Whole Life Carbon Conventions for New Homes

June 2026

Future Homes Hub

Acknowledgements

Thanks to the many people who contributed their time to join the various working groups set up to identify the background data sources and assumptions needed to feed into the conventions for new homes.

Homebuilders:

Barratt Redrow
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Crest Nicholson
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Hayfield Homes
Keepmoat
Latimer (Clarion)
Lendlease
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Miller Homes
Places for People
Story Homes
Taylor Wimpey
Thakeham
VerdeGO

Wider industry and suppliers:

AES
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Cerclos
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Construction Carbon
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Elmhurst
FCB Studios
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Genuit Group
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IstructE
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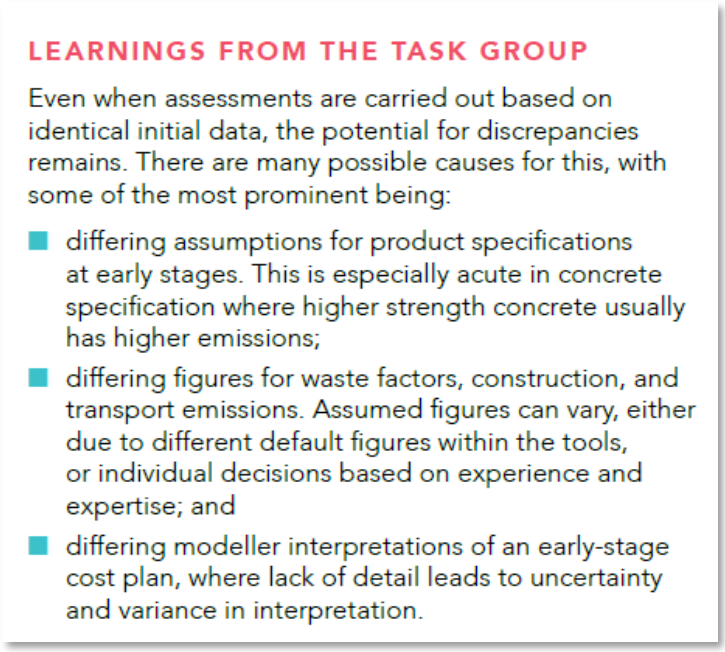
Contents

1 Introduction

1.1 Context: Purpose of the WLC Conventions

The WLC Conventions for New Homes provide a standard set of defaults and assumptions to enable consistent calculation of Whole Life Carbon for the homebuilding sector. They aim to address the underlying issue of variance between assessments – most likely caused by inconsistency between material and methodological assumptions chosen by different consultants using different tools and reference points.

This issue has been observed anecdotally by many – including the Hub during our first phase work, noted within the *Implementation Plan: Embodied and Whole Life Carbon (2023)* and the *UKGBC Embodied Carbon Modelling and Reporting Guidance* (2023).



LEARNINGS FROM THE TASK GROUP

Even when assessments are carried out based on identical initial data, the potential for discrepancies remains. There are many possible causes for this, with some of the most prominent being:

- differing assumptions for product specifications at early stages. This is especially acute in concrete specification where higher strength concrete usually has higher emissions;
- differing figures for waste factors, construction, and transport emissions. Assumed figures can vary, either due to different default figures within the tools, or individual decisions based on experience and expertise; and
- differing modeller interpretations of an early-stage cost plan, where lack of detail leads to uncertainty and variance in interpretation.

Figure 1: UKGBC Embodied Carbon Modelling and Reporting

The key aim of the Future Homes Hub WLC conventions for new build homes is to **help homebuilders assess their carbon impact of their design options in a quick and consistent way** – reducing the barrier to Whole Life Carbon assessment and reduction.

This version has been updated both to address feedback from those already using the Conventions, and to support consistent assessment of development site preparation and infrastructure works.

In parallel, the Hub has developed a free, simple-to-use tool based on these conventions and they have been adopted by commercial tool providers (including One Click LCA and 2050 Materials) to facilitate reporting to the WLC Conventions for New Homes regardless of which tool is being used.

1.2 Summary

The **Future Homes Hub Whole Life Carbon Conventions for New Homes (WLC Conventions)** reference the same core methodology defined by *EN 15978 Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method* (EN 15978) and ***RICS Whole Life Carbon Assessment for the Built Environment 2nd Edition*** **(RICS PS)**. They provide a consistent set of input assumptions and output framework to ensure that assessments can be compared like-with-like.

The WLC Conventions:

- Provide a consistent set of generic carbon impact factors for materials and product-types commonly used in new homes – for use at early design stages, or where product-specific data is not available.
- Define clear 'standard scopes' for lifecycle stages and building elements across various levels of assessment.
- Adopt a consistent approach to calculating location-specific regulated and unregulated energy consumption, based on outputs from SAP assessment.
- Define a reporting format that requires transparency of assumptions, including the quantity, material and whole life cycle assumptions used.

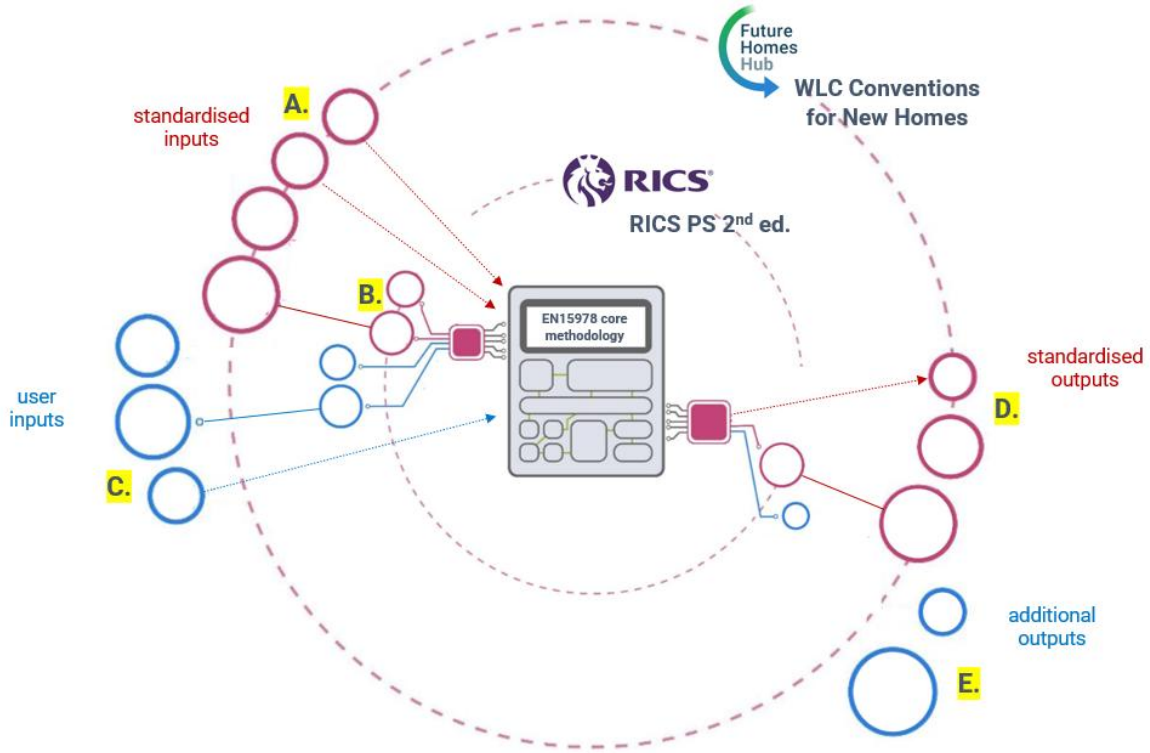


Figure 2: How to apply the WLC Conventions

1.2.1 How to apply the WLC Conventions

For new homes assessments, refer first to the **WLC Conventions**. These provide assumptions and defaults which are specific to new build homes, and – whilst the approach is fully aligned with RICS PS for upfront and whole life embodied carbon – the defaults reflect sector-specific practice and generic data.

Where no specific guidance exists for new homes, refer to **RICS PS**. Figure 2summarises the approach.

Standardised inputs – default carbon data:

A. At early project stages or where manufacturer- and product-specific EPDs are unavailable, refer to the WLC Conventions Default Material and Carbon Dataset in Appendix A.

B. For materials / products not included in the dataset, refer to RICS PS defaults and guidance.

User inputs – product-specific carbon data:

C. At detailed design or as built stages, where product-specific EPDs are available for the actual products specified / procured, these should be used.

   Binary data rule: If you don't have the specific EPD for the specified / procured product, you should use the default.

   For decision logic flow chart, refer to 3.3 Data Sources.

Standardised outputs:

D. Standardised outputs enable transparent comparison of assessments. Refer to 2 Standard Scopes for New Homes and 3.9 Reporting Requirements

Additional outputs:

E. Additional outputs may be reported separately.

2 Standard Scopes for New Homes

The WLC Conventions identify nine standard scopes for disclosure of embodied and whole life carbon of new homes, according to the building elements and life cycle stages being reported.

Figure 3 summarises the life-cycle stage and building element scopes for each of these.

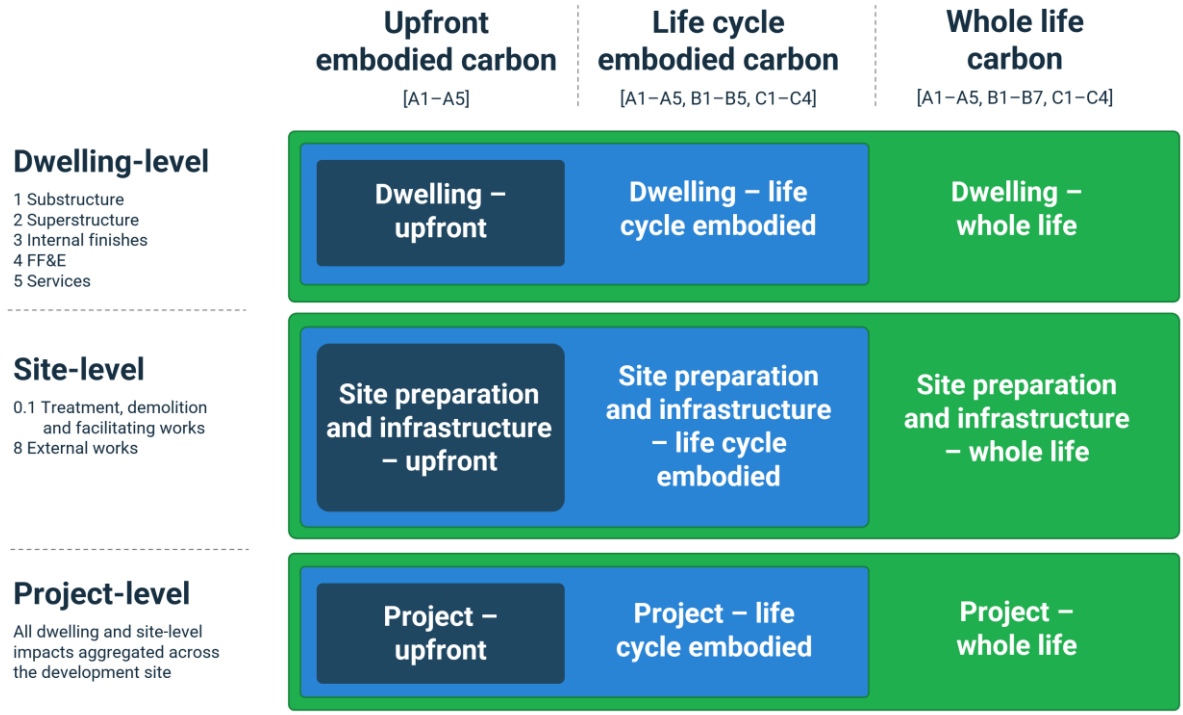


Figure 3: Standard scopes for new homes

Standard scopes are:

1. Dwelling level – upfront embodied
2. Dwelling level – life cycle embodied
3. Dwelling level – whole life

4. Site preparation and infrastructure – upfront embodied
5. Site preparation and infrastructure – life cycle embodied
6. Site preparation and infrastructure – whole life

7. Project level – upfront embodied
8. Project level – life cycle embodied
9. Project level – whole life

Building elements

- **Dwelling-level** scopes consider only the building itself – be it a home, row of terraces or apartment building.
- **Site-level** scopes consider associated site preparation, infrastructure and external works.
- **Project-level** scopes are the aggregate of all dwelling and site-level impacts across a development site.

Table 1: Standard scopes for building elements

		Dwelling-level	Site-level	Project-level
Building Elements	0.1 Facilitating Works [1]	-	✓	✓
	1 Substructure	✓	-	✓
	2 Superstructure	✓	-	✓
	3 Finishes	✓	-	✓
	4 Fixed FF&E	✓	-	✓
	5 MEP Services	✓	-	✓
	6 Pre-fabricated buildings and units [2]	-	-	✓
	7 Works to existing buildings [3]	-	-	✓
	8 External works	-	✓	✓

1. Pre-construction demolition is accounted for at site-level.

2. At detailed design stage onwards, MMC (off-site) prefabricated elements should be broken downs into their constituent building elements and reported within the relevant elements at dwelling-level.

3. Standard scopes are new build and therefore exclude impacts from works to existing buildings. Where retrofit or change of use buildings are included within the development site boundary, they may be calculated separately following RICS PS 2nd edition and aggregated at the project-level. The same applies to mixed use or non-domestic buildings.

Life cycle stages

- **Upfront embodied** scopes consider only the embodied impacts of construction (to practical completion)
- **Life cycle embodied** scopes add to upfront scopes the embodied impacts across all lifecycle stages, including repair and replacement, and end of life disposal or recycling. They exclude the operational impact of the home in use.
- **Whole life** scopes add to whole life embodied scopes the operational impact of the home in use (from energy and water consumption).

Figure 4 summarises the RICS life cycle stages.

Table 2: Standard scopes for life cycle stages

		Upfront embodied carbon	Life cycle embodied carbon	Whole life carbon
Life Cycle Stage	Biogenic Carbon [1]	Reported Separately	✓	✓
	[A0] Pre-construction	✓	✓	✓
	[A1-A3] Product	✓	✓	✓
	[A4] Transport	✓	✓	✓
	[A5] Construction and Installation [2]	✓	✓	✓
	[B1-B5] Embodied In-use [3]	-	✓	✓
	[B6] Operational Energy	-	-	✓
	[B7] Operational Water	-	-	✓
	[B8] User Carbon	-	-	-
	[C1-C4] End of Life	-	✓	✓
	[D] Benefits and loads beyond the system boundary [4]	-	Reported Separately	Reported Separately

Notes:

1. Biogenic carbon is required for upfront standard scopes and should be reported alongside upfront embodied carbon.

2. [A5] Construction and Installation includes submodules A5.1-A5.3 only. A5.4 Worker Transport, noted as an optional submodule in RICS PS 2nd edition, does not form part of the standard scopes for new homes. It may be reported separately.

3. Standard scopes exclude impacts from B5 retrofit/refurbishment/planned changes. [B5] carbon impacts may be reported separately.

4. Module D is required for whole life scopes in RICS PS 2nd edition and should be reported separately.

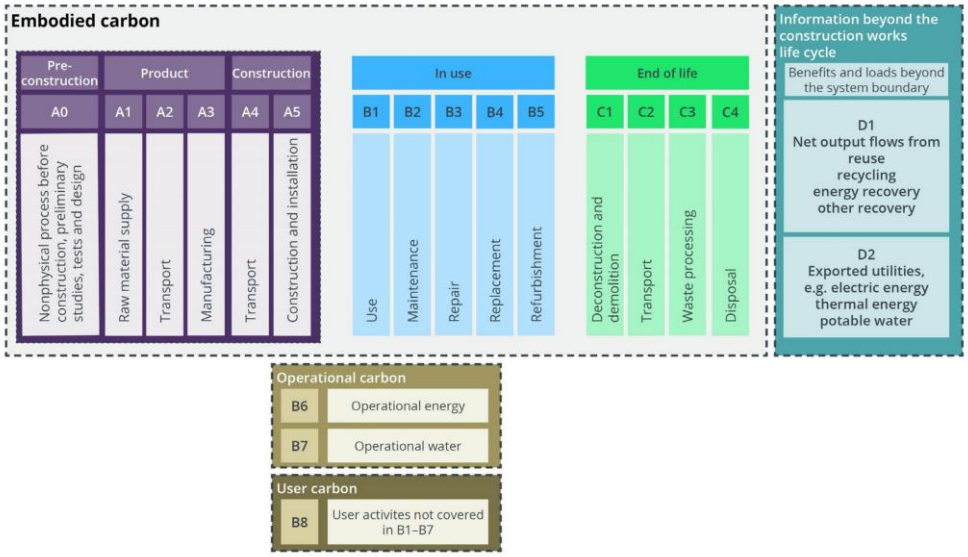


Figure 4: Life cycle stages (RICS)

Scope for site preparation and infrastructure elements

All site preparation and infrastructure works carried out within the following scope should be accounted for:

- **Within 3 years before start on site**. The start date for a homebuilder's responsibility is considered to be the date they take possession of the site under form F10 (Construction Design and Management).
- **Within the red line of the development site boundary**. Any infrastructure or enabling works required outside the development site boundary do not form part of the standard scopes and may be reported separately.

Where possible, **site preparation** (RICS element 0.1 Treatment, demolition and facilitating works) should be accounted for separately from **site infrastructure** (RICS element 8 External works) to support future setting of benchmarks and potentially new homes sector-specific defaults.

Aggregating other building types at the project-level

The WLC Conventions are intended to apply to new homes. In principle, where **retrofit or non-domestic buildings** are included within the development site boundary, they may be calculated separately following RICS PS and aggregated along with dwellings at the project-level.

Dwellings within **mixed-use buildings** may be assessed. Following the RICS PS approach, the impact of shared elements (e.g. substructure and superstructure) should be apportioned pro-rata based on floor area of domestic vs. non-domestic uses. Non-shared elements (e.g. finishes and services) should be attributed to the appropriate use.

3 Conventions

3.1 Alignment to Standards

The WLC Conventions are aligned with the RICS PS calculation methodology and therefore EN 15978, which the RICS PS is based on.

Any deviations from these documents have been outlined within the following sections.

WLC Conventions **upfront embodied** and **life cycle embodied** standard scopes are fully aligned with RICS PS.

Note that **whole life** standard scopes are not aligned for operational carbon. See 3.4.5 B6 Operational Energy Use for more details.

3.2 Reference Study Period

A 60-year Reference Study Period (RSP) should be considered.

It is accepted that many homes will have a longer building life cycle, however a reference study period has been assumed in accordance with the RICS PS guidance.

3.3 Data Sources

An important principle of the WLC Conventions is to reduce subjectivity in selection of data sources. This is achieved in practice by making a binary choice as to **whether a current product-specific EPD is available that covers the exact product specified / installed, or not**.

For decision logic see Figure 5.

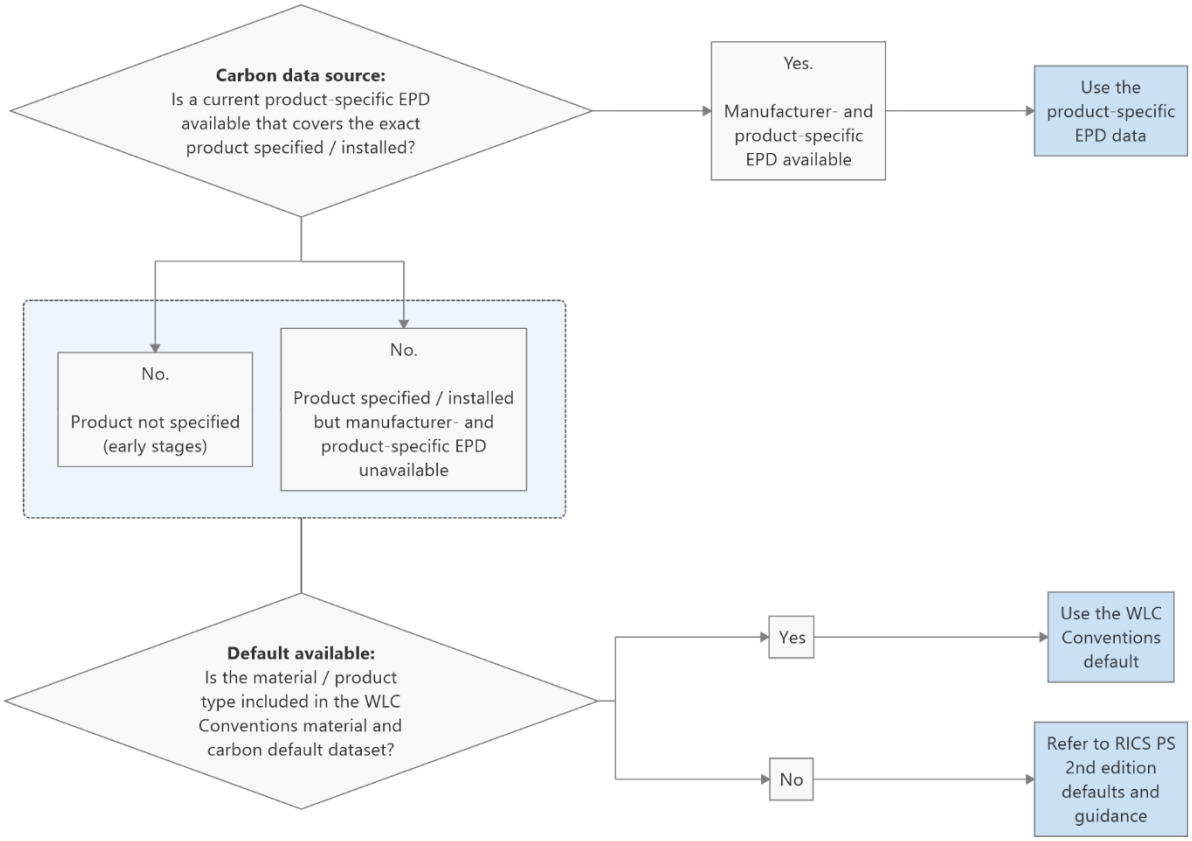


Figure 5: Data sources decision flow chart

For default data see Appendix A – Default Material and Carbon Dataset.

For materials / products not included in the dataset, refer to **RICS PS – 4.7 Carbon data sources for the product stage (A1–A3)** for additional defaults and guidance.

Notes:

- Where no defaults exist in either WLC Conventions or RICS PS, use a representative EPD or other generic value.
- If material quantities data is not available (e.g. early stages), a benchmark figure may be used for entire building components or systems – including but not limited to those identified in Appendix C – Default Component Benchmarks.

3.4 Calculation approach for each life cycle stage

Key considerations and calculations have been included in the following sections. RICS PS and supplementary data sources should be consulted for a further detail and guidance, where these sources are referenced.

3.4.1 A1-A3 Product

The Product [A1-A3] impact is calculated as follows:

A1-A3 Product = **Material quantity** (kg) x **Material A1-A3 embodied carbon factor** (kgCO2e/kg)

Note: the material or product area/volume/number of units can be used in lieu of mass if the A1-A3 carbon factor is provided in a different unit.

At early design stages, or in the absence of product-specific material data, the **Default Material and Carbon Dataset** should be used. Refer to 3.3 Data Sources for further detail.

3.4.2 A4 Transport

The Transport [A4] impact for each quantified material or product is calculated as follows:

A4 Transport = **Material quantity** (tonne) x **Transport distance** (km) x **Carbon conversion factor** (kgCO2e/tonne-km)

Transport impact for each material is aggregated. Return journeys should be included. The **Default Material and Carbon Dataset** includes transport scenarios (distances and transport modes) for all materials listed, which should be used at early design stages, or in the absence of project-specific material transport information – See Appendix A.

*Note: Transport scenarios in the default dataset are broadly aligned **RICS PS – Table 17 (Default transport scenarios for UK projects)** with the exception of timber products, which are aligned with the latest edition of the TDUK Embodied Carbon Data for Timber Products – see 4 References.*

Carbon conversion factors should be differentiated for the outward and return journeys and include an empty running factor in line with RICS PS 2nd edition (see box on next page).

Carbon conversion factor values for road, rail, and sea journeys should be taken from the *UK Government GHG Conversion Factors for Company Reporting 2026 ('Freighting Goods' + 'WTT Delivery Vehicles and Freight')*:

- Average diesel All HGV (road) – Average laden: **0.12448** $kgCO_2e$/tonne-km
- Average cargo container ship (sea): **0.019773** $kgCO_2e$/tonne-km

Empty running factors should be taken as:

- **43%** for road freight, except for concrete mixers – where **100%** should be used.
- **0%** for transportation routes via sea or rail.

3.4.3 A5 Construction and Installation Process

Where measured data for Construction and Installation Process [A5] modules exists, this should be used in preference. In the absence of actual, project-specific data, the defaults indicated should be used.

A5.1 Pre-construction Demolition

In the absence of measured data, **Pre-construction Demolition [A5.1]** should be assumed to be **35** kgCO2e/m2 demolished area. This is aligned with the RICS PS.

Note: pre-construction demolition emissions required to enable the new building are associated with the site-level standard scopes.

A5.2 Construction Activities

Where measured data for construction site impacts is available, **Construction Activities [A5.2]** should be calculated as follows:

A5.2 Construction Activities = ∑ **Total fuel / water consumption** (units vary) x **Carbon conversion factors** (kgCO2e/unit)

The construction site impact for each fuel used on site and water consumption is aggregated.

In the absence of measured data, **Construction Activities [A5.2]** should be assumed to be **40** $kgCO_2e/m^2$ GIA. This is aligned with the RICS PS baseline building-specific impacts related to construction activities in the UK.

*Note: where possible, **site preparation phase** works should be accounted for separately from **construction phase** works to support future setting of benchmarks and potentially new homes sector-specific defaults.*

Construction phase

The construction phase is assumed to include all site infrastructure and buildings.

Site infrastructure: Fuel use for construction of site infrastructure is associated with the site-level standard scopes.

Buildings: Fuel use for construction of buildings (including foundations) is associated with dwelling-level standard scopes.

Site preparation phase

The site preparation phase is assumed to include all facilitating works required to prepare the development site for the construction phase.

Earthworks: Fuel use for topsoil stripping and bulk earthworks (cut and fill) is associated with the site-level standard scopes. At early stages, the following defaults may be used:

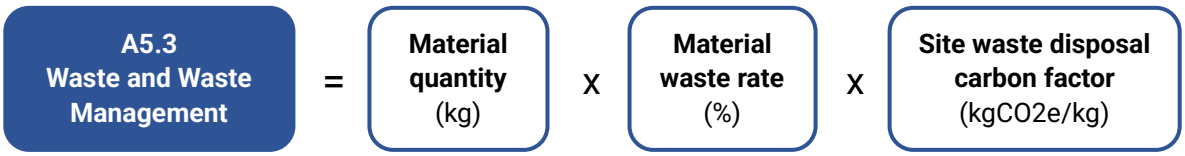
- Fuel use (topsoil stripping): **1.25** litres diesel per m3 topsoil stripped
- Fuel use (bulk earthworks): **1.35** litres diesel per m3 earth moved (cut + fill)

Remediation and ground improvement: Fuel use (and material impacts) relating to treatment of contaminated land, ground improvement, soil stabilisation and structural earthworks are associated with the site-level standard scopes.

No defaults are available. Where required by the scheme, these impacts should be calculated on a project-specific basis.

A5.3 Waste and Waste Management

Waste and Waste Management [A5.3] impact for quantified materials should be calculated as follows:



- *The **material waste rate** is the percentage of the material quantity (A1-A3) that is wasted on-site.*
- *The **site waste disposal embodied carbon factor** is dependent on the end of life (EOL) disposal scenario – i.e. what proportion of each material type is typically reused, recycled, incinerated or sent to landfill – and should be calculated based on A1-A3, A4, C2, C3, and C4 information, in line with RICS PS 2nd edition, Table 19.*

Material waste rates and EOL disposal scenarios are included within the **Default Material and Carbon Dataset** for all materials listed, which should be used at early design stages, or in the absence of project-specific material waste information.

A5.4 Worker Transport

The Worker Transport [A5.4] module does not form part of the standard scopes. These impacts may be calculated following RICS PS and reported separately.

3.4.4 B1-B5 In-use stage

In-use embodied carbon impacts [B1-B5] should be calculated as follows:

B1 Use

In-use Impacts [B1] accounts for off-gassing of blowing agents from insulation, carbonation of cement products and refrigerant leakage from MEP equipment.

Carbonation of concrete products is already accounted for within the **Default Material and Carbon Dataset** in stages [B1] and [C1-C3] as appropriate to the specific material row. Likewise, it is also included in most product-specific EPDs for concrete products.

Refer to 3.6 Carbonation for further background information.

No early-stage defaults are available for **fugitive emissions of refrigerants from MEP equipment**. Therefore, project-specific information – including refrigerant charge and refrigerant GWP, along with default annual leakage rates for systems of different types from CIBSE TM65 should be used.

Note: MEP system Default Component Benchmarks in Appendix C do include an allowance for in-use fugitive emissions.

B2 Maintenance impacts

In absence of EPD and project-specific information, for all building element categories, Maintenance [B2] impacts should be assumed to be **1% of modules [A1-A5]**, or **10 $kgCO_2e/m^2$ GIA** (whichever is greater).

B3 Repair impacts

In absence of project-specific information, Repair [B3] impacts for all building element categories excluding building services should be assumed to be **25% of module [B2]** impacts.

For building services components, Repair [B3] impacts should be assumed to be **10% of modules [A1-A3]** impacts.

B4 Replacement impacts

Replacement impacts [B4] should be calculated based on the life cycle impact of replacement components, which includes supply, installation and end-of-life treatment. The number of replacements during the reference service period is dictated by the product lifespan.

Indicative material / product lifespans are included within the **Default Material and Carbon Dataset**, which should be used at early design stages, or in the absence of project-specific information.

Default data is based on **RICS PS – Table 20: Indicative component lifespans**.

B5 Impacts from retrofit/refurbishment/planned changes

Planned alterations, such as house extensions or conversions throughout the building's reference study period, are excluded from the standard scopes and may be reported separately.

3.4.5 B6 Operational Energy Use

The operational carbon impact associated with energy consumption [B6] is calculated by multiplying the annual energy consumption of the dwelling or site (kWh) by carbon factors (kgCO2e/kWh) associated with the type of fuel used.

B6 Operational Energy Use = ∑ **Annual energy consumption** (kWh/yr) x **Carbon conversion factors** (kgCO2e/kWh)

This is aggregated for each year of use and each fuel type.

- ***Annual energy consumption*** *must include regulated and non-regulated uses, which are calculated separately and aggregated. Refer to Regulated Energy – Buildings, Unregulated energy – Buildings and Unregulated energy – Site infrastructure sections below.*
- ***Carbon conversion factors*** *for each fuel type should follow RICS PS. Refer to Operational Energy Carbon Conversion Factors section below.*

Key point of difference between WLC Conventions and RICS PS 2nd edition:

1. **WLC Conventions** require the operational carbon [B6] calculation for new homes to reference SAP outputs for regulated energy consumption (kWh/yr).

2. **RICS PS 2nd edition** requires the use of 'predictive energy models' to calculate operational energy consumption and specifically precludes the use of Part L 2021 calculation results. Refer to **RICS PS – 4.11.3 Energy modelling**.

Implication: **Upfront embodied and life cycle embodied standard scopes are fully aligned with RICS PS 2nd edition**, however operational energy, and therefore, **whole life carbon is not**.

Why the difference: The underlying reason is that RICS PS requires 'predictive energy models' for increased accuracy, whereas WLC Conventions require SAP outputs (derived from Building Regulations Part L compliance) for increased consistency.

In due course, once the Home Energy Model (HEM) is launched, future versions of these Conventions would be expected to update to the latest Part L methodology. This is a recognised area for further guidance in future.

Regulated energy – buildings

Energy consumption from regulated uses and renewable energy generation based on **location-specific weather data** should be extracted from SAP 10.2 or SAP 10.3 worksheets.

Energy consumption (aggregated separately for gas and electricity):

- Main, secondary and water heating systems
- Instantaneous electric showers
- Pumps, fans and electric keep-hot
- Energy for lighting

Energy generation (electricity):

- Used in dwelling
- Exported

Additional resource: the Pre-calculator – Regulated energy from SAP outputs is an Excel spreadsheet available for download to help those reporting to the WLC Conventions identify the correct SAP boxes to extract data from and calculate total regulated energy.

Unregulated energy – buildings

Energy consumption from unregulated uses should be calculated as follows:

Total Unregulated Energy Consumption = [*Yearly Appliances Consumption* + *Yearly Cooking Consumption*] * *Reference Study Period*

Yearly Cooking Consumption =

- *171 + 98 * Occ* kWh/yr for electric cooking
- *236 +135 * Occ* kWh/yr for mixed cooking, of which:
  - *86 +49 * Occ* kWh/yr is electricity
  - *150+86 * Occ* kWh/yr is non-electric
- *299 +171 × Occ* kWh/yr for non-electric cooking

Yearly Appliances Consumption = $145.04(A * Occ)^{0.4856}$ kWh/yr for electric appliances

Where;
A is Total Floor Area, as defined by SAP.
Occ refers to the number of occupants – this should be based on actual occupancy or, if unavailable, SAP standard occupancy.

This aligns with the FHS assessment wrapper (HEMFHS-TP-04) for appliances and cooking taken from the Future Homes Standard consultation (published 2023).

Additional resource: for those using commercial tools, the Pre-calculator – Unregulated energy is an Excel spreadsheet available to help calculate annual energy consumption from unregulated uses (cooking and appliances) based on the equations in this section.

Unregulated energy – site infrastructure

Where energy is required for operation of site infrastructure – for uses such as external lighting, irrigation, mains or foul pumping stations – the associated operational carbon emissions are included within the site-level standard scopes.

No early-stage defaults are available. RICS PS guidance should be followed.

Operational Energy Carbon Conversion Factors

RICS PS allows for three different sets of carbon factors to be used, depending on the purpose of the assessment. **For reporting to the WLC Conventions for New Homes standard scopes, Set 2 factors should be used.**

- **Set 2 carbon factors** are used for the purpose of reporting, benchmarking, and to enable comparison across different projects. Refer to RICS PS Energy – Supplementary Tables.
- Both embodied carbon and operational generation from on-site renewable energy plant is accounted for.

Table 3: Treatment of on-site renewable energy

Purpose of Assessment	Carbon Conversion Factor Set	Treatment of on-site renewables
Reporting, benchmarking, and predicting the carbon emissions over the Reference Study Period	**Set 2**	On-site renewable energy generation should be **included** within the WLC total. Embodied carbon (upfront, in-use, and EOL) associated with on-site renewable energy plant should be **included** within the WLC total. For further information on how to account for renewable energy, refer to **RICS PS – Appendix H4**.

3.4.6 B7 Operational Water Use

The operational carbon impact associated with water consumption and treatment [B7] is calculated by multiplying the water consumption of the dwelling or site (m^3/yr) by carbon factors ($kgCO2e/m^3$) per type (treated water, ground water, grey water, etc).

B7 Operational Water Use = $\sum$ **Annual water consumption** (m^3/yr) x **Carbon conversion factors for supply and treatment (if applicable)** ($kgCO2e/m^3$)

This is aggregated for each supply and treatment type, and for each year of use over the Reference Service Period.

Water – buildings

Water consumption for dwellings should be estimated based on **Approved Document, Part G** (litres/person/day) and the known or assumed occupancy.

At early design stages, if a project-specific water calculator output is not available, the building regulations maximum may be assumed:

- Residential water consumption: **120 litres/person/day** (excluding external uses)

Water – site infrastructure

Where water is consumed during operation of site infrastructure – for uses such as irrigation – the associated operational carbon emissions are included within the site-level standard scopes.

No early-stage defaults are available. RICS PS guidance should be followed.

Water Carbon Conversion Factors

Where carbon conversion factors for mains water provision and offsite treatment published by the local water supplier are unavailable, the following factors (from *UK Government GHG Conversion Factors for Company Reporting 2026*) should be used:

- Water Supply: **0.177** $kgCO_2e/m^3$
- Water Treatment: **0.201** $kgCO_2e/m^3$

3.4.7 C1-C4 End-of-life

The end-of-life (EOL) carbon impacts [C1-C4] should be calculated as follows. Where product-specific EPDs are available, use the product-specific EPD data. Otherwise, note the following defaults.

C1 Deconstruction and Demolition

- In absence of project- or EPD-specific information, Deconstruction and Demolition [C1] impacts should be taken to be **25% of module [A5.2]**, in line with the RICS PS 2nd edition 'Business as Usual' scenario.

C2 Transport

C2 Transport = **Material quantity** (tonne) x **Transport distance** (km) x **Carbon conversion factor** (kgCO2e/tonne-km)

- The end-of-life transport distance should be the average distance between two closest construction waste processing sites / energy-from-waste sites / landfill sites. Should project-specific information be unavailable, this should be taken to be **50 km**.

Assumed carbon conversion factor for transport of waste, from the *UK Government GHG Conversion Factors for Company Reporting 2026 ('Freighting Goods' + 'WTT Delivery Vehicles and Freight')*:

- Average diesel All HGV (road) – 50% laden: **0.15256** $kgCO_2e$/tonne-km

Use the same carbon conversion factor for both outward and return journeys with an empty running factor of 100%. This accounts for the vehicles coming to site empty and leaving with 100% load.

Waste processing for reuse, recycling or other recovery (C3) and Disposal (C4)

EOL disposal scenarios are included in the **Default Material and Carbon Dataset**, which should be used at early design stages, or in the absence of project- or EPD-specific information.

3.4.8 Module D

Module D should be calculated in line with RICS PS 2nd edition and reported separately to the Whole Life Carbon (A-C) results.

3.5 Biogenic Carbon

Background

Biogenic carbon is carbon dioxide absorbed from the atmosphere by plants and trees during growth (through photosynthesis) and stored as carbon within bio-based construction materials, such as timber and hemp. This carbon remains stored for as long as the material is preserved within the building.

Reporting

Biogenic carbon should be accounted for in line with **RICS PS – *4.11.1 Biogenic Carbon***.

- When reporting **upfront embodied** scopes, [A1-A5] emissions should exclude biogenic carbon, with upfront biogenic carbon removals (negative emissions) being reported separately.
- When reporting **life cycle embodied** scopes, upfront biogenic carbon removals (negative emissions) should be included in [A1-A5] and the corresponding biogenic carbon emissions should be reported within module C3 at the product's end of life.

3.6 Carbonation

Background

Carbonation is a natural chemical process in which carbon dioxide from the atmosphere reacts with cement-based materials, such as concrete and mortar, forming stable carbonate compounds. This process gradually reabsorbs a proportion of the carbon dioxide released during cement manufacture.

Potentially, up to 75% of the carbon dioxide released from the chemical breakdown of limestone in the cement kiln can be reabsorbed by carbonation – or around a third of the [A1-A3] embodied carbon of concrete.

The rate of carbonation can be measured experimentally and depends on variables such as the cement content of the concrete (stronger mixes have more potential for carbonation) and the exposed surface area (limited carbonation if surfaces are covered or underground).

Reporting

Carbonation is included within the relevant life cycle stages and is not expected to be reported separately.

- RICS PS requires carbonation to be accounted for in modules A1-A3, A5, B1 and C3/C4. It references *EN 16757:2022 Sustainability of construction works Environmental product declarations — Product Category Rules for concrete and concrete elements* (EN 16757).

- EN 16757 provides a simplified method for estimating the amount of carbon uptake based on these variables and the exposure time and allows for the use of 'national provisions' to define the end-of-life and secondary use concrete scenarios.
- Refer to 'Embodied carbon values for cement and concrete products' (Mineral Products Association, 2026) for further calculation detail, including the assumed end-of-life concrete waste flows, timescales and aggregate size / distribution.
- This approach has been applied, with the support of the Mineral Products Association, to each relevant row within the **Default Material and Carbon Dataset**. The data for lifecycle stages [B1] and [C1-C3] therefore already includes carbonation, and no further allowance should be made. Select the appropriate default that reflects the use case (exposed or buried) if applicable.
- If using product-specific EPDs, in most cases these will already have carbonation accounted for, so it is recommended to use the data directly from the EPDs.

3.7 Decarbonisation Scenarios

3.7.1 Operational Energy and Water Use

As more renewable energy source gets added to the electricity grid, the carbon intensity of the electricity delivered to end users, on average, is reducing. RICS PS 2nd edition requires both decarbonised (assuming future electricity grid decarbonisation) and non-decarbonised (assuming current grid carbon intensity throughout the 60-year RSP) scenarios to be reported.

Reporting

Operational Energy Use [B6] carbon impacts should be presented for both non-decarbonised and decarbonised scenarios.

The decarbonised carbon conversion factors must reference the Future Energy Scenario Falling Short Scenario, in line with RICS PS.

Refer to **RICS PS – 4.11.4 Future energy projections: grid decarbonisation** for additional guidance.

3.7.2 Material Decarbonisation

Alongside grid decarbonisation, it is expected that extraction, transportation and manufacturing processes will also decarbonise, which most significantly affects the 'future upfront' impacts of replacement products [B4].

Reporting

A **50% material decarbonisation factor** for all predicted impacts associated with **B1.2, B2-B4 and C1-C2** should be applied in accordance with RICS PS decarbonisation scenarios for embodied impacts.

Results accounting for material decarbonisation must been shown in addition to the no-decarbonisation scenario.

Refer to **RICS PS – 4.11.5 Material decarbonisation** for additional guidance.

3.8 Whole Life Carbon Uncertainty Factor

The Whole Life Carbon Uncertainty Factor should be calculated in line with RICS PS 2nd edition based on:

1. A contingency factor,
2. A carbon data uncertainty factor, and
3. A quantities uncertainty factor.

The WLC uncertainty factor should be applied to all embodied carbon modules (A1-A5, B1–B5 and C1-C4) before reporting total upfront, whole life embodied or whole life carbon.

Refer to **RICS PS 4.10 Addressing uncertainty in WLCAs** for additional guidance.

This is a recognised area for further new homes sector-specific guidance in future.

3.9 Reporting Requirements

All assessments

Summary results should be provided for standard scopes identified in the Conventions.

Disaggregated breakdown should be provided for all relevant building elements and life cycle stages.

Proportion of embodied impact covered by each type of data source should be reported, in terms of A1-A4 embodied carbon impact covered by: benchmarks, default impact factors and product-specific EPDs.

Material assumptions should be reported, including the following:

- Material / product quantity
- Data source for each material / product
- Carbon impact factors per unit quantity
- Source of benchmarks used, if applicable
- Transport assumptions, waste rates and end of life scenarios

Uncertainty factors should be reported, including breakdown by contingency, carbon data and quantities factors.

Also refer to **RICS PS – 6.1.1 Mandatory information** for additional reporting requirements.

Dwelling-level assessments

Unregulated energy assumptions should be stated, including the following:

- Number of occupants per dwelling
- Cooking assumption (gas or electric oven / hob)
- Total number of dwellings in the building, if applicable

Key facts should be reported for dwelling-level assessments:

- Floor area (GIA)
- Number of storeys – above ground and below ground.
- Standard house / apartment type or bespoke design
- Dwelling type (detached / semi-detached / terraced / apartments / other)
- Primary structural system (masonry / timber frame / concrete frame / steel frame / other)
- Heating type (gas boiler / heat pump / direct electric / heat network / other)
- Building regulations (Part L) and SAP version
- Description of building fabric elements (wall / floor / roof / windows)
- Description of building services (MEP / renewables)

Site-level assessments

Key facts should be reported for site-level assessments:

- Site area
- Total floor area for all buildings on the site (GIA)
- Site location type (urban / suburban / rural)
- Site type (brownfield / greenfield)
- Type of new buildings on the site (low rise / medium and high-rise / mixed)
- Demolished GIA of existing buildings (if demolition was required to enable a new build).

Project-level assessments

Project-level assessments aggregate a site-level assessment with one or more dwelling-level assessments. Key facts and summary results should be presented as above for each standard scope.

Key facts should be reported for project-level assessments:

- Project stage (outline design (pre-planning) / detail design and procurement / construction / as built (post-construction))
- Project location
- Year of Construction (Actual or Predicted)
- Quantity of each dwelling type on the reported site
- Summary results for all site- and dwelling assessments that make up the project
- Detailed reports referenced

Note: Any other buildings within the development site boundary (e.g. unattached garages, non-domestic buildings or the non-domestic part of mixed-use buildings) should be calculated following RICS PS 2nd edition and included within project-level assessments. These may be reported separately.

Assessment of similar dwellings

In general, a dwelling-level assessment should be provided for each standard dwelling-type on site, plus any bespoke dwellings.

This is a recognised area for further guidance in future.

Worked example 1 – Detached homes with garages

The Project-level assessment would include:

- Site-level assessment
- Dwelling-level assessment for Dwelling 1 (including attached garage)
- Dwelling-level assessment for Dwelling 2
- Additional building assessment for unattached garage

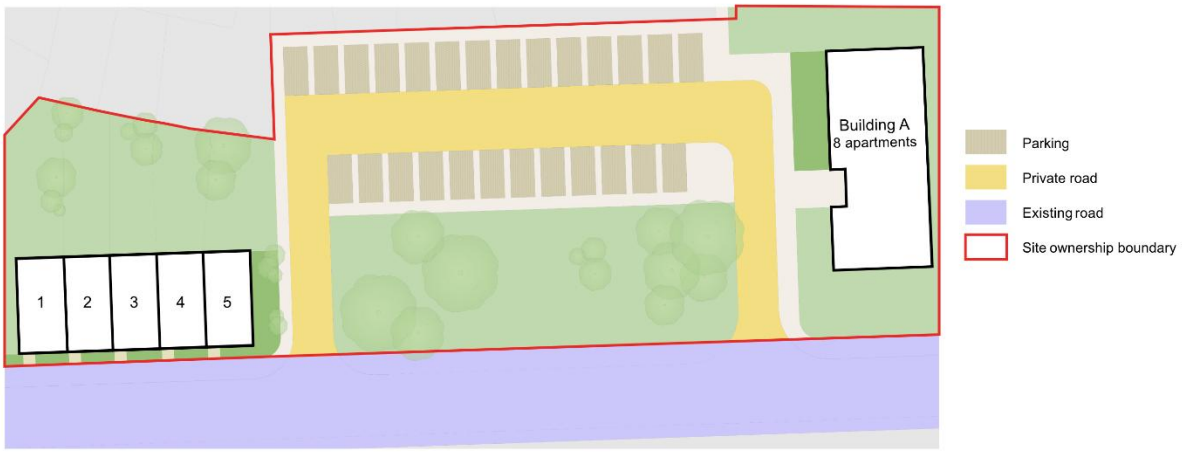
Worked example 2 – Terraced houses

The Project-level assessment would include:

- Site-level assessment
- Dwelling-level assessment for dwellings 1 and 5 (assuming end-terrace standard house type, mirrored)
- Dwelling-level assessment for dwellings 2, 3 and 4 (assuming mid-terrace standard house type)

Note: If preferred, a single dwelling-level assessment could be provided for the whole building.

Worked example 3 – Apartment building and terraced houses



The Project-level assessment would include:

- Site-level assessment
- Dwelling-level assessments for dwellings 1 to 5 (per worked example 2)
- 'Dwelling-level' assessment for Building A (entire apartment block)

4 References

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UK Green Building Council (2023) Embodied Carbon Modelling and Reporting Guidance, Available at: https://ukgbc.org/resources/embodied-carbon-modelling-and-reporting/

Appendix A – Default Material and Carbon Dataset

The full WLC Conventions default material and carbon dataset is provided separately as an Excel spreadsheet.

The sources referenced represent the best freely available generic data points for early-stage Whole Life Carbon assessments for new homes. A Future Homes Hub working group will review and update this appendix periodically, as manufacturing sectors provide new and more up to date generic data.

Below is a list of column headings and example data:

Material / Product Name	Asphalt (base & binder)
Material Impact Factor ID	FHH-BIT-051
Material Type	Bitumin_products
Material Description	Asphalt Concrete - average composition for AC typical of products used in the UK in the structural layers (base and binder courses) of bound pavements.
Functional Unit	m3
Mass per functional unit (kg)	2350
Bulk density (kg/m3)	2350
Source Type	Collective EPD (UK)
Source Title	MPA Asphalt Sector-Level Asphalt Concrete (base & binder)
Published By	Mineral Products Association
Last Updated Date	18/08/2024
Source Notes	HUB-1655
Source Link	https://mineralproducts.org/MPA/media/root/Publications/Asphalt/EPDS/EPD_Mineral_Products_Association_Ltd_Asphalt_MPA_Sector_Level_AC_HUB-1655_2024-08-19.pdf
A4 Transportation Scenario	Locally manufactured (general)
Wastage Rate (%)	6.0%
A5.3 Waste Scenario	Reuse/recycling off-site
Product Lifespan (Years)	60
Number of replacements	0
End-of-life Scenario	EOL scenario from EPD
End-of-life scenario - Reuse	37.0%
End-of-life scenario - Recycling	63.0%
End-of-life scenario - Incineration	0.0%
End-of-life scenario - Disposal	0.0%
C3 Notes	C1-C4 impacts from EPD
C3 factor (kgCO2e/kg)	0
C4 Notes	C1-C4 impacts from EPD
C4 factor (kgCO2e/kg)	0

Upfront Biogenic kgCO2e/functional unit	0.009259
Total A1-A3 (Excl. Biogenic) kgCO2e/functional unit	122.660741
A4 kgCO2e/functional unit	20.91532641
A5.1 kgCO2e/functional unit	0
A5.2 kgCO2e/functional unit	0
A5.3 kgCO2e/functional unit	10.15260755
B1 kgCO2e/functional unit	0
B2 kgCO2e/functional unit	1.53728675
B3 kgCO2e/functional unit	0.384321687
B4 kgCO2e/functional unit	0
B5 kgCO2e/functional unit	0
B6.1-3 kgCO2e/functional unit	0
B7 kgCO2e/functional unit	0
C1 kgCO2e/functional unit	0
C2 kgCO2e/functional unit	25.6340585
C3 kgCO2e/functional unit	0
C4 kgCO2e/functional unit	0

Appendix B – Reporting templates

Dwelling- and project- level reporting templates are provided separately as Excel spreadsheets.

Appendix C – Default Component Benchmarks

It is recognised that at early stages, it is difficult to quantify many building components. Therefore, the Future Homes Hub has developed a set of new homes component benchmarks for MEP, FF&E and finishes.

The full detail of assumptions underlying the benchmarks is provided separately as an Excel spreadsheet.

Benchmark	Description	Unit	A1-A3
Cabins and welfare units	Rental impact factor per cabin per week	kgCO2e / cabin-weeks	500
Electrical system	Electrical equipment including lighting, cabling, consumer unit, fans, switches and sockets	kgCO2e / m2 (GIA)	11.3
FF&E – Bathroom (and ensuite)	Bath/shower, WC, sink, taps, tiling	kgCO2e / number of (bathrooms)	222
FF&E – Kitchen (large)	Recycled particle board cabinets, worktops and premium MDF frontals, with a stainless-steel sink and tap, appliances and tiling.	kgCO2e / number of (kitchens)	2411
FF&E – Kitchen (medium)	Recycled particle board cabinets, frontals, and worktops, with a stainless-steel sink and tap, appliances and tiling		2302
FF&E – Kitchen (small)			1750
FF&E – WC	WC, small sink, taps	kgCO2e / number of (WCs)	121
Floor Finishes 1	Floor finishes if unknown	kgCO2e / m2 (GIA)	7.0
Heating – Apartments - ASHP: individual air source heat pump	Estimation based on CIBSE TM65.1 data Includes: heat source, DHW store, pipework, valves, controls and emitter	kgCO2e / m2 (GIA)	24.6
Heating – Apartments - ComDH: district heating			22.8

Benchmark	Description	Unit	A1-A3
Heating – Apartments - ComGB: communal gas boiler / CHP			26.4
Heating – Apartments - DElec: direct electric space heating and hot water			8.2
Heating – Apartments - VRF: variable refrigerant flow system			22.8
Heating – Houses - ASHP: individual air source heat pump	Estimation based on CIBSE TM65.1 data Includes: heat source, DHW store, pipework, valves, controls and emitter	kgCO2e / m2 (GIA)	15.5
Heating – Houses - DElec: direct electric space heating and hot water			6.4
Heating – Houses - Gas: individual gas boiler			13.7
Stairs – Timber	Timber stairs per core per storey	kgCO2e / number of storeys	304
Wall Finishes 1	Wall finishes if unknown	kgCO2e / m2 (GIA)	5.0
Water system	Water supply, rainwater, soil and waste	kgCO2e / m2 (GIA)	6.6

Note: See spreadsheet for other life cycle stages, estimated in line with WLC Conventions / TM65.1