OFF THE CHART

We take a look at Heyne Tillett Steel's exemplary low-carbon CLT offices for its staff on Chart Street in Shoreditch

Client/Engineer: **Heyne Tillett Steel**
Architect: **Ian Chalk Architects**
Workplace consultant and designer: **spacelab_**
Timber sub-contractor: **B&K Structures**

BUILDING REVIEW

Windows on the world — the building is the redevelopment of an existing 1930s masonry warehouse

THE CLIENT'S ACCOUNT
Tom Steel
Director, Heyne Tillett Steel and co-owner, CSI Investments

On Chart Street we were in the unusual position of being the client, future tenant and structural engineer for the project. This gave us the opportunity to create a building that was not only tailored to our specific business needs and embodied our culture and values, but also a good piece of architecture and an enjoyable space to be in.

When we first walked around the site, we immediately saw its potential as an office space for the practice. The original building is a 1930s warehouse, built on the site of a historic burial ground. The structure of loadbearing masonry, steel frame and concrete floors had been left largely unchanged since it was originally built, making it ideal to expose and celebrate. With windows on all four sides, it also had great natural light and the opportunity for natural ventilation. All in all, the building had 'good bones'! We appointed Ian Chalk Architects to design the building—we have known Ian for many years, and he understands the way we work.

As structural engineers, our work is all about designing low embodied-carbon buildings, and we wanted our office to be an exemplar of this. Reflecting our commitment to reuse, we retained as much of the building's original fabric as we could, and created a new top floor and side extension in engineered timber. We also limited the use of finishes, allowing the structure to be visible and reducing unnecessary carbon. This strategy created an embodied carbon value for the structure of 171kg CO2e/sqm, meaning it outperforms the RIBA, LETI and IStructE targets.

As a growing business, one of our biggest challenges is creating opportunities for people to integrate, collaborate and share ideas. To help achieve this we introduced an internal central stair that links all the floor spaces and created a new large top floor with communal kitchen to comfortably accommodate everyone for our daily lunches. The new top floor gave us complete flexibility to do what we wanted with the structure. Here, Ian Chalk Architects designed the northlight roof profile which provides good natural light while keeping the space a good temperature.

Delivering the project through the COVID pandemic was a real challenge. Not only did we have the site work to contend with, but we were also faced with the existential threat of the future of 'the office'. Would we ever return to working in an office, and if we did, what would that space look like? We worked closely with Spacelab during the pandemic to develop an interior design which allowed for more flexible working, increased levels of natural ventilation, introduced isolated quiet booths for virtual calls and created open-plan meetings rooms, as well as accommodating storage for up to 60 bicycles.

In September 2021, we asked everyone to come back to the office, working at least three days a week. In reality, most people are in the office a lot more than this, which is really encouraging. The space is light and airy and provides a good mix of spaces to work in. It is now our new home and one we are very proud of.

THE ARCHITECT'S ACCOUNT
Giles Wheeldon
Associate, Ian Chalk Architects

Conceived as an expression of its construction and sequencing, the new extension was built using a panellised, cross-laminated timber (CLT) system, and provides a new north lit studio and office space on top and to the side of the existing 1930s masonry building.

Inside the extension, the new materials have been left exposed, mimicking the rawness of the existing materials below: timber, steel and aluminium sit alongside concrete beams, terracotta pots and exposed brickwork. Deep rebates express the joints between panels, and at third floor level a continuous datum, informed by the maximum efficiency of manufacturing, tracks around the space forming the heads of windows and openings. This didactic material expression extends into the detail with welds, connections and services all carefully coordinated, allowing them to be enjoyed.

At the second floor, a new steel structure provides support for CLT slabs to span between—the combination of steel and timber chosen to mediate the transition between the old and the new. Above, bolted connections fix glulam columns to the new beams through precise pre-cut sections in the slab panels. Notched triangular panels span the glulam columns, allowing each 10m-long BauBuche beam to sit in place before being locked in by the next triangular panel. Finally, pitched roof slabs span horizontally, supported centrally at the northlight by steel 'T' sections.

While this interlocking design is simple and efficient, when set on a tight urban site in central London the reality is more complex. The variation of tolerances between the existing masonry and the new CLT provided very little margin for error, and using the structure as the internal finish limits the places to conceal damage, staining or services.

The end project was only viable through the careful coordination of the elements, managing to build and waterproof with a quick turnaround to ensure the protection of the finishes. The structure itself was erected in just over three weeks, with a top hat scaffold then provided to allow waterproofing to take place before window installation.

At Chart Street we employed a deliberately analogue approach to sustainability, one which relies on simple but robust decision-making throughout the process, limiting technology to reduce obsolescence and limiting finishes to maximise recyclability.

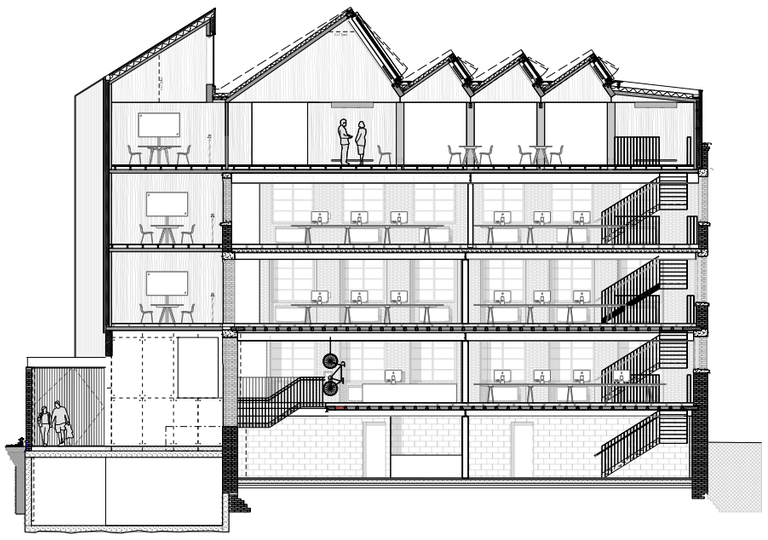
'The resulting project is a characterful and, we hope, enjoyable space to work in'

As an existing building, it's re-use was critical. The decision to use CLT for the new structure and limit internal finishes both reduced on-site construction time and embodied carbon compared with alternative and additional materials.

While this reductive approach to construction through limiting components, and additional finishes through minimising material waste is direct, it also contains more complex choices. The exposed brick was considered an important part of the building's character, and our decision not to insulate the existing masonry walls was seen as a balance between the embodied carbon of all the associated finishes and the potential carbon saved through heat loss over the operational life of the insulation This decision is now being monitored on site to determine its impact.

Natural ventilation is employed throughout the building, with triple-aspect office space providing a comfortable working environment throughout the day. Heat-recovery systems are used within the lower ground floors and new voids puncture the existing lower-ground floor slabs to maximise light into the lower ground floor spaces. The north-lit studio maximises daylight and minimises solar gain, while providing a highly efficient warm lid to the building.

The resulting project is a characterful and, we hope, enjoyable space to work in which carefully balances the patchwork of the old and the new, while clearly enjoying their differences.



Section showing the meeting and studio spaces under its distinctive roofline

Charter mark — 16 Chart Street in context, showing the existing building and new additions

Site savings — using CLT on the new structure and limiting internal finishes reduced on site construction time and embodied carbon

History in the making — the engineers began by looking at the building's past to understand its potential for reuse

BUILDING REVIEW

Wood works — BauBuche laiminated veneer lumber beams were selected for their strength to carry the sawtooth roof form

THE ENGINEER'S ACCOUNT
Andrew Howe
Associate director, Heyne Tillett Steel

Understanding a site and its potential is fundamental to the way we work. It defines our ability to create a great structural design, then push that design to be as efficient as possible. We always begin a reuse and refurbishment project by carrying out extensive investigations into the building's structure and foundations, using both low- and high-tech options including archive drawings, maps and surveys, on-site visits and modelling the existing structure in Revit. At Chart Street, gaining an understanding of the history of the existing building allowed us to understand its full potential for reuse, ultimately reducing demolition works and embodied energy costs.

Once we had completed our research and investigations, we worked closely with Ian Chalk Architects on the complex redesign of the existing building and increasing the floor area. A key structural intervention involved the remodelling of the top floor structure to create a large, open space for meetings and events. Constructed from cross-laminated timber panels, the new floor level has been designed as a flexible, column-free space with four rows of 10m-long north-light windows to maximise daylight while preventing excessive heat gain. A vertical lightweight CLT extension has been designed to the side of the existing building to complement the new sawtooth roof structure, alongside a new stair and lift core and a new covered entrance to the building.

When designing with timber, additional consideration is needed for the exposed connections and articulation of the joints to ensure consistency across the surface, such as the alignment of CLT panels along an exposed soffit to ensure the design looks considered. Another key interface is between the CLT floor panels and perimeter steel angle supports. To prevent an unsightly step between the elements we introduced a 10mm recessed shadow gap that created a clear separation of elements. Similarly, at the point where multiple angles of the BauBuche beam, glulam column and CLT panel connections to the roof were coming together, the introduction of a 6mm chamfered shadow gap helped to navigate construction tolerances between members.

Following extensive benchmarking and research into the strength and visual grade of different timber elements, we selected beech BauBuche laminated veneer lumber (LVL) beams to support the northlights and CLT panels. These hardwood beams provided the natural strength needed to carry the sawtooth roof form, as well as creating beautiful, clean finishes. The exceptionally high characteristic bending strength of BauBuche LVL (75 N/sqmm) allowed for smaller member dimensions than a softwood GL24h glulam beam, which has a lower strength of 24 N/sqmm. The BauBuche also benefits from an improved modulus of elasticity which helps reduce the cross-section over the longer spans. BauBuche LVL needs careful consideration of water protection strategy during transport and installation, as the beech is more susceptible to moisture ingress.

The new floor areas elsewhere in the building have been created using a hybrid of steel and CLT, freeing up the existing structure to create open-plan working areas, collaborative neighbourhoods and break-out spaces.

THE WORKPLACE CONSULTANT AND DESIGNER'S ACCOUNT
Nathalia Asamura
Senior interior designer, Spacelab_

We collaborated on the Chart Street project for over two years, beginning the process by engaging with a wide range of people from across the practice to ensure we had a holistic understanding of their ways of working. The culture of Heyne Tillett Steel (HTS) was a big factor that stood out during this discovery process. Working alongside the team, the future vision for HTS's new home was to create a great space for the lively, fun and innovative collective of people, composed mainly of cyclists!

Understanding how people collaborate and interact in the workplace shaped the design, that kept evolving over the two years. We had a signed-off design that was being built on site by the beginning of 2020, just when COVID hit. Luckily, we had enough time to accommodate some changes that we predicted would happen in the future of the workplace, such as the individual phone booths by the meeting rooms on the lower ground floor.

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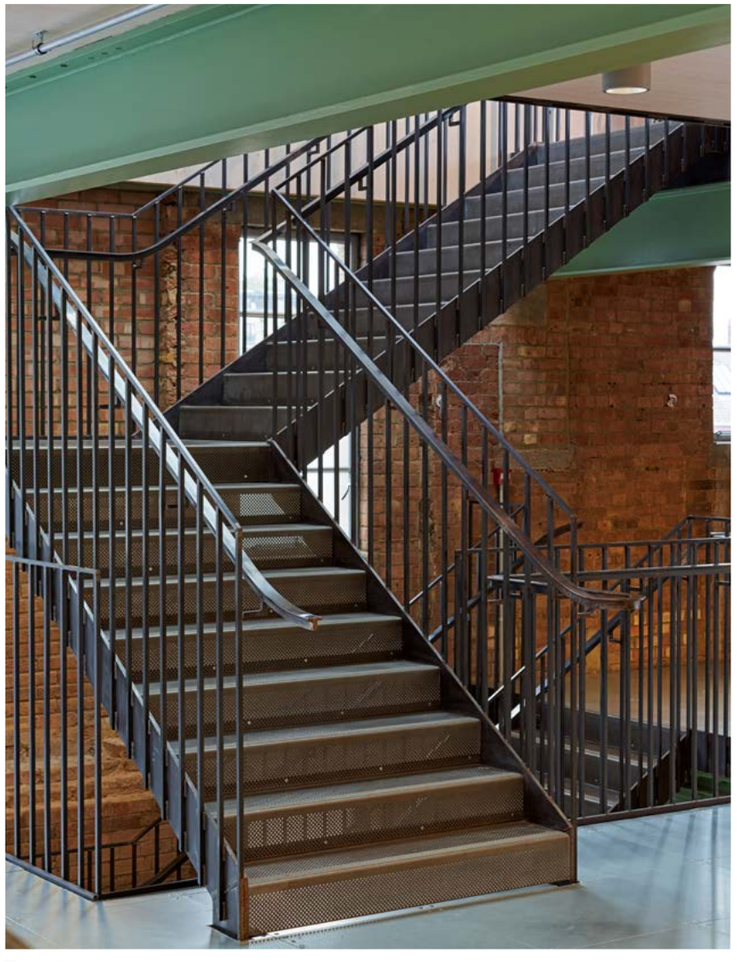
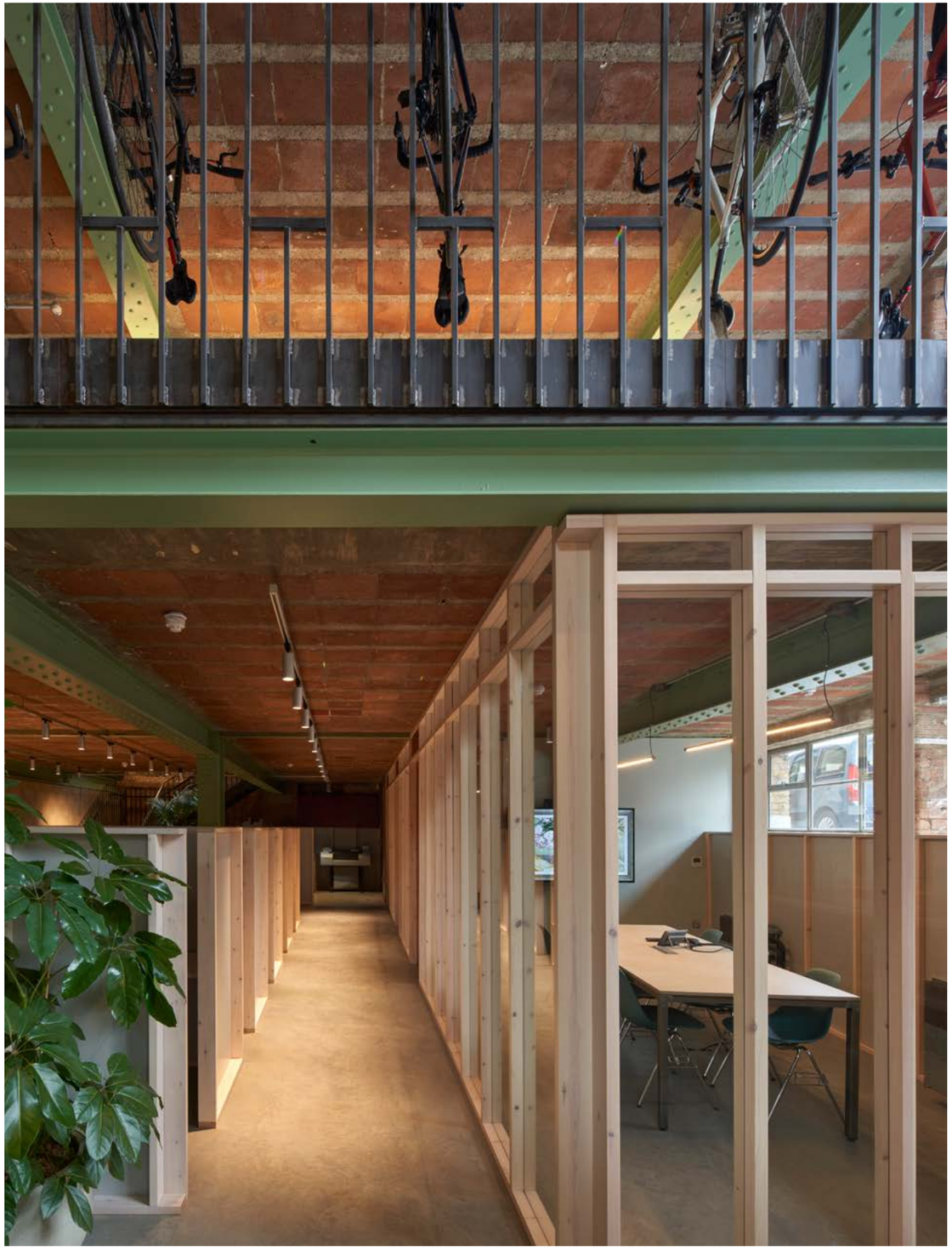


The building is top and tailed with shared amenities to encourage movement

Working alongside Ian Chalk Architects, we developed a strategy for the building to align with the practice's new ways of working. The workspace is spread over three floors, with project areas in the adjoining extension. The building is top and tailed with shared amenities to encourage movement, with meeting rooms, a workshop, crit space and library on the lower-ground floor and an impressive social, communal eating space and large meeting room on the top floor.

Taking inspiration from the linear language used on the extension facade, and with a nod to timber framework construction found in rudimental structural engineering, the interior fixtures and features are all based around a system of vertical softwood studs infilled with soft grey plywood panelling. All the components—including the reception, shelving, meeting rooms and quiet working booths—appear independent to the restored building fabric, leaving the exposed brickwork and painted green steelwork on view where possible.

The workplace has a cool, studio feel, with mild steel and plywood desks. Stand-up benches are positioned between desks with integrated lightboxes, with recycling points and shelving to hold individual personal A3 trays, which at the end of the day are returned to the oversized pigeonholes to ensure the space is clean and tidy for the next working day.



All the components appear independent of the restored building fabric, leaving exposed brickwork and painted green steelwork on view

Board room — one of the meeting spaces in the Chart Street scheme

THE TIMBER SUB-CONTRACTOR'S ACCOUNT

Lee Roberts

Pre-Construction Director, B&K Structures

B&K Structures (BKS) supplied and installed the cross-laminated timber, glulam and BauBuche beams, and the elements of structural steel. Our design team provided the temporary works for the propping of the structure during installation and worked very closely with HTS to contribute to the design and development of their connection details.

The main works were the top-level roof extension, where BKS installed the CLT floor, walls and roof and propped the walls and steelwork gradually throughout the erection phase. Challenges were presented due to the COVID pandemic, weather issues and reduced site deliveries due to minimal space to lay materials. However, the roof extension frame was erected in three weeks and the side erection in one week due to the strong collaborative approach between BKS, HTS and the main contractor, Conamar. The final result is, we think, a sustainable and stunning scheme.

The vast majority of the building materials were manufactured offsite, reducing construction time, carbon inefficiencies and labour costs, in order to erect the prefabricated materials on site. This method of construction helps to provide sustainable buildings which reduce the impact to the local environment and community. All the timber was sustainably sourced, with PEFC Chain of Custody certification. The total volume of the CLT, Glulam and LVL delivered was 194.71m³ (PEFC and 70 per cent PEFC) and the CLT and Glulam timber used on this project has captured 145 tonnes of CO_2e. The responsible management of European PEFC forests ensures that the timber used on this project was completely replaced by new growth in just 1 hour, 13 minutes and 46 seconds. ●

Edmund Sumner; Robert Greshoff

Prefabulous — the vast majority of the building materials were manufactured offsite