

03

Carbon Reductions

03.1 Carbon Reductions

Implemented Reduction Measures

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Omission of basement

One decision that was central to the scheme's reduction of carbon was the decision to omit basements from both block A (Shared living) and block B (Affordable). The associated foundation and sub-structure works (including basement slabs, secant piling, reinforcement, insulation and waterproofing) represented one of the most carbon-intensive elements of the scheme, driven primarily by the secant piling required to retain the excavation. Omitting the basements avoids an estimated 2,025 tCO₂e in total (1,030 tCO₂e for Block A, 995 tCO₂e for Block B).

Limiting transfer slabs to local areas

A further consideration has been made to ensure that there are limited transfer slabs to localised areas. As transfer slabs use substantially more concrete and steel reinforcement to allow for a change in the structural grid, they create an increase in carbon. The scheme has been designed with a consistent structural grid carried through from foundation to roof wherever possible, avoiding the need for transfer structures except where unavoidable, such as at ground floor level to accommodate commercial units and amenity spaces below the residential grid above. By limiting transfers to these localised areas rather than across full floor plates, this represents a carbon saving.

Omission of suspended ceilings

When considering finishes for the shared living block, a decision was made to omit suspended ceilings in the amenity spaces. Suspended ceilings require additional materials, typically a supporting grid system and ceiling tiles, on top of the exposed soffit finish, adding embodied carbon without a corresponding structural or acoustic necessity in these spaces. Over the amenity floor area of approximately 1,387 m², omitting suspended ceilings avoids an estimated 25 tonnes of CO₂e, equivalent to a carbon saving of approximately 18 kgCO₂e/m².



Figure 6: Ground Floor plan of building A & B (provided by DLA Architects) which include basement areas that carbon calculation for a basement has been based on.

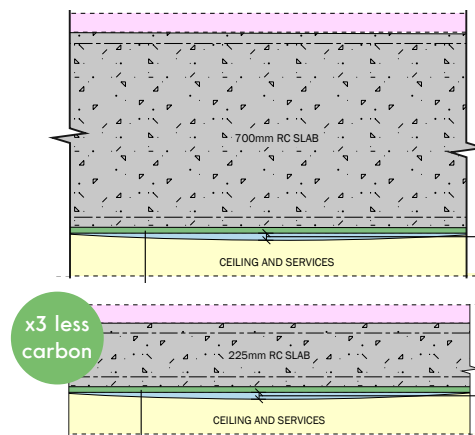


Figure 7: (Top) Image of transfer slab detail (provided by Whitby Wood) vs (bottom) image of typical slab.



Figure 8: Ground Floor plan of building A (provided by DLA Architects) which highlights amenity areas omitting a suspended ceiling finish.

03.2 Carbon Reductions Opportunities

Superstructure studies

Superstructure studies

R.C Flat Slab

A reinforced concrete flat slab is a traditional flat-soffit slab system with no beams, spanning directly between columns at up to 6.5m, here modelled at 225mm deep with an embodied carbon of 153 kgCO₂e/m².

Advantages: excellent flexibility for partition and services layouts due to the flat soffit, strong inherent fire resistance and acoustic performance, straightforward buildability using a simple and widely-used construction method and competitive tender pricing given how common the system is.

Disadvantages: highest embodied carbon of the concrete options studied, along with heavier construction that increases loading on the foundations.

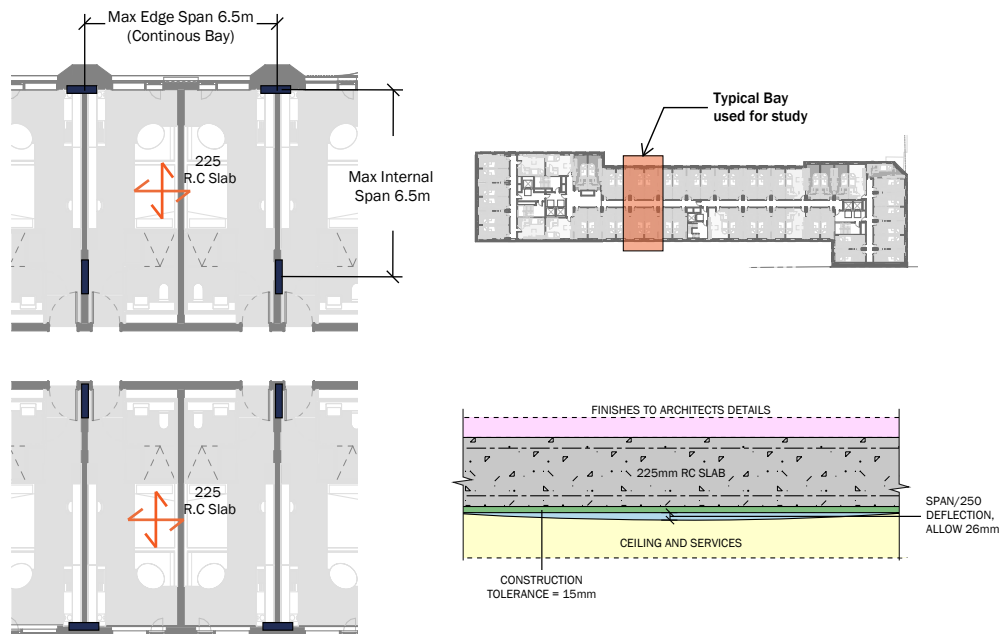


Figure 9: Information, plans and sections provided by Whitby Wood.

Post Tensioned Slab

A post-tensioned slab uses tensioned steel tendons within a 200mm reinforced concrete slab to reduce depth and self-weight while spanning the same 6.5m grid, achieving a lower embodied carbon of 142 kgCO₂e/m².

Advantages: thinner structural zone that can reduce floor-to-floor heights, reduced embodied carbon compared to a flat slab due to lower concrete volume, good fire resistance and acoustic properties, and lower foundation loads as a result of the reduced slab depth.

Disadvantages: the need for specialist frame contractors and machinery to jack and coordinate the tendons, which adds cost and construction complexity compared to conventional reinforced concrete.

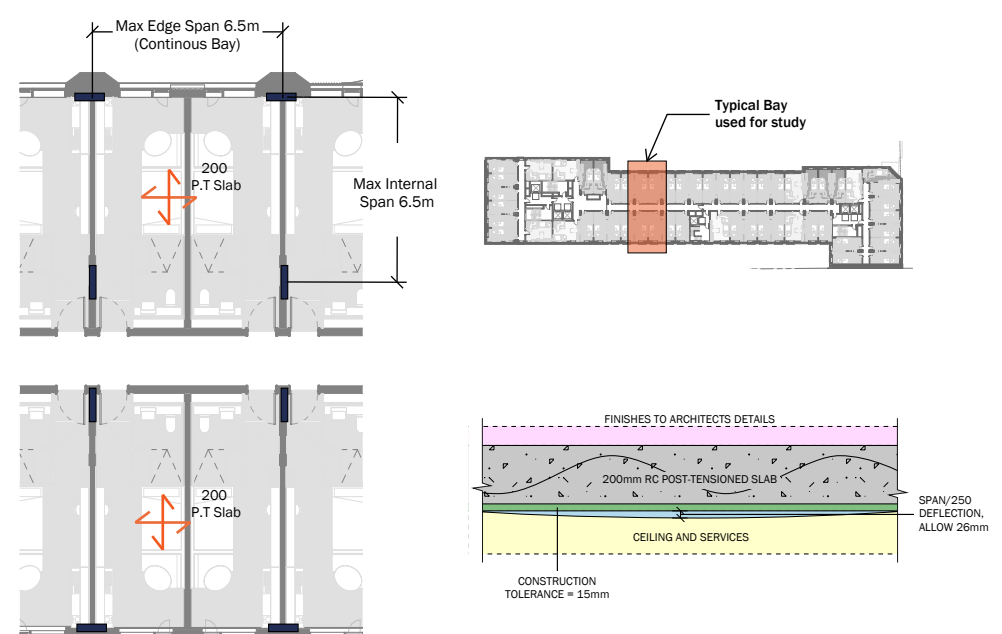


Figure 10: Information, plans and sections provided by Whitby Wood.

03.3 Carbon Reductions Opportunities

Superstructure studies

Superstructure studies

One way ribbed slab

A one way ribbed slab consists of 250mm deep ribs at 750mm centres with a 120mm structural topping, spanning onto 600x300mm RC beams, giving an embodied carbon of 131 kgCO₂e/m².

Advantages: reduced embodied carbon relative to a flat slab through lower concrete volume, and good inherent fire and acoustic performance.

Disadvantages: a more complex, stepped soffit that complicates buildability, the need for MEP services to be routed around the ribs, columns that must align to suit the beam layout, more traditional and labour-intensive formwork, and heavy construction loads on the foundations.

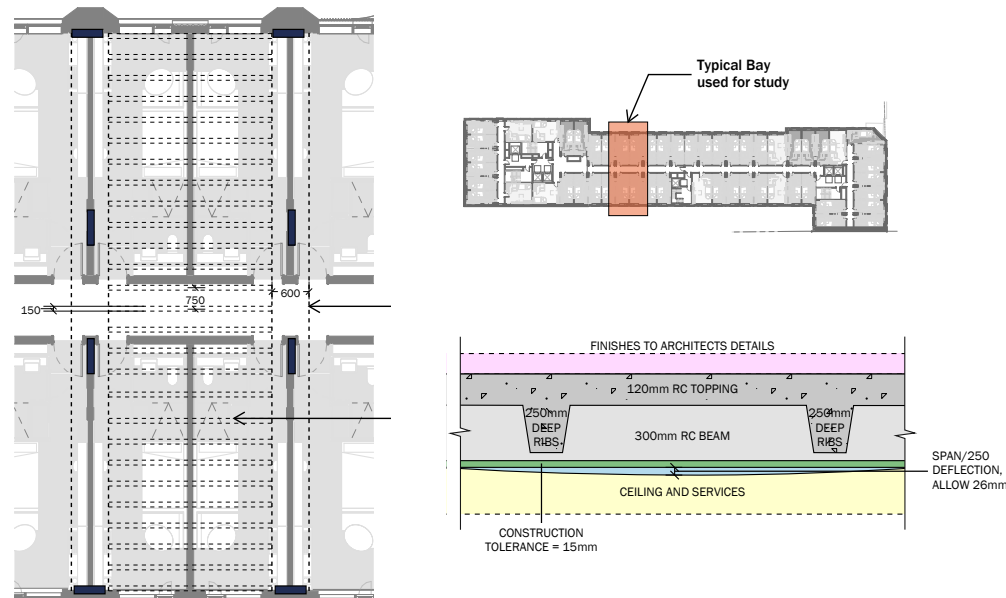


Figure 11: Information, plans and sections provided by Whitby Wood.

One Way slab with band beam

This system uses 150mm one-way spanning slabs bearing onto wide, shallow 2400x250mm band beams, resulting in an embodied carbon of 144 kgCO₂e/m².

Advantages: a soffit that is largely flat except at the band beam junctions, good fire resistance and acoustic properties, and a widely-used construction methodology that should attract competitive tender returns.

Disadvantages: embodied carbon comparable to a flat slab, services needing to be positioned to avoid the band beams, columns needing to align to suit the beam grid, and heavy construction loads on the foundations.

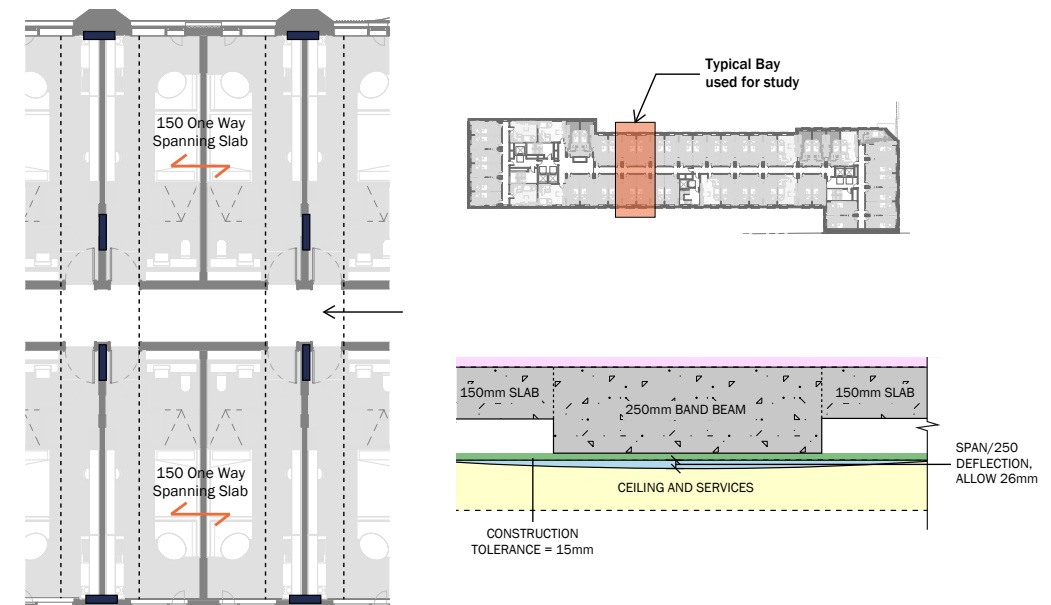


Figure 12: Information, plans and sections provided by Whitby Wood.