat capacity concert hall and a 300-seat capacity recital hall; a conference center with a flexible main hall seating up to 540, a 400-seat cinema, and a symposium hall; as well as a library and archive.

The venue was built in less than 24 months, and includes four buildings that contain 11 multipurpose halls. Each building was designed to meet a different need, and each hall features adjustable seating that can be configured according to an event.

The venue's designers drew inspiration from Islamic culture – the exterior architecture features many-sided geometric forms that use the highest-quality materials and different construction techniques, while the interior design makes use of traditional Arabic colors and calligraphy, and uses marble, glass and wood throughout the halls and foyer areas.

## Tech savvy

The cultural center's design and build company, Al Hani Construction and Trading Company, enlisted Svetlost Teatar from Belgrade for the project. Svetlost Teatar provided complete integration of the stage technology systems, including: supply and installation of stage machinery and control systems; supply and installation of stage lighting and control systems; and supply and installation of sound, video and communication systems. Stage machinery systems were custom-developed and produced for all 11 venues of the JACC.

The theater called for more than 10 types of stage pit elevators, and a stage riser system with seating wagons, offering greater functionality and flexibility thanks to custom-designed understage machinery equipment. All elevators have a mechanical linear drive with variable computer-controlled speed. The lifting mechanisms consist of spiral-wound movement or compression chains, or screw-jack actuating units.

The theater stages have been equipped with modern and motorized high-performance SIL 3 flying. Additionally, chain hoist systems are available throughout the venue to enable easily interchangeable over-grid setup.



Auditoria with portal openings are equipped with adjustable proscenium devices and safety curtains. Elaborate cable management options enable easy and versatile lighting configurations.

Stage lighting systems enable the production of diverse events in all 11 halls. The luminaries are versatile, and include: conventional equipment from ETC, Philips Selecon and Robert Juliat; LED-based technology from ETC and Philips Showline; and motorized equipment from Robe and Philips Varilite.

In terms of control systems, a combination of ETC Eos, Cobalt Series and MA Lighting has been used. Data distribution combines Ethernet and DMX distribution, while networking uses SACN with ETC DMX RDM Gateways. The work lights control system is ETC Unison Paradigm. This system is fully integrated with the house light controls over building-wide architectural control networks.

The sound, video and communications systems installed are highly flexible and configurable for medium- and large-scale events, music and other performances. Main systems installed within all venues include a fully digital site-wide audio routing network with paging system, sound reinforcement system (including cinema surround 7.1 sound), digital mixing console system, video projection system (including 4K cinema projectors), surtitle system, production intercom and IPTV system.

A digital routing system for audio signals creates a distributed system using standard GbE hardware and enables audio routing throughout all venues within each building, as well as between the buildings. ■

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# Flying high

Kinetic equipment was implemented to dazzle audiences at a popular music festival in Rotterdam

Above and opposite page:  
**The spectacular stage theatrics at the Vrienden van Amstel relied on technology provided by Movecat. Photos: Frontline Rigging and Motion**

**T**he Vrienden van Amstel – often referred to as the ‘Biggest pub in the Netherlands’ – is one of the country’s most popular festivals. The event, which is sponsored by Amstel beer, opened its doors once again last January and featured nine back-to-back concerts. Each concert was a sell-out – welcoming 14,000 fans – for a combined audience of 126,000. An unusual feature of the Vrienden van Amstel is that the names of the performers are not made public prior to the start of each show.

For the 19<sup>th</sup> time, the festival was held at the Rotterdam Ahoy, one of the largest events and sports halls in Europe. The first show opened with a display of drumming virtuosity: the backbeat to *Radar Love* by Golden Earring. The group’s drummer, Cesar Zuiderwijk, flew through the hall with a specially developed drum

kit – a mixture of space capsule and chandelier – and was accompanied by other flown drummers from the other acts taking part.

## Spectacular staging

This was only one of a number of kinetic effects – the total weight of the loads moved coming to nearly 84,000 lb – to draw enthusiastic applause. Others featured musicians and trapeze artists ‘flying’ over the heads of the audience, numerous floating platforms employed as stages, and moving trusses carrying lighting and other scenic effects. The highlight was the spectacular transformation of a ring-shaped UFO (with a diameter of 72ft), hovering at ceiling height, into a gigantic spiral staircase with a final length of 230ft, down which a singer made his descent into the hall.

The effects were realized by Frontline Rigging & Motion of the Netherlands, using equipment



from Movecat and eZ-Axis Automation Service and Rentals. For the event, Movecat supplied 84 VMK-S 500-24 and eight VMW-S 1250-10 hoists, to which eZ-Axis contributed six eZ-Hoist flying performer winches, four eZ-Trolleys and an eZ-Rotator. The event made use of Expert-T control desks, 92 Movecat V-Motion 40E, six V-Motion 75E and five V-Motion 15E controllers, to cover a total of 103 axes of movement.

The next Vrienden van Amstel festival will run from January 18 to February 1, 2018, and will again be held at the Rotterdam Ahoy.

Movecat is currently the world's only manufacturer of kinetic equipment for the stage that is

capable of offering practice-tested and certified integrated systems compliant with BGV C1 and SIL3 – including chain hoists, trolleys, winches, load-measurement systems and networks.

The company was founded in 1986 by Andrew and Thomas Abele. Movecat products are developed and manufactured in Germany. Kinetic solutions from Movecat are widely used in major national and international shows, tours and TV productions. In 2015 the company was awarded the VR Innovation Prize for Medium-Sized Enterprises by the cooperative financial group Volksbanken Raiffeisenbanken. ■

[www.movecat.de](http://www.movecat.de)



DYNAMIC STAGE TECHNOLOGY



BGV D8/DGUV V54, D8 Plus and BGV C1/DGUV V17 kinetic solutions according to IGWW SQ P2 as well as EN 61508 / SIL 1 to SIL 3

Controller



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Winch



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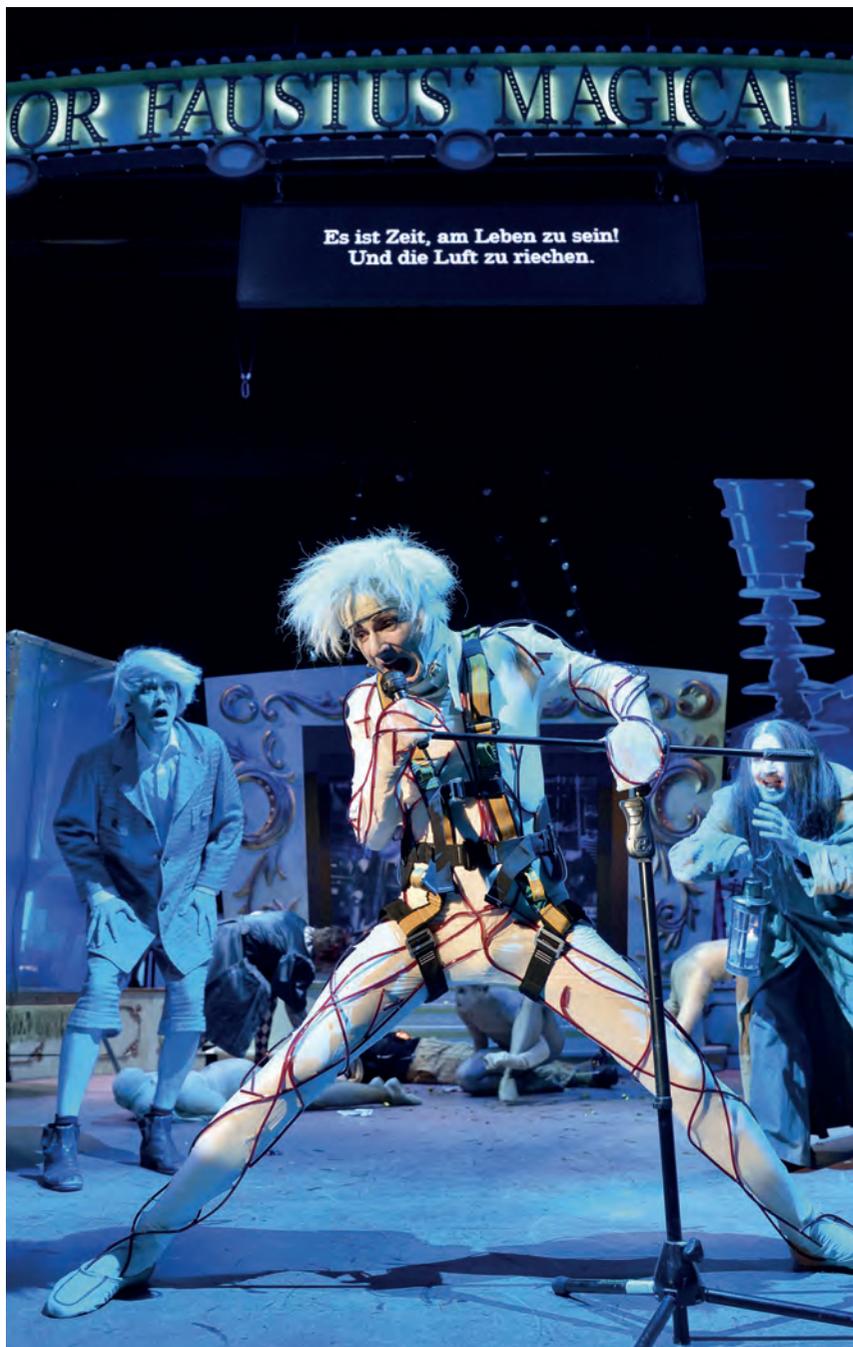
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# Title technology

A new LED supertitle system is key for promoting audience understanding and emotional response



The new Gerriets LED Supertitle system is on track to spark a theater revolution. Seeming to float in mid-air above the stage, the Supertitle system displays a sharp and bright picture even if the stage is completely illuminated. The crisp legibility of the supertitle is thanks to Gerriets' new LED screen technique. The system includes standalone software, compatible with most existing older systems. To fit all theatrical and operatic needs, the software has been developed with technicians and dramaturges.

Long before the availability of supertitle systems, the need for a translation of the libretto has existed. Since the 1960s, operas and plays have been more frequently performed in their original language due to the engagement of internationally acclaimed guest artists.

Different techniques have been used to aid comprehension. Sometimes the singers performed in Italian or German and another actor gave a short translation of the subject matter in the native language. In 1983, the Canadian Opera Company became the first to use a supertitle system, inspired by the standard use of subtitles in cinema. In the following years, supertitling became widely used in opera, theaters and at festivals. In 1992, a German production – a performance of the play *Ein Maskenball* – used this type of system at the German Opera in Berlin for the first time. Today, supertitles are not only used to provide a translated libretto, but also to display the libretto in the original language to make the play accessible for visitors without any previous knowledge of the piece.

During a performance, an experienced technician operates the computer and scrolls through the text (often in two languages) alongside marks in the piano score.

## Replacing classic projection

Until very recently, a bright projector has been used to project the supertitles onto the proscenium. Usually, a black projection screen is used, such as the Gerriets Show screen.

The advantage of a black projection surface is that little backlight is reflected. However, this

often results in an extremely dark supertitle projection, especially when the main stage is brightly illuminated.

This is where Gerriets' cost-effective LED Supertitle system can help. The LED supertitle screen boasts a brighter image, higher contrast, crisp readability, and deeper blacks. By using Gerriets' 'black masking' LEDs, the text appears to float in mid-air above the proscenium.

Another method of providing a sub- or supertitle is the installation of small displays in seat backrests. This solution provides a selection of available languages for every visitor. Aside from the high costs associated with this method, another disadvantage is the continuously interrupted experience of the audience. This method requires the audience member to look from the backrest to the stage and back again for the entire duration of the show, resulting in a choppy viewing experience.

Most critics of an openly displayed supertitle have come around to the technology in recent years. Now, on occasions when the supertitle system isn't working, audiences are quick to communicate their displeasure. The supertitle



and translation system has become crucial to the understanding and the emotional experience of the audience. That is where a reliable and low-maintenance system such as the LED Supertitle system comes in. ■

Left and above: **Operated by an experienced technician, the Supertitle system can help audiences understand more of a performance, and enhances their enjoyment of the show**

[www.gerriets.com](http://www.gerriets.com)

## LED Supertitle System: SUPERTITLE 2000 / P4.81



### Technical specifications

<b>Pixel Pitch</b>	4,81 mm	<b>Colour temperature</b>	6500 K
<b>LEDs</b>	SMD3528	<b>Cabinet, size (w x h x d)</b>	2000 x 500 x 50 mm
<b>Pixel Configuration</b>	1R1G1B	<b>LED module, size (w x h)</b>	250 x 250 mm
<b>Greyscale</b>	14 Bit	<b>LED module, definition</b>	52 x 52 Pixel
<b>Colour depth</b>	36 Bit	<b>Weight</b>	34 kg
<b>Viewing angle</b>	>140° (h/v)	<b>Protection class</b>	IP20
<b>Refresh rate</b>	960 Hz	<b>Power supply</b>	230V/50Hz
<b>Brightness</b>	1200 cd/m <sup>2</sup>	<b>Power consumption</b>	375 W
<b>Viewing distance</b>	>5 m	<b>Frame material</b>	Steel

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Gerriets



# Sound thinking

A range of acoustical shell products offers sophisticated solutions for performance venues

**I**n 2014, Staging Concepts introduced a successful product offering: the Bravado Acoustical Shell System – a portable, lightweight acoustics system designed to blend and reflect sound energy toward audiences in performing arts venues. In 2016, the company released the brand-new Aria Acoustical Shell, a cost-efficient and simple solution for smaller-scale venues. A highly anticipated addition to Staging Concept’s product line, the Aria Acoustical Shell system offers highly engineered towers and ceiling panels that reflect sound to create a resounding performance space.

Staging Concepts spent many months working on the acoustical testing and designing of these products – considering everything from the LED lighting in the ceiling panels to the movable cart and T-handles for the towers. As the market expands with products boasting acoustical enhancement, Staging Concepts is keen to highlight the many advantages of these products to its customer base.

**This page and opposite: Staging Concepts designed and built an acoustical shell for the multipurpose theater at St Croix in Hammond, Wisconsin**



## Expert advice

Marty Thiede, Staging Concepts’ acoustical shell expert, has been a licensed professional engineer for 28 years, so is well placed to explain the products’ main benefits. “As they say, it’s ‘all in the presentation,’” Thiede says. “Our acoustical shells provide an attractive background that highlights the performers to the audience. The background and integrated lighting enables the audience to see and focus in on the performers, delighting parents and friends.” Without an acoustical enclosure surrounding the performers, Thiede continues, a lot of the sound energy produced during a performance is lost in the fly loft and side stage areas, absorbed by stage curtains and drops: “The acoustical shell is made up of curved, reflective surfaces that are designed to reflect the sound energy produced in multiple directions. The end effect is that the reflected sound energy is blended and focused toward the audience, enhancing their listening experience.”

Performers also benefit from the acoustical shell enclosure. “The integrated shell lighting allows adequate light to see their sheet music and surrounding area,” explains Thiede, “while the reflective attributes of the shell allow the

musicians to hear their fellow performers and make adjustments.”

Furthermore, the acoustical testing carried out on the products has been extensive. “Staging Concepts has done formal acoustical performance testing on the Bravado Acoustical Shell in an ASTM-certified lab on our standard acoustical shell panel construction,” adds Thiede.

With the Aria and the Bravado, Staging Concepts is able to provide solutions for a variety of applications. “The Aria Acoustical Shell is the perfect solution for performing arts venues that need a portable and affordable acoustical system to match the beauty of their space. The Aria provides portable and simply configured towers designed for ease of use,” explains Thiede. “The Bravado is much more of a highly customizable solution for large-scale theater spaces. Designed for grand spaces that require a full-stage acoustical shell system, the Bravado offers an extremely customizable design that can be perfectly crafted to meet both the visual and acoustical needs of a venue.” ■

[www.stagingconcepts.com](http://www.stagingconcepts.com)



## IT'S HERE. The ARIA Acoustical Shell

Staging Concepts' Aria™ Acoustical Shell is the perfect solution for performing arts venues that need a portable and affordable acoustical system to match the beauty of their space.

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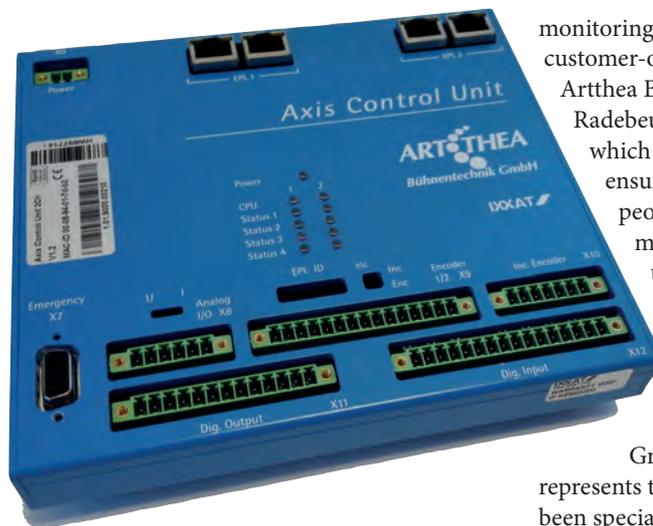
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# Safety first

Reliable stage brakes with contactless release monitoring can ensure the highest levels of operational safety

The city of Leipzig has a long and illustrious association with the theater industry, and the Große Bühne (the so-called Large Stage) of the Schauspielhaus Leipzig is among the city's most famous venues. With 672 seats, it is among the 10 largest theaters in Germany and, in the summer of 2016, the existing stage technical systems were modernized, retrofitted and adapted for increased safety requirements. "We installed a new control system that fulfills all the requirements according to EN 61508 and SIL 3," explains Günter Gruber, technical director at the Schauspielhaus Leipzig. "We integrated load measurement bolts, among other things, for overload disconnection, and a new braking system with contactless release



Clockwise from above: **The Axis Control Unit developed by Artthea. Photo: Artthea Bühnentechnik; machinery at the Schauspielhaus in Leipzig; Mayr brakes with contactless release monitoring**

monitoring." The theater relies on the flexible, customer-orientated Artea control system from Artthea Bühnentechnik, a company based in Radebeul, Saxony. Stage brakes from Mayr, which use contactless release monitoring, ensure reliable safety, protecting the people on the stage, the system and the materials behind the scenes against uncontrolled machine movements.

"With this new control system, combined movements of the upper machinery and the turntable, our only piece of lower machinery, are now also possible on the stage," says Gruber. The Artea control system, which represents the core of the stage technology, has been specially adapted to the requirements of the Leipzig theater. Included in the upper machinery are a total of 36 drives – 31 mechanical hoists, four point hoists and one stage portal. The hoists of the upper machinery travel at a speed of 0.01-1.2m/s (0.03-3.9ft/s) and can assume a payload of 500kg each. Roba-stop-silenzio dual-circuit brakes with a braking torque of 2 x 100Nm or 2 x 32Nm are used in the drives.

## Reliable safety

As the hoists of the upper machinery move and hold stage decorations or lighting units above the actors, or transport people if required, special safety requirements must be fulfilled. The Roba-stop-silenzio safety brakes take on a fundamental role in this process – in the event of a power failure or emergency stop, they bring loads to a standstill as quickly as possible to prevent damage to people or materials. The dual-circuit brakes operate as redundant braking systems completely independently of one another. The Roba-stop-silenzio brakes, with their patented noise damping, are the quietest on the market, even after several hundred thousand switching cycles.

An integrated function monitoring system, which provides feedback regarding the switching



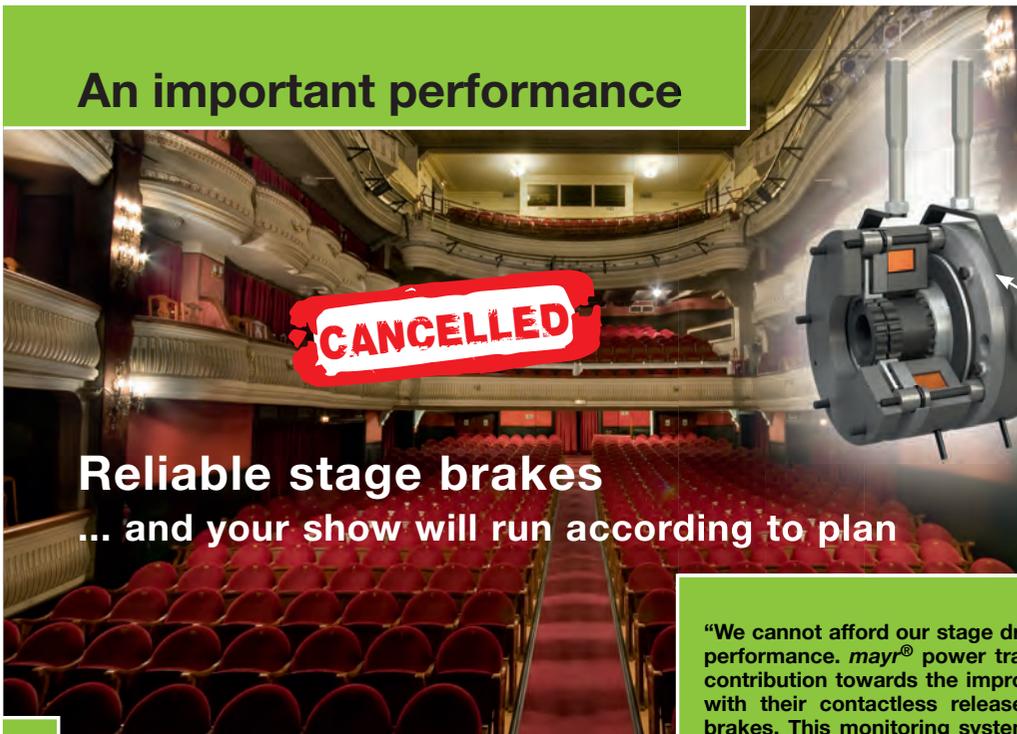
condition of the brake, is an indispensable element for standard-compliant safety brakes (according to BGV C1, DIN 56950 and DIN EN 81). This release monitoring prevents unreliable operating conditions, such as the motor starting up against a closed brake. “The solution with the contactless release monitoring by Mayr was important to the Schauspielhaus Leipzig,” explains Martin Gaida, project manager at Artthea Bühnentechnik. The contactless system, with inductive proximity sensors, enables the control system to record and evaluate the operating condition of the brake, only enabling the motor to start after the brakes have been released. This monitoring system is resistant to the effects of magnetic fields, and is not sensitive to impacts and vibrations. It is reliable and ensures the greatest possible functional and operational safety. “The contactless release monitoring is not only less susceptible to faults, but it also does not have switch contacts that are subject to wear, such as is the case with microswitches,” adds Gaida. ■

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Schauspielhaus Leipzig

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# Big impression

An innovative approach to a unique project brings an animated film's circus tent to life

**Above: The circus tent at the Motiongate Dubai theme park posed a complicated challenge for J&C Joel's creative manufacturing team**

**Opposite page, from top: The SkyDeck tension wire grid system at Motiongate Dubai; a 3D model of the circus tent**

Leading manufacturer of flame-retardant fabrics, drapery and stage engineering solutions J&C Joel proved it was the ringmaster of fabrics when the company created a bespoke circus tent for the Hollywood-inspired theme park Motiongate Dubai.

The theme park, which opened its doors to the public in December 2016, is part of Dubai Parks and Resorts, a US\$2.86bn multi-theme park complex featuring three theme parks and one water park – Motiongate Dubai, Bollywood Parks Dubai, Legoland Dubai and Legoland Water Park. The entire destination is connected by Riverland Dubai – a themed retail and dining destination – and Lapita Hotel – a Polynesian-themed hotel that is part of the Marriott Autograph Collection.

On the back of its successful installation of the SkyDeck tension wire grid system at Motiongate Dubai, J&C Joel was commissioned to design, manufacture and install a circus tent at the Hollywood-inspired theme park.

The company's creative manufacturing team, led by Andrew Hastwell, took on the unique and complicated project as the only company in the world with the ability to meet the client's brief. The tent, which is the entrance to a ride, was inspired by the film *Madagascar* and is based in Madagascar Land in the Dreamworks zone – one of the five zones in Motiongate Dubai.

J&C Joel's senior creative coordinator, Matthew Bland, came up with the design concept for the tent, which had six uniquely shaped tops and included the steel structure for the fabric to fit around to create the desired shapes.

To achieve the shapes, each individual piece of the tent was cut by hand and sewn together by the manufacturing team's talented seamstresses.



Each section of the tent was created individually and then installed on-site separately. Once in place they were then joined to give the overall tent shape desired by the client.

The creation of the tent took more than 400 hours of work by J&C Joel's cutters, seamstresses and the creative manufacturing team, and around 1,300 yards of fabric was used. The installation took three weeks with a dedicated team on-site throughout to ensure it went smoothly and was completed to the client's specification.

## STAGE TECHNOLOGY

### World stage

The Motiongate Dubai project showcased J&C Joel's prowess as a leading provider of design, manufacturing and installation services offering customers a turnkey solution for projects located anywhere in the world.

The British company has achieved a truly global reach through an international network of offices, and has been providing bespoke theater and event drapes, and stage engineering services for more than 38 years. The business now exports to more than 80 countries from its offices in the UK, Europe, Asia, Africa, the Middle East and Australasia.

J&C Joel goes beyond just the manufacture and supply of fabrics and flooring. The company designs, manufactures and installs an entire range of drapes and shapes that feature in a wide spectrum of venues around the world.

Above all else, the J&C Joel family puts its customers at the heart of everything it does, and the company is proud that clients continue to be the inspiration behind its performance. ■

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# Freedom of movement

A challenging production for the Vienna State Opera called for innovative application of stage technology

When set designer Pierre-André Weitz presented the Vienna State Opera with a three-floor construction plan for the new production of the opera *Armide* that required flexibility and a large variety of complex movements, the venue's technical management team started researching to be able to fulfill his wishes.

"What made the entire project a challenge was the demand for freedom of the movement of the set," explains Benjamin Häusler, the man who was ultimately responsible for the production at the Vienna State Opera. "Each level of the three-part stacked steel construction must be able to rotate about an eccentric point on its supporting level. Single motions of each level – or 'cube tower' – as well as the movement of all three as a unit must be possible."

These requirements brought the opera's team to Visual ACT.

## Modular machinery

Visual ACT is a Sweden-based company that specializes in technology, engineering and scenery for the entertainment industry. The Visual ACT Advanced Wagon system consists of a set of modular components that can be built into platforms as low as 200mm (7.9in). The modular components can be reused in wagons of different shapes and sizes, and quickly replaced for service.

The stage set for *Armide* consists of three moving platforms on three levels. Each of the platforms is automated with one Visual ACT Advanced Wagon. The center platform rotates as programmed by the user. The position of the rotation point of the second level changes as the center platform rotates. This position is then



Above: A production of *Armide* required complex movements

Below: Advanced drive units installed in the construction

Opposite page: Visual ACT also provided the control system



passed on to the controller of the second level. The angle of the second level with respect to the first is then programmed by the user. This allows the advanced drive units mounted in the platform of the second level to synchronize the motion of this level with the center platform. In the same manner, the motion of the third level will be synchronized with the second. Encoders placed at the rotation points enable accurate control of the positioning.

The users programmed all the motions described in the storyboard in advance, and tested all movements in simulation mode prior to rehearsals. After moving the constructions to the stage, the motions could easily be adjusted during rehearsals.

In addition to rotation, all three platforms can be moved sideways as a single unit, enabling the complete construction to be moved on and off the stage.

The technicians and engineers from the opera installed all the wagon components into the steel and aluminum constructions built in the opera's workshops. "The build-up of the set design including installation of all Visual ACT components and a first test to check basic functionality took us two-and-a-half days," says Häusler. "Commissioning of the system and programming of the motions were completed after an additional seven days. Considering that the Visual ACT control system was a new setup, this was reasonable."

"It was a complicated, but therefore very thrilling challenge," explains Michael Wilfinger, deputy technical director at the Vienna State Opera. "We're very glad that the decision was made to let Visual ACT carry out this project as, apart from minor teething troubles, the system works excellently and very reliably. We could play all rehearsals and performances without incidents. In particular, the permanent availability of the Visual ACT support team was very helpful." ■

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# Sound effects

A new theater boasts an array of performance spaces, each with its own acoustic requirements

The Jiangsu Grand Theatre is located in the new development district of Nanjing, the capital of Jiangsu Province, China. The project started at the beginning of 2013 and completed in May 2017.

The Grand Theatre is the largest performing arts center project in China to date, and includes six performance halls: a 2,300-seat opera house, 1,500-seat concert hall, 1,000-seat drama theater,

3,000-seat conference hall (which can be used for variety shows) and two small conference halls.

The Jiangsu Grand Theatre was funded by the Jiangsu Provincial government, and the project's architect was the East China Architectural Design & Research Institute, based in Shanghai.

Marshall Day Acoustics provided the full acoustic design and consulting services for the opera house, the concert hall, the drama theater and associated spaces, including rehearsal rooms, practice rooms and foyers.

During the design and construction phase of the theater, Marshall Day Acoustics cooperated closely with the architects, interior designers, stage machinery designers, lighting engineers, sound system engineers and site contractors to ensure acoustic excellence for the performance and rehearsal spaces.

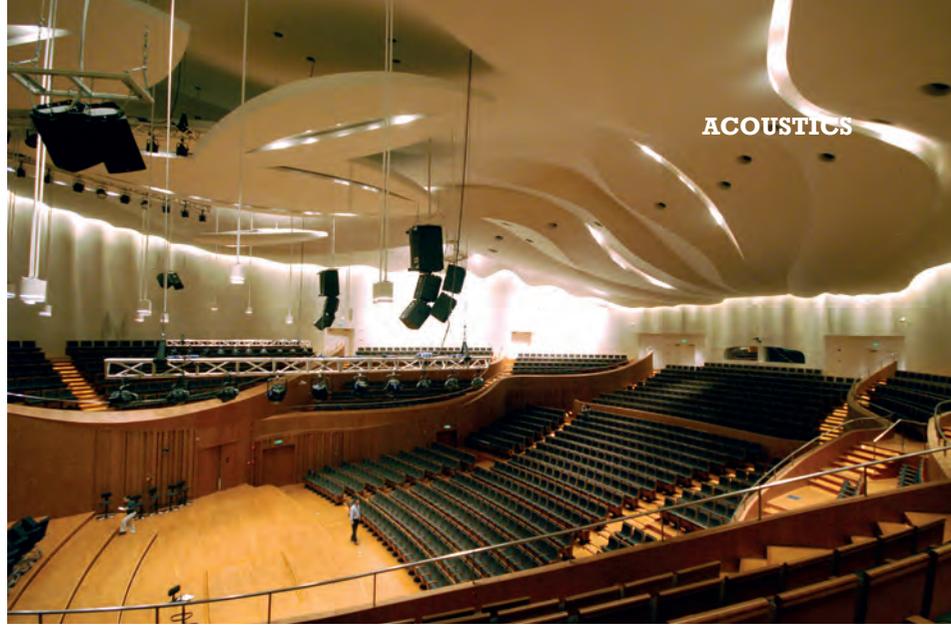
## Different designs

The opera house venue is primarily used for opera, musicals, ballet and variety shows. This auditorium is designed for uncompromised natural acoustics to suit unamplified opera. The sound in the hall possesses sufficient reverberance and fullness to support musicians and opera singers, while also boasting high sound clarity. The design has effectively guided



reflections from the stage, throughout the audience areas, so that every member of the audience can hear sufficiently loud sound during unamplified performances. The design has included acoustic banners – to be installed at the upper part of the rear and side walls – to reduce the reverberation time for amplified performances (the banners have not yet been installed, but spaces for the driving mechanism are reserved in the ceiling space).

The concert hall is intended for western symphonic concerts, Chinese folk music concerts, chorus and solo – all unamplified. The acoustic volume of the concert hall is large enough to provide reverberance and fullness to the sound. The stage is located within the audience hall, surrounded by the seats to achieve visual intimacy between musicians and audience. Five canopies are suspended over the stage and their heights are adjustable to suit different sizes of orchestral bands. These canopies assist in improving the acoustic environment for the musicians on stage. Multiple reflecting surfaces have been installed close to the stage and in the audience area to provide early reflection energy and improve sound clarity in the audience area.



The reflections from these surfaces also provide spaciousness and envelopment to the sound quality in the hall.

The drama theater is intended for spoken drama, Beijing opera and various local operas. This auditorium's acoustics are designed to provide suitable reverberation and high clarity for the performances to be held in the hall, with attentions also given to supporting the actors on stage and musicians in the pit. ■

**Left: The 2,300-seat opera house in the Jiangsu Grand Theatre, which opened in 2017**

**Below left: The drama theater is intended for spoken word, Beijing opera and local opera**

**Above: The concert hall boasts five canopies, used to improve the acoustic environment**

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## DESIGN

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# Inside out

Transforming Canada's National Arts Centre turned a brutalist fortress into an accessible showcase for 21<sup>st</sup> century culture

**Above: The new public space at the National Arts Centre, Ottawa, with entrance beneath the new digital screen tower**

**Opposite page: Amphitheater seating in the new public space activates the NAC for greater engagement with patrons before and after performances**

The National Arts Centre in Ottawa, Ontario, is the premier Canadian showcase for emerging and established talent from across the country and around the world. It is home to the National Arts Centre Orchestra and programs English and French theater and dance, in addition to festivals held throughout the year. The four-stage complex, located in the heart of the city is a well-loved institution and brings in more than 1,300 shows and 1.2 million visitors each year.

The National Arts Centre (NAC) is also a rather forbidding structure. Windowless concrete walls in the brutalist style of the mid-20<sup>th</sup> century made it a fortress for the arts where patrons had trouble even finding the entrance. An ongoing, three-phase US\$200m transformation by Diamond Schmitt Architects is changing all that and will also dramatically improve the performance spaces.

The NAC was founded for Canada's Centennial in 1967. So it is fitting that the first phase of renewal – a major expansion – is timed to open on July 1, 2017, coinciding with the country's 150<sup>th</sup> celebrations. This fast-track project incorporated innovative scheduling and procedures to complete the work within the 18-month construction window, during which time performances continued at the NAC.

### Transformative design

Three new wings of interconnected pavilions provide lobby, program and audience amenity space crafted in Canadian wood, stone and glass that welcomes visitors to a warm and inviting interior. Enclosed by a custom-designed curtain wall, a bold transparency creates a showcase for cultural programming that is visible to millions of visitors at this urban crossroads.

"We wanted to activate the space for 16-hour-a-day engagement, where flexible, interconnected rooms host talks, small performances, rehearsals, and before and after performance events," says Donald Schmitt, principal, Diamond Schmitt Architects. "These lobbies become the urban living rooms for Ottawa."

The north pavilion faces national institutions and commemorative sites; a west pavilion fronts the city and community; and an east pavilion is adjacent to the Rideau Canal, a UNESCO World Heritage Site. Connecting them is a marquee tower that defines a new and generously shaped entry. Transparent digital screens on the tower enable not only live-streaming of performance from within, but also from performing arts centers across the country, linking the arts in a truly national arts center.

A café and welcome desk are positioned at the new entrance on Elgin Street, where a transformed



DESIGN

Fourth Stage, which serves as an incubator for theater and music, animates the street in a lively interplay of exchanging glances.

The ground level of the NAC is flush with the mezzanine level of its main auditorium, Southam Hall. The architects, in collaboration with New York-based Fisher Dachs Associates and Threshold Acoustics of Chicago, enhanced the room's comfort and acoustics within a three-month summer shutdown. New, wider seating with wood seatbacks replaces the original upholstered seats, and wood flooring replaces seat row carpeting. The addition of two new aisles divides the continental configuration of seating in the orchestra and a fourth parterre section was

added. These changes reduced the hall capacity by 250 seats from the maximum of 2,331 but greatly improve acoustics, patron circulation, accessibility and, thus, the value of each seat.

The next stage for Southam Hall will update production facilities, replace the orchestra shell and improve sound isolation with adjacent spaces.

"A cultural center in the 21<sup>st</sup> century should not simply be about performance," adds Schmitt. "It's to be experienced through the whole day and by transforming the NAC to be outward and connected, it now beckons the public to come in and soak up Canadian culture." ■

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Architects for the Toronto Centre for the Arts Main Stage Reconfiguration

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# Set the stage

Advances in stage technologies are helping Estonian theaters compete with international arts facilities

**E**stonian theaters are currently competing with celebrated international arts venues and the market is expanding fast. Trekwerk/Show Canada Group has completed two installations in Estonia – the Ugala Teater in Viljandi, the Vanemuine Teater in Tartu – and has just begun the Endla Theatre project in Pärnu.

The country's theater industry is undergoing a period of widespread upgrades to its arts venues. "Estonia's theater houses are state-owned, with performances facilitated by Soviet systems," says Toomas Peterson, general director of Teater Vanemuine. "They were all built 40 to 100 years ago, and the technology never changed. The government recognized we were sitting on a time bomb and put technology renovations high on the agenda. In Tartu, we had a 50-year-old installation. We put on a lot of performances, and we were never sure if things would work. Now our installation works to perfection. We are extremely pleased."

Jamie Taylor, contractor project manager for Trekwerk/Show Canada Group, is dedicated to the projects in Estonia, and focused on the Endla Theatre in Pärnu: "Estonia's cultural sector is currently enjoying a boom with large investments in the theater infrastructure, with rich and diverse performing arts in demand."

The technical renovation at the Endla Theatre will feature: a new lamel grid, 35 SynchroDisc fly bars, four 250kg SynchroPoints, four 250kg chain hoists, a dual-level revolving stage, two orchestra pit lifts, three lighting frames, a flown portal bridge, and a 600V DC TNM operating system.

The Vanemuine Teater project brought the arts venue's over-stage offering up-to-date. "We are very pleased with the performance of our installation," says Peterson. "We are looking forward to the next renovation, of the under stage, in May 2017. A priority for this project was a control system that allows for synchronicity, making life easier, more controlled and less susceptible to human error." When it is completed in September 2017, the Vanemuine project will include: dismantling of the previous over-stage installation, a new lamel grid floor, 40 cross-stage winches, three lighting frames, 12 250kg SynchroPoints, a HOAC/Harlequin hoistable ballet floor, a dual-level stage revolve, 13 stage lifts in the revolve, three Orchestra pit lifts, and a 600V DC TNM operating system.



## STAGE TECHNOLOGY

### New venues

The need for innovative theater technology doesn't stop with renovation projects. The Estonian government is currently researching a large-scale project that will involve a new national opera house in collaboration with a concert hall in Tallinn. "This is a point of discussion at the moment," says Peterson. "Theaters are very important to us. As a nation, we have one of the highest rates of theater visits – Estonia has 1.3 million inhabitants, and there are 1.2 million theater visits annually."

Theater is rooted in Estonian culture. "The forward-thinking education system in Estonia has enabled a generation of entrepreneurial-minded and tech-savvy students," says Taylor. "We take great pride in upgrading facilities to enable generations, new and old, to continue pushing the boundaries of the arts and assisting them in their continued productions."

"Estonian theaters share the same sentiment," explains Peterson. "We want our technology to at least survive the next 20 to 30 years." ■

**Left: Innovative new stage technologies, such as this flybar system, are helping Estonian theaters to compete with international venues**

**Above: Use of high-performance technologies is just as vital in new venues as it is in the renovation of existing theaters**

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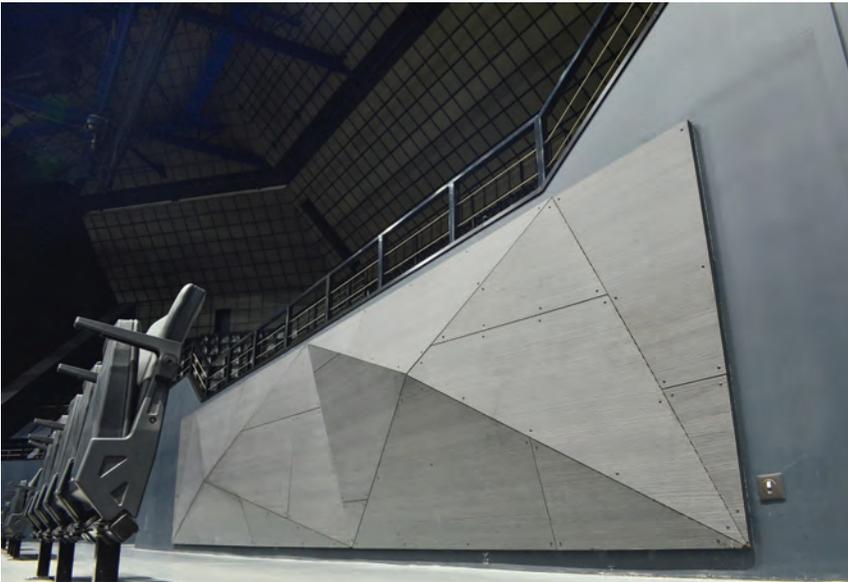
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# Sound of music

Acoustic optimization has resulted in a marked improvement for a Parisian arena



**Above: The acoustic design for the refurbishment of Paris's AccorHotels Arena was intended to reduce mid-frequency reverberation times**

**Opposite page, left: Following the refurbishment, Vanguardia conducted acoustic tests to verify acoustic performance**

**Opposite page, right: The venue refurbishment will ensure the world's best music and sports events can be delivered**

The AccorHotels Arena in Paris, France, has undergone an extensive refurbishment and redevelopment program. The largest indoor entertainment arena in Paris (with a maximum capacity of approximately 20,300), it has had various guises during its lifetime. The venue originally opened in 1984 as the Palais Omnisports de Paris-Bercy, rebranded as the Bercy Arena in 2014, and has been the AccorHotels Arena since 2015.

As one of the primary sports, music and entertainment venues in Paris, operator AEG (in partnership with the owner of the facility, the city of Paris) was keen to ensure that the refurbishment delivered the optimum acoustic environment to attract the world's best sports and music events. As such, it enlisted the consultancy services of UK-based Vanguardia to review the architectural and acoustic design at the construction stage of the project.

The original refurbishment concept was developed by DVVD Architects in conjunction with acoustic engineers from Peutz Group. Given Vanguardia's extensive experience of large-scale venue acoustics, and specifically

venue optimization for amplified music concerts, the company was appointed by AEG to work with the contractor and Peutz to arrive at an optimum acoustic solution.

Prior to the refurbishment, the AccorHotels Arena featured aging surface finishes, notably an extensive quantity of hard tiled surfaces close to the audience. Initial acoustic measurements were conducted before work started on-site, measuring a reverberation time of 2.8 seconds at mid frequencies, rising to 4 seconds at low frequencies. Vanguardia then conducted 3D room acoustic modeling to predict the acoustic characteristics of the main bowl, looking at reverberation time, strong reflections, echoes and the low-frequency bass response.

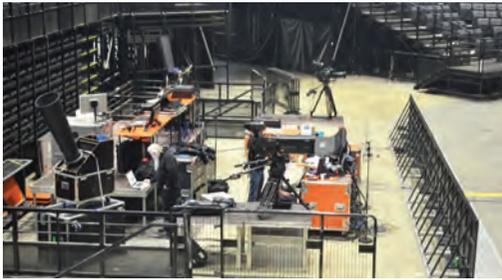
The venue's acoustic design was developed by Vanguardia to reduce the mid-frequency reverberation times to approximately 2.5 seconds across the entire frequency range, including at the sub-frequencies. The goal was to achieve an acoustic characteristic that provides a controlled environment for amplified sound system clarity, while maintaining a good audience atmosphere for varying event types.

Vanguardia introduced additional acoustic absorption to the box fronts, and optimized the design of low-frequency absorption in the upper wall/roof. Large-scale bass traps were also proposed.

## Tour de force

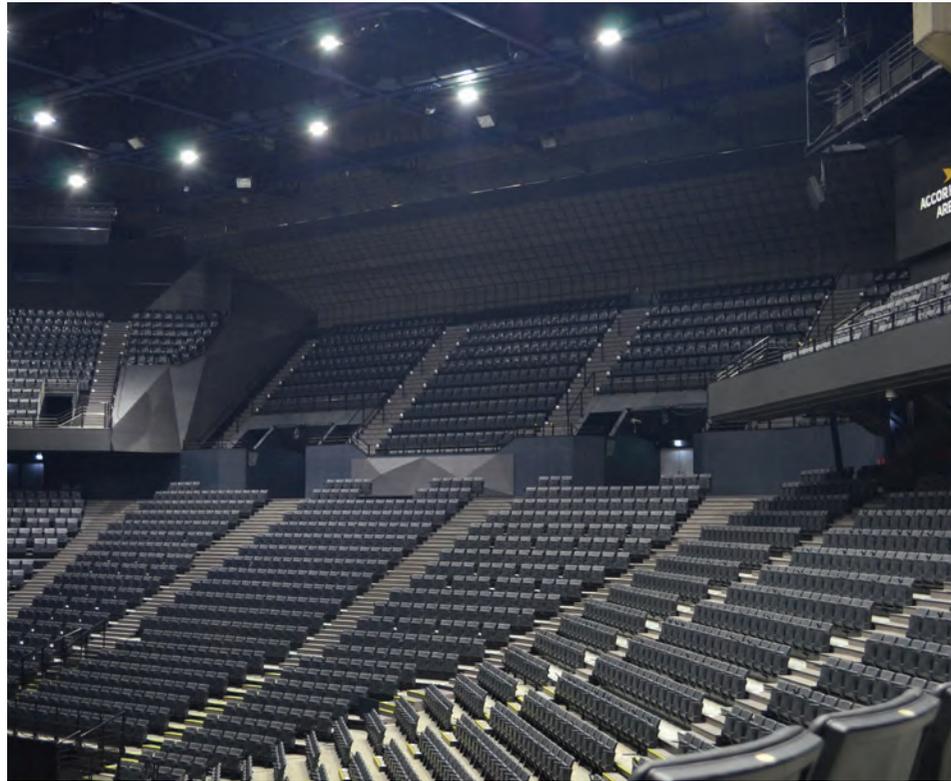
Following the refurbishment, Vanguardia returned to conduct acoustic measurements to verify the performance of the designs. As a result of the company's affiliation and close work with U2 sound engineer Joe O'Herlihy, it was possible to conduct arena bowl measurements using U2's 360° sound system during the band's Innocence + Experience tour. Additional measurements were made using a conventional end stage system in March 2016. Both measurement sets confirmed the acoustic treatment had successfully achieved the desired acoustic performance targets.

"U2 was fortunate to be the first band to play at the AccorHotels Arena following the extensive



refurbishment,” explains Joe O’Herlihy who, in addition to his role as front-of-house mix engineer for U2, is also sound director of Vanguardia. “The band had played at the arena prior to the works and the comparison is like night and day. The extensive works, which included the substantial treatment to the acoustics, have brought the AccorHotels Arena up to world-class standards with excellent sound and acoustics for staging large-scale music concerts. Vanguardia was appointed directly by the arena operators to advise on the acoustics throughout the refurbishment.” ■

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# Q&A



Internationally renowned arts educator Samuel Mungo will take up the role of managing director of the Peabody Opera Theatre in the autumn of 2017

**How did you hear about the new position?**

A colleague knew that I was looking for my next opportunity, and saw the notice. I was at Texas State University for 11 years and had built the program to where I felt it was in a good place for me to leave in other hands.

**What do you anticipate will be the position’s main challenges?**

A number of challenges and opportunities drew me to apply. My previous program was focused on the undergraduate experience primarily, providing the groundwork for young singers to begin their journey in opera. The five to eight master’s students we had per year gave me a taste for what I could do with higher level students, something I will be doing much more of at Peabody. Another challenge I am especially excited about is working with Dean Fred Bronstein to bring his new strategic initiatives to fruition. Expanding the idea of entrepreneurship for the 21<sup>st</sup> century musician, reaching out to the community at large, and engaging interdisciplinary efforts both inside and outside the academic sphere, are all ideas that I have tried to implement in my work everywhere I have taught.

**What experiences gathered during your career to date are you keen to apply to the Peabody?**

I have dedicated my career to teaching acting to opera singers. I have built what I think is a unique and effective technique for singers to create honestly, while still singing beautifully. The tenets are based on the work of three giants in the field – Sanford Meisner,

Michael Chekov and Walter Felsenstein. Combining their ideas, I have found a multidimensional approach that has found success in my students. I will bring this technique to Peabody Opera. I am also an avid proponent of new operatic works, and I will bring my knowledge of composers and compositions to bear on the program, and will look to engage composers at Peabody and around the world to write new works for us.

**You’re a proponent of preparation programs that also involve the technical side of the industry.**

**Why do you feel this is important?** I tell students all the time: Everybody sings pretty – what else you got? Can you dance? Can you do gymnastics? Can you do stage lighting, or build a set? Theater technical skills are especially important on two levels. Our graduates may not step off the Peabody campus and onto the Met stage right away. They may need to create their own opportunities, or work with others creating theirs. If there are two equally talented sopranos vying for a role in a startup, and one can also help build costumes, guess which one will get the job? And if they do step right onto the Met stage, having the technical knowledge will give them a better stage savvy, as well as an appreciation for the work and those doing it.

**Is it important to teach students about the wider industry as well as their craft?**

To my mind, absolutely. If you sing like Jessye Norman or Pavarotti, you might be able to get by on just the voice. But there’s only one Jessye Norman and Pavarotti, and few of us sing like they do. Having additional skills gives you a better chance to land an audition, get a job, engage an audience, be hired back, and create a career in today’s opera world. Having knowledge of the industry and the players in it enables you to best guide yourself to the opportunities that best suit your skillset. ■

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