Classical tradition: ADAM Architecture profiled
Cottrell & Vermeulen at Brentwood School in Essex
Kay Fisker’s Dronningegården housing in Copenhagen
Arkitektene’s Alfaset Crematorium in Oslo
Thomas Bo Jensen’s experimental student workshop
Technical: Prototype freeform masonry vaulting
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Reinventing the brick
Work by Robert Adam, profiled in this issue, demonstrates the enduring appeal of classical and vernacular brick architecture. By contrast, Cottrell & Vermeulen has incorporated traditional masonry detailing into a modern design at Brentwood School in Essex – with striking results. Meanwhile in Denmark, students of Thomas Bo Jensen have been experimenting with radical new forms of brick patterning.

Sarah Huelin
To find out more about the bricks or pavers in featured projects, or to submit work, email brick@brick.org.uk or phone 020 7323 7030.

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The BDA represents manufacturers of clay brick and pavers in the UK and Ireland and promotes excellence in the architectural, structural and landscape applications of brick and pavers. The BDA provides practical, technical and aesthetic advice and information through its website www.brick.org.uk, in its numerous publications and over the phone.
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**Black brick for conservation area**

Huge Architects has obtained planning approval for a contemporary mews house located on the corner of Arrad Street in Liverpool’s Mount Pleasant Conservation Area. Black House avoids competing with a nearby Georgian terrace by employing a reduced scale and random aesthetic associated with its immediate context. Bold black brick facades celebrate the building’s corner site and ensure the two-storey structure is not visually overpowered by its imposing neighbours. Huge Architects was established in May last year by directors Hector Villalba and Philip Owen.

**Brick Awards shortlist announced**

The Brick Awards shortlist has been announced by a judging panel chaired by Bob Allies of Allies & Morrison. The Brick Development Association attracted over 300 entries – the highest number ever received. There are 15 awards split into three categories: housing, building and landscape, and technical and craft. There is one overall winner, the BDA Building of the Year – Supreme Award, which goes to the project judged to be the finest from all categories. Shortlisted entries include Chelsea Academy in London by Robson Guigg Batelle Studio (right above, photo: Tim Crocker) for the best international project, and Cotteridge Primary School, also in London by Nicholas Hare Architects (right below, photo: Alan William) for the best education building. Other notable entries include Newton and Ashtgreen Buildings Nottingham Trent University by Hopkins Architects (best refurbishment and renovation project), and Andreas Ensemble in Amsterdam by Tony Fretton Architects (worldwide brick award). The full list can be seen on the BDA website. The awards will be presented at London’s Mandarin Oriental Hotel on 2 November. For tables and tickets contact the BDA on 020 7723 7030 or email brick@brick.org.uk (details: www.brick.org.uk).

**Brick app for iOS devices**

Developed by Vertical Turtle in association with Bath-based architect Alex Bell, Brick it Pro is said to be the first and only brick design app for architects and other building professionals. It contains interactive brick tables for all 11 British Standard brick sizes, as well as joint types and over 20 different brick bond patterns. Compatible with iOS devices including the iPhone and iPod, Brick it Pro is available to download from the iTunes App Store (details: www.brickitpro.com).

**An intriguing set of experimental brick structures recently constructed in Billund are the result of a two week workshop with 48 students from The Royal Academy of Fine Arts, School of Architecture, held in February this year. The students made 50 wooden models at 1:5 scale exploring the potential of new brick technologies. A jury picked 12 models to be realised at full-scale in Billund (the home of Lego). The brick structure was built by pupils from technical craft schools with whom the School of Architecture has had a long collaboration. The objective of the workshop was to investigate the architectural potential of a new brick form developed by a Danish brick and clay tile manufacturer. By using the system it is possible to turn the bricks upside down or lay them in any direction, while still conforming to the module. By reducing the height of a standard Danish brick from 54mm to 48mm, and retaining the other dimensions, everything can be coordinated around a 60mm module in both the horizontal and vertical plane. This broadens the possibilities of working with various brick patterns and provides the potential to develop new bonds.

At the opening of the exhibition in June, two of the brick structures – what the Danes call brickworks – were awarded prizes for the best design and two others were given prizes for best craftsmanship.

**Thomas Bo Jensen explains how the architectural potential of a new brick format has been investigated using student-designed masonry structures.**

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**Thomas Bo Jensen** is an associate professor at the Royal Danish Academy of Fine Arts, School of Architecture, and author of *PV Jensen-Klint: the Headstrong Master Builder*. 

**First Person**

Thomas Bo Jensen explains how the architectural potential of a new brick format has been investigated using student-designed masonry structures.
Designed by Rijssen-based practice Jorissen Simonetti Architects, Brandenburg Park in Bilthoven, Holland comprises fourteen houses and a residential care building. The latter incorporates specific types of accommodation: group homes for residents needing intensive care and studio apartments for residents who are able to live more independently. The main challenge for the design team was to achieve a strong relationship between the houses and the larger care building.

The roof of each dwelling features a diagonal ridge. By mirroring the houses to form a pair of terraces the ridge line meanders back and forth in an alluring manner. The care building is located opposite the houses and adopts the same architectural form.

A rough-textured purple-brown brick was chosen to complement the sculptural appearance of the buildings. Charcoal was added to the kiln during manufacture to enhance the brick’s rugged appearance. The bricklayers were encouraged to lay the bricks in a rough-and-ready manner, and to use mis-shaped bricks resulting from the manufacturing process. Brightly coloured fenestration contrasts with the dark-coloured masonry.

Peaks and troughs

Traditional values

Cottrell & Vermeulen employs brick ornamentation and patterning at Brentwood School in Essex.

Patterned and decorative brickwork is central to the design of a sixth form centre and assembly hall at Brentwood School in Essex by Cottrell & Vermeulen Architects. The masonry facades of the two new buildings take their inspiration from an existing Victorian vicarage and other instances of brick patterning throughout the school campus.

Comprising social and study areas, as well as classrooms and administration spaces, the sixth form centre is split between the remodeled vicarage building and a new teaching block. The latter is wrapped in a continuous polychromatic diaper brick pattern, which is carried up and onto the roof using alternating handmade tiles to mirror the wall pattern. The roof is punctuated by large brick chimneys which form part of the natural ventilation system and echo the prominent chimneys of the neighbouring vicarage. Contrasting with the rendered internal walls, the chimney brickwork is exposed inside the classrooms and circulation spaces.

The 420-seat assembly hall is connected to the vicarage by a glass link structure at first floor level. This also provides views out to the front of the school and a new landscaped courtyard at the rear. The elevations incorporate a bold, three-dimensional diaper brick pattern relief formed of special solids and corners. At ground floor level a similar pattern is set out on the plinth using the same palette in Flemish bond, with red bricks and coloured mortar forming a contrasting diaper motif on the high level face. The staining was also relinquished, as part of the scheme, which included restoring the decorative brickwork on the facades with handmade bricks.

Credits: Photo: Paul Ridings.
Old meets new

Located in the grounds of Oaklands Park, Thomas Ford & Partners’ Dil extension to grade-two listed Chelmsford Museum in Essex comprises a new entrance, climate-controlled exhibition spaces, an education suite, workshop and office. Careful massing and a restrained material palette are employed to reduce the apparent scale of the 810 square metre building. The facades combine cream-coloured brickwork – in reference to the existing Victorian building – and zinc shingles, which are intended to reflect daylight and colour. A double-height portico and glazed entrance gallery link the new building to the Victorian museum. Enhanced thermal insulation, a ground source heat pump, water-saving devices and rainwater harvesting contribute to the sustainability strategy.

Credits Photos: Paul Riddle.

Social climber

Projecting bricks articulate the facades of a family house in Oslo by Ghilardi & Hellesen Arkitekter.

Designed by Ghilardi & Hellesen Arkitekter, Skogbakken 6b is one of a pair of family houses located in Nordstrand, one of Oslo’s wealthiest suburbs. Partially buried into a steep sloping site, the three-storey dwelling is planned around a courtyard to maximise daylighting and views out across the city.

Choosing visual strength and solidity in favour of decoration, the grey brick facades are inspired by public buildings constructed in the city in the 1930s and 1940s. Surface modulation is provided on the facades most exposed to the sun by randomly projecting around 20 per cent of the bricks from the front face of the wall. The elevations are further articulated by the use of large windows and deeply recessed doors and balconies.

Credits Photos: André Fenger Kristiansen.

Woven together

A sensitive addition to a former mill by Weber & Würschinger

Polimer products manufacturer Rehau has opened a training centre at Rehau in Bavaria. Accommodating 120 young people, the 2,000 square metre building houses workshops and training rooms, locker and laundry rooms, offices and recreation areas. A weaving mill, dating from 1885, was gutted and restored, and a new extension built, continuing the ridge line but cranked to align with the adjacent river. Architect Weber & Würschinger opted to make an ‘interpretation’ rather than a clone of the original building. The ground floor workshops and attic training rooms are separated by a first floor communal ‘living’ space, heated, a concrete core and energy-efficient Rehau windows help retain heat gained by the ground source heat pump. Energy use is expected to be 40 per cent less than current German standards.

Credits Photos: Stefan Meyer.
Go with the flow

Levi Strauss College is an 8200 square metre high school in Lille, northern France, by Tank Architects. Located at the heart of a major urban redevelopment zone close to the city’s port, the £11.5m scheme is planned around a central courtyard, which doubles as a sheltered outdoor recreation area. Opening directly onto this space is the dining hall and club room. Positioned centrally at first floor level, with direct access to the assembly hall, is the library. The southern side of the building is given over to science-based subjects.

Brick was chosen for the facades to complement the surrounding context. Rounded brick specials are employed at the corners of the building to soften its overall appearance. The facades are subtly rendered in three horizontal layers using randomly placed black and white bricks. This corresponds to the three shifted floor levels, which create open spaces and signify the pupil entrances. Further surface articulation is provided by the asymmetrical arrangement of the windows.

Levi Strauss College by Tank Architects is wrapped in a brick skin.

Homegrown HQ

Won in competition by de Architekten Cie, the southern headquarters of the Dutch Federation of Agriculturists & Horticulturists in Den Bosch, is conceived as ‘clubhouse’ where employees and visitors are made to feel welcome. The 4500 square metre building connects two existing agricultural colleges, creating a ‘food and health’ campus. Publicly accessible spaces, including a lounge, meeting areas, a bar and restaurant, are located on the ground floor in order to promote the exchange of knowledge and ideas.

Externally, a series of full-height, vertical curving panels in contrasting red and dark grey brick are intended to evoke cornfields swaying in the breeze. Interspersed with vertical strip glazing, the masonry facades contrast with the linearity of the adjacent college buildings. Solar gain is minimised by carefully controlling the shaded/void ratio of each elevation to suit orientation.

The fluid forms of a French high school by Tank Architects are wrapped in a brick skin.

Back to black

A new public space and surrounding amenity buildings in Hastings, East Sussex, by Tim Ronalds Architects provides community facilities for local people and visitors alike. Located on the Stade adjacent to the historic fishing beach and net shops, the public space is intended to host events and fairs. The western boundary of the square is defined by a community building comprising a hall, fish cookery school and public toilets. To the north is a cafe, while on the east side there is the soon-to-be-completed Jerwood Gallery by HAT Projects.

Inspired by the blocky shapes of the nearby fishermen’s sheds, but enlarged to a civic scale, the buildings are of black glazed brick and black timber. The use of dark masonry identifies the structures with a family of black buildings on the Stade. The glazed surface of the bricks allows them to sparkle in the sun, enhancing the façades.

Above: Detail section through community building facade. 1 zinc coping, 2 glazed bricks, 3 50mm cavity, 4 150mm mineral wool insulation, 5 stainless steel lintel, 6 stainless steel bracket, 7 concrete lintel, 8 standing seam roof, 9 150mm timber joints over glulam beams, 10 150mm timber joists over glulam beams, 11 stained iroko architraves and linings, 12 stained iroko floor, 13 stained iroko window, 14 concrete beam, 15 concrete blockwork, 16 vertical iroko boarding, 17 insulation, 18 stainless steel bracket, 19 stainless steel bracket, 20 stained iroko architraves and linings, 21 motorised blind.

Below: Detail section through community building facade. 1 zinc coping, 2 glazed bricks, 3 50mm cavity, 4 150mm mineral wool insulation, 5 stainless steel lintel, 6 stainless steel bracket, 7 concrete lintel, 8 standing seam roof, 9 150mm timber joints over glulam beams, 10 150mm timber joists over glulam beams, 11 stained iroko architraves and linings, 12 stained iroko floor, 13 stained iroko window, 14 concrete beam, 15 concrete blockwork, 16 vertical iroko boarding, 17 insulation, 18 stainless steel bracket, 19 stainless steel bracket, 20 stained iroko architraves and linings, 21 motorised blind.

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Credit: Photos: Daria Scagliola.

Credit: Photos: Julien Lanoo.

Credit: Photos: Pamela Self.

Credit: Photos: Sara Bogdanski.
Absence and presence

A masonry crematorium by Norwegian practice Arkitektene from a strong connection to its site.

Won in competition by Arkitektene, Alfaset Crematorium is located near an existing funeral chapel in Furuset on the outskirts of Oslo. The £14.8m scheme gradually emerges from its sloping site, providing a shield against traffic noise from Nedre Kalbakkvei to the east. A forecourt for mourners accompanying the coffin to the crematorium is situated between the chapel and the crematorium. To the east is a reception area for non-attended coffin deliveries, a service entrance and a parking area for employees.

The plan is organised around two longitudinal axes running north-south. The coffins follow a predetermined route on the eastern axis that begins in a reception area, before proceeding to a cold storage space, and then to the furnace room. The administration and auxiliary spaces are located along the western axis. Ash processing, storage and urn handling take place behind the furnace room to the south. Naturally lit with floor-to-ceiling windows, the furnace room is approximately five meters high and faces onto the graveyard. A discrete observation room that is accessible from the reception or directly through a separate entrance allows mourners to watch the coffin being placed into the furnace.

Externally, the grey brick facades extend beyond the building envelope forming gentle curving walls that engage with the landscape and define the car park to the north. The subtly nuanced tones of the masonry are intended to complement the washed brick surfaces of the nearby chapel. A series of smaller volumes extending out from the western side of the building are clad in pre-patinated copper. A sedum roof forms an extension to the car park and blends in with the surrounding lawns.

Ground floor plan:
1. Attended coffin delivery, 2 urn storage, 3 lobby, 4 non-attended coffin delivery, 5 cold storage, 6 operators, 7 furnace room, 8 ash processing, 9 operators, 10 urn storage.

Detail section through niche in brick wall; detail section through external wall at ground level.

PROFILE

Robert Adam talks to John Ramshaw about the role of brick in the classical and traditional architecture of ADAM Architecture.

As one might expect with such a long established material, brick is used in a high proportion of buildings undertaken by traditional architect Robert Adam. But the reasons for this are in part rather prosaic: ‘If you are operating in any traditional field, whether it is so-called regionalism or traditional architecture, the most typical and readily available material in most places is brick,’ he explains. ‘It is relatively inexpensive, easy to build with and looks distinctive. It has got a lot going for it.’

Much of Adam’s early work consisted of speculative housing, and he quickly found that brick not only satisfied planning requirements, but also market conditions. Brick is still seen as a durable and low-maintenance material that appeals to the majority of house purchasers. From an architectural viewpoint Adam is drawn to the modulated nature of the material and the scope for detailing and almost endless variation it presents. He is also inspired by the long and rich history of brick building. ‘There is an extensive vocabulary to draw on,’ enthuses Adam. ‘People have been inventing brick details for hundreds of years. But you don’t have to stop there; you can carry on inventing if you think of something different.’

Adam wouldn’t go so far as to claim to have developed his own brick language during his career. ‘You get used to a material and make a whole range of decisions almost intuitively,’ he says. ‘As an architect you look around and take things in all the time. Sometimes you think about brick very deliberately and sometimes you don’t.’

It is clear that Adam has amassed an extensive knowledge and understanding of brick detailing as a result of practical experience. In his own house, Crooked Pightle, outside Winchester in Hampshire (1989), a simple yet effective rustication detail is achieved on the corners of the projecting entrance bay by recessing every sixth brick course approximately 50mm from the outer face of the facade. Despite evidence to the contrary, Adam finds that contractors and structural engineers are sometimes sceptical of this approach – at least initially. ‘They say it’s not the 19th century anymore, and I say I found it in the 1980s,’ he laughs. ‘In truth there are many things that can be done, but other trades and disciplines are sometimes reluctant to undertake them.’

Experience has also taught Adam that careful detailing and good on-site communication are essential when it comes to building in brick. He cites Sheridan House, a mixed-use office and retail development in Winchester, Hampshire (1984), as an early example of this. The main street facade comprises thirty large brick arches, in which Adam drew every brick by hand. As construction progressed he noticed that the arches were not being constructed in accordance with the detail drawings. Instead of instructing the foreman to discuss the issue with the bricklayer, Adam chose to approach the subcontractor himself. By demonstrating his expectations for the project, as well as how much time and effort had gone into the masonry design, the bricklayer committed fully to realizing the intended design. ‘There are a lot of brick-labours out there, as well as some very skilled bricklayers,’ says Adam. ‘Some of them don’t care at all and some care quite a lot. It is no different from any other field. But quality control can be an issue due to the way some contracts are run, such as choosing the lowest priced subcontractor. If you get your sample panels right then at least you have something to test against.’

Within the practice, there are subtle differences in the way the five directors work with brick. Adam describes the approach taken by himself and Nigel Anderson as ‘quite pragmatic traditional design’. This is evidenced by projects such as Anderson’s Bear Wharf commercial and residential development in Reading, Berkshire (2003); Adam’s Union Court office and retail scheme in Richmond town centre, London (2003), and a new country house on virgin farmland in Hampshire (2005), also by Adam. Hugh Peter and George Summervue Smith often pursue a more ‘literal traditional design approach’ exemplified by the former’s neoclassical house in the Buckinghamshire greenbelt (2005) and the latter’s new villa in Hampshire (2007), which draws extensively on Palladian tradition.

In terms of specification, design decisions concerning brick type and colour often relate to the role of brick in the classical and traditional architecture of ADAM Architecture. As one might expect with such a long established material, brick is used in a high proportion of buildings undertaken by traditional architect Robert Adam. But the reasons for this are in part rather prosaic: ‘If you are operating in any traditional field, whether it is so-called regionalism or traditional architecture, the most typical and readily available material in most places is brick,’ he explains. ‘It is relatively inexpensive, easy to build with and looks distinctive. It has got a lot going for it.’

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new Palladian villa in Hampshire and the neoclassical house in Buckinghamshire both use a red brick familiar with historical precedent and context. Union Court for example uses a yellow London stock, whereas the new Palladian villa in Hampshire and the neoclassical house in Buckinghamshire both use a red brick.

Palladian villa in Hampshire, where the combination of a red terracotta brick and a pale lime mortar makes the bond pattern particularly prominent.

An unusual and highly decorative basket-weave bond is employed on a new stable court forming part of Hugh Pettifer’s project to restore and consolidate a Georgian country house in Herefordshire (2009). The bond serves as a visual datum for a series of brickwork pilasters above. An English bond—chosen by Adam for Sheridan House produces a subtle striped aesthetic, while parts of the architect’s own house in Hampshire use a face bond, which involves turning the bricks face-on and then cutting them in half to produce a lattice effect. When asked what influences the choice of one particular brick bond over another, Adam simply replies ‘money’. ‘It is just much more expensive to build cavity walls with any bond other than stretcher’, he explains. ‘Traditional bonds were intended for nine-inch brickwork or thicker. To achieve the same effect in a cavity wall the ends of the bricks have to be cut off. These are called snapped header bricks as well as gauged brickwork, where the face of the bricks is rubbed smooth (ph: Jan Crabb).’

Among the aspects of masonry design that appeals to all the directors are the variety of brick bonds. George Suumarez Smith’s Doric summerhouse in Hampshire (2008) makes use of Flemish and header bonds, as well as gauged brickwork, in keeping with Georgian tradition. Flemish bond is also used to expressive effect by Suumarez Smith on a new farmhouse in Hampshire (2002) by Robert Adam (ph: Lance McNulty).
Adam also expresses a preference for brushed-back mortar joints. This involves securing a flush lime mortar joint with a stiff brush after the mortar has begun to cure, thereby exposing the grit, which is usually a different colour. The joint is then washed-down with acetic acid to eliminate any surface lime. Adam has used this method on the soon-to-be-completed Base 2 Stay Hotel in Soho, London – albeit after encountering some onsite problems in achieving the desired effect. ‘In fairness, a lot of bricklayers do not like lime-based mortars. It can be an irritant and it is more difficult to use’, explains Adam. ‘What has happened over the years is that ready-mixes have become prevalent. These are cement-based, pre-coloured mortars which can look rather bland, but they are easy to use and allow bricklayers to work quickly. You can make the same comparison with plasterboard, which is designed to make the plasterer’s job easier. There is nothing wrong with it, but you can do it well or badly, and we use plasterboard in all of our buildings. If you are involved with speculative housing, you will probably end up using a ready-mix mortar, so you have to accept that and deal with it’.

This leads the discussion inevitably to movement joints. Care is always taken to design these into projects, if they are necessary, rather than leaving them to the whims of the contractor or bricklayer.

‘Movement joints tend to be hidden behind drain pipes’, confesses Adam, ‘although some projects have featured visible dummy joints, as a means of creating a decorative pattern.’

Last but not least, the architect reveals a passion for terracotta mouldings – a traditional form of brick ornamentation that is rarely seen today. Working some years ago with terracotta artist David Bech, Adam produced a range of terracotta features, including roundels and ferns, dimensioned to work with standard brick coursing. Both of these motifs are used to playful effect on an extension to Manor House in Weston Patrick, Hampshire (1993). ‘I chose a Hart’s-tongue fern for the capitals of the external brick pilasters in reference to the acanthus flower that adorns a Corinthian capital’, explains Adam. ‘The acanthus is actually a Mediterranean weed, so my choice of a British weed is very fitting.’

One could be forgiven for thinking that Adam’s approach to masonry design is bound by context, tradition and historical precedent. While this is partly true, he is also refreshingly honest and pragmatic about the reality of procuring high quality brick buildings in today’s competitive economic climate. It is a testament to brick’s adaptability and lasting appeal that the directors of ADAM Architecture remain as committed to the material and as enthusiastic about using it as ever.
Though neglected by history, Kay Fisker was responsible for some remarkable brick projects, including the Dronningegården housing. Photos: Seier + Seier.

**Danish distinction**

Designed and built from 1948-53, the Dronningegården housing project retains a timeless quality that belies its age, both as a result of its design, and because of the quality of materials and detailing. While its architect Kay Fisker (1893-1965) is known within Denmark for a number of housing projects in the Copenhagen area, as well as the Danish Academy in Rome (1965), history has tended to regard him as a marginal figure in comparison with other Scandinavian masters such as Arne Jacobsen and Jørn Utzon.

Fisker studied at the Royal Danish Academy of Fine Arts and during his studies worked at the offices of a number of distinguished architects, including Sigurd Lewerentz, Gunnar Asplund and Hack Kampmann. His breakthrough came in 1915 whilst still a student when, with Aage Rafn, he won the competition to design stations for the Almindingen to Gudhjem railway line on the island of Bornholm, where traditional materials such as brick, tile and timber cladding were employed in a modern idiom. Brick is much in evidence at Århus University (1932-43), designed with Povl Stegemann, CF Møller and Carl Theodor Matria Sorensen, which is regarded as a key example of Danish Functionalism.

His residential projects include Vestersøhus (1935-39, with CF Møller) in which balconies and bay windows are exploited to enhance the qualities of the apartments, and this was further developed at Dronningegården, designed with Eke Kristensen and CF Møller. From 1936-43 Fisker was a professor at the Academy of Fine Arts and his lectures on housing are said to have influenced a generation of young architects.

As an exercise in high density urban living, arranged around a large urban space, Dronningegården exudes monumentality, but this is tempered by the clever use of brick details and open recessed balconies that enliven its nine-storey facades.
Museum Haus Lange and Haus Esters, Wilhelmshofallee 91-97, Krefeld.
Black Research Group has completed a prototype freeform masonry vault using terracotta tiles.

Constructed from thin terracotta tiles, this prototype freeform vault by Black Research Group – an organisation affiliated to the Faculty of Architecture at ETH Zurich, Switzerland – combines traditional timber vaulting techniques, often referred to as Catalan vaulting, with state-of-the-art three-dimensional structural form finding.

The undulating shape of the vault was developed using structural design tools based on Thrust Network Analysis (TNA). Combining projective geometry, duality theory and linear optimization, TNA provides a graphical and intuitive method for generating compression-only vaulted surfaces. It can also be used to analyse historical vaulted structures, including those constructed from unreinforced masonry.

Intuitive form and force diagrams indicated a number of weaknesses in the vault’s cross-section. The use of a third layer of terracotta tiles, sandwiched between the inside and outside skins of the structure, allowed the team to strengthen key areas of the vault without disrupting its smooth, flowing lines.

Fabricated using CNC cutting methods, a cardboard box formwork system was assembled onsite prior to construction. The 26 square metre surface of the vault was built in six weeks by only two people, thereby demonstrating the material – and labour saving – benefits associated with this form of construction.

**Credits:** Architect: Black Research Group; project team: Matthias Rippmann, Lara Davis, Professor Philippe Block, Tom Pawlowski; photos: Klemen Breitfuss.