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\$72 MILLION HIGH SCHOOL STADIUM



ps for multipurpose uses.



By Dan Daley

"You know what they say in Texas—'Go big or go home." That observation came from someone at a company that makes only really big things—giant-screen builder Daktronics, for which Jareel Combest is the Houston TXarea sales rep. And perhaps that quote provides some insight into why a high school would build a \$72 million football stadium. So, too, would the state's famous love affair with the sport.

After all, the popular television series "Friday Night Lights," about high school football as the grout of a town's social existence, was set in a fictional east Texas town. Others, meanwhile, put forth the theory that high school football is to small-town economic development what tax abatements are to urban housing incentives—something to attract investment, new jobs and new residents to build a larger tax base. Whatever the reason, however, it's clear that AV is as much a part of the strategy at the local level as it is in the NFL.

Daktronics installed a \$2 million, 1,500-square-foot, 13mm-pitch scoreboard at one end of the new, 12,000-seat Legacy Stadium in the Katy Independent School District (ISD), in suburban Houston, which opened this school year. The venue probably looked, on the Fox Sports Southwest network, which aired the venue's first game, like many of the college stadiums that regularly appear on regional sports television. AV systems integrator Covenant Communications installed a high-coverage sound system composed of elements from QSC, Fulcrum and JBL, which were specified by AV consultant Idibri.

Notably, the brands and product names are those routinely associated with Pac-12 and





PA speakers being mounted on poles, some of which tower as high as 70 feet above the ground. Covenant's integrators ran the cabling inside most of the poles, mounting the speakers to them using rigging.

NFL stadiums. In some ways, however, Legacy Stadium actually *exceeds* the bigger leagues. It's part of a 43-acre sports campus that also includes the school's existing 9,800-seat Rhodes Memorial Stadium and the Academy Sports-branded Outdoors Student Activities Complex, which hosts basketball and other arena-level events and matches.

The Big Picture

Combest said the door was opened for Daktronics at Legacy Stadium through its work two years earlier for the school, when it added a video scoreboard and Tricaster IP switcher to its arena. Although the new Legacy scoreboard could easily fit into a college bowl, its networked aspects are high school cool. Daktronics monitors the scoreboard's digital health online, and it can do so either through the school's own network or a separate, dedicated AV local area network (LAN).

Blayne Olson, Daktronics Project Manager, noted that, although large-format LED scoreboards are becoming more common at certain secondary schools, the Katy ISD venue is the first to get LED ribbons on fascia—something that is now common at major-league and top-tier college stadiums, but that's rare in lower-level markets. "But you can be sure that, once we put them in high school stadiums, others will ask for them, too," he stated.

It's not unusual for end-zone displays to contain audio components, especially when the PA system uses a pointsource design. However, Legacy Stadium's sound system uses a distributed design—more on that in a moment—so the only audio elements related to the scoreboard are cabling to the video control room, where a proprietary media player gives voice to visual graphics effects, such

One Big Classroom

The Katy Independent School District (ISD)'s sports infrastructure, with the new Legacy Stadium as its hub, also has an educational application: It will be part of the school's media-arts programs, which will see some of the 77,000 students in the ISD's eight schools programming the scoreboard and running the sound.

"I see it as an instructional facility where you have athletes competing for sure, but you also have our bands, cheerleaders and drill teams performing," Lance Hindt, Superintendent of the Katy ISD, told the *Houston Business Journal* in an interview earlier this summer. "In fact, there are more fine-arts kids who will perform there than football players. Our telecommunications students will be operating the digital videoboard."

The AV systems run on their own, separate network within the stadium, although the Daktronics remote-diagnostics program can do specific BOMGAR sessions to access the video control room and display racks remotely, when necessary. The school's main local area network (LAN), however, has been run out to both venues, as well as to the field house and an athletic center on campus. That makes them all part of the school's media-technology program.

Ben Cating, Project Manager from Idibri, said the fact that students would be regularly operating the AV equipment was taken into account when making product choices. "We chose some 'value-oriented' products, because we knew that not everything was going to survive the students," he said with a laugh. "The budget was there, but we recommended some stepped-down products in some cases because of that." His colleague, Ryan Knox, added, "Simple, but flexible. Some of it is equipment you'd find in a mid-level high school theater. Entry level and easy to operate, but of high quality, and with interfaces that could be adjusted to the level of the students who use it."

Blayne Olson, Daktronics Project Manager, said the company's programmers made sure to build in overrides on the video system's controls for instructors to take over quickly, should a student's efforts go awry. "We worked with the school's technology instructor to create panels that let students engage our show-control systems, but also to let instructors take over if a problem develops during a game," he explained.

EQUIPMENT

ASSISTIVE-LISTENING SYSTEM

- 1 Listen Technologies LA-122 universal antenna kit (72 and 216MHz)
- 135 Listen Technologies LA-164 ear speakers
- 34 Listen Technologies LA-166 neck loops
- 1 Listen Technologies LA-304 assistive-listening notification signage kit
- 3 Listen Technologies LA-325-01 16-unit portable RF product charging/carrying cases
- 1 Listen Technologies LA-326 universal rackmounting kit
- 96 Listen Technologies LA-362 rechargeable AA NiMH batteries
- 135 Listen Technologies LR-400-072 portable display RF receivers (72MHz)
- 1 Listen Technologies LT-800-072-01 stationary RF transmitter (72MHz)

BALCONY FASCIA

- 36 JBL AWC129 all-weather compact 2-way coaxial speakers w/12" LF
- 72 JBL Control 28T-60 high-output indoor/outdoor background/foreground speakers
- 72 JBL MTC-28/25CM single-unit ceiling mount adapters
- 72 JBL MTC-28WMG WeatherMax stainless steel replacement grille covers
- 72 JBL MTC-PC2 weatherproof Control speaker panel covers
- 5 QSC CXD4.3Q-NA network amps

CANOPY

- 6 Fulcrum Acoustic AH96-WR high-efficiency full-range coaxial horns (weather resistant)
- 6 Fulcrum Acoustic GX1295-WR 12" coaxial speakers (weather resistant)
- 3 QSC CXD4.3Q-NA network amps

CONCOURSE

- 30 JBL Control 25AV premium monitor speakers
- 30 JBL Control 28T-60 high-output indoor/outdoor background/foreground speakers
- 60 JBL MTC-28/25CM single-unit ceiling mount adapters

- 30 JBL MTC-28WMG WeatherMax stainless steel replacement grille covers
- 30 JBL MTC-PC2 weatherproof Control speaker panel covers
- 1 QSC CXD4.3Q-NA network amp

CONTROL SYSTEM

- 1 Daktronics proprietary primary backup players/processors
- 1 Daktronics Show Control System

DISTRIBUTED AUDIO/PRESS

- 20 JBL Control 25AV premium monitor speakers
- 40 JBL Control 26CT 6.5" ceiling speakers
- 2 QSC CXD4.3Q-NA network amps
- 2 QSC TSC-3 network touchscreen controllers
- 1 Shure SM58S vocal mic w/ on/off switch

FIELD HOUSE EXTERIOR

- 10 JBL AWC129 all-weather compact 2-way coaxial speakers w/12" LF
- 10 JBL AWC82 all-weather compact 2-way coaxial speakers w/8" LF
- 2 QSC CXD4.3Q-NA network amps

FOH AUXILIARY

- 1 Apple Mac mini 2.5GHz
- 1 Apple wireless keyboard and mouse
- 2 Dell 24" LCD monitors
- 1 Denon Professional DN-C620 1RU broadcast CD player
- 1 Denon Professional DN-700R network SD/USB audio recorder
- 1 Electro-Voice RE320 Variable-D dynamic vocal and instrument mic
- 4 Middle Atlantic PDLT-815RV-RN power supplies
- 3 Middle Atlantic PDS-1620R-NS multi-mount rackmount power units
- 1 Middle Atlantic UPS-2200R-8 uninterruptible power supply
- 1 PreSonus AudioBox iTwo USB/iPad recording solution
- 1 Sennheiser HMD 280 PRO headset

- 1 Sonnet Technologies RACK-MIN-2X RackMac mini 1RU rack kit
- 1 Sony MDR-7506 headphones
- 1 Studio Technologies Model 210 announcer's console

FOH CONSOLE

- 1 Middle Atlantic UPS-1000R rackmount uninterruptible power supply
- 2 PreSonus Sceptre S8 studio monitors
- 1 Sony MDR-7506 headphones
- 1 Yamaha LA1L ultra-bright 4-pin XLR gooseneck console light
- 1 Yamaha QL1 32-channel digital mixer
- 2 Yamaha RI8-D Rio Series 8-channel remote input racks
- 1 Yamaha RK1-CA rackmount kit
- 2 Yamaha Ro8-D 8-channel output racks

INFRASTRUCTURE

- 5 Middle Atlantic BGR-4532 BGR Series racks, 45RU, 32"D
- 5 Middle Atlantic BSPN-45-32 side panels, 45RU, 32"D
- 5 Middle Atlantic UPS-2200R-8 uninterruptible power supplies

MAIN LOUDSPEAKER SYSTEM

- 3 Cisco SG300-28P 28-port gigabit PoE managed switches
- 2 Cisco SG300-52P 52-port gigabit PoE managed switches
- 2 QSC Q-SYS Core 110f software-based audio-processing products
- 2 QSC TSC-3 network touchscreen controllers
- 1 QSC TSC-8-BX back box

MEZZANINE OVERHANG

- 15 JBL AWC82 all-weather compact 2-way coaxial speakers w/8" LF
- 15 JBL Control 25AV premium monitor speakers
- 15 JBL MTC-28/25CM single-unit ceiling mount adapters
- 1 QSC CXD4.3Q-NA network amp

PATCHBAYS

2 Bittree 961 Classic TT patchbays w/E3 rear interface with normals out

POLES

9 Fulcrum Acoustic AH96-WR high-efficiency full-range coaxial horns (weather resistant)

- 18 Fulcrum Acoustic GX1295-WR 12" coaxial speakers (weather resistant)
- 18 Fulcrum Acoustic YK2413 GX12 Series yoke brackets
- 9 QSC CXD4.3Q-NA network amps

SCORING/TIMING DISPLAYS

- 1 Daktronics custom scoreboard with LED digits
- 2 Daktronics delay-of-game timers

VIDEO DISPLAYS

- Daktronics 13HD LED video display
- 1 Daktronics 15HD LED ribbon display

VIDEO PRODUCTION SYSTEM

- 1 Blackmagic Design SmartView HD monitor
- 3 JVC GY-HM620 ProHD cameras w/20x lenses
- 1 NewTek 3Play4800 8-channel replay system
- 1 NewTek 8-input video switcher
- 1 Telex intercom package

WIRELESS MIC SYSTEM

- 2 Shure PA805SWB directional antennas
- 2 Shure ULXD1 wireless bodypack transmitters
- 2 Shure ULXD2/B58-G50 handheld transmitters
- 1 Shure ULXD4Q quad-channel digital wireless receiver
- 2 Shure WA661 in-line bodypack mute switches
- 2 Shure WL185 lavalier condenser mics

List is edited from information supplied by the integrators.



as for touchdowns. Daktronics' own Show Control System, which generates those graphics, runs on the same media player. Other video elements in the control room, which was integrated by Media Support Group, include a NewTek eight-input video switcher, which mixes input from three JVC ProHD cameras; a NewTek 3Play4800 eight-channel replay system; and a Telex intercom package.

According to Olson, the company's main task, after assembling the actual video system, was to coordinate the other trades involved in rigging the frame for the score-



board. "The stadium structure, where we hung the LED ribbons on fascia, and the main videoboard structure were designed and installed by others," he said. "Daktronics assisted with the design of the main videoboard structure to make sure all trades were on the same page, so the structure could adequately accommodate our equipment needs." He continued, "We worked with the project engineers and architects to modify our fascia ribbon-mounting hardware to adjust to the size constraints of the building fascia."

Robert Bax, Installation Manager at Media Support Group, which integrated the video control room, said that what sets the video at this facility apart from other highend high school stadiums is that the signal can be kept at 1080i from the camera to the big screen. At 13mm pitch, the display's resolution falls just short of HD, but, at its scale, the difference is visually negligible. The stadium's video signal infrastructure, which rides on single-mode fiber from each of the camera positions to the New-Tek switcher and then onto the Daktronics rack, is very much futureproofed.

"At this level, you'll usually still see a composite video system," Bax said. "Here, they can stream 1080i all the way to the display." That performance is also matched by the video-management platforms, specifically the eight-channel switcher and eightchannel NewTek 3Play4800 replay system. "They have eight channels of source material they can choose from during a game, in addition to the live camera shots," he said. "It's really set up at a very high level for a high school stadium."

An Even Bigger Picture

Idibri, which acted as design consultant on the project, has a hefty portfolio of stadiums, including major league venues like the Minnesota Vikings' U.S. Bank Stadium and the Houston Astros's Minute Maid Park, as well as college venues that include Abilene Christian University's Wildcat Stadium in Abilene TX. Legacy Stadium and its price tag fit easily on the company's projects page; only its status as a high school venue sets it apart.

Idibri was brought to the project by HKS Architects, a firm it has collaborated with on other sports projects, including stadiums for Texas Christian University and AT&T Stadium in Dallas TX. Interestingly, according to Ryan Knox, Senior Consultant at Idibri, who designed Legacy Stadium's sound system, the project came to HKS through its higher-education vertical. "We were on board to bring our sports AV expertise to the project, and to scale it to what was needed for this venue," he explained.

Knox and colleague, Ben Cating, who was Project Manager on Legacy Stadium, saw the biggest challenge as centering on sound. Legacy Stadium is a stone's throw from the school's existing Rhodes Stadium, which dates back to the 1980s. "We had to design the sound system in such a way that the sound from the new venue didn't overlap with the sound from the one next door," Knox explained. To keep the sound inside the bowl, Idibri designed a distributed system: 18 pole-mounted, weatherized Fulcrum GX1295-WR speakers placed at the top of the seating areas and facing down onto the field, with a half dozen more mounted through portals in the canopy above the seating area on one side of the field.

More than 100 IBL MTC Series and Control Series speakers are used to bring sound to under-balcony, fascia and backof-house areas, such as hospitality rooms. Another 20 JBL AWC Series speakers fill in beneath the overhang of a field house that hosts some premium seating at the opposite end of the field from the video scoreboard. Their position relative to the pole-mounted speakers meant they required some delay to be added in the QSC processor. (Rhodes Stadium was fitted with the point-source type of sound system typical of institutional stadiums; as part of the Legacy Stadium project, it was also upgraded to a distributed system, with seven pole-mounted Fulcrum speakers.)

QSC's Q-Sys provides the network for the audio, and CDX Series 4,000W networked amplifiers, also from QSC, power the entire system. Knox said those were chosen, in part, because of the amplifiers' and network's simpler interface. As part of the school's broadcast and technical education, much of the operation of the systems is done by students. "That fact informed a lot of our product choices," Cating revealed. "We always start by asking who is going to operate the equipment, and we base decisions on that. For students, we wanted simpler interfaces for all of the systems. We have to take into account the end-user experience from the beginning." Fulcrum speakers and a Q-Sys network were also installed at Rhodes Stadium as part of the project, along with new Powersoft amplifiers.

Sound Install

Legacy Stadium's audio system was integrated by Covenant Communications, which has done similar work for a number of regional academic sports venues, although, according to Covenant Communications President Shawn Mullins, this project was the largest so far. "Scale is what sets these types of projects apart," he said. "If you forget a tool in the truck at most projects, it's a two-minute walk back to the parking lot; at a stadium, it's a 20-minute walk."

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\$72 MILLION HIGH SCHOOL STADIUM: LEGACY STADIUM PULLS OUT STOPS FOR MULTIPURPOSE USES

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That made coordinating the staging of the sound-system components especially critical. For example, the arrival and installation of the speaker-mount poles, some of which tower 70 feet above the ground, presented a challenge. Covenant's integrators ran the cabling inside most of the poles. mounting the speakers to them using rigging made by supplier Polar Focus; they connected the speakers while they were still on the ground, before being installed upright by the electrical contractor. Two poles that also supported high-voltage light fixtures had their audio cabling run through conduit on the exterior of the pole, thus avoiding electrical-field interference. Other speakers were installed in cutouts in the canopy over the seating on one side of the field. They were winched into place, and they can be lowered the same way for any future maintenance.

Jack Alston, Covenant's Field Opera-

tions Manager, said that "miles" of copper and twisted-pair cabling are used to connect the speakers to the three intermediate distribution frame (IDF) closets in Legacy Stadium. They connect back to the Q-Sys audio network over single-mode fiber. Copper also distributes audio to the JBL ceiling speakers used to distribute sound throughout spaces that include the concourse and coaches' offices. There are no subwoofers in the system. According to Alston, that's because the Fulcrum speakers have extended low end-the AH96-WR reaches down to 19Hz-which helped keep the system design more streamlined.

"You can get a lot more performance out of a single speaker now, and you have to," Alston continued. "People coming to high school football games have much higher expectations now. Twenty years ago, you could get away with a few horns and a sixchannel mixer. Now, you need full-range audio for music and sound that's intelligible for announcements over the crowd noise."

The price tag for Katy ISD's \$72 million Legacy Stadium stands out right now, but, soon, it's getting some company. It's virtually the same as the \$69.9 million being spent for McKinney Independent School District's 12.000-seat stadium in the Dallas-Fort Worth area, for which construction began in December. Alvin TX, which is 25 miles south of downtown Houston, will welcome a 10,000-capacity, \$41 million stadium next year. A fourth district, in Prosper TX, plans to open a \$48 million stadium complex in 2019. But to put Katy's budget into perspective, it was part of a \$748 million bond issue that voters approved in 2014, which also went toward building six new schools, renovating six campuses and upgrading technology.

Not everything centers on football in Texas...just *almost* everything.