Intended for

Downing Living (Manchester South) Limited Partnership Incorporated

Document type

Report

Date

November 2023

FIRST STREET BLOCK C

RIBA STAGE 2 WHOLE LIFE CARBON ASSESSMENT

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FIRST STREET BLOCK C
RIBA STAGE 2 WHOLE LIFE CARBON ASSESSMENT

Project name	**First Street Block C**
Project no.	**1620005201**
Recipient	**Downing Living (Manchester South) Limited Partnership Incorporated**
Version	**3**
Date	**07/11/2023**
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Checked by	**Robert Cairns**
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Description	**Whole Life-Cycle Carbon Assessment in line with BS EN 15978:2011 and RICS guidance.**

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1. EXECUTIVE SUMMARY

Ramboll have been appointed to undertake the Whole Life Carbon Assessment (WLCA) for the development at Block C, Plot 11, First Street, aiming to provide high end student accommodation.

The proposed development will comprise of a 28-storey building with 19,023 m^2 (GIA) floorspace. It is intended to be a concrete framed building with full perimeter glazing.

The report summarises the development's carbon emissions over its 60-year lifespan, accounting for its embodied and operational carbon emissions and post 'end of life'.

Embodied Carbon
707
$kgCO_2e/m^2$ GIA
(A1-A5, B2-B4, C1-C4)

Operational Energy
126 $kWh/m^2/yr$

Operational Carbon
(FES)
314
$kgCO_2e/m^2$ GIA (B6)

Whole Life Carbon
1,021
$kgCO_2e/m^2$ GIA
(A1-A5, B2-B4, B6, C1-C4)

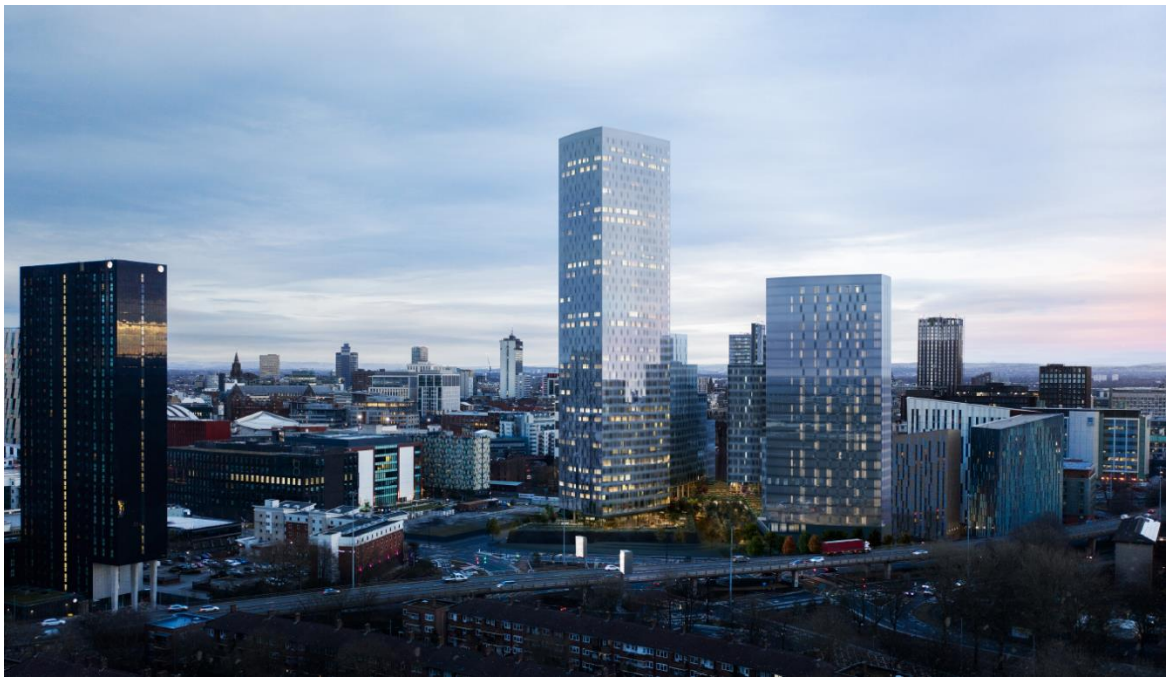

Figure 1: First Street Block C (SimpsonHaugh)

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2. INTRODUCTION

Ramboll have been appointed to undertake a Whole Life-cycle Carbon Assessment (WLCA) in line with the requirements for the Block C, Plot 11, First Street South, located in Manchester.

The proposed residential development will comprise up to 28 storeys and up to **19,023 m²** GIA floorspace.

This document presents the WLCA study and summarises the development's carbon emissions over its lifetime, accounting for its operational carbon emissions, embodied carbon emissions and any future potential carbon emissions 'benefits', post 'end of life'.

2.1 The Site

The proposed development include one block - Block C - which is located in the south part of the site, highlighted in blue.

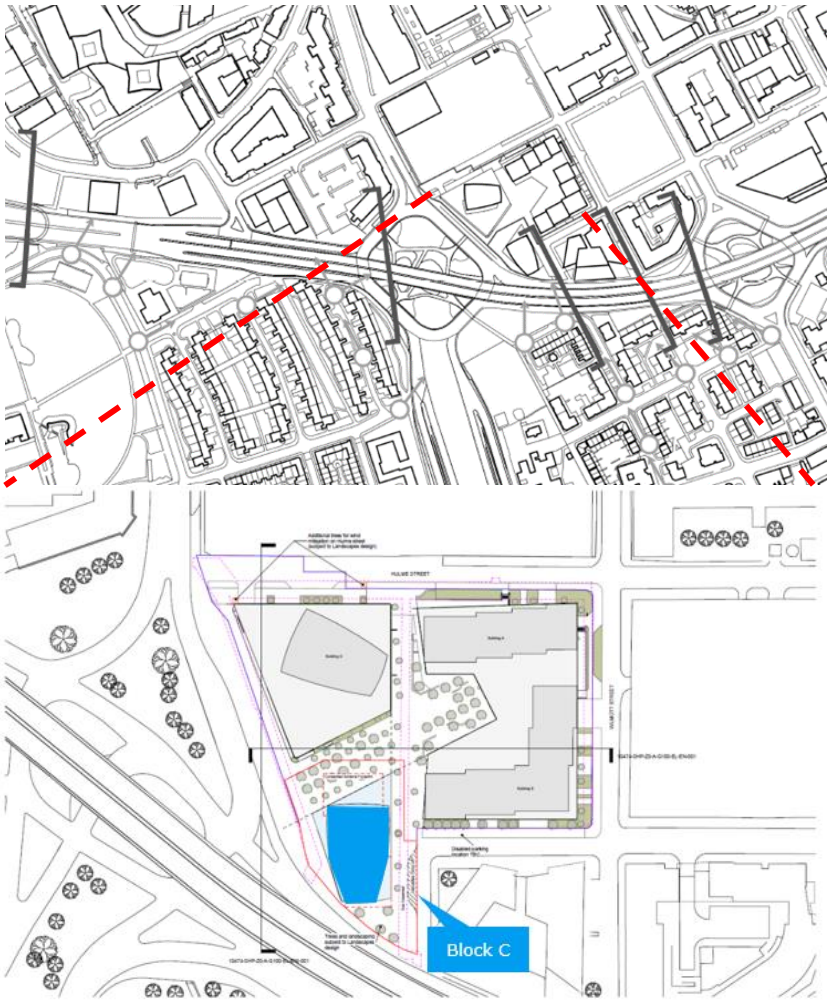

Figure 2: First Street Block C, site location and boundaries (SimpsonHaugh)

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Block C is a multistorey development with student accommodation, comprising bedspaces and communal areas (Figure 3). The building will be 28 storeys, and 19,023 m^2 (GIA) floorspace with an RC frame and double gazed aluminium curtain wall façade (Figure 4).

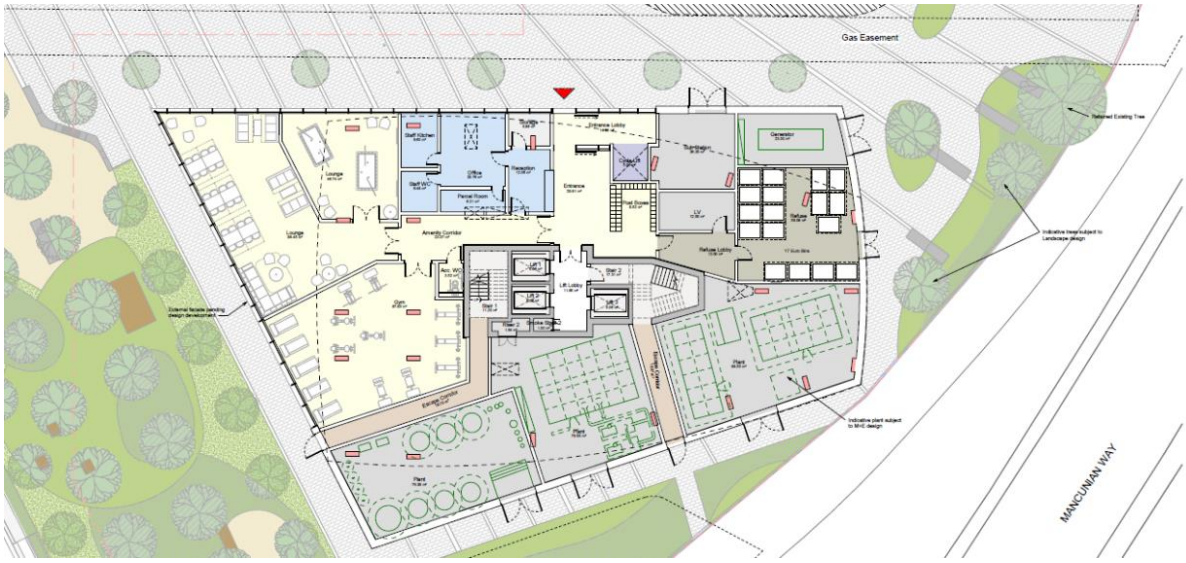

Figure 3: Proposed Ground floor plan (Simpsonhaugh)

Figure 4: First Street Block C (Simpsonhaugh)

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3. WHOLE LIFE-CYCLE CARBON ASSESSMENT (WLCA)

Background

With 49% of the total Green House Gas emissions produced in the UK being attributed to the construction and operation of the built environment, it is evident that the building sector has a significant role to play in reducing carbon emissions and responding to the climate emergency. Carbon emissions associated with the operation of buildings have been the subject of regulation and until recently, the primary focus for reducing the environmental impact of buildings. With increasing building energy efficiency and increasing decarbonisation of electricity supply, building operational carbon emissions are being acknowledged to be rapidly reducing. While we must continue to focus on reducing operational carbon, there must also be increased efforts to address the embodied carbon emissions

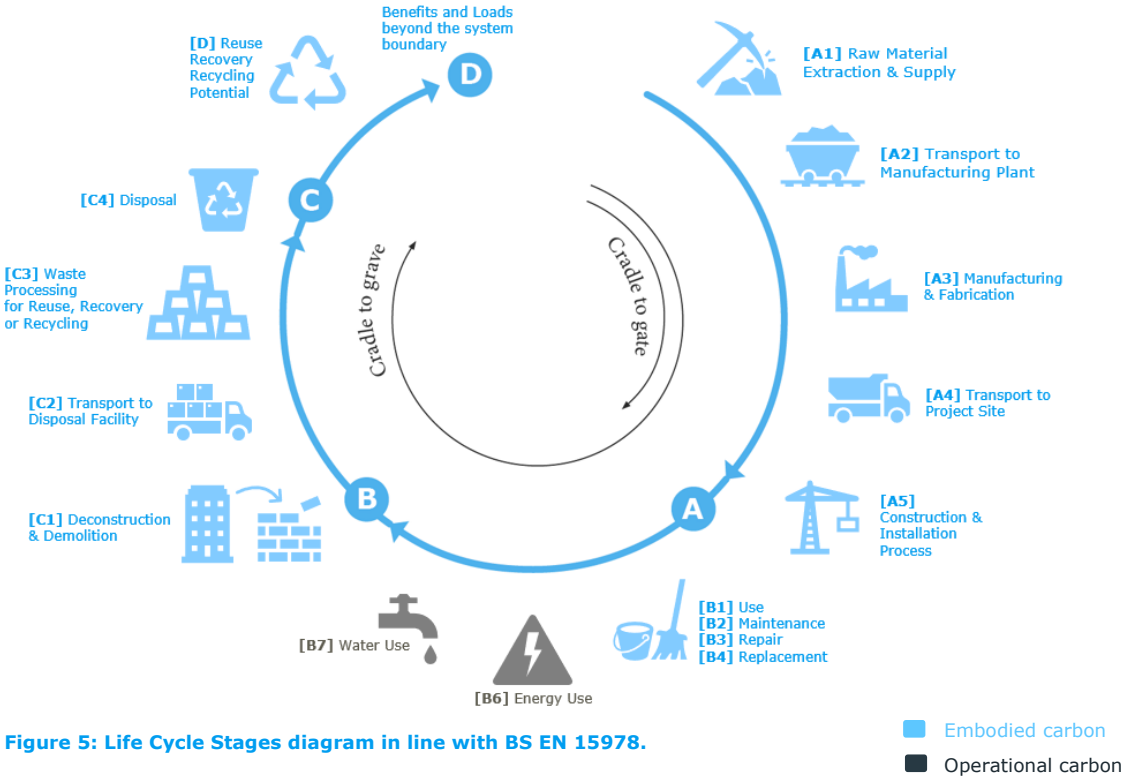

Figure 5: Life Cycle Stages diagram in line with BS EN 15978.

Embodied carbon emissions

All emissions associated with the manufacturing, transportation, construction, and end of life (EoL) stages of all built assets and **contribute around 11% of all global carbon emissions** and can be quantified by undertaking a Life Cycle Assessment study.

Life Cycle Assessment (LCA)

Established methodology of assessing the cumulative environmental impacts associated with all lifecycle stages of a product, process, or a whole construction project. An LCA can help inform decision making not only in terms of identifying measures to reduce carbon emissions, but also in relation to other environmental indicators such as material, water, and energy use across the whole lifecycle.

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4. WLCA - METHODOLOGY

4.1 Whole Life-Cycle Carbon Assessment Guidance

The RICS Professional Statement: Whole Life Carbon Assessment for the built environment is a useful guide to the practical implementation of the BS EN 15978 principles. In the UK it is considered the current industry best practice for applying the techniques of WLCA to measuring carbon on construction projects. It sets out technical details and calculation requirements as well as indicative values.

4.2 Scope of assessment

The assessment of the scheme's WLC emissions includes the following sections: embodied carbon emissions and operational carbon emissions (regulated and unregulated). A more detailed explanation of what the Stages A - C and module D cover is provided below (Table 1).

- Stages A1 - A5 (Product sourcing and construction stage),
- Stages B1 - B7 (Use stage),
- Stages C1 - C4 (End-of-life stage),
- Module D (Benefits and loads beyond the system boundary).

Table 1: Life cycle stages and scope of assessment in line with BS EN 15978: 2011.

WHOLE LIFE CARBON ASSESSMENT INFORMATION														
PROJECT LIFE CYCLE INFORMATION													SUPPLEMENTARY INFO	
A1 – A3 PRODUCT STAGE			A4 – A5 CONSTRUCTION PROCESS STAGE		B1 – B7 USE STAGE					C1 – C4 END OF LIFE STAGE				D BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
RAW MATERIAL EXTRACTION AND SUPPLY	TRANSPORT TO MANUFACTURING PLANT	MANUFACTURING AND FABRICATION	TRNSPORT TO PROJECT SITE	CONSTRUCTION AND INSTALLATION PROCESS	USE	MAINTENANCE	REPAIR	REPLACEMENT	REFURBISHMENT	DECONSTRUCTION DEMOLITONNES	TRANSPORT TO DISPOSAL FACILITY	WASTE PROCESSING	DISPOSAL	REUSE, RECOVERY, RECYCLING POTENTIAL
					B6 – OPERATIONAL ENERGY USE									
					B7 – OPERATIONAL WATER USE									

Embodied carbon – **included** [A1-A5, B2-B4, C1-C4] and **excluded** [B1,B5, B7]
Operational carbon – **included** [B6]
Circularity – **included** [D]

The WLC assessment for the First Street Block C covers all building elements listed in Table 2 that are applicable to the project. The current model captures the shell and core of the building and full fit-out to residential and communal spaces such as reception and lift lobbies, office/study spaces and residential units.

The building elements are broken down according to the RICS New Rules of Measurement (NRM) classification system level 2 sub-elements. The unit of area measurement to be used is m² of Gross Internal Area (GIA).

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Table 2: WLC assessment, building elements (RICS PS).

	Building part/ Element Group	Building element (NRM level 2)	Included in WLCA?
	Demolition	0.1 Toxic/hazardous/contaminated material treatment	Included (deconstruction and demolition process, RICS)
		0.2 Major demolition works	
0	Facilitating works	0.3 & 0.5 Temporary/enabling works	N/A
		0.4. Specialist groundworks	
1	Substructure	1.1 Substructure	Included
2	Superstructure	2.1 Frame 2.2 Upper floors 2.3 Roof 2.4 Stairs and ramps	Included
		2.5 External walls 2.6 Windows and External doors	Included
		2.7 Internal walls and Partitions 2.8 Internal doors	Included
3	Finishes	3.1 Wall finishes 3.2 Floor finishes 3.3 Ceiling finishes	Included
4	Fittings, furnishings and equipment (FF&E)	4.1 Fittings, Furnishings & Equipment incl. building related and non-building related	Included (GLA Benchmark, ~19kgCO2e/m2 GIA))
5	Building services/MEP	5.1, 5.3, 5.4, 5.6, 5.7, 5.8, 5.10, 5.11, 5.12 – Included services 5.2, 5.5, 5.9, 5.13-5.14 – Excluded services	Included as noted based on OneClick benchmark data due to Stage 2 cost plan data limitations)
6	Prefabricated buildings and building units	6.1 Prefabricated buildings and building units	N/A
7	Work to existing buildings	7.1 Minor demolition and Alteration works	N/A
8	External works	8.1 Site preparation works 8.2 Roads, Paths, Pavings and Surfacing 8.3 Soft landscaping, Planting, and Irrigation systems 8.4 Fencing, Railings and Walls 8.5 External fixtures 8.6 External drainage 8.7 External services 8.8 Minor building works and ancillary buildings	Included (Items 8.2, 8.5 & 8.6)

Note: New build projects assessed are considered to commence their development on a cleared, flat site for consistency purposes. Demolition works are often decoupled from new construction projects, hence the responsibility for any emissions arising from demolition is not necessarily solely attributable to the new build project.

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4.3 Coverage Adjustment factor

According to RICS PS '*Whole life carbon assessment for the built environment, November 2017*', a minimum of 95% of the cost allocated to each building element category should be accounted for in the assessment.

As many elements as possible have been included from the information provided, however, cost was not provided on this project, so no adjustment factor has been applied.

4.4 WLCA tool

The WLCA has been undertaken using the Bionova Ltd. 'OneClick LCA' software. OneClick LCA has been developed to comply with the BS EN 15978: 2011 – *Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method* requirements. The OneClick LCA software includes a large database of Environmental Product Declarations (EPDs) and generic material data.

4.5 Data sources and assumptions

Material specifications and quantities at this stage (Stage 2) have been assessed based on the following data (Table 4) received from the wider design team.

Table 3 : Sources of design information used for LCA

Design Information	Sender	Received	File name
Structural details	SimpsonHaugh	17/10/23	*10474-AJP-ZZ-RF-DR-S-0600_MATERIAL SCHEDULE .pdf*
Material quantities for substructure, superstructure, finishes, services, and external works	Downing	18/10/23	*FS, BLock C Cost Plan Nr 1 - DRAFT CARBON.xlsx*
Façade details	SimpsonHaugh	18/10/23	*Information provided via email*
Project background information	SimpsonHaugh	20/09/23	*First Street south – building C, design team meeting.pdf*
Operational energy	Abacus Consult	31/10/2023	*Information provided via email*

The relevant data was summarised in the Life Cycle Inventory (LCI) spreadsheet developed by Ramboll. Any assumptions made regarding specifications are also presented to create the most accurate LCA model possible at this stage. The LCI sheet is included in Appendix A.

Where possible EPDs of the equivalent or closely similar products have been used to extract the material embodied carbon emissions, as these represent the most accurate source of information. Where there are no EPDs available, generic carbon data has been used. The most recent geographically and technologically appropriate data has been selected depending on project location and subject to anticipated supply chains. It should be noted that the certainty of the input data

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decreases the further into the future life cycle of the asset that the assessment covers, meaning B and C stages may change significantly from the time of the assessment over the 60 year WLCA study period.

Table 5 below summarises inputs and assumptions made for all Life Cycle Stages of the study.

Table 4: Main project data sources and key assumptions.

<table>
<tr><th>Life cycle stage</th><th>Data sources and assumptions</th></tr>
<tr><td>A1 – A3
Construction materials</td><td>Material quantities and material description provided as noted above (Table 4).

Where details on the material specification were not provided, appropriate assumptions have been made and the default specifications included within the RICS guidance 'Whole life carbon assessment for the built environment, November 2017', Table 6 has been used.</td></tr>
<tr><td>A4
Transportation to site</td><td>With regards to (A4) emissions, the following assumptions have been made for transport distances in alignment with RICS guidance 'Whole life carbon assessment for the built environment, November 2017':

Materials sourced locally (50km transport distance by road assumed): concrete, cement, soil, aggregates & mortar.

Materials sourced nationally (300km transport distance by road assumed): brick, steel products, insulation, plasterboard, raised access floor tiles and pedestals, paint, concrete blocks & precast paving products.

Materials sourced from Europe (1500km transport distances by road assumed): membranes, carpet tiles, epoxy flooring, ceramic tiles, timber, aluminium, aluminium curtain walls, glass, plastic pedestals, drainage layer, services components & photovoltaic panels.</td></tr>
<tr><td>A5
Construction and installation process</td><td>In the absence of more specific information, average figures have been used to capture the Building Construction Site Emissions (A5) at 13.91 $kgCO_2e/m^2$ of GIA

Default assumptions for the on-site Waste Rates of Materials (A5) have been made based on the standard wastage rates provided by OneClick, WRAP and IstructE. See below material waste rate assumptions (Table 6).

Table 5: Material waste rate assumptions, Module A5.
<table>
<tr><th>Material</th><th>Waste rate (%) assumed</th></tr>
<tr><td>Concrete</td><td>5</td></tr>
<tr><td>Reinforcement Steel</td><td>5</td></tr>
<tr><td>Brick</td><td>5</td></tr>
<tr><td>Precast concrete pavers</td><td>5</td></tr>
<tr><td>Concrete block</td><td>20</td></tr>
<tr><td>Mineral wool</td><td>8</td></tr>
<tr><td>Aluminium sheet</td><td>1</td></tr>
<tr><td>MDF</td><td>10</td></tr>
<tr><td>Membranes</td><td>10</td></tr>
<tr><td>Curtain wall</td><td>2.5</td></tr>
<tr><td>Aluminium louvres</td><td>1</td></tr>
<tr><td>Internal wooden doors</td><td>2.5</td></tr>
<tr><td>Ceramic tiles</td><td>8</td></tr>
<tr><td>Vinyl tiles</td><td>5</td></tr>
<tr><td>Epoxy</td><td>10</td></tr>
<tr><td>Paint</td><td>10</td></tr>
</table></td></tr>
</table>

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<table>
<tr><td></td><td>
<table>
<tr><td>Plasterboard</td><td>12.5</td></tr>
<tr><td>Carpet tiles</td><td>5</td></tr>
<tr><td>Stainless steel</td><td>2.5</td></tr>
<tr><td>Mortar</td><td>5</td></tr>
</table>
</td></tr>
<tr><td>B1
In use emissions</td><td>In use emissions (B1) have been omitted from this report due to lack of available data.</td></tr>
<tr><td>B2-B3
Maintenance and repair emissions</td><td>
Maintenance (B2) stage emissions have been estimated based on GLA standard assumption of 10 $kgCO_2e/m^2$ of gross internal area (GIA) to cover all building element categories (>1% of modules A1-A5: 6.43 $kgCO_2e/m^2$ GIA) in the absence of more specific information.

Repair (B3) stage emissions, the following assumptions have been made for the repair emissions (B3) in the absence of project specific data (e.g., maintenance strategy reports, O&M manuals etc.)

Table 6: Repair rate assumptions, Module B3.
<table>
<tr><th>Element</th><th>Percentage of material repaired [%]</th><th>Repair frequency [years]</th><th>Annual repair rate [%]</th></tr>
<tr><td>Aluminium louvres</td><td>1</td><td>15</td><td>0.07</td></tr>
<tr><td>Aluminium curtain wall</td><td>2</td><td>10</td><td>0.2</td></tr>
<tr><td>Steel profiles/sheets</td><td>1</td><td>15</td><td>0.07</td></tr>
<tr><td>External doors</td><td>2</td><td>10</td><td>0.2</td></tr>
<tr><td>Internal doors</td><td>2</td><td>10</td><td>0.2</td></tr>
<tr><td>Plasterboard</td><td>2</td><td>10</td><td>0.2</td></tr>
<tr><td>Paint finish</td><td>2</td><td>10</td><td>0.2</td></tr>
<tr><td>Epoxy floor covering</td><td>2</td><td>10</td><td>0.2</td></tr>
<tr><td>Ceramic tiles</td><td>1</td><td>10</td><td>0.1</td></tr>
<tr><td>Carpet tiles</td><td>1</td><td>5</td><td>0.2</td></tr>
<tr><td>Precast concrete pavers</td><td>1</td><td>5</td><td>0.2</td></tr>
<tr><td>Vinyl tiles</td><td>1</td><td>10</td><td>0.2</td></tr>
</table>
</td></tr>
</table>

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B4 Replacement emissions

Lifespans used **(B4)** in the assessment are presented below, taken from RICS PS (2017) and OneClick LCA:

Table 7: Replacement cycles / Service life assumptions.

Material group	Service life (years)
Substructure	60
Concrete	60
Rebar	60
Internal walls / Partitions – metal framing components	30
Internal walls / Partitions – gypsum boards	30
Curtain walling	30
External Doors – aluminium/steel	30
Internal Doors - timber	30
Timber	30
Wall/Floor Ceramic tiles	30
Suspended Ceiling – gypsum boards	30
Membranes	30
Paint	10
Carpet tiles	15
Epoxy floor covering	15
Precast concrete pavers	60
Vinyl tiles	15
Lifts	20
HVAC	20-60 depending on component

B5 Refurbishment emissions

In the absence of any proposed refurbishment activities, emissions associated with refurbishments **(B5)** have been **excluded** at this stage.

B6 – B7 Operational energy use and Operational water use

(B6) emissions are based on the calculations received from Abacus mechanical and electrical consulting engineers, see below:

First Street Block C	Regulated [kWh/m²]	Unregulated [kWh/m²]
Energy Consumption by End use	69.21	57.46

Conversion factors used for the operational carbon calculations:

- **2023 UK government GHG electricity emissions factor** 0.207074 $kgCO_2e/kWh$ fixed for 60 years and,
- **Decarbonised grid FES** Falling short scenario, average grid electricity emissions factor 0.0413 kgCO2e/kWh.

Emissions relating to operational water use **(B7)** have been excluded as no data was provided.

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C1 - C4 End-of-Life (EoL) stages

Deconstruction and demolition emissions (C1) include the carbon emissions arising from any on or off-site deconstruction and demolition activities, including any energy consumption for site accommodation and plant use.

According to RICS PS, in the absence of more specific information, an average rate of **(C1) 3.4 kgCO_2e/m² GIA** (rate from monitored demolition case studies in central London) based on aggregated data is used.

End-of-life scenarios for Stages **(C2-C4)** for key material groups are presented below.

Table 8: End-of-life scenarios for key material groups.

Material group	End-of-Life scenario (C2-C4)
Concrete	Crushed into aggregates
Steel	Recycling
Concrete blocks	Crushed into aggregates
Concrete Reinforcement	Steel recycling
Membranes	Incineration
Mineral Wool insulation	Landfilling
Clay Bricks	Crushed to aggregates
Aluminium elements	Recycling
Timber elements	Incineration
Gypsum Plasterboard	Recycling
Glass Panes	Recycling
Mortar (bricklaying)	Landfilling
Paint	Landfilling
Ceramic Tiles	Crushed to aggregates
Carpet Tiles	Recycling
Vinyl tiles	Incineration

D Benefits and loads beyond the system boundary

Module D benefits and loads have been calculated using the above End-of life scenarios (Table 8), which follow the EN 15978 standard.

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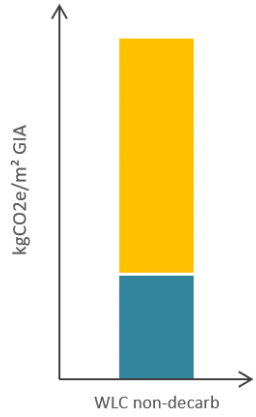
5. WLCA - RESULTS

Table 9 and Table 10 present the estimated WLC emissions for the development for non-decarbonised and decarbonised electrical grid scenarios.

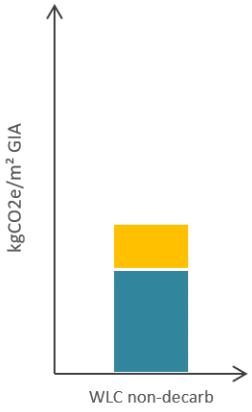
Table 9: WLCA Results Summary – Non-decarbonised grid (2023 UK Government)



Embodied Carbon (A1-A5, B2-B4, C1-C4)	**707** $kgCO_2e/m^2$ of GIA	**13,463** tonnes CO_2e
Including Timber Sequestered Carbon	**-15** $kgCO_2e/m^2$ of GIA	**-289** tonnes CO_2e
Operational Carbon (B6), 2023 UK Government GHG factors	**1,574** $kgCO_2e/m^2$ of GIA over 60-year lifespan	**29,951** tonnes CO_2e over 60-year lifespan
Whole Life Carbon (A-C)	**2,281** $kgCO_2e/m^2$ of GIA	**43,415** tonnes sCO_2e

GIA: 19,023 m^2

Table 10: WLCA Results Summary – With grid decarbonisation (FES 2022 Falling Short Scenario)



Embodied Carbon (A1-A5, B2-B4, C1-C4)	**707** $kgCO_2e/m^2$ of GIA	**13,463** tonnes CO_2e
Including Timber Sequestered Carbon	**-15** $kgCO_2e/m^2$ of GIA	**-289** tonnes CO_2e
Operational Carbon (B6), Decarbonised grid, FES	**314** $kgCO_2e/m^2$ of GIA over 60-year lifespan	**5,975** tonnes CO_2e over 60-year lifespan
Whole Life Carbon (A-C)	**1,021** $kgCO_2e/m^2$ of GIA	**19,437** tonnes sCO_2e

GIA: 19,023 m^2

These show that as the UK grid decarbonises, the embodied carbon emissions are significantly higher (~70% of overall emissions) compared to the operational carbon emissions.

A detailed list of materiality inputs and assumptions is provided within Appendix A.

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5.1 Results uncertainty and ranges

While Table 9 and Table 10 present specific embodied and operational carbon figures, in practice there is significant inherent uncertainty in any carbon assessment. Prior to completion of construction the WLCA is a prediction or estimate, and as the project progresses carbon figures could increase or decrease for a variety of reasons, including:

- design development resulting in material quantity or specification change
- supply chain and sourcing impacting products used or manufacturing processes
- revised methodology or change of scope affecting reporting practice
- estimates and imprecision in source carbon data used

To cover for any uncertainties at RIBA Stage 2, a default contingency factor of 15% is applied to all life cycle stages and modules at this early design stage (Table10, RICS PS, 2023). This is translated to a potential uplift of ~100kgCO2e/m2 on A-C (excl. B6 & B7) figures at this stage. This factor will change at later stages as more detail and materials are added to the design and construction specifications are provided.

5.2 Whole Life Embodied Carbon [A-C] Benchmarks & Targets

A set of embodied carbon benchmarks for various building types have been developed by Greater London Authority (GLA) and are provided within GLA's Whole Life-Cycle Carbon Assessment guidance (March 2022). Embodied carbon results for the proposed scheme will be compared against the recommended GLA WLC benchmark and aspirational benchmark for **Residential Buildings** as the closest available match. Aspirational benchmarks are based on a 40% reduction in WLC emissions on the first set of WLC benchmarks, which is based on the World Green Building Council's target to achieve a 40% reduction in WLC emissions by 2030.

GLA Residential suggests a *WLC benchmark* of **1,200** $kgCO_2e/m^2$ GIA with the *WLC aspirational benchmark set* at **800** $kgCO_2e/m^2$ GIA (stages A-C, excl. B6-B7). As shown First Street Block C is a betterment against the GLA Aspirational benchmark (Figure 6).

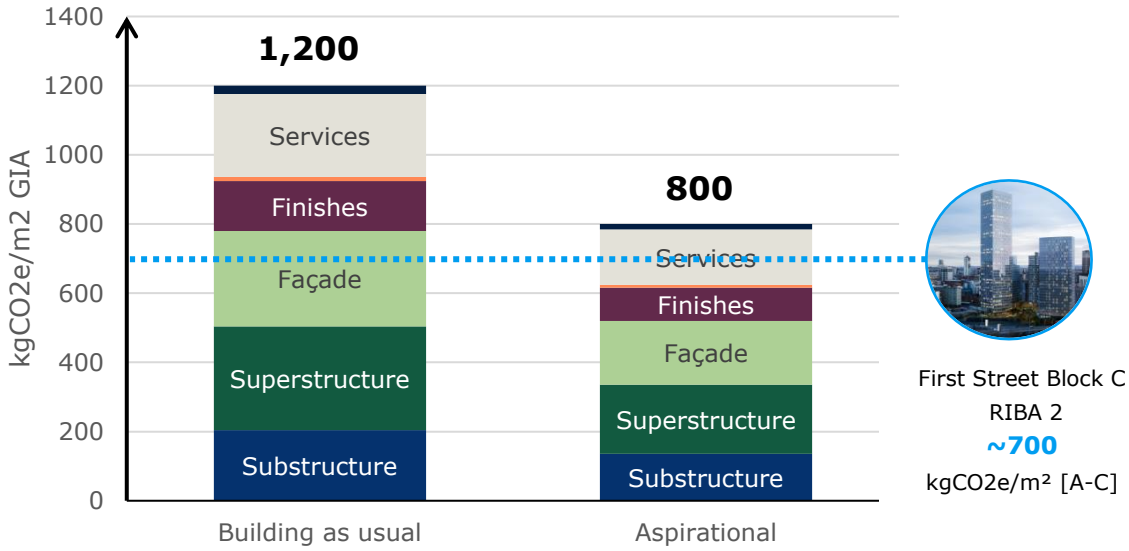

Figure 6: Benchmarks for Residential Buildings, Scope A-C (excluding B6 & B7) vs First Street Block C

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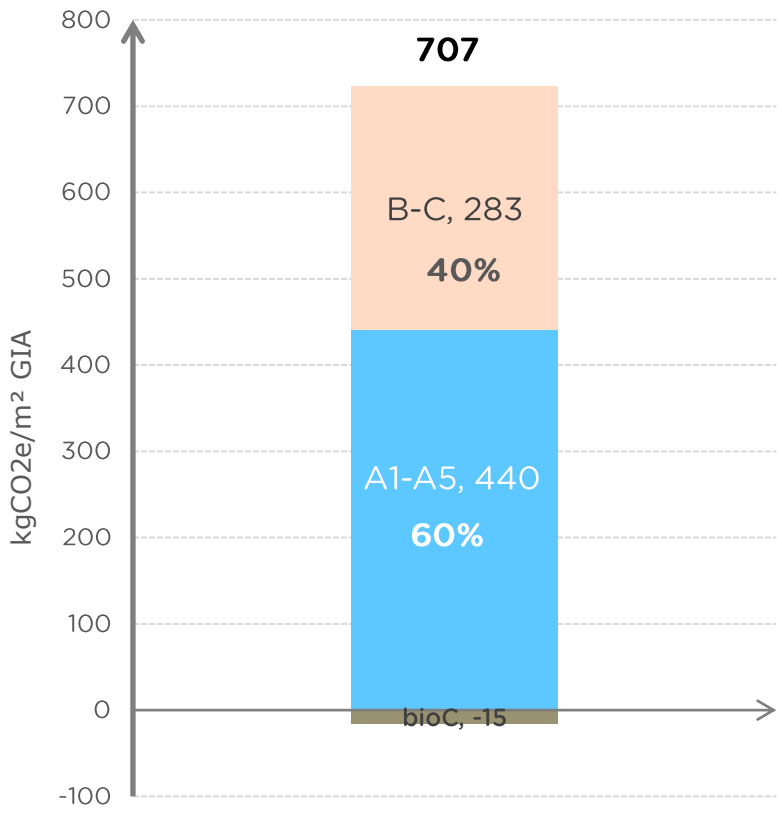
5.3 Embodied Carbon

Figure 7Figure 7 presents the overall embodied carbon emissions broken down by life cycle stages from A to C (excl. B6 & B7). The scope of the assessment covers stages A1-A5, B2-B4 and C1-C4. The overall embodied carbon emissions for Stage 2 have been calculated at ~707 $kgCO_2/m^2$ GIA (including carbon sequestration -15 $kgCO_2/m^2$). Module D potential carbon savings for this project as calculated at -112 $kgCO_2/m^2$ using Table 8 End-of-Life scenarios which follow the EN 15978 standard.

These results are likely to change at later stages as more detail and materials are added to the design and construction specifications are provided. Due to Stage 2 cost plan data limitations and the lack of industry data availability, approximate rates and benchmarks have been specified for the FF&E, Construction Site Emissions and Services.

Emissions up to practical completion of the project (upfront carbon emissions A1-A5) are significant and account for ~60% of the of the total embodied carbon emissions. Use stage (B2-B4) emissions associated with in-use, repair, and replacement cycles of materials and End-of-life emissions (C1-C4) approximately 40%. For approximate rates and assumptions regarding the Life Cycle Stages, see Table 4.



Total includes sequestered carbon from the use of timber. For approximate rates, assumptions and exclusions regarding the LCA stages and building elements included in the assessment refer to Tables 2, 3 & 5.

Figure 7: Embodied Carbon Breakdown of Building Elements (A1-A5, B2-B4, C1-C4)

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Figure 8 below presents the major building element carbon hotspots, rated from the highest to the lowest contributor. Each element has been further broken down in LCA stages (A-C). Among the highest contributors and the top of the list are the services, floor slabs, external works and foundations.

Services is the highest contributor with use stage emissions (Stage B) conservatively responsible for over 21% of the of the total emissions. This due to replacement cycles playing an important role in the life cycle of the building (Stage B4). Replacement periods range from 20 to 60 years depending on the systems used. Services also require refrigerants through the operation of mechanical equipment. This has not been modelled within this report due to lack of available data but is an additional element which contributes significantly to Stage B emissions and should be kept in mind at later stages.

External Walls have similar breakdown between product (A1-A3) and use stage (B4) emissions due to the 30yr lifespan of the external façade elements, allowing for 1nr replacement during the whole life of the building. The embodied carbon value is significant as this allows for the full perimeter glazing on the building.

Upper Floors are next on the list. Floor slabs produce significant emissions due to the large quantities of structural materials (concrete and steel) used in their construction. Almost all these emissions occur during the manufacturing stage (Stages A1-A3), as the materials are energy intensive to produce, but durable and unlikely to be replaced. Concrete with 20% cement replacement that has been used across all structural elements, this assumption should be refined at later stages.

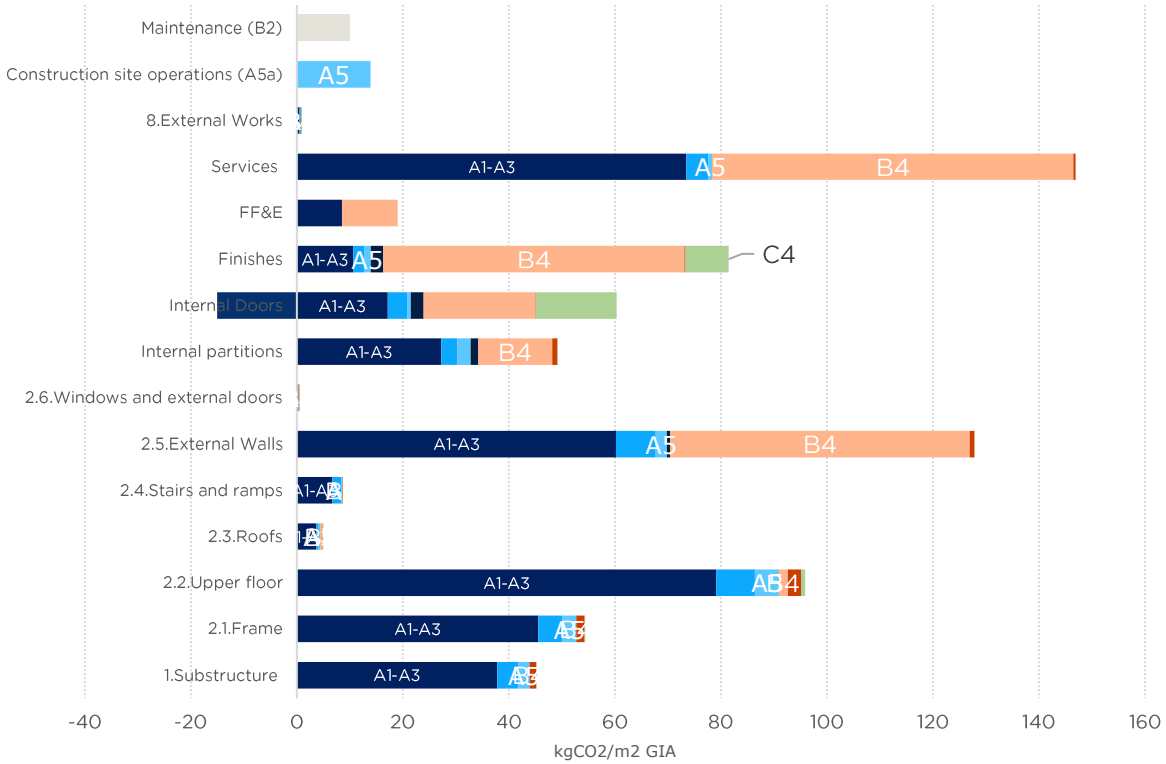

Figure 8: Embodied Carbon Breakdown by Building Elements & LCA Stages (A1-A5, B2-B4, C1-C4)

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Figure 9 presents the breakdown by LCA stages, from A to C (excl. B1,B6 & B7). Emissions up to practical completion of the project (upfront carbon emissions A1-A5) are significant and account for **52%** of the total embodied carbon emissions, followed by In-use (B3-B4) emissions associated with repair, and replacement cycles of materials (33%) and End-of-life emissions (C1-C4).

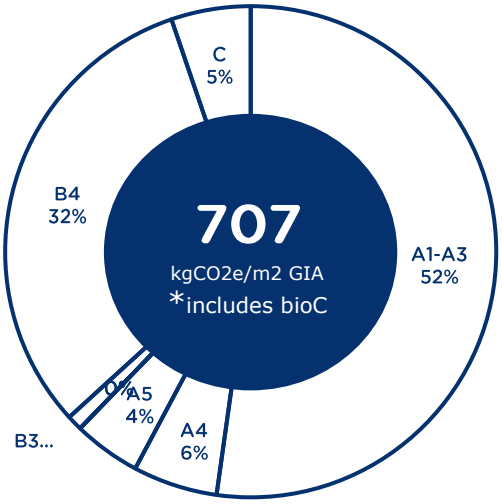

Figure 9 - Upfront [A], in-use [B] and end of life [C] embodied carbon emissions

Figure 10 presents the overall embodied carbon emissions for the development broken down by building elements following RICS New Rules of measurement classification system. Services have the highest percentage of influence around 21%, followed by external walls and internal partitions with 18% and 15% respectively. These results are likely to change on later stages as more detail and materials are added to the design and construction specifications are provided.

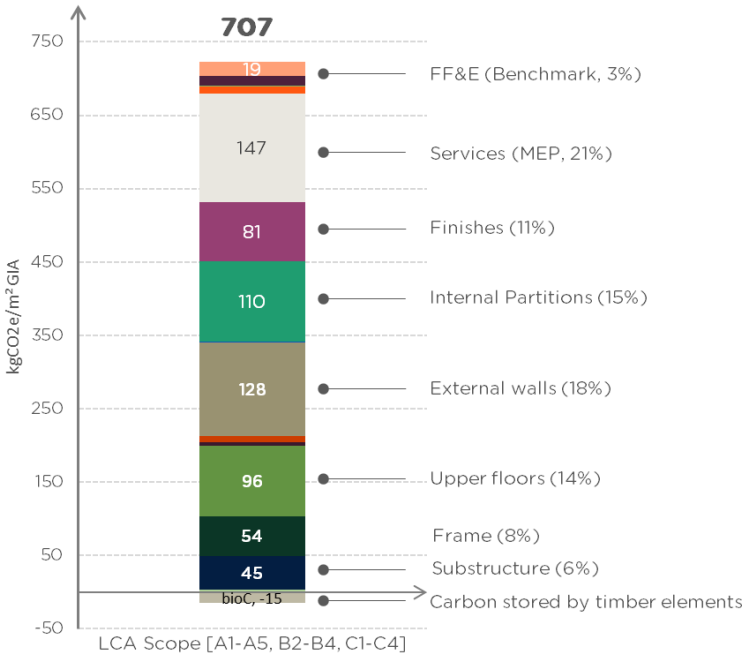

Figure 10: Embodied carbon breakdown by building element.

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As shown in Figure 11 below, for A1-A5 upfront carbon emissions, concrete and glass facades and glazing are the two most carbon intensive materials used, followed by HVAC components and equipment, reinforcement and site operations. By comparing these values to the graph below we can see that concrete has large carbon impacts due to the significant quantities of the material required. Despite the lower material usage intensity, HVAC and facades have high carbon intensity, pointing to the highly carbon intensive components of these elements.

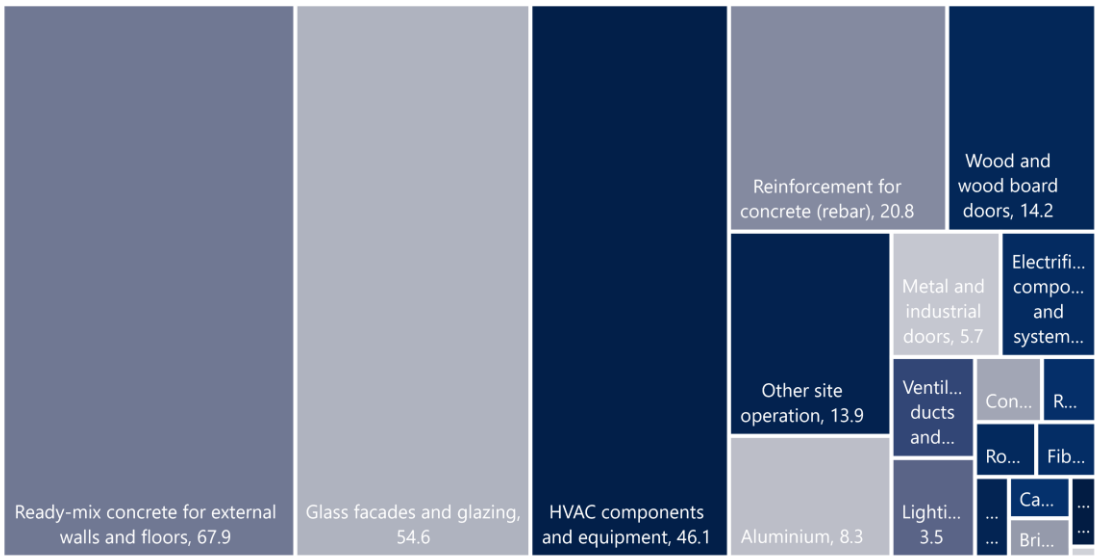

Figure 11: Embodied Carbon Breakdown by Materials (A1-A5), all building elements included.

Figure 12: Material massing (tonnes)

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5.4 Operational Carbon (B6)

The (B6) emissions associated with running the mechanical and electrical systems in the building have been provided by MEP engineers. The estimated annual energy consumption is 69.21 kWh/m^2 of GIA for regulated and 57.46 kWh/m^2 of GIA for unregulated energy use. Regarding the operational carbon emissions two scenarios have been considered:

- **2023 UK government GHG conversion factor** 0.207 kgCO_2e/kWh fixed for 60 years
- **Decarbonised grid FES** Falling short scenario, average grid electricity emissions factor 0.041 kgCO2e/kWh.

The predicted operational carbon rate (B6) is around ~1,574 kgCO_2e/m^2 (current grid) over 60 years lifespan and ~314 kgCO_2e/m^2 (decarbonised grid FES 2022) (Figure 13).

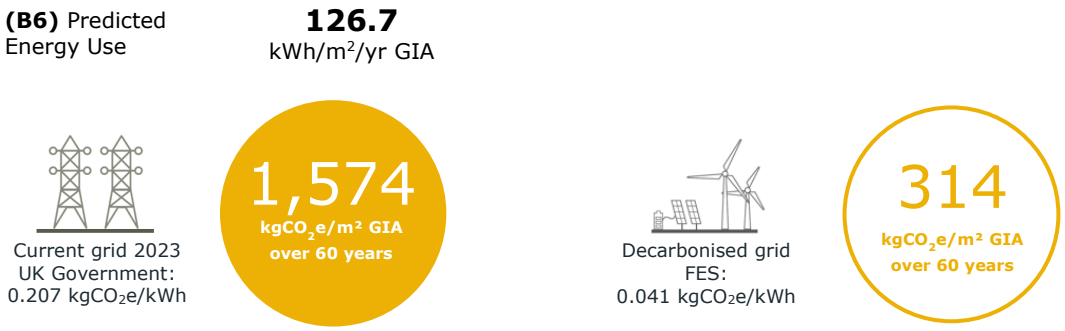

Figure 13: Predicted Energy Use & Carbon Scenario

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6. OPPORTUNITIES FOR REDUCING WHOLE LIFE CARBON

The core philosophy for minimising embodied carbon emissions is indicated in Figure 14. During RIBA stage 2 a number of opportunities can be considered by the design team to minimise carbon and circularity impacts in the context of cost, programme, quality, and other design considerations.

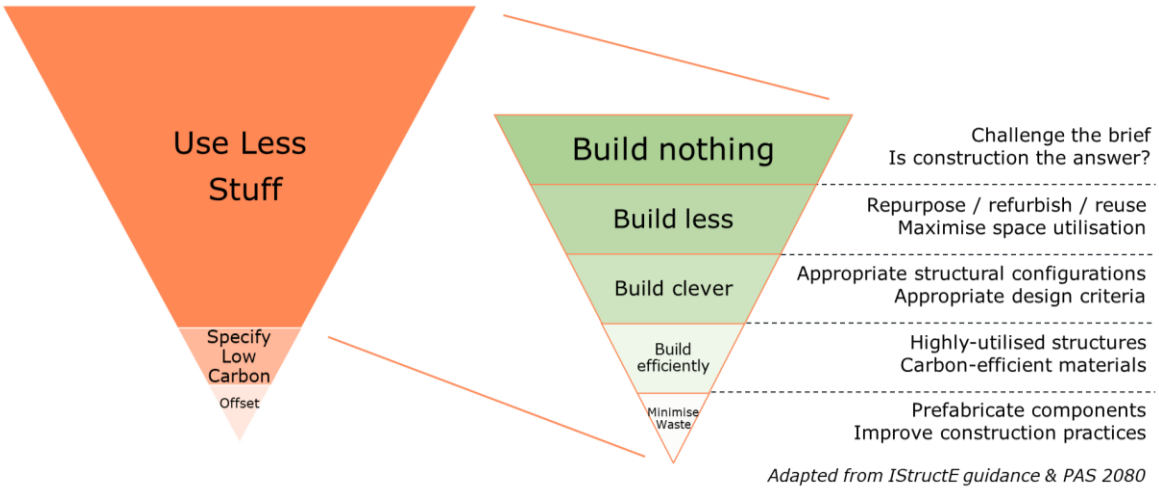

Figure 14: Embodied carbon reduction hierarchy

Based on the findings of the WLCA undertaken at RIBA Stage 2, the following possible mitigation measures have been proposed for the identified carbon hotspots. These should be reviewed and could be incorporated into the Stage 3 design where possible.

- Set a lower carbon concrete mix for the structural elements, particularly upper floors.
- Reduce the amount of glazing on the façade, consider recycled glass/higher recycled content of the aluminium framing components for the curtain walls (currently ~45%).
- Consider timber stud partitions instead of metal studs and SFS.
- Specify carpets with high recycled content to reduce impacts of replacements.
- Selection of durable MEP systems with regular maintenance plans to extend their life.
- Minimise refrigerant charges where possible as leakages result in significant emissions. Offsite specialist refrigerant management and leakage detection systems can further minimise losses.
- Selection of refrigerants with lower environmental impacts.

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APPENDIX A – INPUT DATA AND ASSUMPTIONS

LIFE CYCLE INVENTORY

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APPENDIX A – INPUT DATA AND ASSUMPTIONS

LIFE CYCLE INVENTORY

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Life Cycle Inventory (LCI) - Sustainable Solutions
Spreadsheet

Project Name:	Block C 1st Street
Project Location:	1st Street, Manchester
Project Number:	Please fill
Project Task:	Please fill
Building Typology:	Residential
Refurb or New Build:	New Build
Type of LCA:	RICS/GLA
Scope of LCA:	A1-A5, B1-B4, C1-C4, D
RIBA Stage:	RIBA 2
GIA (m^2):	19,029
GFA (m^2):	Please fill
NIA (m^2):	Please fill - BREEAM Mat01 only
Number of bed spaces:	Please fill - BREEAM Mat01 only
Project value (£):	

Author:	Megan Crossley, Mariami Tkeshelashvili
Checked by:	Robert Cairns
Revision:	01
Date:	01/11/2023

Source List:	
OC	OneClickLCA, Generic material or product data
RICS	RICS, Whole Life Carbon Assessment for the Built Environment (2017), Table 6: Default specifications for main building materials
TM65	Embodied carbon in building services: a calculation methodology, CIBSE TM65: 2021
8	
9	
10	

Hi Rob,

Please find attached some minor comments in relation to the WLCA.

The main issue relates to the fact that the floorspace figures included are slightly off. The final GIA figure is: 19,029 sq. m.

Many thanks,
Kelly

Definition of GIA, GFA

	GFA	GIA
Occupied Areas	Included	Included
Communal Areas (lifts, stairs, toilets (if outside user boundary)	Included	Included
Plant rooms/risers	Included	Included
External wall thickness	Included	Excluded
Non-load bearing partitions	Included	Included
Load bearing partitions	Included	Included
Columns	Included	Included
Covered rooftop plantrooms	Included	Included
Roofs no access	Excluded	Excluded
Roofs, access intended, including terraces and balconies	Included	Included
Carparks below the building	Included	Included
External car parks	Excluded	Excluded
External landscaping	Excluded	Excluded

Life-cycle stages, Adapted from EN 15978: 2011

WHOLE LIFE CARBON ASSESSMENT INFORMATION														
PROJECT LIFE CYCLE INFORMATION														SUPPLEMENTARY INFORMATION
A1 – A3 PRODUCT STAGE			A4 – A5 CONSTRUCTION PROCESS STAGE		B1 – B7 USE STAGE					C1 – C4 END OF LIFE STAGE				D BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	D
RAW MATERIAL EXTRACTION AND SUPPLY	TRANSPORT TO MANUFACTURING PLANT	MANUFACTURING AND FABRICATION	TRNSPORT TO PROJECT SITE	CONSTRUCTION AND INSTALLATION PROCESS	USE	MAINTENANCE	REPAIR	REPLACEMENT	REFURBISHMENT	DECONSTRUCTION DEMOLITON	TRANSPORT TO DISPOSAL FACILITY	WASTE PROCESSING	DISPOSAL	REUSE, RECOVERY, RECYCLING POTENTIAL
					B6 – OPERATIONAL ENERGY USE									
					B7 – OPERATIONAL WATER USE									

Table 9.2 Substructure and hard landscaping – In-scope (applicable to criteria 6 and 7)

Level 1 Group element	Level 2 Element	Level 3 Sub-element
1. Substructure	1. Substructure	1. Standard foundations 2. Specialist foundation systems 3. Lowest floor construction 4. Basement excavation 5. Basement retaining walls
8. External works*	2. Roads, paths and pavings	1. Roads, paths and pavings 2. Special surfacings and pavings

*Include hard landscaping that is installed as part of the project under assessment and:

- Is within a defined curtilage of the building
- Or is clearly more associated with it (for example, an access road or car park that is intended to serve only the building under assessment or the building and, to a lesser extent, other buildings).

Hard landscaping with no such distinction shall be excluded.

RAMBOLL LCI - CONSTRUCTION SITE OPERATIONS

Rev 01	01/11/2023

CONSTRUCTION SITE OPERATIONS

Category ☐	Construction Site Operations Description (Comment)	Quantity	Units ☐	Source ☐	Material ☐	Details ☐	Specification	Spec. Source	Carbon Data	Carbon Source	Notes/Assumptions
1.Construction site scenarios	Assumption for Average site impacts - Construction Emissions A5a	19,029	M2	Ramboll	Average Site impacts	Construction emissions (temperate & southern)	Average production of construction waste	OC	Average construction site impacts, scenario for temperate and southern climate, EU	OC	0
2.Deconstruction/demolition scenarios (C1)	Assumption for Demolition C1 emissions	19,029	M2	Ramboll	Average Site impacts	Deconstruction & Demolition	Deconstruction and Demolition activities	OC	Average deconstruction and demolition process (per GIA)	OC	0
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A

SOURCE LIST:

OC	OneClickLCA, Generic material or product data
RICS	RICS, Whole Life Carbon Assessment for the Built Environment (2017), Table 6: Default specifications for main building materials
TM65	Embodied carbon in building services: a calculation methodology, CIBSE TM65: 2021
1	Cost Plan - updated 18.10.2023
2	Structural Engineering Drawings
3	Simpsonhaugh - façade details, email received on 23/10/23
4	Danny Sinclair - Option 1, email received 17/10/2023
5	
6	
7	
8	
9	

Internal

RAMBOLL **LCI - SERVICES**

Rev 01	01/11/2023

5. Services - Applicable only to GLA/RICS assessments

*default values from Carbon Designer benchmarks

RICS category	*Default Building Elements	Quantity	Units	Source	Material	Details	Specification	Spec. Source	Carbon Data	Carbon Source	Notes/Assumptions
5.1.Sanitary installations	Sanitary installations	19,029	M2	1	Services	Sanitary installations	Approximate rates for services estimated from OneClickLCA benchmark data	OC	Sanitary elements and valves per GFA, Apartment Buildings, Sub-lot 9.1 (RE2020)	OC	0
5.3.Disposal installations	Sewage water drainage piping network	19,029	M2	1	Services	Sewage water piping network - Residential buildings	Approximate rates for services estimated from OneClickLCA benchmark data	OC	Sewage water drainage piping network, per m2 GIFA (residential buildings)	OC	0
5.4.Water installations	Drinking water supply piping network	19,029	M2	1	Services	Drinking water piping network - Residential buildings	Approximate rates for services estimated from OneClickLCA benchmark data	OC	Drinking water supply piping network, per m2 GIFA (residential buildings)	OC	0
5.6.Space heating and Airconditioning	Heat distribution system	19,029	M2	1	Services	Heat distribution system	Approximate rates for services estimated from OneClickLCA benchmark data	OC	Heat distribution system	OC	0
5.7.Ventilation systems	Ventilation system	19,029	M2	1	Services	Ventilation system -Office and care buildings	Approximate rates for services estimated from OneClickLCA benchmark data	OC	Ventilation system for office and care buildings	OC	0
5.8.Electrical installations	Lighitng and power system	19,029	M2	1	Services	Commercial lighting and power system	Approximate rates for services estimated from OneClickLCA benchmark data	OC	Commercial lighting and power system for large size building, high performance per m2	OC	0
5.10.1.Lift and enclosed hoists	Passenger lift, 13 persons, going 27 stops.	81	UNIT	1	Services	Elevator/Lift	Max. transported gross weight 630kg	Ramboll	Electric elevator elements dependent of the number of floors (cabin and others), max. transported gross weight 630kg, DONNEE PAR DEFAUT (DED)	EPD	Electric elevator elements dependent of the number of floors
5.10.1.Lift and enclosed hoists	Cyclist lift	2	UNIT	1	Services	Elevator/Lift	Max. transported gross weight 630kg	Ramboll	Electric elevator elements dependent of the number of floors (cabin and others), max. transported gross weight 630kg, DONNEE PAR DEFAUT (DED)	EPD	Electric elevator elements dependent of the number of floors
5.11.Fire and lightning protection	Fire alarm system	19,029	M2	1	Services	Fire alarm systems - Office buildings	Approximate rates for services estimated from OneClickLCA benchmark data	OC	Fire detection and alarm system for office buildings per m2	OC	0
5.12.Communication, Security and Control Systems	CCTV	19,029	M2	1	Services	CCTV - Office buildings	Approximate rates for services estimated from OneClickLCA benchmark data	OC	CCTV system for office buildings per m2	OC	0
5.12.Communication, Security and Control Systems	Access control/intercom system	19,029	M2	1	Services	Access control system - Office buildings	Approximate rates for services estimated from OneClickLCA benchmark data	OC	Access control system for office buildings per m2	OC	0
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A

RAMBOLL

LCI - SUBSTRUCTURE

Rev 01	01/11/2023

1.SUBSTRUCTURE

RICS category	Material Description	Quantity	Units	Source	Material	Details	Specification	Spec. Source	Carbon Data	Carbon Source	Notes/Assumptions
1.1.2.Specialist foundations	Piling platform; 6f2 hardcore; ne 600 deep	542	M3	1	Aggregate	Recycled stone aggregates	Assuming recycled aggregates from concrete, asphalt a	Ramboll	Recycled stone aggregates, from concrete, asphalt and masonry units, 1530 kg/m3, GP recyclés 4/x* mm (ASGB)	EPD	Assuming 1530kg/m3
1.1.2.Specialist foundations	Allow for Geotex base.	904	M2	1	Membrane	Geotextile	Assumed Geotextile	Ramboll	Geotextile, generic, 312 g/m2 (1.02 oz/ft2), Composition: PP net, non-woven PE felt	OC	Provide area in m2
1.1.3.Lowest floor construction	Insitu concrete ground bearing slab 350 thick.	316	M3	1	Concrete	Superstructure C35/45, 20% GGBS (BREEAM/LEED)	Assumed C35/45, 20% Cement Replacement	Project Specif	Ready-mix concrete, normal strength, generic, C35/45 (5000/6500 PSI) with CEM II/B-V, 20% fly ash content (340 kg/m3; 21.2 lbs/ft3 total cement)	OC	Provide m3
1.1.3.Lowest floor construction	Insitu concrete ground bearing slab 350 thick ; Reinforcement 95kg/m3 reinforcement quantities used for slabs	30058	KG	1	Steel	Reinforcement bars	Assumed reinforcement support for concrete (UK)	IstructE	Carbon steel reinforcing bar (secondary production route – scrap), 7850 kg/m3, 96% recycled steel (UK Cares (2020))	EPD	Provide kg/m3
1.1.2.Specialist foundations	Pile Caps	661	M3	2	Concrete	Superstructure C35/45, 20% GGBS (BREEAM/LEED)	Assumed C35/45, 20% Cement Replacement	Project Specif	Ready-mix concrete, normal strength, generic, C35/45 (5000/6500 PSI) with CEM II/B-V, 20% fly ash content (340 kg/m3; 21.2 lbs/ft3 total cement)	OC	Provide m3
1.1.2.Specialist foundations	Pile Caps ; Reinforcement 115kg/m3 reinforcement quantities used	76045	KG	2	Steel	Reinforcement bars	Assumed reinforcement support for concrete (UK)	IstructE	Carbon steel reinforcing bar (secondary production route – scrap), 7850 kg/m3, 96% recycled steel (UK Cares (2020))	EPD	Provide kg/m3
1.1.1.Standard foundations	Concrete core foundations - TBC	312	M3	1	Concrete	Superstructure C35/45, 20% GGBS (BREEAM/LEED)	Assumed C35/45, 20% Cement Replacement	Project Specif	Ready-mix concrete, normal strength, generic, C35/45 (5000/6500 PSI) with CEM II/B-V, 20% fly ash content (340 kg/m3; 21.2 lbs/ft3 total cement)	OC	Provide m3
1.1.1.Standard foundations	Concrete core foundations - TBC ; Reinforcement 80kg/m3 reinforcement quantities used RC pad foundations	24960	KG	1	Steel	Reinforcement bars	Assumed reinforcement support for concrete (UK)	IstructE	Carbon steel reinforcing bar (secondary production route – scrap), 7850 kg/m3, 96% recycled steel (UK Cares (2020))	EPD	Provide kg/m3
1.1.1.Standard foundations	Capping Beam say 1200 x 1200 mm deep - 1.2m x 1.2m x 133m	192	M3	1	Concrete	Superstructure C35/45, 20% GGBS (BREEAM/LEED)	Assumed C35/45, 20% Cement Replacement	Project Specif	Ready-mix concrete, normal strength, generic, C35/45 (5000/6500 PSI) with CEM II/B-V, 20% fly ash content (340 kg/m3; 21.2 lbs/ft3 total cement)	OC	Provide m3
1.1.1.Standard foundations	Capping Beam say 1200 x 1200 mm deep ; Reinforcement Assumptions as above. Additionally, 230kg/m3 reinforcement quantities used for	44050	KG	1	Steel	Reinforcement bars	Assumed reinforcement support for concrete (UK)	IstructE	Carbon steel reinforcing bar (secondary production route – scrap), 7850 kg/m3, 96% recycled steel (UK Cares (2020))	EPD	Provide kg/m3
1.1.1.Standard foundations	Ground beams - internal ;250 x 450 dp	117	M3	1	Concrete	Superstructure C35/45, 20% GGBS (BREEAM/LEED)	Assumed C35/45, 20% Cement Replacement	Project Specif	Ready-mix concrete, normal strength, generic, C35/45 (5000/6500 PSI) with CEM II/B-V, 20% fly ash content (340 kg/m3; 21.2 lbs/ft3 total cement)	OC	Provide m3
1.1.1.Standard foundations	Ground beams - internal ;250 x 450 dp ; Reinforcement Additionally, 230kg/m3 reinforcement quantities	26910	KG	1	Steel	Reinforcement bars	Assumed reinforcement support for concrete (UK)	IstructE	Carbon steel reinforcing bar (secondary production route – scrap), 7850 kg/m3, 96% recycled steel (UK Cares (2020))	EPD	Provide kg/m3
1.1.1.Standard foundations	Ground beams - perimeter;1200*600 dp (deep) Assuming these are in mm. 1.2m x 0.6 x 133m	96	M3	1	Concrete	Superstructure C35/45, 20% GGBS (BREEAM/LEED)	Assumed C35/45, 20% Cement Replacement	Project Specif	Ready-mix concrete, normal strength, generic, C35/45 (5000/6500 PSI) with CEM II/B-V, 20% fly ash content (340 kg/m3; 21.2 lbs/ft3 total cement)	OC	Provide m3
1.1.1.Standard foundations	Ground beams - perimeter;1200*600 dp (deep) ; Reinforcement 230kg/m3 reinforcement quantities used for	22025	KG	1	Steel	Reinforcement bars	Assumed reinforcement support for concrete (UK)	IstructE	Carbon steel reinforcing bar (secondary production route – scrap), 7850 kg/m3, 96% recycled steel (UK Cares (2020))	EPD	Provide kg/m3
1.1.3.Lowest floor construction	Allowance for slab thickening to plant room - typical concrete thickness is assumed to be 0.15m	44	M3	1	Concrete	Superstructure C35/45, 20% GGBS (BREEAM/LEED)	Assumed C35/45, 20% Cement Replacement	Project Specif	Ready-mix concrete, normal strength, generic, C35/45 (5000/6500 PSI) with CEM II/B-V, 20% fly ash content (340 kg/m3; 21.2 lbs/ft3 total cement)	OC	Provide m3
1.1.3.Lowest floor construction	Allowance for slab thickening to plant room ; Reinforcement 95 kg/m3 reinforcement quantities	4175	KG	1	Steel	Reinforcement bars	Assumed reinforcement support for concrete (UK)	IstructE	Carbon steel reinforcing bar (secondary production route – scrap), 7850 kg/m3, 96% recycled steel (UK Cares (2020))	EPD	Provide kg/m3
1.1.2.Specialist foundations	Piling to cores; 12 m long - 450mm diameter (pile). PI x R=0.25m(squared). x 12m x no. of piles	95	M3	1	Concrete	Superstructure C35/45, 20% GGBS (BREEAM/LEED)	Assumed C35/45, 20% Cement Replacement	Project Specif	Ready-mix concrete, normal strength, generic, C35/45 (5000/6500 PSI) with CEM II/B-V, 20% fly ash content (340 kg/m3; 21.2 lbs/ft3 total cement)	OC	Provide m3
1.1.2.Specialist foundations	Piling to cores; 12 m long ; Reinforcement @1%	1	M3	1	Steel	Reinforcement bars	Assumed reinforcement support for concrete (UK)	IstructE	Carbon steel reinforcing bar (secondary production route – scrap), 7850 kg/m3, 96% recycled steel (UK Cares (2020))	EPD	Provide kg/m3
1.1.2.Specialist foundations	Piling - no detail; say 12 m long - 450mm diameter (pile). PI x R=0.25m(squared). x 12m x no. of piles	149	M3	1	Concrete	Superstructure C35/45, 20% GGBS (BREEAM/LEED)	Assumed C35/45, 20% Cement Replacement	Project Specif	Ready-mix concrete, normal strength, generic, C35/45 (5000/6500 PSI) with CEM II/B-V, 20% fly ash content (340 kg/m3; 21.2 lbs/ft3 total cement)	OC	Provide m3
1.1.2.Specialist foundations	Piling - no detail; say 12 m long ; Reinforcement	1.49	M3	1	Steel	Reinforcement bars	Assumed reinforcement support for concrete (UK)	IstructE	Carbon steel reinforcing bar (secondary production route – scrap), 7850 kg/m3, 96% recycled steel (UK Cares (2020))	EPD	Provide kg/m3
1.1.3.Lowest floor construction	Lift Pits/Pumps - A 6 person lift shaft is typically 1500mm (1.5m) width and 1650mm (1.65m) depth. The typical thickness for a concrete slab is 25cm (0.25m). The lift pit will have 5 slabs. 4 walls, one bottom slab. There are 3 lifts.	9.28	M3	1	Concrete	Superstructure C35/45, 20% GGBS (BREEAM/LEED)	Assumed C35/45, 20% Cement Replacement	Project Specif	Ready-mix concrete, normal strength, generic, C35/45 (5000/6500 PSI) with CEM II/B-V, 20% fly ash content (340 kg/m3; 21.2 lbs/ft3 total cement)	OC	Provide m3
1.1.3.Lowest floor construction	Lift Pits/Pumps ; Reinforcement 95kg/m3 reinforcement quantities used for concrete slabs	881.7187500	KG	1	Steel	Reinforcement bars	Assumed reinforcement support for concrete (UK)	IstructE	Carbon steel reinforcing bar (secondary production route – scrap), 7850 kg/m3, 96% recycled steel (UK Cares (2020))	EPD	Provide kg/m3
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A

Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A

RAMBOLL

LCI- SUPERSTRUCTURE

Baseline option

Rev 01	01/11/2023

QA

2.1 FRAME

RICS category	Material Description	Quantity	Units	Source	Material	Details	Specification	Spec. Source	Carbon Data	Carbon Source	Notes/Assumptions
2.1.1.Steel frames	Fire Protection & fire stopping						0	0	0	0	0
2.1.4.Concrete frames	Parapet Wall - Podium - typical height is 1m, minimum thickness of 230mm	31	M3	1	Concrete	Superstructure C35/45, 20% GGBS (BREEAM/LEED)	Assumed C35/45, 20% Cement Replacement	Project Specification	Ready-mix concrete, normal strength, generic, C35/45 (5000/6500 PSI) with CEM II/B-V, 20% fly ash content (340 kg/m3; 21.2 lbs/ft3 total cement)	OC	Provide m3
2.1.4.Concrete frames	Parapet Wall - Podium - ; Reinforcement @ 65kg/m3	2,033	kg	1	Steel	Reinforcement bars	Assumed reinforcement support for concrete (UK)	IstructE	Carbon steel reinforcing bar (secondary production route – scrap), 7850 kg/m3, 96% recycled steel (UK Cares (2020))	EPD	Provide kg/m3
2.1.4.Concrete frames	Parapet Wall - Roof - typical height is 1m, minimum thickness of 230mm	241	M2	1	Concrete	Superstructure C35/45, 20% GGBS (BREEAM/LEED)	Assumed C35/45, 20% Cement Replacement	Project Specification	Ready-mix concrete, normal strength, generic, C35/45 (5000/6500 PSI) with CEM II/B-V, 20% fly ash content (340 kg/m3; 21.2 lbs/ft3 total cement)	OC	Provide m3
2.1.4.Concrete frames	Parapet Wall - Roof - ; Reinforcement ; 65kg/m3	15,655	kg	1	Steel	Reinforcement bars	Assumed reinforcement support for concrete (UK)	IstructE	Carbon steel reinforcing bar (secondary production route – scrap), 7850 kg/m3, 96% recycled steel (UK Cares (2020))	EPD	Provide kg/m3
2.1.4.Concrete frames	Concrete Columns	579	M3	2	Concrete	Superstructure C35/45, 20% GGBS (BREEAM/LEED)	Assumed C35/45, 20% Cement Replacement	Project Specification	Ready-mix concrete, normal strength, generic, C35/45 (5000/6500 PSI) with CEM II/B-V, 20% fly ash content (340 kg/m3; 21.2 lbs/ft3 total cement)	OC	Provide m3
2.1.4.Concrete frames	Concrete Columns ; Reinforcement - estimated 200kg/m3 reinforcement quantities for columns	115,754	KG	2	Steel	Reinforcement bars	Assumed reinforcement support for concrete (UK)	IstructE	Carbon steel reinforcing bar (secondary production route – scrap), 7850 kg/m3, 96% recycled steel (UK Cares (2020))	EPD	Provide kg/m3
2.1.4.Concrete frames	Concrete Walls	2070	M3	2	Concrete	Superstructure C35/45, 20% GGBS (BREEAM/LEED)	Assumed C35/45, 20% Cement Replacement	Project Specification	Ready-mix concrete, normal strength, generic, C35/45 (5000/6500 PSI) with CEM II/B-V, 20% fly ash content (340 kg/m3; 21.2 lbs/ft3 total cement)	OC	Provide m3
2.1.4.Concrete frames	Concrete Walls ; Reinforcement 65 kg/m3 reinforcement quantities for walls	134572	KG	2	Steel	Reinforcement bars	Assumed reinforcement support for concrete (UK)	IstructE	Carbon steel reinforcing bar (secondary production route – scrap), 7850 kg/m3, 96% recycled steel (UK Cares (2020))	EPD	Provide kg/m3
2.1.4.Concrete frames	Concrete Beams	8	M3	2	Concrete	Superstructure C35/45, 20% GGBS (BREEAM/LEED)	Assumed C35/45, 20% Cement Replacement	Project Specification	Ready-mix concrete, normal strength, generic, C35/45 (5000/6500 PSI) with CEM II/B-V, 20% fly ash content (340 kg/m3; 21.2 lbs/ft3 total cement)	OC	Provide m3
2.1.4.Concrete frames	Concrete Beams ; Reinforcement 230 kg/m3 reinforcement quantities for ground beams	1,917	KG	2	Steel	Reinforcement bars	Assumed reinforcement support for concrete (UK)	IstructE	Carbon steel reinforcing bar (secondary production route – scrap), 7850 kg/m3, 96% recycled steel (UK Cares (2020))	EPD	Provide kg/m3

2.2 UPPER FLOORS

RICS category	Material Description	Quantity	Units	Source	Material	Details	Specification	Spec. Source	Carbon Data	Carbon Source	Notes/Assumptions
2.2.1.Floors	Insulation to underside of slab (plantroom, etc)(PROV) - average thickness of 50mm assumed	17	M3	1	Insulation	Roof - XPS	Assumed XPS	Ramboll	XPS insulation board, 0.033 W/mK, 34 kg/m3, Roofboard Extra, Floorboard Extra, Laminating Board Extra (Polyfoam XPS Ltd (2021))	EPD	Provide m3
2.2.1.Floors	Insulation to underside of slab (cycle store)(PROV) - - average thickness of 50mm assumed	3	M3	1	Insulation	Roof - XPS	Assumed XPS	Ramboll	XPS insulation board, 0.033 W/mK, 34 kg/m3, Roofboard Extra, Floorboard Extra, Laminating Board Extra (Polyfoam XPS Ltd (2021))	EPD	Provide m3
2.2.1.Floors	Insulation to underside of slab to prevent cold bridging (Podium) - average thickness of 50mm assumed	12	M3	1	Insulation	Roof - XPS	Assumed XPS	Ramboll	XPS insulation board, 0.033 W/mK, 34 kg/m3, Roofboard Extra, Floorboard Extra, Laminating Board Extra (Polyfoam XPS Ltd (2021))	EPD	Provide m3
2.2.1.Floors	Riser flooring (incl Smoke shafts) - 30mm grating assumed	246	M2	1	Plastic	Precast Glass Fibre reinforced concrete	GRP Floor Grating, 30mm thickness	Ramboll	Polyester grating for outdoor use, 17 kg/m2, Caillebotis en polyester pour utilisation extérieure (mailles de 38mm*38mm, hauteur porteur : 30 mm) (DONNEE ENVIRONNEMENTALE GENERIQUE PAR DEFAUT)	EPD	
2.2.Upper floor	Concrete upper floors	4419	M3	2	Concrete	Superstructure C35/45, 20% GGBS (BREEAM/LEED)	Assumed C35/45, 20% Cement Replacement	Project Specification	Ready-mix concrete, normal strength, generic, C35/45 (5000/6500 PSI) with CEM II/B-V, 20% fly ash content (340 kg/m3; 21.2 lbs/ft3 total cement)	OC	Provide m3
2.2.Upper floor	Concrete upper floors ; Reinforcement 95kg/m3 reinforcement quantities for slabs	419786	KG	2	Steel	Reinforcement bars	Assumed reinforcement support for concrete (UK)	IstructE	Carbon steel reinforcing bar (secondary production route – scrap), 7850 kg/m3, 96% recycled steel (UK Cares (2020))	EPD	Provide kg/m3

2.3 ROOFS

RICS category	Material Description	Quantity	Units	Source	Material	Details	Specification	Spec. Source	Carbon Data	Carbon Source	Notes/Assumptions
2.3.2.Roof coverings	Single ply roof coverings -	607	M2	1	Membrane	Single ply roofing membrane	Assumed Synthetic roofing membrane	Ramboll	Synthetic roofing membrane from FPO - PP, 1.934 kg/m2, BauderTHERMOFIN (Paul Bauder)	EPD	Provide area in m2
2.3.2.Roof coverings	Single ply roof coverings - Podium area -	242	M2	1	Membrane	Single ply roofing membrane	Assumed Synthetic roofing membrane	Ramboll	Synthetic roofing membrane from FPO - PP, 1.934 kg/m2, BauderTHERMOFIN (Paul Bauder)	EPD	Provide area in m2
2.3.1.Roof structure	Roof slab	199	M3	2	Concrete	Superstructure C35/45, 20% GGBS (BREEAM/LEED)	Assumed C35/45, 20% Cement Replacement	Project Spec	Ready-mix concrete, normal strength, generic, C35/45 (5000/6500 PSI) with CEM II/B-V, 20% fly ash content (340 kg/m3; 21.2 lbs/ft3 total cement)	OC	
2.3.1.Roof structure	Reinforecment to roof slab	18876.12	KG	2	Steel	Reinforcement bars	Assumed reinforcement support for concrete (UK)	IstructE	Carbon steel reinforcing bar (secondary production route – scrap), 7850 kg/m3, 96% recycled steel (UK Cares (2020))	EPD	
2.3.1.Roof structure	Capping to parapet - Podium - assumed solid concrete coping stones, 50mm x 500mm	3.40	M3	1	Concrete	Precast Concrete - C40/50, 0% GGBS (ICE), Average UK cement mix	Assumed C40/50, 0% Cement Replacement	IstructE	Ready-mix concrete, RC 40/50 (40/50 MPa), with CEM I	ICE	Provide m3
2.3.1.Roof structure	Capping to parapet - Roof - assumed solid concrete coping stones, 50mm x 500mm	2.71	M3	1	Concrete	Precast Concrete - C40/50, 0% GGBS (ICE), Average UK cement mix	Assumed C40/50, 0% Cement Replacement	IstructE	Ready-mix concrete, RC 40/50 (40/50 MPa), with CEM I	ICE	Provide m3
2.3.1.Roof structure	Roof Level Plantroom - Roof Assume lightweight profiled roof deck	55	M2	1	Steel	Profiled sheet for decking	Assumed profiled steel decking part of composite floc	IstructE	Profiled steel decking for composite floor slabs/decking, 0.9mm sheet thickness, 11.35kg/m2, ComFlor 80 0.9mm steel structural floor deck (Tata Steel)	EPD	Provide m2/kg/m3
2.3.2.Roof coverings	Paving to Plant - assumes 72 kg/m2	5400	KG	1	Concrete	Precast Concrete Paving	Assumed Precast concrete	Ramboll	Precast concrete paving products, 2350 kg/m3 (BPCF)	EPD	Provide m3 or kgs, Assuming 72kg/m2 (30mm thick), 192kg/m2 (80mm thick)

2.4 STAIRS AND RAMPS

RICS category	Material Description	Quantity	Units	Source	Material	Details	Specification	Spec. Source	Carbon Data	Carbon Source	Notes/Assumptions
2.4.1.Stair and ramp structure	Precast concrete stair going 28 levels (to Roof) - a flight of stairs is approximately 3m, assume 2 flights per level	168	M	1	Concrete	Staircase - 140cm wide	Assumed Precast concrete	Ramboll	Precast concrete staircase, 10 steps, width. 140cm, 1422.6kg/m, CEM III/A, VD (SORIBA)	EPD	Provide length (m)
2.4.1.Stair and ramp structure	Precast concrete stair going 22 levels - a flight of stairs is approximately 3m, assume 2 flights per level	162	M	1	Concrete	Staircase - 140cm wide	Assumed Precast concrete	Ramboll	Precast concrete staircase, 10 steps, width. 140cm, 1422.6kg/m, CEM III/A, VD (SORIBA)	EPD	Provide length (m)
2.4.3.Stair and ramp balustrades and handrails	Painted Mild Steel balustrades and ancilleries	440	M	1	Steel	Handrail	Assumed stainless steel	Ramboll	Stainless steel handrail, diam. 45mm, Donnee par default (MDEGD)	EPD	Provide length (m)
2.4.3.Stair and ramp balustrades and handrails	Painted Mild Steel handrails and ancilleries - includes landing	715	M	1	Steel	Handrail	Assumed stainless steel	Ramboll	Stainless steel handrail, diam. 45mm, Donnee par default (MDEGD)	EPD	Provide length (m)
2.4.1.Stair and ramp structure	Stringers - 1.5m wide x 440mm	216	M2	1	Steel	Steel Staircase straight	Galvanised steel straight staircase	Ramboll	Galvanized steel staircase, straight, 207.21 kg/m2	EPD	Provide area in m2
2.4.3.Stair and ramp balustrades and handrails	Handrail to Plant rooms	13	M	1	Steel	Handrail	Assumed stainless steel	Ramboll	Stainless steel handrail, diam. 45mm, Donnee par default (MDEGD)	EPD	Provide length (m)
2.4.1.Stair and ramp structure	Plant room steps - assume 1.5m x 3m	5	M2	1	Steel	Steel Staircase straight	Galvanised steel straight staircase	Ramboll	Galvanized steel staircase, straight, 207.21 kg/m2	EPD	Provide area in m2

2.5 EXTERNAL WALLS

RICS category	Material Description	Quantity	Units	Source	Material	Details	Specification	Spec. Source	Carbon Data	Carbon Source	Notes/Assumptions
2.5.External walls	Ground floor - **Brickwork**, area 435m², single brick cladding, 102.5mm thick	44.5875	M3	3	Clay	Clay Bricks - Façade	Assumed red brick, average production	Ramboll	Red brick, average production, UK, 215 mm x 102.5 mm x 65 mm, 2.13 kg/unit, 1485 kg/m3 (Brick Development Association (BDA) Ltd (2019))	EPD	Provide m3
2.5.External walls	Ground floor - Brickwork, **mortar**, area 435m², assuming double brick, 205mm thick	6.688125	KG	Select	Mortar	Masonry/Bricklaying Mortar (BREEAM/LEED)	Cement based mortar for bricklaying	Ramboll	Masonry mortars (CPI Mortars Ltd)	EPD	Provide kg/ton Assuming density 1600kg/m3 - Calculating quantity Assuming 15% of brickwork (6% for blockwork) elevation area (m2) x 102.5mm (brick or block thickness)
2.5.External walls	Ground floor - **140mm block** substrate, area 435m²	60.9	M3	3	Concrete	Concrete block wall - Lightweight - 140mm (BREEAM/LEED)	Assumed lightweight concrete blocks	Ramboll	Lightweight concrete block, 13N, 0.35 W/mK, 1183.93 kg/m3, Thermal Liteblock (Roadstone)	EPD	Provide m3
2.5.External walls	Ground floor - **Curtain walling**	177	M2	3	Aluminium	Curtain walls - Double glazed	Assumed curtain wall system with aluminium frame,	Ramboll	Glass facade, size: 3.6 x 7.2m, double glazing, 51.67 kg/m2, Curtain wall Concept Wall® CW 60 – CW 60 HI (Reynaers)	EPD	Provide area in m2
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A
2.5.External walls	UCW - **Glass fronted, double alu frame**, except aluminium rapid vents (~18%) with independent drywall liner and 152mm rockwool insulation (~60%), area 8560m²	7019.2	M2	3	Aluminium	Curtain walls - Double glazed	Assumed curtain wall system with aluminium frame,	Ramboll	Glass facade, size: 3.6 x 7.2m, double glazing, 51.67 kg/m2, Curtain wall Concept Wall® CW 60 – CW 60 HI (Reynaers)	EPD	Provide area in m2
2.5.External walls	UCW - Glass fronted, double alu frame, except **aluminium rapid vents** (~18%) with independent drywall liner and 152mm rockwool insulation (~60%), area 8560m²	22341.6	KG	3	Aluminium	Louvres (BREEAM/LEED)	European Average, 20% recycled content	Ramboll	Aluminium sheet, generic, 20% recycled content, average European technology (One Click LCA 2022)	OC	Assuming 14.5kg/m2 for louvre door/window (excl. frame), 15 horizontal items/ meter of height, 1.5mm gauge, approx. 1kg/liner meter for each item
2.5.External walls	UCW - Glass fronted, double alu frame, except aluminium rapid vents (~18%) **with independent drywall liner 2x12.5mm Wallboard**, 48/50 'I' stud gypframe and 152mm rockwool insulation (~60%), area 8560m²	86284.8	KG	3	Plasterboard	Partitioning/Ceiling - Gyproc Wallboard	Gypsum plasterboard	Ramboll	Gypsum plasterboard, tapered or square edges, 12.5 mm, 8.44 kg/m2, 675 kg/m3, 10µ water vapour resistance, Gyproc WallBoard (British Gypsum (2019))	EPD	Assuming 8.4kg/m2 of elevation area (12.5mm thick)
2.5.External walls	UCW - Glass fronted, double alu frame, except aluminium rapid vents (~18%) **with independent drywall liner 2x12.5mm Wallboard, 48/50 'I' stud gypframe** and 152mm rockwool insulation (~60%), area 8560m²	6163.2	KG	3	Steel	Metal framing components - Gypframe 48 S 50 'C' Studs	Assumed hot-dip galvanized sheet steel - light gauge	Ramboll	Metal framing components for gypsum plasterboard, 7750 kg/m3, Gypframe (British Gypsum Saint Gobain (2021))	EPD	Assuming Gypframe® 48 S 50 'C' Stud 1.2kg/m2 @600mm centres (0.52kg/linear meter)
2.5.External walls	UCW - Glass fronted, double alu frame, except aluminium rapid vents (~18%) with independent drywall liner, **152mm rockwool insulation** (~60%), area 8560m²	780.672	M3	3	Insulation	Ext.Walls - between SFS - Rockwool	Rockwool	Ramboll	Rock wool insulation panels, L=0.037 W/mK, R=2.63 m2k/W, 100 mm, 3.3 kg/m2, 33 kg/m3, Lambda=0.037 W/(m.K), FLEXI 1200x600x100 (ROCKWOOL, UK plant)	EPD	Provide m3
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A

2.6 EXTERNAL WINDOWS

RICS category	Material Description	Quantity	Units	Source	Material	Details	Specification	Spec. Source	Carbon Data	Carbon Source	Notes/Assumptions
2.6.2.External doors	Single door - Automated - assume 0.85m x 2.1m	5.36	M2	1	Aluminium	Glazed Doors	Assumed Aluminium frame double glazing	Ramboll	Aluminium framed glazed doors, double glazed, per sq. meter, 83% glass, 12% aluminium, 3% steel, 40.79, AXILE Family, EDGE Family, KINETIC Family, ELITE Aero (Optima)	OC	Provide area in m2

	2.6.2.External doors	Double door - Automated - Assume 1.2m x 2.1m	2.520	M2	1	Aluminium	Glazed Doors	Assumed Aluminium frame double glazing	Ramboll	Aluminium framed glazed doors, double glazed, per sq. meter, 83% glass, 12% aluminium, 3% steel, 40.79, AXILE Family, EDGE Family, KINETIC Family, ELITE Aero (Optima)	OC	Provide area in m2
	Select	Plenum boxes	609	UNIT								
	2.6.2.External doors	Single Doors - LV - assume 0.85m x 2.1m	1.8	M2	1	Steel	Door	Assumed steel door	Ramboll	Steel doors, 28.3 kg/m2, ET 500 (Kipptor), SP 500 (Sporthallentore), N 500 (Schwingtor) (Hörmann Leqnica)	EPD	Provide area in m2
	2.6.2.External doors	Double Doors - Plant Room, Binstore - assume 1.2m x 2.1m	13	M2	1	Steel	Door	Assumed steel door	Ramboll	Steel doors, 28.3 kg/m2, ET 500 (Kipptor), SP 500 (Sporthallentore), N 500 (Schwingtor) (Hörmann Leqnica)	EPD	Provide area in m2
	2.6.2.External doors	Single Escape External Doors - assume 0.85m x 2.1m	3	M2	1	Steel	Door	Assumed steel door	Ramboll	Steel doors, 28.3 kg/m2, ET 500 (Kipptor), SP 500 (Sporthallentore), N 500 (Schwingtor) (Hörmann Leqnica)	EPD	Provide area in m2
	2.6.1.External Windows	Louvres (rear plinth) -assumes 14.5kg/m2	290	KG	1	Aluminium	Louvres (BREEAM/LEED)	European Average, 20% recycled content	Ramboll	Aluminium sheet, generic, 20% recycled content, average European technology (One Click LCA 2022)	OC	Assuming 14.5kg/m2 for louvre door/window (excl. frame), 15 horizontal items/ meter of height, 1.5mm gauge, approx. 1kg/liner meter for each item
	Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A

2.7 INTERNAL WALLS AND PARTITIONS

	RICS category	Material Description	Quantity	Units	Source	Material	Details	Specification	Spec. Source	Carbon Data	Carbon Source	Notes/Assumptions
	2.7.1.Walls and Partitions	Stud partitions; Corridor/ cluster bed 100 thick; 2450 high; 12.5mm plasterboard, 3mm skim - SFS 100mm @ 600mm crs	10147.90	KG	1	Steel	SFS - 100.50.12 @ 600mm centres	Assumed Galvanised steel, 20% Recycled Content	RICS	Steel sheets, generic, 20% recycled content, S235, S275 and S355	OC	Assuming 4.75 kg/m2 of elevation (including vertical and horizontal studs)
	2.7.1.Walls and Partitions	Stud partitions; Corridor/ cluster bed 100 thick; 2450 high; 12.5mm plasterboard, 3mm skim - 50mm APR Insulation assumed	1922.76	KG	1	Insulation	Internal Walls - Glass wool	Glass wool - Isover	Ramboll	Glass wool/mineral wool insulation, acoustic partition roll, L = 0.039W/mK, T: 50-65 mm, 18 kg/m3, APR1200 (Isover)	EPD	Assuming 0.9kg/m2 (50mm thick)
	2.7.1.Walls and Partitions	Stud partitions; Corridor/ cluster bed 100 thick; 2450 high; 12.5mm plasterboard, 3mm skim - 2 x 12.5mm plasterboard	35891.52	KG	1	Plasterboard	Partitioning/Ceiling - Gyproc Wallboard	Gypsum plasterboard	Ramboll	Gypsum plasterboard, tapered or square edges, 12.5 mm, 8.44 kg/m2, 675 kg/m3, 10μ water vapour resistance, Gyproc WallBoard (British Gypsum (2019))	EPD	Assuming 8.4kg/m2 of elevation area (12.5mm thick)
	2.7.1.Walls and Partitions	Stud partitions; Corridor/ cluster bed 100 thick; 2450 high; 12.5mm plasterboard, 3mm skim - 2 x 3mm skim	8545.60	KG	1	Clay/Lime Plaster	Natural Mineral Plaster - Internal application	Natural clay lime plaster (powdered form, mixed on s	Ramboll	Natural clay lime plaster, Clime (Armourcoat)	EPD	2-3kg/m2 of 2 coats applied
	2.7.1.Walls and Partitions	Stud partitions; Bed/bed100 thick; 2450 high; 12.5mm plasterboard, 3mm skim - SFS 100mm @ 600mm crs	16758.00	KG	1	Steel	SFS - 100.50.12 @ 600mm centres	Assumed Galvanised steel, 20% Recycled Content	RICS	Steel sheets, generic, 20% recycled content, S235, S275 and S355	OC	Assuming 4.75 kg/m2 of elevation (including vertical and horizontal studs)
	2.7.1.Walls and Partitions	Stud partitions; Bed/bed bed 100 thick; 2450 high; 12.5mm plasterboard, 3mm skim - 50mm APR Insulation assumed	3175.20	KG	1	Insulation	Internal Walls - Glass wool	Glass wool - Isover	Ramboll	Glass wool/mineral wool insulation, acoustic partition roll, L = 0.039W/mK, T: 50-65 mm, 18 kg/m3, APR1200 (Isover)	EPD	Assuming 0.9kg/m2 (50mm thick)
	2.7.1.Walls and Partitions	Stud partitions; Bed/bed bed 100 thick; 2450 high; 12.5mm plasterboard, 3mm skim - 2 x 12.5mm plasterboard	59270.40	KG	1	Plasterboard	Partitioning/Ceiling - Gyproc Wallboard	Gypsum plasterboard	Ramboll	Gypsum plasterboard, tapered or square edges, 12.5 mm, 8.44 kg/m2, 675 kg/m3, 10μ water vapour resistance, Gyproc WallBoard (British Gypsum (2019))	EPD	Assuming 8.4kg/m2 of elevation area (12.5mm thick)
	2.7.1.Walls and Partitions	Stud partitions; Bed/bed 100 thick; 2450 high; 12.5mm plasterboard, 3mm skim - 2 x 3mm skim	14112.00	KG	1	Clay/Lime Plaster	Natural Mineral Plaster - Internal application	Natural clay lime plaster (powdered form, mixed on s	Ramboll	Natural clay lime plaster, Clime (Armourcoat)	EPD	2-3kg/m2 of 2 coats applied
	2.7.1.Walls and Partitions	Stud partitions; Studios (FD60) 100 thick; 2450 high; 12.5mm plasterboard, 3mm skim - SFS 100mm @ 600mm crs	54987.19	KG	1	Steel	SFS - 100.50.12 @ 600mm centres	Assumed Galvanised steel, 20% Recycled Content	RICS	Steel sheets, generic, 20% recycled content, S235, S275 and S355	OC	Assuming 4.75 kg/m2 of elevation (including vertical and horizontal studs)
	2.7.1.Walls and Partitions	Stud partitions; Studios (FD60) 100 thick; 2450 high; 12.5mm plasterboard, 3mm skim - 50mm APR Insulation assumed	10418.63	KG	1	Insulation	Internal Walls - Glass wool	Glass wool - Isover	Ramboll	Glass wool/mineral wool insulation, acoustic partition roll, L = 0.039W/mK, T: 50-65 mm, 18 kg/m3, APR1200 (Isover)	EPD	Assuming 0.9kg/m2 (50mm thick)
	2.7.1.Walls and Partitions	Stud partitions; Studios (FD60) 100 thick; 2450 high; 12.5mm plasterboard, 3mm skim - 2 x 12.5mm plasterboard	194481.00	KG	1	Plasterboard	Int.Walls - Gyproc FireLine	Gypsum board A2 fire class	Ramboll	Gypsum plasterboard, fire resistant, 12.5/15 mm, 843 kg/m3, A2 fire class, 10μ water vapour resistance, Gyproc FireLine (British Gypsum (2019))	EPD	Assuming 10.55k/m² (12.5mm thick)
	2.7.1.Walls and Partitions	Stud partitions; Studios (FD60) 100 thick; 2450 high; 12.5mm plasterboard, 3mm skim - 2 x 3mm skim	46305.00	KG	1	Clay/Lime Plaster	Natural Mineral Plaster - Internal application	Natural clay lime plaster (powdered form, mixed on s	Ramboll	Natural clay lime plaster, Clime (Armourcoat)	EPD	2-3kg/m2 of 2 coats applied
	2.7.1.Walls and Partitions	Stud partitions to Amenity Space; Assume 100 thick; 2450 high; 12.5mm plasterboard, 3mm skim - SFS 100m @ 600mm crs	2234.40	KG	1	Steel	SFS - 100.50.12 @ 600mm centres	Assumed Galvanised steel, 20% Recycled Content	RICS	Steel sheets, generic, 20% recycled content, S235, S275 and S355	OC	Assuming 4.75 kg/m2 of elevation (including vertical and horizontal studs)
	2.7.1.Walls and Partitions	Stud partitions to Amenity Space; Assume 100 thick; 2450 high; 12.5mm plasterboard, 3mm skim - 50mm APR	423.36	KG	1	Insulation	Internal Walls - Glass wool	Glass wool - Isover	Ramboll	Glass wool/mineral wool insulation, acoustic partition roll, L = 0.039W/mK, T: 50-65 mm, 18 kg/m3, APR1200 (Isover)	EPD	Assuming 0.9kg/m2 (50mm thick)
	2.7.1.Walls and Partitions	Stud partitions to Amenity Space; Assume 100 thick; 2450 high; 12.5mm plasterboard, 3mm skim - 2 x 12.5mm plasterboard	7902.72	KG	1	Plasterboard	Partitioning/Ceiling - Gyproc Wallboard	Gypsum plasterboard	Ramboll	Gypsum plasterboard, tapered or square edges, 12.5 mm, 8.44 kg/m2, 675 kg/m3, 10μ water vapour resistance, Gyproc WallBoard (British Gypsum (2019))	EPD	Assuming 8.4kg/m2 of elevation area (12.5mm thick)
	2.7.1.Walls and Partitions	Stud partitions to Amenity Space; Assume 100 thick; 2450 high; 12.5mm plasterboard, 3mm skim - 2 x 3mm skim	1881.60	KG	1	Clay/Lime Plaster	Natural Mineral Plaster - Internal application	Natural clay lime plaster (powdered form, mixed on s	Ramboll	Natural clay lime plaster, Clime (Armourcoat)	EPD	2-3kg/m2 of 2 coats applied
	2.7.1.Walls and Partitions	Plasterboard to external walls 1hr fire rating; 2nr layers 12.5mm Knauf Fire Panel one side on 100mm SFS (SFS framing measured elsewhere) at 600mm centres with 100mm Rockwool RWA45 between studs; skim. Assumes 0.9kg/m2	62126	KG	1	Plasterboard	Int.Walls - Gyproc FireLine	Gypsum board A2 fire class	Ramboll	Gypsum plasterboard, fire resistant, 12.5/15 mm, 843 kg/m3, A2 fire class, 10μ water vapour resistance, Gyproc FireLine (British Gypsum (2019))	EPD	Assuming 10.55k/m² (12.5mm thick)
	2.7.1.Walls and Partitions	Plasterboard to external walls 1hr fire rating; 2nr layers 12.5mm Knauf Fire Panel one side on 100mm SFS (SFS framing measured elsewhere) at 600mm centres with 100mm Rockwool RWA45 between studs; skim. Assumes 4.75kg/m2	14437	KG	1	Steel	SFS - 100.50.12 @ 600mm centres	Assumed Galvanised steel, 20% Recycled Content	RICS	Steel sheets, generic, 20% recycled content, S235, S275 and S355	OC	Assuming 4.75 kg/m2 of elevation (including vertical and horizontal studs)

	2.7.1.Walls and Partitions	Plasterboard to external walls 1hr fire rating; 2nr layers 12.5mm Knauf Fire Panel one side on 100mm SFS (SFS framing measured elsewhere) at 600mm centres with **100mm Rockwool** RWA45 between studs; skim.	304	M3	1	Insulation	Ext.Walls - between SFS - Rockwool	Rockwool	Ramboll	Rock wool insulation panels, L=0.037 W/mK, R=2.63 m2k/W, 100 mm, 3.3 kg/m2, 33 kg/m3, Lambda=0.037 W/(m.K), FLEXI 1200x600x100 (ROCKWOOL, UK plant)	EPD	Provide m3
	2.7.1.Walls and Partitions	Plasterboard to external walls 1hr fire rating; 2nr layers 12.5mm Knauf Fire Panel one side on 100mm SFS (SFS framing measured elsewhere) at 600mm centres with 100mm Rockwool RWA45 between studs; **skim.** Assumes 1 x 3mm **as it's only on one side of the wall -** assumes 2kg/m2	6079	KG	1	Clay/Lime Plaster	Natural Mineral Plaster - Internal application	Natural clay lime plaster (powdered form, mixed on s	Ramboll	Natural clay lime plaster, Clime (Armourcoat)	EPD	2-3kg/m2 of 2 coats applied
	2.7.1.Walls and Partitions	Ditto in Wdw Reveals - Assume 200mm width for window surrounds, 2No. Layers of fire rated	29513	KG	1	Plasterboard	Int.Walls - Gyproc FireLine	Gypsum board A2 fire class	Ramboll	Gypsum plasterboard, fire resistant, 12.5/15 mm, 843 kg/m3, A2 fire class, 10µ water vapour resistance, Gyproc FireLine (British Gypsum (2019))	EPD	Assuming 10.55k/m² (12.5mm thick)
	2.7.1.Walls and Partitions	Shaft wall; 2 hour FR; Lining to external wall (Spread of flame) - Assumed build up: **gypframe 60 I70 @ 600mm crs**, grproc coreboard 19mm between studs, 2 layers 12.5mm Fireline to non shaft side	2658.25	KG	1	Steel	Metal framing components - Gypframe 70 S 50 Studs	Assumed hot-dip galvanized sheet steel - light gauge	Ramboll	Metal framing components for gypsum plasterboard, 7750 kg/m3, Gypframe (British Gypsum Saint Gobain (2021))	EPD	Assuming Gypframe® 70 S 50 AcouStud 1.4kg/m2 @600mm centres (0.61kg/linear meter)
	2.7.1.Walls and Partitions	Shaft wall; 2 hour FR; Lining to external wall (Spread of flame) - Assumed build up: gypframe 60 I70 @ 600mm crs, **grproc coreboard 19mm** between studs, 2 layers 12.5mm Fireline to non shaft side	36.08	M3	1	Plasterboard	Partitioning/Ceiling - Gyproc Wallboard	Gyproc Coreboard	Ramboll	Gypsum plasterboard, fire resistant, moisture resistant, 19 mm, 16.13 kg/m2, 849 kg/m3, fire resistance class A2-s1, d0, CoreBoard (Saint-Gobain Gyproc, Kingscourt plant)	EPD	
	2.7.1.Walls and Partitions	Shaft wall; 2 hour FR; Lining to external wall (Spread of flame) - Assumed build up: gypframe 60 I70 @ 600mm crs, grproc coreboard 19mm between studs, **2 layers 12.5mm Fireline to non shaft side**	40063.63	KG	1	Plasterboard	Int.Walls - Gyproc FireLine	Gypsum board A2 fire class	Ramboll	Gypsum plasterboard, fire resistant, 12.5/15 mm, 843 kg/m3, A2 fire class, 10µ water vapour resistance, Gyproc FireLine (British Gypsum (2019))	EPD	Assuming 10.55k/m² (12.5mm thick)
	2.7.1.Walls and Partitions	300 mm Blockwork walls; plastered one sides - assumes the thickness of a concrete wall is 8 inches (0.2032 metres)	94	M3	1	Concrete	Concrete block wall - Lightweight - 140mm (BREEAM/LEED)	Assumed lightweight concrete blocks	Ramboll	Lightweight concrete block, 13N, 0.35 W/mK, 1183.93 kg/m3, Thermal Liteblock (Roadstone)	EPD	Provide m3
	2.7.1.Walls and Partitions	300 mm Blockwork walls; plastered one sides - **plasterd one side**	629.00	KG	1	Clay/Lime Plaster	Natural Mineral Plaster - Internal application	Natural clay lime plaster (powdered form, mixed on s	Ramboll	Natural clay lime plaster, Clime (Armourcoat)	EPD	2-3kg/m2 of 2 coats applied
	2.7.1.Walls and Partitions	Dry lining to pods - assumes 10kg/m2	46620	KG	1	Plasterboard	Plasterboard/Tileboard	Specialty gypsum board for tiling surface	Ramboll	Gypsum plasterboard, reinforced, water resistant, with square edges, 1200x900x6/12.5 mm, 800 kg/m3, 10µ water resistance, Glasroc H TILEBACKER (British Gypsum)	EPD	Assuming 10kg/m2 (12.5mm thick)
	2.7.1.Walls and Partitions	Dry lining/ Plaster to Core Walls (including cleaners cupboards) - assumes 10kg/m2	101745	KG	1	Plasterboard	Plasterboard/Tileboard	Specialty gypsum board for tiling surface	Ramboll	Gypsum plasterboard, reinforced, water resistant, with square edges, 1200x900x6/12.5 mm, 800 kg	EPD	Assuming 10kg/m2 (12.5mm thick)
	2.7.1.Walls and Partitions	Stud Patyition to management area - **2No. 12.5mm plasterboard**, 70mm stud @ 600mm crs, 3mm plaster skim both sides	391	KG	1	Plasterboard	Partitioning/Ceiling - Gyproc Wallboard	Gypsum plasterboard	Ramboll	Gypsum plasterboard, tapered or square edges, 12.5 mm, 8.44 kg/m2, 675 kg/m3, 10µ water vapour resistance, Gyproc WallBoard (British Gypsum (2019))	EPD	Assuming 8.4kg/m2 of elevation area (12.5mm thick)
	2.7.1.Walls and Partitions	Stud Patyition to management area - 2No. 12.5mm plasterboard, **70mm stud @ 600mm crs**, 3mm plaster skim both sides	65	KG	2	Steel	Metal framing components - Gypframe 70 S 50 Studs	Assumed hot-dip galvanized sheet steel - light gauge	Ramboll	Metal framing components for gypsum plasterboard, 7750 kg/m3, Gypframe (British Gypsum Saint Gobain (2021))	EPD	Assuming Gypframe® 70 S 50 AcouStud 1.4kg/m2 @600mm centres (0.61kg/linear meter)
	2.7.1.Walls and Partitions	Stud Patyition to management area - 2No. 12.5mm plasterboard, 70mm stud @ 600mm crs, **3mm plaster skim both sides**	93	KG	3	Clay/Lime Plaster	Natural Mineral Plaster - Internal application	Natural clay lime plaster (powdered form, mixed on s	Ramboll	Natural clay lime plaster, Clime (Armourcoat)	EPD	2-3kg/m2 of 2 coats applied
	2.7.1.Walls and Partitions	Rockwool to pods - 50mm of rockwool	83	M3	1	Insulation	Ext.Walls - between SFS - Rockwool	Rockwool	Ramboll	Rock wool insulation panels, L=0.037 W/mK, R=2.63 m2k/W, 100 mm, 3.3 kg/m2, 33 kg/m3, Lambda=0.037 W/(m.K), FLEXI 1200x600x100 (ROCKWOOL, UK plant)	EPD	Provide m3
assume this is included in FFE allowance	2.7.1.Walls and Partitions	Cluster Cupboards - assumes 900mm x 600mm x 600mm, assumes density 500kg/m3										
	2.7.1.Walls and Partitions	Fire resistant to pod riser and void above		UNIT	1	Select	Select					
	2.7.1.Walls and Partitions	Glazed screen to stairs/reception at Ground Floor (Provisional)	12	M2	1	Aluminium	Glazed Partitions	Assumed double-glazed aluminium frame partitions	Ramboll	Aluminium framed glazed partition systems, double glazed, per m2, 90% glass, 9% aluminium, width 3.0m; height 2.70m, glazing thickness 12mm, Optima 117, 217, Revolution 54,100, Kinetic, Technishield (Optima)	EPD	Provide area in m2
	2.7.1.Walls and Partitions	EO for single doors - glazed, sliding automatic, access control	36	M2	1	Aluminium	Glazed Sliding Doors	Assumed Aluminium frame double glazing	Ramboll	Aluminum frame sliding door, size: 1.23 x 2.18m, double glazing, 27.87 kg/m2, SlimLine 38 Door (Reynaers)	OC	Provide area in m2
To ask about the RICS guidance for these - to exclude, contingency factor at the end	Select	Pattressing to entrance doors (PAS 24)- 18mm Selex ply to surround of door opening		UNIT	1	Timber	Select					
	Select	3 sided letterbox to head of entrances		UNIT	1	Timber	Select					
	Select	Boxing in detail - cill		M	1	Timber	Select					
	Select	Blind boxes		M	1	Plasterboard	Select					
	Select	Plenum boxes		UNIT	1	Steel	Galvanised profiled sheet					
	Select			Select	Select	Select	Select					

2.8 INTERNAL DOORS

RICS category	Material Description	Quantity	Units	Source	Material	Details	Specification	Spec. Source	Carbon Data	Carbon Source	Notes/Assumptions
2.8.Internal Doors	Single Doorset - cluster bedroom; pre-finished laminate doors including all ironmongery; acoustic seal - assume 0.85m x 2.1m, 241No.	430	M2	1	Timber	Timber door	Assumed interior door	Ramboll	Wooden and engineered wood interior doors, 1,23 m x 2,18 m, 72.8 kg/m2 (VHI)	EPD	Provide area in m2
2.8.Internal Doors	EO for accessible bedroom door ironmongery, allow 0.2kg/doorset	5	KG	1	Steel	Stainless steel	Assumed stainless steel sheets or plates	Ramboll	Stainless steel sheets or plates, 7900 kg/m3 (Outokumpu Oyj)	EPD	Provide kg or m3
2.8.Internal Doors	Single Doorset - cluster Entrance; pre-finished laminate oors including all ironmongery - assume 0.85 x 2.1m, 53No.	95	M2	1	Timber	Timber door	Assumed interior door	Ramboll	Wooden and engineered wood interior doors, 1,23 m x 2,18 m, 72.8 kg/m2 (VHI)	EPD	Provide area in m2

	2.8.Internal Doors	EO for accessible cluster entrance door ironmongery, allow 0.2kg/doorset	5	KG	1	Steel	Stainless steel	Assumed stainless steel sheets or plates	Ramboll	Stainless steel sheets or plates, 7900 kg/m3 (Outokumpu Oyj)	EPD	Provide kg or m3
	2.8.Internal Doors	Single Doorset - to cluster kitchen/living room; pre-finished laminate doors including all ironmongery - assume 0.85 x 2.1m, 52No.	95	M2	1	Timber	Timber door	Assumed interior door	Ramboll	Wooden and engineered wood interior doors, 1,23 m x 2,18 m, 72.8 kg/m2 (VHI)	EPD	Provide area in m2
	2.8.Internal Doors	Single Doorset - to studio entrance; pre-finished laminate doors including all ironmongery; acoustic seal - assume 0.85 x 2.1m, 114No.	560	M2	1	Timber	Timber door	Assumed interior door	Ramboll	Wooden and engineered wood interior doors, 1,23 m x 2,18 m, 72.8 kg/m2 (VHI)	EPD	Provide area in m2
	2.8.Internal Doors	EO for accessible cluster entrance door ironmongery, allow 0.2kg/doorset	5	KG	1	Steel	Stainless steel	Assumed stainless steel sheets or plates	Ramboll	Stainless steel sheets or plates, 7900 kg/m3 (Outokumpu Oyj)	EPD	Provide kg or m3
	2.8.Internal Doors	Pod Doors including threshold - assume 0.85 x 2.1m, 503No.	898	M2	1	Timber	Timber door	Assumed interior door	Ramboll	Wooden and engineered wood interior doors, 1,23 m x 2,18 m, 72.8 kg/m2 (VHI)	EPD	Provide area in m2
	2.8.Internal Doors	Pod Doors Accessible including threshold - assume 0.85 x 2.1m, 52No.	93	M2	1	Timber	Timber door	Assumed interior door	Ramboll	Wooden and engineered wood interior doors, 1,23 m x 2,18 m, 72.8 kg/m2 (VHI)	EPD	Provide area in m2
	2.8.Internal Doors	Single door - to student circulation; pre-finished; staircase FD 60 - assume 0.85 x 2.1m, 162Nr	289	M2	1	Timber	Timber door	Assumed interior door	Ramboll	Wooden and engineered wood interior doors, 1,23 m x 2,18 m, 72.8 kg/m2 (VHI)	EPD	Provide area in m2
	2.8.Internal Doors	Double door - to student circulation; pre-finished; staircase FD 60 - assume 1.2m x 2.1m	3	M2	1	Timber	Timber door	Assumed interior door	Ramboll	Wooden and engineered wood interior doors, 1,23 m x 2,18 m, 72.8 kg/m2 (VHI)	EPD	Provide area in m2
	2.8.Internal Doors	Single door - to student circulation; pre-finished : offices,laundry, common room (PROVISIONAL) - assume 0.85 x 2.1m, 6No.	11	M2	1	Timber	Timber door	Assumed interior door	Ramboll	Wooden and engineered wood interior doors, 1,23 m x 2,18 m, 72.8 kg/m2 (VHI)	EPD	Provide area in m2
	2.8.Internal Doors	Double door - to student circulation; pre-finished - Assume 1.2m x 2.1m	3	M2	1	Timber	Timber door	Assumed interior door	Ramboll	Wooden and engineered wood interior doors, 1,23 m x 2,18 m, 72.8 kg/m2 (VHI)	EPD	Provide area in m2
	2.8.Internal Doors	Single door - BOH; pre-finished - assume 0.85 x 2.1m, 9No.	16	M2	1	Timber	Timber door	Assumed interior door	Ramboll	Wooden and engineered wood interior doors, 1,23 m x 2,18 m, 72.8 kg/m2 (VHI)	EPD	Provide area in m2
	2.8.Internal Doors	Double door - BOH; pre-finished - Assume 1.2m x 2.1m, 7No.	35	M2	1	Timber	Timber door	Assumed interior door	Ramboll	Wooden and engineered wood interior doors, 1,23 m x 2,18 m, 72.8 kg/m2 (VHI)	EPD	Provide area in m2
	2.8.Internal Doors	Single door - to cleaners/comms; pre-finished - assume 0.85 x 2.1m, 55No.	98	M2	1	Timber	Timber door	Assumed interior door	Ramboll	Wooden and engineered wood interior doors, 1,23 m x 2,18 m, 72.8 kg/m2 (VHI)	EPD	Provide area in m2
	2.8.Internal Doors	Accessible WC Door - to student area; pre-finished veneer doors including all ironmongery - assume 2.1m, and the standard accessible width is 950mm. 1.20m and 0.35m	2	M2	1	Timber	Timber door	Assumed interior door	Ramboll	Wooden and engineered wood interior doors, 1,23 m x 2,18 m, 72.8 kg/m2 (VHI)	EPD	Provide area in m2
	2.8.Internal Doors	Single Duct Access Door; paint grade (Pods) - assume 600x600m	200	M2	1	Steel	Hatch door	Assumed Coated steel hatch door	Ramboll	Coated steel hatch door, 11.67kg/m2, DONNEE PAR DEFAUT (DED)	EPD	Provide area in m2
	2.8.Internal Doors	Riser doors - Single - assume 0.85 x 2.1m	48	M2	1	Steel	Door	Assumed steel door	Ramboll	Steel doors, 28.3 kg/m2, ET 500 (Kipptor), SP 500 (Sporthallentore), N 500 (Schwingtor) (Hörmann Leqnica)	EPD	Provide area in m2
	2.8.Internal Doors	Riser doors - Double - Assume 1.2m x 2.1m	680	M2	1	Steel	Door	Assumed steel door	Ramboll	Steel doors, 28.3 kg/m2, ET 500 (Kipptor), SP 500 (Sporthallentore), N 500 (Schwingtor) (Hörmann Leqnica)	EPD	Provide area in m2
	2.8.Internal Doors	Cluster Cupboard door	95	M2	1	Timber	Timber door	Assumed interior door	Ramboll	Wooden and engineered wood interior doors, 1,23 m x 2,18 m, 72.8 kg/m2 (VHI)	EPD	Provide area in m2
	2.8.Internal Doors	Smoke Vent Doors; FD 60 - assume 0.85 x 2.1m FD60 doors	100	M2	1	Steel	Door	Assumed steel door	Ramboll	Steel doors, 28.3 kg/m2, ET 500 (Kipptor), SP 500 (Sporthallentore), N 500 (Schwingtor) (Hörmann Leqnica)	EPD	Provide area in m2
	2.8.Internal Doors	EO Entrabce Doors for PAS 24 (Provisional)										
	2.8.Internal Doors	Window boards - assumes 219mm wide and thickness of 30mm	2979	KG	1	Timber	Skirting boards	Assumed MDF generic	Ramboll	Timber, MDF	ICE	Provide kg (density 500kg/m3)
	2.8.Internal Doors	Skirtings - assumes 18mm thickness, 171mm width	17527	KG	1	Timber	Skirting boards	Assumed MDF generic	Ramboll	Timber, MDF	ICE	Provide kg (density 500kg/m3)
	2.8.Internal Doors	SAA corner protection 25 x 25 x 1150 - assumes 2.7kg/m2, 150Nr	23	KG	1	Aluminium	Sheets	General European mix - ICE	IstructE	Aluminium sheet, European Mix, Inc Imports	ICE	Assuming 1.90kg/m2 for 0.7mm thick profile, 2.7kg/m2 for 1mm thick profile
Less than 1% of the cost of that element category, then it would be okay to excl. negli	2.8.Internal Doors	VING - Entrance and Bedroom Doors										
	Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A

3. INTERNAL FINISHES

	RICS category	Material Description	Quantity	Units	Source	Material	Details	Specification	Spec. Source	Carbon Data	Carbon Source	Notes/Assumptions
	3.1.Wall finishes	Tiling to kitchen areas - 4 m2 per kitchen; brick pattern	212	M2	1	Ceramics	Wall/Floor Tiles	Assumed ceramic tiles 18.65kg/m2	Ramboll	Ceramic tiles, Italian average, 10mm, 19.9 kg/m2 (Confindustria Ceramica	EPD	Provide area in m2
Included based on area of partitions	3.1.Wall finishes	Painting and decorating - as RHSC -	2795.00165	KG	1	Paint	Water based - Indoor use	Indoor use	Ramboll	Paint, water-based, mid sheen finish, indoor use, 1090-1230 kg/m3, 12 m2/l, Johnstone's Trade Acrylic Durable Eggshell Base L, Base M, Base D, Base Z, Base Z2 (PPG Architectural Coatings UK (2020))	EPD	Assumed 0.097kg/m2 (0.8mm thick coat)
	3.1.Wall finishes	2 coat Plaster; staircases 2.4-2.7m hi - 3.5 floors - assuming 3mm thick	2548	KG	1	Plaster Gypsum	Interior Applications	Gypsum Plaster	Ramboll	Gypsum-based plaster, for most internal backgrounds, 94.6% gypsum, 5.4% additives, 861.5 kg/m3, Thistle Universal OneCoat (British Gypsum Saint Gobain)	EPD	2.6 kg for 3mm thick coat, 4.3kg/m2 for 5mm thick coat, 8.6kg/m2 for 10mm thick coat
	3.2.Floor finishes	Carpet Tiles; Burmatex Oska to student cluster bedrooms	3800.56	M2	1	Carpet	Carpet Tiles	Assumed carpet tiles with 50% recycled content and	Ramboll	Modular carpet tiles, tufted, 4.8 kg/m2, pile material of polyamide (PA) 6.6, max. 1.1 kg/m2, with a bitumen backing, Graphlex (Interface Europe Manufacturing BV)	EPD	Provide area in m2
	3.2.Floor finishes	Vinyl to cluster kitchen/Lounges (includes Latex) - assumes 3.25kg/m2	4431.375	KG	1	Vinyl	Flooring	Assumed vinyl flooring 2mm thick, 3.25kg/m2	Ramboll	Luxury vinyl floor tile, glue down, 0.118 in (3.0 mm), 16.43 oz/ft2 (5.015 kg/m2), Art Select (Desig	EPD	Assuming 3.25kg/m2 (2mm thick vinyl)
	3.2.Floor finishes	Carpet Tiles to studios	6874.93	M2	1	Carpet	Carpet Tiles	Assumed carpet tiles with 50% recycled content and	Ramboll	Modular carpet tiles, tufted, 4.8 kg/m2, pile material of polyamide (PA) 6.6, max. 1.1 kg/m2, with a	EPD	Provide area in m2
	3.2.Floor finishes	Carpet tiles to cluster corridor: laid to pattern	864.595	M2	1	Carpet	Carpet Tiles	Assumed carpet tiles with 50% recycled content and	Ramboll	Modular carpet tiles, tufted, 4.8 kg/m2, pile material of polyamide (PA) 6.6, max. 1.1 kg/m2, with a	EPD	Provide area in m2
	3.2.Floor finishes	Carpet tiles to student circulation	1722.88	M2	1	Carpet	Carpet Tiles	Assumed carpet tiles with 50% recycled content and	Ramboll	Modular carpet tiles, tufted, 4.8 kg/m2, pile material of polyamide (PA) 6.6, max. 1.1 kg/m2, with a	EPD	Provide area in m2
	3.2.Floor finishes	Lift Lobbies - assume floor finish, carpet tiles	338.47	M2	1	Carpet	Carpet Tiles	Assumed carpet tiles with 50% recycled content and	Ramboll	Modular carpet tiles, tufted, 4.8 kg/m2, pile material of polyamide (PA) 6.6, max. 1.1 kg/m2, with a	EPD	Provide area in m2

	3.2.Floor finishes	Carpet tiles to amenity space	448.8	M2	1	Carpet	Carpet Tiles	Assumed carpet tiles with 50% recycled content and	Ramboll	Modular carpet tiles, tufted, 4.8 kg/m2, pile material of polyamide (PA) 6.6, max. 1.1 kg/m2, with a	EPD	Provide area in m2
	3.2.Floor finishes	Carprt Tilres to Management Suite	66	M2	1	Carpet	Carpet Tiles	Assumed carpet tiles with 50% recycled content and 1100 g/m² pile weight	Ramboll	Modular carpet tiles, tufted, 4.8 kg/m2, pile material of polyamide (PA) 6.6, max. 1.1 kg/m2, with a bitumen backing, Graphlex (Interface Europe Manufacturing BV)	EPD	Provide area in m2
	3.2.Floor finishes	Vinyl to communal disabled toilets - assumes 3.25kg/m2	16.3475	KG	1	Vinyl	Flooring	Assumed vinyl flooring 2mm thick, 3.25kg/m2	Ramboll	Luxury vinyl floor tile, glue down, 0.118 in (3.0 mm), 16.43 oz/ft2 (5.015 kg/m2), Art Select (Desig	EPD	Assuming 3.25kg/m2 (2mm thick vinyl)
	3.2.Floor finishes	Vinyl to student Laundry/cleaner stores - PC Sum - assumes 3.25kg/m2	226	KG	1	Vinyl	Flooring	Assumed vinyl flooring 2mm thick, 3.25kg/m2	Ramboll	Luxury vinyl floor tile, glue down, 0.118 in (3.0 mm), 16.43 oz/ft2 (5.015 kg/m2), Art Select (Designflooring)	EPD	Assuming 3.25kg/m2 (2mm thick vinyl)
	3.2.Floor finishes	Staircase carpet - student - PC Sum	91	M2	1	Carpet	Carpet Tiles	Assumed carpet tiles with 50% recycled content and	Ramboll	Modular carpet tiles, tufted, 4.8 kg/m2, pile material of polyamide (PA) 6.6, max. 1.1 kg/m2, with a bitumen backing, Graphlex (Interface Europe Manufacturing BV)	EPD	Provide area in m2
	3.2.Floor finishes	Floor paint to staircase above level 3 - assumes 0.242kg/m2	284	KG	1	Epoxy	Epoxy floor	Assumed epoxy flooring	Ramboll	Epoxy floor covering, 2 mm, 5.188 kg/m2	EPD	Provide area in m2
	3.2.Floor finishes	Staircase stringer trimming - allow for 200mm high finish x 10mm / skirting /MDF apply 500kg/m3	440	KG	1	Timber	Skirting boards	Assumed MDF generic	Ramboll	Timber, MDF	ICE	Provide kg (density 500kg/m3)
	3.2.Floor finishes	Staircase nosings - first 3 floors only - assumes 50mm width and 1.90kg/m2	20.52	KG	1	Aluminium	Sheets	General European mix - ICE	IstructE	Aluminium sheet, European Mix, Inc Imports	ICE	Assuming 1.90kg/m2 for 0.7mm thick profile, 2.7kg/m2 for 1mm thick
	3.2.Floor finishes	Entrance Lobby - Vinl plank (Amtico) - assumes 3.25kg/m2	244	KG	1	Vinyl	Flooring	Assumed vinyl flooring 2mm thick, 3.25kg/m2	Ramboll	Luxury vinyl floor tile, glue down, 0.118 in (3.0 mm), 16.43 oz/ft2 (5.015 kg/m2), Art Select (Desig	EPD	Assuming 3.25kg/m2 (2mm thick vinyl)
	3.2.Floor finishes	Entrance flooring to Student areas; pedimatt entrance matting - in Revolving door - assumes 3.25kg/m2	42	KG	1	Vinyl	Flooring	Assumed vinyl flooring 2mm thick, 3.25kg/m2	Ramboll	Luxury vinyl floor tile, glue down, 0.118 in (3.0 mm), 16.43 oz/ft2 (5.015 kg/m2), Art Select (Designflooring)	EPD	Assuming 3.25kg/m2 (2mm thick vinyl)
	3.2.Floor finishes	Non-slip paint to bike storage - assumes 0.242kg/m2	15	KG	1	Epoxy	Epoxy floor	Assumed epoxy flooring	Ramboll	Epoxy floor covering, 2 mm, 5.188 kg/m2	EPD	Provide area in m2
	3.2.Floor finishes	Non-slip paint to refuse areas/Plant room - assumes 0.242kg/m2	73	KG	1	Epoxy	Epoxy floor	Assumed epoxy flooring	Ramboll	Epoxy floor covering, 2 mm, 5.188 kg/m2	EPD	Provide area in m2
	3.2.Floor finishes	Reception/Management office/POST Room - assumes 3.25kg/m2	213	KG	1	Vinyl	Flooring	Assumed vinyl flooring 2mm thick, 3.25kg/m2	Ramboll	Luxury vinyl floor tile, glue down, 0.118 in (3.0 mm), 16.43 oz/ft2 (5.015 kg/m2), Art Select (Designflooring)	EPD	Assuming 3.25kg/m2 (2mm thick vinyl)
	3.3.1.Finishes to ceilings	Student bedroom ceiling; plasterboard, skim & paint - assumes 10kg/m2	106755	KG	1	Plasterboard	Partitioning/Ceiling - Gyproc Wallboard	Gypsum plasterboard	Ramboll	Gypsum plasterboard, tapered or square edges, 12.5 mm, 8.44 kg/m2, 675 kg/m3, 10µ water vapour resistance, Gyproc WallBoard (British Gypsum (2019))	EPD	Assuming 8.4kg/m2 of elevation area (12.5mm thick)
	3.3.1.Finishes to ceilings	Student bedroom ceiling; plasterboard, skim & paint, area 10,675 m2, assumes 3 mm thick	27755	KG	1	Plaster Gypsum	Interior Applications	Gypsum Plaster	Ramboll	Gypsum-based plaster, for most internal backgrounds, 94.6% gypsum, 5.4% additives, 861.5 kg/m3, Thistle Universal OneCoat (British Gypsum Saint Gobain)	EPD	2.6 kg for 3mm thick coat, 4.3kg/m2 for 5mm thick coat, 8.6kg/m2 for 10mm thick coat
	3.3.1.Finishes to ceilings	Student bedroom ceiling; plasterboard, skim & paint	10675	M2	1	Paint	Vinyl matt emulsion - Walls/Ceilings	Indoor & outdoor use	Ramboll	Paint, vinyl matt emulsion, indoor and outdoor use, 1240-1360 kg/m3, 17 m2/l, Johnstone's Trade Covaplus Vinyl Matt Base L, Base M, Base D, Base Z, Base Z2 (PPG Architectural Coatings UK (2020))	EPD	Provide area in m2
	3.3.1.Finishes to ceilings	Student Communal Ceiling; plasterboard, skim & paint - assumes 10kg/m2	13635	KG	1	Plasterboard	Partitioning/Ceiling - Gyproc Wallboard	Gypsum plasterboard	Ramboll	Gypsum plasterboard, tapered or square edges, 12.5 mm, 8.44 kg/m2, 675 kg/m3, 10µ water vapour resistance, Gyproc WallBoard (British Gypsum (2019))	EPD	Assuming 8.4kg/m2 of elevation area (12.5mm thick)
	3.3.1.Finishes to ceilings	Student Communal ceiling; plasterboard, skim & paint, area 1363.5 m2, assumes 3 mm thick	3545	KG	1	Plaster Gypsum	Interior Applications	Gypsum Plaster	Ramboll	Gypsum-based plaster, for most internal backgrounds, 94.6% gypsum, 5.4% additives, 861.5 kg/m3, Thistle Universal OneCoat (British Gypsum Saint Gobain)	EPD	2.6 kg for 3mm thick coat, 4.3kg/m2 for 5mm thick coat, 8.6kg/m2 for 10mm thick coat
	3.3.1.Finishes to ceilings	Student Communal ceiling; plasterboard, skim & paint	1364	M2	1	Paint	Vinyl matt emulsion - Walls/Ceilings	Indoor & outdoor use	Ramboll	Paint, vinyl matt emulsion, indoor and outdoor use, 1240-1360 kg/m3, 17 m2/l, Johnstone's Trade Covaplus Vinyl Matt Base L, Base M, Base D, Base Z, Base Z2 (PPG Architectural Coatings UK (2020))	EPD	Provide area in m2
	3.3.1.Finishes to ceilings	Student Circulation Ceiling; plasterboard, skim & paint - assumes 10kg/m2	25874.75	KG	1	Plasterboard	Plasterboard/Tileboard	Specialty gypsum board for tiling surface	Ramboll	Gypsum plasterboard, reinforced, water resistant, with square edges, 1200x900x6/12.5 mm, 800 kg/m3, 10µ water resistance, Glasroc H TILEBACKER (British Gypsum)	EPD	Assuming 10kg/m2 (12.5mm thick)
	3.3.1.Finishes to ceilings	Student circulation ceiling; plasterboard, skim & paint, area 2587.475 m2, assumes 3 mm thick	6727	KG	1	Plaster Gypsum	Interior Applications	Gypsum Plaster	Ramboll	Gypsum-based plaster, for most internal backgrounds, 94.6% gypsum, 5.4% additives, 861.5 kg/m3, Thistle Universal OneCoat (British Gypsum Saint Gobain)	EPD	2.6 kg for 3mm thick coat, 4.3kg/m2 for 5mm thick coat, 8.6kg/m2 for 10mm thick coat
	3.3.1.Finishes to ceilings	Student circulation ceiling; plasterboard, skim & paint	2587	M2	1	Paint	Vinyl matt emulsion - Walls/Ceilings	Indoor & outdoor use	Ramboll	Paint, vinyl matt emulsion, indoor and outdoor use, 1240-1360 kg/m3, 17 m2/l, Johnstone's Trade Covaplus Vinyl Matt Base L, Base M, Base D, Base Z, Base Z2 (PPG Architectural Coatings UK (2020))	EPD	Provide area in m2
	3.3.1.Finishes to ceilings	Student Staircase Ceiling; painted exposed concrete soffit - assumes 0.242kg/m2	14.68456	KG	1	Paint	Concrete sealant	Assumed coating for concrete elements	Ramboll	Concrete sealant, generic, silicone/siloxane solution	OC	Provide kg/ton
	3.3.1.Finishes to ceilings	Student Entrance Ceiling; plasterboard, skim & paint - assumes 10kg/m2	751.8	KG	1	Plasterboard	Partitioning/Ceiling - Gyproc Wallboard	Gypsum plasterboard	Ramboll	Gypsum plasterboard, tapered or square edges, 12.5 mm, 8.44 kg/m2, 675 kg/m3, 10µ water vapo	EPD	Assuming 8.4kg/m2 of elevation area (12.5mm thick)
	3.3.1.Finishes to ceilings	Student entrance ceiling; plasterboard, skim & paint, area 2587.475 m2, assumes 3 mm thick	195	KG	1	Plaster Gypsum	Interior Applications	Gypsum Plaster	Ramboll	Gypsum-based plaster, for most internal backgrounds, 94.6% gypsum, 5.4% additives, 861.5 kg/m:	EPD	2.6 kg for 3mm thick coat, 4.3kg/m2 for 5mm thick coat, 8.6kg/m2 for 10mm thick coat
	3.3.1.Finishes to ceilings	Student entranceceiling; plasterboard, skim & paint	75	M2	1	Paint	Vinyl matt emulsion - Walls/Ceilings	Indoor & outdoor use	Ramboll	Paint, vinyl matt emulsion, indoor and outdoor use, 1240-1360 kg/m3, 17 m2/l, Johnstone's Trade C	EPD	Provide area in m2
	3.3.1.Finishes to ceilings	Ceiling to student Laundry/cleaner stores/disabled Wc's - assumes 0.242kg/m2	18.06046	KG	1	Paint	Acrylic emulsion - Indoor/Outdoor use	External/Internal application	Ramboll	Paint, acrylic emulsion, indoor and outdoor use, 12 m2/l, Johnstones Acrylic Durable Matt (PPG)	EPD	Assumed 0.242kg/m2 for 2 coats (0.167mm thick coat)
	3.3.1.Finishes to ceilings	Refuse Area/LV Room Ceiling - Painted Soffit - assumes 0.242kg/m2	72.634364	KG	1	Paint	Acrylic emulsion - Indoor/Outdoor use	External/Internal application	Ramboll	Paint, acrylic emulsion, indoor and outdoor use, 12 m2/l, Johnstones Acrylic Durable Matt (PPG)	EPD	Assumed 0.242kg/m2 for 2 coats (0.167mm thick coat)
	3.3.1.Finishes to ceilings	Ceiling to Bike Store; 1nr layer 136mm Rockwool High Impact Soffit Slab fixed to underside of soffit - assumes 50mm of rockwool	3	M3	1	Insulation	Ext.Walls - between SFS - Rockwool	Rockwool	Ramboll	Rock wool insulation panels, L=0.037 W/mK, R=2.63 m2k/W, 100 mm, 3.3 kg/m2, 33 kg/m3, Lamb	EPD	Provide m3
	3.3.1.Finishes to ceilings	Ceiling to Amenity Space, Reception area - possible Acoustic - 6.4kg/m2	2586	KG	1	Insulation	Acoustic baffles	Assumed Rock Wool	Ramboll	Frameless acoustic baffles, 50mm, 6.4kg/m2, 128kg/m3, Contour (ROCKWOOL FRANCE)	EPD	Assuming 6.4kg/m2 (50mm thick)
	3.3.1.Finishes to ceilings	Allowance for forming ceiling bulkheads: ne 300 wide - 300mm wide, 1207m, assumes 10kg/m2	3621	KG	1	Plasterboard	Plasterboard/Tileboard	Specialty gypsum board for tiling surface	Ramboll	Gypsum plasterboard, reinforced, water resistant, with square edges, 1200x900x6/12.5 mm, 800 kg	EPD	Assuming 10kg/m2 (12.5mm thick)
	3.3.1.Finishes to ceilings	Access hatches to bulkheads: 600 x 600 non fire rated; tamper proof lock MDF Panel - 600 x 600 x 18mm *(367) - 500 kg/m3	1189	KG	1	Timber	Skirting boards	Assumed MDF generic	Ramboll	Timber, MDF	ICE	Provide kg (density 500kg/m3)
	Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A
	Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A

RAMBOLL **LCI - LANDSCAPING**

Rev 01	01/11/2023

8. External Works

RICS category	Material Description	Quantity	Units	Source	Material	Details	Specification	Spec. Source	Carbon Data	Carbon Source	Notes/Assumptions
8.2.1.Roads, paths and pavings	**Hard paving;** 600 x 600, assuming 30mm thick, 862m²	62,064	KG	1	Concrete	Precast Concrete Paving	Assumed Precast concrete	Ramboll	Precast concrete paving products, 2350 kg/m3 (BPCF)	EPD	Provide m3 or kgs, Assuming 72kg/m2 (30mm thick), 192kg/m2 (80mm thick)
8.2.1.Roads, paths and pavings	**Bound gravel** Surfacing, assuming 100mm thick, 42m²	6,720	KG	1	Aggregate	Crushed gravel	Assumed aggregate (crushed gravel), generic	Ramboll	Aggregate (crushed gravel), generic, dry bulk density, 1600 kg/m3	OC	Provide m3 or kg - Assuming 640kg/m2 (400mm thick), 160kg/m2 (100mm thick), 128kg/m2 (80mm thick)
8.6.1.Surface water and foul water drainage	Drainage to external works	862	M2	1	Soil	Wastewater drainage	Wastewater drainage system per m²	OC	Wastewater drainage system	OC	provide m²
8.5.1.Site/Street furniture and equipment	Benches; 2400 long	3	UNIT	1	FF&E	Bench	Wooden bench	Ramboll	Wooden bench, 13.5 kg/unit, OVO Bench Collection (Benchmark)	EPD	Provide units
Select		19,029	Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A
Select			Select	Select	Select	Select	N/A	N/A	N/A	N/A	N/A