

Stadia

March 2020

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Also inside:

Architects discuss new projects and the impact of the coronavirus crisis

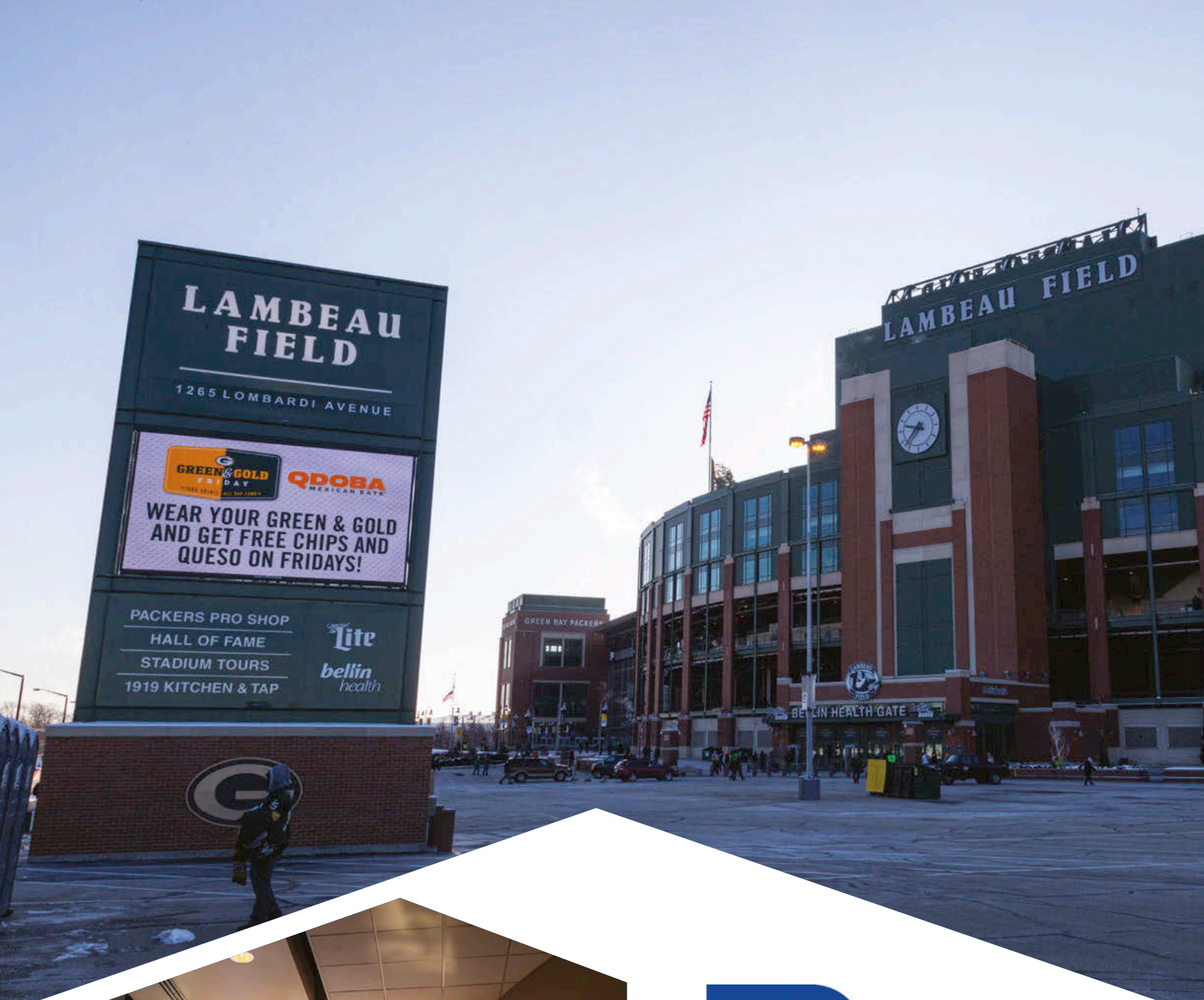
Ticketing technology takes on the scammers



**Inclusivity in sports:
How venues are becoming
more welcoming spaces**

WINDS OF CHANGE

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Coming into 2020, the stadium industry was set for one of its most exciting years ever. Yet, just hours before sending this issue of Stadia to the printers, events around the world quickly unraveled and we now find ourselves in time of crisis. As you will surely know, the coronavirus (Covid-19) pandemic has spread across the globe with its effects bringing societies, industries and entire countries to their knees. The impact to human life has been great, as is what it has done to economies. Sport has been shutdown, with all professional leagues stopping play. Major international tournaments such as UEFA Euro 2020 have been postponed, and at time of writing even the Olympic Games is very much in doubt as to whether it will take place in 2020. It is unimaginable scenes.

Stadia stand empty, supply chains are broken, construction is grinding to a halt and future projects are in jeopardy. While the result leaves hundreds of billions of dollars up in the air, this industry really is only one of many under all the rubble. As the full impact of the virus only became clear as we were going to press, frustratingly we did not have the chance to bring you a deep dive into what the ramifications of the pandemic could be for the stadium industry. However, while talking to leading architects about their latest projects (page 20) we managed to include opinion on how the coronavirus has, and will, effect their line of work. Perhaps it is too early to predict what the full extent of the impact will be – will it lead to new health and safety measures at venues? Will virtual reality broadcasts and digital audiences become the norm? Will planned projects fall through?

One thing we can say with certainty is that despite facing adversity we must carry on. And perhaps the great content we have in this issue, from the engineering excellence at Queensland Country Bank Stadium (page 38) to the high-tech ticketing technology transforming events (page 52), will serve as a welcome distraction and inspiration for the future. One particular feature I am extremely proud to highlight is our reporting of how professional sports are making great strides in the awareness, acceptance and action for inclusivity at stadia (page 30). The growing movement for venues to build dedicated spaces and train staff to support fans who have sensory needs is a fantastic effort and important cause.

Keep safe, keep positive and enjoy the issue.

James Billington, editor



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Stadia
MAGAZINE



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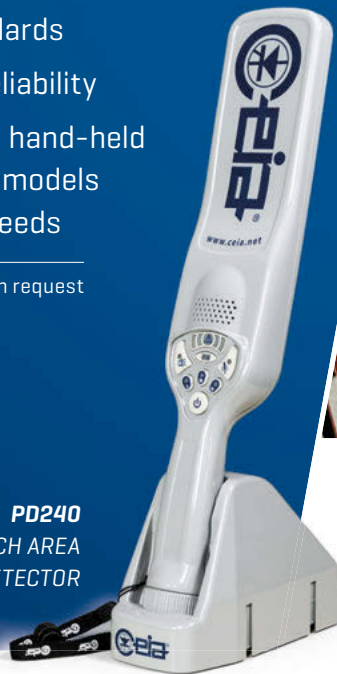
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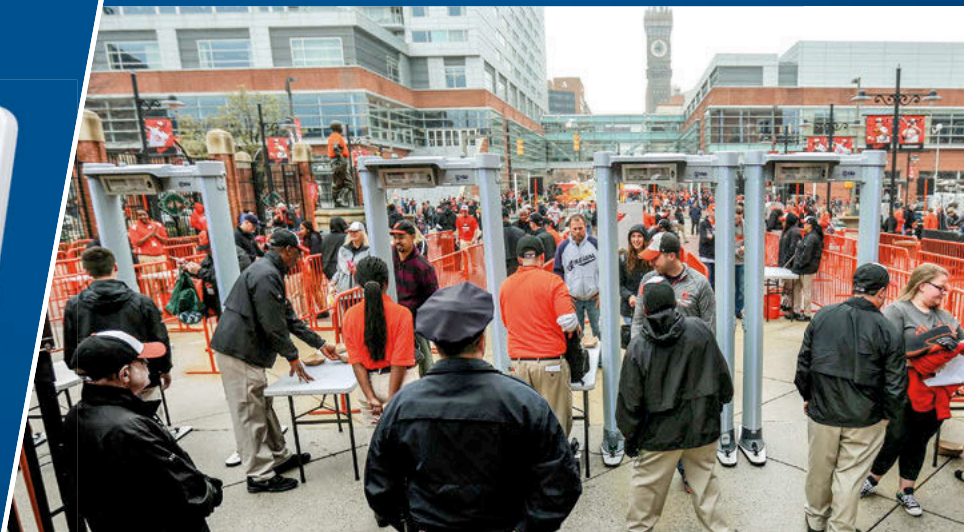
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A round-up of the biggest stadium and arena industry news, moves, launches and announcements

Motera Cricket Stadium has a capacity for over 110,000 fans

World's largest cricket stadium opens

Following three years in construction, the Motera Cricket Stadium in Ahmedabad, India, has opened its doors where it will serve as the world's largest cricket venue with a capacity for over 110,000 fans.

Surpassing preceding record holder Melbourne Cricket Ground's 100,000 seats, the stadium is double the capacity of the old Motera Stadium and built on the same 63-acre site. It took two years alone to demolish the old venue and construction then took a further three years.

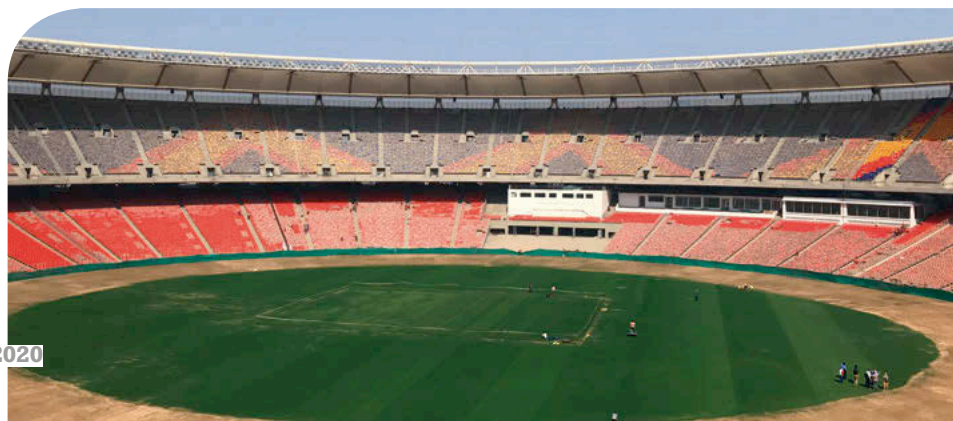
Designed by architects Populous, the 360-degree stadium has been deliberately made to be round and open to provide uninterrupted sightlines onto the pitch. The bowl design consists of two large seating tiers, each with approximately 50,000 general admission seats.

The new home of the Gujarat Cricket Association, it includes 76 corporate boxes, four team dressing rooms, state-of-the-art club facilities with three practice grounds, an indoor cricket academy, and a 55-room

clubhouse which will have an Olympic-size swimming pool.

Walter P Moore served as the structural engineer for Motera's roof system. Taking into consideration the fact that the city of Ahmedabad is located in a level three seismic zone, the roof needed to be lightweight to reduce seismic demand and develop an economical roof system. Walter P Moore proposed a tensile fabric roof system that is seismically separate from the concrete seating bowl and supported by steel V-shaped columns. These columns resist gravity and lateral loads resulting from high winds and earthquakes.

PTFE (polytetrafluoroethylene), Teflon-coated woven fiberglass, was stretched between a circumferential inner tension ring and an outer compression ring. A wind tunnel test was also performed to optimize roof design. Walter P Moore used Load Response Correlation Method to develop critical wind load patterns from the wind tunnel test. The Motera Stadium exists in tiers to accommodate smaller events and maintain the atmosphere for spectators even when the bowl isn't full. These tiers carry through to the roof, making the fact that it is structurally independent a crucial design element.





The Stadium of Life in Lethoso, South Africa



Future stadium and arena construction market worth US\$125.5bn

A new report has been published that reveals the value of future stadium and arena construction projects in the pipeline stands at US\$125.5bn. The analysis tracked by the Construction Intelligence Center (CIC) and released by HTF Market Intelligence comprises numerous projects related to major sporting events such as the forthcoming Summer Olympic Games 2020 in Tokyo, the Winter Olympics 2022 in Beijing and the FIFA World Cup in Qatar in 2022.



The report also lists the top countries in order of project values. In terms of the project pipeline value, the Americas account for the highest share with US\$54.9bn, equivalent to 41% of the total global value of stadia and arena projects. This is due to the maturity of the market and the large investment from professional and amateur sporting leagues. Asia-Pacific is in second place, with projects valuing US\$31.8bn with the growth of the Chinese Super League, while India continues to invest in stadia for its Indian Premier League cricket. Europe has projects valued at US\$25.6bn, while the Middle East and Africa has a project pipeline of US\$13bn.

Turf Talk

SIS Pitches donates artificial turf field to Kick4Life FC project

A sporting development project in Lesotho, South Africa, has been revealed that will include the building of a 1,500 seat facility in Maseru, which is said to be the world's first stadium built for social change. Turf specialists SIS Pitches has announced it will supply and install an 11-a-side artificial pitch to the cause.

Led by the Kick4Life organization, the Stadium of Life will be designed pro bono by architects and will include a range of facilities dedicated to enhancing the health, education and employment prospects of disadvantaged young people in Lesotho. The Stadium of Life will include in-built HIV testing and counselling units, with education facilities, a cultural village and indigenous trees and shrubs integrated within the stands. It will also be a home for Kick4Life's women's and men's team which play in the top flight divisions of football in Lesotho.

DID YOU KNOW?

At Super Bowl LIV, held at Hard Rock Stadium in Miami, a record 26.42TB of data was transferred within the venue, this is comprised of 11.1TB before kickoff and 15.32 after kickoff. This usage is an increase of 9.9% from last year's NFL Championship game.

What makes this figure even more staggering is that it was achieved at a smaller capacity stadium than Super Bowl LIII at Mercedes-Benz Stadium with 10,000 fewer fans in attendance. Since Super Bowl XLVIII in 2014, Wi-Fi usage has increased by eight times and in addition to this, new communications technology such as 5G, is allowing fans to stream and share more on the move and each user consumed an average of 595.6MB of data during this year's game.

The five most used social media apps used by fans at the game were Instagram, Facebook, Twitter, Bitmoji and Snapchat. Results show Instagram was the top driver of Wi-Fi usage.

First-of-its-kind standing seat system announced for the UK

A UK first has been announced for a sports venue in Telford, UK.

At Telford Athletics Stadium, its grandstand is to become the first in the country to have a seating system that increases capacity when used for standing.

The rail seats to be installed will enable a capacity increase of 80% when used in standing mode. To be supplied by Ferco Seating from nearby Shrewsbury, this style of seating has been installed previously by the company at Celtic FC and Shrewsbury Town, where the ratio of standing fans to seats is 1:1. Now, for the first time in Britain, the ratio in Telford will be 1.8:1. This will be achieved by having an



intermediate step along each row, thus enabling spectators to stand in two lines between the end-to-end barriers formed by the rail seats.

"At [soccer] stadia like these, the key to being able to increase capacity in this way is fitting rail seats that take up as little space as possible. If when closed the seats are just 50mm deep, then wherever regulations allow creating extra capacity in this way is very doable," said Ferco Seating's managing director, Michael Burnett.

VIDEO BOARD

Take a look inside Dodger Stadium's centerfield ballpark renovations



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DRAWING BOARD



Proposed plans to redevelop Millwall FC's stadium will remain true to the club's history and industrial past of the surrounding London area



THE DEN, BERMONDSEY, LONDON

English soccer side Millwall FC has revealed renderings of recently approved proposed plans to expand its home stadium, The Den, as well as redevelop its surrounding areas.

Millwall FC has played at The Den in Bermondsey, south east London since 1993 (following a short move down the road from its Old Den, which was its home since 1901) where the stadium has garnered a reputation for having one of the most lively crowd atmospheres in soccer.

As a result, the proposed design of the new Den created by AFL Architects is inspired by the club's history and the industrial past of its surrounding area. On the exterior, the use of brickwork arches references the railway viaducts and industrial past that surround the current site. Internally, as much of the original stadium infrastructure as possible will be kept, to ensure

the famously intense atmosphere of the Den will be retained.

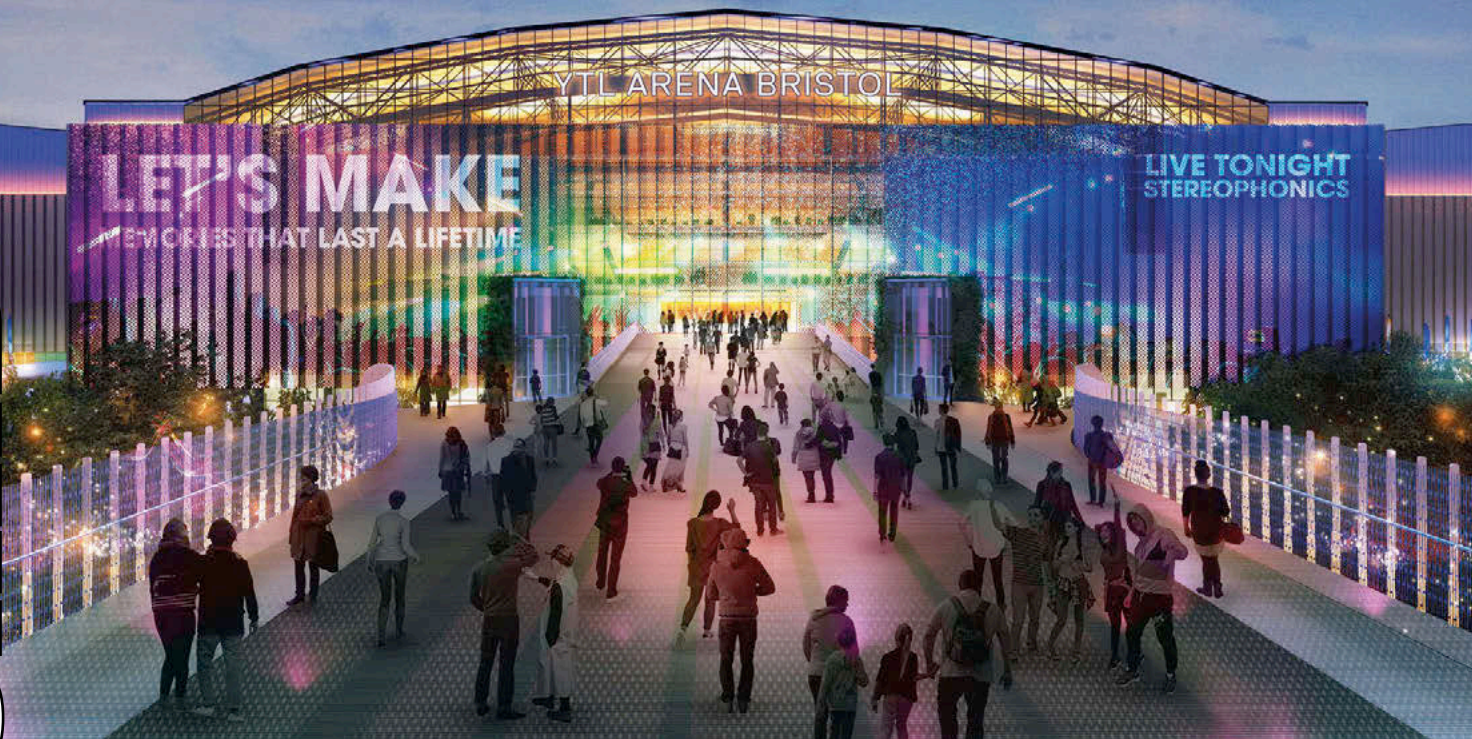
The proposals under development include a strategy for incremental, phased expansion of the existing stadium, up to a total maximum capacity of 34,000 seats, built as additional upper tiers behind the existing seating bowl. This will not only provide the facilities needed to meet Premier League requirements – such as additional media and player accommodation – but will also in the future provide enhanced facilities for fans to transform their match day experience.

The development strategy is to retain as much of the existing stadium structure as possible while providing for a flexible phased uplift to both facilities and capacity over time. This not only maintains the stadium in use for

fans, but minimizes demolition and construction waste. The design approach is to create spaces that are adaptable, flexible and multi-use, encouraging activity within and around the stadium seven days a week to make optimal use of resources and create a sustainable future for the club.

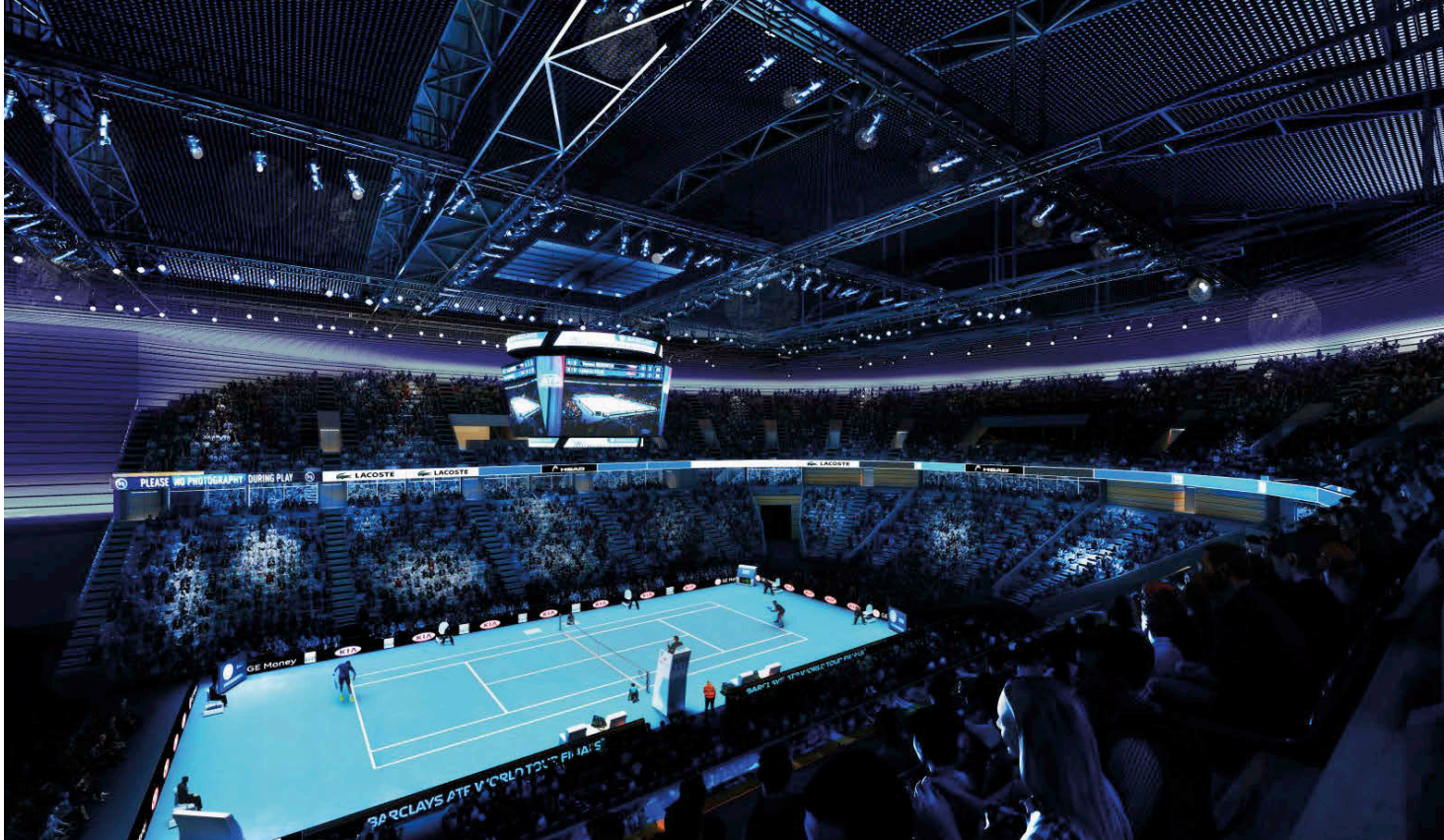
Part of the proposal is the creation of a new public plaza at the heart of New Bermondsey, providing an area for the community, as well as an engaging space for fans on match days. This is elevated over parking and service areas and accommodates retail, commercial and community use spaces along the street frontages. Complementing all of this will be flexible commercial space for events and conferencing, alongside residential developments that would drive additional funding to the surrounding site. ■

DRAWING BOARD



The YTL Arena will convert old airplane hangars to sustainably construct an entertainment complex, including the UK's third largest event arena





YTL ARENA BRISTOL, BRISTOL, UK

The green light has been given for a project in Bristol, UK, that will repurpose the historic Brabazon Hangars (where the Concorde airplane was born and built) to create a year-round entertainment and exhibition destination by 2023.

The project consists of converting the vast hangars to create three individual, but interconnected, spaces with the central hangar being home to the UK's third largest arena with a 17,080 capacity for live music. Its east hangar will take advantage of the large flat floor to host exhibitions and events, and the west hangar will become a large space offering food and drink.

A new neighborhood will be built as part of the plans, however,

to ensure that music events do not disturb residents the venue will use sound isolating materials to prevent noise leak. The construction of the main arena is designed to act as a 'box within a box' with sound insulation installed in the roof and façade fabric of the hangars. Inside, the walls and ceiling will be lined with sound absorbing materials, while the seats are to be designed to further reduce reverberation and minimize the change in acoustics between occupied and unoccupied arena conditions.

Sustainability is also key focus of the plans and the construction will employ adaptive reuse methods, which reuses and adapts the existing structure, as opposed

to demolition. For any areas of new construction, it will source locally the materials required. In addition, it will employ low carbon energy sources, rainwater harvesting, recycling, electrical self-generation, neutral impact on local air quality, and water efficiency.

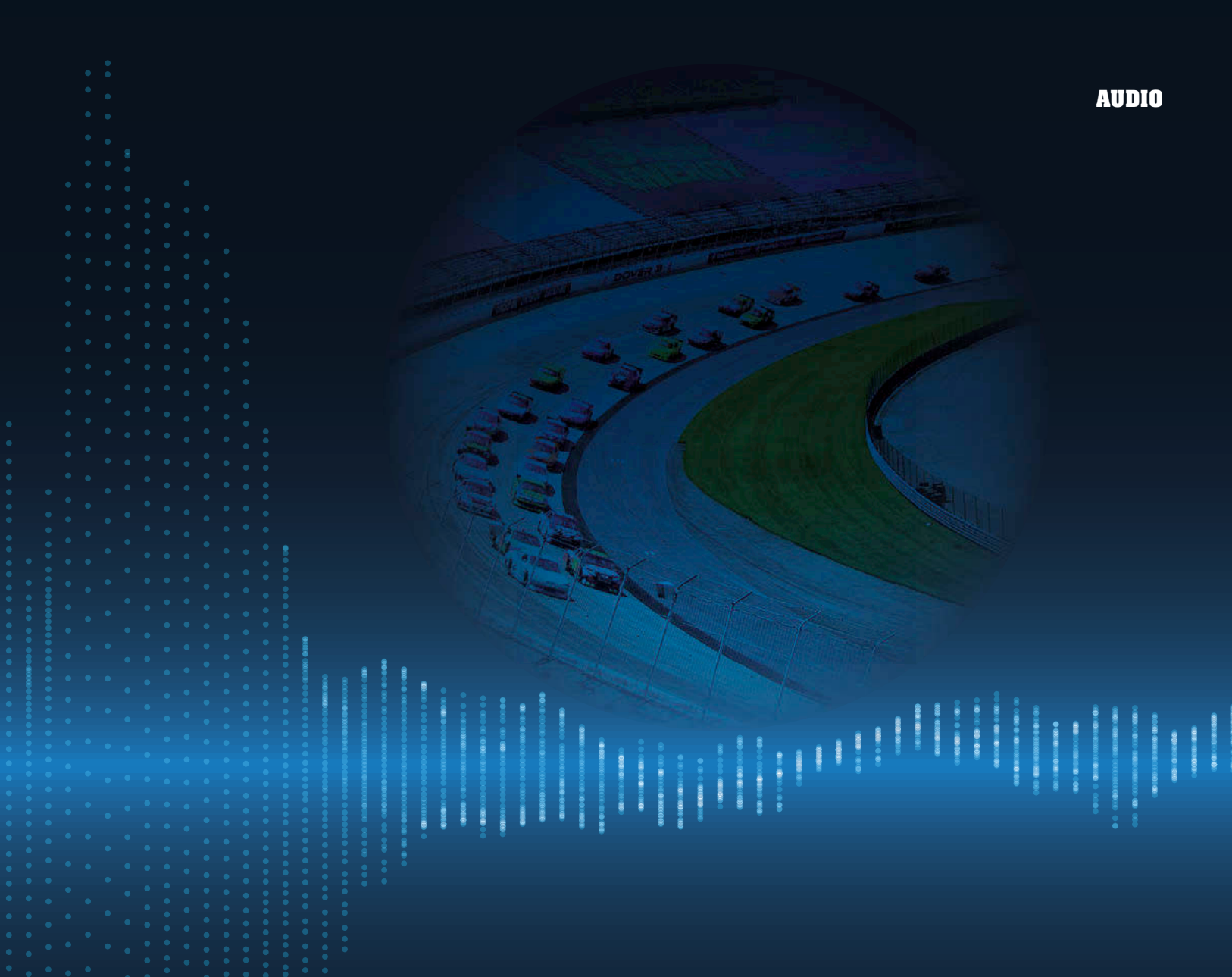
YTL Utilities is the company behind the scheme, which bought the Filton Airfield site back in 2015. The construction will be a privately funded project with no public money involved. Included in the plans is the creation of transport connections to the complex, including a new railway station and the building of a superhighway connecting the Brabazon site to all surrounding neighborhoods. ■



AUDIO
BY DAVID W SMITH

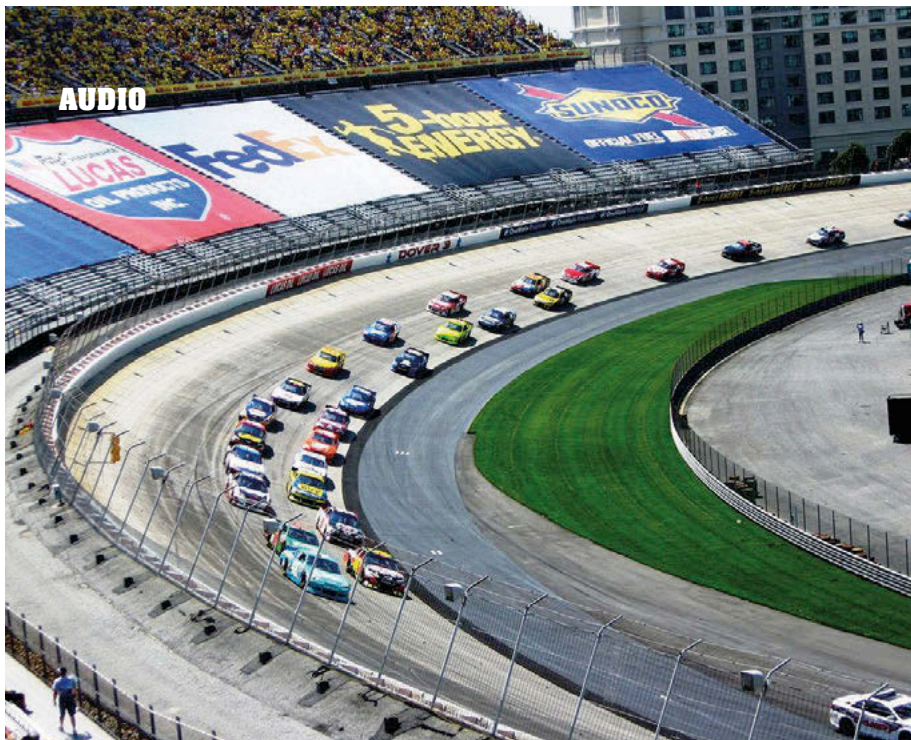
SOUND CHECK





Audio engineers face numerous challenges in the design and delivery of loudspeaker systems at open-air venues, so how can technology help compensate to produce intelligible sound?

For open-air stadium events such as Nascar, Formula 1, or horse racing, the lack of reverberation due to them not having a canopy roof or building sidings can sometimes make an audio engineer's life easier. However, stadia that don't have a traditional enclosed bowl structure present other issues by being more exposed to audio-affecting outdoor elements such as buffeting winds and low levels of humidity. Large and complex open-air venues also require a variety of speaker system solutions to deliver intelligible audio over greater sites to a more dispersed audience, all without taking advantage of stadium infrastructure.



“Outdoor sound disperses into the atmosphere, whereas in enclosed venues, it hangs around and gets trapped in the space causing reverberation. But that doesn’t always mean it’s more straightforward to set up an outdoor venue,” says Dave Howden, technical services manager for large venues at Biamp, an AV specialist based in Oregon, USA. Howden, also a freelance sound operator for Nascar, Monster Jam and major US sports, describes: “Some of the biggest threats to the clarity of sound come outside from the weather. Wind causes the listening experience to be highly variable, depending on its direction relative to the sound source. Low levels of humidity of 20-30% can cause excess attenuation of high frequencies, which can be perceived as a duller sound. For particularly dry environments, like those in the Middle East, it’s possible to set the computer controls to operate at low levels of humidity by increasing the power to the high-frequency drivers.”

Howden explains it is virtually impossible to remedy all the constantly changing atmospheric conditions across a large venue with a point-source system, which concentrates speakers in one location. “It’s often cost-effective to have one location for speakers, such as a scoreboard or video board, but they could have sound throw distances of 100 to 150m when wind and humidity impact intelligibility. It’s better to have a distributed system with multiple speakers scattered around and located 20 to 30m from

Main: Sound operators have the difficult job of adjusting system levels at very noisy events to ensure announcements and music can still be heard, but at safe and lawful volumes

Top left: Motorsport events such as Nascar take place on large, open sites that are exposed to the wind, which is a challenge for audio intelligibility



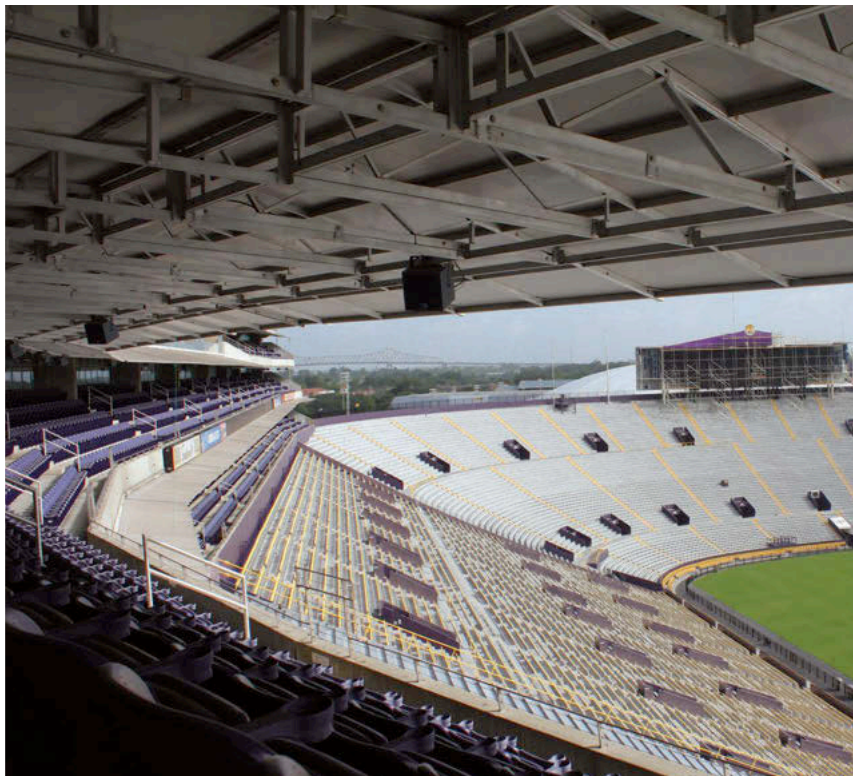
the crowd. They also don’t ‘spill’ as much sound, because the individual speakers don’t need to be as loud. But it’s a balancing act with budgets at a lot of venues as the latter solution is much more expensive.”

Crowd control

A particular challenge for intelligibility at outdoor venues is background noise, especially from crowds that generate around 105 decibels. Configuration of the system at the outset is therefore critical. When Dave Howden is operating the permanently installed in-house systems his role is to adapt them to the nature of the sport. “Monster Jam and Nascar are events with high ambient noise and it’s not responsible to compete with the sound of the engines. You can endanger people’s hearing, or violate noise regulations,” he says. “Monster Jams are stop-start shows and announcers usually wait until the engine noise has died down to make their announcements. As a sound system operator, your job is to make sure the system level is appropriate,” Howden adds.

“Monster Jam and Nascar are events with high ambient noise and it’s not responsible to compete with the sound of the engines. You can endanger people’s hearing, or violate noise regulations”

Dave Howden, technical services manager, Biamp



The challenge is also related to the limited number of suitable installation points in outdoor venues, according to Michele Begotti, project design manager at RCF's Engineering Support Group, an Italian manufacturer of speakers and PA systems. "Open-air stadia can sometimes be even more challenging than closed ones because there are often no 'optimal' installation points. Locations are typically scoreboards, light masts, press boxes, or poles beside the tribunes and it's not always possible to guarantee clarity of sound, especially when there's a lot of background noise," he says.

The challenging tasks for system installers include achieving the correct sound pressure levels (SPL) over the entire venue. If they fail, it can lead to a lack of, or non-uniform, sound coverage for certain areas, which results in a poor signal-to-noise ratio (S/N), or echoes. If the speakers have to throw sound a long way, which occurs at many outdoor venues, speaker echoes come into play once again. Everything has to be calculated and tested carefully. "For example, if the speakers are at the rear of the audience it may alter their perception of sound. But if they're on masts facing in opposite directions, it can create different arrival times at the same level and therefore we get echoes, or image broadening," Begotti says.

Recent technical developments have helped to improve sound at outdoor venues, Begotti reveals. RCF has adopted systems that use large format compression drivers and optimize the waveguides and the horns. They allow the speakers to reproduce frequencies of

GOOD NEIGHBORS

Danley Sound Labs' speakers are responsible for delivering the sound at Louisiana State University's 100,000-plus seater Tiger Stadium, reputed to be the loudest in the world. But no matter how loud, the sound will stay within the enclosed bowl. Open-air venues are sometimes quite different, however. Company president Mike Hedden explains the challenge can be to prevent spillage onto adjacent properties.

"It's an issue for horse racing and motor racing venues, especially cross-country venues. It's not easy to get approval if owners of neighboring properties don't want hideous noise," he says. "There's a similar issue in the lighting world but it's easier to control light pollution using shutters. With acoustics, when wavelengths are measured in tens or hundreds of feet, you can't just put a piece of metal to block sound."

Danley Sound Labs uses horn-loaded sub woofers that allow the energy to stay in one direction more than the other. Unlike other technical solutions that try to cut sound off, it allows speakers to be quiet at the back and louder at the front. This means it's possible to have incredibly high energy sound up to a boundary, then abruptly cut it off. "We used the technology at the We Out There Music Festival in Cambridge, England, last year across a multiple acreage site with a boundary fence. Just like at some sports venues, the neighbors didn't want to hear it, especially at night."



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AUDIO

500Hz and above from a single component, which makes the sound more coherent, he says. The use of FIR (finite impulse response) filters is another positive development. “The FIR filters make the phase response linear which means we can achieve more emphasis on the voice even at long distances. The improved coherency allows us to increase the throw distance. In three-way speaker systems, with horn-loaded sealed mid ranges, it’s possible to reach ranges above 100m with high voice intelligibility and extremely high SPL.”

Above: At Ascot racecourse in the UK, a complete system overhaul by SSE Audio uses Bose speaker technology to enhance site-wide coverage

Below: The Bose ArenaMatch loudspeaker range can be configured to deliver a finely focussed dispersion pattern

Track meet

The genteel surroundings of Ascot racecourse in the UK offers a stark contrast to the rowdy Monster Jams, where the noise from the engines is part of the atmosphere. Horse racing venues have to be more careful because of the danger of scaring horses.

“We don’t allow the loud noise to reach them. We monitor dispersion patterns and broadcasting levels to make sure we cover audience areas, but the sound gets cut off at the white fence of the race track,” says Eddie Thomas, vice president of integrated projects division at SSE Audio, which is refurbishing the sound systems at Ascot racecourse. The 12-month installation will include coverage for the vast 400m long grandstand that can accommodate 57,000 racegoers and includes eight restaurants and 265 hospitality boxes.

The sound can be prevented from being thrown too far and spilling from the venue using tightly controlled, dispersion loudspeakers. The angle and dispersion of the horns control how far it is thrown. Meanwhile, sound operatives adjust the decibel levels with the amplifiers. The parade rings are another sensitive location. Speakers have to be set up to broadcast to the audience in the raked areas surrounding the rings, but never pointed at the horses, or towards the parade ring. “We use very controlled columns or loudspeakers with DSP controls to steer the audio where we want it to go,” Thomas says.

SSE Audio is using two different types of loudspeakers from Bose, including its latest ArenaMatch range and amplifier technology, in each cluster to cover the wide open space in front of the stands. A near-field speaker with a wide dispersion



AUDIO



A far-field loudspeaker can cover the furthest reaches of a space, but lag is an issue to consider

OUTSIDE THE BOX

Outdoor speakers have to resist everything from frost to pollution, or the heat of the sun. Most manufacturers offer both indoor and weather-proofed outdoor versions of speakers with similar internal components. RCF outdoor speakers are made of composite materials that are resistant to rain, humidity and UV light. The company adds poly-urea coatings to the wooden enclosures, internal bracing and mechanical parts to provide resistance to pollution and extreme weather. The speaker grilles feature water-repellent filters and there are chemical treatments on the transducer cones. Electrical connections are also protected and sealed to fully protect from the elements.



RCF's TTL 55-A is a weatherproof, three-way line array module

angle covers areas near the stand, and a far-field loudspeaker throws audio to the furthest reaches of the space. The loudspeakers can be configured with different horizontal and vertical coverage patterns, meaning that the dispersion pattern can be finely focussed to where it is needed. Each ArenaMatch speaker features a 14in woofer, plus six EMB2S compression drivers delivering full range, high SPL, performance, without the need for subs, which offers greater install options and flexibility. Meanwhile, the hospitality boxes in the stands will contain small loudspeakers and Bluetooth technology that connects to the PA systems, or the commentary.

Time alignment issues also need to be considered when configuring any AV network. Ascot racecourse, for example, has multiple screens down the length of the track. Each one has a natural lag time which means Thomas has to place a delay in the speaker systems that synchronizes the images with the sound. "It's not so bad for racing, but the live interviews need the lips in sync, or it looks silly," he says.

Dave Howden faces similar discontinuity issues during Monster Jam monster truck events and Nascar races. Some parts of the crowd could potentially see the image half a second before the sound arrives. His teams have to calculate a "sweet spot" in the crowd over a 40ft (12m) wide area, and calibrate the sound in order that some people in the audience receive it a little bit earlier and others a little bit later. But the gaps remain tolerable to the human ear. ■



Bukit Jalil National Stadium – Kuala Lumpur, MY



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ARCHITECTURE
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Confidential Stadium

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ON THE BOARDS

Leading experts in the world of sports architecture and design discuss exciting projects they've been working on and explore industry trends





Confidential Stadium, China

AFL ARCHITECTS

Phil Osbourne, *director*



What new projects have you been working on?

Over the last year or so we've increasingly been asked to engage in some fairly substantial stadium design competitions and soccer related projects in China. Our team has already been working over there for the past three years, so as we've become more visible we've been seeing some positive results.

The profile of our projects started off with smaller clients and soccer training grounds, but these have now graduated to internationally-recognized clubs. We're currently participating in a design competition for a major new stadium, which is still ongoing. We're down to the final few from a very big field.

Have you encountered any particular challenges?

These projects have all been very interesting, although quite a challenge because China has a different perception [to the western world] of what constitutes a soccer stadium. However, it has been an educational process for both us and our Chinese clients as we are able to inform what makes an appropriate venue for a soccer match rather than a generalized, multi-use stadium, which is what was typically built in the country.

The Chinese are now very keen on the British model of getting the crowd as close to the pitch as possible. They are also learning about the corporate offer, which until recently has been overlooked as most stadia have been owned by cities and governments, rather than the clubs themselves.

We're seeing clients now very focused on getting the most out of a stadium, so we are being encouraged to mix it up with other uses, such as retail. However, they don't tend to want multi-sport,

so that means no running tracks around the pitch like the old European model.

How have current world events affected your projects?

We've got a number of projects on-the-go in China, but banks have been shut down so we are monitoring the situation and adapting where necessary. For future projects, there could be a great detrimental effect for many companies, especially those out of country like us, as the Chinese take a personal approach to projects and strongly value face-to-face contact during the process. With limited or no international travel, this makes things very difficult and will inevitably have a significant effect on business in China.

Otherwise, we've developed a very strong relationship with the UK government's Department of International Trade. They've been very good at supporting us in our engagement with Chinese clients.



Rizhao stadium, China

Lusail Stadium, Qatar

How different is it working on a build in China compared to Europe or the Americas?

It is very different. Not only from country to country, but the regions in China are different. It is a huge country and there are variations in the way people do things and even the applicable regulations. Conditions within which you are building are also vastly different. Climate changes between the north and south are massive.

For example, we've got a project with a developer for a training base, located three hours north of Beijing, highly elevated and very cold. Our team has to consider differing palettes of materials, as well as various means in how they are procured and the differing regulations. The best way to get around these issues is to have local partners or LDIs (local design institutes) for the projects. We typically take our concept and do a set of design intent drawings up to RIBA Stage 3, and then the LDI partner would pick it up and produce detailed design and

working drawings, with AFL assuming an overseeing role.

What stadium design trends are you seeing more of?

For soccer in developing countries, there is a focus on creating an authentic soccer environment that brings fans close to the action, along with lighting and audio systems to offer fans a more immersive experience.

There's been a very positive response to the approach taken at Tottenham [Hotspur Stadium] in respect of a properly designed-in alternative sport. That stadium is a huge leap forward, and we're getting many clients asking us to benchmark their corporate offer against it. The concept of the club concourse is now basically the general admission concourse – it's like the US model, where fans can gather with better F&B options.

There is also another trend that I have been noticing with stadium size where you don't have to go large, you can go better – so more consideration is being given to the

experience. This is particularly evident in Major League Soccer.

Tell us about your work with Millwall FC and the plans for its new stadium

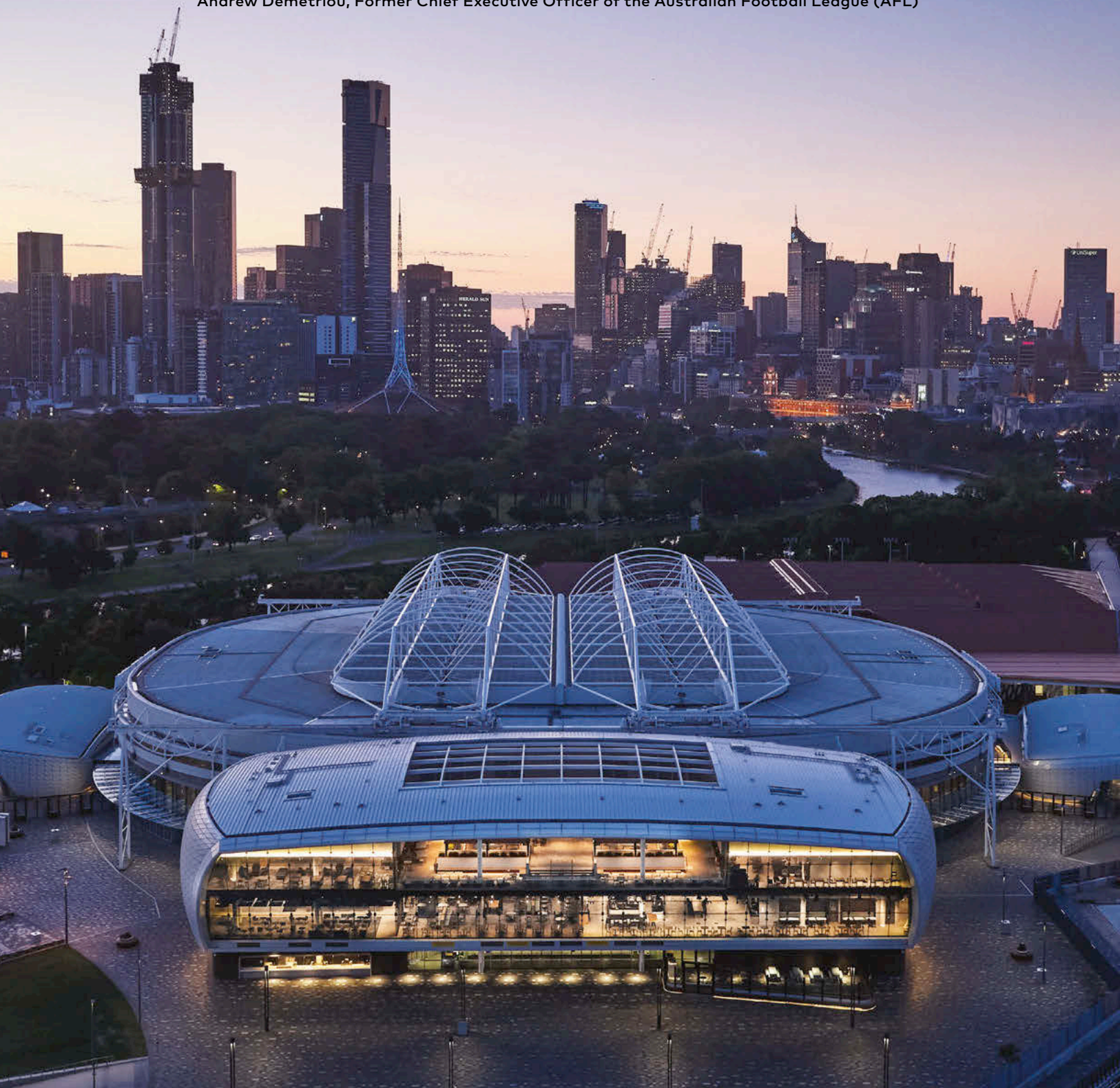
Millwall has fully embraced our design for the elevation and expansion of its stadium on the basis that we understood the delicate nature of the project. We went right back to the bones of the scheme, understanding that the club didn't want to move away but they did want to make a change to capacity and comfort if they wanted to get to the Premiership.

We integrated the nature of the area, so we embraced industrial architecture of the railways that surround the site and injected contemporary, efficient and green materials for new build sections.

They've been sensible with capacity of around 30,000 and they have a sustainable approach that can incrementally uplift the capacity when needed. Flexibility is always the key.

"There's no place on earth for sport and entertainment like Melbourne"

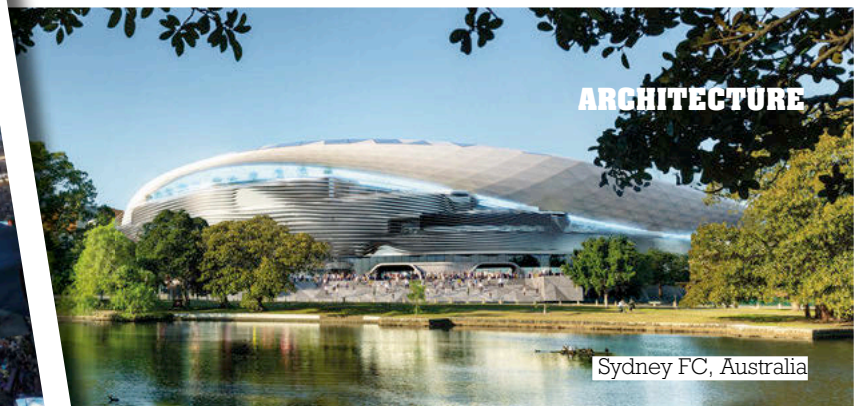
Andrew Demetriou, Former Chief Executive Officer of the Australian Football League (AFL)



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Sydney FC, Australia

COX ARCHITECTURE

Alastair Richardson, *director*

Talk us through what future projects are on the boards?



We are currently working on the redevelopment of Sydney's iconic football stadium, due to be competed in 2022. This boutique 42,000 seat stadium will be home to three professional football codes (Rugby Union, Rugby League and Football) providing a community-based stadium that responds to multiple users as well as being a stadium focused on the delivery of community membership and engagement, and is a far cry from the purely commercial stadia development model the USA and UK.

We are also responsible for the reference design for the redevelopment of ANZ Stadium, the flagship venue of the Sydney Olympics in 2000. The new design addresses the shortcomings of the original Olympic venue by addressing the issues of proximity and fan engagement in athletic venues. The redevelopment allows for the reconfiguration of the seating bowl to be a dedicated rugby and football stadium. The proposed design brings fans closer to the action and provides a translucent roof that allows light in while providing shade and shelter for fans. We're also working on smaller community venues for soccer, cricket and Australian Rules Football.

What are you most excited about, industry-wise, this year?

We are excited about our evolving offering of integrated delivery models that focus both on advanced BIM 360 and the customer experience through the virtual and augmented stadium. This holistic focus on both the technical and the social can deliver design and construction efficiencies, truly integrated sustainable design, operational excellence and a truly fan focussed experience. BIM 360 is enabling us to build a fully augmented reality design prior to opening which is allowing our clients to visualize and pre-sell inventory prior to the opening of the venue. This was used to great effect at Country Bank Stadium in Townsville, which opened this year.

What do you expect will be the biggest sports stadium design and engineering trends this year?

Without a doubt, true sustainability. Venue operators and owners will be aiming for carbon neutrality by 2050 and at Cox we believe this is eminently achievable. With government and sporting code's commitment the Paris Accord and carbon neutrality in 2050 we are now addressing significant design issues to reduce energy consumption, embodied energy and sustainability in our venues. The advance to renewable technology is now allowing us to develop carbon neutral facilities by 2050 and we are working

closely with energy providers and venue owners to achieve these outcomes. We are undertaking extensive research into sustainable structures and minimization of the use for concrete to provide effective carbon sinks and believe that these approaches go far beyond any LEED or other 'green' assessment tools.

What do you expect from the Australasian region this year?

We expect to see an increased emphasis on community participation and fair play. This is demonstrated by a growing number of smaller, local venues, with a focus on community facilities rather than huge flagship venues. This can be attributed to several things: aging or decrepit community infrastructure; grass roots sporting movements that are, happily, an increasingly important feature of the sporting landscape in Australia; and concerns about climate change leading to the development of smaller, more sustainable venues closer to home.

Climate change is, of course, a huge driver in the design of sporting venues now. From designing climate appropriate venues, to redevelopments to improve sustainability and thermal comfort, to a continuing emphasis on reuse and redevelopment rather than new build. In many cases, venues may get smaller, and they will absolutely get smarter and more responsive to suit our changing world.

MANICA



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Allegiant Stadium, Las Vegas, USA

MANICA ARCHITECTURE

David Manica, *president and owner*



What new projects are you working on and what's interesting about them?

We have a lot of projects in various phases on the boards right now all around the world including: South Korea, Japan, China, Italy, Austria, UK, Sydney, and the US. One of the most interesting projects we are developing is the new 18,000 seat arena in Seoul. It has a fantastic ability to host both indoor and outdoor events.

Have you encountered any particular challenges?

All our projects have the different variations on the same challenges. Budget always seems to be a driving challenge for any large project. The design and delivery schedule is also becoming increasingly compressed. I see that our clients are wanting more building for less money in half the amount of time. That's the new normal in our industry. And as we succeed, the bar just gets lifted a bit higher. For example, in Miami we just finished a new 18,000-seater outdoor stadium for Major League Soccer side Inter Miami FC. We designed and built the project in a total of 10 months, for less than US\$100m. That's an incredible accomplishment that I'm really proud of.

The Raiders' Allegiant stadium is near completion, what was it like working on this project?

Allegiant Stadium was an incredible experience in every way. Designing such a unique and customized building for the [NFL's Las Vegas] Raiders was a lot of fun, and the collaboration between the ownership and our team resulted in something really special and forward thinking. And, spending time in Las Vegas was a fun perk of the job too. All in all, I think the building will stand out as a new benchmark for the industry.

What new stadium design trends are you expecting to see more of this year?

There are many. We're seeing more and more multi-use flexibility for event programming, there is the rise of dedicated venues for esports, and the industry is introducing a wider variety of seating and ticketing options. In addition to this, there's bigger and bolder technology being more integrated throughout the venue.

Clubs are offering fans more personalized guest experiences, and making spaces within the stadium available to be used on non-matchdays, which is something that its local communities can benefit from.

Finally, as I already mentioned, stadium owners are demanding projects that have faster and faster delivery schedules.

Have current world events with the coronavirus pandemic affected you in any way? How will it impact the industry going forward?

This is a really interesting question. We just finished the Chase Center in San Francisco. When the team decided to play a game in a completely empty arena I never would have guessed that a brand-new state-of-the-art venue after years of design and construction would be one of the first in the world to play an official "sold out" game with nobody in the seats. Then, the NBA decides to suspend the season altogether.

I hope the world heals from this latest pandemic, and that we can all return to enjoying ourselves in the company of large crowds. But in the same way that 9/11 changed airport security forever, I can imagine a day in our near future where security at the door of our large sport facilities may soon include bio analysis to ensure we are not spreading disease.

I remember entering Hong Kong during the SARS breakout, and there was a temperature checkpoint where they analyzed every person for elevated temperatures and fever. Those that were even slightly elevated, were pulled aside for more testing before allowed entry into the city. I can definitely see that kind of bio-security becoming the new normal at the doors of our venues.



Würzburg Arena, Germany

VISION4VENUE

Florian Hupfer, *managing partner*



What are you working on at the moment?

We are still working on the Würzburg Arena in Germany, which is an 8,000-capacity venue for basketball and concerts. We are working not only as architects, but also as consultants and a project manager for the client. In addition, we are also in the final negotiation stage for the arena operation itself.

What has been the most interesting or challenging aspect of this project?

What makes this interesting is the complexity of the plot of land, which is not very big for an arena like this. It has to handle a lot of elements such as public transportation and cars on a small site. It also presents challenges in regard to the operators as they all are bringing their input to the arena. While this is very valuable to the project it's also very difficult to get all these ideas incorporated.

Are you able to talk about any future projects?

We have our arena project in Lagos, Nigeria, which is being developed by a local private real estate company. It is planning to build a 15,000-capacity sport and concert arena, that also includes a hotel and a smaller concert venue with about 2,000 seats, a shopping mall and cinema. It is a very complex project.

How much more work have you done with esports arenas and what makes an ideal venue design for them?

We have had quite a few talks about these projects but nothing concrete is planned yet, but you never know what might happen in the next few months. I think esports will not require big arenas, rather smaller auditoriums with 2,000-4,000 seats.

I believe one design element they need to have is a very close and intimate seating configuration. While the venue itself needs to be multi-functional and flexible with the ability to adapt in the future, as well as having plenty of technical equipment.

Currently, however, my opinion is that esports events will be hosted at existing multi-functional arenas. Most of these venues can be adapted to host such events.

What design trends are you seeing on the rise?

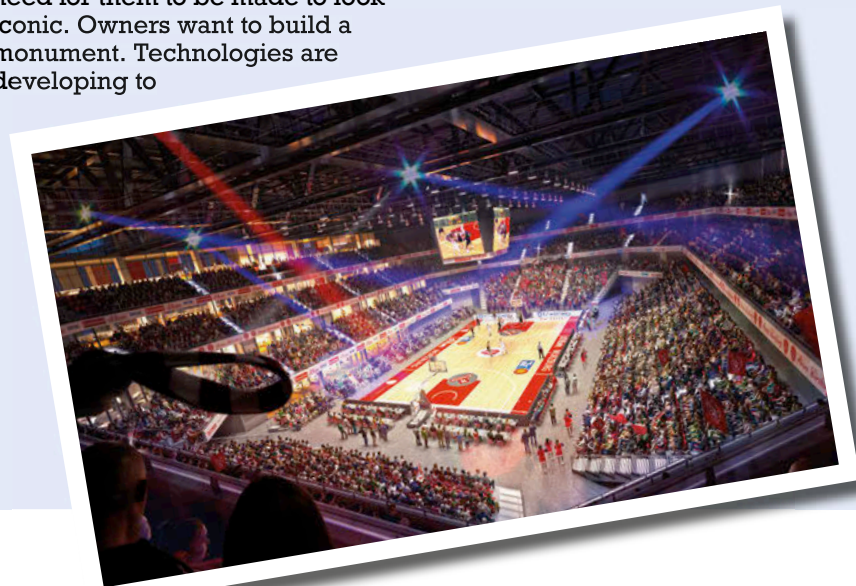
I have noticed that the façade and appearance of the building has become more of a focus with a need for them to be made to look iconic. Owners want to build a monument. Technologies are developing to

facilitate this trend, with lighter and more energy-saving materials to create such exteriors. Our design philosophy, however, has always been to think from the inside to the outside in terms of functionality and revenue generating streams, but it really depends on the client on how much we can spend on the façade.

What we have noticed in the last few years working in different countries is that we're seeing clients are not willing to spend much more for engineering consultancy and design. This means construction has more value than the platework.

Are fans using stadia differently these days and how are venues adapting to meet their needs?

In the city, the stadium is offering more chance for it to become part of the daily lives of the community as well as the fans. The stadium is introducing more to appeal for fans to come earlier and enjoy its amenities, and also to keep them around the arena after the game. ■



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INCLUSIVITY
BY JOHN CHALLEN



SENSE ABILITY

With more awareness about mental health and sensory needs, there is a growing movement for sports stadia to introduce special areas and technologies to improve levels of inclusivity and accessibility



Gurrent statistics suggest that as many as one in six people have sensory needs. For those people – who might have autism, Down syndrome, ADHD, early onset dementia or any other kind of sensory need – attending sports events and concerts can be a struggle, sometimes impossible. But the situation is improving for fans as sports teams are turning awareness into action by supporting those with invisible disabilities with new technologies and amenities, including sensory rooms, which are being integrated into stadia all over the world. As a result, fans with mental and physical disabilities are now being accommodated better than ever before.

One of the companies driving things forward is non-profit Kulture City, which modifies an environment with equipment such as sensory bags, lights and headphones. The company also provides specialist training for stadium staff who supervise the users of the room. “Sensory rooms are not mandatory in stadia and some of the venues don’t have any space. So they will come to us – either existing venues undergoing renovations or new sites being built – to ask for help,” explains Uma Srivastava, COO, at Kulture City.

The first sensory room Kulture City was involved with was for the NBA’s Cleveland Cavaliers and since then, it has helped build rooms for other NBA, NFL and MLB teams in the US, as well as other spaces for teams in Australia and England. Part of the growth in these facilities has been because, while many teams put on a ‘sensory-

friendly’ game once a season, many want to attend multiple games, which can prove difficult in such an overwhelming environment and they end up only attending part of a game.

Conversions and new-builds

Whether it’s a brand new stadium or a refurbishment, facilities for those with sensory needs can be accommodated relatively easily. While it’s easier for Srivastava and her team to be involved at the start of the project, they’re happy to work with any situation. “We treat every venue the same, regardless of size,” she says. “The requirements for training and facilities are common across all the venues we’ve worked on.”

Dickies Arena in Fort Worth, Texas, which opened in November 2019, contacted Kulture City when it was finalizing the floorplan, because they saw the value in a sensory room. The Texas Rangers’ new home, Globe Life Field will also have a bespoke room to be used for those with sensory needs. “In these new builds, we still have the same lighting requirements, we make sure there are wall dimmers, and ensure the carpet and wall colors are compliant,” explains Srivastava. “The big advantage of a new stadium is that we are able to some degree to pick where the room will be. That scenario helps because it means we can go to a quieter part of the venue. When we are retrofitting an existing room we have less control, which means we might have to add in more materials for soundproofing and sound masking.”

INCLUSIVITY

The fans are an important part of the process, when creating these spaces. “In Australia, the Geelong Cats had several focus groups to better understand the needs of the users,” explains Srivastava. “There were also a couple of players who had children with sensory needs who weren’t able to come, so we were able to gather more information from them, as well as the fans and the local council.”

League leaders

The National Football League is the most attended and most-watched sport on the planet. So, it’s only fitting that teams are responsibly using their position to raise awareness. The Philadelphia Eagles has been one of the teams at the forefront of this cause. In August 2019, its Lincoln Financial Field was officially certified as a sensory-inclusive stadium following the build of a 500ft² state-of-the-art sensory room that has been carefully designed by top medical professionals to ensure a quieter and more secure environment. The sensory inclusive certification process entailed training for Eagles employees and Lincoln Financial Field staff by leading medical professionals. It included how to recognize guests with sensory needs and how to handle a sensory overload situation. Sensory bags equipped with noise-cancelling headphones, fidget tools, verbal cue cards and weighted lap pads are made available to all guests as part of their experience.

Pics: Philadelphia Eagles

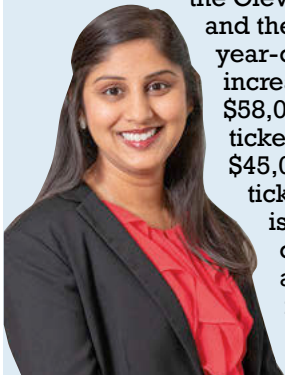


Clockwise from top left: Making sporting events more inclusive is a big part of the agenda for professional teams, including the NFL’s Philadelphia Eagles and Seattle Seahawks, with both installing specially-designed sensory rooms equipped with calming lights and fixtures, and trained staff

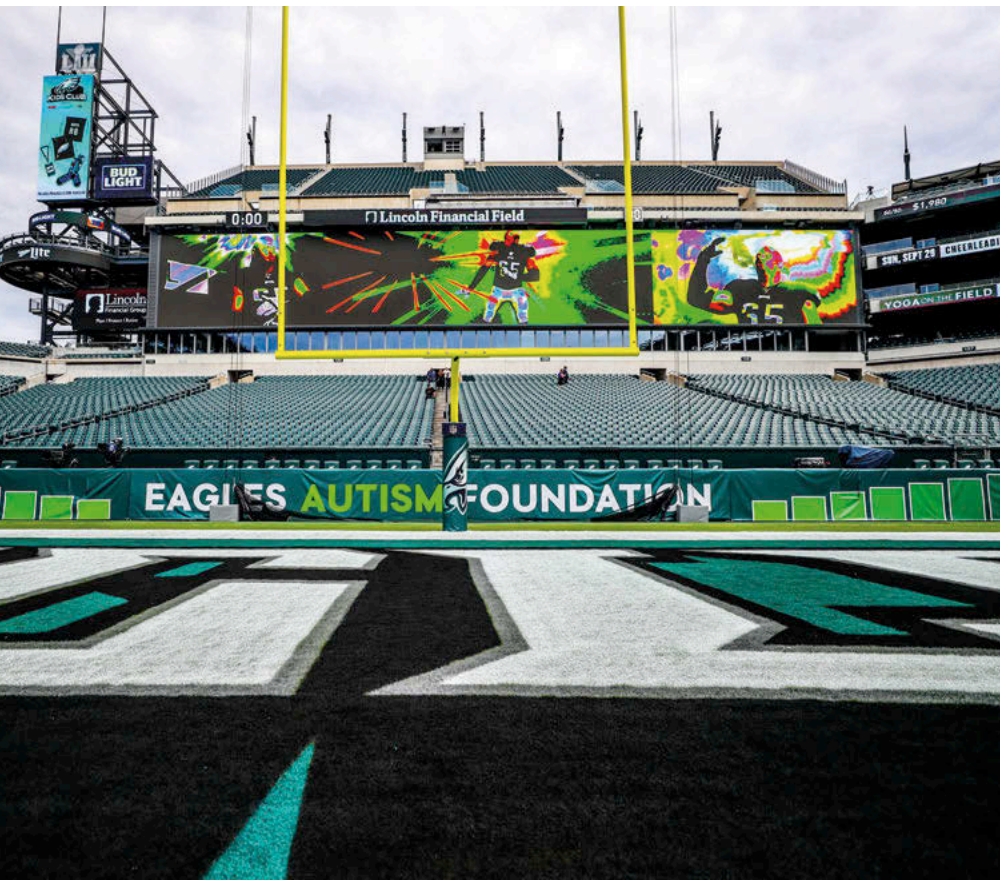


PAY IT FORWARD, EARN IT BACK

There is an interesting financial side-note to the creation of rooms that help those with sensory needs. As well as being a positive step on behalf of the clubs, it’s also proven – in one case at least – to have boosted revenues. “We’ve done a study with the Cleveland Cavaliers and they have seen a year-on-year increase of around \$58,000 in season tickets sales and \$45,000 general ticket sales, which is attributed to our program and the sensory room,” explains Uma Srivastava



Pics: Seattle Seahawks



WATCHING THROUGH WORDS

Founded in 2009 by UEFA, who donated one million Swiss Francs to the cause, the Centre for Access to Football in Europe (CAFE) works with leagues and clubs across Europe to promote inclusion of disabled people within the sport.

“We were the official charity of Euro 2012 and had a project to improve inclusion at the finals. One of the aspects of the projects was to introduce audio descriptive commentary (ADC), which didn’t exist at the time in Poland or in Ukraine,” says Michael Rice, communications manager, CAFE. “It was available at every match at the tournaments and we have since expanded it out to other European Championships and also worked with Brazil at the World Cup to have ADC at four of the venues. It is now also available for all of the UEFA men’s and woman’s club cup finals.”

For those fans who need it, the difference between ADC and regular commentary is huge. “With ADC, it is about painting a fuller picture for the listener, so picking out colors, explaining the atmosphere in the stadium and anything specific that is happening, such as a Mexican Wave,” says Rice. “We’ve had a lot of powerful testimonials from fans who have said it’s revolutionized their match day experience. Blind fans who had never thought about going to a game before this and other fans who have been to a game, used ADC and gone back to a game without it and said they couldn’t go anymore, it was that important to them.”

The network of ADC-ready stadia is growing, partly thanks to the CAFE team leaving the systems for clubs to use after a tournament. “We’ve also done training with AC Milan, the San Marino FA, and in Georgia, Russia, Greece, and Portugal where we did the Nations League,” says Rice.

Pic: Eagles Autism Foundation



Top: The Philadelphia Eagles was one of the first NFL teams to install a sensory room, which is part of its Autism Foundation that supports those with the condition through charity fund-raising events



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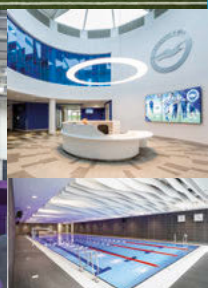
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Pic: Minnesota Vikings

IN THE BANK

The NFL's Minnesota Vikings have gone to extra efforts to ensure all fans enjoy gameday by opening a sensory room at U.S. Bank Stadium for individuals with additional needs.

Already one of the most advanced venues in the league, the facility will now offer a quiet, safe and soothing space for fans with autism, Down syndrome, post-traumatic stress disorder, dementia and other conditions.

Located on the upper concourse near the southwest escalator behind section 346, the 6ft by 12ft, sound-protected room includes a sensory active wall display, sensory toys, low lighting, bean bag chairs and sensory bags. The Vikings official science partner 3M has provided ear plugs and noise cancelling headphones for those who enter the space. A single-use bathroom is connected directly to the room. The quiet retreat will have two licensed behavioral specialists for every Vikings home game.

Elsewhere, at CenturyLink Field, home to the NFL's Seattle Seahawks, its A-OK Sensory Room project was also conceived due to a personal connection. It was led by Traci Schneider, the wife of the Seahawks' general manager John, whose son was diagnosed with autism 15 years ago. "We want to be a stadium where our fans feel welcome, and give them a space and an opportunity, if they are getting overwhelmed," said Traci. "We all know that CenturyLink is very loud and very high sensory—so we wanted to give them a space to have that moment and to come back down so they can rejoin our gameday and be part of it."

It's the latest in a series of initiatives to help affected fans feel more comfortable at CenturyLink Field. In 2015, for example, the Seattle Seahawks Women's Association partnered with A-OK Autism in to provide toolkits for fans on the autism spectrum and an "I'm A-OK" identifier badge. "I love where we're all going and what we're all doing and how we're all trying to be a little bit more inclusive and supportive to all of our fans," says Schneider, referring to the whole movement within the league to support and raise awareness of sensory needs.

One eye on the action

Location is one variable in the creation of these inclusion rooms, with some having views onto the playing surface, but others are windowless. In the case of Brighton and Hove Albion's Amex Stadium, good fortune meant that the 'Charlie Perry Inclusion Room' had a great view of the Premier League soccer team's playing surface.

"The room was originally a catering kiosk, but when we established a bigger catering kiosk on the tier above, the room became available," recalls Sarah Gould, supporter liaison officer at the club. "We identified it as a perfect, because there is an unrestricted view of the pitch, so we set about converting it into the room."

The investment in the room was around US\$64,000 – it's a purpose-built facility with wheelchair access via a platform as well as seating outside the room for fans. Essentially a collaboration between Brighton and Hove



Pics: Andy Webb, Albion in the Community

Albion and its charity arm, Albion in the Community (AITC), the room is slightly different to what a lot of other English soccer clubs offer. “I have a lot of dealings with other clubs and there has been a big move on equality and inclusion at soccer stadia and teams are keen to make them as inclusive as possible,” says Gould. “We were keen to explore it and rather than opening a sensory room, we wanted a safe space where people with all kinds of issues mental or physical can come to the room, where previously they might not go to soccer matches. That was the main thinking behind it.

“We’ve had, for example, people who have been sectioned under the UK’s Mental Health Act come and watch a game. We’ve also welcomed adults with their carers to come and watch soccer; those people would never be able to go to a stadium in normal circumstances,” says Gould.

For many uses of sensory rooms, what happens outside is a by-product of them being there. At the Amex Stadium, that is very much not the case. Soccer is very much the focus and there is a plan in place to give users the opportunity to progress from the room into seats in other parts of the stadium. “When we talked about the design, we were conscious that we wanted the room to be about soccer and retaining the focus on the match playing out on the pitch,” says Paul Brackley, disability manager, AITC.

“There are six dedicated seats inside and also six outside, so the whole process is about giving people a positive experience around attending and watching a [soccer] match.

“We’ve got some sensory equipment in there, but it’s all tactile and pitch-facing. We don’t have a sensory room, per se, but there is an area with different seating and where the lights can change,” he adds. “The biggest success for me has been people who have returned to



Above: English Premier League soccer side, Brighton and Hove Albion, converted a catering kiosk at Amex Stadium to build a supportive environment that is quiet yet is still very much part of action with views of the field

watch other games in the stadium. We’ve actually had people purchase season tickets off the back of their experience in the inclusion room – seats that are elsewhere in the stadium, with the other fans. The design and the layout is very much about giving a calm, sensory experience in the room, but also geared towards watching the game.” Gould reveals that the next project is to find another space at the Amex Stadium that fans of visiting teams can use, further adding to the appeal to watching a match on the England’s south coast. ■



NON-MATCHDAY FOCUS

For Brighton and Hove Albion, the inclusivity doesn’t stop on a matchday. The club’s training ground welcomes those with sensory needs (typically autism) every other Sunday, allowing participants to play soccer on the main pitch within a low sensory environment. The club has also arranged ‘Autism hours’ in the retail store and the ticket office, providing a more comfortable environment for everyone. “We are doing it the Brighton way, not necessarily following what others do,” says Sarah Gould.

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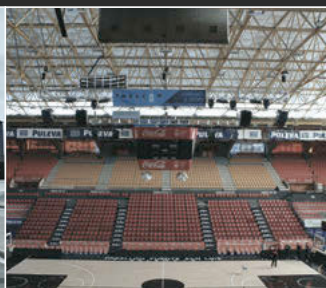


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QUEENSLAND COUNTRY BANK STADIUM
BY SCOTT STONEHEWER



Photos: Cox Architecture

AND GAMES

North Queensland Country Bank Stadium is the first world-class venue to be built in Australia's northeast in 25 years and the only multi-purpose facility of its kind in the region. *Stadia* takes a closer look under its cyclone-proof roof

North Queensland Country Bank Stadium has been more than a decade in the making having first arrived on the political agenda in 2009, following an analysis of Townsville's existing stadium as part of Australia's bid for the 2022 FIFA World Cup.

Its completion represents a milestone for the state, which has a wider policy to upgrade venues rather than build new. As a joint project of the Queensland Government, Australian Government and Townsville City Council, its construction is supported by the National Rugby League (NRL) and the stadium's primary tenant, the North Queensland Cowboys.

The new stadium features an iconic horseshoe-shaped roof that was inspired by the strap-like tapered

leaves of the native pandanus plant. Its cantilevered form was specially designed and engineered to withstand the rigors of Townsville's cyclonic conditions explains Richard Coulson, director at Cox Architecture.

"Wind loads in the city are approximately 50% higher than in Brisbane and 100% higher than in Sydney. As a result, the weight of steel needed for the build had to be proportionate to these loads while still maintaining its design integrity," he says.

In place of traditional trusses, folded plates were used to achieve the roof's unique geometry. Peaked sections were formed using 36 steel trusses that were clad in a durable weather, fire and UV resistant fabric. Flat metal infill sections were then installed in between each truss.

QUEENSLAND COUNTRY BANK STADIUM

This provides the strength needed to resist cyclonic wind loads while also giving flexibility to allow the canopy roof to expand and contract with tropical temperature fluctuations.

“There’s a prevailing north-easterly afternoon breeze so we rotated the bowl 25° to open up the northern end to naturally regulate temperatures in the stadium. Also, the combination between metal deck and a stretched membrane provides alternative insulation against intense heat,” describes Coulson.

“The stadium’s unfurled pandanus roof design is fitted with low energy LED sports and broadcast lighting, which eliminates the need for light towers and provides unobstructed panoramic views to the city, Castle Hill and Magnetic Island,” he says.

“We were able to get the lights on a gantry at the leading edge of the roof with the right casting angle for the pitch with corner lighting suspended underneath. It’s a very elegant and sculptural solution that creates an openness for greater engagement with the bowl from the concourse and removes some of the light pollution.”

The canopy’s sweeping curves shade 75% of seating, including generous overhangs for the concourse and main entry, which is integral to the stadium’s success.

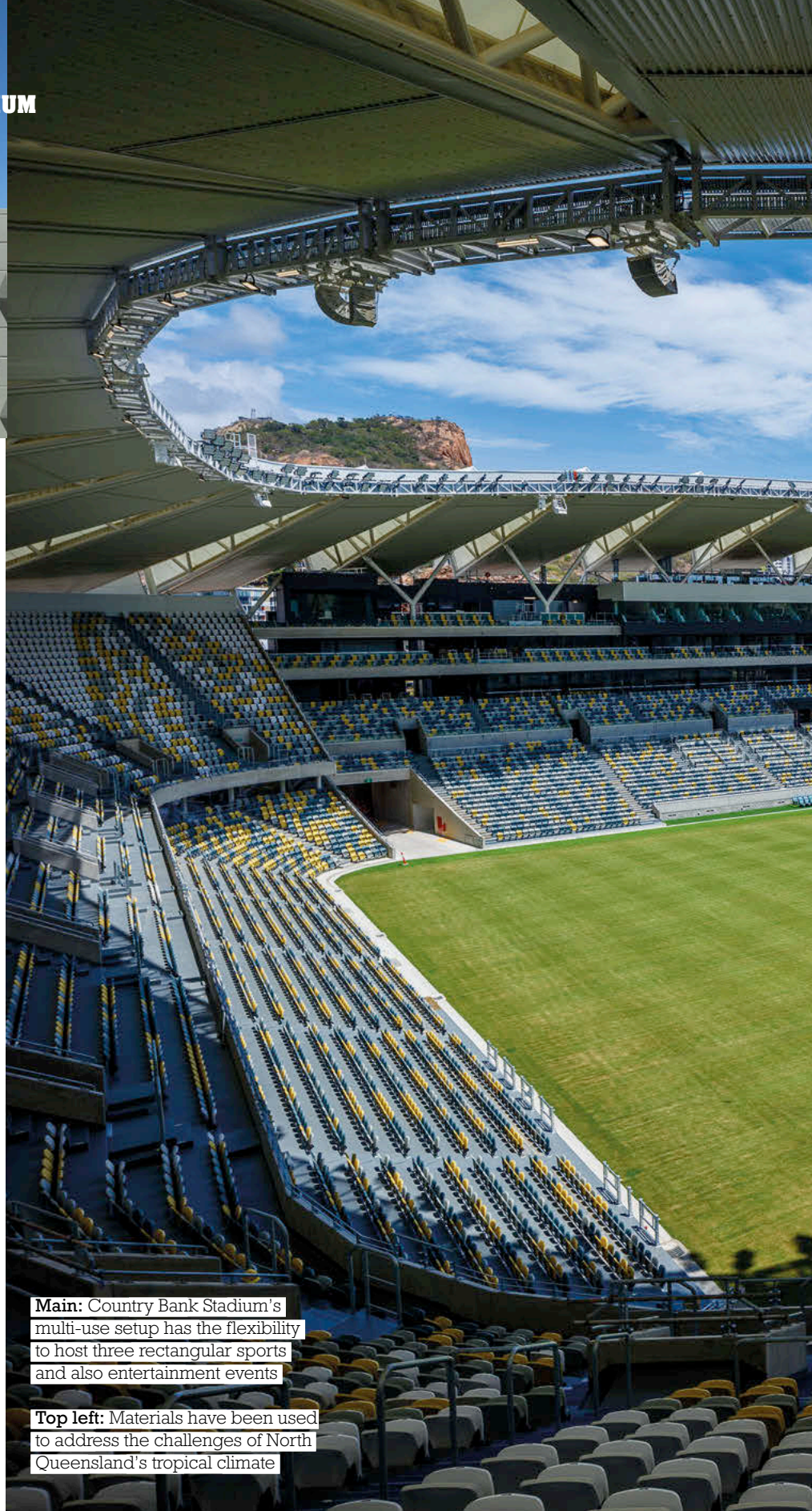
“Its form was essential to the elegant expression of the stadium but also combines structural, functional and operational aspects of modern design with engagement of the environment that is quintessentially Queensland,” Coulson adds.

Best of three

The stadium will host three rectangular sports – rugby league, rugby union and soccer – with the added flexibility to accommodate a range of alternative entertainment events including concerts and the 2020 NQ Games opening ceremony, which is the largest multi-sport event in regional Australia.

The stadium has a 25,000-seat double-tiered capacity, which is 7,000 more than the Cowboys’ previous home, with the option to expand to 30,000 seats in future. It can also accommodate 40,000 patrons in concert mode.

Due to Townsville’s extreme tropical climate, the stadium owners opted to install Camatic Seating’s Axiom system, which was thoroughly tested by local exposure laboratory Allunga for durability, reveals Camatic’s engineering manager Bruce Ansell.



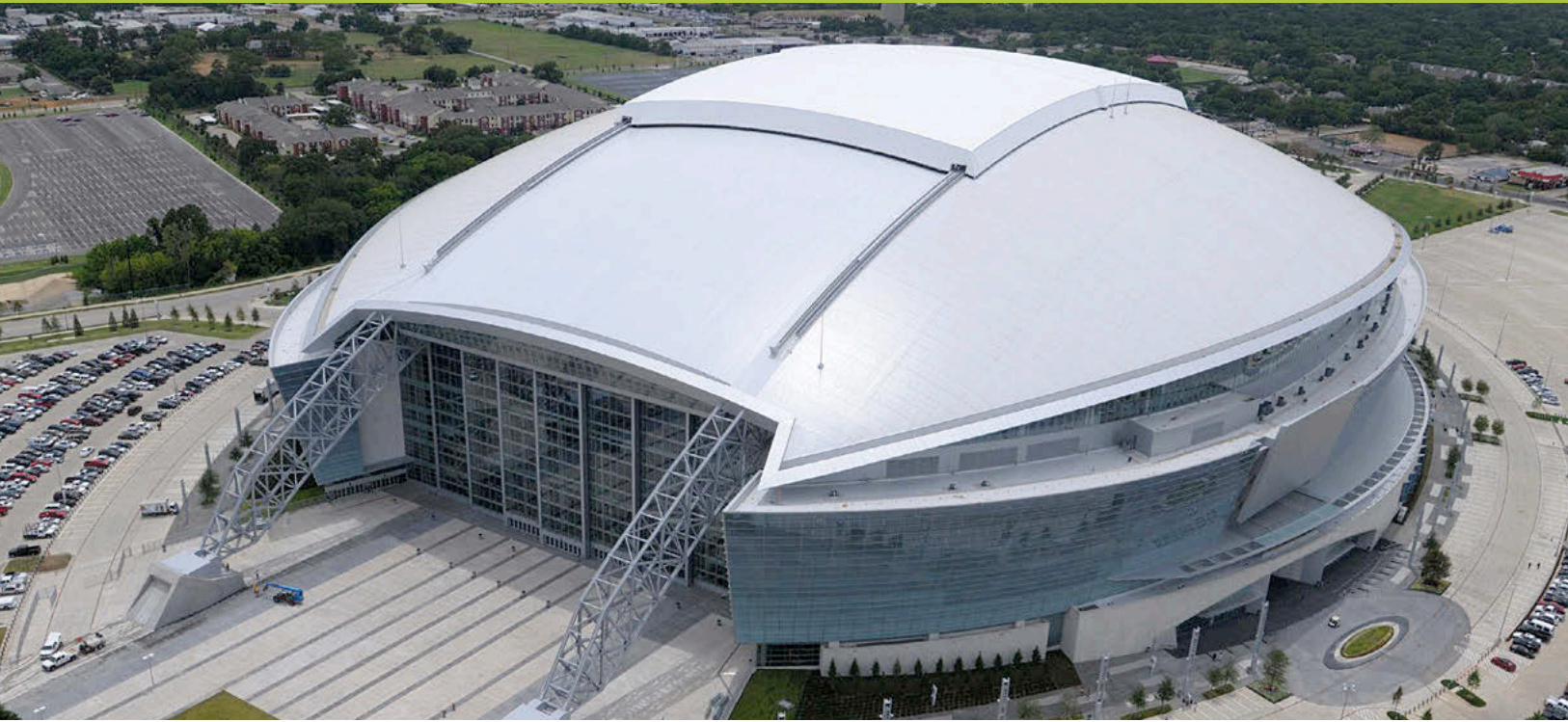
Main: Country Bank Stadium's multi-use setup has the flexibility to host three rectangular sports and also entertainment events

Top left: Materials have been used to address the challenges of North Queensland's tropical climate



“The stadium’s unfurled pandanus roof design is fitted with low energy LED sports and broadcast lighting, which eliminates the need for light towers and provides unobstructed panoramic views to the city, Castle Hill and Magnetic Island”

Richard Coulson, director, Cox Architecture



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“Allunga understands the toll that the strong Queensland sun can take on outdoor fixtures, so it made sense to partner with them for our material performance weather testing,” he says.

The system is fitted to pre-fabricated seating platforms manufactured in Townsville by local company Jackson Semler.

“We’ve refined the beam that the seat is mounted on to allow for a quicker installation and the profile of the beam has been changed to make more efficient use of the material, which helps make the whole system more cost-effective,” he says.

The weather also played a role in the choice of Point of Sale (POS) technology at the stadium as systems had to comply with extreme reliability and performance standards explains Tim Brown, vice president of global sales consulting at Oracle Food and Beverage.

“Conditions in the food and beverage industry can be tough – particularly in an open-air stadium such as North Queensland, although our workstations are designed to withstand the harshest environments.”

The stadium will feature the Oracle MICROS Symphony system, which comprises 164 compact workstations, tablets and a POS platform that extends across 29 food and beverage outlets, three corporate experience bars and additional concession stands.



Above: The tapered leaves of a native plant informed the shape of the stadium’s roof geometry

Below: Oracle’s point of sale workstations were specifically chosen for their ability to cope with an open-air environment

Digital menu boards will integrate with the system to display concession choices while its core technology allows the Oracle POS platform to easily assimilate with other systems.

“It can become the transaction platform for all points of service for food and beverage. With the introduction of open access API’s and Symphony Transaction Services, we are able to provide direct

CHANGING OF THE YARD

In a symbolic transfer of 25 seasons of history, a helicopter was used to transplant a slice of turf from 1300SMILES Stadium to its new home at Queensland Country Bank Stadium.

The removal and transfer of the turf was done with the permission of, and overseen by, representatives of the Wulgurukaba First Nations People, the traditional custodians of the land on which both stadia reside.

The remaining 118,400ft² (11,000m²) playing surface was grown in a single plot at Gumlow just outside of the city by local firm Fortini Turf, under the technical guidance of field specialists HG Sports Turf.

The grass called Greenlees Park Couch was chosen for its hard-wearing semi-dwarf couch, with a deep root system and aggressive surface growth, which makes it ideal for North Queensland conditions explains Bruce Fouracre, grounds manager of Queensland Country Bank Stadium.

“The grass is grown to withstand the rigors of football and you can literally roll it out and play on it the next day,” he says.

A patented system, developed by HG Sports Turf, combines natural grass as the playing surface with an underlying mesh of artificial fibers to create a vertically and horizontally stable turf.



QUEENSLAND COUNTRY BANK STADIUM



Above: The stadium features a low-grade ramp that provides access to an open concourse, which encourages natural movement around the venue

Above right: With wind loads up to 100% higher than in other parts of the country, the weight of structural steel had to be proportionate to these loads

access to solutions that drive customer experience for operators, whether that is mobile fan engagement, kiosks to drive down queuing or integrated and dynamic menu boards.”

Unchartered water

The Country Bank Stadium also features an array of energy and water saving measures that inspired many of its design decisions.

The scheme includes 110,000 gallons (500,000 liters) of storage for rainwater, the minimization of potable use along with the city council’s plan to link to its recycled water network to the stadium for watering the pitch and its surrounding landscape.

“Rainwater capture storage from the roof is used for toilet and post-game wash down and cooling tower

water demand on match days with a capacity to cover four major events without refilling,” states Coulson.

As part of the project, 30,000 plants and 111 trees have also been planted in a variety of large plazas and landscaped green spaces.

Unlike the old venue, which was buried in the south-western suburb of Kirwan, the new stadium resides in the heart of the Waterfront Priority Development Area, adjacent to the Townsville central business district, with fans able to easily walk (0.75 miles/1.2km) to the venue from the city center.

There is no public parking at the stadium in an effort to encourage patrons to take advantage of the pre- and post-game atmosphere and upgrade to the city’s public transport network and pedestrianized interior says Coulson.

“We created a low-grade ramp with access from the city that sweeps up into the bowl, which encourages natural movement with no lifts or stairs. This democratic ideal and ability to circumnavigate the concourse without changing levels is very exciting but also important to the strategy to provide the best experience for all patrons.”

BIM THERE BEFORE

Fans had a chance to experience the stadium long before it opened its gates courtesy of a free purpose-built app released on the Apple App Store and Google Play.

The app, developed by principal consultant Cox Architecture and the Department of Housing and Public Works, uses BIM digital representations of structures, 3D modeling and virtual reality to showcase the design through a diorama image that users can rotate on their mobile devices.

Hotspots on the image can be clicked to access artist impressions, 360° images and 'before and after' sliders that compare the existing 1300SMILES Stadium at Kirwan to the new stadium adjacent to the city’s CBD.

Voiceovers and on-screen text provide descriptions throughout the app.

“We’re really excited to share this leading digital technology with the public,” explains Mick de Brenni, Queensland minister for housing and public works.

This app is just a pre-cursor to the development of a more enhanced and sophisticated version intended to cover more aspects of the venue says a Stadiums Queensland spokesperson.

“The app will further improve the user’s experience – with a range of solutions being investigated to improve the fan experience, including seat bookings, game day information, food and drink options and the purchasing of merchandise.”

Inside job

A key objective for managing contractor Watpac was to work with local industries and support local jobs through a dedicated employment strategy. It targeted 80% of the building hours spent on the stadium to be by locals, and 80% of the value of the project to be spent on local subcontractors and suppliers.

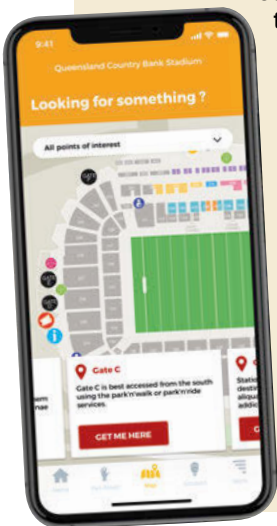
“Watpac is putting its commitment to Indigenous engagement into practice and the North Queensland Stadium sets a strong benchmark”, explains Indigenous Engagement Officer James Alley.

“We tried to align the technology requirements with the labor contingent available in the region to take advantage of local skills and manufacturing. A lot of the block work and fabricated elements were made in Townsville, which upskills the community but also adds real value to the project,” says Coulson.

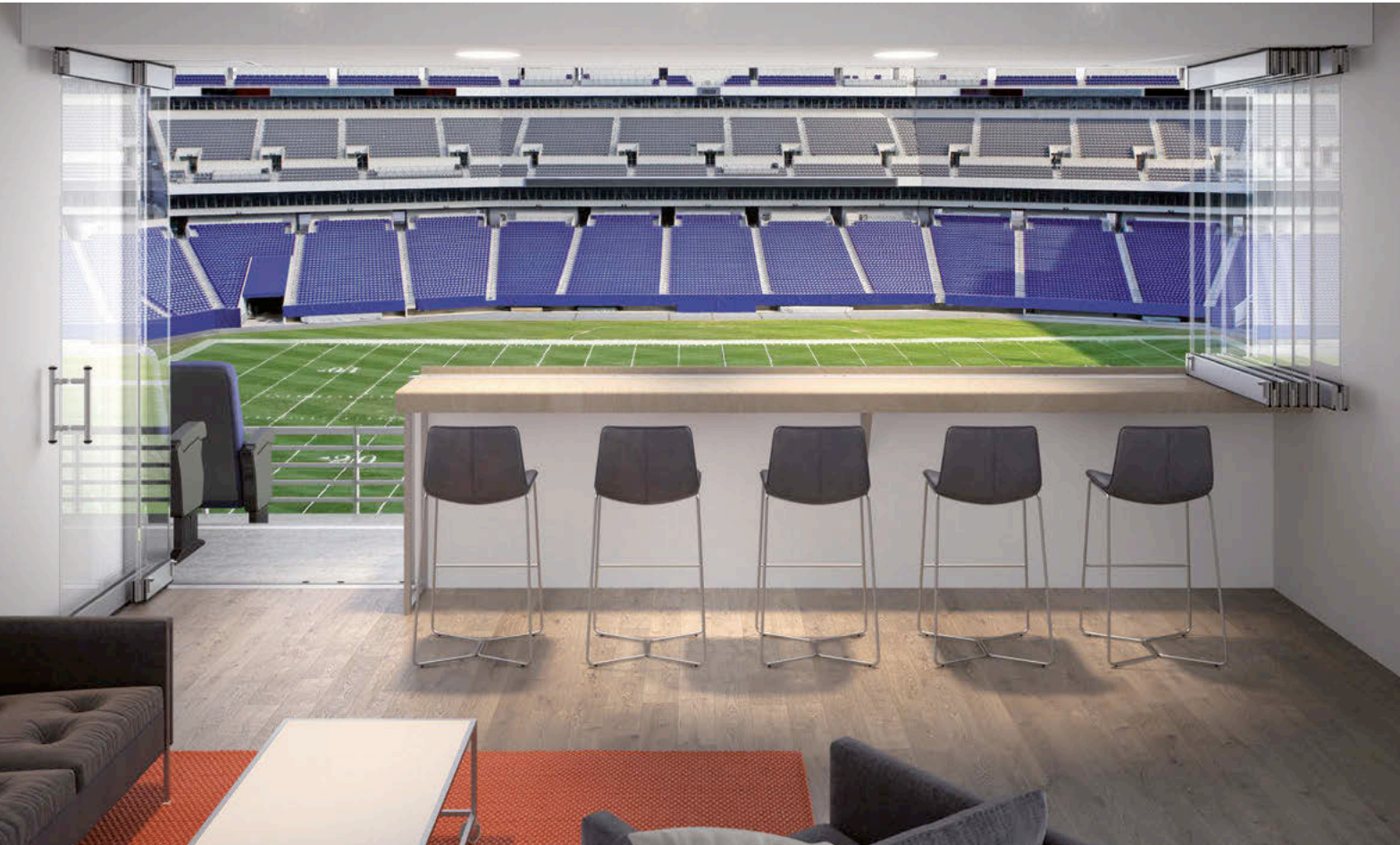
The approach was a marked success with 488 North Queensland businesses engaged in extended supply chain to the tune of A\$232m (US\$153m) awarded in local trade packages.

In addition, 12.2% of the construction workforce identified as Aboriginal and Torres Strait Islander people, almost double its original target of 6.6%.

“Queensland is incredibly patriotic and this project reflects its community, it’s been built by locals and has a unique and memorable identity that is exiting for the region,” says Coulson. ■



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BRIGHT IDEAS

As evolving regulations and higher quality demands from broadcasters has resulted in dramatic changes for sports field lighting, LED has emerged as the leading technology to enable operators to do much more than just illuminate the action



“We have had new regulations for lighting in the UK. The English Premier League has put out new lighting requirements and so has the Championship. The lighting level required now lends itself perfectly to LED, especially when it comes to slow motion cameras – they need to be flicker free”

James Brunt, director of sports, Midstream Lighting

LIGHTING



The last 30 years has seen a large number of revolutionary changes in the way sports stadia are designed.

Curved facades and bowled amphitheaters have all but replaced the utilitarian squared stands of yesterday, and architects have a far freer rein in making each venue more innovative than the last.

As stadia have evolved, so too has sports field lighting. Few teams still play under halide floodlights, which were once a common sight installed on poles in each corner of the field.

Scott Gerard, managing director at ME Engineers, a company that has been involved in stadia lighting design solutions since the early 1990s, explains that field lights are no longer an afterthought.

ME Engineers worked on the architectural lighting for the enclosed U.S. Bank Stadium in Minneapolis as well as at the T-Mobile Arena in Las Vegas.

“Lighting has become part of the overall aesthetics of the architecture. You don’t want lights on poles in the corner of the stadium anymore,” he states.

“Lights are not an afterthought anymore, they are an important part of the stadium, and I really don’t see this trend changing,” insists Gerard.

But he believes one thing that has changed over the last five years is a near-total shift from traditional halide lamps, used for decades in field lighting, to modern LED systems.

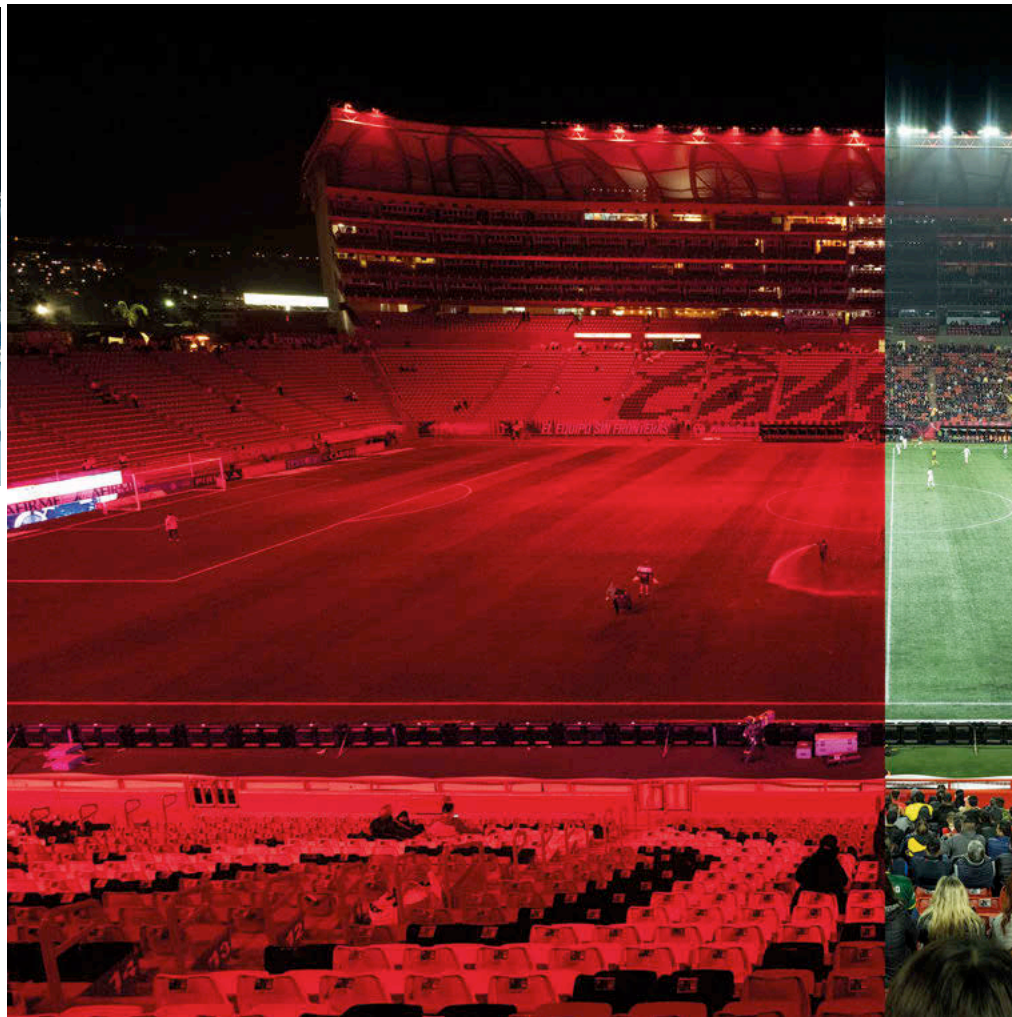
Regulation changes

“Firstly, this has been brought about by a reduction in costs compared to what they were five years ago, they are very close to being equal with traditional lighting,” adds James Brunt, director of sports at Midstream Lighting, which is based in the UK.

“Then you have all the other benefits such as the low energy consumption, the quality of the light – the sharpness is better, and they are longer lasting.

“We have also had new regulations for lighting in the UK. The English Premier League has put out new lighting requirements and so has the Championship. The lighting level required now lends itself perfectly to LED, especially when it comes to slow motion cameras – they need to be flicker free.”

“Secondly, the control. There’s a lot of razzmatazz going on, creating lighting effects for better entertainment and spectator environment,” he says.



Main: New broadcasting standards are pushing field lighting technology to new levels, but much work goes into fine-tuning the optics

Top left: Energy efficiency is also a big influence behind the rise in LED lighting installations

Below: Lighting is part of the aesthetics at U.S. Bank Stadium



In some instances, this shift to LED has been dramatic, as Jeff Rogers, vice president at Musco Lighting, an Iowa based company that carries out more than 3,000 lighting projects a year, explains.

“In 2016 about 30% of what we did was LED. In 2019, it was 92%,” he claims.

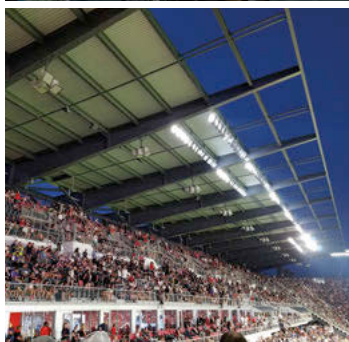
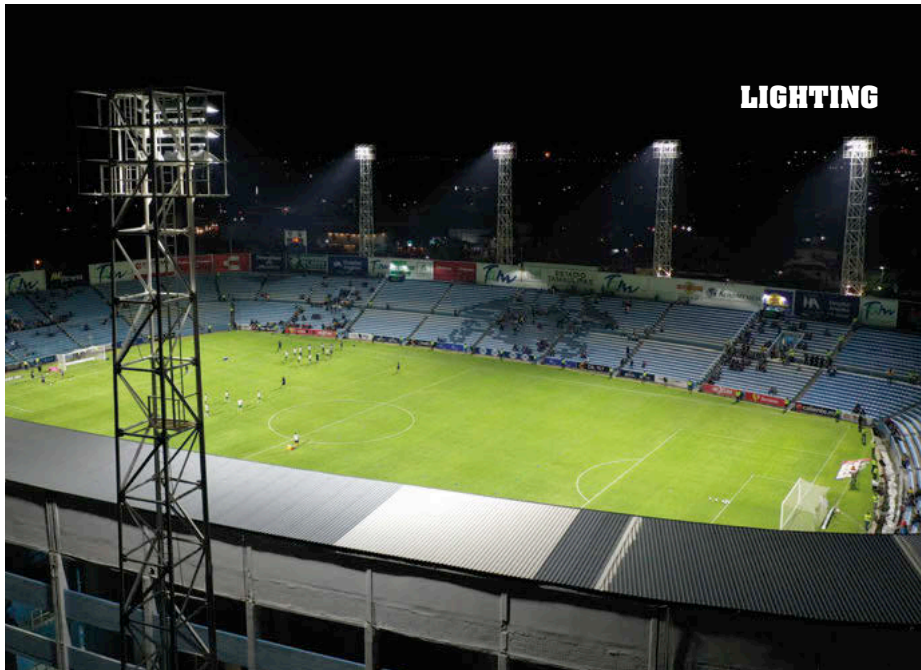
“Energy efficiency is part of why LED has driven a such big market change, and quality of broadcast has improved in this time too and when TV gets involved that helps bring change.”

Broadcast quality

Rogers explains that broadcasters, with their continuous strides for higher and higher broadcast definition, have really embraced the new LED technology, but their interest does add to the complexity of installing a lighting system.

“LED has some basic core technology that eliminates flicker, but you still have to have a lighting designer to ensure the light is applied correctly,” he says. “This involves a lot of location visits and looking at the quality of the optics – it is really making sure you are supplying broadcasters what they need.

“You have to work with the venue and the broadcasters and the players – you have to put a lot of light onto their faces, so you need to ensure that it’s not blinding them. All this has to be worked out and this invariably means lots of back and forth and trial and error,” he adds.



Among Musco's recent achievements includes the Estadio Tamaulipas, home to the Tampico Madero Football Club, which has become the first professional team in Latin America to go 100% LED by replacing the stadium's 120 metal halide lamps with 68 LED luminaires – more than doubling the lighting standards (lux) and ensuring the stadium meets new Mexican Soccer Federation Standards.

Musco has also recently installed a new LED lighting system at Dublin's Aviva Stadium in preparation for the UEFA Euro 2020 soccer tournament (which will now be played in 2021).

Aviva Stadium director Martin Murphy is under no illusion as to why the venue decided on LED. "As we continue to evolve the stadium and stay at the forefront of sports and entertainment, it was vital to install a

Top: Tampico Madero FC was the first team in Latin America to install 100% LED lighting

Above left and right: Sports stadia are now using LED to put on light shows during the game



lighting system with the most advanced technology, capable of providing the best possible experience for players and spectators, meet the enhanced light levels required for a variety of sanctioning bodies, and produce exciting new special effects and light shows."

Using sports lighting beyond just illuminating the pitch is what nearly all professional venues are looking at right now.

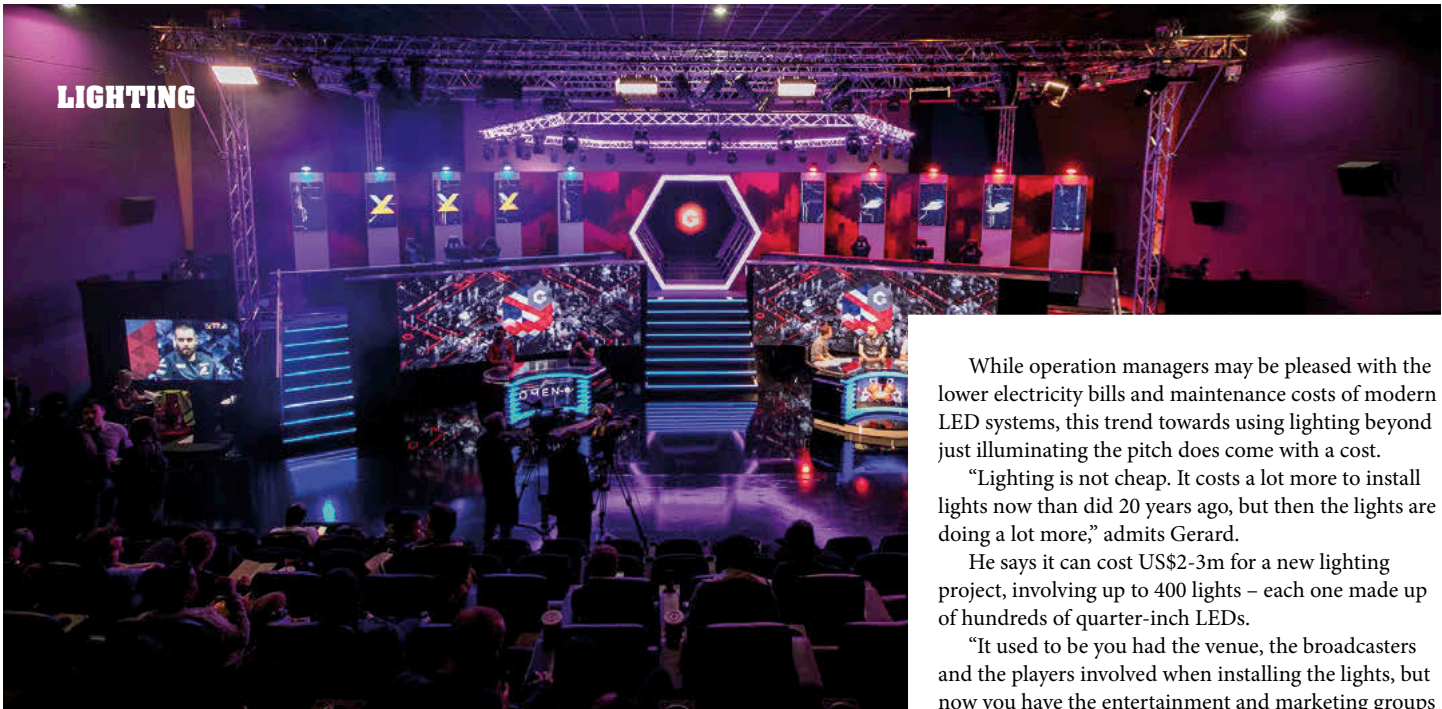
"Traditional lights are an unstable technology," says Jeff Rogers. "If you turn off a metal halide light you have to wait a good while to turn it on again.

"But with LED you can turn them on, off, and dim them [instantly]. You can entertain fans at half time or during the game, have colors moving in steps. Lighting becomes part of the show, but the quality of the light on the pitch always remains our focus."

"If you turn off a metal halide light you have to wait a good while to turn it on again. With LED you can dim them, you can entertain fans at half time or during the game. Lighting becomes part of the show, but the quality of the light on the pitch always remains our focus"

Jeff Rogers, vice president, Musco Lighting

LIGHTING



EMERGING APPLICATIONS

Lighting designers are always looking for inspiration for applying light in sports stadia, and one area that has caught their attention is the rise of new events.

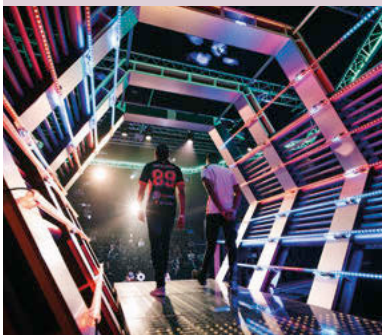
“We have partnered with X Games and esports, so are always looking for what the next generation of sporting events are doing and how you can apply light to improve the show,” says Musco’s Jeff Rogers.

The rise of esports – professional video gaming, which is becoming a hugely popular spectator sport – has led to some innovative lighting ideas that can translate to other sporting codes and their venues.

UK-based White Light was asked to turn a movie theater in Fulham, London, into an esports arena for the Gfinity Elite Series.

“We needed to turn an empty space into an immersive gaming environment that featured three custom-built stages and would house a sold-out arena of gaming fanatics,” explains White Light project manager Tom Cass.

“When the players enter the gaming arena, they walk through a hexagon tunnel. We lined the walls with LED video tubes and positioned LED tape on the exterior. Similarly, as the players walked to their gaming booths, we installed pixel flex on the staircase in order to perpetuate the mesmerizing effect created by the tunnel.”



Lighting design at esports events presents new challenges as well as new opportunities to bring those ideas into areas of other sports

Light entertainment

It is not just professional clubs that are using lighting for added effects reveals ME Engineers’ Scott Gerard.

“We now have colleges that want to change the color of the dome for team colors, or they want to flash purple when somebody scores or does something on the field.

“The biggest trend is for more color and more dancing lights, and this started with the NBA with its choreographed shows and now everybody wants to do this sort of thing.

“LED has made this possible. It is not that we are just replacing lights with lights, you are able to do so much more. We will continue to see more of this, especially at the professional level. They want to integrate music and have both light and sound speaking to the audience,” adds Gerard.

While operation managers may be pleased with the lower electricity bills and maintenance costs of modern LED systems, this trend towards using lighting beyond just illuminating the pitch does come with a cost.

“Lighting is not cheap. It costs a lot more to install lights now than did 20 years ago, but then the lights are doing a lot more,” admits Gerard.

He says it can cost US\$2-3m for a new lighting project, involving up to 400 lights – each one made up of hundreds of quarter-inch LEDs.

“It used to be you had the venue, the broadcasters and the players involved when installing the lights, but now you have the entertainment and marketing groups all the teams employ that also want to get involved.”

“You can spend a couple of weeks getting the balance right and then you can spend weeks and weeks trying to sort all this dynamic stuff out, the colors and dancing lights.”

Gerard explains that this is all done with electronic control systems.

“The lights are fixed where they are fixed, and this is dependent on the type of sport. We have glare zones, so for instance you don’t want a light opposite a corner at a soccer game, and there’s different rules for different sports,” he says.

“LED [technology] is getting better and better and there’s a lot more technical aspects to them now. If you think of lights in a home it’s a warm type of light, but for outdoors lighting is usually colder.

“But we can now change lights from warm for say a basketball game, to the colder blue lights when you are playing hockey, and all without changing the bulbs – the flexibility is amazing.”

The technology is improving all the time, but there are still hurdles to overcome with LED lighting.

“It used to be there was difficulties with glare because you have all these tiny light sources, but now we have better optics,” says Gerard.

“The challenge now is reducing shadows. You don’t notice when you are at the game so much, but when you are watching high definition on TV you can clearly see the four shadows on the pitch, so the next challenge is better uniformity of light. This means more light sources and more angles.”

“It is improving all the time,” adds Rogers. “The lumens per watt has gotten better and better and the stability of the technology – it is well manufactured and when it is delivered to market it is very robust”

But is there a lighting system out there that will eventually replace LED?

“I don’t think so,” says Midstream’s James Brunt. “I don’t think there’s anything emerging beyond LED right now. LED goes above and beyond everything broadcasters and venues need.” ■

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TICKET INSPECTOR

The introduction of new ticketing technology is helping stadium operators to enhance security, eliminate scalper activity, as well as offer fans added value and a smoother experience on gameday

Globally, there's US\$15.2bn to be generated in the 'scalped' market for all live events in 2020 – a significant sum of money that the secondary ticket market isn't going to give up lightly. And it's ironic that scalping has proliferated with evermore sophisticated bots – predicted to comprise the majority of ticket buyers within two years – yet high-tech can combat this nefarious activity.

"The secondary ticket market has many problems surrounding it," laments Ashton Addison, the CEO and founder of Canada's EventChain, who's been on the end of such unscrupulous behavior after buying a fake concert ticket and then being refused entry at the door. It was this moment that led to the idea of turning physical tickets into "scarce digital assets" in a blockchain to consign such scams to the past. "Scalpers can print off hundreds of the same ticket and sell them all and only the first person to the turnstile will get in," he says. "On a blockchain every transaction is recorded in a block and chained together, so if a ticket is transferred multiple times, it's always recorded.

"With EventChain's SmartTickets, club owners can trace their tickets from inception into the primary market and any transfers or resale within the secondary market, all the way to the ticket check-in at the gate," Addison explains. "They'll have more

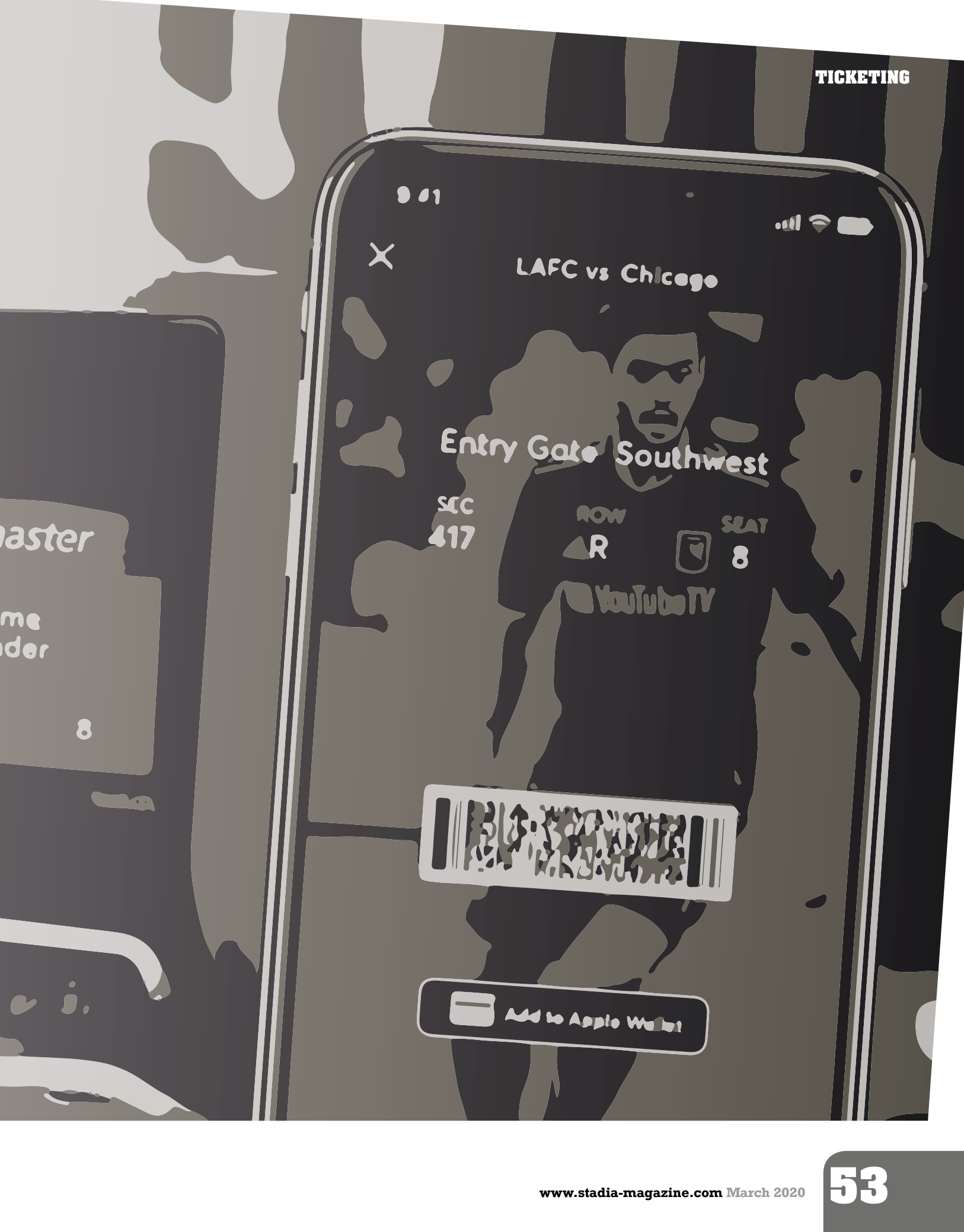
information regarding their actual attendees to better serve them and to market toward them for future events."

SmartTickets also enables the programmability of ticket prices. "If an event organizer wants to limit scalping and enforce a face-only-value ticket on the secondary market, they can program that in," continues Addison. "As the technology evolves, we'll see more fan engagement through digital experiences and a lot more data behind these interactions as well."

Nick Maynard, lead researcher at consultant Juniper Research, recently authored a deep dive into the marketplace and agrees the promise of blockchain is substantial. "Scalping is a challenge but being able to record details around ticketing purchase adds transparency and can eliminate the scourge," he feels.

Having field-tested the technology for around 18 months, UEFA has confirmed that more than a million blockchain tickets will be distributed for the Euro 2020 (2021) soccer tournament, with the back-end solution rumored to have come from Switzerland's SecuTix. Blockchain has also been discussed for the Olympic Games in Tokyo.

"By using blockchain, QR codes and pre-validation of user identities, digital ticketing can make the entrance process much faster in terms of queuing and safer by automatically being able to screen-out banned visitors," says Maynard. "They make it easier to see



9:01



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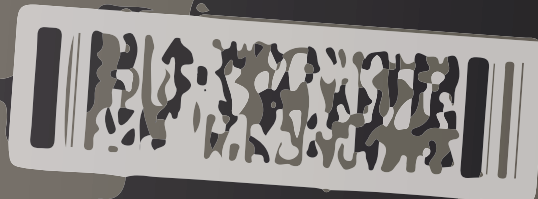
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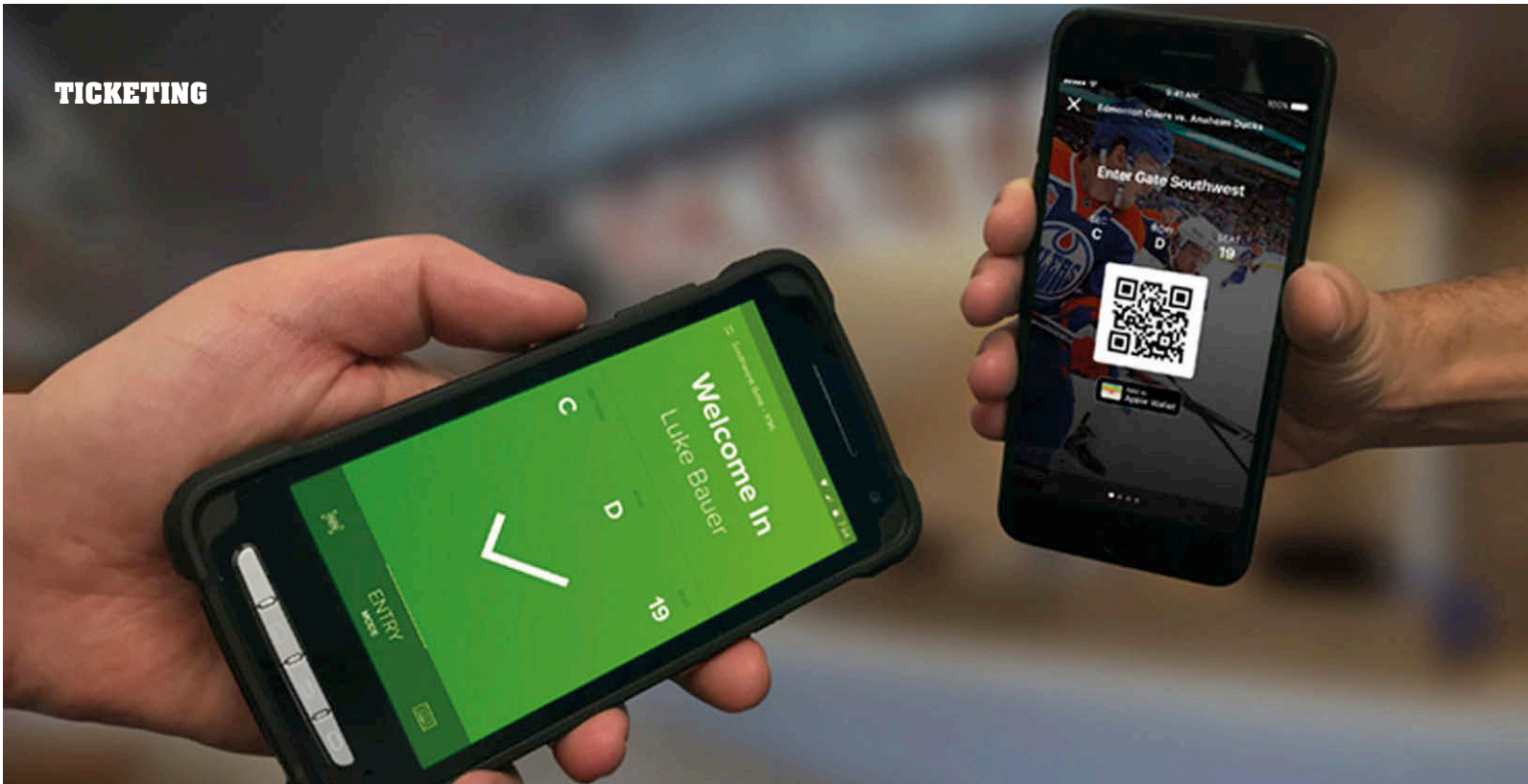


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which fan was where and to reconstruct events.” Blockchain could be a valuable tool for weeding out any perpetrators at a sporting event.

“Transferability is a hot topic in the UK, but in the USA the transfer of a ticket can be valuable, because not only do you know who’s in your stadium from a security perspective, you have a whole new audience of fans you wouldn’t have known about,” suggests Peter Joyce, MD (EMEA Sport) of SeatGeek, a mobile ticketing specialist. “M-tickets are also more dynamic – for example, in the USA, users can buy merchandise or food right from the ticket, which is something our US app supports.”

Ticket support

As well as working with five MLS franchises, including Sporting Kansas City and Seattle Sounders, SeatGeek is a partner to the NFL’s Dallas Cowboys and New Orleans Saints and recently introduced its solution at Lord’s, the home of English cricket. Joyce and his team are also making inroads in the English Premier League. “When SeatGeek acquired TopTix’s SRO technology in 2017, there was just one EPL club using it,” he reports. “We now work with nine of the 20 teams, with Manchester City, Leicester City, Newcastle United, Aston Villa, Wolverhampton Wanderers and Brighton & Hove Albion among our EPL clients.”

“SeatGeek’s instant and flexible reporting system allows us to be self-sufficient and stay in control of our ticket sales, and react to trends and opportunities as they arise,” says Jenny Gower, head of supporter services at Brighton’s Amex Stadium. “We have the flexibility to drive attendance by creating ticket packages and promotions that appeal to our fans.”

Giving supporters the ability to manage their own accounts has proved a boon for Brighton & Hove

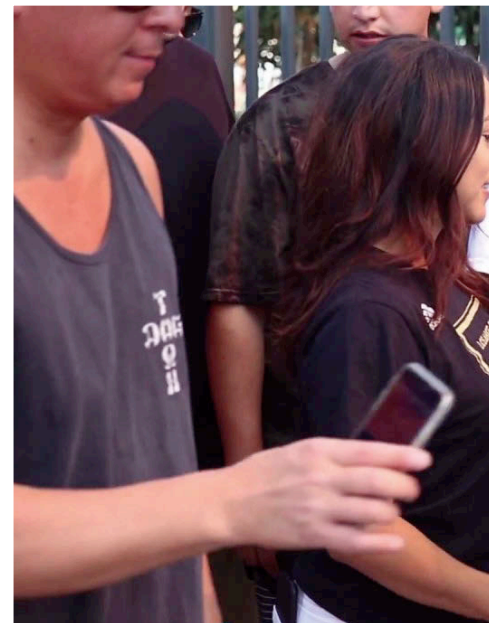
Albion. “SRO lets us reward their loyalty by building-in savings or price limits for season ticket holders or regulars, ensuring their purchases automatically receive a set discount or don’t breach a threshold,” Gower explains.

“Generally, all clients want easy-to-use solutions that empower them to grow their business,” continues SeatGeek’s Joyce. “Legacy systems are known for manual reporting, overworked staff and inflexibility in the configuration of events, whereas SRO is endlessly customizable and gives clients control. But it’s not just the operational perspective; it’s also our ability to embrace consumers’ drive toward more online purchases while ensuring the end-user experience is seamless.”

Face value

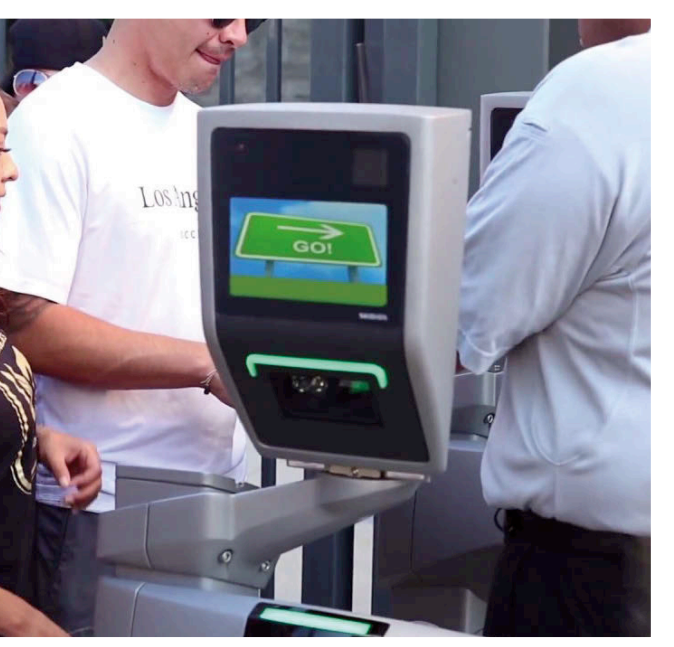
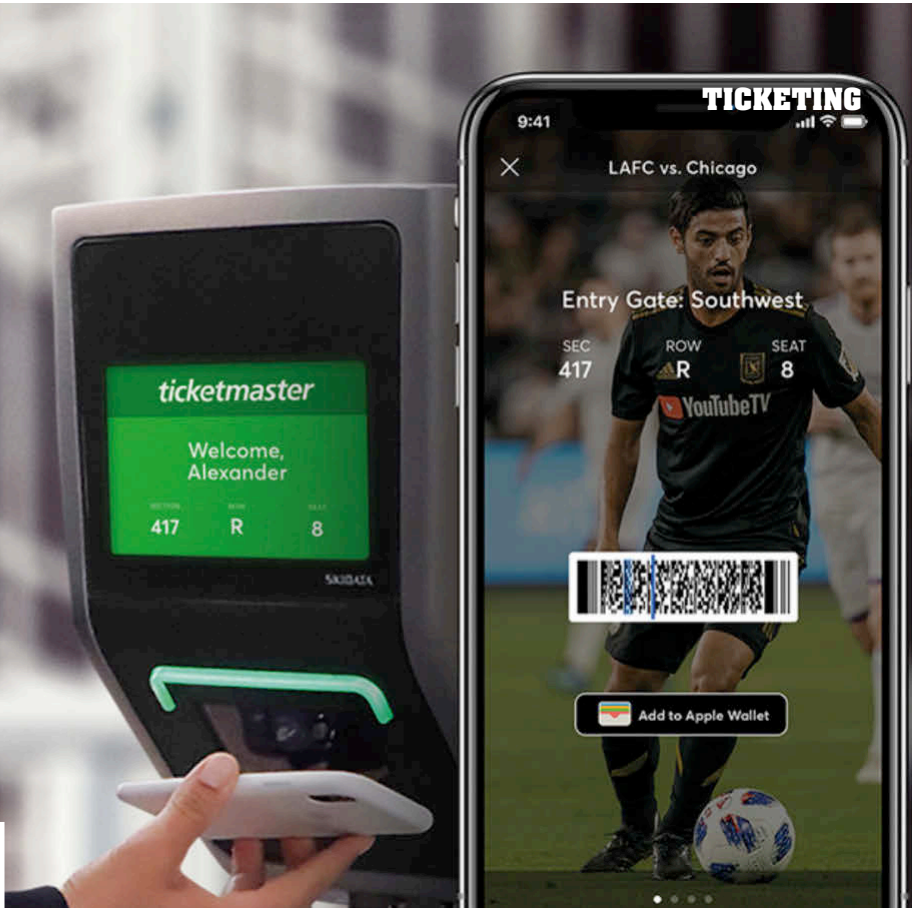
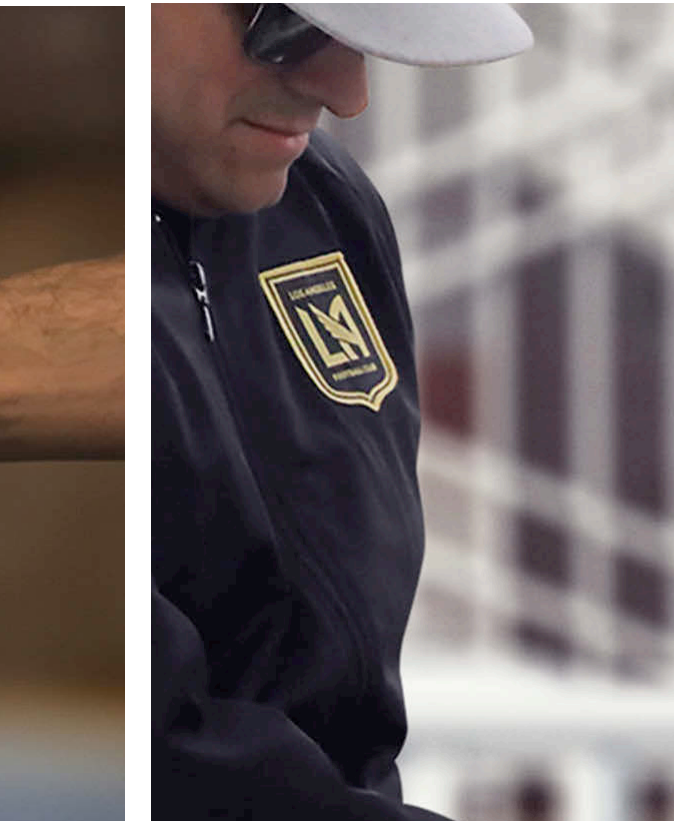
While SeatGeek can boast the Cowboys and the Saints in the NFL, Ticketmaster’s ‘Presence’ API has the rest of the league sewn up. And last year it added ‘SafeTix’, now deployed by 27 NFL teams across 26 venues. Ticketmaster’s Clay Luter, EVP and co-head of sports, feels going digital unlocks a “bunch of opportunities” including but not limited to “eliminating fraud, streamlining entry, and obtaining data about – and interacting with – fans”, although he feels the environmental benefits of removing paper shouldn’t be discounted. “Going digital is going green,” he says.

Certainly, Christian Lau has been impressed. As the CTO of Los Angeles FC, he is in charge of the technical vision at the MLS side’s 22,000-capacity Banc of California Stadium. “As long as the ‘basics’ were covered, such as getting fans into the venue and purchasing F&B and merchandise, we were given license to try things to eliminate friction and enhance



Clockwise from top left:

Mobile ticketing technology uses an encrypted, scannable code to prevent fraud, while also offering greater stadium security and fans faster access



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KOP THAT

English Premier League soccer side Liverpool FC will be giving its ticketing system a technology transformation to enhance the way fans purchase tickets and access the stadium.

Liverpool has partnered with mobile-focused ticketing platform, SeatGeek, to improve the performance of its ticketing website and make for a smoother fan experience during peak sale times.

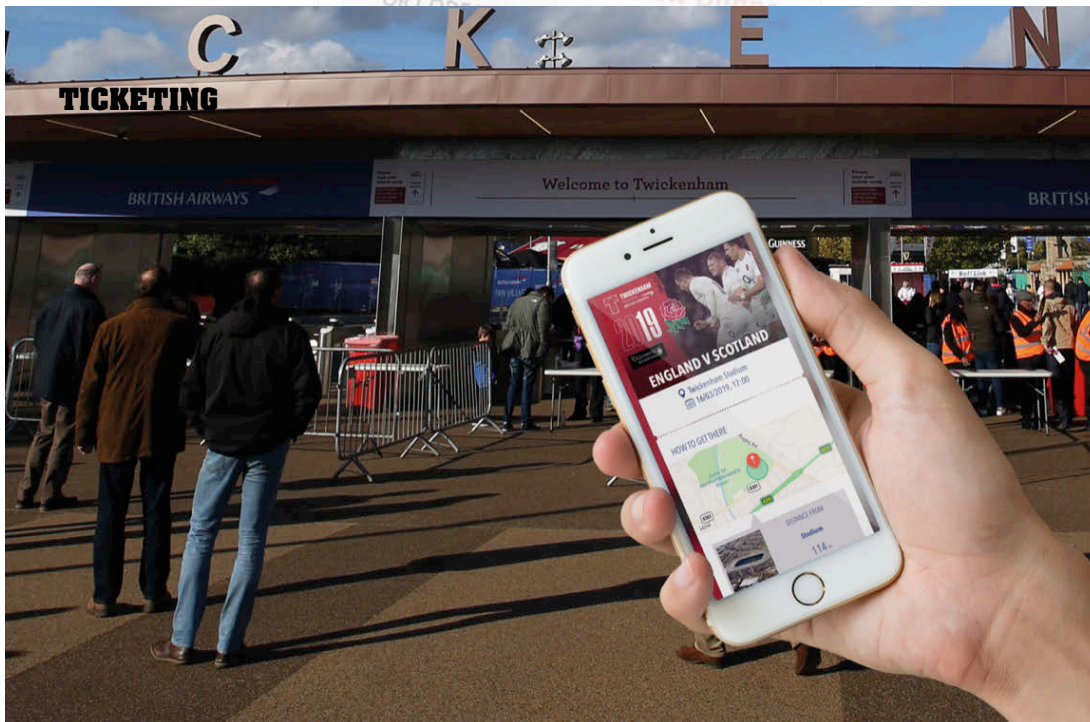
The new platform will offer supporters a more simplified buying experience and also boasts an improved queuing system to manage traffic volumes during busy periods and give fans more clarity on their status in the queue through live updates.

Focused on improving the mobile fan experience, the platform not only allows supporters to purchase through their mobile devices but will also support mobile access at the turnstiles for match e-tickets for fans wishing to move away from paper tickets.

Along with LFC, SeatGeek serves as the ticketing platform for nine of the 20 EPL clubs, which represents 45% of the league.

the guest experience,” he recalls. “For us, ticketing had to be digital and had to embrace ‘what’s next.’ We chose Ticketmaster as a result of SafeTix and its willingness to assist with biometric ticketing,” Lau confirms. “The challenge for us was the timeline – we only had 44 days, but the onboarding went as planned.”

SafeTix is a unique, identifiable m-ticket with an encrypted barcode that automatically refreshes every few seconds, making it nigh-on impossible to counterfeit as it can't be screen-grabbed or photocopied, nor can it be sold multiple times by scalpers. In terms of biometrics, LAFC was just the



infrastructure while providing uniquely secure tickets," he says. "Given each ticket holder is identifiable and can be communicated with directly prior to, during and post event, the use of stadium facilities can be significantly leveraged. On matchdays, there is typically a surge of arrivals in the final 20 minutes before kick-off, which results in issues for crowd control, loss of revenue for in-stadia F&B and empty seats for TV

third MLS franchise to use the scanning technology (from CLEAR), so fans enter the stadium via special lanes with a touch of the finger. It could even move in-stadium, with plans afoot to use it for faster purchases. "If buying a beer, for instance, you're identified in the system and already age-verified, and you can pay simultaneously." Ticketmaster also has a share in Texas-based Blink Identity and is reportedly looking at integrating iris and facial recognition into Presence.

Such solutions have had civil rights groups claiming it could risk normalizing a 'mass surveillance tool' – just last year Manchester City distanced itself from reports it was trialing a solution at the Etihad. Meanwhile, Blink Identity's CEO and co-founder, Mary Haskett, has been compelled to allay fears relating to the misuse of information collected by revealing its system "puts individuals entirely in control of their data and how it is used". Facial recognition can be "compatible with personal privacy", she notes, before stressing the Blink system is "transparent, accountable and voluntary".

The benefits of going digital

Tixserve's CTO, David Mc Carthy, sings from a similar hymn sheet when it comes to the benefits of m-ticket advances, and cites the moves made by the NFL, legislation such as Italy's requiring named ticket holders for large events, and last but not least consumer demand. "We enable stadia to retain their existing

Tixserve's platform, which is in operation at Twickenham Stadium, UK, can provide vital customer data insights to the venue operators to help deliver a more individual interaction

broadcasters. With Tixserve, you can offer time-based vouchers – to cajole ticket holders into arriving early, with the added benefits that ensue."

Tixserve in-ticket vouchers and other advertising and m-commerce functionality also have the capability to track the redemption of such vouchers down to an individual, which Mc Carthy feels is a game-changer. "Our solution has even been used for live crowd control with ticket holders being sent targeted messages to move to other gates with shorter queues."

Last year, Tixserve announced a deal with the Rugby Football Union at Twickenham, the goal being to improve customer service, prevent unauthorized resale of tickets and enhance interaction with patrons, while providing vital 'know-your-customer' data and other insights. Mc Carthy confirms the rollout has been well received and is now being used to scale. "Our solution solves real-life issues identified by our initial research and now extensive experience at large events and stadia," he says. "Other solutions often use technology for the sake of it and create more challenges for venues, not fewer."

"In the future – when everything has gone digital and it's more integrated into society – I could envisage people themselves being an extension of technology, just using their online identities to purchase 'authentication' to enter events," predicts EventChain's Addison. "At the end of the day, a ticket is merely a paper representation of our identities." ■



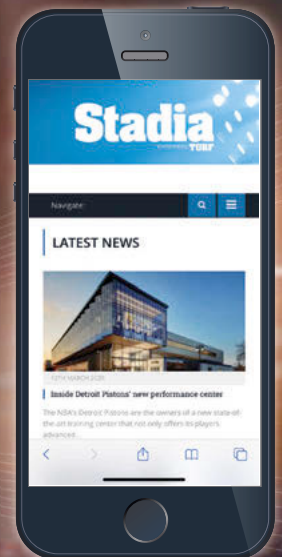
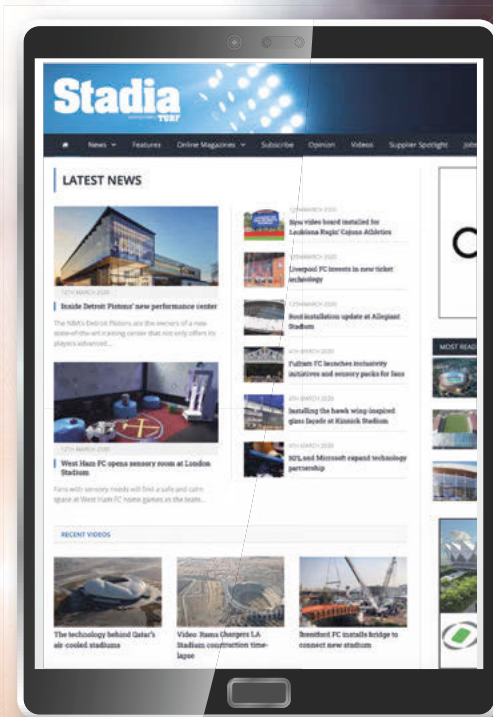
"Our solution has even been used for live crowd control with ticket holders being sent targeted messages to move to other gates with shorter queues"

David Mc Carthy, CTO, Tixserve

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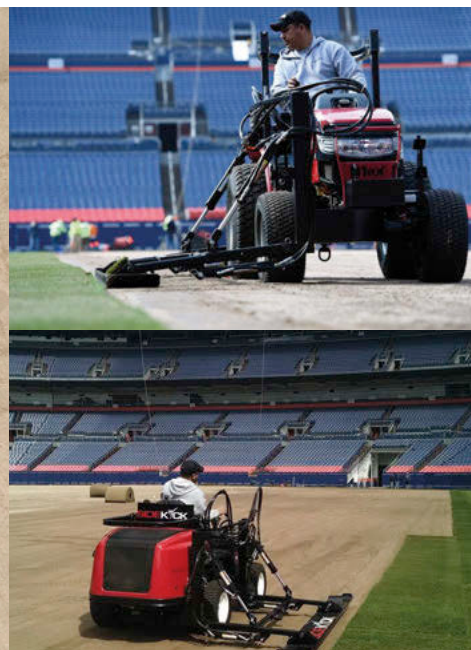
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Pitch count: Turf installation technology that can transform a field in just a matter of hours is setting new industry standards



Sidekick's compression plate technology enables stadia to replace turf quicker and therefore host more events

The traditional method of natural turf installation requires a team of workers armed with rakes and a generous window of time to complete the project. This process may be acceptable for youth athletic fields but not for multi-million-dollar stadia in need of dozens of rapid change-outs a year.

However, with SideKick USA's patented turf placement machine it reduces labor costs, damage to turf, and also greatly decreases the time it takes to install.

The technology enabled the Rose Bowl Stadium in California to hold a concert on Saturday and then be ready for a football game the following Monday. Even more impressive, it made it possible for Raymond James Stadium to hold two NCAA bowl games only days apart – including the College Football National Championship – where the playing surface was replaced, painted, and ready for play immediately.

The key to SideKick's success lies with its internationally patented turf placement and compression plate. With the use of hydraulics, the plate extends to slide the turf into place and completes the work of a dozen pulling

rakes -- all without ever touching or damaging the playing surface. The power of the SideKick's plate in-turn eliminates the resulting seams left between the turf, making for tight, clean rows down the field. This is also why the surface is safer, stronger, and ready for play immediately after installation.

Kickstarting a revolution

What used to be a product used exclusively in the United States is now in five countries around the world and counting. From New York to Yokohama, SideKick units are helping install natural grass pitches at some of the most important stadia throughout professional and amateur sports. With its internationally patented technology, SideKick has helped the stadium industry reach its full potential to host as many events as possible and still having ample amount of time for top quality turf installation – resulting in immediate playability.

Since SideKick USA's inception in the early part of the decade, numerous professional and collegiate stadia across the United States have benefited from its time and labor-saving compression plate, including over a dozen

NFL stadia. The machine has been utilized for an assortment of high-profile events including NFL Super Bowl 50 at Levi's Stadium, the 2017 MLS All-Star Game at Soldier Field, and 2017 College Football National Championship at Raymond James Stadium. Since SideKick USA expansion outside of the United States, units have been utilized in several stadia around the world, such as Metricom Stadium in Australia and Nissan Stadium in Japan. Most recently in record-breaking installs at stadia to be used in the upcoming 2022 FIFA World Cup in Qatar, including Al Janoub Stadium, Ahmed bin Ali Stadium, and Al Bayt Stadium.

With the help of SideKick, transforming stadia from sold-out concert venues into pristine athletic fields capable of holding league championships in a matter of hours is no longer a stadia management dream – it has become the industry standard. ■

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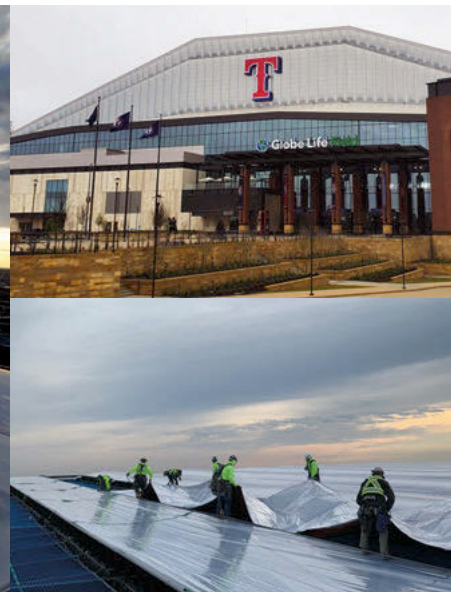
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Top of their game: The Texas Rangers' new Globe Life Field presents baseball's first retractable Texlon ETFE roof installation



The use of Texlon ETFE offers benefits of light transmission and flexible design for stadium roofing and façades

Stadium and arena designs have changed over the last 15 years. No matter the location around the world there are commonalities in overall design results, and they are the comfort and experience of the individuals in these stadia.

Each new stadium brings more advanced technology and more efficiencies than the last. In addition to the ETFE (ethylene tetrafluoroethylene) façade, Globe Life Field, the new home of Major League Baseball's Texas Rangers, includes an intelligent shading Texlon ETFE roof system designed and supplied by Vector Foiltec.

Large stadia are no longer reserved only for sporting venues, they are multi-purpose destinations. Just like other professional

sports teams, the Texas Rangers will share its space for special events and musical concerts. Olympic stadia are transformed into usable spaces post-Olympics as well. Vector Foiltec has been an integral part of the transformation of stadia, both old and new, with its Texlon ETFE technology.

Best of both worlds

This innovative technology offers a variety of benefits when included in the design of stadia. Fully enclosing venues is important in many different climates to protect spectators and players from environmental elements, and in this case the hot humid Texas weather. ETFE offers enough transparency that fans feel as though they are in an open air stadium, while simultaneously controlling the light transmission. But, at the same time, a retractable roof, that incorporates ETFE, can be opened within minutes and offer spectators a whole new experience.

Different print patterns, foil thicknesses and the number of ETFE layers, are all unique to the goals of each stadium project. Each of those key components affects the light transmission, U-Values, and Solar Heat Gain Coefficients, which all affect the overall comfort for the visitors of the stadium.

Texlon ETFE can also be used for smaller areas of stadia, such as canopies covering seating areas, or even as a façade for aesthetics. Its durable and lightweight properties enable many design possibilities. ETFE can span long distances, and the cushions of a multi-layered system can be easily designed in various shapes and sizes.

With over 35 years of experience, Vector Foiltec is a specialist in ETFE technology, and was responsible for the first stadium ETFE application in North America at U.S. Bank Stadium, and the largest ETFE application in the world at the Beijing Water Cube. Vector Foiltec provides turn-key design build services; from initial concept through to scheme design, climate based optical and thermal assessment, and foil and structural engineering analysis. Vector Foiltec constantly brings more innovations to the industry and holds the world's only independently verified environmental product declaration for this technology. ■

The facts:

Globe Life Field Texlon ETFE façade and roof installation

- ETFE - 124,000ft²
- Retractable roof
- East façade
- Retractable upper east façade
- West concourse
- Cushions: Three layers

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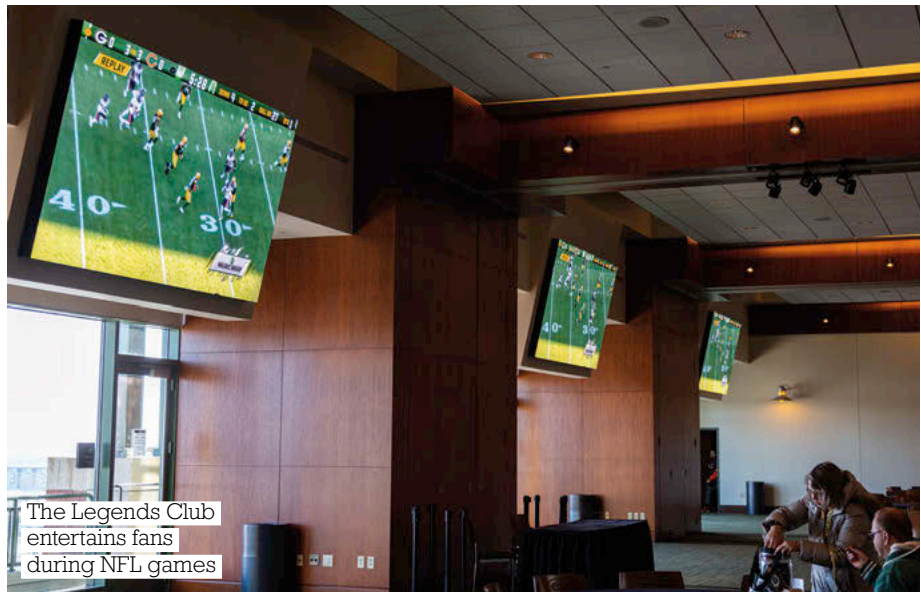
Evolving entertainment: The use of fine pitch LED video displays is captivating sports fans before, during and after live events

While fans are already able to enjoy the live action by watching their favorite teams compete right before their eyes, adding to the experience in a positive way is the next step for stadia and arenas. Installing LED video displays in gathering areas encourages fans to come together to enjoy a thrilling and exciting atmosphere they can't get at home. And this experience is constantly evolving and improving.

In today's live event environment, stadia are now offering more entertainment options resulting in fans arriving earlier than ever before, sometimes even hours before the event begins to participate in and soak up a greater gameday experience. In turn, stadium operators are finding that fans are purchasing food and beverages near the stadium and gathering with other fans prior to the doors opening. Their enthusiasm and anticipation for the upcoming event grows as more people start showing up.

After the event, fans are also choosing to stay longer rather than heading home the moment the final whistle is blown. They drink and eat, and celebrate the game with other fans at dedicated fan zones and public plazas in and around the stadium to extend the overall experience.

The areas in which fans gather in around the stadium are called entertainment



The Legends Club entertains fans during NFL games

districts, and venues are capitalizing on these areas by providing fans with more to do before and after events. Constructing these adjacent to and sometimes attached to entertainment locations creates a complete entertainment destination which encourages fans to extend their day while also providing a means for additional revenue generation.

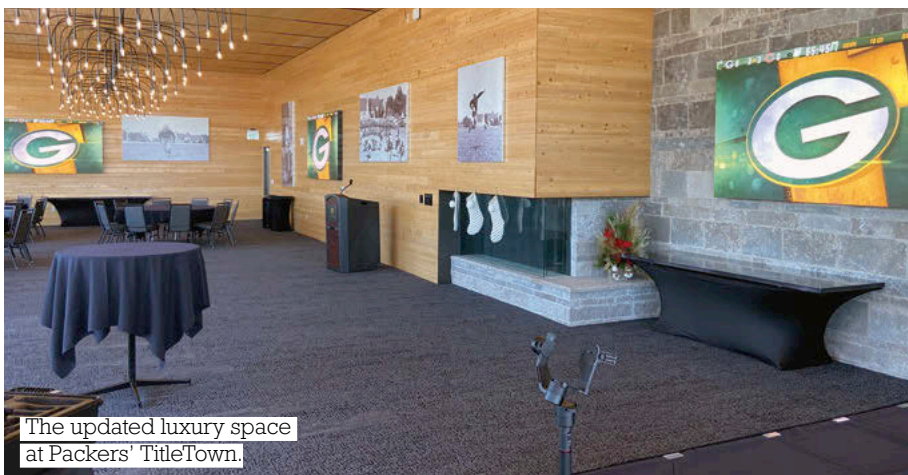
A fixture of entertainment districts includes LED video technology. Displays in these areas draw fans in, capture their attention and show them relevant content.

Before games, they can air pre-game shows or other league games currently taking place. The displays can build excitement for the upcoming game by showing historical and highlight footage of the home team's previous victories or great plays.

Green screen

The NFL's Green Bay Packers recently added Daktronics' LED displays to its stadium, Lambeau Field, and its entertainment district, Titledown. Six video walls measuring 7ft high by 12ft wide (2.1m by 3.6m) feature 1.9mm line spacing inside the stadium and three video walls measuring 4.5ft high by 8ft wide (1.3m by 2.4m) feature 1.5mm line spacing inside Titledown.

These displays bring a focal point and additional energy to the space as fans come together to enjoy the live event. They share live feeds of the game as well as additional revenue generating advertising for the captive audience in the venue. ■



The updated luxury space at Packers' Titledown.

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Revitalize, not rebuild: Why rejuvenating existing infrastructure and branding is a cost-effective method to updating sports venues



Sevilla FC modernized its home stadium with a new exterior and bolder branding

When sports venues are unable to meet modern demands it often becomes necessary to build a new structure. This is a challenge, which requires sourcing funds and can bring into question potential return on investment, with the vast majority of projects requiring a significant financial outlay.

However, in most cases, stadium renovations have nothing to do with capacity and size, but rather they've become outdated, which has drawbacks when it comes to increasing commercial investment. In these situations, instead of teams moving stadium or embarking on a full rebuild, an attractive alternative is to carry out a partial or complete rebranding. A facelift and a new look can modernize the club's image, generate new income, as well as engaging with fans and motivating players.

This rejuvenation of a stadium has been the choice adopted by many soccer clubs in Spain's La Liga. These include Valencia CF's Mestalla Stadium, Sevilla FC's Ramón Sánchez Pizjuán Stadium, and Real Betis' Benito Villamarín Stadium. The list continues with Levante UD, RC Celta, RCD Espanyol de Barcelona, RCD Mallorca, CA Osasuna, Málaga CF, and SD Huesca. These branding projects are also carried out with new stadia, such as Atletico de Madrid's Wanda Metropolitano.

On each of these occasions, Molcaworld, which provides a strategic service to transform sports arenas, was trusted with the part or complete revitalization of the stadium, always staying true to the history and DNA of each individual club.

The creative process

Following an analysis of the stadium, Molcaworld's team of designers and architects create a concept and manual for all of the areas, generating commercial income through the conceptualization of new VIP experiences, analyzing and distributing the sponsorship commercial pyramid, the press room, or the mixed zone. Fan engagement is also generated with a redesign of the stands, exterior façade, or interior public concourses. Another important aspect that is studied is player motivation, where redesigning areas such as the locker rooms and player tunnel can play an influential role.

On many occasions, the implementation of this new image is carried out in phases, according to the club's budget availability, something which is highly advantageous in terms of planning.

Molcaworld is responsible of all aspects of the project management to ensure the correct development of the new image being generated by their architects and design team.

The data for this revitalization of Spanish stadia, according to La Liga and Nielsen, shows that attendance at these venues increased by an average of 32%. In some cases, the increase in the number of fans coming to the ground increased by 50% in the year following the work.

The newly created VIP areas have always been a great success, in most cases being sold even before their completion. Furthermore, the ROI saw exponential increases of over 1000%. These are figures which attract numerous sponsors and, in turn, increase club profits.

The results are, therefore, very similar between the construction of a new stadium and a revitalization. However, the investment for each case is very different. In the case of a rebranding/revitalization, the return on investment is estimated to be in the region of just one to three years, depending on the extent of project carried out.

With these facts and figures it may help team owners choose the best course of action when they are deciding whether or not to build a new stadium.

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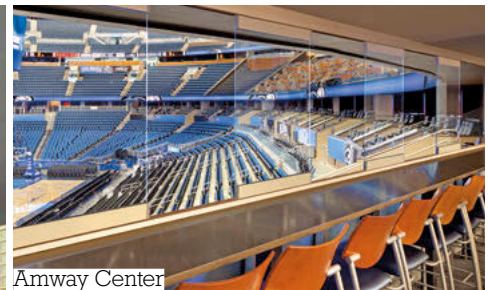
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Grand opening: The use of glass walls within a stadium enables any space to become more open, dynamic and modern



Chase Center



Amway Center



Salt River Fields

The new home of the NBA's Golden State Warriors, the Chase Center, is nothing less than luxurious. Sitting on the waterfront of San Francisco's Bay Area, the state-of-the-art, 18,000-seat multi-purpose arena opened in 2019 as the team moved from its Oracle Arena, where they played for 38 years. The Warriors' new home has created a more premium offering of everything from fan experience down to the materials that were used during the build.

As part of the Chase Center site, it features the Gatehouse, a 5,000ft² building that is located across from the main arena which faces an outside plaza and welcomes visitors. A large staircase winds around the outside of the building all the way to the top of the structure. From those steps, fans can watch live Warriors games shown on the adjacent big video screen. On the side of the winding staircase a strip of digital scoreboards display the results of other NBA games.

As well as retail, it has stadium seating for up to 250 to sit and observe the activities on the main plaza, including the NBC Sports Bay Area pre and postgame shows. To provide a window to all of this, the Gatehouse features

an innovative product from local company NanaWall called cero, which is a minimal framed sliding glass wall.

The cero sits on the ground floor and is large, impactful system. The Chase Center's cero is a full floor-to-ceiling, six-panel system that spans 32ft (9.7m) wide. The four central 10.6ft (3.2m) tall panels slide to each side with recessed top and bottom tracks to create a grand opening. The large panels and minimal frame of cero matches the Chase Center's design ethos.

Seeing is believing

NanaWall has provided large glass opening wall systems to many other sports stadia and arenas, such as the Amway Center, home to the NBA's Orlando Magic, which has a folding panel system installed in its luxury suites to provide fans with large, open, uninterrupted viewing of the basketball court below.

Elsewhere, NanaWall's folding glass wall systems are helping venues achieve more sustainability and energy efficiency goals. At Salt River Fields at Talking Stick, the training facility for the Arizona Diamondbacks and Colorado Rockies in Scottsdale, Arizona, the use of its SL45 folding glass walls blurs

indoors and out while optimizing building performance. The first LEED Gold-certified venue selected wide-opening NanaWall SL45 folding systems for the third-tier suites and press area so they can be completely retracted during games for optimal viewing and filming. The training and office areas, using the same specification, allow athletes to enjoy the desert air while managers and coaches in their offices stay connected to practice outdoors.

To ensure proper enclosure performance, the NanaWall SL45 systems have carefully engineered mechanical seals and insulated glazing. The glass walls provide excellent thermal control, with energy savings calculated at 23.5% over baseline.

By combining precision engineering and design options across more than 25 customizable systems, it offers design possibilities beyond the conventional for almost any space. ■

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SMART THINKING

Colm Moran, facility manager at Thomond Park, shares how stadium operations can be transformed for the better by technology



Stadia are hard venues to manage. Many rely on hundreds, if not thousands, of part time staff to ensure event days go off without a hitch.

At Thomond Park, the home of Munster Rugby Club, on a match day, we see the number of staff rise from a few dozen to over 1,500. Relying on paper-based methods is untenable in the long-term when dealing with that many contractors, so what are the alternatives?

Today, there is the trend to make many things smart. From smart watches to smart cities, technology is revolutionizing all aspects of our lives. Stadium management is no different. However, when we redeveloped Thomond Park in 2008 to increase capacity to over 26,000, our paper-based operation was anything but smart. The clunky and clumsy operation worked, but it was neither streamlined nor intuitive. Reports had to be written up based on the event's notes, with data often being inaccessible until a week after gameday and often not before the next event. By the time we had properly analysed our data, it was already old.

Many in the industry rely on the same slow process. However, thanks to innovations in staff management and operations technology, the industry can finally step up to the next level.

A smart stadium is relatively straightforward to implement and requires just two changes: the deployment of sensors and the use of mobile devices by staff and contractors. Wireless sensors can be deployed in various parts of a stadium to track key assets, from making sure screens are working to monitoring lighting infrastructure. These can feed back data in real time to central management as well as triggering different tasks and workflow orders to ensure action is taken when required.

However, as all operations professionals will know, the key to a smoothly run stadium is good staff. It's the use of technology to empower staff and contractors that really makes a stadium smarter. Solutions such as those we employed at Thomond Park can be used by staff members on their mobile devices. All of the data being monitored by those sensors can be loaded onto an app and sent directly to relevant teams through their mobile devices. These systems also allow for staff members to update their

location through the use of RFID tag technology. The benefit of this allows the control room to see exactly where in the venue staff are, and to be able to coordinate quicker and more effective responses to problems as and when they arise.

The core of what we do in the stadium management industry is ensuring the fan experience is the best it can possibly be. By empowering our frontline staff and streamlining their work, as well as being able to track what needs to be done and who is doing what, stadium managers can spend less time managing people and more time getting on with operations. This allows both the management team and frontline workers to spend less time filling in forms and more time championing and improving the fan experience during an event.

To say that smart stadia are the future would be an understatement. Removing paper-based processes and replacing them with real time data collection, which can be accessed by front-line workers is already revolutionizing stadium operations. Our experience at Thomond Park is proof that it is a smart idea. ■

Colm Moran has 29 years' experience working as an operations manager across multiple disciplines, including at a multi-award winning stadium. Thomond Park, in Limerick, Ireland, has recently deployed a bespoke digital solution from Over-C to automate operational processes.





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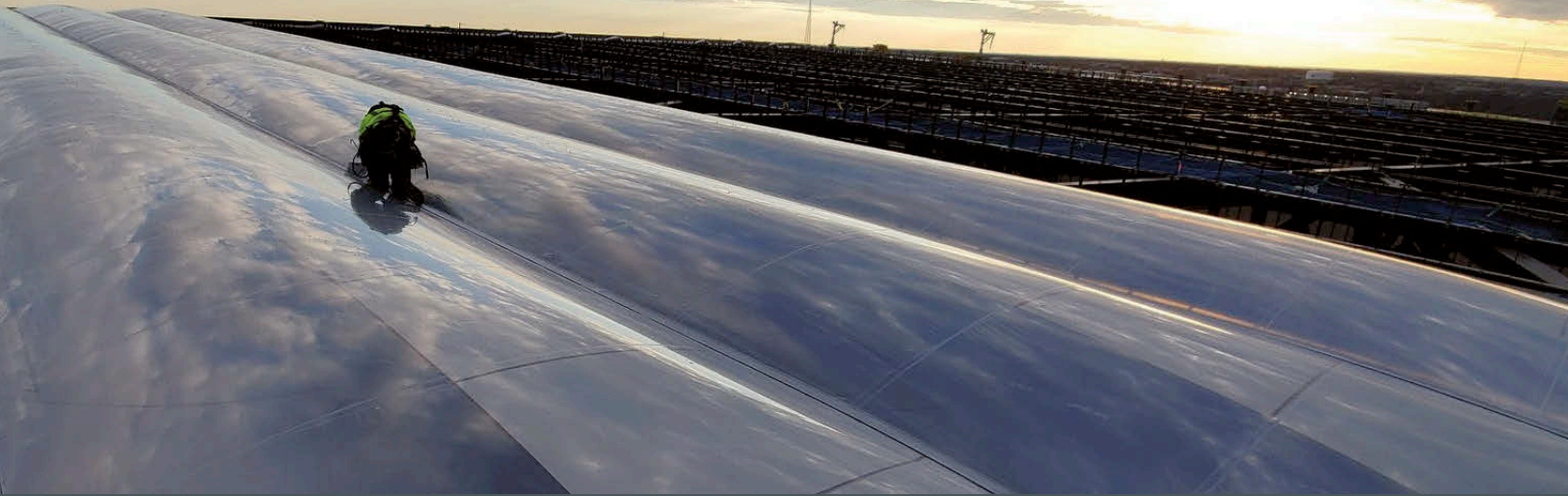


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With 18 offices around the world, we provide local service with global knowledge, continuously delivering great design and engineering, as well as on time performance for successful projects. Vector Foiltec would like to help you develop the best solution and execute your design ideas successfully.

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