







Net Zero Embodied Carbon  
Summary Report,  
RIBA Stage 4 Analysis,  
Rev01.

Joint Archives Facility,  
Mold.

# Quality Management

Issue/ Revision	Issue 1	Revision 1	Revision 2	Revision 3
Remarks	First issue	Second issue		
Date	23/04/2026	29/04/2026		
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Reviewed by	Gareth Davies	Gareth Davies		
Position	Director	Director		
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Project Number	P-1603	P-1603		

Disclaimer - The LCA predictions of embodied and operational impacts (including costs) conducted using the One Click LCA software, by their very nature, cannot be exact. It is not possible to track all the impacts associated with a product or service back through history accurately. One Click LCA software has been built and tested to enable informed decisions when comparing design options. Generic cost and environmental impact coefficients do not necessarily correspond to those of individual brands of the same product or service due to differences within industries in the way these products and services are delivered. Additionally, the modelling is only as accurate as the information provided, where this is not robust enough assumptions have to be made to ensure modelling can take place. One Click LCA and RedSix Ltd cannot make assurances regarding the accuracy of these reports for the above reasons.

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## 1. INTRODUCTION

RedSix have been appointed by Wynne Construction to undertake a Net Zero Embodied Carbon assessment for the proposed new-build development at the Joint Archives Facility, Mold.

The purpose of this report is to outline the findings of a RIBA Stage 2 Embodied carbon modelling analysis and detail the indicative embodied carbon associated with the proposed RIBA stage 2 of design. This will facilitate the option to purchase carbon offsets and influence the design through carbon reduction measures. The software used to conduct this analysis was OneClick LCA, an online life cycle assessment tool. This assessment follows the UKGBC Net Zero framework, which is referred to throughout the report.

This analysis demonstrates the achievement of the '1.1 Net Zero Carbon – Construction' route of the UKGBC Net Zero Framework, and further analysis should be conducted throughout the detailed design and construction process, once a full bill of quantities is available. Another study would need to be conducted which would demonstrate the achievement of route '1.2 Net Zero Carbon – Operational Energy' if being pursued, which is not covered within this study.

This report outlines the initial findings of the Embodied Carbon assessment undertaken during RIBA stage 2 of the project.

## 2. PROJECT SCOPE

The proposed development comprises of a new archives facility which consists of two floors of archives storage spaces, office, and communal spaces along with ancillary facilities.

The following documents were used to inform this analysis:

- DB3 Group Architects Stage 2 Package and current stage revit model
- Engineering services design M&E Stage 2 Package and current stage revit model
- Eng Assist Stage 2 Package and current stage revit model
- Fenton+Reece Landscaping Stage 2 Package
- RICS Whole Life Carbon Assessment for the Built Environment 2nd Edition, September 2023
- UKGBC Net Zero Carbon Buildings: A Framework Definition, 2019
- RIBA Sustainable Outcomes Guide, 2019
- RIBA 2030 Climate Challenge, 2021

Additional information was provided through liaison with the design team, which has helped to inform the quantities and material specifications used within this analysis.

Where building elements had a quantity deemed too low to have a noticeable contribution to the embodied carbon total (less than 1%), they have been excluded from the assessment.

### 3. BACKGROUND – NET ZERO CARBON & UKGBC

The purpose of this RIBA Stage 2 Embodied Carbon assessment is to develop a pathway to a net zero embodied carbon footprint. 'Net Zero Carbon' is the achievement of effectively delivering zero emissions from the development, through the reduction of embodied carbon where possible and offsetting of any remaining carbon emissions. This analysis has been conducted during the concept stage of design and is therefore limited to the current development proposals. Assumptions have been made where detailed information is not yet known.

The UK Green Building Council (UKGBC) have developed a framework definition for net zero carbon buildings, which provides clarity on how to achieve net zero carbon during construction and operation. (Net Zero Carbon Buildings: A Framework Definition, 2019)

The UKGBC framework applies the principles of the RICS methodology for whole life carbon (Whole Life Carbon Assessment for the Built Environment 2nd Edition, September 2023). At this stage of the framework's development, the emphasis is on the construction (for new buildings and major renovations) definition.

The summary table on the following page outlines the principles within the UKGBC framework which should be followed to demonstrate alignment with net zero carbon for construction and for operational energy, and where possible this should be achieved annually in use for the development.

This analysis demonstrates at an early stage of the design the achievement of the '1.1 Net Zero Carbon – Construction' route of the UKGBC Framework. It is recommended this analysis and report is updated during detailed design and construction stages to reflect a detailed bill of quantities and main contractor site activities. Another study would need to be conducted which would demonstrate the achievement of route '1.2 Net Zero Carbon – Operational Energy' if pursued, which is not covered within this study.

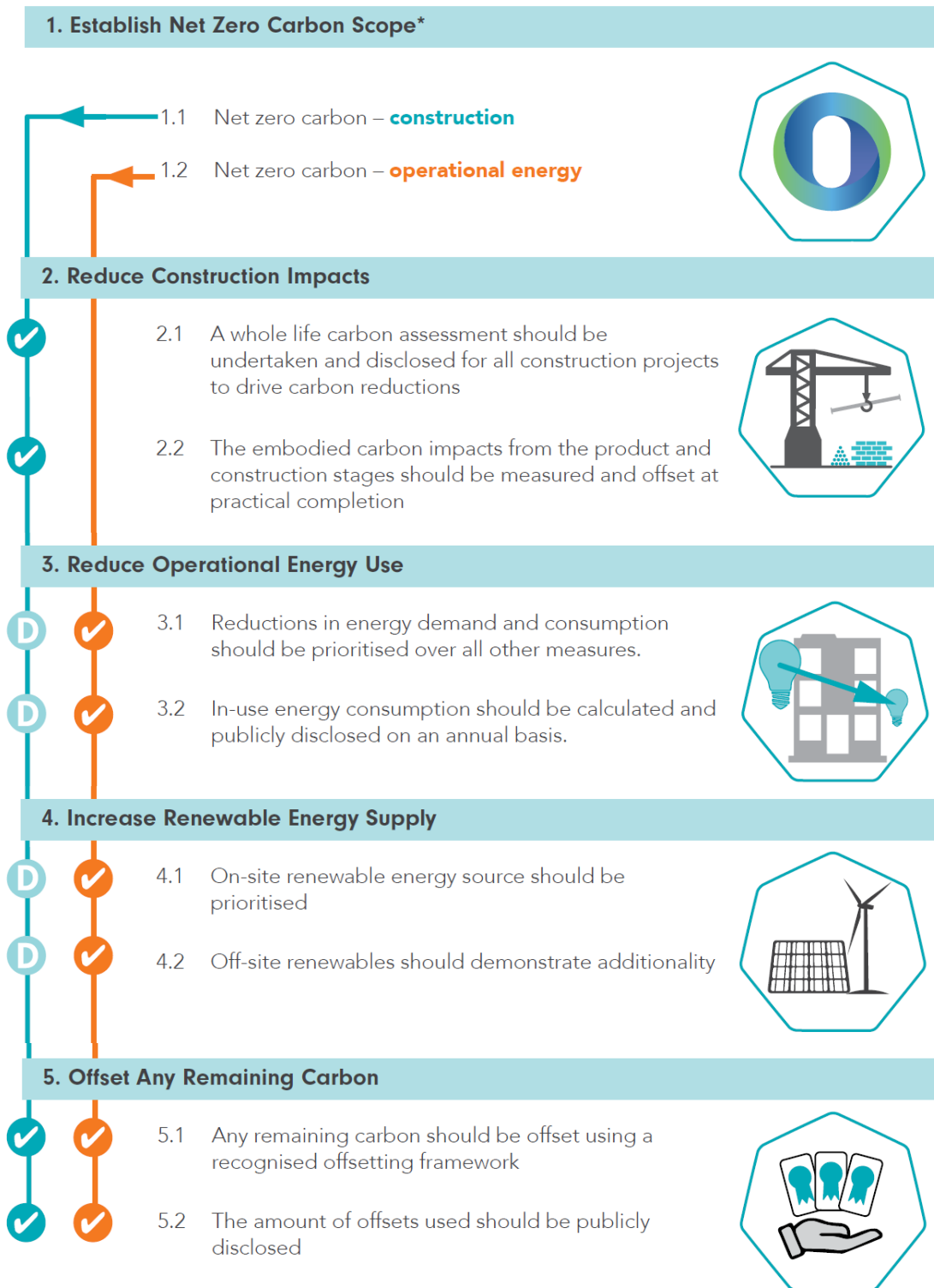


Figure 1 – Routes to Net Zero

## 4. METHODOLOGY

This analysis determines the carbon dioxide emissions associated with the development and has been completed using the OneClick Life Cycle Assessment (LCA) software.

A Life Cycle Assessment (LCA) is an integrative methodology within Life Cycle Design that assesses the impacts of a product or process over its entire life span. The LCA focusses on emissions associated with the non-operational phase of a project, from extraction to demolition or recycling of the material, where possible.

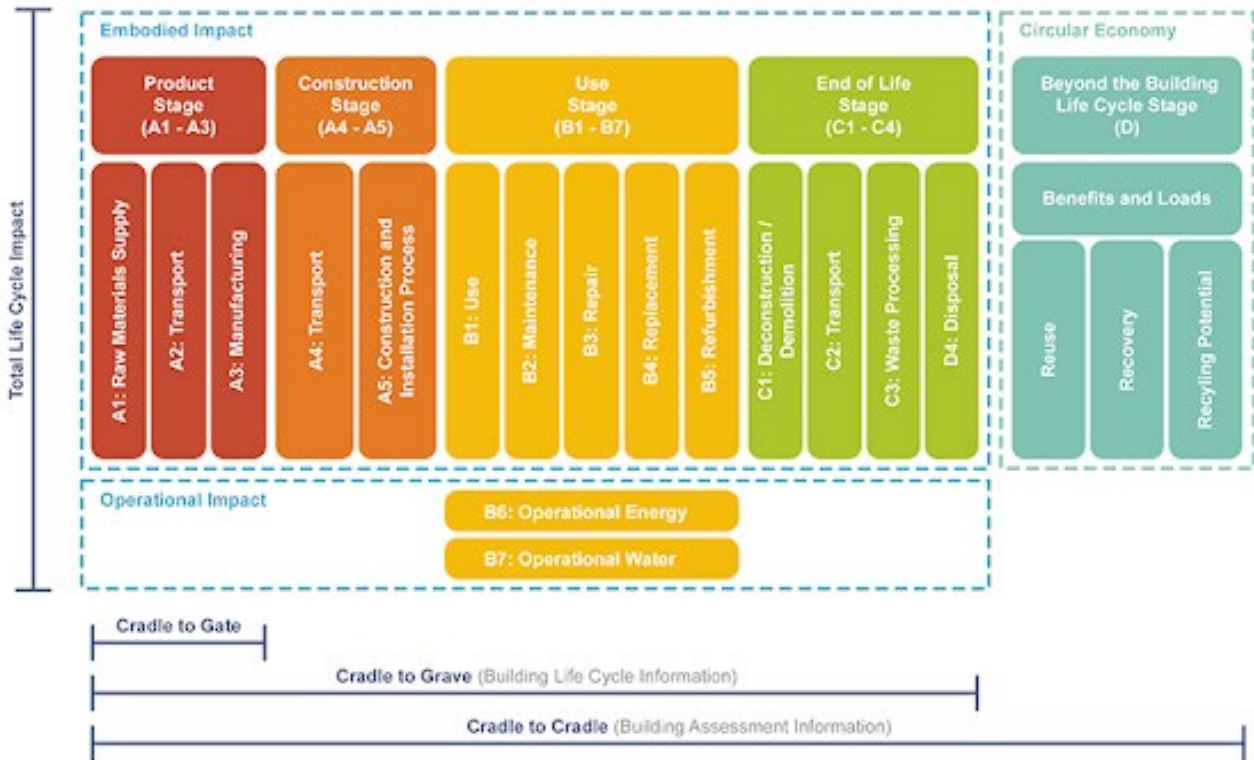
Each of the constituent products/materials/components are measured and assessed by their environmental impacts from 'cradle to grave' (raw material supply to disposal of material) or 'cradle to cradle' (raw material supply to reuse/recovery/recycling of material). This collection of unique environmental profiles is then used to comprehensively evaluate the lifetime effect of the whole building on the embodied carbon. The embodied carbon refers to the carbon dioxide emitted during the manufacture, transport, construction and end of life emissions of building materials.

The embodied carbon is quantified in this report as Global Warming Potential (GWP), which is measured in kgCO<sub>2</sub>e. Carbon Dioxide, by definition, has a GWP of 1, regardless of the time period used because it is the gas being used in reference. Using kgCO<sub>2</sub>e allows a comparison of the global warming impacts of different gasses, as CO<sub>2</sub>e pertains to the equivalent carbon dioxide emissions of different substances. The larger the GWP, the more that a given gas warms the Earth compared to CO<sub>2</sub> over a certain period of time.

The aim of conducting an LCA is to support the mitigation of carbon impacts through the design and specification of buildings, whilst encouraging innovation in low-carbon manufacture and assembly. The UK Green Building Council in 2017 predicted that the total embodied carbon in buildings amounted to 22% of environmental emissions, however in 2050 this is predicted to rise to 40%, which highlights the growing influence of embodied carbon. The LCA therefore promotes the ideology of 'build right' over 'build less' to encourage lower levels of embodied carbon in buildings.

The scope of the impacts of the LCA have been characterised across modules A to C, which reflects the timeline from production of materials and products through to their eventual disposal. These modules are detailed in figure 2 on the following page.

Figure 2: Life-cycle stages and modules (source - <https://www.buildingenclosureonline.com/blogs/14-the-be-blog/post/89547-lca-stages-matter-when-tracking-embodied-carbon>)



This scope of the proposed works best fits with the UKGBC Net Zero Carbon (NZC) Framework definition 1.1 construction stage, which covers EN 15978 modules A-C, for embodied carbon of materials throughout their whole-life cycle.

The modelling within OneClick has been based on the RICS guidance on whole life carbon, this has ensured that the contents were aligned with the UKGBC construction stage net zero carbon scope. The OneClick software is an online software system that provides the ability to conduct a detailed Life Cycle Assessment analysis.

The dataset used through One Click LCA was the One Click LCA Default dataset, which complies with ISO 14040 and 14044 and is based on Ecoinvent's globally recognised database with regionalised scaling for the UK.

At this stage of design, the data used within the analysis has been as detailed as possible, but where detailed information is not yet readily available assumptions have been made. As the design progresses and additional iterations of this analysis are completed, more accurate and detailed information will be used which will better reflect the true-life cycle impact of the development.

Below is a summary of the steps taken within this analysis so far:

- A OneClick model was built for the proposed development using information provided by the design team as outlined in section 2.0 above.
- Each material element of the proposed design was incorporated into the model on OneClick, using the most appropriate elemental template from the OneClick LCA library, where quantities were modified to match the project's design information. (Please see appendix A of this document for a full breakdown)
- The resulting overall GWP and any major impacts have been reported (see Section 6.0 Below)

## 5. SCOPING

Any works associated with site preparation have been excluded from the analysis due to the RICS guidance stating that all new build projects should be considered to commence on a cleared flat site for consistency purposes.

The RICS Whole Life Carbon Guidance requires that 95% of the cost for each major element be included. This allows for any small items to be excluded which only have a small impact on the overall life cycle impacts of the development. This approach is based on the typical correlation between high cost and high environmental impact for materials. This rule has been applied throughout the analysis wherever possible for each key element.

The analysis should cover all items listed in the development's RIBA Stage 2 package and include any external works that are being conducted within the site boundary. This analysis should be updated during contractor design and construction stages to reflect a detailed bill of quantities and main contractor site activities.

Where items that are included in the assessment do not have specific qualifying carbon data, equivalent or similar products are to be used.

In line with RICS guidance, a construction site operations scenario has been used to estimate energy, water, and materials use, as well as waste quantities produced on site. Project specific information relating to site operations was not available, due to the analysis being conducted at a design stage of works. Therefore, once more detailed information on site operations becomes available, the construction stage analysis can be conducted using input from the contractor, reflecting more accurate data.

Whole life carbon is based upon a 60-year lifespan for domestic and non-domestic projects (infrastructure 120 years).

## 6. RESULTS AND DISCUSSION

Table 1 below details the total carbon emissions in tonnes CO<sub>2</sub>eq for both the construction stages (A1-A5) and the whole life (A-C) for the development from the OneClick LCA analysis results.

	Construction (Stages A1 – A5)	Whole life – 60 Year (Stages A-C)
Whole Development Total	956 tCO <sub>2</sub> eq	1,182 tCO <sub>2</sub> eq

Table 1: Total carbon Emissions by Construction Module

Table 2 below details the total whole-life (60 year) embodied carbon emissions (Stages A-C, excluding B6 Operational Energy and B7 Operational Water) results in kgCO<sub>2</sub>eq per m<sup>2</sup> of floor area. An area weighted value allows comparison against other similar projects of this type, and it also allows for comparison against the Welsh Government Embodied Carbon Target.

	Whole-Life (kgCO <sub>2</sub> eq per m <sup>2</sup> )	2022 – 2024 Target	2025 – 2029 Target	2030 – Onwards Target
Whole Development	576	800	600	350

Table 2: Total Carbon Emissions per GIFA against the Welsh Government Embodied Carbon Targets)

The table above demonstrates that the RIBA Stage 2 development currently meets the 2025-2029 target of 600 kgCO<sub>2</sub>eq per m<sup>2</sup>.

Figure 3 and 4 on the following page highlights the largest impacts for the development in terms of the material resource types. The figure demonstrates that the most impactful resource type is ready-mix concrete walls and floors followed by Ready-mix concrete within the foundations and internal walls. This is not surprising due to concrete having an intensive carbon footprint. Other resource types relate to internal works, such as plasterboard, stud walls, ceiling finishes, floor finishes and paints/renders. The specification of these will also need to be carefully considered.

The most contributing material type is the in-situ concrete within the roof, floors and foundations, with an impact of 124 tonnes of CO<sub>2</sub>e (15.2%) followed by the ready-mix concrete within the frame with an impact of 96 tonnes of CO<sub>2</sub>e (11.8%).

- Ready-mix concrete for external walls and floors - 15.6%
- Other site operation - 9.3%
- Ready-mix concrete for foundations and internal walls - 7.7%
- Energy production systems from renewable energy - 5.6%
- HVAC components and equipment - 5.5%
- PIR (polyisocyanurate foam) insulation - 5.4%
- Reinforcement for concrete (rebar) - 4.5%
- Furniture - 3.8%
- Hot-dip galvanized/zinc coated steel - 3.8%
- Other resource types - 38.7%

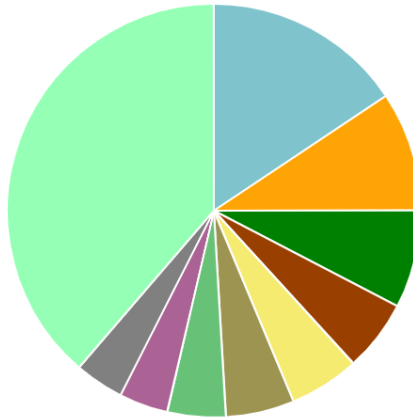


Figure 3: Total kg CO2e - Resource Types

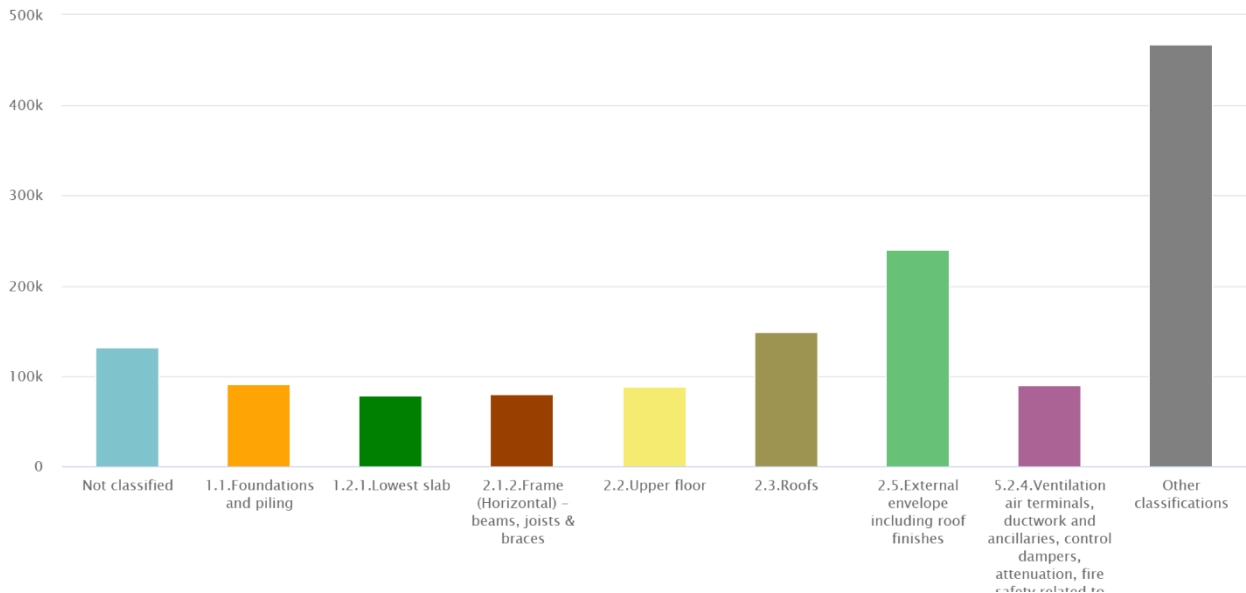


Figure 4: Total kg CO2e - Classifications

Figure 5 below shows the most impactful life-cycle stages of the development. Stage A1-A3 Materials is the most impactful life-cycle stage, followed by the second largest impactful life-cycle stage of B4 Replacement.

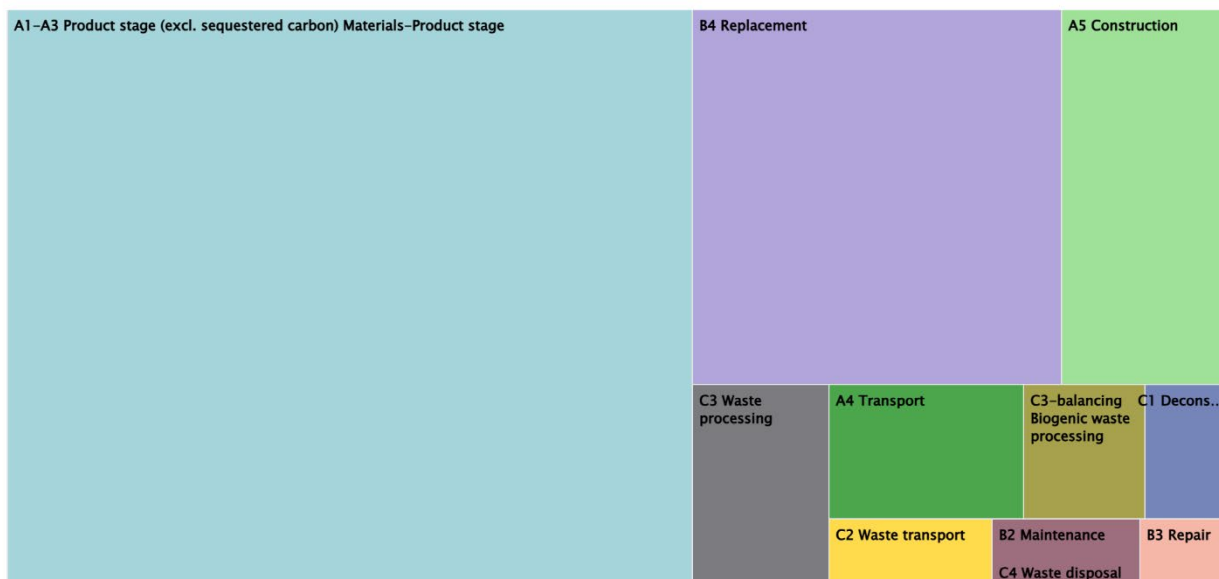


Figure 5: Total kg CO<sub>2</sub>e - Life-Cycle Stages

To reduce the overall impact from the top impactful elements the following actions should be implemented:

**1. Floors, foundations and roof - Ready-mix concrete, C30/37 with 30% GGBS – 124 tCO<sub>2</sub>e (15.2%)**

If further reductions are required a specification with greater GGBS content could be used.

**2. Columns and beams – In-situ concrete C25/30 with 30% GGBS – 96 tCO<sub>2</sub>e (11.8%)**

If further reductions are required a specification with greater GGBS content could be used.

**3. Foundations and walls - Ready-mix concrete, C35/40, 30% GGBS – 65 tCO<sub>2</sub>e (7.9%)**

If further reductions are required a specification with greater GGBS content could be used.

**4. Steel REBAR reinforcements – UK Average – 53 tCO<sub>2</sub>e (6.5%)**

A typical specification has been used, if further reductions are required a specification with greater recycled content could be used.

**5. Aluminium facade cladding panel, 0% recycled – 53 tCO<sub>2</sub>e (6.5%)**

A typical specification has been used, if further reductions are required a specification with greater recycled content could be used.

**6. Soprema Roof Insulation – 44 tCO<sub>2</sub>e (5.3%)**

If further reductions are required a specification with greater recycled content could be used or a different insulation manufacturer with a reduced embodied carbon impact.

**7. External wall – Knauf rocksilks Insulation – 38 tCO<sub>2</sub>e (4.7%)**

If further reductions are required a specification with greater recycled content could be used or a different insulation manufacturer with a reduced embodied carbon impact.

**8. Screed – Sand Cement C25/30 – 33 tCO<sub>2</sub>e (4.1%)**

A typical specification has been used, if further reductions are required a specification with greater cement replacement could be used.

### 9. Composite floor and roof metal decking (Public building) – 30 tCO<sub>2</sub>e (3.7%)

A typical specification has been used, if further reductions are required a specification with greater recycled content could be used.

### 10. Rigid EPS Insulation, Ground Floor Slab – 24 tCO<sub>2</sub>e (2.9%)

If further reductions are required a specification with greater recycled content could be used or a different insulation manufacturer with a reduced embodied carbon impact.

## 7. UKGBC NET ZERO CARBON PROCESS

The UKGBC framework sets out the following process for declaring a development as net Zero Carbon:

- Quantification of the total carbon emissions associated with the specific development. This analysis has been conducted at RIBA stage 2 of design and will additionally be conducted during developed design, construction stage and at practical completion.
- Where 1.1 Net Zero Carbon – construction only is being sought, evidence will need to be provided which demonstrates how the development can reduce its energy demand and consumption in use and maximise any on-site renewable energy. This will allow the achievement of 1.2 Net Zero carbon – Operational Energy within the future.
- Carbon offsetting should be purchased in order to compensate for the carbon emissions associated with the practical completion modelling (UKGBC recommend existing frameworks, or others could be used providing they meet the same level of rigour. Further information relating to the frameworks are detailed below.
- Public disclosure of the ‘minimum level of reporting’ required by UKGBC (appendices in the UKGBC definition document provides a template to ensure the minimum information is covered).
- The publicly reported information should be subjected to third-party auditing, to ensure that the information is transparent and proportionate (further detail is provided below).

UKGBC recommends the carbon offsetting frameworks the United Nations Clean Development Mechanism (CDM) (<http://cdm.unfccc.int/>) and Gold Standard (<https://www.goldstandard.org/>). Both frameworks facilitate the purchase of carbon credits (known as certified emission reductions, or CER’s under the CDM). These credits support development projects e.g., the installation of photovoltaic arrays, reforestation efforts or improvement of cook stoves which all lead to a reduction in carbon emissions (amongst other benefits). The price associated with each tonne of carbon varies between the different projects and on a daily basis (anything from \$10-\$90 under Gold Standard, or \$0.14-\$35 under CDM), and the quantity and availability of credits available to purchase on a project-by-project basis also varies (6-142,157t under Gold Standard, 3-1,448,260t under CDM).

Both frameworks are global schemes, with most projects located in developing countries. UKGBC are currently developing further guidance on offsetting frameworks, and some flexibility exists in providing offsets via local projects (possibly even local authority schemes). Any deviation from the recommended frameworks would need to demonstrate credibility, with the benefits made clear and delivery of the projects assured.

The other route to offsetting carbon emissions is to ensure the installation of on-site renewable energy generation (e.g., photovoltaics). Any on-site energy generation must first be used to offset the anticipated operational energy use of the development, with any leftover energy then able to be used for the emissions associated with the construction impacts. This would require full modelling of the operational energy of the development, even if only definition 1.1 is sought.

With regards to the final point of third-party testing, during the final stage of analysis the calculations used for the LCA study should be provided to a third party who will review the information and confirm its validity, if certification was pursued.

## 8. NEXT STEPS

This modelling study has provided a clear indication of the total RIBA Stage 2 embodied carbon of the development at concept stage of design, against the '1.1 Net Zero Carbon – Construction' route of the UKGBC Net Zero Framework and currently meets the required Welsh Government target of <600 kgCO<sub>2</sub>e/m<sup>2</sup>.

The next step should be to conduct further updates to this analysis utilising more detailed information during RIBA Stage 3, 4, 5 and 6 sourced from the detailed and final contractor design, detailed bill of quantities and contractor site practices. This will provide greater accuracy of the resulting total embodied carbon for the development.

Following this study and when more detailed information is available, another optional study could be conducted which would assess and demonstrate the achievement of route '1.2 Net Zero Carbon – Operational Energy' if pursued, which is not covered within this study.

An appropriate offsetting route will need to be identified and agreed with the project team, in due course.

## APPENDIX A – NEW-BUILD DEVELOPMENT, JOINT ARCHIVES FACILITY, MOLD, MODELLING INPUTS

### LIFE CYCLE ASSESSMENT MATERIALS TEMPLATE

Project: Joint Archives Facility, Mold

Completed by: Gwen Forwood

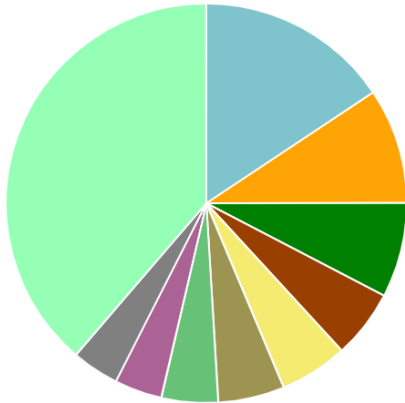
1,874 m<sup>2</sup> = Total Gross Internal Floor Area

	A1-A3 Product Stage	A4 Transportation to site	A5 Site operations	B4 Replacement	C1-C4 End of Life
Total kg CO <sub>2</sub> e	773,170	54,063	129,184	111,144	114,991
Construction (modules A1 – A5) Total kg CO <sub>2</sub> e	956,416				
Convert to tCO <sub>2</sub> eq	956				
60 Year Lifetime (modules A-C) Total kg CO <sub>2</sub> e	1,181,551				
Convert to tCO <sub>2</sub> eq	1,182				
60 Year Lifetime (kgCO <sub>2</sub> eq per m <sup>2</sup> )	576				

Category	tCO <sub>2</sub> eq	% impact
Floors, foundations and roof - Ready-mix concrete, C30/37 with 30% GGBS	124	15.2%
Columns and beams – In-situ concrete C25/30 with 30% GGBS	96	11.8%
Foundations and walls - Ready-mix concrete, C35/40, 30% GGBS	65	7.9%
Steel REBAR reinforcements – UK Average	53	6.5%
Aluminium facade cladding panel, 0% recycled	53	6.5%
Soprema Roof Insulation	44	5.3%
External wall – Knauf rocksilk Insulation	38	4.7%
Screed – Sand Cement C25/30	33	4.1%
Composite floor and roof metal decking (Public building)	30	3.7%
Rigid EPS Insulation, Ground Floor Slab	24	2.9%

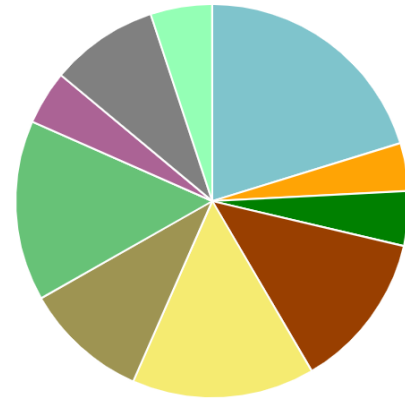
### TOTAL kg CO2e - Resource types

- Ready-mix concrete for external walls and floors - 15.6%
- Other site operation - 9.3%
- Ready-mix concrete for foundations and internal walls - 7.7%
- Energy production systems from renewable energy - 5.6%
- HVAC components and equipment - 5.5%
- PIR (polyisocyanurate foam) insulation - 5.4%
- Reinforcement for concrete (rebar) - 4.5%
- Furniture - 3.8%
- Hot-dip galvanized/zinc coated steel - 3.8%
- Other resource types - 38.7%



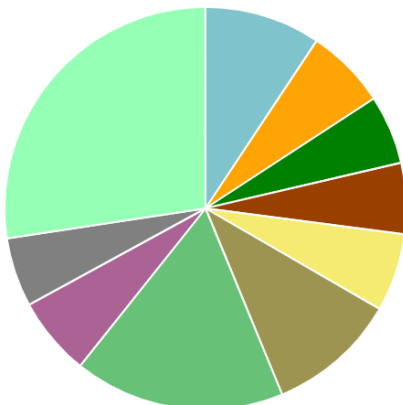
### Mass kg - Classifications

- 1.1. Foundations and piling - 20.2%
- 1.2.1. Lowest slab - 3.9%
- 2.1.1. Frame (vertical) - columns/ structural walls & braces - 4.5%
- 2.1.2. Frame (Horizontal) - beams, joists & braces - 12.9%
- 2.2. Upper floor - 15.0%
- 2.3. Roofs - 10.2%
- 2.5. External envelope including roof finishes - 14.8%
- 2.7. Internal walls and partitions - 4.4%
- 8. External Works - 8.9%
- Other classifications - 5.1%



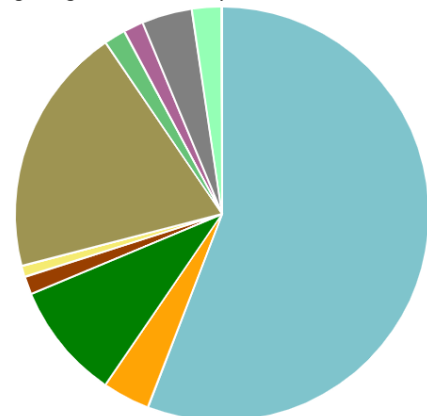
### TOTAL kg CO2e - Classifications

- Not classified - 9.3%
- 1.1. Foundations and piling - 6.5%
- 1.2.1. Lowest slab - 5.6%
- 2.1.2. Frame (Horizontal) - beams, joists & braces - 5.7%
- 2.2. Upper floor - 6.2%
- 2.3. Roofs - 10.5%
- 2.5. External envelope including roof finishes - 17.0%
- 5.2.4. Ventilation air terminals, ductwork and ancillaries, control - 5.6%
- 5.4. On site renewable energy generation - 5.6%
- Other classifications - 27.4%

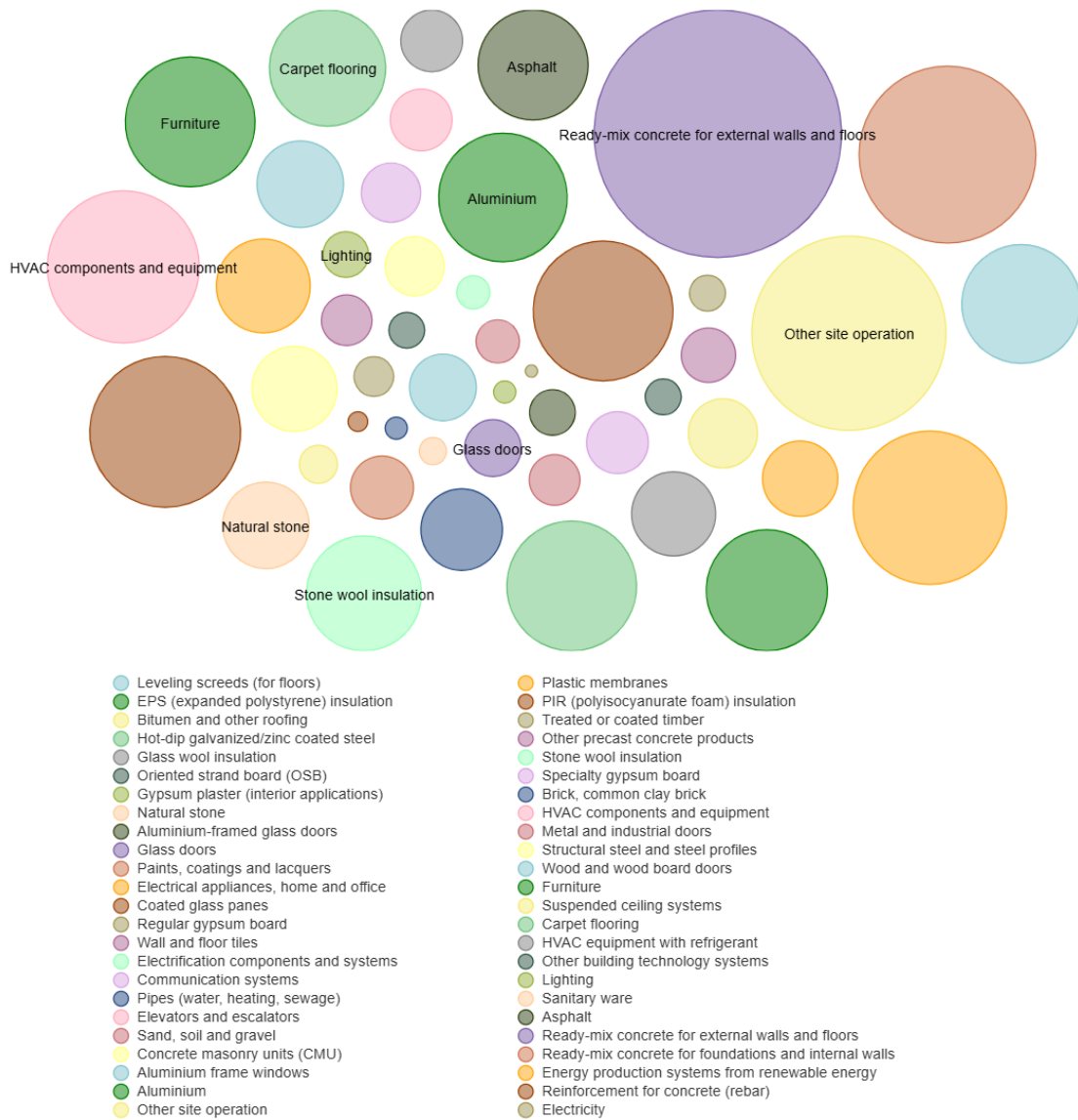


### TOTAL kg CO2e - Life-cycle stages

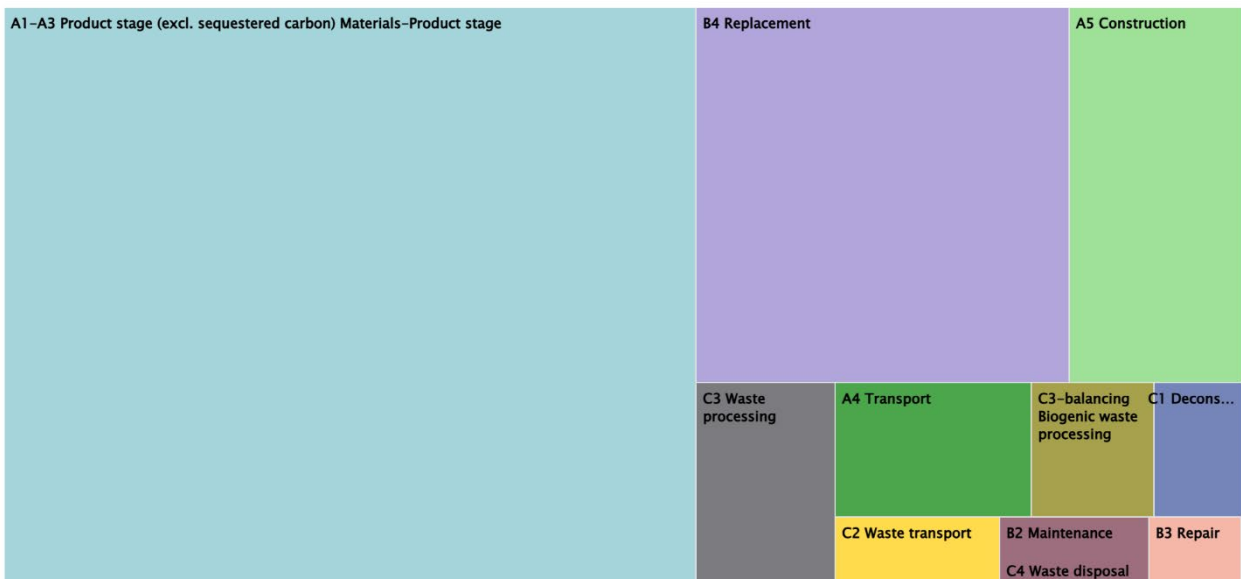
- A1-A3 Product stage (excl. sequestered carbon) Materials-Product - 19.5%
- A4 Transport - 3.7%
- A5 Construction - 9.1%
- B2 Maintenance - 1.4%
- B3 Repair - 0.9%
- B4 Replacement - 19.5%
- C1 Deconstruction/demolition - 1.7%
- C2 Waste transport - 1.6%
- C3 Waste processing - 3.9%
- C3-balancing Biogenic waste processing - 2.3%
- C4 Waste disposal - 0.0%
- C4-balancing Biogenic waste disposal - 0.0%



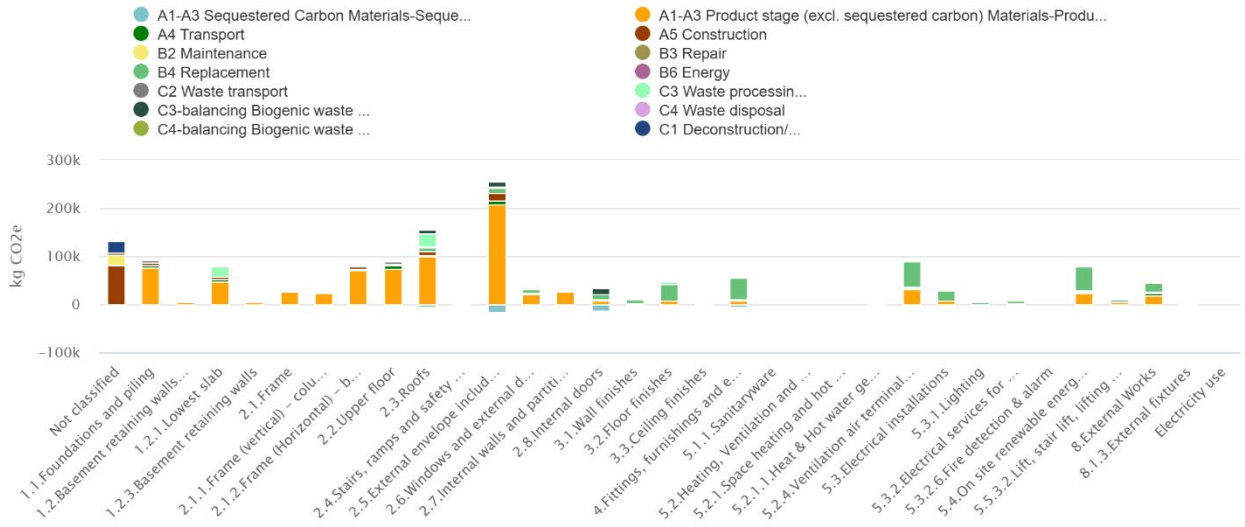
### Bubble chart, total life-cycle impact by resource type and subtype, TOTAL



### Global warming potential - Non-Decarbonised scenario kg CO2e - Life-cycle stages



### Global warming potential - Non-Decarbonised scenario (GWP-total-Non-Decarbonised Scenario) grouped by Building element breakdown



Resource	User input	Unit	Description	Comments
<b>1.1. Foundations and piling</b>				
Ready-mix concrete, 30% GGBS, C35/45	171.96	m <sup>3</sup>	Foundations - concrete	Taken from drawings
Reinforcement steel bar (rebar), UK average, IStructE (2025)	24.500	kg	Foundations - rebar	Taken from drawings
<b>1.2.1. Lowest slab</b>				
Screed - Sand cement C25/30	37.8	m <sup>3</sup>	Archive - 75mm screed	Taken from model data and sketch drawings
Ready-mix concrete, 30% GGBS, C30/37	154.45	m <sup>3</sup>	Archive 300mm concrete slab	Taken from drawing
Reinforcement steel bar (rebar), UK average, IStructE (2025)	17.000	kg	Archive slab rebar	Taken from drawing
Waterproofing membranes, calculated average for United Kingdom, 1.52 mm, 1.5 kg/m <sup>2</sup> , One Click LCA	503.79	m <sup>2</sup>	Archive - DPM	Taken from model data and sketch drawings
Expanded polystyrene (EPS) insulation, unfaced, calculated average for United Kingdom, L=0.02-0.040 W/mK, 150 mm, 2 kg/m <sup>2</sup> , One Click LCA	201.52	m <sup>3</sup>	Archive - 150mm rigid insulation	Taken from model data and sketch drawings
Reinforcement steel bar (rebar), UK average, IStructE (2025)	10.000	kg	Public - slab rebar	Taken from drawing
Screed - Sand cement C25/30	41.59	m <sup>3</sup>	Public - 75mm screed	Taken from model data and sketch drawings
Waterproofing membranes, calculated average for United Kingdom, 1.52 mm, 1.5 kg/m <sup>2</sup> , One Click LCA	554.51	m <sup>2</sup>	Public - DPM	Taken from model data and sketch drawings
Ready-mix concrete, 30% GGBS, C30/37	86.89	m <sup>3</sup>	Public 150mm concrete slab	Taken from drawing
Expanded polystyrene (EPS) insulation, unfaced, calculated average for United Kingdom, L=0.02-0.040 W/mK, 150 mm, 2 kg/m <sup>2</sup> , One Click LCA	221.8	m <sup>3</sup>	Public - 150mm rigid insulation	Taken from model data and sketch drawings
<b>1.2.3. Basement retaining walls</b>				
Cellular concrete block wall with high density solid blocks, including mortar, 100 mm thickness wall, 162 kg/m <sup>2</sup>	22	m <sup>2</sup>	100mm block retaining walls	Taken from drawings
Brick, average production, UK	19.65	m <sup>3</sup>	Cavity wall retaining walls - brick	Taken from drawings
Solid concrete block wall with high density solid blocks, including mortar, 215 mm thickness wall, 435.1 kg/m <sup>2</sup>	150	m <sup>2</sup>	215mm block retaining walls	Taken from drawings
<b>2.1. Frame</b>				
Electric Arc Furnace Steel	64,663.53	kg	Structural steel columns and beams	Taken from drawings
Ready-mix concrete, RC 25/30, 30% GGBS	95.26	m <sup>3</sup>	Concrete columns	Taken from drawings
Ready-mix concrete, RC 25/30, 30% GGBS	275.68	m <sup>3</sup>	Concrete beams	Taken from drawings
Reinforcement steel bar (rebar), UK average, IStructE (2025)	28.000	kg	Concrete column and beams rebar	Taken from drawings
<b>2.2. Upper floor</b>				
Ready-mix concrete, 30% GGBS, C30/37	153.75	m <sup>3</sup>	Archive - 300mm concrete in-situ	Taken from drawings
Screed - Sand cement C25/30	37.78	m <sup>3</sup>	Archive - 75mm screed	Taken from model data and sketch drawings
Reinforcement steel bar (rebar), UK average, IStructE (2025)	17.000	kg	Archive - rebar	Taken from drawings
Reinforcement steel bar (rebar), UK average, IStructE (2025)	3.000	kg	Public - rebar	Taken from drawings
Screed - Sand cement C25/30	36.88	m <sup>3</sup>	Public - screed	Taken from model data and sketch drawings
Ready-mix concrete, 30% GGBS, C30/37	78.92	m <sup>3</sup>	Public - 150mm concrete in-situ	Taken from drawings
Galvanised profiled sheet, 1 mm, 60 mm deep, 11.62 kg/m <sup>2</sup> , RICS UK baseline dataset, One Click LCA	491.69	m <sup>2</sup>	Public - metal decking	Taken from model data and sketch drawings
<b>2.3. Roofs</b>				
Ready-mix concrete, 30% GGBS, C30/37	68.14	m <sup>3</sup>	Public - 130mm concrete	Taken from drawings
Reinforcement steel bar (rebar), UK average, IStructE (2025)	3.000	kg	Public - rebar	Taken from drawings
Polyisocyanurate-based thermal insulation, tissue faced PIR, SOPRATHERM G, SOPREMA NV	205.44	m <sup>3</sup>	Public - Tapered Soprema insulation	Taken from model data and sketch drawings
Bitumen waterproofing membrane for roof, 4.5 mm, 5.822 kg/m <sup>2</sup> , DEBOVIX 5000 ANT/F C195 FC ZVB LARSEN, SOPREMA-LARSEN	513.6	m <sup>2</sup>	Public - soprema roofing felt	Taken from model data and sketch drawings
Galvanised profiled sheet, 1 mm, 60 mm deep, 11.62 kg/m <sup>2</sup> , RICS UK baseline dataset, One Click LCA	513.6	m <sup>2</sup>	Public - metal decking	Taken from model data and sketch drawings
Ready-mix concrete, 30% GGBS, C30/37	131.61	m <sup>3</sup>	Archive - 250mm concrete	Taken from drawings
Reinforcement steel bar (rebar), UK average, IStructE (2025)	9.000	kg	Archive - Rebar	Taken from drawings
Polyisocyanurate-based thermal insulation, tissue faced PIR, SOPRATHERM G, SOPREMA NV	202.496	m <sup>3</sup>	Archive - Tapered Soprema insulation	Taken from model data and sketch drawings
Bitumen waterproofing membrane for roof, 4.5 mm, 5.822 kg/m <sup>2</sup> , DEBOVIX 5000 ANT/F C195 FC ZVB LARSEN, SOPREMA-LARSEN	506.24	m <sup>2</sup>	Archive - Soprema roofing felt	Taken from model data and sketch drawings
<b>2.4. Stairs, ramps and safety guarding</b>				
Precast concrete stairs landings and balconies, 2500 kg/m <sup>3</sup> , Mannok Stairs, Landings and Balconies, Mannok Hollowcore	5.6	m <sup>3</sup>	Precast concrete stairs	Taken from model data
Reinforcement steel bar (rebar), UK average, IStructE (2025)	0.056	m <sup>3</sup>	Stair rebar	Taken from model data
<b>2.5. External envelope including roof finishes</b>				
Glass wool insulation boards, R=2.7 m <sup>2</sup> K/W, 300 mm, 8.5 kg/m <sup>2</sup> , Tectonic HT Advance, URSAL Insulation	295.73	m <sup>3</sup>	Archive - Ursa wall tec rigid insulation	Taken from model data and sketch details
Ready-mix concrete, 30% GGBS, C35/45	230.33	m <sup>3</sup>	Archive - 250mm concrete	Taken from drawings
Reinforcement steel bar (rebar), UK average, IStructE (2025)	15.000	kg	Archive - rebar	Taken from drawings
Aluminium façade cladding panel, UK Average	985.77	m <sup>2</sup>	Archive - aluminium rainscreen cladding	Taken from model data and sketch details
Vapour and air membranes, calculated average for United Kingdom, 0.25 mm, 0.22 kg/m <sup>2</sup> , One Click LCA	985.77	m <sup>2</sup>	Archive - breather membrane	Taken from model data and sketch details
Hot-dip galvanized steel sheets, Steel thickness range: 0.4-3.0 mm (0.015-0.12 in), zinc coating: 20 µm (787.4 µin) (0.28kg/m <sup>2</sup> / 0.057 lbs/ft <sup>2</sup> sheet steel), 0% recycled content, One Click LCA	49	m <sup>2</sup>	Archive - cladding rails	Taken from model data and sketch details
Rock wool insulation panel, unfaced, L=0.04 W/mK, R=2.6 W/m <sup>2</sup> K, 200 mm, 18.9 kg/m <sup>2</sup> , 180 kg/m <sup>3</sup> , Lambda=0.04 W/(m.K), Rocksilik®, Knauf	718.68	m <sup>2</sup>	Public - 200mm knauf rocksilik	Taken from model data and sketch details
Oriented strand board (OSB), calculated average for United Kingdom, 12.5 mm, 9.45 kg/m <sup>2</sup> , One Click LCA	718.68	m <sup>2</sup>	Public - wood sheathing 12.5mm knauf windliner	Taken from model data and sketch details
Glass wool insulation roll, unfaced, L=0.034 W/m.K, R=2.9 m <sup>2</sup> K/W, 200 mm, 2.16 kg/m <sup>2</sup> , 21.6 kg/m <sup>3</sup> , Lambda=0.034 W/(m.K), OmniFit® 34, Knauf	718.68	m <sup>2</sup>	Public - 200mm knauf insulation	Taken from model data and sketch details
Galvanised profiled steel sheet, UK average, IStructE (2025)	0.17	m <sup>3</sup>	Public - metal stud	Taken from model data and sketch details
Vapour and air membranes, calculated average for United Kingdom, 0.25 mm, 0.22 kg/m <sup>2</sup> , One Click LCA	718.68	m <sup>2</sup>	Public - breather membrane	Taken from model data and sketch details
Fire resistant gypsum board, L=0.25 W/mK, 12.5 mm, 12.2 kg/m <sup>2</sup> , 800 kg/m <sup>3</sup> , Lambda=0.25 W/(m.K), Knauf Fire Panel 12.5mm, Knauf UK/I	17.967	m <sup>3</sup>	Public - 2 12.5mm knauf fire panel	Taken from model data and sketch details
Finish plaster, 2 mm, 921 kg/m <sup>3</sup> , Skimcoat, Skimcoat Short Set, Carlite, Carlite Ultra, Gyproc (2021)	718.68	m <sup>2</sup>	Public - skim finish	Taken from model data and sketch details
Red brick, average production, UK, The Brick Development Association	431.73	m <sup>2</sup>	Public - brick	Taken from model data and sketch details
Natural stone cladding and roofing, calculated average for United Kingdom, 2600 kg/m <sup>3</sup> , One Click LCA	17.37	m <sup>3</sup>	Public - natural stone cladding	Taken from model data and sketch details
Vapour and air membranes, calculated average for United Kingdom, 0.25 mm, 0.22 kg/m <sup>2</sup> , One Click LCA	718.68	m <sup>2</sup>	Public - vapour check membrane	Taken from model data and sketch details
Galvanised profiled steel sheet, UK average, IStructE (2025)	0.4	m <sup>3</sup>	Public - metal sfs	Taken from model data and sketch details
<b>2.6. Windows and external doors</b>				
Aluminium framed curtain walling, 2 kgCo2e/kg	175.11	m <sup>2</sup>	Curtain walling	Taken from drawings
Polycarbonate roof hatch for smoke extraction and daylighting	4.14	m <sup>2</sup>	Roof hatch	Taken from model data
Aluminium frame sliding patio door, double-glazed, 0% recycled aluminium, 43.77 kg/m <sup>2</sup> , One Click LCA	17.88	m <sup>2</sup>	Sliding doors	Taken from model data
Overhead sectional metal door roller shutters, calculated average for United Kingdom, 26 kg/m <sup>2</sup> , 162.5 kg/unit, One Click LCA	14.97	m <sup>2</sup>	Roller shutter door	Taken from model data
Aluminium framed glass doors, calculated average for United Kingdom, 43 kg/m <sup>2</sup> , 115 kg/unit, One Click LCA	21.68	m <sup>2</sup>	Aluminium framed glass doors	Taken from model data
<b>2.7. Internal walls and partitions</b>				
Ready-mix concrete, 30% GGBS, C35/45	90.7	m <sup>3</sup>	Concrete	Taken from model data
Reinforcement steel bar (rebar), UK average, IStructE (2025)	0.91	m <sup>3</sup>	Rebar	Assumed to be 1% of concrete volume
Gypsum plasterboard, fire resistant, 15 mm, 10.6 kg/m <sup>2</sup> , L=0.19 W/mK, Fire resistance class: A2-s1,d0, Lambda=0.19 W/(m.K), Gyproc Wallboard, Saint-Gobain Construction Products t/a British Gypsum	68.4	m <sup>2</sup>	Gyproc wallboard	Taken from model data
Glass wool insulation roll, unfaced, L=0.034 W/m.K, R=2.9 m <sup>2</sup> K/W, 2.16 kg/m <sup>2</sup> , 21.6 kg/m <sup>3</sup> , Lambda=0.034 W/(m.K), OmniFit® 34, Knauf	218.2	m <sup>3</sup>	Rigid insulation	Taken from model data
Steel stud per m <sup>2</sup> of wall area (air gap included), 66 mm, 600 mm spacing	1028.79	m <sup>2</sup>	Steel stud	Taken from model data

<b>2.8.Internal doors</b>				
Wooden doors, calculated average for United Kingdom, 36 kg/m <sup>2</sup> , 96 kg/unit, One Click LCA	258.23	m <sup>2</sup>	Internal wooden doors	Taken from model data
<b>3.1.Wall finishes</b>				
Water-borne paints and coatings, calculated average for United Kingdom, 0.154 mm, 0.2 kg/m <sup>2</sup> , One Click LCA	2875.98	m <sup>2</sup>	Paint	Taken from model data
<b>3.2.Floor finishes</b>				
Synthetic carpet tiles, calculated average for United Kingdom, 3.3 kg/m <sup>2</sup> , One Click LCA	836.96	m <sup>2</sup>	Tile floor finish	Specification assumed
Ceramic tiles, calculated average for United Kingdom, 10 mm, 22 kg/m <sup>2</sup> , One Click LCA	209.24	m <sup>2</sup>	Carpet floor finish	Specification assumed
<b>3.3.Ceiling finishes</b>				
Suspended ceiling systems, calculated average for United Kingdom, 6 kg/m <sup>2</sup> , One Click LCA	0.736	m <sup>2</sup>	MF Frame	Taken from model data
Gypsum plasterboard ceiling tiles, calculated average for United Kingdom, 11.5 mm, 9.5 kg/m <sup>2</sup> , One Click LCA	14.72	m <sup>2</sup>	Ceiling tile	Taken from model data
Suspended ceiling systems, calculated average for United Kingdom, 6 kg/m <sup>2</sup> , One Click LCA	36.051	m <sup>2</sup>	IN-CG-A MF Frame	Taken from model data
Suspended ceiling systems, calculated average for United Kingdom, 6 kg/m <sup>2</sup> , One Click LCA	1.88	m <sup>2</sup>	IN-CG-B MF Frame	Taken from model data
Gypsum plasterboard ceiling tiles, calculated average for United Kingdom, 11.5 mm, 9.5 kg/m <sup>2</sup> , One Click LCA	721.02	m <sup>2</sup>	IN-CG-A Ceiling tiles	Taken from model data
Gypsum plasterboard ceiling tiles, calculated average for United Kingdom, 11.5 mm, 9.5 kg/m <sup>2</sup> , One Click LCA	37.63	m <sup>2</sup>	IN-CG-B Ceiling tiles	Taken from model data
<b>4.Fittings, furnishings and equipment</b>				
Plastic shell chair, 4.69 kg/unit	64	unit	Chair	Taken from model data
Ergonomic office chair, 12.5 kg/unit, Recur HBA, Orangebox	32	unit	Office chair	Taken from model data
Upholstered wooden chair with steel frame, 20.4 kg/unit	5	unit	Cushioned chair	Taken from model data
Steel storage unit, 36 kg/unit	1	unit	Archive shelving	Taken from model data
Wooden meeting table, 1800-2800x1200 mm, 79.46 kg/unit	2	unit	Round dining table	Taken from model data
Coffee table, 6 kg/unit	1	unit	Coffee table	Taken from model data
Wooden desk and drawer units, 73.4 kg/unit	5	unit	Desk	Taken from model data
Folding wooden table with steel base, 15.54 kg/unit	35	unit	Folding table	Taken from model data
Wooden desk and drawer units, 73.4 kg/unit	2	unit	Reception desk	Taken from model data
Wooden meeting table, 1800-2800x1200 mm, 79.46 kg/unit	16	unit	Table	Taken from model data
Upholstered bar stool with steel frame and wooden base, 9.49 kg/unit	3	unit	Stools	Taken from model data
Wooden lockers and cupboards, 58.1 kg/unit	25	unit	Lockers	Taken from model data
Steel storage unit, 36 kg/unit	3	unit	Metal shelving	Taken from model data
Mirror, 6 mm, 15 kg/m <sup>2</sup> , 2500 kg/m <sup>3</sup>	3.75	m <sup>2</sup>	Mirror	Taken from model data
Countertops for kitchen and offices from laminated MDF, 38 mm, 5.928 kg/m	4	m	Vanity countertop	Taken from model data
Hot-dip galvanized steel sheets, Steel thickness range: 0.4-3.0 mm (0.015-0.12 in), zinc coating: 20 µm (787.4 µin) (0.28kg/m <sup>2</sup> / 0.057 lbs/ft <sup>2</sup> sheet steel), 0% recycled content, One Click LCA	922	m <sup>2</sup>	Metal spur shelving	Taken from model data
<b>5.1.1.Sanitaryware</b>				
Ceramic toilet set, 26.93 kg/unit	5	unit	WC	Taken from floor plans
Ceramic bathroom washbasin, 16.7 kg/unit	5	unit	WC sinks	Taken from floor plans
Brass tap, 0.3kg	2	unit	Cleaners tap	Taken from floor plans
Stainless steel sink, 15 kg/unit	2	unit	Cleaners sink	Taken from floor plans
Brass tap, 0.3kg	5	unit	WC taps	Taken from floor plans
Electric wall-mounted shower, 3.35 kg/unit	1	unit	Shower	Taken from floor plans
Ceramic shower tray, 50.3 kg/unit	1	unit	Shower tray	Taken from floor plans
<b>Building Systems</b>				
Water heaters, calculated average for United Kingdom, 40 kg/unit, One Click LCA	7	unit	Point of use water heater	Taken from model data
Drinking water supply piping network, per m <sup>2</sup> GfA (office buildings), 0.0765 kg/m <sup>2</sup> , One Click LCA	1046	m <sup>2</sup>	Pipe network	Average based on GIA
Air handling unit (AHU), commercial grade, 3800 m <sup>3</sup> /h (134000 cuft), 450 kg/unit, One Click LCA	2	unit	AHU	Taken from model data
Reversible air/air heat pump, P= 8 kW, 118 kg/unit including packaging	4	unit	Internal unit	Taken from model data
Reversible air/air heat pump, P= 8 kW, 118 kg/unit including packaging	17	unit	Outdoor unit	Taken from model data
Wall or ceiling mounted active air extraction vent with accessories, 125 mm connection diameter, 30-45 m <sup>3</sup> /h, 0.68 kg/unit, One Click LCA	7	unit	Extract fan	Taken from model data
Ventilation system, per m <sup>2</sup> GfA, for office buildings, 2.9 kg/m <sup>2</sup> , One Click LCA	983.38	m <sup>2</sup>	Ventilation system and network	Average based on GIA of public block
Electric horizontal convactor radiator, wall mounted, 6.1 kg/unit, 1000W/unit, One Click LCA	10	unit	Electric panel radiators	No. estimated
Circular LED module, 2500 lm, 63.3 g/unit, One Click LCA	250	unit	Lighting	No. estimated
Outdoor decorative light columns, P=18W	15	unit	External lighting - columns	No. estimated
Recessed mounted luminaires for outdoor lighting, 2.890 kg/unit	20	unit	External lighting building mounted lighting	No. estimated
Autonomous sound and flash fire alarm, 0.604 kg/unit, One Click LCA	50	unit	Fire alarm	No. estimated
Surveillance camera, French average	25	unit	CCTV cameras	Taken from model data
Fridge, 2060 x 650 x 710 mm (81 x 26 x 28 in), one-door, 500L capacity, 116.7 kg/unit (257.2 lbs/unit), One Click LCA	8	unit	Fridge / freezers	Taken from model data
Commercial grade dishwasher, 820 x 600 x 650 mm (32 x 24 x 26 in), 25-40 racks/h washing capacity, 70.4 kg/unit (155.3 lbs/unit), One Click LCA	3	unit	Dishwashers	Taken from model data
Multipurpose printer, 5.49 kg/unit, imageFORMULA DRC340, Canon Inc.	1	unit	A3 scanner	Taken from model data
Microwave, 280 x 402 x 212 mm (11.0 x 15.9 x 8.3 in), 17L capacity, 10.6 kg/unit (23.4 lbs/unit), One Click LCA	2	unit	Microwave	Taken from model data
Energy efficient hands-under hand dryer, 8.6 kg/unit, 20 sec drying speed, 1500 W, One Click LCA	3	unit	Hand dryers	Taken from model data
Wall socket (electrical outlet), 2P+T-16A, 0.142 kg/unit, One Click LCA	350	unit	Sockets	No. estimated
Metering devices, calculated average for United Kingdom, 2.1 kg/unit, One Click LCA	20	unit	Energy meters	No. estimated
Metering devices, calculated average for United Kingdom, 2.1 kg/unit, One Click LCA	2	unit	Water meters	No. estimated
EV charging stations and components, calculated average for United Kingdom, 6.75 kg/unit, One Click LCA	1	unit	EV charging	Confirmed in meeting
Mono-crystalline Photovoltaic module, 470-500W, 21.2kg per unit, per m <sup>2</sup>	399.62	m <sup>2</sup>	Solar PV	Confirmed in email
Passenger elevator car, electrical controls, counter weight, drive and motor of traction (cable) type, 630 kg (8 persons) load capacity, 1.0 m/s speed, 1587.7 kg/unit (USE ONLY WITH Elevator hoistway), One Click LCA	1	unit	Lift	Taken from model
<b>8.External Works</b>				
Public seating, calculated average for United Kingdom, 15 kg/unit, One Click LCA	5	unit		Taken from landscape general arrangement
Asphalt, generic, compacted, 5/95% bitumen-aggregate ratio, 2350 kg/m <sup>3</sup> , One Click LCA	406.82	m <sup>2</sup>	Vehicular asphalt	Taken from landscape general arrangement
Crushed gravel, One Click LCA	32.46	m <sup>2</sup>	Loose gravel	Taken from landscape general arrangement
Aggregate (crushed gravel), generic, dry bulk density, 1600 kg/m <sup>3</sup> , One Click LCA	1221.49	m <sup>2</sup>	Hardcore	Taken from landscape general arrangement
Concrete paving blocks, semi dry mix, 60 mm, 138 kg/m <sup>2</sup> , Marshalls Plc	187.22	m <sup>2</sup>	Paving	Taken from landscape general arrangement
Asphalt, generic, compacted, 5/95% bitumen-aggregate ratio, 2350 kg/m <sup>3</sup> , One Click LCA	453.39	m <sup>2</sup>	Pedestrian asphalt	Taken from landscape general arrangement
Crushed gravel, One Click LCA	141.6	m <sup>2</sup>	Resin bound gravel	Taken from landscape general arrangement