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Addressing Net Zero: Timber construction and whole life carbon

2024 / RIBA London

Chris Gaze

Whole life carbon

A1-3: Product stage

D: Beyond the project life cycle

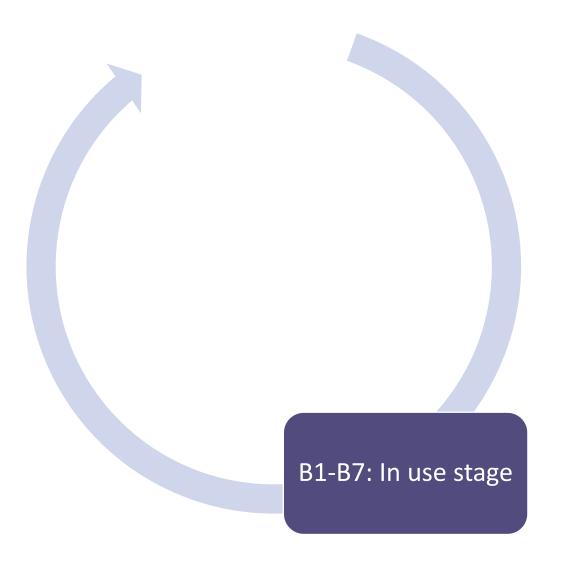
A4-A5: Construction stage

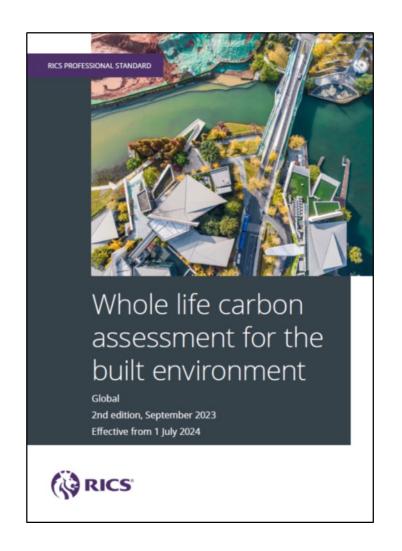
C1-C4: End of life stage

B1-B7: In use stage

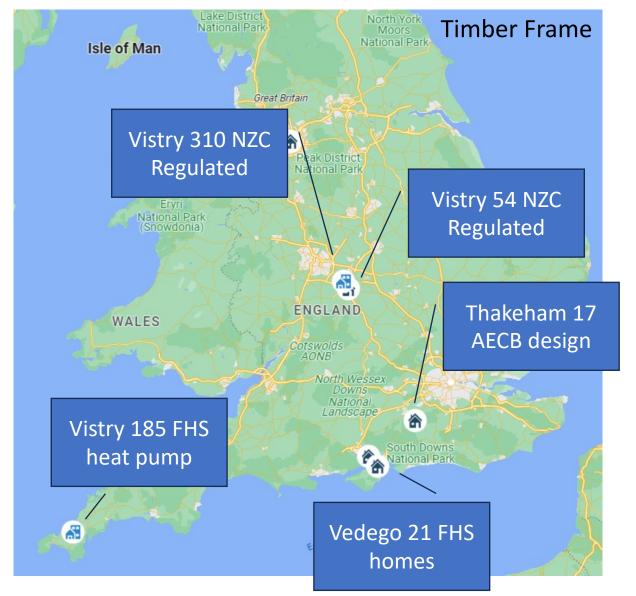


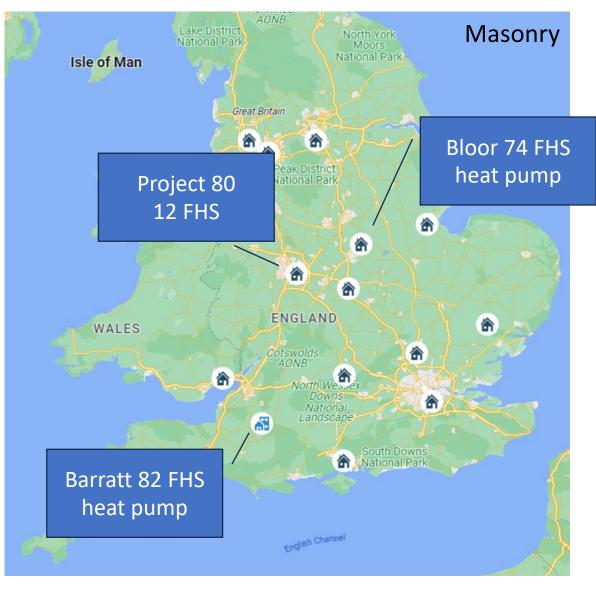
Carbon in use





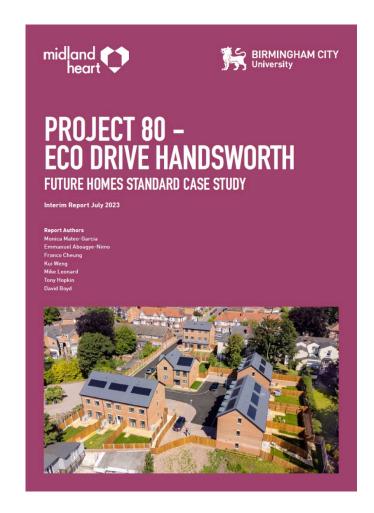
Carbon in-use: FHS Case Studies (see Future Homes Hub)





Project 80: Design Specification

	Type 1	Type 2	Type 3
External wall U- value (W/m2 K)	0.13	0.13	0.13
Air permeability (m3/h/m2)	1.5	1.5	5
Y-value	0.028	0.0274	0.028
			IEF As built: 4.51 – I.99 (8 homes)



Project 80: Construction and costs

- Fully filled 150mm cavities
 - Clean mortar from behind bricks
 - Placing solid insulation
 - Detailing around windows
 - Xtratherm insulation 382% additional cost (average £2900 per house)
- Type 1 & 2 non-permeable blocks
 - Average £1200 per house
- Type 1 & 2 polymer spray
 - No one else can work in the houses
 - Average £2900 per house
- Improvements will be made
 - Trades will improve
 - Costs will reduce







Future Homes Hub Details (see guides)

U-value	Insulation	Structure	Description (dims in mm)	Dim
0.19 15% timber fraction	Mineral wool λ=0.032	Lightweight blk	140mm full fill cavity	370
		Timber Frame	Int cavity, low-e BM, 140 stud	342
	PIR λ=0.022	Aircrete	75mm insulation & 50mm cavity	355
		Timber Frame	Low-e BM, 120 PIR in 140 stud	317
0.18 masonry/ 0.17 timber frame 15% timber fraction	Mineral wool λ=0.032	Aircrete	150mm full fill cavity	380
		Timber Frame	Int cavity, low-e BM, 25 PIR over boarding, 140 stud	367
	PIR λ=0.022	Aircrete	85mm insulation & 50mm cavity	365
		Timber Frame	Int cavity, low e BM, 25 PIR over boarding, 90 PIR in 140	367
0.15 15% timber fraction	Mineral wool λ=0.032	Aircrete	185mm full fill cavity	415
		Timber Frame	Int cavity, low-e BM, 40 PIR over boarding, 140 stud	382
	PIR λ=0.022	Aircrete	85 insulation in cavity & 50 clear. 35 on plasterboard	390
		Timber Frame	Int cavity low-e BM, 25 PIR over boarding, 90 PIR in 140	367

Whole Life Carbon vs Embodied carbon

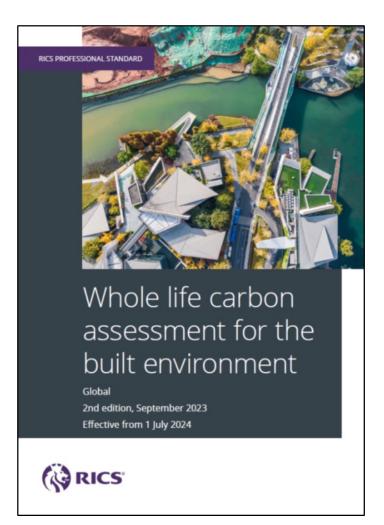
A1-3: Product stage

D: Beyond the project life cycle

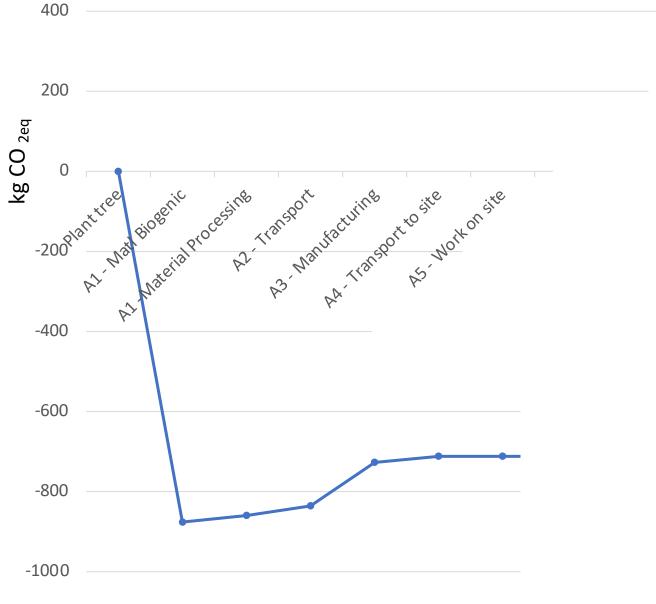
A4-A5: Construction stage

C1-C4: End of life stage

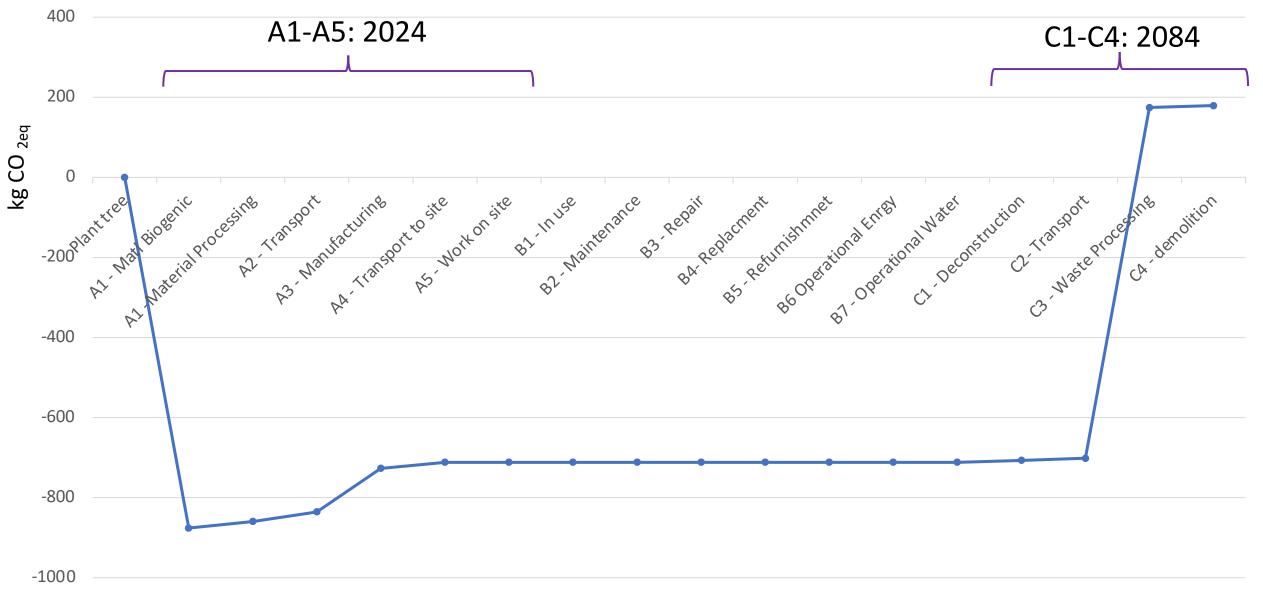
B1-B7: In use stage



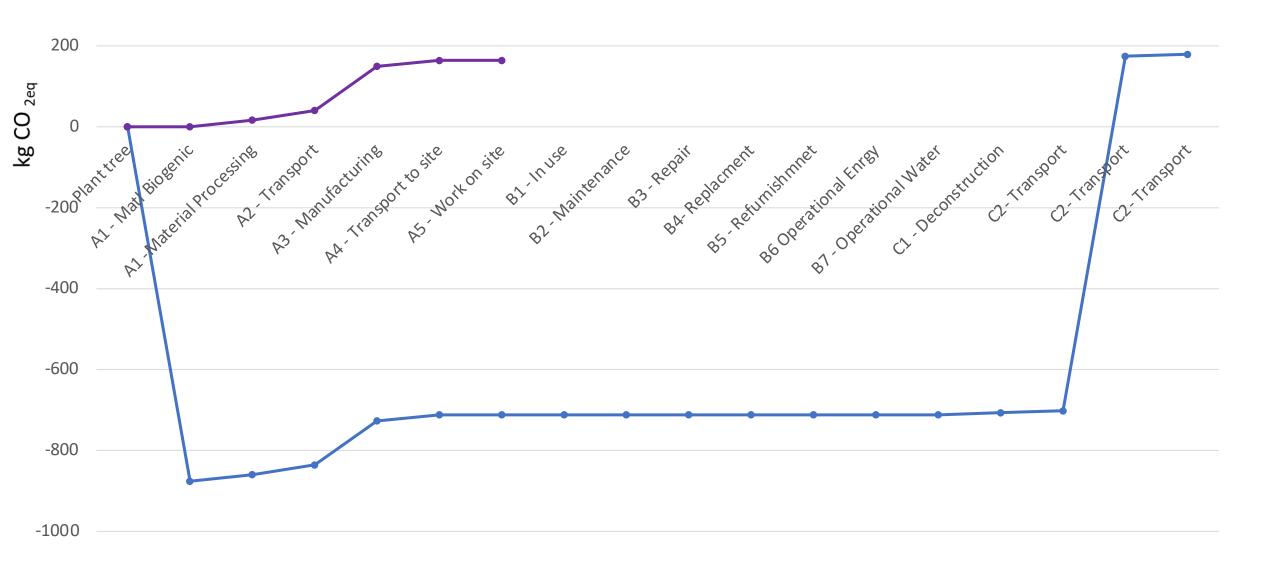
Whole Life Carbon for 1m³ of timber (indicative only)



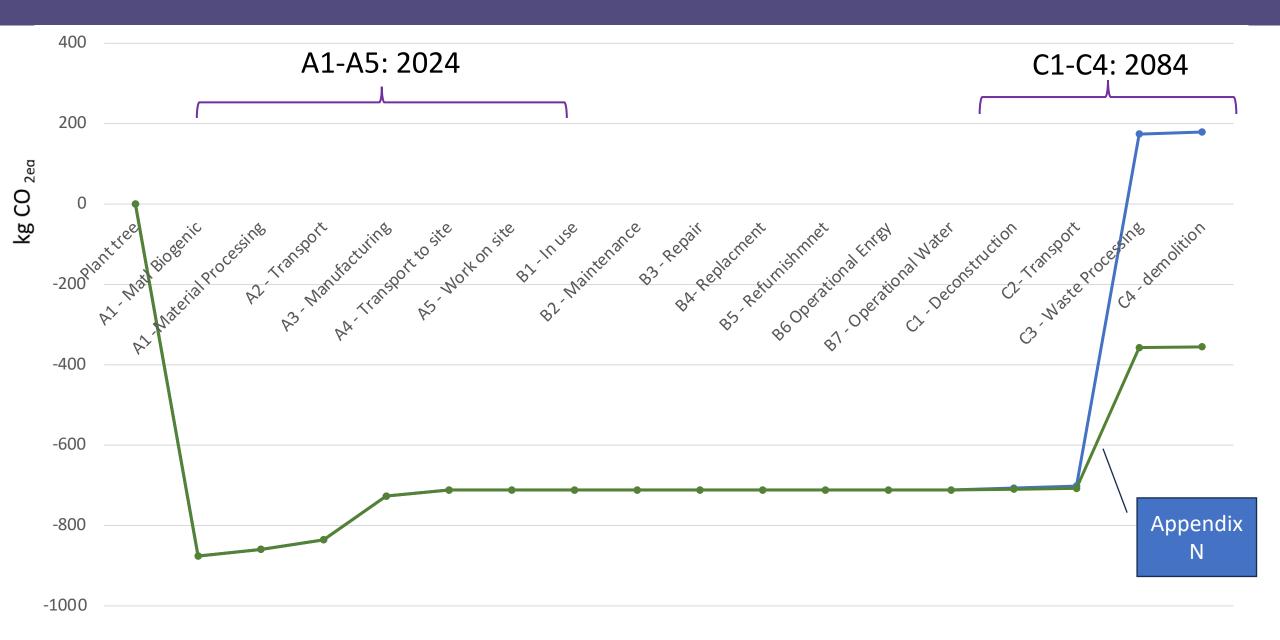
Whole Life Carbon for 1m³ of timber (indicative only)



Upfront carbon only (ignore biogenic carbon)



Time Value of Carbon over 60 years



Conclusion: Whole Life Carbon Calculation

- The RICS Professional Standard main calculation:
 - "cancels out" the advantages of sequestration, but you can use Appendix N
 - assumes end of life at 60 years regardless
- Benchmark yourselves perhaps via the Future Homes
 Hub
- Look to reduce carbon wherever you find it

An industry-proposed amendment to The Building Regulations 2010

Whole life carbon

INDUSTRY-PROPOSED DOCUMENT

- Z1 Carbon assessments
- **Z2** Carbon intensity

Disclaimer: This document is not part of the Building Regulations. It has been produced by and in conjunction with the construction industry as proof of concept in order to demonstrate one way in which embodied carbon could be introduced into UK regulation. For accompanying commentary on this document, visit www.part-z.uk, or contact hello@part-z.uk or contact hellow or contact

Proposal revision 2 31 January 2024

A proposal from the construction industry

Conclusion: Carbon and Timber Frame

- Good whole carbon results
- Compact walls for a given U-value
- Airtight (if you want it to be)
- A dry process which quickly produces a weathertight shell

