

Method Consulting

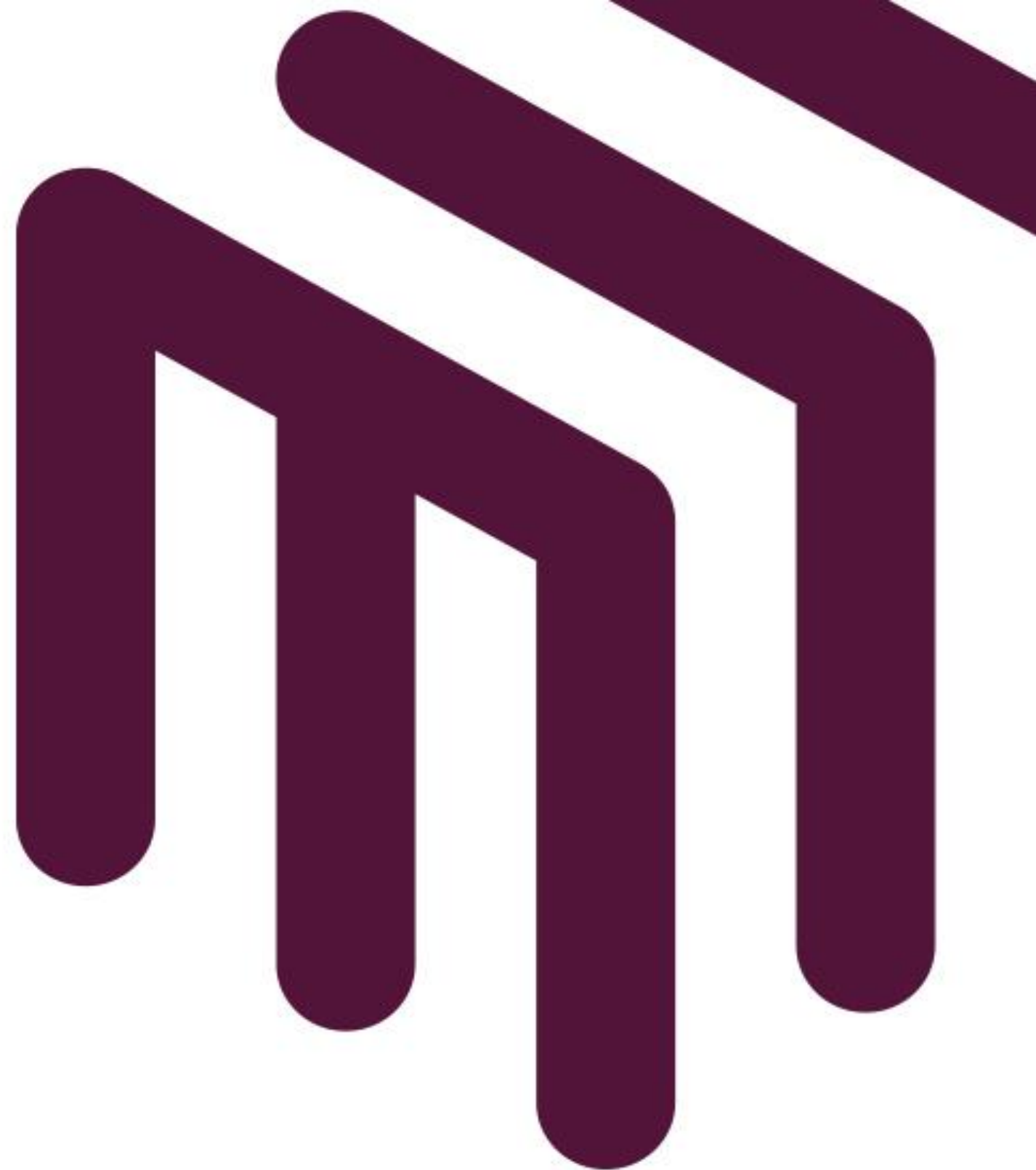
Intelligent engineering,
sustainable buildings

David Lloyd, Chippenham

BREEAM V6.1 Mat 01 Embodied Carbon Report (Concept Design)

For David Lloyd Leisure Ltd

February 2026



Document History

This document has been revised and issued as below:

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1 Executive Summary

Method Consulting LLP has been appointed by David Lloyd Leisure Ltd, to conduct a life-cycle assessment for embodied carbon emissions (measured in carbon dioxide equivalents, kgCO₂e) for a proposed new-build leisure complex in Chippenham, Wiltshire.

This assessment is based on information provided by the design team at concept design, in line with the BRE's requirements to satisfy the V6.1 Mat 01 credit process. This assessment has been completed with reference to RICS' Whole Life Carbon Assessment for the Built Environment – Second Edition, Version 3 (2024), the latest professional standard for conducting embodied carbon assessments.

Whilst it is not required in adopted planning policies to undertake an embodied carbon assessment, its completion demonstrates the project team's ambition to develop a sustainable design, through calculating the embodied carbon result of the project, and examining alternative designs and strategies to seek potential carbon reduction opportunities for this or future projects.

A summary of the embodied carbon analysis, split by building element, is presented below:

Embodied Carbon Over Life-Cycle (tonnes CO ₂ e)		Upfront Carbon at Practical Completion (A1-A5)	Embodied Carbon (A1-C4)	Embodied Carbon (A1-C4) %
Substructure		248	391	11
	Frame	399	402	11
Superstructure	Upper Floors	177	185	5.3
	Roof	123	196	5.6
	Stairs and Ramps	1.0	1.1	0.03
	External Walls	219	433	12
Building Services		142	593	17
External Works		269	1,088	31
Construction Site Impacts		222	222	6.3
End-of-Life Demolition Impacts		-	15	0.43
Total Embodied Carbon (kgCO₂e)		1,901,373	3,526,473	
Total Embodied Carbon (tonnes CO₂e)		1,901	3,526	
Embodied Carbon Intensity (kgCO₂/m² GIA)		427	793	

Table 1: Embodied Carbon Results by Building Element: To Practical Completion and Total Embodied Carbon

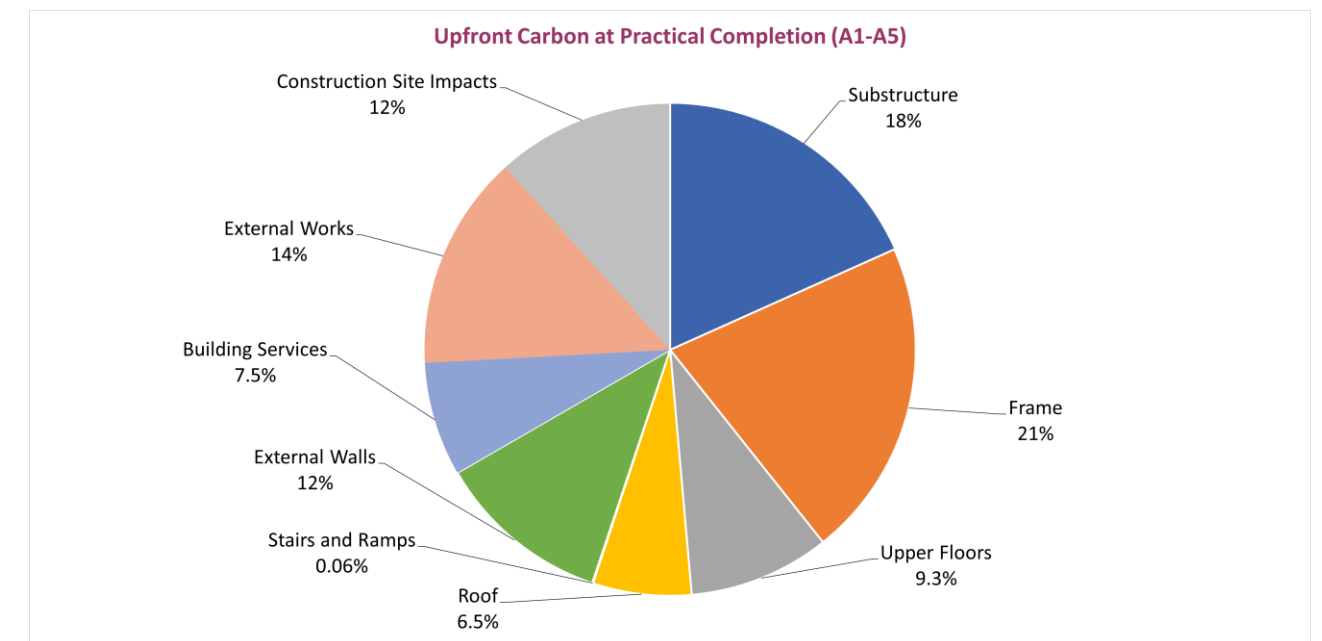


Figure 1: Upfront Carbon at Practical Completion (A1 – A5) by Building Element Group

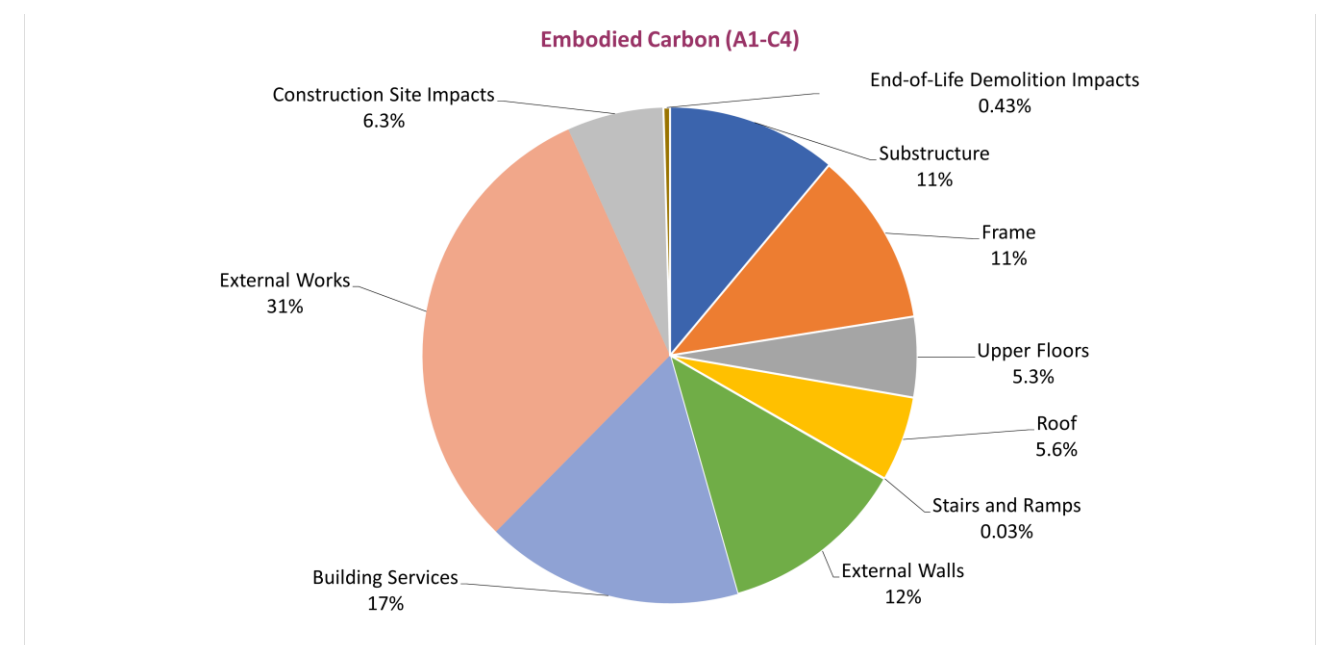


Figure 2: Total Embodied Carbon (A1 – C4) by Building Element Group

This analysis (to the BREEAM V6.1 scope) has shown that the upfront carbon to practical completion (A1-A5) figure for this building is 1,901 tonnes CO₂e. This analysis has also shown that the embodied carbon (A1-C4) figure (to the BREEAM V6.1 scope) for this building is 3,526 tonnes CO₂e.

An options appraisal was undertaken at concept design for the substructure, superstructure, hard landscaping (external works), and building services:

The design team discussed the options modelled and provided justifications for their inclusion or exclusion from the design. Following these discussions, the results of the modelling were submitted to the BRE through the relevant portal by the BREEAM Assessor.

	Scenario / Building Category	Current Specification	Alternative Specification	Potential Savings (kgCO ₂ e)	Potential Savings (kgCO ₂ e/m ²)
1	Superstructure	Aluminium standing seam roof	Green roof system	-54,087	-12
2		Composite cladding, with brick slip and strip cladding overlay in parts	All brick slip façade system	-180,782	-41
3		Aluminium curtain walling	Aluminium-timber composite curtain walling	-18,819	-4.2
4	Substructure	Pad foundations	Piled foundations	-101,799	-23
5		Ground bearing slab	Beam and block floor	-86,229	-19
6	Hard Landscaping	Pedestrian macadam	Concrete paving	-2,814	-0.63
7		Virgin aggregate	Recycled aggregate	-26,343	-5.9
8	Building Services	Gas boilers	Air-to-water source heat pump	+1,096,049	+246
9			Electric boilers	+2,536	+0.57
Total Saving Over Life-Cycle for Options 1 – 7 <i>(based on the combined highest saving for compatible options)</i>				-470,873	-106
Total Saving Over Life-Cycle for Options 1 – 7 (tonnes CO ₂ e)				-471	

Table 2: Embodied Carbon Reduction Options (Concept Design)

2 Introduction

Method Consulting LLP has been appointed by David Lloyd Leisure Ltd, to conduct a life-cycle assessment for embodied carbon emissions (measured in carbon dioxide equivalents, kgCO₂e) for a proposed new-build leisure complex in Chippenham, Wiltshire.

The project scope comprises of a 4,449m² (gross internal area) two-storey leisure building, including internal and external sports facilities, swimming pools, terraced areas, and associated parking and landscaping.

This assessment is based on information provided by the design team at concept design, in line with the BRE's requirements to satisfy the V6.1 Mat 01 credit process.

The scope of this assessment does not include operational energy or operational water.

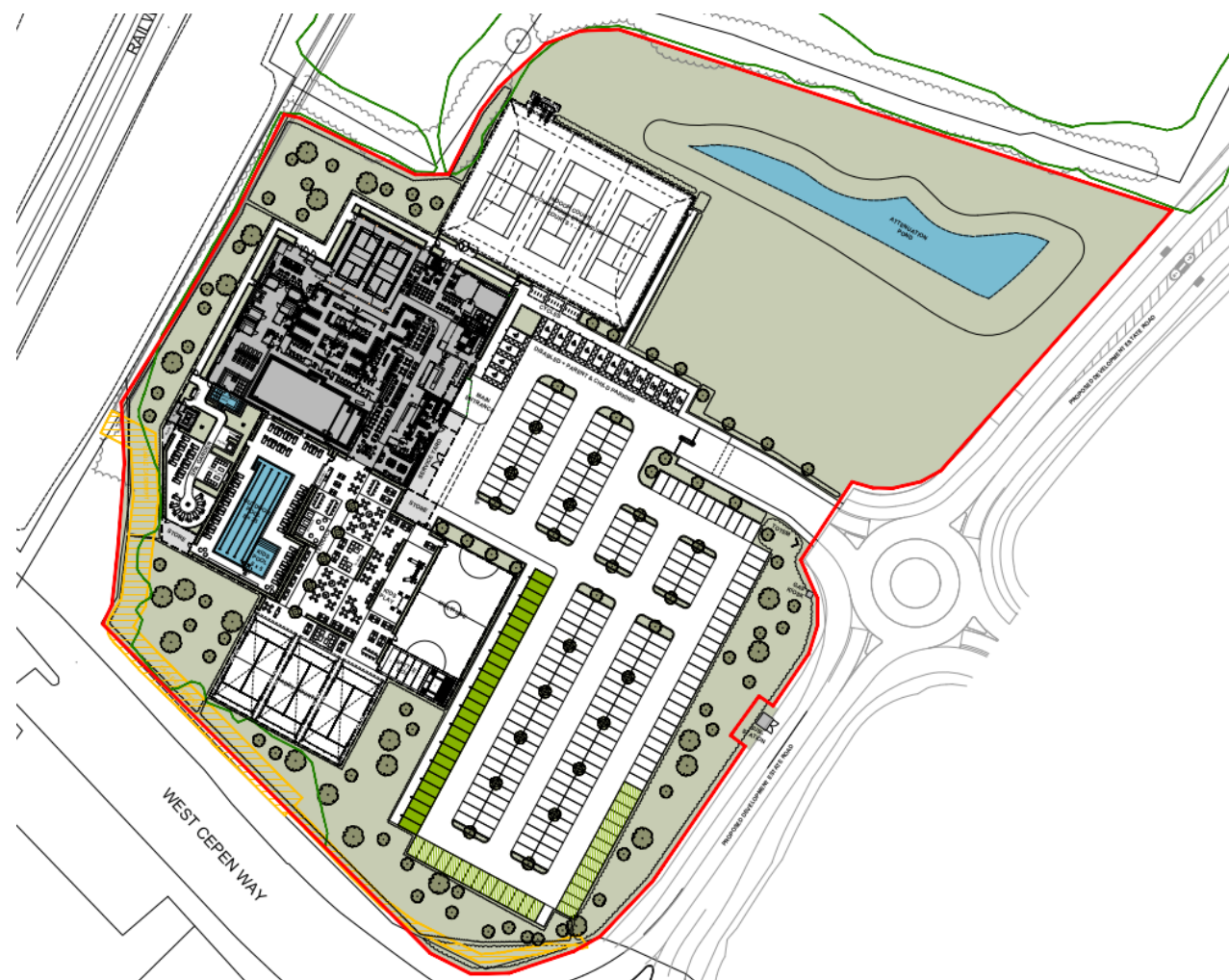


Figure 3: Proposed Site Plan ("24245-HCD-ZZ-00-DR-A-PL-003-P01" – HCD)

2.1 Background

Climate change is considered one of the greatest environmental challenges and is expected to have major implications for society. With carbon dioxide (CO₂) emissions being a significant cause of climate change, there has been a recent surge in momentum to attain the goal of *zero carbon* at country, industry, and company level.

The United Kingdom (UK) Green Building Council (UKGBC) estimates that the embodied carbon from construction could account for up to half of a new building's total life-cycle carbon impacts. Therefore, it is important to consider the whole life carbon impacts (both operational carbon emissions for the building during use, and embodied carbon from construction) when designing a building.

The Whole Life Carbon Network (WLCN) and Low Energy Transformation Initiative (LETI) define a net-zero carbon building as one where the sum of all building-related carbon emissions, both operational and embodied over a building's life cycle, are minimised in line with applicable industry targets, and with residual *offsets*, equate to zero.

Embodied carbon can be assessed through life-cycle analysis, which in this context, consists of modelling materials and quantity data from a verified database of construction materials, which quantifies associated environmental impacts through the use of Environmental Product Declarations. These results allow the environmental impact of a building to be analysed over its life cycle, as standard set as 60 years, which in-turn permits us to make recommendations as how to lower a building's embodied carbon, and subsequently, environmental impact.

2.2 Achieving Net-Zero Carbon

UKGBC define net-zero carbon for construction as being achieved when the carbon emissions for the building's product and construction stages (up to practical completion) are zero. Buildings targeting net-zero carbon for construction are recommended to be designed to achieve net-zero carbon for operational energy, with reductions in energy demand and consumption prioritised.

UKGBC set out the following steps for achieving a net zero carbon building:

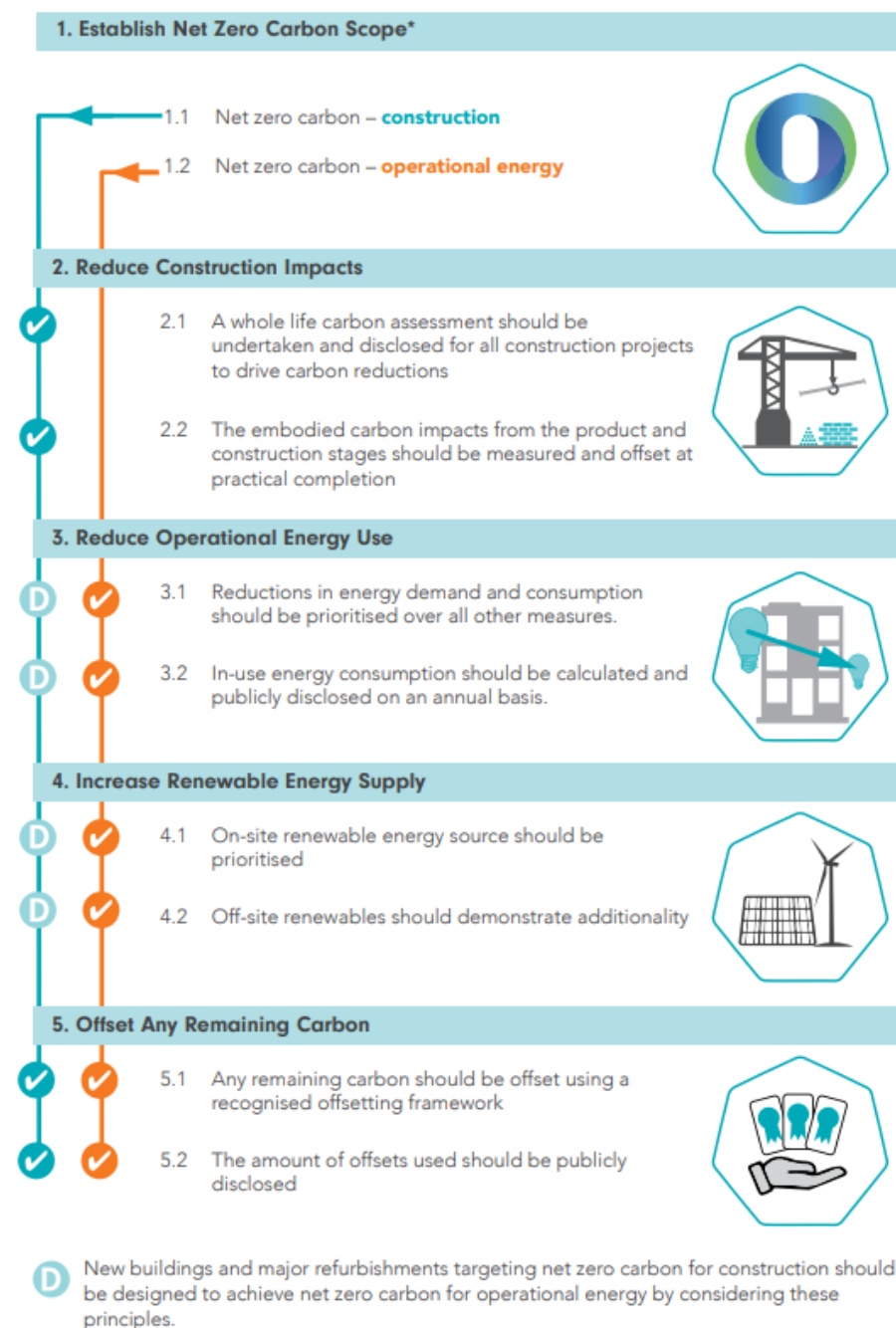


Figure 4: Steps to Achieving Net-Zero Carbon
from "Net-Zero Carbon Buildings: A Framework Definition" (UKGBC, 2019)

This analysis falls within the second step of this process by quantifying the current embodied carbon impacts of this project.

In working towards whole life net-zero carbon design, LETI sets out a series of best practice embodied carbon targets to be met at different points in time as the UK transitions to net-zero.

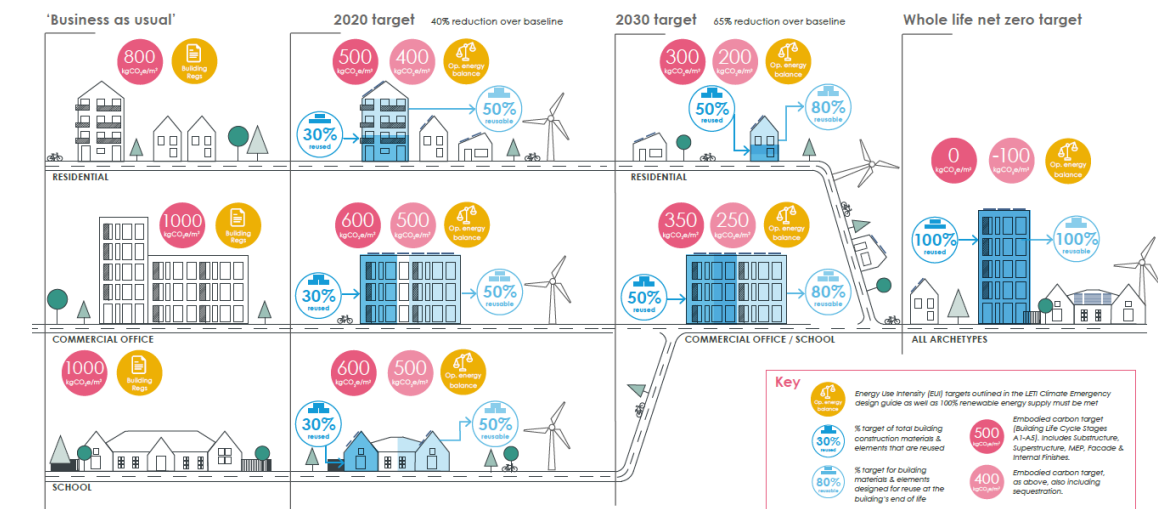


Figure 5: Targets for Achieving Net-Zero Carbon from "Embodied Carbon Primer" (LETI, 2019)

LETI also define some key principles in terms of reducing embodied carbon impacts, which are helpful to consider in terms of the framing of this report and when considering next steps for this or future projects of a similar design.



Figure 6: Principles to Reduce Embodied Carbon from "Embodied Carbon Primer" (LETI, 2019)

Whilst the purpose of this report is to quantify the current embodied carbon emissions of this project for the BREEAM V6.1 Mat 01 credit, UKGBC and LETI guidance documents provide the background and framework for the analysis.

2.3 Local Planning Policies

The Chippenham Neighbourhood Plan requires for Policy SCC2, “proposals for major development demonstrate optimised sustainability credentials in terms of a design, construction materials and methods of construction, minimising or avoiding emissions and other environmental impacts”.

Whilst there is no requirement for an embodied carbon assessment to be undertaken as part of the neighbourhood plan, or as part of the adopted Wiltshire Local Plan, the completion of this assessment demonstrates the project team’s ambition to develop a sustainable design, through calculating the embodied carbon result of the project, and examining alternative designs and strategies to seek potential carbon reduction opportunities for this or future projects.

3 Defining the Scope

When conducting embodied carbon modelling, it is important to define the boundaries and scope of what will be modelled in terms of building elements and life-cycle stages.

3.1 Life-Cycle Stages

Life-cycle assessment modelling has the potential to model all life-cycle stages from raw material extraction through to building end-of-life. These life-cycle stages are defined in modules:

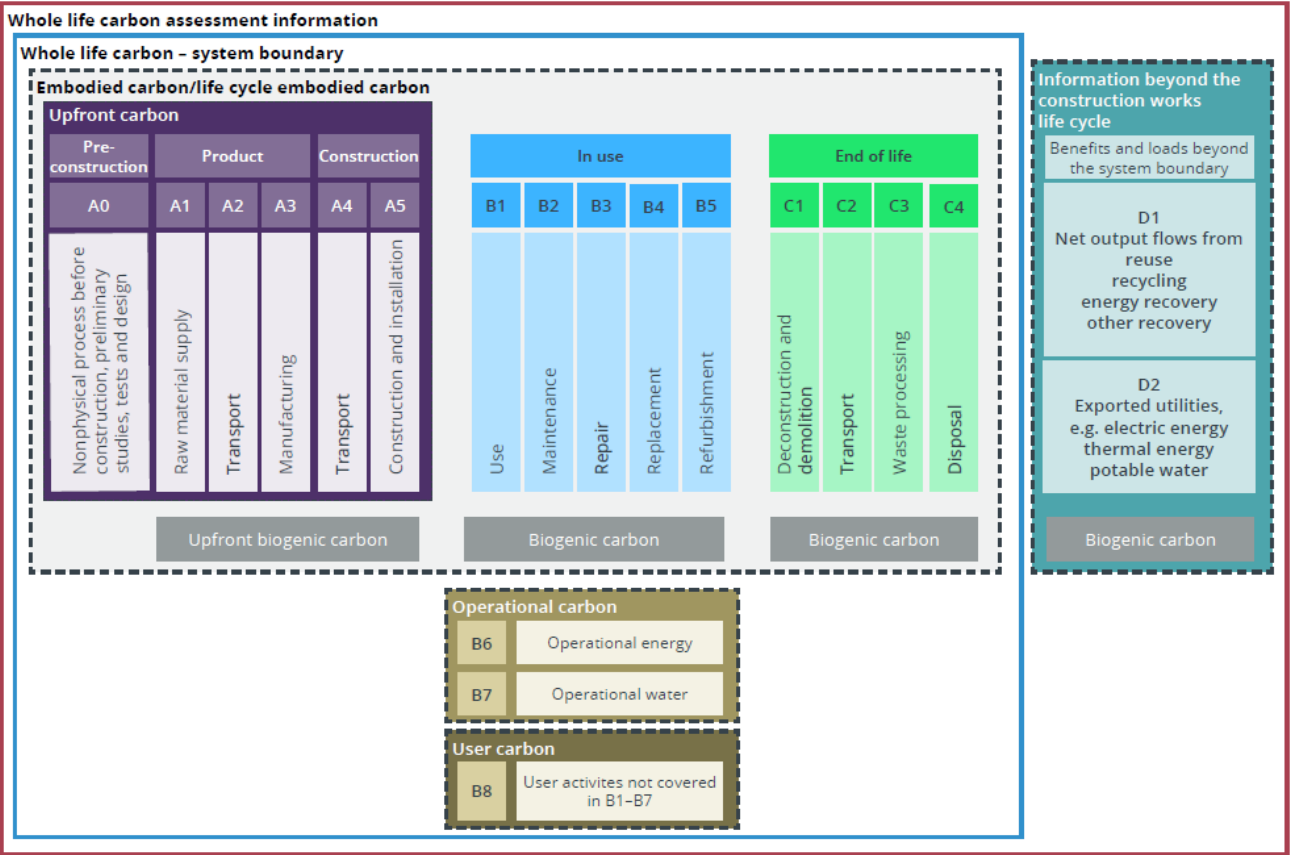


Figure 7: “Building and Infrastructure Life-Cycle Stage and Information Modules” (RICS, 2024)

This report focuses on upfront carbon, which relates to modules A1-A5 (as shown in Figure 9), and embodied carbon, which relates to modules A1-C4, excluding operational energy (module B6) and operational water (module B7).

Modules B and C were typically not included in embodied carbon modelling in the past due to a lack of robust data within the industry. These modules are harder to measure and predict, particularly in the case of end-of-life impacts as these will depend on the final disposal measures chosen decades after practical completion. Despite this, estimates, based on guidance from the Royal Institution of Chartered Surveyors (RICS), have been used to provide a standardised method of accounting for these modules within an assessment.

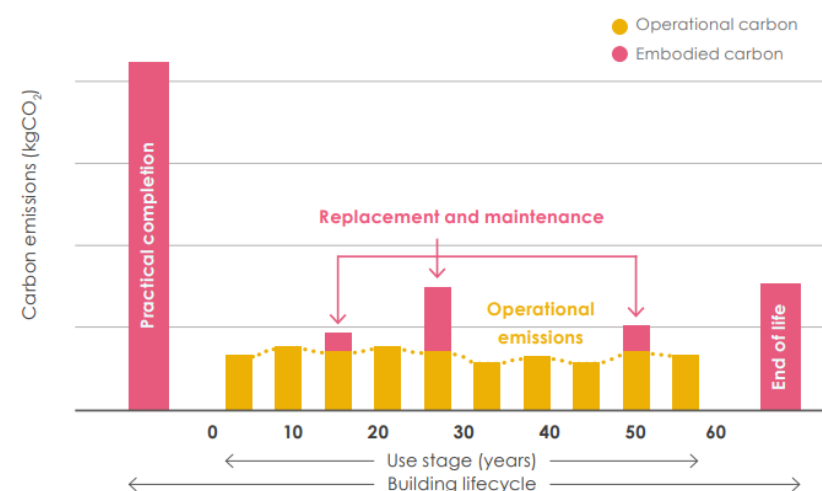


Figure 8: Breakdown of Carbon Emissions over a Building's Life-Cycle from "Embodied Carbon Primer" (LEI, 2019)

This assessment reports the upfront carbon to practical completion (modules A1-A5) emissions following the BREEAM V6.1 scope. Operational energy (module B6) and operational water (module B7) are not considered in this report.

3.2 BREEAM V6.1 Scope

This assessment has been used to satisfy the requirements of the BREEAM "Mat 01" credit process, available under the BRE's BREEAM Version 6.1 (V6.1) certification scheme. Under the scheme, up to 10 (7 + 3 exemplary) "Mat 01" credits are achievable where IMPACT-compliant tools are used to measure the environmental impact of the building, and where a benefit from the analysis is demonstrated.

Aim

To reduce the burden on the environment from construction products by recognising and encouraging measures to optimise construction product consumption efficiency and the selection of products with a low environmental impact (including embodied carbon), over the life cycle of the building.

Value

- Help project teams to understand the overall environmental impact of the building design.
- Ensure that all life cycle greenhouse gas emissions are taken into account in the design, not just operational emissions.
- Reduce the impact of the construction industry and construction product industries.
- Assess the environmental impacts at the building level to provide flexibility when specifying construction products, to take into account project-specific conditions and priorities.
- Allow optimal solutions to be identified and adopted to reduce overall environmental impacts arising from construction product use.

Figure 9: Mat 01 Credit Aims and Values from the BREEAM UK New Construction V6.1 Manual

Credits are awarded for conducting an options appraisal for:

- Superstructure (Up to 6 Credits)
 - For office, retail and industrial buildings, a comparison with BREEAM LCA benchmark must be undertaken.
- Substructure and Hard Landscaping (External Works) (1 Credit Available)

Three further exemplary credits are available; one credit is available for third-party verification of the LCA model, the second credit is available where the LCA modelling is aligned with the life-cycle cost (LCC) reports for Man 02 (where targeted), and the third credit for running a building services options analysis. The calculation study period for the LCA is taken as 60 years as required by the BRE.

BREEAM's V6.1 scope for embodied carbon assessments at concept design include the following:

Level 1 Group element	Level 2 Element	Level 3 Sub-element
2. Superstructure	1. Frame	1. Steel frames 2. Space decks 3. Concrete casings to steel frames 4. Concrete frames 5. Timber frames 6. Other frame systems
	2. Upper floors	1. Floors
	3. Roof	1. Roof structure 2. Roof coverings 3. Specialist roof systems 5. Rooflights, skylights and openings
	4. Stairs and ramps	1. Stair or ramp structures
	5. External walls	1. External enclosing walls above ground floor level 2. External enclosing walls below ground level 3. Solar or rain screening
	6. Windows and external doors	1. External windows
	7. Internal Walls and Partitions	1. Walls and partitions (Education only)

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

Level 1 Group element	Level 2 Element	Level 3 Sub-element
		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.		

Table 9.3 Core building Services – In-scope (applicable to criteria 8 and 9)

Level 1 Group element	Level 2 Element	Level 3 Sub-element
5. Services	5. Heat source	1. Heat source
	6. Space heating and Air-conditioning	1. Central heating 2. Local heating 3. Central cooling 4. Local cooling 5. Central heating and cooling 6. Local heating and cooling 7. Central air-conditioning 8. Local air-conditioning
	7. Ventilation	1. Central ventilation 2. Local ventilation 3. Smoke extract or control
	9. Fuel installations and systems	1. Fuel storage 2. Fuel distribution systems

Figure 10: Extracts from the BREEAM UK New Construction V6.1 Manual
Noting the Scope of Materials for the Mat 01 Credit Section

The BRE require modelling at concept design to be completed and uploaded to its portal **before** the end of that design stage and planning submission, which usually corresponds with the end of RIBA Stage 2.

3.3 Methodology

The scope of this report has been defined in this table following the BREEAM V6.1 methodology noted in Section 3.2.

This assessment has been completed with reference to RICS' Whole Life Carbon Assessment for the Built Environment – Second Edition, Version 3 (2024), the latest professional standard for conducting embodied carbon assessments.

The analysis was conducted using One Click LCA, a dedicated life-cycle assessment tool, which allows the embodied CO₂e impacts for all the specified materials to be modelled using the One Click LCA "LCA for BREEAM UK" database, which is integrated into the modelling tool. The calculation study period for the life-cycle assessment, as required by the BRE, is taken as 60 years.

In line with current guidance, biogenic carbon for timber products is normally included within embodied carbon (A1-C4) figures, but not included in separate upfront carbon at practical completion (A1-A5), in-use (B1-B5), and end-of-life (C1-C4) figures. For BREEAM projects, the modelling tool does not account for biogenic carbon as part of the total results, therefore, this figure is reported separately.

Default data has also been used to represent construction and end-of-life demolition impacts, which includes estimates for electricity and fuel use, along with waste and transportation impacts, based on the development's proposed gross internal area.

The project team provided Method Consulting LLP with access to drawings, plans, and specifications to collate build-ups and quantities. Any queries were subsequently clarified with the design team, to ensure the information used to complete the modelling reflected the design at the time.

3.4 Environmental Product Declarations (EPDs)

EPDs have been used for specific products that are available within the modelling tool. Where product specific EPDs are not available in the modelling tool's database, or where the material manufacturer and product types are not currently known, the closest matching product has been selected. This is either a generic material based on average industry data or the closest matching EPD for a similar product.

It is worth noting that data from EPDs should not solely be used to make assumptions of comparisons on embodied carbon for the project, as some EPDs only report data for the product (A1-A3) stage, and, therefore, do not include for the construction (A4-A5) stage, the in-use (B1-B5) stage, which includes replacement of products, or the end-of-life (C1-C4) stage.

4 Results

The table below details the embodied carbon results for this new-build project at concept design, broken down by life-cycle stage and over the whole life-cycle period of 60 years. The embodied carbon (A1-C4) is **3,527 tonnes CO₂e (793 kgCO₂e/m² GIA)** of which the upfront carbon at practical completion (A1-A5) is **1,901 tonnes CO₂e (427 kgCO₂e/m² GIA)**.

Embodied Carbon Over Life-Cycle (tonnes CO ₂ e)		Upfront Carbon at Practical Completion (A1-A5)	In-Use (B1-B5)	End-of-Life (C1-C4)	Embodied Carbon (A1-C4)
Substructure		348	-	43	391
Superstructure	Frame	399	-	2.7	402
	Upper Floors	177	-	8.4	185
	Roof	123	61	12	196
	Stairs and Ramps	1.0	-	0.10	1.1
	External Walls	219	212	2.4	433
Building Services		142	450	0.43	593
External Works		269	648	171	1,088
Construction Site Impacts		222	-	-	222
End-of-Life Demolition Impacts		-	-	15	15
Total Embodied Carbon (kgCO ₂ e)		1,901,373	1,370,241	254,859	3,526,473
Total Embodied Carbon (tonnes CO ₂ e)		1,901	1,370	255	3,527
Biogenic Carbon (tonnes CO ₂ e)		-	-	-	-10

Table 3: Embodied Carbon Results by Building Element and Life-Cycle Stage (Concept Design)

Embodied Carbon Intensity (kgCO ₂ e/m ² GIA)	Upfront Carbon at Practical Completion (A1-A5)	In-Use (B1-B5)	End-of-Life (C1-C4)	Embodied Carbon (A1-C4)
Total Embodied Carbon Intensity	427	308	57	793

Table 4: Embodied Carbon Intensity Comparison (Concept Design)

The majority of embodied carbon (A1-C4) emissions for this project are in the upfront carbon to practical completion (A1-A5) stage. The upfront carbon hotspot is primarily the frame, as can be seen in Figure 13, however, the substructure and external works are also significant elements of upfront carbon. The frame is higher in the proportion of embodied carbon when compared to similar projects due to the more limited scope of the assessment.

Figure 14 demonstrates that whilst the frame is still a high contributor to the embodied carbon result, the external works account for the highest proportion across the building's entire life-cycle. For this project, this proportion can be attributed to the quantities being a high level estimate at this early design stage in absence of more specific data, ensuring that a worst case scenario for the project has been modelled.

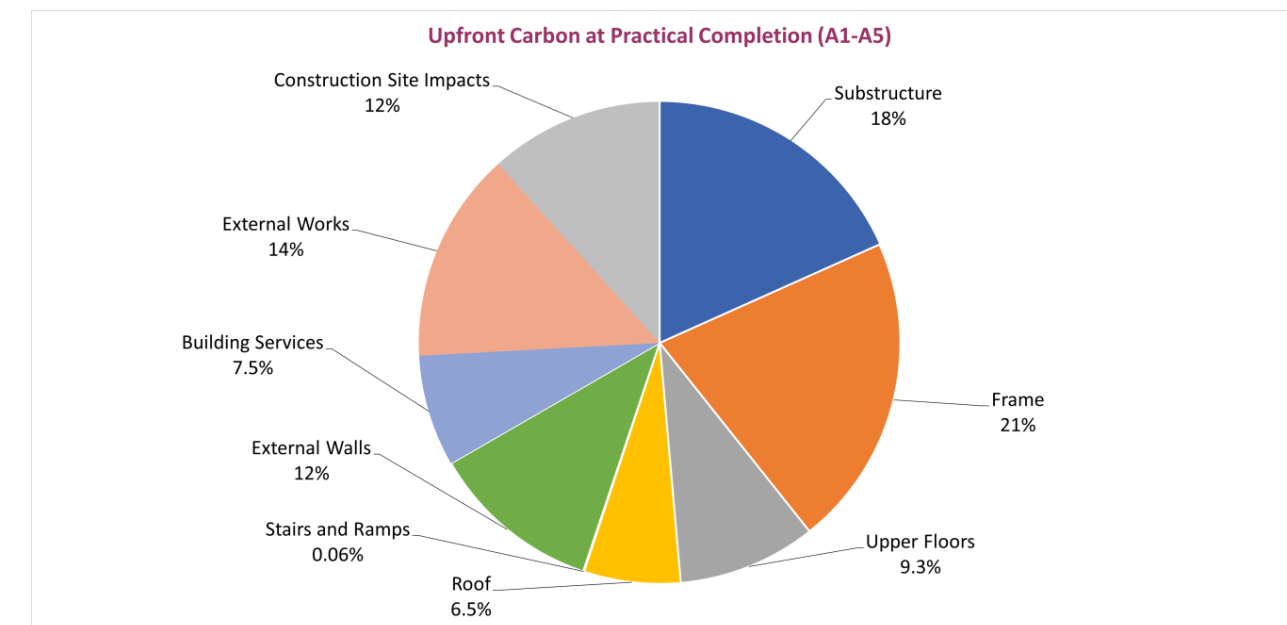


Figure 11: Upfront Carbon at Practical Completion (A1 – A5) by Building Element Group (Concept Design)

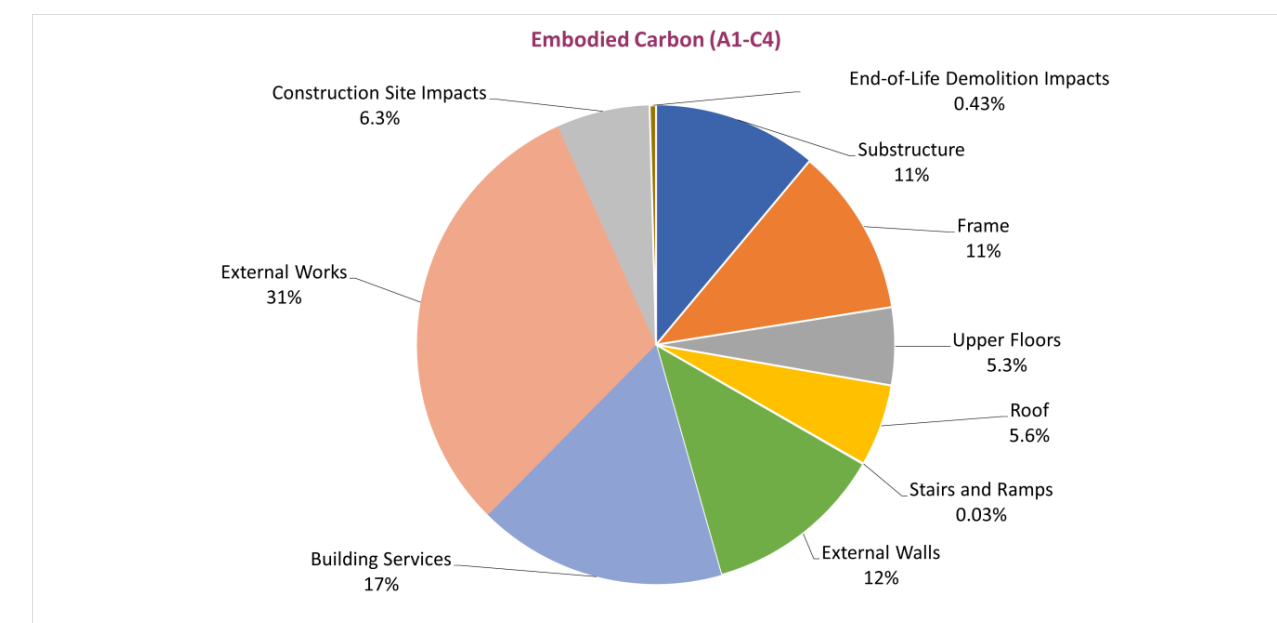


Figure 12: Total Embodied Carbon (A1 – C4) by Building Element Group (Concept Design)

5 Options Appraisal

LETI provide some examples of how embodied carbon reductions could be made in a design:



Figure 13: Embodied Carbon Reductions by Element from “Embodied Carbon Primer” (LETI, 2019)

An options appraisal was undertaken at concept design for the superstructure, substructure and hard landscaping, and building services. The results of the options appraisal are summarised in Table 5. The left-hand column of results states the potential carbon saving (kgCO₂e) whilst the right-hand column indicates the potential change in carbon intensity, based on the project’s gross internal area.

This figure can be added or subtracted from the current project’s total embodied carbon intensity of 793 kgCO₂e/m² to give an approximate total saving. The nine alternative design options are also visible as the second and tenth bars (left to right) in Figure 16.

	Scenario / Building Category	Current Specification	Alternative Specification	Potential Savings (kgCO ₂ e)	Potential Savings (kgCO ₂ e/m ²)
1	Superstructure	Aluminium standing seam roof	Green roof system	-54,087	-12
2		Composite cladding, with brick slip and strip cladding overlay in parts	All brick slip façade system	-180,782	-41
3		Aluminium curtain walling	Aluminium-timber composite curtain walling	-18,819	-4.2
4	Substructure	Pad foundations	Piled foundations	-101,799	-23
5		Ground bearing slab	Beam and block floor	-86,229	-19
6	Hard Landscaping	Pedestrian macadam	Concrete paving	-2,814	-0.63
7		Virgin aggregate	Recycled aggregate	-26,343	-5.9
8	Building Services	Gas boilers	Air-to-water source heat pump	+1,096,049	+246
9			Electric boilers	+2,536	+0.57
Total Saving Over Life-Cycle for Options 1 – 7 <i>(based on the combined highest saving for compatible options)</i>				-470,873	-106
Total Saving Over Life-Cycle for Options 1 – 7 (tonnes CO ₂ e)				-471	

Table 5: Embodied Carbon Reduction Options – Results (Concept Design)

As part of the credit requirements, the design team discussed the options modelled and provided justifications for their inclusion or exclusion from the design, which were submitted to the BRE alongside the modelling results before the end of concept design and the submission of a planning application.

	Scenario / Building Category	Current Specification	Design Team Comments
1	Superstructure	Green roof system	The roof has a large area, so there are concerns surrounding how the increased weight of a green roof system will affect the structure. Any modifications to the structural design are likely to have a cost implication. The architect noted that there could be a maintenance access issue with a green roof system, in contrast to the proposed design of a standing seam system which is maintenance free. This option will not be taken forward.
2		All brick slip façade system	This option does not give the desired aesthetic for the building and will not be taken forward.
3		Aluminium-timber composite curtain walling	The architect noted concerns over cost and durability, therefore, this option will not be taken forward.
4	Substructure	Piled foundations	The substructure design is still at an early stage, however, the proposed pad and strip foundation strategy is the preferred strategy for this project as it aligns well with the model design of the superstructure. This option will not be taken forward at this stage.
5		Beam and block floor	The substructure design is still at an early stage, however, the proposed ground bearing slab strategy is the preferred strategy for this project as it aligns well with the model design of the superstructure. This option will not be taken forward at this stage. This option is not being taken forward.

	Scenario / Building Category	Current Specification	Design Team Comments
6	Hard Landscaping	Concrete paving	The project is still at an early stage, and the hard landscaping design has not been fully developed to the point that decisions on material specifications can be made. This option may be considered as the design progresses, but will not be taken forward at this stage.
7		Recycled aggregate	The project is still at an early stage, and the hard landscaping design has not been fully developed to the point that decisions on material specifications can be made. This option may be considered as the design progresses, but will not be taken forward at this stage.
8	Building Services	Air-to-water source heat pump	This option resulted in a significant increase in embodied carbon, although, there are other environmental benefits to consider when changing from a gas to an electric-powered system. Whilst this project is still at an early stage, the proposed core services strategy is based on a model design, and it is unlikely that this design will be able to be changed for this specific project. This option will not be taken forward for this project but could be investigated if the client and design team re-evaluate the overall model design.
9		Electric boilers	Whilst this project is still at an early stage, the proposed core services strategy is based on a model design, and it is unlikely that this design will be able to be changed for this specific project. Using direct electric heating will also increase primary energy consumption, which may jeopardise the building's ability to achieve compliance with Approved Document Part L, Version 2. This option will not be taken forward for this project but could be investigated if the client and design team re-evaluate the overall model design.

Table 6: Embodied Carbon Reduction Options – Design Team Comments (Concept Design)

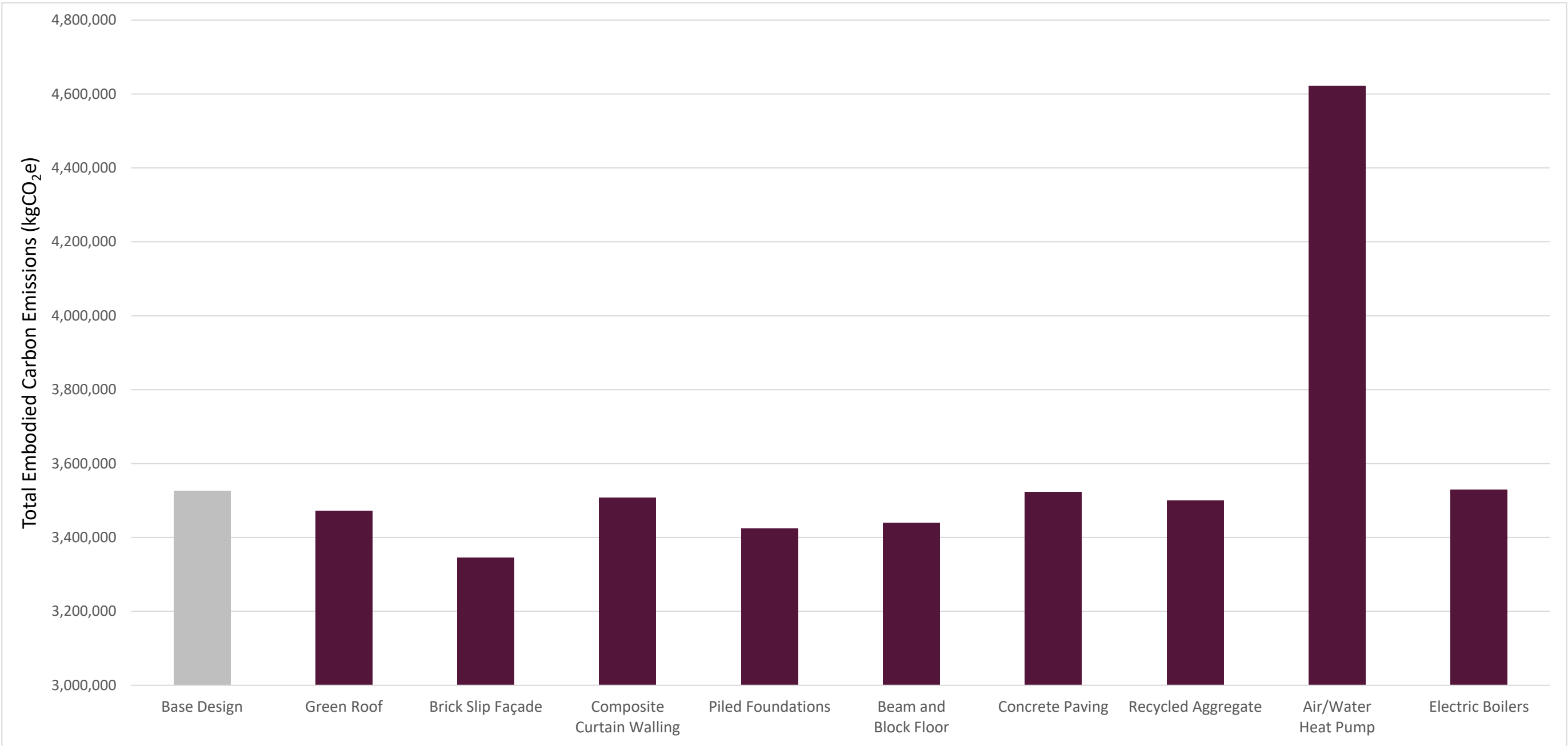


Figure 14: Concept Design (RIBA Stage 2) Options Appraisal Summary Graph

6 Technical Design

The below results table will be completed at technical design to account for the requirement to update the superstructure design in the modelling:

6.1 Results

Embodied Carbon Over Life-Cycle (kgCO ₂ e)	Upfront Carbon at Practical Completion (A1-A5)	In-Use (B1-B5)	End-of-Life (C1-C4)	Embodied Carbon (A1-C4)
Frame				
Upper Floors				
Roof				
Stairs and Ramps				
External Walls				
Total Embodied Carbon (kgCO ₂ e)				
Total Embodied Carbon (tonnes CO ₂ e)				

Table 7: Embodied Carbon Results by Building Element and Life-Cycle Stage (Technical Design)

6.2 Options Appraisal

A further options appraisal will be undertaken at technical design for the superstructure, where two further alternative design options are to be considered. The below table will be completed at technical design once the model has been updated based on revised information from the design team.

Superstructure Options	Carbon Saving (kgCO ₂ e)	Percentage Change (%)
Current Specification:		
Type 1:		
Type 2:		
Alternatives:		
Option 1:		
Option 2:		

Table 8: Embodied Carbon Reduction Options – Results (Technical Design)

6.3 Design Team Comments

As with concept design, the design team are required to discuss the options modelled at technical design, and provide justifications for their inclusion or exclusion from the design. The modelling and the design team comments must be completed and submitted by the end of technical design.

Superstructure Options	Carbon Saving (kg CO ₂ e)	Design Team Comments
Current Specification:		
Type 1:		
Type 2:		
Alternatives:		
Option 1:		
Option 2:		

Table 9: Embodied Carbon Reduction Options – Design Team Comments (Technical Design)

7 Conclusion

A life-cycle assessment study has been completed to determine the embodied carbon emissions of a proposed new-build leisure complex in Chippenham, Wiltshire.

The project scope comprises of a 4,449m² (gross internal area) two-storey leisure building, including internal and external sports facilities, swimming pools, terraced areas, and associated parking and landscaping.

This assessment is based on information provided by the design team at concept design, in line with the BRE's requirements to satisfy the V6.1 Mat 01 credit process.

This assessment has been completed with reference to RICS' Whole Life Carbon Assessment for the Built Environment – Second Edition, Version 3 (2024), the latest professional standard for conducting embodied carbon assessments.

Whilst it is not required in adopted planning policies to undertake an embodied carbon assessment, its completion demonstrates the project team's ambition to develop a sustainable design, through calculating the embodied carbon result of the project, and examining alternative designs and strategies to seek potential carbon reduction opportunities for this or future projects.

The scope of this assessment does not include operational energy or operational water.

Nine potential carbon reduction options were appraised for the project at concept design.

To summarise, the principal results are as follows:

- Upfront Carbon at Practical Completion (A1-A5): **1,901 tonnes CO₂e (427 kgCO₂e/m²)**
- Embodied Carbon (A1-C4): **3,527 tonnes CO₂e (793 kgCO₂e/m²)**

The design team discussed the options modelled and provided justifications for their inclusion or exclusion from the design. Following these discussions, the results of the modelling were forwarded on to the BREEAM Assessor for submission through the relevant BRE portal.

At concept design, the project has so far achieved five credits, plus an exemplary credit.

8 Appendices

8.1 Material Modelling Assumptions and Limitations

A non-exhaustive summary of assumptions and limitations for material types and quantities is listed below. Unless otherwise specified by the design team, the following product specifications have been included, as per the default specifications for main building materials from RICS’ Whole Life Carbon Assessment for the Built Environment – Second Edition, Version 3 (2024) Professional Standard.

Material	Details	Baseline specification representative of standard practice (UK)
Concrete, cast in situ (ready-mix concrete)	Piling and foundations	Reinforced concrete, C32/40, 25% cement replacement
	Vertical structural elements, e.g. columns, walls	Reinforced concrete, up to 20 storeys (in situ, C32/40, 25% cement replacement, excluding reinforcement) Structure, concrete, over 20 storeys (in situ, C40/50, 25% cement replacement)
	Horizontal structural elements, e.g. beams, slabs	Reinforced concrete (C32/40, 25% cement replacement)
	Facilitating/auxiliary works	Reinforced concrete (C16/20, 25% cement replacement)
	Backfill	Reinforced concrete (C8/10, 25% cement replacement)
Concrete, precast	Structural elements: beams, segments, slabs, etc. pours of <25m³	Reinforced concrete (C40/50, 0% cement replacement)
	Structural elements: beams, segments, slabs, etc. pours of >25m³	Reinforced concrete (C40/50, 25% cement replacement, excluding reinforcement)
	Cladding panels	C16/20, 0% cement replacement
Concrete, sprayed	Tunnel/shaft linings Curved surfaces: roof shells, domes, etc.	Fibre reinforced concrete, C32/40, 0% cement replacement)
Concrete reinforcement	Reinforcement bars	UK CARES sector average (EAF production, typically 96% recycled content in UK)

Plasterboard	Partitioning/ceilings	FGD gypsum plasterboard (approximately 10% recycled content)
Insulation	For floors and external walls	Blended market rate of 60% BOF/40% EAF production
	For roof – polyisocyanurate (PIR)/rigid polyurethane (PU)	Polyurethane (PU) rigid foam
Aggregates/ granular material	Fill material	Aggregates and sand, general UK fill material, mixture of land won, marine, secondary and recycled, bulk, loose
Glass	Glass: general, glazing, toughened, multilayer safety, skylight, fibreglass, expanded glass	Relevant generic datasets
Plastics	Plastics (various)	Relevant generic datasets
Coatings	Paints: general, waterborne, solventborne	Amotherm steel WB
	Cementitious spray	Isolatek international product average
Asphalt	For highway and pavement construction	Asphalt, 5% binder content
Bitumen	For road construction, roofing, waterproofing and other applications	Straight run bitumen
MEP products	All	CIBSE TM65 (specification of MEP constituent materials rather than composite assemblies in Table 2.1 from TM65: 2021)
Facade build up	All types	Centre for Window and Cladding Technology (CWCT) How to calculate the embodied carbon of facades: a methodology (refer to Appendix B and Appendix C)

Steel	Sheet piling	Blended EAF/BOF Replacement
	Structural steel sections – rolled sections	Blended market rate of 60% BOF/40% EAF production
	Structural steel sections – plate and closed sections	100% BOF production
	Studwork/support frames	Galvanised steel, 15% recycled content
	Galvanised profiled sheet	UK TATA ComFlor®
Masonry	Precast concrete blocks	Lightweight aerated autoclaved concrete (AAC, such as Aircrete) blocks for non-structural uses (600kg/m³)
		Medium-density blocks for structural uses (1425kg/m³)
	Brickwork	Generic UK clay brick, dry brick weight 2.13kg
Timber	Manufactured structural timber: cross-laminated timber (CLT), Glulam, laminated veneered lumber (LVL), etc.	Engineered wood, sustainably sourced
	Studwork (e.g. secondary members such as internal partitions)	Softwood, C16, sustainably sourced
	Framing (e.g. primary members such as joists)	Softwood, C24, sustainably sourced
Aluminium	Sheet	Aluminium sheet, 31% recycled content
	Extruded profiles	Aluminium extrusions, 31% recycled content

Table 10: Default Specifications for Building Materials
from “Whole Life Carbon Assessment for the Built Environment” (RICS, 2024)

8.1.1 Superstructure

Frame:

- In line with Table 11, the structural steel was modelled as a structural steel profile, with a 40% recycled content; this was the closest match in the database to the blended steel suggested within RICS' default guidance.

Upper Floors:

- The composite concrete slab was modelled based on a ComFlor 60 system.

Roof:

- The polyester powder coated aluminium parapet capping/flushing detail/fascias and standing seam aluminium roof covering were modelled as an aluminium façade cladding panel, powder coated, as this was the closest match in the modelling database.
- It was assumed that the single-ply membrane would be of EPDM construction.

External Walls:

- It was assumed that the steel framing system, specified by the architect, would not be included in the primary and secondary framing designed by the structural engineer. An estimate for this, therefore, was generated and modelled separately to the main frame.
- In accordance with RICS, the curtain walling was modelled under external walls.
- Whilst usually out-of-scope for a Mat 01 assessment, the external doors were designed and counted as part of the total curtain walling area, and therefore modelled as such. In practice, the area of curtain walling modelled is likely to be a slight over-estimate as a result.

8.1.2 Substructure

- The structural engineer noted that David Lloyd Leisure Ltd, projects usually do not have developed substructure plans at the pre-planning stage. An estimate for this site, and other pre-planning projects, uses substructure plans developed for David Lloyd, Bishop's Cleeve as an approximate estimate.

8.1.3 Building Services

- Whilst no project specific design was available at the time of the assessment, the core services design is a model design utilised for multiple projects, so plant and equipment information was taken from schedules for David Lloyd, St. Neots.
- For pipework and ductwork, a quantity estimate was generated based on the net and gross internal areas, based on early-stage guidance in RICS' Whole Life Carbon Assessment for the Built Environment – Second Edition, Version 3 (2024).

8.2 Schedule of Materials for Embodied Carbon Modelling

The following pages detail the inputs used in the life-cycle assessment model to produce the results included within this report.

Schedule of Materials for Embodied Carbon Modelling

RICS Category	Comment	Selected Modelling Database Input	Quantity	Quantity Units	Thickness (mm)	Material Lifespan (Years)
1.1.1.Standard foundations	Pad Foundations - C32/40	Ready-mix concrete, generic, C32/40 (4600/5800 PSI), XC1, 25% GGBS in cement, CEM II/B-S portland-slag cement, 2389 kg/m3, (version 2024) (One Click LCA)	298.37	m3	-	60.0
1.1.1.Standard foundations	Pad Foundations - Rebar	Reinforcement steel (rebar), generic, 97% recycled content (typical), A615 (One Click LCA)	2506.05	kg	-	60.0
1.1.1.Standard foundations	Strip Foundations - C32/40	Ready-mix concrete, generic, C32/40 (4600/5800 PSI), XC1, 25% GGBS in cement, CEM II/B-S portland-slag cement, 2389 kg/m3, (version 2024) (One Click LCA)	31.72	m3	-	60.0
1.1.3.Lowest floor construction	Ground Floor Slab - Aggregate	Crushed rock, 0–100 mm, 1680 kg/m3, (version 2025) (One Click LCA)	2675	m2	200	60.0
1.1.3.Lowest floor construction	Ground Floor Slab - C32/40	Ready-mix concrete, generic, C32/40 (4600/5800 PSI), XC1, 25% GGBS in cement, CEM II/B-S portland-slag cement, 2389 kg/m3, (version 2024) (One Click LCA)	2675	m2	150	60.0
1.1.3.Lowest floor construction	Ground Floor Slab - Reinforcement	Reinforcement steel mesh (rebar) (Van Merksteijn Steel-Netherlands)	312.58	kg	-	60.0
1.1.3.Lowest floor construction	Ground Floor Slab - Screed	Cementitious floor leveling screed, 10-250 mm, 1.8 kg/m2/mm, 1.6–1.8 kg/l, webervetonit 6000 Rapid Screed (Saint-Gobain Finland Oy)	865	m2	50	60.0
2.1 Frame	1: Primary Steel Frame	Structural steel profiles, generic, 40% recycled content, I, H, U, L, and T sections, S235, S275 and S355 (One Click LCA)	136	ton	-	60.0
2.1 Frame	2: Secondary Steel Frame	Structural steel profiles, generic, 40% recycled content, I, H, U, L, and T sections, S235, S275 and S355 (One Click LCA)	24	ton	-	60.0

RICS Category	Comment	Selected Modelling Database Input	Quantity	Quantity Units	Thickness (mm)	Material Lifespan (Years)
2.2 Upper Floors	1: Concrete Slab	Ready-mix concrete, generic, C32/40 (4600/5800 PSI), XC1, 25% GGBS in cement, CEM II/B-S portland-slag cement, 2389 kg/m3, (version 2024) (One Click LCA)	214.88	m3	-	60.0
2.2 Upper Floors	1: Concrete Slab - Rebar	Reinforcement steel (rebar), generic, 97% recycled content (typical), A615 (One Click LCA)	21488	kg	-	60.0
2.2 Upper Floors	1: Steel Deck	Galvanized profiled steel decking, for composite floor slabs/decks, 1 mm sheet thickness, 11.62 kg/m2, ComFlor® 60 1.0mm (Tata Steel Europe, Tata Steel International (2021))	1821	m2	1	60.0
2.3. Roofs	1: Vapour Control Layer	Polyethylene vapour barrier membrane, 0.15 mm, 0.14 kg/m2 (One Click LCA)	2175	m2	0.15	60.0
2.3. Roofs	2: Mineral Wool Insulation (160 * 2)	Stone wool insulation panels, unfaced, generic, L = 0.035 W/mK, R = 2.89 m2K/W (16 ft2°Fh/BTU), 50 kg/m3 (3.12 lbs/ft3) (applicable for densities: 25-50 kg/m3 (1.56-3.12 lbs/ft3)), Lambda=0.0346 W/(m.K) (One Click LCA)	2175	m2	320	60.0
2.3. Roofs	3: PIR Insulation (150)	PIR (polyisocyanurate foam) insulation panels, unfaced, generic, L = 0.022 W/mK, R = 4.55 m2K/W (26.7 ft2°Fh/BTU), 100 mm (3.94 in), 45 kg/m3 (2.81 lbs/ft3), Lambda=0.022 W/(m.K) (One Click LCA)	493	m2	150	60.0
2.3. Roofs	4: Single Ply Membrane	EPDM waterproofing membrane, 1.5 mm, 1.95 kg/m2 (One Click LCA)	493	m2	1,5	30.0
2.3. Roofs	5: Aluminium Standing Seam	Aluminium façade cladding panel, powder coated, 2.5 kg/m2, 30% recycled content (One Click LCA)	2175	m2	0	30.0
2.3. Roofs	6: Aluminium Flashing Detail	Aluminium façade cladding panel, powder coated, 2.5 kg/m2, 30% recycled content (One Click LCA)	150	m2	0	30.0
2.4. Stairs and Ramps	1: Precast Concrete Stair	Precast concrete staircase, U-shaped, with no flat landing, with no center support column, width. 120cm, 1558.2kg/m, CEM III/A, EV (SORIBA)	4.08	m	-	60.0

RICS Category	Comment	Selected Modelling Database Input	Quantity	Quantity Units	Thickness (mm)	Material Lifespan (Years)
2.5. External Walls	A: Brick Slip	Clay brick, UK average production, 215 mm x 102.5 mm x 65 mm, 2.13 kg/unit, 1485 kg/m3 (Brick Development Association (BDA) Ltd (2023))	390	m2	30	30.0
2.5. External Walls	A: Brick Slip - Mortar	Cement mortar (One Click LCA)	21295	kg	-	30.0
2.5. External Walls	A: Brick Slip - Fixings	Hot-dip galvanized steel coils with Magnelis coating (ArcelorMittal Europe – Flat Products)	3755	kg	-	30.0
2.5. External Walls	B / H: EuroBond Strip Cladding	Weathering pre-finished steel profile, 0.75 mm sheet thickness, 1035 mm width, 7.11 kg/m2, SAB 35/10135 wall profile (SAB-profiel, Tata Steel Europe)	1.799	m3	-	30.0
2.5. External Walls	C: Composite Cladding Panel	Steel-faced sandwich panel with mineral wool core, Steel facing thickness: 0.5/0.7 mm, 175 mm, 29.09 kg/m2, Europanel F5 Extra, Europanel S5 Extra, Rockspan Extra, Firemaster Extra (Euroclad Group)	1310	m2	200	30.0
2.5. External Walls	F: Aluminium Cladding - Fascias	Aluminium façade cladding panel, powder coated, 4.5 kg/m2, 30% recycled content (One Click LCA)	148	m2	0	30.0
2.5. External Walls	1: In-Fill Framing	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/m2 / 0.057 lbs/ft2 sheet steel), 15% recycled content (One Click LCA)	1514	kg	-	60.0
2.5. External Walls	2: Plaster Board	Gypsum plasterboard, L= 0.19 W/mK, R = 0.065 m2K/W, 12.5 mm, 8.1 kg/m2, 648 kg/m3, Lambda=0.19 W/(m.K), Wallboard (Knauf)	1310	m2	12,5	60.0
2.5. External Walls	3: Aluminium Louvre	Aluminium louvres for ventilation systems, 6.5 kg/m2 (Maple Façades Ltd.)	38	m2	0	30.0
2.5. External Walls	4: Curtain Walling	Glass facade, size: 3.6 x 7.2m, double glazing, 51.67 kg/m2, Curtain wall Concept Wall® CW 60 – CW 60 HI (Reynaers)	184	m2	0	35.0
5.5. Heat Source	Mitsubishi A/C - Outdoor Units	Outdoor unit for air/air heat pump, P=17.4 kW, 83 kg/unit (One Click LCA)	2331	kg	-	15.0
5.5. Heat Source	Mitsubishi A/C - Indoor Units	Indoor unit for air/air heat pump, P=17.4 kW, 44 kg/unit (One Click LCA)	882	kg	-	15.0
5.5. Heat Source	Gas Boiler	Gas boiler, 104 kg/unit, 100 kW (One Click LCA)	520	kg	-	20.0
5.5. Heat Source	Heating / Hot Water Tank (Proxy)	Hot water buffer tank, 139 kg/unit, V=1000 L, Ballon tampon chauffage [V=1000L] (DONNEE ENVIRONNEMENTALE GENERIQUE PAR DEFAUT)	1	unit	-	20.0

RICS Category	Comment	Selected Modelling Database Input	Quantity	Quantity Units	Thickness (mm)	Material Lifespan (Years)
5.6. Space heating and Airconditioning	Water Heater Battery (Proxy)	Fan coil unit, 50 kg/unit, P=1 kW (One Click LCA)	38.5	kg	-	20.0
5.6. Space heating and Airconditioning	Cooling Pipe (RICS)	Copper pipes, Type L, DN 25 mm, (1 in), 0.98 kg/m, wall thickness: 1.27 mm (One Click LCA)	1995	m	-	20.0
5.6. Space heating and Airconditioning	Heating Pipe (RICS)	Copper pipes, Type L, DN 20 mm, (3/4 in), 0.68 kg/m, wall thickness: 1.14 mm (One Click LCA)	1995	m	-	20.0
5.7. Ventilation systems	AHU (6.40 m3/s Proxy)	Air handling unit (AHU), large commercial grade, 16000 m3/h (565000 cuft), 2400 kg/unit (One Click LCA)	1.44	unit	-	20.0
5.7. Ventilation systems	AHU (6.33 m3/s Proxy)	Air handling unit (AHU), large commercial grade, 16000 m3/h (565000 cuft), 2400 kg/unit (One Click LCA)	1.42	unit	-	20.0
5.7. Ventilation systems	AHU (5.50 m3/s Proxy)	Air handling unit (AHU), large commercial grade, 16000 m3/h (565000 cuft), 2400 kg/unit (One Click LCA)	1.2375	unit	-	20.0
5.7. Ventilation systems	Ducting (RICS)	Galvanized steel ventilation ducts, rectangular, 200x200 mm, 6.1 kg/m, wall thickness: 0.75 mm (One Click LCA)	9714	kg	-	40.0
5.7. Ventilation systems	Supply & Extract Grilles (High Level)	Aluminium air intake vent, 200 x 200 mm, 0.04 m2/unit, 1.295 kg/unit, Grille extérieure de ventilation de type pare-pluie en aluminium 200x200 (DONNEE ENVIRONNEMENTALE GENERIQUE PAR DEFAULT)	67	unit	-	20.0
5.7. Ventilation systems	Attenuators (Proxy)	Circular noise attenuator, DN 700mm, L 700mm, Atténuateur de bruit circulaire/silencieux circulaire (DONNEE ENVIRONNEMENTALE GENERIQUE PAR DEFAULT)	13	unit	-	20.0
8.2.1. Roads, paths and pavings	1: Aggregate - Asphalt	Aggregates from loose rocks layer, for residential zones, Aggregate mass = 618 kg/m2, Water mass = 30 kg/m2, 2100 kg/m3, 300 mm (Union Nationale des Producteurs de Granulats)	7100.95	m2	200	60.0
8.2.1. Roads, paths and pavings	1: Base - Asphalt	Asphalt pavement (asphalt concrete) base course, hot mix, 2330 kg/m3, 0% recycled bitmuen binder (One Click LCA)	7100.95	m2	70	35.0
8.2.1. Roads, paths and pavings	1: Binder - Asphalt	Asphalt concrete binder course, hot mix, 20 mm nominal aggregate size (One Click LCA)	7100.95	m2	60	35.0
8.2.1. Roads, paths and pavings	1: Surface - Asphalt	Asphalt concrete surface course, hot mix, 10 mm nominal aggregate size (One Click LCA)	7100.95	m2	30	35.0
8.2.1. Roads, paths and pavings	2: Aggregate - Delivery	Aggregates from loose rocks layer, for residential zones, Aggregate mass = 618 kg/m2, Water mass = 30 kg/m2, 2100 kg/m3, 300 mm (Union Nationale des Producteurs de Granulats)	196.82	m2	200	60.0

RICS Category	Comment	Selected Modelling Database Input	Quantity	Quantity Units	Thickness (mm)	Material Lifespan (Years)
8.2.1. Roads, paths and pavings	2: Concrete - Delivery	Ready-mix concrete, generic, C16/20 (2320/2900 PSI), XC1, 25% GGBS in cement, CEM II/B-S portland-slag cement, 2369 kg/m3, RICS UK baseline dataset, (version 2024) (One Click LCA)	196.82	m2	200	60.0
8.2.1. Roads, paths and pavings	2: Rebar - Delivery	Reinforcement steel (rebar), generic, 97% recycled content (typical), A615 (One Click LCA)	39.36	kg	-	60.0
8.2.1. Roads, paths and pavings	3: Aggregate - Tennis	Aggregates from loose rocks layer, for residential zones, Aggregate mass = 618 kg/m2, Water mass = 30 kg/m2, 2100 kg/m3, 300 mm (Union Nationale des Producteurs de Granulats)	1755.82	m2	254	60.0
8.2.1. Roads, paths and pavings	3: Aggregate - Tennis	Aggregates from loose rocks layer, for residential zones, Aggregate mass = 618 kg/m2, Water mass = 30 kg/m2, 2100 kg/m3, 300 mm (Union Nationale des Producteurs de Granulats)	1755.82	m2	75	60.0
8.2.1. Roads, paths and pavings	3: Macadam - Tennis	Macadam, 4.75–10 mm, 1680 kg/m3, (version 2025) (One Click LCA)	1755.82	m2	25	35.0
8.2.1. Roads, paths and pavings	3: Surface - Tennis	Linoleum flooring, PUR/acrylic surface layer, jute backing, 4.6 mm, 4.03 kg/m2 (Tarkett)	1755.82	m2	4.6	7.0
8.2.1. Roads, paths and pavings	4: Geotextile - MUGA	Woven polypropylene geotextile, 0.11 kg/m2 (One Click LCA)	644.87	m2	0	60.0
8.2.1. Roads, paths and pavings	4: Aggregate - MUGA	Aggregates from loose rocks layer, for residential zones, Aggregate mass = 618 kg/m2, Water mass = 30 kg/m2, 2100 kg/m3, 300 mm (Union Nationale des Producteurs de Granulats)	644.87	m2	283	60.0
8.2.1. Roads, paths and pavings	4: Binder - MUGA	Macadam, 19–26.5 mm, 1680 kg/m3, (version 2025) (One Click LCA)	644.87	m2	40	35.0
8.2.1. Roads, paths and pavings	4: Surface - MUGA	Macadam, 4.75–10 mm, 1680 kg/m3, (version 2025) (One Click LCA)	644.87	m2	25	35.0
8.2.1. Roads, paths and pavings	4: Turf - MUGA	Synthetic turf flooring for athletic use, 6.36 kg/m2, FlexTurf Motivate (Ecore International)	644.87	m2	0	7.0
8.2.1. Roads, paths and pavings	5: Aggregate - Macadam	Aggregates from loose rocks layer, for residential zones, Aggregate mass = 618 kg/m2, Water mass = 30 kg/m2, 2100 kg/m3, 300 mm (Union Nationale des Producteurs de Granulats)	615.8	m2	290	60.0

RICS Category	Comment	Selected Modelling Database Input	Quantity	Quantity Units	Thickness (mm)	Material Lifespan (Years)
8.2.1. Roads, paths and pavings	5: Binder - Macadam	Macadam, 26.5–37.5 mm, 1680 kg/m3, (version 2025) (One Click LCA)	615.8	m2	50	35.0
8.2.1. Roads, paths and pavings	5: Surface - Macadam	Macadam, 4.75–10 mm, 1680 kg/m3, (version 2025) (One Click LCA)	615.8	m2	20	35.0
8.2.1. Roads, paths and pavings	6-7: Aggregate - Paving	Aggregates from loose rocks layer, for residential zones, Aggregate mass = 618 kg/m2, Water mass = 30 kg/m2, 2100 kg/m3, 300 mm (Union Nationale des Producteurs de Granulats)	413.14	m2	275	60.0
8.2.1. Roads, paths and pavings	6-7: Sand - Paving	Sand, loose dry density, 1555 kg/m3, (version 2025) (One Click LCA)	413.14	m2	50	60.0
8.2.1. Roads, paths and pavings	6-7: Flag - Paving	Concrete flag paving unit from premium wet pressed process, 118 kg/m3, Conservation X , Saxon, Perfecta, Charnwood, Argent , Rio (Marshalls Plc)	24.804	m3	-	60.0
8.2.1. Roads, paths and pavings	8: Aggregate - Paving	Aggregates from loose rocks layer, for residential zones, Aggregate mass = 618 kg/m2, Water mass = 30 kg/m2, 2100 kg/m3, 300 mm (Union Nationale des Producteurs de Granulats)	60.15	m2	275	60.0
8.2.1. Roads, paths and pavings	8: Sand - Paving	Sand, loose dry density, 1555 kg/m3, (version 2025) (One Click LCA)	60.15	m2	50	60.0
8.2.1. Roads, paths and pavings	8: Flag - Paving	Concrete flag paving unit from premium wet pressed process, 118 kg/m3, Conservation X , Saxon, Perfecta, Charnwood, Argent , Rio (Marshalls Plc)	3.61	m3	-	60.0
8.2.1. Roads, paths and pavings	9: Aggregate - Soft Play	Aggregates from loose rocks layer, for residential zones, Aggregate mass = 618 kg/m2, Water mass = 30 kg/m2, 2100 kg/m3, 300 mm (Union Nationale des Producteurs de Granulats)	135.77	m2	275	60.0
8.2.1. Roads, paths and pavings	9: Binder - Soft Play	Asphalt concrete binder course, hot mix, 20 mm nominal aggregate size (One Click LCA)	135.77	m2	60	35.0
8.2.1. Roads, paths and pavings	9: Surface - Soft Play	Asphalt concrete surface course, hot mix, 10 mm nominal aggregate size (One Click LCA)	135.77	m2	30	35.0
8.2.1. Roads, paths and pavings	10-11: Aggregate - Gravel	Aggregates from loose rocks layer, for residential zones, Aggregate mass = 618 kg/m2, Water mass = 30 kg/m2, 2100 kg/m3, 300 mm (Union Nationale des Producteurs de Granulats)	415.58	m2	275	60.0

RICS Category	Comment	Selected Modelling Database Input	Quantity	Quantity Units	Thickness (mm)	Material Lifespan (Years)
8.2.1. Roads, paths and pavings	10-11: Surface - Gravel	Resin bound aggregate decorative paving system, 3-10 mm grain size, 100 - 150 mm, 1060 kg/m3, Addaset, Addabound, Terrabound and Terrabase (Addagrip Terraco)	415.58	m2	100	35.0
8.2.1. Roads, paths and pavings	12: Aggregate - Padel	Aggregates from loose rocks layer, for residential zones, Aggregate mass = 618 kg/m2, Water mass = 30 kg/m2, 2100 kg/m3, 300 mm (Union Nationale des Producteurs de Granulats)	806.86	m2	283	60.0
8.2.1. Roads, paths and pavings	12: Binder - Padel	Macadam, 19–26.5 mm, 1680 kg/m3, (version 2025) (One Click LCA)	806.86	m2	40	35.0
8.2.1. Roads, paths and pavings	12: Surface - Padel	Macadam, 4.75–10 mm, 1680 kg/m3, (version 2025) (One Click LCA)	806.86	m2	25	35.0
8.2.1. Roads, paths and pavings	12: Turf - Padel	Synthetic turf flooring for athletic use, 6.36 kg/m2, FlexTurf Motivate (Ecore International)	806.86	m2	0	7.0



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