



Richmond Inn

Whole Life Carbon Comparison

Bridges Healthcare (Richmond) Limited

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This is the report summarizing the attached updated Whole life Carbon (over 60 years) calculation and comparison graphs to demonstrate the carbon difference between existing and proposed development.

Reuse of the existing modern extension has been considered by the client and the design team. From an operational point of view the existing extension does not provide the required spatial quality in terms of accessible layouts and ceiling heights. Furthermore an additional storey is required to make the scheme viable. The proposed scheme achieves this mainly by lowering the ground floor and increasing slightly the roof level. The existing load-bearing masonry structure is not suitable for excavating beneath or realigning internal partitions to the extent required for the proposed scheme. The existing building is also of poor build and design standards, resulting in a sub-standard energy performance, the existing extension performs significantly worse than the new building, which is expected to achieve BREEAM Excellent rating and to be 67% better in regulated emissions than a standard new build property in accordance to the Sustainability and Energy Strategy submitted within the planning application.

Whole life-cycle carbon emissions are the total greenhouse gas emissions arising from a development over its lifetime, from the emissions associated with raw material extraction, the manufacture and transport of building materials, to installation/ construction, operation, maintenance and eventual material disposal.

Operational carbon emissions will make up a declining proportion of a development's whole life carbon emissions as operational carbon targets become more stringent. To fully capture a development's carbon impact, a whole life-cycle approach is needed to capture its unregulated emissions (i.e. those associated with cooking and small appliances), its embodied emissions (i.e. those associated with raw material extraction, manufacture and transport of building materials, and construction) and emissions associated with maintenance and eventual material disposal).

To provide a holistic view of the Whole Life Carbon of the development, the assessment accounts for all components relating to the project during all life stages.

Whole Life Carbon emissions are attributed to four main categories taken from BS EN 15978. The categories are:

- Product Stages (module A1 to A3): The carbon emissions generated at this stage arise from extracting the raw materials from the ground, their transport to a point of manufacture and then the primary energy used (and the associated carbon impacts that arise) from transforming the raw materials into construction products.
- Construction (module A4 to A5): These carbon impacts arise from transporting the construction products to site, and their subsequent processing and assembly into the building.
- In-Use Stages (module B1 to B5): This covers a wide range of sources from the embodied carbon emissions associated with the operation of the building, including the materials used during maintenance, replacement and refurbishment.

- End of Life Stages (module C1 to C4): The eventual deconstruction and disposal of the existing building at the end of its life takes account of the on-site activities of the demolition contractors. No 'credit' is taken for any future carbon benefit associated with the reuse or recycling of a material into new products.

This study covers the following:

- Embodied Carbon at Practical Completion (A1 to A5);
- Embodied Carbon over life cycle (B1-B5 and C1-C4)
- Operational emissions (B6)

The following building components are included in the assessment:

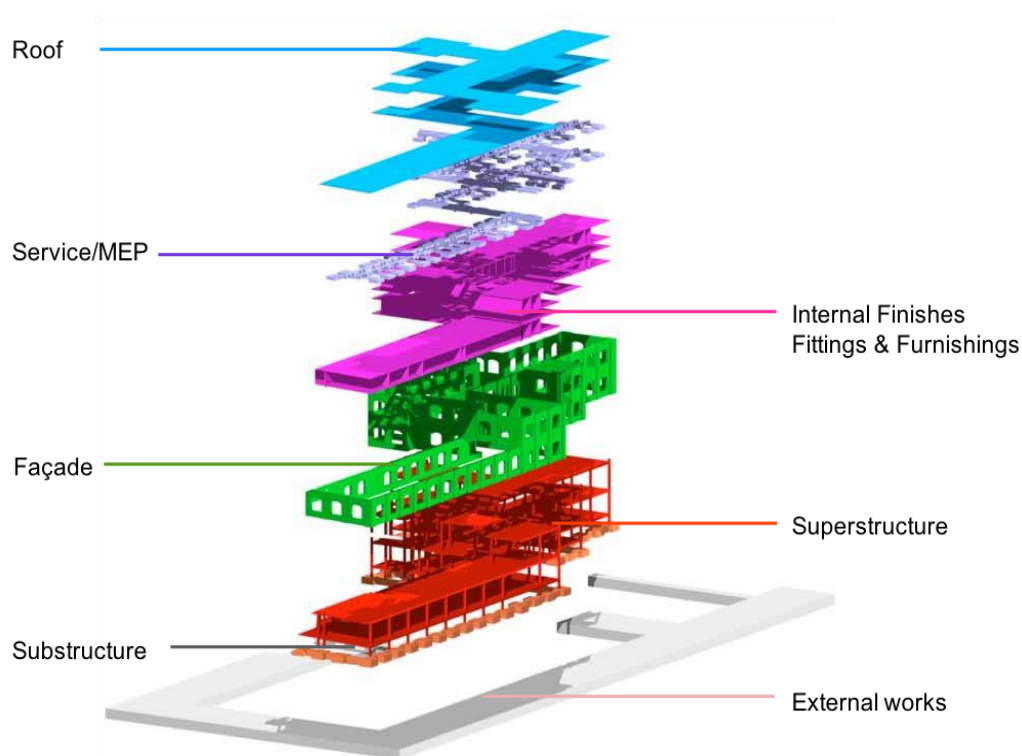


Figure 1: Indicative 3D Model of scope of elements analysed for embodied carbon Impact

The following data and allowance were used for the assessment:

- Existing building (1722 m² GIA)
- Proposed design (866 m² existing +1832 m² new =2698 m² GIA)
- The operational emission of the existing building was estimated using BRUKL/EPC reports
- The operation emission of the new proposal was calculated using BRUKL repost result
- Embodied Carbon at completion and over life cycle of the proposed building was calculated using bill of quantities supplied by the client).
- Embodied Carbon over life cycle of the existing building was estimated to be the same as new built (carbon per m² GIA).

- Emission from Demolition (site energy use and transport of demolition waste) is calculated using industry average benchmarks for similar projects
- External work and MEP elements are calculated using industry average benchmarks from similar projects.
- Operational water (B7) is not yet included

Assessment result summary

Richmond Inn	Embodied carbon at practical completion A1-A5)	Embodied carbon over life cycle (B1-B5 and C1-C4)	Operational emission B6
Existing building (1,722 m2 GIA)	None	378 kg CO2e/m2	Taken from CIBSE Guide F
Proposed refurbish & extension (866 m2 existing +1832 m2 new =2698 m2 GIA)	338 Kg CO2e/m2	378 kg CO2e/m2	Data from energy strategy report

From the results below, it can be observed that the existing hotel building has high operational emissions (due to the poor fabric and obsolete plant). and this has made the proposed new build C2 development more favourable in terms of Whole life Carbon reduction.

Both total carbon value and carbon intensity value (kg CO2e/m2 GIA) were compared, see graphs below and vales used.

Total Carbon Value compare of the two scenarios (unit: Tonne CO2e):

Richmond Inn	Embodied carbon at practical completion A1-A5)	Embodied carbon over life cycle (B1-B5 and C1-C4)	Operational emission B6	Total Whole Life Carbon
Existing building	None	650,742	16,376,220	17,026,962
Proposed refurbish & extension	910,699	1,019,571	4,912,700	6,842,970
				60% less than existing building

Total Carbon Value compare of the two scenarios (unit kg CO2e/m2):

Richmond Inn	Embodied carbon at practical completion A1-A5)	Embodied carbon over life cycle (B1-B5 and C1-C4)	Operational emission B6	Total Whole Life Carbon
Existing building	0	378	9,510	9,888
Proposed refurbish & extension	338	378	1,821	2,536
				74% less than existing building

