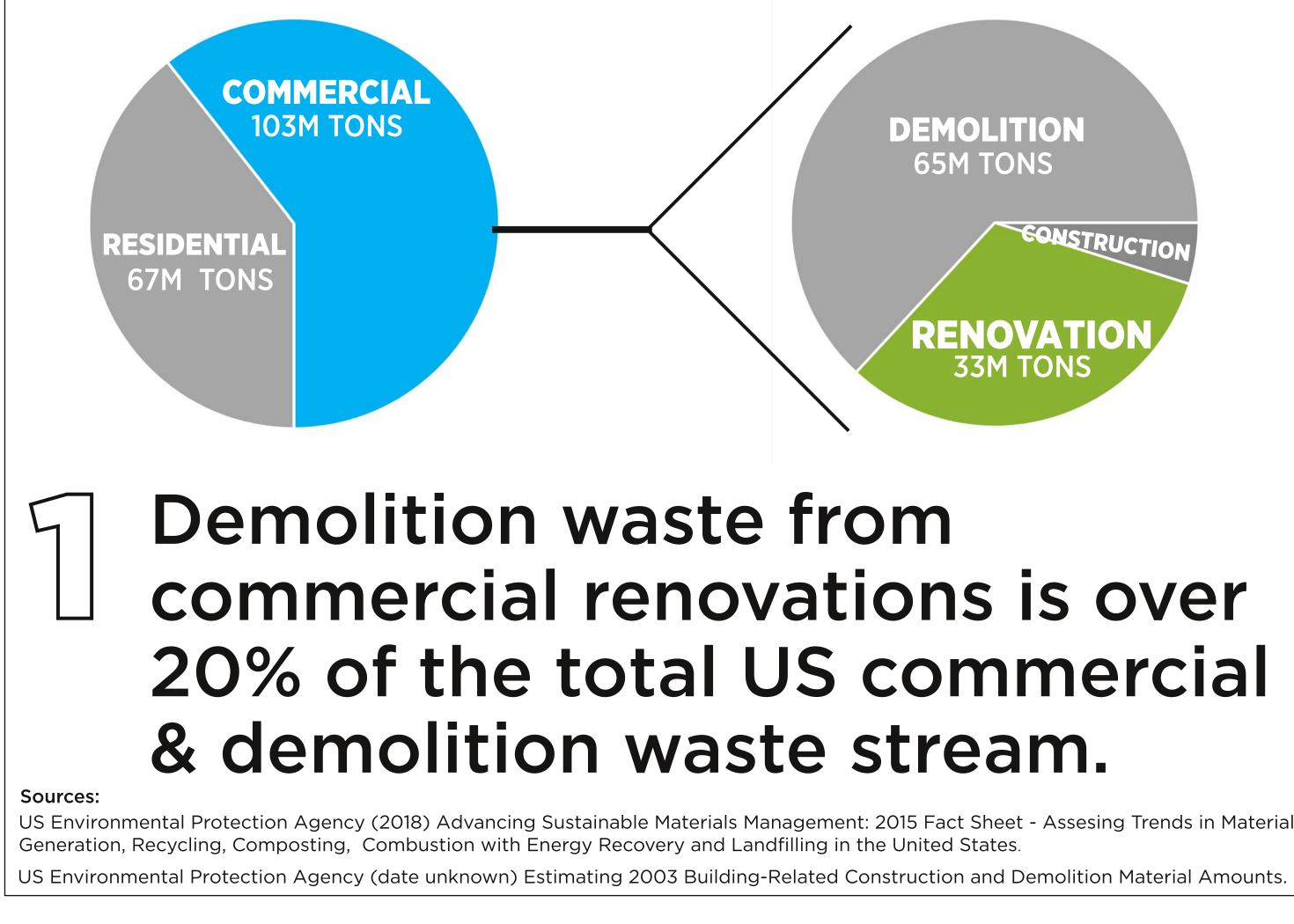
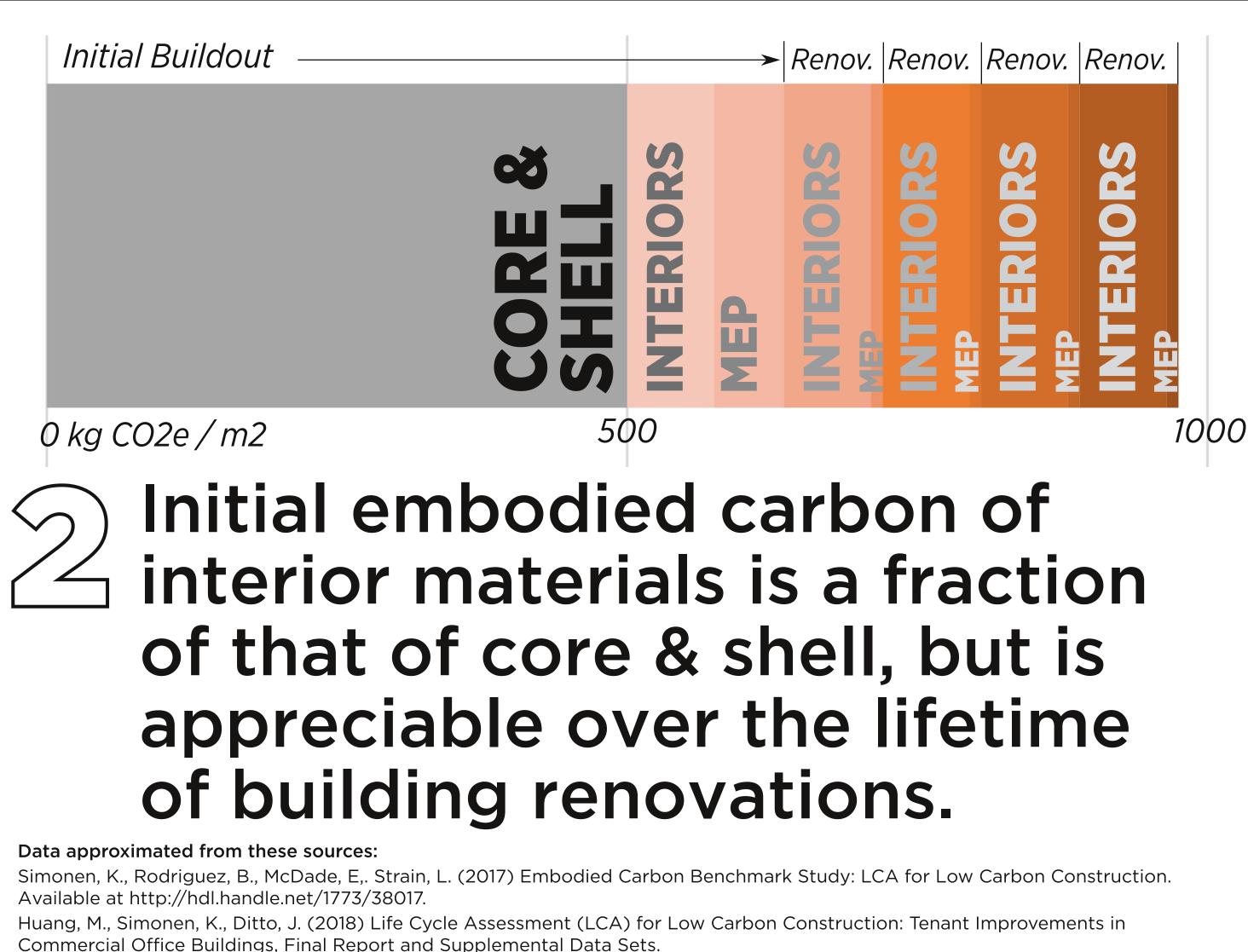
# **Building Material Reuse: The Overlooked Solution to Carbon Reduction**

Materials from commercial interiors are voluminous, standardized, frequently landfilled, have substantial embodied carbon, and are readily reusable.

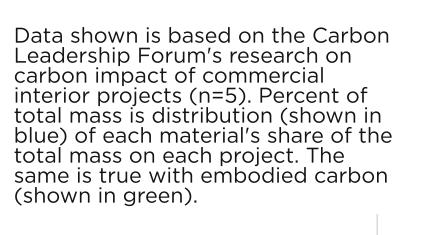




Rodriguez, B.X., Lee H.W., Simonen, K., Huang, M. (2018) Life Cycle Assessment (LCA) for Low Carbon Construction: Mechanical, Electrical, and Plumbing in Commercial Office Buildings, Final Report.

Abstract: Building material reuse represents a tremendous opportunity for sequestering carbon, retaining embodied energy, reducing landfilled material, and conserving natural resources. It is far more effective than many other forms of construction waste management that rely on additional inputs to grind, melt or pulp materials into a new form. Interior renovations in commercial buildings can occur within a few years of space being built, and in most cases the hard-to-recycle interior finishes are landfilled. Material reuse is the perfect strategy to address these materials that are intact, usable, and would otherwise be landfilled. Cursory analysis and comparison of manufacturer-reported environmental product declarations to approximated energy inputs for deconstruction shows up to 99% reduction in CO2e emissions by reusing materials. For example, the emissions from manufacturing a standard commercial door system (wood door, metal frame and hardware) is ~155 kg CO2e, whereas the emissions from salvaging that same door system is less than 1 kg CO2e. Unfortunately, material reuse is a seldom-used strategy in the commercial building sector, more because of aesthetic preferences and logistics than availability of materials.

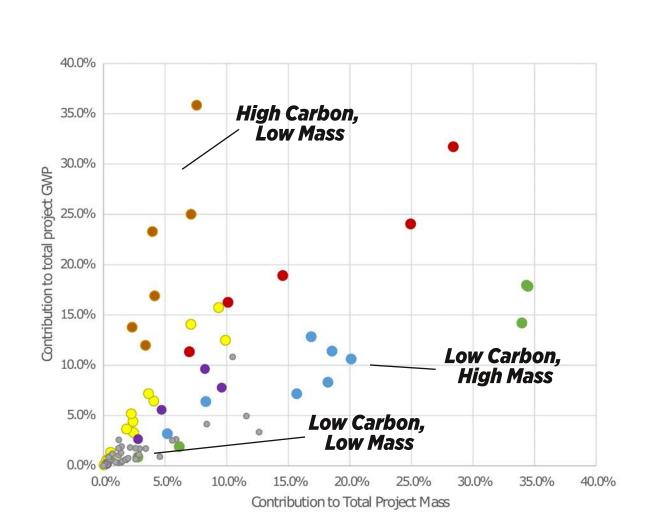
DEMOLITION 65M TONS NSTRUCTIO RENOVATION 33M TONS





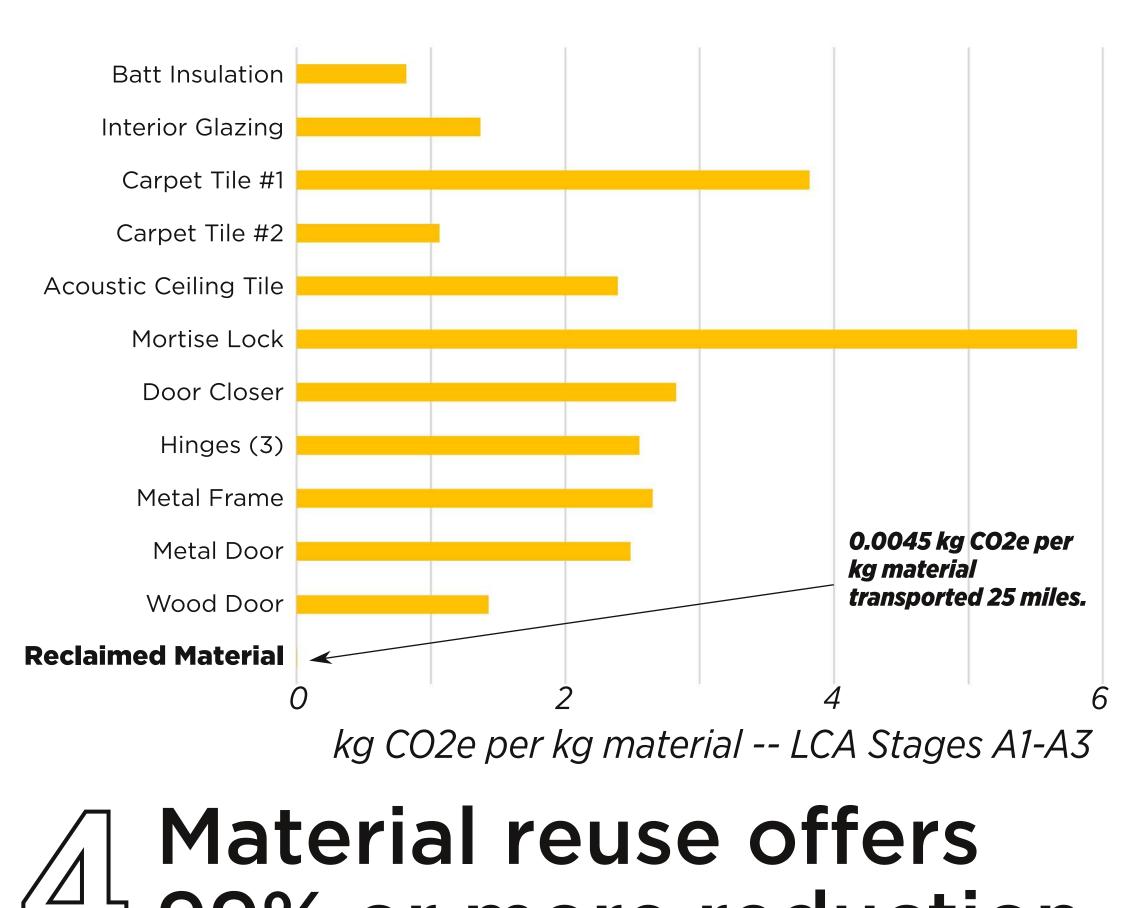
ceiling panel suspension system

- o door
- interior glazing
- partition wall
- Other



#### Several interior materials 5 $\bigcirc$ have high embodied carbon, are widely used, and are easily reusable.

Sources: Huang, M., Simonen, K., Ditto, J. (2018) Life Cycle Assessment (LCA) for Low Carbon Construction: Tenant Improvements in Commercial Office Buildings, Final Report and Supplemental Data Sets.



## 99% or more reduction in embodied carbon.

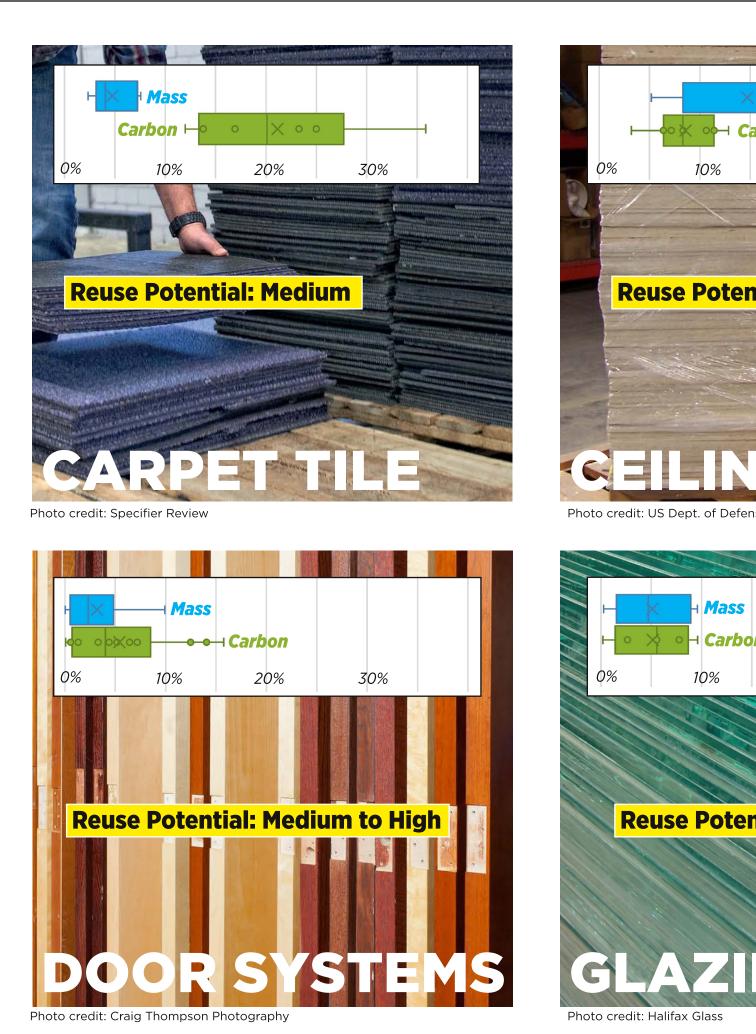
#### Sources:

Manufacturer Environmental Product Declarations: Certainteed, Vitro Glass, Shaw Contract, Interface Carpet, Armstrong Ceiling Solutions, Allegion/Schlage, Allegion/LCN, ASSA ABLOY/McKinney, Allegion/Steelcraft, ASSA ABLOY/CECO, Masonite.

Andrew Ellsworth, LEED AP Founder & CEO, Doors Unhinged, LLC

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Doors Unhinged is a for-profit enterprise based in Pittsburgh, PA that reclaims and resells exclusively commercial doors, frames and hardware.



## Envision

Of the 400 million sf of commercial office space constructed each year in US, what if 50% of interior buildouts used 50% reclaimed materials?

Embodied carbon of avg. interior buildout = 75 kg  $CO_2e/m^2$ 

400 million SF = 3.67 x 10^7 m2

 $3.67 \times 107 \text{ m2} \times 75 \text{ kg/ m2} \text{ CO}_{2}\text{e} = 2.75 \text{ Megatonnes} \text{ CO}_{2}\text{e}$ 

2.75 MT \* 0.5 \* 0.5 = 0.7 MT CO<sub>2</sub>e avoided/yr

### **⊂** Widespread reuse of **Ocommercial materials in** the US could yield 20 megatonnes of CO<sub>2</sub>e reductions by 2050.

Data approximated from these sources:

Colliers International (2018) US Research Report, Office Market Outlook Q1 2018. Huang, M., Simonen, K., Ditto, J. (2018) Life Cycle Assessment (LCA) for Low Carbon Construction: Tenant Improvements in Commercial Office Buildings, Final Report and Supplemental Data Sets.



