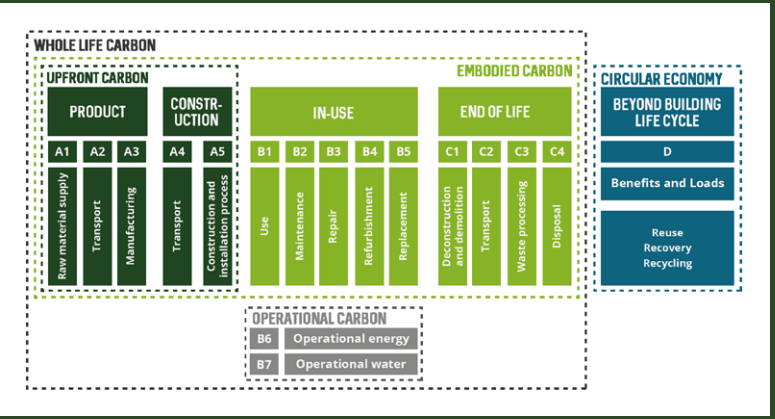


We focus on Upfront carbon as they are most likely the majority of embodied carbon impacts associated with a project.

Included are Product stages A1-A3, plus Transport A4 to wales and Material waste from Construction installation A5W.
Excluded are emissions due to energy usage on site during construction installation A5a.

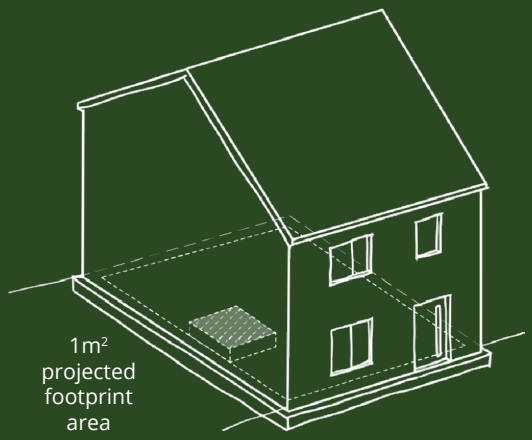
FLOORS AND FOUNDATIONS

Estimation of upfront embodied carbon impacts.

Calculated per m^2 of horizontal projection area (or footprint area including external walls) to a common U-value of 0.13W/m^2K. Benign soil conditions have been assumed for all foundations.

Figures include floor build-up as well as foundation with an assumed perimeter ratio of xxx. Includes masonry below DPC and an allowance for reuse of plywood formwork by reducing related impacts by 50%.

Excludes floor finishes, damp-proof membranes, any further enabling works, below-ground drainage etc.



Based on a notional detached 2-storey 3B house of 80m2

Foundations are one of the Biggest contributors to Embodied carbon, but it is Difficult to make direct comparisons between options because they are closely linked to the floor and wall constructions.

Site Specific soil conditions or structural requirements can also dictate the range of available solutions and their relative carbon impacts .

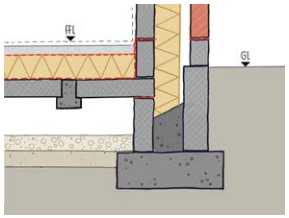
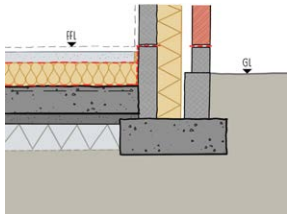
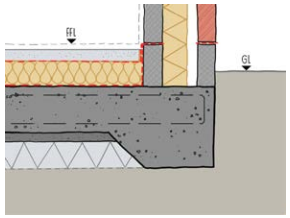
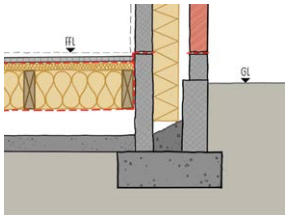
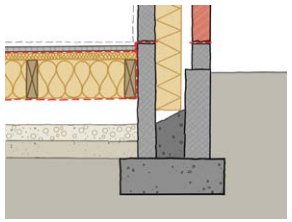
EMBODIED CARBON IMPACTS

FLOORS AND FOUNDATIONS

EMBODIED CARBON: EXAMPLE OF FLOOR BUILD UPS

A1-A4 plus A5 site wastage only (excludes A5.2)

0.13W/m^{2}K

	Beam and Block Strip Foundations	Ground-bearing Slab Strip Foundations	Ground-bearing Slab Raft Foundations	Suspended Timber Floor Strip Foundations Concrete Solum Capping	Suspended Timber Floor Strip Foundations Sand and Gravel Solum Capping
					
Estimated Upfront Carbon Impacts per m2 footprint	100 kgCO2e/m² A1-A5w upfront carbon	Biogenic carbon stored 0 kgCO2e/m²	125 kgCO2e/m² A1-A5w upfront carbon	Biogenic carbon stored 0 kgCO2e/m²	195 kgCO2e/m² A1-A5w upfront carbon	Biogenic carbon stored 0 kgCO2e/m²	90 kgCO2e/m² A1-A5w upfront carbon	Biogenic carbon stored 50 kgCO2e/m²	70 kgCO2e/m² A1-A5w upfront carbon	Biogenic carbon stored 50 kgCO2e/m²
Floor structure	54	86	162	46	27
Foundations	43	37	31	42	42
Floor structure biogenic stored	0.0	0.0	0.0	49	49

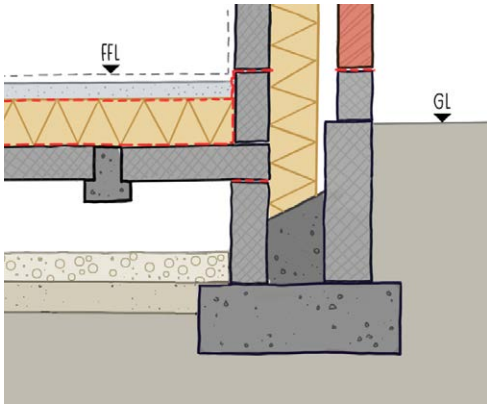
Reducing the amount of concrete in the foundations and floor construction has the biggest impact!

EMBODIED CARBON: EXAMPLE OF FLOOR BUILD UPS

A1-A4 plus A5 site wastage only (excludes A5.2)

0.13W/m^{2}K

Beam and Block Suspended Pre-cast Concrete Floor and Strip Foundations



(25mm floor finish excluded)

60mm sand cement screed

140mm PIR insulation

100/150mm pre-cast beam and block floor
average beam spacing 413mm

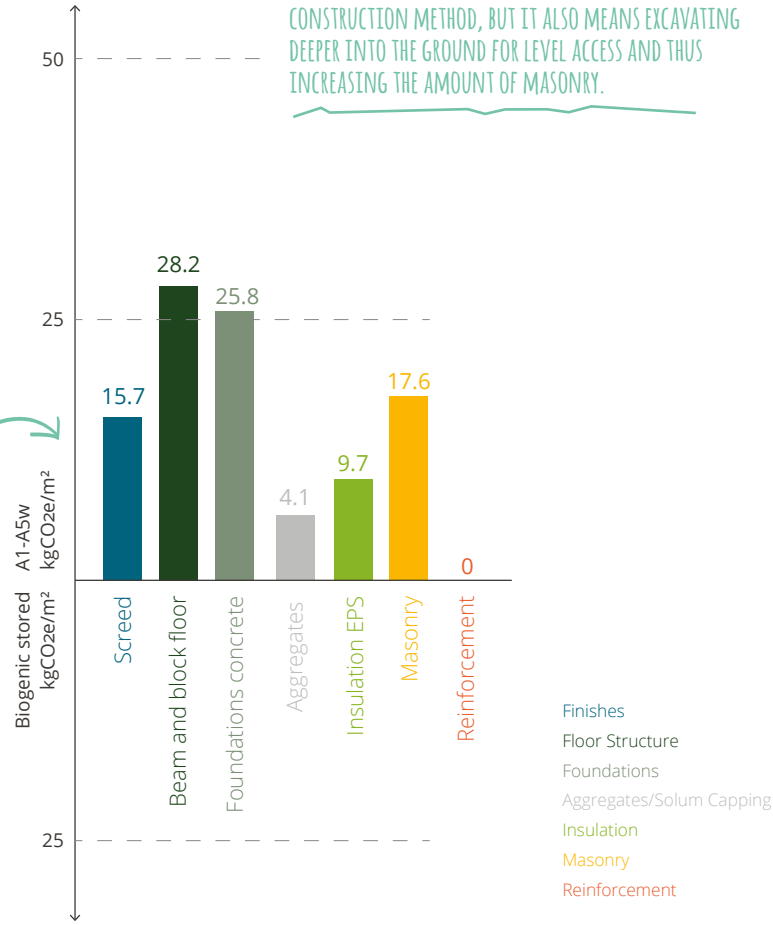
min. 150mm ventilated void

100mm gravel and sand solum capping

(Unformed foundation edges; DPM not included)

Made from cement, screed has a similar carbon impact to concrete!

Prefabricated Beam and block floors with strip foundations can be a relatively lean construction method, but it also means excavating deeper into the ground for level access and thus increasing the amount of masonry.



Combined upfront embodied carbon per m²

97

kgCO2e/m²

A1-A5w carbon impact

0

kgCO2e/m²

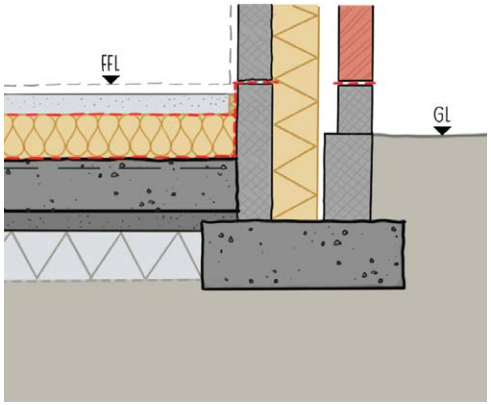
Biogenic carbon stored

EMBODIED CARBON: EXAMPLE OF FLOOR BUILD UPS

A1-A4 plus A5 site wastage only (excludes A5.2)

0.13W/m^{2}K

Ground Bearing Concrete Slab with Strip Foundations



(25mm floor finish excluded)

60mm sand cement screed

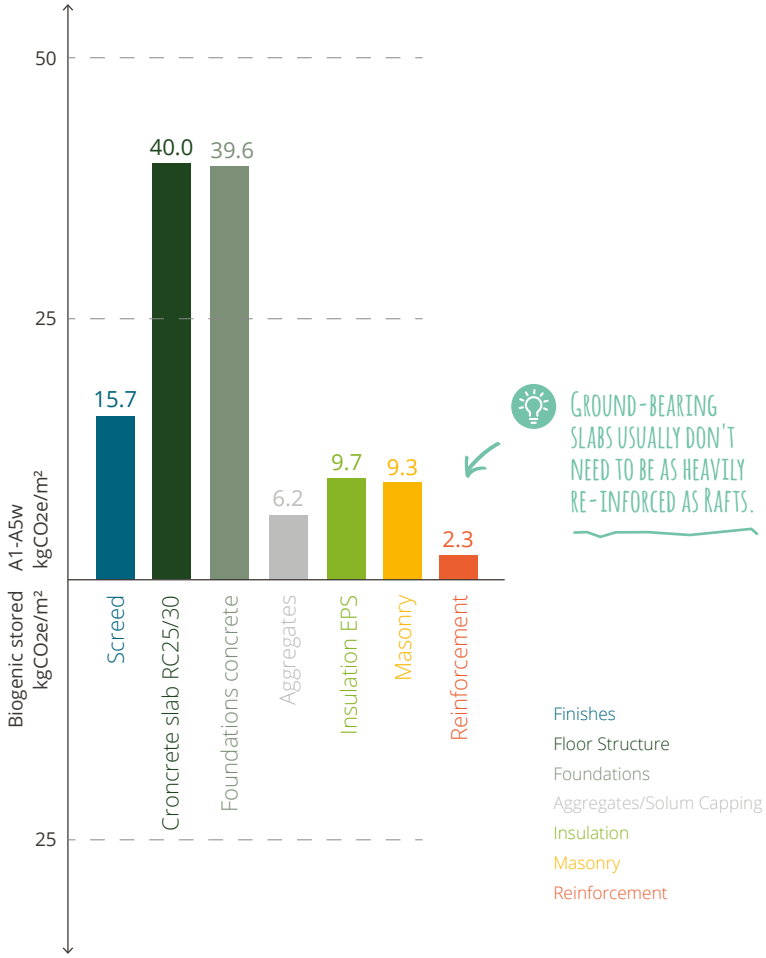
140mm PIR insulation

150mm re-inforced concrete raft RC32/40 with A193 mesh

50mm concrete blinding

150mm type 1 hardcore

(Unformed slab edges; DPM not included)



Combined upfront embodied carbon per m²

123

kgCO2e/m²

A1-A5w carbon impact

0 kgCO2e/m²

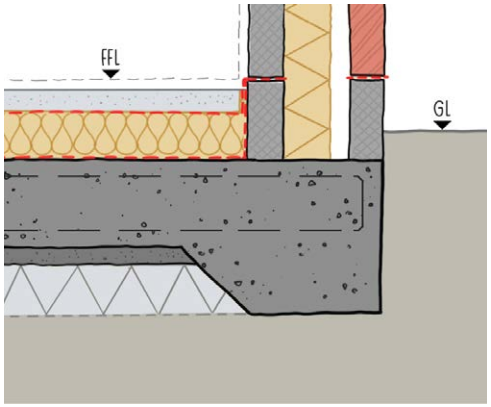
Biogenic carbon stored

EMBODIED CARBON: EXAMPLE OF FLOOR BUILD UPS

A1-A4 plus A5 site wastage only (excludes A5.2)

0.13W/m^{2}K

Ground Bearing Concrete Slab with Raft Foundation

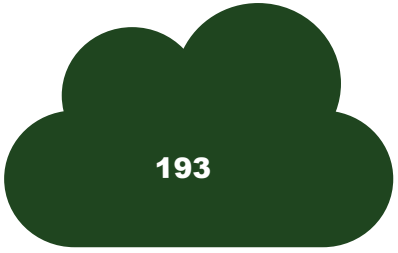


(25mm floor finish excluded)
60mm sand cement screed
140mm PIR insulation
250mm re-inforced concrete raft RC32/40
with H12 bars @ 200 top and bottom
50mm concrete blinding
150mm type 1 hardcore

(Includes formwork at slab edge; DPM not included)

Another point to think about are thermal bridges, which may require additional insulation below ground and further increase carbon impacts.

Combined upfront embodied carbon per m²

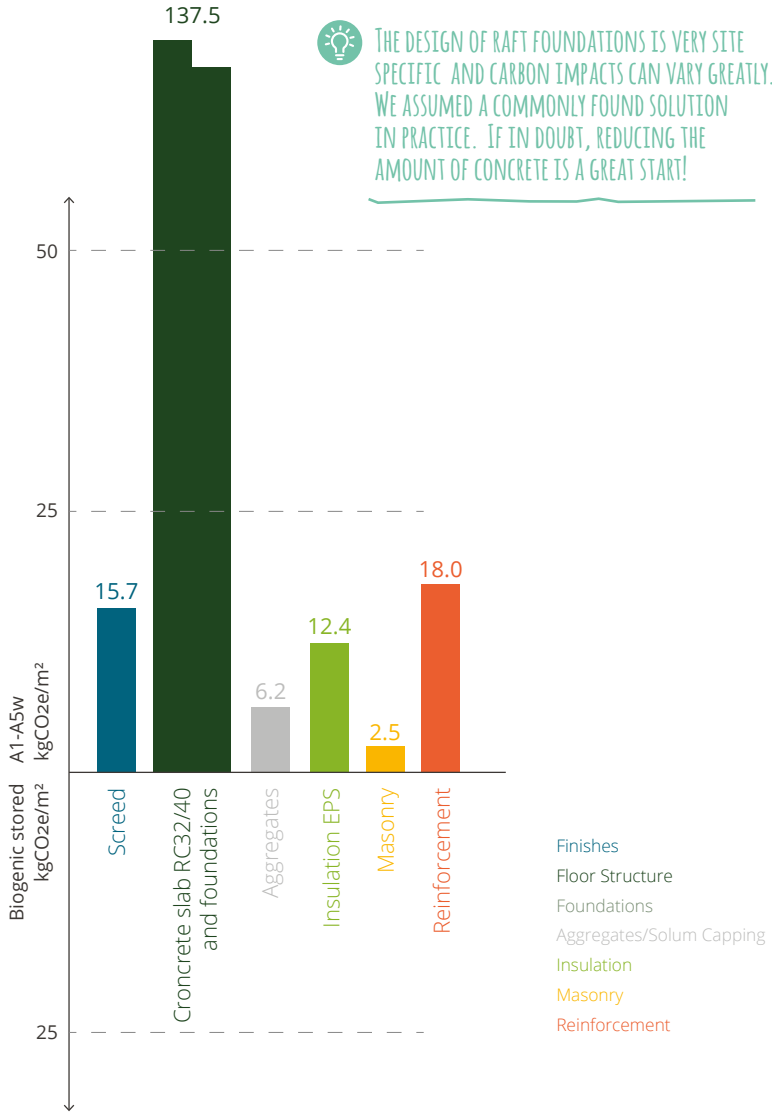


kgCO2e/m²
A1-A5w carbon impact

0 kgCO2e/m²

Biogenic carbon stored

The design of raft foundations is very site specific and carbon impacts can vary greatly. We assumed a commonly found solution in practice. If in doubt, reducing the amount of concrete is a great start!

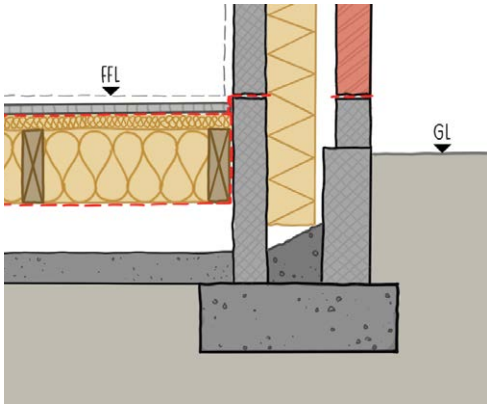


EMBODIED CARBON: EXAMPLE OF FLOOR BUILD UPS

A1-A4 plus A5 site wastage only (excludes A5.2)

0.13W/m^{2}K

Suspended Timber Floor with Strip Foundations and Concrete Solum Capping



(25mm floor finish excluded)

20mm plywood base

45mm C16 timber battens @600ctrs with low density woodfibre batt insulation in between

245mm x 45mm C16 timber joists @600mmwith low density wood fibre insulation between

min. 150mm ventilated void

100mm concrete solum capping

(Unformed foundation edges; DPM not included)

SUSPENDED TIMBER FLOORS HAVE A MUCH LOWER UPFRONT EMBODIED CARBON THAN CONCRETE-BASED SOLUTIONS, BUT CORRECT MOISTURE MANAGEMENT IS IMPORTANT, ESPECIALLY IN CONJUNCTION WITH TIMBER FRAME WALL CONSTRUCTIONS.

TO FURTHER REDUCE UPFRONT EMBODIED CARBON, ONE COULD HAVE A LOOK INTO REPLACING THE CONCRETE FOUNDATIONS WITH ALTERNATIVES SUCH AS GROUND SCREWS OR STONE.

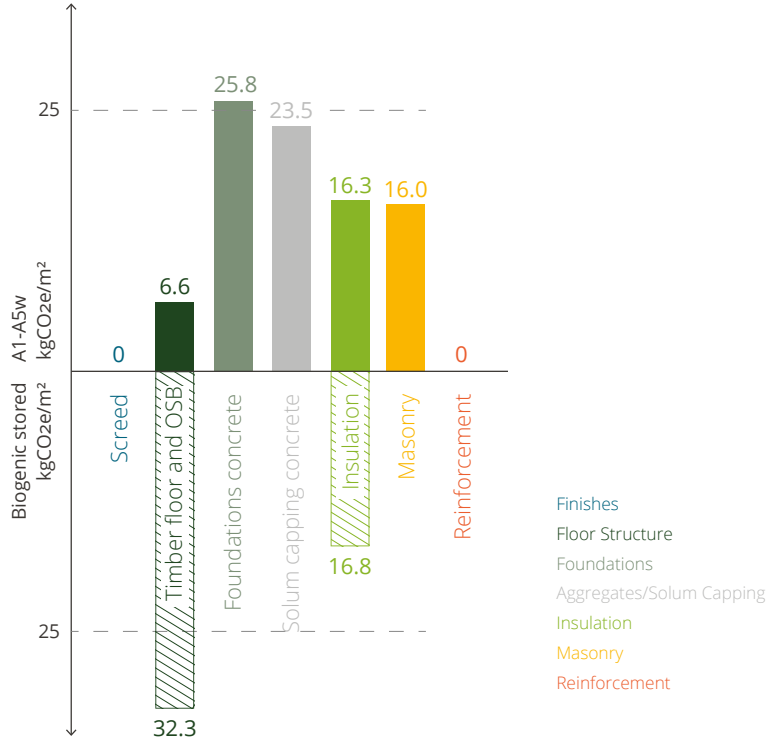
Combined upfront embodied carbon per m²

88
kgCO2e/m²

A1-A5w carbon impact

49
kgCO2e/m²

Biogenic carbon stored

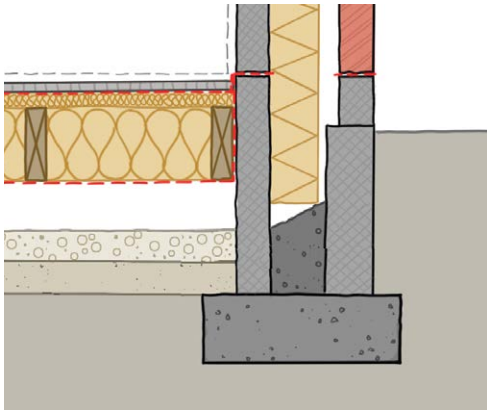


EMBODIED CARBON: EXAMPLE OF FLOOR BUILD UPS

A1-A4 plus A5 site wastage only (excluding A5.2)

0.13W/m^{2}K

Suspended Timber Floor with Strip Foundations and Sand & Gravel Solum Capping



(25mm floor finish excluded)

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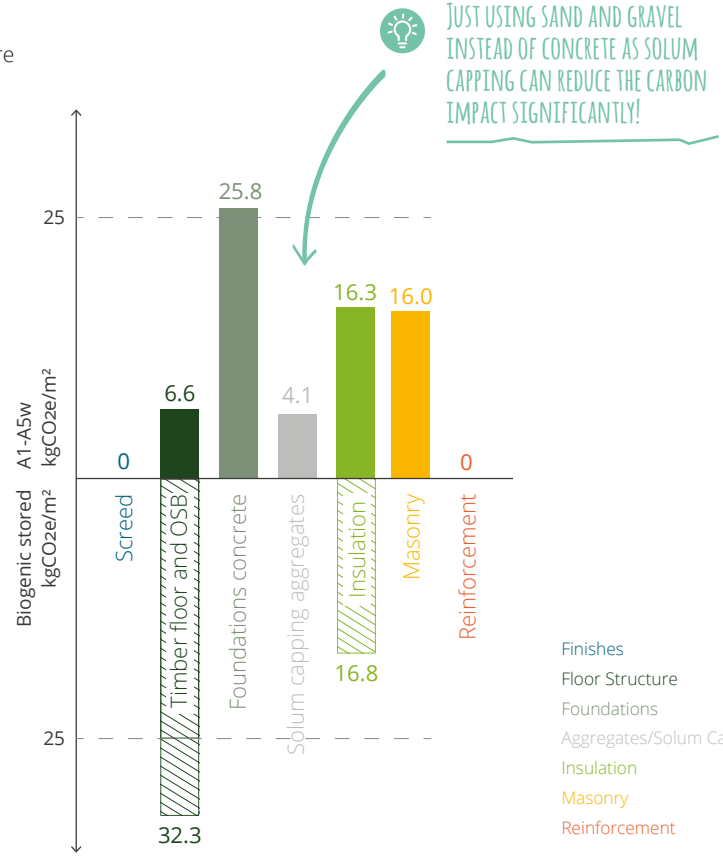
245mm x 45mm C16 timber joists @600mmwith low density wood fibre insulation between

min. 150mm ventilated void

100mm gravel and 50mm sand solum capping

(Unformed foundation edges; DPM not included)



Combined upfront embodied carbon per m²

69
kgCO2e/m²

A1-A5w carbon impact

49
kgCO2e/m²

Biogenic carbon stored