

TEACHING THEATER ARTS EARLY

Palo Alto HS provides a world-class educational environment.



This view from the mix position shows how the sound operators are in the acoustic envelope of the room, allowing them to hear the same thing the audience is hearing.

Tim Maloney



BY DAN DALEY

There's high school, then there's high school in Palo Alto CA, one of the municipal anchors of Silicon Valley. Located adjacent to Stanford University, Palo Alto High School puts as much emphasis on its fine-arts programs as it does its technology-oriented ones. Unsurprisingly, the school's 583-seat, \$29-million performing arts center on its campus, which opened last September, is about as high-tech as you'd find on the theater rows of Broadway or London's West End. Crestron 3-Series systems control video using Blackmagic Design content storage, projection using Digital Projection and Da-Lite systems, and audio utilizing Sennheiser, Meyer Sound and Yamaha platforms. Meyer's Constellation active-acoustics system augments the room's physical acoustic with additional early reflections and reverberation to help tailor the room to suit the performance.

Provides Opportunity

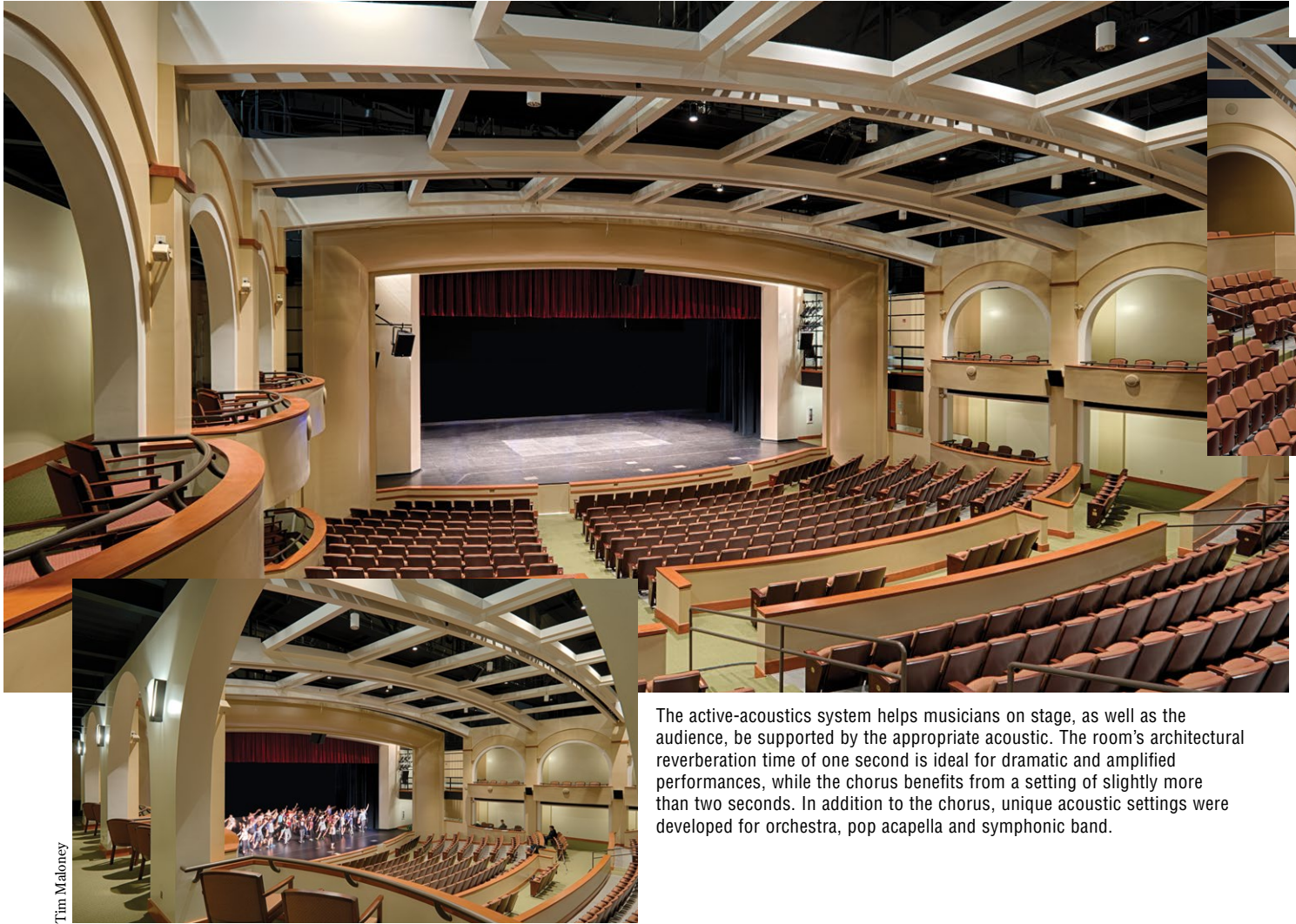
"It provides teachers and students an opportunity to work with the latest and greatest technical equipment within a very modern performance-oriented infrastructure," observed R. Dean Bunderson, Theatre Facilities Supervisor at the school, who added that it will fulfill the needs of rehearsals and performances of music, movies, drama, choir and dance, either within the framework of education or of outside renters.

The theater-systems design includes elements the school's theater-major graduates will encounter in the upper echelons of that industry, including a full fly loft and a motorized orchestra pit, a parterre that provides access to second-floor side boxes, and an arched ante-proscenium and open coffered ceiling that mask three lighting catwalks and two utility walks from audience view. The backstage area includes green rooms, dressing rooms and a staging area for the construction and storage of large props and set pieces.

A black-box practice space doubles as a classroom, and the large lobby, flush with natural light and rich textures, accommodates dinners and special events. The building is sited on a large new plaza and features a terraced patio for small outdoor gatherings. The project incorporates additional campus-wide improvements, including new monument entry gates, site trellises and landscaping, and campus signage and lighting.

"It's pretty astounding for a high school, even

Overhead and lateral loudspeakers provide enveloping acoustic energy in the house.



Tim Maloney

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The active-acoustics system helps musicians on stage, as well as the audience, be supported by the appropriate acoustic. The room's architectural reverberation time of one second is ideal for dramatic and amplified performances, while the chorus benefits from a setting of slightly more than two seconds. In addition to the chorus, unique acoustic settings were developed for orchestra, pop acapella and symphonic band.

Equipment

AUDIO

MIXER/MULTICHANNEL

- 2 Anvil ATA 4RU cases
- 2 Furman Pro PL-PLUS C 15A power conditioners
- 1 Whirlwind custom multi-fan out FM Series snake input
- 1 Whirlwind custom multi-fan out FM Series snake output
- 4 Whirlwind ENC2025 ruggedized Cat5e cables, 25'
- 4 Whirlwind ENC2050 ruggedized Cat5e cables, 50'
- 1 Yamaha LS9-32 digital mixing console
- 2 Yamaha Dante-MY16-AUD 16-channel network I/O cards
- 2 Yamaha LA1L ULTRA-BRIGHT 4-pin XLR gooseneck console lights
- 2 Yamaha RIO1608-D Yamaha 16x8 digital audio interfaces

AUTOMIXER/DSP

- 1 Biamp Tesira SERVER-IO AVB onboard DSP
- 8 Biamp Tesira SIC-4 4-channel mic/line modular input cards
- 3 Biamp Tesira SOC-4 4-channel line level modular output cards
- 1 Biamp Tesira DAN-1 Dante card for Tesira server

OUTBOARD/PLAYBACK RACK

- 1 Adesso WKB-4210UB wireless keyboard, trackpad
- 1 Apple Mac mini w/keyboard, mouse
- 2 Audinate virtual sound cards
- 1 Calzone ATA20R24LC 20RU ATA rolling rack

- 1 Ergotron LX LCD desktop mount
- 1 Figure 53 Q-Lab pro audio software
- 1 Furman Pro PL-PLUS C 15A power conditioner
- 1 Mac SuperDrive external drive
- 1 PCD Custom multi-format I/O panel
- 1 RDL ST-PD5U power hub
- 4 RDL ST-UBA2 stereo unbalanced to balanced transformers
- 1 Samsung S19B420BW 19" Syncmaster display
- 1 Sonnetech RackMac Mini mac rackmount
- 1 TASCAM CD-500B CD playback player
- 1 Whirlwind custom 25' snake

WIRELESS MIC

- 3 Countryman WCB6LT bodypack mics
- 2 Sennheiser EW335 G3 wireless receivers w/handheld mics
- 1 Sennheiser G3 OMNI KITactive antenna splitter kit
- 2 Sennheiser SK300 G3 bodypack transmitters w/minature TRS connector

REINFORCEMENT

- 1 Lab.gruppen 992235011 C 10:4X 4-channel amp
- 2 Meyer Sound 600-HP powered subwoofers, black
- 1 Meyer Sound Galileo 408 speaker processor, 4x8
- 1 Meyer Sound MAAM-UPJ powered delay speaker mount, black
- 16 Meyer Sound MM-4XP front fill speakers, SP-1, stage, lip, gallery fill, black
- 1 Meyer Sound MPA-UPQ main speaker mount (pair), black
- 12 Meyer Sound MUB-MM4XP front fill, gallery fill speaker mounts, black



Tim Maloney

Wall-mounted loudspeakers provide lateral and rear acoustic energy and are integrated with the sound-reinforcement system as surrounds.

in Silicon Valley; it would fit right in as a theater in any major city,” observed Angelo Scalese, field technician and the lead technician on the project for PCD Audio-Video System Integration in Santa Rosa CA, of what’s formally known as the Palo Alto High School Performing Arts Center, or colloquially, Paly PAC. “It was designed with a lot of flexibility to accommodate a wide range of performance types and to make it adaptable to teaching theater arts.”

Some of the venue’s technology features were included to make it attractive to outside users, as well, such as the investor pitch presentations that are almost a daily occurrence in the region. But at its heart, Scalese said, it’s a teaching facility, though you might only realize that if you were a teacher or a student.

Complex Sound

The sound systems are the venue’s most complex platforms, with the main PA and the Constellation systems designed and integrated to be capable of operating in conjunction with each other or completely independent of each other, which Scalese said is the case in the vast majority of educational and other applications. The main PA system, used for applications like concerts and theatrical performances, is anchored at the proscenium by four UPQ-1P loudspeakers, with one each left and right and a pair in the center. UPJ and MM series speakers serve as delays and fills, respectively. For delays, fills, sub-bass and loudspeaker processing, the system

also includes two UPJ-1P and 16 MM-4XP loudspeakers, two 600-HP subwoofers and a Galileo 408 processor. The system front end comprises a Yamaha 32-channel LS9 digital mixing console and a Biamp Tesira DSP and matrixing unit

“We designed the systems, the conventional PA and the Constellation systems after sorting out the kinds of programs they’d be used for,” explained Ian Hunter, AV Systems Designer and a Principal at Shalleck Inc., the AV design consultants. As sophisticated as the Constellation system

is, it requires an acoustically predictable space to achieve its optimal performance. The acoustician, Bill Dohn of Dohn & Associates, placed a combination of absorptive and diffusive treatments on the walls and ceiling, reducing the first reflection time to 0.6 seconds. That was trickier than it might at first seem: During the architectural design stages, the venue’s interior volume had to be reduced to conform to campus aesthetics and to local building codes. That reduction in size actually helped the project’s economics by cutting construc-



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The active-acoustics system includes an electronic stage shell consisting of microphones, loudspeakers and signal processing to provide early reflections and reverberation to musicians onstage. This helps musicians in instrumental and vocal ensembles hear themselves and each other better, and perform with more confidence.

Tim Maloney

- 2 Meyer Sound MYA-UPQ main speaker mounts, L/R, black
- 2 Meyer Sound UPJ-1P powered delay speakers, black
- 2 Meyer Sound UPQ-1P main powered speakers, L/R, black
- 2 Meyer Sound UPQ-2P powered main speaker, black

MISC.

- 4 AVP custom audio patchbays
- 50 AVP LPC-3-RED 3' patchbay cables
- 1 Cisco SG300-20 26-port rackmount Gigabit switch "A", Dante Network
- 3 FSR FL-640P-6/BLK-C floor boxes
- 2 Leviton 6A586-U24 data patchbays, 24-port
- 1 Leviton 6A586-U48 data patchbay, 48-port
- 1 LynTec SS2-LRP motorized breaker control
- 1 Middle Atlantic SR-46-28 46-space (80½") swinging wall rack w/accessories
- 3 Middle Atlantic WRK-44-32 44-space (77"), 32"-deep gangable racks w/accessories
- 2 RDL STD-10K passive audio divider/combiners, 10,000Ω
- 2 RDL STD-600 passive audio divider/combiners, 600Ω
- 2 RDL TX-AT1 Audio isolation transformers, 600Ω
- 4 Tripp Lite DRS1215 power outlets
- 5 Whirlwind custom Y cables
- 10 Whirlwind NL4-003 cables

VIDEO

CATV

- 1 Blonder Tongue CATV taps, splitters
- 1 Contemporary Research QMOD-SDI1.5 HDTV modulator, SDI input
- 1 Contemporary Research QCA9-33 active combiner, 8+1 inputs, 33dB max level
- 2 Contemporary Research RK1 rackmounts

CONTROL

- 1 Cisco SG200-26 24-port rackmount Gigabit switch for control system
- 1 Cisco SG200D-18-NA 18-port Gigabit switch "C"
- 1 Crestron CP3N 3-Series control system
- 2 Crestron TSW-750-B-S 7" touchscreens, black smooth
- 1 Gefen EXT232 Cat5 extender
- 1 Linksys LGS124P 24-port rackmount Gigabit switch, "B" w/PoE

ASSISTIVE LISTENING

- 1 Listen Technologies LT-800-072-01 stationary RF transmitter (72MHz)
- 1 Listen Technologies LA-326 universal rackmount kit
- 1 Listen Technologies LA-125 antenna kit for rackmount (72MHz)
- 16 Listen Technologies LR-300-072 portable digital RF receivers (72MHz)
- 16 Listen Technologies LA-165 stereo headphones

PRODUCTION INTERCOM

- 1 Clear-Com MS-704 4-channel headset/speaker main station
- 1 Clear-Com RM-704 4 channel remote station rackmount
- 2 Clear-Com GM-9 9" plug-in GN mics
- 3 Clear-Com HB-704 4-channel flush-mount headset stations
- 3 Clear-Com HS-6 telephone-style handsets, XLR-4F
- 1 Clear-Com RM-704 4-channel remote station rackmount
- 1 Clear-Com GM-9 9" plug-in GN mic
- 1 Furman Pro PL-PLUSC 15A power conditioner
- 1 SKB R4S portable rack case
- 3 Wireworks WWRP21102 G1 female panel connectors
- 1 Wireworks WWRP2110o G1 male shell w/25' cable



Scott Krenzke/Shalleck Collaborative

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tion and material costs, and some of the savings went toward the capital cost of the Constellation system, which can range into six figures.

“There’s [only] so much we could have accomplished with variable acoustical treatments like drapes,” said Hunter. “Because the construction costs could be scaled back, we brought up the electro-acoustical solution and the school said, ‘Let’s do it.’”

Another economic benefit of the Constellation system is that it allowed the use of a virtual orchestra shell versus a mechanical one, using speakers on either side of the orchestra pit to function as monitors that mimic the reflectivity of a physical bandshell. According to Jedd de Lucia, Shalleck Principal and Project Manager on the project, this meant using a dual-zone approach with the Constellation system, in which the two zones can interact with each other.

“It is quite impressive to run an orchestra event without a physical bandshell upstage of the musicians and gain the same results or better through electronics,” Bunderson noted.

The Constellation system added one more benefit: Some of the several dozen speakers it uses to create various reverberant spaces can also be used as part of a 7.1 surround sound system for cinema; and, with some processor tweaking, overhead speakers would make it compatible with Dolby’s Atmos cinema-sound system, said Hunter.

Speaker & Cable-intensive

Constellation is speaker- and cable-intensive, and that impinged to some extent on the installation in the theater interior. Scalese said that some of the speakers and microphones the system requires are mounted on pipe battens that can be raised and lowered manually as necessary, when the electro-acoustical system is used. Other speakers were drop-mounted from the grid above the stage and have to be capable of being raised and lowered as needed on pulleys. “We had to wait for the rigging installation up there to get finished before we could start,” Scalese recalled.

PAHS’ performing arts center has another

unique wrinkle: Its control room is mostly out in the open, centered on what Scalese called the “audio porch.” “The porch is in the prime spot to mix the sound for a show,” he said. “It puts the mixer in the same space as the audience.” Jedd de Lucia of Shalleck said that the idea of putting an audio mixer in a booth in a venue like this seems counterintuitive. “We wanted to put the operator’s ears in the same space as the audience in the seats, not lock him away in a sealed booth,” he offered. However, the porch nonetheless has to be ADA compliant, and it has to be able to maintain its territorial integrity and not be too easy to access, lest the audience get too close and create distractions for the mixers. “We had to be careful not to let it look like a throne,” he laughed.

According to Scalese, the audio porch was one of several locations throughout the venue that required some finesse when it came to running wires. “It required a lot of preplanning for the Constellation and the other wiring,” he said. “We had to have 18-

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TEACHING THEATER ARTS EARLY: PALO ALTO HS PROVIDES A WORLD-CLASS EDUCATIONAL ENVIRONMENT

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MISC.

- 1 AJA HD5DA HD-SDI DA distribution amp/repeater
- 3 AVP custom video patch bays
- 25 AVP VPC-2-XXX video patch cables, blue
- 1 Blackmagic SDI to analog 4K SDI to composite converter
- 1 DataVideo TLM-702 dual 7" LCD monitor
- 2 Extron DA 6A 6-output stereo audio distribution amps
- 1 Extron RSU 126 universal rack shelf kit
- 1 SKB 1SKB-R3S 3RU carrying case for dual monitor
- 1 Vaddio 535-2000-214 expandable wall mount
- 2 Viewsonic VT1602L 16" color monitors
- 1 VITEK VTC-C2B-HS fixed camera w/SDI output

PROGRAM, PAGING

- 1 AtlasIED AARMK2-5 amp rackmount kit
- 3 AtlasIED AT100-RM ATN 100W 3dB RM attenuators
- 9 AtlasIED AT100-RM ATN 100W attenuators
- 1 AtlasIED PA601 single-channel power amp
- 1 Audio-Technica AT8035 line + gradient mic
- 1 Audio-Technica AT8415 mic shock mount
- 3 Biamp Tesira EX-LOGIC logic control boxes for Tesira system
- 1 Crown CDi 1000 2-channel, 500W/channel power amp
- 22 Electro-Voice C4.2 EVID ceiling speakers
- 8 Electro-Voice C8.2HC EVID high ceiling speakers
- 1 Lowell 200LVC-RMDB 200W volume control for HM panel, lobby speakers
- 1 Mega Clamp MAB 1"-2" pipe clamp
- 2 OWI TRP470 wide-range paging speakers, mounting bracket
- 1 RDL DB-CIJ3 consumer input jacks, mono, black
- 1 RDL ST-LCR1H relay for paging override
- 1 Shure SM58S cardioid dynamic, on-off switch
- 9 SoundTube RS500i-BK 51/4" pendant speakers, black
- 1 TOA EV-20R US digital message repeater

ELECTRO-ACOUSTIC ARCHITECTURE

- 3 Hubbell KELLEMS deluxe cord grips, 38-.5 for (3) mic cables
- 2 Hubbell KELLEMS deluxe cord grips, 63-.75 for (5 or 6) AxLink cables
- 2 Hubbell KELLEMS deluxe cord grips, .88-1.0 for (8) AxLink cables
- 10 Lowell CP87 backcans for Stella w/PR8-1624 mounting rings
- 1 Meyer Sound D'Mitri DCP audio DSP core processor
- 1 Meyer Sound D'Mitri DAI-24 audio DSP-24-channel input module
- 1 Meyer Sound D'Mitri DAIO-816 audio DSP-8x16 I/O module

- 2 Meyer Sound D'Mitri DAO-24 audio DSP-24-channel output modules
- 2 Meyer Sound D'Mitri DVRAS-16 audio DSP-VRAS processors
- 2 Meyer Sound D'Mitri AVB switches, audio DSP-AVB switch
- 24 Meyer Sound MIC-CARD-GN-BK mic-cardioid, mini
- 4 Meyer Sound Stella 4C 4" powered speakers, SPL-4C, DEC743, High Noon
- 4 Meyer Sound Stella 4C 4" powered speakers, SPL-4C, DEC744, Celtic Linen
- 2 Meyer Sound Stella 4C 4" powered speakers, SPL-4C, DEC 745, Chaparral
- 16 Meyer Sound Stella 8C 8" powered speakers, SPL-8C, black
- 16 Meyer Sound UP-4XP powered speakers, SPL-UP4, (all with PHX), black
- 13 Meyer Sound UPJunior-XP UltraCompact speakers, SPL-JR, black
- 14 Meyer Sound HMS-10 SPL-HMS cinema surround speakers, DEC 745, Chaparral
- 12 Meyer Sound MM-10XP Mini Subwoofers SPL-M10, PHX, black
- 4 Meyer Sound MM-4XP front-fill speakers, SP-1, white
- 1 Middle Atlantic TOR-4-20SP 4-space surface-mount, tilt-out wall rack, 20" usable depth

VIDEO PROJECTION

- 1 Analog Way PLS350-3G AV switcher
- 1 Analog Way RK-350 AV switcher remote control
- 8 Belden AX105202-S1 FiberExpress Brilliance fiber field termination connectors
- 1 Belden B9C037 FiberExpress distribution cables
- 1 Blackmagic Hyper Deck Studio pro hard disk recorder
- 1 Chief VCMU HD universal projector mount
- 1 Contemporary Research ATSC+SDI HDTV tuner w/SDI output
- 1 Da-Lite 36431 lace and grommet Da-Mat black back (21'4"x12')
- 1 Da-Lite 94160 SERIES 200 Pro-Trim lace and grommet frame (21'4"x12')
- 1 Digital Projection 112-340 E-Vision 1080p-8000, 8K Lumen, 1080p native, DLP digital projector
- 1 Extron SYM BNCM 15-pin HD male-to-BNC-male mini hi-res cable
- 2 Extron 2LC OM4 MM P LC-to-LC laser-optimized multimode fiberoptic cable assemblies, plenum
- 4 Extron FOXBOX Rx HDMI fiberoptic receivers for HDMI, audio, RS232
- 4 Extron FOX T UWP 302 2-input fiberoptic transmitter, decorator-style wallplates
- 3 Extron RSU 126 universal rack shelf kits
- 1 Extron SSP 7.1 surround sound processor
- 1 FSR DR-PCB-H23M HDMI male-to-HDMI-male plenum (23m or 75' cable)
- 1 OPPO BDP-103 Blu-ray player
- 1 Pelican carrying case for remote control

List is edited from information supplied by PCD Audio-Video System Integration.

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inch cans placed in the slabs so we could snake wires through the concrete sections. We had to let Shalleck and Panel Authority, which were fabricating the wiring panels, know what our needs were going to be. We did walkthroughs with Shalleck ahead of time so we would be able to ask any questions that might come up. Shalleck designed [the wiring plots] and we verified them on paper through emails, but we had to wait until all of the construction was done before we could get in there."

The venue's video may seem secondary to the audio, but it's still substantial. In ad-

dition to the main projection system and 22-foot 16:10 screen, a VITEK video camera covers the interior and streams video to the lobby for overflow situations. (Video displays in the lobby were installed by the school's internal AV team.) That same video stream can also be used to stream outside the venue. An Analog Way switcher is used to select between Blu-ray and other video sources. Video is controlled from a small control room directly behind the audio mix position; the lighting control is set to house-right of audio, and the stage manager has a position to house-left, which is

equipped with a Clear-Com intercom panel and a seven-inch Crestron control panel. Teachers and instructors can use that same position during classroom use of the theater. An automix function allows them to simply plug in a microphone and a laptop to access the AV system.

"Any students walking in here are coming into a professional space that's going to give them the feel of a professional performance," Scalese said. "We've done a few venues in the Silicon Valley area, but nothing like this. It's just a spectacular space. I hope it gets used to its full potential." 