



RIDGE

WYTHENSHAW TOWN CENTRE EMBODIED CARBON SUMMARY REPORT

27th November 2025

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Prepared for

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

EXECUTIVE SUMMARY

Ridge and Partners LLP have been appointed by Muse & Wythenshawe Community Housing Group to undertake an Embodied Carbon study for the proposed new residential development 'Wythenshawe Town Centre' in Manchester. The study covers the proposed scheme which consists of 3.3 Brotherton House, C2 The Birtles and 2.1 Alpha House. The modelling results are based on the Arcadis Stage 2 Cost Plans, further supplemented by design information and assumed material quantities where necessary to provide a best estimate of each building's impact at this stage. Please note the below modelling does not include emissions associated with operational energy or water, as this is not within an embodied carbon scope.

All available information was collected from the team to form the most accurate picture of the proposed scheme as possible, however it is acknowledged that some elements rely on more detailed information being developed by the team during the upcoming design stages. The headline results are reported below:

Table 1. Embodied Carbon totals.

	Embodied Carbon (Carbon Modules A1-A5, B1-B4 & C1-C4)	
	tCO ₂ eq	kgCO ₂ eq/m ² GIFA
3.3 Brotherton House (19,614m²)	15,730	802
C2 The Birtles (6,929m²)	5,620	811
2.1 Alpha House (7,528m²)	6,150	817
Total (34,071m²)	27,500	807

To put the above results into context, the buildings are currently each located within Band D of the RIBA Embodied Carbon rating scale, narrowly exceeding the RIBA 2025 Target for residential buildings by a range of 2-17kgCO₂/m², which equates to a 1-2% exceedance in total.

As the construction methodologies and results are similar across the 3no developments, the further data analysis of the modelling applies a cumulative approach to the results. Interrogating the reported carbon totals further, the figure below shows the 12 most significant impacts for Embodied Carbon (carbon modules A1-A5, B1-B4, C1-C4). The graph also shows the division between the Upfront Carbon (A1-A5) and the subsequent In-Use and End-of-Life Carbon emissions (B1-B4, C1-C4). The results show that the Building MEP Services are the most significant embodied carbon impact of the scheme (21%), which is likely as a result of a combination of a substantial amount of material introduced to the scheme initially, combined with significant and frequent predicted replacement of materials and systems over the development lifetime (known as Module B4), accounting for 10% of the total embodied carbon impact across the scheme.

The significant contribution of MEP carbon emissions to embodied carbon for the development is influenced by several factors. The MEP equipment is often replaced multiple times over the building's lifespan, and therefore maintenance, replacement, and other emissions such as refrigerant leakage, can massively increase the contribution of services equipment to a building's embodied carbon footprint. Prioritising passive design solutions, such as natural ventilation and the optimisation of building orientation alongside effective shading strategies can minimise the reliance on mechanical and electrical components. Identifying and selecting durable equipment which provides a greater service life, to reduce through-life maintenance requirements should also be considered for future schemes. Additionally, any further rationalisation of wiring, pipework, ducting extent would help to reduce the total impact of this element.

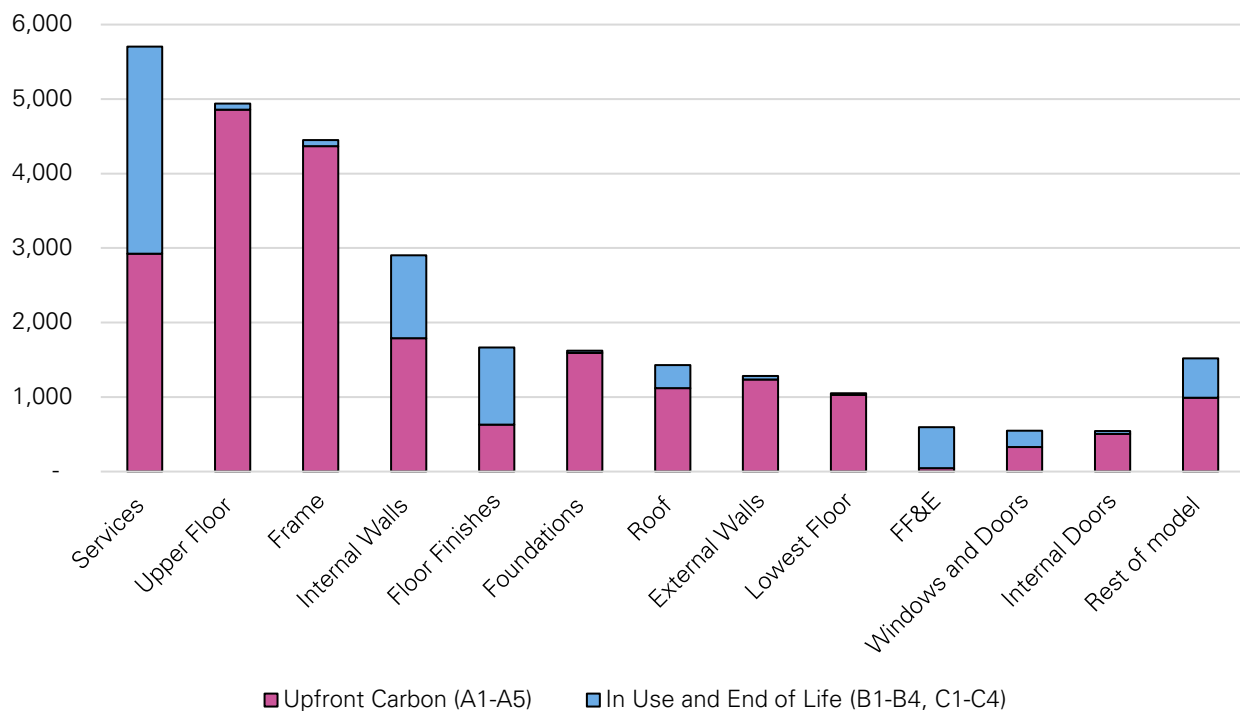


Figure 1. Embodied Carbon by key elemental impacts

Without exact information or specifications provided (which is typically the case for scheme at this early stage), based on RICS methodology and dependent on the equipment assumed at this stage of design, a lifecycle of 15-20 years has been applied to the MEP elements. During the remaining design and construction stages, where the service design is further progressed and manufacturers can provide documentation showing their products are guaranteed for a longer period than specified, these assumptions can be amended to reduce the emissions associated with replacement. This will provide a much more accurate overview of the emissions associated of their systems, and their service life.

Given the mid / high-rise nature of the buildings, the structural solution is also shown to be a significant contributor to the carbon. As such, when combined the Lowest Floor, Upper Floor, Frame and Foundation construction are the most significant material impacts across the buildings by some margin, with 51% of the total embodied carbon impact attributed to these elements. In contrast, although the Upper Floor and Frame make up the largest upfront carbon impact due to the carbon intensity of Ordinary Portland Cement within the concrete construction, in-use emissions associated with replacement and repair are negligible and therefore the contribution to the total embodied carbon is significantly lower (albeit a very minor embodied carbon impact is reported for the end-of-life processes).

The External and Internal Walls are both within the top impacts for the scheme. In contrast to the services, the external walls and to a lesser extent the internal walls demonstrate a significant impact due to the carbon intensity associated with each of their constructions. Utilising materials containing a recycled content reduces the need for raw material extraction and processing, consequently lowering carbon emissions. Further steps to specify reused or higher recycled content products or materials could be made for the external walls and internal blockwork walls, through exploring initiatives such as using reclaimed bricks and blocks containing cement replacement. The use of unfired bricks for the external and non-bearing internal walls could also be investigated as these contain significantly less embodied carbon than standard clay bricks.

Finishes to floors are a significant contributor to the embodied carbon reported. Primarily finishes have short replacement cycles (~10 years on average) and as such have contributed highly to the In-Use emissions, as shown in Figure 1. Some specific finish products have been assumed for the Development at this stage based

on the information provided within the Wythenshawe Employers Requirement Documentation and EPDs have been applied to the model where these are available. Any possibility of increasing the duration of the service life of the finishes specified for the development is likely to provide a significant carbon saving. This emphasises the importance of optimising the finishes specification by modelling and comparing products, verified using Environmental Product Declarations, to ensure long lasting and durable products are selected.

The breakdown between upfront and subsequent embodied carbon impacts ultimately highlights which elements have an impact predominantly associated with the initial material and construction (e.g. concrete frame, substructure) and which elements have a more staggered impact associated with cumulative lifetime replacements (e.g. building services, floor finishes and fittings & furnishings).

POSSIBLE MITIGATION MEASURES

The most efficient method of reducing carbon emissions is to build less and reuse existing products and materials, however, this is not always possible due to availability or building performance requirements. Therefore, the next step is often to look for lower carbon alternatives within the materials commonly used and to prioritise efficiency.

Cement

Concrete is one of the most carbon intensive materials used in construction and this is largely attributable to the Portland Cement within, which has a very energy intensive production process. Long term, concrete manufacturers need to bring down the impacts associated with cement to help decarbonise construction, but in the short-term replacing cement with functionally equivalent alternatives can help to achieve notable savings.



Figure 2. Pour of concrete slab. Where cement replacement and minimisation practices are implemented the carbon impact associated with concrete elements can be notably reduced.

Fly Ash (PFA) and Ground Granulated Blast Furnace Slag (GGBS) are two examples of commercially available cement replacement products which are both by-products of heavy industry (iron-making blast furnaces for GGBS, and coal-burning power plants for PFA). In both cases, their carbon impact is comparatively lower than Portland Cement, and therefore their partial usage helps to reduce reliance on more high-carbon material. In the case of this study, allowances have been made for the minimum cement replacement rates to the Raft Foundations and Lower Structural Columns based on information provided by the structural engineer Renaissance Ltd, however higher proportions of cement replacement could potentially be incorporated subject to review of the impact on concrete curing times and their availability at the time of procurement.

At present, GGBS is increasingly being specified on developments as a means of reducing the embodied carbon impact of concrete, so much so that GGBS is transitioning away from being an underutilised by-product and instead is now in high commercial demand for the sustainability benefits and other unique technical properties. At the same time, the heavy industry processes that produce these by-products are slowly being phased out in the UK (with blast furnaces being replaced by electric arc furnaces for steel production, and coal fired power stations being decommissioned). As a result, the subsequent embodied carbon impact of GGBS / PFA is expected to increase over the coming years. Additionally, the UK standard for concrete specification (BS8500) is in the process of being updated to provide further opportunities for cement replacement through the use of materials such as Limestone Calcined Clay Cements (LC³) at higher than previously allowed rates, again offering a route to lowering the embodied carbon impact of concrete.

As shown within the results section above, the substructure and superstructure elements are all predicted to be significant contributors to the upfront total due to the concrete construction, currently exacerbated by the assumption that no cement replacement will be included in the concrete mixes at this stage. There are various opportunities to reduce the impacts arising from the concrete elements as the design progresses. As per the outcomes of the design scenario modelling, the use of 40% GGBS cement replacement has been applied to the substructure elements, such as the piles and pile caps in addition to the use of 25% GGBS in the lowest floor slab, upper floor slabs, walls and column elements as a comparative measure to reduce the carbon impact of the design.

As shown in Table 2 below, if the proposed rates of GGBS were incorporated into the development this would lead to notable savings across each building, with each scheme subsequently within the performance levels set out for 2025 in the RIBA Climate Challenge guidance. The application of the recommended rates of cement replacement will be subject to review at a later stage by the structural engineers for the scheme.

Building Totals - With Cement Replacement Incorporated As Above	Embodied Carbon (Modules A1-A5, B1-B4 & C1-C4) kgCO₂eq/m² GIFA
3.3 Brotherton House (19,614m²)	763
C2 The Birtles (6,929m²)	779
2.1 Alpha House (7,528m²)	766

Table 2. Embodied Carbon totals associated with the application of 40% and 25% GGBS respectively to the substructure and superstructure elements to each plot

Transportation of Products and Site Construction Impacts

In addition to using industry average material quantities (where estimations are unavailable at the early design stage), the modelling software also relies on default transport distances (Module A4) which are currently included in line with RICS Whole Life Carbon guidance. These impacts are assigned to each element individually, so the reported values for each building element include a proportion of transport impact within them. Typically, the A4 impacts contribute ~10% of the upfront carbon total, so interrogating and improving upon the default transport distances allowed for currently by procuring construction materials and products locally could lead to a notable saving in the carbon total.

Construction site impacts (Module A5), meanwhile, are calculated and applied across the development generally, rather than against individual elements, based on best practice guidance from the Building Research Establishment (BRE). These impacts form a significant part of the overall reported embodied carbon total (approximately 4%) therefore improved contractor performance over the baseline assumptions will generate a reduction in the overall upfront carbon totals. Savings could be made by targeting reductions in waste generated on site (and maximising re-use of materials), and through reduction in impact of site fuel use (lower diesel usage, replacing diesel with grid electricity / biodiesel).



Figure 3. Transport of concrete from manufacturing plant to construction site. Transport of materials to site typically accounts for around a tenth of the total upfront carbon impact (A1-A5).

ASSUMPTIONS AND LIMITATIONS

To further supplement the information provided by the design team, certain assumptions have been made. These are based on reasonable industry standards and on our experience with similar building projects. These assumptions were verified with the design team / client team, and are listed below:

- Arcadis have provided Stage 2 Cost Plans which provides an indicative cost of all materials specified at this stage and ensures a minimum of 95% of the capital cost for the project for each building element has been accounted for within the assessment. This has been further supplemented by material allowances provided within the Wythenshawe Employers Requirement document and assumed material quantities from the design team where necessary to provide a best estimate of the scheme's impact at this stage.
- Transport impacts (Module A4) have been included in line with the RICS Whole Life Carbon guidance. No specific product transport details have been included, as procurement has not been defined at this early stage.
- Construction impacts (Module A5) have been included in line with assumed fuel usage and waste production values across the full construction period of the project as follows:
 - Site Waste: 6.5t per 100m² gross internal area based on BRE good practice site waste guidance.
 - Site Energy Use: 23.58 kWh; 1.12 l diesel and 0.05l petrol all per m² gross floor area (based research conducted on construction site operations in temperate climatic regions, provided by One Click LCA software).
- For concrete specifications, information provided by Civic and AJP for the likely strength, reinforcement and cement replacement rates have been used. Temporary structures, such as formwork have been excluded from the assessment scope.
- At this stage, high level allowances for mechanical & electrical installation have been made based on information provided by the Civic MEP team and extrapolated across the whole design.
- Information provided by the design team and the Employers Requirement Specification has been used to account for finishes, sanitaryware, fittings and furnishings across the scheme. Non-fixed fittings, furnishings and equipment have been excluded from the assessment scope.

- Where no EPD information or specific product references have been provided, generic UK EPDs have been selected matching the closest description to the materials detailed on the documents provided, with assumed recycled contents aligning with RICS Whole Life Carbon Guidance.
- Module B1 (Emissions in Use) has been accounted for using values for refrigerant charge provided by the design team. R32 and R1234ze have been included as the operational refrigerant types and annual / end-of life have been assumed as 2% and 1% respectively for package systems, and 6% and 3% respectively for VRF systems, in line with TM65 guidance
- Modules B2 (Maintenance) and B3 (Repair) have been assumed at 10 kgCO₂eq/m² GIFA and 2.5 kgCO₂eq/m² GIFA respectively, in accordance with GLA Whole Life carbon assessment methodology (London Plan Guidance: Whole Life Carbon Assessments).
- Module B4 (Replacement) has been incorporated in the form of default product service lives for each material, based on RICS Whole Life Carbon guidance. For example, windows and internal finishes have an assumed expected lifespan of 35 years and 10 years respectively.
- Module C1 (Deconstruction / Demolition) has been assumed based on UK average demolition impacts relative to gross floor area, as provided by RICS / One Click LCA software.
- Modules C2-C4 (Waste Transportation, Waste Processing & Waste Disposal) are assumed based on end-of-life processing chains relative to each material, as provided by One Click LCA software.