

Students' centre in London

Vertical market place

Just south of Lincoln's Inn Fields, situated between the area of London frequented by judges and lawyers and in close proximity to theatre goers and street artists, there is a district that seems to have missed out on the globalisation and gentrification of recent decades. The crooked lanes are lined by a higgledy-piggledy mixture of inconspicuous brick houses, representative Victorian architecture and office buildings from the inter-war era, all of which have one thing in common: they are all owned by the London School of Economics, the elite institution for important politicians and business leaders, and one of the very few universities in the world that is dedicated solely to the study of social sciences. Since the foundation of the LSE, the inner-city campus has expanded into approximately 30 separate buildings. Up until recently, the university complex has lacked not only a spatial focus and social centre, but also an architectural landmark. This is no longer the case thanks to the 24-million-pound new-build designed by the Irish architects, O'Donnell + Tuomey. Its complex plan layout provides space for two cafés, a music venue, prayer rooms, a gym and offices for the career and accommodation agency, as well as the student union. In 2009, the LSE announced a two-stage design competition for its first new-build

in 15 years. As many as 133 architectural practices applied, six of whom were admitted to the second stage. These included renowned British offices: FCB Studios, Allford Hall Monaghan Morris and David Chipperfield Architects. The success of O'Donnell + Tuomey came as rather a surprise since – despite being among the most highly rated architects in Ireland – they had only completed very few buildings outside their home country at the time.

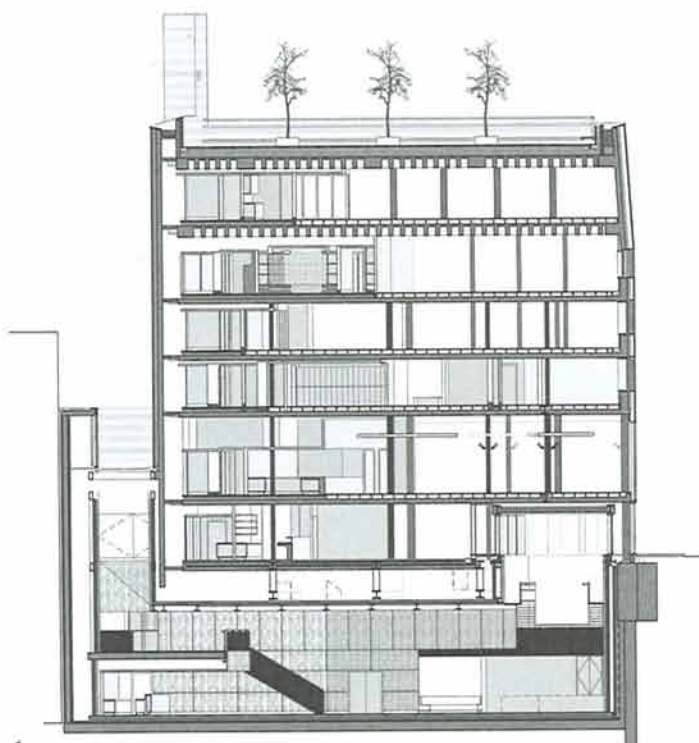
The requirements, in terms of sustainability, were set at the highest level. The intention was that the student centre would reach the top grade 'outstanding' in the British certification system, BREEAM, and the highest energy rating 'A' in the two British energy performance certificates: the Energy Performance Certificate (EPC) and the Display Energy Certificate (DEC). The latter is not issued until one year after the building's occupation and its assessment is based on actual energy performance, which means that the users of the building, as well as the managers of the facility, all have a contribution to make if the top rating is to be achieved. The architects' prime objective was therefore to create a building that maximises energy efficiency through the fabric itself, rather than through complex building service systems.

Ocean liner with a brick envelope

Sheila O'Donnell, founder partner at O'Donnell + Tuomey, once compared the student centre to an ocean liner – by this she was referring to the variety of different functions stacked once above another, rather than to the chimney rising high above the building, which forms part of the gas-fired heat and power unit in the basement. Nevertheless, at first glance, the new-build appears somewhat alien in the middle of the university campus, despite the exterior, mainly red brick envelope – a ubiquitous material in London, even if often covered with plaster or natural stone.

The clever way in which the building has been embedded into its awkward surroundings is only perceived at second glance. Its sharply oblique shape was determined by the age-old British principle of 'right to light', which specifies that a new building may not obstruct the daylight received by a long-standing neighbouring property. The volume dictated by this law, however, represented only the starting point for the volumetric experiments performed by the architects.

The new-build stands higher than any of the designs submitted by the other competitors and, at the same time, its distance to neighbouring properties is greater. Instead of filling the site to the maximum, the architects created two triangular indentations into the front and rear sides of the building, thus reducing the depth of the interior spaces. A triangular-shaped glass canopy covers the setback at the front, where the main entrance is located; the other setback serves as a courtyard and important source of daylight at the centre of the block. The enormous red-





- 1 Section Scale 1:400
- 2 Site plan showing plan of 6th floor and roof terrace Scale 1:1500
- 3 South elevation with the chimney of the CHP unit to the left of the photo

Client:

London School of Economics and Political Science, Estates Division

Architects:

O'Donnell + Tuomey Architects, Dublin

Structural engineers:

Dewhurst Macfarlane and Partners, London

Horganlynch Consulting Engineers, Dublin

Services and environmental engineers:

BDSP Partnership, London

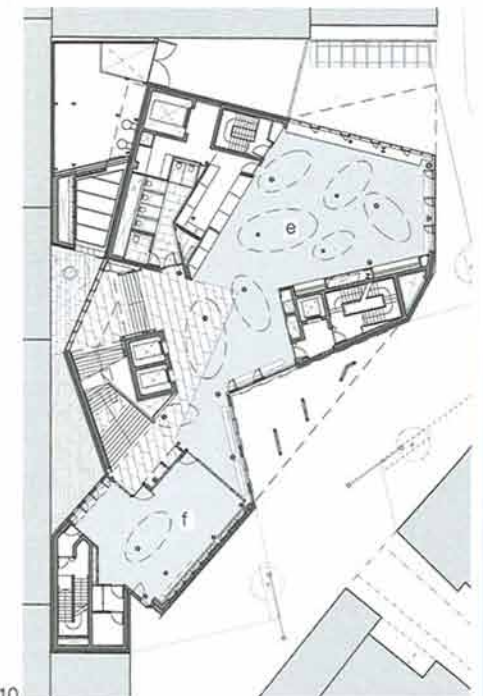
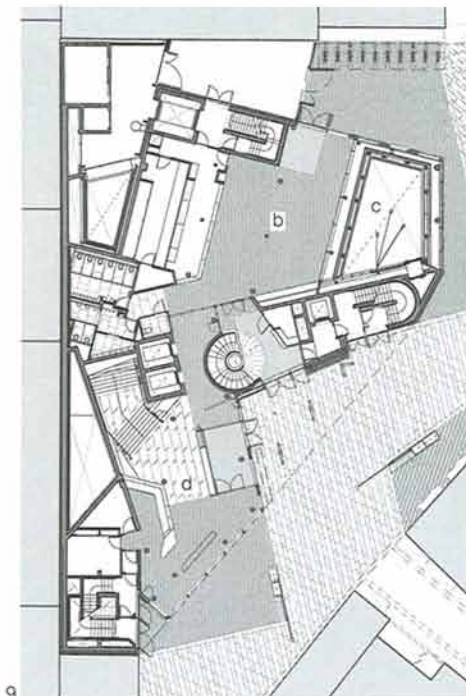
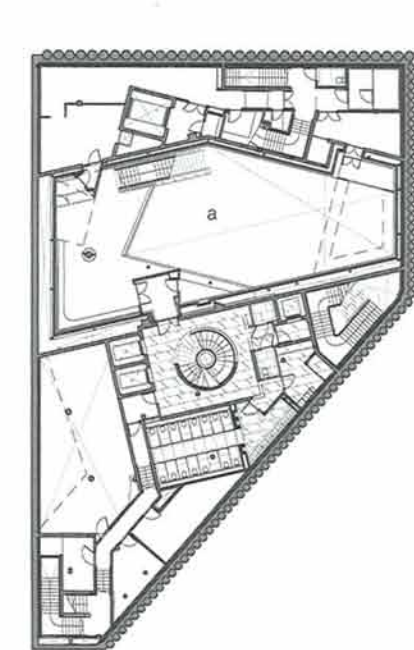
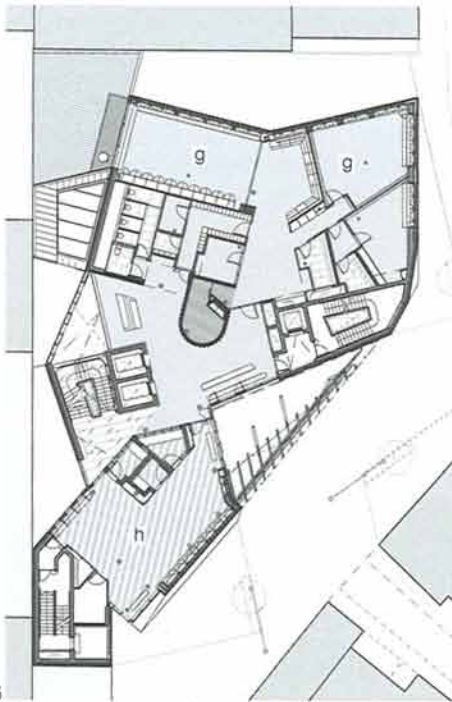
Security, fire protection, acoustics, transport & logistics:

Arup, London





- 4 Southeast view with the triangular glass canopy over the entrance
 5 2nd floor plan
 6 4th floor plan
 7 5th floor plan
 8 Lower basement plan
 9 Ground floor plan
 10 First floor plan
 All floor plans at scale 1:600
 a Events hall
 b Pub
 c Void over hall
 d Reception
 e Café
 f Activity centre for groups
 g Prayer rooms
 h Media centre
 i Gym
 j Changing rooms
 k Career services/career centre
 11 Glass canopy over the entrance area, seen from below
 12 Main staircase with elevator core





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brick surfaces, responsible for the slightly out-of-scale appearance (in real life, the building is smaller than it appears in photographs), only appear to be homogeneous. In many areas the brickwork has been perforated by leaving sizeable openings between the bricks, thus allowing glare-free daylight to infiltrate the rooms behind. The result is a range of different daylight conditions in the interior: subdued immediately behind the perforated brick surface and brighter towards the rear, where framed glazing opens up the building to the exterior.

The masonry walls are a masterpiece in terms of workmanship. More than 170,000 bricks for the facades were handmade in Gloucestershire; approximately a quarter of them formed in one of 88 different, bespoke formats. Thirty of these bespoke bricks were only required once throughout the entire building. The architects used the extensive detailing that this intricacy involved as a form of quality assurance and as a technique to counter any kind of 'value engineering' in the procurement and construction process. The effort appears to have been worthwhile, as the consistency between the design drawings of the facade and the actual, built result is impressive. Furthermore, the use of the numerous special formats was also a method to avoid brick off-cuts and thus meet the BREEAM requirements concerning the reduction of construction waste.

Compared to the bricks, the timber used for the framed glazing system came from far further afield: the posts and mullions are made of tropical Jatoba timber, which is FSC-certified to comply with the BREEAM specifications. The architects justify their choice by citing the excellent durability of the exotic wood, which requires neither mechanical or chemical treatment, nor the use of aluminium cover strips on the exterior.

Indoor promenade

O'Donnell + Tuomey's new-build does not have one, dominant facade; on the contrary, every corner reveals a new perspective. This complexity is intensified in the interior. Overall, the building has nine levels, two of which are subterranean. There are three lifts, no less than seven staircases and two main entrances, both of which are positioned beneath the triangular glass canopy. One of these guides visitors into the ground-floor pub and to the events hall, which, together with a number of ancillary rooms, occupies the two basement levels. This space is designed mainly as a venue for fashion shows and concerts, but is also used as a discotheque at weekends. In terms of construction, the hall is completely isolated from the rest of the building with fully insulated cavity walls to ensure that noise is not transmitted through the structure. Despite the basement location, there is access to daylight via what might be described as a triple-storey 'lantern' to the rear of the building. This is also fitted with an acoustically decoupled, double facade system.

The second main entrance provides access to the rooms on the

Gross floor area: 6101 m² | Treated floor area: 5915 m² | Construction cost: £ 24.1 million = £ 3952/m² | Final energy demand for heating and cooling: 36.8 kWh/m²a | for regulated electricity usage: 35.1 kWh/m²a | Energy from on-site renewable sources: 11.7 kWh/m²a | Total CO₂ emissions: 18,8 kg CO₂/m²_{TFA}

upper levels, where the architects have created a true 'promenade architecturale' that unfolds along the main staircase and the central lift shaft clad in colourful enamelled steel sheeting. The staircase, which is bathed in daylight that filters through from the rear courtyard, is modelled on the character of a busy urban street and serves as a social hub and circulation spine along which a variety of facilities are situated. The transparency and openness in the interior is much greater than the closed facades might suggest, and every turn offers new, often totally unexpected views.

The first landing of the ascending promenade takes students and their guests to the student café on the first floor, which is rather spacious thanks to the high ceiling. Three prayer rooms are accommodated on the second floor; two of them designed for Islamic students and staff facing Mecca, one each for men and for women. The media centre is located immediately adja-



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- 13 Student café on the 1st floor
- 14 Main staircase with view of the rear courtyard
- 15 Energy flow diagram of the building
- 16 BREEAM certification results
- 17 Café on the 1st floor with the acoustic 'clouds' and (to the right, outside the building) the glass canopy over the entrance area



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cent to this and is where an academic journal, the student newsletter, the campus radio and television are produced. The student union, with an open-plan office area for 28 people and meeting room, is accommodated on the third floor. Further up, on the fourth floor, there is a gym, whilst the fifth floor accommodates the education and career consultancy. Right at the top of the building, on the sixth floor, there is a roof terrace and areas for social activities, as well as a coffee and juice bar.

Reincarnation of the 1970s

The inner structure of the student centre features a complex, hybrid structural framework. The vertical loads are transmitted through the lift shaft, steel posts and, in some cases, the exterior walls. These are connected either by flat slab or ribbed slab floor systems made of reinforced concrete. Vierendeel trusses have been integrated into the exterior walls of the fifth floor in

order to span the gym below with as few vertical supports as possible.

The materials for the interior finishes were chosen with resistance to wear and tear and durability in mind. The brick floor in the entrance area features the same bricks as used in the facade. The stairs, corridors and the walls in the bathrooms, toilets and kitchens have a terrazzo finish; oak flooring has been used in most of the remaining rooms. Brick and exposed concrete alternate with timber cladding on the wall surfaces, which in many places has been designed to conceal acoustic insulation. The oval ceiling panels in the café, referred to by the architects as 'clouds', have been installed for the same sound-absorbing purpose, but also to reflect light. They consist of acoustic plaster applied onto glass-fibre mesh and mounted onto a timber sub-structure.

One of the most significant features, though, is the colourful interior – and this has not been added by the hubbub of the students alone. All steel posts, handrails and banisters are finished in oxblood red. Elsewhere, muted tones of moss green, ochre yellow and prussian blue are featured in and around the central lift shaft, which doubles as a notice board for events and other student activities. The courageous use of colour, the labyrinth-like structure inside and the palette of robust materials are reminiscent of the architectural style of the 1970s. The light and open character of the interior space, however, is absolutely in line with the zeitgeist of today.

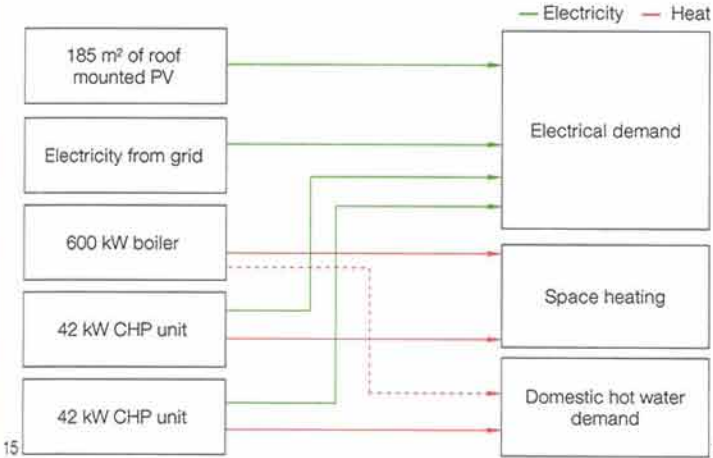
Heat and power from the basement

In contrast to the widely held belief that energy-efficient buildings should be compact, the low energy consumption of the student centre owes much to its jagged, fragmented shape. As a result of the reduced depth of the building, rooms have access to natural daylight, but also – with exception of the two basement levels and very few rooms on the upper levels – benefit from natural ventilation. The aluminium windows, concealed behind the masonry screen, can all open manually. The glazed facades at the rear of the building feature a combination of automatically operated, wooden ventilation flaps, as well as automatically and manually operated windows. Even with the automatically operated elements, users can override the building management system at the touch of a button for a limited period of time, after which the building management system resumes control. Only in a few areas where natural ventilation is insufficient or impossible, have decentralised ventilation units with heat recovery been installed. These include the events hall in the basement floors, the radio and TV studios, the café on the 1st floor and the changing rooms of the gym. Active cooling is only provided to the events hall and the TV/radio studios. For this purpose, the ventilation units have been equipped with cooling coils (connected to decentralised chillers) in these areas.



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Results of BREEAM Design Stage Assessment
(Version: BREEAM Education 2008)

| Category | Credits | | Weighted score |
|--------------------|----------|------------|----------------|
| | achieved | achievable | |
| Management | 20 | 20 | 12.00 % |
| Health & Wellbeing | 9 | 15 | 9.00 % |
| Energy | 22 | 28 | 14.93 % |
| Transport | 13 | 13 | 8.00 % |
| Water | 8 | 8 | 6.00 % |
| Materials | 10 | 15 | 8.33 % |
| Waste | 5 | 8 | 4.69 % |
| Land Use & Ecology | 8 | 10 | 8.00 % |
| Pollution | 9 | 12 | 7.50 % |
| Innovation | 8 | 10 | 6.00 % |

Total score 86.45 %

Result BREEAM Outstanding

(Pass: 30 %, Good: 45 %, Very Good: 55 %, Excellent: 70 %, Outstanding: 85 %)

Despite its high energy efficiency, the LSE has not quite managed to become independent of fossil fuels with its new-build. Two gas-fired combined heat and power units (CHP), each with a heating capacity of 42 kilowatt, and a 600-kilowatt boiler are located in the boiler room in the basement level. One of the CHPs produces domestic hot water for the building; the other supplies 25 % of the required heat output. The boiler provides the remaining heating supply. In this cascade solution, each one of the three systems only operates when required. The CHP for hot water is the only unit that operates throughout the year, and supplies electricity at the same time. The other two heating units only function during the colder months. According to calculations, the two CHPs and the 185 m² photovoltaic plant mounted on the roof of the building provide approximately two thirds of the building's power demand (IT, kitchen appliances and plug loads are excluded from these calculations).

Whether these targets are actually met will depend to a large extent on the interaction between the users and the building, as well as on the efficiency of the building management system. Temperature, humidity, CO₂ and daylight sensors keep a check on the interior climate whilst motion or CO₂ sensors detect the presence of people. The heating and cooling, as well as the ventilation of the rooms are controlled by the building management system according to the measurements taken. For now, the figures speak for themselves. According to design-stage calculations, the Students' Centre consumes 70 % less thermal energy, 27 % less domestic hot water and almost 40 % less energy for lighting than a traditional building of the same scale and construction. In a BREEAM design-stage assessment, the new-build achieved a score of 86 %, thus the 'Outstanding' rating that the client and the architects had aimed for has been achieved.



18 Northeast corner junction, seen from Lincoln's Inn Fields

19 Section, glazed facade

Scale 1:25

a Roof ($U = 0.106 \text{ W/m}^2\text{K}$):

Standing seam zinc roofing; PUR insulation with aluminium facing, 160 mm + 60 mm; vapour barrier; reinforced concrete roof slab, 250 mm

b Curtain wall ($U_{cw} = 1.3 \text{ W/m}^2\text{K}$):

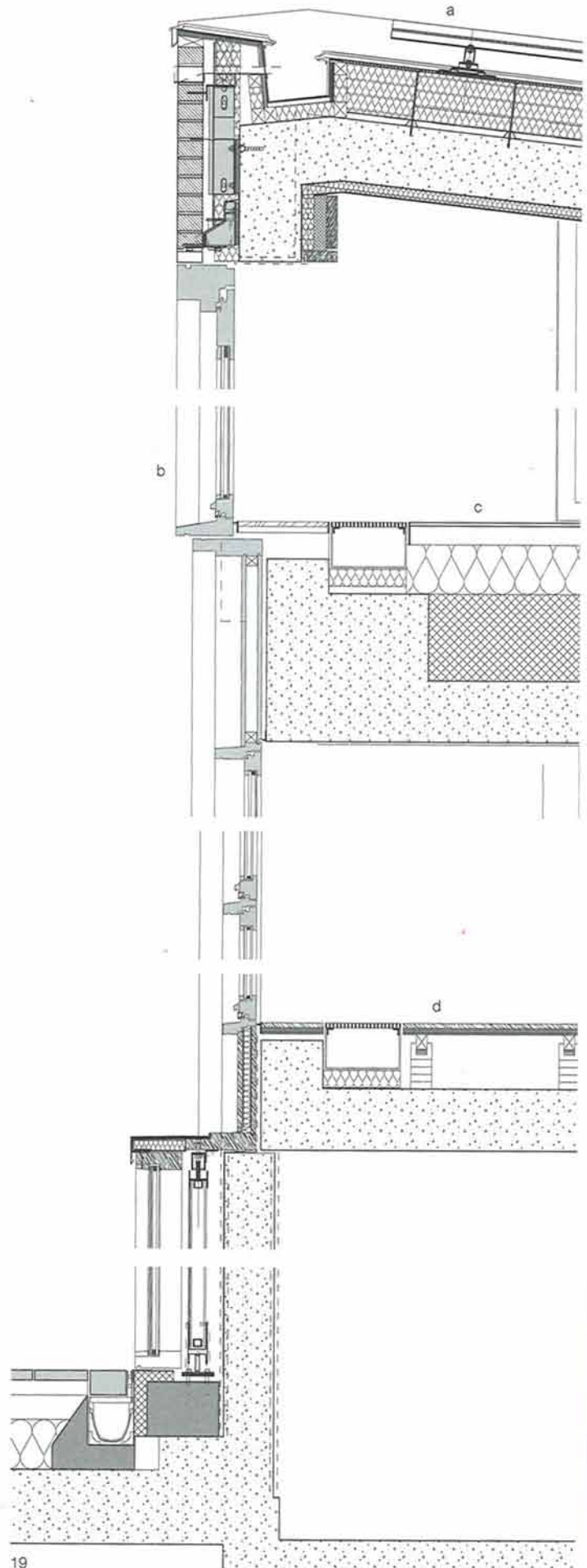
Double glazing ($U_g = 1.1 \text{ W/m}^2\text{K}$; $g = 0.4$) in Jatoba hardwood frames

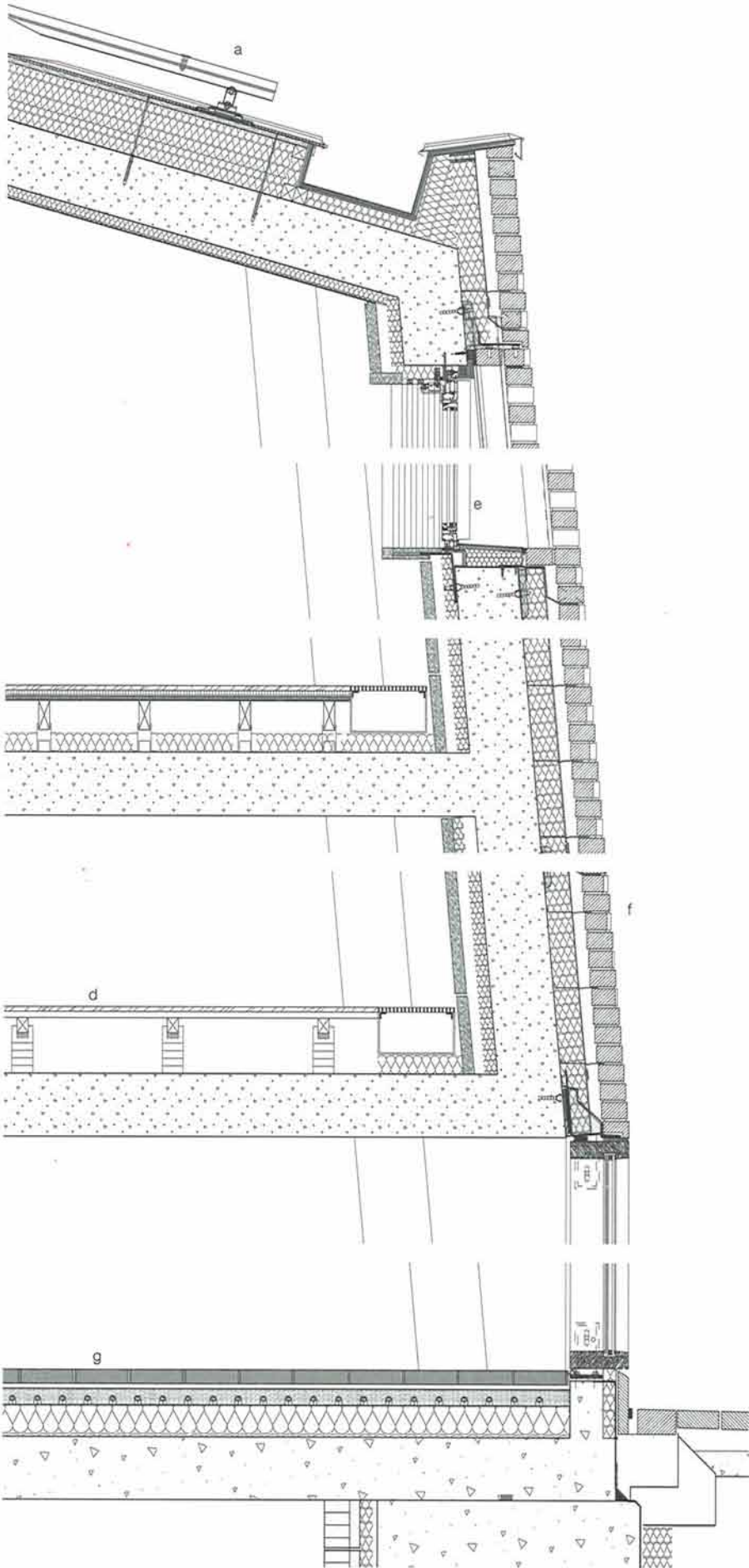
c Floor slab of 6th floor:

In-situ terrazzo flooring, sealed, 15 mm; cement screed with underfloor heating, 75 mm; PIR insulation with aluminium facing, 200 mm; EPS insulation, 325 mm; in-situ reinforced concrete slab, 250 mm

d Floor slab of 1st floor:

White oak flooring, 19 mm; tongue-and-groove plywood boards, 25 mm; acoustic cradle & batten flooring system, 236 mm; in-situ reinforced concrete slab, 250 mm





- 20 Section, brick facade
Scale 1:25
e Windows ($U = 2.0 \text{ W/m}^2\text{K}$):
Double glazing ($U_g = 1.0 \text{ W/m}^2\text{K}$) in aluminium frames
f External brick wall ($U = 0.10 \text{ W/m}^2\text{K}$):
Brickwork facing, full bricks in Flemish bond, 102.5 mm; airspace, 50 mm; rigid thermoset insulation, phenolic resin, 100 mm; reinforced concrete wall, 250 mm; rigid thermoset insulation, phenolic resin, 50 mm; mineral wool insulation, 42 mm; birch plywood, 17 mm
g Floor slab of ground floor (reception area):
Brick pavers, 55x 65 x 215 mm; sand & cement screed, 30 mm; screed with underfloor heating, 80 mm; PIR insulation with aluminium facing, 100 mm; reinforced concrete slab, 250 mm
- 21 Detail view of the southeast facade with glass canopy over the entrance area
22 East facade with perforated brick wall and ventilation casements (behind wooden louvres)

