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Zeroing In

It's become increasingly common to hear the term "zero energy" or "zero carbon" used to describe buildings that achieve complete energy sustainability by generating as much energy as they consume. Zero-energy homes require no input from nonrenewable off-site power sources, emit no net greenhouse gases into the atmosphere, and sometimes feed surplus energy back into the grid. Many combinations of passive and active generation can be used for designing a zero-energy structure, depending on what's appropriate for local climate, budget, site regulations, codes, and individual preferences.

Passive efficiency strategies are best implemented during the construction phase. These include things like orientation on the site for maximum southern sun exposure during winter months, natural ventilation systems, strategically placed windows and shade trees, and thermal mass that can absorb and retain heat. More active strategies include geothermal heat pumps that recover energy from ground sources, and wind turbines placed on site.

Zero Energy from the Ground Up: Glass & Bedolla House

One of the earliest and most memorable examples of designing and building for zero energy comes from architect Zoka Zola, whose zero-energy Glass & Bedolla House exemplifies a modern-organic-fusion style and low-impact luxury living. Some critics point out that the house is not small (a deal-breaker for those who consider compactness an inextricable part of sustainable building), but Zola zeroes out every square foot through solar, wind, and geothermal systems. One of the crowning characteristics of the house is its external coat of greenery, which creates an elegant insulating shroud. As a prototype, the house's Chicago location offers an optimal laboratory for testing extremes. Frigid winters and sweltering summers don't make the task easy, but through extensive preliminary observation of the site and surrounding environment, Zola managed to equip the house properly to handle the weather.

Energy Retrofit: The Now House Project

It may be simpler to build a zero-energy home from scratch than to retrofit an existing structure, but buildings constructed in the 20th century are generally the most in need of upgrades for energy efficiency. There are some simple modifications that can be made on existing homes to dramatically reduce waste, emissions, resource exploitation, and energy bills. The Canada-based Now House project has developed a replicable model for retrofitting World War II homes to near-zero net energy. Deterioration that comes with old age and the inferior quality of mid-century materials is the largest issue these homes face. As a rebuttal, the Now House focuses primarily on sealing the building envelope, replacing worn insulation, and installing solar panels. It's a homeowner-friendly strategy that keeps costs and disruption down. ■