



MAGAZINE

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CULTURAL ICON

Expo 2020's Al Wasl Plaza shines bright

Digital transformation: reshaping the way we work **21**

Military grade: tech's mission critical role in defence **26**

Educators in VR: lessons in the virtual realm **56**

INNOVATION /// BUSINESS /// CREATIVITY

The stunning Al Wasl Plaza will play a central role throughout the Expo 2020 global showcase for innovation in Dubai



CREATING A CULTURAL ICON

Standing at 67.5 metres tall, Al Wasl Plaza boasts a 360-degree immersive projection surface which will form a visual centrepiece for the upcoming Expo 2020 Dubai.

Zoe Mutter examines how the unique domed structure was created and the immersive technologies playing a starring role in its inauguration event.

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ositioned right at the heart of Expo Dubai 2020, Al Wasl Plaza will play an integral role throughout the global showcase for innovation when the event begins in

October. The magnificent showpiece will host the opening, closing and main events along with a variety of other special occasions during the six-month celebration of culture and creativity, the largest event ever held in the Middle East and the first World Expo in the region.

Technical capabilities

Ahead of the grand opening ceremony, the technical capabilities of the 724,000 cubic metre dazzling dome which will help unite 190 countries, were showcased at an inauguration event on 29 January. Among the high-profile list of attendees were His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice-President and Prime Minister of the UAE and Ruler of Dubai, and His Highness Sheikh Mohamed bin Zayed Al Nahyan, Crown Prince of Abu Dhabi and Deputy Supreme Commander of the UAE Armed Forces, who both inaugurated the dome.

These guests, alongside a high-level UAE delegation and hundreds of staff helping Expo 2020 to become a reality, were treated to a projection show supported by immersive audio presenting the history of the UAE and some of the nation's current and future innovations, many of which will be showcased at Expo 2020.

"Bringing people together is one of the main functions of the plaza. Al Wasl means 'the connection' in Arabic, and it is also the old name of Dubai which fits in perfectly with the theme of Expo

2020: 'Connecting Minds, Creating the Future,'" says Ahmed Al Khatib, chief development and delivery officer, Expo 2020 Dubai.

Designing with legacy in mind

The plaza was designed not only with events such as Expo 2020 in mind, but as a lasting legacy for future generations. The plan for the site comprises three petal-shaped areas with Al Wasl Plaza located where they meet in the middle, connecting the entire site and its three Thematic Districts – Opportunity, Sustainability and Mobility.

Working in close collaboration with the Expo 2020 team, US-based Adrian Smith + Gordon Gill Architecture helped create the design identity for Al Wasl and were also heavily involved in the legacy master plan for Expo 2020. The brief

outlined a need to establish a centrepiece for the future city of District 2020 - Al Wasl had to be inclusive, creative and have a strong cultural reference. The vision was clear from the start, as was the message from the client: Al Wasl is about people.

"We approached the problem by searching for an iconic idea that could embody the sense of place, provide a lasting memory of Expo and embrace people from all walks of life. The idea evolved around a public space as the iconic symbol," says Gordon Gill, founding partner, Adrian Smith + Gordon Gill Architecture.

"In order to be usable throughout the year, the space needed to be shaded. With the grand trellis for shade came the idea of creating art through projection. The art would add a creative and dynamic dimension to the space that could be used for education and celebration."

Surrounding the park are five buildings, two hotels and three office buildings, all of which lean into the park to provide shade and protect the space while offering unique views into the plaza.

A sense of strength

The design introduces a formal public park as an icon of a neighbourhood and a city. Typically, this is the role of a building but here the architects chose to achieve this using a public space, introducing a shared public urban room as the object or icon.

"We hope this space will be a unifying connector for all those who visit and live in the neighbourhood and in Dubai," says Gill. "We hope it will rise to the level of a cultural icon through its detailing and historic references to the ancient ring, found in the desert, that is the inspiration behind Expo 2020's logo."

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"The initial design effort required a balance between a sense of strength and one that was relatable to a human. A large amount of effort was focused on its scale and on the architectural language of the trellis, as well as the quality of natural light in the plaza. All of this, including the design of the five surrounding buildings, was framed within a strong sustainable platform to reduce energy consumption and carbon."

Zonal design and functionality

Key design considerations related to scale, movement, visibility and quality of light. It was important the space did not feel too expansive and yet it still needed to remain powerful. To achieve this several layers were incorporated into the design including a paved walkable roadway encircling the park and pedestrian paths that enclose and organically navigate the park. The space also needed to operate at various scales of occupancy, from large crowds at events to people strolling through.

"In addition, we wanted the surface of the trellis to always be visible and easy to look toward. Therefore, the density or translucency of the fabric was critical for comfort, for plant life and for protection both internally and externally, since the projection imagery is also visible from the exterior," adds Gill.

The architects worked on many patterns of geometry for the trellis; some were simpler, but not as meaningful. The idea of developing a series of flat discs that reference the iconic historic ring, which is the logo of the Expo, proved to be the best solution. "Integrating this pattern into a structurally efficient system and one that could be shipped and assembled on site was an incredible design and logistical endeavour," says Gill.

The team was also required to define the typology of the structure. Is it a building or is it a park? "Great care was taken to establish criteria for safety, maintenance and operations throughout, and we faced technical challenges in defining criteria with consultants to create accurate projection imagery on a compound surface," adds Gill. "The scale and constructability of the trellis was unique. Never done before, the crowning of Al Wasl by jacking up the assembled steel 65 metres into the air was an engineering feat and we are proud to have been a part of this incredible event."

Careful monitoring

The crowning of the dome was the culmination of more than 14 months of preparation that began when the final pieces of the dome's steel trellising left Italy in June 2018. The dome's crown had to

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be precisely positioned on top of the 550-tonne moulded steel vertical trellis, with a margin of error of only three millimetres.

"This minute margin of error in the fabrication and lifting process and the putting together of the pieces of the dome as well as the welding of the joints to ensure none are visible were big challenges," says Al Khatib. "We overcame these by employing the right, highly-skilled professionals from all over the world and through careful monitoring of the entire process."

Including the structures and equipment required to lift the 130-metre-wide dome during this process, the total weight was a staggering 830 tonnes. Eighteen hydraulic jacks, aided by steel

lifting ropes connected to 18 freestanding temporary columns, were used to slowly raise the curved steel crown before positioning it directly on top of the vertical intricate trellising, 43 metres above the ground and attaching it to the existing structure using 53 temporary connection brackets. Eight hundred engineers and construction experts carefully monitored every millimetre of the process, using GPS indicators throughout to ensure perfect alignment. Welding the final piece of Al Wasl dome to the rest of the trellis then took 25 days to complete.

Packing a punch with projection

While the domed steel trellis is a visual spectacle in itself, towering above the audience during events such as the inauguration, in order to fully engage and immerse, the magnificent structure was paired with the creative use of visual content and audio.

Building a 360-degree projection surface was a necessity as the team saw it as the solution most capable of delivering the brightness and flexibility needed to display life-like imagery on the surface. This required individual pieces of a specially made projection screen material to be stretched tightly between each section of trellis. As the dome is translucent, the projection is then visible from inside and outside the covered plaza.

Projectors offering sufficient brightness were required to accommodate the size and open-air design of the dome, as well as TV broadcasts and projection mapping, while not deterring from the dome's beauty. During TV broadcasts, the projectors will run at full brightness whereas non broadcast events will run at a much lower lux.



To produce the most powerful visual experience 42 projection pods were installed around the inside perimeter of the dome, with each pod holding two stacks of three projectors and hermetically sealed for dust prevention and cooling. The pods, which resemble aircraft jet engines with a glass front and a rear entry door accessible by a catwalk, are hung at about one-third of the total dome height, creating the maximum immersive projection surface without interfering with the content.

The bright and compact projector selected for the dome mapping was Christie's new pure RGB laser model, the D4K40-RGB. Its smaller size meant fewer projectors were needed which helped ease concerns regarding the space available for kit to be installed.

"The Christie D4K40-RGB requires no heavy external chillers, remote laser racks, or special pedestals. Everything is integrated into a single chassis. Combined with TruLife electronics and 4K resolutions, the D4K40-RGB provides a wide colour gamut and produces an impressive depth of detail," says Doug Starr, director of special projects, Middle East, Christie.

"Add high frame rates up to 120fps and 5000:1 On/Off contrast ratio, the D4K40-RGB delivers the kind of brightness and colour needed for such a space while being small enough to be stacked within the pods. The omnidirectional capabilities also ensured they could deliver content wherever it was needed."

Monitoring and control

During the design phase Christie worked closely with Obscura Digital, Expo's design integrator, and the team at Creative Technology Middle East (CTME) which provided system integration and project management across both video and audio contracts. "We needed a way to control and monitor the 252 Christie pure RGB laser projectors which led to the creation of a new Christie software product, Christie Conductor," says Bill Ainley, head of projects, system Integration, CTME.

Any issues that arise must be dealt with swiftly and without interruption to the show taking place in the dome. This is possible using Christie Conductor to control and monitor all projectors simultaneously, including remote firmware updates and health checks. The projectors can also be timed to turn on and off at specific times of day so, for example, the Expo team can set them to automatically power up when the sun goes down and auto-power down upon closing each night.

As Al Wasl Plaza was designed and built with Expo 2020's legacy in mind and will remain part of

PHOTO CREDIT: EXPO 2020 DUBAI

Al Wasl Plaza, Dubai Expo 2020, Dubai



District 2020 after the six-month event, the technology had to be future-proof. With an initial project life of at least three functional years, all technical solutions also had to be resilient.

"Much thought had already gone into the design, aesthetics and environmental control of the projector enclosures, however with the internal temperature of the trellis expected to reach over 75 °C, careful consideration of correct material specifications will be just as important in ensuring the longevity of the installation," says Ainley.

Responding to a brief designed by Obscura on behalf of the architect, CTME recommended using disguise gx2 servers to handle the sheer scale and quantity of video channels, offering the required generative content production functionality.

The 84 channels are driven from a server fleet comprising 11 disguise gx2 slaves, a master, a master understudy and three slave understudies.

The technical line-up also included Thinklogical TLX160 fibre matrix with DVI encoders and receivers; Crestron control systems and touch interfaces for system control and monitoring; Panasonic 4K PTZ cameras; and Ubiquiti routers and switchers.

Exceeding expectations

The dome's audio system was designed to work in unison with the all-encompassing projection and provide a fully immersive audio visual experience. This required a 360-degree solution that could produce a flexible sound 'image' throughout the dome. Careful sound design made it possible to reinforce the visuals and provide supplementary

ambient effects.

Whilst the audio set-up was designed for the immersive environment in the dome, it will also interface with the temporary ceremonies and daily production systems to extend capabilities across the live events programme.

The speaker system needed to provide good coverage, whilst having minimal impact on the projection and offering enough point sources. Comprising 27 arrays of 16 L-Acoustics Kiva II elements, the PA system also features six bespoke enclosures each containing four KS28 sub-woofer arrays, driven from a combination of LA4X and LA12X amps in four AV rooms in the basement.

The centre of the system revolves around the L-ISA Immersive Hyperreal Sound processor which runs through a DiGiCo SD12 and Area4. Signal is distributed via both AES and AVB for full redundancy, using Luminex routers while playback and timecode control comes off a Merging Technologies Ovation system with full redundancy.

"With 27 equally spaced and identical sounding sources in the horizontal plane providing even SPL and frequency response across the 130m diameter audience area, the creative possibilities are endless. The loudspeakers are located within the projected image so the localisation to projected objects is remarkable," says Scott Willsallen, director, Auditoria and audio consultant on the project.

In such a large space care must be taken to ensure music retains its timing when using multiple arrays. "The vastness of Al Wasl Plaza requires sound to direct the audience's attention to different parts of the projected image in a way that pictures can't," adds Willsallen.

"Our ears are highly effective at locating a sound source in the horizontal plane in a way that our eyes can't, and this will be used in fun and exciting ways. The system is also capable of full bandwidth music reproduction and when combined with the rental performance system in the centre of Al Wasl, Expo visitors are in for a truly remarkable experience at any time of the day." ■