Gilbert-Ash

A fresh perspective on building

# Construction Environment Management Plan
# 70 Great Bridgewater Street, Manchester M1 5ES

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## INTRODUCTIONS

The following statement has been produced to support a Construction Environmental Management Plan being coordinated by Gilbert Ash as the main contractor on the redevelopment of an existing office building at 70 Great Bridgewater Street, Manchester.

The project consists of the retention of an existing concrete building with an additional two storey vertical extension as well as the installation of a new curtain wall façade. The project will deliver circa 10,000m2 of high-quality office and associated spaces.

## SUSTAINABILITY APPROACH

Sustainability has been a key driver for the project from its inception with a desire to demonstrate an innovative and 'best-in-class' sustainable development. As a result a number of large scale proposals sought to ensure these sustainability goals as follows:-

- Retention of existing concrete frame and basement structures with resulting savings in embodied carbon
- Replacement of defective and poorly performing façade and replacement with a highly insulated and airtight new façade that also maximised internal daylighting
- Replacement of out-dated and energy inefficient services and equipment an in order to reduce in-use energy demand (with an aim of achieving a NABERS 5* rating)
- Inclusion of on-site energy generation though air source heat pumps and large-scale photo-voltaic panel arrays
- The aim of achieving design and construction stage BREEAM rating of 'Outstanding' making this project the first retrofit project on the current BREEAM scoring system to achieve both design and construction stage accreditations in Manchester

The result of these decisions has allowed the team to identify the following credentials that place the design decisions in context:-

- EPC A
- Whole life carbon saving of 4,005,00kgCO2 (compared to new build)
- 26% of all energy demand from on-site generation)
- 78% improvement in operational carbon emissions (compared to the previous building)
- Incorporation of rainwater harvesting on site

## POLICY CONTEXT

Planning policy is set at the national level by the National Planning Policy Framework (NPPF) and associated Planning Practice Guidance (PPG) the relevant sections are summarised below.

*National Planning Policy Framework* - Most recently updated in September 2023, the National Planning Policy Framework (NPPF) sets out the Government's planning policies for England. The NPPF 7 states "the purpose of the planning system is to contribute to the achievement of sustainable development". Key requirements for the environmental objective of relevance to this statement include making efficient use of land, using resources prudently, minimising waste and pollution and mitigating climate change.

*Planning Practice Guidance* - Planning Practice Guidance (PPG)2 underpins policies within the NPPF and provides guidance on their implementation. As such PPG is a material consideration in planning decisions and should generally be followed unless there are clear reasons not to. PPG includes a specific section on the implementation of waste planning policy. It explains how local planning authorities can help ensure waste is handled in a manner which protects human health and the environment. Local planning authorities, to the extent appropriate to their responsibilities, should look to drive waste management up the 'waste hierarchy'

*Manchester Core Strategy 2012 - 2027* - The Core Strategy is the key Development Plan which was adopted in 2012 and sets out policies EN19 Waste, that requires all developers to demonstrate the proposal's consistency with the principles of the waste hierarchy, and DM1 Development Management, that requires all development to have regard for refuse storage and collection in the design.

*Greater Manchester Spatial Framework 2020 - 2037 - The* production of the Greater Manchester Spatial Framework, an update to the Core Strategy, is no longer being progressed in its current form however the draft plan sets out the ambition for Greater Manchester to achieve a circular economy and a zero-waste economy, in part by implementing Policy GM-S 7 – Resource Efficiency. This policy outlines measures to help achieve a circular economy such as using sustainable design and construction techniques to reduce carbon emissions, adapt and future proof the impact of climate change, reduce and recycle waste and minimise water use.

## MATERIAL STRATEGY

In addition to the wider scale energy and resource efficiency measures that have been incorporated in the scheme and outlined above the team have sought to apply the same principles to material usage and specification. Much of this is measured and been validated by the BRE through the scheme successfully achieving BREEAM 'Outstanding' at design stage (certificate no. BREEAM-0087-4651). Key points from the BREEAM assessment are identified below. Appendices illustrating the BREEAM process in action can be seen at the end of this statement.

*Efficiency* - The approach has been to use material as efficiently as possible and this has been achieved throughout the design process. At each stage the team has reflected on how material is used as well as how and when decisions could affect the efficient use of resources (for further information see enclosed BREEAM 'Mat 06' information).

*Robustness* – By carefully considering how materials are used on the project the team identified where measures to improve the longevity and robustness of various building elements could extend the life of the buildings material resources and, as a result, reduce the long terms need for additional materials to enact repairs (for further information see enclosed BREEAM 'Mat 05' information).

*Material Sourcing* – Through careful and defined specification the team has ensured that where significant new material is required that this material is sustainably sourced and that this is backed by evidence. The approach, via the BREEAM process was to highlight which key materials the specification would be explicit regarding the requirement that the manufacturer or supplier was either BES 6001 or ISO 14001 accredited. In the case of timber this requirement was replaced with FSC accreditation (for further information see enclosed BREEAM 'Mat 03' information).

*Life Cycle Analysis* – an independent consultant undertook a full life cycle analysis to evidence and inform the design team to recognise and encourage the use of construction materials with a low environmental impact (including embodied carbon) over the full life cycle of the building (for further information see enclosed BREEAM 'Mat 01' information).

*Adaptability* – the team have identified ways in which the proposed design can not only adapt to other users over its lifespan, but also how the building itself is designed to adapt to climate change. Practically, this has taken the form of ensuring resilience to overheating via the façade, sufficient building access to allow for maintenance as well as a degree of redundancy with riser space and ventilation capacity to ensure ease of upgrade of systems should this be required (for further information see enclosed BREEAM 'Wst 05 & Wst 06' information).

As a more general point some key design decisions were made that will make a significant contribution to the inherent sustainability of the proposals and these are as follows:-

- The façade system is aluminium framed which is a fully and efficiently recyclable product
- The façade system has a design life of 60 years which is at the highest end of the likely lifespan of any construction within the contemporary construction industry. However, with proper maintenance and repair the façade could be functional for a considerably longer period
- Where possible internal linings have been avoided and the underside of structural slabs have been left exposed significantly reducing the amount of material required and improving the thermal mass performance of the

building
• As a speculatively built proposal no internal finishes will be applied where the is a high likelihood that incoming tenants would either need to amend or change these finishes

DEMOLITION & SITE WASTE

The requirements of the BREEAM rating have resulted in onerous responsibilities on the main contractor Gilbert Ash as regards the handling and reduction of waste. The target of the project has been to divert 92% of demolition waste and 85% of non-demolition waste away from landfill.

LIST OF APPENDICES

Life Cycle Analysis Report: *for BREEAM credit Mat01*
Responsible sourcing of materials Tracker Document Sample: *for BREEAM credit Mat 03*
Design for robustness and durability Tracker Document Sample*: for BREEAM credit Mat 05*
Material Efficiency Tracker Document Sample*: for BREEAM credit Mat 06*
Design for disassembly and adaptability: *for BREEAM credit WST 06*

BEECHFIELD
CONSULTING ENGINEERS
*Mechanical, Electrical & Energy Consultants*

# 70 Great Bridgewater Street

BS EN ISO 14040 Life Cycle Analysis, West Building

## Document Control

| | |
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## Scope and Exclusions

Beechfield Consulting Engineers has been commissioned by Element Sustainability to carry out this assessment as detailed in the document title.

The study is based on BS EN ISO 14040 and standard lifecycle analysis methodology.

All results and strategies are directly affected by the inputs listed in this document; any deviation from these is bound to output different results.

It is important to note that with any modelling exercise there are assumptions and approximations that must be made. Details of assumptions made, and approximations used are supplied as part of the report.

All results are based on the output from computer modelling software which is based on climatic conditions and patterns of use bound not to be identical to the real-life situation. Therefore, these results should be read as those following the calculation methodology, but not as guaranteed real-life observations.

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## Introduction

Life Cycle Assessment (LCA) is a method for evaluating the environmental load of processes and products during their life cycle from cradle to grave. It attempts to identify the environmental effects during all stages of the life of a product and produces a figure that represents the environmental load of a product. It is a process that is becoming more widely adopted in the context of national and international environmental regulations.

Increasingly, building designers are looking at some or all the steps of the building lifecycle to guide their decisions; from raw material to manufactured product; including extraction of the materials; energy consumption; manufacture; transportation; use; recycling; and final disposal or end of life.

Lifecycle assessment effectively means the designer looks at what happens before and after the final product is used by the building occupant, measuring effects over a typical building's life. A BREEAM compliant LCA for example is conducted over 60 years as standard, though other certifications have different or no standard building lifespan.

Designers can also use LCA to compare options to find the best balance of cost, durability, overall environmental impacts, functionality, and aesthetics.

For example, some building elements may be cheaper, but degrade faster than others. It may well be better value overall to select a more expensive product that does not need constant replacement. Undertaking an LCA allows the design team to make such informed decisions that would usually not be considered.

In a full LCA, the energy and materials used, along with waste and pollutants produced because of a product or activity are quantified over the whole life cycle.

The ISO 14040 standard refers to LCA as 'the collection and assessment of the inputs and outputs of any potential environmental impacts caused by the product system throughout its life cycle'




At this design stage, the analysis relates purely to the carbon impact of estimated quantities of building materials in the assigned building. Throughout the lifecycle of the building, carbon emissions will also be generated from Energy usage, water consumption, and construction site

operations. Carbon may also be mitigated by the absorption of emissions by the materials on site. These may be fully integrated into LCA analysis once established by design and construction teams.

Construction materials are calculated using the building design to produce BIM data, which in-turn is converted into estimates of material quantities.

The methodology uses like for like impacts using functional units such as required strength or thermal resistance, rather than impact per tonne of material, as for example, comparing steel and concrete structures on a per tonne basis would be meaningless as steel may have a large impact per tonne but much less may be required to perform the same function. Therefore, where less of a material is required to perform the same function, this is accurately represented.

As an example, the functional unit for roofs as defined in the Green Guide to Specification is, “1 sq. m of roof construction, measured horizontally, to satisfy Building Regulations, in particular to a U value of 0.25 W/m2K. To include any repair, refurbishment or replacement over a 60-year building life”

At this stage of design, the quantities used must be understood as estimates, these may be desired be updated to actual quantities at an appropriate stage, however this is not necessary to fulfil the requirements of the LCA.

Product characteristics are taken from the various available databases, such as those provide by RICS, BRE, RIBA and certain manufacturers. Details of those used are contained in the appendix.

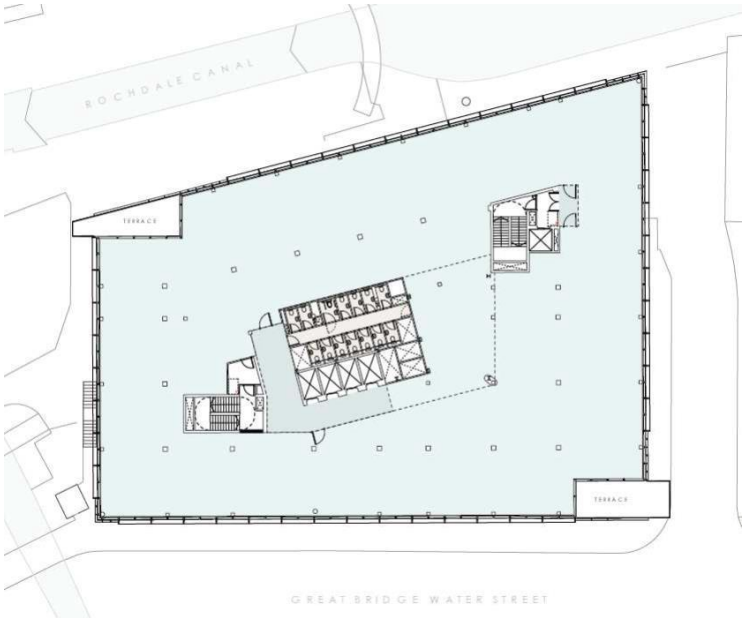
## The Development

The proposed development site is located on Great Bridgewater Street within Manchester City Centre.

The site boundaries are formed by the Rochdale Canal to the south and east, existing hotel building (known as the Jurys Inn) to the west and Great Bridgewater Street to the north (see Figure 2.1). The surrounding area provides predominantly commercial accommodation, along with hotels, bars and restaurants. The iconic Bridgewater Hall venue and Manchester Central Convention Complex are located to the north of the site. The application site is not situated within a conservation area.

The development proposals include the partial demolition, retention of the frame and reconfiguration of 70 Great Bridgewater Street to create a new office building (Use Class E), including replacement of building facades, two storey roof extension and alterations to the internal layout including servicing and cycle parking, access and associated works. The proposed office accommodation will increase the net internal floor area by 6,590m2.





# Life-cycle Assessment

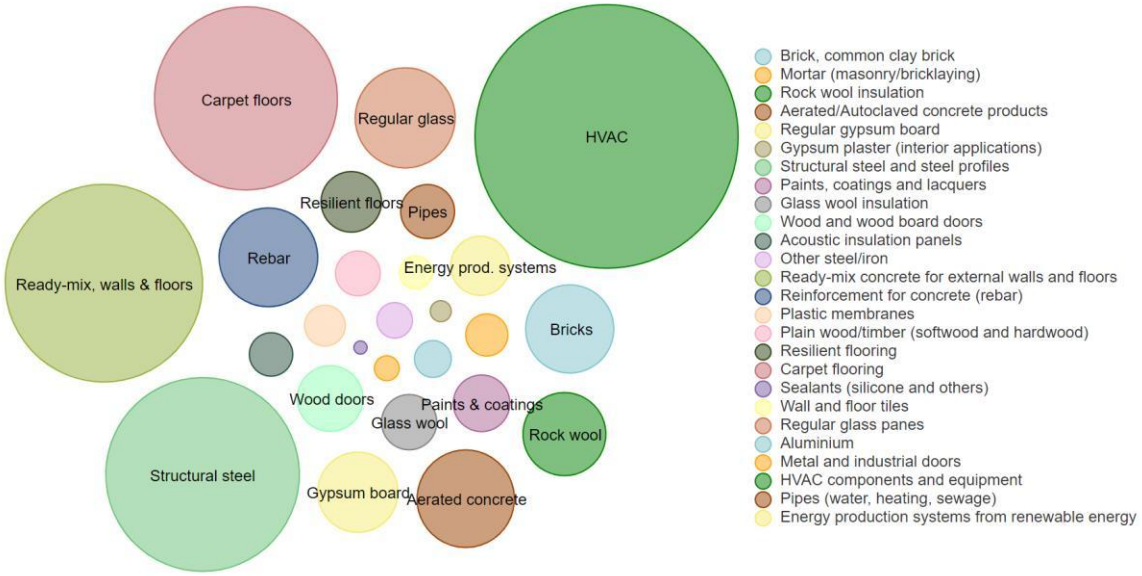
Based on the material breakdown, the emissions for each material are added and categorised to produce the impact assessment:

| | Result category | Global warming kg $CO_2e$ | Acidification kg $SO_2e$ | Eutrophication kg $PO_4e$ | Ozone depletion potential kg CFC11e | Formation of ozone of lower atmosphere kg Ethenee | Non hazardous waste disposed kg | Biogenic carbon storage kg $CO_2e$ bio |
|---|---|---|---|---|---|---|---|---|
| A1-A3 | Construction Materials | 3,613,849.55 | 14,643.71 | 2,547.27 | 0.21 | 1,440.59 | 174,511.36 | 102,645.84 |
| A4 | Transportation to site | 61,004.36 | 116.91 | 24.41 | 0.01 | 8.34 | 323.02 | |
| B4-B5 | Material replacement and refurbishment | 1,655,257.65 | 7,683.36 | 1,394.68 | 0.08 | 672.18 | 237,619.88 | |
| C1-C4 | End of life | 190,627.45 | 381.49 | 100.23 | 0.02 | 17.02 | 882,129.44 | |
| D | External impacts (not included in totals) | -1,180,851.6 | -3,830.47 | -1,150.09 | -0.04 | -569.92 | -48,822.5 | |
| | **Total** | **5,520,739.01** | **22,825.47** | **4,066.59** | **0.32** | **2,138.13** | **1,294,583.69** | **102,645.84** |
| | **Results per denominator** | | | | | | | |
| | Gross Internal Floor Area (IPMS/RICS) 12759.0 $m^2$ | 432.69 | 1.79 | 0.32 | 0 | 0.17 | 101.46 | 8.04 |

*Module D contains benefits and loads beyond the asset lifecycle – These are reusable or recyclable products that may be taken advantage of at end of life, and the useful energy that may be reclaimed. As this is beyond the end of the measured lifecycle it is not included in the totals.

# Breakdown of LCA

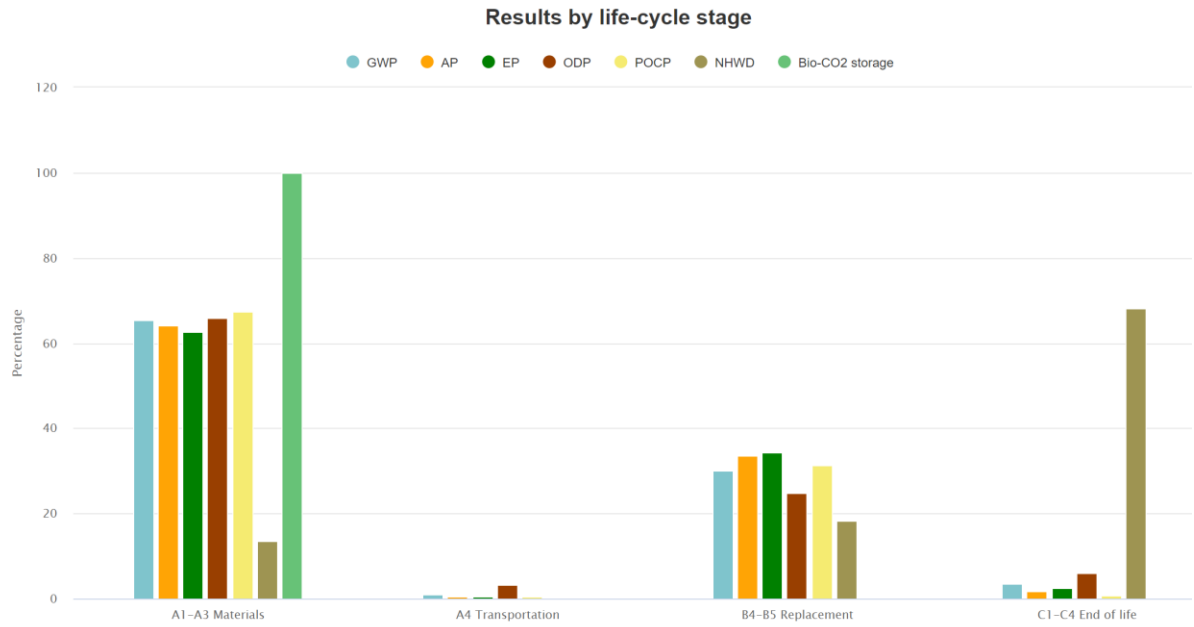
## Analysis by Materials




The bubble diagram above provides a visual breakdown of the materials in the project, against their global warming potential, whilst concrete and timber are well known to be high contributors, other large impacts of interest are from gypsum, glass, and insulation materials, and purchasing of these should include a consideration of the global warming potential of the various choices.

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## Analysis by Life Stage




This chart shows a breakdown of the various kgCO2 outputs for each stage, alongside their individual contributing carbon types.

As would be expected, the majority of the impact is in the construction, highlighting the importance of sustainable choice of construction materials and techniques.

Of interest is the large peak for non-hazardous waste disposal at end of life. Waste disposal is currently a very carbon intensive activity, and any advancements that allow this to be reduced should be planned into the building life as appropriate.

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## Comparison of Construction Methods

When conducing LCA, significantly different design options are defined in terms of either the types of, or quantity of, construction products specified for one or more major elemental constructions that are within the scope of the assessment.

The level of detail depends on the stage in which the LCA is being conducted.

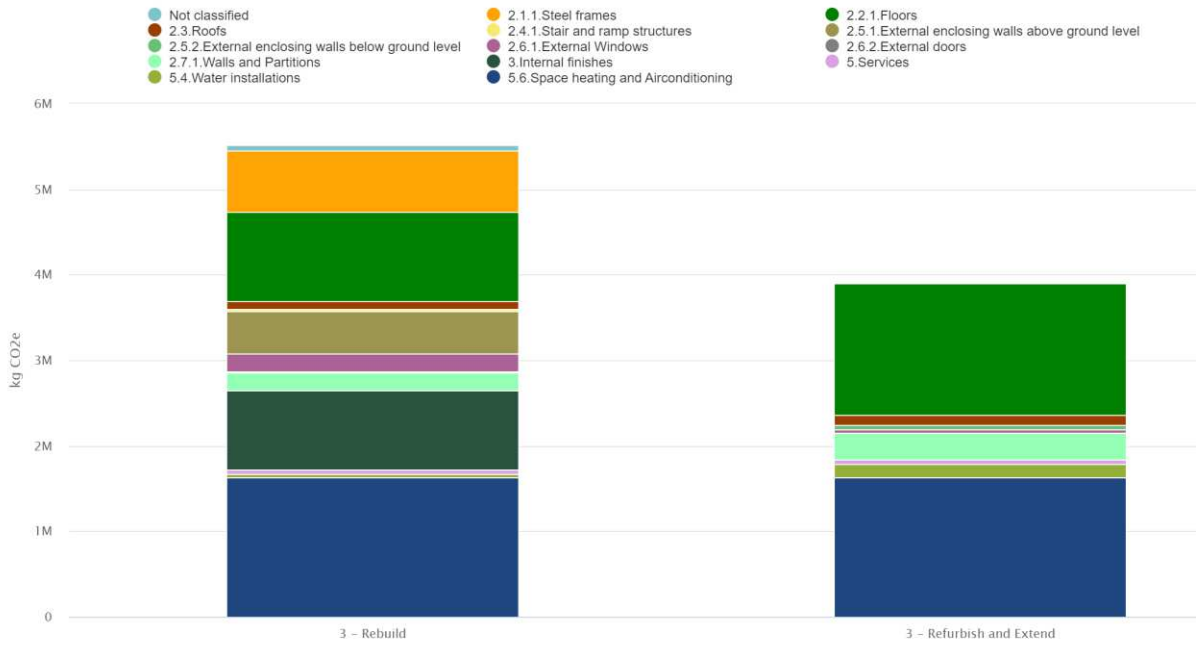
During early stage LCAs, design options are typically assessed at the elemental construction level. For example, seeing if it is possible to replace steel with aluminium, or if steel content can be reduced.

For later stage LCAs, design options are assessed at product level. The intention is that the design stage should be fixed at this point; the main questions left are minutiae, for example, shipping distance from factory to site of one insulation product vs another.

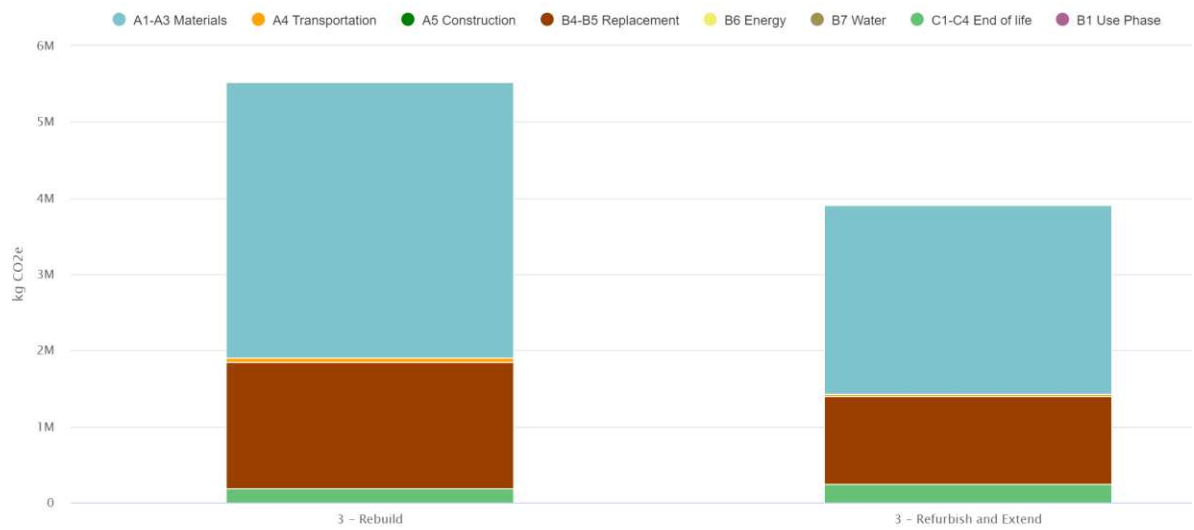
The analysis was run with differing construction methods in addition to the baseline. This provides a useful comparison to validate construction technique choices.

- The baseline is for the building as designed.
- The second option is for complete demolition and rebuild.

*Note that no inference is made of the technical feasibility of these methods.*

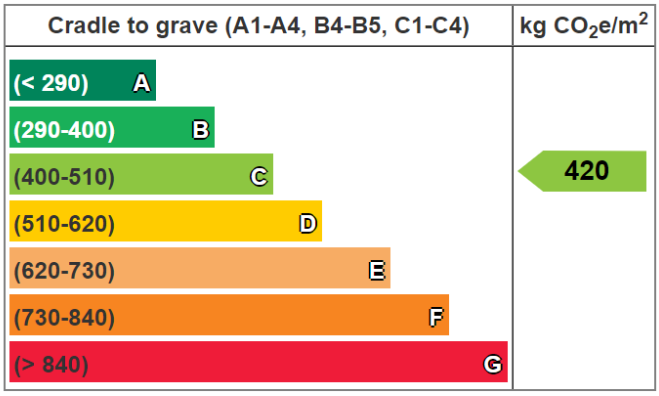



In this bar chart we see the contribution of different building elements to the overall global warming potential. Note the significant reduction in global warming potential of the chosen design.




This chart shows that the impact by life cycle stage is proportional between the options, however this can also be used to show that the impact of choosing refurbishment at each stage is significant, for example the transportation emissions may be a small part of the overall project for either design notion, however these are cut in half by the refurbishment option, providing a crucial reduction in fumes to this urban area.

# Conclusion

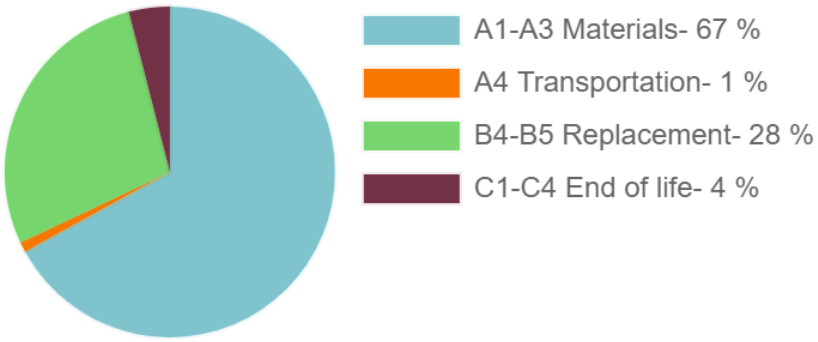



The building achieves an C-rating against the Carbon Heroes CH Q1 2020 Western Europe – Apartment benchmark. The C-rated benchmark shows that the project is better than many other similar projects.

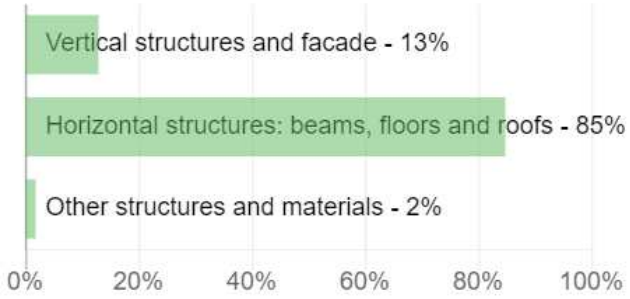
($kgCO_2e$ is way to describe all types of carbon emissions in terms of their equivalent global warming impact to a kg of pure CO2 emissions)

| Construction Type | Emissions ($kgCO_2e$) |
|---|---|
| Refurbish and Extend | 3,903,044 |
| Demolish and Rebuild | 5,520,739 |

This is the lowest environmental impact of the various studied construction techniques, and the proposed construction methods will generate the least environmental impact when compared to the other two options we have assessed.




The above chart shows a breakdown of the sources of the carbon impact by lifecycle stage. As one would expect, the largest segment shows impact from manufacturing of the products, however a significant segment occurs from mid-life replacement activity, and end of life (building decommissioning). These are areas where the use of improved materials and techniques give the building operator significant future opportunity to lower the carbon footprint of the building.




In this chart we see a breakdown by structure type, showing the contribution of what can be seen as building structural components vs. façade, and other components.

**In summary, the project is shown to have a reduced environmental impact when compared to other projects, and other construction techniques, and is the most sustainable option of those considered.**

# Data Sources

| *Resource name* | Technical specification | Product | Manufacturer | EPD number | Year | Upstream database | Density | Product Category Rules (PCR) |
|---|---|---|---|---|---|---|---|---|
| *Asphalt, generic, compacted* | 5/95% bitumen-aggregate ratio, 2350 kg/m3 | | | - | 2018 | ecoinvent | 2350.0 | EN15804 |
| *Concrete block, masonry* | 149x250x499 mm | SCAN Blokk | RC Beton | MD-15008-DA | 2015 | GaBi | 650.0 | EN15804 |
| *Floor levelling screed, cement based* | 10-100 mm | | Proplan | NEPD 00173N | 2013 | - | 2000.0 | IBU PCR Requirements on the EPD for Mineral factory-made mortar, 2012 |
| *Glass wool/mineral wool insulation with ECOSE Technology* | 0.032-0.033 W/mK | | Knauf | BREG EN EPD000062 | 2015 | ecoinvent | 29.0 | EN15804 |
| *Glass wool/mineral wool insulation with ECOSE Technology* | 0.031-0.033 W/mK | | Knauf | BREG EN EPD000063 | 2015 | ecoinvent | 56.0 | EN15804 |
| *Glass, clear, float* | 3 mm, LT 90.8%, RLE 8.2%, SF 0.89, 7.5 kg/m2 | Planiclear | SGG | S-P-00882 | 2016 | GaBi | 2500.0 | PCR 2012:01 Construction products and Construction services, ver. 2.01 |
| *Gypsum plasterboard* | 12.5 mm, 8.985 kg/m2 (average product weight) | | Etex Building Performance | BREG EN EPD 000204 | 2018 | ecoinvent | 718.8 | EN15804 |
| *Gypsum plasterboard* | 6,5 - 18 mm; 5,5 - 18 kg/m2 | PRO, 4PRO | Rigips | ITB EPD No 25a | 2014 | ecoinvent | 968.0 | PCR-24-PL |
| *Gypsum plasterboard, reinforced, water resistant, with square edges* | 1200x900x6/12.5 mm, 800 kg/m3, 10µ water resistance | Glasroc H TILEBACKER | British Gypsum | S-P-00472 | 2014 | ecoinvent | 800.0 | PCR 2012:01 Construction Products and Construction services, ver. 1.2, IBU PCR GuidanceTexts for Building-Related Products and services, Part B: Requirements on the EPD for Plasterboard version 1.5 |
| *Hollow core concrete slabs, generic* | C30/37 (4400/5400 PSI), 10% recycled binders in cement (300 | | | - | 2018 | ecoinvent | 1400.0 | EN15804 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | kg/m3 / 18.72 lbs/ft3), incl. reinforcement | | | | | | | |
| *Insulation, expanded polystyrene (EPS), for walls, French average* | R=5m2K/W, L=0.035W/mK, ép. 175 mm, Lambda=0.035 W/(m.K) | Donnee par default | MDEGD | INIES_DISO201 70113_162011, 5962 | 2016 | ecoinvent | 20.0 | EN15804 |
| *MDF board, for timber frame structures* | 12x1197x2397 mm | Vent | Medite | BREG EN EPD000090, Issue 03 | 2017 | ecoinvent | 740.0 | EN15804 |
| *Phenolic insulation, glass tissue double faced, for floors* | 60 mm, L = 0.02 W/mK, R = 3 m2K/W, 2.1 kg/m2, approx. dens. = 35 kg/m3 | Kooltherm K3 | Kingspan | BREG EN EPD 000200 | 2018 | ecoinvent | 35.0 | EN15804 |
| *Red brick, average production, UK* | | | The Brick Development Association | BREG EN EPD000002 | 2015 | ecoinvent | 1550.0 | EN15804 |
| *Rock wool/mineral wool insulation* | 0.035-0.039 W/mK, 106-160 kg/m3 | | Knauf | BREG EN EPD000097 | 2016 | ecoinvent | 136.0 | EN15804 |
| *Roof underlay rainscreen* | | | WINCO | INIES_ISKY201 60307_140951, 4818 | 2015 | ecoinvent | 117.39 | EN15804 |

**70 Great Bridgewater Street**

## BREEAM Credit Mat 03: Responsible Sourcing of Materials (Design Stage)

**Date:** 12.07.21
**Ref:** 1416 - 70 GBS

The following schedule is to be read in conjunction with General arrangement drawings and specification

| Location / Use Category | Product Name | Manufacturer | Responsible Sourcing Certification Scheme (RSCS) | Material Category | Quantity (weight or volume): | | Certificate Ref: |
|---|---|---|---|---|---|---|---|
| | | | | | Weight (kg) | Volume (m3) | |
| Insulation | Mineral Wool Insulation | Knauf | BES 6001 | Other | | | RS 0050 |
| Roof (structure), Floor (structure) | Steel | tbc | BES 6001 | Metal | | | tbc |
| Internal Partitions, Ceiling Finishes | Gypsum Plasterboard & Plasters | British Gypsum | ISO 14001 | Gypsum | | | EMS 543324 |
| Fittings, Furniture | Soft & Hardwood Timber | tbc | FSC | Timber | | | tbc |
| External Wall | Glass | Saint Gobain | ISO 14001 | Glass | | | EMS 98384 |
| External Wall | Alumnium Extrusions | Kawneer UK | BES 6001 | Metal | | | BES 650797 |
| Flooring Finishes | Chipboard | Kingspan | FSC | TBP | | | tbc |
| Internal Partitions, Ceiling Finishes | Paint | Azko Nobel | BES 6001 | Paint | | | RS 0031 |
| Internal Doors | Internal Doorsets | Performance Doorsets | FSC | Timber | | | tbc |
| Roof Finishes | Bituminous Membrane | Bauder | ISO 14001 | Bituminous | | | 19ACM6595R |
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**Link to Greenbook Live - BES 6001 The Framework Standard for Responsible Sourcing Page:**
https://www.greenbooklive.com/search/scheme.jsp?id=153

**Other Responsible Sourcing Certification Schemes:**

Where a product has not been assessed using BES 6001, the individual manufacturer/supplier will need to provide the relevant certification in accordance with Table B, this can usually be found on their website, or, by contacting their technical department.

| Material Category: |
|---|
| Timber or timber-based |
| Concrete or cementitious |
| Metal |
| Stone or Aggregate |
| Clay-based |
| Gypsum |
| Glass |
| Plastic, polymer, resin, paint, chemicals and bituminous |
| Animal fibre or skin, cellulose fibre |
| Other |

**Location table/use categories**

1. External wall (e.g. bricks, blocks)
2. External wall finishes (plastering, cladding, render, internal dry lining, wall coverings etc.)
3. Insulation
4. Roof (structure)
5. Roof finishes (e.g. tiles, cladding systems, etc.)
6. Upper floors (mezzanines)
7. Floor (structure)
8. Flooring finishes (including coatings)
9. Internal partitions/internal walls (structure)
10. Internal partitions/internal walls (finishes, wall coverings)
11. Ceiling (structure)
12. Ceiling finishes (including coatings)
13. External/internal doors/ windows
14. Staircases/ramps
15. Fittings (shop fittings, railings, screens, gutters, vents, air grilles)
16. Furniture (desks, chairs, display cabinets, shelving)
17. Building services (equipment, distribution systems)
18. Hard landscaping
19. Other

| BREEAM Recognised Responsbile Sourcing Certification Schemes (RSCS): |
|---|
| None |
| BES 6001 Framework Standard for Responsible Sourcing |
| Cares Sustainable Constructional Steel System |
| Concrete Sustainability Council (CSC). Label: Certified concrete (bronze, silver, gold & platinum levels) |
| Eco Reinforcement Responsible Sourcing Standard, Steel Products for the Reinforcement of Concrete |
| FSC. Label: '100%' |
| FSC. Label: 'Mix' |
| FSC. Label: 'FSC Recycled' |
| PEFC. Label 'PEFC Certified' |
| PEFC. Label 'PEFC Recycled' |
| SFI. Label: 'SFI Certified CoC, Promoting Sustainable Forestry' - Certified forest content = 100% of total |
| SFI. Label: 'SFI Certified CoC, Promoting Sustainable Forestry' - Recycled timber/fibre content = 0% of total |
| Re-used In-Situ (according to GN 18) |
| Environmental Management Systems (EMS) (certified): Key Process and supply chain extraction process |
| Environmental Management Systems (EMS) (certified): Key Process |

**MAT 05 - Design for Robustness and Durability**

For each of the building elements below, the listed environmental / biological / polluting factors / agents may have degradation effects that could be protected against by taking appropriate measures during design / specification / construction. Please provide a review of the measures taken for the project to protect the building from the following Degradation Effects where they may be caused by the listed agents:

1. Corrosion
2. Dimensional change, e.g. swelling or shrinkage
3. Fading/discolouration
4. Rotting
5. Leaching
6. Blistering
7. Melting
8. Salt crystallisation
9. Abrasion

**Project:** 70 Great Bridgewater Street
**By:**
**Organisation:** OMI Architects
**Date:** Jul-22

| | | Foundation/ substructure/ lowest floor/ retaining walls | External walls | Roof/balconies | Glazing: windows, skylight | External doors |
|---|---|---|---|---|---|---|
| Environmental agents, including: | Solar radiation | Existing building foundations and primary structure designed to be concealed behind building façade and therefore protected from damage from solar radiation | Materials and finishes have been specified for robustness. Aluminium does not corrode and proposed finishes will have minimum 60 year lifespan prior to degradation (at which point only colour fastness is affected) | Balcony paving is stone paviours with extremely long lifespan when properly maintained. Metalwork, where not aluminium, will be galvanised to prevent corrosion. Roofing membrane is fully concealed by 'finishes' to ensure that it is protected from the deleterious effects of UV light | A full analysis of glazing types has been undertaken and a specifciation optimised to ensure key performance criteria are met | External steel door sets are galvanised to prevnet from corrosion |
| | Temperature variation | Full survey of existing structures undertaken to establish viability of retention; existing building foundations and primary structure designed to be concealed behind building façade and therefore a degree of protection from temperature variation | A fully considered design of the façade system has been undertaken to understand the movement requirements of the façade both due to struucural ovement and temperature variations and mitigating design elements included (i.e. movement joints etc) | As with façade this has been fully considered and mitigating measures included within design | As wiith façade this has been fully considered and mitigating measures included within design | No significant impact on these elements expected |
| | Water/moisture | Existing structures retained and existing waterproofing measures retained and extended where necessary | The design of the façade system has taken into account the risk of water ingress as well as interstictial condensation and design has been developed to remove the risks wherever possible | Roofing membrane is fully concealed by 'finishes' to ensure that it is protected damage due to access. A full analysis of drainage routes and risk of condensation has been undertaken. | Considered as a part of the façade design | No significant impact on these elements expected |
| | Wind | Full survey of existing structures undertaken to establish viability of retention and validation of wind loading potential | The facade system includes a series of projecting aluminium fins which have a risk of damage / failure due to high wind speeds. An analysis of local existing and proposed buildings was undertakento understand any increased risks to the presceence of tall buildings. Furthermore the fixing details of these fins has been developed to a level of detail that gives certainty to the robustness of the structural solution. | Balcony and roof areas do not include any items that are at risk of damage by wind action. | Considered as a part of the façade design | Steel doors proposed are of high security type and therefore likely to perform more than sufficiently |
| | Precipitation, e.g. rain and snow | Existing building foundations and primary structure designed to be concealed behind building façade and therefore protected from impacts of rain and snow | Issues of rain are covered above (water / moisture). The snow loading on alumnium projecting fins is a lesser load than any wind action and therefore this has been considered | The roofing solution has been deisgned to be fully waterproofed up the full height of parapets therefore reducing the risk of water penetration including snow build-up. Balcony spaces are all independently drained, despite being covered (i.e. set-back). This is to esnure that even extreme levels of rain can be accommodated in what are typically areas subject to a high risk of water ingress | Considered as a part of the façade design | No significant impact on these elements expected |
| | Extreme weather conditions: high wind speeds, flooding, driving rain, snow | Full survey of existing structures undertaken to establish viability of retention | A conservative approach has been taken in the façade design including the allowance for extreme weather in line with expectations of climate change | Balcony spaces are all independently drained, despite being covered (i.e. set-back). This is to esnure that even extreme levels of rain can be accommodated in what are typically areas subject to a high risk of water ingress | Considered as a part of the façade design | There are no external doors proposed at the lowest, most at risk levels. Consderation has been given to risk of flood via floor risk assessment |
| Biological agents, including: | Vegetation | Existing building foundations and primary structure designed to be concealed behind building façade and therefore protected from impact of vegetation | Not considered to be a risk item | Not considered to be a risk item | Not considered to be a risk item | Not considered to be a risk item |
| | Pests, insects | Existing building foundations and primary structure designed to be concealed behind building façade and therefore protected from impact of pests / insects | Where cavities are shown insect mesh is included but this is considered a low risk across all areas of the scheme | Where cavities are shown insect mesh is included but this is considered a low risk across all areas of the scheme | Where cavities are shown insect mesh is included but this is considered a low risk across all areas of the scheme | Where cavities are shown insect mesh is included but this is considered a low risk across all areas of the scheme |
| Pollutants, including: | Air contaminants | Existing building foundations and primary structure designed to be concealed behind building façade and therefore protected from impact of external air contaminants | The choice of primarily glass and aluminium means the effect of air contaminants is likely to be neglible | Not considered to be a risk item | Considered as a part of the façade design | Not considered to be a risk item |
| | Ground contaminants | Existing structures retained and existing protection of ground contaminants retained | n/a | n/a | n/a | n/a |

| | | Railings/ balusters (where exposed to external environment) | Cladding (where exposed to external environment) | Staircase/ ramps (where exposed to external environment) | Hard landscaping |
|---|---|---|---|---|---|
| Environmental agents, including: | Solar radiation | Considered as a part of the balcony design (see under separate heading) | Considered as a part of the facade design (see under separate heading) | n/a | n/a and / or considered as a part of the balcony design (see under separate heading) |
| | Temperature variation | | | | |
| | Water/moisture | | | | |
| | Wind | | | | |
| | Precipitation, e.g. rain and snow | | | | |
| | Extreme weather conditions: high wind speeds, flooding, driving rain, snow | | | | |
| Biological agents, including: | Vegetation | | | | |
| | Pests, insects | | | | |
| Pollutants, including: | Air contaminants | | | | |
| | Ground contaminants | | | | |

**RIBA Stage 2 (C) - Concept Design**

| Measure | | Comment |
|---|---|---|
| Design for Re-use and Recovery | Have materials, structures or existing building components that will be reused be identified? | Structure has been validated as being able to be retained and extended |
| | What testing, refurnishment or certification is required for the above? | All known existing structural information for the building has been located and this has enabled the structural engineer to understand the original design loadings and from this confirm the impact of the proposed extension |
| Design for Off-Site Construction | Have the impacts of off-site construction solutions on the design, cost and programme been reviewed? | Initial discussions have been had regarding the beneift of off-site fabrication of the façade system |
| | What site conditions facilitate (easy access or use of local manufacturer) the use of Off Site Construction? | Off-site manufacture (other than façade - see below) is unlikley to be beneficial due to complex site access and the lack of a requirement for large building elements (due to being the refurbishment of an existing building |
| | What site conditions impede (access/traffic problems, neighbours, air rights issues, buildability e.g. craneage) the use of Offsite Construction? | The complexity of site access (city centre, close adjacent buildings and canal) has suggested that an off-site façade system may have significant benefits |
| | What benefits or disadvantages does Offsite Construction offer the project in terms of local residents? | Local residents will see little benefit for off-site construction other than the potential for reduced overall construction phase |
| | Have benefits and disadvantages of offsite methods been reviewed with the design team when compared to traditional on-site methods? | Yes |
| | Has the cost of any testing / certification required been taken account of? | Not at this stage |
| Design for Materials Optimisation | Have structural solutions using less materials and simplify the design been considered? | Minimising overall weight of the new structural elements has been a key consderation in order to maximise the total additional number of storeys achievable |
| | Have building functions with similar specialist requirements been grouped together to simlify servicing and design? | Building has one primary function (office space) so grouping of services is taken as a given |
| | Is the building as simple as possible in terms of:<br>- building form<br>- structural system<br>- building services<br>- construction sequence / methodology | The building for is simple except for terraces and balconies which provide a significant benefit to building occupiers<br>The structural system is rational and follows the structural grid of the existing building<br>Building services have been optimised within the confines of an existing structure<br>Construction sequence has yet to be fully developed |
| | What opportunities to avoid excavation have been considered, what restraints are there with respect to this? | No excavation is required |
| | What % of excavated material can be re-used on site? | n/a |
| | Have the client and design team agreed the balance between excavation minimisation and functional requirements / practicality? | n/a |
| | What foundation solutions have been considered, are these the most efficient? | Existing foundations / substructures are retained in their entirety |
| Design for Waste Efficient Procurement | Which specification documents will contain details of waste minimisation requirements? | |
| | What contractual requirements / targets are going to be placed on the Demolition Contractor to to maximise reuse, recovery and recycling? | |
| | What contractual requirements / targets are going to be placed on the Sub-Contractors of major waste producing packages to maximise reuse, recovery and recycling? | |
| Design for Deconstruction and Flexibility | How easy to recycle / recover are the materials selected for the structural frame, foundations and substructure, ground floor, upper floors, external walls, internal walls, windows / doors? | Existing foundations / substructures / structural frame are retained in their entirety therefore the principle of re-use has been established. At this stage the façade design is based on an independent curtain wall system that could be dismantled in due course should this be necessary. |
| | How flexible is the building to adapt for changing future needs? | The existing building is being refurbished but retaining use as a large floorplate office space. Consideration has been given to the sub-division of typical floors and a number of options have been explored for the lower levels and flexibility has been allowed for a number of potential different uses |

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**29th October 2021**

**70 Great Bridgewater Street, Manchester**

1420/Cah/Mat 04

Dear BREEAM Assessor,

BREEAM Wst 06: Material Efficiency

Please see below functional adaptation strategy:-

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FUNCTIONAL ADAPTATION STRATEGY

The project is for the full refurbishment and extension of an existing city centre office building. The project is undertaken on a 'speculative' basis at the design stage, i.e. there is no specific future tenant(s) identified. The below strategy is broken down in to two sections as follows:-

1. Approach to existing building
2. Measures taken within new elements

Through these two sections this strategy will outline the approach the design team has taken through RIBA Stages 0-4 and how decision making through this time considered the re-use of building elements and the adaptability of any new proposals.

1 – APPROACH TO EXISTING

The existing building is a 5 storey office building with 2 levels of basement car parking. Initial reviews of the structural capacity of the building suggested there were opportunities to add 2No. additional floors and infill an existing atrium. The additional floors provides additional office space and the strategy for infilling the atrium results in a significantly more adaptable office space with improved potential for the floors to be split giving a greater degree of flexibility. These proposals allowed for the full retention of the existing concrete frame and the benefits in terms of embodied carbon that this entails.

The existing façade was investigated and the curtain wall glazing system was found to have come to the end of its serviceable lifespan and would not have been economically viable to refurbish to a sufficient level to ensure future longevity and thermal performance. Studies for the retention of existing brickwork cavity wall elements were undertaken as well as reviewing potential performance upgrades. However, it was at this point the team became aware of latent design defects in this cladding and that this would need to be removed.

It was at this stage a new façade was considered and the design of this element is covered in section 2.

At Stage 1 & 2 opportunities were identified to utilise existing car parking spaces for communal amenity spaces such as studios, bike storage, showers and changing rooms. Through careful analysis of space, structure, M&E and thermal performance this arrangement has allowed a building with few such facilities to incorporate features that are increasingly expected of contemporary office buildings.

All existing staircase structures are to be retained and extended and existing lift shafts are also being retained, modified and additional lifts added. Existing M&E equipment was deemed past its lifespan and was in need of a full overhaul. Due to the extent of the structural works no existing partitions and ceilings, except those to the stair cores are to be retained. Those being retained will be repaired and incorporated with the new layouts.

Existing internal finishes were generally at the end of their lifespan and due to the extent of alterations little viable scope for retention on site was identified.

MEASURES TAKEN WITHIN NEW ELEMENTS

With the proposals to increase the height of the existing building the potential for future extension of the building are limited, however, contextual factors, such as rights-to-light for nearby residential buildings would limit this in any case. The proposals include for 2No. external terraces per floor to provide the office accommodation with access to external space and fresh-air. However, the design allows for infilling of these terrace areas should this be desirable in future.

The replacement external façade was designed as a 'unitised' façade system which sits entirely outboard of the existing structure minimising the extent of structural adaptations. The system was identified as the optimum system in allowing for structural movement, a significant factor given the use of the existing frame.

The external façade is to have a finish and system guarantee of 60 years without need for replacement or maintenance. Despite this the building is to be provided with a façade access system that has been designed to ensure that maintenance and replacement can be achieved, this includes full consideration of the size and weight of the largest glazed units.

The façade glazing, aluminium panels and aluminium extrusions can easily be replaced should damage and breakage occur. Glazed panels can be replaced with solid panels in future should this be deemed necessary

The roofing system has a 20 year guarantee but all areas of the roofing membrane are accessible without the need to resort to fall arrest systems aiding maintenance and repair should this be necessary. Wherever possible the upper membrane layer is covered by 'sacrificial' finishes such as ballast or paving so that material degradation is minimised.

The roof area includes a large plant enclosure area which provides the potential for the replacement or adaptation of the roof mounted equipment. A significant area of roof mounted PV panels has been allowed for but the enclosure structure has been designed so that additional panels could be mounted on top to further increase the available area should this be required.

The M&E installations have been designed to ensure that no or only minimal amendments should be necessary at the office 'fit-out' stage. This has been achieved as follows:-

- Office space 'test-fits' were produced to provide a reasonable prediction of how office spaces will be fitted-out
- An M&E design was based on this layout allowing for the following:-
- Soffit mounted heating / cooling equipment positioned to in standard 'bays' allowing for future partitioning of space
- Provision of discontinuous linear light fittings avoiding the need for substantial amendments if partitions are introduced
- Full allowances for floor sub-division and metering of services to this effect

Large riser spaces within the building core allow for adaptability of primary service routes and all distribution boards, alarm panels and HVAC equipment can be reconfigured and updated without any remedial works required to the structure of the building. The services have all been designed with sufficient additional capacity to allow for an increase in demand over and above expected building requirements.

The primary plant rooms for the building are all located within the basement areas meaning they can be accessed and adapted without impacting on other building users / tenants.

The building has its own separate service access road providing a route to the basement area. The result of this is that if items of large equipment within the basement need replacement or modification there is a clear access route that does not require structural alterations to be made to facilitate.

The office spaces are designed to be 'shell' spaces in which no final floor finish and no suspended ceilings are to be installed. This gives the ability for tenants to fit-out the spaces as necessary without wastage of material. The soffit mounted services are all kept exposed and have been designed so that although a ceiling could be installed it is not necessary. This gives ease of access for altering and maintaining equipment.

The façade system has been designed to minimise potential for glare but there is the opportunity to install blinds as part of office fit-out if necessary.

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I trust this is of assistance, however if you require anything further pleases let me know.

Yours sincerely,



Philip Etchells

**Associate**
**OMI Architects**