



↑ Ohlone Community College District

MEP 2040 Embodied Carbon Action Plan 2024

CANNONDESIGN

Introduction

CannonDesign — a design practice where strategy, experience, architecture, engineering and social impact converge — has a history of innovation and expertise in sustainable design. Our firm was an initial signatory to the AIA 2030 Commitment, tracking our progress toward achieving net-zero carbon buildings by 2030. Our employees are continually working to reduce building energy consumption by annually tracking and reporting progress.

Energy use intensity (EUI) is a key metric and design driver to elevate building energy use in creating solutions for our clients, and we utilize energy design processes to achieve a high-performance baseline.

MEP 2040 Commitment Statement

CannonDesign's leadership frames our bold strategies while supporting our targets and proactive directions. Our firm's journey is going well beyond energy use and operational carbon; this journey also focuses on reducing embodied carbon in our designs. Forging bold connections, reducing operational and embodied carbon to zero across mechanical/electrical/plumbing systems by 2040 is at the core of CannonDesign's ethos.

Our engineers have recognized and demonstrated the importance of reducing operational energy and emissions. As signatories of AIA 2030, we believe our energy design process will help eliminate operational energy and carbon emissions by 2030. With these focused efforts in mind our MEP practice began prioritizing the impacts of MEP/low-voltage systems and the priority within a building's overall carbon footprint.

CannonDesign pledges to the MEP 2040 commitment:

Establish a firmwide plan to reduce embodied carbon across our MEP system designs for all projects, targeting zero embodied carbon associated by 2040. This framework will annually assess and report progress for yearly target reductions of embodied carbon.

Request low global warming potential (GWP) refrigerants within designs. We encourage designers to investigate low GWP refrigerants when creating systems, aiming to minimize or eliminate Greenhouse Gas (GHG) emissions from refrigerants.

Request Environmental Product Declarations (EPDs) for MEP/low-voltage system components in project specifications.

Engage in the quarterly MEP 2040 forum, as well as the Carbon Leadership Forum (CLF) community discussion group to exchange insights and add to the expanding knowledge pool.



← St. John's University

The Buildings and Carbon Connections

Buildings, energy consumption and carbon emissions are deeply interconnected. Traditionally, efforts to reduce a building's carbon footprint focused on lowering energy use as a proxy for minimizing greenhouse gas emissions. Building codes and third-party sustainability standards have been essential in driving industry-wide progress in this area. Key initiatives, such as the AIA 2030 commitment, MEP 2040 and SE 2050, have advanced the integration of operational and embodied carbon considerations. As buildings become more energy-efficient, the role of embodied carbon — encompassing materials, systems and refrigerants — grows more significant, shaping the total life-cycle carbon impact of building design.

THE URGENCY WITH EMBODIED CARBON

If operational carbon is the beginning for reducing carbon emissions, then embodied carbon is the next phase of emission reduction goals. Because of its relative anonymity for MEP engineers and facility managers, it is important that designers and engineers educate our industries and clients about the impact embodied carbon will have on structures. As scope 1 and scope 2 emissions are reduced through collective utility decarbonization and building electrification efforts, the impact of embodied carbon for products produced today is exacerbated. The impacts of today's carbon may have negative repercussions on tomorrow's climate or impacts on the health of the occupants we are committed to serving with our designs.

MEP systems often have an underappreciated effect on the whole building carbon calculation. By better understanding the impacts these systems through the MEP 2040 commitment and developing an Embodied Carbon Action Plan (ECAP) we will continue to support our firm's strategic goal of having remarkable and regenerative designs accelerating toward Planet 2100.

- Replacing the Portland Cement content with Type 1L cement or supplementary cementitious materials like fly ash, slag, or ground glass pozzolans
- Changing concrete specifications to performance based, to allow contractors to reduce the amount of cement required
- Using biogenic materials like Mass Timber
- Restricting the Global Warming Potential (GWP) of materials and verifying conformance through Environmental Product Declarations.

San Mateo County,
Cordilleras Mental
Health Center →



The MEP 2040 Embodied Carbon Action Plan

CannonDesign's MEP 2040 Embodied Carbon Action Plan define our goals to reduce our MEP systems embodied carbon emissions to zero by 2040. Our ECAP is a primary requirement of our commitment to the MEP 2040 program, and we have further developed it beyond the industry commitment.

↓ SUNY Albany



An education process that covers our methods for spreading embodied carbon literacy and conversations throughout the firm and to our clients. We are developing a training program to our internal group, expand and present.

1. We will provide reduction strategies to reduce embodied carbon in MEP systems for our teams to implement in our designs.

As a part of our commitment to specifying only low-GWP refrigerants in our designs, we also will commit to explaining the importance of specifying low-GWP refrigerants as a part of our educational program. This education will be in concert with education opportunities on the phase out of high-GWP refrigerants as a part of American Innovation and Manufacturing (AIM) Act of 2020 that provides training materials to engineers, architects and clients about the latest refrigerant options that have lower global warming potential (GWP).

We will also focus our project teams on understanding the impacts of refrigerant choice on system selection to begin quantifying the long-term operational emissions and leaks among different

refrigerant options. In addition, with the new refrigerant landscape of low- and ultra-low- GWP refrigerants we will continue to educate our teams to the impact of these new refrigerants on building design in 2025.

2. We will include a reporting section that addresses other primary requirements of MEP 2040, and implement a reporting procedure for embodied carbon of MEP systems and track these annually to ensure a reduction to net zero embodied carbon by 2040.

CannonDesign is committed to measuring, tracking and reporting embodied carbon data, with reporting as the key portion of measuring success of our operational carbon and embodied carbon reduction goals. Our reporting is currently limited to the design and future energy use of buildings. As a part of our ECAP, we will work within our current database and look for ways to expand to allow for reporting of embodied carbon in our designs. As data and calculation methods are further developed to quantify the impacts of sheet metal, piping, conduit and equipment embodied carbon, we plan to move this from an informational datapoint to one informing our designs.

3. We will advocate and spread awareness of reducing MEP/low-voltage embodied carbon beyond our firm. The construction industry must be onboard with the MEP 2040 commitment if we are to achieve actionable impact on carbon reductions, we see our trade and construction partners as well as our clients and vendors as key contributors to these reductions. Advocate beyond the industry of why embodied carbon is important.

Further enhancing our embodied carbon tracking we will include (in our master specifications) additional information required on every project:

- a. We will request that the contractors provide a quantification of the amount of refrigerant provided as a part of the project to include an impact by specifying the low-GWP refrigerant.

- b. Require via the specifications to ask for the contractor to provide product specific environmental and health documentation including EPDs for all available equipment.

It is our hope to coordinate with our trade partners on each of our projects to gain better data on the actual emissions of our projects. Attempting to leverage open-source databases to also give back to the broader industry.

Our CannonDesign MEP/Low Voltage group will revisit our ECAP yearly to reflect on what worked best, what can be improved and honest reflections, to further our path to designing net-zero embodied carbon MEP systems by 2040.

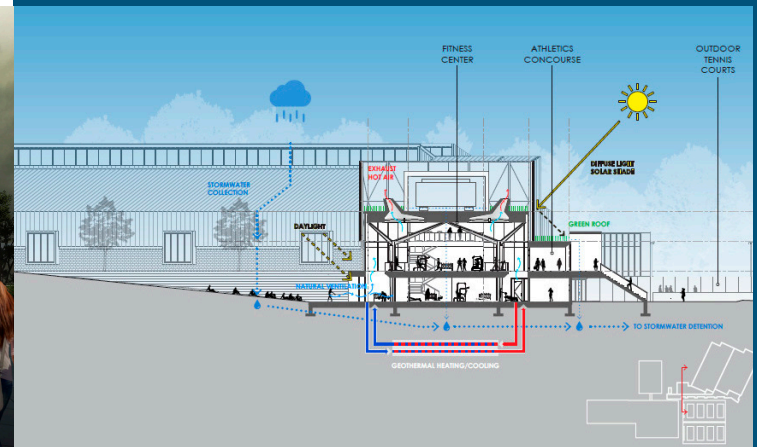
↓ Skidmore College



TARGETS AND GOALS

In keeping with other firmwide commitments, CannonDesign will target designing carbon neutral buildings by 2030 and embodied carbon structural systems by 2050, and reducing embodied carbon of MEP systems to zero by 2040.

To achieve these goals, we set additional targets to help us ensure we are on track. We are aiming to reduce our operational energy consumption by 80% when compared to 2003 CBECS data by 2025, currently we are on track to achieve that goal. Detailed energy modeling is important to meeting these goals as well as carbon modeling. We are targeting to have 100% of our project energy modeled and by 2030 100% of our project modeled for embodied carbon. We recognize that embodied carbon modeling currently is limited to envelope and structural systems, and as more EPDs are available to quantify the impacts of MEP systems they will be incorporated in to the analyses.



Advocacy

Building upon our architectural and structural team members we intend on being advocates for EPDs with the various manufacturers and vendors that we work with; as more EPDs become available we will incorporate those EPD requests in to our project specifications. We will also be active participants in the MEP 2040 quarterly forums, working groups and CLF community to continue improving our own knowledge, but to also give back and contribute to the growth of industry knowledge on these subjects. Data is crucial. If someone were to use EC3's embodied carbon tool or Mindful Materials to search for Environmental Product Declarations (EPDs) for MEP components, they would find limited coverage of the MEP system by EPDs, except for insulation and some air distribution products. We hope that through continuous collaboration with vendors and trade partners, we can encourage the market to produce more EPDs, allowing us to better quantify the impacts on the design of MEP systems.

CannonDesign's ethos revolves around our Living-Centered Design approach to all of our decisions we make and the commitment to MEP 2040 and our approach embodied carbon reduction is crucial to

this approach. Much like other aspects, Living-Centered Design motivates us to dream ambitiously and reflect on the ripple effects of our choices across various facets of life. Our advocacy will particularly emphasize understanding the influence of embodied carbon on life and the broader world, alongside other priorities outlined in the ECAP.

Because this effort is larger than any one person within our firm we have formed a team of advocates to not only develop this ECAP, but to continue to move this effort forward. Members within the team of advocates are not only engineers, but also members of our sustainability team. In order to continue to expand these efforts even beyond CannonDesign we are actively looking for collaborators to partner with us. Both Colin Hale and Keith Hammelman will be co-leading this effort representing CannonDesign engineering with assistance from the broader MEP team and CannonDesign's sustainability team lead by Eric Corey Freed. If you are interested in partnering or want to learn more about CannonDesign's commitment to the MEP 2040 challenge, please reach out to either Colin or Keith.



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