Thornton Tomase

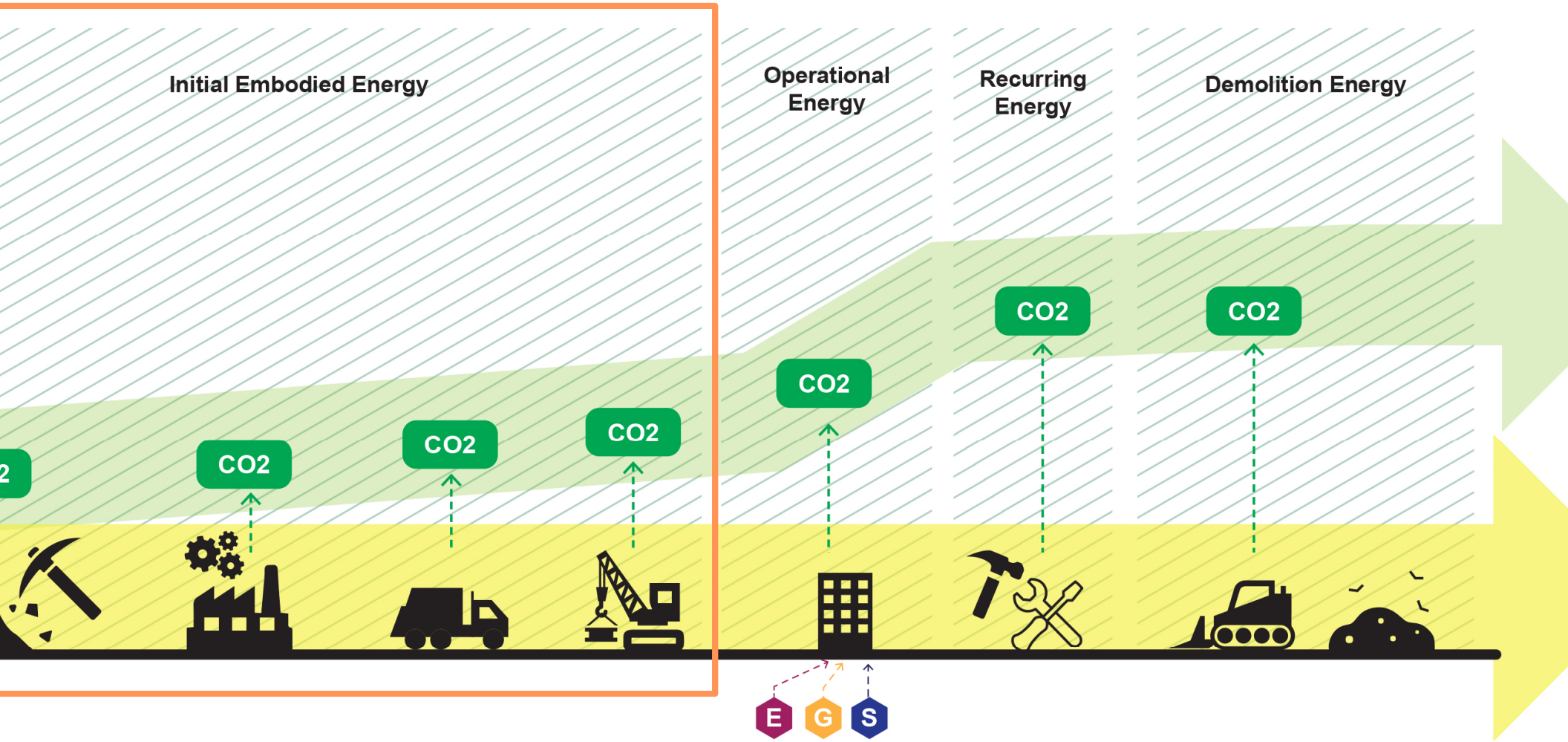
New Priorities – Embodied Carbon in Concrete Constru

Presenter: Michael E. Cropp

ACI Strategic Development Council For

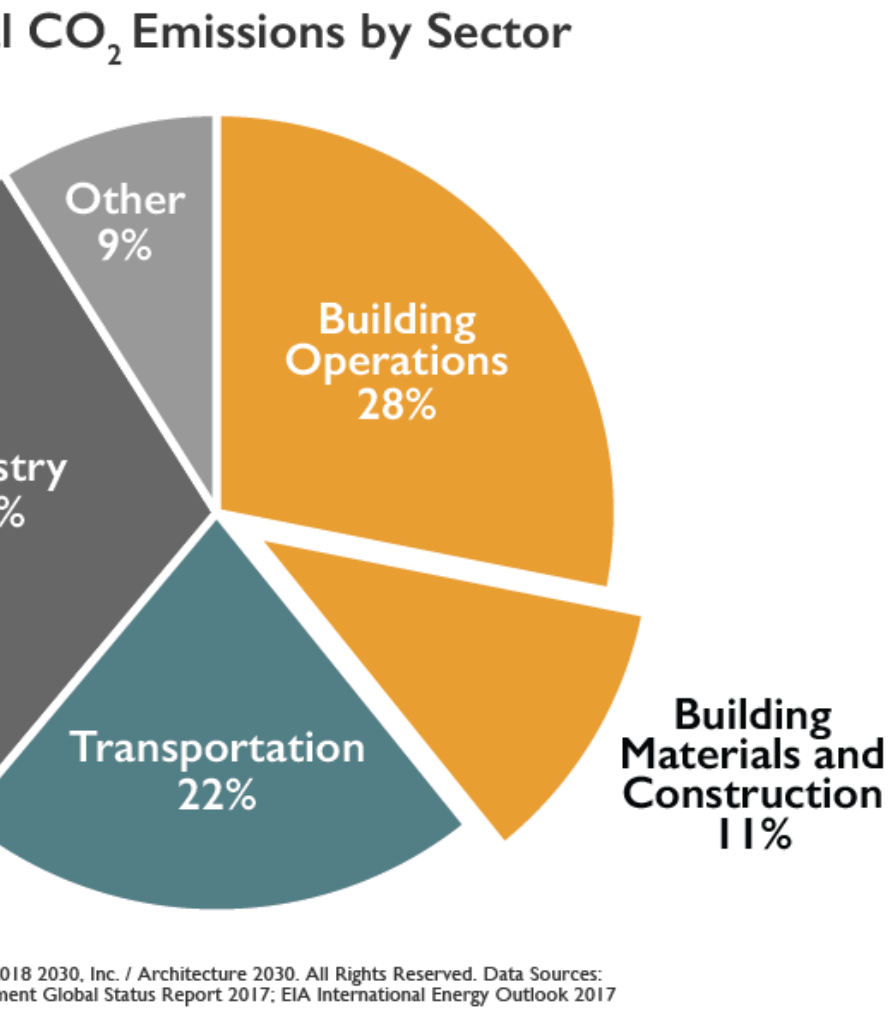
February 13

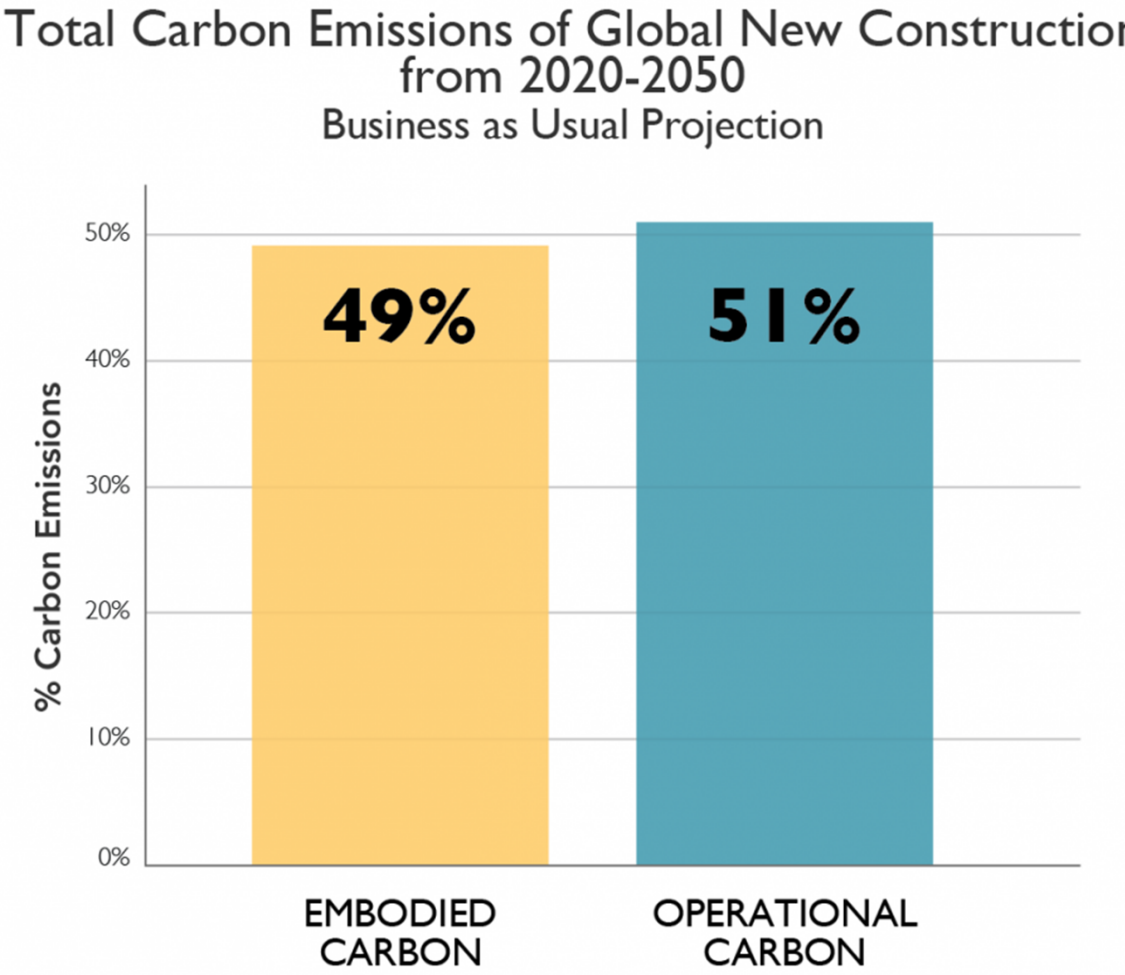
at is Embodied Carbon?



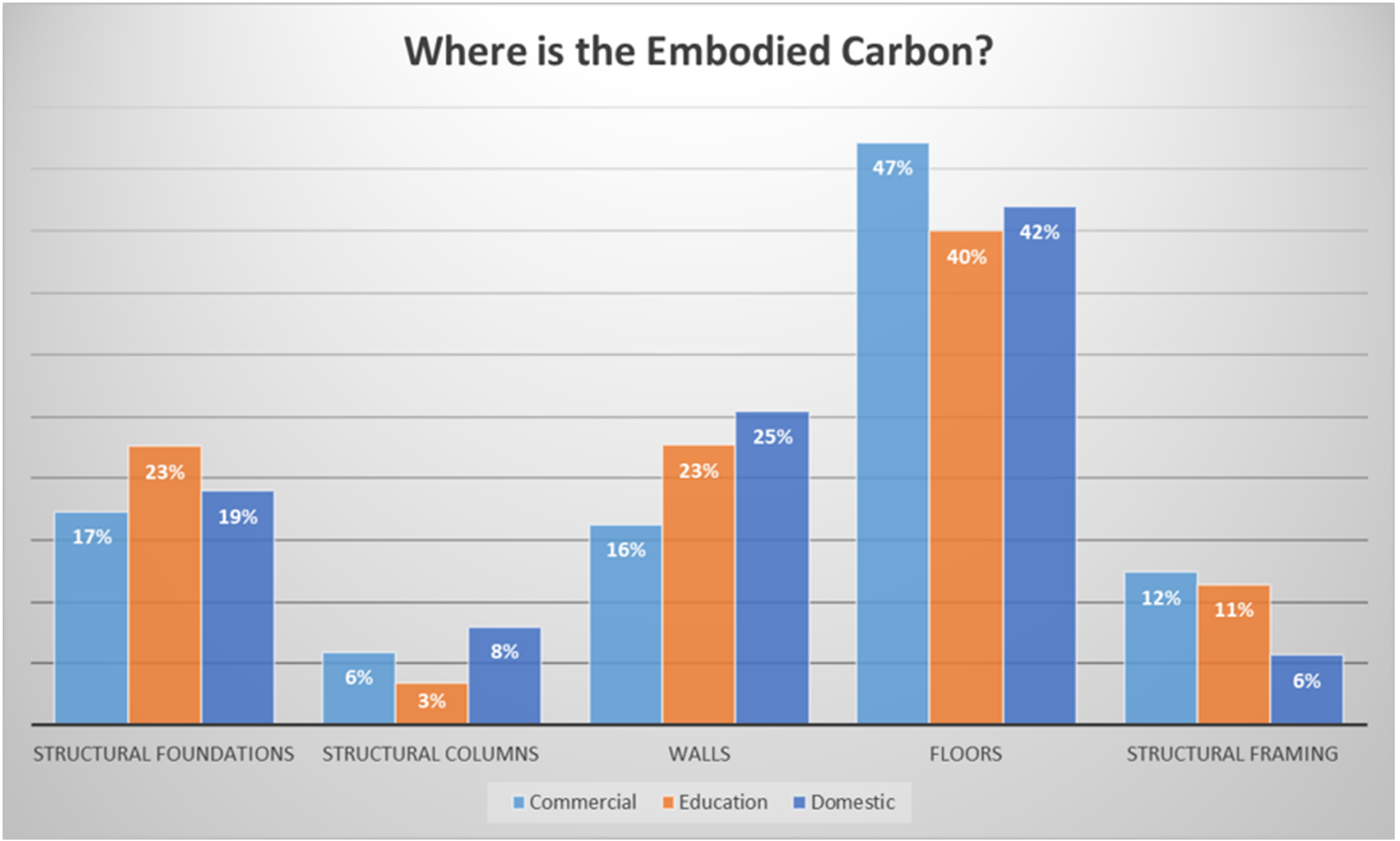
Cradle to Grave Building Life Cycle

in the Built Environment



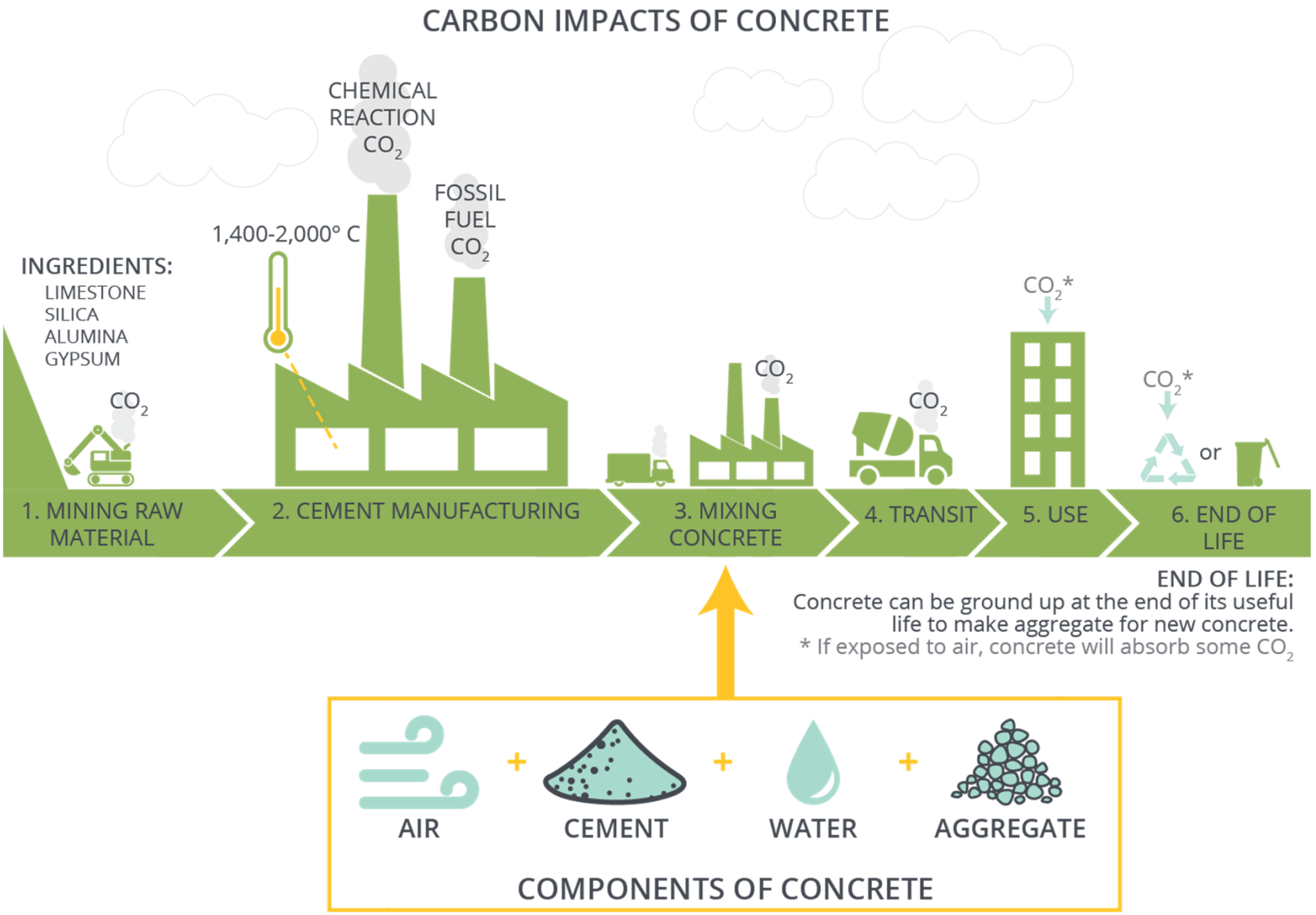


in Building Structure



Courtesy: Thornton Tomasetti

in Concrete Construction



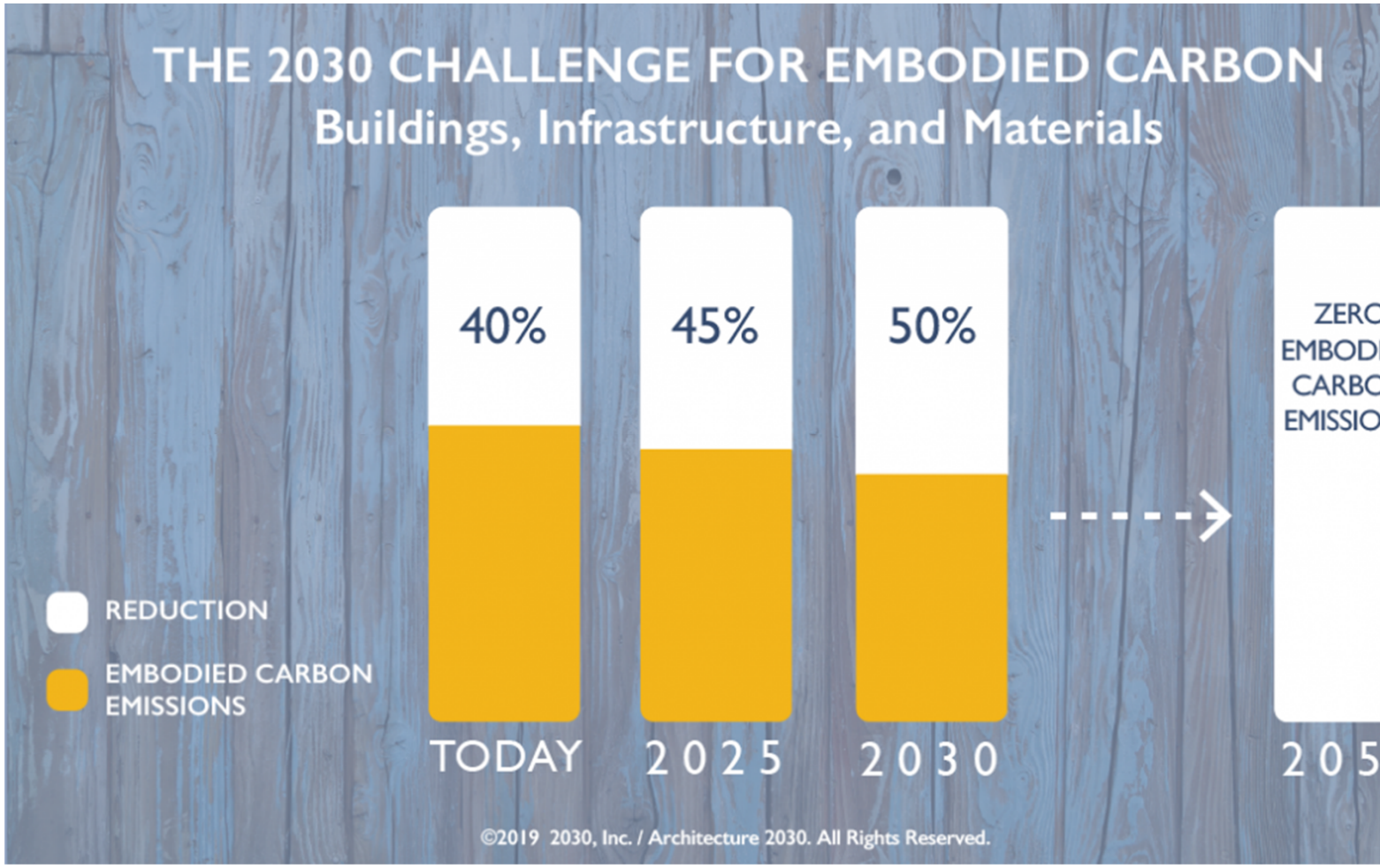
C Industry Response

architecture 2030

CLF Carbon Leadership Forum

URAL ENGINEERS 2050
NGE

4 Building Lifecycle
Reduction



lding Codes

MARIN COUNTY CODE CHAPTER 19.07 ADDED TO MARIN COUNTY CODE

EFORE, THE BOARD OF SUPERVISORS OF THE COUN 'N ORDAINS
WS: Marin County Code Chapter 19.07 (Low Carbo ements) is
d as follows:

Carbon Concrete Requirements
ing: Pursuant to Section 17958.2(a) he
y Board of Supervisors hereby
ilding Standards Code, a wable mix
naterials for plain and sary. This is
rin County exper ative moisture content,
th our heav creased wildfire risk to our
m carb ered by sea water on three
b evel rise as the result of construction-
ficant carbon emissions from cement

maintains adequate strength
d durability ...at the same time
educes greenhouse gas emissions"

provide practical standards and requirements for the
defined herein, that maintains adequate strength and durability for
and at the same time reduces greenhouse gas emissions associated
position. This code includes pathways for compliance with either reduced
or lower-emission supplementary cementitious materials.

cent shift in owner thinking

at defines a successful project?

On Budget

On Schedule

Achieves the Design Vision

Achieves Sustainability Targets

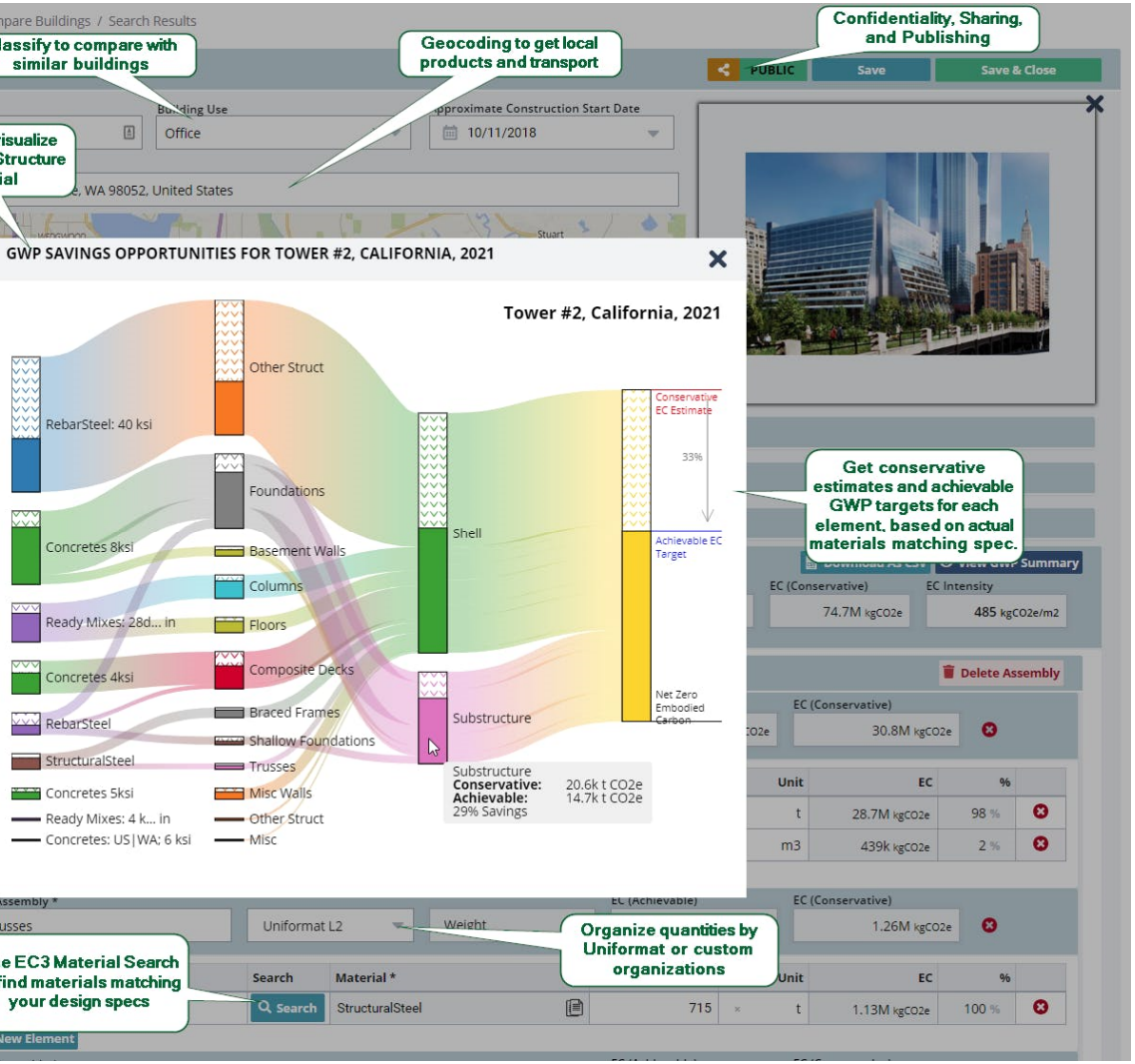
(Embodied + Operational Carbon)

hway to EC Reductions

ata collection and assessment
oduct Declarations (EPDs)
esilience
aterial choice (best suited for the job)
chitecture
aterial efficiency (design)
aterial optimization (concrete mix)
acking and evaluation

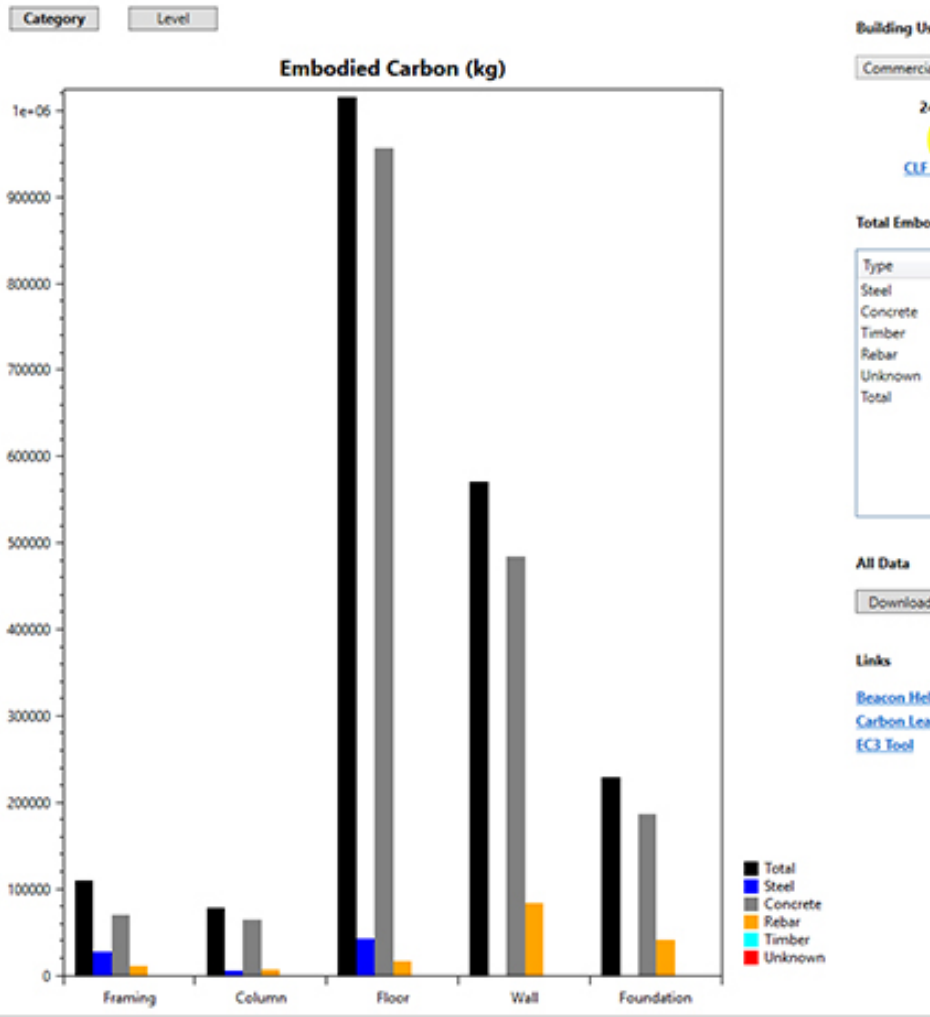
Courtesy: Thornton Tomasetti

ta Collection and Assessment



uilding Transparency.org

Beacon



Courtesy: Thornton Tomasetti

duct Declarations

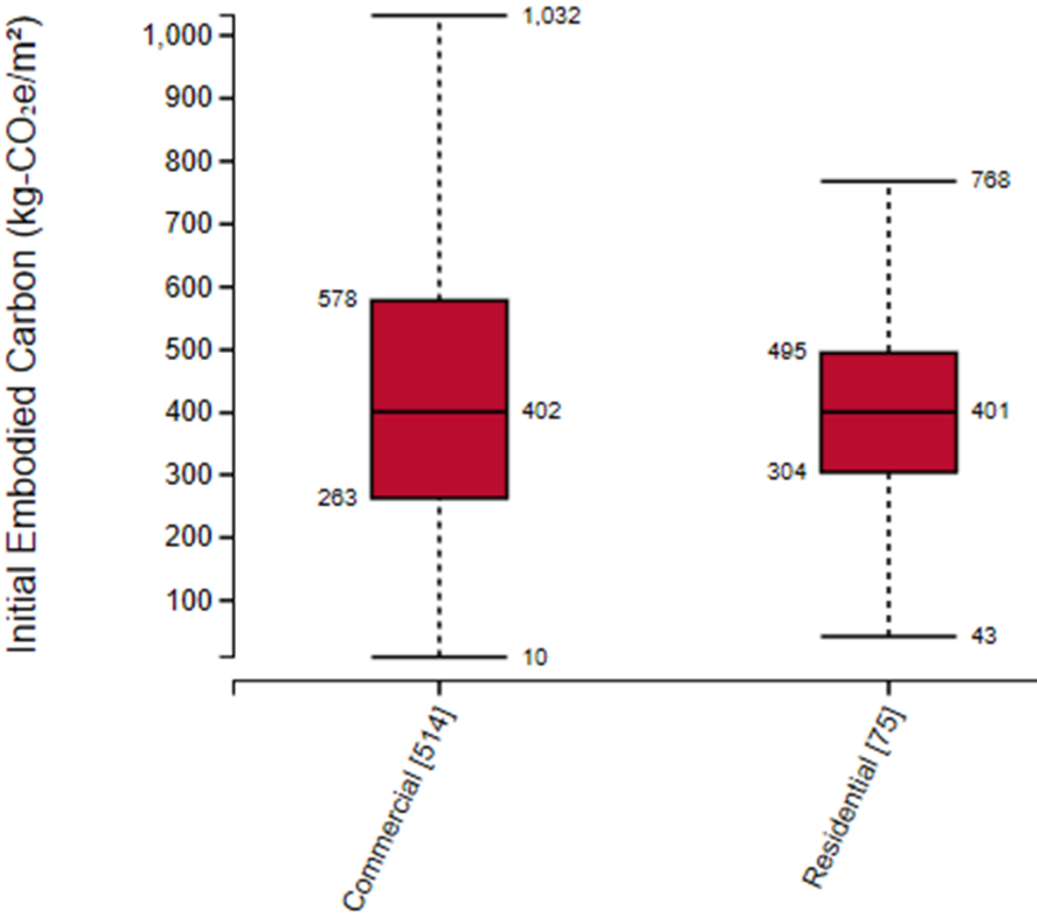
"Nutrition" Label

Building Product

per Unit

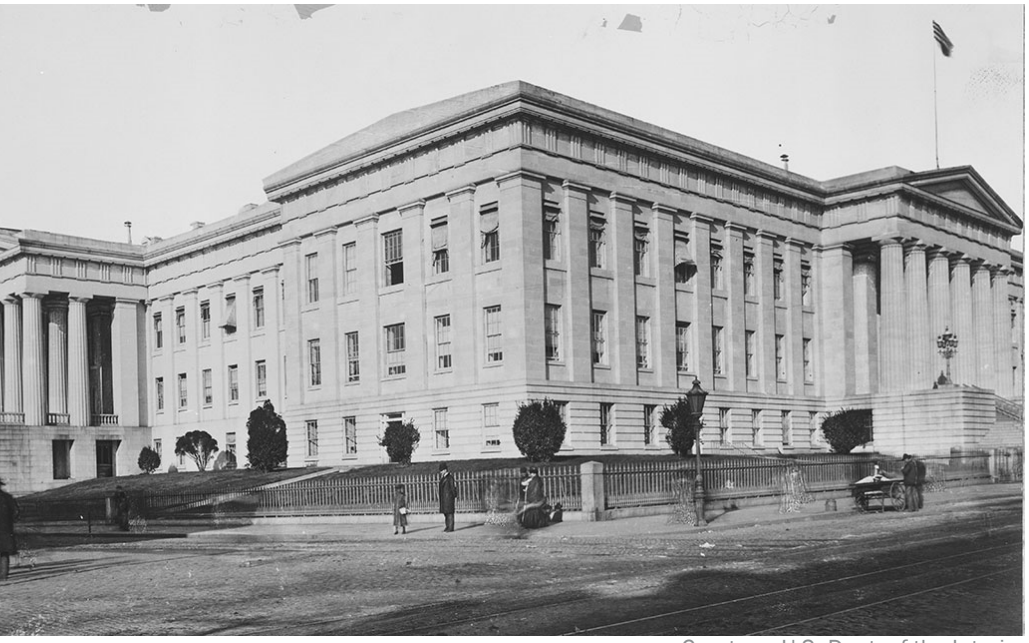
PACT MEASURES	TOTAL
Energy (MJ)	0.0
Warming Potential (kg CO_2 eq)	0.0
Depletion (kg CFC^- 11 eq)	0.0
ation Potential (mol H^+ eq)	0.0
ication Potential (kg N^- eq)	0.0
Oxidant Creation Potential (kg 03 eq)	0.0

duct's Ingredients: Listed Here



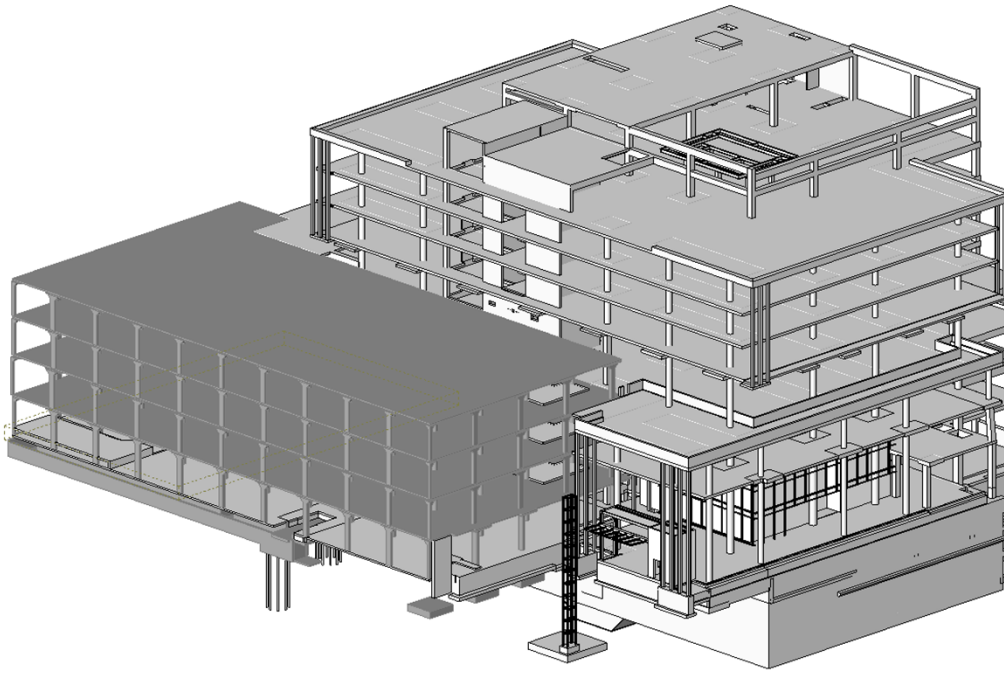
Courtesy: Carbon Leadership, Embodied Carbon Benchmark Study

sign - Resilience

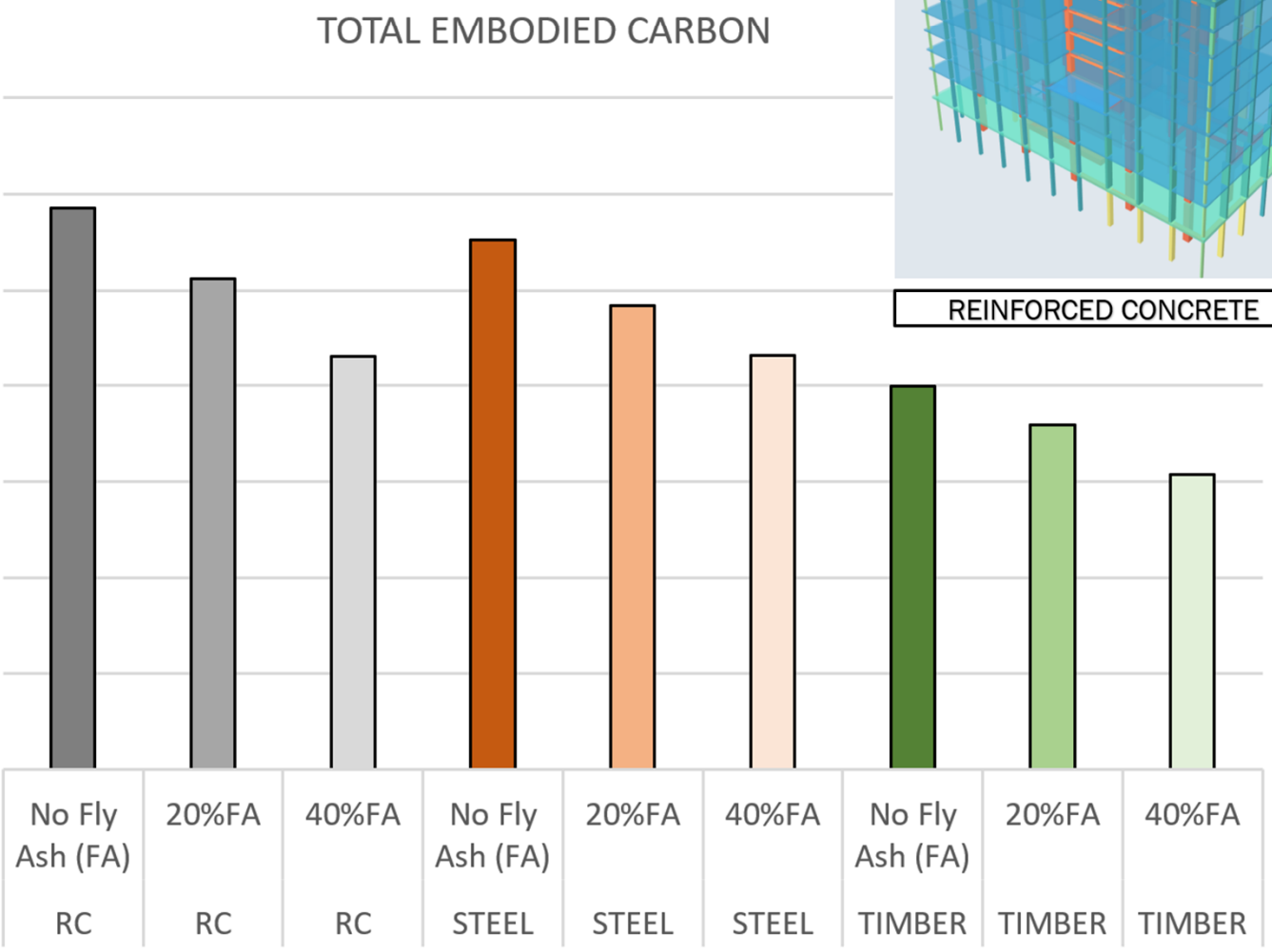


Courtesy: U.S. Dept. of the Interior

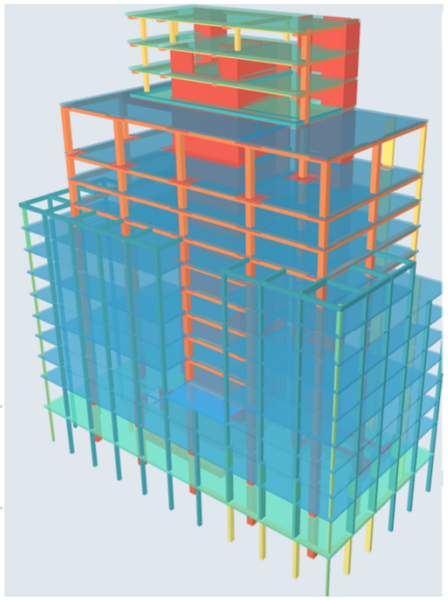
Courtesy: Shalom Baranes Associates



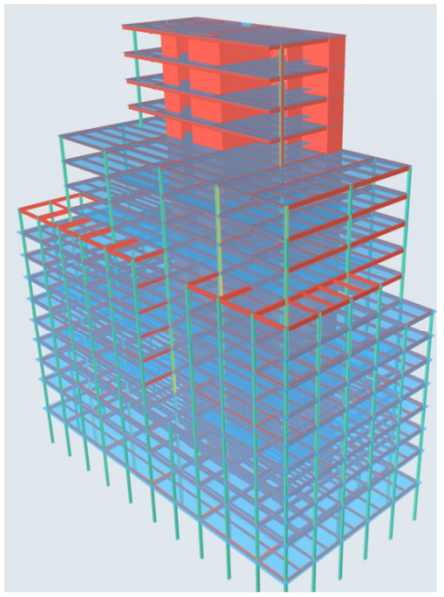
terial selection



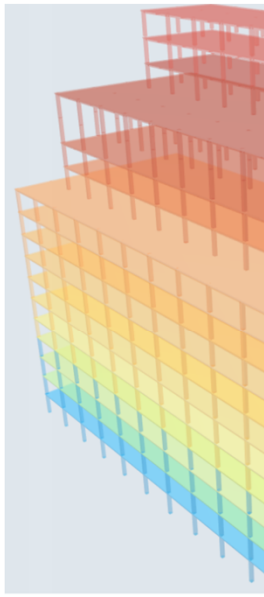
Courtesy: Emre Kalayci, Thornton Tomasetti



REINFORCED CONCRETE



STEEL

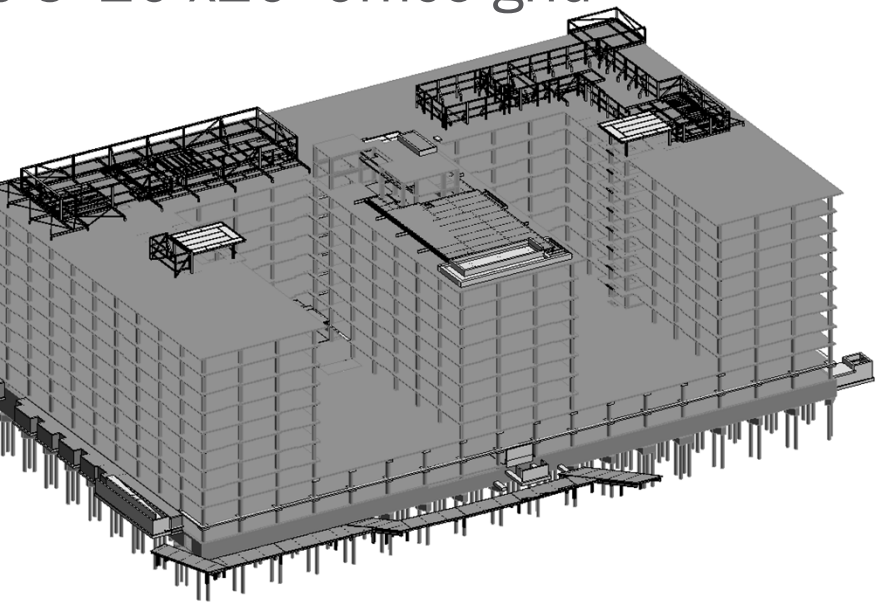


TIMBE

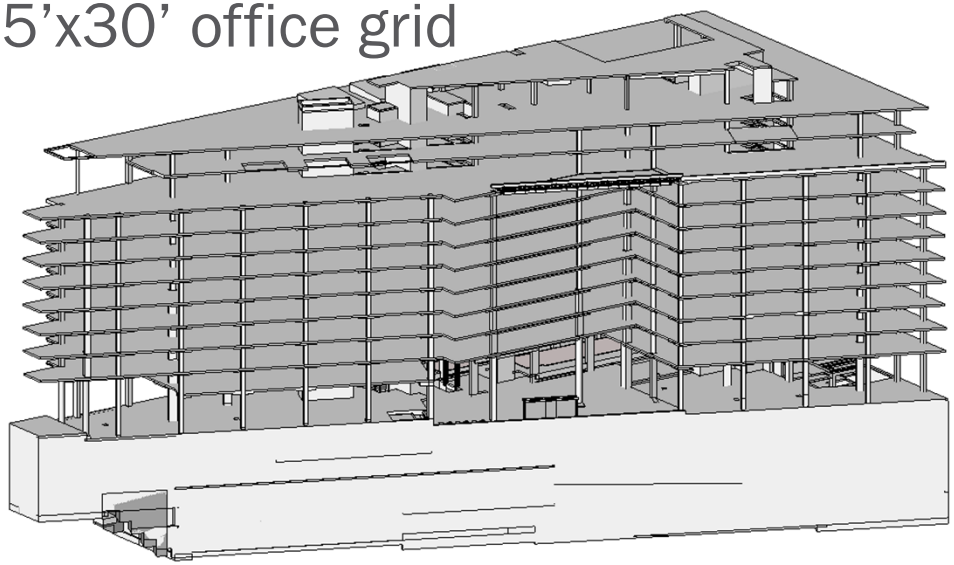
Courtesy: Emre Kalayci, Th

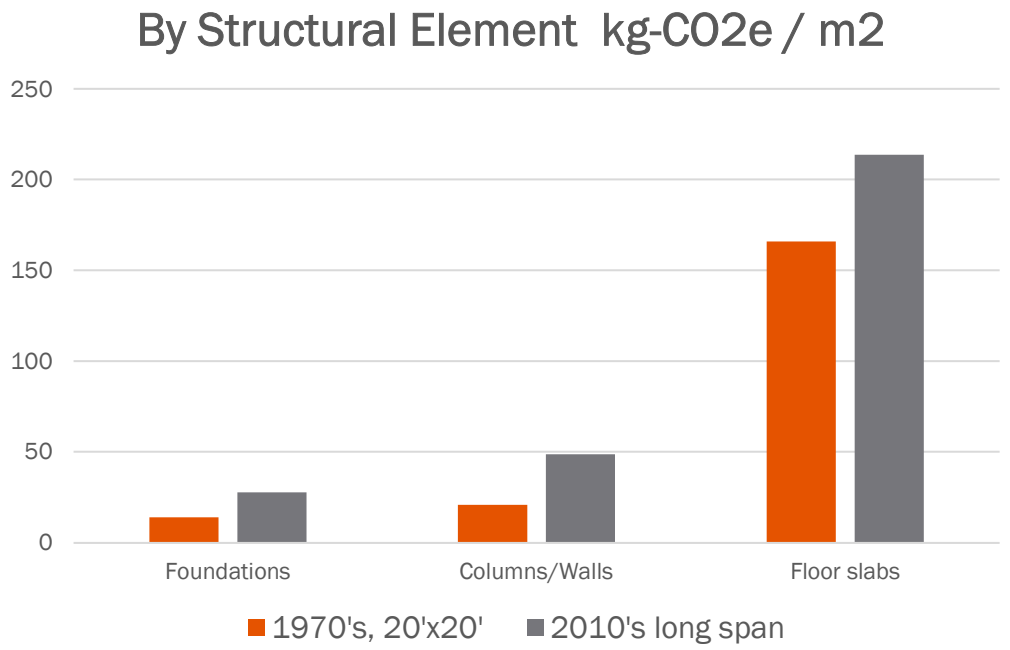
sign

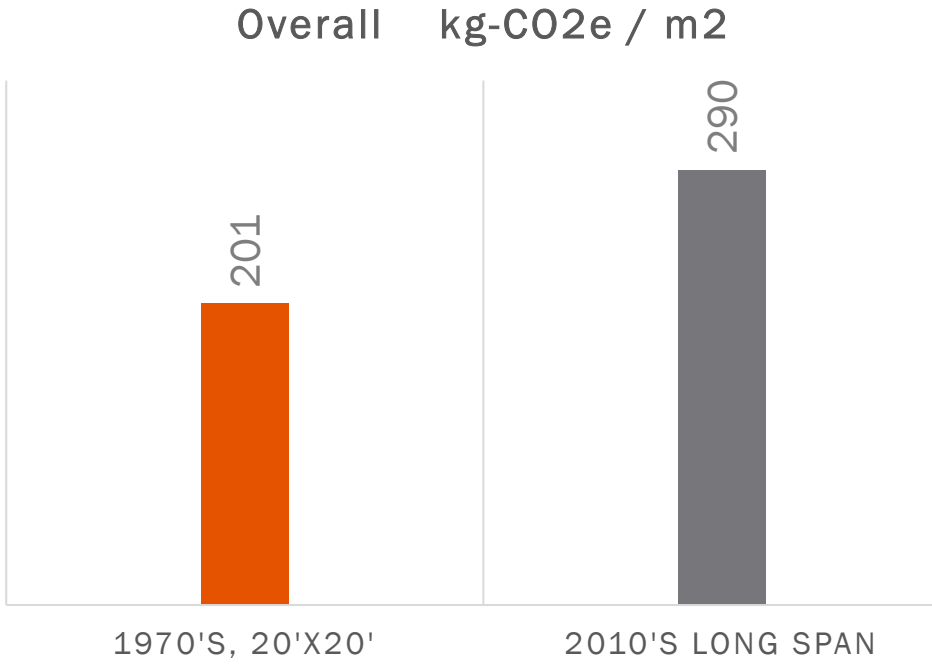
0’s 20’x20’ office grid



0’s 45’x30’ office grid

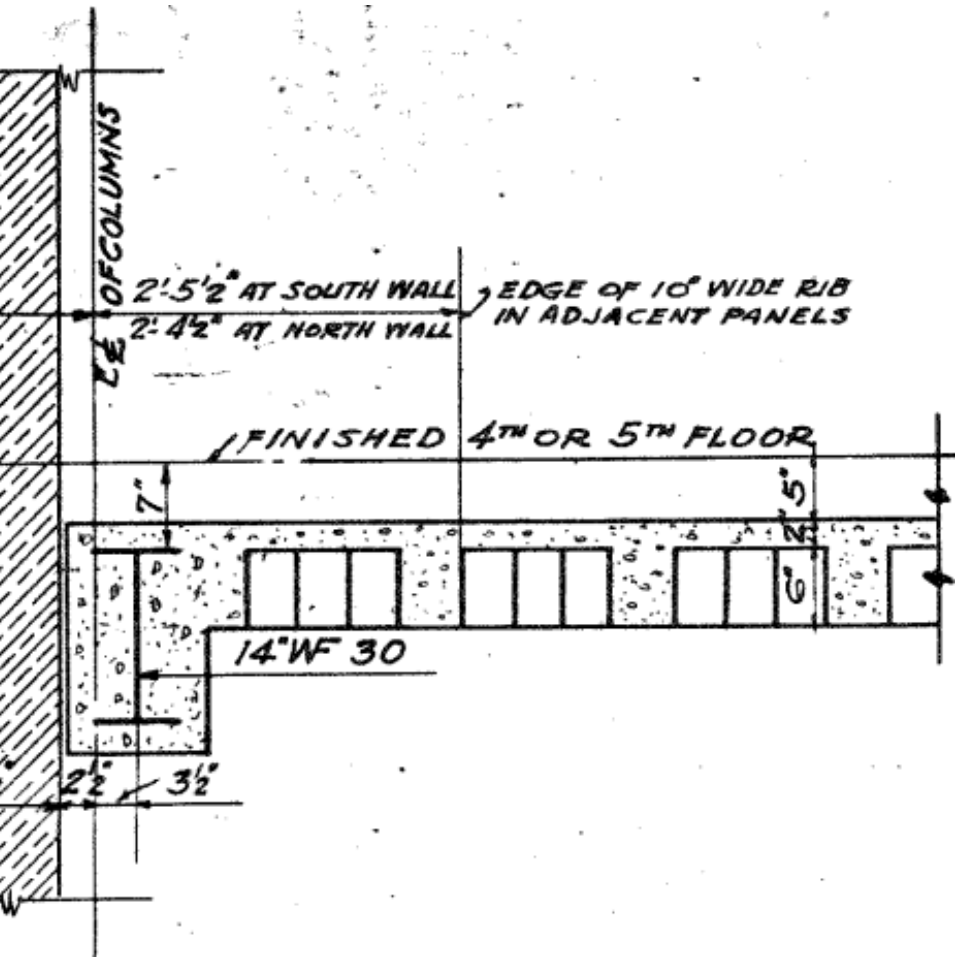




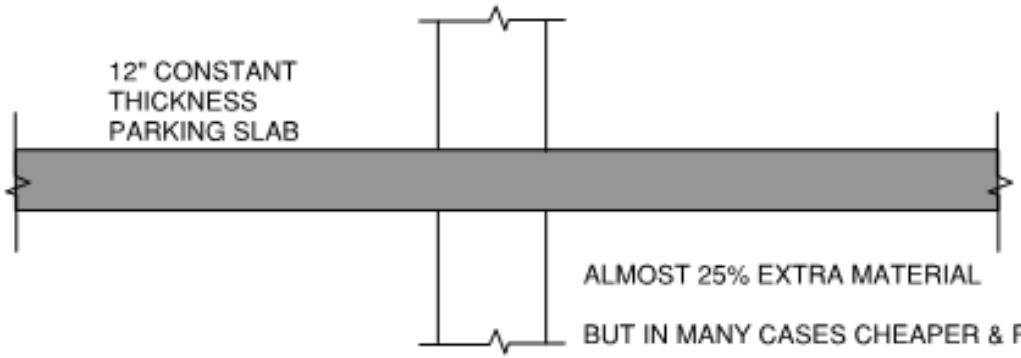


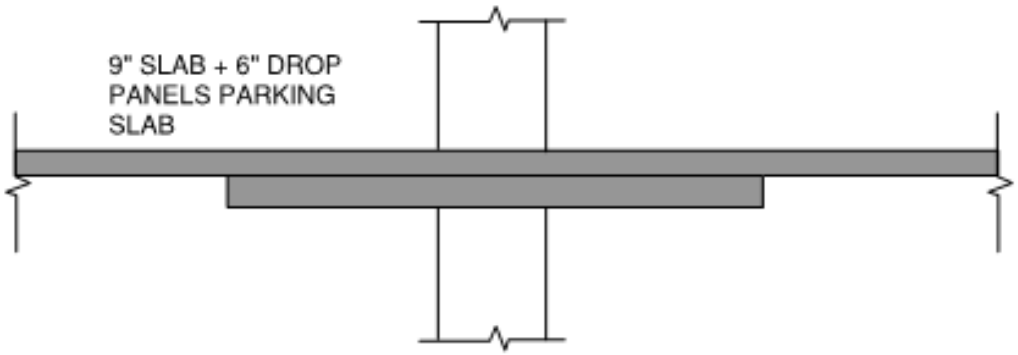
terial Efficiency – elevated slab example

s Washington DC Construction

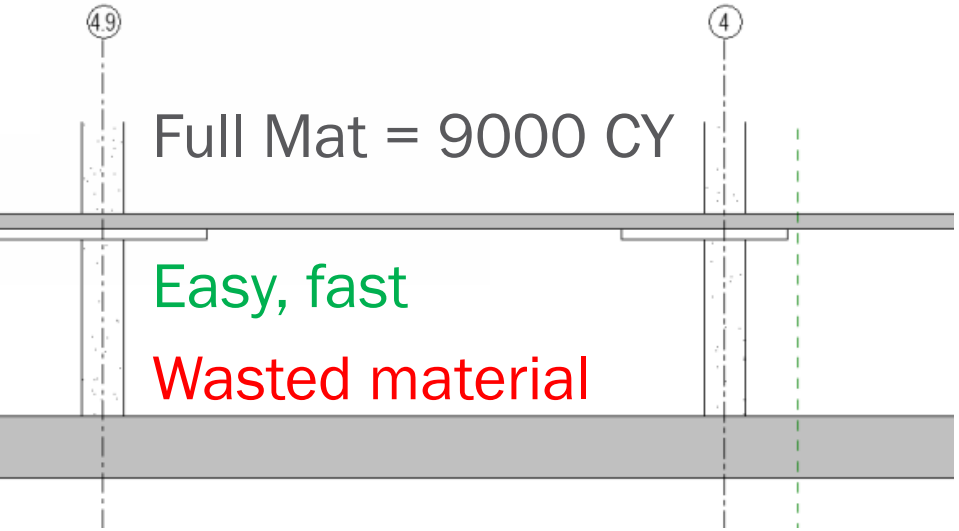


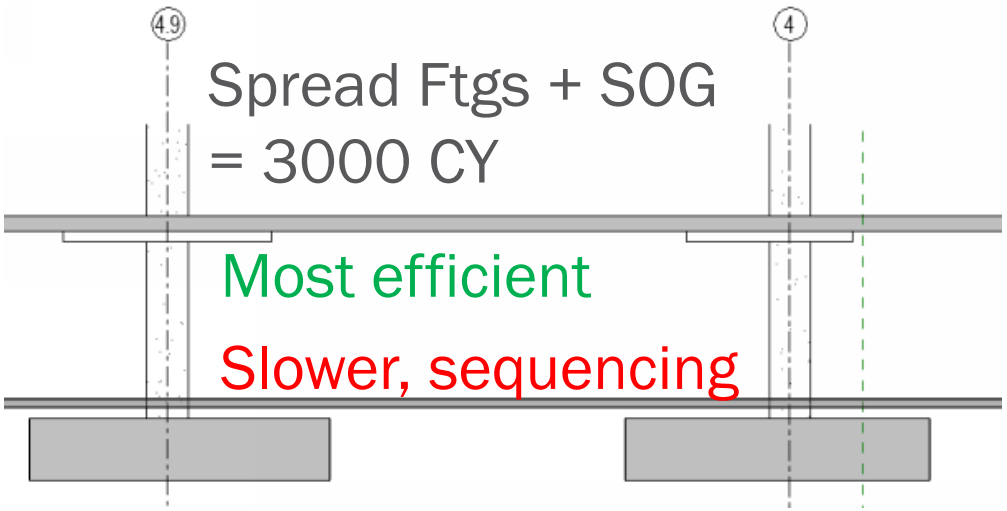
Today

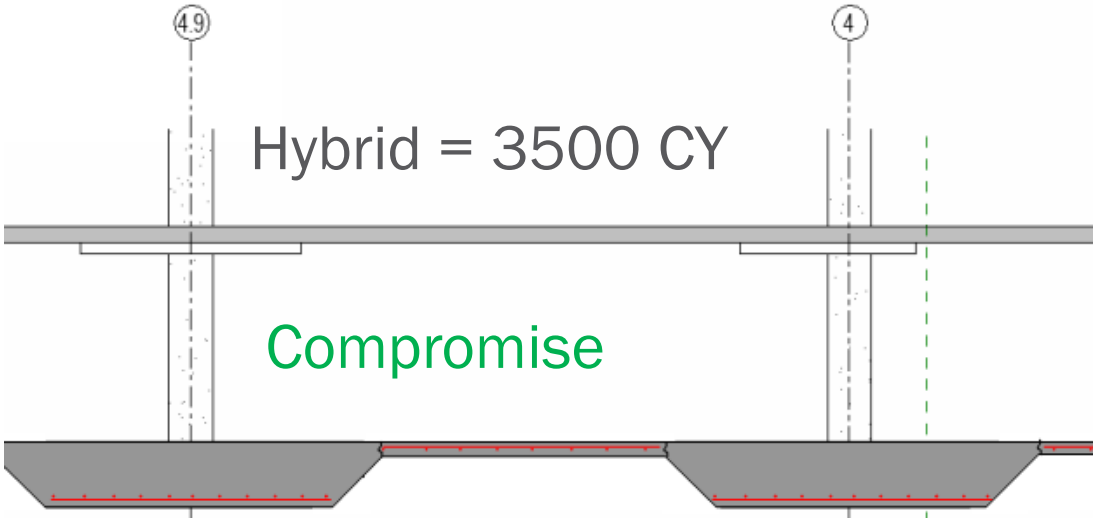




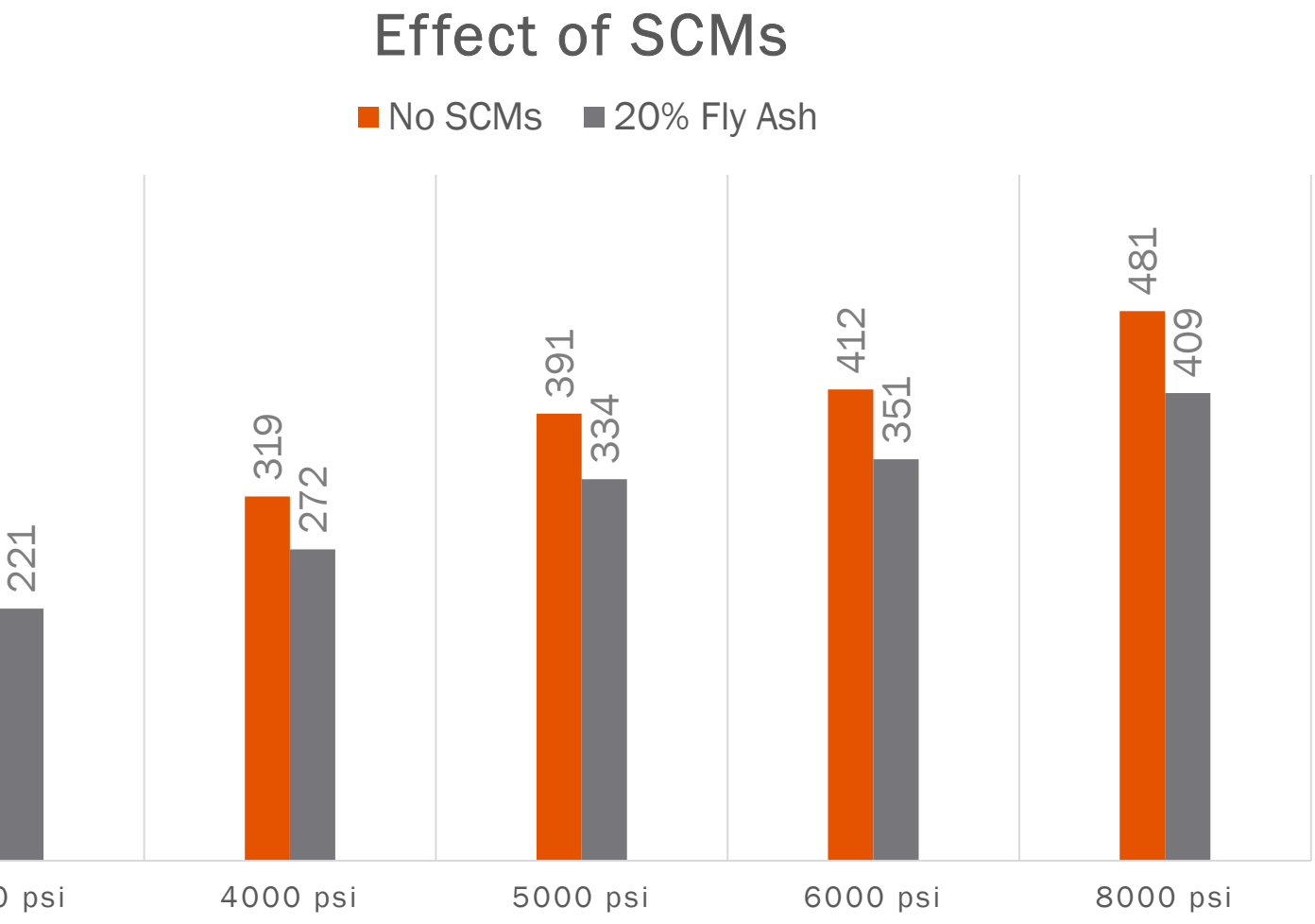
terial Efficiency – foundation example







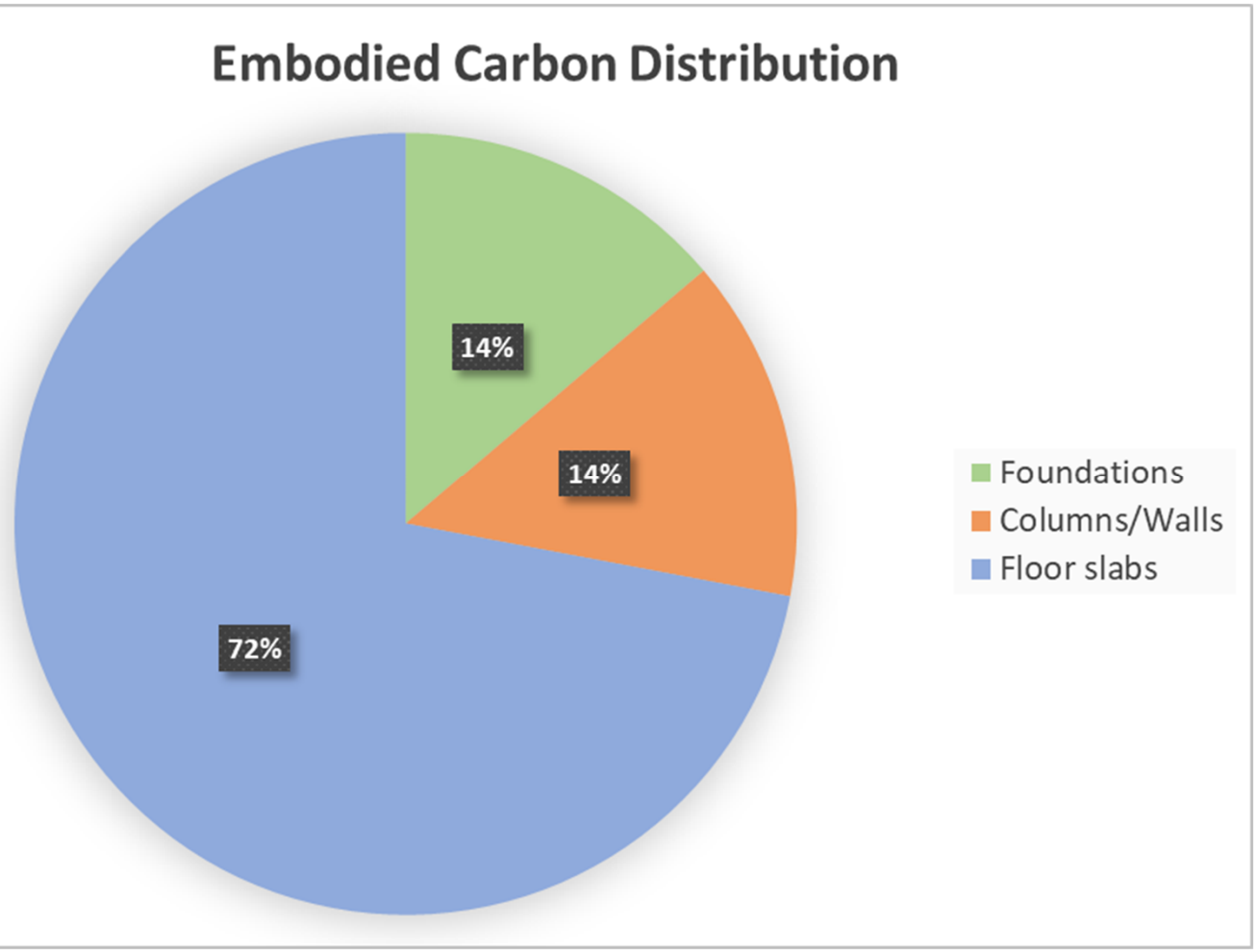
terial Optimization



Source: National Ready Mix Concrete Association EPD 2016-2021

terial Optimization

e tower on podium example



Slabs are the largest contrib

1. High early strength
2. Usually no SCMs

5000 psi PT slabs

a. 3000 @ 2 days
b. >8000 @ 28 days

=25% more embodied carbo
than required by the design

cent Advances

Concrete, LLC — CO2 sequestration + cement replaced with Portlandite

rbiCrete — CO2 sequestration + cement replaced with blast furnace sla

CARBON CURE — CO2 sequestration. Claim about 11 kg/cy carbon reduction (3%-5%)

SOLIDIA — Combines energy reductions from cement production with carbon-bath curing of concrete

at story we will tell?

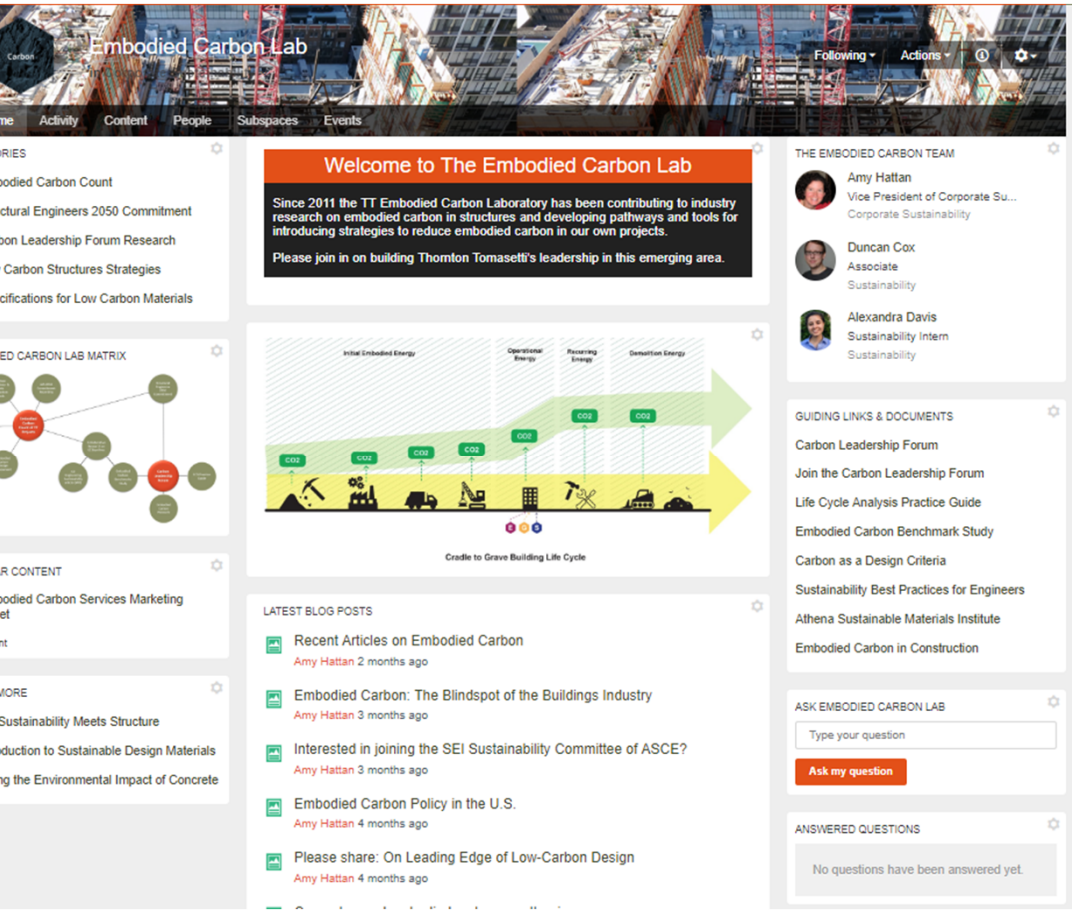
CI 130 involvement and vision

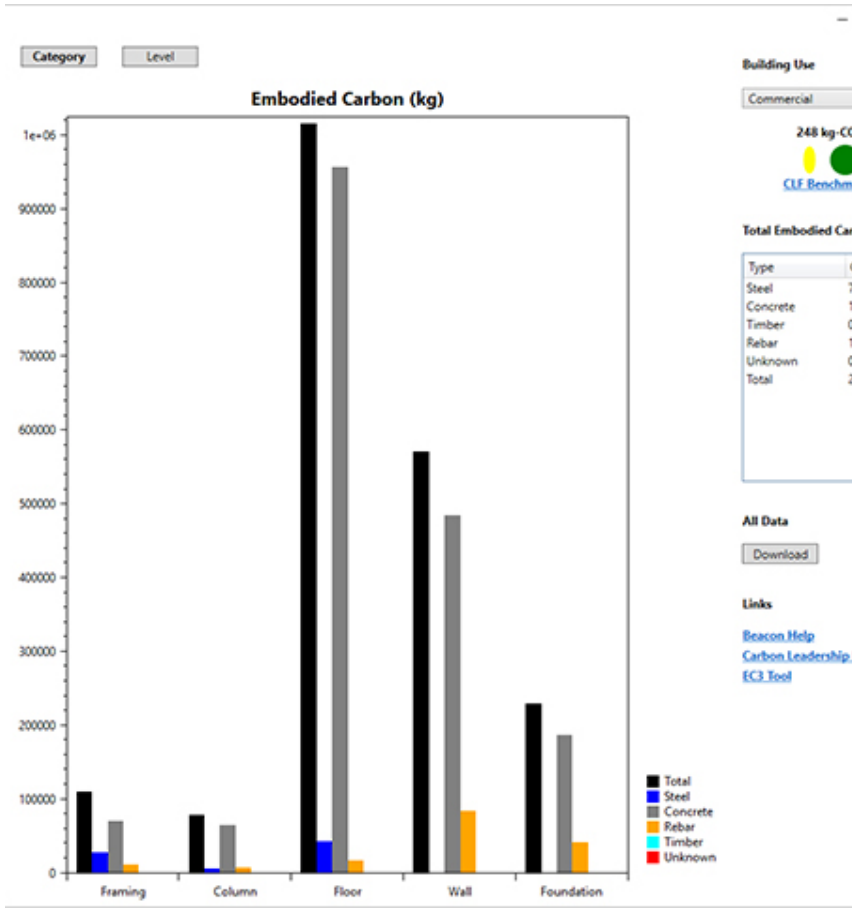
dustry support: EPDs, carbon
questration, mix designs, new
chnologies

eative thinking: owners, design
ofessionals, contractors, suppliers,
dustry officials, researchers,
novators

Courtesy: Thornton Tomasetti

estions?





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