



STRUCTURAL
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The First Two Years of SE 2050

2022 ANNUAL REPORT

2022 Year in Review

2
YEARS

SE 2050 launched only two
years ago

101
FIRMS

Proud to have 101 firms sign
the commitment

254
PROJECTS

Submitted projects to
the SE 2050 Database

65
ECAPS

Number of Embodied Carbon
Action Plans created

60%
FIRMS

Firms creating internal embodied
carbon reduction groups

23%
FIRMS

Firms developing internal
tools to conduct LCAs

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Introduction



The SE 2050 Commitment Program originated in grassroots style from structural engineers who recognized the necessity of the structural engineering profession to engage more actively in conversations surrounding sustainability. Upon the announcement of the AIA 2030 Commitment Program in 2009, several structural engineers began to formulate a program that would specifically address the embodied carbon of structures. These early conversations occurred predominantly within the Carbon Leadership Forum (CLF) community. After several notable workshops, including a 2019 workshop in which representatives from SEI, CLF, AIA, and U.S. Green Building Council (USGBC) met to create a commitment program focused on embodied carbon reduction, **the SE 2050 Challenge was presented with the express goal of eliminating industry embodied carbon emissions by 2050.**

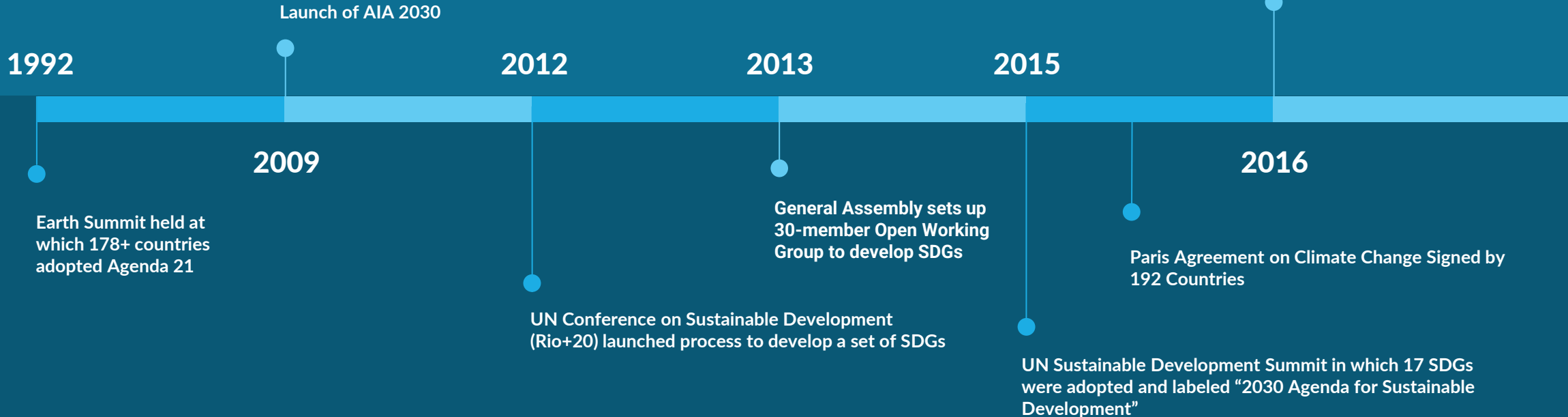
After endorsing the SE 2050 Challenge, SEI officially launched the SE 2050 Commitment as a subcommittee of the SEI Sustainability Committee in 2020. The SE 2050 subcommittee has rallied over 30 dedicated members as well as gained over 100 signatory engineering firms across North America. In mid-2021, SE 2050 launched the SE 2050 Database to which firms submit life cycle assessment (LCA) data from their projects. Still in the developmental stages of its existence, SE 2050 continues its focus on advocacy for sustainable structural design, growth of firm commitments, and refinement of the database. The timeline on the next page highlights key moments of SE 2050 up to this point (Top). It also displays how SE 2050 fits into the broader landscape of sustainability focused movements globally (Bot.).



Timeline



SE 2050 TIMELINE



Timelines for Sustainability Movements – Top: SE 2050 Timeline, Bottom: International Events
(United Nations, 2020 & Carbon Leadership Forum, 2021)

Timeline (continued)

SE 2050 TIMELINE

Workshop including representatives from SEI, CLF, the AIA, and USBGC occurs to focus on the creation of a commitment program

SEI Board of Governors endorses the SE 2050 Challenge

SEI Board of Governors makes SE 2050 Commitment a formal SEI program

SE 2050 Commitment is publicly launched

SE 2050 Beta Database is launched

2022

2023

PRESENT DAY

2019

2020

2021

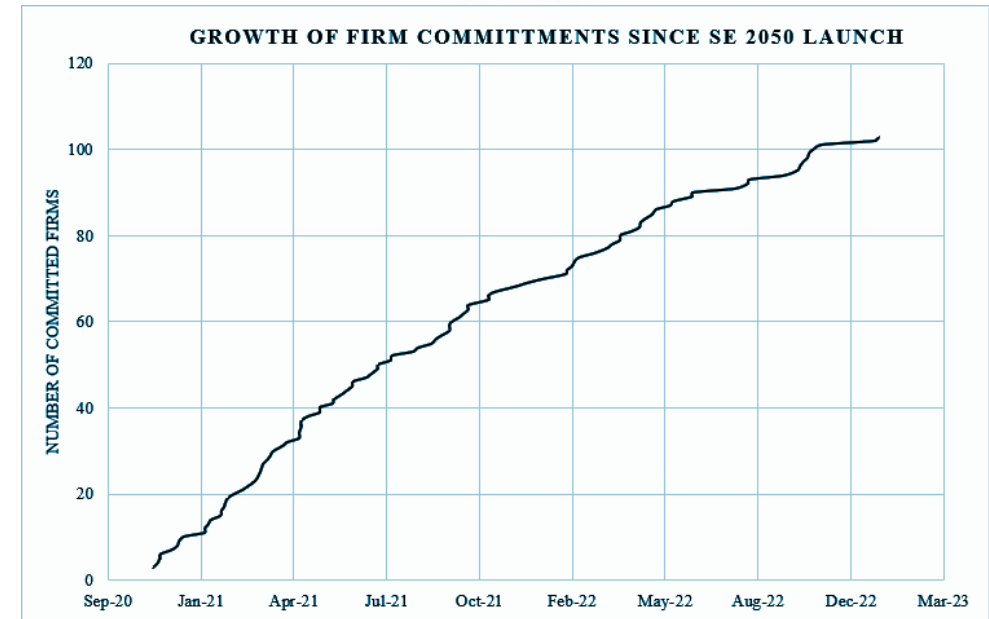
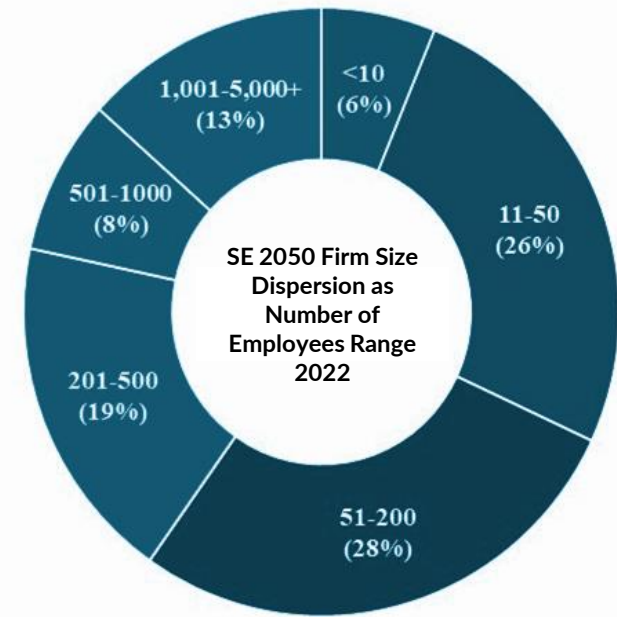
INTERNATIONAL EVENTS

Buy Clean Task Force established for USA by President Biden

COP26 hosts the Cities, Regions, and Built Environment Day (CRBE Day)

SE 2050 Committed Firms

SE 2050 is proud of the steady growth in firm commitments over the past 2 years. Through advocacy of the program and education on the cause, SE 2050 has successfully garnered the commitment of over 100 firms. As shown on these diagrams, these firms are located across North America and come in a wide range of sizes. Firm size is an important aspect of how the SE 2050 Subcommittee continues to discuss and formulate future requirements. As a program, inclusivity and representation across the full range of structural engineering firms is considered critically important to achieving carbon reduction goals. While acknowledging these successes, the program recognizes the need to continue to grow the movement and increase engagement.



Embodied Carbon Action Plans (ECAPs)

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 *educate*, *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. Up to this point, a total of **65 ECAPs** have been submitted.

They come in all different shapes and sizes, including **styling upgrades from the first year to the second (Figure 5)**. **Figure 6 features a page from a thirty-page ECAP that not only outlines the firm’s carbon related goals, but also spotlights several projects where actions were already taken to limit negative impacts on the climate.** Other ECAPs were only a few pages long, but still provided all the necessary information in the form of a checklist to reviewed when beginning any new project.

Figure 5: KPFF ECAP Year 1

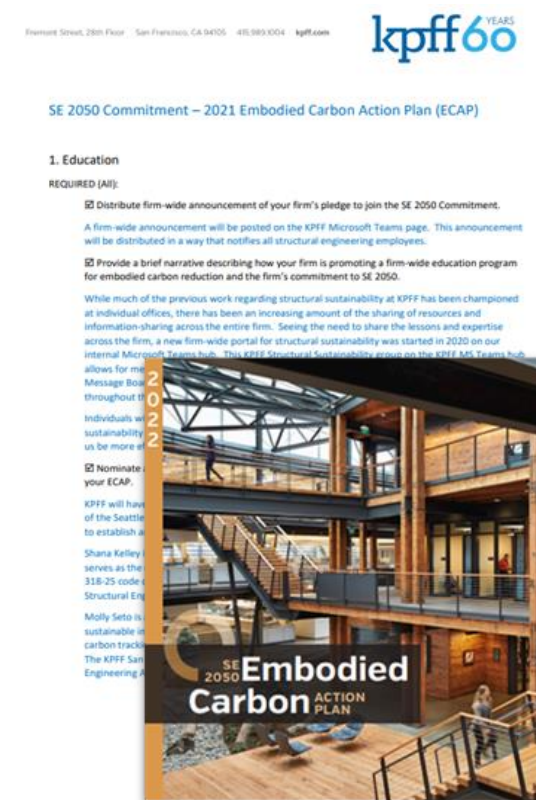


Figure 6: KPFF ECAP Year 2

ECAPS - Educate & Advocate

From the 65 unique firm ECAPs, it is apparent that the structural engineering industry acknowledges their role in the management of embodied carbon and supports the SE 2050 mission to achieve net zero embodied carbon for structures by 2050. The ECAPs reveal an array of strategies firms are using to educate employees and advocate for net zero embodied carbon structures.

In the ECAPs, all firms list at least one recurring educational event for sustainability. These events come in the form of monthly meetings, internal seminar series, or young engineer on-boarding methods. **60% of ECAPs showed the creation of an internal working group** for embodied carbon reduction as unique from a general sustainability team. A common set of statements exists within ECAPs surrounding education and advocacy of processes that would better facilitate sustainable design.

65%

Stated the need to onboard and educate the client as an initial or highly important step

60%

referenced the benefit of greater access to product specific EPDs and/or their desire to use them in specifications

46%

stated a high benefit in engaging across disciplines and stakeholders early in the design process to achieve sustainability goals

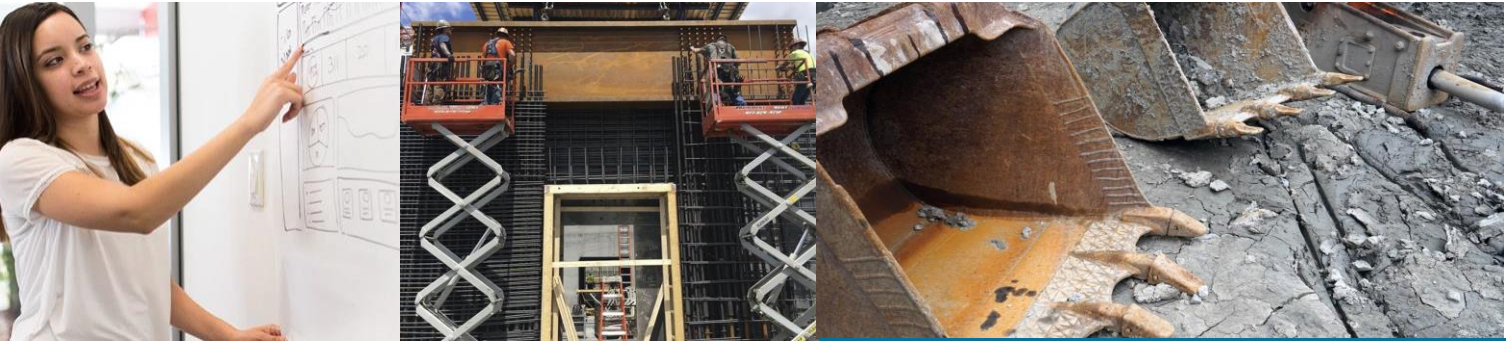


ECAPS - Educate & Advocate

Collectively, the submitted ECAPs show that most firms advocate for several sustainability-related organizations and movements beyond SE 2050. Notably, **the majority of ECAPs refer to the AIA 2030 Commitment** and several go on to explain the relationship between operational and embodied carbon. Other “green” organizations mentioned include USGBC, Green Globes, LEED, CLF, NCSEA, and IStructE, with the latter three being explicit partners of SE 2050.



Figure 6: Project Spotlight from the Buro Happold ECAP



ECAPS - Educate & Advocate

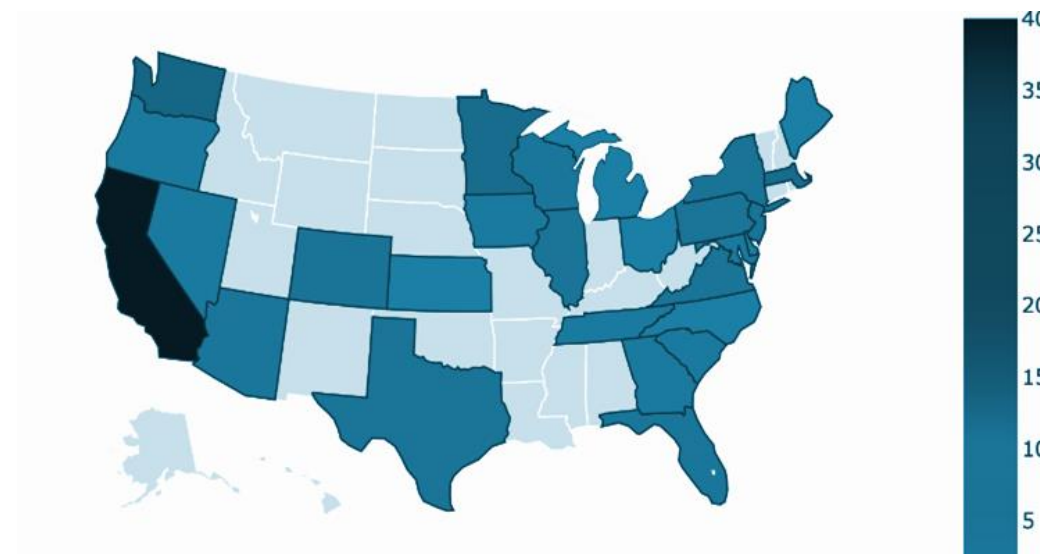


Less common, but of interest, is that **23% of firm ECAPs state the firm's interest in driving policy and/or code requirements as related to the sustainability of structural systems.** In addition to better design and materials, it is clear that policy will be critical in achieving net zero structures.

ECAPS - Report & Reduce

Firm reporting is integral to the success of SE 2050. Therefore, ECAPs are required to explain how firms will collect and report their life cycle assessment (LCA) data. As such, **72% of firms explicitly identified the LCA tool they are using**. Most firms are using external tools like Tally, OneClick, or Athena, but **22% of firms reported that they are developing internal tools to conduct LCAs**. Currently, it is widely known that LCA tools can produce different GWP results for a similar set of material inputs and one input parameter for the SE 2050 database is the LCA tool used.

It is also important to note that **14% of firms state limited resource availability** to conduct life cycle assessments making reduction targets difficult to establish. Even among firms capable of performing LCAs, **most (70%) call for more data before establishing embodied carbon targets**. 11% of companies have stated clear reduction targets with those targets ranging from 5% - 30%. **Broader goals held by 60% of ECAP submitting firms state that they intend to adjust specifications to limit material GWP values and/or require product-specific EPDs**. Additionally, 38% of firms aim to feature more biogenic materials in their designs and 12% of firms aim to design for adaptive reuse and/or regenerative design.



ECAPS - Report & Reduce (continued)

The SE 2050 Database will be a powerful tool to address the current lack of sufficient baseline data for the embodied carbon of structural systems. While still in its beta stage, SE 2050 is focused on ensuring smooth processes of data collection as well as increasing the quantity of data submitted to the database.

The SE 2050 Database anonymizes and aggregates firm-submitted LCA data for structural systems. To date, firms have collectively submitted embodied carbon data for 160+ projects. As shown in Figure 9, submitted embodied carbon data represents projects across many demographic regions. There exists no other cross-firm database for embodied carbon that has such widespread support in North America.

Detailed analysis of this quantity of data will provide new insights into GWP baselines for a variety of structural designs. SE 2050 is currently working to analyze this collection of data in a meaningful way for the engineering community.



Future Goals of SE 2050

After nearly two years of establishing a strong foundation, the SE 2050 Commitment Program is looking to expand its impact. Our ability to provide Signatories appropriate and accurate structural system and structural embodied carbon information is directly tied to the number of signatories. **Therefore, the Program aims to increase:**

- Committed signatory firms and ECAPs
- Submitted projects to SE 2050 Database
- Guidance documents published on SE 2050 website

Additionally, the subcommittee has begun formulating several mid- and long-term goals. These goals – which will be refined over time in response to the lessons learned sections of annual ECAP updates (next page) - will largely take the form of deliverables to the structural engineering community. This can only be done via firm action and, consequently, SE 2050's main responsibility will be providing the tools, guidance, and motivation to achieve net-zero as a reality.

Therefore, the following constitute SE 2050's current mid- and long-term goals:

- Maintain the SE 2050 website as a database for ECAPs of firms across North America
- Yearly report of the data collected in the SE 2050 Database (e.g. baseline GWP for structures, tracking reported values against reduction goals, etc.)
- Enhanced program requirements that drive firms towards net zero embodied carbon structural systems
- Supporting benchmark recommendations for policy

NOTE: Much of this report was taken directly from Graham et al. (2022)¹ found on the SE 2050 website.

Future Goals of SE 2050: Lessons Learned

- The process for developing in-house tools and procedures takes substantial time, effort, and trials. Internal tools can better fit the users' needs when developed in parallel with existing tools and methods. Ultimately, the process helps to avoid veering off course without addressing the initial needs for the tool.
- The accuracy and quality of an LCA performed through a Revit add-in is only as good as the model itself. General material assignments must be consistent and concrete design information (e.g., compressive strength, weight, reinforcement layout) should be included in the modeled element, as these details can greatly impact LCA results.
- Project information exchange and design change organization are critical to performing an accurate LCA. Without a procedural set of steps adopted by an organization, there is not an effective or consistent way to implement this practice firmwide.
- Early conversations with clients are important to build confidence in the effectiveness of embodied carbon reduction strategies.
- For resources to be effective, awareness and ease of access are as important as quality.
- The industry is open and ready to implement strategic changes to improve the built environment by reducing the embodied carbon.

Acknowledgement–Signatory Firms (Page 1 of 7)

Firm Name	Embodied Carbon Champion	Submitted ECAPs	Start Year	Next ECAP due	Next Data due
Ai-Alt Structural Engineering	Alvin Tabar	2022 Submitted	2021	2023-01	2023-07
Armstrong-Douglass Partners	Scott Douglass	2021 Submitted	2021	2022-07	2023-01
Arup (North America)	Frances Yang	2021 Submitted , 2022 Submitted	2020	2023-06	2023-12
Aspect Structural Engineers	Ross Jardine	2021 Submitted , 2022 Submitted	2021	2023-08	2024-02
Bala Consulting Engineers	Elizabeth Larsen	2022 Submitted	2022	2023-10	2024-04
Ballinger	Brent Ellmann	2022 Submitted	2022	2023-08	2024-02
Black Box Engineering	David Bueno	-	2021	2022-02	2022-08
Buehler	Ryan Miller	2021 Submitted , 2022 Submitted	2021	2024-01	2023-07
Buro Happold	Stephen Curtis	2022 Submitted	2021	2023-04	2023-10
Bush, Bohlman & Partners <i>Inactive</i>	Trevor Whitney	-	2021	2021-10	2022-04
CannonDesign	Julie Shaw	2021 Submitted , 2022 Submitted	2021	2023-12	2023-06
Clark Nexsen	Peter Allen	2021 Submitted , 2022 Submitted	2021	2023-07	2024-01
Coffman Engineers, Inc.	Jacob Gottlieb	2022 Submitted	2021	2023-04	2023-10
Conn Shaffer Consulting Engineers <i>Inactive</i>	Chris Conn	-	2021	2021-07	2022-01
Coughlin Porter Lundeen	Laura Lindeman	2021 Submitted , 2022 Submitted	2021	2023-08	2023-02

Acknowledgement–Signatory Firms (Page 2 of 7)

Firm Name	Embodied Carbon Champion	Submitted ECAPs	Start Year	Next ECAP due	Next Data due
DATUM ENGINEERS, INC.	Swarna Karuppiah	2022 Submitted	2021	2023-03	2023-09
DCI Engineers	Ethan Martin	2021 Submitted , 2022 Submitted	2021	2023-09	2024-03
Degenkolb Engineers	Elena Good	2021 Submitted , 2022 Submitted	2021	2023-07	2024-01
Dekker Perich Sabatini	Patience Raby	-	2022	2023-02	2023-08
DeSimone Consulting Engineers	Tarek Abdallah	2022 Submitted , 2023 Submitted	2021	2024-11	2025-05
DIALOG	David Pesta	2022 Submitted	2021	2023-01	2023-07
DLR Group	Murad Hamdallah	2021 Submitted , 2022 Submitted	2021	2023-12	2023-06
Engineering Ventures, PC	Russ Miller-Johnson	2022 Submitted	2021	2023-11	2024-05
Entuitive	Emily King	2022 Submitted	2022	2023-07	2024-01
EQUILIBRIUM Consulting	Matt Kantner	2021 Submitted , 2022 Submitted	2020	2023-06	2023-12
EwingCole	Colleen Blackwell	2022 Submitted	2021	2023-03	2023-09
EXP	Amy Pastor	-	2022	2022-09	2023-03
Fast + Epp	Olivia Healy	2022 Submitted	2022	2023-09	2024-03
Flad Structural Engineers	Tim Liebhold	2021 Submitted , 2022 Submitted	2021	2023-08	2024-02
Forell Elsesser Structural Engineers	Sydney Gallion	2021 Submitted , 2022 Submitted	2021	2023-10	2024-04

Acknowledgement–Signatory Firms (Page 3 of 7)

Firm Name	Embodied Carbon Champion	Submitted ECAPs	Start Year	Next ECAP due	Next Data due
Fortis Structural, LLC	Michael Gritzmacher	-	2022	2023-04	2023-10
FTF Engineering	Alejandra Bravo	2021 Submitted	2021	2022-04	2022-10
Glotman Simpson Consulting Engineers	Harrison Glotman	2021 Submitted , 2022 Submitted	2021	2023-07	2024-01
Gresham Smith	Allison Hampton	2022 Submitted	2021	2023-03	2023-09
Grimm & Chen Structural Engineering, Inc.	Sitanan Tanyasakulkit	2021 Submitted , 2022 Submitted	2021	2023-10	2024-04
HGA	Ethan Fogle	2021 Submitted , 2022 Submitted	2020	2023-05	2023-11
HKS	Erin Winston	2022 Submitted	2022	2023-10	2024-04
HOK	Jaclyn Lee	2021 Submitted , 2022 Submitted	2021	2023-09	2024-03
Hollingsworth Pack, Austin	Chris Hewitt	2022 Submitted	2022	2023-08	2024-02
Holmes	Megan Stringer	2021 Submitted , 2022 Submitted	2021	2023-07	2024-01
Hope Furrer Associates	Nicole Baer	-	2022	2023-04	2023-10
IMEG Corp.	Laura Hagan	2021 Submitted , 2022 Submitted	2021	2023-10	2024-04
Innovative Structural and Specialty Engineering PLLC	Radhi Majmudar	-	2022	2023-04	2023-10
Integrus Architecture	Morgan Wiese	2022 Submitted	2022	2023-09	2024-03
Jirsa Hedrick Structural Engineers	Austin Reese	2022 Submitted	2022	2023-11	2024-05

Acknowledgement–Signatory Firms (Page 4 of 7)

Firm Name	Embodied Carbon Champion	Submitted ECAPs	Start Year	Next ECAP due	Next Data due
KAI Hawaii	Eric Borchers	-	2022	2023-04	2023-10
Keast & Hood	Lauren Schmitz	2021 Submitted , 2022 Submitted	2021	2023-08	2024-02
KICSEC Ltd.	Yadav Khwaounjoo	2021 Submitted , 2022 Submitted	2021	2023-09	2024-03
KL&A Engineers and Builders	Alexis Feitel	2021 Submitted , 2022 Submitted	2020	2023-05	2023-11
Klepper, Hahn & Hyatt	James A. D'Aloisio	2022 Submitted	2022	2023-12	2023-06
KPFF Consulting Engineers	Shana Kelley	2021 Submitted , 2022 Submitted	2021	2023-10	2024-04
Kurt Fischer Structural Engineering	Carl Kloos	2022 Submitted	2022	2023-10	2024-04
Larsen and Landis <i>Inactive</i>	John Grieshaber	-	2021	2021-12	2022-06
LeMessurier	Michael Gryniuk	2021 Submitted	2021	2022-10	2023-04
LEO A DALY	Jacob Zach	2022 Submitted	2022	2023-10	2024-04
LERA Consulting Structural Engineers	Carrie Villani	2022 Submitted	2021	2023-09	2024-03
Linchpin Structural Engineering	Eric Rademacher	2022 Submitted	2021	2023-05	2023-11
Little Diversified Architectural Consulting	Sina Flynn	2022 Submitted	2021	2023-05	2023-11
Maffei Structural Engineering	Rob Ward	2022 Submitted	2022	2023-11	2024-05
Magnusson Klemencic Associates	Catherine Cai	2021 Submitted , 2022 Submitted	2021	2023-09	2024-03

Acknowledgement–Signatory Firms (Page 5 of 7)

Firm Name	Embodied Carbon Champion	Submitted ECAPs	Start Year	Next ECAP due	Next Data due
Mar Structural Design	Bridget Carls	2022 Submitted	2022	2023-09	2023-03
Martin/Martin, Inc.	McKenzie Glass	2022 Submitted	2021	2023-02	2023-08
Martinez Moore Engineers	Kate Tomlinson	2022 Submitted	2021	2023-03	2023-09
McMullan & Associates, Inc.	Colleen Nasta, PE	2021 Submitted	2021	2022-10	2023-04
McNamara Salvia Structural Engineers	AJ Unander	2021 Submitted , 2022 Submitted	2021	2023-09	2024-03
McNicolls And Associates Ltd	Tonee Mc Nicolls	2022 Submitted	2021	2023-11	2024-05
Meyer Borgman Johnson	Catherine Lumitap	2021 Submitted , 2022 Submitted	2020	2023-06	2023-12
Morrish Design	Alan Tonissen	-	2022	2023-04	2023-10
NORR	Hassan Saffarini	2021 Submitted	2021	2022-10	2023-04
Oak Point Associates	Torey Brooks	-	2021	2022-11	2023-05
Odeh Engineers, Inc.	Michael Scancarello	2022 Submitted	2022	2023-11	2024-05
O'Donnell & Naccarato, Inc.	Scott Bauer	2021 Submitted , 2022 Submitted	2020	2023-05	2023-11
One Hermitage	James Richardson	-	2022	2022-10	2023-04
PCS Structural Solutions	Chris Jeseritz	2021 Submitted , 2022 Submitted	2020	2023-05	2023-11
PES Structural Engineers	Ryan Krusko	-	2022	2023-06	2023-12

Acknowledgement–Signatory Firms (Page 6 of 7)

Firm Name	Embodied Carbon Champion	Submitted ECAPs	Start Year	Next ECAP due	Next Data due
Professional Engineering Consultants, PA	Zach Bowden	2022 Submitted	2021	2023-03	2023-09
PRYCO STRUCTURAL LLC	Jose R. Hernandez	2022 Submitted	2021	2023-01	2023-07
Reaveley Engineers + Associates	Jacob Linford	2022 Submitted	2022	2023-03	2023-09
RJC Engineers	Damien Stoneham	-	2022	2022-08	2023-02
Saiful Bouquet Structural Engineers	Nofel Teldjoune	2022 Submitted	2021	2023-01	2023-07
Siegel Associates	Allison Olinsky	-	2022	2023-05	2023-11
Silman	Ian C. Schmellick	2021 Submitted , 2022 Submitted	2020	2023-06	2023-12
Simpson Gumpertz & Heger, Inc.	Julia K. Hogroian, Michael A. Tecci	2021 Submitted , 2022 Submitted	2021	2023-03	2023-09
SK&A Structural Engineers	Sara Zaman	-	2022	2023-02	2023-08
Skidmore, Owings & Merrill LLP	Matthew Streeter	2021 Submitted , 2022 Submitted	2021	2023-09	2024-03
SLAM Collaborative	Jamie Littlefield	2022 Submitted	2022	2023-12	2024-06
SmithGroup	Andrea K Reynolds	2022 Submitted	2021	2023-12	2024-06
SMRT Architects and Engineers	Andrew Bradley	2022 Submitted	2021	2023-04	2023-10
Stantec Architecture Inc	Robby Vogel	-	2022	2022-11	2023-05

Acknowledgement–Signatory Firms (Page 7 of 7)

Firm Name	Embodied Carbon Champion	Submitted ECAPs	Start Year	Next ECAP due	Next Data due
Stone Fleet	Justin Kordas	-	2022	2023-04	2023-10
Structural Focus	Michael Daciolas-Semon	2022 Submitted	2021	2023-06	2023-12
StructureCraft	Leif Johnson	2021 Submitted , 2022 Submitted	2021	2023-12	2023-06
Studio NYL Structural Engineers and Facade Designers	Julian Lineham	2021 Submitted , 2022 Submitted	2021	2023-07	2024-01
Taylor Timber	Chad Taylor	-	2023	2023-07	2024-01
Thornton Tomasetti	Michael Cropper	2021 Submitted , 2022 Submitted	2020	2023-05	2023-11
Tipping Structural Engineers	Bruce Danziger	2021 Submitted , 2022 Submitted	2021	2023-11	2023-05
Uzun+Case	Thomas Trotter	2022 Submitted	2022	2023-07	2024-01
Verdant Structural Engineers	Nora Murray, PE	2021 Submitted , 2022 Submitted	2021	2023-07	2024-01
Walter P Moore	Dirk Kestner	2021 Submitted , 2022 Submitted	2020	2023-05	2023-11
Wight & Company	Matthew Aquino	2021 Submitted	2021	2022-10	2023-04
WSP USA	Teresa Vangeli	2022 Submitted	2021	2023-03	2023-09
ZFA Structural Engineers	Lindsey Broderick	-	2022	2023-02	2023-08

Acknowledgements–Subcommittee Members

SE 2050 Leadership

Chair

Michael Gryniuk, P.E., *LeMessurier*

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

Annabel Shephard, *PCS*

Mark Webster, P.E., *SGH*

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

Chris Jeseritz, P.E., *PCS*

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

Charlotte Sauer, *Cannon Design*

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

Chris Horiuchi, P.E., *SOM*

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Demi Fang, *MIT*

Christianos Burlotos, *Martin/Martin*

Jessica Martinez, *DCI Engineers*

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