

Building study

Defining the English mosque

Marks Barfield's multid denominational mosque in Cambridge gives Muslim traditions a contemporary context



The brief was to provide a prayer hall for 1,000 worshippers plus additional women's areas, with an Islamic garden, teaching room, café and kitchen, imam's house, visiting scholars' flat, a mortuary and car park. It called for a design 'based on universal principles', socially integrated into the wider community, secure and with a scale and massing that respected its urban context. The client had high aspirations with respect to sustainability, encouraging on-site renewables and a minimal carbon footprint, and was also ambitious for the building to be a positive civic asset for the city.

Words Rob Wilson
Photography Morley von Sternberg

At the end of Eid prayers, worshippers at the Marks Barfield-designed mosque in Cambridge have just exited the prayer hall and are milling outside, greeting, chatting and catching up with each other in front of the expressive, sprouting forms of the glulam columns of its porch. The atmosphere is

celebratory. In the middle of the crowd stands Marks Barfield co-founder Julia Barfield, beaming. 'I've never been here when there were so many people,' she says. 'It's amazing to see it so fully in use.'

The mosque sits back from Mill Road, in a traditionally working-class neighbourhood of the city, far from the mellow stone colleges to the north-west. Around are tightly packed grey-yellow gault-brick terraces and a few light industrial sites. A John Lewis warehouse, destroyed by fire in 2009, previously stood on the site. While this didn't exactly set a high bar in terms of creating a more public-facing street frontage and use for the site, the insertion of a major public building, designed to accommodate a congregation of up to 1,000 in what is a busy but still primarily residential neighbourhood, has taken some skill.

The deep site extends northwards back from the roughly east-west orientation of the street. Marks Barfield has used this depth to create a series of threshold spaces,

working back from the main south entrance. These begin with a community garden lying alongside the pavement, beyond which railings enclose a more formal Islamic garden, on to which opens the lofty entrance loggia to the mosque. Beyond this, a glazed wall fronts a square-set atrium, behind which, past a lobby, sits much the largest space: the prayer hall of the mosque, also square in footprint, but twisted on plan so as to be orientated on its eastern side to face Mecca.

The planting in the garden, designed by Emma Clark, working with landscape designer Urquhart & Hunt, is beginning to bulk out. The Islamic garden is divided into quarters, with four paths meeting at a central fountain. The layout and water both reference Paradise in Islamic tradition, as does its planting with fruit trees – crab apples here replacing the quinces usually found in Middle Eastern Islamic gardens. The garden is open to the public during the day as a place of contemplation and rest, but after Eid prayers it is packed, full of people chatting and kids

running up and down the paths. 'It's on days like this that the mosque is really stress-tested,' says the mosque's imam Tim Winter, who as a convert has taken the Islamic name Abdul Hakim Murad. 'What we hadn't anticipated was people staying so long to take selfies.'

Winter is a lecturer in Islamic studies at the university, founder and dean of the Cambridge Muslim College, and a founder and chair of the Cambridge Mosque Trust – the prime mover in raising the funds for the mosque's construction.

The need for the project arose from the inadequacy of existing places of worship in the city – often small, ad-hoc venues – for its growing Muslim population. This now numbers about 5,500, a number constantly swelling as more come to the city from around the world to attend the university or work here. As a result of this flux, Cambridge's Muslim community is notable for its diversity, with people coming from all different traditions of Islam.

'Inclusivity was the watchword from day one,' recalls Winter. The planning of the mosque needed to cater for all Islamic traditions while also minimising separation between the sexes, with men and women sharing the prayer hall.

For all their tropes of domes and minarets, mosques are actually less architecturally proscriptive than churches. The requisite prayer hall is, in essence, a large, open room with ample floor space for worship, ideally orientated eastwards towards Mecca. But, when deciding to set up an architectural competition for the commission, Winter was adamant that what they didn't want was a 'barn with a dome'.

Winter's strong views on architecture are not surprising after you learn that his father was architect John Winter. He has written of his appreciation of the house he grew up in – a Modernist family home in Highgate which was the first Cor-ten-clad structure in the UK. As he told the AJ after his father's death: 'Envy any child or teenager nurtured in a Winter's home.'

While the clear intention was for the mosque to be a piece of contemporary architecture, there was also the requirement for it to be 'sacred' architecture, a less



The underlying idea was the metaphor of mosque as oasis or grove of trees – from this developed the expressive, tree-like glulam columns

definable concept but one that, as the competition brief rather cryptically attempted to describe, 'may require a totally different appreciation from that of modern architecture, one that is not necessarily centred on architecture as the work of the individual, but ... on the architect's particular expression of a universal principle'. It was, perhaps, a caution against starchitect posturing.

It was important, too, that the design should 'reflect the local culture' without resorting to pastiche. This complex brief – to combine the transcendent with the contextual – was something that clearly fired up Marks Barfield, which won the competition in 2009. As it late co-founder David Marks said in 2013: 'The opportunity to do something English, something British, excited us. Now that there is a significant Muslim community in the UK, it's time to work out what it means to have an English mosque.'

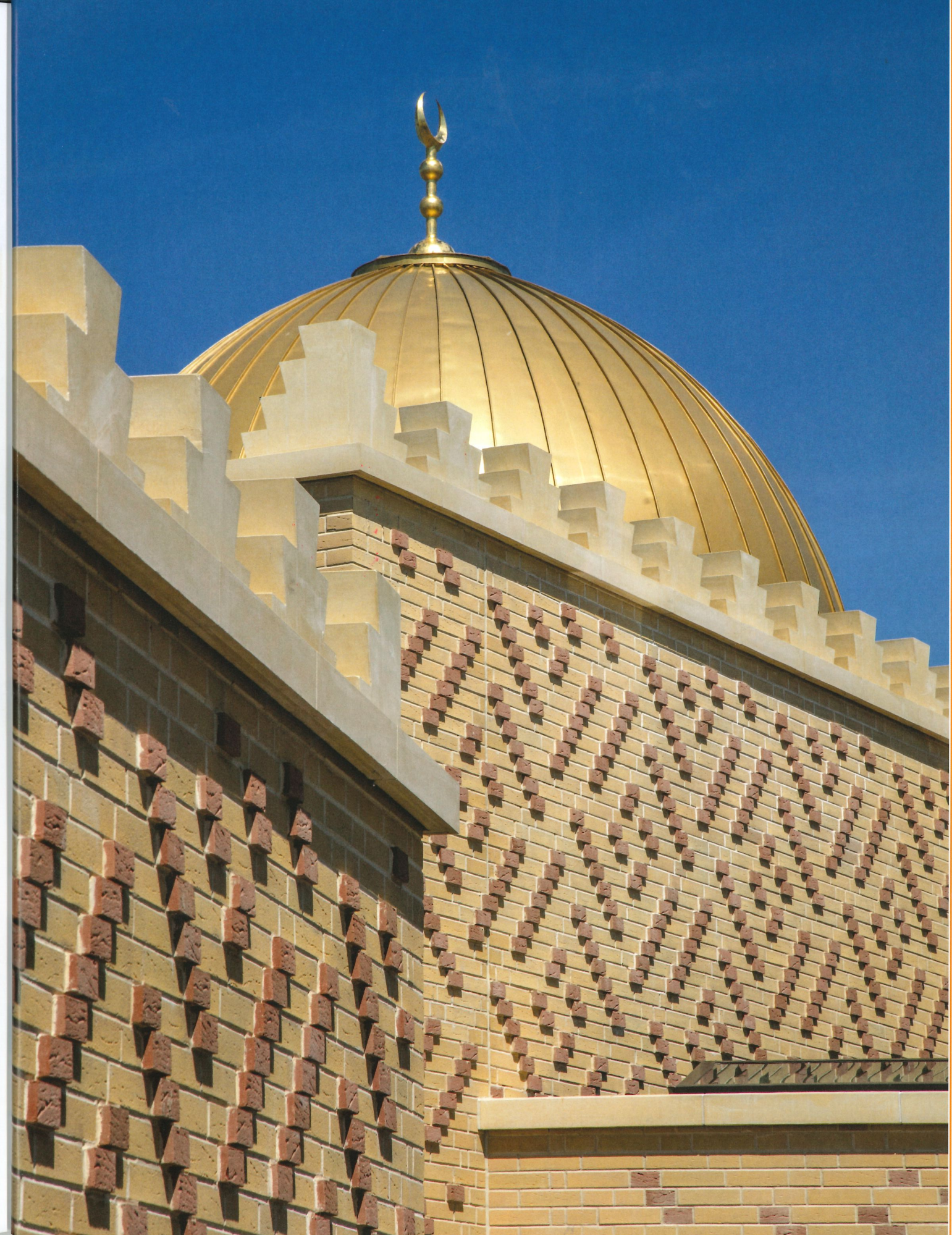
The practice conducted an immense amount of research, looking at mosques historically and internationally in terms of typology and planning. It worked closely with Keith Critchlow, an expert in sacred architecture and Islamic geometry, in developing the design. He proposed a guiding

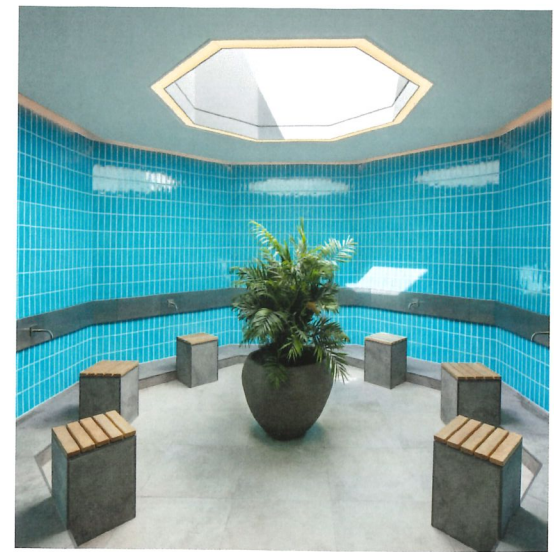
geometric pattern known as 'the breath of the compassionate', based on octagons and symbolising the rhythm of life. As such, the overall design can be seen to stem from a 'universal principle' of geometry, providing an abstract sacred ordering device for the architecture, but here reworked for a contemporary context.

Geometry apart, the underlying idea was the metaphor of mosque as oasis or grove of trees. From this at first rather glib-sounding starting point developed the key structural ordering of the building – the expressive, tree-like glulam columns. Four of these define the face of the mosque from the street, then are multiplied inside to form a gridded grove in the prayer hall. Far from being just metaphoric gestures, however, the columns are remarkably successful architecturally, bringing a grand, celebratory yet warm and welcoming sense to the internal spaces.

Their forms are given further depth and drama by each surrounding an oculus skylight. These help flood the deep floorplates with light. Their complex geometries are generated through 3D extrapolations of Critchlow's guiding geometries – while also invoking the very English tradition of fan vaulting, as seen famously in the university's King's College Chapel. It's nicely and simply expressive of the universal and the contextual/local in one.

Sadly, the quality of fabrication required for the columns and main cross-laminated timber body of the mosque could not be sourced locally. Instead, this was made and





constructed by the Swiss firm of Blumer Lehmann, whose immense experience and skill has evidently been crucial to the project's success.

The use of timber throughout underlines the project's overall ambition to be as carbon-neutral as possible – both in its fabric and operation. The mosque is designed to be naturally lit throughout the day and naturally ventilated, even at peak occupancy, while using a combination of green technologies, including rainwater harvesting, air source heat pumps and photovoltaics to minimise its carbon footprint. The only element that undercuts this somewhat is the concrete basement car park – a feature that sits oddly with the green intentions elsewhere.

Functionally, the building has a sophisticated simplicity to its plan – almost Beaux Arts in its geometries of primary spaces arranged with adjacencies to more secondary service rooms, which occupy poché-type spaces between. Thus the four-square entrance atrium is flanked by two supplementary spaces: one intended as a flexible teaching area – for anything from religious study to yoga; the other as a café-cum-event space, its kitchen still under commission. All three can also be combined to host events such as weddings or indeed the celebratory meal that had just occurred there as 500 people broke fast at the end of Ramadan.

To the north side of the atrium is the lobby leading to the prayer hall, off which to the right are male toilets and a washroom for ritual ablutions and to the left, the same for women, who then pass through this to access a separate women's door into the prayer hall. Within the hall, a Mashrabiya screen separates the women's area from the men's, although its staggered height allows for different levels of visibility and separation for individuals and it also has a break in the middle. At the back of this, a glazed room creates a relatively soundproofed but connected environment for mothers with

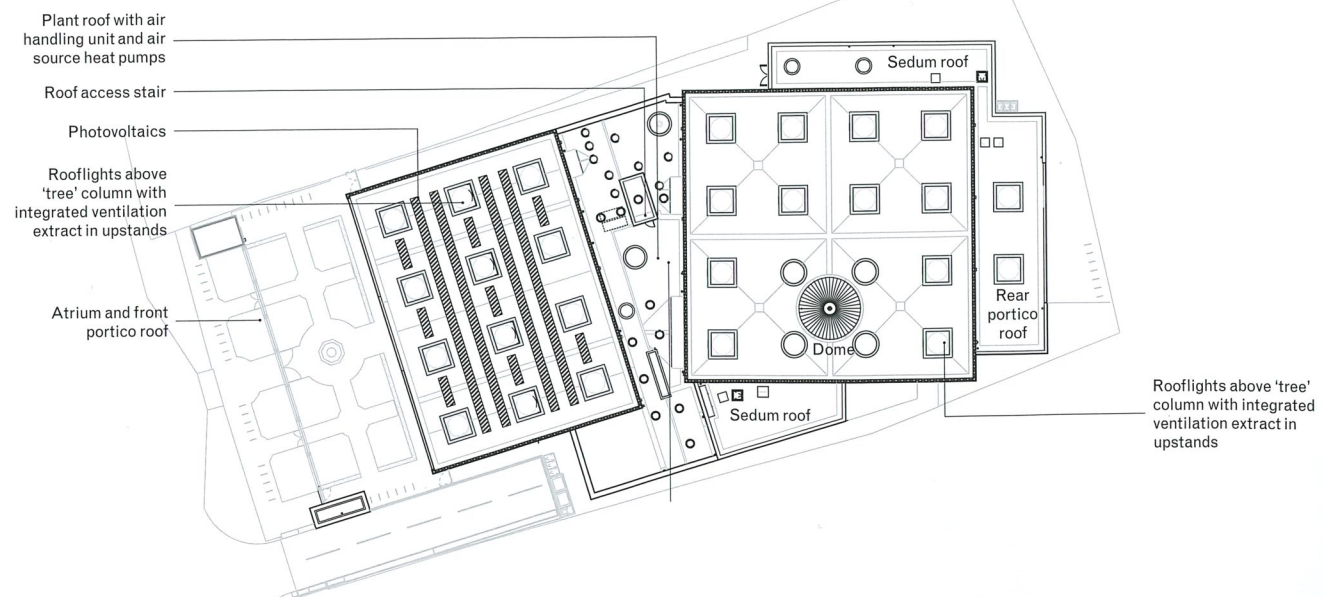
small children, while above this, a gallery space allows for further separation for some women from the main body of the prayer hall as required by certain traditions. These spaces are indicative of the thickness of the flank walls to the prayer hall, which also contains an adjacent duplex flat for visiting scholars and students, and on the eastern side another duplex for the imam.

The bluff and robust contemporary material language of the glulam columns is picked up elsewhere in the mostly high level of detailing and materials – the fine turquoise-glazed tiles in the washrooms for one. However, with elements such as the Mashrabiya screens, this seems thinner and less satisfyingly considered; more applied patterning not digested into the same contemporary language.

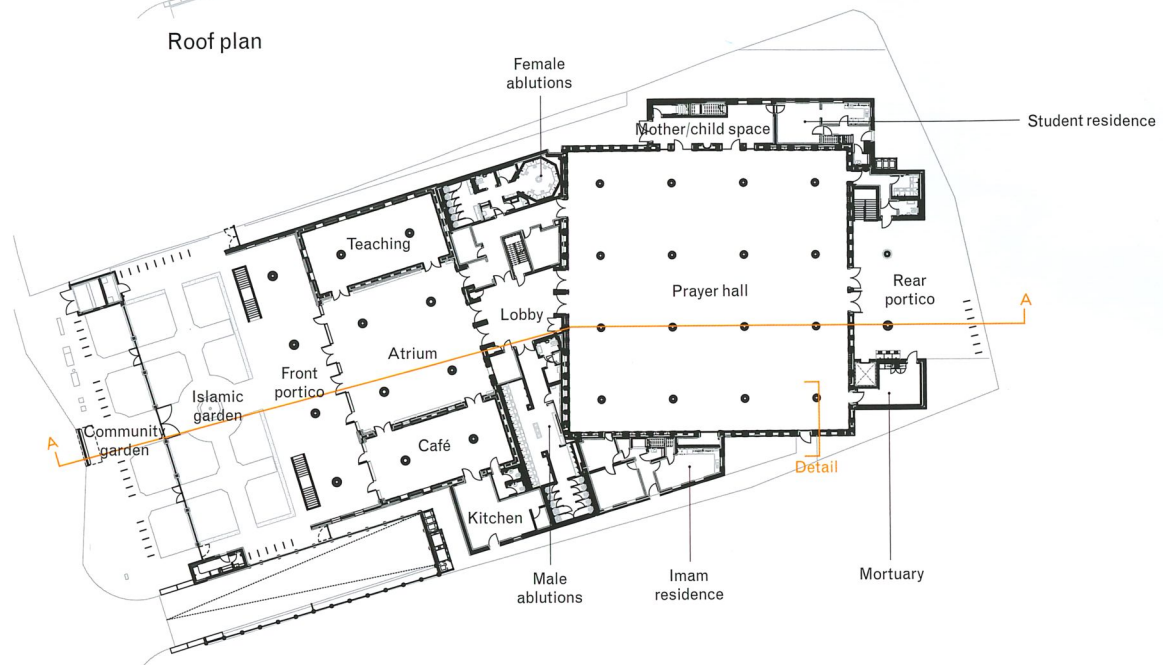
The tiling used for the external rainscreen to the cross-laminated timber structure is also disappointing, a casualty of value engineering. Its brick-like finish gives it an appearance more akin to cheap slip bricks, despite the intention to echo monuments across the Middle East by picking out in red brick the phrase 'Say He is God the One' in Square Kufic lettering against Cambridge yellow gault. Overall, while some lovely materials are used here, this doesn't feel like an architecture in love with its materials in a way you might expect.

Spatially too, while the columns add drama to the internal spaces, to a large degree they carry the 'architecture' of the spaces, which are otherwise spatially pretty orthogonal or even shed-like – a point underlined by the dome, added at a late stage at the insistence of a major funder, which just pops out weakly from the otherwise flat ceiling.

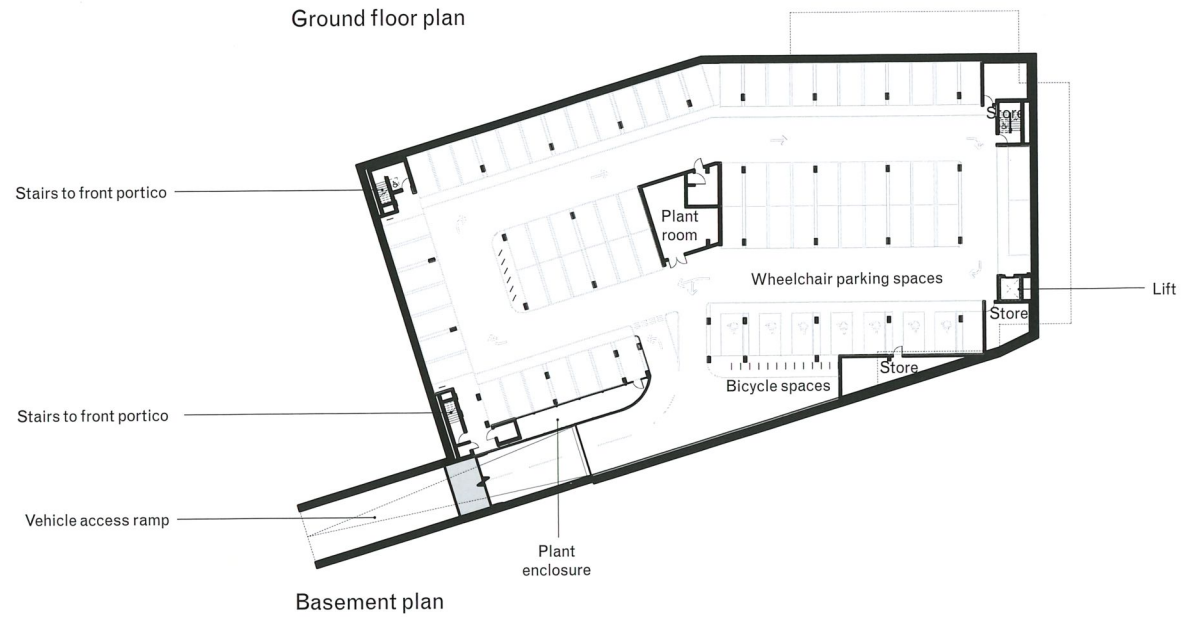
But this is much more than a decorated shed. It is a significant achievement with great poetry in parts – a point underlined when a blackbird hops in the back door of the prayer hall and flies up into the branches of the columns – in endorsement of their arboreal magic.



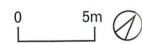
Roof plan



Ground floor plan



Basement plan



The columns are remarkably successful, bringing a grand, celebratory yet warm and welcoming sense to the internal spaces

Client's view

With the Muslim population of Britain doubling every 15 years, the pressure on its places of worship is intense. No sooner is a mosque built than it overflows. The response until now has been to run up cheap but vast barns with scant attention paid to architectural nuance. But a newer generation, both more educated and more reflective about religion, is growing restless. Enter the Cambridge Mosque Project.

An international competition was held, calling for inventive and innovative ideas. Interesting cultural arguments ensued.

Mosque design has historically reflected the local cultures of the Muslim world. A hybrid seemed inevitable, and one with local references. The dangers of pastiche would be immense. So, too, would be the potential alienation of the mosque's users, unused to a form so alien to the religion's heritage.

Confronted by four superb finalists, the jury picked a design by Marks Barfield Architects. The scheme exploited the overlap between the colour and texture of Cambridge gault brickwork with some of the great brick buildings of central Asia and

Turkey. But the building is strongly modern in inspiration and temper. It acknowledges Islam as an ongoing tradition, not as a cultural fossil.

It is clear that the very secular city of Cambridge is about to be challenged by a new monument, which will remind us that, for many, the principle of sanctity is still interesting, and that it can still inspire subtle and intelligent artistic expression.

Tim Winter, Shaykh Zayed lecturer in Islamic Studies, Faculty of Divinity, University of Cambridge; chair, Cambridge Mosque Trust

M&E engineer's view

As a religious building that emphasises spiritual belief in humanity's role as a humble and responsible custodian of creation, the mosque has been designed with a minimal carbon footprint, and with no emissions on site in use.

Energy use is minimised by using mixed-mode systems: static heating and natural ventilation supplemented by displacement cool air supply at times of high occupancy or high heat gains and natural light supplemented by low-energy LED artificial lighting.

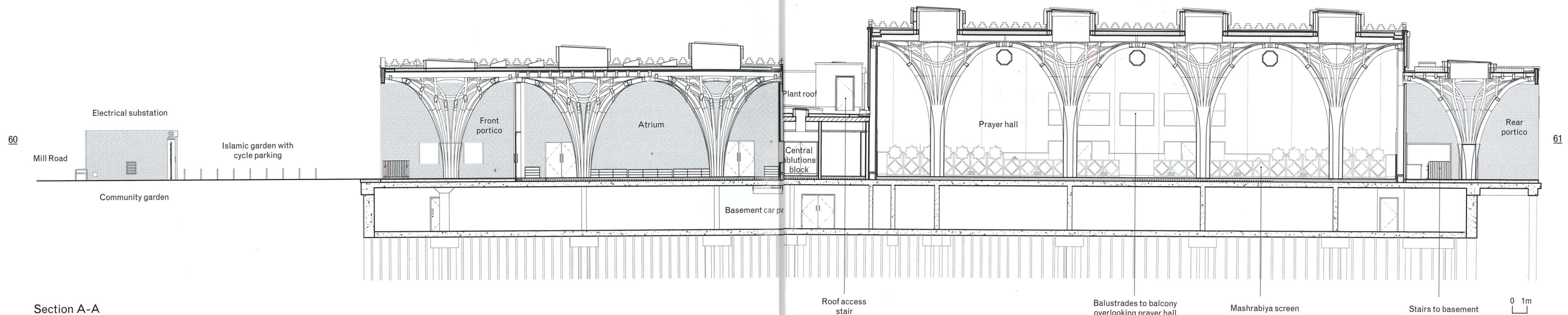
Air source heat pumps are used for underfloor heating/cooling which also includes an innovative system of direct hot water heating via buffer tanks. Given that grid electricity is becoming increasingly less carbon intensive, the overall footprint will reduce year on year.

The building is part powered by a photovoltaic array, which is sufficient to cover all of the hot water used in the building, all of the cooling and 13 per cent of the heating. Rainwater is harvested for flushing WCs and irrigation.

The building form and fabric specification ensure it can be naturally lit during daylight hours and naturally ventilated throughout the year – even during periods of peak occupancy. The building fabric is designed to ultra-low U-values with airtight construction to minimise energy need and energy loss.

In the prayer hall and atrium, each timber 'tree' vault sits beneath a glass oculus, and the overall effect is an interior bathed in natural light.

Mark Maidment, director, Skelly & Couch



Section A-A

Architect's view

We researched the architecture of mosques and observed that, for centuries and throughout the world, mosques have adapted to their local conditions – cultural, climatic and constructional – using the local vernacular. So we asked ourselves how should a British mosque be designed for the 21st century?

The idea emerged of a calm oasis within a grove of trees. We were inspired by elements from both Islamic and English sacred architecture, in particular English fan vaulting as seen in King's College chapel, together with sacred Islamic geometry. Worshippers and visitors take a journey

from the street through an Islamic garden, to a covered portico and into an atrium, preparing them in a gradual transition from the mundane world towards the lofty prayer hall and an underlying spiritual reality – orientated towards Mecca.

The defining feature of Cambridge Mosque is its timber structure – timber being one of the most sustainable of all building materials. The timber columns, or 'trees', reach up to support the roof using an interlaced octagonal lattice vault structure. Rooflights above the trees create a prayer hall bathed in natural light. The external walls are made of cross-laminated

timber, clad in brick tiles of the traditional Cambridge Gault and red brick colours. They form a pattern of Kufic calligraphy.

The mosque incorporates many sustainable features, which are described elsewhere.

The mosque is intended to be nondenominational, inclusive, open and welcoming to the wider community – a meeting place and a cultural bridge where modernity and innovation meet timeless sacred principles. It also hopes to be one of the UK's leading women-friendly mosques.

Julia Barfield, director and co-founder, Marks Barfield Architects

Performance data

Percentage of floor area with daylight factor >2% 95%
 Percentage of floor area with daylight factor >5% 80%
 On-site energy generation 15.9 mWh/yr / 8.2 tonnes CO₂
 Heating and hot water load 36.2 mWh/yr / 18.7 tonnes CO₂
 Total energy load Regulated + PV: 64.2 mWh/yr / 33.1 tonnes CO₂
 Carbon emissions (all) 70.9 tonnes CO₂ including unregulated
 Airtightness at 50pa 2.75 m³/hr/m²
 Design life in years 60 years

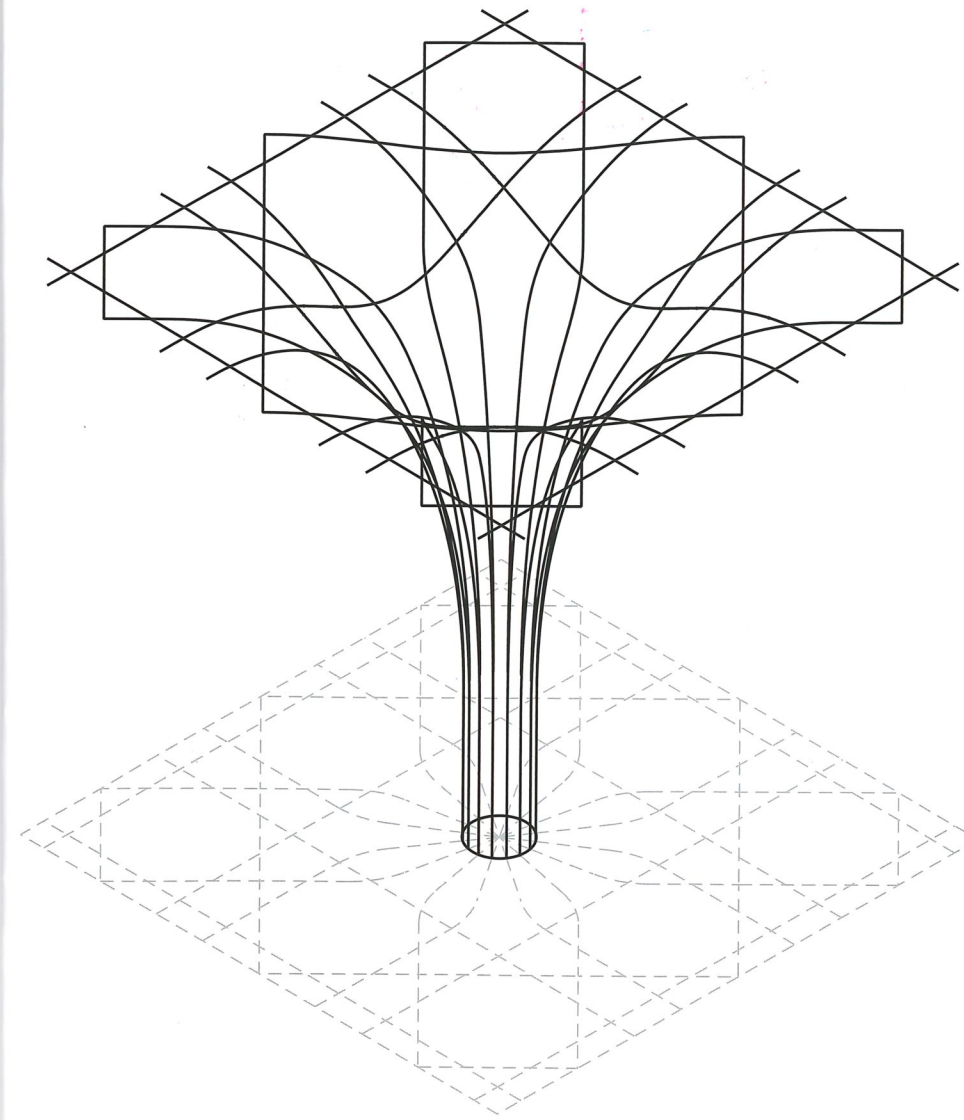
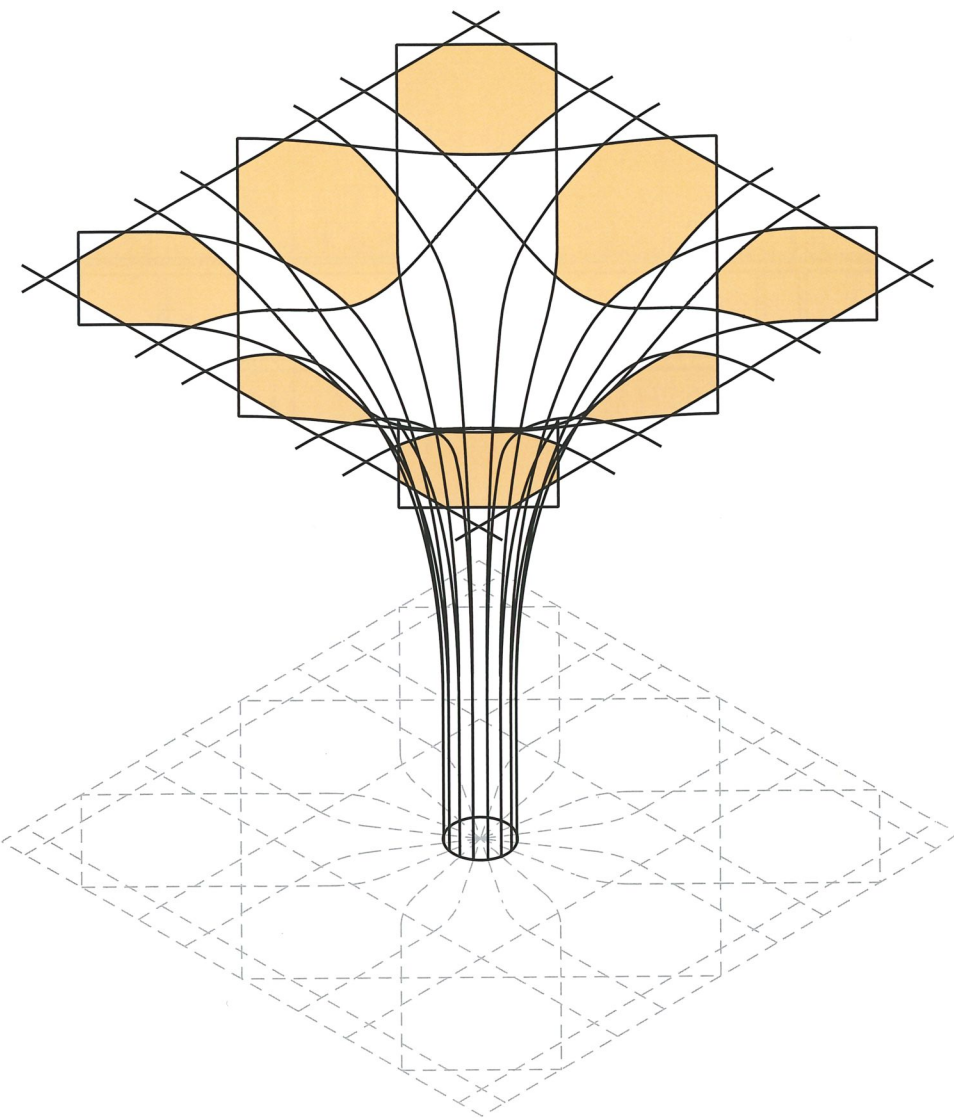
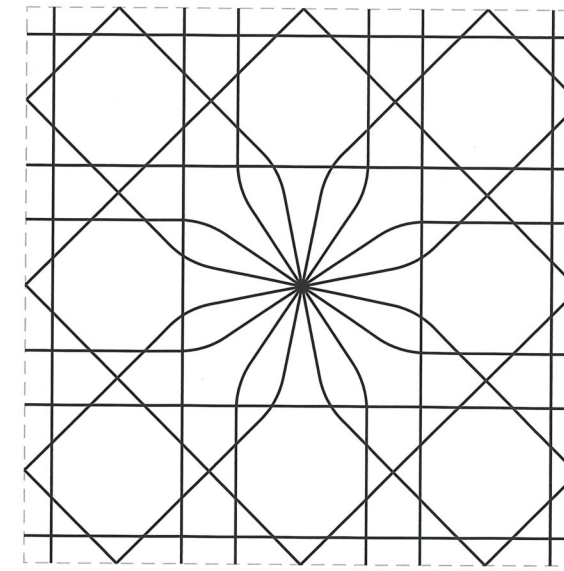
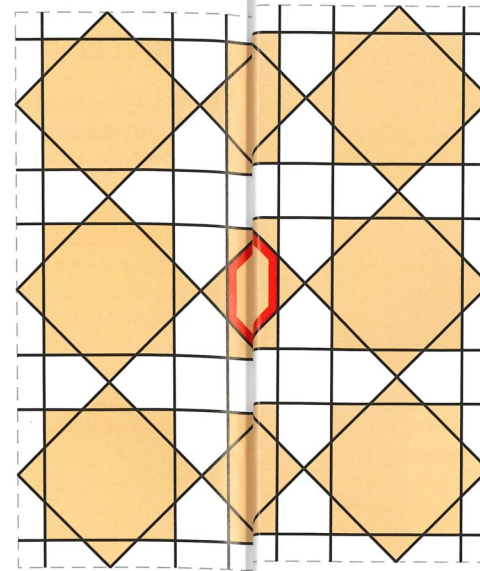
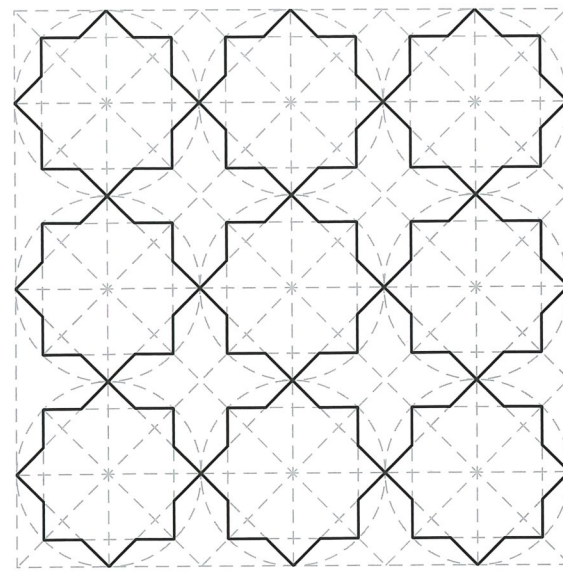
Project data

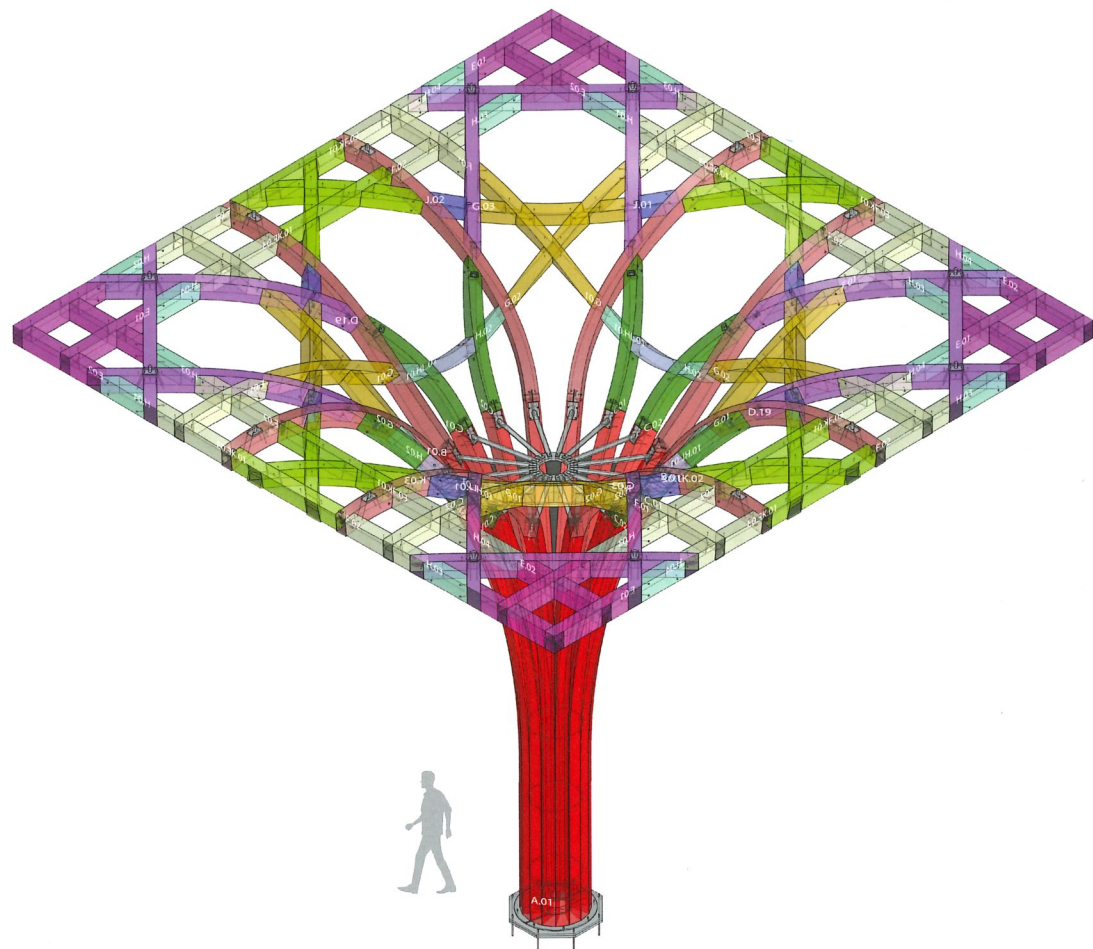
Start on site September 2016
 Completion April 2019
 Gross internal floor area 2,340m² (mosque)
 2,560m² (basement car park)
 Construction cost £25 million
 Architect Marks Barfield Architects
 M&E consultant Skelly & Couch
 Quantity surveyor Faithful & Gould
 Project manager Bidwells
 CDM co-ordinator Faithful & Gould
 Approved building inspector MLM
 Main contractor Gilbert-Ash
 CAD software used Revit 2015

Annual CO₂ emissions 15.6 kg/m² (regulated emissions)
 Timber engineer Blumer Lehmann
 Landscape architect Emma Clark with Urquhart & Hunt
 Geometric artist Keith Critchlow
 Acoustic consultant Ramboll
 Fire consultant Harris TPS

The compassionate pattern

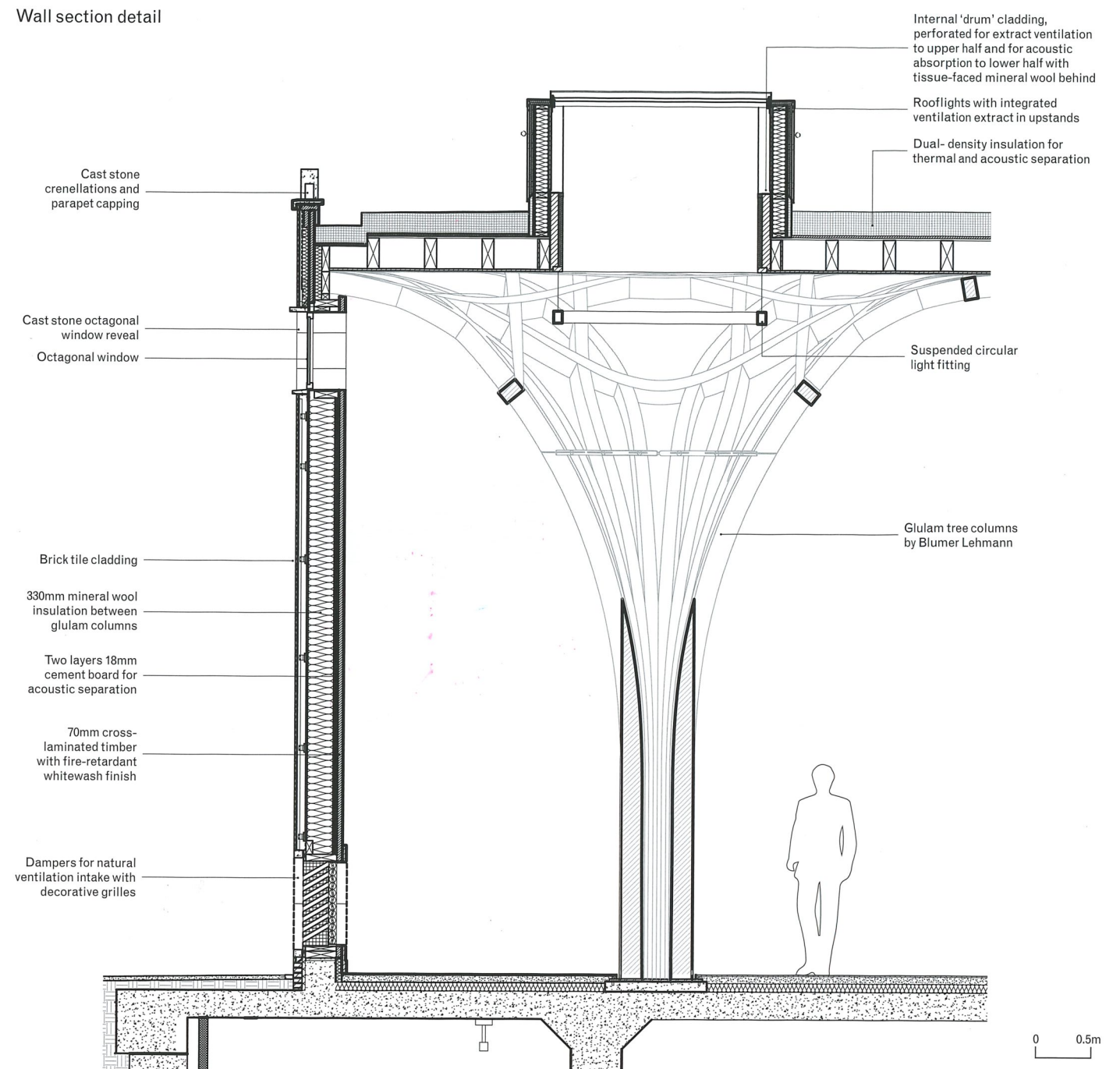
The guiding geometry of the building is The Breath of the Compassionate, a historic Islamic pattern which evokes breathing in and out; the rhythms of life. The repeating star octagons are converted into a continuous structural pattern and projected on to the three-dimensional fan vaulting form. Alternate octagons are converted to the structural columns or 'trunks'. There are 30 trees, creating an overall impression of calm, stillness, stability, quiet and focus, combined with a strong sense of place.
*Julia Barfield, director and co-founder,
Marks Barfield Architects*





Tree perspective diagram

Wall section detail



Timber engineer's view

Executing the roof support structure required a high degree of organisation. The architects created a detailed 3D parametric model. We then worked with digitalisation experts from Design-to-Production (D2P) and engineers from SJB Kempter Fitze to create the complete digitalised prefabrication and assembly model.

We reduced 2,746 segments down to 145 different component types based on just 23 different types of laminated timber blanks. These blanks, some of which are straight and some of which have single- and

double-curved source elements, were all processed with 5-axis milling. The approach required a meticulous production strategy and further development of the software. The joints between the segments in the complex support structure also required painstaking planning.

Slotted plates and Idifix connectors, among others, were used for the cross-grained joints in the lengthwise direction of the beams. Lateral butt joints were lap-jointed and screwed together, but not glued. With the curved areas in particular,

the insertion of the halving joints had to be simulated in advance to validate the geometry of the assembly sequence.

A total of 80 lorry loads carrying nearly 3,800 components made the 1,100km journey to Cambridge from our factory in Switzerland. This required careful planning, including the assignment, labelling and sequence of all parts. Each part had to arrive at the construction site at exactly the right moment for the assembly to go to plan. *Jephtha Schaffner, project timber engineer, Blumer Lehmann*