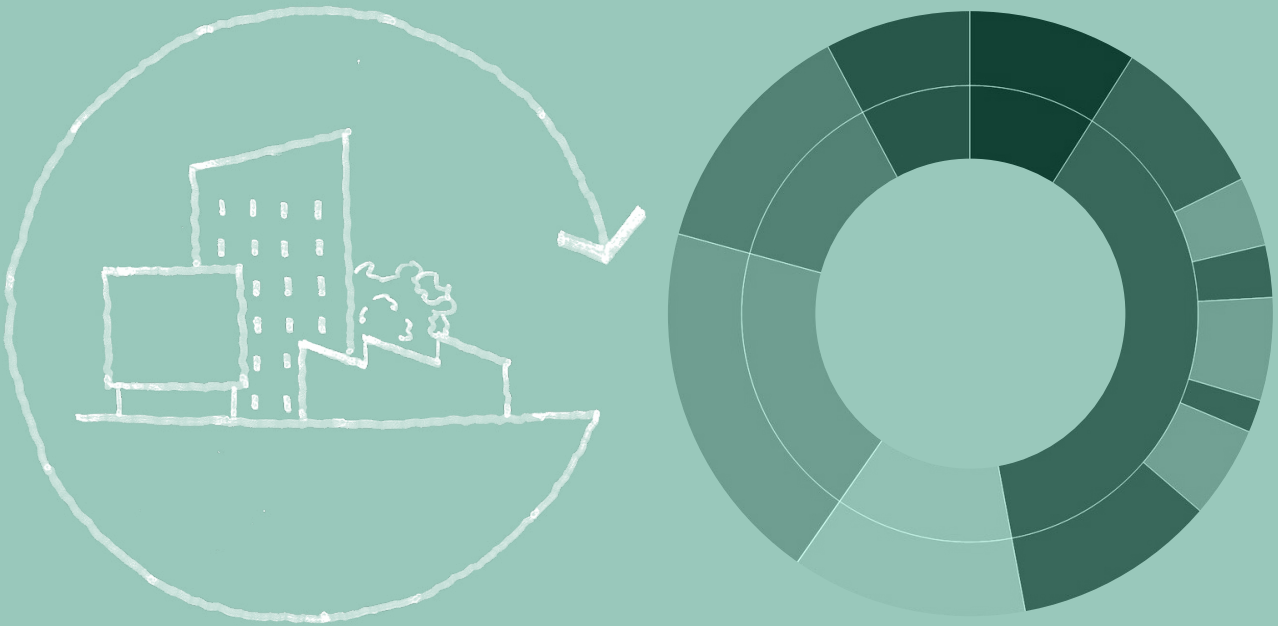


# Retrofit & Reuse





## Our Approach to Retrofit & Reuse

It is difficult to overstate the importance of reusing our existing buildings.

In cities like London the vast majority of buildings that we'll inhabit in 2050 already exist. While these do need to be decarbonised rapidly, replacing them is seldom the most efficient use of resources. Demolition material makes up the overwhelming proportion of all solid waste leaving cities, and newly built structures have a significant carbon footprint.

There is also the cultural, historic and human importance of our existing built environment that helps to engender a sense of connection and rootedness. The most successful major redevelopments, such as King's Cross, have enough retained fabric to link them with the wider city in which they are located, in a way that entirely new build ones usually fail to do.

Reuse and retrofit of course cover a wide range of building types and degrees of intervention. This is something covered in detail in the recent UKGBC report on the net zero carbon retrofitting of commercial offices, which outlines a pathway to upgrading buildings' operational carbon impacts. With regard to upfront carbon, the now commonly referenced LETI upfront carbon target of  $350\text{kgCO}_2/\text{m}^2$  assumes 50% reuse and is effectively impossible to meet without substantial reuse.

The following pages show a range of projects covering historic and modern retrofit projects. In each, the upfront carbon for the projects has been studied in detail. Collectively, they show the enormous benefit in carbon terms of retaining as many existing buildings as we possibly can.

# Storyhouse

A cultural hub that has redefined a city centre and offers an alluring model for the integration of civic and cultural services.

Located in the heart of Chester's historic centre, Storyhouse provides the city with a much-needed new home for drama, film and literature, curated under the over-arching theme of storytelling.

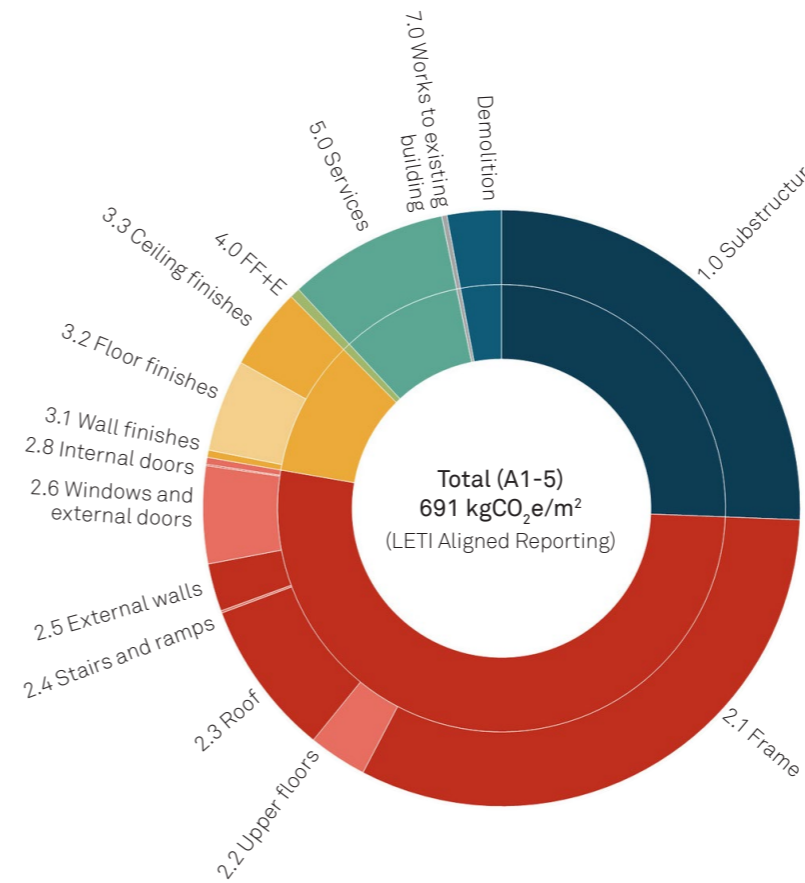
The £37m building incorporates an 800-seat main auditorium, a studio theatre, a cinema, a brand-new city-centre library and a café. The site includes a Grade II listed cinema, formerly an Odeon dating from 1936. Cheshire West and Chester Council hoped to achieve a unique city-centre building with 18-hour a day activity.

The concept for the building places the technically complex new auditorium and flytower outside the existing Odeon, allowing the cinema's striking Art Deco interior to be restored and used to house the foyer, studio and library. The prominent brick exterior of the historic Odeon retains its landmark status in Chester's townscape and continues to mark one of the major entrances to the site.

Location	Chester
Client	Cheshire West and Chester Council
Area	7,000 m <sup>2</sup>
Value	£37 million
Completion	2017

**“One of the most exciting projects in England at the moment... A powerful, modern, forward-thinking vision.”**  
 Sir Peter Bazalgette  
 Executive Chairman, ITV

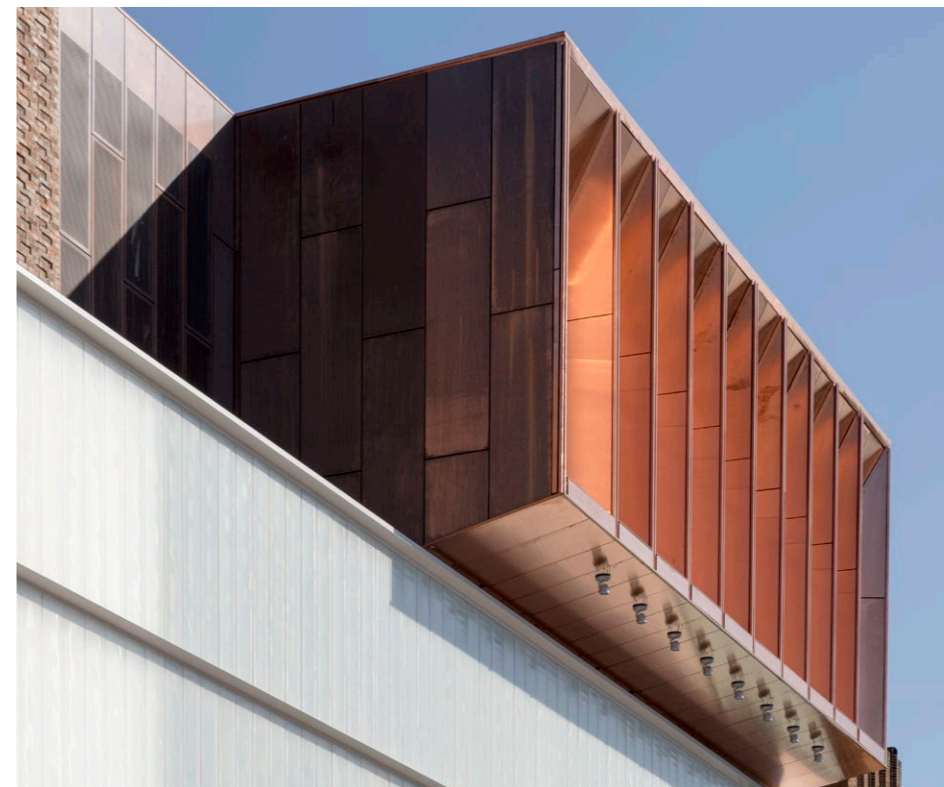
Total Upfront Embodied Carbon (kgCO<sub>2</sub>e/m<sup>2</sup>)



## Upfront Carbon and the Challenges of Theatres

The carbon study in this section focuses on the retrofit element which houses a library, bar cinema and offices within an old auditorium space. This study was undertaken as part of a comparative assessment of multiple theatre projects included within our **Net Zero Theatres** report, with the neighbouring new-build theatre featured. The study evaluated the upfront carbon of the odeon retrofit at 691 kgCO<sub>2</sub>e/m<sup>2</sup> with the new build theatre elements being significantly more intensive.

Whilst there were limited works needed to the existing fabric, substantial new structure was added, including infilling the previous stalls area, and creating a cinema and bar space within the library area. Combined, new structural elements accounted for 78% of the total upfront carbon in the retrofit. In today's context, different approaches would likely have been taken for the structural challenges, but the project still demonstrated the benefits and importance of reuse in cultural buildings considering that a similar quality and size of space would have likely required a significant carbon outlay.



# Edinburgh Futures Institute

Transforming a Grade A listed heritage building into a cutting-edge research facility that is integrated into the rest of the city.

The historic surgical building of Edinburgh's Old Royal Infirmary has been extended and upgraded to become the home of Edinburgh University's multi-disciplinary Edinburgh Futures Institute, where people from the university and beyond grapple with some of the world's most pressing questions. Inside a wide range of teaching and learning spaces, meeting rooms, IT hubs and workspace for academics are linked together by broad circulation routes and dynamic spatial volumes. The redeveloped building provides 21,300 sq m of floor space, 6,000 of which will be sensitive new blocks in the courtyard spaces. Six historically significant Nightingale Wards have been restored and connected by wide corridors and stairs that will become natural break-out spaces and informal meeting areas. There is a new public plaza, and a generous multi-functional auditorium for events and performances has been created below this square.

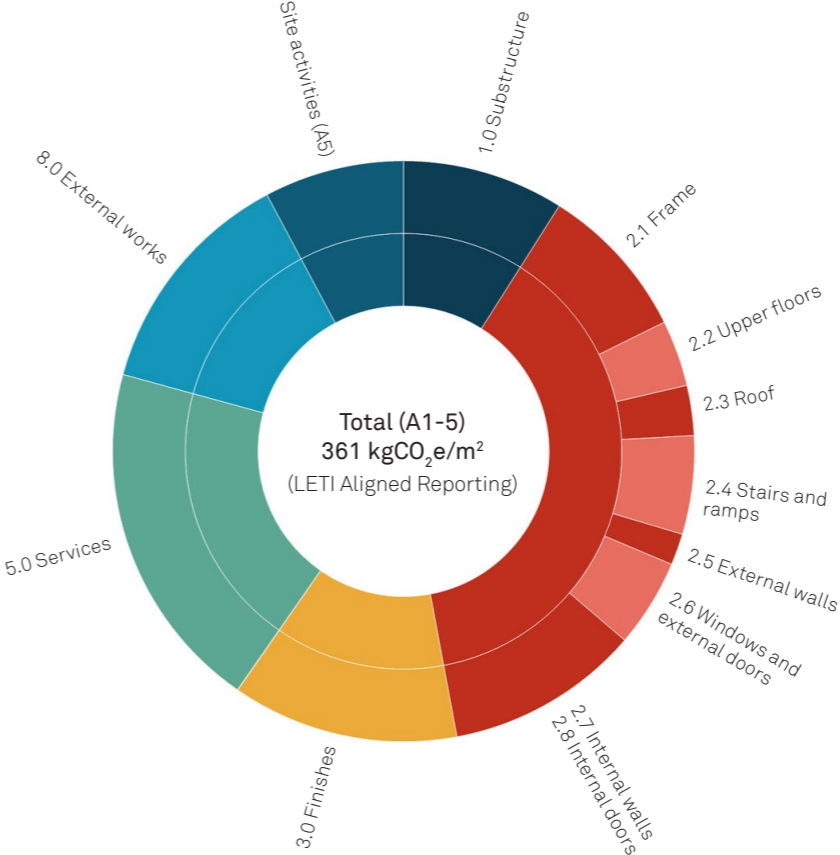
The listed building lies at the heart of the 19-acre Quartermile development masterplanned by Foster + Partners, one of the largest and most comprehensive regeneration schemes in Scotland, that includes the creation of 100 apartments, a five-star hotel, offices, restaurants, cafés, shops and the restoration and conversion of nine listed buildings. Located between the heart of the city and the parkland of the Meadows the project will open up a previously very inward-looking and hermetic site and create a series of pedestrian routes and landscaped spaces through it. This vast piece of Edinburgh will become a part of the city once again.

Location	Edinburgh
Client	The University of Edinburgh
Area	21,000 m <sup>2</sup>
Value	£120 million
Completion	2023

“... a truly exceptional teaching and research environment.”

Prof Sir Timothy O’Shea,  
Principal, University of Edinburgh

Total Upfront Embodied Carbon (kgCO<sub>2</sub>e/m<sup>2</sup>)



**Upfront Carbon and Deep Retrofit**  
The Edinburgh Futures Institute is an example of a deep retrofit for a complex historic building bringing a derelict shell up to the requirements of a state-of-the-art higher education estate. The upfront carbon has been assessed at Stage 5 and the retrofit anticipated to meet a LETI Rating B at 361 kgCO<sub>2</sub>e/m<sup>2</sup>. The initial condition of the existing building was poor, meaning the required improvements to fabric and structure have contributed significantly to the impact of the project, with sub- and superstructure contributing 54% of the total upfront carbon. The fabric has been improved thermally via internal linings and window replacement, though the project pre-dates NABERS and did not involve predictive energy assessment.

The infirmary was designed to support the needs of a 1800s medical facility, some of which align to modern day expectations for wellbeing such as the high provision of daylight and views out for the wards which now act as workspace. Building services were needed to meet the current thermal expectations of comfort and ventilation, with upgrades contributing a further 22% of the upfront carbon breakdown at 81 kgCO<sub>2</sub>e/m<sup>2</sup>. Whilst the new-build elements would be designed differently today, they make up a relatively small proportion of the total area, enabling the existing building to function and exemplifying the benefit of additive retrofit.



# Woolwich Works

Carved out of five historic military buildings, Woolwich Works is a new cultural destination in London located in the Royal Arsenal. The predominantly unused Grade II and II\* listed buildings have been converted to a 16,500-square-metre creative hub for multiple cultural occupiers, led by The Royal Borough of Greenwich.

The new Woolwich Works now includes a 450-seat theatre, a music venue, a museum and a variety of rehearsal studios, as well as providing a base for a number of internationally acclaimed theatre and dance companies including Punchdrunk.

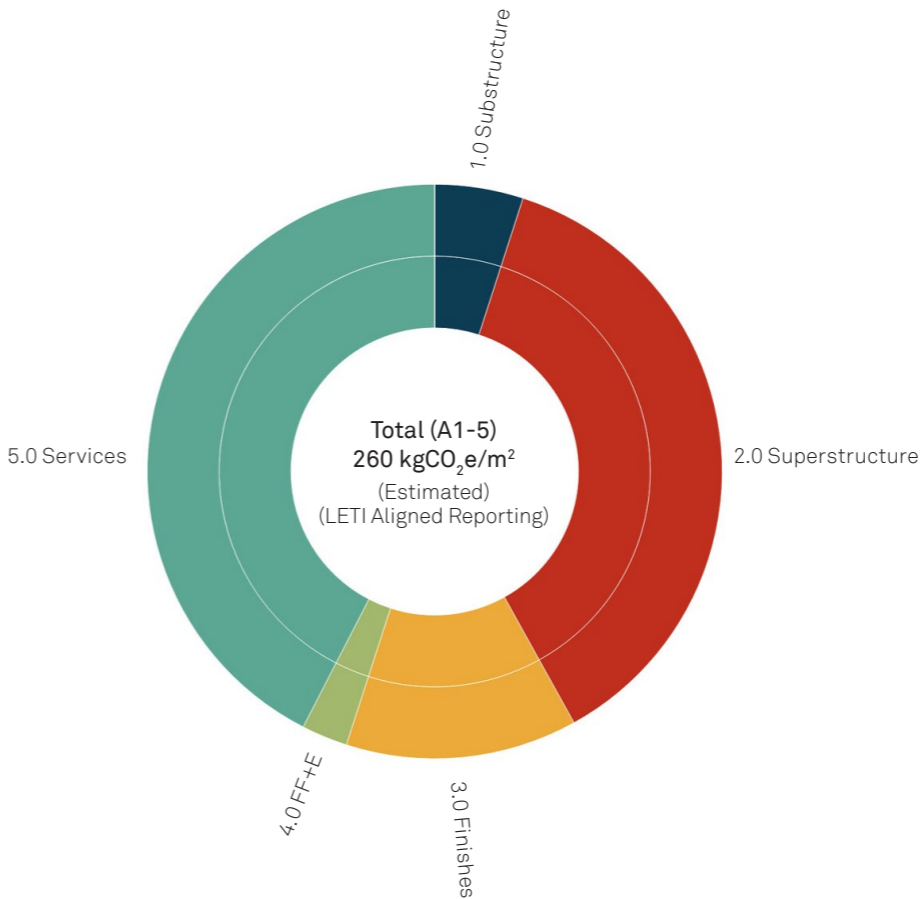
Working closely with the client throughout the design process, the project team helped identify the types of uses and tenants that would work well with the existing buildings, rather than undertaking significant works to the buildings to accommodate the requirements of less naturally aligned uses. This considered approach was complemented across all design disciplines.

The centrepiece of the project is "Building 41", which comprises an impressive performance space with capacity for 1200 seated or 1800 standing, an external courtyard and three smaller wings accommodating five studios, which can also be used for performance and rehearsal space creating flexibility for the venue. A café, bar and a further river-facing events space can be hired by community groups and the public, meaning Woolwich Works is truly flexible in how it can be used and the performances it can host.

Location	Woolwich, London
Client	The Royal Borough of Greenwich
Area	16,500 m <sup>2</sup>
Value	£31 million
Completion	2021

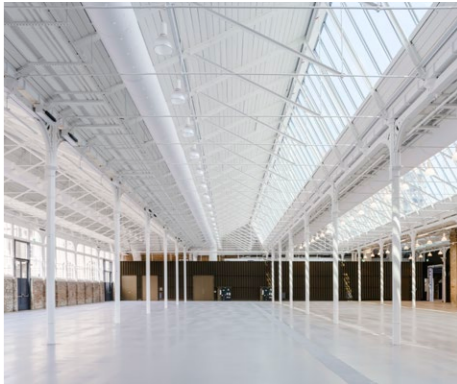
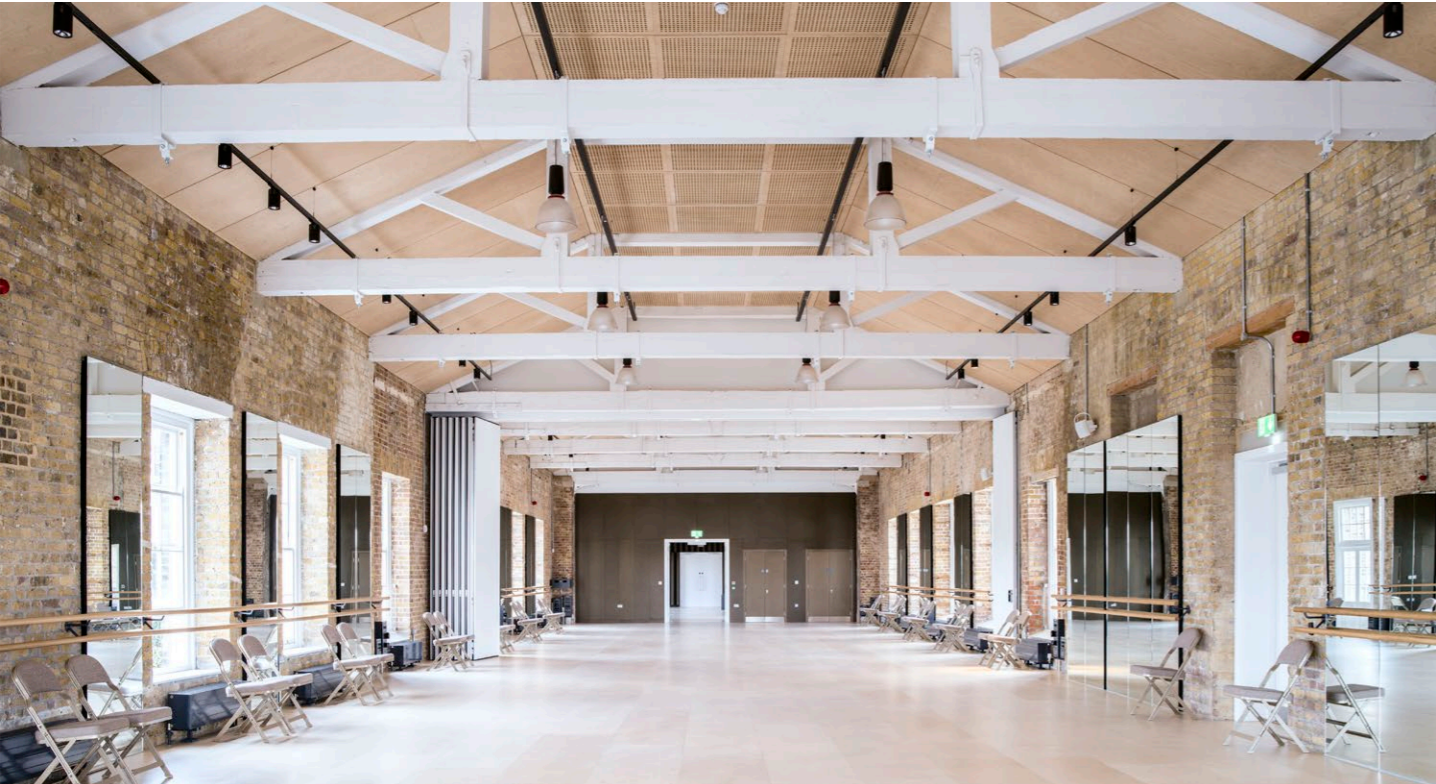
**“This is an incredibly exciting vision. It’s about putting Woolwich and the borough firmly on the map as a leading cultural destination.”**  
 Miranda Williams,  
 Cabinet Member for Culture and Creative Industries

Total Upfront Embodied Carbon (kgCO<sub>2</sub>e/m<sup>2</sup>)



**Upfront Carbon and Cultural Retrofit**  
 In a similar fashion to the Edinburgh Futures Institute, Building 41 at Woolwich Works takes a derelict historic building which had a prior life as a functional frame (a munitions factory) and makes it usable through a series of specific and limited new-build interventions. Similarly to EFI, the new-build elements are not an exemplar of low carbon design, but by the very nature of retaining such a vast amount of existing building the upfront carbon is kept low.

As the project predated practice commitments to calculate upfront carbon on all projects, a light touch exercise was undertaken to assess the new-build elements and then average those across the wider building with conservative benchmarks used for roof, MEP and other fit-out works. The result is a building which has a reported upfront carbon of approximately 260 kgCO<sub>2</sub>e/m<sup>2</sup>, the majority of which is split evenly between services and a new roof required for acoustic and thermal reasons.



# 5 New Street Square

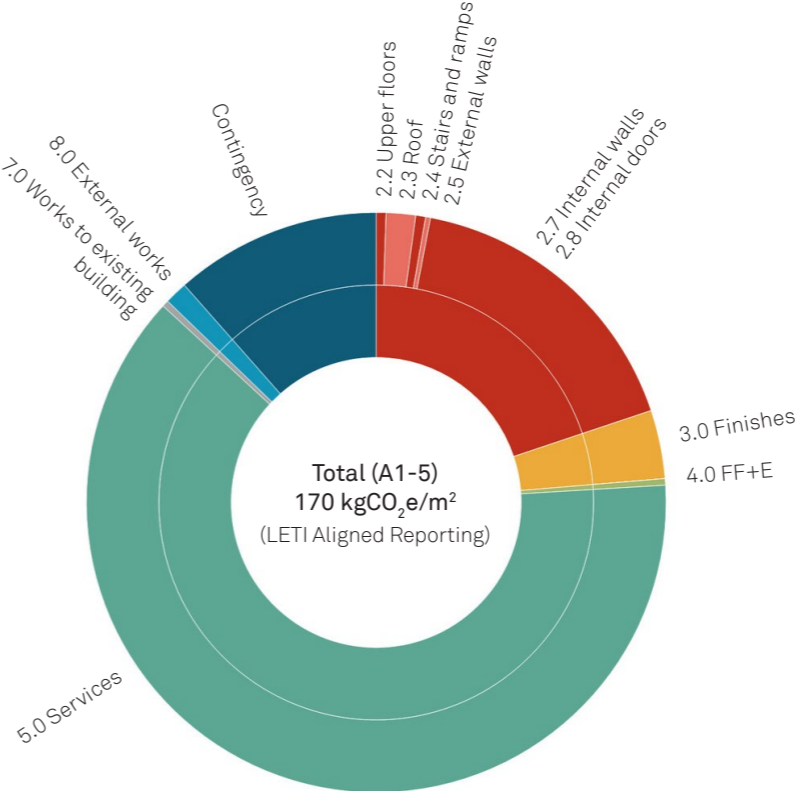
**Bennetts Associates' study looks at various upgrades to the building, with a focus on changes that can achieve net zero carbon operation before 2030.**

5 New Street Square is part of the New Street Square development by Bennetts Associates which completed in 2008 and comprises of a group of office buildings of different sizes set around a public space, located off Fetter Lane in the City of London. The development primarily consists of high-quality office space for long-term ownership and occupation, with the emphasis on an efficient, adaptable workplace set in a stimulating public realm, and includes retail, restaurant, and leisure activities at ground level. 5 New Street Square is currently under a process of decarbonisation, renovation, and refreshment in line with landlord and tenant aspirations to deliver a best-in-class experience.

The building's occupant, Taylor Wessing, is committed to being carbon neutral by 2025 and net zero carbon by 2030. The study outlines what these targets mean for both a landlord and a tenant. It looks at ways in which they can be met with varying degrees of cost and intervention which will impact on both the landlord in terms of physical changes to the building, and the tenant in terms of business behaviour. It also looks at the opportunity to invigorate and improve other areas of the building with an understanding of embodied carbon and how this can also affect the net zero ambition of the tenant. To achieve this will require changes to the individual floorplates as well as the centralised systems, with a focus on the key areas: the atrium, central plant, reception, floorplates, and roof terraces. This presents an opportunity to reshape and update the building in line with Taylor Wessing's goals and current trends in workplace design.

Location	City of London
Client	Landsec
Area	21,500 m <sup>2</sup>
Value	£42 million
Completion	Expected 2025

**Total Upfront Embodied Carbon (kgCO<sub>2</sub>e/m<sup>2</sup>)**



**Upfront Carbon and Commercial Retrofit**

5 New Street Square is a systems-led light-touch retrofit which aims to meet the energy efficiency and space requirements of the landlord and occupier within an upfront carbon budget of 225 kgCO<sub>2</sub>e/m<sup>2</sup>.

The scope involved retaining the substructure and superstructure with slight alterations and additions, consequently reducing these building elements to just 12% of the total upfront carbon. Meanwhile 81% (138 kgCO<sub>2</sub>e/m<sup>2</sup>) of the total upfront carbon is contributed by the upgrades to building services which help to deliver the energy efficiency reductions and comfort needs and align with the brief to meet NABERS 5\*. This is an example of an increasingly common commercial retrofit of more recent built assets to meet current expectations, with the original New Street Square development built in 2008.

After services, all other elements have small contributions, with internal walls, partitions and doors adding only 9% (15 kgCO<sub>2</sub>e/m<sup>2</sup>) and finishes just 5% (8 kgCO<sub>2</sub>e/m<sup>2</sup>) which was achieved primarily through reducing the amount of material used and replaced. This upfront carbon assessment was undertaken at RIBA Stage 3 and will continue to be reviewed and revised at intervals until project completion.



# Workspace in Belgravia

Nestled within a conservation area in Westminster, London, the project connects two Grade II listed Victorian townhouses to embody the vision of a single holistic workspace.

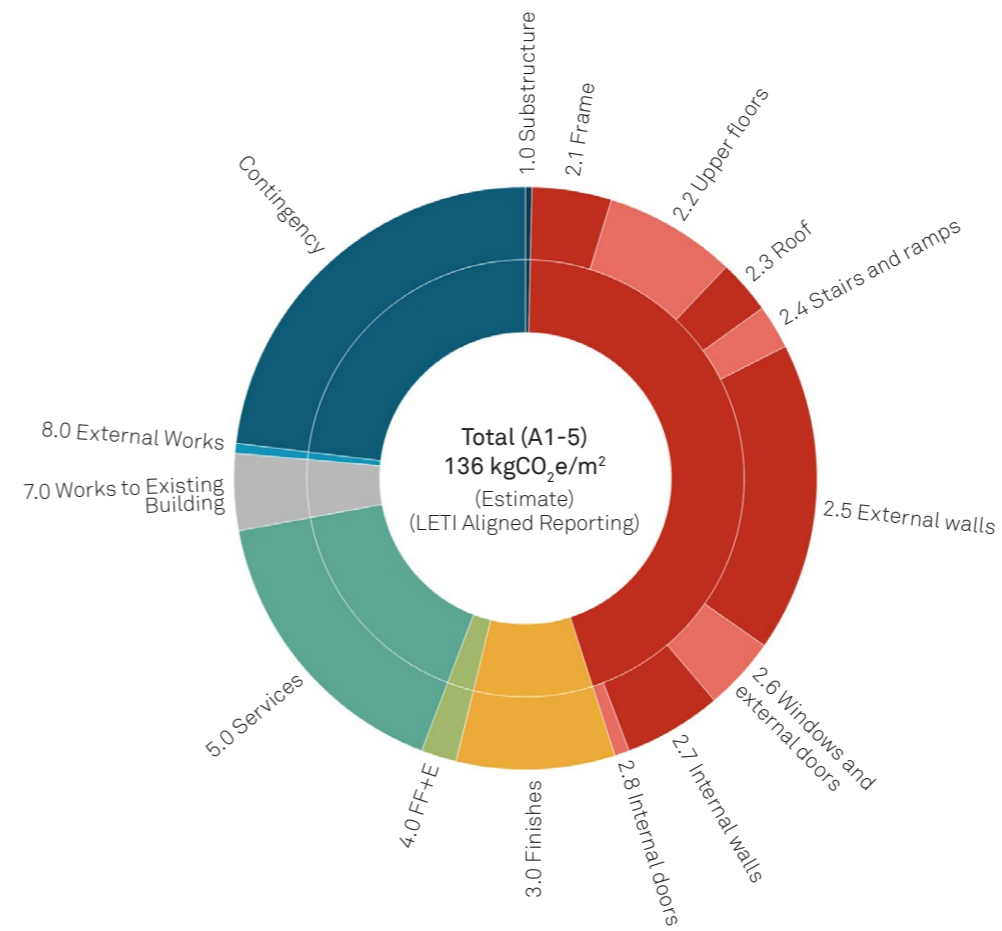
The two listed terraces will be retrofitted with fabric upgrades and new connections between the two. Spread across seven floors, our proposals comprise internal and external refurbishment to futureproof the building and link the properties along the party wall with minimal interventions and disturbance to the remaining heritage fabric. A modern fire escape strategy has been proposed and there are plans to reinstate the unique entry sequence of the corner property to better showcase its striking former arrangement while providing compliant lift access, thereby enabling full accessibility to both terraces for the first time.

While the lower ground floor will offer functional entertainment and flexible spaces, the grand upper floors will serve as open work-meet areas. A key aspect of the brief is to craft spaces of uniqueness and interest, steering away from typical office environments.

The scheme truly comes to life through its interior design, which celebrates historic features by seamlessly blending them with vibrant fabrics and textures, including lively wallpaper, as well as blending vintage and contemporary furniture elements. This combination creates an inviting space aimed at fostering collaboration and productivity.

**Location** Belgravia, London  
**Area** 2,250 m<sup>2</sup>  
**Completion** Expected 2026

Total Upfront Embodied Carbon (kgCO<sub>2</sub>e/m<sup>2</sup>)



## Upfront Carbon and Commercial Retrofit

Given the considerable constraints of the existing Grade II listed buildings, the project uses a light-touch retrofit approach to adapt the two Victorian town houses into high-end contemporary office space.

The high level of retention helps to keep upfront carbon low. The design team undertook an upfront carbon study at RIBA Stage 4 which showed the retrofit sitting within a LETI band A+ with a total of 136 kgCO<sub>2</sub>e/m<sup>2</sup>. Of this, 45% was contributed by the superstructure upgrades including some limited envelope upgrades and internal partitioning. In addition, much of the internal finishes (particularly the existing lime plaster) are being retained with limited interventions. Much of the colour and vibrancy of the spaces is being provided by the furniture as opposed to intensive finishes.

Whilst the constraints of the Grade II listing work to support the upfront carbon performance of the project, the operational performance is unlikely to meet that of a new build or deeper retrofit. As this study was a high level assessment using quantity information from Revit, a substantial contingency of 30% has been added to account for coverage and uncertainty in quantities.

