The Francis Crick Institute

The envelope of London's new biomedical research centre, designed by HOK and PLP Architecture, responds to both its context and its contents.

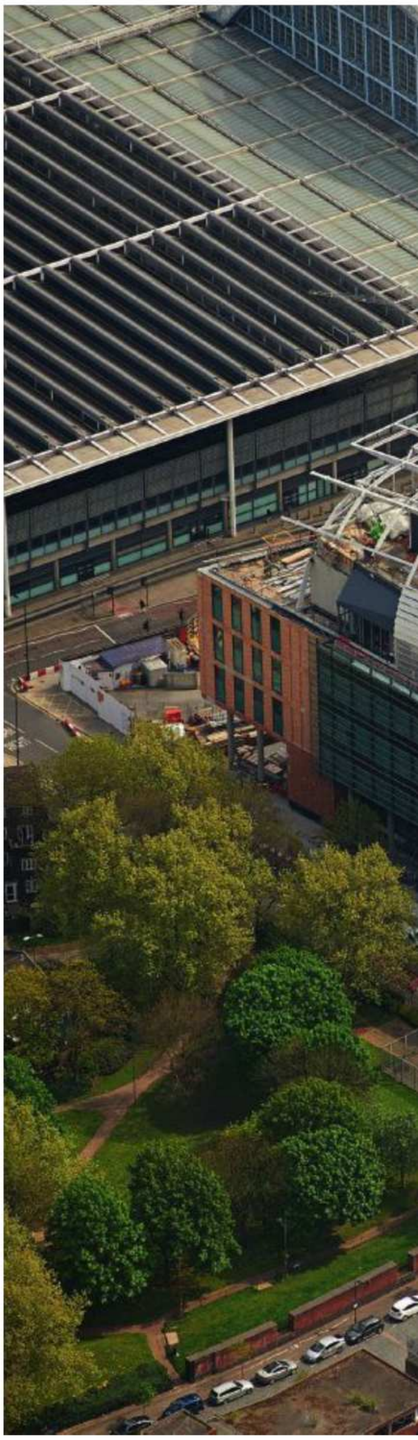
On completion in late 2015, the Francis Crick Institute will provide a world-leading biomedical research facility formed through a collaboration by six influential scientific and academic organisations: the Medical Research Council, Cancer Research UK, the Wellcome Trust, UCL, Imperial College London and King's College London.

The central London building will accommodate 1,500 staff, bringing together multidisciplinary teams in the largest such facility in Europe. It includes labs and research space, teaching facilities, exhibition and social spaces and a community facility.

The design, by HOK, encourages integrated ways of working, fostering collaboration between academic disciplines as well as promoting public engagement. PLP Architecture was invited to collaborate with HOK on the development of the external massing and act as lead designer on the design of the building envelope.

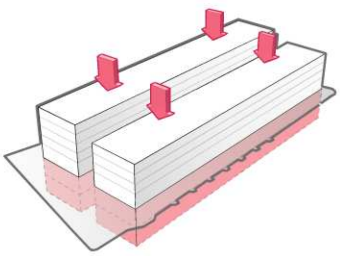
The massing and elevations express the arrangement of the various building functions and are intended to respect the Institute's neighbours – St Pancras International Station and the British Library. Two new public spaces are created: a small green park fronting the corner of residential streets to the west and a piazza fronting the station to the east.

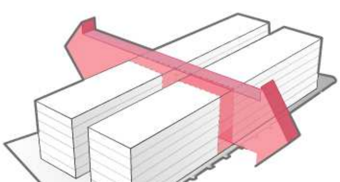
The base of the building contains the public and social spaces and is extensively glazed to link the interior and the exterior. The body of the building is composed of two long laboratory wings that run east to west, separated by a glazed-ended atrium that flares out to the east. The southern wing consists of ground plus five storeys; the north, ground plus four storeys. The wings are bisected by a north-south atrium dividing the building into four distinct science 'neighbourhoods'. The resulting cruciform atrium introduces daylight deep into the laboratory quadrants through its glass roof and four glazed end walls.

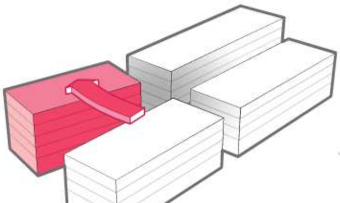


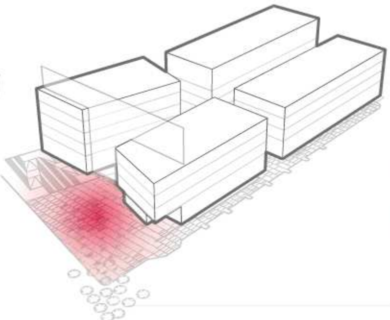
RIGHT The laboratory blocks and solid areas of the facade at the lower levels are wrapped in mortared terracotta in reference both to civic neighbours and the local 'vernacular'. Above the laboratory wings sit two vast vaulted roofs which echo the Victorian canopy over St Pancras Station and enclose the large plant volumes required to service the building. To the east and west, the roof shells cantilever beyond the facades to signal entrances (phs: Laing O'Rourke).

BELOW Photovoltaic louvres on the 79,500-square-metre Institute, which sits on a 1.47ha site (including public realm) in Camden.

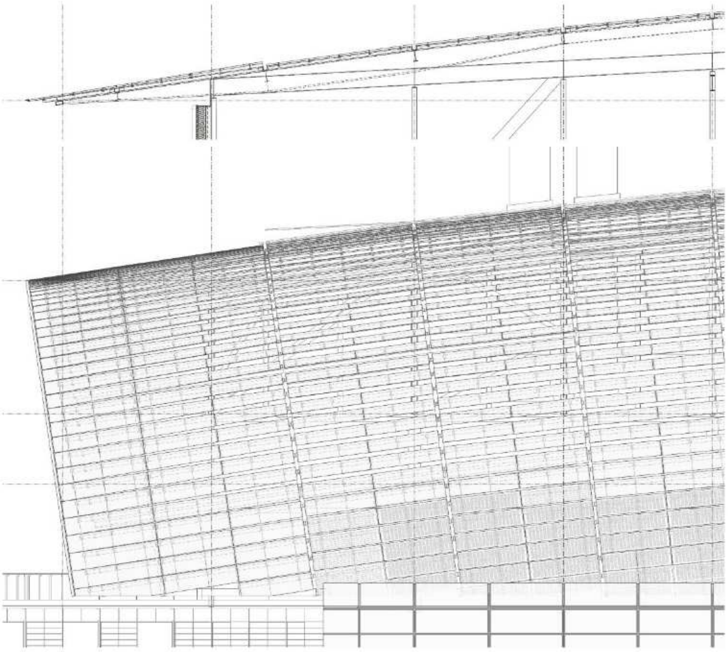


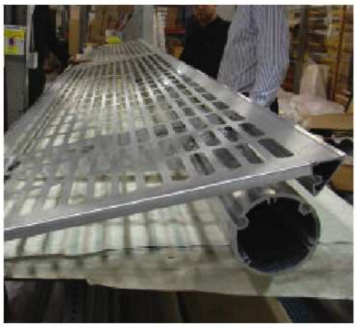






Project: Francis Crick Institute, London
Architect: HOK and PLP Architecture





Roof Construction

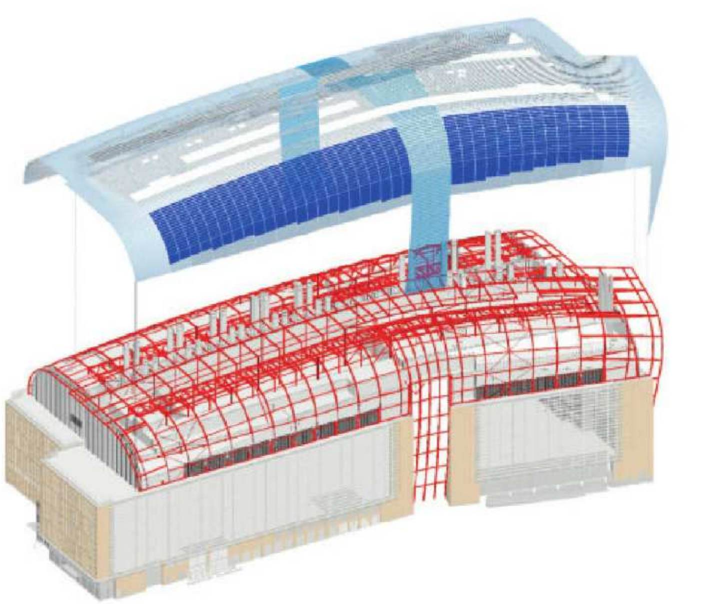
The underlying structure of the roof is painted steel, hooped in the north-south direction and gently curved in the east-west direction. This grid is braced back to the main building frame for stability and is capable of large cantilevers at the east and west ends and on the north side of the higher roof.

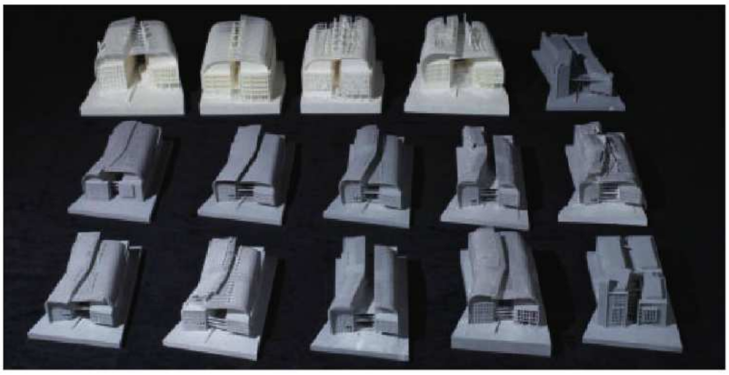
The visible surface is an extensive kit of different louvres, attached via transverse brackets to an extruded aluminium tubular spine spanning between the main roof hoops. These include solid and perforated aluminium and laminated glass blades of different widths, and photovoltaic blades, all angled at 15 degrees to the tangent of the hoop to which they are fixed. The east and west oversailing blades widen and flatten towards their ends to form a continuous curved roof edge. The twist is achieved by simply rotating the blade brackets around the central spine.

The cross-widths of the louvre blades reduce from 750mm at the lower levels to 150mm at the top where the roof flattens to provide more free area for plant ventilation. The spines are set at 750mm centres along the curve of the roof hoop structure. The blades vary in length from 6.0 to 6.5 metres.

The solid and perforated louvres are skinned in a natural anodised aluminum sheet bonded to an edge extrusion to ensure stiffness to prevent 'flutter'. Glazed and photovoltaic glass louvres are similarly bonded into the edge frame.

South-facing photovoltaic louvres comprise up to 144 mono-crystalline cells per blade, laminated into low-iron glass with integral micro-inverters.





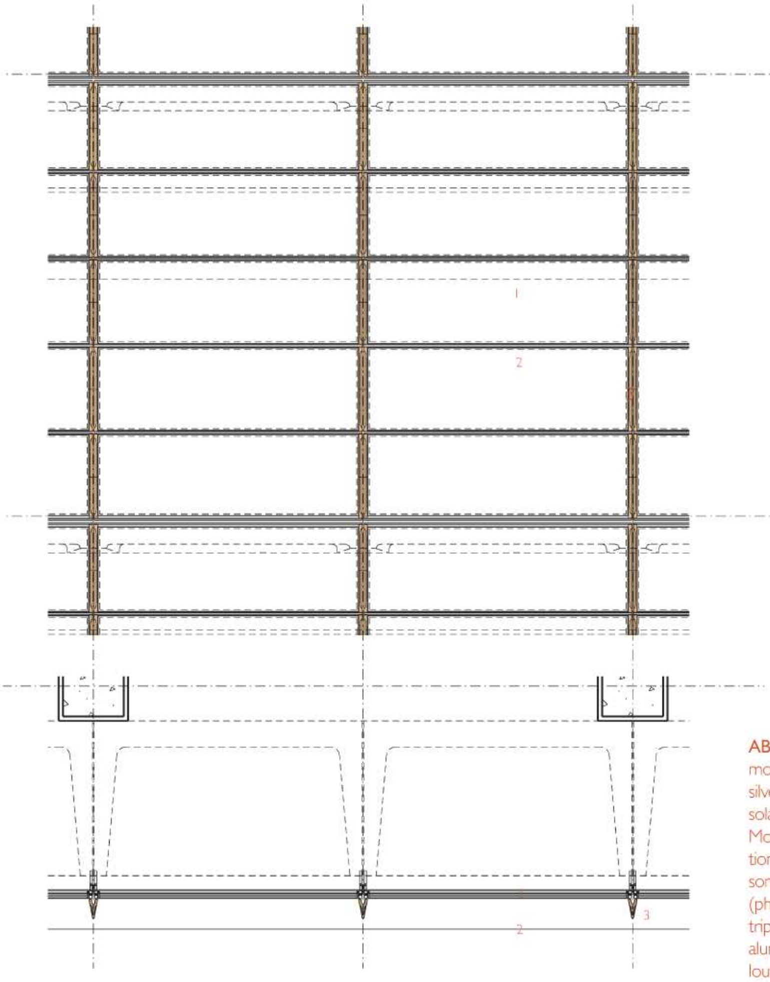
TOP Louvre fabrication and installation.
ABOVE, LEFT The roof form is derived from a parametric model generated by PLP Architecture in GenerativeComponents and MicroStation, which allowed many iterations to be tested quickly for massing purposes as well as clash detection. The model was constructed using basic mathematical elements such as coordinate systems, planes, points, lines and arcs and surfaces. The use of b-spline curves and nurbs was generally avoided to achieve a more precise definition of geometry and a simpler construction. Roof surfaces are flat, single- or double-curved – the latter are part of a torus, whose curvature in one direction is constant. The key established surface is the exterior face of the steel structure; everything outside this is the 'facade' build-up. The model was also used to produce tender information, by the structural engineer for the steelwork set-out, and by the louvre manufacturer as the basis of its own drawings.

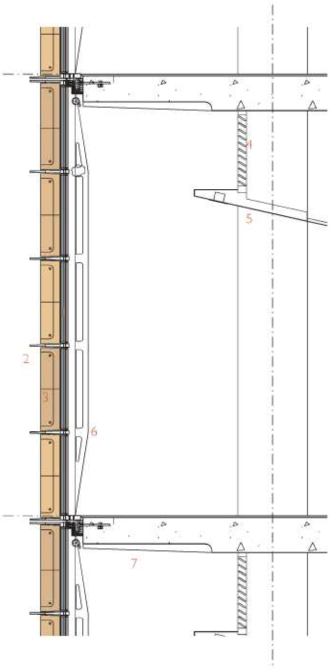
Facade Construction

Each of the building's four quadrants is book-ended by a service core expressed as solid masonry. These frame laboratory floors expressed as large-format glazed curtain walled zones. These north and south elevations are formed from storey-height triple-glazed, thermally-broken aluminium units, split vertically into five equal vision panels. This facade encloses the long perimeter corridors linking labs and write-up spaces, and gives deep natural light penetration.

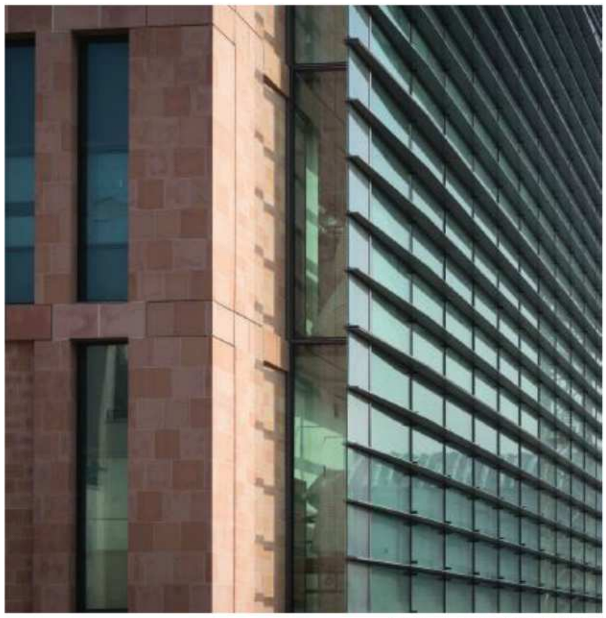
The dark grey polyester powder-coated frames are shallow; to achieve the five-metre height and 3.1-metre widths, additional elements acting compositively with the frames provide structural depth to resolve wind and barrier loads. Internally, these elements comprise paired aluminium fins machined from solid plate with tapered ends and tall vertical cut-outs to allow transparency at oblique angles. Externally, narrow, deep extruded horizontal fins span between the mullions. These act as a brise soleil, shading the facades.

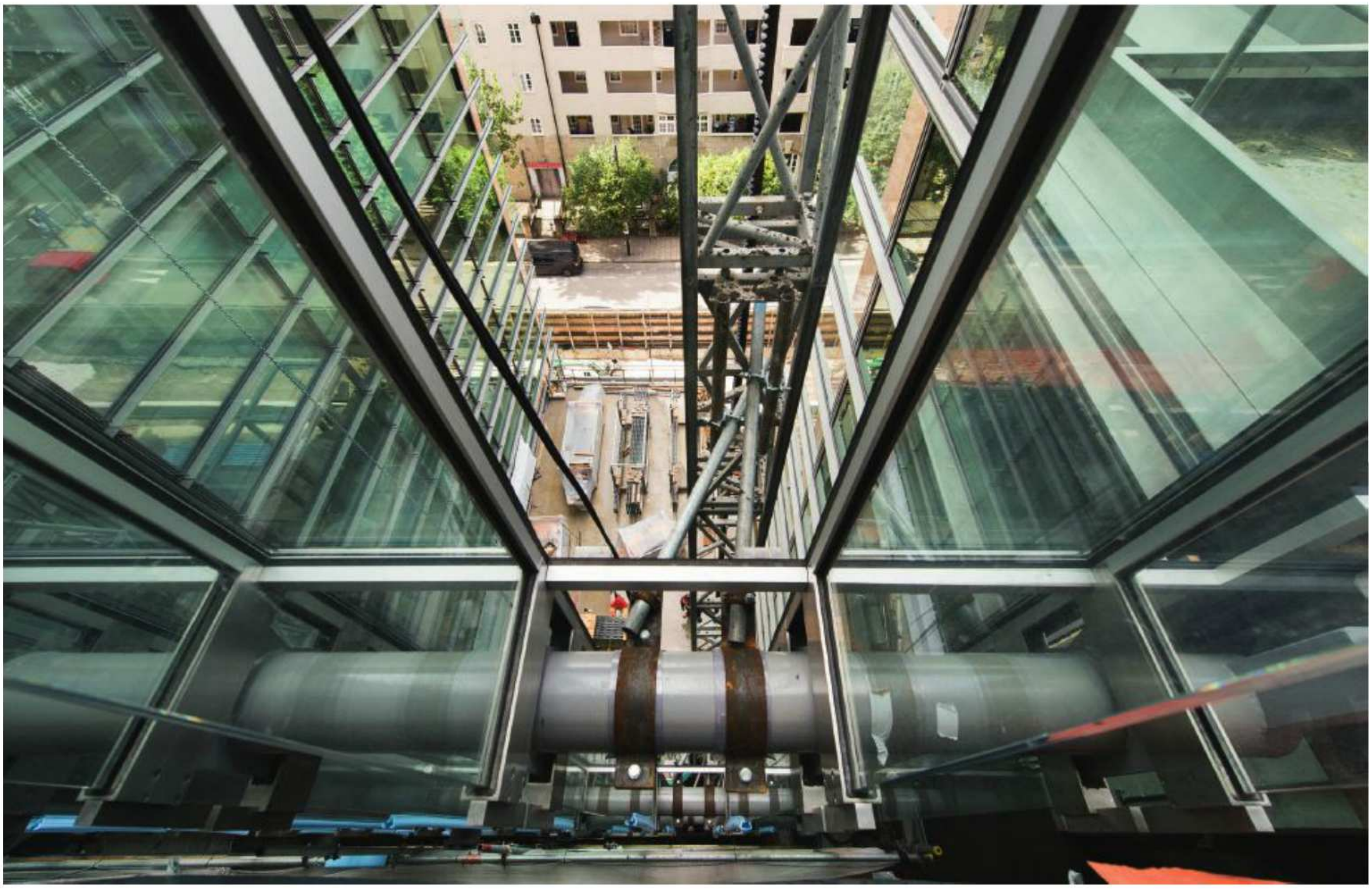
The moulded natural terracotta nosings that clad the mullions were introduced to 'soften' the horizontality of the facade.





ABOVE, BELOW Curtain walls with terracotta mouldings to the north and south facades. A triple silver coating to the glass provides high thermal and solar performance and excellent light transmission. Motorised fabric roller blinds provide glare protection to write-up spaces. Manual override allows some control over their automatic operation (phs: Wellcome Images). Key: 1 high-performance triple-glazing, 2 horizontal powder-coated finish aluminium fins, 3 vertical terracotta fin, 4 ventilation louvres, 5 suspended ceiling, 6 machined aluminium plate fin, 7 exposed sculpted concrete soffit.





Atrium Facade Construction

The eight-storey east atrium facade has a primary structural grid of tubular steel sections at 6.0m centres and at each floor level, with wind loads taken back to the cross atrium bridges which act as a beam in plan. All structural penetrations through the facade are thermally broken using high-load isolator plates.

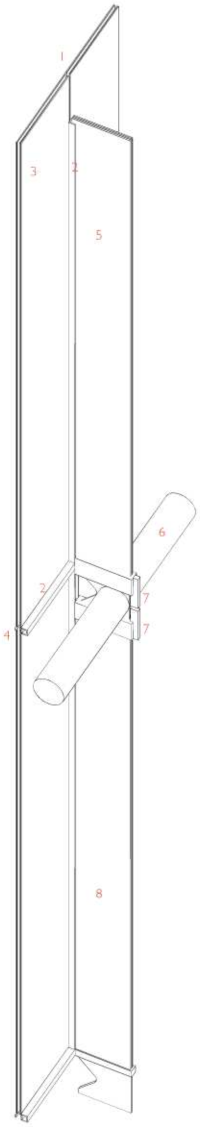
The weather skin is 5.08m-high double-glazing fixed back to vertical glass fins at 0.75m centres spanning floor to floor. The fins are predominately on the outside of the glazed wall, but where the atrium facade abuts the main body of the building, the system reverses with the fins being on the interior. This leads to an unusual detail where the glass fin becomes part of the thermal envelope, which is achieved by adding a further layer of glass to make it a double-glazed unit.

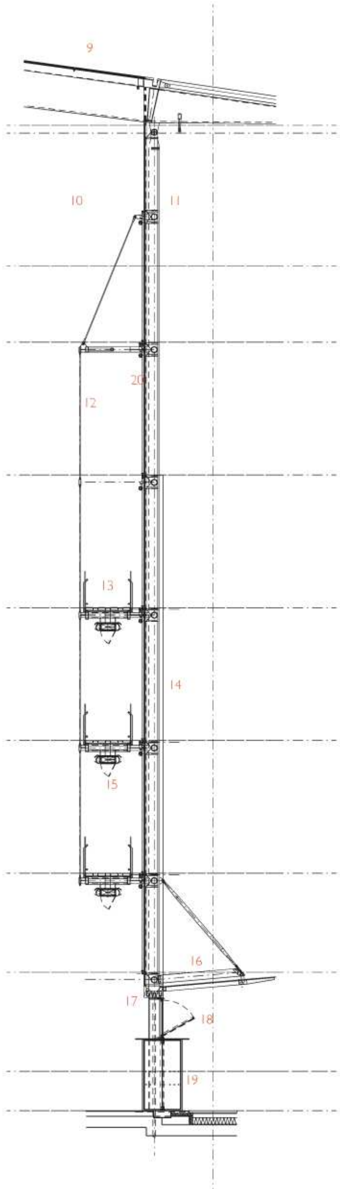
The low-iron glass fins (4.6m high and 0.45m deep) comprise three structural layers bonded together with Dupont Sentry Plus interlayers. Their visible edges are polished. To introduce flashes of colour in a random pattern across the facade, an additional dichroic interlayer is incorporated to the outside of many of the fins, protected by a thin glass sheet. The fins are bonded into stainless steel shoes which are fixed back to the facade steelwork.

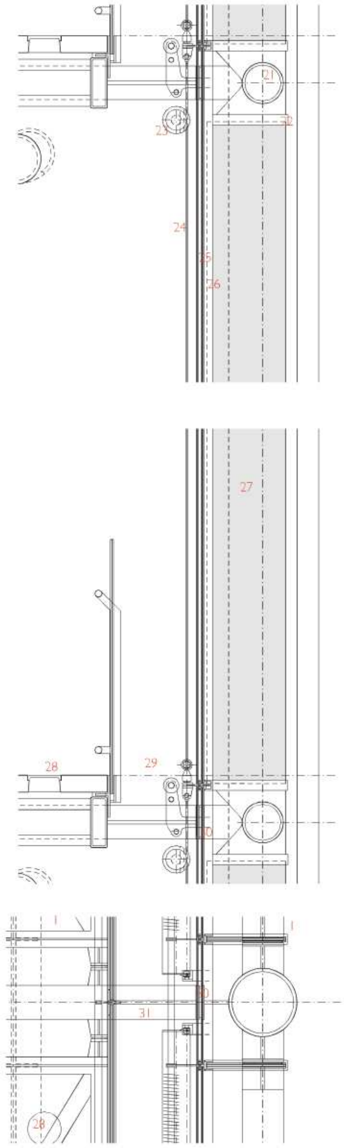
Argon-filled double-glazed units are low-e coated to minimise heat loss. A continuous stainless steel strip bonded to their inner face provides the fixing back to a minimal anodised carrier frame which is structurally bonded to the glass fin. The vertical glass-to-glass joint is face-sealed with silicone.

The horizontal joints have an expressed nosing detail to conceal the floor-to-floor deflection joint. Three-metre-long motorised blinds, suspended from stainless steel rods, are incorporated for solar glare control.

A 19m-wide, 7m-deep laminated glass canopy is supported off the primary structure via plate beams and tubular suspension members. It declines back to a gutter concealed in the offset between the glazing at ground and first floor. The glass has a dot frit to its top surface to give shading to the ground floor. The visible edge is ground and polished at a 45 degree angle to achieve a prism effect when exposed to sunlight.







OPPOSITE Construction in progress on the atrium facade with primary horizontal CHS steel structure; mock-up of cruciform tubular section of primary steel structure; construction of glazed atrium/main entrance facade and curved roof structure (March 2014).
LEFT Glass fin axo; atrium facade section; atrium facade detail. Key: 1 silicone seal, 2 natural anodised carrier frame, 3 laminated low-iron double-glazing with low-e coating, 4 horizontal pressure cap, 5 triple-glazed low-iron fin, 6 steel atrium facade structure, 7 stainless steel fin shoe, 8 quadruple-glazed low-iron dichroic fin, 9 atrium roof, 10 interior, 11 exterior, 12 bridge suspension structure, 13 atrium bridge, 14 glass fin, 15 services duct, 16 entrance canopy, 17 drainage gutter, 18 make up air vent, 19 revolving door, 20 atrium facade line, 21 horizontal steel support structure, 22 stainless steel shoe bracket, 23 BMS controlled motorised fabric roller blind, 24 stainless steel blind guide rod, 25 laminated double-glazed unit, 26 natural anodised carrier frame, 27 laminated glass fin, 28 internal bridge link, 29 spiral fin radiator, 30 thermally broken structure, 31 steel cruciform beam.
BELOW Construction of atrium facade with primary steel structure grid of tubular sections with atrium bridges acting as a structural beam; CGI of east entrance facade (ph: Wadsworth 3D); dichroic fins.

Credits Architects: HOK with PLP Architecture; structural engineer: AKT II; services engineer: Arup; facade engineer: Emmer Pfenninger Partner; environmental engineer: URS; planning consultant: CB Richard Ellis; project manager: Arup; costs: Turner & Townsend; main contractor: Laing O'Rourke; curtain wall and atrium envelope contractor: Scheldebouw with Josef Gartner; roof louvre contractor: Levolux; client: The Francis Crick Institute.