SEI ASCE STRUCTURAL ENGINEERING INSTITUTE

SE2050 COMMITTING TO NET ZERO

SE 2050

2023 Annual Report

2023 Year in Review

3
YEARS
SE 2050 launched three years ago

138
FIRMS
Proud to have 138 firms sign the commitment

156
ECAPS
Number of Embodied Carbon Action Plans created

500+
PROJECTS
Submitted projects to the SE 2050 Database

Table of Contents

Letter from the Chair

Dear SE 2050 Community,

As we celebrate our three-year anniversary since the official launch at the Greenbuild International Expo in November 2020, reflecting on our journey is truly remarkable. Despite the challenges posed by the Covid-19 pandemic, each milestone achieved stands as a testament to the unwavering dedication of this exceptional community.

The past year marked a turning point, with a noticeable shift from adoption to active implementation. With more firms joining our cause, industry momentum is growing, and existing signatories are showcasing impressive progress.

Our aspiration for net-zero structures remains our guiding light, fueling our determination and inspiring us to pursue greater heights. We take pride in the program's accomplishments and draw continuous inspiration from global initiatives, embracing emerging industry trends like the circular economy and emphasizing reuse to position ourselves as leaders in sustainable practices.

The emergence of standards, benchmarks, and imminent performance limits represents a transformative phase for our industry, providing crucial tools to shape a more sustainable future. Collaborations with organizations like the SEI Pre-Standard, ASHRAE 240P, ECHO Project, the Global Building Data Initiative, and others promise a comprehensive data analysis and industry alignment, continuing into the coming year.

Anticipation grows as we prepare to share the results of our data science team's assessment of our initial round of embodied carbon data at SEICon'24 in late March, a significant stride in our collective journey.

Policies mandating designers to address embodied carbon emissions are sparking a vital and long-overdue conversation, gathering stakeholders at the table and driving essential change. Indicators of change are sounding across the United States and Canada with Buy Clean policies, emerging Whole Building Life Cycle Assessment policies, and deconstruction requirements by municipalities such as Vancouver, Toronto, and California.

As urgency and pressure continue to mount, the integration of embodied carbon into daily firm practices is a source of great excitement. The increasing interest from numerous firms eager to join our movement further fuels our enthusiasm.

The prospect of upcoming collaborations, both domestically and internationally, fills us with excitement and hope for the exchange of ideas and collective progress.

With deep gratitude and eager anticipation, we look forward to the continued success of SE 2050 and the sustainable future we're shaping together.

Sincerely,

Mike Gryniuk
Chair, Structural Engineering 2050 Commitment Program (SE 2050)

SE 2050 Committed Firms

The strength of SE 2050 comes from the hard work our signatory firms put in to reduce embodied carbon and raise awareness. As more firms join our commitment, we will continue to grow closer to decarbonizing the built environment.

Since its inception, 138 firms from all around the US have joined the commitment, representing tens of thousands of engineers around the country. It is imperative that SE 2050 continues to engage with firms of all sizes working on all types of projects. We need to decarbonize the *entire* built environment, which requires us to be comprehensive in our approach to decarbonization. We have come a long way since our launch, but we still have a long way to go. We're immensely grateful to all of our signatory firms and we look forward to continued growth. Keep spreading the word about SE 2050 and the importance of embodied carbon reduction!

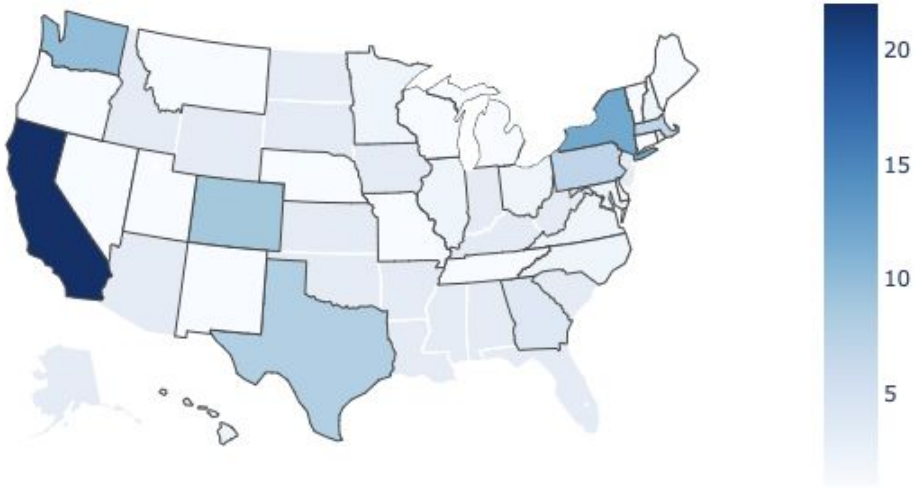

Figure 1: Location of Embodied Carbon Champions by State

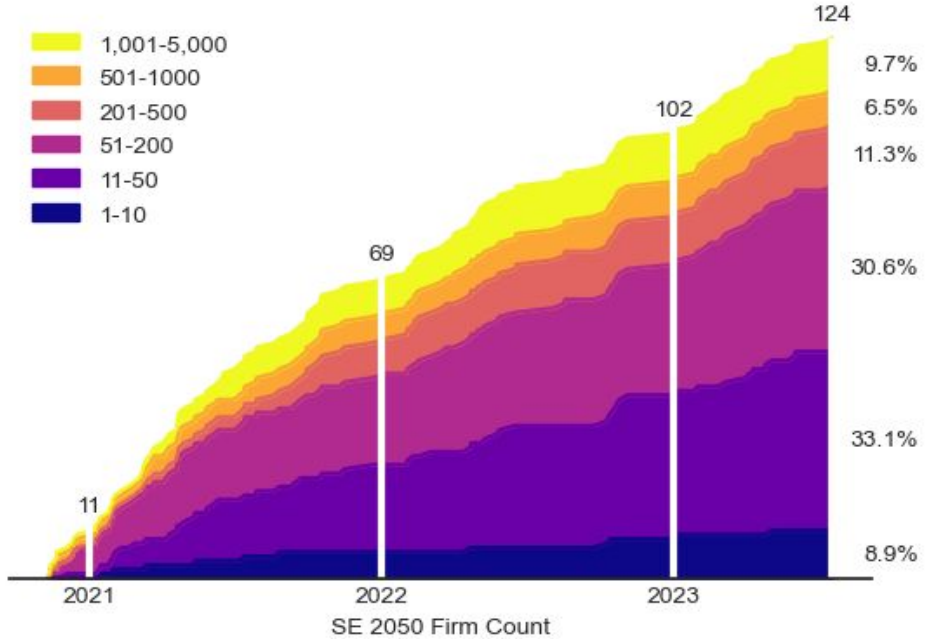

Figure 2: SE 2050 Signatory Firm Commitment Growth and Firm Size Distribution

Embodied Carbon Action Plans

Embodied Carbon Action Plans (ECAPs) are central to firm engagement with SE 2050 and the path to net zero embodied carbon structures. The ECAP articulates how a firm will e*ducate*, *advocate*, *report*, and *reduce* the embodied carbon of building structures. More specifically all firms must:

- Provide an outline of the firm's strategy to **educate** employees about embodied carbon and **advocate** for net zero embodied carbon structures
- Provide an outline of the firm's commitment to **report** project embodied carbon data to the SE 2050 Database
- Specify measurable goals to assess your firm's progress in **reducing** embodied carbon in project work

These are plans which are submitted in the first year of joining and updated annually. This year, the SE 2050 Program Mechanics Committee reviewed over +110 ECAPs.

These plans continue to develop in the character and brand of each firm. It is clear that progress is being made as the industry adapts broader understanding and best practices.

ECAPS - Educate

Signatories continue to emphasize the importance of advancing embodied carbon education and training. Companies are investing in tools and webinars with many developing EC 101 and 201 presentations. Signatory firms are often aligning their employees in a company-wide effort by starting internal working groups led by the Embodied Carbon Champion.

Concerning SE 2050's other crucial goals, resource development and knowledge sharing, companies are actively creating resources, from baseline databases to expansive digital forums on embodied carbon. Sharing practical tools, guidelines, and educational content ensures a uniform, company-wide understanding and approach.

It's essential for signatories to reflect on how their efforts aligned with their goals by sharing lessons learned. Companies are gleaning knowledge from hands-on experiences, with particular emphasis on actionable insights like the cost-neutral benefits of concrete procurement and the efficient use of BIM for Life Cycle Assessments (LCA). This holistic blend of theory and practice underscores a mature, integrated approach to sustainability in the corporate realm.

Figure 3: Educate Spotlight on Degenkolb 2023 ECAP

ECAPS - Advocate

Advocacy amongst signatories extends well beyond SE 2050 as firms are embracing the structural engineer's role in policy development. Signatory firms are extending their sustainability dialogue to the broader community in various forms, from insightful articles and social media engagements to dedicated client presentations. Many firms noted advocating for EPD development and nearly 20 firms noted engagement in policy development - including advocacy for state-level Buy Clean programs.

Signatory firms are embracing sustainable practices, sharing their journey and insights with a wider audience, and fostering a collective responsibility towards a sustainable future.

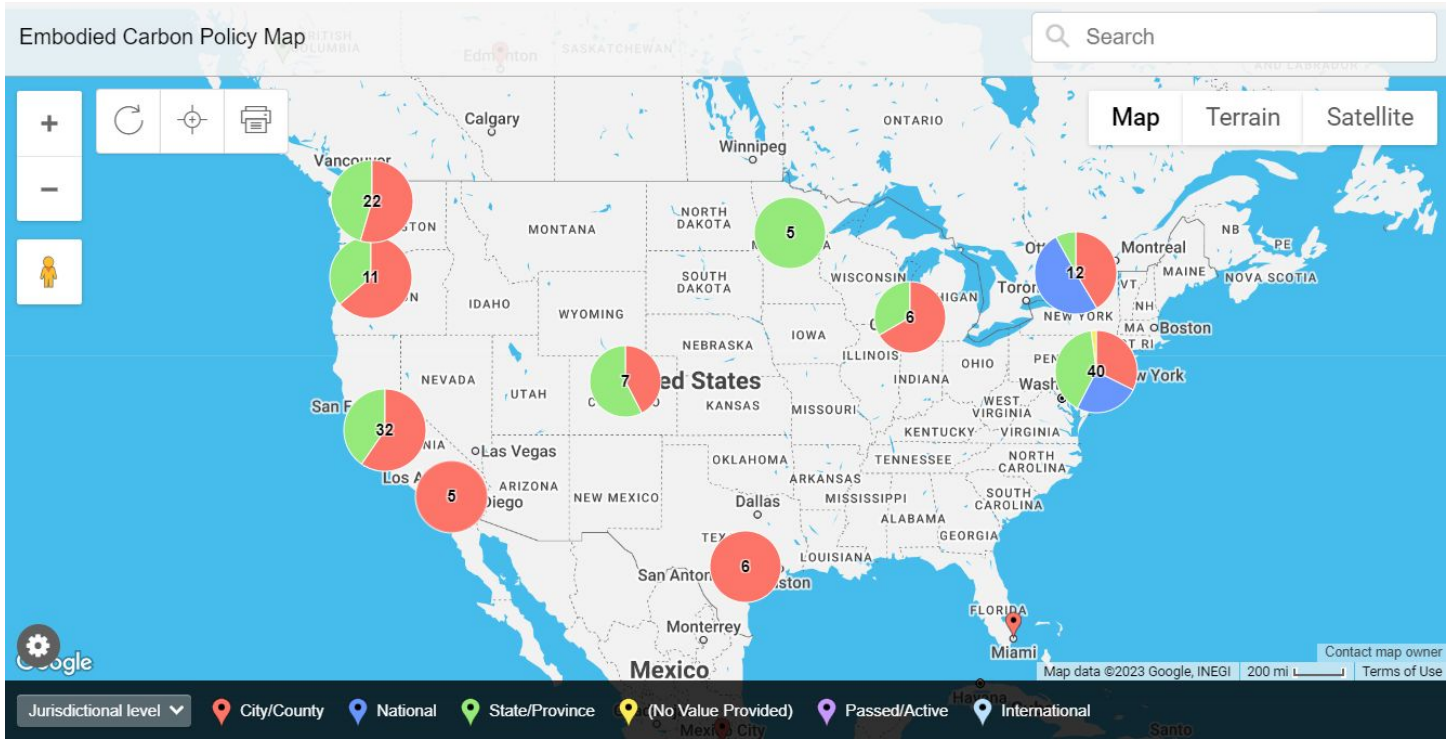

Figure 4: SE 2050 Embodied Carbon Policy Map

ECAPS - Report

Reporting data is integral to the success of SE 2050. The LCA tools most frequently used by signatory firms are Tally and One Click LCA, followed by Athena, Beacon, and SE2050's ECOM. Similar to last year, 22% of firms reported using their own in-house LCA tools. However, there are more frequent mentions of creating in-house EPD databases as companies look to optimize their LCA workflows.

Most embodied carbon calculations focus solely on stages A1-A3, although there is discussion about potentially incorporating emissions from material transportation and end of life actions in the future. There is also deliberation regarding when LCAs should be performed. The majority of firms calculate a project's embodied carbon only after the issuance of construction documents, but nearly 20% of firms specifically mentioned performing LCAs at earlier design stages, which has higher potential for more embodied carbon reduction. Walter P Moore went so far as to create a materials pedigree table describing the different amounts of specificity required at different project stages for various common structural materials (Figure 5).

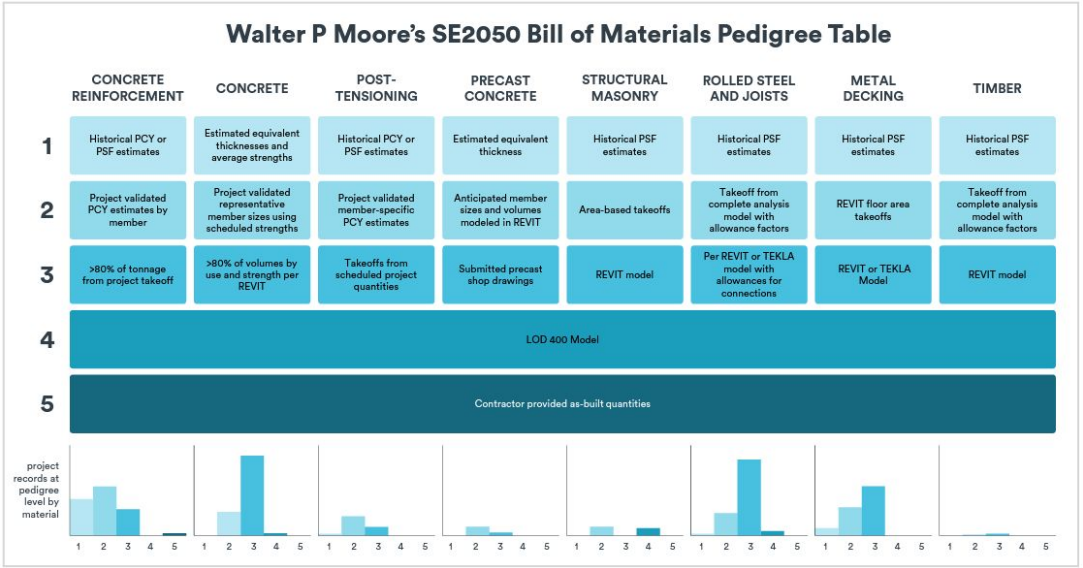

Figure 5: Report Spotlight on Walter P. Moore 2023 ECAP

ECAPS - Report (continued)

While the structural system typically accounts for 50-70% of a building's embodied carbon, several firms also discussed interfacing with architects to track embodied carbon for non-structural elements. This year, there was a small decrease in the number of firms stating limited resources inhibiting them from tracking embodied carbon for projects, but 11% still report a barrier. To help address this, SE 2050 constructed a trial mentorship program in 2023, to be launched to all signatory firms in 2024. To see key takeaways from the data being reported by signatory firms, refer to the database section of this report.

Figure 6: Report Spotlight on Bala Consulting Engineers 2023 ECAP

ECAPS - Reduce

As we get closer to 2050, it is essential to review reduction strategies being discussed and implemented within the structural engineering industry. Last year, 60% of firms stated that they intended to update their specifications for purposes of reducing embodied carbon. This year, 54% of ECAPs reported that they were able to achieve this goal. This was focused mainly on concrete, although several companies with in-house architects also set carbon-based guidelines for other products, such as rigid insulation. Some of the updates to concrete specifications include specifically calling out Type IL cement as a viable option, specifying minimum cement replacement percentages, and even setting max allowable global warming potential as seen in Figure 7 to allow contractors to achieve that target however they see fit.

	TYP. STRUCTURAL COMPONENT, OR AS SHOWN ON DRAWINGS	MIN. 28 DAY STRENGTH, MPa	MAX. AGGREGATE mm (in)	EXPOSURE CLASS	MAX. ALLOWABLE GWP[7] ($kgCO_2e/m^3$)
Slabs on Grade	Interior	25	20 (3/4")	N [1]	215
	Exterior	32	20 (3/4")	C2 [2]	260
	Interior parking/vehicle areas	25	20 (3/4")	C4 [3]	215
Foundations	Spread and strip footings	25	20 (3/4")	N [4]	215
	Raft foundation, interior	30	20 (3/4")	N	235
	Raft foundation, as parking/vehicle surface	50	20 (3/4")	C-XL [5]	370
Suspended Slabs, Slab Bands, and Beams	Interior, non-parking	Per plan, 30 MPa min.	20 (3/4")	N	Table A
	Exterior without membrane, non-parking	Per plan, 30 MPa min.	20 (3/4")	F1 [6]	Table A
	Exterior with membrane, non-parking	Per plan, 30 MPa min.	20 (3/4")	F2 [7]	Table A
	At parking/vehicle areas (interior or exterior)	Per plan, 35 MPa min.	20 (3/4")	C1 [8]	Table A
Columns and Walls	Interior	Per plan, 30 MPa min.	20 (3/4")	N	Table B
	Exterior	Per plan, 30 MPa min.	20 (3/4")	F2 [9]	Table B
	At parking/vehicle areas (interior or exterior)	Per plan, 35 MPa min.	20 (3/4")	C1 [10]	Table B
Concrete Topping	Interior	20	14 (9/16")	See note 9.c	215
	Exterior	32	14 (9/16")		260
	For use with steel decking	25	14 (9/16")		215
Concrete Masonry	Grout	12.5	10 (3/8")	-	-

GWP VALUES SELECTED FROM CRMCA EPDs. THESE ARE EQUIVALENT TO MIXES THAT WE CONSIDER CAN BE ACHIEVEABLE FOR THE APPLICATION.

REF. TABLES BELOW

TABLE A (SUSPENDED ELEMENTS) [11]		
STRENGTH (MPa)	MAX. ALLOWABLE GWP ($kgCO_2e/m^3$)	
	EXPOSURE CLASS	
	N	F1,F2,C1
30	260	280
35	285	330
40	315	360
45	340	380
50	365	405

TABLE B (COLUMNS AND WALLS) [11]		
STRENGTH (MPa)	MAX. ALLOWABLE GWP ($kgCO_2e/m^3$)	
	EXPOSURE CLASS	
	N	F1,F2,C1
30	235	255
35	260	300
40	290	330
45	310	350
50	335	370

SUSPENDED ELEMENTS GENERALLY WILL REQUIRE MORE CEMENT THAT SCMs TO ENSURE THAT EARLY STRENGTH IS ACHIEVED

Figure 7: Reduce Spotlight on ASPECT Structural Engineers 2023 ECAP

THE INCLUSION OF GWP ON OUR CONCRETE SPECIFICATIONS IS TO START THE CONVERSATION WITH THE SUPPLIER. LARGER SUPPLIERS ARE AWARE OF THIS AND CAN ACCOMMODATE IT BUT SMALLER SUPPLIERS ARE STILL IN THE EARLY DAYS OF UNDERSTAND AND ACCOUNTING FOR GWP.

ECAPS - Reduce

Similar to last year, a majority of firms reported having internal embodied carbon reduction groups. Magnusson Klemencic Associates mentioned that they have champions for different structural materials to ensure their company is keeping up with industry-wide innovation. 33% of companies mentioned the need to use biogenic materials and there was an increase from 12% to 24% of ECAPs mentioning the importance of building reuse. With the submitted ECAPS, there were also several mentions of designing for durability and flexibility to increase the lifespan of buildings. Nearly 20% of reporting firms published a case study, demonstrating the growing interest in sharing their own findings along with lessons learned. Still only 11% of firms have explicit embodied carbon reduction targets, which needs to improve as we near the midpoint of this decade. SE 2050 will soon be publishing a Pathway to Zero Roadmap to aid companies with goal setting and long-term planning.

Figure 8 from KLA looks at cost between a concrete and mass timber structure, and while mass timber may appear to come at a large cost premium initially - over the entire construction process - costs are more so in line.

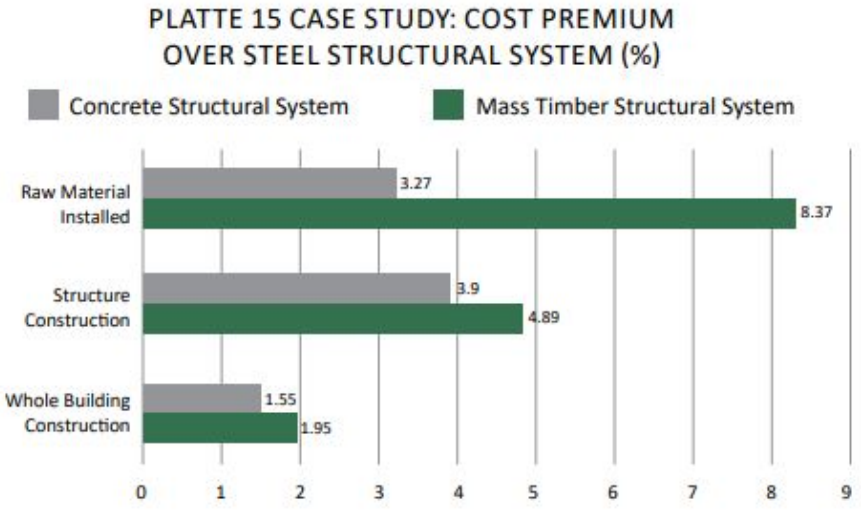

Figure 8: Reduce Spotlight on KLA 2023 ECAP

Database

The SE 2050 Database is the collection apparatus for signatory firms to submit structural embodied carbon (global warming potential) data. The data submitted to the SE 2050 Database will be used to inform industry benchmarks and targets, ultimately working towards net zero embodied carbon by 2050.

The primary operation of the database team is the collection of signatory data. This year of operation, the database team has doubled the number of projects in the database with over 500 projects currently in the database. From those submissions, projects from 41 US states are represented (Figure 9).

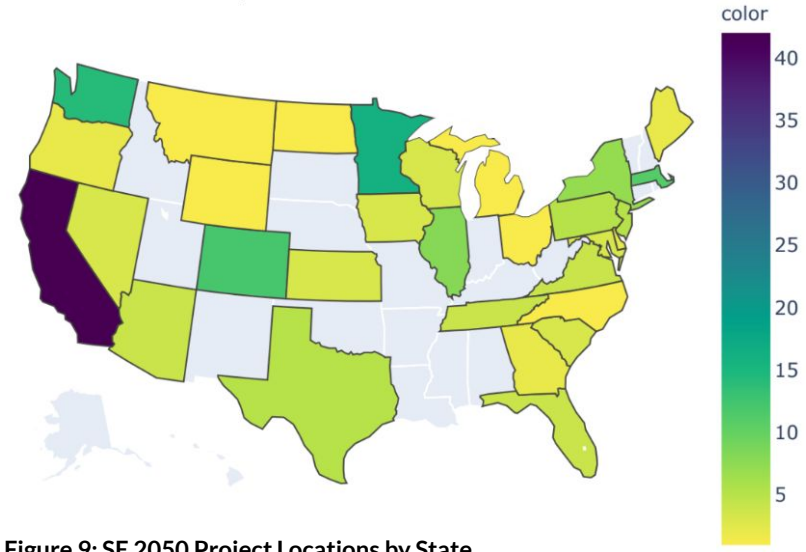

Figure 9: SE 2050 Project Locations by State

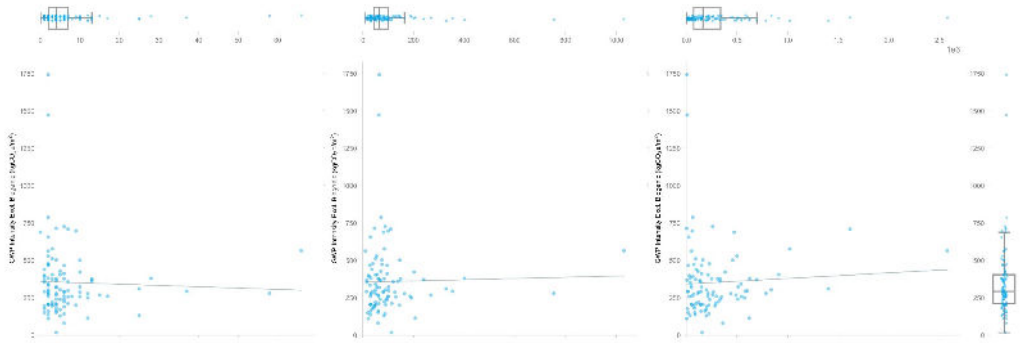

Figure 10: Crunching the numbers for initial SE 2050 data analyses

The database team is actively working on updates to improve the experience for users and the quality of data collected. This year their work to refine the database includes the following:

- Allowing the input of global warming potential by life-cycle stage (Figure 10),
- Improving data validation for project imports,
- Fixing bugs in the system,
- Adding tooltips for users, and
- General user enhancements.

Looking ahead, 2024 is the year the database team will be releasing preliminary data analysis (Figure 10). These findings will be released at the SEICON 24 in San Antonio, Texas. We hope this analysis will provide the engineering community with a meaningful tool to support their work.

Future Goals of SE 2050

After three years of establishing a strong foundation, the SE 2050 Commitment Program and building industry is making a transition from commitment to implementation. The Program aims to:

- Maintain the commitment to ECAPs and submission of projects to the SE 2050 Database
- Support development of standards and data efficacy
- Align with and encourage members to contribute to other industry efforts such as ECHO and the CLF Benchmark Study V2.0.
- Continue to adapt the commitments of the Program aligned with the goal of Net Zero by 2050.

A significant focus of the committee last year was thinking about how the Program should continue to develop into the future based in large part on feedback from signatories. Notably, in order to reach the ultimate goals of the Program three pillars of adaptation came to the forefront: continued whole-building life cycle assessment development, incorporation of carbon-sequestering materials, and a shift to a circular economy.

Between now and 2050, we anticipate a need to:

- Increase percentage of projects providing material quantity data on projects submitted to the Database.
- Focus on enhancing the accuracy and comprehensiveness of whole-building LCAs, making them an integral part of a larger percentage of projects over time.
- Work towards the progressive Global Warming Potential (GWP) reduction goals set for each milestone year. This is with the understanding that benchmark data is eminent and will continue to develop in specificity and accuracy.
- Actively increase the adoption and integration of carbon-sequestering materials in design practices, aiming for more significant usage in projects each year and reporting on these advancements.
- Actively encourage and integrate circular economy principles in structural design, aiming to extend the lifespan and reuse of building materials. Amongst these strategies, develop and implement design strategies that prioritize disassembly and reuse, working towards incorporating a higher percentage of reused structural materials in new construction as well as consideration of deconstruction at end-of-life.

Future Goals of SE 2050: Lessons Learned

In the past year, the committee observed an evolution and deepening of understanding in several key areas. These developments have continued and expanded critical discussions to reach a deeper understanding. The following summary bullet points highlight how these ideas have been further developed and refined:

- **Data-Driven Decision Making and Quality of Tools**: Transitioned from focusing on the development of in-house tools and procedures to emphasizing their practical application in decision-making, particularly highlighting the importance of data tracking and the impactful use of life cycle assessments.
- **Accuracy and Quality of LCAs**: Moved from a detailed technical focus on the specifics of LCAs, especially in Revit add-ins, to a broader perspective that includes standardizing metrics across projects for more comprehensive and comparative analysis.
- **Importance of Early Conversations with Clients**: Evolved from initiating early conversations to deepening client engagement through effective communication, education, and simplification of complex concepts, indicating a more mature approach to client interactions.
- **Industry Readiness for Strategic Changes**: Shifted from recognizing the industry's openness and readiness for change to actively implementing diverse strategies, material choices, and collaborative efforts, reflecting a move from readiness to active participation in sustainable practices.

The committee started to see several new and noteworthy themes in the ECAPs as well. These evolving themes reflect the industry's growing commitment to sustainable practices and a deeper understanding of their impact. Key among these new themes are:

- **Holistic Approach and Policy Engagement**: The importance of having a holistic approach in projects that goes beyond design and includes engaging in code development, advocacy, and considering the entire lifecycle of a project was emphasized. With the emergence of several new local embodied carbon policies, in places like Vancouver and California, this can be expected to continue to gain momentum.
- **Leadership Engagement:** Engaging leadership in each office to drive participation in embodied carbon education and achieve tracking and reduction goals is a new theme.
- **Uniformity in Metrics:** The necessity of employing a uniform approach with consistent assumptions for tracking structural material quantities (SMQ) and embodied carbon (EC) for comparability was highlighted.
- **Collaboration and Communication:** The importance of effective internal and external communication--particularly in the use of Building Information Modeling (BIM) tools. This theme goes hand in hand with industry efforts to standardize scope and takeoff methodology. This area of development remains in its early stages with much room for improvement.

Acknowledgement–Signatory Firms (Page 1 of 11)

Firm Name	Embodied Carbon Champion	Start Year
Ai-Alt Structural Engineering	Alvin Tabar	2021
Armstrong-Douglass Partners	Scott Douglass	2021
Arup (North America)	Frances Yang	2020
Aspect Structural Engineers	Rachel Kazaka	2021
Bala Consulting Engineers	Elizabeth Larsen	2022
Ballinger	Brent Ellmann	2022
BASE	Fernando Frontera	2023
Black Box Engineering	David Bueno	2021
Blackwell Structural Engineers	Simon Rayment	2023
Buehler	Ryan Miller	2021
Buro Happold	Stephen Curtis	2021
Bush, Bohlman & Partners Inactive	Trevor Whitney	2021
BWE	Dane Hansen	2023

Acknowledgement–Signatory Firms (Page 2 of 11)

Firm Name	Embodied Carbon Champion	Start Year
CannonDesign	Julie Shaw	2021
CJI	Khalid Abdelhadi Zuiater	2023
Clark Nexsen	Bethany Whitehurst	2021
Coffman Engineers, Inc.	Jacob Gottlieb	2021
Conn Shaffer Consulting Engineers Inactive	Chris Conn	2021
Cora Structural	Michael Gryniuk	2023
Coughlin Porter Lundeen	Laura Lindeman	2021
COWI North America	Palak Kamdar	2023
DATUM ENGINEERS, INC.	Swarna Karuppiah	2021
Davies-Crooks Associates	Don Davies	2023
DCI Engineers	Ethan Martin	2021
Degenkolb Engineers	Elena Good	2021
Dekker Perich Sabatini	Patience Raby	2022

Acknowledgement–Signatory Firms (Page 3 of 11)

Firm Name	Embodied Carbon Champion	Start Year
DeSimone Consulting Engineers	Tarek Abdallah	2021
DIALOG	David Pesta	2021
DLR Group	Murad Hamdallah	2021
Eckersley O'Callaghan	Angie Neefus	2023
Ehlert Bryan	Chris Heckmann	2023
Element Structural Engineers, Inc.	James Enright	2023
Engineering Ventures, PC	Russ Miller-Johnson	2021
Entuitive	Oscar Valdes	2022
EQUILIBRIUM Consulting	Matt Kantner	2020
EwingCole	Colleen Blackwell	2021
EXP	Amy Pastor	2022
Fast + Epp	Olivia Healy	2022
Flad Structural Engineers	Tim Liebhold	2021

Acknowledgement–Signatory Firms (Page 4 of 11)

Firm Name	Embodied Carbon Champion	Start Year
Foley Buhl Roberts & Associates	Zachary Chabot	2023
Forell | Elsesser Structural Engineers	Lindsey Maclise	2021
Fortis Structural, LLC	Michael Gritzmacher	2022
FTF Engineering	Alejandra Bravo	2021
Glotman Simpson Consulting Engineers	Harrison Glotman	2021
GRAEF	Natalie Georgieff	2023
Gresham Smith	Allison Hampton	2021
Grimm & Chen Structural Engineering, Inc.	Sitanan Tanyasakulkit	2021
Harriott Valentine Engineers	Kevin Tsuchida	2023
Hatfield Group	Rebecca Jones	2023
HGA	Ethan Fogle	2020
HKS	Erin Winston	2022
HOK	Jaclyn Lee	2021

Acknowledgement–Signatory Firms (Page 5 of 11)

Firm Name	Embodied Carbon Champion	Start Year
Hollingsworth Pack, Austin	Chris Hewitt	2022
Holmes	Megan Stringer	2021
Hope Furrer Associates	Nicole Baer	2022
IMEG Corp.	Laura Hagan	2021
Innovative Structural and Specialty Engineering PLLC	Radhi Majmudar	2022
Insight Structural Engineers, Inc.	Hank Lin	2023
Integrus Architecture	Morgan Wiese	2022
Jacobs	Clint Townsend	2023
Jirsa Hedrick Structural Engineers	Austin Reese	2022
John A. Martin & Associates	Raven Odian	2023
JVA Inc.	Laura Coates	2023
KAI Hawaii	Eric Borchers	2022
Keast & Hood	Lauren Schmitz	2021

Acknowledgement–Signatory Firms (Page 6 of 11)

Firm Name	Embodied Carbon Champion	Start Year
KICSEC Ltd.	Yadav Khwaounjoo	2021
KL&A Engineers and Builders	Alexis Feitel	2020
Klein & Hoffman	Nathan Barry	2023
Klepper, Hahn & Hyatt	James A. D'Aloisio	2022
KMV Engineering	Daniel Vicars	2023
KPFF Consulting Engineers	Shana Kelley	2021
Kurt Fischer Structural Engineering	Carl Kloos	2022
Larsen and Landis Inactive	John Grieshaber	2021
LeMessurier	Suzanne Robinson	2021
LEO A DALY	Jacob Zach	2022
LERA Consulting Structural Engineers	Carrie Villani	2021
Linchpin Structural Engineering	Eric Rademacher	2021
Little Diversified Architectural Consulting	Sina Flynn	2021

Acknowledgement–Signatory Firms (Page 7 of 11)

Firm Name	Embodied Carbon Champion	Start Year
LPA Design Studios	Aron Tezveren-Johnson	2023
Lund Opsahl	Jeremiah Walter Bowles	2023
Mackenzie	Jo Ann Offill	2023
Maffei Structural Engineering	Rob Ward	2022
Magnusson Klemencic Associates	Catherine Cai	2021
Mar Structural Design	Bridget Carls	2022
Martin/Martin, Inc.	Chris Adams	2021
Martinez Moore Engineers	Kate Tomlinson	2021
McMullan & Associates, Inc.	Colleen Nasta, PE	2021
McNamara Salvia Structural Engineers	AJ Unander	2021
McNicolls And Associates Ltd	Tonee Mc Nicolls	2021
Mead & Hunt	Victoria Herrero Garcia	2023
Meyer Borgman Johnson	Catherine Lumitap	2020

Acknowledgement–Signatory Firms (Page 8 of 11)

Firm Name	Embodied Carbon Champion	Start Year
Morrish Design	Alan Tonissen	2022
NORR	Hassan Saffarini	2021
Nous Engineering	Mit Gala	2023
Oak Point Associates	Torey Brooks	2021
Odeh Engineers, Inc.	Michael Scancarello	2022
O'Donnell & Naccarato, Inc.	Scott Bauer	2020
One Hermitage	James Richardson	2022
PCS Structural Solutions	Chris Jeseritz	2020
PES Structural Engineers	Ryan Krusko	2022
Pierce Engineers	Ezra Hilton	2023
Professional Engineering Consultants, PA	Zach Bowden	2021
PRYCO STRUCTURAL LLC	Jose R. Hernandez	2021
REI Build Up Design Corp	Ali Afrasiabi	2023

Acknowledgement–Signatory Firms (Page 9 of 11)

Firm Name	Embodied Carbon Champion	Start Year
Reaveley Engineers + Associates	Jacob Linford	2022
Rutherford + Chekene	Spencer Wright	2023
RJC Engineers	Dominic Mattman	2022
S.A.Miro, Inc.	Chad S. Mitchell	2023
Saiful Bouquet Structural Engineers	Nofel Teldjoune	2021
Schaefer	Lara Stroup	2023
Schemmer	Elena Hoff	2023
Siegel Structural Engineers	Allison Olinsky	2022
Silman	Ian C. Schmellick	2020
Simpson Gumpertz & Heger, Inc.	Julia Hogroian, Michael Tecci	2021
SK&A Structural Engineers	Sara Zaman	2022
Skidmore, Owings & Merrill LLP	Matthew Streeter	2021
SLAM Collaborative	Jamie Littlefield	2022

Acknowledgement–Signatory Firms (Page 10 of 11)

Firm Name	Embodied Carbon Champion	Start Year
SMBH Inc.	Ebiji Akah	2023
SmithGroup	Andrea K Reynolds	2021
SMRT Architects and Engineers	Andrew Bradley	2021
Snell Engineering Consultants	Stephen Rauch	2023
Stantec Architecture Inc	Robby Vogel	2022
Stone Fleet	Justin Kordas	2022
Structural Focus	Michael Daciolas-Semon	2021
StructureCraft	Leif Johnson	2021
Studio NYL Structural Engineers and Facade Designers	Julian Lineham	2021
STV	Lauren Alger	2023
Taylor Timber	Chad Taylor	2023
Thornton Tomasetti	Patrick Kenny	2020
Tipping Structural Engineers	Bruce Danziger	2021

Acknowledgement–Signatory Firms (Page 11 of 11)

Firm Name	Embodied Carbon Champion	Start Year
TLC Engineering Solutions	Rebecca Cegelis	2023
Uzun+Case	Thomas Trotter	2022
Verdant Structural Engineers	Nora Murray, PE	2021
Walter P Moore	Dirk Kestner	2020
Wicke Herfst Maver Consulting, Inc.	Graham Taylor	2023
Wight & Company	Matthew Aquino	2021
WSP USA	Teresa Vangeli	2021
ZFA Structural Engineers	Lindsey Broderick	2022

Acknowledgement–Subcommittee Members

SE 2050 Leadership

Chair

Michael Gryniuk, *P.E., Cora Structural*

Vice Chair and Partnerships

Frances Yang, *S.E., ARUP*

Subgroup Leaders

Lauren Wingo, *P.E., ARUP*

Megan Stringer, *P.E., S.E., Holmes*

Dirk Kestner, *P.E., Walter P Moore*

Annabel Shephard, *P.E., PCS Structural Solutions*

Mark Webster, *P.E., SGH*

Eric Borchers, *P.E., KAI Hawaii*

Chris Jeseritz, *P.E., PCS Structural Solutions*

Genevieve Graham, *ARUP*

Subgroup Members

Luke Lombardi, *Buro Happold*

Teresa Vangeli, *P.E., WSP*

Emily Lorenz, *P.E., Independent Consultant*

Kelsey Price, *P.E., Building Transparency*

Charlotte Sauer, *Cannon Design*

Swarna Karuppiah, *P.E., Datum Engineers*

Chris Horiuchi, *P.E., SOM*

Matt Kantner, *EQUILIBRIUM Consulting*

Chelsea Drenick, *P.E., S.E., WoodWorks*

Brian McSweeney, *TLC Engineering*

Luke Bastian, *Buro Happold*

Joseph Arehart, *University of Colorado*

Jonathan Broyles, *Penn State*

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