BUILDINGS CASE STUDY

Low-Carbon Building Materials
LinkedIn

ACTION:

Use lower-carbon materials in the construction of new buildings

Overview

When LinkedIn designed and built a new 245,000-square-foot headquarters, the company demonstrated how using commercially available low-carbon concrete products for construction can significantly reduce the overall embodied carbon of a building or infrastructure project

Challenge

Cement, an important component of concrete, accounts for approximately 7 percent of global carbon dioxide emissions. Demand for cement and concrete is projected to grow significantly as these products are used to build buildings, water infrastructure, sanitation facilities, and highways throughout the world.

There are considerable challenges in developing lower-carbon cement and concrete that also meet performance criteria such as set time, strength, and compatibility with other materials.

Manufacturers can reduce the carbon footprint of concrete in a number of ways, including using low-carbon fuels during production, reducing the amount of cement in concrete, substituting cement with supplementary cementitious materials (such as fly ash and slag) and deploying carbon-capture technologies to directly sequester CO_2 and further optimize cement efficiency.

Goals

LinkedIn, the world's largest professional network with nearly 740 million members globally, has committed to reducing its global carbon emissions by 75 percent (relative to a 2013 baseline). In the construction of its new 245,000-square-foot, 1,000-person headquarters building and adjacent parking garage in Silicon Valley, LinkedIn wanted to implement all available technologies and practices to reduce the embodied carbon footprint of the complex as well as its operating impacts. These efforts include sourcing the lowest-carbon materials for the building, exceeding LEED Platinum building standards, generating solar electricity on-site, using recycled water, installing highly efficient mechanical systems, and planting drought-tolerant landscaping.

The use of low-carbon blended concrete solutions alone for the headquarters will result in a 30 percent emissions reduction compared to the industry average concrete.

Operational Overview

When the project was first introduced, LinkedIn's construction lead identified a variety of low-carbon concrete mixes suitable for the technical specifications of the proposed headquarters. This range of mixes allows the team the flexibility to minimize the building's embodied carbon while delivering on the engineering requirements, construction schedule, and cost parameters.

LinkedIn's concrete supplier for this project, Central Concrete (a business unit of U.S. Concrete) used CarbonCure's CO2 utilization technology to consume CO2 sourced from industrial emitters into its concrete. Once injected into mixing concrete, the CO2 chemically converts into a mineral which improves the concrete's strength. This CO2 mineralized concrete can be used as-is or in combination with other strategies, such as switching to low-carbon fuel during production or substituting cement for post-industrial byproducts in the concrete (such as limestone, fly ash, and slag) to reduce overall embodied carbon even further. Central Concrete established its partnership with CarbonCure in early 2017 and introduced this low-carbon concrete as part of its product mix in 2018. Today, about 250 concrete plants across the U.S., Canada, and Southeast Asia use CarbonCure, and the company has supplied more than 5.5 million cubic yards to hundreds of construction projects including transportation infrastructure, commercial, and residential construction.

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Key Inputs and Resources

The sustainability commitments the executive leadership of LinkedIn made have been critical to implementing emerging technologies like lower-carbon concrete. The success of this project can be tied directly to the background and educational outreach of LinkedIn's construction lead, who worked closely with material suppliers and had a strong understanding of the industry. Central Concrete, the project's concrete supplier, and CarbonCure, its technology partner, were important collaborators and could provide data about their products' performance.

Low-carbon concrete products are already commercially available and can be specified on private and public projects within normal Request for Proposals (RFP) processes. In some cases, organizations can achieve embodied carbon reductions at no additional cost. For example, concrete made using CarbonCure's technology can provide an emissions benefit at comparable prices to standard concrete. Deeper decarbonization requires combinations of technologies, so organizations will need to balance overall cost and sustainability objectives within each project.

Key Outputs

The headquarters project will not be finished until 2021, so in-use metrics are not yet available. However, the use of low-carbon blended concrete is expected to result in an emissions reduction of about 30 percent relative to standard concrete. Since the embodied emissions from building materials are locked in place upon construction, LinkedIn will see the climate benefits of its low-carbon choices right away.

Replicating for Impact

All companies and governments pursuing new construction or retrofits should utilize low-carbon concrete and appropriately structure their RFPs to facilitate bids with these materials. Tools such as the Embodied Carbon in Construction Calculator (EC3) assessor can help organizations compare options and trade-offs for each material and calculate the embodied carbon impact for their overall project.

Organizations looking to source low-carbon materials should work with project architects, contractors, and engineers to ensure they optimize specifications for embodied carbon reductions, cost, and performance. Looking beyond construction, private and public organizations alike can accelerate the concrete industry's path to decarbonization by implementing low embodied carbon procurement policies and incorporating embodied carbon reduction goals into greater corporate sustainability programs.