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ROLLIN' ON HOVE

Design and construction of the new Hove Beach Skate Plaza

LOW-CARBON CONSTRUCTION

Leveraging the LCCG Market Benchmark: a precast concrete perspective

REINFORCEMENT AND ACCESSORIES

Looking at a new guide on the benefits of prefabrication

MAIN IMAGE:
New lecture theatre with exposed concrete frame and elliptical beam.

The Warburg Institute, London

Client
The Warburg Institute, University of London

Main contractor
Quinn Heritage London

Architect
Haworth Tompkins

Project manager
Artelia

Cost consultant
Artelia

Structural engineer
Price & Myers

Concrete specialist
David Bennett Associates

Concrete subcontractor
4-Site

Formwork
Cordek

Acoustics
Gillieron Scott Acoustic Design

Heritage consultant
Alan Baxter

(Photo: Hufton+Crow)

THE WARBURG INSTITUTE, WOBURN SQUARE, LONDON

The Warburg Institute, founded by Aby Warburg in Hamburg in 1900, is one of the world's leading centres for studying the interaction of ideas, images and society and has been part of the School of Advanced Study, University of London since 1944. Its open-stack library, photographic collection and archive enable interdisciplinary research, postgraduate teaching and prestigious events and publication programmes. It is housed in a historic Charles Holden Building, part of the University of London's Bloomsbury campus. **Nigel Hetherington** and **Elizabeth Flower** of **Haworth Tompkins** and **Paul Batty** of **Price & Myers** report.

(Photo: Hufton+Crow.)

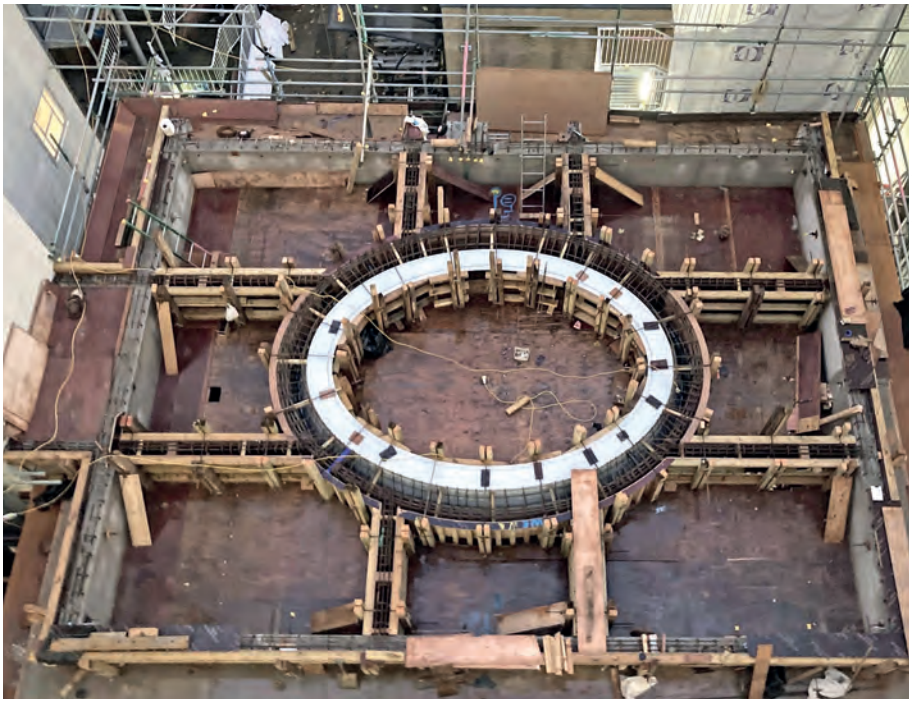
Following an invited competition, Haworth Tompkins was appointed as architect and lead consultant on an ambitious refurbishment of the institute – the 'Warburg Renaissance'. The project presented an opportunity to open up its collections to new audiences and facilitate a more public-facing programme. In addition to much-needed upgrades of the existing building fabric and mechanical, electrical, plumbing (MEP) services, the brief included new and enhanced spaces, a purpose-built lecture theatre, public gallery space, classrooms and new storage and study areas for the library collections.

The existing building, completed in 1958, was one of several university buildings by Charles Holden, including the well-known Senate House, and was intended to be the northern 'bookend' of the ambitious (and largely unrealised) campus masterplan. Although a fairly unassuming façade, Warburg has a certain gravitas, through well-proportioned spaces, a simple material palette and careful detailing of stone and timber. The architectural approach aimed to respect these qualities, while also modernising, extending and reconfiguring the spaces to accommodate the future requirements of the institute. Key to this was the insertion of a new two-storey extension into the previously underused courtyard, providing 330m^2 of space for a new lecture theatre and secure reading room for viewing the special collections material.

The courtyard extension required a clearly legible structure that would complement the aesthetics of the existing building. The as-struck structural concrete frame draws on inspiration from many of Holden's other designs, such as the ticket hall at Oakwood Station or the more ornate entrance hall at Senate House. This expressed frame helps to delineate new from old and facilitates the large, glazed openings within the walls and roof.

HISTORICAL IMPORTANCE

The original Warburg Library in Hamburg contains a reading and lecture room of significant historical importance, designed by Aby Warburg. The room is partly elliptical in shape and features an elliptical roof-light; the shape was an important symbol for Warburg, representing concepts of freedom and continuous oscillation between thought and research. The design of the new courtyard extension



(Photo: Haworth Tompkins.)

LEFT:
The Warburg Institute exterior.

ABOVE:
Formwork for the elliptical beam.

was seen as an opportunity to reintroduce Warburg's ellipse; thus, the structure integrates an elliptical ring beam at the centre, formed with a double curvature.

Haworth Tompkins worked with structural engineer Price & Myers and concrete specialist David Bennett Associates to develop the design and formwork arrangements that would enable the intricate detailing and sequencing of the concrete pours. The final design of the extension incorporates slender columns – expressed as double-height within the adjacent lightwell spaces – and exposed downstand beams.

Working with main contractor Quinn Heritage and its concrete subcontractor, 4-Site, the team conducted early visits to well-executed concrete in nearby buildings, setting benchmarks for the quality of the as-struck concrete.

CANTILEVERS

The new structure had to fit within and over elements of the existing building, which resulted in cantilevers in multiple directions and the roof over the lecture theatre, with its central elliptical beam set within a grillage, is intrinsically a two-way spanning structure. Although cantilevers are not ideal for a concrete structure, this material is perfect for the lecture theatre ceiling and it is this, as well as the architectural preference for exposed concrete surfaces, that has driven the design.

The use of slender columns and shallow beams at the lower floors and the interaction of the grillage beams and ellipse in the principal ceiling have required extreme care in the detailing of reinforcement. The continuous variation in curvature of the ellipse has required the use of small-diameter (typically 12mm) longitudinal bars, fixed in three layers, which were delivered as straight bars and then eased into shape on-site to suit the precise lines of the formwork.

The connections between the ellipse and the grillage beams are of critical importance to the performance of the ceiling and used larger diameter L-bars slotted into the spacer zone between the lowest and intermediate layers of bars in the elliptical beam. This required great diligence from both the RC detailer, Trevor Plumb and 4-Site. It should also be noted that the availability of an almost complete set of original reinforcement drawings for the existing building was an invaluable asset.

(Photo: Fred Howarth.)

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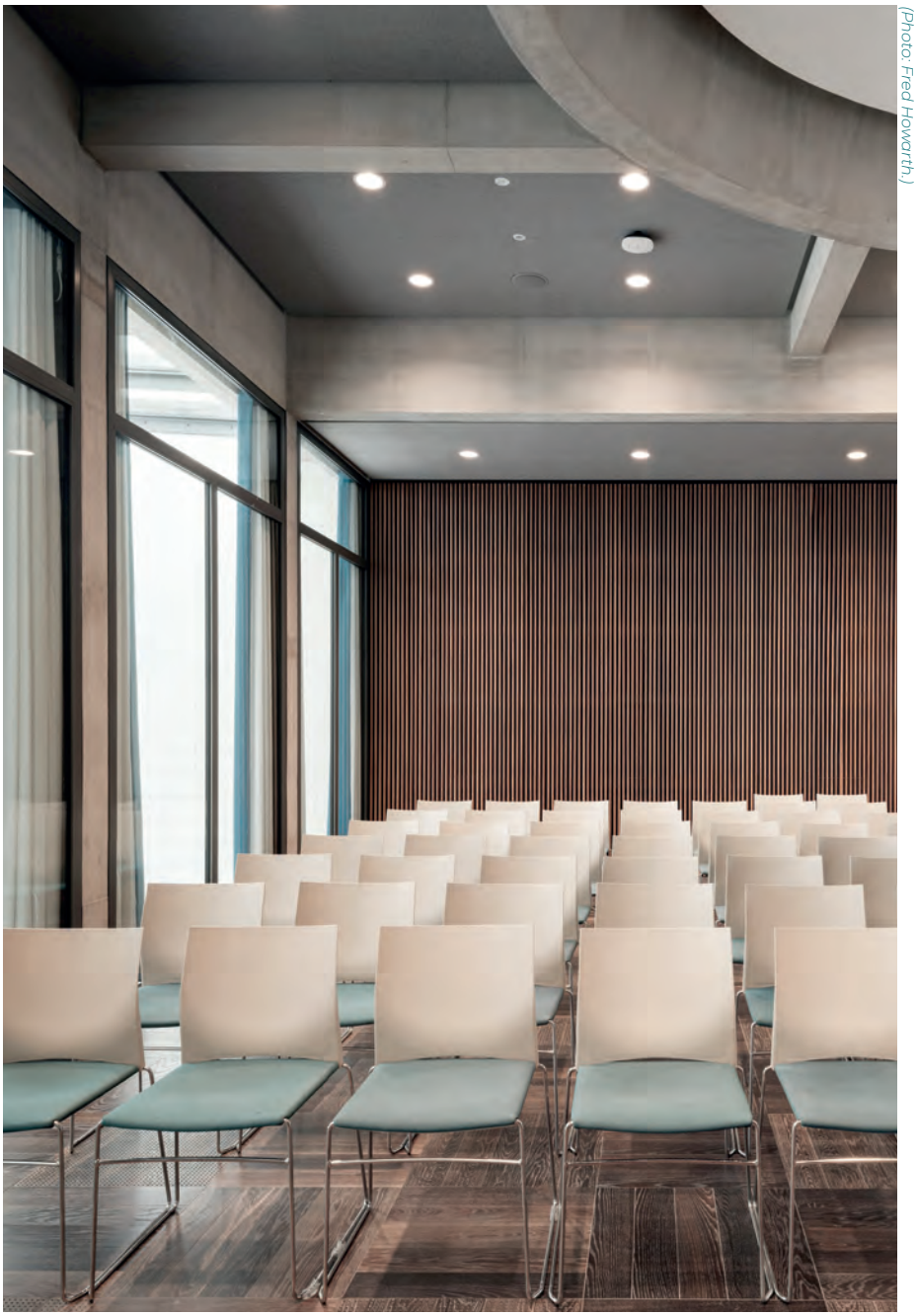

(Photo: Fred Howarth.)

TOP:
Lightwell between existing and new.

ABOVE:
Warburg ellipse detail.

ABOVE RIGHT:
New lecture theatre.

While looking at mix and aggregate options, it became clear that self-compacting concrete (SCC) would offer many benefits (including eliminating the need for vibration of the slender column profiles). A Tarmac mix was agreed and sampled on-site.

MDO formwork, with all board joints and day joints carefully set out, was used, with strengthened supporting props required by the additional hydrostatic pressure of the SCC. Due to the complexity of the geometry of the elliptical beam (the angled inner face meant a double curvature), the formwork shape was CNC-formed and cast in fibre-glass, in two sections by fabricator Cordek. A concave plywood disk was fabricated in-situ, with soft plaster finish and back-lit, strengthening the expression of the elliptical shape.

The concrete finish (sealed using Keim Concretal-Lasur) was architecturally successful, bridging the softer material finishes – stained oak joinery and flooring, fabric ceilings – with the harder detailing of the steel-framed glazing and the original courtyard tiling and Crittal windows.

LIGHTWELLS

Two double-height lightwells separate the lecture theatre from the courtyard façades and allow natural light down onto study spaces in the reading room below. Windows in the entrance foyer and main reading room give sight lines into the lightwells and through the glazed walls of the lecture theatre, allowing glimpses into the inner workings of the institute not previously available to the public.

On the ground floor, a new 185m^2 public gallery has been created and the much-loved main reading room has been retained, with the refurbishment providing new finishes, lighting and seating. On the upper levels, the library stacks were reorientated back to their original position perpendicular to the external walls, bringing natural light deeper into the plan. The denser arrangement, combined with the expansion of the library areas, has increased capacity for 20 years' future growth and facilitated full reinstatement of Warburg's unique cataloguing system. The project embodies a reinvigoration of the Warburg Institute, with the concrete-framed extension a centrepiece of the design.