

# Guidance on LCA and embodied carbon calculations for Mat 01 in BREEAM V7

## 1. Scope

This guidance note applies to:

| Scheme                                 | Version |
|----------------------------------------|---------|
| BREEAM International New Construction  | V7      |
| BREEAM UK New Construction             | V7      |
| BREEAM UK New Construction Residential | V6.1    |
| BREEAM Refurbishment and Fit Out       | V7      |

## 2. Introduction

This guidance note focuses on Mat 01 in BREEAM New Construction V7 and BREEAM Refurbishment and Fit Out V7 and is applicable to both UK and International schemes. It is also applicable to issue 6.2 ('Building life cycle assessment') in BREEAM UK New Construction Residential V6.1. Its development is driven by the introduction of new credit allocation criteria for Mat 01. While the core principles of measuring and reporting a building's environmental performance through Life Cycle Assessment (LCA) and benchmarking were introduced in BREEAM UK New Construction 2018, significant revisions have been made to align the criteria across BREEAM schemes and with existing LCA frameworks and methodologies. This guidance note explains the primary methodology for Mat 01, including minimum requirements and the scope of the LCA.

The primary purpose of this guidance note is to facilitate the effective application of the information generated throughout the project within the framework of BREEAM V7. It aims to assist assessors in understanding how to align and report project LCA data and information with the specific criteria related to Mat 01.

It's important to note that the guidance presented in this document is intended to provide support in assessing the criteria associated with Mat 01 and should not be construed as constituting the actual criteria. To ensure full compliance, this guidance note should be used in conjunction with the corresponding technical manual that is relevant to the assessment. This will ensure that all criteria are met, and that the methodology section is appropriately followed.

### 3. Project stages

LCAs should be systematically conducted at various stages of a project, including the early design, technical design, and post-construction phases. These assessments should be seamlessly integrated into the project's decision-making process. This approach promotes consistency, encourages early evaluation of environmental impacts, and enables cost-effective mitigation measures compared to later project stages. Thus, compliant LCAs are essential at the following key project phases:

- For interim design stage certification, credits will be awarded for completing LCA and embodied carbon calculations during:
  - **Early design phase:** This sets the architectural concept for a project, aligning with site information and the project brief. You must complete and submit the LCA to BREEAM within 20 working days after submitting for planning application. At this stage, pre-construction forecasts should be used to set the project baseline for ongoing reporting and progress tracking throughout the project. Options appraisals should be carried out at this stage while there is still significant capacity to influence decisions. There are no requirements to carry out a specific number of options appraisals for the project.
  - **Technical design phase:** This typically involves the preparation of all information required to manufacture and construct a building. At this stage pre-construction forecasts should be employed to evaluate the evolving design.
- For post-construction stage certification, credits will be awarded for completing LCA and embodied carbon calculations during:
  - **Post-construction phase:** This is typically after the building has been handed over to the client. A post-construction assessment should be conducted to verify that the predicted carbon reductions outlined in the pre-construction and at-tender forecasts have been achieved.

For further guidance on how the key project phases referenced in this issue compare to other approaches see Figure 1 below.

| SOURCE                                                     | WORK STAGES                  |                            |                        |            |                                           |                      |                              |                                |                                      |                       |              |                                |
|------------------------------------------------------------|------------------------------|----------------------------|------------------------|------------|-------------------------------------------|----------------------|------------------------------|--------------------------------|--------------------------------------|-----------------------|--------------|--------------------------------|
| BREEAM                                                     | INTERIM DESIGN STAGE         |                            |                        |            |                                           |                      |                              |                                | FINAL POST-CONSTRUCTION STAGE        |                       |              |                                |
|                                                            | Early Design Phase           |                            |                        |            | Technical Design Phase                    |                      |                              |                                | Post-construction Phase              |                       |              |                                |
| RICS PS WLC 2023                                           | Early Design Phase           |                            |                        |            | Technical Design Phase                    |                      |                              |                                | Construction Phase                   | Post Completion Phase | In Use Phase | End of Life                    |
|                                                            | Strategic Design Phase       |                            | Concept Design Phase   |            |                                           |                      |                              |                                |                                      |                       |              |                                |
| EU Level(s) (2021)                                         | Level 1: Conceptual Design   |                            |                        |            | Level 2: Detailed Design and Construction |                      |                              |                                | Level 3: As-built and In-use         |                       |              |                                |
| RIBA Plan of Work (2020)                                   | 0 Strategic Definition       | 1 Preparation and Briefing | 2 Concept Design       |            | 3 Spatial Coordination                    | 4 Technical Design   |                              |                                | 5 Manufacturing and Construction     | 6 Handover            | 7 Use        |                                |
| ICMS v3 Project Status                                     | Initiation and Concept Phase |                            |                        |            | Design Phase                              |                      |                              |                                | Construction and Commissioning Phase |                       | Complete     |                                |
| American Institute of Architects (AIA) Plan of Work (2012) |                              | 0 Project Brief            | 1 Pre-design / Concept |            | 2 Schematic                               | 3 Design Development | 4 Construction Documentation | 5 Bidding                      | 6 Construction                       | 7 Commissioning       | 8 Occupancy  |                                |
| BS 8536:2022 Infrastructure                                | Strategy                     | Preparation and Brief      | Concept                | Definition | Technical Design                          |                      |                              | Manufacturing and Construction |                                      | Handover and Closure  | Use          |                                |
| PAS 2080:2023 Work Stages                                  | Need                         | Optioneering               |                        |            | Design                                    |                      |                              |                                | Delivery                             |                       | Operation    | Purpose and Performance Review |

Figure 1: Key project phases used in BREEAM and their relationship to other approaches

## 4. Scenario data

LCAs primarily anticipate future impacts, particularly during early design phases where material predictions, construction effects, and operational outcomes are forecasted. As projects evolve, initial estimations may be replaced by more accurate data or calculations. These forecasts, termed 'scenarios', are mandated to align with current industry norms according to CEN/TC350 standards, presuming 'like for like' replacements for products over the asset's lifespan and modelling end-of-life scenarios based on current demolition or deconstruction practices rather than future predictions. Thus, initial LCA scenarios rely on typical practices, becoming more precise as projects advance and incorporating real construction data for post-completion evaluations. This is shown in Table 1 below.

Table 1: Scenario data for each project phase

| Project phase           | A1-A5                                                                                                                                   | B1-B5                                                    | C1-C4 | D |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-------|---|
| Early Design Phase      | Prediction of scenarios based on default specifications or generic data.                                                                |                                                          |       |   |
| Technical Design Phase  | Prediction of scenarios based on specific data as products are specified and purchased.                                                 |                                                          |       |   |
| Post-construction Phase | Not scenario-based. As-built data used, including actual transport, on-site waste quantities, waste transportation and waste treatment. | Prediction of scenarios based on specific as-built data. |       |   |

## 5. Environmental indicators

LCA results must be submitted for all core environmental impact indicators that the tool or data permits. Indicators specified in EN 15978 and EN 15804 must be used. All BREEAM recognised LCA tools comply with EN 15978 and EN 15804 and offer a suitable range of indicators for reporting. See Table 2 and Table 3 for a full list of indicators from EN 15804 A1 (2013) and A2 (2019). Only one set of indicators can be used at a time (either A1 or A2, unless the tool allows otherwise). BREEAM-recognised LCA tools will produce outputs using suitable indicators (and in a suitable format). There is no requirement for this to be submitted in a specific format as long the LCA output report from the tool used includes all the relevant indicators that the tool or data permits.

Table 2: Indicators in BS EN 15804:2012+A1:2013

| Parameter / indicator type                  | Indicator                                                                                                           | Unit                                    |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| Parameters describing environmental impacts | Abiotic depletion potential (ADP-elements) for non-fossil resources                                                 | kg Sb eq.                               |
|                                             | Abiotic depletion potential (ADP-fossil fuels) for fossil resources                                                 | MJ, net calorific value                 |
|                                             | Acidification potential of soil and water, AP                                                                       | kg SO <sub>2</sub> eq.                  |
|                                             | Depletion potential of the stratospheric ozone layer, ODP                                                           | kg CFC-11 eq.                           |
|                                             | Global warming potential, GWP                                                                                       | kg CO <sub>2</sub> eq.                  |
|                                             | Eutrophication potential, EP                                                                                        | kg (PO <sub>4</sub> ) <sup>3-</sup> eq. |
|                                             | Formation potential of tropospheric ozone, POCP                                                                     | kg ethene eq.                           |
| Parameters describing resource use          | Use of renewable primary energy excluding renewable primary energy resources used as raw materials                  | MJ, net calorific value                 |
|                                             | Use of renewable primary energy resources used as raw materials                                                     | MJ, net calorific value                 |
|                                             | Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ, net calorific value                 |
|                                             | Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials          | MJ, net calorific value                 |

| Parameter / indicator type                                | Indicator                                                           | Unit                    |
|-----------------------------------------------------------|---------------------------------------------------------------------|-------------------------|
|                                                           | Use of non renewable primary energy resources used as raw materials | MJ, net calorific value |
|                                                           | Total use of non renewable primary energy resources                 | MJ, net calorific value |
|                                                           | Use of secondary material                                           | kg                      |
|                                                           | Use of renewable secondary fuel                                     | MJ, net calorific value |
|                                                           | Use of non renewable secondary fuels                                | MJ, net calorific value |
|                                                           | Net use of fresh water                                              | m <sup>3</sup>          |
| Indicators describing waste categories                    | Hazardous waste disposed                                            | kg                      |
|                                                           | Non hazardous waste disposed                                        | kg                      |
|                                                           | Radioactive waste disposed                                          | kg                      |
| Indicators describing the output flows leaving the system | Components for re-use                                               | kg                      |
|                                                           | Materials for recycling                                             | kg                      |
|                                                           | Materials for energy recovery                                       | kg                      |
|                                                           | Exported energy                                                     | MJ per energy carrier   |

Table 3: Indicators in BS EN 15804:2012+A2:2019

| Parameter / indicator type                 | Indicator                                                                                           | Unit                              |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------|
| Core environmental impact indicators       | Global Warming Potential total (GWP-total)                                                          | kg CO <sub>2</sub> eq.            |
|                                            | Global Warming Potential fossil fuels (GWP-fossil)                                                  | kg CO <sub>2</sub> eq.            |
|                                            | Global Warming Potential biogenic (GWP-biogenic)                                                    | kg CO <sub>2</sub> eq.            |
|                                            | Global Warming Potential land use and land use change (GWP-luluc)                                   | kg CO <sub>2</sub> eq.            |
|                                            | Depletion potential of the stratospheric ozone layer (ODP)                                          | kg CFC-11 eq.                     |
|                                            | Acidification potential, Accumulated Exceedance (AP)                                                | mol H <sup>+</sup> eq.            |
|                                            | Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater) | kg P eq.                          |
|                                            | Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine)         | kg N eq.                          |
|                                            | Eutrophication potential, Accumulated Exceedance (EP-terrestrial)                                   | mol N eq.                         |
|                                            | Formation potential of tropospheric ozone (POCP);                                                   | kg NMVOC eq.                      |
|                                            | Abiotic depletion potential for nonfossil resources (ADPminerals& metals)                           | kg Sb eq.                         |
|                                            | Abiotic depletion for fossil resources potential (ADP-fossil)                                       | MJ, net calorific value           |
|                                            | Water (user) deprivation potential, deprivation-weighted water consumption (WDP)                    | m <sup>3</sup> world eq. deprived |
| Additional environmental impact indicators | Potential incidence of disease due to PM emissions (PM)                                             | Disease incidence                 |
|                                            | Potential Human exposure efficiency relative to U235 (IRP)                                          | kBq U235 eq.                      |
|                                            | Potential Comparative Toxic Unit for ecosystems (ETP-fw)                                            | CTUe                              |
|                                            | Potential Comparative Toxic Unit for humans (HTP-c)                                                 | CTUh                              |
|                                            | Potential Comparative Toxic Unit for humans (HTP-nc)                                                | CTUh                              |
|                                            | Potential soil quality index (SQP)                                                                  | dimensionless                     |

## 6. Building elements

All building elements as set out in the BREEAM Platform that are within the scope of the assessment type must be included in any compliant LCA, whatever the project phase. The elemental breakdown structure of building elements is aligned with RICS Whole Life Carbon Assessment Standard, 2nd Edition. See Table 4 for a full breakdown of building elements and alignment between RICS and BREEAM assessment type. All BREEAM recognised LCA tools automatically produce outputs aligned with the structure shown in Table 4.

Table 4: Scope and breakdown of building elements classification for BREEAM assessment types

| Building elements                         |                                                                | BREEAM           |                |            |        |        |        |        | General |       |
|-------------------------------------------|----------------------------------------------------------------|------------------|----------------|------------|--------|--------|--------|--------|---------|-------|
| Granularity Level 1<br>Early design stage | Granularity Level 2<br>Technical design and construction phase | New construction |                |            | RFO    |        |        |        | Cat A*  | Cat B |
|                                           |                                                                | Fully fitted     | Shell and core | Shell only | Part 1 | Part 2 | Part 3 | Part 4 |         |       |
| Demolition                                | Toxic material treatment                                       | Y                | Y              | Y          | Y      | N      | N      | N      | Y       | Y     |
|                                           | Major demolition works                                         | Y                | Y              | Y          | Y      | N      | N      | N      | Y       | Y     |
| Facilitating works                        | Temporary / enabling works                                     | Y                | Y              | Y          | Y      | N      | N      | N      | Y       | Y     |
|                                           | Specialist ground works                                        | Y                | Y              | Y          | Y      | N      | N      | N      | Y       | Y     |
| Substructure                              | Substructure                                                   | Y                | Y              | Y          | Y      | N      | N      | N      | Y       | Y     |
| Superstructure                            | Frame                                                          | Y                | Y              | Y          | Y      | N      | N      | N      | Y       | Y     |
|                                           | Upper floors                                                   | Y                | Y              | Y          | Y      | N      | N      | N      | Y       | Y     |
|                                           | Roof                                                           | Y                | Y              | Y          | Y      | N      | N      | N      | Y       | Y     |
|                                           | Stairs and ramp                                                | Y                | Y              | Y          | Y      | N      | N      | N      | Y       | Y     |
|                                           | External walls                                                 | Y                | Y              | Y          | Y      | N      | N      | N      | Y       | Y     |
|                                           | Windows and external doors                                     | Y                | Y              | Y          | Y      | N      | N      | N      | Y       | Y     |
|                                           | Internal walls and partitions                                  | Y                | S              | S          | S      | N      | N      | Y      | S       | Y     |
|                                           | Internal doors                                                 | Y                | S              | S          | S      | N      | N      | Y      | S       | Y     |
| Finishes                                  | Wall finishes                                                  | Y                | S              | N          | N      | N      | N      | Y      | S       | Y     |
|                                           | Floor finishes                                                 | Y                | S              | N          | N      | N      | N      | Y      | S       | Y     |
|                                           | Ceiling finishes                                               | Y                | S              | N          | N      | N      | N      | Y      | S       | Y     |
| FF&E                                      | FF&E (fixed)                                                   | Y                | S              | N          | N      | N      | N      | Y      | S       | Y     |
|                                           | FF&E (non-fixed)                                               | Y                | N              | N          | N      | N      | N      | Y      | N       | Y     |
| Building services                         | Building services                                              | Y                | S              | N          | N      | S      | S      | S      | S       | Y     |
|                                           | Refrigerant leakage                                            | Y                | S              | N          | N      | Y      | S      | N      | S       | Y     |
|                                           | Renewable electricity generation                               | Y                | S              | N          | N      | Y      | N      | N      | S       | Y     |
| Prefabricated buildings                   | Pre-fab building units                                         | Y                | Y              | S          | Y      | N      | N      | N      | Y       | Y     |
| Work to existing buildings                | Minor demolition and alternation                               | Y                | Y              | S          | Y      | N      | N      | N      | S       | Y     |
| External works                            | External works                                                 | Y                | Y              | S          | Y      | S      | N      | S      | S       | Y     |

\* Category A no standard definition

### Legend

- Y : Yes, included in scope.
- S : Some items included in scope but not all within the NRM category OR it is project dependant if is part of scope.
- N : Not in scope.

## 7. Embodied carbon reporting in the BREEAM Platform

To ensure consistency in the reporting of embodied carbon data, and to align with wider industry, the data structure on the BREEAM Platform follows the RICS Whole life carbon assessment for the built environment (2nd edition). In the BREEAM Platform, embodied carbon data must be completed as follows:

- Modules A1-A5, B1-B5, C1-C4 must be reported.
- Submit results in kilograms of CO<sub>2</sub>e per square metre (kgCO<sub>2</sub>e/m<sup>2</sup>)
- For area measurements, use the Gross Internal Area (GIA) in square metres (m<sup>2</sup>).
- Modules A1-A3 may be reported together.
- When possible, and if the tool used allows for it, report biogenic carbon from construction products (negative value) separately.
- Module D is required unless EN 15804-A2 EPD data is not available for used products.

## 8. Schedule of changes

| Version | Release date | Description of change                                                                                                                                                                                                                                                                           |
|---------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.0     | Jul 2024     | First issue                                                                                                                                                                                                                                                                                     |
| 1.1     | Jul 2026     | Added and updated 'Scope' section to include BREEAM Refurbishment and Fit Out V7 and BREEAM UK New Construction Residential V6.1. Updates and clarifications to Sections 3, 5, 6, and 7 to remove references to the "Embodied Carbon Template" and align with reporting in the BREEAM Platform. |

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