

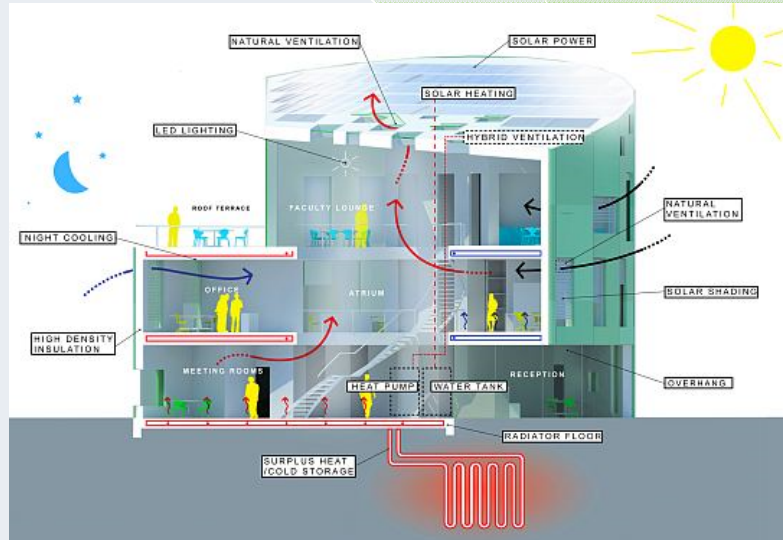
What Architects Need to Know About:

Carbon Neutral and Zero Carbon Buildings

Overview

Carbon neutral is an emerging definition that relates to measuring, reducing and offsetting carbon energy used either a building or an organization as a whole. To provide a little background, a popular approach for designing a carbon neutral building is as follows:

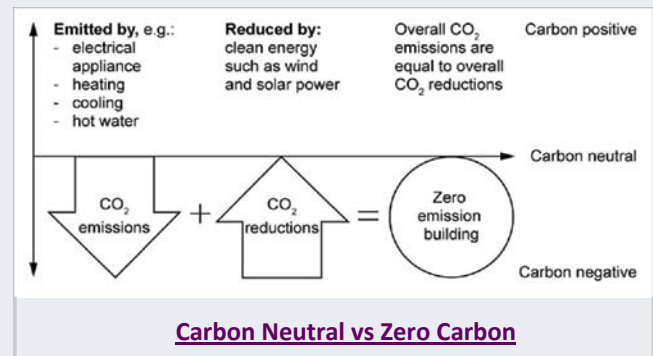
1. Integrating passive design strategies
2. Designing a high performance building envelope
3. Specifying energy efficient HVAC systems, lighting and equipment
4. Installing on-site renewable energy
5. Offsetting



Building elements to be considered for Carbon Neutral Design

Definitions: Zero Carbon vs Carbon Neutral

There is a subtle but important difference between what zero-carbon and carbon neutral actually mean. *Zero-carbon* implies that the operation of development does not produce CO₂ emissions. By contrast, emissions produced from the operation of a *carbon neutral* building are offset. It is the intent of the carbon neutral concept that the building also produce less CO₂ than a conventional building, rather than simply producing - and then offsetting - the same amount of carbon. Offsetting can be achieved by, for example, contribution of renewable energy produced on-site to the main power grid, by extending plantation forests on-site or off-site, or by investment in renewable energy projects offsite.



The aim of zero carbon and carbon neutral buildings is to reduce and offset carbon emissions.

Carbon Neutral vs Green and Sustainable

Many of the design elements that can be utilized to achieve carbon neutral status can also be used in sustainable or green building design. However, because the focus of carbon neutral or zero carbon is on carbon emissions and energy efficiency, other sustainable elements can be neglected. These include wastewater reduction, biodiversity protection, affordability, sustainable materials and comfort conditions. It is possible that a carbon neutral or zero carbon building to not be truly sustainable or green by current definitions.



Architectural Elements to Consider in Zero Carbon or Carbon Neutral Design

1. **Climate:** The starting point in framing a CN problem is the *acceptance* and *incorporation* of the climate characteristics of the location of the project. Climate considerations include heating and cooling degree days which inform on whether the focus is on heating or cooling of the building.
2. **Solar Potential of Site:** Design strategies for passive heating as well as using the sun to power photovoltaics or solar hot water heating will require an assessment of the solar potential of the site.
3. **Wind Potential of Site:** It will be important to understand the wind patterns on the site to take advantage of natural ventilation to cool the building.
4. **Passive Solar Design Elements:** Passive Solar Design takes advantage of site, climate, and the energy of the sun to provide thermal comfort through heating and cooling. Passive cooling similarly features proper shading and thermal mass within the building envelope, as well as operable windows placed to take advantage of natural ventilation.

Carbon Offsets

Carbon offsetting is the use of carbon credits to enable businesses to compensate for their emissions, meet their carbon reduction goals. Carbon offsetting works by purchasing carbon credits which are sold in metric tons of carbon dioxide equivalent (tons CO₂e). On its own, carbon offsetting will not provide a solution to global warming, however it does enable business to deliver finance to essential projects around the world that are reducing emissions and contributing to building a low carbon economy.

The Carbon Challenge

Achieving a zero carbon, or carbon neutral, building with today's technologies and occupant expectations is challenging. There are a handful of projects out there proving that it is possible—for the right building in the right setting with the right team.

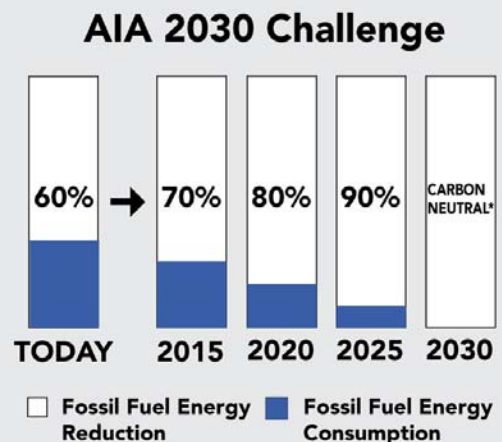
Another concern is that the investment in dollars and resources to get to carbon neutral, or zero carbon, are significant and might be better spent on more cost-effective energy saving options, such as a more efficient building envelope.

A carbon-neutral building has to first achieve significant load reductions and system efficiencies, and then meet the remaining loads with onsite energy generation. Onsite generation typically includes photovoltaic panels and/or wind turbines.

The building industry is in the early development stage of low carbon foot print building design. Those that embark on this goal must accept the reality that the industry does not have clearly defined solutions for the many challenges involved. Each building will require a creative and forward thinking design team to approach the goal of a carbon neutral, or zero carbon, building.

AIA and the 2030 Challenge

The 2030 Challenge has been adopted and is being implemented by 80% of the top 10, and 70% of the top 20 architecture firms in the U.S. In addition, the AIA, ASHRAE, the U.S. Conference of Mayors, the federal government, and many other organizations and state and local governments and agencies have adopted the Challenge. Only time will tell if the goals set are realistic.



*Using no fossil fuel GHG-emitting energy to operate

[The AIA roadmap to the 2030 Challenge](#)

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