

The Contractor's Role in Reducing Upfront Embodied Carbon

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About Webcor



**AVIATION +
TRANSPORTATION**

CIVIC + CULTURAL

COMMERCIAL OFFICE

EDUCATION



**FEDERAL +
GOVERNMENT**

HEALTH + SCIENCE

HOSPITALITY

INFRASTRUCTURE



MIXED-USE

PARKING STRUCTURE

RESIDENTIAL

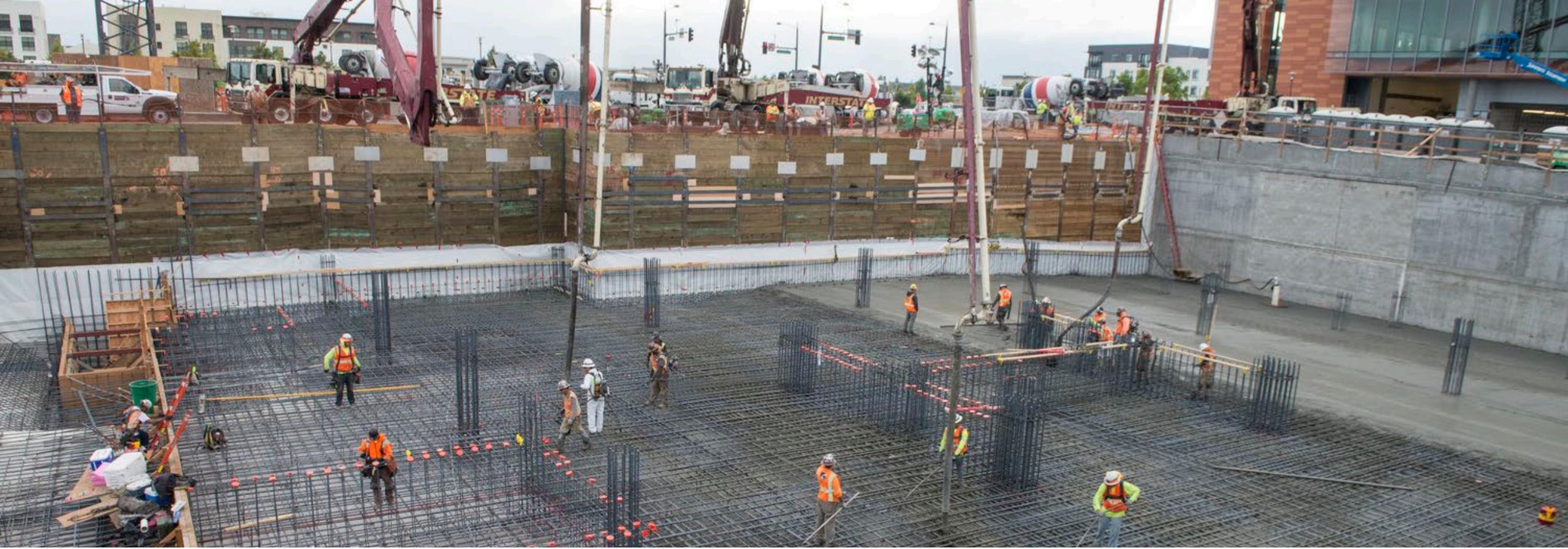
RETAIL + RESTAURANT

\$2.1 B
revenue in 2019

1,800+
employees

>100 million s.f.
projects built to date

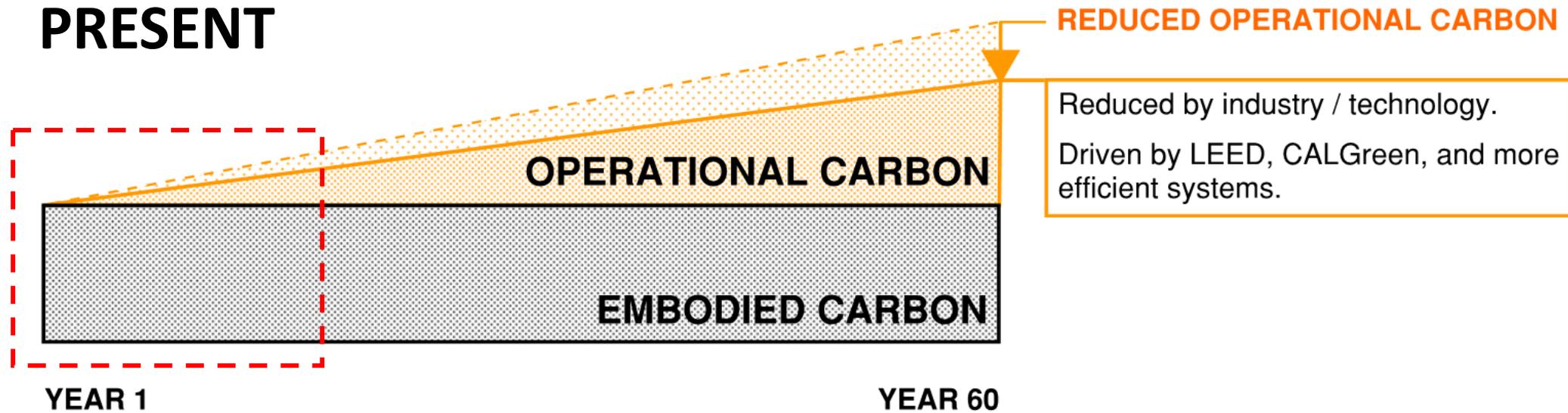




01 Lay the Groundwork

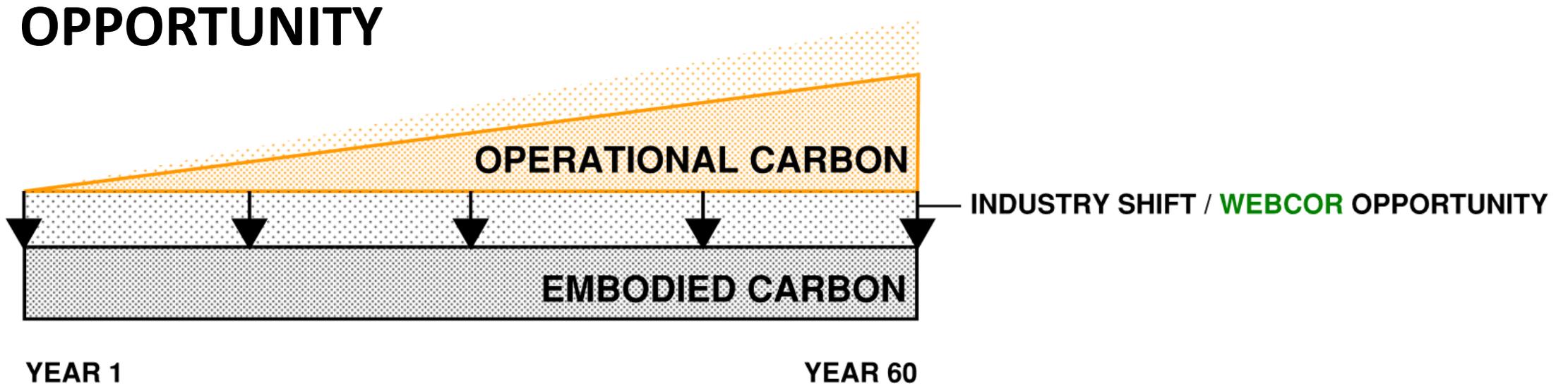
Understanding Carbon Emissions – Over Time

Carbon produced by a building over time:



Understanding Carbon Emissions – Opportunity

Carbon produced by a building over time:



How do we source low carbon materials for our buildings?



Embodied Carbon in Construction Calculator

EC3 – *What is it?*

- Carbon footprinting tool
- Utilizes product database for carbon benchmarking and product comparison
- Contractor-friendly and streamlined for quick use



www.buildingtransparency.org

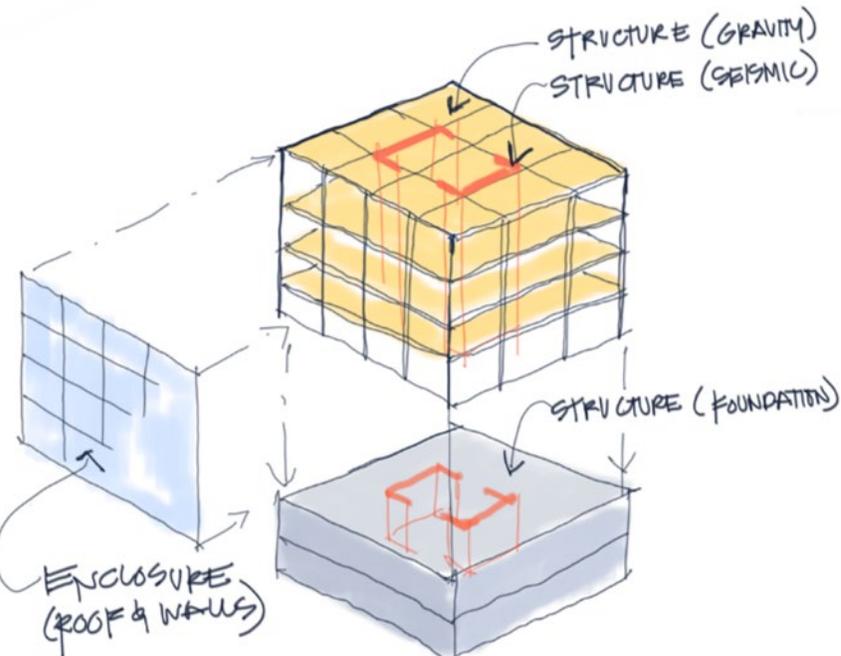
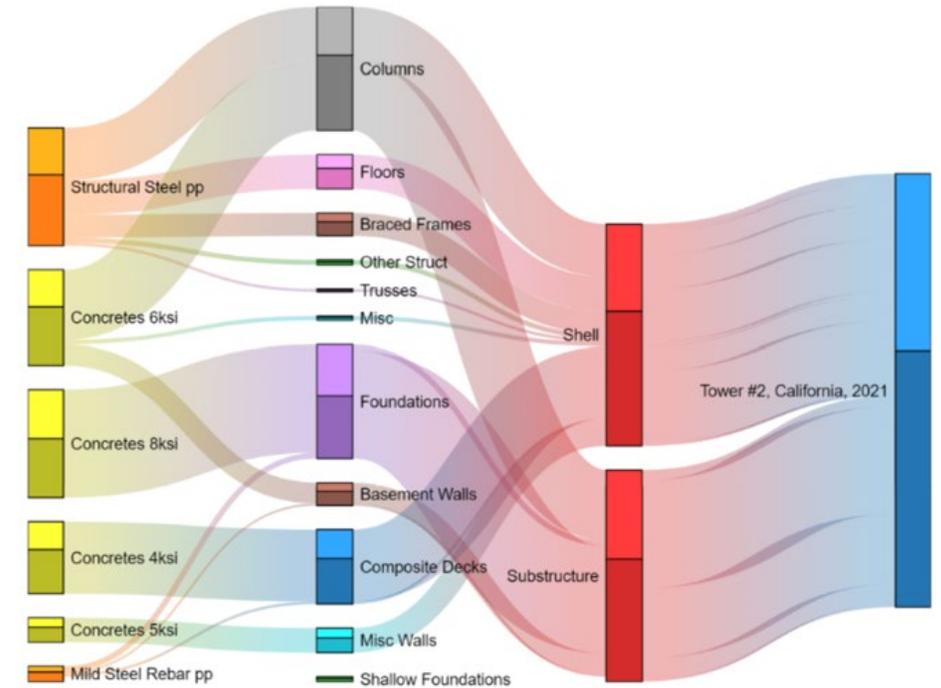
Carbon Smart Estimating



Life Cycle Impact Results (per m³)

Declared Unit: 1 m³ of 10,000 psi concrete at 28 days

OPERATIONAL IMPACTS		PerformX™ PECC10K
Plant Operating Energy (MJ)		38.6
On-Site Plant Fuel Consumption (MJ)		11.1
Concrete Batch Water (m ³)		1.68E-01
Concrete Wash Water (m ³)		1.91E-02
On-Site Waste Disposal (kg)		0.0
ENVIRONMENTAL IMPACTS		
Total Primary Energy (MJ)		3,017
Climate Change (kg CO ₂ eq)		445
Ozone Depletion (kg CFC 11 eq)		1.31E-08
Acidification Air (kg SO ₂ eq)		2.96
Eutrophication (kg N eq)		0.09
Photochemical Ozone Creation (kg O ₃ eq)		0.61



MATERIAL QUANTITY ESTIMATE



EMBODIED CARBON PER MATERIAL EPDs



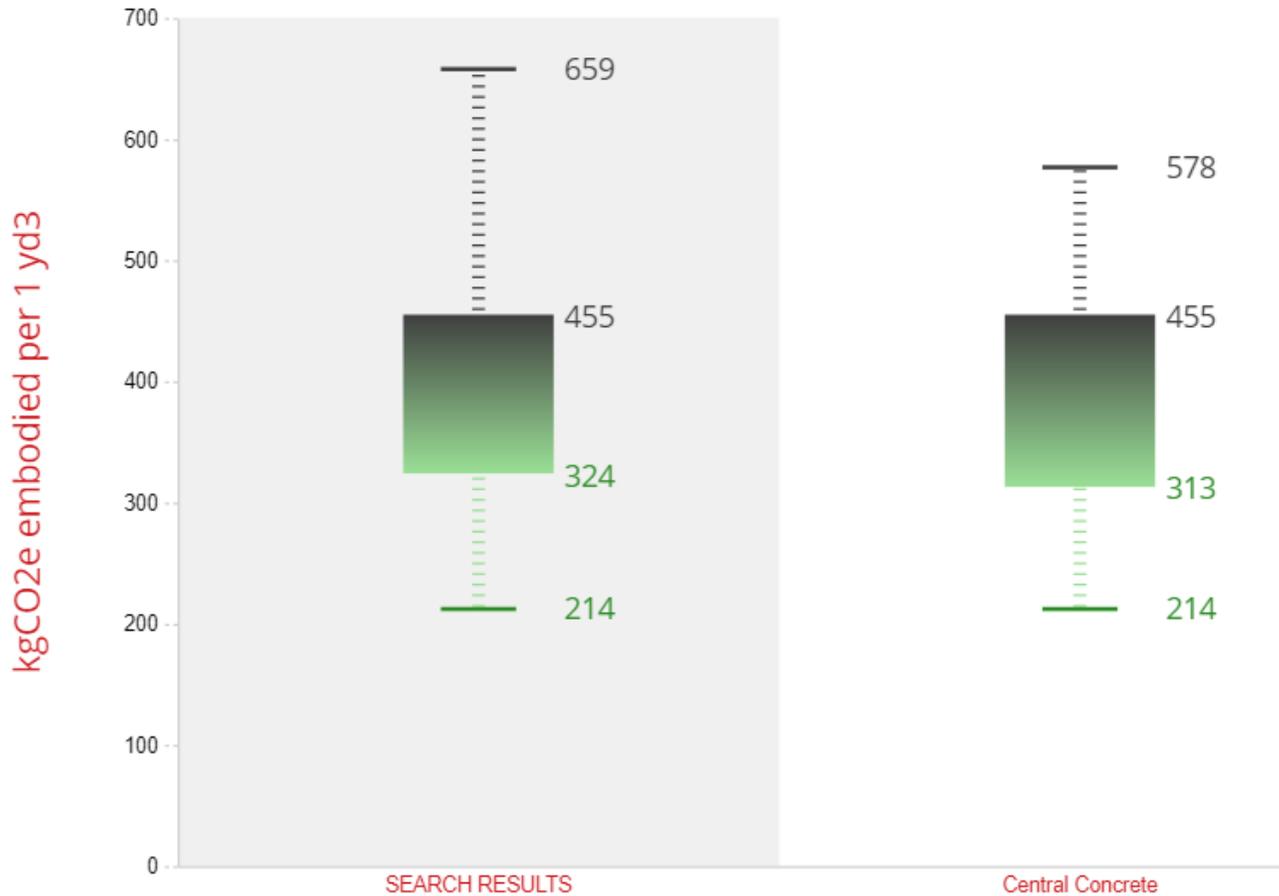
BUILDING EMBODIED CARBON (EC) ESTIMATE

Using the Tool

Concrete Assessment Example – Concrete Mix

COMPARE BY MANUFACTURER

Search Terms: **Jurisdiction : US** **Plant Straight-line Distance ≤ 5 miles** **Valid after : 2019-0**

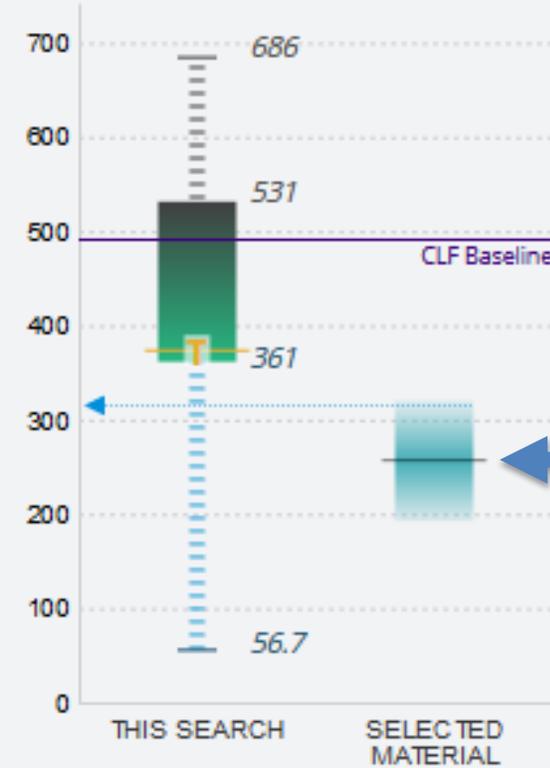


Selected material

1557388, Pier 92 Amador, 4000 psi, 316 kgCO2e, 2.95 miles

kgCO2e embodied per 1 yd3

Tour : **BOXPLOT DIAGRAM - SELECTED MATERIAL**



Selected Material

--T-- My Target

Using the Tool – Estimated Footprint & Opportunity Sankey Diagram

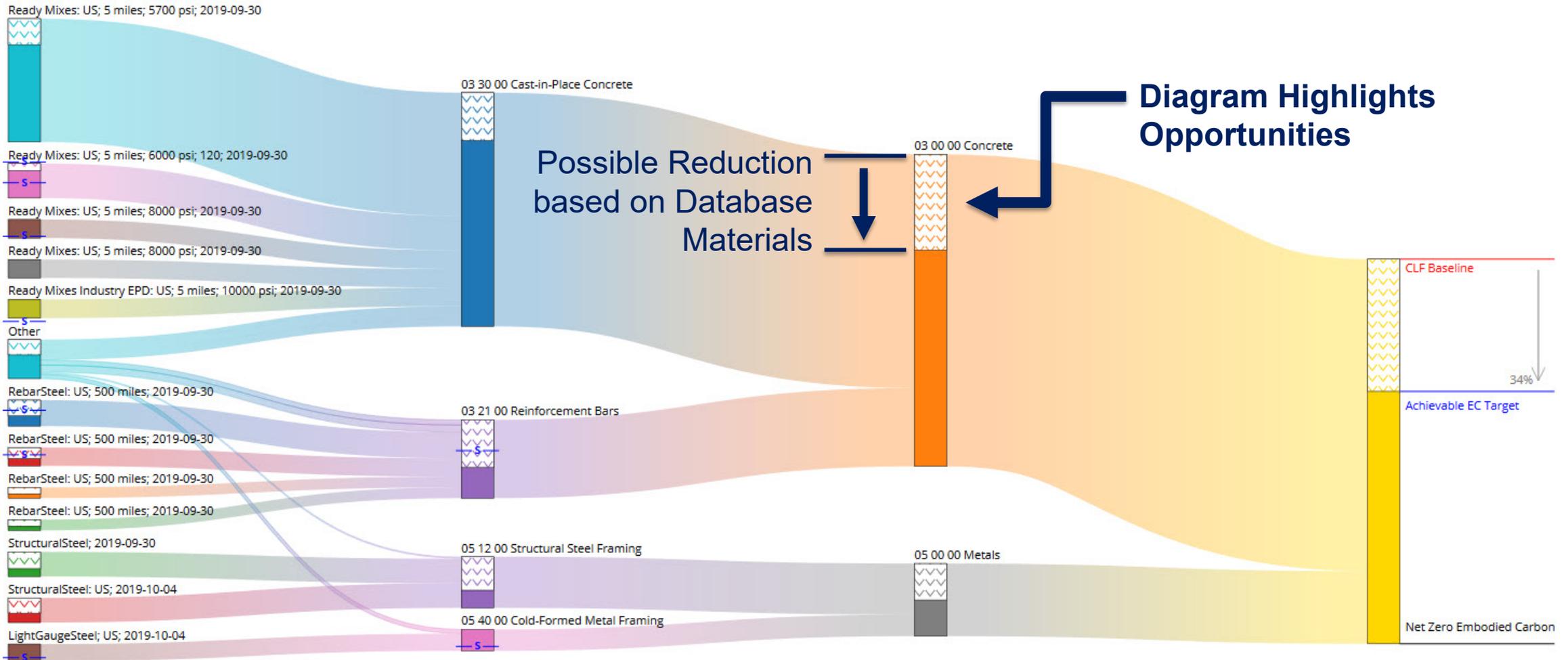
GWP SAVINGS OPPORTUNITIES

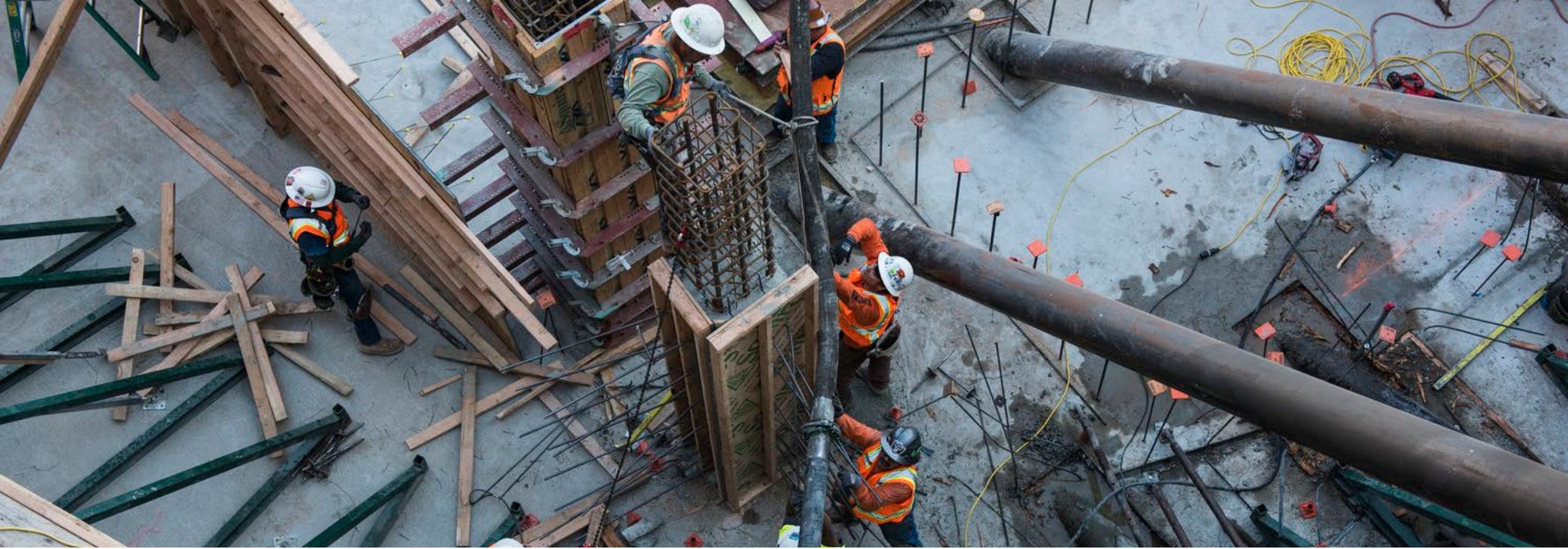
(MASTERFORMAT VIEW)

Tour : [SANKEY DIAGRAM](#)



706 Mission St





02 Upon “Mastering” the Tool

Taking it to the Next Level

- Insight into EC3 allowed us to think bigger
- Development of our corporate carbon commitment

What needed more focus within our industry?

What were local jurisdictions doing that we could build upon?

What new norms could we directly influence as a GC?



Webcor's Carbon Commitment

Find more info about Webcor's implementation [here](#)

1

Employ the EC3 on all new projects to compare and reduce embodied carbon emissions from construction materials through informed materials selection

2

Request and collect data on all concrete, structural steel, rebar, drywall and glass manufacturers to provide EPDs at time of bid for review as part of Webcor's evaluation process

3

Continue as a pilot partner of EC3 to provide tool updates based on our valuable industry expertise

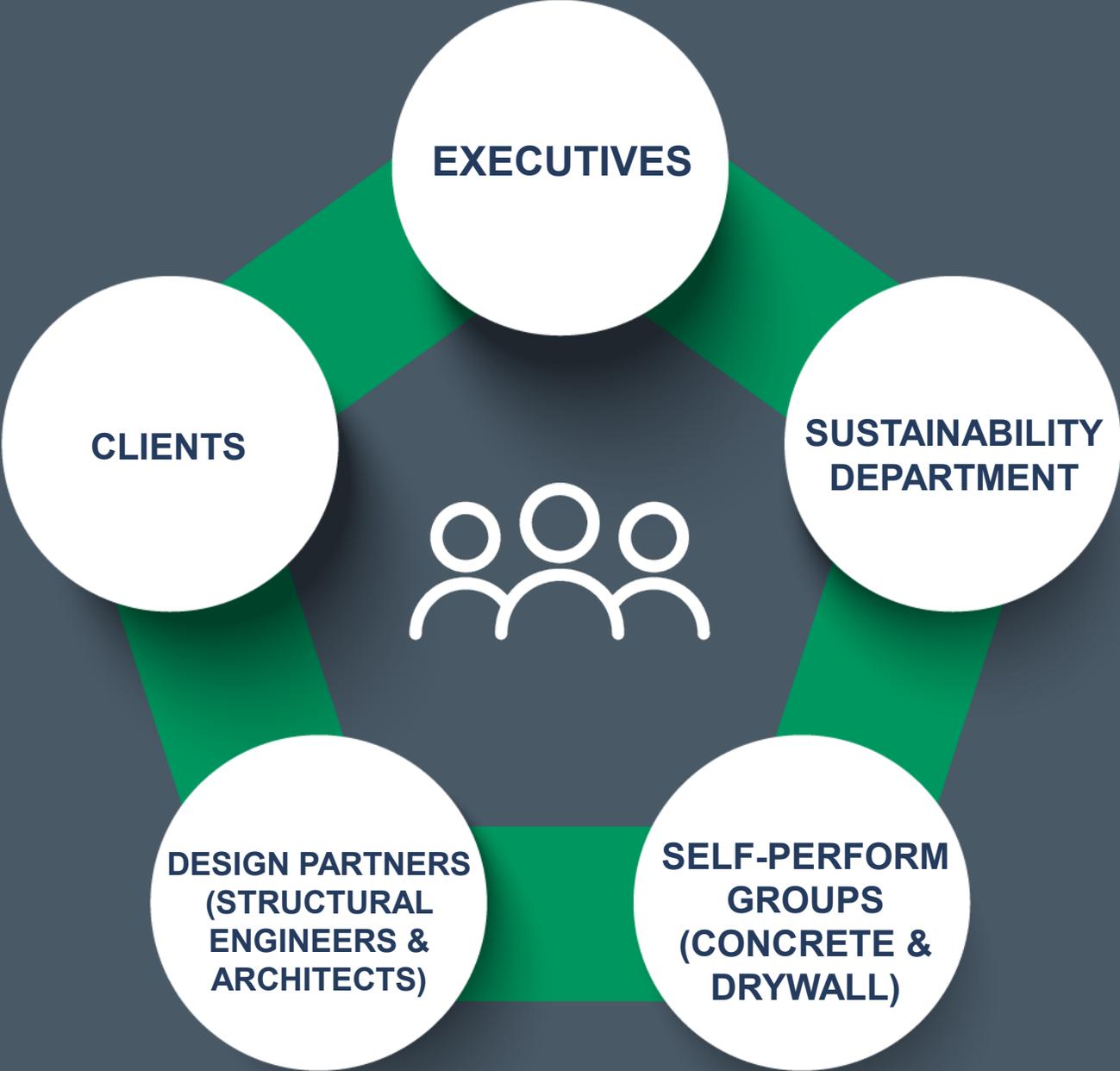
4

Go beyond the public project requirements set forth by California's Article 5: Buy Clean California Act, establishing maximum allowable global warming potential (GWP) limits (beginning in January 2021)



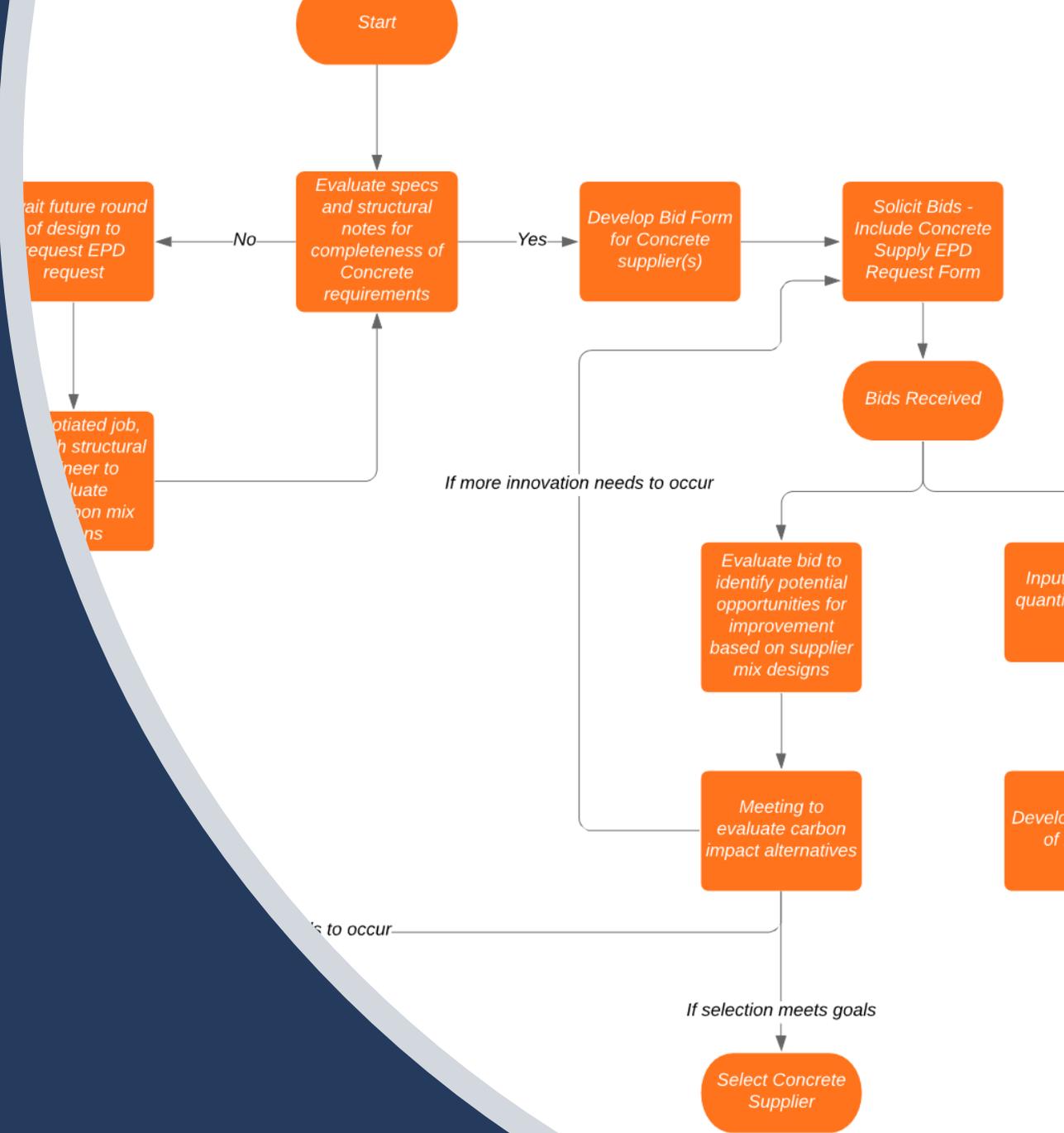
03 Implementation

Critical Team



Process Roadmap

- Walk through this process for all self-perform groups (Concrete, Rebar, Drywall)
- Define decision/action points during design and construction to influence embodied carbon
 - Spec design
 - Solicitation of bids
 - Buyout and procurement of materials



Bid Buyout Process

Developed EPD request forms for:

- Carpet
- Ceiling Tile
- Concrete
- Rebar
- Drywall/Framing/Insulation
- Enclosure/Glazing
- Structural Steel/Metal Stairs
- Timber



DRYWALL, INSULATION, & FRAMING

EPD REQUEST

[Project Name]

INTRODUCTION:

Webcor Builders has partnered with the Carbon Leadership Forum and will be using the Embodied Carbon in Construction Calculator (EC3) on this project. The tool can be found and accessed online at <https://buildingtransparency.org/>.

EC3 allows users to measure the embodied carbon in specific products and materials through the use of Environmental Product Declarations (EPDs), please see example EPDs for partition assembly materials attached.

- Embodied carbon refers to carbon dioxide emitted during the manufacture, transport and construction of building materials, together with end of life emissions. An EPD is a report which lists the environmental impacts of a specific material based on a unit of measure (e.g. square foot, ton, cubic yard).

The embodied carbon measurement is to assist in reducing the embodied carbon in the project's materials. Webcor understands this is accomplished through both the sourcing of the construction materials as the designer's specifications.

In your proposal, Webcor would like to evaluate the embodied carbon expected in the gauge framing, drywall, and other sheet goods to be installed based on the sourced products.

REQUIRED (See Form on Next Page):

Provide EPDs for the light gauge framing, gypsum board, and other sheet goods anticipated to be installed. See example EPDs attached.

If any products have not been specified at this time, please provide general information on the products you anticipate to be installed in the project.

Provide the wall height for the interior framing to be installed.



04 Case Studies

960 W 7th, Los Angeles

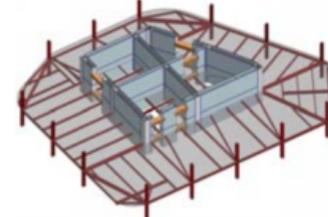
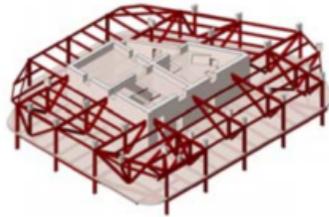
- 56-story, 1.4m sf mixed-use apartment tower
- Early coordination with GC, ready-mix supplier and design team
- Aggregate evaluation to increase compressive strength
 - Weaker option, local = > cement (OLD)
 - Premium option, Orca in BC = greater distance, < cement (NEW)

EPD Comparison												
	Application	Description	Est. Project Quantity	Cement	Fly Ash	Slag	GWP per unit	Total GWP	ODP	AP	EP	
			cy	lb	lb	lb	kgCO2-eq	kgCO2-eq	kg CFC-11-eq	kg SO2-eq	kg N-eq	
OLD	Mat Foundation	1" 6000PSI PU PL F'c @ 56 DAY	17,860	600	200	0	428	7,644,080	1.10E-05	1.34	0.50	
NEW	Mat Foundation	1" 6000PSI PU PL F'c @ 56 DAY	17,860	506	169	0	391	6,983,260	1.30E-05	2.19	0.47	
OLD	Basement Walls	3/8" 6000PSI PU	1,228	846	0	0	583	715,924	1.40E-05	1.68	0.68	
NEW	Basement Walls	1/2" 6000PSI PU	1,228	580	102	0	436	535,408	1.40E-05	2.24	0.52	
OLD	Concrete on Steel Deck	1" 4000PSI PU PL	73	592	0	0	415	30,295	1.00E-05	1.25	0.49	
NEW	Concrete on Steel Deck	1" 4000PSI PU PL	73	421	105	0	332	24,236	1.20E-05	2.05	0.40	
OLD	Mild Steel Slabs & Beams	1" 5000PSI PU PL	18,250	705	0	0	490	8,942,500	1.20E-05	1.44	0.57	
NEW	Mild Steel Slabs & Beams	1" 5000PSI PU PL	18,250	564	0	0	424	7,738,000	1.40E-05	2.26	0.51	
OLD	PT Slabs	1" 6000PSI PU PL	21,333	799	0	0	554	11,818,482	1.40E-05	1.60	0.65	
NEW	PT Slabs	1" 6000PSI PU PL	21,333	322	0	322	295	6,293,235	1.40E-05	2.24	0.38	
OLD	Columns & Walls	3/8" 8000PSI PU PL	7,027	684	228	0	483	3,394,041	1.20E-05	1.48	0.56	
NEW	Columns & Walls	1/2" 8000PSI PU PL	7,027	400	120	280	344	2,417,288	1.40E-05	2.31	0.43	
OLD	Columns & Walls	3/4" 10000PSI PU PL	12,955	1003	177	0	713	9,236,915	1.70E-05	2.22	0.83	
NEW	Columns & Walls	1/2" 10000PSI PU PL	12,955	570	399	171	464	6,011,120	1.80E-05	2.61	0.58	
								Total GWP Savings:	11,779,690			



Private Client, Northern California

- Cost and schedule evaluation for two proposed designs
 - Reinforced concrete core walls
 - Composite steel/concrete plate shear walls
- Evaluated the embodied carbon impact via EC3
- Presented to client aligned with cost estimate



OPTIONS	BASE ESTIMATE - CORE WALLS		EMBODIED CARBON ANALYSIS - BASE ESTIMATE Unit of Measure is kCO2e	DESIGN ALTERNATE - CORE WALLS		EMBODIED CARBON ANALYSIS - DESIGN ALTERNATE Unit of Measure is kCO2e
	Core Walls	Reinforced Concrete Wall		Composite Plate Shear Wall		
	Core Walls - Steel Surface Area (SF), Ext.	460975		262067		
	Core Walls - Steel Surface Area (SF), Int.	398243		226404		
	Levels	B1-L33		B1-L33		
	Concrete w/ rebar & formwork (inc. core fill, FOMD)	\$	61,488,649	\$	42,061,609	
	Metal Deck	\$	4,300,078	\$	4,443,680	
	Steel Core + framing	\$	44,916,237	\$	51,207,822	
	Excavation Modifications	\$		\$		
EMBODIED CARBON TOTAL			110,704,964		97,713,111	
EMBODIED CARBON DELTA					(12,991,853)	- The Composite Plate Shear Wall Design Alternate has less embodied carbon than the typical concrete core wall design included in the base estimate. - <i>This embodied carbon reduction is similar to removing 31.8 million miles driven by a passenger car or;</i> - <i>Removing 2,758 cars off the road for one year.</i>

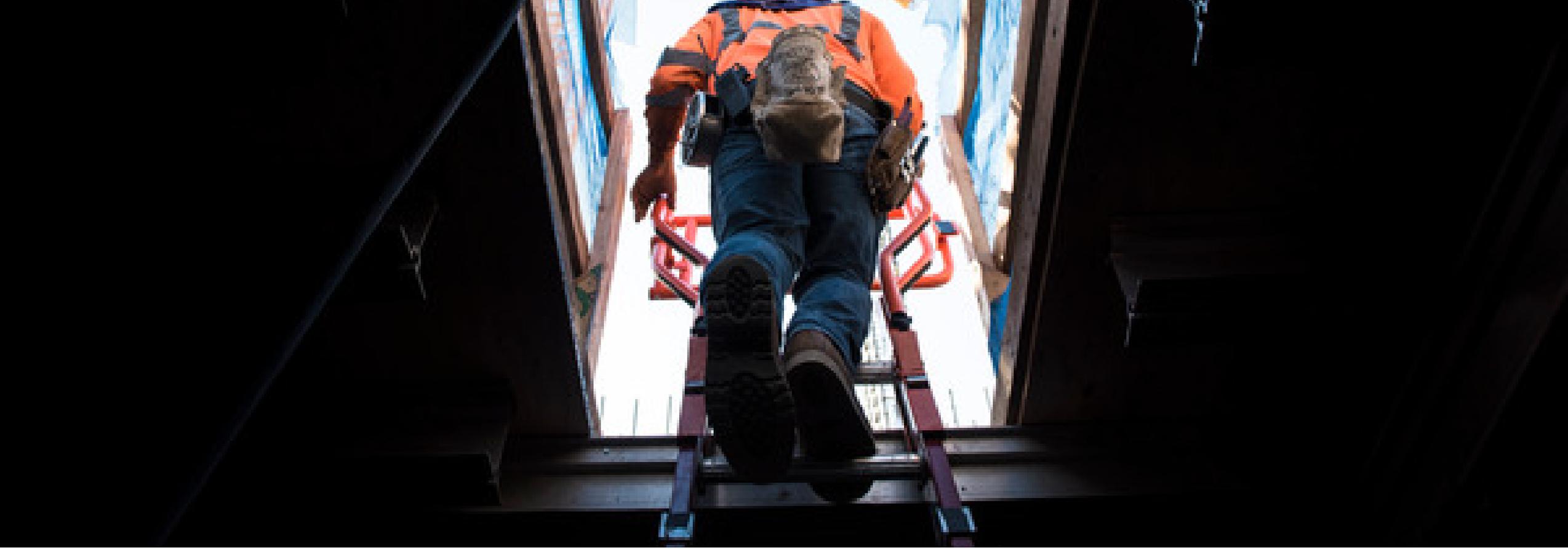
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- The Composite Plate Shear Wall Design Alternate has less embodied carbon than the typical concrete core wall design included in the base estimate.
 - *This embodied carbon reduction is similar to removing 31.8 million miles driven by a passenger car or;*
 - *Removing 2,758 cars off the road for one year.*

OPTIONS	ESTIMATE		DESIGN ALTERNATE - CORE WALLS		EMBODIED CARBON ANALYSIS - DESIGN ALTERNATE Unit of Measure is kCO2e
	Unit of Measure is kCO2e	Unit of Measure is kCO2e	Unit of Measure is kCO2e	Unit of Measure is kCO2e	
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Excavation Modifications	\$		\$		



05 Next Steps

Continue Momentum

- Continuous Improvement
- Expand assessment portfolio
- Expand overall emissions impact considerations holistically
 - Collaborate with AEC network throughout lifecycle
 - Move the market upstream, leveraging relationship with suppliers/manufacturers
- Keep the conversation going!



Thank You!

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hotel INDIGO