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Stadiums and Sporting Venues Going Digital – White Paper

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Al Ain Stadium © Dennis Gilbert

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EXECUTIVE SUMMARY

GOING DIGITAL

Information technology (IT) and audio-visual (AV) systems are critical to delivering and engaging supporter experience. Advances in mobile technology enable stadiums and other sporting venues to create and sustain a deeper and more profitable relationship with the fan base.

Smart phone ownership provides the opportunity for developing the relationship but also creates the demand for content. If you are not providing the content to engage the fans someone else will.

In this whitepaper we outline how digital (IT & AV) technology contributes to the fan experience and our approach to delivering solutions for stadiums and other sporting venues.

We provide a summary of our recent work in stadiums and other sporting venues in the UK and overseas.

Our approach is essentially pragmatic, helping our clients to select and integrate best-of-breed technology into the built environment that is effective, reliable and easy to maintain.
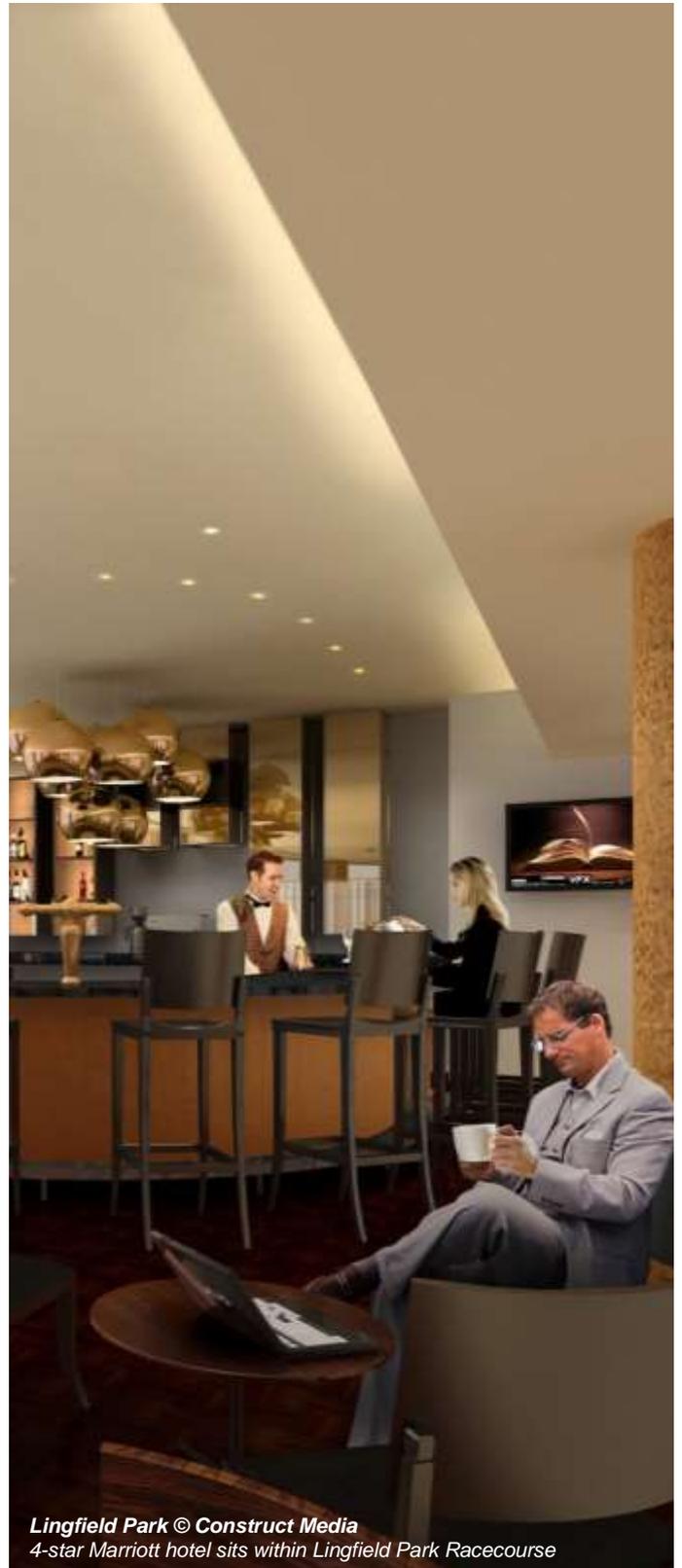

Twickenham Rugby Stadium, UK

Al Ain Football Club, Hazza Bin Zayed Stadium, UAE

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Lingfield Park © Construct Media
4-star Marriott hotel sits within Lingfield Park Racecourse

DELIVERING THE STADIUM EXPERIENCE

KNOW YOUR FAN BASE

To engage with fans, stadiums need to offer something that the fan values – that might be streaming live video of the game to their smart phones from 8 different camera angles, and an app that allows them to rewind the action from any point.

If the content is interesting enough fans will register with the stadium, download the app and stay connected.

SMART PHONES

Mobile phone providers have a track record of sport sponsorship but can also do much more. 3G / 4G reinforcement at the stadium or other sporting venue needs to be able to support hundreds or thousands of calls before, during and after a game. Providing the mobile operators with equipment space, and providing access to electrical power and antenna locations can form part of a sponsorship deal. The mobile operator will use its own funds to supply and install the equipment and contribute to sponsorship funding.

The 3G / 4G reinforcement based on pico cells within the stadium helps maintain good relationships with other businesses and residents living near the stadium who, no longer suffer from mobile coverage being swamped on match days.
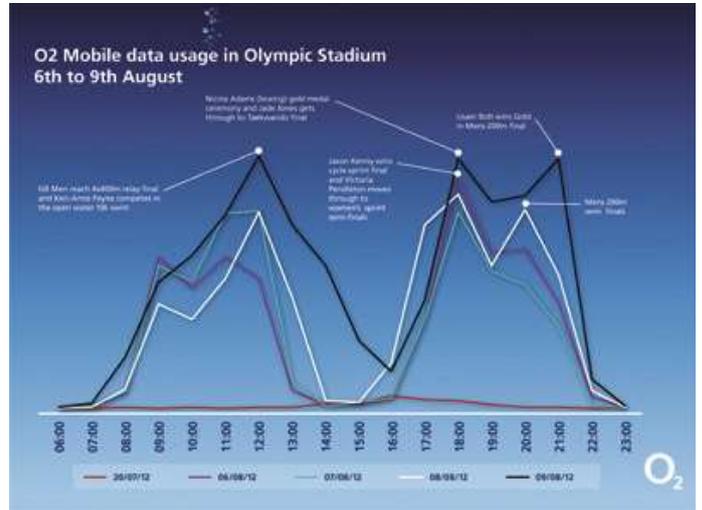
HIGH DENSITY WI-FI

There is a limit to the amount of traffic that any 3G / 4G (mobile) network can carry and fans will not want to use up their monthly data allowance with live video.

With a smart phone, the bulk of the image / streamed video can be handed off to a Wi-Fi network.

The Wi-Fi also provides the main channel for communication with fans offering the possibility of selling tickets to future games, promoting merchandise and making food and beverage offers.

Wi-Fi handled well and used in conjunction with IPTV displays can encourage fans to arrive earlier for the game, stay longer and spend more.

O2 Mobile data use in Olympic Stadium 6-9 Aug
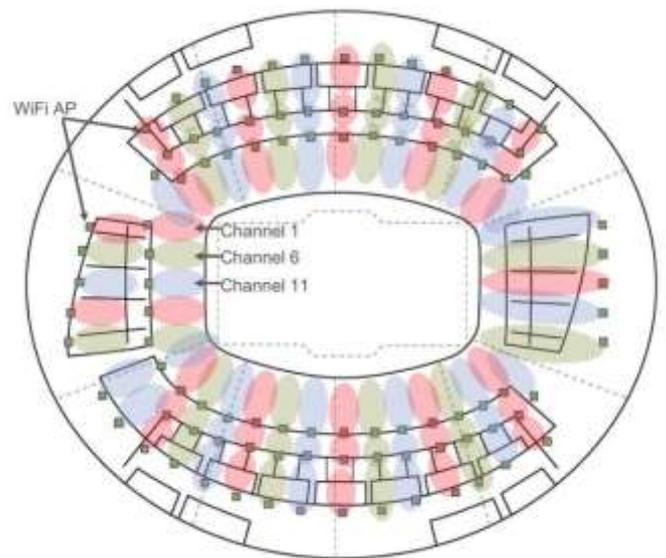
In Bowl High Density Wi-Fi

SELECTING APPROPRIATE TECHNOLOGY

EASE OF USE AND AVAILABILITY

Investing in High Density (HD) Wi-Fi is expensive and stadium operators need to be sure that the technology will work and that it will not become obsolete.

Wi-Fi technology is developing rapidly with each new generation offering faster data speeds and more capacity.

With any system the starting point is estimating how many fans will register to use the system and how many will actually use it at peak times. US soccer and UK football experience suggest that up to 30% of fans will register for a Wi-Fi application and as many as 10-20% of those in the stadium will use it during a game. These numbers could grow and systems should be modular to allow for future growth.

IP TV AND EVENT INFORMATION

Live TV and event information can be conveniently combined using Internet Protocol (IP) distribution of TV signals.

The IP TV system can distribute multiple channels to groups of displays / video walls, which can be either centrally scheduled or locally selected, as would normally be provided in a hospitality box.

The flexibility of IP TV technology combines live TV with static / live display of food and beverage pricing, future events and other information. The information can be 'published' during a game or other event to a pre-planned time schedule with all the displays in a group synchronised to show the same information.

One complication inherent in all digital systems including IPTV is latency or delay due to the encoding and decoding of the TV signal. This means that displays such as giant screens that can be seen at the same time as the live game must have a direct feed with the minimum possible latency.

TRANSIT AND REDUCE QUEUING

Not everybody is a season ticket holder. Route to seat and similar navigation apps inform people prior to their arrival at the stadium.

The use of cashless tills, either pre-paid or via contactless card payment assists in speeding up transactions at food / beverage outlets. The use of live menus with up-to-date stock availability avoids disappointment.

Conference facilities

Giant Screen installation at Twickenham Stadium

PERFORMANCE: DIGITAL COACHING

Leading the digital coaching revolution for football is Leeds-based company Prozone, which has been developing its systems since 1998. The majority of top clubs use the Prozone 3 system. In most systems, 8 to 12 cameras are installed in the stadium, usually hanging from the roofs of the stands, allowing anything that takes place on the pitch at any given point in the game to be captured.

All the coding is carried out by Prozone. The data is then delivered to the clubs, utilising software provided by Prozone, and the analyst at the football club can extract the information required.

The software that they receive allows you to flick between the different learning tools. There is a simple video installed in case you just want to show a specific image, and in Prozone 3 there is also 2D animation which would enable you to play them side-by-side. You could show something in the video footage and then replay to show something else outside of that camera angle, for example off-the-ball runs could be viewed which the player with the ball may have missed.

A cut-down system can be seen at clubs in the lower leagues. The Matchviewer system works off just a single camera – perhaps the TV camera or the football club's own footage from the gantry. Such footage tends to follow the ball, allowing the same technical on-the-ball statistics.

FAN ENGAGEMENT

The TryTracker is a platform which provides real-time data about rugby matches, as well as predictive analytics about the outcome of games.

This predictive data analytics platform, created by IBM, is part of a wider RFU strategy to engage with rugby fans and in the long term, educate spectators about the sport.

The technology being implemented by the RFU aims to combine the top players on the pitch, with the grassroots of the local club, to educate users and to generate interest in the sport.

Referee Link enables fans to hear the audio feed from the match officials.

Prozone 3 using 12 cameras
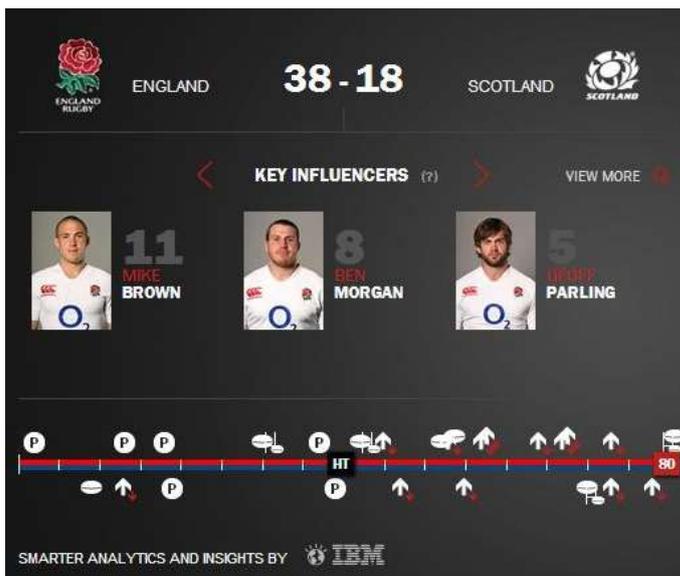
RFU TryTracker

DATA NETWORK DESIGN

All stadium or sports venue systems can now be delivered using IP technology over CAT-6 data cable including the most demanding, which are High Density Wi-Fi and High Definition IPTV.

Stadiums and other sports venues are large compared to the 90-meter limit of CAT-6 or 6a copper cables so it is inevitable that a fibre backbone will be required. The more systems running on the backbone the more important is its resilience so that a dual backbone is seen as a basic requirement.

In most cases CAT-6 or 6a, copper cables with Power over Ethernet are the most cost effective for the local distribution but this will result in a large number of hub rooms each potentially requiring back-up power and mechanical cooling.

There is no one design that will suit all venues but establishing dual-backbone fibre routes and enough hub rooms so all services' delivery points are within 90m of the nearest hub is a good place to start.

High Density Wi-Fi may require Wi-Fi access points mounted on the roof or other remote parts of the structure, which stretch the 90-metre rule to the limit and may justify additional intermediate hubs just for Wi-Fi.

High Density Wi-Fi not just in radio frequency management but holding state for 10,000's of devices.

## CCTV AND SECURITY – EVENT MANAGEMENT

A popular sport event attracts many thousands of people, gathered in a stadium to be carried away by the excitement and emotions of the game. Though the atmosphere is mostly positive, there are incidents that may cause problems for spectators, staff, players and athletes. Such incidents include violence between fans, pick-pocketing, black market tickets and vandalism.

HD CCTV systems provide high-quality images making it possible to identify people and objects, manage crowds from a control room, share images with the police and provide evidential quality images where incidents lead to court action.

Unified stadium operations systems which bring together multiple sources (such as CCTV, Access Control, Intruder alarm, fire, public address), offer the ability to programme multiple event profiles for match and non-match days.

Network integration – IP network patch panel
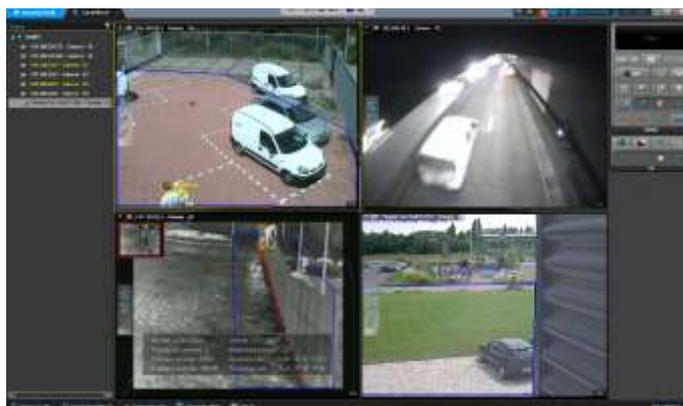
Genetec security center with vechile and virtual wire analytics

STADIUM NETWORK INTEGRATION

All stadium premises systems can now be delivered using IP technology over a fibre backbone and CAT-6 or 6a data cable.

Certain life safety systems including fire detection, fire incident management and Public Address / Voice Alarm (PA / VA) will typically have their own fire-resistant cabling but all other systems including:

- Access control
- BMS
- CCTV
- Electronic ticketing and turnstiles
- Energy management
- Lighting control including Sports Lighting
- SCADA

can share an IP backbone. The degree of integration may be determined by maintenance and support considerations so that there may be a premises IP backbone as well as a pure IT backbone. However, in all cases the smaller the number of separate networks the lower the costs and management overheads.

VRF/VLAN with identity based networking technology enables individual sub-systems to be segregated so that, for example, the access control system only 'sees' other access control devices and access control traffic on the network.

The diagram on the right shows how a single IP network can support all stadium premises systems and eliminate multiple proprietary networks.
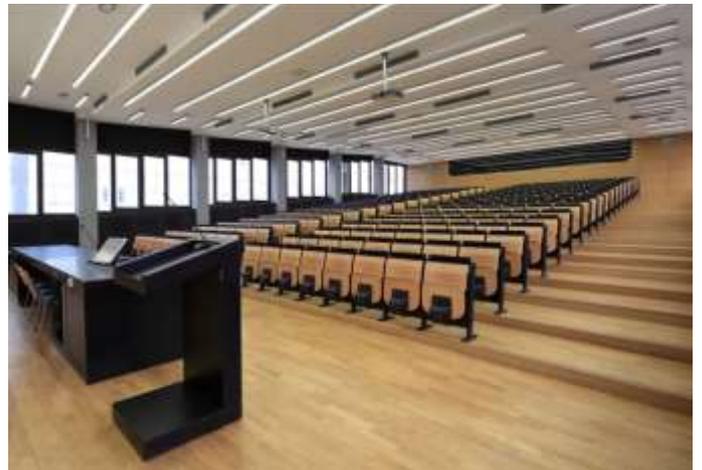
MEDIA FACILITIES

Media facilities require careful design to meet the needs of TV, radio and press reporters. In larger venues, dedicated media auditoriums are required with suitable lighting and acoustics.

Whilst TV and radio reporters will have their own technology, they will need space and power to deploy it. The usability of the auditorium can be enhanced by having a dedicated audio-visual system that can be used for other events and local presentations that are not being broadcast.
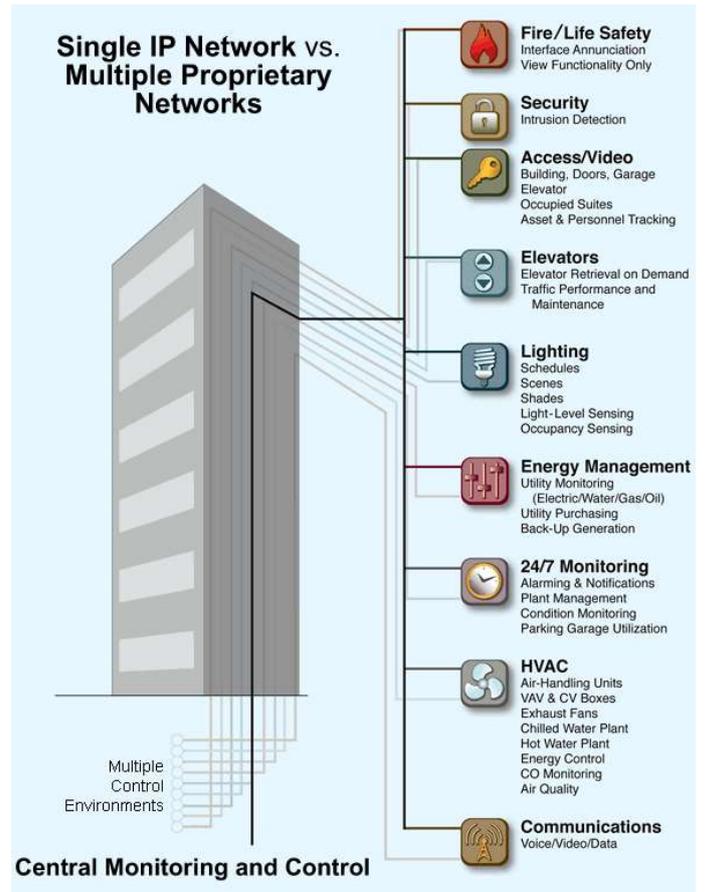
Single IP backbone for stadium systems

Media Auditorium

BROADCASTERS

Stadiums need to provide facilities for Outside Broadcast TV crews whenever a match is to be televised. Different providers require different facilities but all will require a substantial OB compound for the OB trucks, which will include power generation, production and uplink vehicles.

Most stadiums have a pre-planned set-up with established camera positions and permanent cabling for power, cameras, audio and communications including multiple ISDN lines to the broadcaster's HQ.

Increasingly stadium operators would like to capture some of their own content at source rather than just relying on feeds from the OB provider.

Whilst there may be good working relations between the OB provider and the stadium at the highest levels, there can be some conflict of interest at a day-to-day level with stadium technology managers finding it difficult to keep on top of third party cabling and general tidiness around camera and commentary positions.

DIGITAL SIGNAGE

IP TV systems can deliver static or semi-static signage for food and beverage pricing, way finding and other information. The system can be designed to schedule information to groups of screens pre-match, during the game, at half time and post-match. Landscape and portrait displays can be used and where required a flexible mix of content including video, ticker and static information on one screen.

LED PERIMETER ADVERTISING SYSTEMS

LED Perimeter Advertising Systems have become standard features for football stadiums and sports arenas offering a bright dynamic daylight display that commands significantly higher rates than static, perimeter-advertising. Installations can be at ground level or mid-tier and typically have a 140-degree viewing angle with a 16mm pixel pitch suitable for outdoor use in all climates and lighting conditions.

Broadcasters are increasingly manipulating the LED perimeters to offer dedicated advertising feeds to particular TV channels / countries, increasing revenue.

HOSPITALITY: AUDIO-VISUAL

Hospitality boxes are used for a wide range of purposes as well as match day events. Box owners often use their box for marketing and business meetings on non-match days. The stadium location contributes to a corporate sponsor's brand image and adds interest to what might otherwise be a rather dull event in the sponsor's office or a hotel.

Hospitality box audio-visual technology needs to be flexible but also straightforward to use. Box owner's staff will not have any IT or AV support people with them and need to be able to rapidly set up and make a presentation using the equipment in the box.

Stadium owners are finding it increasingly important to retain control of IP TV signal distribution and the Wi-Fi radio spectrum. Without high quality centrally managed systems, box owners may start to install their own ADSL services and Wi-Fi access points, which compromise the main stadium systems.

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RELEVANT EXPERIENCE

Twickenham Rugby Stadium Upgrade Programme (TSUP)

Services: IT & audio visual
Location: London
Client : Rugby Football Union
Value: Confidential
Completion Date: 2015
Architect: KSS

Lee Valley White Water Centre, Olympics, London 2012

Services: Building services, civil, structural engineering, geotechnical and sustainability
Location: Broxbourne, Hertfordshire
Client : Olympic Delivery Authority
Value: £21 million
Completion Date: 2010
Architect: Faulkner Browns
Imagery: © Faulkner Browns Architects and Philip Vile

Queens Tennis Club

Services: Building services, IT & audio visual
Location: Baron's Court London
Client : Queens Tennis Club
Value: Confidential
Completion Date: Ongoing
Architect: Edward Hill Partnership
Imagery: © Leo Mason sports photos and Alamy

Twickenham Stadium, The Home of Rugby, was upgraded in preparation for the World Rugby Cup in 2015, along with infrastructure upgrades for the next 10-25 years.

This award-winning artificial white water canoe course is a major multi-disciplinary engineering project. The centre hosted the Canoe Slalom competition during the London 2012 Summer Olympics. The site accommodated some 12,000 spectators in the temporary stands. The Lee Valley White Water centre was designed with sustainability in mind and is expected to become a major leisure attraction in Hertfordshire.

Opened in spring 2011, it was the first new sporting complex to be completed and the only London 2012 venue to be opened to the public ahead of the Games.

Cundall was appointed to provide services on a series of projects at the Queens Club since 2009 including the refurbishment of the Junior Tennis Academy, the Rackets Court Building, the Pavilion Café, Bar and Terrace areas within the Pavilion Building.

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Lingfield Park Racecourse

Services: Building services and fire engineering, lighting design, IT & audio visual
Location: Lingfield, UK
Client : Arena Leisure plc
Value: Confidential
Completion Date: 2010
Architect: EPR Architects / Stephen Langer Associates
Imagery: © Construct Media

Twickenham Rugby Stadium – South Stand

Services: IT & audio visual
Location: London
Client: Rugby Football Union
Value: Confidential
Completion Date: 2010
Architect: Ward McHugh Associates / Chapman Associates
Imagery: © Kristen McCluskie

This project involved the regeneration of the operational core of the racecourse. This included the replacement of outmoded buildings with an integrated leisure building, incorporating a 120-bed four-star Marriott hotel, replacement viewing terraces and boxes, golf clubhouse, and leisure club. Cundall IT and Audio Visual (AV) was appointed by Arena to design and monitor the construction of the IT & AV systems for the new Marriott Hotel. Cundall also advised on the replacement of the racecourse telephone systems and the integration of racecourse and hotel systems. The hotel systems included:

- Server room, structured cabling
- Telephone system
- Guest Wi-Fi and high speed internet access
- Meeting room and hospitality box AV systems
- Bar and restaurant background music systems
- PMS (reservation and billing system)

Integrated reservations: The new telephone system was designed to use the same technology on the racecourse and in the hotel so that calls could easily be transferred between reservation desks. Callers can book overnight accommodation in the hotel at the same time as making bookings for race-day events and hospitality.

Budgeting and cost control: Cundall assisted Arena in its negotiations with Marriott Hotels to ensure that the new hotel met Marriott's standards whilst also keeping the IT & AV costs under control.

Fully operational on day one: Cundall site monitoring ensured that the IT & AV systems were properly addressed during the construction and fit-out stages so that the hotel was fully operational on day one and there were no delays in the program due to IT issues.

Twickenham South Stand has become part of a prominent and highly specified stadium within the UK. The 'home of rugby' was developed to give a significant increase to the level of service available on-site, such as hospitality and hotel services.

Cundall IT and audio visual (AV) was appointed as part of a multi-disciplinary team to design the IT & AV facilities for the South Stand which include the following areas:

- 162-bed Marriott Hotel
- New purpose-built offices for the RFU
- Conferencing and banqueting suites for Twickenham Experience Ltd, including a banqueting hall which can accommodate 1600 seated for dinner
- A 400 seat theatre
- Franchised cafes, restaurants and bars

Budget and cost control: Cundall's IT & AV team enabled the RFU to identify the IT & AV costs early in the program and make informed decisions as to the IT & AV facilities to be provided.

Integration and control: The relocation of the RFU offices created the infrastructure for the digital development of the stadium. In particular, the new Main and Secondary Computer Rooms provide resilient accommodation for new IP-based systems and allow the RFU to work towards a single IP network for all services.

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Emirates Durham International Cricket Ground

Services: Civil, Structural, building services, IT and audio visual
Location: Durham
Client : Durham County Cricket Club
Value: £25 million
Completion Date: 2012
Architect: Ainsworth Spark Architects / Red Box Architecture

York Racecourse – Melrose Stand

Services: Building services, fire engineering, IT and audio visual
Location: York
Client : York Racecourse Committee
Value: £20 million
Completion Date: 2010
Architect: EPR Architects
Imagery: © Construct Media

Al Ain Mixed Use Development & Stadium Project

Services: Building services engineering, acoustics and IT
Location: Al Ain
Client : AAFAQ Holding LLC
Value: Confidential
Completion Date: Ongoing
Architect: Broadway Malyan / RMJM
Imagery: © Dennis Gilbert

In preparation for the Ashes 2013 and to cement their status in the international calendar, Durham County Cricket Club's ground has been redeveloped. Cundall has been working with the club since 2008, designing a series of phased developments to increase the permanent seating available as well as extending the main stand to provide enhanced VIP facilities.

The Melrose stand redevelopment involves the regeneration of the last available site adjacent to the finish line at York Racecourse, matching the development of the Ebor and Knavesmire stands.

Cundall IT and audio-visual was part of the multidisciplinary team commissioned to undertake the design studies for the improvement or replacement of the Melrose Stand.

This masterplan project has created a community with a stadium and sports facility at its centre. Located on a 50 Hectare site, the mixed use development includes a 25,000 seat football stadium providing a new home to Al-Ain Football Club.

The first phase has involved the construction of the stadium, a sports centre complex and one commercial block. The second phase will see two further commercial blocks a 5 star hotel, a food and beverage plot, retail space and eight residential buildings. The final phase will include further housing and a community hub providing retail, food and beverage outlets, a health centre and a mosque. Car parks, public realm areas, local parks and associated infrastructure works have been addressed during all the phases.