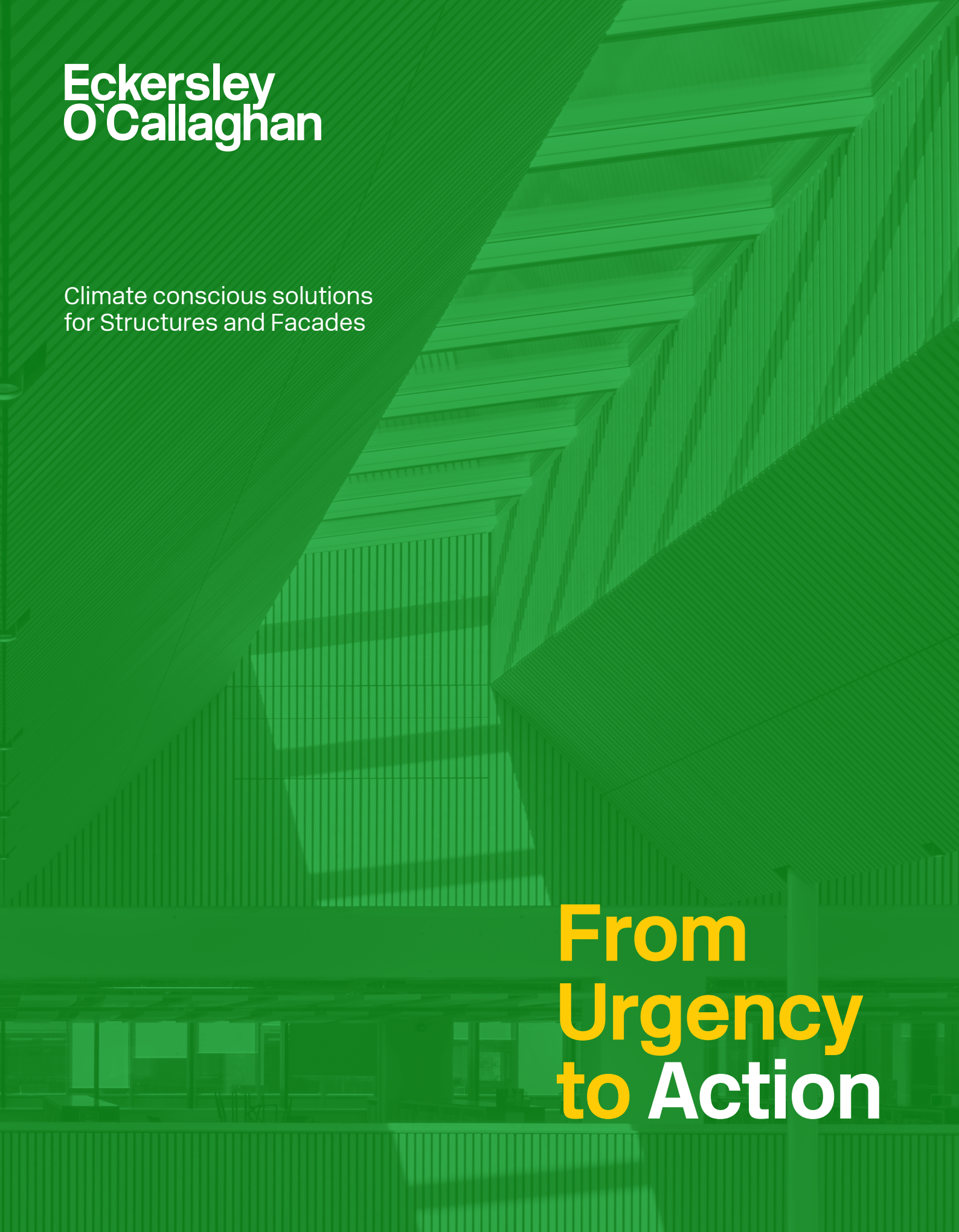
Eckersley O'Callaghan

Climate conscious solutions for Structures and Facades



From Urgency to Action

Contents

This document contains interactive features

Eckersley O'Callaghan is a global leader in sustainable engineering, collaborating with visionary clients on projects that push the boundaries of what is possible.

Vitsœ Headquarters
Royal Leamington Spa, UK

Championing sustainability from within

An inclusive & diverse studio. Our international team of specialists across the globe bring together perspectives which impact design, challenge preconceptions and encourage debate.

Sustainable thinking informs all our projects, beginning at the earliest conceptual stages and continuing right the way through to completion.

Since forming in 2004, our team has grown to more than 140 across offices in London, Manchester, Paris, Milan, New York, San Francisco, Los Angeles, Hong Kong, Shanghai, Delhi and Sydney.

We have established an international reputation for our creative, yet rigorous approach to engineering structures and designing facades. We work on a range of extraordinary building projects across the world, from complex structures of timber, steel or concrete, through to bespoke glass designs and spcialist heritage projects.

Our innovative work has received some of the highest accolades in the industry, and we are synonymous with pioneering new advances.

Through our continued engagement with architects, designers and the wider built environment and manufacturing industries, we have been able to propel our pioneering use of materials to realise projects of exceptional quality, efficiency and elegance.

Our approach goes beyond the built asset. We recognise our responsibility to promote social equity and prioritise the needs of the local community in our design solutions.

Across our offices, we provide platforms for a new generation of climate-aware engineers and designers to constantly strive to learn and improve their methods, incorporating new technologies and design approaches to achieve greater sustainability.

2023 Construction News Awards
Low Carbon Project of the Year
The Black & White Building - Shortlisted

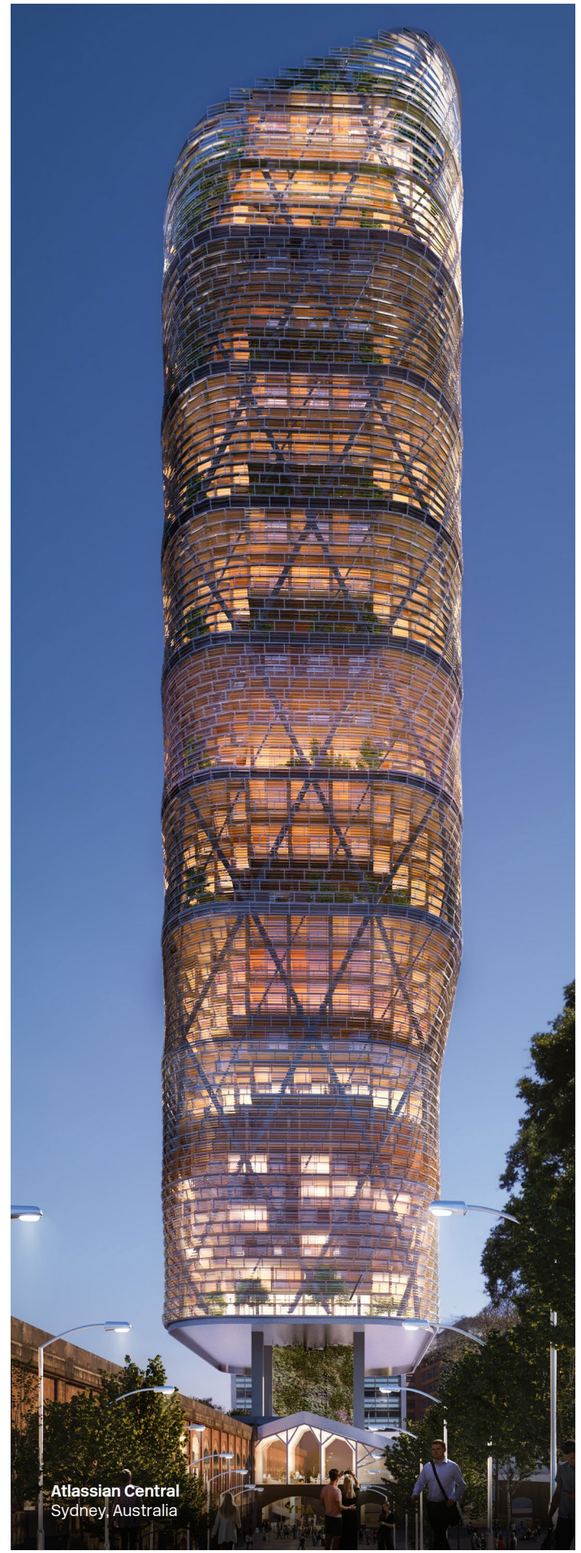
2022 Construction News Awards
Net Zero Team of the Year

2022 IStructE Award for Transformative Sustainable Design
London South Bank University

2021 Holcim Award for Sustainable Construction
Atlassian Central - Special Commendation

2019 IStructE Award for Sustainability
La Référence de Ganthier

2018 RIBA South East Sustainability Award
City of London Freemen's School Swimming Pool



Atlassian Central
Sydney, Australia

The Black & White Building
London, UK

We have a responsibility to create sustainable and resilient societies where people and nature flourish. Our vision to advance sustained economic, social and environmental wellbeing is underpinned by the sustainable engineering services we provide to help our clients meet the future with confidence.

Our commitment

To guide our collective efforts in a sustainable direction, we have implemented a **Climate Action Charter** based on ten pillars.

To put this charter into practice and adopt a systemic approach to addressing the climate emergency, we are increasing communication and collaboration between our teams and offices, as well as our external partnerships.

Climate Action Charter

1. Assess the embodied carbon of all our construction projects
2. Challenge the briefs to reduce their environmental impact
3. Optimise designs to be inherently efficient
4. Challenge the industry and traditional practices
5. Specify low carbon materials and systems
6. Facilitate reduced energy consumption and increased internal comfort
7. Develop resilience strategies
8. Maximise the service life of the buildings and challenge the need for new build projects
9. Integrate circularity principles as a basis of our projects
10. Share knowledge and experience

Our approach to whole life sustainability

We tackle carbon at each stage of a building's life – from cradle to grave – whilst interrogating wider sustainability issues such as resilience, waste reduction, energy performance, thermal comfort, biodiversity net gain and sustainable procurement.

Our life cycle analysis (LCA) evaluates the burdens throughout the entire building life span, quantifying the embodied environmental impacts of the building and its constituent materials.

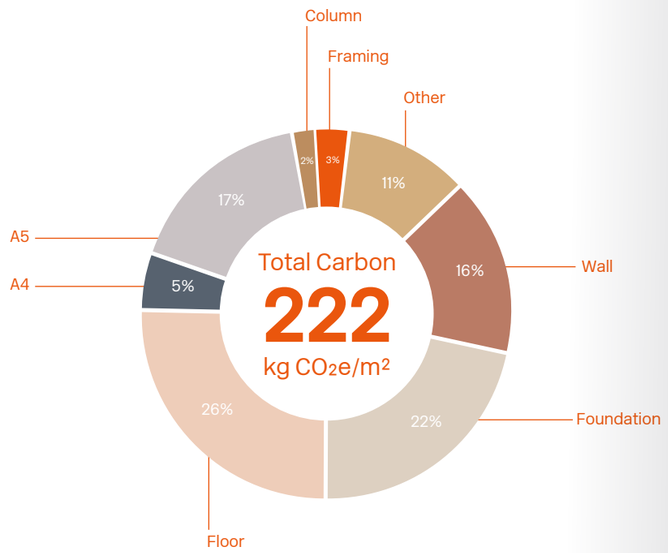
The quantitative data collected from our LCA provides a basis by which we can provide clients with practical means and measures for initiating sustainable building practices.

The Black & White Building
London, UK

Buildings are responsible for around 40% of global carbon emissions.

'Up-front Carbon' refers to the emissions released before the built asset is used and includes carbon emitted through construction materials – from its extraction, through manufacture, to installation, and the emissions associated with the construction works.

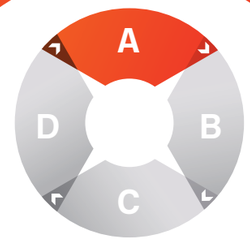
Limiting embodied carbon cannot be an afterthought, it needs to be integrated early into the design attracting the same focus as other design considerations. We push our clients and teams to consider all opportunities to reduce upfront emissions at the earliest stages and actively challenge briefs and designs to find new approaches to deliver better solutions.



Combined Structural and Facade carbon emissions, excluding sequestration for The Black & White Building, far less than the LETI 2030 target of 284 kgCO_2e/m^2.

Reduce up-front emissions

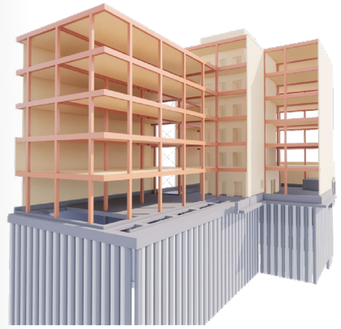
- Reduce material quantities
- Reduce pre-consumer waste production
- Increase prefabrication
- Design for manufacture and assembly
- Source locally and transport efficiently

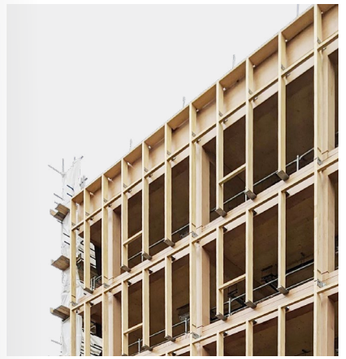


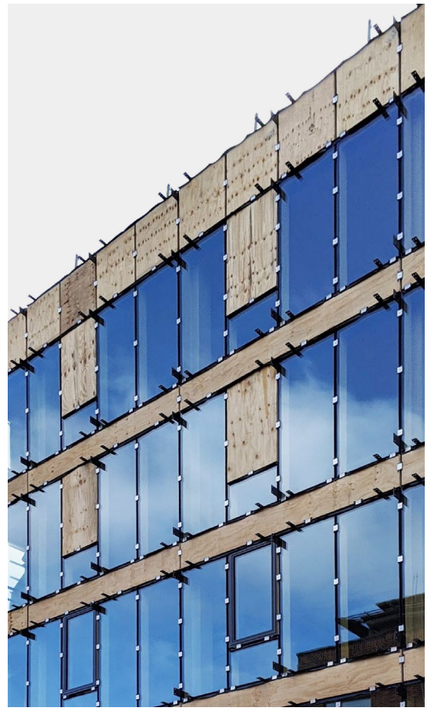
Our work on The Black & White Building helped minimise the up-front carbon by

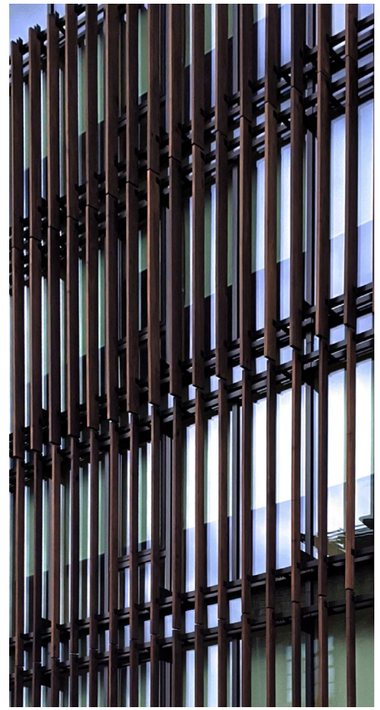
37%

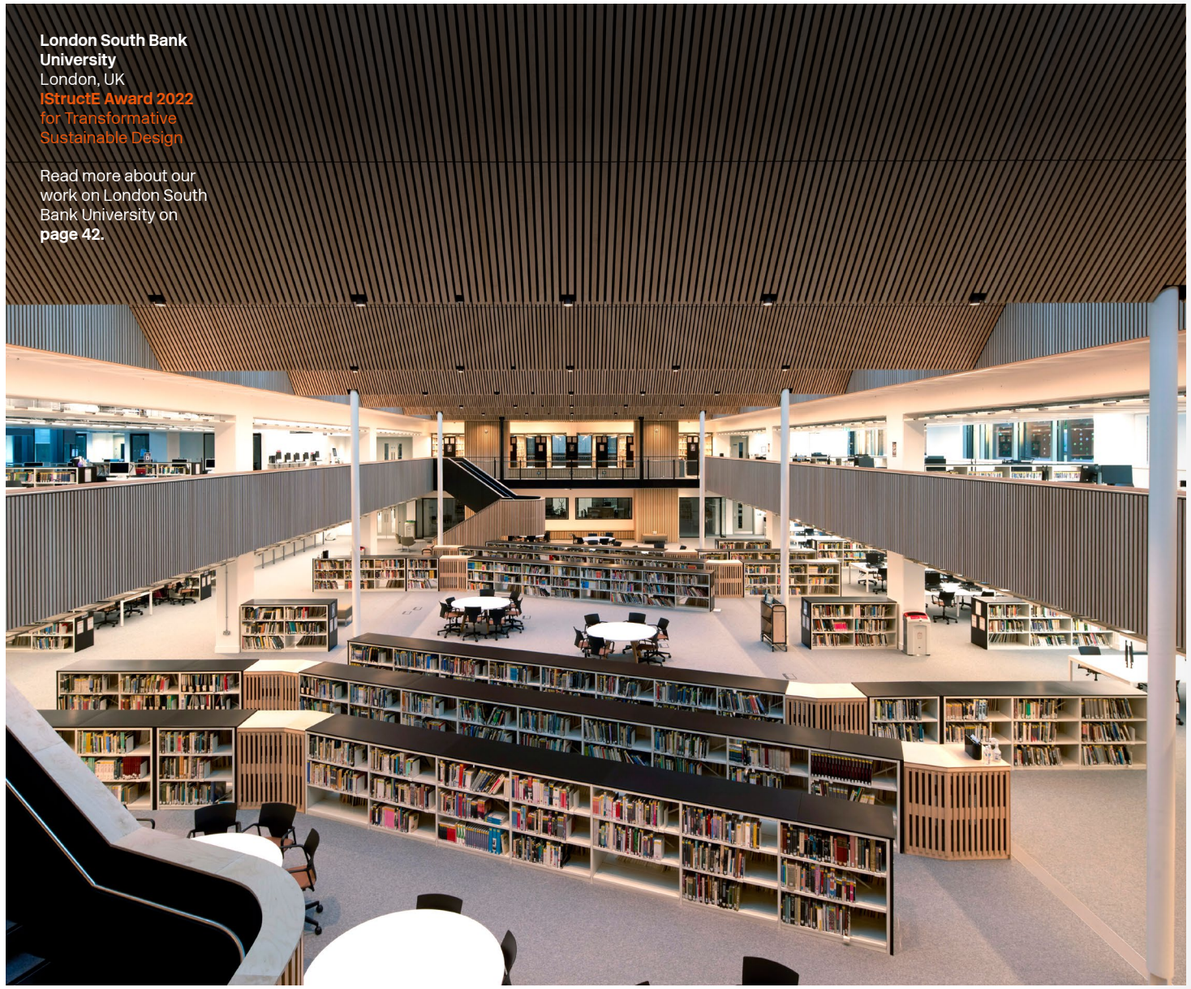
Read more about our work on The Black & White Building on **page 34.**





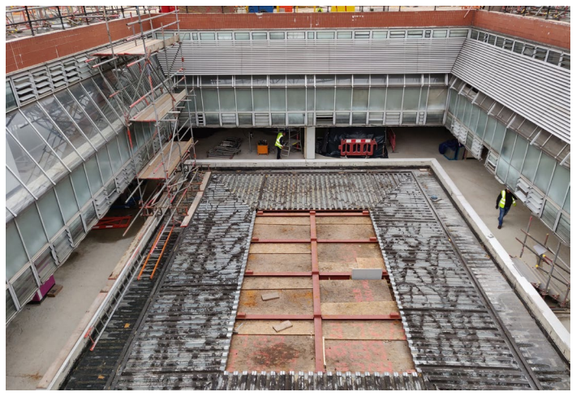




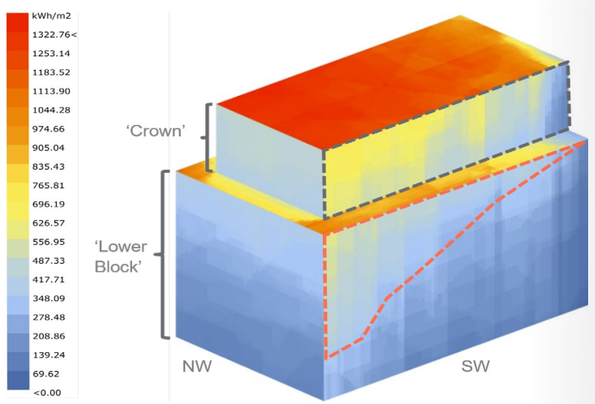


London South Bank University
London, UK
IStructE Award 2022
for Transformative Sustainable Design

Read more about our work on London South Bank University on **page 42.**



Before: The project involved the redevelopment of the four-storey 1970s London Road Building, adding 50 years of life to the existing frame.



Operational Carbon represents up to

65%*

of a building's Whole Life Carbon

*Source: LETI Climate Emergency Design Guide, Average Value

Once an asset is built, we have to make the best use of it.

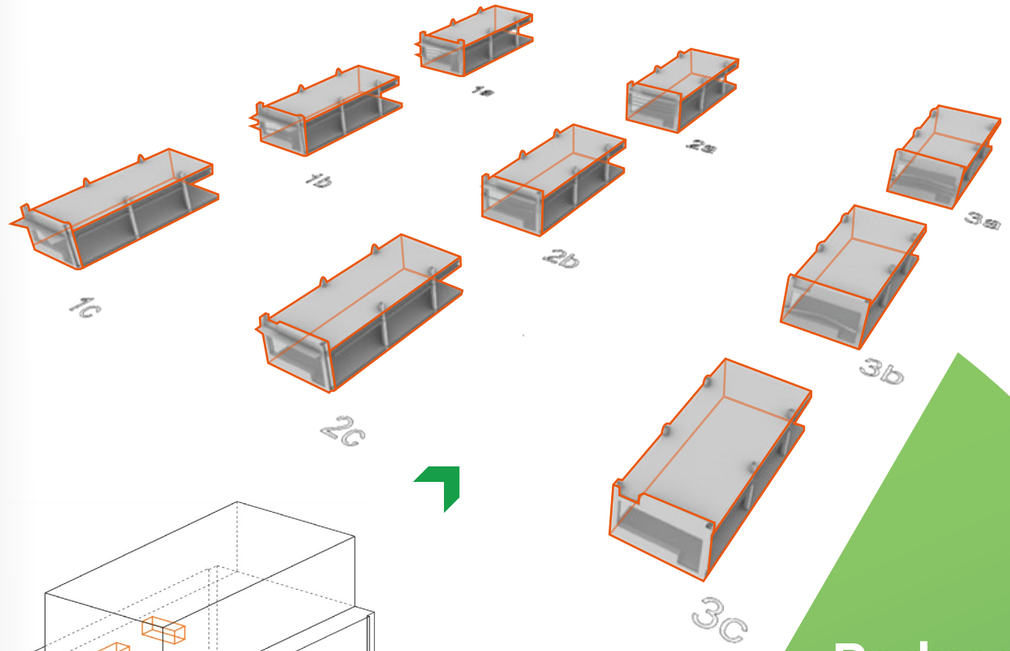
In order to 'pay back' the materials, we have a responsibility to make Phase B last as long as possible, for the building and its parts.

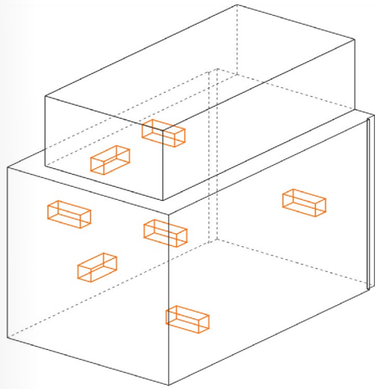
Operational emissions relate to the carbon released from the ongoing operation of the building over its lifetime through sources including lighting, power, heating, ventilation, air conditioning, maintenance and other infrastructure.

Our extensive experience, knowledge and skills in structural and facade engineering, coupled with our in-house research and tools can help push design solutions to ensure they increase thermal performance, comfort, solar and light performance and visual comfort.

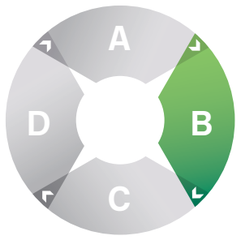
We create and use bespoke scripted tools to assist with building physics assessments which directly feed into operational performance.

For instance, shoebox modelling is used to create early design energy models, using actual climate data, building type and usage patterns to optimise building energy performance.





Shoebox modelling
The whole-life carbon emissions related to an asset's facade can inform its design at the earliest stages using parametric modelling tools.



Reduce operational emissions

- Increase life duration
- Build with resilience
- Reduce energy consumption
- Increase internal comfort

The outdated 1967 facade at the UNESCO Headquarters in Paris, France

Recycling of flat glass

Recycled glass fabrication

By prioritising refurbishment over new build, we can avoid emissions related to the deconstruction of buildings, increase the lifespan of precious construction materials and avoid unnecessary carbon emissions.

We have extensive expertise in the refurbishment and retrofit of existing structures and facades, as exemplified by our London South Bank University and UNESCO Headquarters projects.

We are the lead author for a design guide into the refurbishment of existing facades, helping to show the way that others can put these principles into practice. Our sustainability experts can provide whole-life carbon calculations to demonstrate the value of reuse.

Reduce end-of-life emissions

— Prioritise refurbishment
— Adapt and reuse / repurpose
— Deconstruction towards circular economy

Dismantled aluminium facade elements

We seek to embrace circularity and leverage the end-of-life potential of the materials and components that make up our buildings.

Every component can be designed from the beginning with its end of life in mind, ensuring that it can be separated from connecting elements and then repurposed or recycled in future.

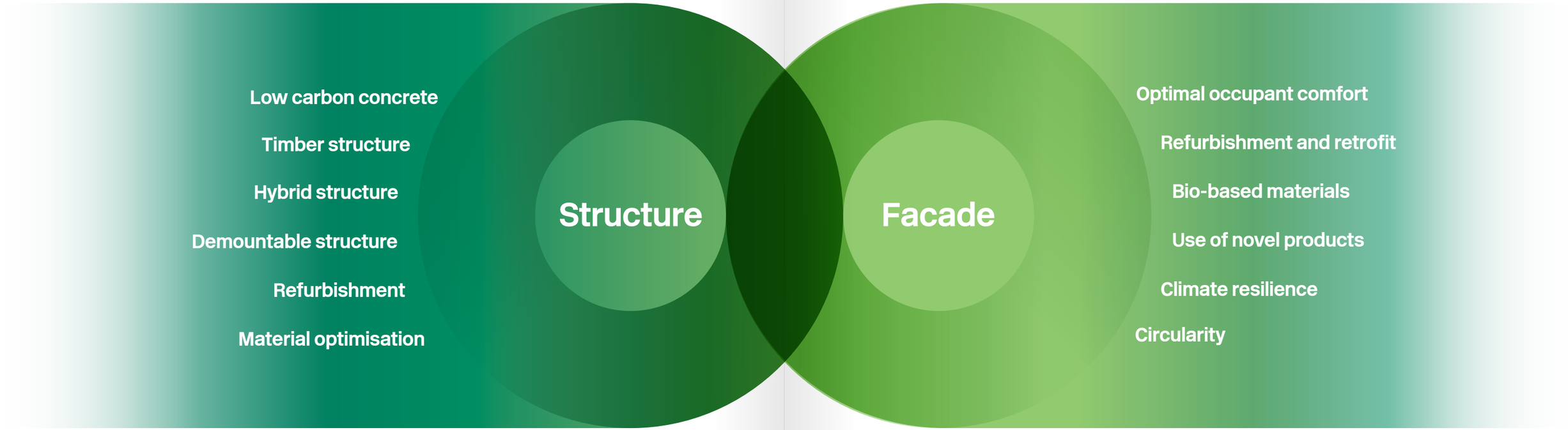
We encourage this approach in all our new buildings and are implementing circularity strategies on many projects. We are also working with industry bodies in the glass and facade sector to increase the adoption of a circular economy in construction.

Leverage the end-of-life potential

— Design for circular economy
— Adopt recycled materials

Read more about our work on UNESCO Headquarters on **page 38.**

Integrated low carbon design



Our structures and facade teams bring together key skill sets to tackle the climate emergency through a holistic approach.

Structural design

Committed to promoting low-carbon building design, we have been pioneering the use of timber in a number of our built projects.

We track the embodied carbon of our structures and in doing, we highlight to our clients the role different materials can play within their projects as we move towards net zero buildings.

Digital design tools are key to successfully realising intelligent engineering solutions for complex challenges. As such, we employ a range of digital design tools and building information modelling (BIM) which are embedded in our workflow.

These processes allow us to uncover efficiencies, improve decision making, fully integrate our structures, and enhance delivery.

Facade design

A well-performing building envelope is essential to the design of low-energy buildings. Through our building physics expertise, we can model the thermal, solar and daylight performance of facades to optimise the facade efficiency and ensure a comfortable internal environment.

We take a whole-life approach to embodied carbon and can assess a variety of system typologies to balance embodied and operational carbon across the building's lifetime.

As part of our sustainability commitments, we want to push facade refurbishment and retrofit and have carried out many exemplar projects renovating historic and mid-century facades. We are also pioneering circular approaches to facade design and carrying out research to increase the viability of circular design across the industry.

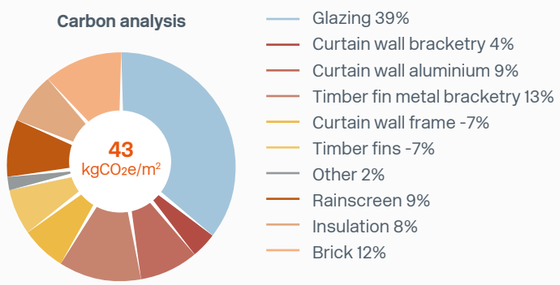
How do we tackle climate change and design sustainable building solutions for a better future?

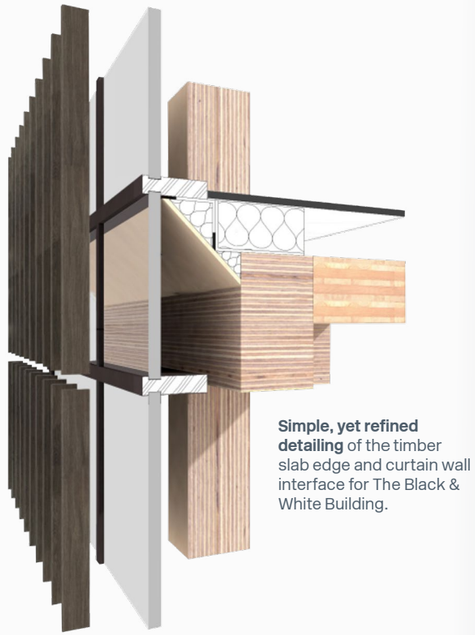
City of London Freemen's School Swimming Pool
Ashstead,UK
RIBA South East 2018 Sustainability Award

Our services

Low-carbon studies

Through these studies, we can identify, optimise and specify low-carbon materials and systems for building structures and facades.

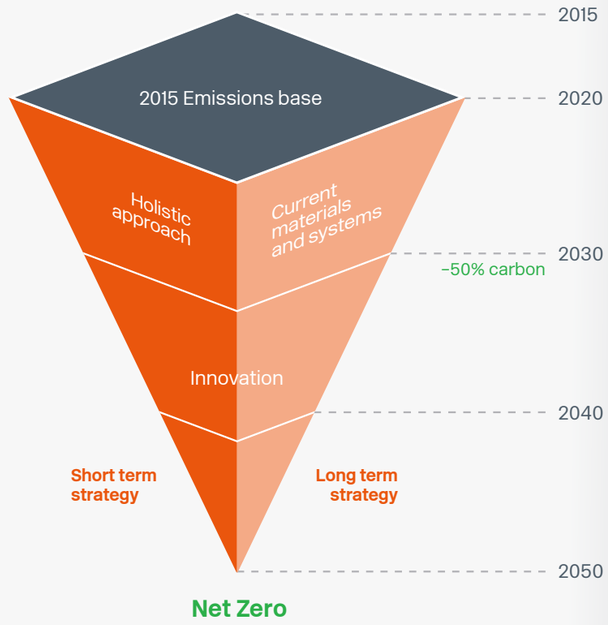




Simple, yet refined detailing of the timber slab edge and curtain wall interface for The Black & White Building.

Net zero strategy

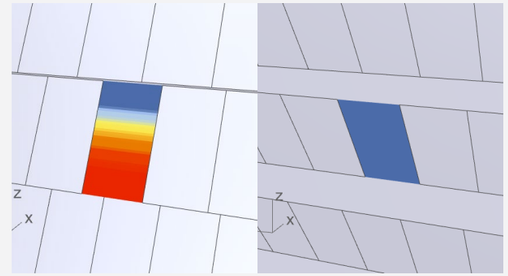
We help our clients develop their roadmap towards net zero by setting strategies for building structures and facades at the portfolio and building level. We can also define guidelines for a specific project to achieve defined sustainability targets.



Roadmap to net zero strategy using Science Based Targets Initiative (SBTi)

Facade performance optimisation

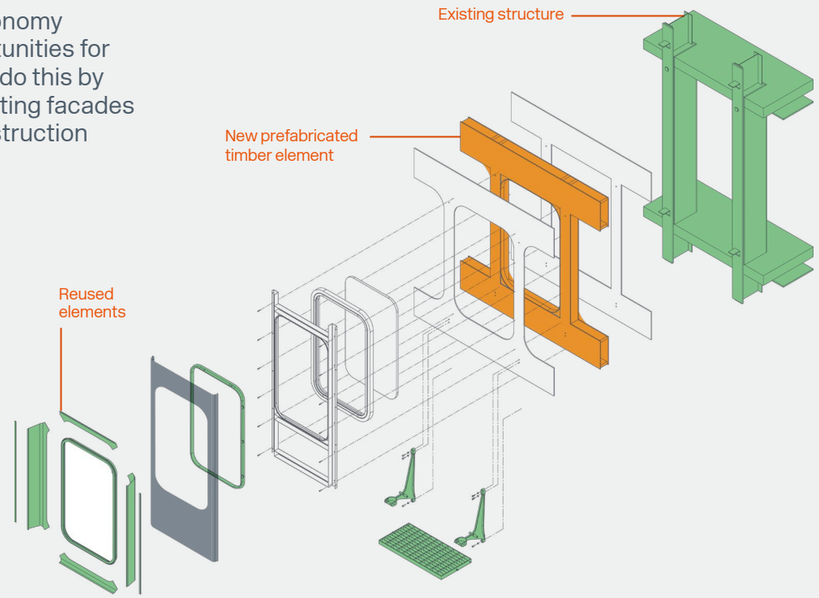
Our environmental design experts employ a number of tools to assess energy gain through the facade and can advise on strategies to control solar gain and internal comfort conditions. Using in-house parametric tools, we can advise from concept design to help steer sustainable solutions from the outset.



Radiation analysis of different self shading of options for different facade unit inclinations / geometries.

Pre-development circularity audits

We help implement circular economy strategies by identifying opportunities for repair, reuse and recycling. We do this by carrying out diagnostics of existing facades and structures and pre-deconstruction studies.



We deconstructed and studied UNESCO Headquarters' 55 year old facade to see where we could add new parts and recycle old ones.

Research and development

The future of facades

We actively participate in collaborative projects which drive sustainable development and improvement programmes – working alongside industry, academia, architects, clients and consultants.

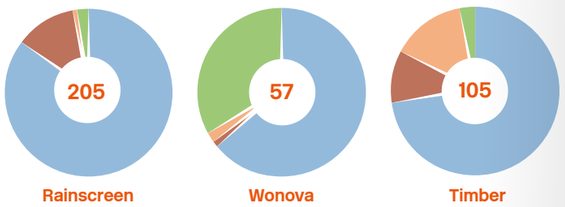
In late 2021, we were approached by long-time collaborators, Etcetera, who had just succeeded in gaining grant funding to study potential applications of 3D-printed facades.

Following nine months of research, the result of our collaboration is – **Wonova** – a building enclosure platform that replaces a typical multi-layered facade build-up with a unified single-material construction.

Helping to lower the carbon footprint of the building construction industry, Wonova employs the concept of mono-materiality, and uses as little virgin material as needed, providing maximum recyclability.

Complete life cycle embodied carbon
kgCO2e/m²

Production
Construction
End of life
Recycled

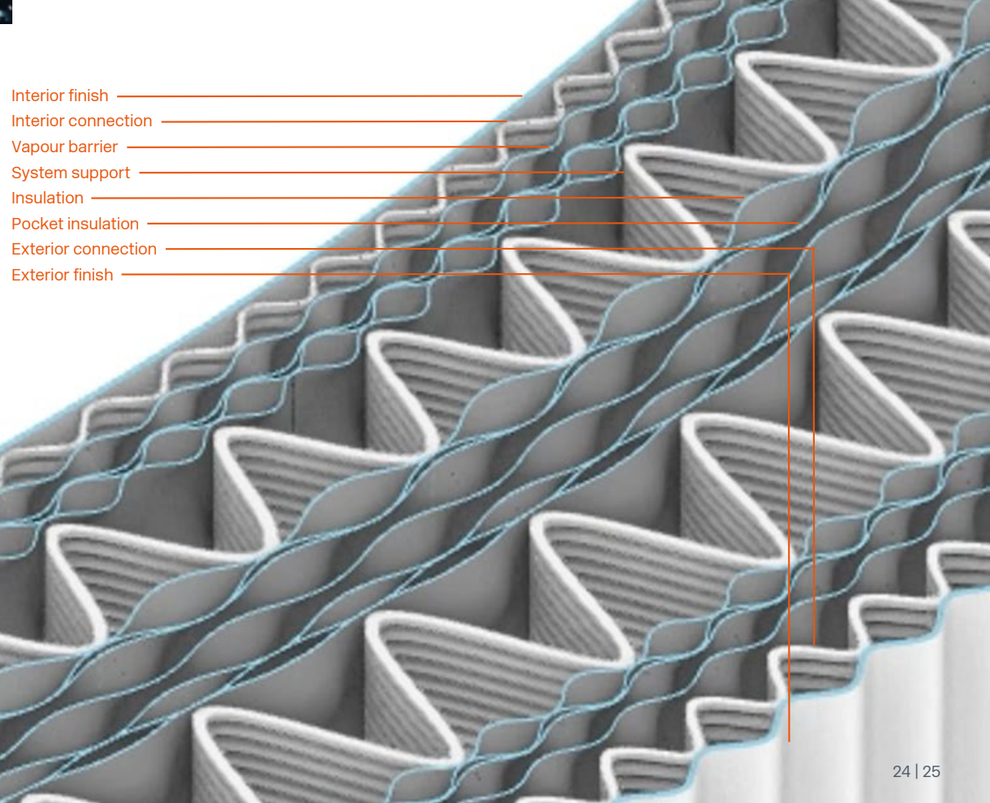


Using polymers made from upcycled plastic waste, we can achieve a substantial reduction in lifetime embodied carbon compared to traditional rain screen cladding construction.

System build-up

Sine curves as shown below are used in the AM process and given specific characteristics where there assigned to the performance zones. This allows design and engineering flexibility and fabrication efficiency.

Whether we can expect 3D printing to make its way into mainstream facade construction in the near future remains to be seen, but our work has convinced us that it can offer enormous environmental benefits to facade design, and that potential can't be ignored.



Climate resilience evaluation

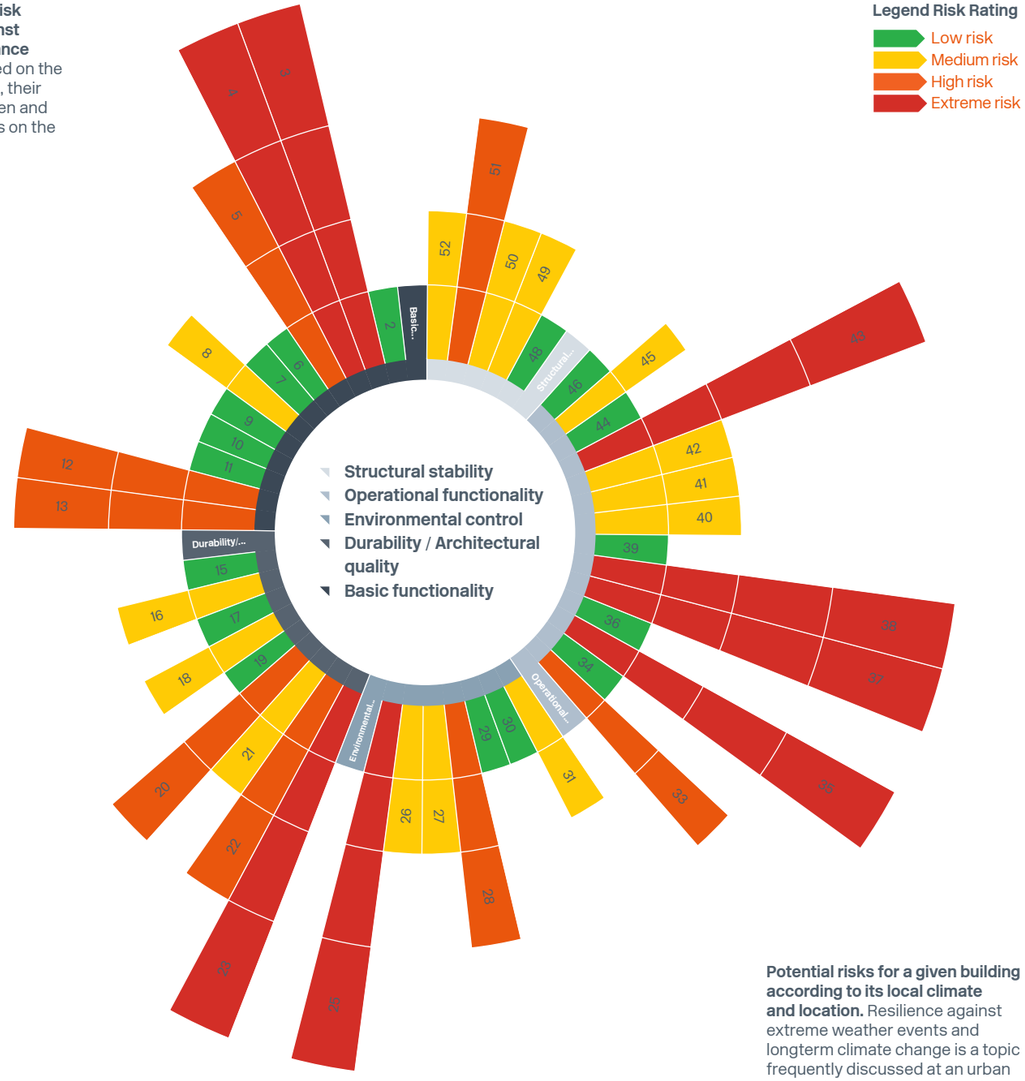
We've developed a resilience evaluation framework – a numerical tool that allows users to create a risk assessment according to different stressors deriving from a building's geographic location, function and criticality, and covering both human safety and comfort and a building's asset value.

It allows us to evaluate the consequences and the risks of climate changes on structural stability, basic functionality, environmental control, operational functionality, durability and architectural quality – helping building owners to make more informed design and investment decisions – and has been used on projects such as Two Taikoo Place in Hong Kong.

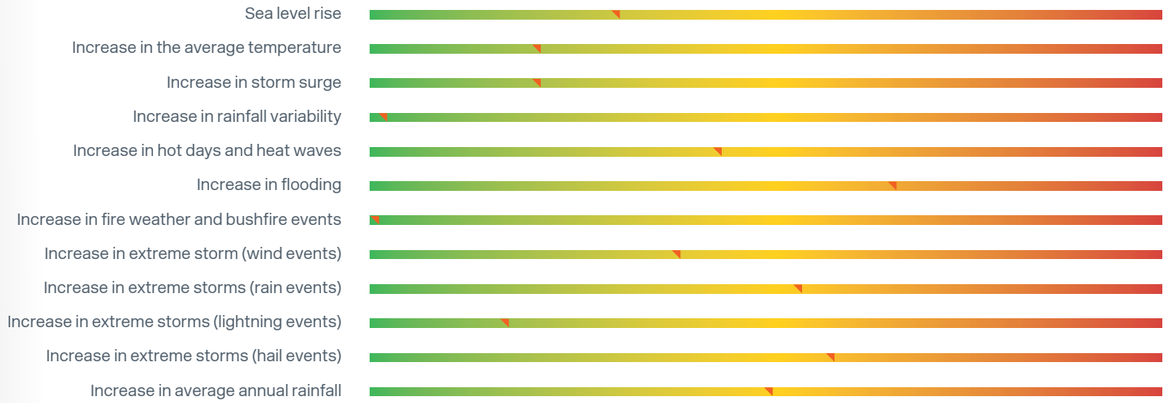
We are actively inviting collaboration with partners to test this tool on live projects. **Please get in touch** if you would like us to collaborate on your project!

Two Taikoo Place
Hong Kong

Facade-specific risk assessment against building performance goals. This is based on the specific stressors, their likelihood to happen and the consequences on the building.



Potential risks for a given building according to its local climate and location. Resilience against extreme weather events and longterm climate change is a topic frequently discussed at an urban level but often overlooked at the building level.



London South Bank University
London, UK
IStructE Award 2022
for Transformative Sustainable Design

We drive carbon reduction within the engineering sector through research, innovation and collaboration.

Scan to enquire
about EOC ECO_2

Tools

EOC ECO_2

Our in-house R&D team has created a new Autodesk Revit plugin called **EOC ECO_2**. Available to peers and colleagues across the design and construction sector, EOC ECO_2 is a piece of scripted software which gives a breakdown of the embodied carbon output for the structural materials used in a building.

By sharing this tool our hope is that others will use it to inform low carbon routes on projects and share the data.

This bespoke carbon measurement tool allows users to measure all the embodied carbon within structural framing or any volumetric element and propose solutions with an efficient carbon payback time.

Our approach to tackling net zero and our work on developing and sharing EOC ECO_2 has been recognised with an accolade for ‘Net Zero Team of the Year’ at the 2022 Construction News Workforce Awards.

EOC ECO_2

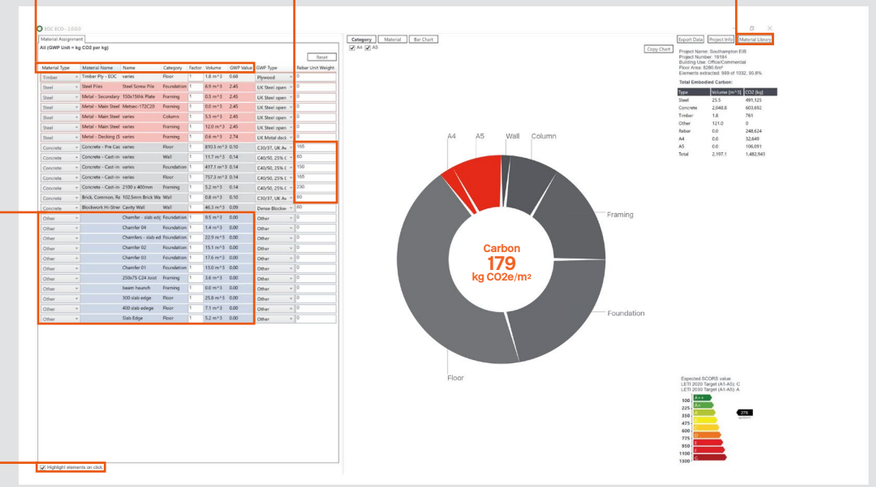
3
Multiple sort options including material name, volume and weight

4
Verify reinforcement weight of concrete elements

5
Materials library

2
Colour coded materials allocation

1
Toggle list to highlight elements in the model view



Atlassian Central
Sydney, Australia
2021 Holcim Award
for Sustainable
Construction

Tools

Global embodied carbon database

In order to monitor our progress and support our clients and collaborators in making informed decisions, we have developed an international embodied carbon dataset which helps us monitor the carbon associated with our projects around the globe. We use this data to learn lessons, form insights, identify carbon emission reduction options and to ensure we are on track with our 2050 carbon emissions roadmap.

Embodied carbon calculator

A key part of our conceptual design work, our calculator enables us to put embodied carbon alongside cost, aesthetics and functionality in the project team's appraisal of options. Using the carbon calculator at the concept design stage helps shape both a client's aspirations and budgets, and more frequently, the holistic design approach.

Parametric facade modelling

We have developed in-house parametric tools to model facade performance at an early design stage, allowing us to process multiple options and steer the architectural expression to an efficient, effective solution. We can measure the impact on cooling and heating demand and advise on payback periods for different design options, ensuring that investments in the facade design are compensated by energy reductions in use.

Occupant comfort assessment

A key building design consideration is user comfort: the levels of natural daylight, glare and heat gain experienced by building users. We have developed tools to assess user comfort and can direct the facade design towards solutions that balance these factors, helping building owners achieve **LEED**, **WELL** or **BREEAM** certification.

Our commitment to decarbonisation, alongside our project experience and unique skills, enables us to tackle complex sustainable design challenges.

The Beecroft Building
Oxford, UK
BREEAM Excellent

The Black & White Building

Location	London, UK
Client	The Office Group
Architect	Waugh Thistleton Architects
Date	2022
Services provided	Structural and Facade Engineering

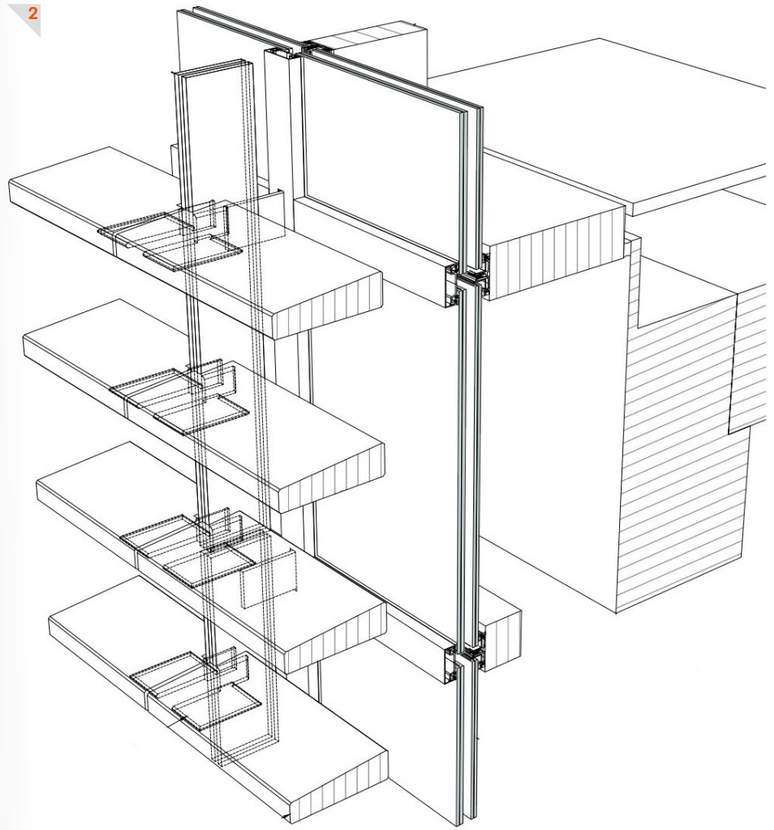
Standing at six storeys in height, The Black & White Building is central London's tallest mass timber office building and one of only a few London projects with a timber structure and facade. With no structural internal partition walls, the layout can be easily adapted as future demands change.

The Black & White Building features a Cross-Laminated Timber (CLT) core and floors and a Laminated Veneer Lumber (LVL) frame with a timber curtain wall facade with external timber shading fins.

The project champions pushing the boundaries of sustainable workplace living and what can be achieved and realised with timber construction.

1

2



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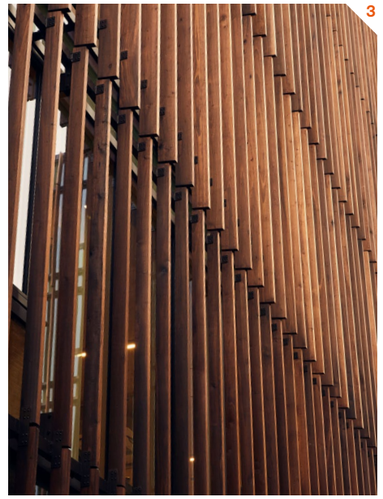


2023 Construction News Awards

Shortlisted for Low Carbon Project of the Year

410kgCO_2e/m^2

Embodied carbon (A1-A5) of the overall building, including carbon sequestration

1 **Record height**
Central London's tallest mass timber office building.

2 **3D model of shading fins**
The timber fins are deeper where greater solar protection is needed, allowing for optimum heat and natural light.

3 **Facade bracketry**
All detailing is refined and minimalist to express the timber.

The project champions the use of timber as a framing material and provides a benchmark and valuable learnings for the design and construction sector, both in the UK and internationally. This will drive similar projects to be designed and constructed in the future.

The project boasts impressive sustainability credentials due to the inherent sustainability benefits of timber. By using largely engineered timber and omitting concrete generally, except for in the subterranean level, we have calculated the embodied carbon at just 410kgCO_2e/m^2 (A1-A5), including sequestration.

A key project requirement was achieving long spans of up to 10 metres between the internal columns within a restricted floor-to-ceiling height. To enable these long spans, we specified high performance Laminated Veneer Lumber and designed internal beams with moment continuity over their supports, resulting in unconventional connections between beam and column.

The facade team has been responsible for designing the curtain walling and creating solar shading which uses a timber fin design. The architectural intent was to partly expose the bracketry supporting the curtain wall and external shading fins.

Atlassian Central

1

100%
renewable energy operated building

180m
world's tallest hybrid timber building

50%
less embodied carbon than a benchmark building for the same site

Location	Sydney, Australia
Client	Atlassian
Architect	SHoP | BVN
Date	2025
Services	Structural and Facade Engineering
Sustainability certifications	World Architecture Award 2021, Future Office Holcim Awards 2021, Commendation Holcim Awards for Asia Pacific 2020, Bronze

We are designing the structure and facade for the world's tallest hybrid timber building – a 40-storey office tower for Atlassian in Sydney, Australia – which provides 75,000sqm of commercial office space as well hotel and retail accommodation.

Located near Sydney's Central Station, the development will benefit from unbeatable access to multiple modes of public transport, cycle paths and pedestrian access. The building incorporates the existing heritage Parcels Shed at its base, serving as a connection point, both physical and visual, to the scheme's rich history. All heritage elements will be re-used within the site.

We devised a ground-breaking hybrid timber structure, composed of four-storey timber 'habitats' stacked on steel and concrete megafloors, achieving 50% less embodied and operational carbon compared to a conventional tower.

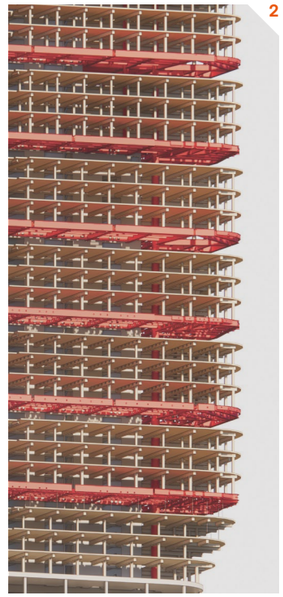
These megafloors are supported by a steel diagrid vertical structure which defines the building's unique appearance.

The building is 36% timber by volume – significantly reducing its embodied carbon. Naturally ventilated zones, akin to outdoor gardens, are key to exceptional environmental innovation and occupant wellbeing. The operable facades allow large areas of each floor to function without mechanical cooling and air handling.

Operating on 100% renewable energy from day one, Atlassian Central will include solar panels built into the facade to generate green power on-site. The glazing is angled away from the sun and shaded by horizontal ledges, a simple move that cuts peak solar gain by 30%. The project targets a NABERS 5.5-rating and a Green Star 6-rating.

1 **Internal 'habitats'**
The interior mass timber ensures a significant reduction in embodied carbon.

2 **3D structural model**
View of the timber and steel floors.



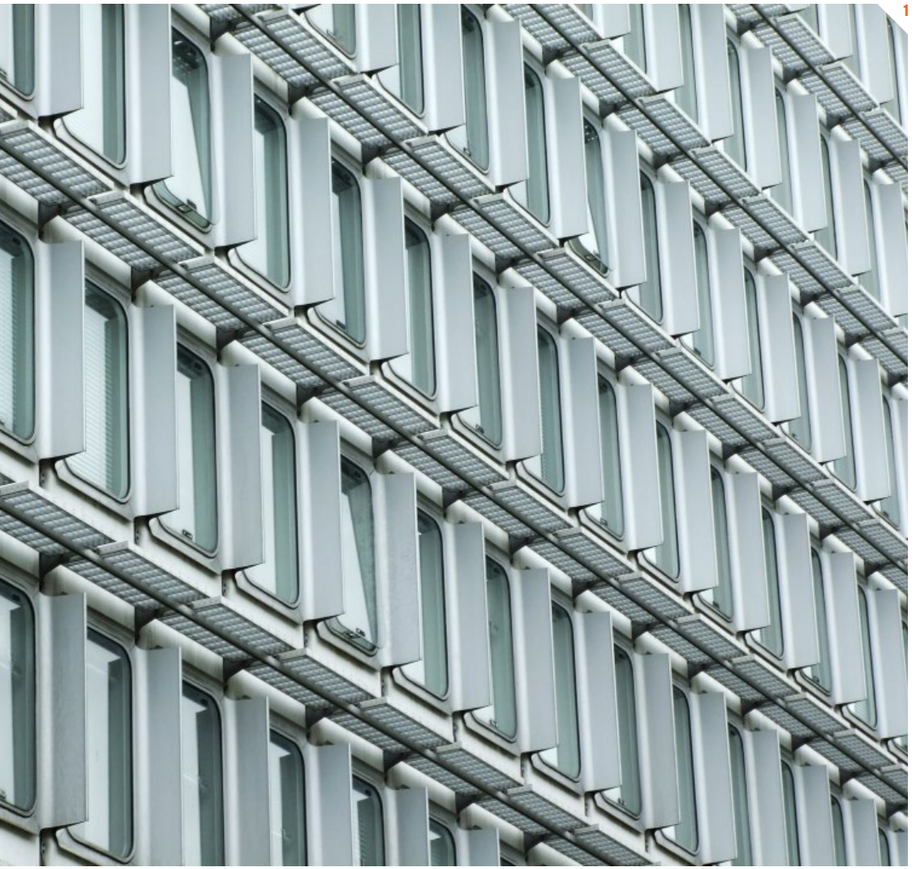
2

2020 | 2021 Holcim Awards for Sustainable Construction

2

3

113 tonnes
of glass recycled into new flat glass



1

1 **The existing facade**
Our transformation of the building pilots a pioneering circular project of cladding reuse and glass recycling which is audited and approved by glass manufacturers.

2 **Recycling of glazing panels**
The glazing panels were removed from their frames and returned as high quality cullet for recycling into new flat glass.

3 **Testing our approach**
A full-size prototype was constructed to trial the proposed approach and repurposed aluminium panels.

4 **Combining old and new**
The new facade is incorporating both new materials and retaining existing elements of the cladding.

UNESCO Headquarters

Location	Paris, France
Client	UNESCO
Architect	Patriarche
Date	2023
Services	Facade Engineering

Building V of the UNESCO Headquarters is undergoing a major transformation after its first 55 years of operation and forms part of a pioneering pilot glass-recycling project.

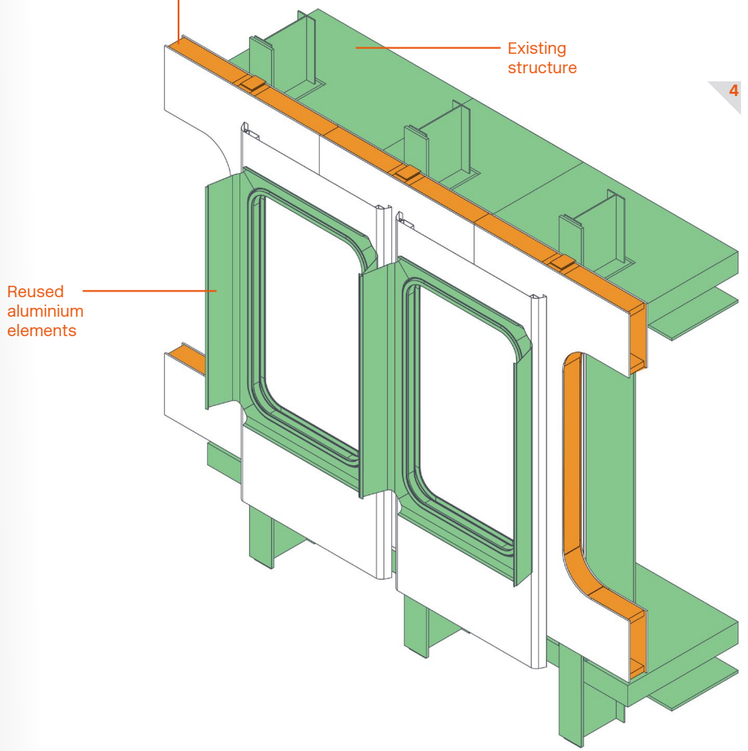
The original office building, designed in a creative partnership between the architect Bernard Zehrfuss and the engineer Jean Prouvé, must be brought up to current energy performance standards without exceeding the schedule or budget. Eckersley O'Callaghan, as part of a team including Patriarche, won the competition with a simple ambition that respects its architectural heritage by reusing the existing facade.

These facades bear witness to an innovative and pioneering era in many respects: recycling of flat glass (architectural products such as windows and doors), prefabrication in the workshop, an innovative block curtain wall system integrating comfort ventilation, thermal insulation, solar protection, access for maintenance, and above all, a facade kit-of-parts-approach which has initiated and accommodated our reuse process.

The UNESCO project will test a more circular approach for flat glass where the existing glass panels will be carefully removed and transported to a glass recycling factory and re-manufactured into internal glass partitions for the building.

Our objective was to create a new thermal skin inserted between the existing skin and the period structure, while minimising the visual impact of this adaptation. A systematic verification of the carbon footprint of our design iterations was carried out, leading us to propose a prefabricated timber cassette backing wall to ensure thermal, sealing and safety performance.

The existing aluminum elements – cheeks, gratings, consoles and frames – are refurbished and reused to dress the new facade. This reuse resulted in a gain of 500 tCO_2eq. Added to this is the recycling of approximately 113 tonnes of existing glazing, which saved 34 tCO_2eq.



4

65%
reduction in carbon emissions due to material reuse, recycling and use of a bio-based system.

Creating a circular economy for architectural glazing

We have partnered with researchers from the University of Cambridge to map material flows of the global glass industry to better understand the value chain and factors preventing greater recycling rates. Among these are technical and contamination issues but also logistical challenges deriving from the fragmented supply chain.

The study assesses the cost and carbon implications of increased glass recycling under different recovery scenarios and compares the flat glass industry to the glass bottle industry and looks at recycling schemes in other countries.

We are now working with industry leaders to develop solutions and propose incentives to bring about greater post-consumer recycling and the associated carbon reductions needed.

1

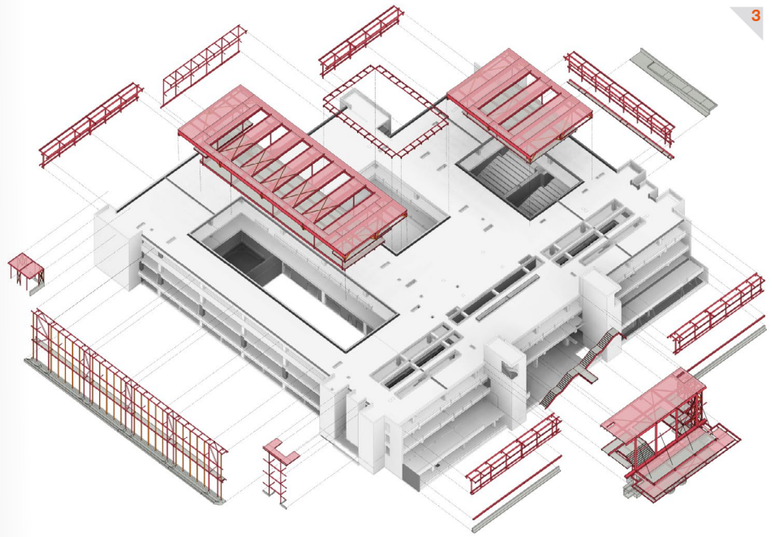
1 **New atrium**
The existing roof is lifted up to create a new dramatic double-height space.

2 **Low carbon facade**
Glass Reinforced Concrete (GRC) facade modules have lower embodied carbon than traditional brickwork.

3 **Old meets new**
Structural interventions include recladding of facade and structural infill to atrium and courtyards.

2

London South Bank University



3

Location	London, UK
Client	London South Bank University
Architect	WilkinsonEyre
Date	2022
Services	Structural and Facade Engineering

The redevelopment of this four-storey 1970s London Road Building demonstrates how an existing building can be upgraded – extending its design life by another 50 years and achieving a contemporary look whilst minimising its carbon footprint.

Design and construction works include carbon-fibre strengthening, existing structure verification and new structural additions of various scale. While retaining the original concrete frame, the current lightwells are infilled with new floors, while the existing roof is lifted up to create a new dramatic double-height spaces. An additional 2,000 sqm of floorspace has been created and the building entrance has also been remodelled with full-height glazing and a sweeping new canopy.

Our facade intervention involved stripping the existing envelope back to the frame and recladding it with a combination of brickwork, glazing and Glass Reinforced Concrete (GRC).

Carbon studies showed that GRC backed unitised facade modules have lower embodied carbon than traditional brickwork.

By refurbishing and saving as much of the existing materials as possible, the A1-A3 (cradle-to-grave) embodied carbon component related to substructure and superstructure for the project is just 49 $kgCO_2e/m^2$. This value compared to the approximate structural components of LETI targets is three and a half times less than the 179 $kgCO_2e/m^2$ 2020 LETI target, and under half of the 105 $kgCO_2e/m^2$ 2030 LETI target for education buildings.

A total of approximately 1,100 tonnes of CO_2 has been released into the atmosphere, one third accounting for facade steelwork, 35% for general steelwork, and 3% for carbon fibre and epoxy resin.

The project showcases the potential for minimising the carbon impact of construction whilst creating a modern educational environment. It is a prime example of a sustainable adaptive reuse project that economically delivers a 'like-new' building for the client.

The structural embodied carbon value of the project per gross internal floor area is 5 to 6 times lower than that of an equivalent new build concrete frame structure of this scale, estimated as 250-300 $kgCO_2e/m^2$ if built at present.

2022 IStructE Award for Transformative Sustainable Design

La Référence de Ganthier

Location	Ganthier, Haiti
Client	KONEKTE
Architect	Studio PHH
Date	2020
Services	Structural Engineering

We contributed engineering expertise to support the building of La Référence secondary school in Ganthier, Haiti, in collaboration with charity KONEKTE and New York-based architects Studio PHH. Our involvement in the project forms part of our commitment to charitable causes.

We helped design this school which exemplifies resilient design following the devastation caused by earthquakes. The earthquake in January 2010 destroyed many schools, homes and livelihoods. 70% of children do not attend secondary school in Haiti and the illiteracy rate is about 60%.

Drawings of the constuction stages inform which trusses, beams and stabilisers connect to one another, a vital stage to ensure the school remains safe during seismic activity.

We were delighted that La Référence was awarded an Honor at the 2022 AIANY Design Awards.

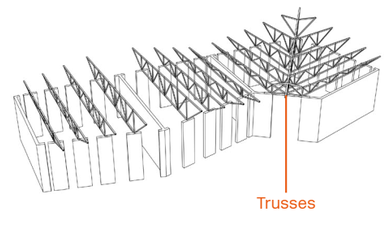
2019 IStructE **Award** for Sustainability

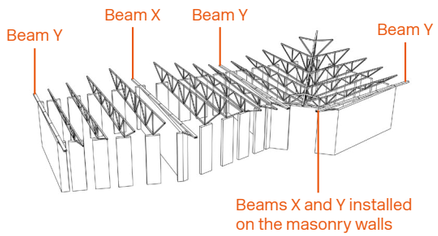
1

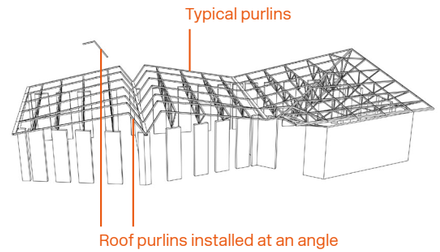
1 **Safety and security**
The outdoor central space of the school is encircled by a continuous ring created by the existing trees and the floating corrugated metal roof, which ensures the privacy and safety of the students.

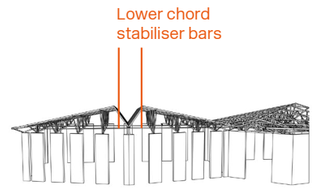
2 **Sustainable foundations**
We developed the building as a series of repeating modules that could be constructed using locally accessible materials and local skill sets.

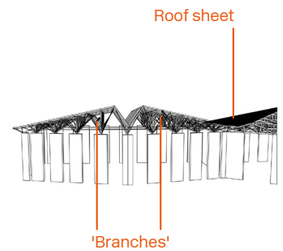
2











1 Exchange Square

1 **Exemplary sustainable credentials**
This adaptive reuse project is 100 percent electric and by using intelligent facade design and mechanical services twinned with building management systems, it will be net zero carbon in operation.

1

Location	London, UK
Client	PNBJ
Architect	Fletcher Priest Architects
Date	2025
Services	Facade Engineering
Sustainability certifications	BREEAM Outstanding WELL Standard v2 ‘ready’ Platinum NABERS 4.5*

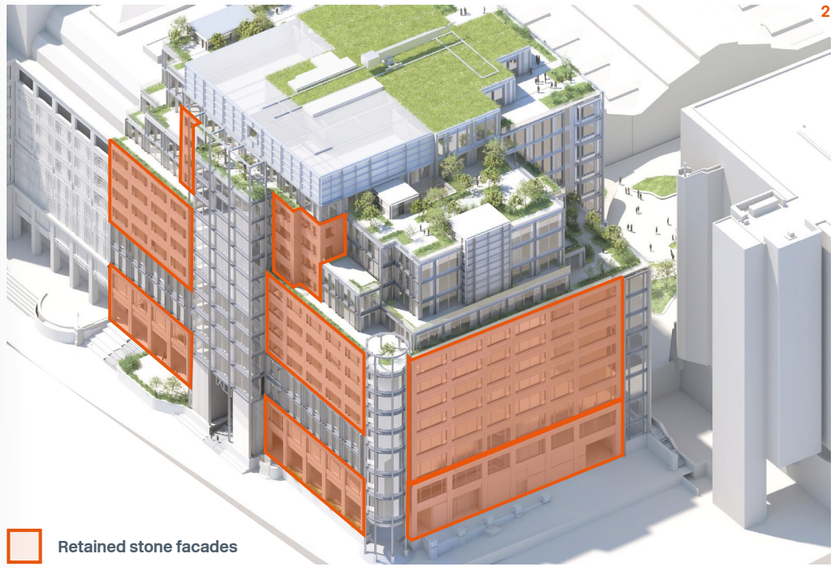
1 Exchange Square is the redevelopment of a 1990s postmodern office building designed to meet the highest sustainability criteria. The block is being dramatically transformed and extended while retaining 90% of the existing structure and a substantial amount of the original facade. The enlarged building will offer 42,000sqm of office space over 13 floors, 1500sqm of retail, and a new public pavilion.

The building is to increase in height and extended to the west, where the floor plates will be suspended from a steel exoskeleton penetrating the facade. The facade panelisation and installation strategy has been led by this challenge and the resulting thermal movement of the structure.

The design seeks to retain the existing stone cladding mounted on steel ‘mega panels’ on the street elevation. The stone cladding will be removed and cleaned, but internally the insulation is to be enhanced to meet current standards. Windows mounted into the mega panels are to be replaced and upgraded to triple glazing. The additional weight on the mega panels has required careful review of record drawings, site measurements and detailed structural analysis.

We have carried out embodied carbon calculations at all stages of the design to steer options towards low-carbon solutions. By retaining the existing stone facades on the east and north elevations, a saving of nearly 50% is achieved compared to full replacement.

The facade has opening windows as part of a mixed-mode ventilation strategy, while solar shading and glazing ratios have been carefully managed on the west elevation to mitigate heat gain.



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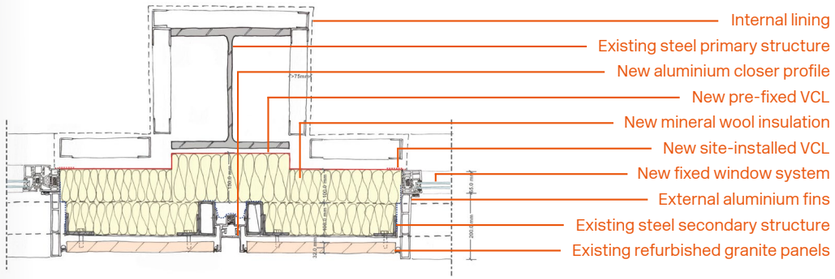


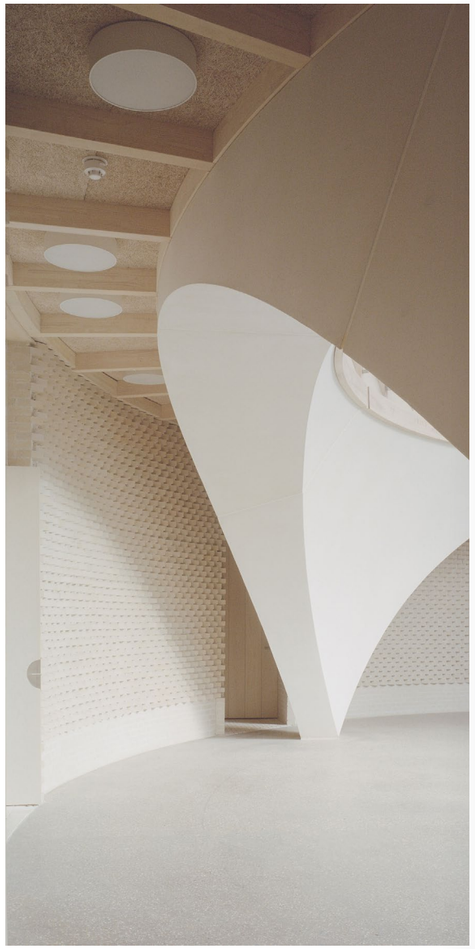
2 **Retained red and light granite facade**
Retention of the existing stone facade and support system will significantly reduce the embodied carbon of a typical retained stone bay. We estimate the embodied carbon to be about half compared to a typical new curtain walling bay.

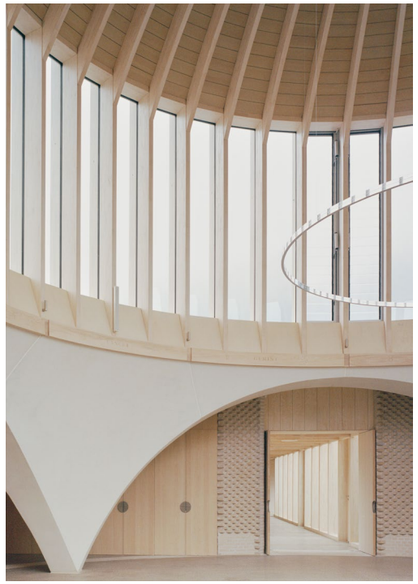
3 **Contemporary and sustainable**
The building has been extensively reconfigured and reimagined to accommodate new ways of working, improve well-being and meet net-zero environmental targets.

3

1 Exchange Square

50%
embodied carbon saving from our retention of the existing facade





White Eagle Lodge

Location	Hampshire, UK
Client	White Eagle Lodge
Architect	James Gorst Architects
Date	2022
Services	Structural and Civil Engineering

Situated on a large, rural site in Hampshire, we are collaborating with James Gorst Architects to design and deliver a new temple building for the White Eagle Lodge (WEL) – a spiritual organisation founded in 1936.

The building forms part of a wider 558sqm complex – which when complete is set to become a spiritual centre for the worldwide WEL community.

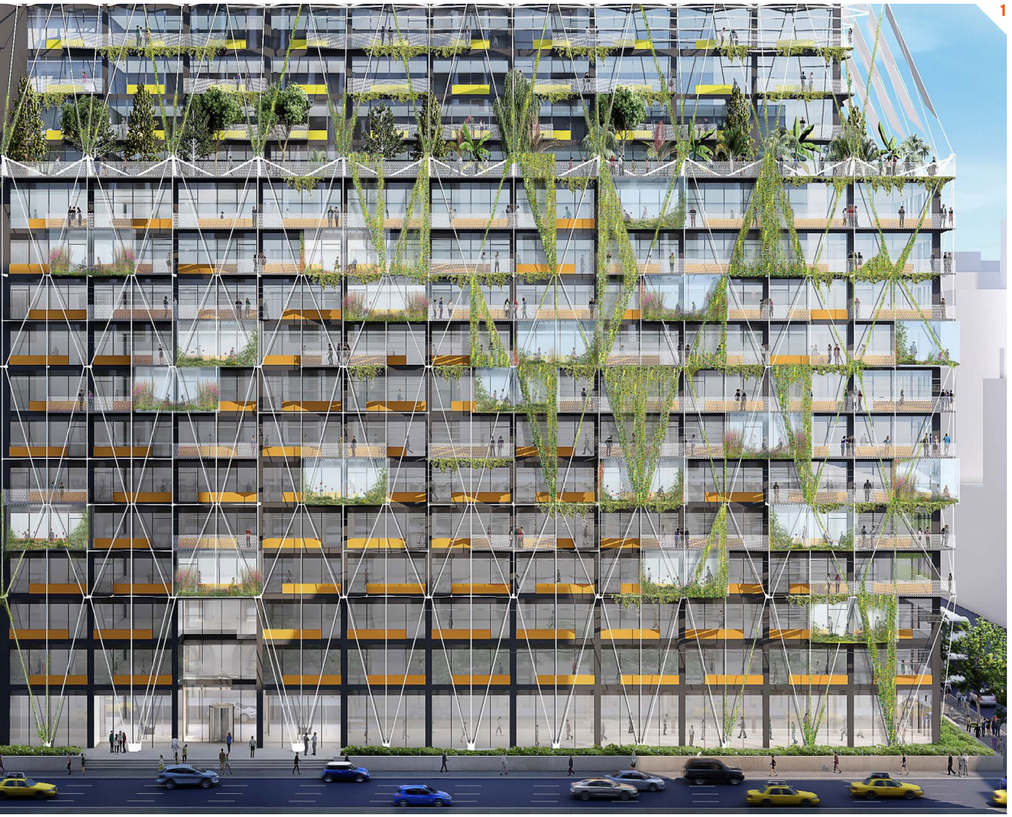
The designs will replace an existing 1970s temple, which has been demolished on account of irreparable water damage. The new complex has been conceived as a composition of orthogonal pavilions arranged around a courtyard and connected by cloisters.

The arrangement of these pavilions is shifted locally, to create carefully landscaped gardens and to address the processional requirements of the group.

We carried out a full analysis of frame options using our embodied carbon calculator to justify the timber frame. Through this we were able to give a saving of ~50kg/m² of CO_2 when compared to the alternative load bearing masonry and steel-framed options performance. A sub-floor cooling labyrinth below the concrete floor is used to provide cost effective cooling strategy.

~50kg/m²

CO_2 saved through timber framing



1 **Repurposed for carbon neutrality**
A simple solution with applicability to a wide range of buildings.

63 Madison Avenue

Location	New York, US
Architect	WilkinsonEyre
Date	2019
Services	Facade Engineering

Working with WilkinsonEyre and Josef Gartner, Eckersley O'Callaghan won a major conceptual design competition to design retrofitted sustainable facades for inefficient tower blocks – helping to ensure they comply with New York City's new Green New Deal goals.

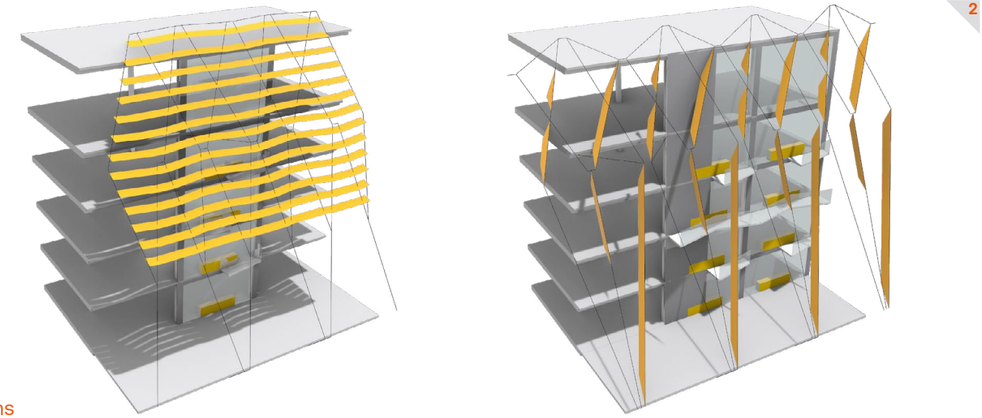
The challenge addressed how to transform New York City's existing highrise office buildings so they are on the city's roadmap to carbon neutrality. The brief specified using a cladding solution to reduce the building's energy consumption by half, bringing daylight deeper into the buildings and providing better access to the outside.

The winning scheme, called Second Skin, employs the concept of an 'adaptive net' facade which creates a habitable area within a highly efficient, simple, regular cladding system. The 'adaptive net' allows a response to the specifics such as the building's location, protecting it against seasonal environmental conditions, and optimising views and introducing natural greening – all enhancing occupants' wellness.

A system of external shading/reflector devices was developed to provide shade and reduce glare – increasing the quality of daylight and improving the usable area by 20%, whilst preserving views to the outside.

Through thermal modelling we determined that this concept combined with an improvement in the efficiency of M&E equipment, would offer a 50% reduction in carbon emissions as well as offering an embodied carbon offset after only four years. The proposed planting and vegetation will respond to light, heat, humidity and seasonal variations, and the baseline palette will increase biodiversity and ecological resilience.

50%
reduction in operational carbon emissions



2 **External shading design**
Due to the path of the sun, horizontal shading elemnts are more effective than vertical elements for the South West elevation, while the opposite is true for the North West elevation.

3 **An adaptive facade**
The design considers the carbon impact of the system over its lifecycle and ensures that it makes a net positive contribution though its application.

Vitsœ Headquarters

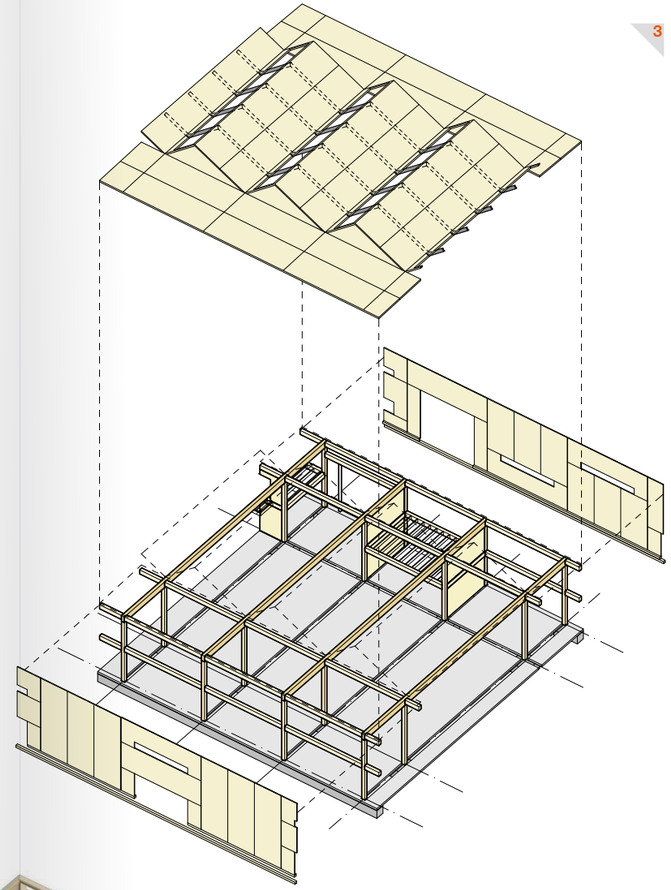
Location	Warwickshire, UK
Client	Vitsœ
Architect	Waugh Thistleton Architects
Date	2022
Services	Structural Engineering

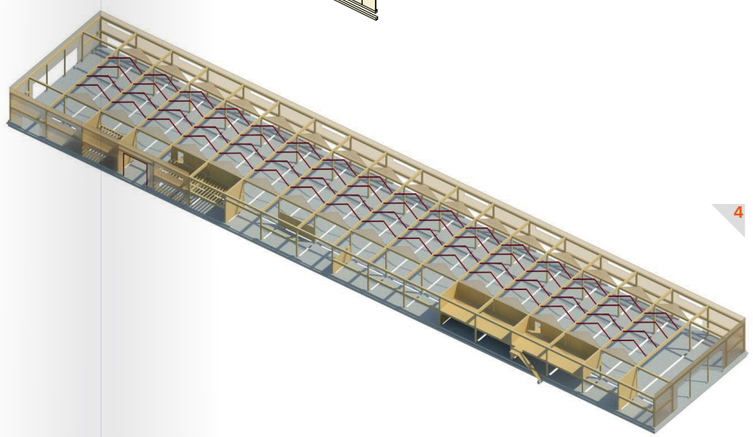
In 2017, British furniture manufacturer, Vitsœ, moved to a new headquarters and production building. Conceived as an extension of Vitsœ's system-thinking, the building spans 135 metres in length, 25 metres in width and six metres in height. The structure is engineered to be modular, flexible, adaptable, and self-explanatory, with innovative material use.

Featuring a timber frame, its comprised of hardwood, Laminated Veneered Lumber (LVL) members and Cross-Laminated timber (CLT) walls for both the envelope and internal shear walls. It's the first building in the UK to be made almost entirely from a newly developed beech LVL timber material. The LVL used on this project has twice the strength of typical glue laminated timber beams.

Eckersley O'Callaghan provided the design of all timber frame elements from concept through to detailed design. To avoid piles and settlements of the ground floor slab, an innovative stabilisation technique was utilised to strengthen the made ground. As a result, only pad and strip footings were necessary to support the superstructure, which represented a significant saving in cost. It took just 23 days to erect 18 bays and resulted in a carbon negative building, saving 320 tonnes of carbon being emitted into the atmosphere.

Our challenge was to design a building that could be constructed in the same spirit as Vitsœ's own products. This has been achieved with a flexible system building that can be easily altered, dismantled and replicated anywhere in the world.





~65kgCO_2e/m^2

CO_2 saved when sequestered carbon is locked into the cells of the timber

1 **Manifest the brand values**
An extension of Vitsœ's system thinking, where the building can be altered, dismantled and replicated anywhere in the world.

2 **Concept to detail**
The Laminated Veneer Lumbar (LVL) used on this project has twice the strength of typical glue laminated timber beams.

3 **Revit model**
3D exploded view of structural concept.

4 **Big savings**
Erected in just 18 days the project resulted in a carbon negative solution.

1 **A Google first**
The design of Google's first mass timber office renders timber visible both inside and out.


1

Google Borregas

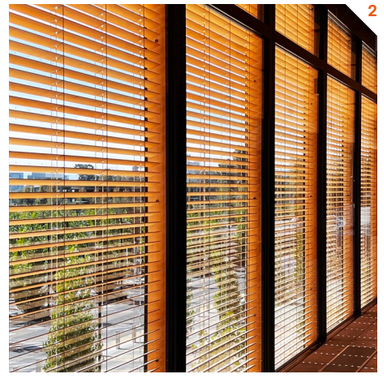
Location	Sunnyvale, California, US
Client	Google
Architect	Michael Green Architecture
Date	2022
Services	Facade Engineering

Designed by Michael Green Architecture, this commercial development located at 1265 Borregas Avenue will open as Google's first mass timber office building. The entire building is designed with an emphasis on timber which is visible both inside and out.

The facade is designed as a Closed Cavity Facade (CCF) incorporating timber blinds within the cavity. This chosen approach and incorporation of dynamic shading allows for clear views out and in, while providing the required performance.

This facade approach is not only a first for Google, but also the first CCF in North America. The blinds are located in an enclosed and hermetically sealed cavity which is fed with dry air to avoid any condensation. As a result, the facade performs significantly better than a traditional curtain wall. This approach has negated the requirement for traditional trench convectors which are typically used to address peak loads.

Highlighting the significant potential a facade has on the overall sustainability of a building, this approach demonstrates how a facade can reduce both embodied and operational energy in the long term.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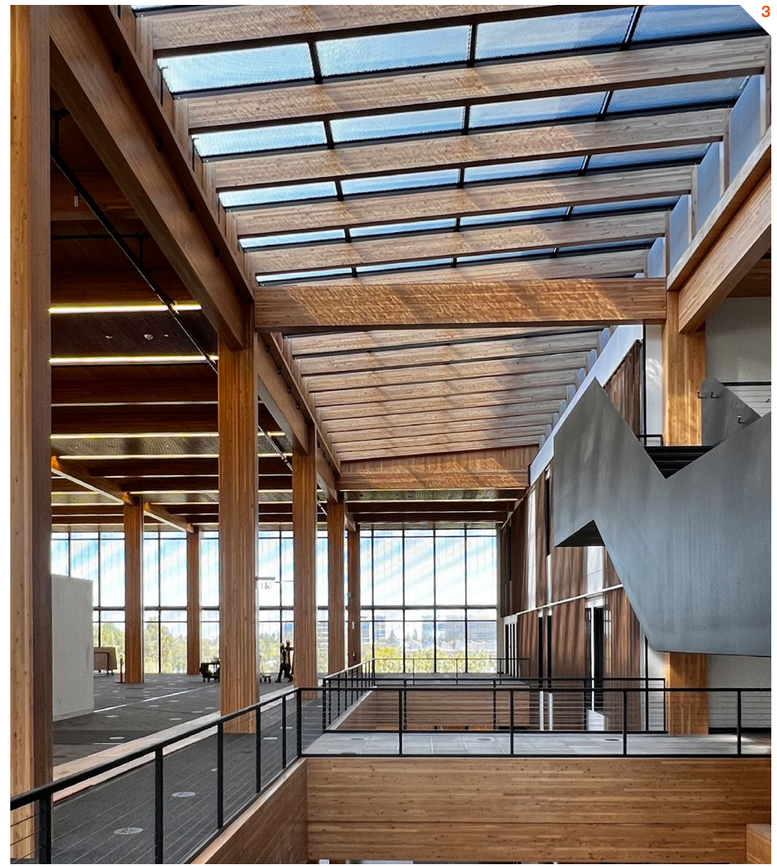
2 **A Closed Cavity Facade (CCF)**
North America's first building to incorporate a CCF, allowing clear views from inside and out, whilst performing significantly better than a traditional curtain wall.

3 **The future of campus design**
The use of mass timber is a precursor to Google's plans for future projects.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Aisher House, Sevenoaks School
Kent, UK
2022 RIBA South East Awards - Shortlisted
This new three-storey boarding house, designed alongside Tim Ronalds Architects, uses a Cross-Laminated Timber (CLT) structure, on a thin concrete raft, which minimises the embodied carbon. The house is all electric, has Mechanical Ventilation with Heat Recovery (MVHR) ventilation systems and its heat comes from an air source heat pump installation.

We see every project as an opportunity for change – rethinking and reinventing to find solutions to global challenges such as climate change, and helping to make positive advances through creativity.

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