AUERBACH·POLLOCK·FRIEDLANDER
Performing Arts/Media Facilities Planning and Design

Principals
S. Leonard Auerbach, ASTC
Holly Auerbach
Steve Pollock, ASTC
Steven Friedlander, ASTC
Kenneth R. Fause
Paul Garrity
Michael McMackin, ASTC
Tom Neville, ASTC

February 13, 2014

Todd Hensley, ASTC
American Society of Theatre Consultants
P.O. Box 22
La Luz, New Mexico, 88337

Dear Todd:

Please accept this proposal to honor and nominate Len Auerbach, ASTC, for Fellow of the Society. Len is a founding member and founding President of the ASTC. His contributions to the organization and to the theatre industry as a whole make him worthy of this distinguished honor.

As Founder and President of Auerbach Pollock Friedlander and Auerbach Glasow French, Len has contributed over 40 years of professional experience and international expertise in theatre consulting to the theatre and architecture world. His experienced leadership and personal involvement has resulted in the highest level of design and quality of work to his firm. Throughout Len's career he has been an innovative force in our industry. In the course of providing unique technical solutions and theatre designs, Len as created many custom products including the patented Sure Clamp and has initiated advancements in the areas of stage machinery, luminaires, seating and safety.

In 1968, Len left his position as Resident Lighting Designer at the Tyrone Guthrie Theatre in Minneapolis and joined the consulting firm of Bolt, Beranek, and Newman in New York, ultimately becoming Director of their Theatre Consulting Services in San Francisco. In 1972, he formed, Piacentini/Auerbach which became S. Leonard Auerbach & Associates, Inc. in 1973. In 2002 the growth of the firm culminated in its reorganization into Auerbach Pollock Friedlander and Auerbach Glasow French.

As a founder and founding President of ASTC Len was instrumental in forming the foundation of the organization and guiding the membership though the early years of its development. He has contributed to the growth and national and international recognition of ASTC through his leadership and contributions to important programs which have grown out of the organization such as the Theatre Design Challenge, Code Work, Intern Program to name a few.

Len has made significant contributions to education and the promotion of our industry through volunteer work by participation in the USITT, AIA, OSITAT among many other organizations. He has lectured at many educational institutions. Len remains key contributor to the Theater Architecture Program at Carnegie Mellon University which he initialed. This program continues to bring world class professionals and theatre and architecture students together in a collaborative learning experience through theatre design projects with mentor guidance.

Ned Lustig and Van Phillips have provided letters supporting Len's nomination. See attachments.

Sincerely,

Mike McMackin, ASTC

S. LEONARD AUERBACH, ASTC – SELECTED PROJECT EXPERIENCE

- American Museum of Natural History, Rose Center for Earth and Space, Hayden Planetarium, New York, New York
- Atlanta Symphony Orchestra, Atlanta, Georgia
- Beijing Tianqiao Performing Arts District Core Area, Beijing, China
- Berkeley Repertory Theatre, Berkeley, California
- Berkeley Repertory Theatre, Thrust Stage, Berkeley, California
- Campbell Heritage Theatre Renovation, Campbell, California
- Carnegie Hall, Judy and Arthur Zankel Hall, New York, New York
- Cathedral of Christ the Light, Oakland, California
- Conference Center for the Church of Jesus Christ of Latter-day Saints, Salt Lake City, Utah
- Cooper Union, Frederick P. Rose Auditorium, New York, New York
- Cyprus Cultural Center, Nicosia, Cyprus
- Denver Museum of Nature and Science, Gates Planetarium, Denver, Colorado
- deYoung Museum, San Francisco, California
- Drew Preparatory School, Assembly Wing, San Francisco, California
- Electronic Arts, Redwood Shores, California
- Esplanade Phase Two Planning Study, Singapore
- EXPO 86 World Exposition Theatres, Vancouver, British Columbia, Canada
- EXPO 86, B.C. Place, Gathering Place Corporation, Vancouver, British Columbia, Canada
- EXPO 86, Canadian Pacific Pavilion, Vancouver, British Columbia, Canada
- Griffith Observatory, Samuel Oschin Planetarium, Los Angeles, California
- Guangzhou Grand Theatre Competition, Guangzhou, China
- Guggenheim Abu Dhabi, Abu Dhabi, United Arab Emirates
- Hartland High School, Hartland, Michigan
- Joseph Meyerhoff Symphony Hall Renovation, Baltimore, Maryland
- Lake Louise Study, San Francisco Symphony and SFJazz, San Francisco, California
- Lake Louise Study, San Francisco Symphony, San Francisco Opera, SFJazz, Joint Use Consortium, San Francisco, California
- Mandalay Bay, Cirque du Soleil Michael Jackson Theatre, Las Vegas, Nevada
- MGM City Center, Cirque du Soleil *Viva ELVIS*™ Theatre, Las Vegas, Nevada
- MGM City Center, Convention Center, Las Vegas, Nevada
- MGM Grand Hotel and Casino, *KÀ*™ for Cirque du Soleil, Las Vegas, Nevada
- MGM Mirage, Cirque du Soleil *LOVE*™ Theatre, Las Vegas, Nevada
- New York New York Hotel and Casino, *Zumanity*™ for Cirque du Soleil, Las Vegas, Nevada
- North Peninsula Jewish Community Cultural Arts Center, Foster City, California
- Ordway Music Theatre, St. Paul, Minnesota
- Philadelphia Academy of Music, Philadelphia, Pennsylvania
- Port Theatre, Nanaimo, British Columbia, Canada
- Qwest Center, Omaha, Nebraska
- Red Deer University Arts Centre, Red Deer, Alberta, Canada
- Rice University, Opera House Study, Houston, Texas
- San Francisco Conservatory of Music, San Francisco, California
- San Francisco War Memorial Opera House, San Francisco, California
- San Francisco War Memorial Performing Arts Center and Veterans Building, San Francisco, California
- Santa Fe Opera Theater, Santa Fe, New Mexico
- SFJAZZ, San Francisco, California
- Shanghai Cultural Square Development, Shanghai Cultural Gardens Music Theatre, Shanghai, China
- Sonoma Academy, Sonoma, California
- Sonoma State University, The Donald and Maureen Green Music Center, Rohnert Park, California
- Stanford University, Frost Amphitheatre, Stanford, California

S. LEONARD AUERBACH, ASTC – SELECTED PROJECT EXPERIENCE (*CONTINUED*)

- Stern Grove, San Francisco, California
- The August Wilson Center for African American Culture, Pittsburgh, Pennsylvania
- The Venetian Macao, *ZAIA*™ for Cirque du Soleil, Macao, China
- The Venetian Orient, Ltd, Multi-purpose Theatre, Cotai Headliner Theatre and Presentation Theatre, Macao, China
- University of California, Davis, Robert and Margrit Mondavi Center for the Performing Arts, Davis, California
- University of California, San Francisco, Mission Bay Campus Community Center, San Francisco, California
- University of California, Santa Barbara, California Nanosystems Institute, Santa Barbara, California
- University of Victoria, McLaren Music Building, Victoria, British Columbia, Canada
- University of Washington, Playhouse Theater Renovation, Seattle, Washington
- Washington & Lee University, John and Anne Wilson Hall, Lexington, Virginia
- West Kowloon Cultural District Competition, Hong Kong, China
- Willamette University, Mary Stuart Rogers Music Center, Salem, Oregon
- Yerba Buena Center for the Arts, San Francisco, California

S. LEONARD AUERBACH, ASTC - AWARDS

S. Leonard Auerbach, ASTC

- American Institute of Architects, California Council, Allied Professions Honor Award, 1999
  "In recognition of …unique dedication…to enhance, support and significantly contribute to the advancement of architectural design."

American Museum of Natural History, Rose Center for Earth and Space, Hayden Planetarium, New York, New York

- AIA National Honor Award For Architecture, 2002
- AIA/New York Chapter, Design Excellence Award, 2001
- Award For Design Excellence, New York Concrete Industry Board, 2000
- Best Of 1999 Award, New York Construction News, 1999
- Bronze Plaque For Excellence In Design, The Municipal Art Society Of New York, 2000
- Business Week/Architectural Record Award, 2000
- New York Association Of Consulting Engineers, Engineering Excellence Diamond Award, 2000
- The Chicago Athenaeum, American Architecture Award, 2001
- *Time* magazine's Best In Design, 2000

Berkeley Repertory Theatre, Berkeley, California

- AIA East Bay, Honor Award, 2001
- Downtown Berkeley Association, Design Excellence Award for New Construction, 2002
- United States Institute for Theatre Technology, Architecture Awards, Honor Award, 2003

British Columbia Pavilion, EXPO '86, Vancouver, British Columbia

- Illuminating Engineering Society of North America, International Illumination Design Awards, Edwin F. Guth Memorial Award for Interior Lighting, Award of Excellence

Carnegie Hall, Judy and Arthur Zankel Hall, New York, New York

- AIA/New York Chapter, Honor Award, 2004
- Contract magazine, Interiors Awards, Public Spaces Award, 2003
- New York Construction News, Cultural Project of the Year, 2004
- New York Construction News, Institutional Project of the Year, Best of 2003
- Structural Systems Category, Engineering Excellence Award, 2004
- United States Institute of Theatre Technology, Architecture Award, Merit Award, 2004

Carnegie Mellon University, Purnell Center for the Arts, Pittsburgh, Pennsylvania

- AIA/SFV, Citation Award, 1999
- AIA/SFV, Citation Award, 1998
- Society of American Registered Architects, Design Award of Honor, 2000

Conference Center for the Church of Jesus Christ of Latter-day Saints, Salt Lake City, Utah

- Illuminating Engineering Society of North America, International Illumination Design Awards, Edwin F. Guth Memorial Award for Interior Lighting, Award of Merit

Cooper Union, Frederick P. Rose Auditorium, New York, New York

- The Chicago Athenaeum, International Architecture Award, 2010

deYoung Museum, San Francisco, California

- McGraw Hill Construction, California Construction Northern California, Best of 2006

S. LEONARD AUERBACH, ASTC - AWARDS *(CONTINUED)*

Electronic Arts, Redwood Shores, California
- American Concrete Institute, Architectural Award, 2002

Emerson College, Los Angeles Center, California
- Los Angeles Business Council, Architecture Awards, Design Concept Award, Education Category, 2011

Griffith Observatory Planetarium, Los Angeles, California
- California Preservation Foundation, Trustees Award for Excellence in Preservation, 2007

MGM Hotel and Casino, KÀ™ for Cirque du Soleil, Las Vegas, Nevada
- United States Institute for Theatre Technology, Architecture Awards, Honor Award, 2006
- TEA 14th Annual THEA Awards, Award for Outstanding Achievement, 2008

Meyer Sound, Pearson Theatre, Berkeley, California
- AIA/San Francisco Chapter, Citation, 2009
- United States Institute for Theatre Technology, Architecture Awards, Merit Award, 2008
- Mills College, Jeannik Méquet Littlefield Concert Hall, Oakland, California
- California Preservation Foundation, Design Award for Large Rehabilitation, 2009
- SCUP and AIA CAE, Award of Merit for Excellence in Architecture for Restoration or Preservation, 2009

New York New York Hotel and Casino, *Zumanity™: Another Side of Cirque du Soleil*, Las Vegas, Nevada
- United States Institute for Theatre Technology, Architecture Awards, Merit Award, 2005

Philadelphia Academy of Music, Philadelphia, Pennsylvania
- *Building* Design & Construction magazine, Honorable Mention, 2003
- General Contractors Association, Award, 2003

Rice University, Shepherd School of Music, Houston, Texas
- Illuminating Engineering Society of North America, International Illumination Design Awards, Edwin F. Guth Memorial Award for Interior Lighting, Award of Merit

San Francisco Conservatory of Music, San Francisco, California
- AIA San Francisco Design Awards, Merit Award, 2010
- McGraw Hill Construction, California Construction Northern California, Best of 2007
- SCUP/AIA-CAE, Excellence in Renovation/Adaptive Reuse, 2010

San Francisco War Memorial Opera House Renovation, San Francisco, California
- Illuminating Engineering Society of North America, International Illumination Design Awards, Edwin F. Guth Memorial Award for Interior Lighting, Award of Excellence
- International Association of Lighting Designers, Special Citation for Sensitive Historic Restoration
- The California Preservation Society, Honor Award, 1998
- The National Trust for Historic Preservation, National Preservation Award, 1998

Santa Fe Opera Theatre, Santa Fe, New Mexico
- Best Buildings, Exterior Design Citation, 1999
- Chicago Athenaeum Museum of Architecture And Design, American Architecture Award, 2000
- New York Chapter/AIA, Citation, 1999
- New York State Association of Architects/AIA, Award For Excellence In Design, 2000
- New York State Association of Architects/AIA, Design Citation, 1999
- The New Mexico Business Journal, Best Buildings Award, Exteriors Category, 1999

S. LEONARD AUERBACH, ASTC - AWARDS *(CONTINUED)*

- United States Institute for Theatre Technology, Architecture Awards, Merit Award, 1999

SFJAZZ Center, San Francisco, California
- AIA San Francisco, Honor Award, 2013
- InfoComm, People's Choice Awards, Arts & Leisure category winner, 2013
- San Francisco Business Times, Real Estate Deal Awards, Public/Cultural category winner, 2013

Temple Emanu-El, San Francisco, California
- Illuminating Engineering Society of North America, International Illumination Design Awards, Edwin F. Guth Memorial Award for Interior Lighting, Award of Excellence

The August Wilson Center for African American Culture, Pittsburgh, Pennsylvania
- AIA Pittsburgh, Honor Award, 2010

The Historic Salt Lake Tabernacle of The Church of Jesus Christ of Latter-day Saints, Salt Lake City, Utah
- AIA Utah, Honor Award 2007
- AIA Utah, Peoples Choice, 2007
- Associated General Contractors, Building Project of the Year $25+ million, 2008
- Excellence in Concrete Award, 2008
- Intermountain Contractor, Best Renovation/Restoration Project, 2007.
- Intermountain Contractor, Best Structural Engineering Project, 2007

University of California, Davis, Robert and Magrit Mondavi Center for the Performing Arts, Davis, California
- American Institute of Architects, Northwest and Pacific Region, Award of Merit, 2004
- American Institute of Architects, Portland Chapter, Honor Award, 2003
- American Institute of Architects, Portland Chapter, People's Choice Award, 2003
- American Institute of Architects, Portland Chapter, Virtual Craft Award, 1999
- California Construction magazine, Best of California Awards, 2003
- IIDA, Honor Award, 2003
- Structural Engineers Association, Best Use of Conventional Technologies, 2004

Willamette University, Mary Stuart Rogers Music Center, Salem, Oregon
- Illuminating Engineering Society of North America, International Illumination Design Awards, Edwin F. Guth Memorial Award for Interior Lighting, Award of Merit, 2001

Yerba Buena Center for the Arts Galleries & Forum, San Francisco, California
- American Institute of Architects, California Council, Honor Award
- Illuminating Engineering Society of North America, International Illumination Design Awards, Edwin F. Guth Memorial Award for Interior Lighting, Award of Merit

Yerba Buena Center for the Arts, Theatre, San Francisco, California
- American Institute of Architects, National Honor Award for Architecture, 1994
- American Institute of Architects, National Honor Award for Interiors, 1994
- American Institute of Architects, New York Chapter, Award for Distinguished Architecture, 1994
- American Institute of Architects, San Francisco Chapter, Honor Award for Architecture, 1995
- Institute for Urban Design, Rudy Bruner Gold Medal for Urban Excellence, 1999
- New York State Association of Architects/American Institute of Architects, Award For Excellence in Design, 1994
- United States Institute for Theatre Technology, Architecture Awards, Honor Award, 1995

The Cross-disciplinary Approach

By Randi Minetor

In the Carnegie Mellon theatre architecture program, architects and theatre practitioners learn from each other

"The best work in school and in real life is when you have collaboration between two groups," says Kevin Rodriguez, a fifth-year architecture student at Carnegie Mellon University (CMU). "The people who use the building are going to view it very differently from the way we view it as designers."

In this program, students from the schools of architecture and drama come together for a semester to understand each other's approach to their work. The final product: Design of an actual theatre building, based on a real project already in progress in New York City. In essence, the theatre majors become the clients of the architecture majors, sharing the common goal of a great theatre design.

> **"In school, you usually don't really have a client. I thought it was very interesting to have a client who would really tell you what they want, and how they do what they do."**—Kevin Rodriguez

It may seem like an obvious point, but to students who are used to working solely with a professor or instructor in an academic situation, the opportunity to collaborate becomes a revelation. This is exactly what leaders of the CMU School of Architecture and School of Drama had in mind in 2001, when they created a new interdisciplinary program in theatre architecture—an innovative collaboration between two schools in the College of Fine Arts.

The program aims to open architecture students' eyes to the unique challenges of designing a space for theatrical performance—creating a new generation of theatre architects who understand issues like sightlines, wing and loft spaces, load-bearing structural strength, lighting and sound, dressing rooms, scene and costume shops, and many others.

"In school, you usually don't really have a client," explains Rodriguez, who participated in the program in the fall 2010 semester. "I thought it was very interesting to have a client who would really tell you what they want, and how they do what they do."

One consultant's vision

The one-of-a-kind program got its start in 2001, when CMU alumnus S. Leonard Auerbach, founder and president of the theatre consulting firm Auerbach Pollock Friedlander, became the consultant for CMU's new Purnell Center for the Arts.

While studying at CMU in 1966, Auerbach received a Heinz Fellowship for an interdisciplinary graduate study of theatre architecture—the first of its kind at then-Carnegie Tech. "I worked with the graduate architects in the urban design studio, focusing on the design of theatres," he says. "My thesis project was an expansion and functional renovation of the Tyrone Guthrie Theatre."

The program played an instrumental role in Auerbach's career, enough so that he conceived the idea to create an academic program based on his experience. The Purnell Center project opened the door for a discussion with Martin Prekop, dean of the CMU College of Fine Arts at the time. "At the end of construction, Martin asked if I would like to become a donor and sponsor a room in the new building," Auerbach says. "I responded that more importantly, I would like to see a theatre architecture program fashioned after the study I had participated in as a graduate student."

Auerbach and Prekop brought together the heads of the schools of drama and architecture—then Peter Frisch and Vivian Loftness, respectively—to determine the best way to move forward. With the help of funding Auerbach provided, the two schools launched a pilot semester. Lectures delivered by top theatre architects and acoustics consultants, a theatre design seminar, and an architecture design studio engaged fourth-year architecture students and drama graduate students in a semester of intensive collaboration.

As the program got underway, Auerbach approached Bob Theis, then president of J. R. Clancy, Inc., to

make a significant corporate contribution as well. A major designer and manufacturer of rigging equipment for theatres around the world, J. R. Clancy has a vested interest in educating future theatre architects.

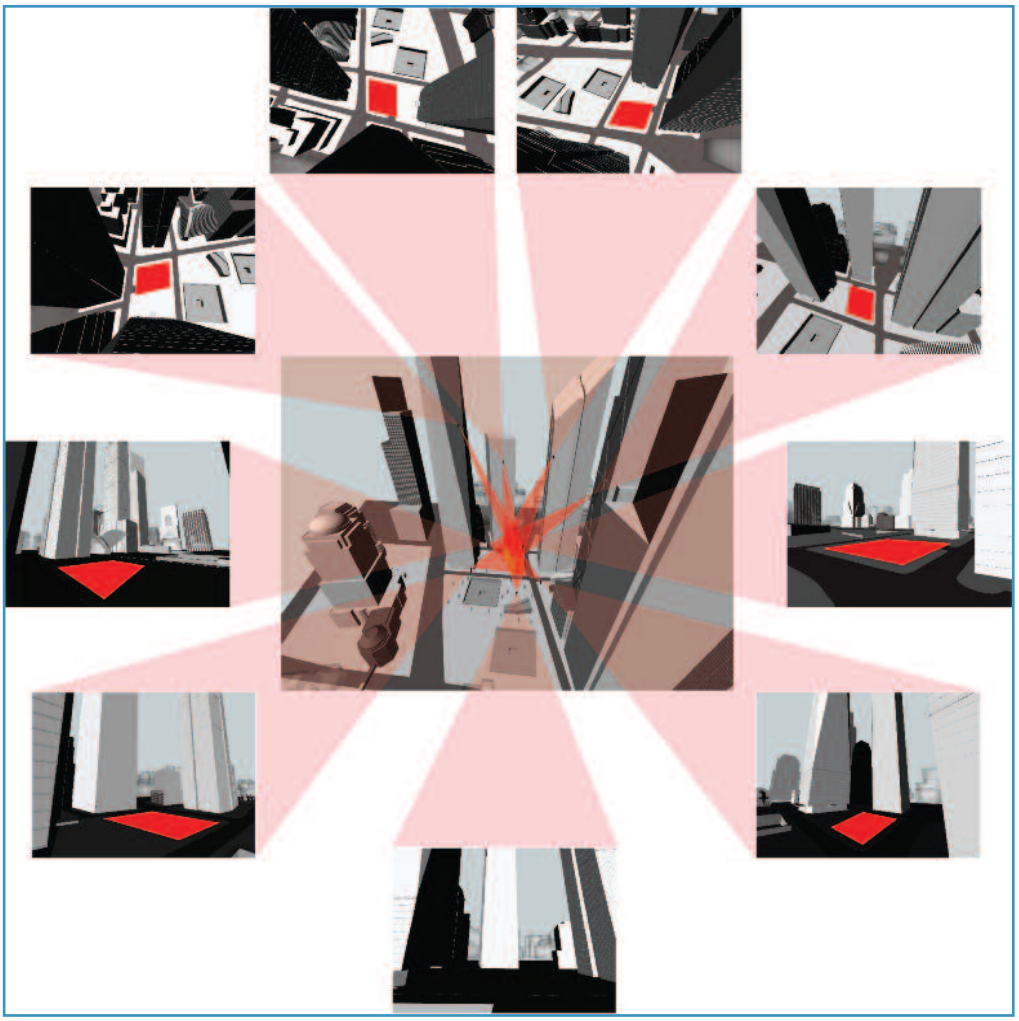
"We were absolutely delighted to be able to participate with Len in the startup of this program," says Theis, now J. R. Clancy chairman. "This will be a great success for a lot of young people, while creating the next generation of highly specialized professionals who understand all aspects of theatre design."

The gift established the J. R. Clancy Endowment, which, together with Auerbach's contributions, funds lectures and field trips for students and their instructors to New York City, Las Vegas, and other areas to see theatres under construction, as well as some of the most complex performance facilities in the nation.

"It's a fantastic program that Len's initiated," says Peter Cooke, head of the CMU school of drama. A native of Australia, Cooke shares Auerbach's understanding of the need to educate architects about the peculiarities of theatre design.

"In Australia, there was a whole spate of theatres built in the 1980s and 1990s," he says. "Every town wanted a theatre complex, so these buildings went up everywhere with extremely poor communication between the architects and the theatre world. There had been and there continues to be bad halls built, and you just can't do theatre in these venues. So having an informed and bright cohort of students who understand the needs of the artist will make a much better landscape down the road."

To teach the course, CMU has connected with a number of theatre design professionals. Kevin Wagstaff, adjunct assistant professor of architecture and a principal at the Pittsburgh architectural firm Perfido Weiskopf Wagstaff + Goettel, taught the spring 2010 semester with Dick Block, associate head of the CMU School of Drama. Matthew Fineout, a partner with Smart Architecture in Pittsburgh, also served as an instructor.



Above: A conceptual drawing by Jiwon Hur, a student in the program, for the Joyce Theatre at One World Trade Center.

Most recently, the School of Architecture recruited one of its own alumni: Hal Hayes, a practicing theatre architect in New York City. "Hal is very connected to the New York theatre scene," said Stephen Lee, head of CMU's school of architecture. "He's very involved with the World Trade Center project, and he's a wonderful designer."

The creative cauldron

Bringing theatre students into the architectural studio creates an exciting learning environment, Cooke says. "In drama, we have designers, we have technicians, we have directors, but we don't know a lot about building systems and infrastructure, like heating and air conditioning," he explains. "We know the things that make a good theatre. So having that sensibility, having that interaction that informs each other's process…it's a wonderful cauldron in which they're all swimming."

Kevin Rodriguez had exactly that experience as a student: "I had questions about how lighting works. Is it one room where they control everything, and is there sound in there as well? So I talked with the lighting

majors, and they really were able to go into how they do everything, and the questions I had were answered. Then they asked about how the construction process works, and how we do what we do. We had people to help us understand what we were supposed to be doing."

And the result? "I found that they picked it up; they were very quick on the uptake on both sides," says Cooke. "When I went to the last big pin-up [where students share their final designs], the architecture students really understood the staging issues. And then how to bring everything into the building with street entrances and subways—were they actually going to bring everything in through the front door, for example. I found it as interesting as the students did, I'm sure."

From the outside in

As part of the semester-long seminar, students create their own designs for a site on which a real theatre is under construction. In the fall 2010 semester, the class engaged with Len Auerbach and Steve Friedlander in New York, where the firm is currently the theatre consultant for Signature Center, the new home of the Signature Theatre Company in New York City. Construction had just begun on a 70,000-sq.-ft. space designed by architect Frank Gehry. Students had the opportunity to meet with Jim Houghton, Signature's artistic director, and learn about the challenges involved in creating a center in a mixed use high-rise with three performance spaces: a 299-seat theatre with a stationary stage and seating, a 199-seat flexible space, and a miniature opera house with just 199 seats.

"The Signature was just starting construction, and one of the staff people took a real interest in our activity," says Lee. "The students got far more time on the job site than we would ever have hoped would happen. It's a balancing act, because we're not producing work that can be legally incorporated into the project, but the students can envision things and help the architect think in a slightly different way."

This fall's studio assignment is the new Joyce Theatre Company's 1,000-seat performance center, currently under construction in the World Trade Center in downtown Manhattan. The J. R. Clancy Endowment provides the funds for multiple field trips from CMU's Pittsburgh campus to New York City.

In addition to the Manhattan junkets, students travel with Auerbach annually to visit some of the nation's most complex stages.

"The J. R. Clancy funding and my personal funding have enabled several valuable field trips to visit Cirque du Soleil theatres in Las Vegas and multiple venues in New York," says Auerbach. Once on site, the students benefit from Auerbach's commentary about the building design process as they take a backstage tour of the facility, and again as they watch a performance on the stage he designed. "While going to the theatre is very important from the audience point of view, there is nothing like getting into the inner workings of the building in

A concept drawing by Ranjit Korah, another student, for the Joyce Theatre's interior.

"While going to the theatre is very important from the audience point of view, there is nothing like getting into the inner workings of the building in helping to understand how design affects the experience." Auerbach

helping to understand how design affects the experience," he says.

Last year's trip to Las Vegas to tour the backstage facilities of Cirque's *KA* and *The Beatles LOVE* exposed 14 students to the most advanced theatre technology in the world, Auerbach says. Students viewed stage machinery, lighting, and sound systems, and other elements involved in designing a performance venue: "In my orientation lecture, I said that no matter how complex the venues you are about to experience may be, all of the elements, in different scales and scope, are required for theatres of all sizes and forms. Everything is applicable."

A bright future for theatre design

How effective is the CMU program in opening future architects' eyes to theatre design?

Several studio graduates have gone on to positions at Auerbach Pollock Friedlander, in the company's New York City and San Francisco offices. "Over the years, we have hired CMU graduates who have risen to principal, senior associate, and associate levels within our firm," Auerbach says. Another graduate obtained a senior design position with J. R. Clancy.

"The really important lesson that I want my students to take away is that buildings are becoming so complex in our society that the architectural practice today is collaboration," says Lee. "We are very protective of the numbers we have in studio, so we embrace every opportunity we have for students to work across disciplines. I want them to know that they don't know everything, and they will be asking a lot of questions."

"The collaborative merging of many design and technical disciplines is now critical to the success of creating effective buildings," says Auerbach. "Just consider the new presentation media, theatre machinery, automation, production and directorial values, video and projection, 3D imagery, 3D tracking of flying performers, audience viewing and comfort criteria, ADA, sustainable architecture, and expressive architectural design as icons of the arts and architecture. These facets need to come together with design leadership, not only from the architect but also from multiple disciplines."

This drawing, by Hur, offers a cutaway view of a version of the Joyce Theatre.

If Rodriguez's experience is typical, CMU is on the right track "The final project really showed how much we had worked together, and how much we learned from each other,," he says. "This was exponentially better than other studios, because we learned so much from the other students."

Mike Murphy, president of J. R. Clancy, sees the value in bringing theatre students together with future architects as well. "With the complexity and imagination we see applied to new theatres of every size, it's critical that architects understand all of the systems that go into the building," he says. "CMU has taken an important step in teaching its architecture students to be aware of the ways that the finished building will be used, from the stagecraft to the audience experience. We at J. R. Clancy are proud to be a part of this excellent effort."

INTERNATIONAL
artsmanager

Grand designs

Maria Roberts meets the theatre consulting masterminds behind some of the world's foremost arts venues

Based in San Francisco, and with offices in New York and Minneapolis, Auerbach Pollock Friedlander is an international design consultancy firm for performing arts projects worldwide. Its portfolio includes state-of-the-art work on opera houses, professional repertory theatres, concert halls, performing arts training facilities, museums, planetariums, and even popular entertainment venues in theme parks, casinos, cruise ships and nightclubs, spanning from Las Vegas to Beijing.

Shanghai Grand Theatre, Carnegie Hall's Judy and Arthur Zankel Hall and Berkeley Repertory Theatre are just some of the many projects that APF have impressed with its very modern stamp.

Services cover all aspects of theatre design, from planning and programming through design, documentation and construction administration to the detailed development of all theatrical systems, including sound, video and communications. (Its client base includes the spectacular Cirque du Soleil.)

In California's wider Bay Area, the firm, which was founded in 1972 by current company president S Leonard Auerbach, has left a lasting impression on the arts community. Furthermore, APF has worked on some of San Francisco's most prominent arts institutions – many situated in the city's Hayes Valley district, close to Van Ness.

The company has contributed to the renovation of the San Francisco Opera House, made its mark on the San Francisco Conservatory of Music, as well as the Yerba Buena Center for the Arts. Its latest project, and newcomer to the golden cultural corridor, is the SFJAZZ Center.

As the first stand-alone facility dedicated to jazz on the West Coast, and one of only two such purpose built venues in the US, the SFJAZZ Center's completion is hotly anticipated.

> 'We meet regularly to coordinate our work and there's always an understanding of utilisation because the spaces are so different'

The modern venue is to become a permanent home to the 28-year-old organisation that previously presented its shows, as well as the San Francisco Jazz Festival, in rented facilities throughout the city.

Auerbach was involved from the very beginning. 'In the case of SFJAZZ we started very early on when they were looking for a venue to go to, and we looked at a number of existing spaces that were vacant,' he says. 'We designed the theatre itself and collaborated with the architect on the building and the site but the design and the theatre spaces were a result of working with Randall Kline [executive artistic director and founder of SFJazz], to get the essence of what he wanted that space to be.'

The centre's scaffolding was pulled down just under a month ago and now with its swish exterior finally revealed to the public, it makes for a spectacular sight.

Above: Interior of Joan and Sanford I Weill Hall at the Green Music Center

Photo: © Drew Altizer

Photo: © Kristen Loken

The USD60m (€46.2m) modern three-story building, with acoustic design by SIA Acoustics, is made of glass, steel and concrete and features lobbies that are clearly visible from the street. The main space accommodates 700 and the steeply raked seating elicits an atmosphere intended to match the intimacy of a New York jazz club.

Other spaces include the 80-seat ensemble room/rehearsal space, which will be used for smaller performances, rehearsals, classes and lectures. APF worked with architects Mark Cavagnero Associates, and the project is designed to LEED (Leadership in Energy and Environmental Design) Gold specifications.

Of course, one of the advantages of the company's involvement in the cultural quarter's ongoing development of its venues is that a harmony and synchronicity can run throughout the sites.

'It is essential to consider Herbst Theatre [at the War Memorial Veterans Building Performing Arts Center] and the Opera House and Davies Symphony Hall as an entire campus of arts organisations,' he says. 'We meet regularly to coordinate our work and there's always an understanding of utilisation because the spaces are so different. Herbst, for example, has no resident company. There has to be a cooperative understanding when you are doing the planning.'

Over on the sunnier side of the state, at Sonoma State University, sits another jewel in APF's crown. Here the impressive Donald and Maureen Green Music Center (known as Green Music Center) boasts the recently completed Joan and Sanford I Weill Hall, a multi-use space that will host concerts by leading classical musicians, as well as other performing art forms, and even present lectures for its students.

The firm provided theatre design and consulting services in collaboration with acoustician Kirkegaard Associates and the design architect William Rawn Associates. Kirkegaard is a long-term friend of Auerbach; they worked together early on in their respective careers.

'It is a very interesting concept because the situation was that there was a brief that was pretty much developed and legislated by the state university system to build this performance space – and they had their ideas of what they wanted it to be. They wanted to focus on music because of the Greens, who became a major benefactor of the project,' says Auerbach.

Dr Ruben Armiñana, president of Sonoma State University, went to Tanglewood some years ago and heard the Boston Symphony Orchestra in the then new Seiji Ozawa Hall. He famously declared: 'I want one of those'.

Photos: top © Kristen Loken; right © David Wakely

A period of time followed as the committee tried to raise the money to make a concert hall happen. With funds drying up, the centre was built phase by phase, provoking protests from community members along the way. It was considered an expensive pursuit in light of a nationwide economic recession in the US, not to mention soaring building and material costs. It was a USD12m donation by Joan and Sandy Weill in 2011 that gave the flagging project a much-needed boost. Other donors then came forward to offer support and the concert hall inaugural concert by Lang Lang took place on 29 September. By this point the project's estimated cost had soared to an estimated USD145m.

By all accounts, Green Music Center is a striking venue that seamlessly joins interior and exterior spaces, effortlessly marrying understated elegance with academic practicality. The end result is a big-bang 'wow factor' that will draw locals and tourists alike: the vast landscape of the Sonoma Mountains, set against an expansive skyline, create the perfect mise-en-scène for productions taking place inside the hall. For patrons at a table on the lawn, the effect is like peering through an enormous television to see real-life characters playing within.

APF's services included consultancy on the layout and sightlines,

Above: The grounds at Green Music Center; a rear view of Weill Hall; S Leonard Auerbach

> ‘We find that audiences expect a lot more in terms of presentational gratification, such as multi-media projected images’

a custom-made stage lift for orchestra, a flexible overhead rigging infrastructure, programmable theatrical lighting, automated variable acoustics banners and custom designed theatre chairs, all of which were handmade. Weill Hall seats 1,400 indoors, whilst outside the rear wall opens up to provide visibility for 5,105 patrons (3,457 on the lawn and 1,648 at tables and chairs) on a series of terraced risers for casual or formal dining and picnickers.

The rear wall can also remain closed and act as an exterior stage area for outdoor performances. Weill Hall will be used for the university’s performance programme, as a regular venue for the Santa Rosa Symphony, the San Francisco Bach Choir and other Bay Area orchestras.

‘The difference [between the Green Music Center and Seiji Ozawa Hall] is that is has to work more as a year-round venue. It has to be a lot more of an appropriate building for the environment, plus the programme of activities goes beyond just classical music, and so consequently the building became a lot more highly developed,’ explains Auerbach. ‘If you look at the site, it not only addresses the community and access requirements – you don’t have to go through campus to get to it – but is also totally open to the academic part of the university and is totally accessible. By marrying the performance side for the public with the academic spaces that are on campus, such as the academic wing and the recital hall, it’s perfectly guided to encourage this cross traffic.’

Of course, the commercial requirements of a touring orchestra, or popular performers, also had to be considered; the artists can, when necessary, be safeguarded by restricted access.

‘They have, by contrast, complete exclusive use of the building for reasons of security, soundchecks and touring schedule requirements. It had to be designed with sensitivity to internal circulation. It needed to be a totally open complex that could be used by students on a daily basis, and yet also function independently while a touring group has exclusive use of the performance space.’ APF is also providing theatre design consulting for the Green Music Center’s 250-seat Schroeder Recital Hall, currently in construction, and named after the pianist character in Charles Schulz’s beloved *Peanuts* comic.

Schroeder Recital Hall will accommodate choral, organ, chamber and jazz concerts, community performances and lectures. The design was inspired by European churches and features a soaring ceiling. A further phase of the project will see the 2015 completion of an outdoor amphitheatre with seating for 10,000.

Auerbach has more than 40 years experience in theatre consulting industry, and throughout this time requirements have altered dramatically.

‘The expectation of the audiences have been greatly expanded with the different generations that have evolved over the years. We’ve gone from purpose-built spaces to large multi-purpose halls – these didn’t work very well for everybody – then back towards more purpose-built concert halls, Broadway theatres, repertory theatres and the like.

‘What we’re finding now is that audiences expect a lot more in terms of presentational gratification; such as multi-media and projected images. The difference now is that this special concept of presentation is now being planned in the design of concert halls, even where you have the traditional subscription or patrons of classical music. They [venues] are trying to engage a younger audience and so there’s a lot of media presentation, video projections, special projections and changes to enhance the music and make the concert – where its appropriate – a lot more dynamic.’

Though the team at APF are architecture and tech specialists, experience in the arts runs right through the firm. ‘Essentially everyone on our staff has worked in the arts – the architectural designers have been involved in the theatre; either they have been dancers or have worked in scenic design,’ says Auerbach. ‘We have a broad base of people in our highly advanced audiovisual department, who have broadcast experience or have toured with Rock’n’Roll. We have people who have done rigging and we have Broadway lighting designers, so the skills that are necessary come out of practice.’

‘We’re not consultants that are theoreticians,’ adds Auerbach. ‘We are practitioners.’

www.auerbachconsultants.com

Above: SFJAZZ Center

Photos: courtesy of Mark Cavagnero Associates

Sonoma State University's Joan and Sanford I. Weill Hall draws inspiration from a modern classic

The Tanglewood Model

By: Mel Lambert

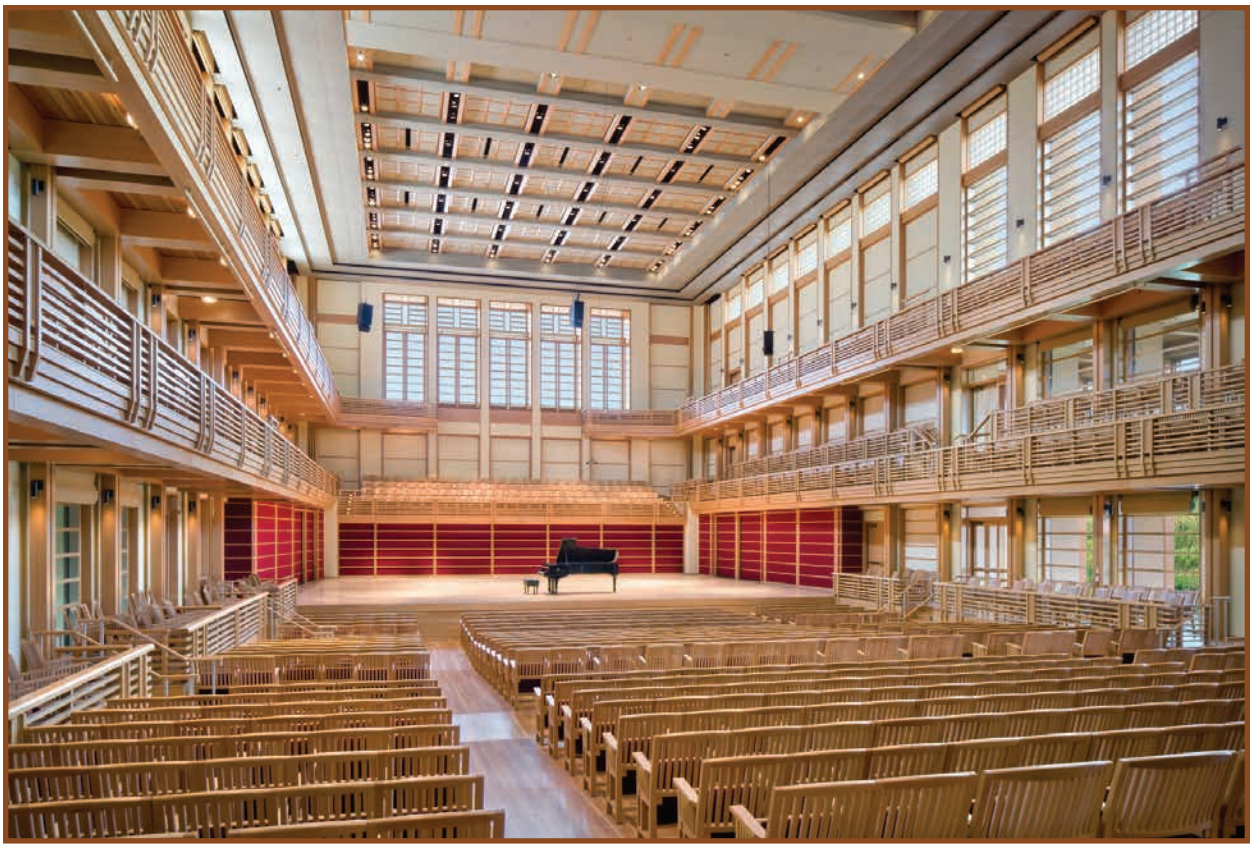
Seiji Ozawa Hall at Tanglewood Music Center, nestled in the landscape of Massachusetts' Berkshires, serves as Boston Symphony Orchestra's summer academy for advanced musical study. The venue's main features, including wooden surfaces and a wide door opposite the stage that leads into an outdoor seating area, has become the model for a number of concert-hall designs within a natural setting.

When Sonoma State University, in Rohnert Park, California, made the decision to add a new concert hall, the organization chose to emulate the look and ambient feel of Tanglewood Music Center in Lenox, Massachusetts. As SSU president Ruben Armiñan recalls, "We went to Tanglewood to listen to music and were having a picnic on the lawn while a trio from the Boston Symphony was playing. The sound was spectacular, so we went into the hall. The openness and congruity of music and performance was amazing. I said, 'This has to be in Northern California, at Sonoma State.'" The resulting Joan and Sanford I. Weill Hall within the Green Music Center, which opened last September, is on the Sonoma State University campus in the heart of California's wine region, just north of San Francisco.

The exterior of the Sanford I. Weill Hall, with the rear wall of the auditorium open to the lawn.

Photo: David Wakely

William Rawn Associates served as project designer for Weill Hall, working closely with AC Martin as executive architects, Kirkegaard Associates as acousticians, and Auerbach Pollock Friedlander as theatre consultants. BAR Architects served as architects for the hospitality center, music education wing, and the planned Schroeder Hall; Rudolph and Sletten was the general contractor. Christopher Dinno, Sonoma State University's senior director for facilities management, capital planning, and design, headed the project administration team. The Santa Rosa Symphony is Weill Hall's resident orchestra; San Francisco Symphony also held a four-concert series during the current season. The total estimated cost for the project was $148 million.



Fabricated by Theatre Solutions from European steamed beech wood, each seat features an open back and a burgundy cushion.

Indoor/outdoor hall design

The initial concept, formulated in the 1990s for SSU's Green Music Center, involved building a choral recital hall for the campus; this plan expanded into the establishment of an arts center. "Extensive acoustical and theatrical design went into creating an environment almost identical to that of Ozawa Hall at Tanglewood," says Leonard Auerbach, lead theatre consultant from Auerbach Pollock Friedlander. "We were approached by Floyd Ross, the owner representative for Sonoma State University, to engage in a programming study for the new music school; the basic concepts for the venue were defined in that study, prior to the involvement of architects. The university was looking to replicate the acoustic experience of Ozawa Hall with its hybrid indoor/outdoor design," which led to the hiring of William Rawn and R. Lawrence Kirkegaard, who were principally responsible for the design of Ozawa Hall. "Bill and Larry were tasked with creating a new concert hall that would honor the spirit and sonic quality of Ozawa Hall, while drawing on the special physical and cultural environments of the Sonoma County setting," Auerbach says. After more than a decade of planning, fundraising for the project slowed in 2006. In 2011, Joan and Sanford I. Weill donated $12 million to complete the concert hall and adjacent lawn area.

Weill Hall is a traditional shoe box-shaped building with 1,400 seats custom-designed by Auerbach Pollock Friedlander with input from the university, Kirkegaard & Associates, and ergonomic consultants from Seating Dynamics. Fabricated by Theatre Solutions from European steamed beech wood, each seat features an open back and a burgundy cushion. Total capacity is 784 on the orchestra floor, 312 in the first balcony, and 321 in the second balcony.

"Extensive acoustical and theatrical design went into creating an environment almost identical to that of Ozawa Hall at Tanglewood." –Auerbach

The hall's internal construction features a combination of beech, white maple, and Douglas fir. Large windows line the north and east walls, with seating areas on a main orchestra floor, two side galleries that connect to a chorus balcony at the rear of the stage, and an upper balcony in the hall's rear. As a nod to Ozawa Hall, an operable acoustic wall at the back of Weill Hall opens onto terraced patio levels and lawn seating. "This will be a very important academic building with the ability to be used for concerts,

Photo: David Wakely

While extensive glass windows within the hall fill the space with natural light and provide concertgoers with a view of the hills to the east, they posed challenges for the acousticians in terms of ensuring proper bass response.

performance, and conventions, as well as education," Armiñan states. "Developing a world-class performing arts center will help our students understand the perspectives of others, contributing to the creation of more globally aware, collaborative, and responsible future world citizens."

In addition to performance areas, Green Music Center also houses a music education wing with classrooms, practice studios, and ensemble spaces. Schroeder Hall, a smaller 250-seat venue named by Jean Schulz in recognition of her late husband Charles Schulz's piano-playing *Peanuts* character, awaits final funding and completion. A planned outdoor performance pavilion with approximately 10,000 seats will accommodate symphonic music and dance in addition to amplified concerts, with a combination of fixed seats and lawn areas reminiscent of such venues as Ravinia, Highland Park, and the Hollywood Bowl.

Acoustically, the 38,500-sq.-ft. Weill Hall was designed to support a broad range of programming, from full symphony orchestra with chorus to vocalists, smaller instrumental ensembles, solo recitals, jazz, and world music. To provide a variety of flexible acoustic environments for amplified performances as well as lectures, a system of motorized sound-absorbing banners can be progressively deployed to control reverberation time. Audio and video recording equipment has also been provided, with full AV connectivity throughout the complex.

By design, orchestra-to-ceiling height and balcony-to-balcony width are both 53', with 75' from the front of the stage to the front face of the rear balcony, where a 20'-by-54' modular rear door runs the width of the south wall and extends the hall's reach to an additional 5,000 patrons located on the adjacent Weill Lawn. The 48'-by-60' stage is made of white maple, with adjustable lifts and risers to accommodate a full orchestra and fine-tune ensemble communications and sound on the main floor. A system of inverted screw jacks drives two orchestra risers; the inner section contains retractable chevron risers for string sections.

Initial system programming

"The initial programming began independently from the desire to base the Weill Hall design on Tanglewood's Ozawa Hall," recalls Michael McMackin, ASTC, Auerbach Pollock Friedlander's principal project manager. "Our goal was to merge the wide variety of year-round performances with the concept of a purely musical venue that would be open-air. Working with Bill Rawn brought about a true synergy of function and design."

"In addition to its formal acoustic environment," Auerbach says, "the hall provides unique staging flexibility,

Photo: Dan Stone

variable acoustics, overhead rigging, and backstage support for a variety of popular performance events. As an example, we designed automated stage lift systems—installed by J. R. Clancy—to vary the tiered configuration of the stage for different performance ensembles. The automated and programmable acoustics banners are variable but also integrated into the architecture of the room; they match the color tones and mesh with the predominant architectural gestures."

"The natural acoustic was inspired by the sound of Ozawa Hall," adds Kirkegaard. "We were charged with enhancing the hall's capabilities and modifying the acoustic design to respond to project-specific conditions, which is more difficult than it sounds! Compared to Ozawa, Weill Hall has extensive adjustable absorption, which allows it to support amplified music performances such as jazz ensembles. Weill Hall also has a lot of glass that fills the space with natural light and allows concert-goers to view the hills to the east while listening to music; we were able to accommodate all this glass and still maintain bass response. Another significant difference is the hall's acoustical ceiling, which is constructed of wood—making it a giant sound board. A wooden construction was chosen to minimize the up-high seismic load—this was not a factor at Ozawa Hall, which has a precast concrete acoustical ceiling. And Weill Hall is an academic facility that is operated year-round; as such, it needed a more sophisticated heating, ventilation, and AC system than Ozawa Hall. The mechanical system is designed to provide comfort any time of the year and do so quietly."

Patrons on the lawn get ready to enjoy an outdoor concert.

Photo: Kristen Loken

In terms of overall planning, Kirkegaard says, "We knew from the beginning that Weill Hall would have to support a broad range of events; therefore, adjustable acoustics were essential to the project. There were numerous occasions when value engineering of the absorbent banners was considered but ultimately rejected. The design team reduced the cost by moving from a custom integrated banner system, deployed from the floor up, to incorporating into the building design an early prototype of the acouStac variable acoustics banner deployed from the top down," with a custom control system supplied by J. R. Clancy. "Considering the types of events held at the hall—from Alison Krauss and Union Station, to Wynton Marsalis and the Santa Rosa Symphony—it's a good thing that the banners survived the cost-cutting!"

A system of motorized, absorbent banners acoustically "shapes" the hall for various types of performances. "Configurations were determined during system commissioning and programmed into a touch-screen control panel located backstage," says Anthony Shou, of Kirkegaard Associates. The J. R. Clancy Scene Control 500 is connected to a portable Siemens Simatic mobile panel that oversees movement of 44 acouStaCorp acoustic banners, a pair of manual bi-parting travelers, four motorized bi-parting travelers, and eight motorized travelers. (acouStaCorp is part of the PDO Group, owned by rigging specialists Pook Diemont & Ohl.)

"Internally, we had specialists who focused on room acoustics, noise, and vibration control of the mechanical/electrical systems and audio systems plus a project manager who oversaw all three disciplines," Shou continues. "What further complicated matters were the

often overlapping design and construction schedules as various components of the facility were designed and built in phases."

The results of extensive testing and listening at Seiji Ozawa Hall provided primary acoustic input. "In many ways, we used Ozawa Hall as a full-scale model of Weill Hall," Kirkegaard explains. "Early in the project, we created full-scale mockups of adjustable absorption and sound-transparent wood screens. Later on, we evaluated fabric and perforated metal for sound transparency. During construction, we tested the custom seating at Riverbank Acoustical Laboratories. These in-depth investigations informed the design and construction of Weill Hall."

The hall's permanent sound system, specified by Kirkegaard Associates, is comprised of left, center, and right clusters of d&b audiotechnik Q7 full-range cabinets flown from the lighting truss, augmented by stage-lip fill loudspeakers, balcony delays, and subwoofers. The d&b E6 cabinets provide down-fill coverage, with a d&b xS Series 10S-D for the choral terrace loudspeaker, two d&b xS 10S cabinets for the balcony, and Meyer Sound MM-4XPs underbalcony loudspeakers. Several d&b Qi-SUB boxes are available as portable main subwoofers, with d&b E0s for portable front-fill stage-lip loudspeakers. Multiple d&b D12/NL4 amplifiers power the LCR, subwoofer, and balcony speakers, plus D6/NL4 amps for the down-fill, choral terrace, and stage-lip cabinets. All signal distribution, delay, and equalization is handled by BSS London processors. Crown XLS 2500 amplifiers power the stage monitors.

Photo: Kristen Loken

Available microphones include Shure wireless models, AKG C480B/CK61s, Audio-Technica AT-4051a omnidirectionals, Audio-Technica AT-4053a and AT-4053a-EL hypdercardioids, AKG C414B/XLS large-diaphragm and AKG C451B small-diaphragm models, Neumann KMS105-MTs, and beyerdynamic M88TG handhelds, plus Sennheiser MD421 IIs, Audix OM3s, Audix OM5s, Shure SM57-LC, and Shure SM58s; direct boxes include Radial JDI-MK3 passive and J48 active models.

Within the South Lawn, Electro-Voice EVH-1152D/94-PI boxes serve as rear-wall left, center, and right loudspeakers, with Renkus-Heinz PNX 82/9W powered by Crown amplifiers as pole loudspeakers augmented by Crown-powered JBL ASB6112WRX subwoofers integrated within custom, in-ground landscape elements.

"Our top criterion for the hall loudspeakers was for them to be as discreet as possible," Shou says. "The selection process for the main LCR cabinets also included a demonstration in Weill Hall, the end result being we selected d&b for the main system, which is used frequently for reinforced speech and commentary as well as concert performances with the Santa Rosa Symphony." Removable seating platforms accommodate a Soundcraft Vi1 digital production console handling front-of-house and monitor mixing duties.

"The loudspeaker system is quite modest but very capable in terms of sound reinforcement for the day-to-day academic schedule," Shou concedes. "Heavy amplification would be provided by temporary side stacks used in conjunction with the permanent systems to cover various seating areas. Typically, significant portions—if not all—of the adjustable banners and curtains would be deployed for such events."

The large, double-thickness side windows are fabricated with an outer 3/4" pane and an inner 1/4" pane separated by a 1" air gap. "We angled the glass slightly by about 1/8" per foot to reflect sound back into the audience and prevent parallel geometry across the hall's width," Shou recalls. "We have proposed the addition of a recital screen to shield late sound from the upstage wall and provide in-fill early reflections for the audience, which will have a profound effect on the sound of the hall for recitals and small ensembles.

"Although, for a whole host of reasons, the project took longer to complete and required more money than expected, the glorious results came from an unfaltering dedication by everyone involved, from construction workers to donors. There is no comprehensive model to simulate the level of data that the human ear picks up. So upon hearing the first musical sounds in the hall, we were extremely pleased with the acoustics, not to speak of all the other aspects of the completed center," Kirkegaard says.

ETC Paradigm touch screen permits use of a general stage wash and other presets for most performances. The orchestra platform is illuminated by dimmed down-lights—primarily ETC Source Four PARs—mounted overhead and ellipsoidal fixtures from front-light positions. ETC [Sensor+ SineWave] dimmers are used for quiet operation. Additional circuits are provided in the attic, on-stage, and at the surround galleries for use with the house ETC Ion 1000 lighting console with a two-by-ten fader wing or a rental board."

A total of seven ETC Sensor+ 24-module dimmer racks features 240 dimmers for production lighting and 74 dimmers for architectural and house lighting; the theatrical rig includes 110 ETC Source Fours in various models and sizes.

"Realizing the design of any concert hall is a very involved process," McMackin says. "They are inherently complex spaces; the interweaving of infrastructure, acoustics, architectural design, theatre functionality, and

"Although, for a whole host of reasons, the project took longer to complete and required more money than expected, the glorious results came from an unfaltering dedication by everyone involved, from construction workers to donors." — Kierkegaard

"Before the grand opening, we had the opportunity to work with various student ensembles, including jazz, faculty musicians, and the Santa Rosa Symphony, to fine-tune the acoustics. It was an emotional experience to hear music played in the completed hall. That tuning exercise allowed us to make adjustments to the banner settings for different ensembles. Furthermore, it allowed us to listen critically to the acoustics of the hall and identify opportunities to enhance the hall's sound."

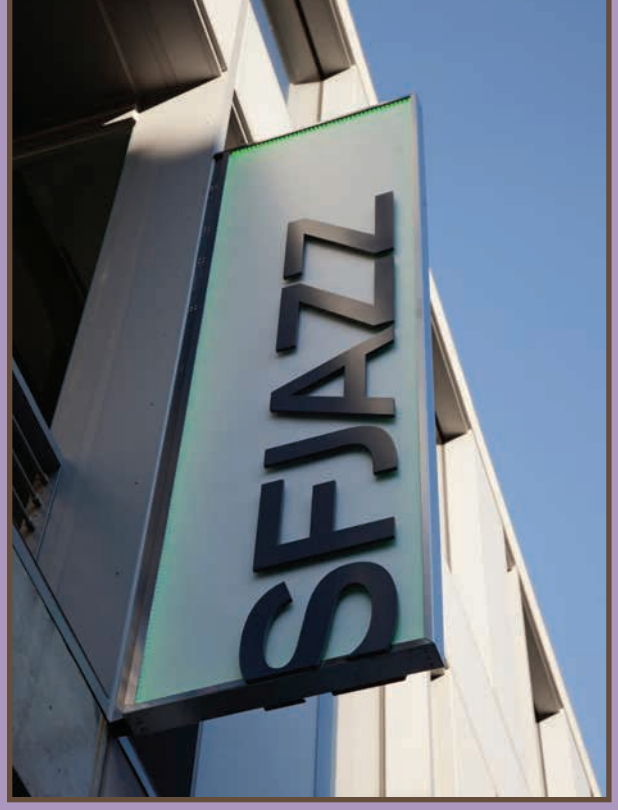
Stage lighting system

"Lighting positions are recessed into the architectural ceiling slots behind glass lighting bays and at the perimeter galleries," Auerbach continues. "Due to the long throws, incandescent sources were selected to provide the necessary foot-candles at the music stands. The attic space is walkable and allows access to the rigging beam at the architectural ceiling slots for overhead rigging." Rigging points and power are provided in the attic for lighting trusses, loudspeakers, and scenic elements.

"The lighting system was designed for easy day-to-day use by music instructors and nontechnical staff, with enough flexibility and capacity for more demanding productions," the theatre consultant says. "A backstage code compliance—while all the time anticipating the best experience for the audience and performers—is a process that can easily take over a year to complete. The team generates sketches, renderings, physical models, virtual models, and technical drawings to study the various aspects of the room. This process continues well into the documentation phase, allowing for adjustments along the way."

"The responses we've received with regard to not only the design and acoustical quality of the hall but to the overall experience, have been nothing less than exemplary," concludes Dinno. "The positive reactions from both audiences and artists alike have provided us with such strong momentum. Isaac Stern once said that, 'Everywhere in the world, music enhances a hall, with one exception: Carnegie Hall enhances the music.' We at the Green Music Center know that there is now a second exception to this rule, and that is Weill Hall."

Mel Lambert has been intimately involved with production industries on both sides of the Atlantic for more years than he cares to remember. He is now principal of Media&Marketing, a Los Angeles-based consulting service for the professional audio industry, and he can be reached at mel.lambert@mediaandmarketing.com.



Jazz Town

SFJAZZ is the West Coast's center for America's signature art form

By: Mel Lambert

Jazz is probably the only truly American musical genre, with roots from European harmony and form blended into African-based music, moving through improvisation, polyrhythms, syncopation, and swung notes. But in live performance, jazz music often needs to work against unsympathetic environments that hinder spontaneity between the players and, in turn, their ability to communicate with the audience. As trombonist J. J. Johnson said in 1988, "Jazz is restless; it won't stay put, and it never will."

Opened in January of this year in San Francisco's arts-centric Hayes Valley neighborhood—adjacent to Davies Symphony Hall and Conservatory of Music—the three-story SFJAZZ Center is considered to be the first performance and education complex to be built on the West Coast exclusively for jazz. "The challenge was to design a hall that has the effect of an acoustical performance even when amplified," says SFJAZZ founder and executive artistic director Randall Kline. However, it also has to work "when used purely acoustically—say with a solo-piano recital. Most jazz is performed on acoustic instruments but is typically reinforced for the audience and for the artists via stage monitors. It was important that the audience hear the music as transparently as possible."

The 35,000-sq.-ft. complex houses Robert N. Miner Auditorium, which can be formatted with as many as eight configurations from 350 – 700 seats, depending upon the performance requirements. An ensemble room directly off the lower lobby is used for intimate performances and rehearsing larger acts. It was christened Joe Henderson Lab and is augmented by three practice rooms and a digital laboratory. The architect of record was Mark Cavagnero Associates, of San Francisco—winner of the 2011 American Institute of Architect's California Firm of the Year—with Auerbach Pollock Friedlander, of San Francisco, handling general theatre consulting and production video elements. SIA Acoustics served as acousticians, taking the lead with sound system design and acoustical issues. Structural engineering was supervised by Forell/Elsesser Engineers, of San Francisco, with WSP Flack+Kurtz, of New York, overseeing mechanical, electrical, and plumbing, and Hathaway Dinwiddie, of San Francisco, as lead contractor. Construction, which took seven years to complete, is reported to be $65 million.

"Openness and proximity were two big words used often and early," Kline says. "The first big aspect to settle was the shape of Miner Auditorium; there was an early bias from me to use an amphitheatre as a starting point. The ancient form—with steeply raked seating surrounding a stage—is a natural choice for jazz. But since we also present a lot of music that is related to jazz—world music and some chamber music—we needed an acoustically flexible hall."

"Randall Kline saw our Community School of Music and Arts project [in Mountain View, California] and felt it was

Photos: Courtesy of SFJAZZ

close to the spirit he desired," Cavagnero says. "The goal was to develop a space with the intimacy of a club but the acoustic quality of a music hall. This meant moving the performer out into the audience area and positioning audience seating on all four sides of the stage. Acoustically, the project was extremely challenging and required full integration of the architectural design and materials with acoustic needs. Similarly, because the SFJAZZ Center would host small, medium, and large bands, lighting positions needed to be flexible and have multiple locations. Keeping these elements and maintaining the club-like intimacy was the overarching challenge of the entire design.

"My first thoughts were to have a steeply raked auditorium so that the audience could see the performers with the shortest possible sightlines, and the performers could see the audience's faces engulf them. The Miner Auditorium is designed to be highly flexible to accommodate different seating setups and acoustic needs, from a solo pianist to a large ensemble on stage. The raked seating allows for storage and operational accommodations under the main area. This space also allows for low-velocity, quieter air to be delivered under the seats to the audience."

Inside Miner Auditorium

"We designed the seating, stage, and auditorium configuration in collaboration with the architect," says S. Leonard Auerbach, ASTC, Auerbach Pollock Friedlander's president and founding principal. "Up to 700 patrons can be accommodated in the custom theatre, with seats no further than 50' from the stage. By wrapping the stage on four sides, with tiered seating risers and terraces, the [Miner] is configured for optimal intimacy [and is] ideal for experiencing jazz concerts and other events." The firm developed a family of custom solutions, including fixed theatre seats, loose stacking chairs, and swivel stools, which "created a unified visual audience experience while providing excellent sightlines, comfort, and meeting all ADA guidelines," says Auerbach, who served as principal designer on the project.

The stage itself was fitted with twenty 3'-x-6' platforms and ten custom platforms, supplied by Clare, Michigan-based Stage Right, along with two custom stair units and one portable exit stair, all integrated with custom hardwood flooring.

Flexible theatrical systems developed by Auerbach Pollock Friedlander included a spiral piano lift supplied by Gala Theatrical equipment, a material lift, overhead rigging support and technical catwalk system, theatrical lighting, room-reduction banners, video-projection systems, and a broadcast infrastructure. "Seating surrounds the stage in various asymmetrical locations and elevations for intimacy and a variety of viewing experiences," Auerbach says. "Six variable-acoustic AcouRoll banners, from Bronx, New York-based acouStaCorp, have been concealed from the audience behind the upstage wall; configurations were determined by the acoustician and programmed by the owner at a control panel backstage." Two custom AcouRoll banners were added for window treatments in the auditorium stage.

Eleven retractable AcouRoll banners, integrated into the ceiling with mesh closure panels, shape the hall visually for various types of performances, with configurations that allow for reduction to approximately 350 seats for more intimate performances. Steeldeck custom-built 22 NivoFlex platforms, semi-automated scissor platforms stored flush to the main finished floor for dance and flat floor events; raised from the storage position, these platforms provide flexible seating risers. Stage extension platforms allow multiple stage configurations and, combined with the semi-automated platforms, provide more than eight seating and stage configurations.

"The acoustical canopy contains an integrated hidden film screen [supplied by Stewart Filmscreen], with overhead lighting catwalks, balcony rail, and soft-fit lighting positions that enable various theatrical lighting angles consistent with the asymmetrical room design," Auerbach explains. "Finally, pathways, technical power, and camera-mounting positions accommodate a broadcast TV-production truck for documenting high-profile events."

Joe Henderson Lab

Configured as a multipurpose space, Joe Henderson Lab is situated directly off the lower lobby. "The flexible space allows for up to 70 patrons and is located at street level with glass walls on two corners emphasizing a connection to the surrounding area," Auerbach points out. "Like the main auditorium, automated variable-acoustics AcouRoll banners shape window walls acoustically for various types of performances. A computerized lighting-control system and power is also provided. The floor is sound-isolated." Configurations were determined by the acoustician and recorded by the owner at the touch screen control panel backstage.

"Overhead is an integrated series of strut and theatrical-purpose bus power tracks for theatrical lighting and speaker hang points, which allows for flexible lighting while maintaining a cleanly designed ceiling. A video screen is integrated into the ceiling for projection," Auerbach says.

Flown Meyer Sound line arrays for Miner Auditorium

Sam Berkow, of SIA Acoustics, designed the performance sound, acoustic canopy, and banner systems for Miner Auditorium. "SFJAZZ wanted an ultimate room for musicians to play in, for the audience to listen, and for engineers to record," he says. "To do it all in a relatively small space that allowed flexible seating for up to 700 wasn't easy."

The adjustable auditorium allows a variety of performances, seating between 350 and 700 audience members.

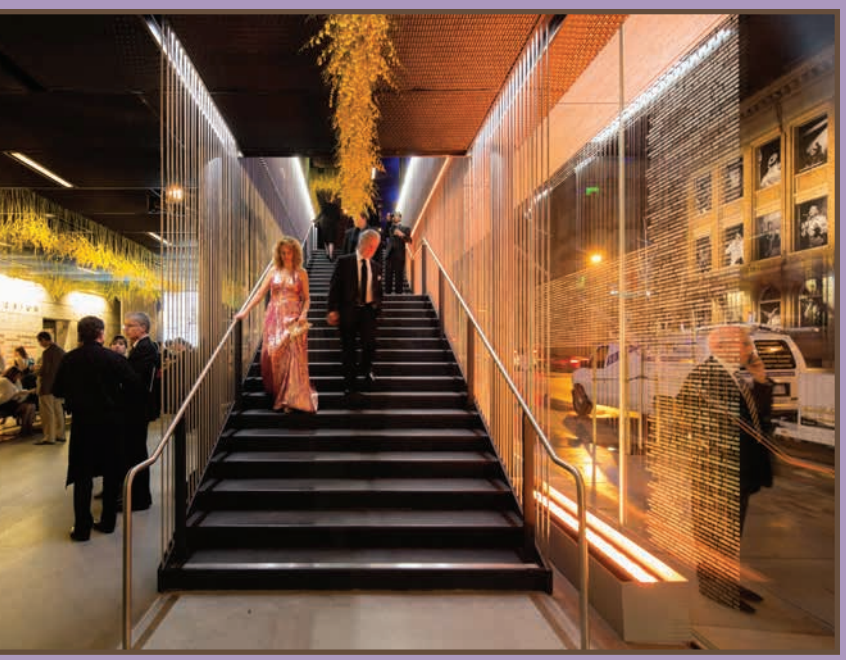
Photo: Matthew Millman

The sound system's role is about balancing and augmenting the natural stage sound while remaining sonically transparent. Thus, Berkow, Kline, and production manager Cecilia Engelhart selected Meyer Sound MINA loudspeakers. "We picked Mina cabinets for several reasons," Berkow says, "including a great high-frequency response, great dispersion characteristics, and their compact size. Overall, we strongly preferred the sound of Mina because we could be confident that the sound from the speakers would match the sound from the stage. In particular, the cabinet's acoustic manifold ensures a very soft, 'silky,' high-frequency sound that brings out the nuances of instruments like saxophones. And Mina is a small cabinet, in keeping with the scale of the room; it is also extremely well-behaved in long line arrays, performing almost exactly as [MAPP Online Pro, Meyer's acoustical prediction software system] predicts it should."

The dual arrays of 16 Mina cabinets per side are augmented by five Meyer 500-HP subwoofers flown in a three-front, two-rear cardioid array. "The sub array works extremely well," he says. "It has a null on stage, allowing musicians and microphones to be free from the off-axis low-frequency energy that a traditional cluster would generate. Keeping such energy from muddying up the on-stage sound is extremely important for jazz. Although the system can rock, it's intended to provide a natural sound and to enhance the energy from the stage, not overwhelm it!"

Eight Meyer JM-1P arrayable loudspeakers, two UPJ-1P VariO boxes, and four M1D-SM line array cabinets were specified as side-, rear-, and front-fills. A Meyer Galileo loudspeaker management system with two Galileo 616 processors handles signal routing. BBI Engineering's principal Mark Roos and project manager Pete Maiers served as AV integrator/contractor.

"We defined a set of three criteria for the sound system to meet: uniform coverage of the audience seating areas, low distortion for high-frequency devices, and minimal off-axis energy reaching the stage," Berkow says. "The use of long line arrays creates uniform coverage and reduces the amount of off-axis energy on the stage. Flying subs is a bit unusual, but, given the lower height of the stage, the floor mounting would result in both disruption of sightlines and tonal balance for those seated



The names of Giant Steps donors appear within the SFJAZZ sign on the center's Franklin Street glass wall.

SFJAZZ hosts a variety of educational programs, including family matinées, jazz history courses, and a digital lab program.

directly in front of the subwoofers."

For mixing consoles, SIA specified an Avid Profile at the front of house, an Avid SC48 at monitors, and an Avid ICON D-Command feeding a full Pro Tools rig in the recording/broadcast booth. The sound system offers both digital and analog splits for recording purposes.

Variable acoustics control

"The program, or intended use for the space, presented a number of challenges," Berkow says. "First, we faced the challenge of two performance spaces that allowed simultaneous usage in close proximity. So we needed to allocate space and resources to create two acoustically isolated spaces. It was also apparent early in the design process that in order to accommodate a 700-seat-count space, we would not be able to use room-shaping techniques—meaning that one of the most effective tools available for acoustical design, slanting walls, could not be used. This implied that our selection and positioning of acoustical materials, both sound-absorbing and sound-diffusing, would be critical.

"Jazz spans a wide range of styles, volumes, and sizes of ensembles. Early on, we decided on a limited number of acoustically variable elements [because] the team was challenged by Randall Kline to create a space that was 'acoustically alive' and use the sound system to enhance sound from the stage rather than being the primary source of sound reaching the audience. In order to do this, we proposed an acoustically diffusive acoustical canopy above the stage, a diffusive upstage wall, plus extensive use of diffusive materials on the side walls and ceiling." SIA worked with the team to help the architects find a set of wall and ceiling treatments that could provide control of reflections and meet the visual requirements.

"Miner Auditorium was designed to project sound from the stage uniformly to the audience," the acoustician continues, "whereas the balcony is asymmetric and shallow, which, in many aspects, is a very interesting design! The 24'-wide and 12'-deep acoustical canopy area above the stage is filled with a total of sixty-four 2'-by-2' variable-depth panels manufactured by RPG Diffusor Systems [based in Upper Marlboro, Maryland], which provide a critical acoustical element within the auditorium. The goal of this canopy is twofold: to create a responsive and supportive stage environment for acoustic instruments and to help project the sound into the audience. The only variable acoustical elements are some retractable AcuRoll absorptive banners hidden within the lower section of the upstage wall. This section holds a 16'-wide acoustical diffuser that can be covered by banners when more absorption is needed.

"In this project, we put forward several elements, such as the diffusive acoustical canopy that houses more than 64 wooden diffusers, the cardioid subwoofer cluster, and the diffusive side wall and ceiling treatments, all of which are nonstandard. By getting these elements into the design early and emphasizing their importance throughout the project, we were able to achieve a very positive result. I also think that the entire design team worked to achieve the client's vision.

Left photo: Matthew Millman; Right photo: Tim Griffith

SIA Acoustics has been involved with a number of projects related to jazz music. “Our team worked on Jazz at Lincoln Center, New York City, and the new JALC facility in Qatar. We also served as acoustical and sound system designer for The Jazz Standard in New York as well as many other venues. Having opened an LA office more than seven years ago, we have also been working in and around the Bay Area for many years. As a fan of jazz music, I was able to talk about the specific design challenges [that genre] presents,” Berkow says.

“At SIA Acoustics, we believe that reverberation time, as a single number, is not as useful or critical as widely thought. Instead, we spend tremendous effort looking to create a spectrum of reverberation times that result in a tonally balanced decay of sound. We strongly believe [this] is a critical factor in creating a successful venue. Tonal balance is generally believed to require that the decay of sound energy at low frequencies should not exceed the upper-mid frequencies by more than a predetermined amount. For this hall, we spent considerable effort trying to find a set of finishes that balance the LF decay with the higher frequencies.”

Joe Henderson Lab presented its own audio challenges. “The room is rectangular, with two solid glass walls,” Berkow says. “Additionally, the room was programmed to host a wide range of events in two staging orientations, length-wise and cross-wise. We used a wide range of sound-absorptive and diffusive materials on the non-glass walls to control reflections from the glass. Additionally, a set of acoustical banners was included to allow the glass to be covered when required. Lastly, the architects proposed a glass wall segment, allowing the room to be visually connected to the main lobby. We suggested slanting this piece of glass to direct reflections upward to the sound absorptive ceiling.

“After this facility opened, and from experience during subsequent concerts [in Miner Auditorium], we will be recommending many more cardioid subwoofer arrays in sound critical fixed-audio installations. And for venues where the stage sound is an important part of what the audience is hearing, we’ll be quicker to recommend diffusive upstage walls.”

Video and lighting systems

“The video systems were developed to support ‘guerilla broadcasting’, live streaming, and large-scale, real-time IMAG and content-developed video projection,” Auerbach says. “We designed the video infrastructure and control center to enable a readily adaptable setup, including the interface of outside broadcast trucks.”

Housed in a series of Middle Atlantic equipment racks, the video equipment installed in Miner Auditorium includes a Crestron DM-MD16X16 digital media matrix switcher with 8G optical fiber I/Os, AJA HD10DA distribution amplifiers, Denon DBP-2012UDCIP universal disc players, a Panasonic PT-DZ12000 projector feeding a Stewart motorized projection screen concealed in the acoustic canopy, a Panasonic AW-HE120 HD-SDI camera with IP control and a Crestron control system and touch panels. Video includes Samsung 1080p LCD monitors and an LG 42" flat panel with Innovox Flex speaker bar. A Da-Lite custom screen in Joe Henderson Lab is fed from a Panasonic PT-DZ50U projector.

Theatrical lighting systems are built around a series of ceiling concealed catwalks and distributed positions throughout the auditorium. The power and control is provided with traditional dimming, distributed power, and data for standard fixed and advanced automated moving lights. Selected for its flexibility across a wide range of productions, the hall’s theatrical lighting package includes a pair of ETC Sensor dimmer racks that are production-linked and a single Sensor dimmer rack for architectural and house lighting. A total of 148 ETC 2.4kW dimmers handle production lighting, while 44 ETC 2.4kW and 14 ETC ELV10 low-voltage dimmers are used for architectural/house lighting. Some two dozen 120 VAC and four 208 VAC DMX-switched relay circuits are available with a DMX multiplexer for LED architectural/house lights.

A single MA Lighting grandMA2 Lite console connects to the dimmers via a total of eight portable ETC NET3 gateways. Theatrical rigging includes a Skjonberg Controls control system with a pair of one-ton C&M chain hoists and an LCD handheld interface with 13 chain-hoist power and control receptacles.

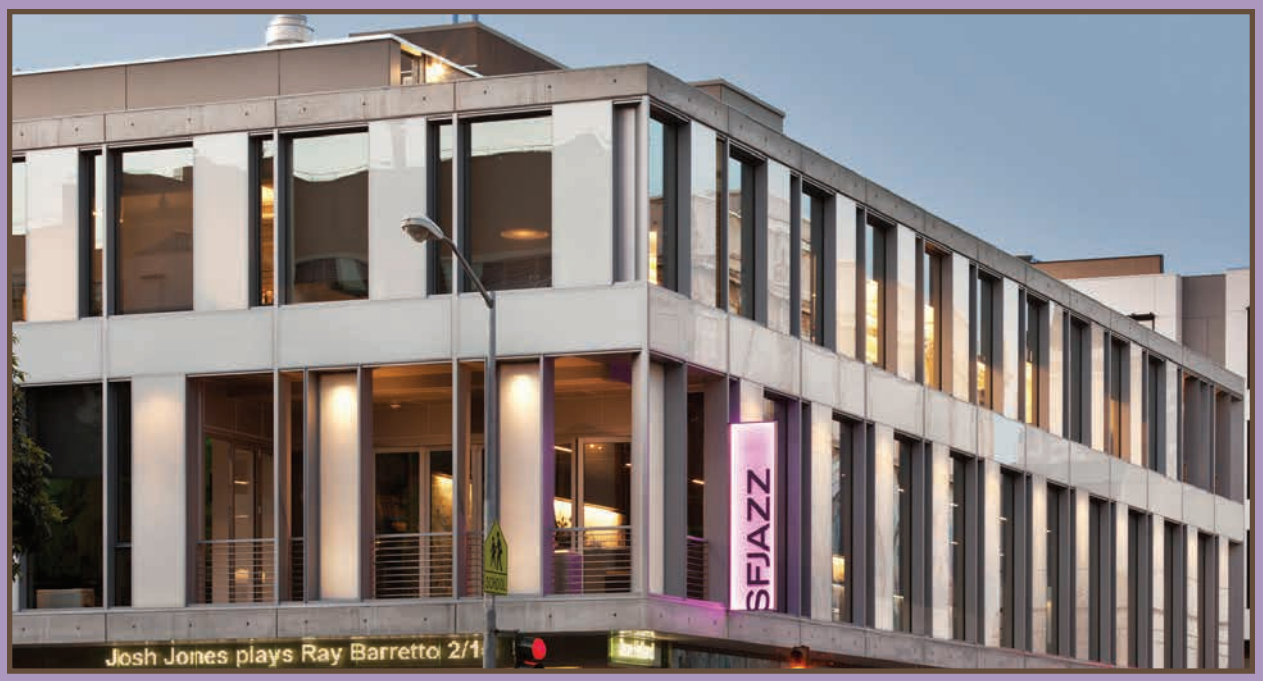
The lighting rig consists of eight ETC Source Four PARnels, five Clay Paky Alpha Profile 800 STs, 12 Martin Professional MAC Auras, 62 ETC Source Fours, and four ETC Source Four PAR EAs.

A positive acoustical experience

To codify an approach, the entire design team visited a variety of venues, from small intimate jazz joints to historical jazz venues such as the Village Vanguard and Jazz Standard, Jazz at Lincoln Center, Carnegie Hall’s Zankel Hall, and St. Anne’s Warehouse in Brooklyn.

Numerous iterations of room configurations were developed, from the most formal to the most eccentric. “An auto muffler shop used to stand on the site, and one of the biggest challenges was fitting the desired design configuration within the very compact area,” Auerbach says. “All members of the design team and SFJAZZ staff worked in an integrated fashion to make it successful. The separate performance, public, and administrative areas were conceived to function to specific needs and work together as a whole.”

Berkow says that the design team first started listening



The building, located in San Francisco's Hayes Valley, includes an adjustable auditorium, a multi-purpose ensemble room, rehearsal spaces, digital learning lab, and administrative offices as well as a café, lobby, retail shop, and box office on the ground floor.

to the room about a month prior to opening. "At that time, the room was still a construction site, but we began four days of system tuning. We were immediately impressed with the sound. In the weeks prior to the opening, we held a series of 'super-secret testing concerts,' which were not really all that secret but did allow us to bring in audiences of varying sizes and listen in real-world conditions. During these concerts, tweaks were made to the sound system, helping us to get closer to our goals. Feedback from both musicians and audiences has been impressive. We are extremely proud of both the acoustical and sound system design of this facility."

"My first reaction to Miner Auditorium was based on the acoustics," Kline says. "We could see how the room was shaping up architecturally as the finishes were being put into place, and it was all that I hoped for. The acoustics are always a nail-biter until the end. When Sam [Berkow] was doing his first tests, it was clear that we might have something special. This building is a perfect example of the sum being greater than the parts, except that the parts are of the highest quality and that the people designing them were the best in the world.

"The sound system is flawless, crystal-clear, transparent, and perfectly matched to the hall; the sounds of the instruments were the most natural I have heard in a hall this size. I especially noticed the vibraphones of Bobby Hutcherson and Stefon Harris [during the venue's grand-opening spotlight, a Bobby Hutcherson birthday celebration], which sounded intimate but powerful.

"Comments I have heard from audiences, artists, and critics in the months since opening are a true measure of what the SFJAZZ Center is becoming. A typical comment is: 'This is the best-sounding hall for jazz I have ever been in.' What makes it work so well is the way the architecture, theatre design, and sound design work together—like a great jazz band."

"The realization that we helped to achieve the client's vision of a place for jazz was very special," Auerbach says. "The entire venue has been very well-received by the public and the music community. It is always thrilling when the first note is struck; opening night at SFJAZZ was especially significant. Each project has its own criteria and dynamic. The SFJAZZ Center site was compact and a bit challenging, but the art of compromise without losing sight of the goal enabled all of us to produce amazing results. No matter what the scale of a project may be, this level of collaboration is essential."

Mel Lambert has been intimately involved with production industries on both sides of the Atlantic for more years than he cares to remember. He is now principal of Media&Marketing, a Los Angeles-based consulting service for the professional audio industry, and can be reached at mel.lambert@mediaandmarketing.com or 818.558.3924.

Photo: Courtesy of SFJAZZ

Keep Watching the Sky:

Restoring the Samuel Oschin Planetarium at L.A.'s Griffith Observatory

PHOTO: TIM GRIFFITH

Auerbach Pollock Friedlander Performing Arts/Media Facilities Planning and Design, and Auerbach Glasow Architectural Lighting Design and Consulting collaborated with Pfeiffer Partners Architecture, Levin & Associates Artchitects, and acousticians McKay Conant Brook on the Samuel Oschin Planetarium at Griffith Observatory in Los Angeles. The firm provided theatre consulting for planetarium lighting, audio systems design, projector lifts, and projection constrol infrastructure coordination elements for the project. The Griffith Observatory, a Los Angeles landmark, re-opened on November 3.

In April 2001, the design initiative began with HHPA (now Pfeiffer Partners Architects), in coordination with Griffith Observatory personnel led by the director Dr. E.C. Krupp. Creating a personal connection with the audience was a key consideration; emphasis was placed on the use of live presenters. In a venue filled with high-tech systems, Auerbach Pollock Friedlander's charge was to hide the technology behind the show. Thus an extensive use of wireless control in the planetarium allows presenters to interact with audience members under a replica of the LA sky. "Our goal was to make the technology appear seamless within the scope of the project, while respecting the historic nature of the architecture," says Len Auerbach, founding principal of Auerbach Pollock Friedlander.

For example, the firm designed a high-precision lift, which allowed the Mark IX Universarium projector, from the German firm Carl Zeiss, to be hidden when not in use. The overall synchronized control of the Universarium, the laser projection, lighting, and sound is coordinated by a centralized show control system.

The presentation space provides for daily planetarium shows, and other events, such as lectures and live music, in a semi-front-facing seating configuration. A new perforated 76' diameter Spitz dome replaces the old plaster dome. Full ADA access and accommodations were added throughout the planetarium. Lighting positions, a control area, and technical support are integrated into the room's architecture. The audio playback and control systems allow sound to have a three-dimensional quality and appear at any point in the dome, and behind the audience. A catwalk system is integrated with the dome to permit easy access to the technical areas. Wireless computer control of all show systems was installed.

The original quadraphonic sound system in the planetarium has been replaced by a 30-channel system, allowing each loudspeaker to be individually addressed and virtual sound sources to be located between loudspeakers. The loudspeakers are placed throughout to envelop the audience on all vertical and horizontal axes. A left-center-right system, plus special narration reinforcement

PHOTO: TIM GRIFFITH

loudspeakers, provides primary audio to the audience in live presentation mode. Other loudspeakers allow simulation of sound movement; all of the units are placed behind the trans-sondent dome.

Corridors and circulation paths support backstage and front-of-house needs, with easy access between each zone. The HVAC systems are designed for both heat loads and acoustic criteria. The electrical systems are designed to support presentations by visiting companies, and K-rated transformers with isolated grounds were installed for lighting and audio power.

The sound package includes Meyer Sound CQ-1s for the narration, UPA-2Ps for the horizon loudspeakers and UPA-1Ps for the surround, USW-1Ps subwoofers, EAW UB-12s and Crown CP660s for side fill. The package also included a Level Control Systems control and playback system, a master show control system, provided and programmed by Bowen Technovation, and plug-in boxes to allow microphones and additional loudspeakers to interface with the audio system.

Filling out the audio package are a Listen Technologies assistive listening systems; Clear-Com intercom; mics from Shure, Sennheiser, and AKG; EAW SM-200 stage monitors; and a Yamaha 02R96 digital mixing console."The audio system brings the observatory into the era of new technology, enhancing the aural experience of the audience," says Greg Weddig, project manager,

The lighting package includes two racks of ETC Sensor dimmers, one hundred-twenty-four 20A performance/architectural dimmers, an ETC Unison architectural processor to control house lighting, an ETCnet DMX-over-Ethernet system, control racks in the dimmer room and control area for house and work light control and data distribution, Ethernet network taps installed throughout the theatre, and an ETC Expression console. Four High End Systems automated fixtures function through automated concealed ports in the dome and can focus anywhere in the audience level of the planetarium.

The planetarium lighting is coordinated with the projection systems and the Universarium to create an illusionary response to a sense of space. The lighting of the dome is intended to make it disappear, whether with the movement of the setting sun or finding a direction on the horizon. This effect is created using a continuous array of Altman strip lights with color filters on multiple dimmed control circuits, allowing the light effect to move around the horizon or fill the dome. The dome is also cross-lighted with arrays of Strand Fresnels that provide a smooth wash of light, making the dome invisible.

The planetarium features 298 seats in an architecturally integrated seating plan. The seats have a custom-designed tilt to provide comfortable viewing.

A two-part lift enables rapid deployment of the Universarium from its storage position to its full-height playing position in a matter of seconds. The telescoping lift system uses a four-point ball screw mechanism in coordination with two independent, precision linear actuator-operated lifts, to allow the Universarium to fit between the planetarium floor and the basement level 15' below. The lift has two programmed stops. The handrail position allows laser projectors to be used without being interrupted by the Universarium.

Controls for the Universarium lift are located at the control panel in the lift pit, in the planetarium's control area, and via a hard-wired umbilicus. Safety features include dead-man push-buttons for lift controls, door and railing interlocks, and astragal pressure tape switches at all shear points. The Universarium's controls are hard-wired through cable chains that allow power and control signals to safely navigate the lift mechanisms. Four custom-made floor panels cover the lift keyhole when not in use. They're finished with the same historically important cork flooring that covers the rest of the Planetarium audience area. The lift has an area of 148 sq. ft, and a total lifting and sustaining load capability of 20,000lbs. It travels 11' at 10' per minute.

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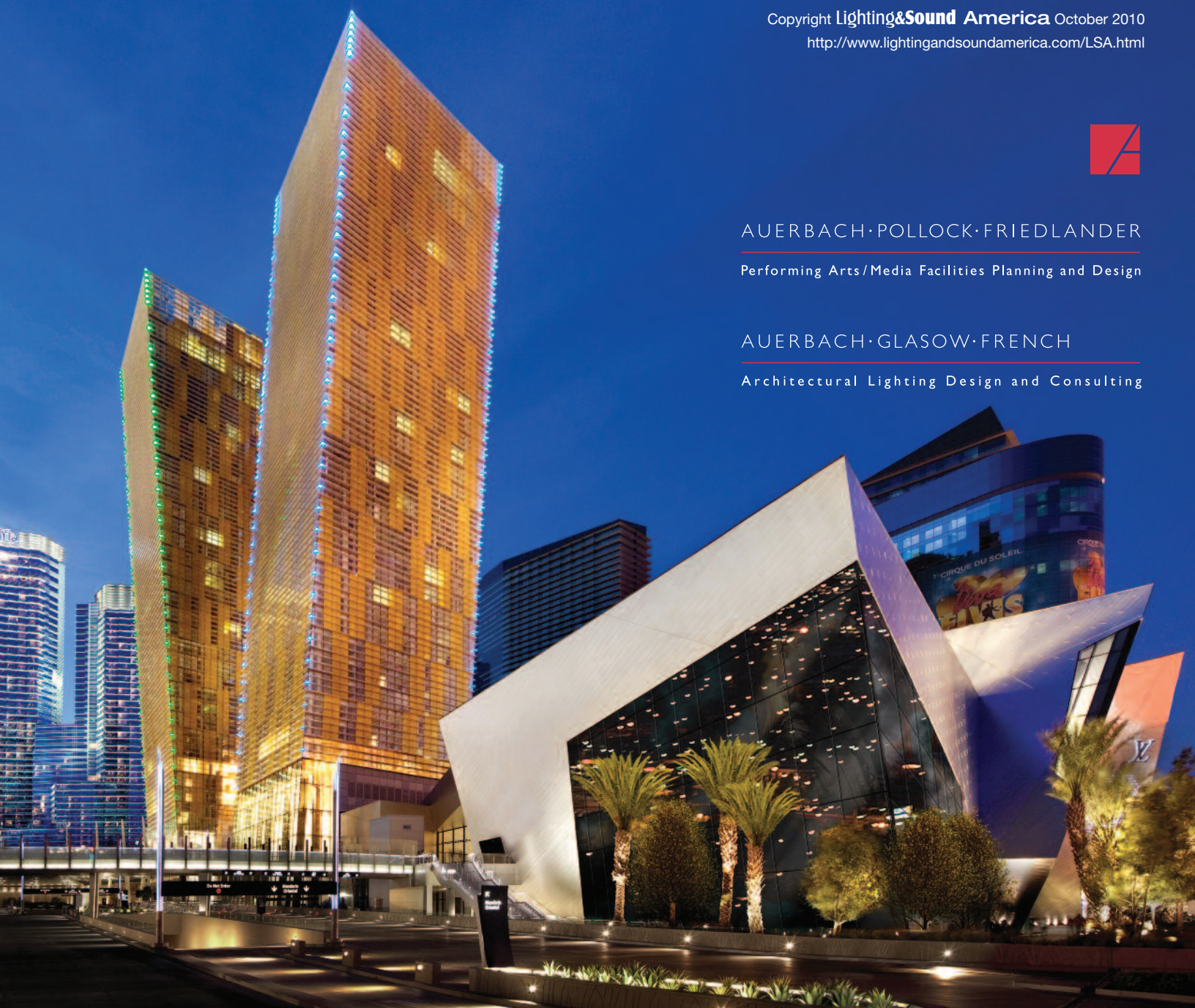
CityCenter Las Vegas:

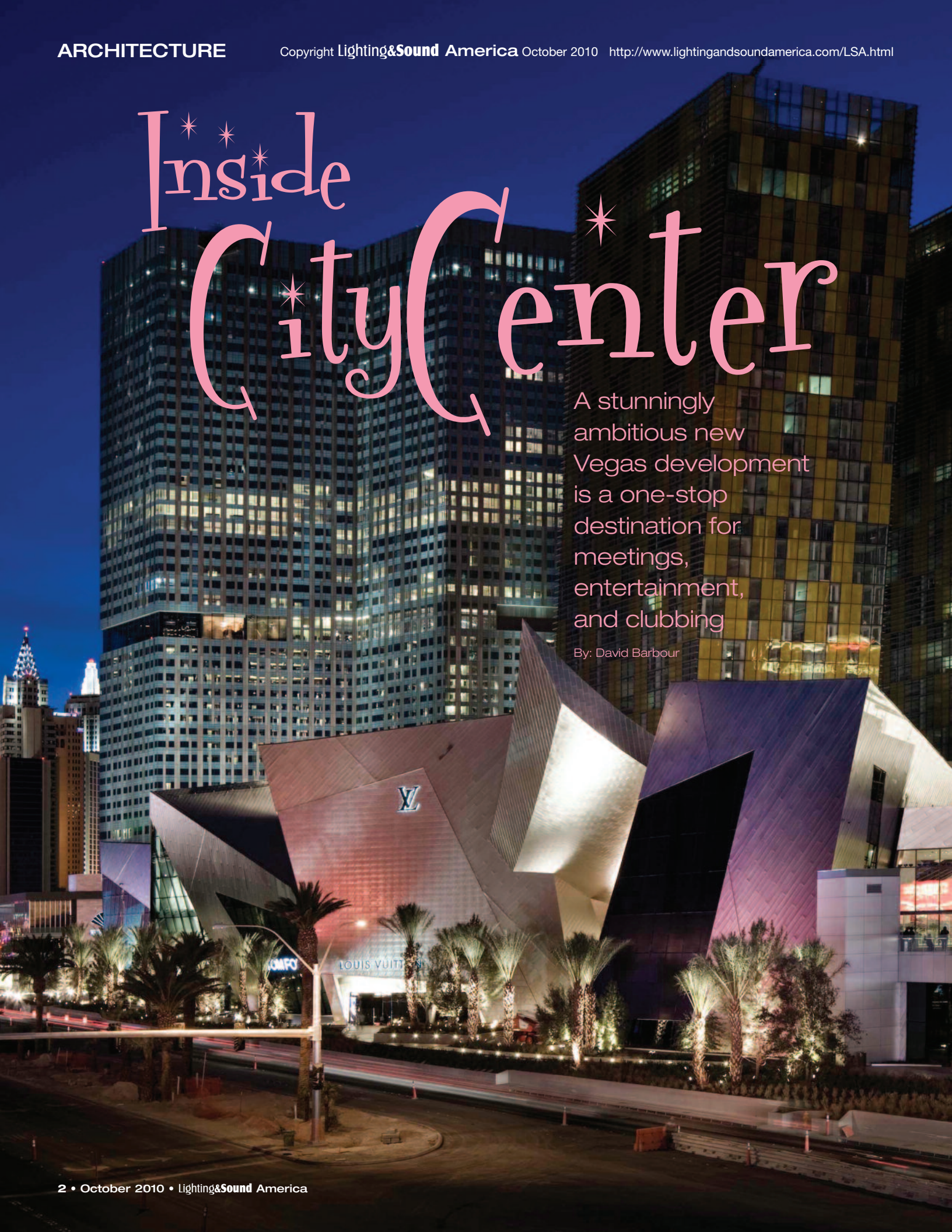
Viva ELVIS Theatre/Aria Convention Center/HAZE Nightclub



Inside CityCenter

A stunningly ambitious new Vegas development is a one-stop destination for meetings, entertainment, and clubbing

By: David Barbour



Even if one fully appreciates the tear-it-down-and-build-it-up-again ethos that prevails along the Strip, it's hard to grasp the scale and ambition of CityCenter Las Vegas. Others build resorts, casinos, and nightclubs; CityCenter is a major act of urban renewal. Located on 67 acres between the Bellagio and Monte Carlo resorts, CityCenter—a joint venture between MGM Resorts International and Infinity World Development Corp, a subsidiary of Dubai World—takes in the Aria resort and casino, Vdara hotel and spa, Crystals restaurant and entertainment district, Mandarin Oriental resort, and a residential area. It's a kind of city-within-the-city; one could conceivably spend an entire visit there without seeing the rest of Vegas.

Designed by the architectural firm Pelli Clarke Pelli, Aria—the focus of this story—consists of two curvilinear steel and glass towers; it contains 4,004 rooms, including 588 suites offering floor-to-ceiling glass windows. Other features include a 215,000-sq.-ft. pool deck, 150,000-sq.-ft. casino, an 80,000-sq.-ft. spa, 300,000 sq. ft. of convention space, ten bars and lounges, many restaurants, large-scale public art works by the likes of Jenny Holzer and Maya Lin, and a theatre featuring the latest Cirque du Soleil spectacular, *Viva ELVIS*. Put it all together and you have the largest privately funded development in the US. It's also the world's largest green complex, having earned LEED certification from the US Green Building Council.

A major player in the realization of CityCenter is Auerbach Pollock Friedlander, Performing Arts/Media Facilities Planning and Design (APF), which, working with a number of collaborators, provided consulting services on the Viva Elvis Theatre, convention center, and nightclub known as Haze. A sibling firm, Auerbach Glasow French, Architectural Lighting Design, was also involved in the Viva Elvis Theatre. It all adds up to a trilogy of projects that are unusual for their ambition, scale, and for the way in which they challenge the prevailing Las Vegas style.

Above and opposite: CityCenter makes a glittering addition to the strip.

"We essentially had three clients with the owner," says S. Leonard Auerbach, president of Auerbach Pollock Friedlander and Auerbach Glasow French. "Each project had its own timeline; we had three different teams in-house, with many key principal consultants overlapping. The architect of record, HKS, and the executive architect, Gensler, were the same, but with different management teams for each project.

"We started working on *Viva Elvis* first," Auerbach adds, "and were well along with it when HKS and MGM asked us to step in on the convention center. Much later, we were approached to consult on Haze. It was really a case of having three separate projects with the same target opening, although, from our point of view, the Viva Elvis Theatre was on a much earlier deadline, to be finished for Cirque du Soleil's move-in, so it could mount the production." Overall, he adds, "It functioned as three separate stand-alone projects."

Elvis has returned to the building

Regular readers will recall *LSA*'s feature story on *Viva Elvis* in the May 2010 issue. The 1,840-seat theatre housing the show is the seventh permanent venue for Cirque du Soleil (CDS) in Vegas. (The others are *Mystère*, *O*, *Zumanity*, *KÀ*, *The Beatles LOVE*, and *Criss Angel Believe*.) APF collaborated with Cirque, Pelli Clarke Pelli, the MGM Mirage Design Group, Gensler, JaffeHolden and HKS to coordinate the technical systems to be integrated into the building, implementing the theatre concept created by Johnny Boivin, of CDS, as well as systems involving stage machinery, theatrical lighting, and audio/video.

In some ways, the theatre is a throwback to the showrooms of Vegas in its glamorous 1950s heyday, with curving aisles, rose woodwork, and side wall drapery. The use of banquette seating in the center of the room is designed to facilitate a communal experience for the audience. It's appropriate for a show that celebrates one of the greatest stars of Vegas' golden era.

As is often the case with CDS shows, the scale is enormous. The show unfolds on the 19,200-sq.-ft.

Photos: Courtesy of CityCenter Vegas

Viva ELVIS.

cruciform stage, which has been engineered to accommodated scenic elements weighing up to 60,000lbs. The rear and side stages are the full height of the 104' grid. The stage's 80'-wide proscenium opening required the largest curved fire curtain in the world, supplied by Brooklyn-based rigging and drapery specialist Pook Diemont & Ohl.

To accommodate the show's effects, APF developed an infrastructure that includes 17 stage lifts, covering a total surface area of 3,726 sq. ft. The largest, which weighs about 265,000lbs and measures 1,350 sq. ft., can travel at 1' per second; it supports eight additional stage lifts, which can also travel at the same speed. The 20' by 20' center lift travels at 2' per second; it is fitted with a horizontally traversing cover, known as "the sloat," allowing scenery to be reconfigured in the basement area while new scenery is revealed directly above it.

The rigging system was conceived on a similar scale: Five motorized overhead trolleys, integrated with wireless control to travel at a speed of 6' per second, transport both scenery and performers. The trolleys are fitted with vertical hoists as well as a rotational axis; one trolley unit consists of four vertical hoists and one trolley rotating assembly, so performers or scenery can rotate while moving horizontally and vertically. A six-panel motorized LED screen traverses upstage of the scenery; the six separate projection surfaces are deployed and retracted as needed—in *Viva Elvis*, large dimensional scenic pieces and projected visual imagery often work together. In addition, eight fixed winch assemblies are positioned on the grid surface to assist with the movement of a 60,000lb scenic element in and out of the space. Ten motorized lighting trusses deliver lighting gear to the proper elevations and positions. Twenty-one motorized multi-line winches are used for moving scenic elements.

The stage lifts, traps, and sliding covers were supplied by Show Canada; the winches, tracks, and trolleys came from Stage Technologies. The automation system, also by Stage Technologies, includes four of the company's Nomad control consoles. The structural support systems for the automated rigging were developed in conjunction with Thornton Tomasetti Engineers, and control of the rigging system noise was by JaffeHolden.

In addition, the auditorium features an extensive network of technical catwalks located over the seating area, to support the front-of-house technical systems. The control suite features 1,450 sq. ft. of booth space and 102 linear feet of glass, providing a clear view of the onstage action.

It's an incredibly complex network of systems, yet, says Auerbach, "We started the project with only a vague idea about the production." Surprisingly, he suggests, in projects of this nature, its not uncommon for the consultants to begin work before the show concept has been fully realized. In situations like this, he adds, "Major stage configurations, which may need to accommodate extensive machinery, require bold decisions and faith in the consultant, with CDS' approval, to ensure that, later on, the design intent will not be impeded. With *Viva Elvis*, we received input from Gilles St. Croix, CDS' executive producer, and Stéphane Mongeau, the VP of production, because we had very limited knowledge of what [the production designer] Mark Fisher would be doing, and, at that time, the show's creative team was not fully on board. We worked closely with Don MacLean, CDS' technical project manager, to set the general scope of the project, with certain 'placeholders' that would allow Mark Fisher to have the design freedom he needed. We were then able to design the stage machinery, automation, and lighting and sound systems to fit the production without obstruction."

Photo: Julie Aucoin

APF has a long history with CDS, which certainly must help. For example, Auerbach says, "The acrobatic rigging concept for *Viva Elvis* carried forward developments we had provided for *KÀ*, *LOVE*, and *ZAIA* [a CDS spectacle in Macao]. The size of *Viva Elvis'* stage and the desire for faster acrobatic tracking and hoisting pushed us away from previous approaches using cog belts and cable drives. This evolved from early criteria, given to us by CDS, requiring tracking systems that crossed one another." Tom Neville, a project principal, says, "We worked with Stage Technologies to develop a traversing hoist carriage with friction drive, which used motors on each of six friction drive wheels, much like a light rail train, and enabled the tracking carriage to still have drive purchase and complete position accuracy while moving over the gap of an intersecting track. The intersecting tracks were eliminated, but we were able to take real advantage of the new development for a quiet, precisely controlled carriage with rotating multiple high-speed hoists."

The production's lighting package, Auerbach notes, reflects a gradual shift at CDS to an ever more concentrated use of moving lighting. The lineup of gear, specified with the production's lighting designers, marc brickman and Martin Lebrecque, includes 110 Philips Vari*Lite VL3500 FX units, 28 VL3000 Spots, 67 VL3500 Spots, 24 Syncrolite Syncro MX4s, 170 Elation TriPARs, 26 Martin Atomic strobes with scrollers, 36 Solaris Quasar 15K strobes, one Solaris T-Light 85K strobe, twenty-five T8 Technologies Lumapanels, six Robert Juliat Cyrano followspots, two Clay Paky Alpha Spot 700 HPEs, 90 ETC Source Fours in various models and degree sizes, 25 James Thomas PAR 20s, 30 Altman StarPAR CDMs, 75 Altman PAR 64s, and 154 Altman short-nose PAR 62s. Lighting is controlled by a grandMA console, from MA Lighting, with ETC Sensor dimming and an ETC Net3 network. Wireless Solution's W-DMX Blackbox S2000 transmitters and R512 micro receivers send DMX to six roving VL300s and some LED units, as well as rope light, MR16s, and red beacons on stage.

Volumes of sound

Mark Holden, of JaffeHolden, the theatre's acoustician, notes that, in some ways, the project's biggest challenge was its sheer size. "One can think of a couple of backstage areas that are bigger," he muses, "but this theatre just blows your mind. The room is such a gigantic volume; you have to find a way to absorb that natural energy on stage. How do you make a room like that sound bright and clear and intelligible while making sure it has some character to it?

"The designers wanted the room to have big poly columns on the side walls, with cutouts built into them," Holden adds. "That could have been an acoustic disaster but, working with them, we cut big openings in the columns, with drapes, scrims, and acoustic treatments behind them, all of which created a layered acoustic effect. On the column exteriors, we have curved wood reflectors that bounce sound around the room to give it a sense of brightness and clarity.

"Behind the scrim, which is acoustically transparent to let sound and light come through, are gigantic acoustic baffles hanging from the ceiling to the floor. They're 4' wide and 2-3" thick. In the corners of the room's attic, we created giant bass traps, some of the largest ever built. They're almost 20' high, 20' deep, and 20' on the side, and are located in the room's four corners. They are there to totally soak up the low-frequency sound without affecting the room's clarity. We partnered with Jonathan Deans [*Viva Elvis*' sound designer] to create a sound that is very clear and precise. It's the opposite of the wall-of-sound effect; we want you to hear each single instrument."

Interestingly, Holden adds, "The huge backstage area is less of a concern; we filled it up with as much sound-absorbing material as we could. The real trick is how to put the right sound in the auditorium. Also, Cirque du Soleil's offices are located just below the audience seating; there are some subwoofers built into the floor, so we created acoustic enclosures to contain the sound, keeping it from spilling into the offices below."

Like the APF team, Holden had to deal with the fact that the show was not fully conceived. "It wasn't clear if there was going to be an offstage band or not," he says. "Therefore, there are music rooms at stage right and left; they're totally sound-isolated, with a kind of box-in-a-box construction." Because the band is on stage for most of the show, however, he adds, "their function evolved. They rooms are now used for the monitors and the radio monitor mix for the musicians."

APF's responsibility also includes the design of sound, video, and communications system, which was developed in concert with Deans, and it reflects his preference for certain key brand names, notes Paul Garrity, APF's prinicpal sound designer. The primary front-of-house sound reinforcement and effects playback is handled by a computer-controlled audio matrix and processing system, drawing on a Meyer Sound/Level Control Systems Cue Console, including an LX-300 frame, DSP modules, CueStation software, Wild Tracks hard disk playback, Apple Mac Pro, and Mac Mini computers and Cinematic monitors for primary playback. The system controls 168 sources into 176 matrix outputs. Modular control surfaces are deployed for sophisticated live mixing and routing control of microphones and multi-track audio playback. A secondary 168 by 176-channel audio matrix and processing system provides performer in-ear and stage

loudspeaker monitoring. (See pg.122 to learn about the Optocore 512-channel fiber-optic redundant audio transport system.)

The main loudspeaker system of arrays and overhead boxes consists of Meyer Sound MICA, MTS-4A, CQ-1, and UPJ units. The subwoofer component includes Meyer M3Ds and 700-HPs, along with Danley Sound Labs TH-115 boxes. The surround system includes Meyer MSL-4s, UPQ-1Ps, UPJ-1Ps, UPJuniors, M'elodies, M1Ds, and Innovox FS-V2 units. More M1Ds are found on the stage edge, with Meyer SB-2s functioning as stage monitors. Portable speakers include UPJ-1Ps, UPQ-1Ps, and M1Ds. Signal processing is handled by Meyer's Galileo and Waves MaxxBCL. Providing power where needed are Crown MA-12000i and CTs 4200 amplifiers. Monitoring is provided by Meyer's RMS (remote monitoring system) with iLon Ethernet adapters. The sound gear package was supplied by Montreal-based Solotech.

A wireless performer tracking system, supplied by TiMax, provides real-time three-dimensional performer positioning. The information is sent to the front-of-house reinforcement system for automated panning across all channels. The microphone system includes 36 channels of wireless mics, 26 channels of stereo in-ear monitoring, two channels of IFB (interruptible foldback), with 40 wireless receivers. Sennheiser EM3732 dual UHF receivers with SK5212 body packs and SKM5200 handheld transmitters are used.

All spaces, including rehearsal halls, technical offices, training rooms, dressing rooms, shoe and costume maintenance, greenrooms, and the technical grid are connected with sound, video, and communications systems from the stage area. An 80-port Clear-Com Eclipse Median 80 digital matrix intercom system, interconnected with a digitally controlled Clear-Com TCVS-2700 eight-channel analog matrix, is capable of switching 288 stations into eight party lines. The system provides 20 channels of wireless intercom feeding 40 wireless belt packs. In addition to the Clear-Com RS-601 and RS-602 belt packs and KB-7-2 loudspeaker stations, there are Telex BRT-800 wireless base stations and TR-800 belt packs. Backstage monitoring and paging is controlled by a Dynacord ProAnnounce system feeding over 135 Electro-Voice 409-8T and EVID4-DT loudspeakers and allowing for paging from portable stations or digital matrix intercom systems. A Listen Technologies LT-800-216 wide-band wireless FM assistive listening system is available for the hearing-impaired. Middle Atlantic racks are use throughout the venue to store equipment.

More than 20 Panasonic AW-E560 and CP480 production fixed-focus and AW-560 remote-controllable color video cameras are routed through a 26-channel modulated video system for monitoring of performers, musicians, and critical backstage systems.

Lighting the auditorium and lobby

Auerbach, noting that the look of the theatre and the lobby were the work of Johnny Boivin, CDS' architectural designer, says, "His intent was to create a harmonious audience environment with comfortable seating, so that intimate groups could sit together. We worked with him and the interior designer, Cleo Design, to develop a custom seat that functioned well and met the building code. We also had mock-ups built to confirm the ergonomics and mechanical functions for the banquette seat."

As the audience arrives in the showroom, the house lighting, designed by Auerbach Glasow French (AGF), includes theatrical ellipsoidals with circle pattern templates to provide general illumination via a soft patterned light. Downlights mounted between the architectural ceiling panels supplement the pattern lighting without washing out the pattern effect. Pathway illumination is provided by low-level LED lighting and fluorescent aisle lighting. High-intensity color-changing LED fixtures are incorporated into side wall openings, lighting the room's draperies. Before show time, the side wall lighting is restrained, complementing the rest of the architecture. As the show starts, the side walls burst into color, surrounding the audience with pulsing color changes.

The showroom lighting makes use of ETC Sensor dimmer racks, SmartSwitch relay panels, Cisco fiber-optic and Ethernet switches, an ETC Emphasis console, ETC Net3 gateways, MA Lighting grandMA NSPs and replay units, Creston TMPC-SX wireless handheld-touch-screen controllers, and a Doug Fleenor Design 1211 optical isolation amplifier.

Speaking of the theatre's spectacular lobby, Auerbach adds, "Johnny Boivin's concept included a dynamic lighting wall that sprung from an idea that envisioned sculptured glass and changing light sources. Our architectural lighting department [AGF] was also architectural lighting designer for the lobby."

The outer entry lobby features a curving glass soffit internally illuminated by more than 6,000 RGB color-changing LEDs. The soffit changes color throughout the day, with changes becoming more frequent and vivid as show time approaches. The inner lobby features a 44'-high ceiling; located 12' above the theatre entries is a 150'-long glass wall, internally illuminated by 357 RGB fixtures made up of 5,355 LEDs. The glass wall, referred to as the Diamond Wall, is comprised of lenticular lenses behind fluted vertical glass panels. The lenses' teardrop forms move in juxtaposed images with the angle of view, creating an effect of color and movement behind the lenses.

Photos: Julie Aucoin

The *Viva Elvis* auditorium recalls the showrooms of Vegas' early glory days.

Mirrors line the opposite wall, reflecting the images created in the glass wall; Holden notes that the mirror wall consists of 5mm-thick Mylar stretched over acoustical panels. "It looks like a hard piece of glass, but it isn't; it's a sound transparent skin over fuzz," he says. "It controls the sound in the lobby, which otherwise consists of hard surfaces."

Also, says Matthew Ezold, APF's sound project manager, "To provide pre-show music and announcements in the reverberant, high-ceilinged lobby while concealing the loudspeakers, we broke the system into two segments. Overhead directional ceiling loudspeakers and subwoofers provide the higher SPL desired to get the audience excited, and a second set of loudspeakers, at head height hidden behind the lobby's decorative finishes, increases intelligibility and pulls the audience toward the theatre entrance." The lobby effects system includes a Digigram hard disk and Tascam CD playback; the loudspeaker rig includes Electro-Voice C4.2 and V10.1, Innovox FS-V2, and Atlas Sound FA136T87 loudspeakers, along with Crown CTs 12000 CTs 2000, CTs 4000, and CTs 8200 amplifiers. Control and digital signal processing are via a BSS BLU system, with a Calypso Systems Pro I/O with touch panel.

Lighting gear in the lobby and auditorium include Alko undercounter fluorescent task lights; Bega compact fluorescent steplights; a Bruck flexible track system, ETC ellipsoidals; Kurt Versen MR16 downlights, compact fluorescent downlights, and T4 downlights; Light Control fluorescent wall slots; Lightolier pendants and MR16 downlights; Lumiere surface-mounted MR16 downlights; Philips Color Kinetics RGB LED fixtures and LED white cove units; Q-trans low-voltage transformers; Sistemalux Iguzzini LED recessed steplights; and Tivoli LED undercounter task lights.

Many others were involved in the project. From CDS, key personnel included Anik Patry, director, theatre projects; Jean-Francois Lavalée, assistant director, theatre projects; Ray Forton, administrator, theatre projects; Nathalie Thibeault, project manager, theatre design; Jean-Nicolas Rousseau, project manager, theatre development; Danah Abarr, project manager, theatre construction, architecture; Steve Dubuc and James Tomlinson, project managers, theatre construction, TSE, Carol Rexhouse, construction supervisor; Stéphane Lemay, technical support director; Robert Levac, sound and video communications and projections technical advisor; Éric Bouchard, lighting technical advisor; and Michel Demers and Jeremy Hodgson, automation technical advisors. Also from APF, Howard Glickman handled lighting system design. From AGF, Patty Glasow was project principal and Marlene Lieu project manager.

By all accounts, *Viva Elvis* looks like another CDS hit; interestingly, the show, which celebrates Vegas' gaudy past, is an anchor of fun in the middle of its city's newest place to eat, sleep, and play.

Two views of the lobby, with the color-changing wall.

The Aria Convention Center

Since Las Vegas is the world's pre-eminent convention city, you can never have too many convention centers. The Aria Convention Center features 300,000 sq. ft. of meeting and convention space, which can accommodate gatherings ranging in size from 10 to 5,000 attendees. There are four ballrooms, three offering fully functioning theatrical stages ranging from 21,000-50,000 sq. ft., and 38 meeting rooms, each ranging from 800-2,000 sq. ft. Auerbach Pollock Friedlander (APF) planned and designed the theatrical and event services elements of the facility, developed the ballroom and meeting room rigging concept, and designed the theatrical systems, including the ballroom stage rigging systems and architectural lighting control systems in the public spaces.

The most technically complex venue in the convention center is the Bristlecone Ballroom, located on Level One. It provides 51,561 sq. ft. of meeting space, seating up 5,100 people in its theatre layout. The room is divisible into as many as ten separate segments, each of provide provides a clear ceiling height of 24' 3".

The room is designed for rapid load-ins, thanks to dedicated truck docks conveniently located next door—so convenient, in fact, that when carpet protection is installed, full-size trucks can be driven directly onto the ballroom floor. Dual Megavator freight elevators provide for direct loading access to the over-ceiling concealed catwalk system.

For the ballroom stages, APF proposed automated rigging to avoid use of a conventional double-purchase counterweight scheme that would otherwise be required with the building's limited loft height. The automated rigging permits for a significantly reduced load to the building's structure and results in more efficient use of the limited stage floor area; it also provides ongoing savings in turnover time and staffing

The fully equipped stage has a proscenium opening of 22' 6" high by 48' wide. The stage ceiling is 49' 11" above the stage floor. All of the stage rigging, provided by Stage Technologies, is automated, including the main curtain, four dedicated electric battens, and 21 general-purpose electric battens, each of which is 58' long.

Event rigging provisions within the ballroom are fully integrated in to the ceiling design. More than 300 concealed hatches provide access to rigging beams located in the catwalk space above. Lighter weight decorative and signage elements may be supported from approximately 7,000 linear feet of load-rated strut integrated into the ceiling.

Rob Hill, APF's project manager, says the stage lighting provisions include four on-stage dedicated electric battens, two on-stage side lighting galleries, and three front-of-house stage lighting positions integrated into the ballroom's ceiling. Theatrical-purpose lighting distribution is available, concealed throughout the ballroom ceiling to provide for decorative lighting of dining tables and décor elements. A full complement of conventional and moving lights is available.

All lighting systems are integrated and managed as a cohesive whole. Lighting controls are segmented to coordinate with the ballroom operable partitions and the individual cove elevations of the ceiling. Controlled architectural loads include dimmed halogen downlights, dimmed halogen decorative chandeliers, dimmed linear fluorescent cove fixtures, dimmed LED wall art elements, relay-switched fluorescent and HID work lights, and relay-switched fluorescent blue light running lights. Two dimmer rooms, located at the ballroom catwalk level, provide for efficient load distribution to the ballroom stage, theatrical-purpose, and architectural lighting loads.

For basic meetings, load-ins, load-outs, and cleaning, the lighting can be controlled from local touch panels and by a snapshot memory system. For larger and/or more complex events, the stage and architectural lighting can be operated by theatre-style consoles, which, thanks to the network in place, can be located anywhere in the ballroom.

There are three other ballrooms of varying sizes. The Pinyon Ballroom contains 38,301 sq. ft. of meeting space, seating up to 3,800 in theatre mode. It can be divided into eight segments, each with a clear ceiling height of 24' 3". In terms of stage layout and facilities, it is identical to the Bristlecone. The Ironwood Ballroom is identical in size and capacity to the Pinyon and in technical facilities to the Pinyon and the Bristlecone. Because it is located on Level Three, load-in is achieved using Megavators; three dimmer rooms on this level supply power. The smaller Juniper Ballroom

The sleek design of the Aria Convention Center allows for plenty of sunlight.

features 20,275 sq.-ft. of space, and can seat up to 2,000 in theatre mode; it can be divided into four segments, each with a clear ceiling height of 20'. The technical support includes concealed heavy load rigging points, strut rigging integrated into the ceiling, theatrical-purpose lighting distribution, and agile lighting control systems.

The various meeting rooms can accommodate between 70-195 people, depending on the room, and each has 14' clear ceiling. Each features strut rigging integrated into the ceiling and distribution for theatrical lighting. Two pre-function spaces and an atrium are also set up in much the same way.

The rigging systems for the ballrooms employ 12 Stage Technologies Big Tow 390 and 65 Big Tow 250 zero-fleet winches, three Stage Technologies Nomad control systems, three H&H Specialties/Stage Technologies draw curtain machines, and 24 SSRC pantograph systems. Overall, the project called on 30,000 linear feet of ceiling rigging strut with over 900 heavy rigging points.

Kenneth Fause, of APF, says, "The convention center rigging was designed with drops distributed over each of the ballroom floors, with access through the ceiling designed as a 10' grid spacing. This grid conforms to standard lighting trusses, permitting locations anywhere within the space. A secondary steel support structure is coordinated with the drop points and is accessed from a catwalk system from which you can hang chain hoists at any 10 by 10 drop point."

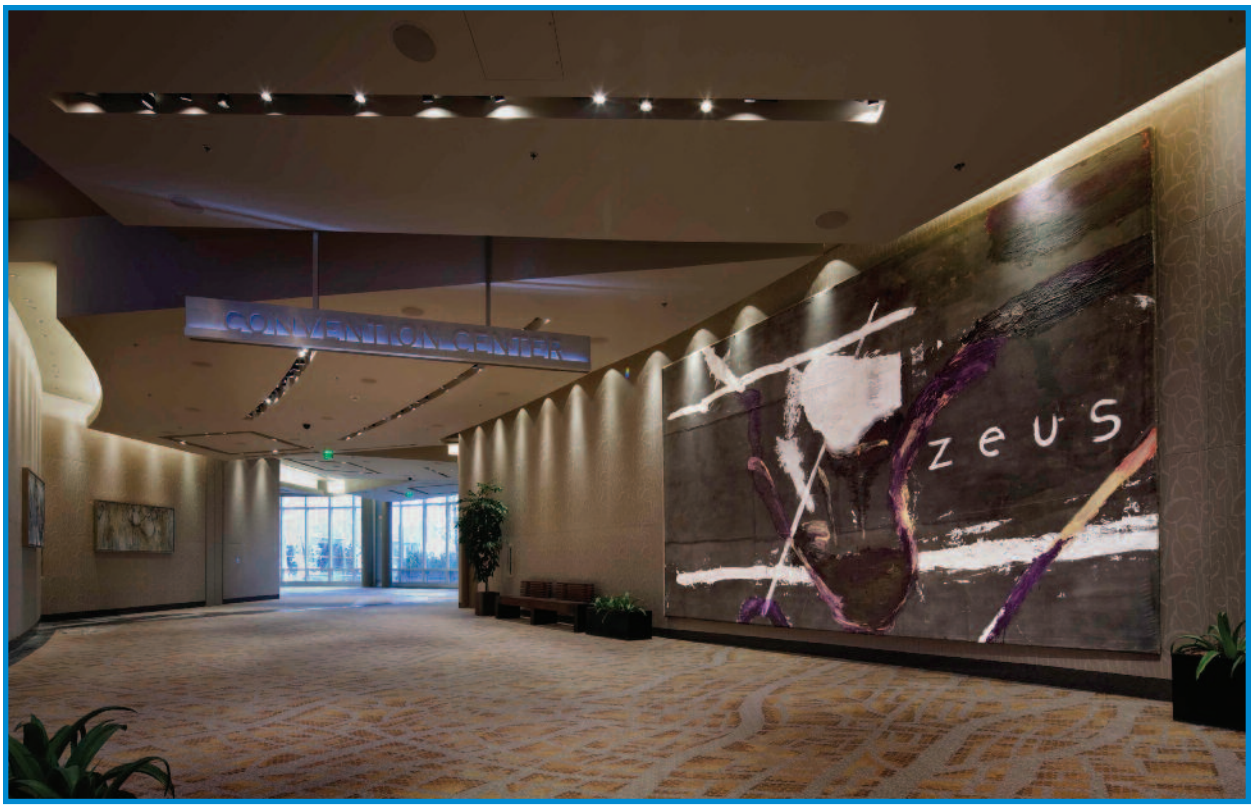
The lighting systems use 3,752 channels of ETC Sensor dimmers, 432 channels of ETC Unison universal fluorescent dimmers, 72 channels of DMX control for LED decorative lighting elements, more than 1,000 Ethernet taps on the theatrical and architectural lighting control network, 17,000 linear feet of two-circuit theatrical-purpose bus track, and more than 1,000 theatrical-purpose bus track tapoff receptacle devices.

Regarding the lighting systems, Fause says, "The design challenges were driven by the scale of the convention center. We defined a total of eight dimmer rooms to keep branch circuits to reasonable length for voltage drops and for reasonable economics. For the architectural lighting control system used for load-in, load-out, cleaning, and basic meetings, we had a preview of the proposed ETC Paradigm products well ahead of release. ETC committed to deliver on the project schedule and implemented specific control features the project required. ETC and Creston cooperated to produce driver software to operate the Paradigm control platform from the touch panels that were part of the scope of the AV system."

Convention sound

The sound package for the convention center makes use of a staggering amount of Harman Professional gear. The loudspeaker tally includes 606 JBL Control 332C, 446 Control 432CT, 192 Control 328C, 14 Control 227CT, and 14 Control 26Ct units. The amplifier

Photo: Courtesy of CityCenter Vegas



The entrance to the convention center.

count includes five Crown CT 4200 USPCN, 262 CTs 2000 USP3CN, 113 CTs 1200 USP3CN, and three Crown 1160A units, and, for digital signal processing, the BSS London BLU system, including 80 BSS London BLU Blu Net 0x16 outputs and 109 Blu Net 16x0 inputs. Also available are 44 JBL VerTec 4887APD line array elements, 18 JBL VerTec 4881APD subwoofers, 24 JBL VP7212/64 powered delays, 54 VP7212M powered stage monitors, and 36 dbx in-ear monitor processors—and, for control, three Soundcraft Vi6 ninety-six channel digital consoles

Darren L. Smith, at the time a senior consultant for PMK Consultants—he is now CEO of Vegas-based Entertainment Systems Design—reports that he was responsible for the entire AV system design for the Aria Casino and Conventional Center, as well the Vdara Hotel. His colleagues were Andy Weaver and Scott Bray, now also partners in Entertainment Systems Designs. Smith says, "Harman offered my only option to satisfy my vision and the project requirements, specifically with London. The size of the project dictated that equipment rooms be spread out all over the campus, with complete interconnectability and inter-routeability of any an all sources, and that meant that we theoretically needed all of the BSS BluLink channels plus all of the CobraNet channels. We could not come up with a solution using any other platform."

Smith adds, "We evaluated several top manufacturers' speakers and a few not-so-well-known manufacturers. The top two choices were Tannoy and JBL. JBL won out due to the package. No other manufacturer had ceiling speakers for every application/condition that we encountered, complete with UL-listed and fire-rated back boxes and sleek and sexy grills coupled with the supporting product lines in cabinet-style speakers with the same voicing."

He adds, "There were three criteria that were the decisions makers: 1.) code compliance, 2.) sound quality and matching voicing out of speakers that fit the application to maintain the continuity of design, and 3.) and the total package, to streamline design process and purchasing. Harman won #3 hands-down; it was the only manufacturer that could provide amps, processing, and speakers from a single source. It also won #2 hands-down, with the vast product line and commitment to deliver product that was still in the design phase at the time. Number one was also won by Harman, as JBL has nailed the UL and fire process in functional and good-sounding back cans and integrated can speakers."

Smith says, "I believe that it is the best-sounding property in Las Vegas. Ultimately, the sound quality delivered from the BSS DSP through the Crown amps and out the JBL speakers is a

Photos: Courtesy of CityCenter Vegas

One of the convention center's ballrooms is set up for a banquet.

winning combination for this project. Given the number of amps, speakers, and processors, there have been very few failures, which is often more important than sound quality in a project of this magnitude."

Interestingly, he says, "Recently, I was given the opportunity to contract services for a couple of shows in the Aria Convention Center as a front-of-house engineer, working with the VerTec rigs that we specified for the Convention Services Department. The most recent show included two 10-box hangs of 4887DP with eight 4881ADP and eight 4881ADP subs, plus VP7212 delays and center fills, VP7210 front fills, and VP7212DP wedges. The consoles were a [Soundcraft] Vi6 for the front of house and another Vi6 for monitors; extra processing was via dbx Drive Rack 4800s. A 60-piece orchestra was on the main stage, with a five-piece band in the round on the center stage. The first set featured the orchestra alone; the second set was a combination of the two groups, with the third featuring the five-piece band alone. The system needed to function as one rig, and, with careful speaker placement and delay alignment, it was great-sounding, a dream to use, and incredibly easy to tune."

Also on the audio video gear list are 36 Shure PSM700 in-ear monitor systems, 24 Symetrix 581E distribution amplifiers, 80 Furman PL-PRO power conditioners/surge protectors, 42 Da-Lite screens, 42 Christie HD10K projectors, 80 Extron ISS-506 scaler/switchers, six Multidyne EOS-4000 HD-SDI switchers, 240 Multidyne HD-3000 fiber-optic transport links, one Ashly Audio MX-508 mixer, 24 Crestron PRO2 dual-bus control system, 71 Crestron TPMC-8L wired touch panels, and 16 TMPC-8X wireless touch panels.

Speaking of its work on the Aria and Vdara, Smith adds, "This is rumored to be the single-largest consolidated AV system design in history. Sixty venues, thousands of ceiling speakers, three complete concert line array systems, 20-plus equipment rooms, thousands of runs of fiber infrastructure, hundreds of input/output panels. The list goes on and on and on. The battle was a long one, but the winner, hands-down, on this project is the client."

Haze in the Night

In a city overrun with gimmicky, high-concept nightclubs, Haze stands alone. A 25,500-sq.-ft space on two levels with an enclosed VIP lounge and three full-service bars, it has something entirely novel to offer: Conceptually developed by the interior design firm ICrave, it's a spatially variable club, thanks to five oval articulating overhead truss units, suspended over the dance floor and housing the performance lighting rig. The dance floor ceiling height can be adjusted from 11' 6" to 21', with a nearly infinite number of possible ceiling configurations, thanks to individual and group truss control from the DJ booth.

According to Steven Friedlander, of Auerbach Pollock Friedlander (APF), Crave developed the concept to "explore the relationships between guests in different areas of the nightclub. By using larger-than-life props and performance areas dotted throughout the dance floor and circulation areas, ICrave was working to constantly redefine guests as both performers and voyeurs."

Friedlander adds, "To reinforce these relationships and to allow for dramatic changes to the dance floor volume, a lighting and rigging package was designed by John Lyons Systems that would allow complete control of the nightclub systems from a single control area in the DJ booth. Working with John Lyons Systems [JSL, credited also with audio visual design] and Fisher Marantz Stone [architectural lighting design], we detailed a flexible lighting and rigging system that interfaced with the surrounding architectural lighting." (Lyons' company, John Lyons Systems, consists of two divisions: Avalon Sound, specializing in the sales, design and installation of audio systems, and Moonlighting, for sales, design, installation, and programming of lighting systems.)

As Matthew Ezold, project manager and theatrical systems designer for APF on Haze, notes, the moving ceiling is the thing: "Articulating trusses above the dance floor and an extensive motorized video screen wall allow the view from the dance floor to shrink and expand, connecting the dance floor to the VIP area by recalling system presents or allowing operators to create new looks on the fly." Lyons adds, "The moving ceiling allows you to change the look of the space, as well as the orientation of the lighting, many times each night. With a retractable video wall, you can change the focus of the room as well."

The rigging system's custom oval truss units were fabricated by Total Structures; each is supplied with four Stagemaker BGV-C1 variable-speed hoists, customized by Niscon for the project, allowing for multi-axis positioning, with tolerances of ¼", controlled by a Niscon MK2 console control surface with Raynok software. An Ethernet network constantly monitors the truss speed, acceleration, positioning, and loading. The truss units incorporate DMX distribution equipment for the performance lighting gear, with hanging points located throughout the structure.

In addition, a fixed perimeter truss system, also supplied by Total Structures, surrounds the dance floor (and lower-floor VIP seating area), providing positions for the performance and architectural lighting units. Ten motorized perforated screens cover the front face of the performance catwalk, allowing for large-scale projections and theatrical scrim effects highlighting dancers on the performance catwalk. Control of the motorized screens, which is handled by a Creston control interface, is also integrated into the performance lighting Crestron master control touch panels, permitting individual screen height adjustment and overall system preset recall.

"I had done a number of moving truss systems in the past, and I felt they had been done *ad nauseam*," says Lyons. "One thing I wanted to achieve at Haze was a system that moved quickly and smoothly and articulated gracefully. The drive system for this truss set it apart from the others. The Niscon MK2 console control surface with Raynok software does things in three dimensions. These trusses don't just pan and tilt; they have four different types of movement. When they work in sync with each other, there are 20 motors in action, each of them getting unique information about movement and speed. For example, you can create a wave movement. It's pretty wild to

Haze encompasses 25,000 sq. ft. on two levels, with an enclosed VIP lounge and three full-service bars.

Photo: Courtesy of CityCenter Vegas

see the entire ceiling move as one single plane. If it tips from left to right, there are 20 motors moving at different rates of speed, but it looks dead solid, like a unified structure. It moves fast and slows down gently. I've never seen that kind of elegant movement before in a club."

The dance floor is lit with approximately 150 performance lighting units—a broad range of moving mirror, fixed lens, moving head, strobe, and LED wash fixtures. The lineup includes ten Clay Paky Alpha 700 HPE Beams, 20 Clay Paky Miniscan HP3 intelligent DMX mirror scans with irises, 24 Clay Paky Golden Scan 4 intelligent DMX mirror scans, and 10 Martin Atomic 3000 DMX strobes, outfitted with Atomic Colors scrollers. Lighting gear was supplied by PRG. The DMX network for the lighting gear is entirely by Pathway Connectivity. It includes Pathport Manager Plus 5301 four-port rack-mounted DMX nodes, two 6911 portable enclosures, fourteen 6901 standard enclosures, 14 Uno fixed one-port DMX nodes type EN1, and 18 C-Series 6202 two-port DMX nodes type EN2.

Lyons notes that the lighting gear was chosen in part for the way it could be stored into the truss. "I wanted the truss to look empty," he says. "When it moves, all you see is a nice clean ceiling. The Miniscans are placed inside the truss. On the perimeter, we needed something with punch and fast movement, which is how we chose the Golden Scan. The lighting industry as a whole has moved away from making mirror-scanning fixtures, but Clay Paky had what we needed. We wanted to have a beam fixture and, since Clay Paky makes a smooth, fast, lightweight beam fixture, we ended up with that."

Another distinctive feature in Haze is the wall-of-light system, which consists of 192 Elation OPTI Tri 30 LED PAR units plus 12 Martin Atomic strobes, mounted on a unistrut grid and fed with switched power and portable network nodes. "It's a very powerful effect," says Lyons. "I wanted it to read as a dot matrix." Providing atmospheric effects are a Martin Professional Hydra distributed head fog system, three Look Solutions Unique 2 hazers, and three Martin AF1 DMX-controlled fans.

The performance lighting system is powered from a single rack of 96 ETC Sensor dimmers and four 42-pole motorized breaker panels, supplied by Siemens. Completing the set-up is a set of switched and dimmed ETC power distribution devices. A portion of the architectural lighting system, which consists of 25 ETC Source Fours in various models and degree sizes, is also powered from here. Architectural and performance lighting control is provided by two

> "It's pretty wild to see the entire ceiling move as one single plane. I've never seen that kind of elegant movement before in a club." — John Lyons

separate control systems working in tandem over a multi-universe network DMX distribution system. Performance lighting and dance floor systems are controlled by the ShowCAD Artist computer-based lighting playback software, with Novation, Korg, and MOTU MIDI control hardware and surfaces. It was chosen by Richard Worboys, of JLS, because "we wanted the operator's interface to be user-definable," says Lyons. "Also, ShowCAD has a pixel-mapping engine that allows you to take complex lighting plots—like the LED wall of light—and treat it as one surface. With ShowCAD, you can effortlessly create animations that go up the wall and across the ceiling." A Crestron user-interface system with touch-panel control handles the architectural lighting.

Explaining the projection systems, Lyons says that there are ten screens, each of which is 7' wide. (They were supplied by Stage Technologies with Skyco Shading Systems, Inc.) "They're motorized and they come together to create a 70'-wide screen. We have five BenQ projectors, which are tied together to create a single large image. To do this, we use a media server program called Xnth; it was developed by Mark McCall, who works at Avalon, a club that I own in Hollywood." He adds that Xnth allows one to create 3-D images, by which he means imagery containing multiple planes of surfaces. (Think of an image of tumbling dice, which allows you to see three surfaces at once.) "You can do some really trippy graphics as the music is happening," he says. "The club's VJ creates live video on the fly, working with live imagery and stock footage, combining them to create an infinite number of visual effects on the 70' screen." Completing the visual system are four Panasonic WV-CS954 PTZ cameras, one Panasonic WV-CU650 PTZ camera controller, eight Kramer VP419xl video scalers two Kramer VP 12 x 8 VGA matrix switchers, two Denon DN-V210 rack-mount Pro DVD players. The BenQ projectors are MP771 3,500-lumen units.

Clear Sound in Haze

For the loudspeaker system, Lyons went with gear from Fulcrum Acoustics. It's a new company, founded in 2008 by Chris Alfiero, David Gunness, and Stephen Siegel, who previously were part of such well-known companies as EAW and Electro-Voice.

Lyons' association with the Fulcrum team goes back some time. "I collaborated with EAW on the development of the Avalon loudspeaker series," he says. "While I was there, two engineers I worked with started Fulcrum. I got together with them on boxes that are now part of Fulcrum's product line. With them, I was able to create products that were specifically suited to Haze."

Among other things, he says, "I wanted high-output, high-fidelity sound out of a small box. We were able to achieve that using processing with an algorithm that Dave Gunness came up with to correct the distortions inherent in coaxial design when moving that much mass at high SPLs. He put it in a nice enclosure, allowing us to put a lot of speakers into a small space." The result is "the kind of sound you get in your living room with esoteric high-fidelity speakers, but extremely high output; that's hard to achieve on a dance floor."

The Fulcrum Acoustic loudspeaker lineup includes ten JL-CCX 12 P 12" coaxial boxes, six JL-XL high-output dance mid-highs 16 JL-M dual 12" biamp DJ monitors, 28 JL-S dual 8" coaxials, 28 JL-P single 8" coaxials, six JL-115 single 15" subwoofers, 17 JL-215 dual 15" subs, and ten JL Sub 121 dual 21" subs. Speaking of the latter units, he adds, "we have them arrayed in a concrete bunker under the DJ booth, making a single source for the dance floor, with Gunness processing. It's really powerful and clean, a sound you've never heard on a dance floor before."

Other gear in the club includes eight JBL Control 322 C 12" coaxial ceiling speakers; 36 QSC AD-C152ST 6" ceiling speakers; ten Community Professional Veris 210 dual 10" subs. The amplifiers, all from Crown, include three I-Tech 4000, 30 Macro Tech-I 5000, seven Marco-Tech-I 9000, three CDi 4000, and one CTs 600 units. On the control side, a system from BSS includes two BLU-160 DSP network processors, one BLU-320 and one BLU-120 processors, and three BLU-10 remote controls. Programming of the audio network was by Bradley Drummond, of JLS. Filling out the list are four Technics 1200 M5G turntables; two Pioneer DJM-800 DJ audio mixers; two Pioneer CDJ 1000 and two DVJ 1000 CD players, two Formula Sound AC2 volume limiters, and two Rane SL.3 Serrato Scratch Live units.

Other key players include Anne Tovatt, senior designer of JLS, Thornton Tomasetti (structural engineer), PMK (acoustics consultant). Haze, which opened in December, is off to a flying start. Lyons, who owns clubs, is well-versed in the Vegas scene, having designed nine clubs there. "I know where the high-water mark is in Vegas, and I try to make each one different," he says. "I've been back to Haze five or six times. Even now, with the ceiling rigs and the lighting and sound, I still get chills."

ABOUT AUERBACH POLLOCK FRIEDLANDER, Performing Arts/Media Facilities Planning and Design

Auerbach Pollock Friedlander are design consultants for performing arts projects worldwide, including opera houses and professional repertory theatres, concert halls, performing arts training facilities, museums, planetariums, and popular entertainment venues in theme parks, casinos, cruise ships and night clubs. Services cover all aspects of theatre design, from planning and programming through design, documentation and construction administration to the detail development of all theatrical systems, including sound, video and communications.

Selected Projects: Aspen Music Festival and School, Benedict Music Tent • Berkeley Repertory Theatre, Roda Theatre and Thrust Stage • Boston Conservatory • Brigham Young University, BYU-Idaho Center Auditorium • Carnegie Hall, Judy and Arthur Zankel Hall • California State University San Bernardino, Valley Performing Arts Center • Carnegie Mellon University, Purnell Center for the Arts • Celebrity Cruise Lines • Conference Center for the Church of Jesus Christ of Latter-day Saints • Cyprus Cultural Centre • Denver Art Museum, Frederic C. Hamilton Building • Emerson College, Cutler Majestic Theatre, Paramount Center and Tufte Performance and Production Center • Emerson College, Los Angeles • Guggenheim Abu Dhabi Museum • Hayden Planetarium, Rose Center for Earth and Space • Joseph Meyerhoff Symphony Hall Renovation • Mesa Arts Center • MGM Grand Hotel and Casino, *KÀ*™ for Cirque du Soleil • MGM Mirage, Cirque du Soleil *LOVE*™ • New York New York, *Zumanity, Another Side of Cirque du Soleil* • Oregon Shakespeare Festival, Elizabethan Theatre, Allen Pavilion • Qatar National Theatre and Convention Center • San Francisco Conservatory of Music • San Francisco Symphony Center, Expansion of Davies Symphony Hall • San Francisco War Memorial Opera House • Santa Fe Opera Theater • SF Jazz • Shanghai Grand Theatre • Signature Center • Sonoma State University, Green Music Center • Space Center Houston, NASA Visitors Center • Sun Valley Music Pavilion • The Historic Salt Lake Tabernacle of the Church of Jesus Christ of Latter-day Saints renovation • The Venetian Macau, ZAIA™ for Cirque du Soleil • United States Capitol Visitor Center • University of California, Robert and Margrit Mondavi Center for the Performing Arts • University of California, Nanosystems Institute • University of Denver, Newman Center for the Performing Arts, Lamont School of Music • Verizon Wireless Amphitheatre at Encore Park • Yerba Buena Center for the Arts, Novellus Theater, Esplanade, Galleries and Forum.

ABOUT AUERBACH GLASOW FRENCH, Architectural Lighting Design and Consulting

Auerbach Glasow French provides comprehensive architectural lighting design and consulting services for a wide range of projects including municipal and commercial exteriors, exhibits, museums, attractions, public spaces, corporate offices, theaters, large institutional projects, retail, and hospitality. From project design and management to the design and documentation of custom decorative luminaries, optics and control systems, Auerbach Glasow French synthesizes the technical and aesthetic requirements of a project to achieve lighting designs which realize the goal of lighting as a defining element in architectural space.

Selected Projects: A.C.T. Geary Theatre • Berkeley Repertory Theatre, Roda Theatre • Brigham Young University, BYU-Idaho Center Auditorium • California Palace of the Legion of Honor • Carnegie Hall, Judy and Arthur Zankel Hall • Conference Center for the Church of Jesus Christ of Latter-day Saints • Contemporary Jewish Museum of San Francisco • David Brower Center • Epic Systems Corporation • Euro Disneyland Resort Center/Lake District Site • Fisherman's Wharf Exterior Renovation • Fox California Theatre • Hayden Planetarium, Rose Center for Earth and Space • Lotte Hotel, Seoul • MGM Grand Hotel and Casino, *KÀ*™ for Cirque du Soleil • Nautilus Theatre Sea World • New York New York, *Zumanity, Another Side of Cirque du Soleil* • Oakland Museum of California Renovation • Oregon Shakespeare Festival, Elizabethan Theatre, Allen Pavilion • Philadelphia Academy of Music • Pixar Animation Studios, Building I and Phase 2 Production Building • Rice University, Shepherd School of Music • San Francisco Conservatory of Music • San Francisco War Memorial Opera House • San Jose Convention Center • San Jose Greater Downtown Exterior Lighting Master Plan • Shanghai Grand Theatre • Space Center Houston, NASA Visitor's Center • The Metropolitan Museum of Art, The Wrightsman Galleries • Toledo Museum of Art, Sculpture Walk and Campus Master Plan • Transbay Transit Center • University of California, Law Building • University of California, Robert and Margrit Mondavi Center for the Performing Arts • University of Cincinnati, Eden Quad, CARE and Medical Sciences Buildings • Vancouver International Airport, New International Wing • Willamette University, Mary Stuart Rogers Music Center • Yerba Buena Center for the Arts, Galleries and Forum.

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April 2005

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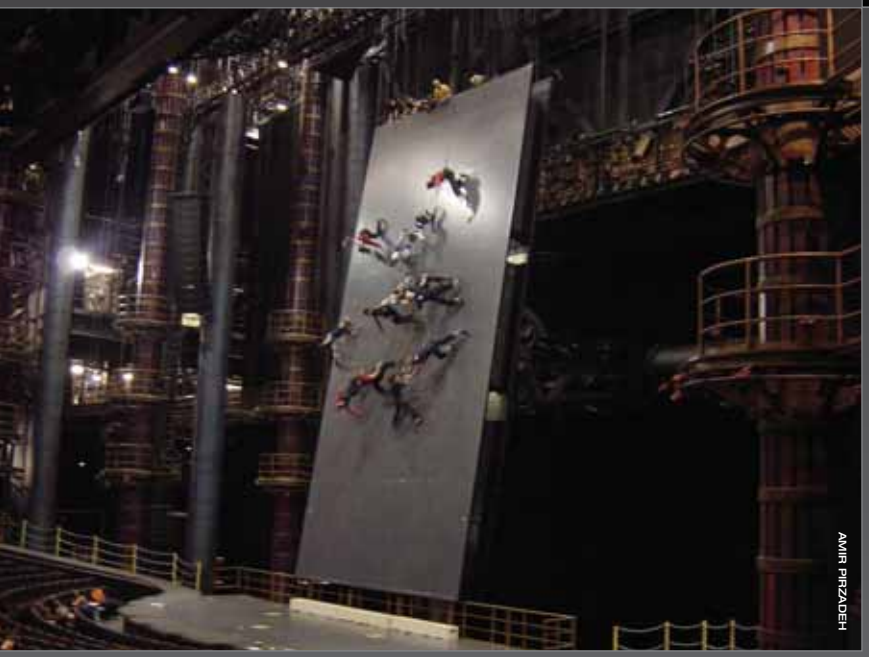
Entertainment, Presentation, Communication

KÀ :

THE DESIGN
THE TECHNOLOGY
THE ARCHITECTURE

Cirque du Soleil's astonishing achievement



Above: performers rehearsing one of the vertical battle scenes under work light on the Sand Cliff deck. Above right: The Sand Cliff deck rotated to a different position.

HOW DID

A look at the scenic automation,

By John Huntington

After 20 years in the business, it's rare that I see a live show and say, "Wow—how did they do that?" But when I saw *KÀ*, I was so amazed that I felt compelled to write a behind-the-scenes detail piece, something I haven't done in many years.

Under the brilliant creative leadership of Robert Lepage and the Cirque team, the technology in *KÀ* is completely at the service of the art. While *KÀ* certainly could be called a spectacle, it certainly is not a case where the technology trumps the art, like one of those depressing high-concept special-effects action movies. In many ways, *KÀ* is an example of the kind of show I've been hoping would exist—and have been advocating for—for many years, because the performers are often in control of the technology, rather than the other way around, and the technology is integral to the performance, not a gimmick. In *KÀ*, the technology allows the show to connect with and reach the audience, extending the performance; it doesn't get in the way.

Scenic Automation

There is no stage in *KÀ*. There is simply a huge pit, from which enormous performance spaces rise, descend, track, tilt, and swivel. The scenic elements were conceptualized by Mark Fisher; the Tatami Deck and the Gantry were designed by the entertainment team at the McLaren Engineering Group in West Nyack, New York, starting in late 2002; McLaren also engineered the Sand Cliff deck, which was designed by Tomcat. (The other sce-

nic pieces were done in-house at Cirque du Soleil, with the company also handling the integration of the pieces.) "Mark is a very clever man," says McLaren Engineering president Malcolm McLaren. "He thinks motion through, and he has a very good understanding of the mechanics that it takes to drive these things. So when he gives us his thoughts on how something could be actuated, he respects the laws of physics."

"so we actually had to write a cue automation front end for Nastran in Excel."

The smallest amount of power needed to make the gantry lift work as desired was "just less than a locomotive," says McLaren. After calculating all the trade-offs and determining the maximum move velocities, the resulting *KÀ* hydraulic power plant was designed for 1,250 HP continuous from electric pumps, and, according to McLaren, about 6,000HP

mic regulations resulted in a new answer of no. Therefore, the team had to come up with an enormous bracing structure for the tubes, creating a sort of freestanding 75' tall "building within the building," according to Stephen Sywak of McLaren. Many details were considered; the enormous vertical tubes are even fitted with acoustical dampers to keep them from acting like "pipe organ tubes."

A massive 6' diameter cross tube, called the "torque tube, connects the

THEY DO THAT?

projection, and show control systems in *KÀ*

The Gantry Lift

The enormous 50'x25' Sand Cliff Deck is actuated by the Gantry Lift, the largest and most incredible element of the scenic automation system—a mechanism you'd be more likely to see in an aluminum smelting plant than a theatre. The Gantry Lift mechanism can rotate the Sand Cliff Deck 360° at 2RPM (which is 12° per second) tilt it from flat up 100° (beyond vertical), and track the whole thing up and down vertically nearly 70' at 2' per second. Determining the maximum speeds of the Gantry Lift mechanism was a critical part of the design process, since a faster move meant more horsepower was needed. To make these horsepower calculations, McLaren made extensive use of sophisticated MSC Nastran design simulation software. However, Nastran "was designed for mechanics and assembly lines and so forth," explains McLaren's Murphy Gigliotti,

stored as hydraulic pressure in giant accumulators for peak usage during high-power cues. "The hydraulic power plant," explains James Tomlinson, the head of automation for *KÀ*, "will fully pressurize the accumulators (approximately 1,700 gallons) in about five minutes. The accumulator bank is reminiscent of the missile tube scene from [the 1990 film] *The Hunt for Red October*."

The Gantry Lift mechanism itself tracks on two enormous 4' diameter steel tubes that run from the lowest floor of the building to the roof, made, along with the rest of the "static" steel, by Fabriweld, of Salt Lake City, Utah, a company whose primary business is roller coasters and other enormous structures. McLaren Engineering was initially told that these tubes could be connected to the massive existing structure of the MGM's roof, but, partway through the design process, compliance with seis-

two 'hammerheads,'" says Tomlinson, "which are guided by 75- and 150-ton capacity Hilman rollers traveling on steel wear plates on the columns." The rollers, made by the Hilman company of Marlboro, New Jersey, are generally used to move massive loads, like oil rigs components, entire buildings, and bridges. Perpendicularly attached to the center of the torque tube is an arm which goes out, towards the audience, to a pivot joint called the "wrist," which, according to Tomlinson, "includes a 10' diameter Rotek bearing typically used in tower cranes," and connects to the Sand Cliff Deck itself. The moving parts of the Gantry Lift were made by Timberland Industries from Woodstock, Canada, a company whose primary business is offshore and timber harvesting equipment, giant winches and other huge mechanisms. The whole torque tube assembly and arm gets lifted, says McLaren,

"by what we understand to be the longest cylinders ever produced in North America—a 70' stroke. When they are fully extended, the cylinders are 145' long." The cylinders are so massive that they must only ever be in tension—if put under a compressive load, they might buckle.The cylinders were made by Parker, of Cleveland, Ohio and supplied (with the rest of the hydraulic system) by Atlantic Industrial Technologies, of Islandia, New York, working in conjunction with GS-Hydro U.S. Inc., of League City, Texas. Even getting the cylinders to the site proved a challenge. "We had to get special trusses fabricated," says McLaren's integration project manager, Jay Reichgott, "just to support the 75' hydraulic cylinders during transit."

The Sand Cliff Deck

The 80,000lb. Sand Cliff Deck was manufactured by Tomcat USA in Midland, Texas. Longue Vue Scenique of Montreal, according to Tomlinson, "supervised the artistic treatment of the playing surface by Tomcat staff." The deck is over 6' thick, and, according to William Gorlin, McLaren Engineering VP, consists of, "a steel primary truss structure that bolts to the slew ring. Mounted to that steel structure is an aluminum outer structure and deck system; it's configured so that you can have technicians inside to service all the pieces." During one part of the show, adds Tomlinson, "an 8 x 16' 'refuge' platform flies in from the grid and attaches to one end of the vertical Sand Cliff Deck, then moves with the Sand Cliff Deck as it rotates, tilts, and descends to the basement. It has a trap door for access to and from the Sand Cliff catwalk system."

In addition to lifts and other features of the deck, there are 80 pegs, each roughly 2' long, manufactured by Microtrol of Montreal, that can shoot out at 8' per second. At that velocity, the pegs appear to the audience in a quarter second, which is surprisingly fast since they are run by electric linear actuators. These pegs were designed so that performers can slide, swing between, and catch them when the Sand Cliff Deck is vertical. Many performers slide more than 60' from this platform to their "deaths," where they land on an enormous, hydraulically tensioned safety net in the pit, out of sight of the audience. Some falls are so extreme that air bags are placed on top of safety nets to break the performer's fall.

In one stunning scene, the Sand Cliff Deck is covered with "sand;" then the deck is raised before our eyes and the sand pours off. Real sand was originally considered but abandoned, due to weight and dust issues. The team considered walnut shells and Santoprene, but eventually chose cork. The material is contained on the edges of the deck by 3" "flippers," run by 18 electrical actuators, which are retracted when the material is dumped.

"No one wanted to be the one to flip the switch the first time. The system was so expensive and massive that there was no room for error."

The Tatami Deck

The 30 x 30', 75,000lb. Tatami deck is an amazing feat of engineering and construction, but it's actually the "small" piece on the show. The deck was named, according to Tomlinson, "because the opening scene with Tatami mats was to play there," but that scene was later moved to the Sand Cliff Deck. The Tatami deck is supported by a giant, 65' long, two-stage "drawer slide" mechanism, which is tilted at a 4° rake towards the audience from its anchorage upstage, with 45'-6" of cantilever. The Tatami deck and mechanism is actuated by 75 and 150 HP electric motors, and was built by Show-Canada in Montreal, with scenic treatment again by Longue Vue Scenique.

Scenic Automation Control

Controlling all this scenic automation equipment was the daunting challenge taken up by Stage Technologies, which has offices in London and Las Vegas. The company's Nomad system for *KÀ* controls over 40 arbor winches; 16 high-speed winches for the performers in the battle scenes, each axis with individual radio control; five lifts controlled by 26 motors; a giant bird flown over the audience, controlled via five 2,200lb winches with wings flapped by performers; the 80 pegs in the Sand Cliff deck; three small pod lifts [called "sand traps," according to Tomlinson]; 12 winches for the forest scene; 18 hydraulic safety net winches in the pit; and 16 actuators for the Sand Cliff deck's edges.

Control is highly distributed throughout the system. "We have 17 nodes in the theatre, each controlling up to 40 axes," explains Kevin Taylor, Stage Technologies' director of electrical engineering. "The desk sends commands to the nodes, and the nodes do the housekeeping, whilst the axes deal with actual position control. There are the Delta Tau [hydraulic control] nodes, 12 Siemens S7_400 PLCs, and the entire safety Estop [emergency stop] system is done using a Siemens safety PLC. In addition, we have two extra processors, one for the interlock system and the other to run the 3D flying of the bird. The consoles are connected over the primary command network, which is Ethernet, and the MaxisID internally positioning drives connect to the node PLCs over ProfiBus. A

separate high-speed deterministic network is used for synchronization. The crew uses four desks during the show, with a fifth backup in the event of a failure, and, happily, we have had no desk failures to date. In addition, we provide a local backup network with a completely independent path for controlling axes via a hand held HMI in a crisis. In the worst case, during the climb scene using the pegs, we could be running 90 axes at once. The majority of the time, we are running 20-25 axes at once. In the event of a motor failure, we can continue to run the lifts right down until only two are left. The lifts are the show, so there is a huge amount of redundancy there."

Hydraulic Control

While the Stage Technologies system provides overall control of the scenery, the hydraulics control is handled by Tisfoon Ulterior Systems, of Raleigh, North Carolina, using a Delta Tau motion-control system as a basis. "We provided Tisfoon with a spec at the beginning of the project," explains Taylor, "to enable us to make it mimic standard axes [in the Nomad control system]. The operator can instruct the axes to move to a different dead [target position] at a different speed for every cue as he so wishes." The Tisfoon system takes it from there, and also provides a local controller so that the hydraulic systems can be run independently of the Nomad. To protect the cylinders, the Tisfoon system provides "a closed loop 'charge-up' of the rod side of the cylinder before releasing the brakes," explains the company's president and chief software engineer Amir Pirzadeh. "This insures that the valves are operational and that there is oil in the rod side before the brakes are released. The load balancing is a closed-loop system on top of the regular positioning loop. This system uses the load cell information from the four cylinders to lead or lag an upstage axis (relative to downstage) for proper load balancing." The Tisfoon system incorporates a "VCR" feature, where all data related to the hydraulic systems is logged every 100ms continuously for 24 hours; if a problem develops, precise information is later available for troubleshooting. "No one wanted to be the one to flip the switch the first time," says Pirzadeh, only partly in jest. "The system was so expensive and massive that there was no room for error. I was not only the developer, but became the de-facto operator, as well."

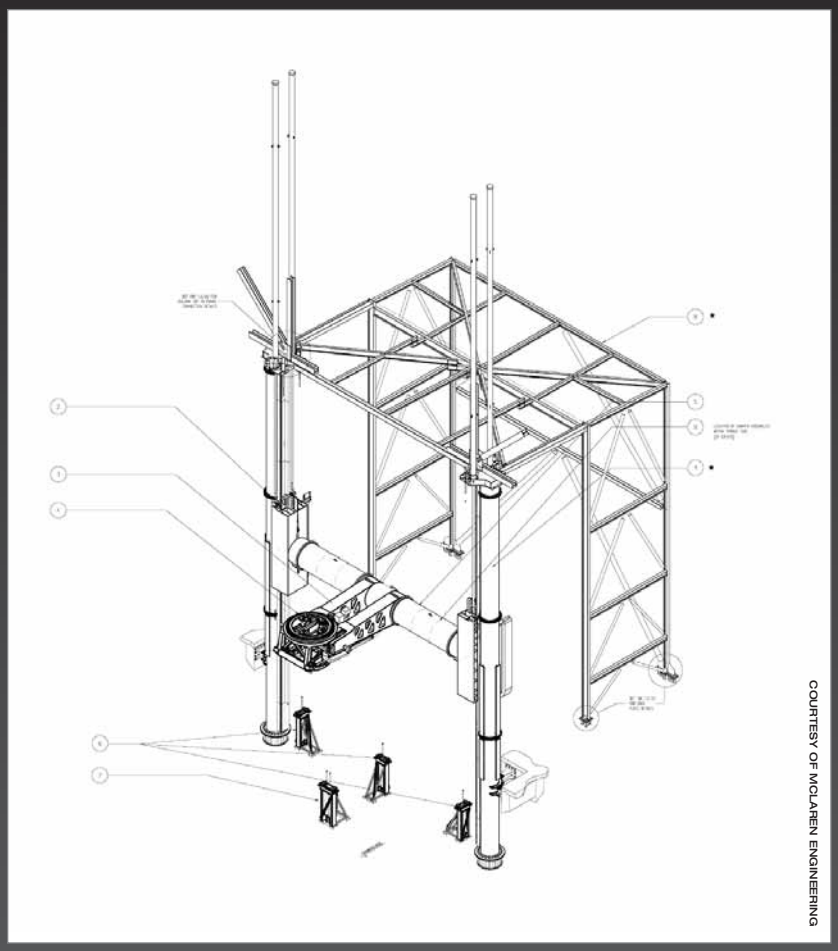
Performer Winches

Some of the most incredible scenes in *KÀ* are the "vertical battles," where performers appear to defy gravity while battling on the Sand Cliff Deck in an almost vertical position. In fact, they are supported on high-speed winches supplied by Stage Technologies. Each of the 16 performers controls his own movement through a radio control, with the transmitter in his costume, using a handset controller. "The winches", explains Stage Technologies' Taylor, "are capable of running at up to 14' per second, and accelerating and decelerating in .75 seconds. The radio units are a standard component supplied from Germany, meet the very highest standards, and, in the event of [interference], shut down to prevent unauthorized movement."

Malcolm McLaren, summing up the team's experience on *KÀ*, says, "When the Ford Motor Company releases a new car, they design it, test it, crash it, run it around the track a few thousand times, tweak it, alter it, and value-engineer it. We have to build one prototype and it has to work, with time and budget constraints. It's not easy, and the tricks just keep getting bigger and bigger."

In this work light shot, the massive Sand Cliff deck is at about mid-height, with the Tatami deck retracted upstage.

COURTESY OF MCLAREN ENGINEERING



COURTESY OF MCLAREN ENGINEERING

McLaren's schematic view of the Gantry Crane mechanism and bracing structure.

Projections

One of the most groundbreaking aspects of *KÀ* is Holger Förterer's interactive projection design. "I attempt to express poetry, emotion, and content in the language of mathematics and algorithms," he explains. "This is my artistic language, and the result on-stage is referred to 'augmented reality.' We do not use any real video footage in the imagery of the production—all images are generated on-the-fly by the projection computer in real time using physical or artificial simulation. Water, stone, clouds, air are all completely synthesized by the image computer—at the same instant they are shown—and react to the action on stage." This is the hallmark of Förterer and his team's work on *KÀ*—the performers are actually controlling the imagery that surrounds them in a fully interactive and meaningful way. While, of course, there is a tight structure and some general predictability to the performers' motions for story and safety reasons, Förterer says, "We give the performers the freedom to improvise and follow the set wherever it moves."

Tracking the Performers

The freedom to which Förterer refers is quite apparent when you see the show. In one example, a scene called "The Deep"—a giant ship full of performers is raised, and performers fall off and "drown," descending almost the entire stage space, followed by a trail of bubbles. Förterer is tracking the performers, *creating the bubble images in real time and projecting them onto the scrim*. "Here, we are using camera tracking," explains Förterer. "We are lighting the actors with invisible infrared LED light. The IR camera acquires their movement through a scrim onto which we project the bubbles. The use of infrared light is necessary to avoid feedback of the projected image into the camera and be able to light the scene brightly without the audience noticing anything. My tracker picks up movement in the scene and generates bubbles based on the size and motion of the objects causing it. This is one of the scenes where projection helps in telling the story."

Scenic Interactions

In "The Climb", "The Blizzard," and—the most astonishing scene of the show—"The Battle," Förterer not only tracks the performers themselves, but can sense how they are interacting with the scenery. For example, under the Taraflex performance surface of the Sand Cliff Deck, are sensing tiles manufactured by Les Ateliers Numériques of Montreal, which turn the entire deck into (to overly simplify for the purposes of explanation) a giant touchscreen. Förterer uses this information to create graphical waves and other images that radiate out from where the performers' feet contact the deck, or to create interactive falling "rocks" that they must dodge. "The system of sensors in the deck was specifically created for this show by the interface designer and inventor Philippe Jean from Montreal," explains Förterer. "It works on a technology comparable to the musical instrument theremin, which allows musicians to control electronic instruments by moving their hands in the air. The deck is literally able to 'sense' the proximity and presence of the artists to and on the surface. The maximum sensor depth is approximately 4". So it makes a difference if you are very close to the surface, tiptoeing, or sliding across it at a certain distance." JT Tomlinson, Cirque's head of automation, adds, "The sens-

McLaren: "When the Ford Motor Company releases a new car, they design it, test it, crash it, run it around the track a few thousand times, tweak it, alter it, and value-engineer it. We have to build one prototype and it has to work with time and budget constraints. It's not easy, and the tricks just keep getting bigger and bigger."

ing tiles system detects performer locations on a 6" grid pattern all across the deck and can simultaneously report every one of those coordinates, at 60Hz, via Ethernet."

With all that imagery created in real time, Förterer then projects it onto real, physical, three-dimensional, moving scenery, and the approach is so effective that many in the audience won't even realize they are looking at projections. To accomplish this, Förterer must track the movements of the scenery exactly. The projection system "listens to positions that multicast out through the Nomad system," explains Kevin Taylor, Stage Technologies director of electrical engineering. "The positions from this system are sent every 50msec, and because of the size of the pieces a lot of the data is sent in 1,000th or 10,000th of a degree resolution." To cope with the latency of the various systems, and potential encoder error, Förterer says, "We actually use an adaptive physical model that predicts the position of the stage into the future and smooths those values correctly to avoid both lag and jitter, so we're always on. I was surprised myself to see this work smoothly after punching in the maths for a month, but I think we mastered something you could never pre-cue or plan, since every show will not only be slightly different on the artistic, but also on the technical side."

Projecting it All

Three converged Barco Director R18 DLP projectors are used to give the required brightness and project from the back of the auditorium to create a canvas across a large part of the performance area. "Theoretically, we could project onto any moving surface within the show," explains Förterer. "We are using different convergence files [which call up different projector settings] to take care of the depth ranges. We are also using dousers in the drowning scene to avoid hard edges of video black resulting of the coupling, and to be able to kill all projection in an emergency." All projections on the main moving stage use 3D modeling, "but we use a technique [similar to] the bubbles in the drowning scene to match the position of the actors one-by-one,"says Förterer. "A two-dimensional distort[ed] image would not have hit the main stage without causing warping on the close or far edge."

Infrastructure

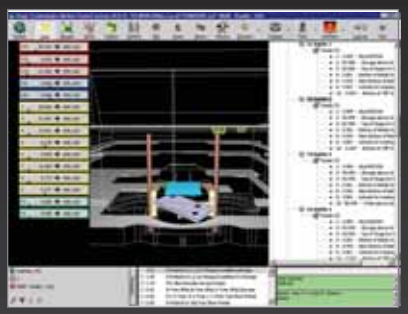
Förterer needed a lot of computer horsepower and I/O for this project, and also had to ensure that the system can be maintained and updated over the projected 10-year run of the show. "We are using dual-processor PCs," he explains, "to ensure fast calculations and display of all virtual simulation and imagery. We kept away from most proprietary packages. Windows-dependency was reduced to a minimum; we are using OpenGL, and we skipped using the Intel Performance Libraries, since I strived for minimum dependency on the platform or processors used. Not too many portions of the code would have to be rewritten if the [IT] market went berserk for whatever reason."

With projections so critical to the show, Förterer had to also ensure that there was sufficient redundancy in the system. "We have a backup PC for all vital systems," he explains. "Switching to backup systems is partly automated. On a crash of the main computer, the backup computer would automatically take over within a maximum of two seconds, causing the Barco projectors to smoothly fade into the new system's video output. This would be much faster than the operator could diagnose the problem and react by himself."

The front end for the system is actually a lighting desk, and, says Förterer, "we are not connected to the rest of lighting, to avoid both systems going down at the same time. Luc Lafortune prepared backup lighting if projections should fail—and if a certain part of lighting should, we are still ready to go."

Show Control

As a show control guy who has seen and enjoyed almost every Cirque production since 1991, it has always bothered me that some of the cue timings across and between departments were not as tight as they could have been. This is not the case on *KÀ*, and this is partly because of the use of show control for certain aspects of the show. A widely misused and misunderstood term, show control simply means interconnecting more than one pro-



COURTESY OF STAGE TECHNOLOGIES

Two screen captures from the Stage Technologies Nomad scenic automation system showing some of the show's systems.

duction element control system (scenery, projections, sound, etc.), and on *KÀ*, says Förterer, "our system is networked to quite a few systems in the theatre." The projection system receives positional data from the scenic automation systems as detailed above, and then also communicates via Ethernet to sound. "We get data from projections," explains sound designer Jonathan Deans, "and then convert it (via MAX MSP [software]) to MIDI to trigger our effects." In some scenes, this structure allows performers to not only generate imagery interactively, but trigger sound effects as well. Cirque has recently been implementing show control systems on its cruise ship projects. However, for the more traditional shows, *KÀ* is "the first attempt for two departments to link," according to Deans, who has worked on many Cirque productions for more than 10 years.

Rigid, time-based control is what most people think of when they think of show control, and this approach has become routine in many shows today. However, the distributed and interactive interconnection seen on *KÀ* and other recent projects is an even more interesting and powerful way forward, and is one that I hope we will see more of in the future from Cirque and others.

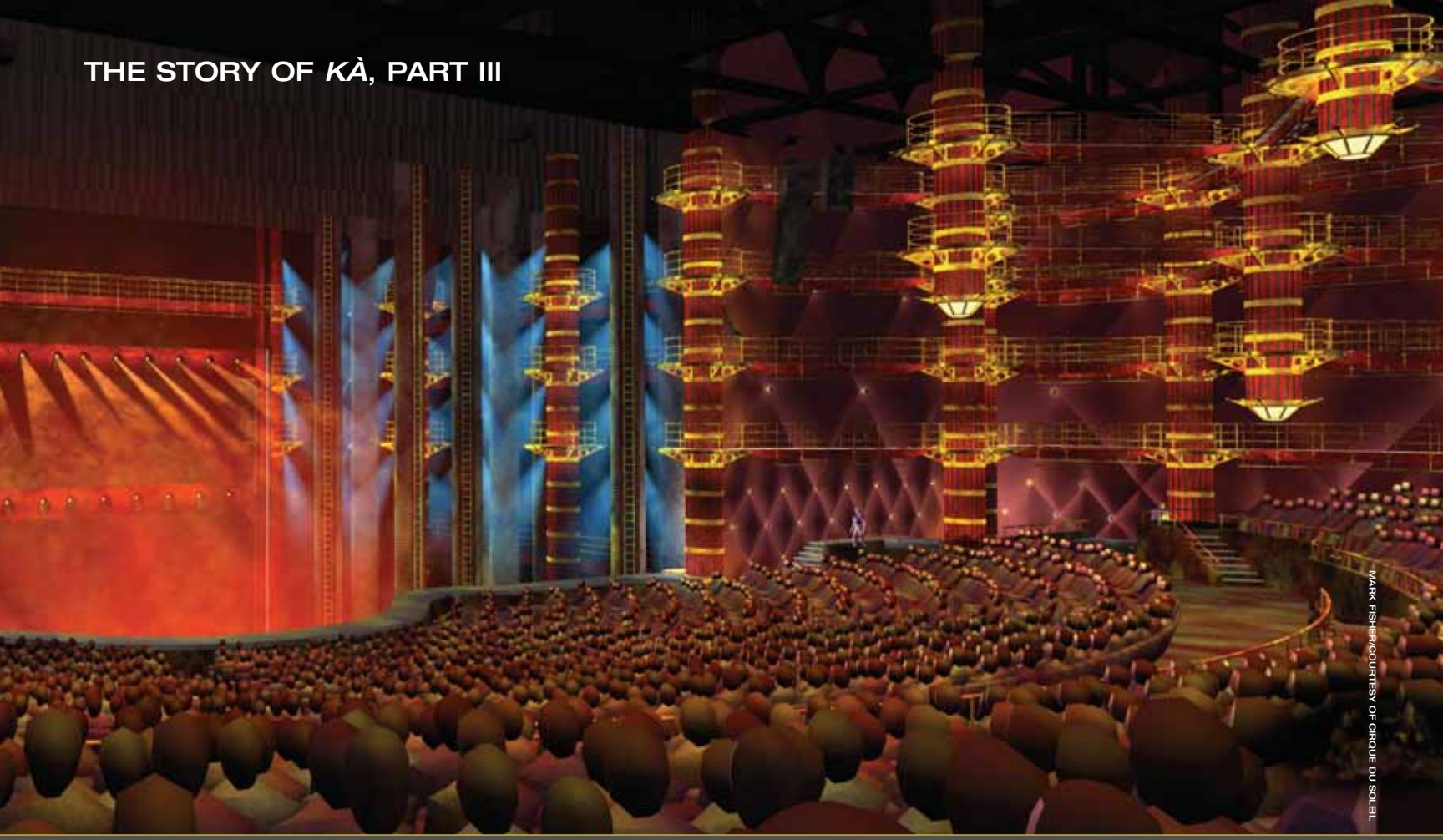
Everyone I know is tiring of me talking about this show, but I have to say that *KÀ* is now Mecca for anyone interested in the intersection of art and technology for live performance. You should make the pilgrimage yourself, and it's worth plopping down $150 for the ticket, as I did. *KÀ* sets a new standard in artistic use of technology, raising the bar so high I'm not sure who will have the imagination and resources to exceed it.

(John Huntington is an Associate Professor of Entertainment Technology at NYC College of Technology, and is author of the first book on entertainment and show control: Control Systems for Live Entertainment. *He can be reached through his consulting company at http://www.zircondesigns.com/.)*

Förterer: "I attempt to express poetry, emotion, and content in the language of mathematics and algorithms. This is my artistic language, and the result on-stage is referred to 'augmented reality.'"

TOMAS MUSCIONICO

Förterer's projections can be seen clearly in this photo, although to fully appreciate them you have to see them in motion.



MARK FISHER/COURTESY OF CIRQUE DU SOLEIL

INSIDE THE THEATRE

How a Vegas showroom was remade into the home of *KÀ*

By David Barbour

The theatre that houses *KÀ* has been described here as a unique space; its most extraordinary aspect may be that it was achieved within the confines of an existing building. The former home of *EFX* was reduced to a shell and a completely new theatre and lobby put in its place, accommodating the design and production requirements of Cirque du Soleil.

Although Mark Fisher is the designer of the theatre, its execution was an ensemble effort, involving architect Marnell Corrao Associates, theatre consultant Auerbach Pollock Friedlander, acousticians Pelton Marsh Kinsella, production manager Stéphane Mongeau, technical directors Paul Bates and Matthew Whelan, vice-president/production Luc Plamondon, assistant vice president, production Gabriel Pinkstone, and senior supervisor/theatre projects Don MacLean, among others. In addition, architectural lighting was designed and specified by Auerbach Glasow. The two Auerbach firms will be familiar to readers of this magazine—their many credits include the Judy and Arthur Zankel Hall at Carnegie Hall, the Borgata Hotel Casino and Spa in Atlantic City, and the theatre for *Zumanity,* another Cirque du Soleil show in Las Vegas. Pelton Marsh Kinsella has provided services for numerous theatres and performing arts centers across the country as well as venues such as the Golden Moon Hotel and Casino in Choctaw, Mississippi Marnell Corrao has worked for such hotel/casino players as Harrah's, MGM/Mirage, and Wynn Design and Development.

As has already been stated, perhaps the most unique aspect of the theatre is that it lacks a traditional stage. Instead, the show takes place within a 50' deep cavity filled with moving scenic elements. (According to Michael McMakin, project manager, a basement was already in place

from the building's previous life, but, he adds, "A fair bit of excavation was required for the gantry lifting columns.") Because the performance extends into the audience, the boundaries are blurred between show and spectators, a unity that could probably only be achieved in a situation where the theatre and set designers are the same person.

First, the floor area of the stage was removed, creating an abyss housing the five stage lifts, resulting in a total of 4,950 sq. ft. of flexible staging area. In addition, the theatre configuration was altered, from a cabaret space filled with booths, tables, and chairs, to a theatre that seats 1,951 audience members. In addition, a new set of catwalks and grid decking over the seating area was added for performer access and lighting and technical systems in the front-of-house area. The control booth was reconfigured to allow space for the production's extensive lighting, audio, projection, and automation controls. The control suite features 2,850 sq. ft. of booth space and 170 linear feet of glass; it offers a view of the entire performance area.

Meanwhile, the building's infrastructure had to be totally reworked to accommodate the production's extensive technical needs. All spaces, including rehearsals halls, technical offices, training rooms, dressing rooms, shoe and costume maintenance areas, green rooms, and a new annex (housing Cirque du Soleil offices, support facilities, and a rehearsal room with a full-span overhead gridiron) were interconnected with sound, video, and communications from the stage area. New structural supports were added for the extensive automated rigging system, including an 82' long hoist-support structure in the arbor pit, as well as a 37' long "battle-hoist" structure on the grid. A series of new company switches and equipment power were distributed throughout the theatre, for chain hoists, special effects, and specialty equipment. And a new multi-tiered rigging system was developed at the grid level to allow for sophisticated stage automation systems. (Jaque Paquin conceptualized and designed, with Pierre Mase the theatre's rigging and acrobatic systems; project manager Jeremy Hodgson, working with Tom Neville of Auerbach, developed the system).

Also, three high-speed data and communications networks were installed in the space. These independent systems are set up to ensure that the automation, lighting, and hydraulic systems can function separately and also be synchronized. Each system is provided with a minimum RAID-1 shared-drive array to help ensure system redundancy.

In order to achieve many of the staging effects discussed in the previous articles, Auerbach Pollock Friedlander developed an infrastructure for the stage machinery to Cirque's criteria. This included a number of elements, such as the five stage lifts previously referred to. Also, 40 individual counterweight-assist automated hoists were mounted in the newly configured arbor pit area. These hoists automate the operation of lighting pipes, special effects, curtains, and scenic elements. Five 1,000kg specialty hoists were designed for flying human scenery in a circular path over the audience and back into the stage area and six 1,000kg specialty hoists were designed for large scenic transitions.

An additional 16 high-speed hoists are used for flying human scenery for a dynamic encounter sequence involving several performers. Here is another instance in which the performers control the technology: each of them controls his or her own hoist via a wireless controller integrated into his or her costume. Using this system, one can travel up or down at a maximum of 4' per second. There are also 18 high-speed mooring hoists to enable the rapid deployment of the safety nets used in the battle sequence. These hydraulic hoists can deploy the safety nets in less than 10 seconds. Then there are the 80 high-speed scenic pegs, mentioned earlier, which are actuated from within the Sand Cliff Deck.

The implementation of the Gantry and Sand Cliff Deck was also a group effort. Jay Reichgott, the systems integrator of McLaren Engineering, coordinated the installation, tuning, and acceptance-test procedures of the Gantry. Jeremy Hodgson, Cirque's automation project manager kept an eye on the project. Project manager David Prior coordinated the fabrication, installation, and integration of the Sand Cliff Deck, working with Tomcat. During the acceptance test procedures, Tom Neville of Auerbach, served as facilitator. The Sand Cliff Deck system, the largest ever installed in a theatre, makes it possible to move a 280,000lb. scenic element at 2' per second.

There were extensive rigging and automation issues to be addressed, as well. The theatre's fly tower was re-rigged with manual and counterweight-assist linesets. The working areas over the stage and audience were equipped to support motorized spot winches.

Working together, the lighting staff at Cirque du Soleil, including lighting designer Luc Lafortune and lighting director Jeanette Farmer, and Auerbach Pollock Friedlander developed one of the largest and most complex theatrical lighting networks ever designed for a single venue. A completely new dimmer system was installed, consisting of 24 Strand SLD series dimmer racks in three dimmer rooms. Two thousand twenty-six 20A dimmers and forty-five 50A dimmers are network-controlled. All dimmers are status-reporting, with local PCs running Reporter Pro for this purpose in each dimmer room. In addition to

Mark Fisher's stunning picture of the theatre reveals many key characteristics, including the Post and Beam structure.

the main dimmer racks, two remote dimmer packs are located in the Sand/Cliff Deck and are controlled via wireless Ethernet.

There is extensive distribution of 20A and 50A dimmed circuits, utilizing custom-fabricated plug boxes. A wide-ranging system of cable trays was installed throughout to allow multi-cable distribution from these circuit boxes to virtually any light fixture hanging in the theatre. Emergency power transfer to selected architectural circuits is handled with six 24-circuit, UL 1008-compliant emergency transfer panels. All networked power circuits for consoles, PCs, and other sensitive computer-grade components are on dedicated centralized UPS circuits. A large system of switched loads of 120V single-phase and 280V single-phase are distributed throughout the theatre and are under network control.

Lighting control is provided by two Strand 550i 54-submaster consoles, each with 6,000 channels and quad video displays; four Strand 520i 24-submaster consoles with 6,000 channels and dual video displays; two Strand 510i rack-mount consoles with 6,000 channels, and two High End Systems Wholehog II consoles with Strand ShowNet network nodes. Forty universes of DMX can be mixed and matched to any of the 100 double-network taps distributed throughout the theatre. Sixty portable SN 110 nodes are available, all using power over Ethernet ports. There are five wireless data access points allowing use of handheld wireless remotes, and/or a remote wireless notebook for console video displays anywhere in the theatre. (Michael Lay was project manager for Strand).

All network equipment is housed in nine racks interconnected with three fully redundant fiber-optic backbones. All network switches/hubs are managed and patch bays are included for all taps and nodes. AMX-based card racks are also located in the racks for use of touch screens for network, house, and work light controls, and network video distribution electronics for touch screen feeds. In addition, the racks include space for system file servers and rack-mount consoles. Remote AMX-driven color touch screens, in both fixed and portable configurations, are located throughout the theatre for use by stage managers and lighting technicians to control cue lights, rehearsal lights (featuring digital virtual sliders) and to view remote stage video feeds.

Beyond lighting, extensive sound, video, and production communications systems were designed for the space in close cooperation with Cirque du Soleil's audio staff and Jonathan Deans. The Level Control Systems (LCS) computer-controlled audio matrix and processing system is in three sections: front-of-house, stage monitoring, and VRAS. The front of house system controls 144 sources in 184 matrix outputs. LCS is also used to control the stage monitoring system with a 112 x 80 matrix. Modular Cue Console control surfaces are used for sophisticated live mixing and routing control of microphones and other musical instruments and effects sources. The LCS Virtual Room Acoustics System (VRAS), as has been previously discussed, is used to enhance and augment room acoustics, providing real-time ability to alter reverberation time and delay characteristics as needed, using a 40 x 128 routing matrix and special DSP processors.

Much more gear was specified for the production. Eighty-eight channels of Aphex remote-controlled microphone preamplifiers are provided. More than 90 primary and surround loudspeaker systems by Meyer Sound (MILO, CQ, and UPA series) Nexo (PS series), and EAW are located throughout the stage and auditorium. Effect processors are by t.c. electronic, Presonus, dbx, Klark Teknik, and Aphex. Sennheiser provided 16 wireless mic channels.

In terms of communications systems, a 72-port Clear-Com Matrix-Plus-3 digital intercom system is interconnected with a Clear-Com 72x8 analog matrix and 24 channels of Telex wireless intercom. More than 16 channels of in-ear monitors and 10 IFB monitor channels feed 100 receivers. Backstage monitoring is provided by a BSS Soundweb computer-controlled monitoring and paging system. The lobby playback systems use Tascam 2424 hard-drive players and BSS Soundweb computer control and routing systems, which feed Electro-Voice special effects loudspeakers. Custom theatre seating was supplied by Irwin Seating; as Leonard Auerbach himself notes, "The customized chairs were critical to the integration of a stereo pair of loudspeakers for each patron concealed in the back of each seat."

Also, more than 25 production

In Fisher's design, even though the theatre is quite large, it retains a notable sense of intimacy.

fixed-focus and remote-controllable color video cameras are routed through a modulated video system for monitoring performers, musicians, and critical backstage systems. An FM assisted-listening system for the hearing-impaired is provided.

The theatre is designed to provide lighting that will begin transporting audience members to the magical world of KÀ as soon as they enter the theatre. Guests enter from the casino into a dark, low-ceiling space with lights the color of glowing embers. Large tree trunks, banded with light, marks the edge of the main lobby, where the ceiling soars to expose the full height of a wall, which appears to be an inverted ancient ship's hull. Colored light plays on the surface of the vessel wall. Before the performance, musicians located in the trees play the strings of a giant harp.

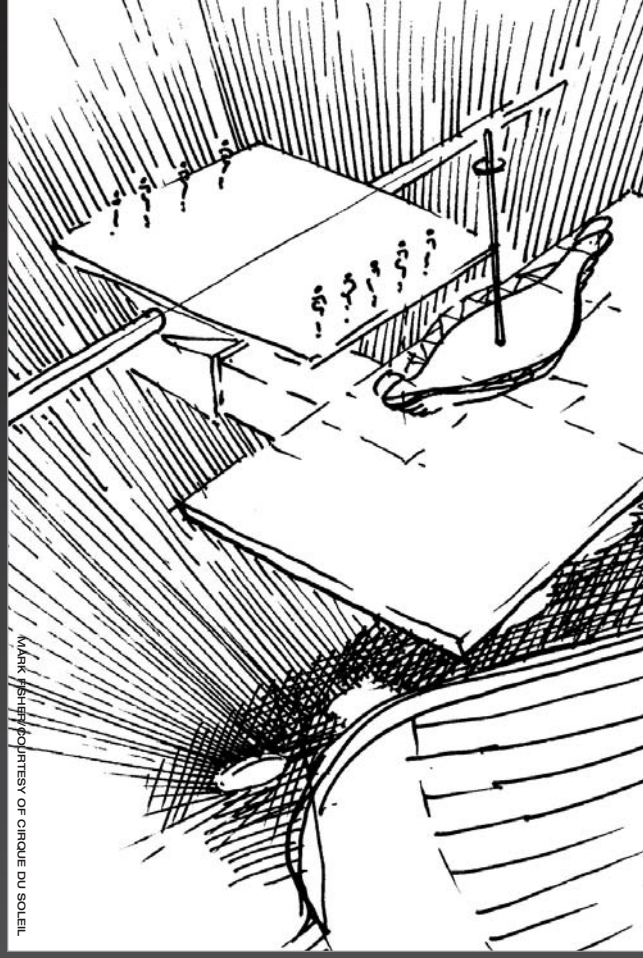
The main lobby theatrical lighting, designed and project-managed by Farmer (drawing inspiration from Fisher and Lafortune) is provided by ETC units, using color and pattern projectors to light the floors, metal mesh wall curtains, and stringed harp. ETC Source Four Zooms light the vessel wall. Other Source Four Zooms with gels light the lengths of the harp strings. Mole-Richardson Nooklites mounted to the exposed structural beams are inspired by the Post and Beam design. Surface-mounted MR16 monopoints, by BK Lighting, are recessed into the floor to reinforce the shape of the curved glass wall and uplight the glass fins.

Openings in the vessel wall led to the concession counters and public rest rooms. These spaces have an industrial feel, with metallic painted finishes and glow acrylic panels in the ceiling, walls, and the fronts of the counters. Fluorescent strips with dimming ballast and T8 lamps are mounted so as to be visible behind the acrylic panels. Prescolite recessed adjustable MR16 downlights with colored lenses light the counters. Compact Shaper Lighting fluorescent sconces with dimming ballast create a sense of glowing portholes leading to the rest rooms.

Entering the audience chamber from the lobby, one passes through a sheet of saturated blue light into a glowing blue entry vestibule. The blue light is created by a fiber-optic narrow beam wall-grazer by Glass Illuminations mounted in the ceiling behind the first set of doors. Mounted on the ceiling line at the side walls are Color Kinetics ColorBlaze fixtures with blue LEDs to fill the void with blue light. Recessed Prescolite adjustable MR16 units with blue glass filters provide pools of light at the entry doors.

In the audience chamber, the ramp is lit with Architectural Area Lighting Occulus fixtures above the entry doors. Architectural MR16 and PAR lamp fixtures are integrated into the Post and Beam structures. The house lighting system uses Kurt Versen fixtures mounted halogen downlights, each customized with a yoke and top relamping feature. The fixtures are mounted to the technical catwalks above the house and have narrow or medium distributions based on throw distances. ETC Source Four PARs mounted to the Post and Beam structure and Prescolite recessed adjustable downlights under the control booths supplement the catwalk fixtures to provide uniform lighting. Bega low-voltage halogen step lights are recessed into the walls for egress lighting. Tivoli warm white LED seat lighting, on dimmers, provides egress lighting during the performance. (Again, division of labor was key; Auerbach's house lighting system, with the exception of the Occulus fixtures and a few others, is mostly used as work light; Lafortune designed the preshow lighting).

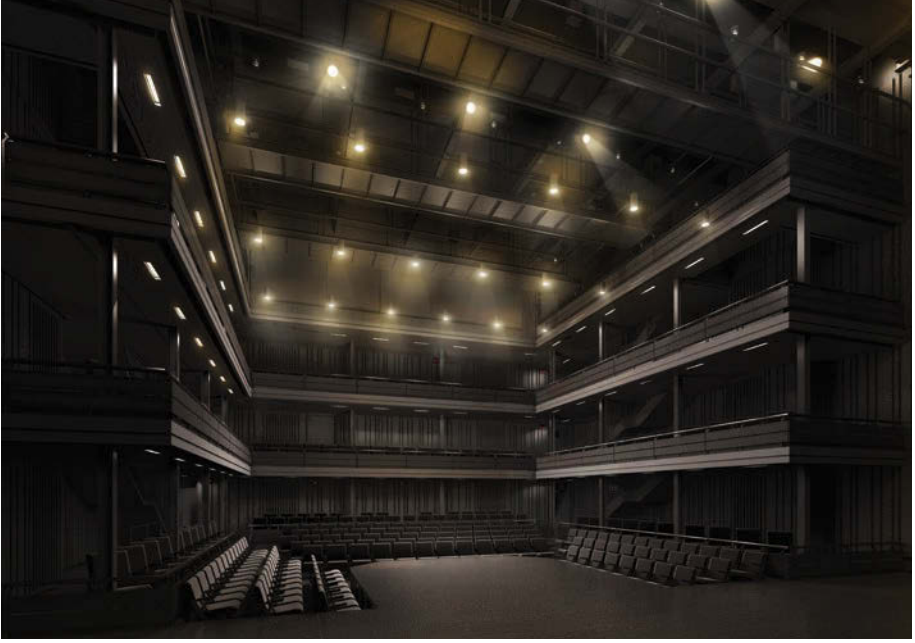
All this happened in a very short 12-month schedule. It's another case of typical Cirque magic, with a little help from their friends.



MARK FISHER/COURTESY OF CIRQUE DU SOLEIL

An early Fisher sketch shows the absence of a stage with one of the deck's rising up, bearing performers and scenery.

UNITED STATES OF PERFORMING ARTS



A stage for soul

A brand-new, purpose-built jazz performance centre is San Francisco's newest hotbed for cool notes

For 30 years, San Francisco's SFJAZZ organisation didn't have a home of its own. It presented its annual festival and other performances in rented spaces scattered around the city. But not any longer. This year saw the opening of the SFJAZZ Center – the first freestanding facility built specifically for, and dedicated to, the creation, teaching and preservation of jazz in the USA.

Auerbach Pollock Friedlander and founding principal Len Auerbach were part of the planning and design process from the start, collaborating with SFJAZZ founder and executive artistic director Randall Kline. "Auerbach was instrumental in the creation and realisation of SFJAZZ Center," says Kline. "He listened to our wants and needs, guided us with his experience early on and helped us fulfil this ambitious dream. But most importantly, he brought heart into the project."

The firm initially assisted in studying vacant buildings that could be adapted into a jazz hall, including a retail space on Market Street, a warehouse space in the SOMA district and former military spaces in the Presidio. Although each of these buildings offered some suitable features, they did not fulfil all the criteria outlined by the team for the new SFJAZZ Center, which included access to public transit, high interior volume and a highly visible location. These spaces would have required substantial renovations yet still wouldn't have been the perfect building to suit the SFJAZZ programme. A possible joint-use venue with the San Francisco Symphony was also explored and a concept developed, but in the end SFJAZZ decided that it was time for a facility of its own.

Customised from scratch

Auerbach Pollock Friedlander then began collaborating with Mark Cavagnero Associates for a new-building project. Together they studied several locations before SFJAZZ acquired a site that was once home to a muffler shop. Even though the site had a smaller footprint than originally envisioned, it was a very good fit geographically as a result of its proximity to other cultural venues – the San Francisco Conservatory of Music and the San Francisco War Memorial & Performing Arts Center, which includes the Davies Symphony Hall, the War Memorial Opera House and the Veterans Building's Herbst Theatre. Notably, Auerbach Pollock Friedlander had previously provided consulting services for these venues.

"I look at the Civic Center/Hayes Valley area as a performing arts campus," says Auerbach. "The venues work together. Each contributes a different element that enhances the whole district but they also maintain their individuality and are a stronghold to performing arts in the city. We also considered how SFJAZZ Center would be used as it relates to our current work on the Herbst Theatre."

After finalising the location the design team – including SIA Acoustics – began the collaborative process of developing a concept for the building. From San Francisco to New York City, the team and representatives from SFJAZZ

Photos (right and above): Matthew Millman

(Above) **The auditorium design encourages a strong artist-audience relationship** (Below left) **The SFJAZZ Center is a community space and social hub** (Below right) **Its transparency makes it a beacon in San Francisco's cultural corridor**

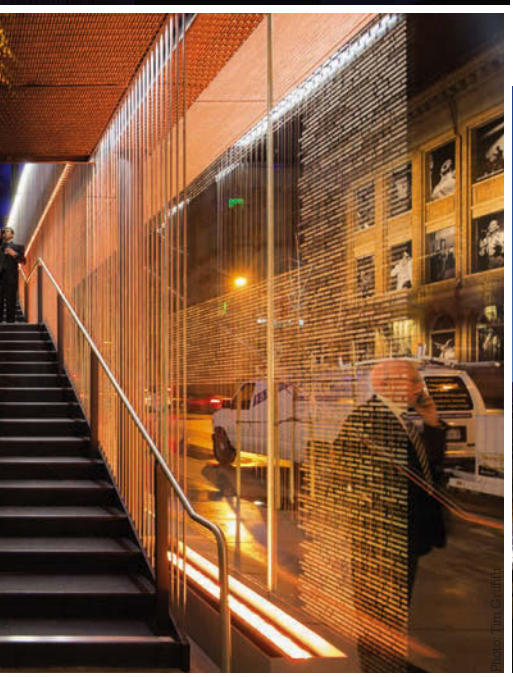


Photo: Tim Griffith

toured and experienced a wide variety of jazz venues – from small back rooms for jam sessions, to intimate night clubs, to historical music halls. These expeditions were an essential part of the development of the design and determined not only the essence of the venue but also helped to further develop the identity of SFJAZZ.

"Underpinning all of the spatial and visual design priorities was the most important goal: to create performance spaces with the highest-quality performance and acoustic qualities throughout," says architect Mark Cavagnero. "We worked closely with Auerbach Pollock Friedlander and Sam Berkow, founder of SIA Acoustics, to create the highest-quality acoustics and a performance experience specific to jazz. While the public spaces are highly transparent, the performance hall is strong and focused. This great room is flexible and multidimensional, designed so audience members can have very different views of the performers, even from the side and rear. This required a great deal of creativity from the Auerbach team."

Flexibility and intimacy

The centre's main room, the Robert N Miner Auditorium, can be formatted in up to eight configurations – from 350 to 700 seats –

Photograph courtesy of Tim Griffith

The Robert N Miner Auditorium was visually and acoustically designed to enhance the creation of spontaneous music

depending upon the performance requirements. "Numerous iterations of the room configuration were developed for the auditorium, from the most formal to the most eccentric," explains Auerbach. "One of the biggest challenges was developing each of the various desired designs to fit within a very compact building site."

Miner Auditorium is configured for optimal intimacy, with the stage on four sides wrapped with tiered seating risers and terraces, ideal for experiencing jazz performances and other events. Flexible stage and seating configurations are achieved with manual and semi-automated platforms, stair plugs and custom portable seating. A resilient floor in the lower orchestra accommodates standing concerts and dancing by the audience and performers. The auditorium recently hosted a concert by pianist and composer Jason Moran accompanied by 10 professional skateboarders improvising tricks on a 36 x 20ft ramp installed at the front of the stage.

Designed for connection

Auerbach Pollock Friedlander was integral in the development and adaptive design of the centre's family of custom seats, which include fixed theatre seats, loose stacking seats and swivel stools. Tailor-made, they create a unified visual audience experience, providing excellent sightlines and comfort while meeting all ADA guidelines. The swivel stools, in particular, are one of the details that make the venue feel more like a club and less like a formal concert hall.

The firm also developed theatrical systems to support production flexibility, including a technical catwalk system, overhead rigging support, theatrical lighting, room-reduction banners, video projection systems, a broadcast infrastructure, piano lift and a material lift.

In addition to the main hall, the centre includes the Joe Henderson Lab – an ensemble room and rehearsal space that also hosts small performances. This intimate multipurpose space is accessed directly from the lower lobby and can accommodate 70 patrons.

The facility's interaction with the surrounding urban landscape plays a vital role in the overall visitor experience. The building is a three-storey glass, concrete and steel structure, with the two lobbies, street-level restaurant and ensemble room all visible to people wandering past outside.

"We wanted to lock it into the street and to have the sidewalk, the lobby and the café all open up into the public realm," notes Cavagnero. "There is no opaque wall between you and the SFJAZZ Center. Once you start engaging the neighbourhood, the neighbourhood can benefit from you – but you can benefit from it, too. The lobby isn't 25ft wide, it's 125ft when you look through an open window wall to the old brick schoolhouse across Fell Street."

The *New York Times* has called SFJAZZ Center, "a temple of jazz in California", while the *Wall Street Journal* affirmed, "This building sounds the right note". The *JazzTimes*, meanwhile, declared "jazz has an enviable new home in San Francisco". And indeed, it has. ■

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