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Siegel & Strain Architects

Defining Zero Net Carbon

Time Value of Carbon

When you save matters, what you build matters, what you don't build matters:
Build well, Rebuild better

Tipping Point

1.5°C

Emissions Peak

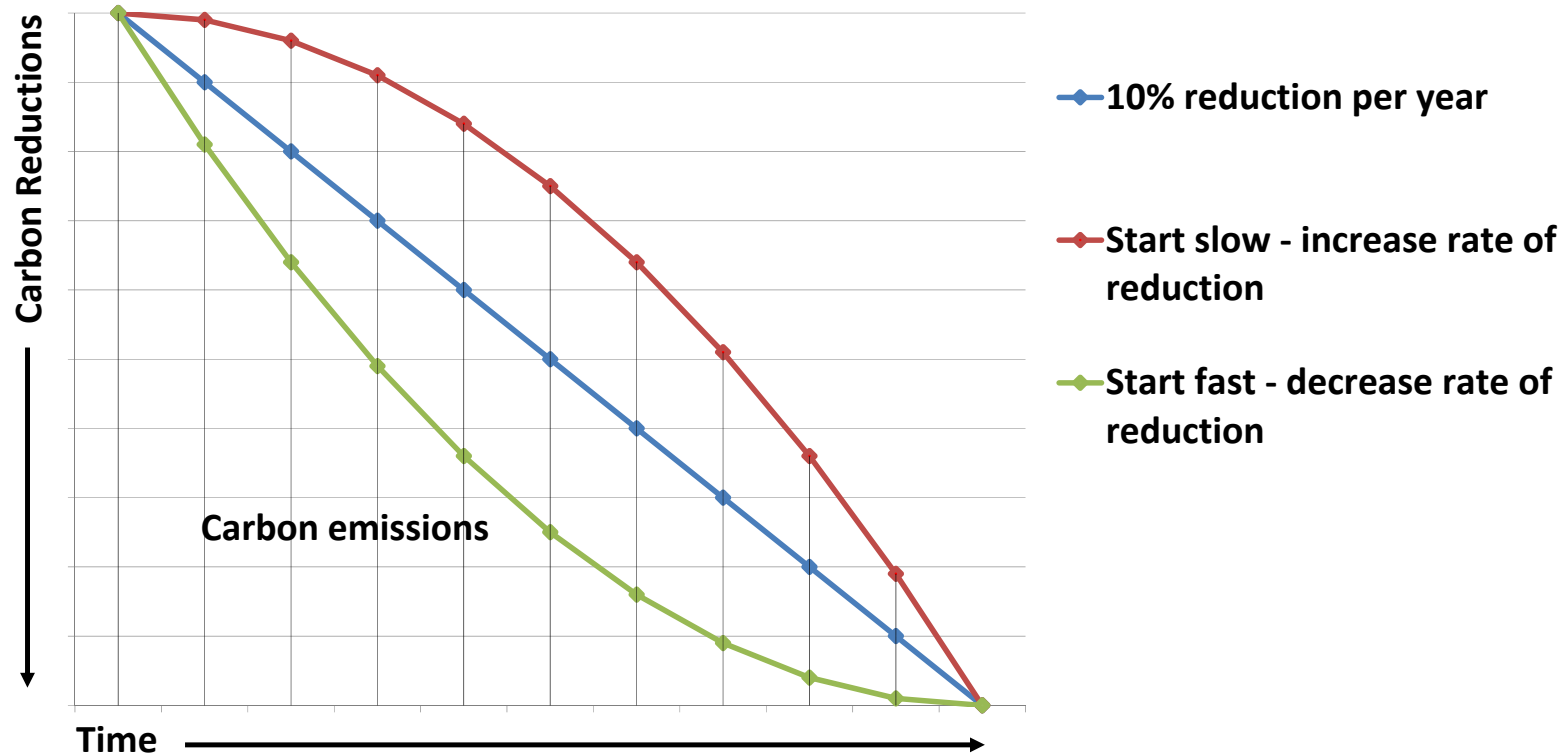
2020

Fossil Fuel Phase out

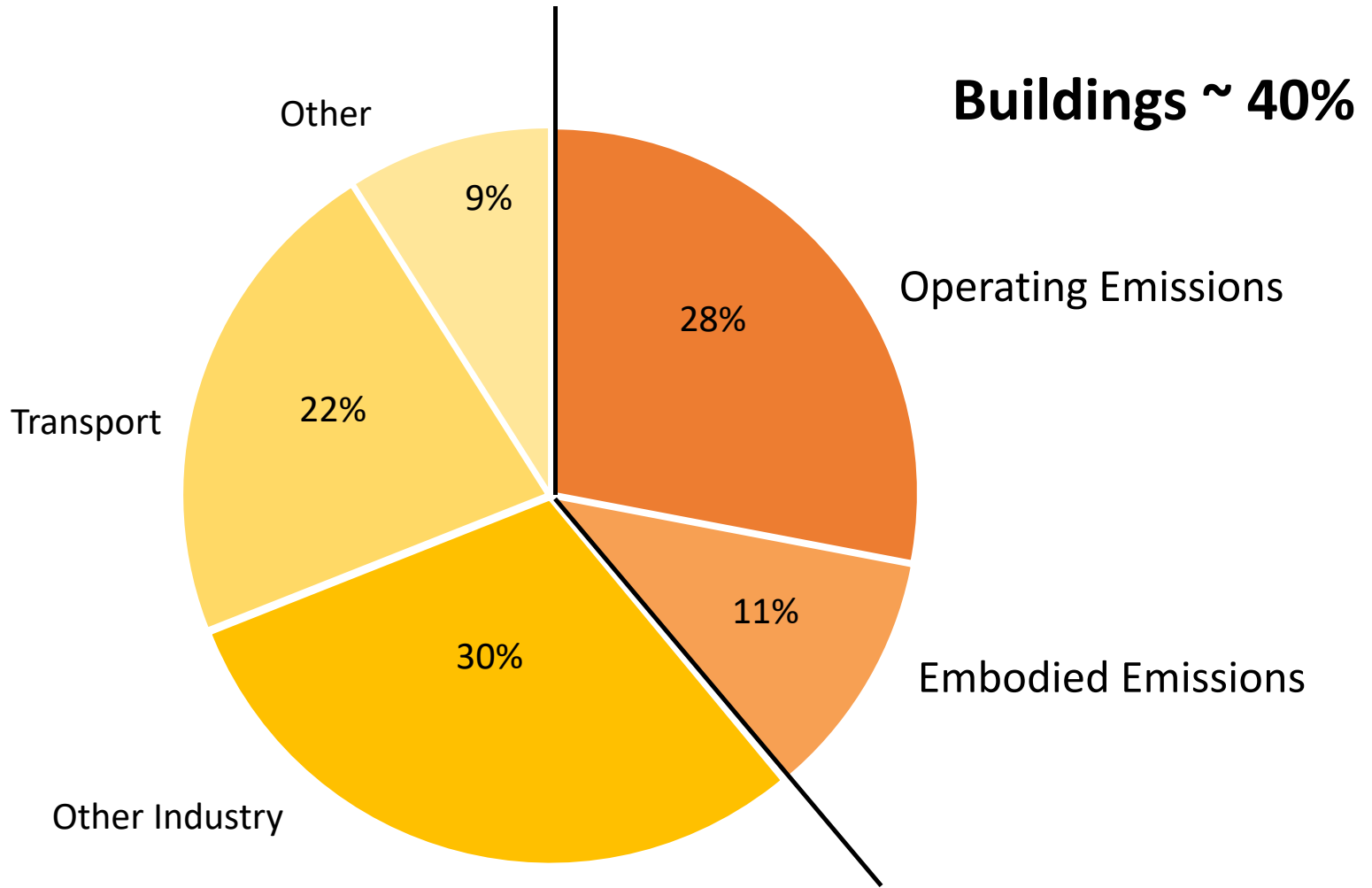
2050

Time Value of Carbon

- We need strategies that produce large savings now
- Reuse + upgrades avoids new emissions and reduces current emissions

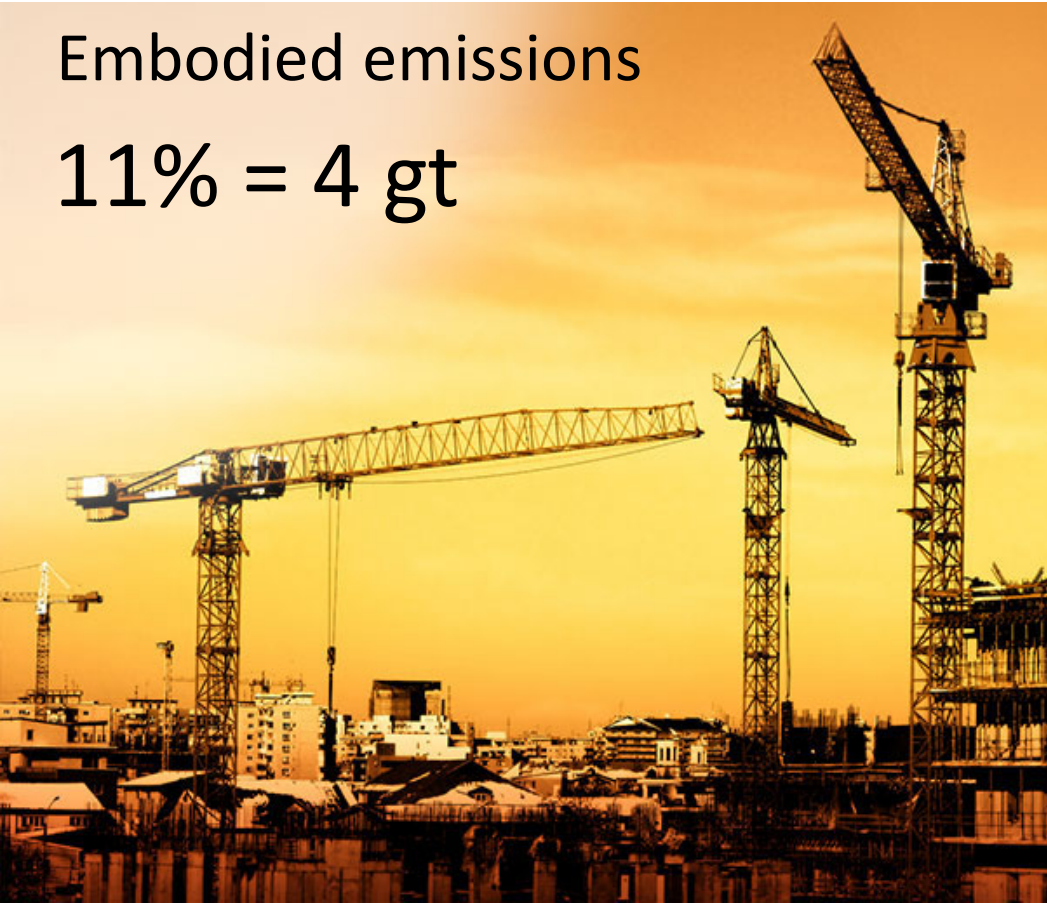


Annual Global GHG Emissions by End Use



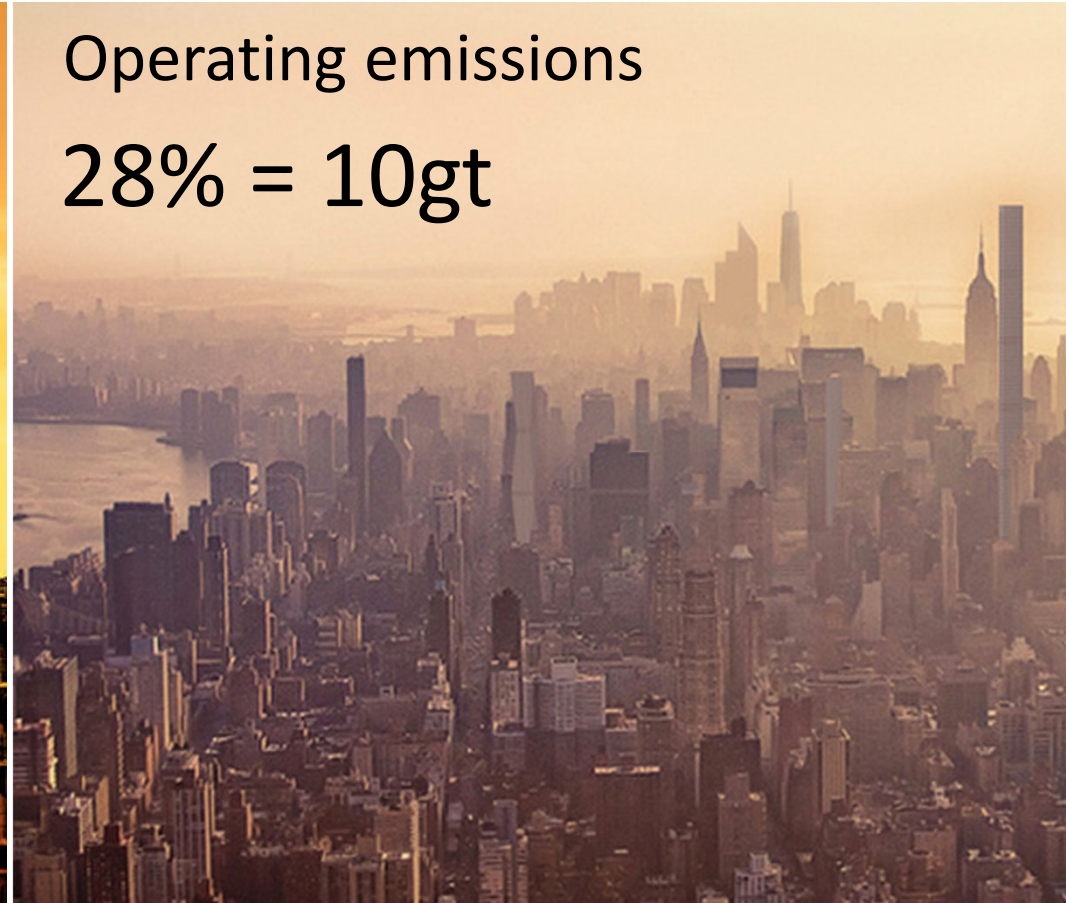
Embodied emissions

11% = 4 gt



Operating emissions

28% = 10gt



New Buildings

5.5 billion m² / year

Existing Buildings

(230 billion m²)

Getting to Zero

Tipping Point

1.5°C

Emissions Peak

2020

Fossil Fuel Phase out

2050

Current thinking

- Make New Buildings Net Zero
- Reduce Embodied Emissions
- Upgrade Existing Buildings

New Buildings - 5.5 billion M²/yr

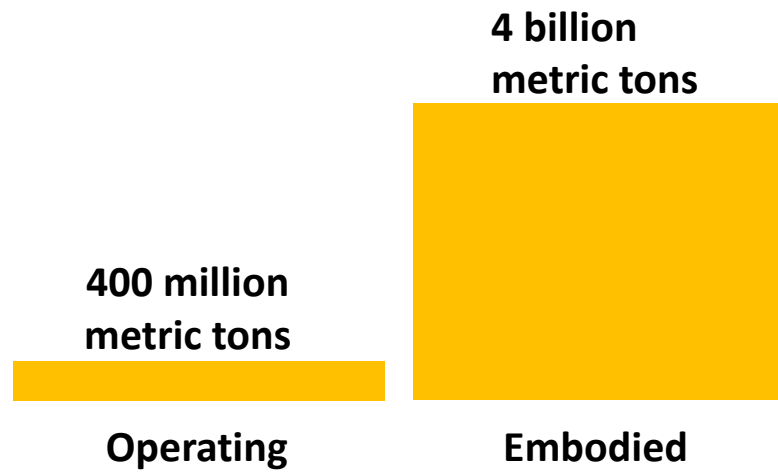
**400 million
metric tons**



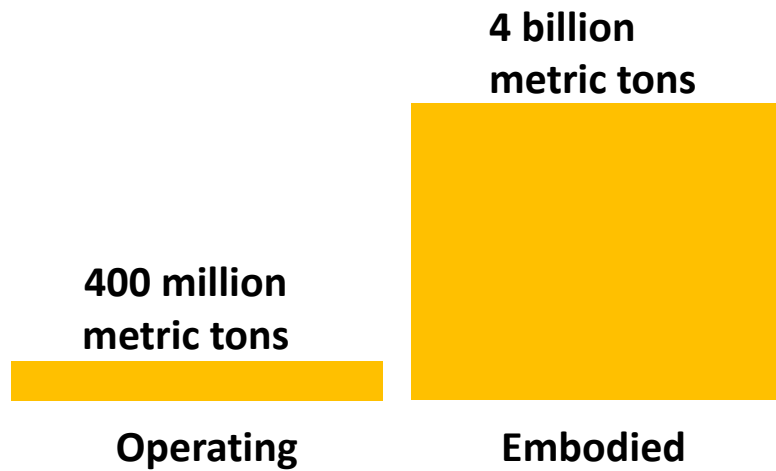
Operating



New Buildings - 5.5 billion M²/yr



New Buildings - 5.5 billion M²/yr



Existing Buildings - 310 billion ft²



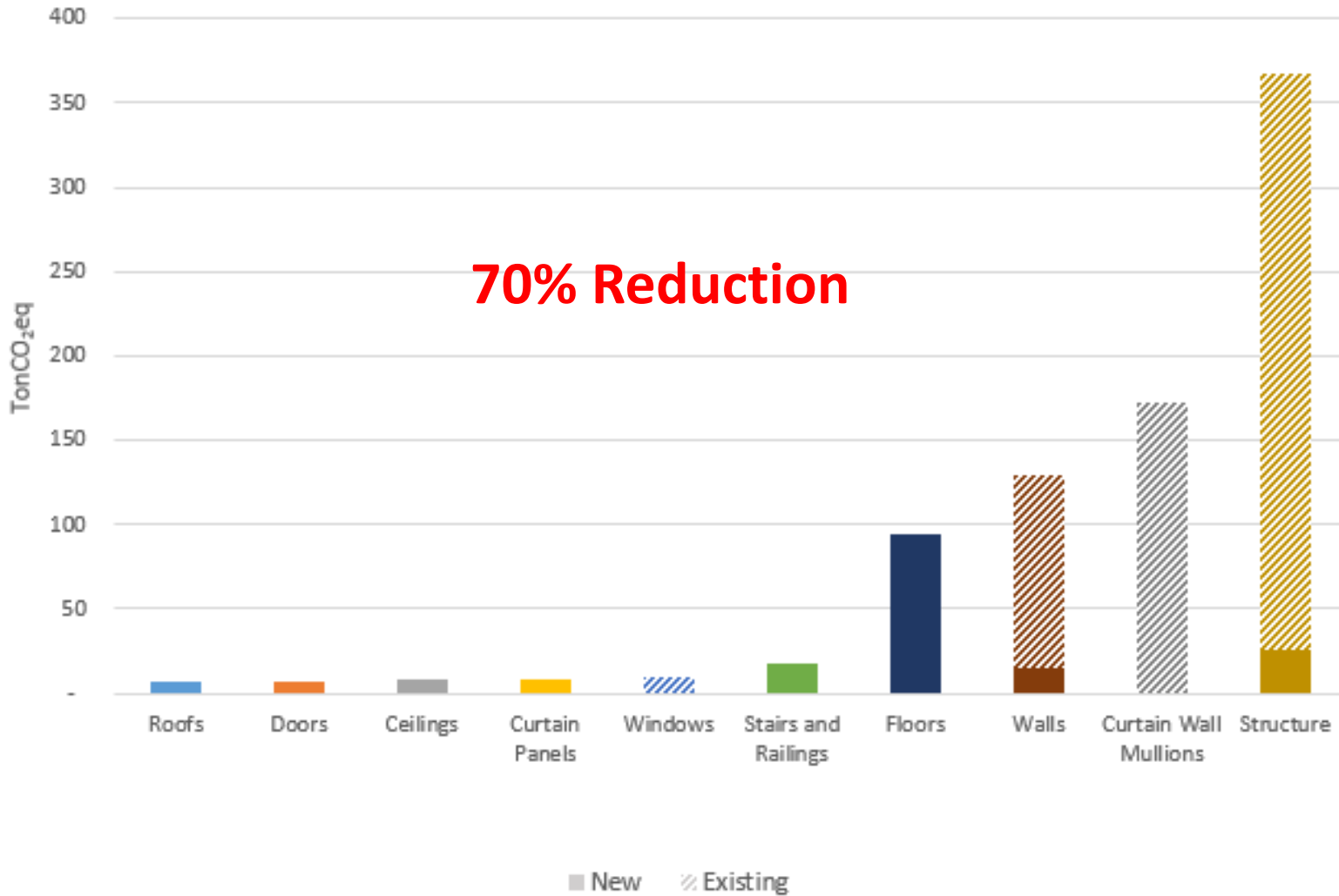
- Upgrade Existing Buildings to Net Zero
- Reduce Embodied Emissions
- Make New Buildings Net Zero by 2020

Reuse + upgrade is a complete GHG reduction strategy

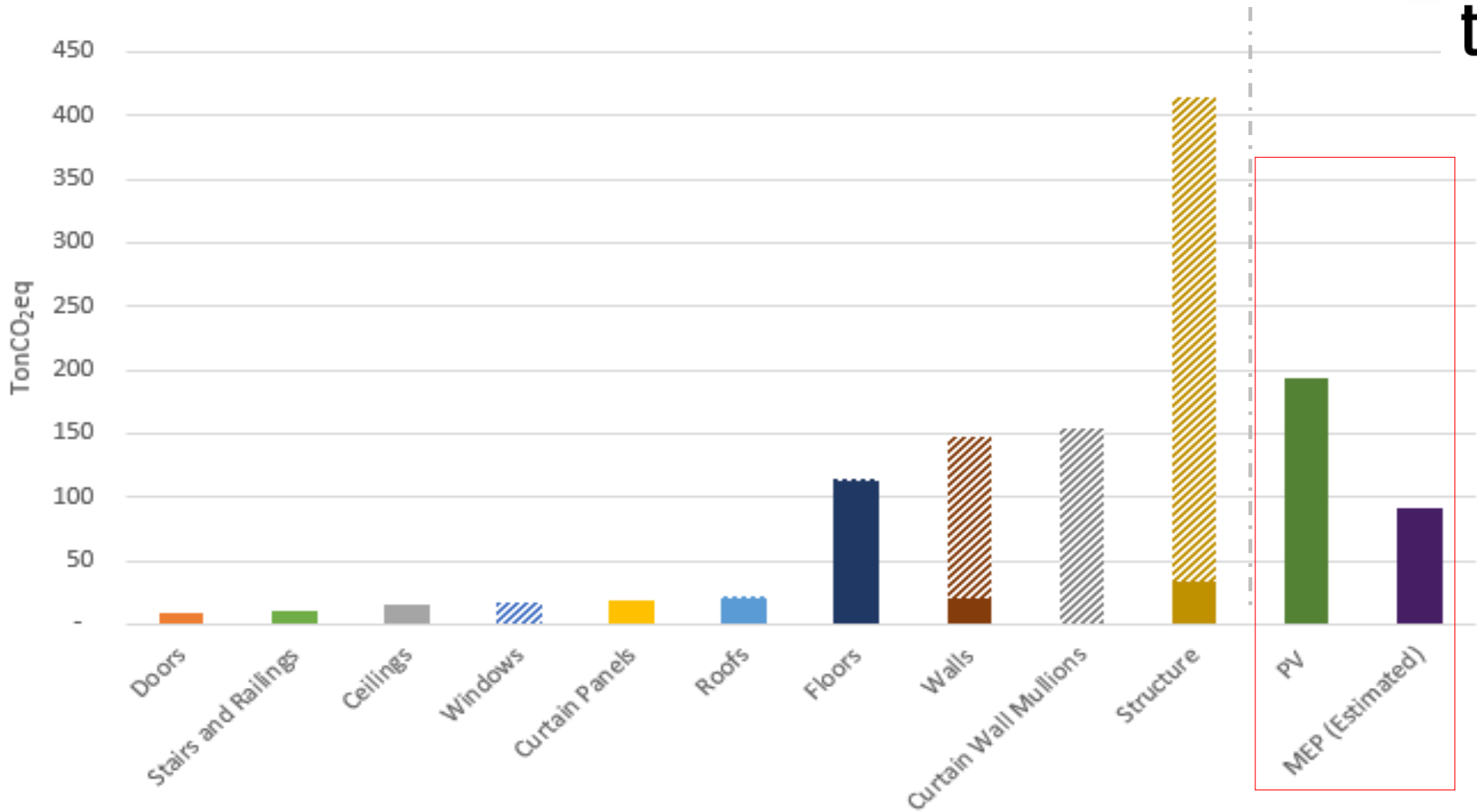
- DPR offices SF – net zero remodel
- Total Carbon Study - Siegel & Strain, Integral Group, EBNet, StopWaste



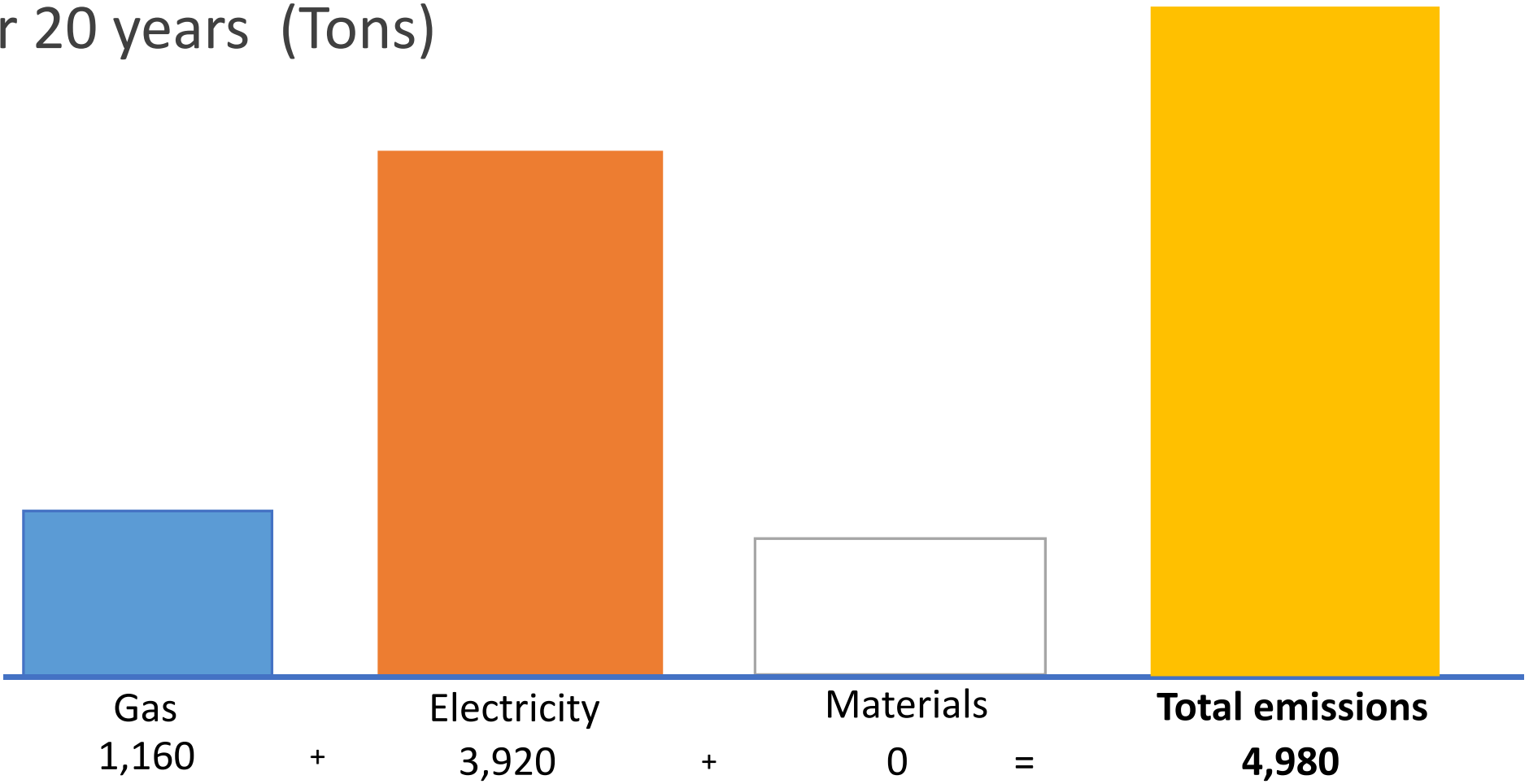
Embodied emissions per assembly (Tons of CO₂)



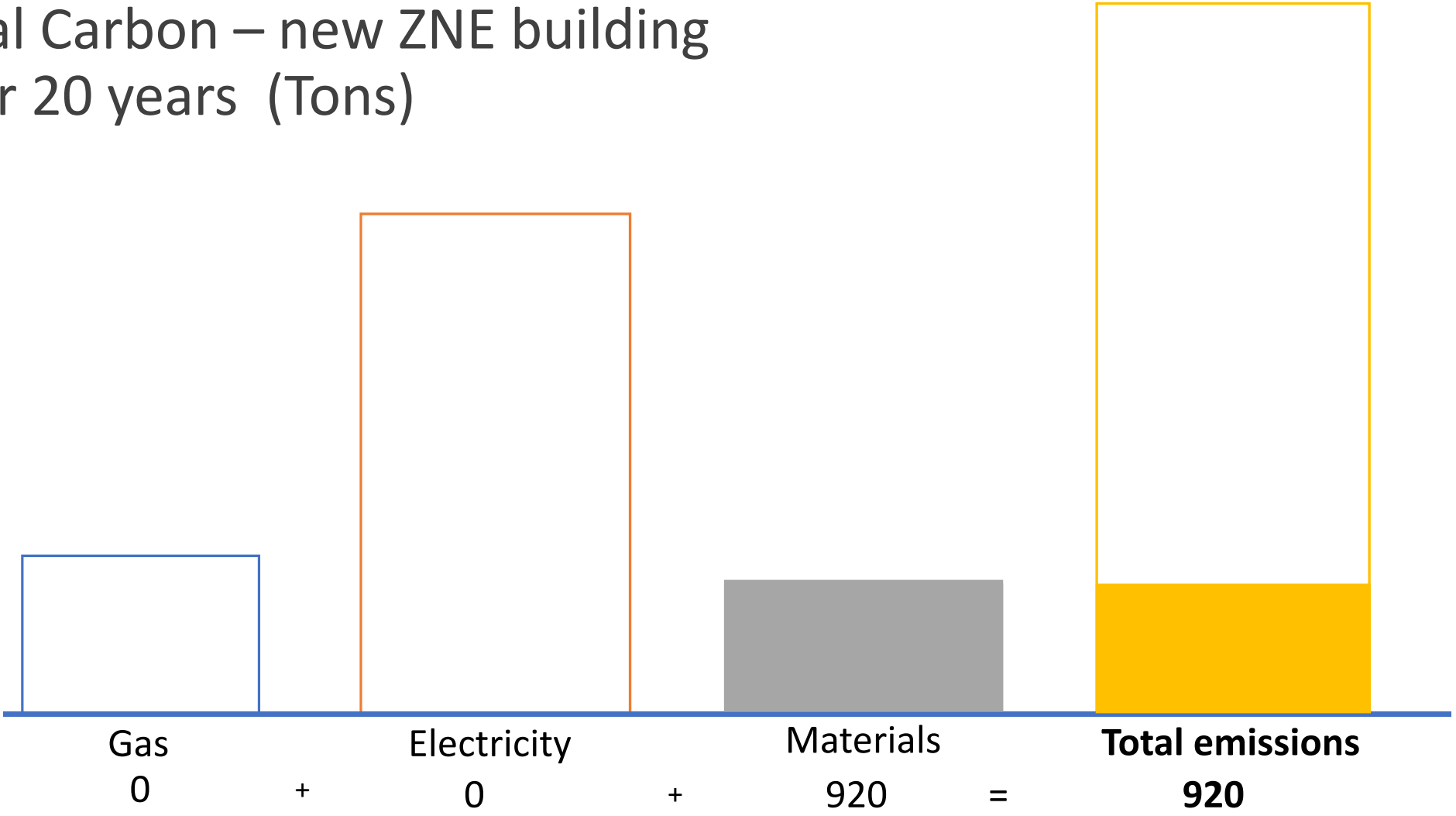
Embodied emissions per assembly (Tons of CO₂)



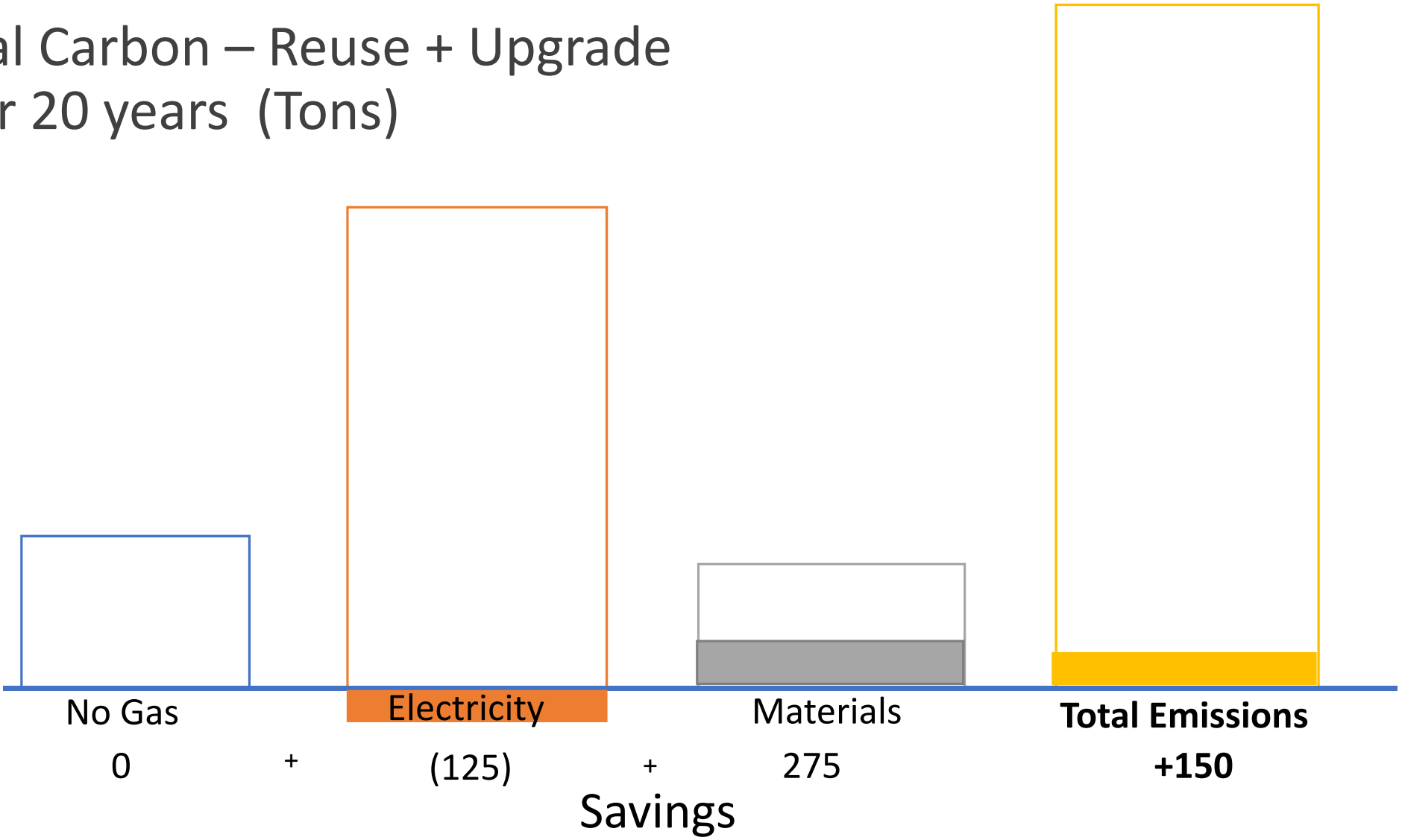
Total Carbon – Do nothing over 20 years (Tons)



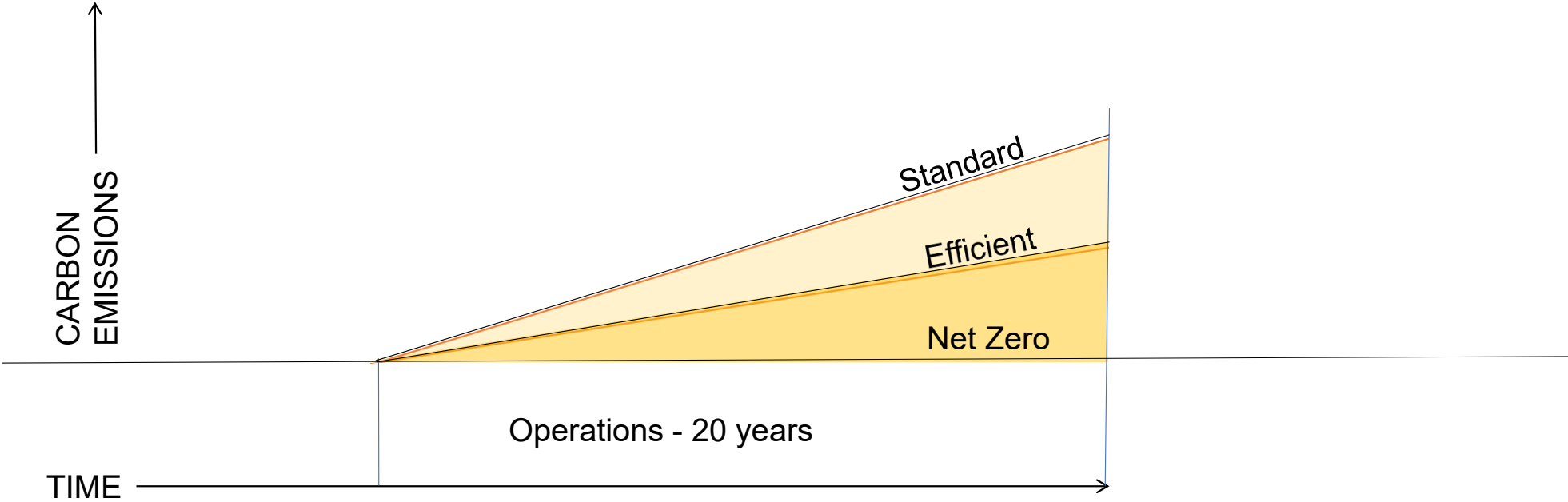
Total Carbon – new ZNE building over 20 years (Tons)



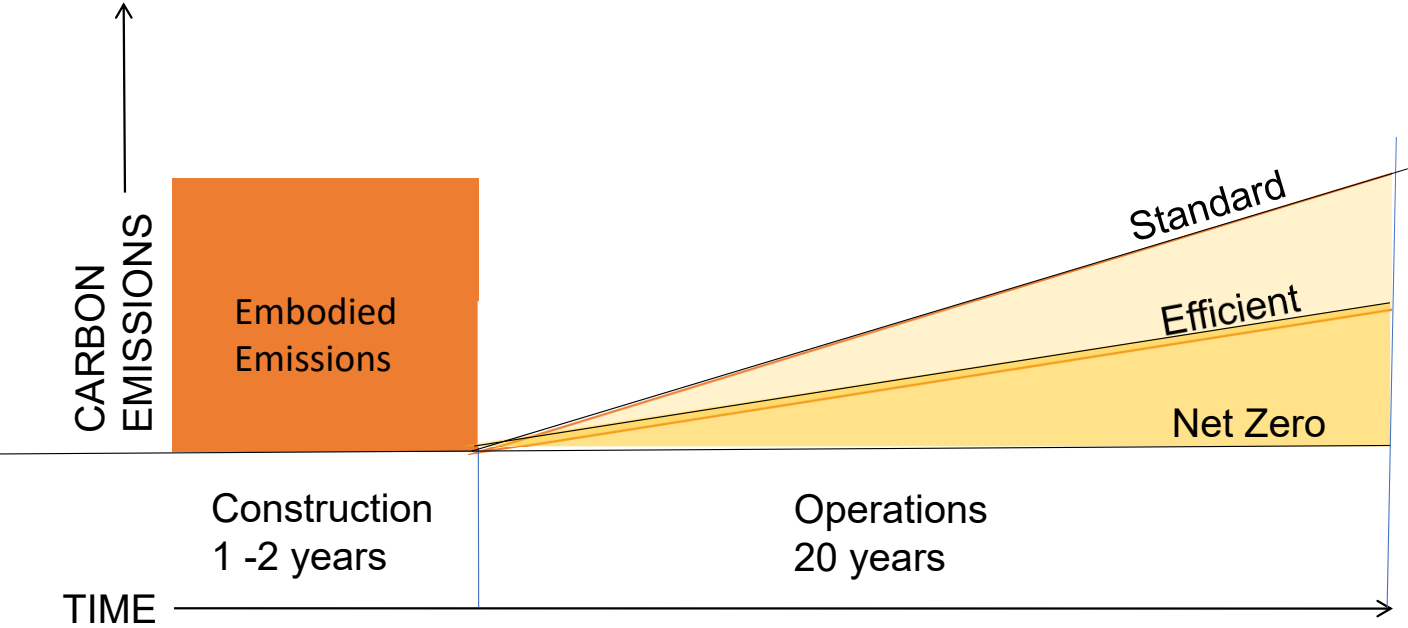
Total Carbon – Reuse + Upgrade over 20 years (Tons)

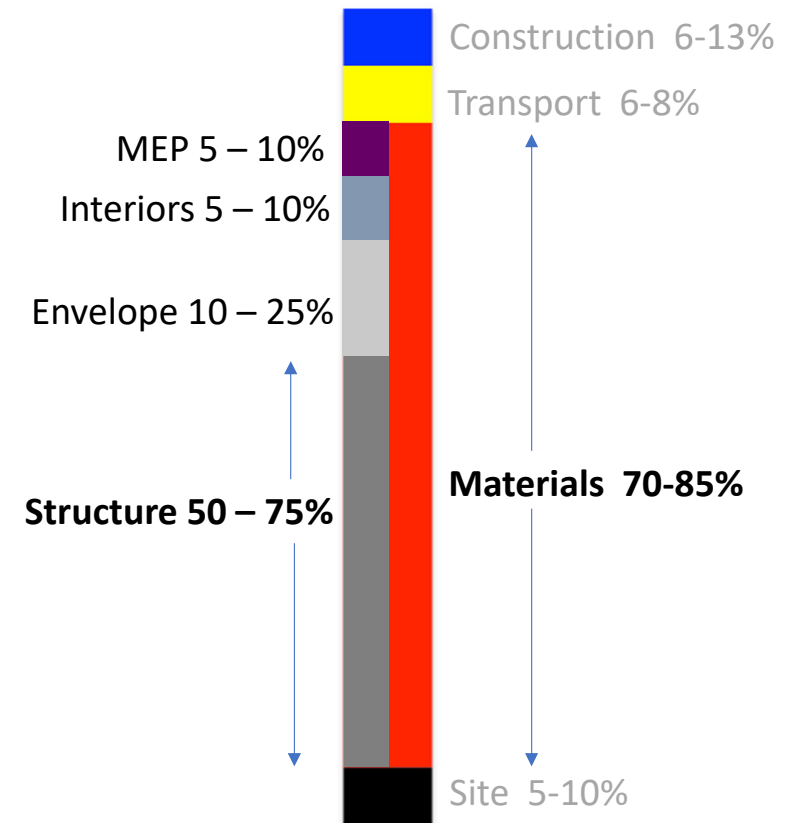


Carbon Emissions for New Buildings - Operating

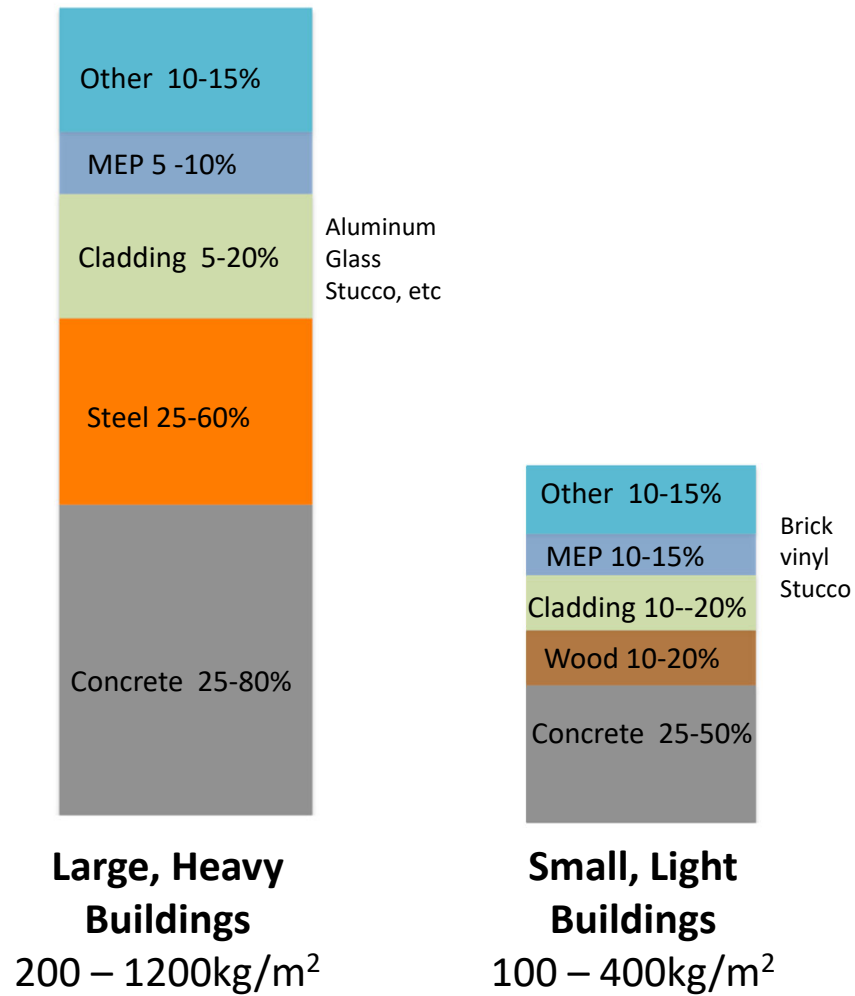


Carbon Emissions for a New Building - Operating + Embodied + End of Life

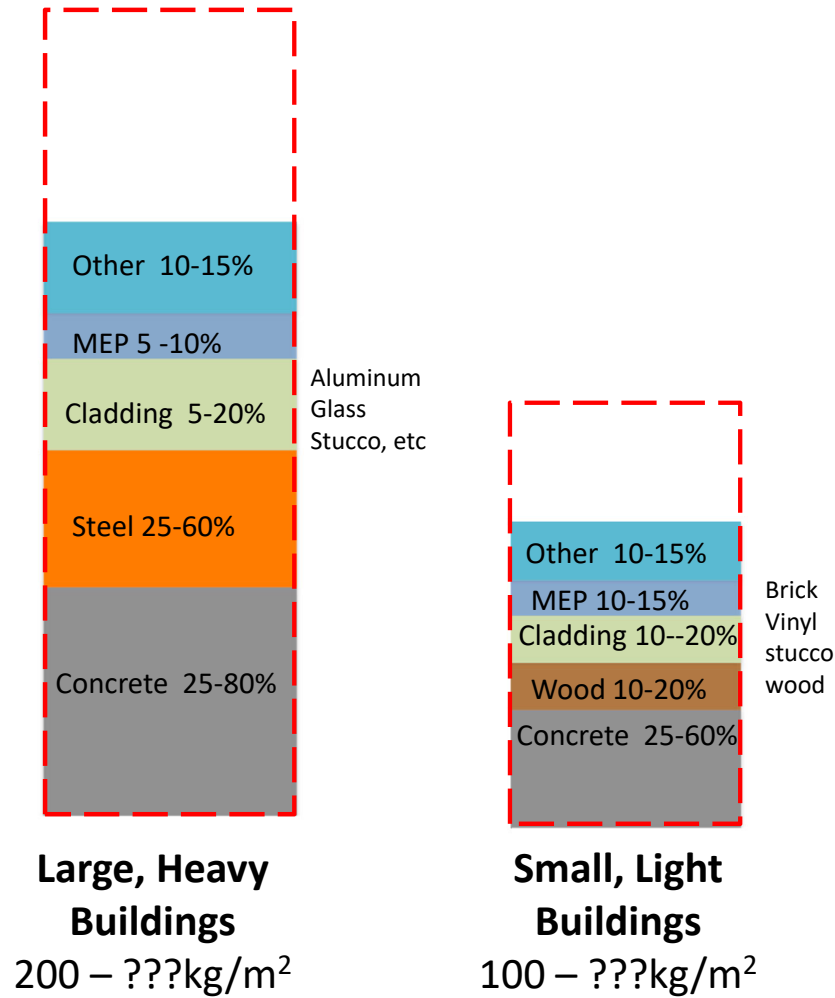




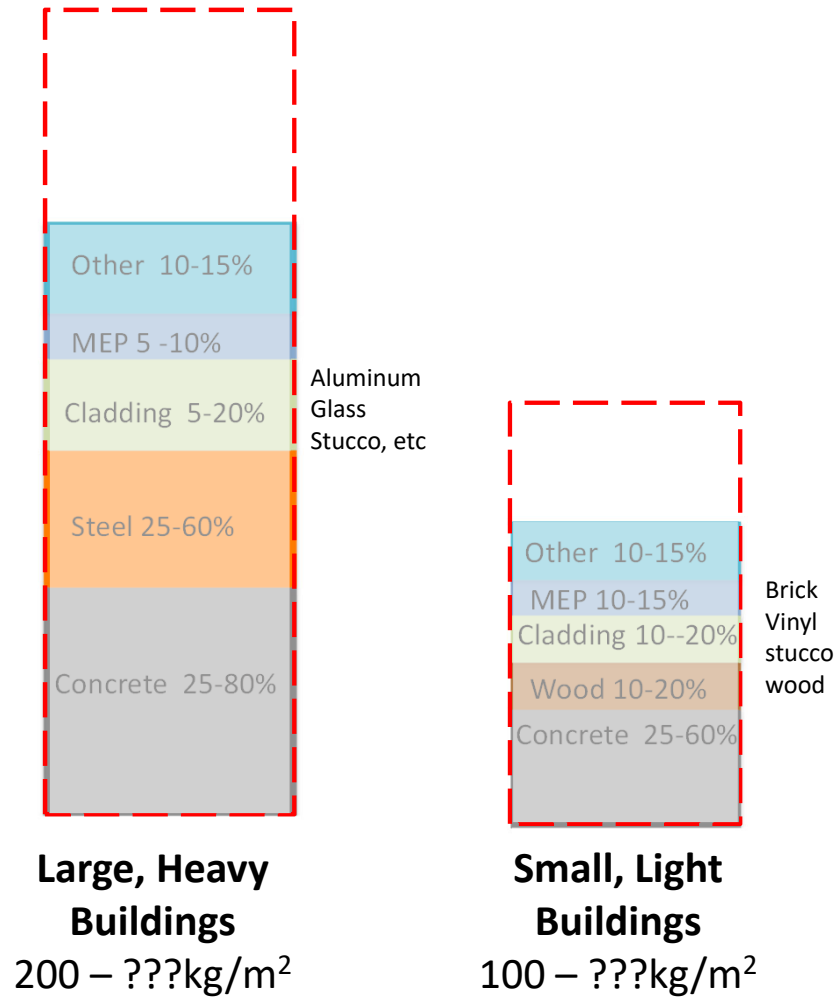
Embodied CO₂ by Construction Type & Material



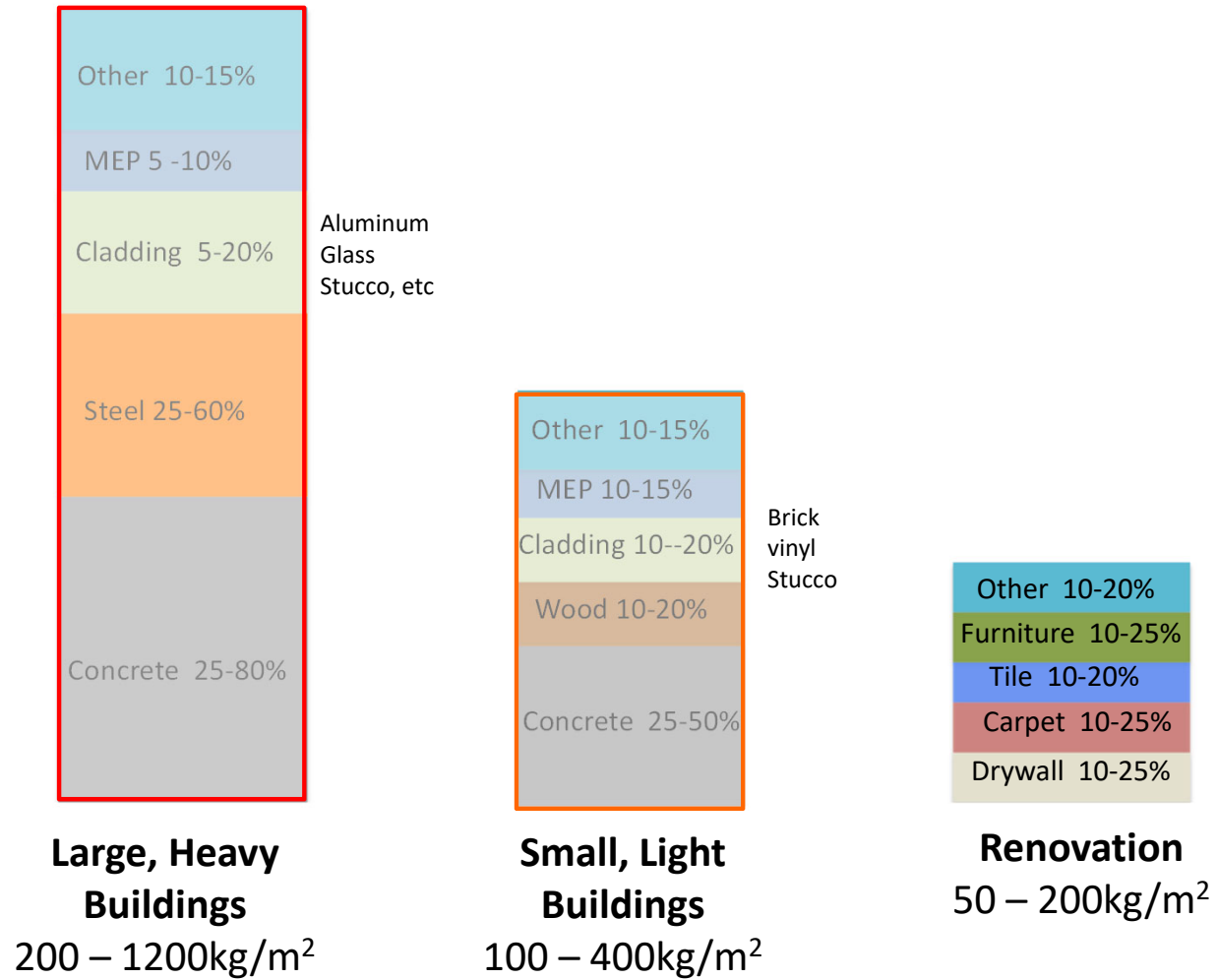
Embodied CO₂ - reduce by using fewer materials



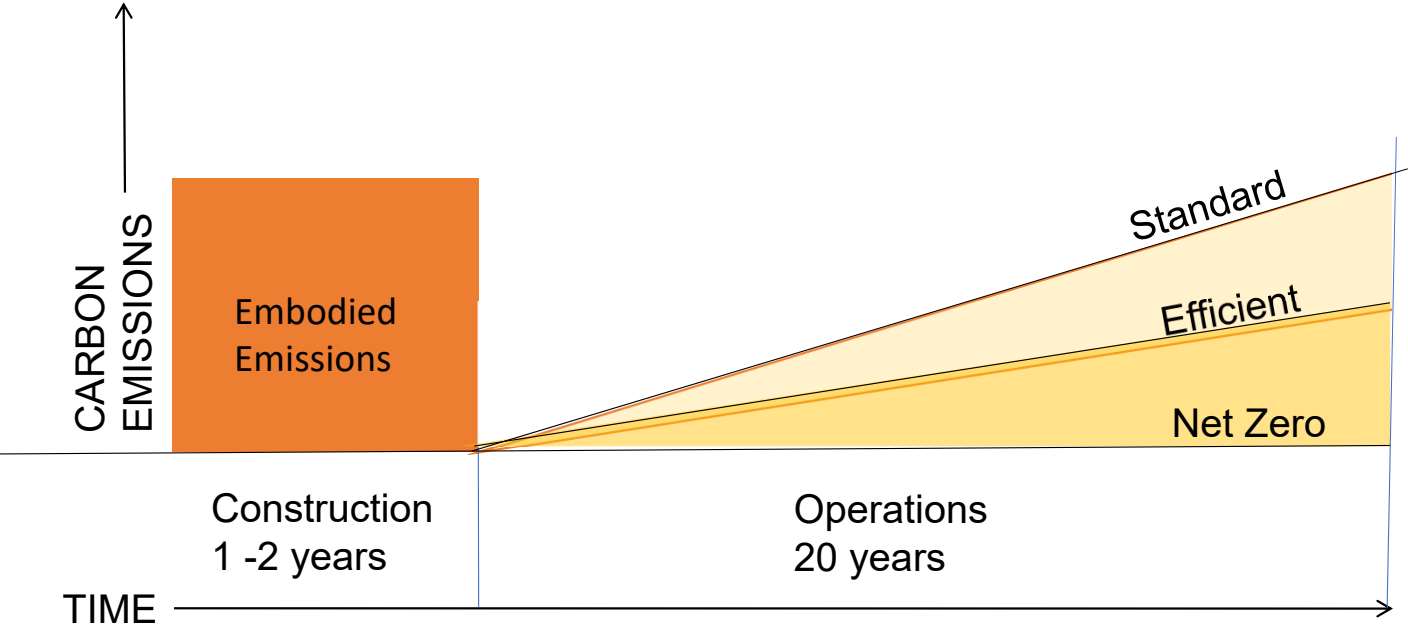
Embodied CO₂ - reduce by using better materials



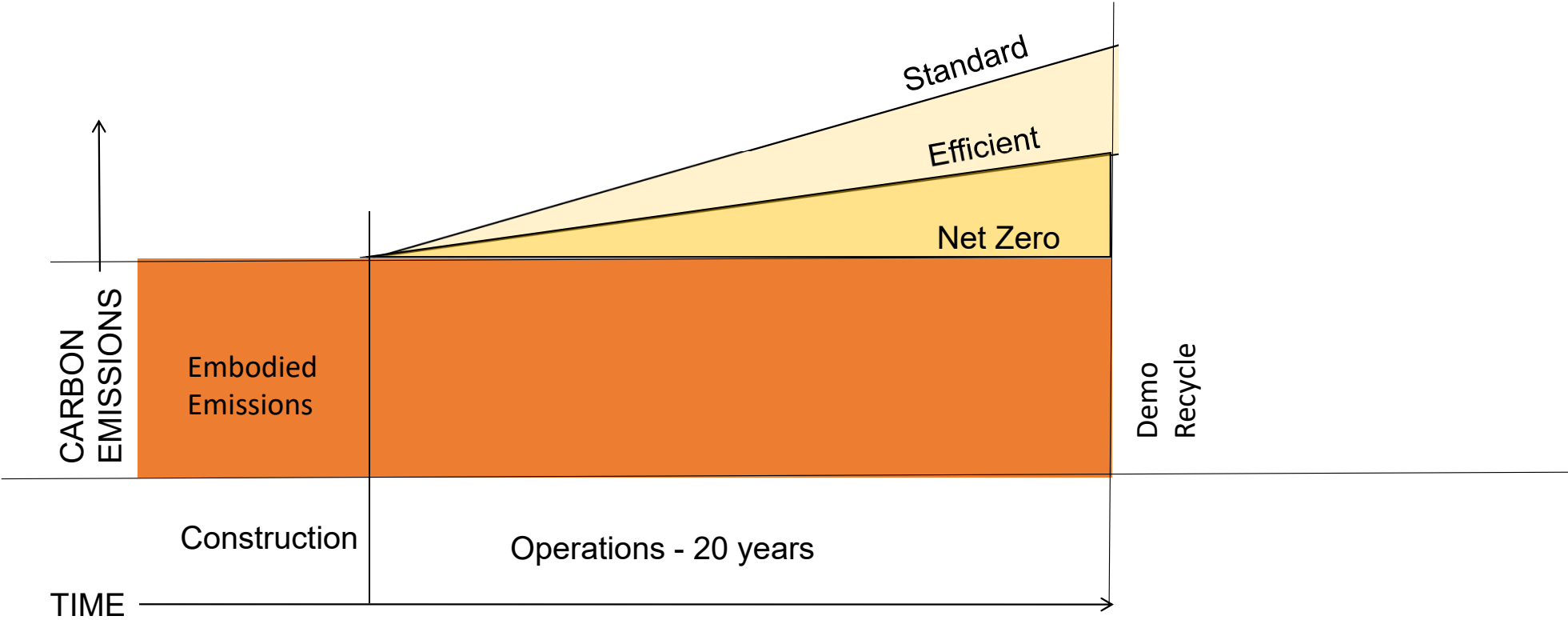
Embodied CO₂ - reduce by reuse



Carbon Emissions for a New Building - Operating + Embodied + End of Life



Carbon Emissions for a New Building - Operating + Embodied + End of Life



Total Carbon Emissions for New Buildings

