Carbon drawdown in your next construction project

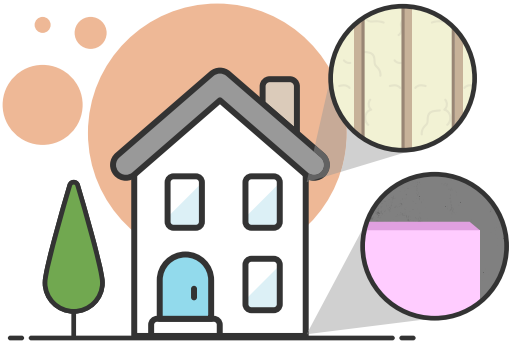
Choosing insulation materials with the lowest greenhouse gas impact

Embodied carbon refers to the greenhouse gas (GHG) emissions that went into the production of materials. A summary of common insulation materials appears in the table below. Materials that contain carbon and/or require less energy to produce have the lowest (best) GHG impact. At the other end, materials with high-GHG refrigerants tend to have the worst carbon footprint.[1]

Material	Example manufacturers / products	GHG Impact[2]	Notes
Wood fiber	Steico, Gutex	Lowest / Best	Boardstock, batts
Cellulose	Cleanfiber, GreenFiber	Lowest / Best	Densepack, loosefill
Fiberglass	CertainTeed Sustainable, Knauf EcoBatt	Low	Batts, boardstock, loosefill/densepack
Polyisocyanurate	DuPont Thermax	Low	Boardstock; Blowing agent: pentane
EPS* (expanded polystyrene)	Atlas, BASF Neopor	Low	Boardstock; Blowing agent: pentane
Open cell spray foam	Demilec APX, Lapolla Foam-Lok 450	Low	Site-blown; Blowing agent: water
Phenolic foam	Kingspan Kooltherm	Low	Boardstock; Blowing agent: pentane
Cellular glass	Glavel, Foamglas	Low	Aggregate, boardstock
Mineral wool	Rockwool, Owens Corning	Medium	Batts, boardstock
Closed cell spray foam, HFO	Demilec Heatlok HFO Pro, Lapolla ProSeal HFO	Medium	Site-blown; Blowing agent: HFOs
Next gen. XPS*, HFO/HFC	Owens Corning NGX series, DuPont XPS-ST-100 series	Medium / High	Boardstock; Blowing agent: HFO/HFC blend
Closed cell spray foam, HFC	Demilec Heatlok XT, Dow Froth-Pak	Highest / Worst	Site-blown; Blowing agent: HFCs
XPS*	Dow Styrofoam (blueboard), Owens Corning (pinkboard)	Highest / Worst	Boardstock; Blowing agent: HFCs

Partners have shared that many material substitutions are not only easy to implement, they can actually save money. Furthermore, many lower-GHG materials are less toxic to workers and/or building occupants.[3]

Example: A 2-story, 2,000 square foot home making insulation substitutions detailed below avoids approximately 55,000 kg CO_2e, roughly equal to not driving 136,000 miles or not burning 60,000 pounds of coal. Provided the installed R-value is the same and proper air sealing is done, there is no significant difference between the two homes' operational energy.



GHG Impact: High

- XPS for sub-slab and foundation
- HFC-based spray foams in walls and cathedral ceiling

GHG Impact: Low

- EPS Type IX for sub-slab and polyisocyanurate (interior) foundation
- Densepack cellulose in walls and cathedral ceiling

[1] Our analysis is based on Cradle to Gate: extraction of resources from the earth until the point that a product leaves the factory. This corresponds to Life Cycle Assessment product stages A1, A2, and A3. We also include A5 for materials manufactured on-site (such as spray polyurethane foam that emits refrigerant at installation) and B1 (which is important to consider for insulations which off-gas refrigerants over time).
[2] Lowest: < 0 $kgCO_2e$ including carbon content, per 1 m_2 RSI-1. Low: 0-5. Medium: 5-10. High > 10.
[3] A useful summary of cost, health, and environmental considerations of insulation materials is available at: https://www.buildinggreen.com/sites/default/files/BG_Insulation_Recommendations.pdf
*Expanded polystyrene (EPS); Extruded polystyrene (XPS)

Efficiency Vermont
efficiencyvermont.com
888-921-5990 | 802-860-4095