

PROJECT FEATURE

MALL OF AFRICA

MALL OF AFRICA Midrand

CLIENTS
Attacq
Atterbury Property Holdings

ARCHITECTS
MDS Architecture

PROJECT MANAGERS
GHC Africa

QUANTITY SURVEYORS
Norval Wentzel Steinberg

STRUCTURAL/CIVIL ENGINEERS
Aurecon South Africa

ELECTRICAL ENGINEERS
Rawlins Wales & Partners

MECHANICAL ENGINEERS
Graeme Page Consulting Engineers

WET SERVICES
CKR Consulting Engineers (Sub-consultant
to MDS Architecture)

TRAFFIC
Arup

FIRE
Specialised Fire Technology

LIFT CONSULTANTS
ALC Lift Consultants

HEALTH & SAFETY CONSULTANTS
Cairnmead Industrial Consultants

LANDSCAPE ARCHITECTS
Danie Rebel Landscape Architects

TENANT CO-ORDINATOR
EQF

MAIN CONTRACTOR
Mall of Africa JV comprising:
WBHO
Group Five Building

PHOTOGRAPHY
Mike Pawley
Charles Corbett

The Mall of Africa in Midrand opened its doors to the public on 28 April 2016. Close to 130,000m² GLA, it is South Africa's largest single-phase shopping centre to be built in the country. Visitor numbers have been unprecedented, with over 1.3 million visitors in the first month of trading.

ARCHITECT'S REPORT

Mall of Africa was designed by MDS Architecture for clients, Attacq and Atterbury. The centre is located in Waterfall City, Midrand – midway between Johannesburg and Pretoria.





Tia Kanakakis, the partner at MDS Architecture who led the project, says that the architecture and materials are inspired by the geological beauty of Africa and that the development is a tribute to local talent. “We wanted the Mall of Africa to set a new benchmark in retail design. The combination of excellent architecture and leasing expertise within a new urban framework intended

to provide the catalyst for a new CBD. It was designed and developed by Africans and can stand proudly amongst the best retail developments internationally,” she says.

In the initial design brief, the retail leasable area was 110,000m² but, during construction, the client decided to increase the area to 130,000m² of Gross Leasable Area due to demand.





The centre has two major food anchor tenants, many fashion retailers and a nine-auditorium cinema complex. The gross building area of the entire centre is 485,000m².

The Site

Waterfall City is highly accessible, located adjacent to the Allandale Road exit of the N1 Highway, the first free-flow intersection of its size in Africa. The Mall holds prime position in the tailor-made 330ha new city that embraces integrated living, with shops, offices, homes, hotels, a hospital, light industry and the all-important lifestyle and leisure components. The precinct master plan's

urban design seeks to promote an integrated live-work-play environment.

The developer undertook major roads upgrades around the development to make it easy for shoppers to arrive at Mall of Africa's 26 entrances.

Challenges

Construction began in October 2012, providing a construction period of just 42 months for this development, which included 12 months for bulk earthworks. The sheer magnitude of the project and the limited construction period for completion posed an interesting challenge. The structural engineer and the architects needed to stay ahead





of the contractor with design and construction documentation. There were various teams on site pouring concrete slabs at a rate of up to 40,000m² per month.

“Meticulous planning, innovative design solutions and ongoing collaboration between all stakeholders enabled us to keep meeting deadlines and resolving challenges to reach the key milestones of the programme. There was a phenomenal team of professionals working together, which allowed us to meet the deadline,” explains Kanakakis.

“Another challenge was remaining focused on creating the retail and design vision within

commercial constraints for almost four years,” she adds.

Evolution of the Design Process

The design process was led by MDS Architecture to fulfil the client’s desire to provide not just a mall in Africa but ‘the’ Mall in Africa, something of greatness on the African continent. The design inspiration for the mall and the courts was drawn from the geological beauty of the continent of Africa. This formed the direction of the design and the inspiration for the mall interior, aesthetics and finishes was developed on this concept in a non-stylised manner.





Exterior Aesthetic

Mall of Africa's design is based on creating an exterior aesthetic that gives the entrances, parkades and retail stores their own architectural identities.

The exterior of the mall was developed in a contemporary design with a combination of structural glazing, modulated walls and an abundance of roof lights. The roof was treated as the fifth façade as it would, in future, be visible from many of the high level commercial office buildings surrounding the shopping centre. The roof initially had two green roofs (one on either side of the eastern and western portion of the roof) but, due to cost constraints, this was ultimately omitted and replaced with soft roofs.

At the centre of the mall, the interior opens up onto an external restaurant area and the 'green lung' of the Waterfall City development – a large park that extends towards the bottom of the mixed-use development. "The Town Square, as it is known, ensures that the Mall of Africa is not an introverted design along its entire external perimeter extent," explains Kanakakis. This outdoor park is a highlight, with a children's play area and an interactive musical water fountain.

There are 6,500 parking bays for customers with their own transport. Mall of Africa also offers two taxi lay-bye areas, valet parking, special drop-off facilities for buses and dedicated Uber pick-up

and drop-off points – a first in the South African retail environment. It is also minutes away from the Gautrain Midrand Station.

Natural Light and a Unique Identity

The mall's top level is accentuated by extensive double glazed rooflights, which are hung from an overhead structure steel support to allow the seamless extent of glazing to be visible from within the mall. These glazed rooflights are framed on either side of the mall by curved, flush-plastered ceiling bulkheads that enhance daylight entry.

The mall's central spine boasts an undulating ETFE of approximately 4,500m² which is supported by a suspended concrete ring beam and only four columns. The roof comprises inflated pillows on an undulating diagrid. "It is an engineer's nightmare but an architect's dream," quips Kanakakis.

The ETFE roof's undulating shape is reminiscent of many of the design inspiration lines in the Mall. The ETFE roof is an environmentally friendly product made of recycled tin and metal. The design development of the ETFE roof took close to a year to complete.

Extensive LED lighting design has been combined with this roof, providing lighting and animation to the key centralised area with three trillion colours. "This roof was selected for its flexible design capability as





well as being an environmentally friendly material. It is an amazing roofing feature and has become a talking point in the Mall," says Kanakakis.

The ETFE roof was subjected to solar study modelling, which revealed specific hot spots along the length of the mall. The diagrid design pattern on the roof responded to the hot spots in the solar model. "The white Texlon pattern was specifically placed on the roof design where the most shading was required to the mall below, with the translucent Texlon placed in areas in between

to form the diagrid pattern. The combination of white and translucent ETFE panels may appear to be randomly designed but, in fact, the random pattern we designed is used as a shading device," she explains.

Mall Interiors

Throughout the Mall, shop fronts feature high spaces bathed with natural light. The various areas in the Mall take their inspiration from Africa's natural features and landscapes but interpreted in a very





contemporary way. Designated identifiable court areas enable easy shopper navigation through the Mall, which also has a spacious circulation layout.

Each shopping court has been given its own identity with a resembling look and feel in texture, colour and materials used. The great lakes of Africa inspired the Great Lakes Court to the east, while the Oleum Court draws its inspiration from the West African oil producing regions, sporting bold colours and dramatic patterns. The Sand Court combines desert tones, soft contours and colours

of the North African desert region with unique features and motifs found in that architectural style. The mineral wealth of southern Africa is celebrated by the Crystal Court and its lustrous features with strong geometric patterns resembling shards of crystals and diamonds.

The central spine of the Mall of Africa resembles the rain forests of central Africa and is also aptly named the Forest Walk. Featuring tropical elements, the Forest Walk follows the curve of the dramatic and expansive roof feature. At night,



specialist animated LED lighting adds even more subtle animation.

Many stores have flagship outlets at Mall of Africa. The shop front designs are also important to the overall design experience. “Tenants were required to submit shopfront and interior design proposals for approval to ensure that the developer’s vision of the mall was carried throughout each of the retail outlets. We were strict about the tenant submissions as the designs needed to speak to the Mall of Africa’s design criteria,” explains Kanakakis.

Although each distinctive court node is given a subtle unique character, the malls in between these courts have a more neutral character which allows the retail experience to have maximum impact.

Multiple Green Technologies

Mall of Africa’s inspired design, construction and operational practices reflect a commitment to energy efficiency and sustainability.

The project implemented multiple green technologies, including a massive photovoltaic installation on the roof of Mall of Africa. The installation is the largest in South Africa and

provides 4.8MVA of sustainable power for the centre. Long term, the developer’s intention is to add some of the power back in to the grid in the Waterfall CBD when not needed for the centre.

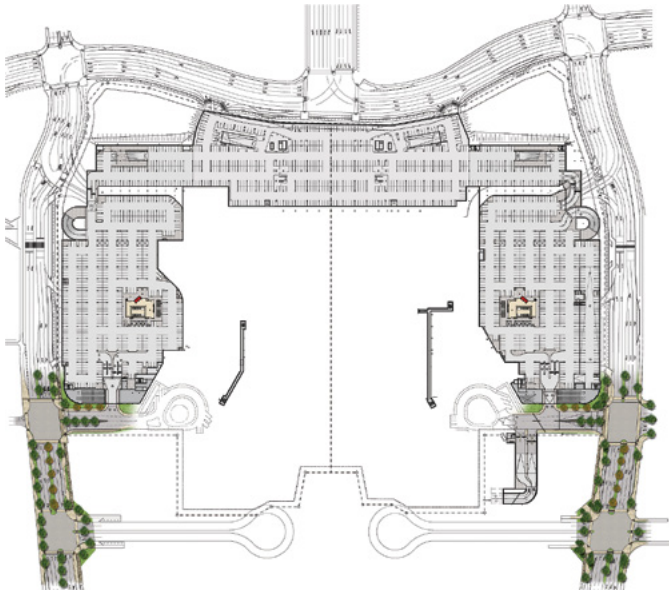
The Mall uses grey water harvesting in all public toilets and for the irrigation of the entire development. “The grey water also provides irrigation for the public park alongside the building,” adds Kanakakis.

The design means that natural light is maximised in the Mall in such a way that shopper comfort is also optimised. Together with the mechanical engineers and environmental specialists, a solar study was generated for the mall, where all of the rooflights were modelled for summer and winter conditions. This solar study provided the thermal values required for the glass to be used to the rooflights, to enable the ambient temperatures in the Mall to be retained and for the right amount of shading to be provided along the internal shopfronts.

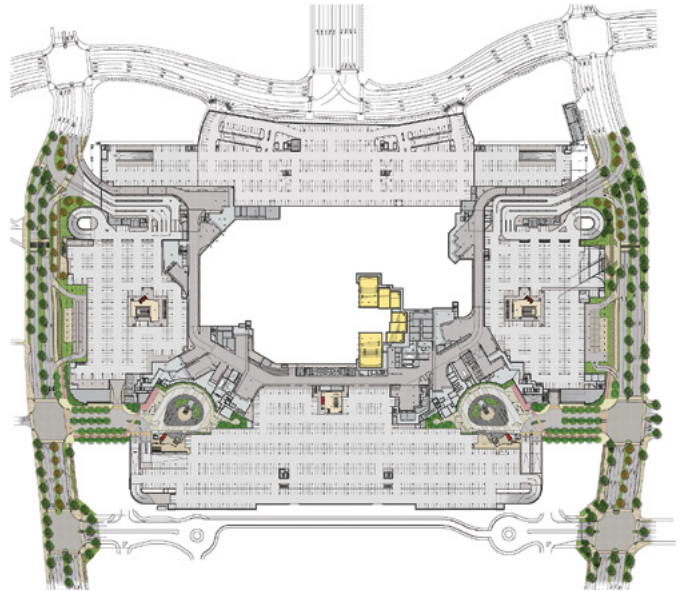
The ETFE roofing material is an environmentally friendly product and is manufactured according to sustainable practices, sustainable features and benefits when compared to alternative transparent cladding systems. The low levels of embodied



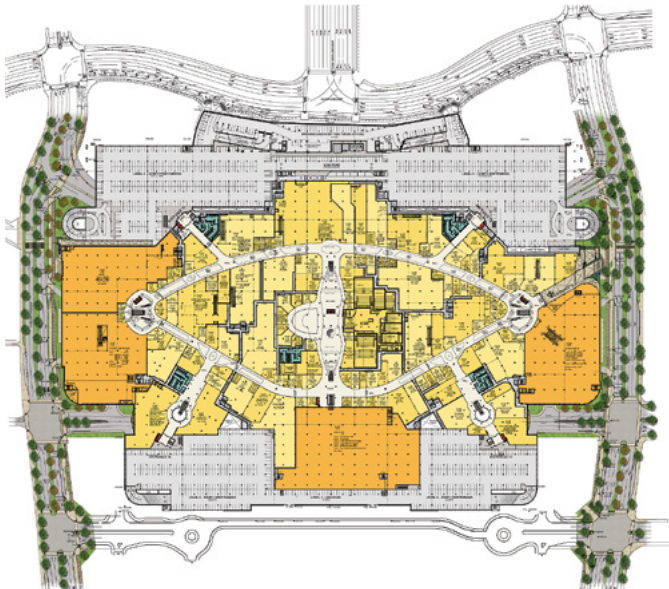




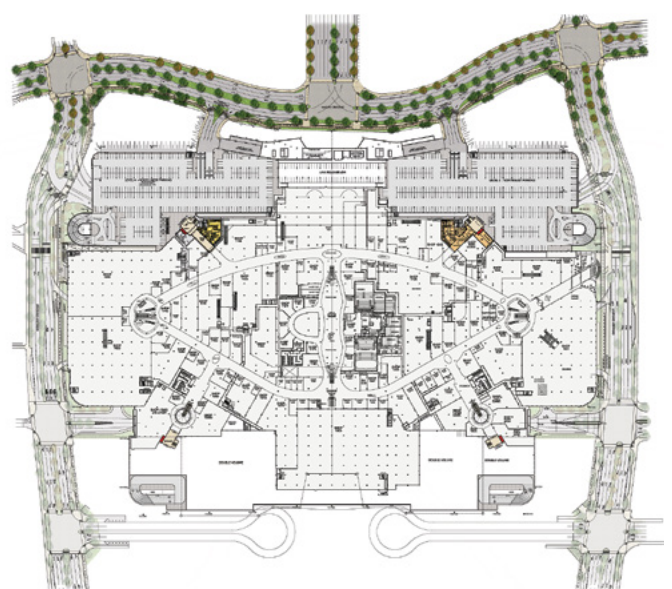
LEVEL 1 - PARKADES



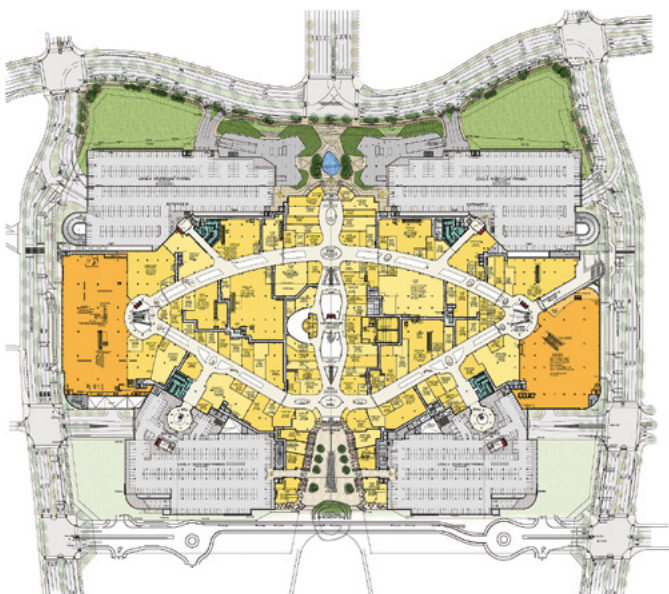
LEVEL 2 - TRUCK TUNNEL DELIVERY & PARKADES



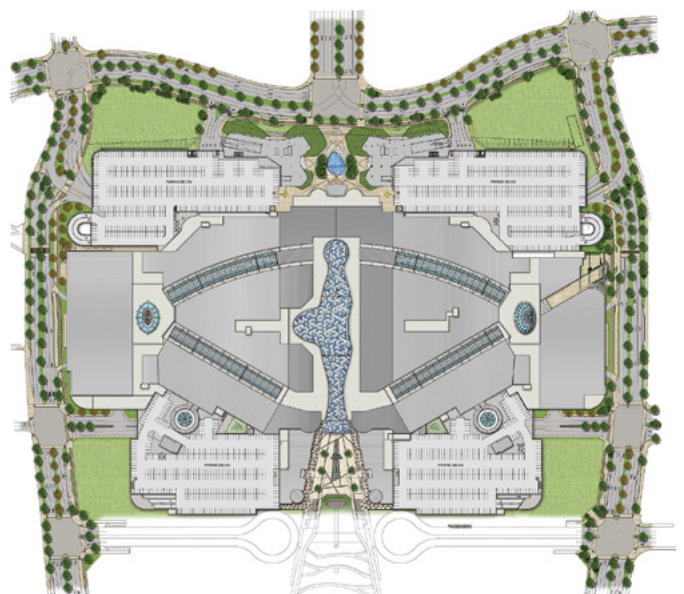
LEVEL 3 - LOWER LEVEL SHOPPING & PARKADES



LEVEL 4 - PARKADES



LEVEL 3 - UPPER LEVEL SHOPPING & PARKADES



LEVEL 7 - ROOF

energy combined with environmental benefits results in ecologically benign building envelopes.

ETFE is recycled and the recycled material is used to manufacture valves and small components for new ETFE systems. The Texlon® ETFE system has been awarded an Environmental Product Declaration (EPD).

The external façade was constructed with a lightweight polystyrene wall system called Etics. This wall system facilitates a reduction in thermal transition which facilitates the mechanical environmental control requirements for the building and limits structural support weight requirements, whilst allowing for faster installation methods than conventional structural masonry wall systems.

A Unique Shopping and Design Experience

The Mall of Africa is the first shopping experience in the country that has the sophistication and footprint of some of the most prominent malls in Europe, England and the USA. Amid some initial dissent about the size of this development in a country that some feel has an oversupply of shopping centres, tenants continue to report trading results that surpass their projected expectations. "Most importantly, beyond the initial interest that literally caused traffic jams in the vicinity, the Mall of Africa continues to generate much interest from visitors to the centre," concludes Kanakakis.

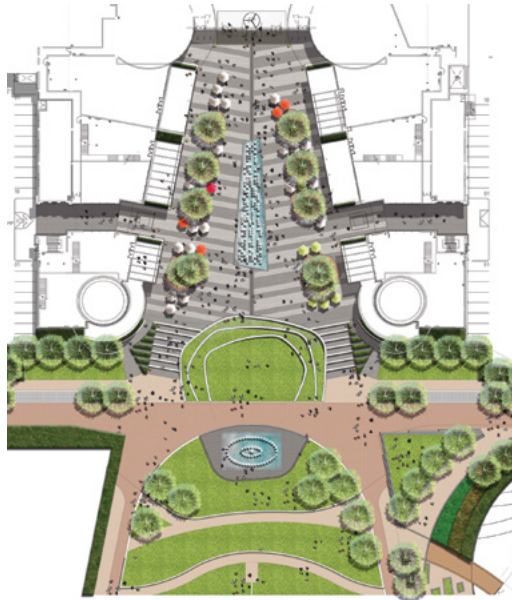
LANDSCAPE ARCHITECT'S REPORT

The landscape design of the Waterfall Precinct integrates the surrounding urban street fabric with the Mall of Africa as well as the newly constructed central park. The Town Square can be accessed from the food court on level 5. The space is lined with hand-picked restaurants with a majestic zero level water feature being the central focus. Sculpted wooden benches with Plane trees, not only frame the water feature, but also the view towards the central park, and in the distance, the Sandton City skyline.

Designed by Danie Rebel Landscape Architects, the 1.3 ha central park forms an integral part of the Mall of Africa development and is the 'green' and social hub of Waterfall City and is central to the open space system. Access to the park is from the Mall of Africa Town Square and spans across Jukskei Drive to link the park and the Mall of Africa to the future mix-use development to the south of the park, a High rise mix-use and office towers will form the eastern and western edges to the park.

The park was constructed on top of a super basement consisting of 5 levels of parking and will provide well-designed recreation amenities and soft spaces needed in the heart of a modern city and will provide for the needs of city dwellers, office workers and visitors alike.

From the town square, the park slopes down to create an intimate scale amphitheatre with

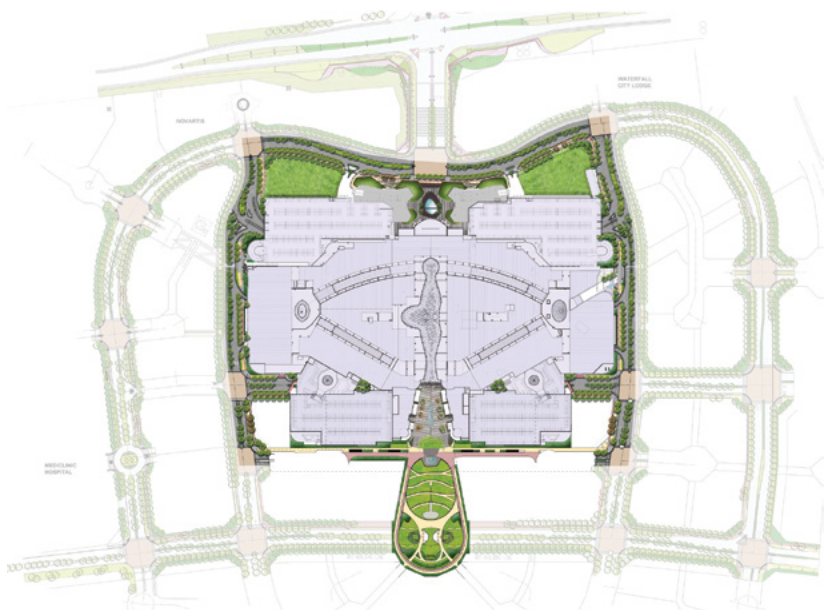


LANDSCAPING DETAIL

an interactive fountain and a performance stage area. A larger terraced lawn space provides seating space for concerts and events hosting up to 5,000 spectators. Specialised market facilities and ablution facilities are provided to ensure all year round activities and attractions to the park. Picnicking, relaxation, jogging, cycling and dog walking in a safe and well secured environment will be among the major attractions to the park.

The design of the park is based on the proven principle that responsive and meaningful open spaces do improve quality of life and add value to the adjoining property values.

The design aims to provide pleasant, inviting valuable and sustainable spaces for human use and the enjoyment as an added experience in visiting the Mall of Africa. The design not only provides nature in an urban ecology, but it represents the indigenous Highveld Ecosystem.



LANDSCAPING PLAN



SKYLIGHT CONSTRUCTION REPORT

At the centre of the Mall there is a 4,300m² undulating, free-form skylight, running 170m in the north-south direction. Novum Structures was appointed as the design-build specialist sub-contractor for the design and installation of the skylight. Aurecon designed the perimeter concrete support structure.

Design Overview

The 3D surface and grid development of the skylight was a multi-stepped interactive process which aimed to balance the overall architectural

intent, the spanning capacity of the cladding, drainage, cost and other structural considerations. To create a single-layer steel structure, the overall skylight was designed as three independent thrusting skylights, separated by two building expansion joints.

The structural design was carried out using the direct design method, considering both local and global imperfections and considering lateral movements in the perimeter concrete upstand beams. Due to the large spans at the central region of the skylight, tree columns were added to ensure that the same overall rectangular tube sizes could be used throughout the skylight.

Logistics

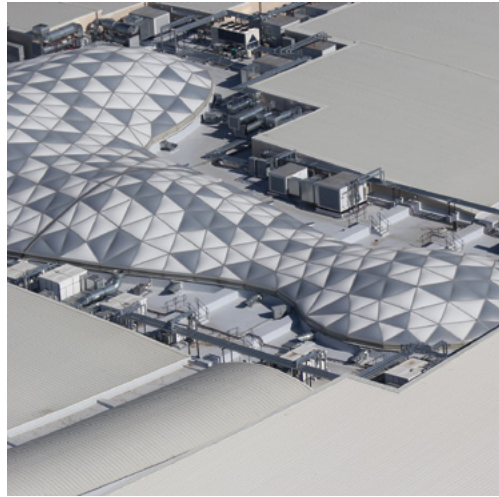
A combination of 1,352 unique rectangular steel beams with custom end castings and 577 machined nodes were used to create the free form structural grid. To increase the accuracy and speed of installation, the beams were site-bolted to the disk-shaped nodes using the Novum FF-system.

The cladding consists of 1,352 unique aluminium extrusions which support 846 ETFE pillows. In order to efficiently manage the fabrication, transportation and installation of these components, each part was marked with a unique number and the orientation was stipulated in the installation drawings. The structure and cladding were fabricated by a combination of various in-house Novum entities and local suppliers. Due to site constraints, materials were stored off-site and delivered to site as required to meet the installation sequence.

Steel Installation

The steelwork for the skylight was installed using a combination of a self-erecting crane standing on the level three slab and an eight-ton mobile crane on the level five slab. The structure was assembled by lifting pre-bolted three-arm spider





sections, consisting of three beams and one node and bolting these to the partly installed skylight. A series of shoring towers were erected at specific locations to provide temporary support while the structure was being installed. Once a full arch section had been installed and fully torqued, the shoring towers were removed.

ETFE

The cladding consists of a series of ethylene tetra-fluoro-ethylene (ETFE) air-filled pillows. Each pillow is supported by aluminium extrusions and the system is inflated by three air machines

mounted on the roof. Each air machine is equipped with two blowers a dehumidifier and a series of sensors which continually monitor the overall pressure in the pillows and adjust this pressure as required. Based on glare and shading studies, the pillows were made of a combination of either two partly opaque ETFE layers or one clear printed ETFE upper layer and a fully clear lower layer.

The extrusions and ETFE cladding were installed using nets which were tied to the steel structure and removed once a portion was fully installed and water-tested.

