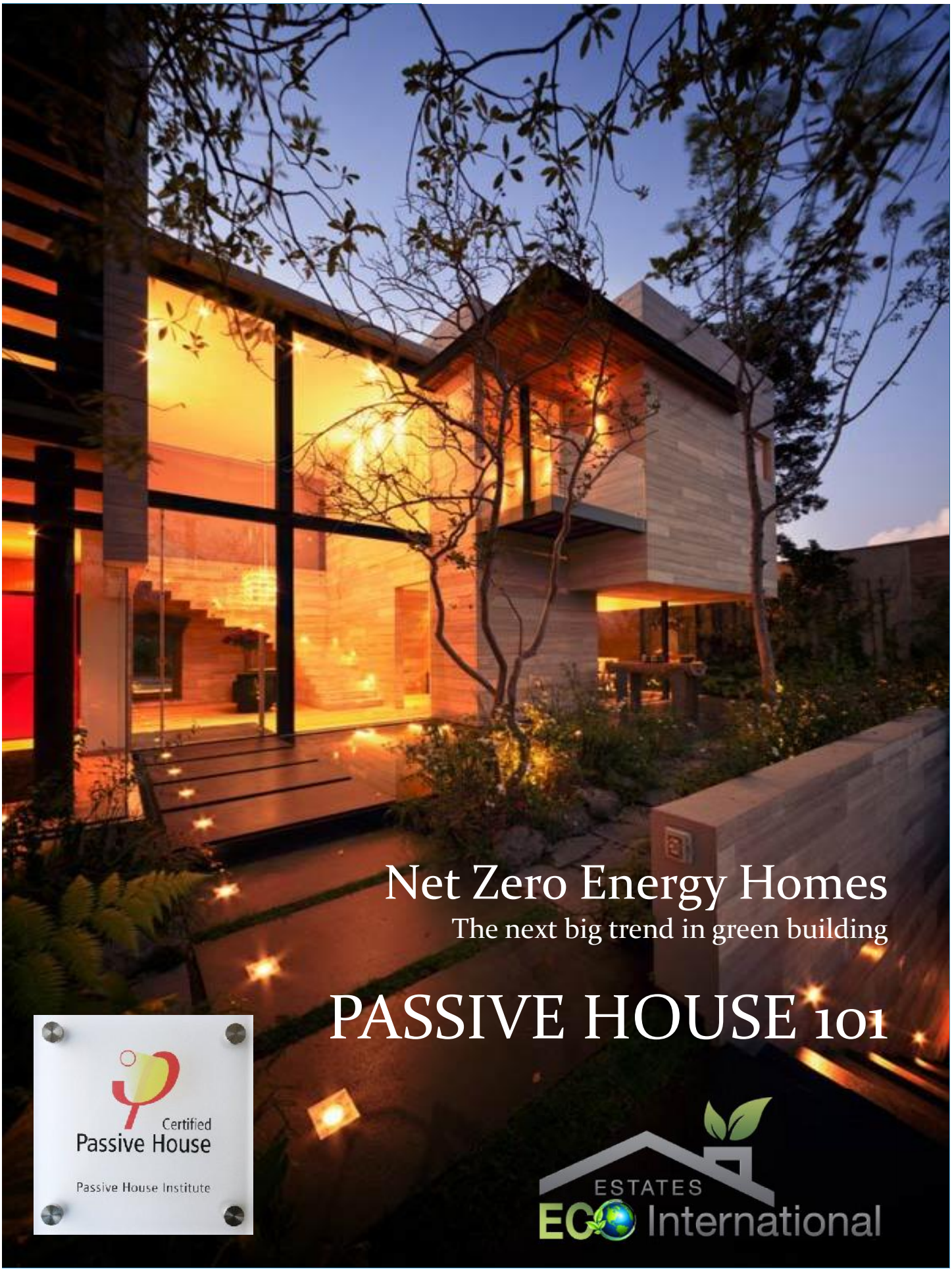

Net Zero Energy Homes
The next big trend in green building
PASSIVE HOUSE 101
Certified
Passive House
Passive House Institute
ESTATES
ECO International

Passive house

The universal standard in very low energy buildings

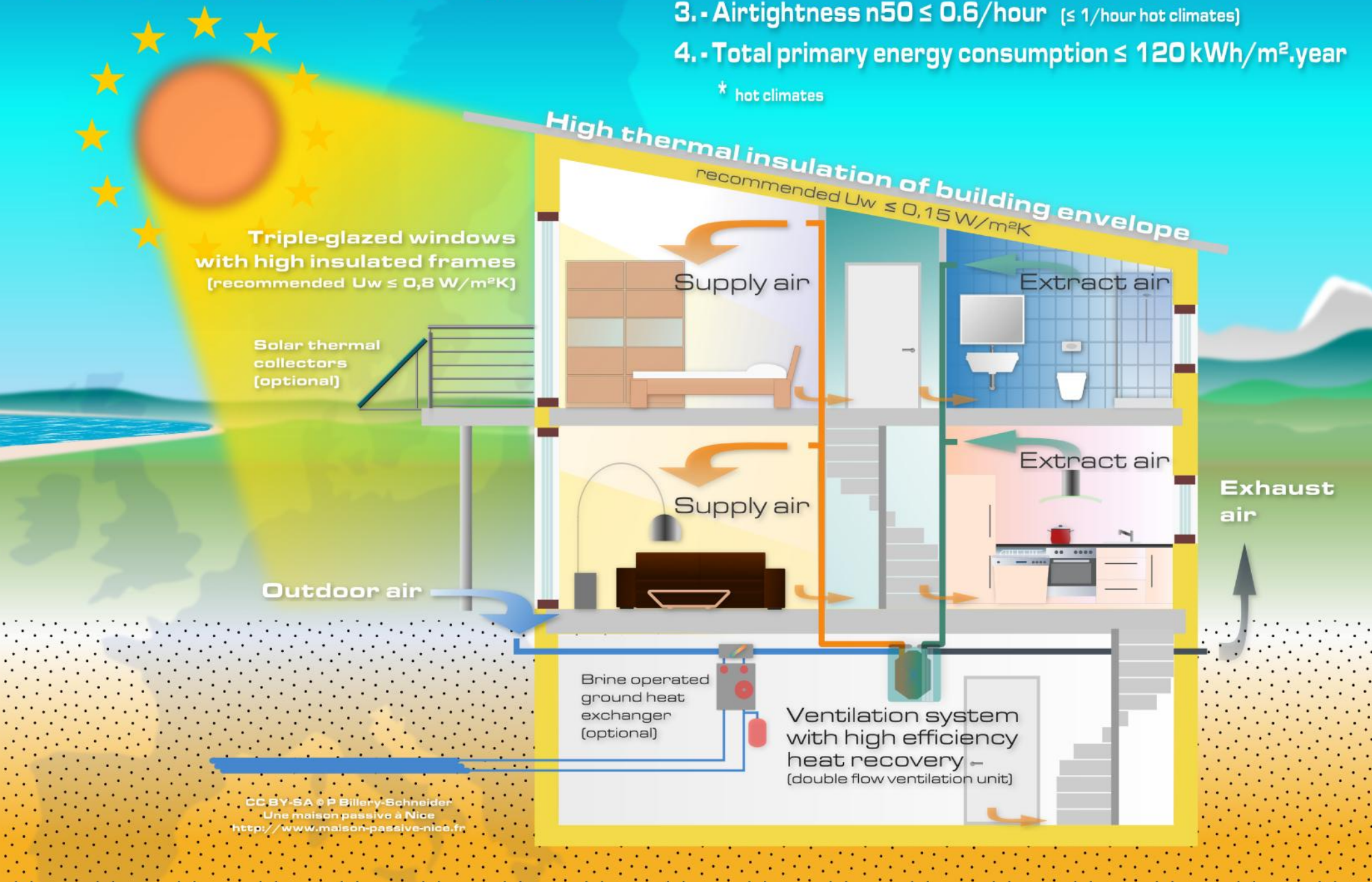
1.- Annual heat requirement ≤ 15 kWh/m².year

2.- Annual active cooling needs * ≤ 15 kWh/m².year

3.- Airtightness n50 ≤ 0.6/hour (≤ 1/hour hot climates)

4.- Total primary energy consumption ≤ 120 kWh/m².year

* hot climates



What is a Passive House?

The term passive house (Passivhaus in German) refers to a rigorous, voluntary standard for energy efficiency in a building, reducing its ecological footprint. It results in ultra-low energy buildings that require little energy for space heating or cooling.

Simply put, the Passive House is a house that is certified by the Passive House Institute to meet the following energy standards:

- Use no more than 1.4 kWh/square foot per year in heating energy.
- Use no more than 11 kWh/square foot per year for all energy.
- Allow no more than .6 air changes per hour of air infiltration (at 50 pascals).

What does this mean in laymen's terms?

A Passive House is super-insulated and nearly airtight. It uses 10% of the heating and cooling energy of homes built to today's building codes. It is designed as an integrated system, with site, energy, ventilation, air quality, humidity, health, comfort—and economy—all taken into account. In climates like ours, nearly all of the heating energy needed is provided by the household appliances, the body heat of the inhabitants, and sun streaming into the windows. And yes, you can open the windows!

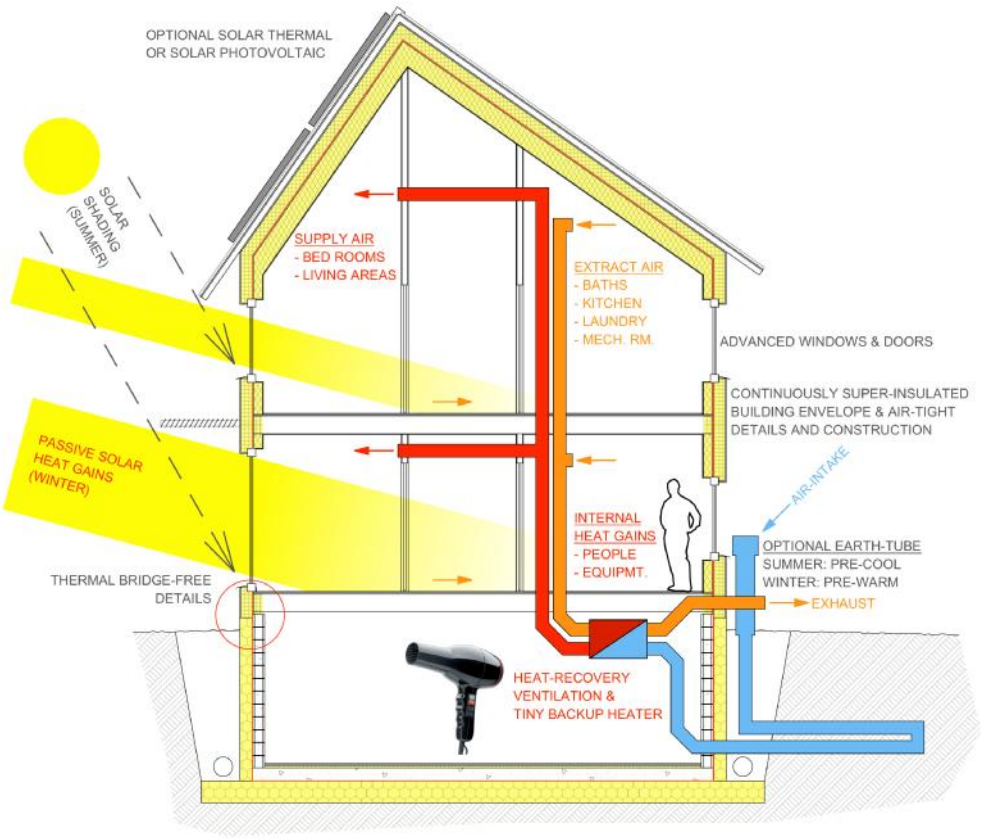
The Passive House is the logical end-product of an approach to sustainable design that focuses upon reductions on the demand side of the energy equation. Rather than adding expensive, high-tech components (solar panels, geothermal heat pumps and the like) to more efficiently meet energy demand, it uses low-tech solutions to eliminate the need for those state-of-the-art products. Our firm is committed to this approach because

- It is more affordable (insulation is cheaper than photovoltaic cells);
- It requires less on-going maintenance through the life of the home (expensive, high-tech things break);
- It is in accord with the way we should approach energy use on the macro level.

What does it look like?

It looks like a normal house. Our first Passive House is designed to show that a Passive House can look like a traditional American home, that style need not be affected by the decision to build a Passive House. Nor does the approach require a particular construction technology. A Passive House can be built using SIPS, double stud walls, TJI walls, or any other wall system that can be made to achieve the required insulation values. A few things will give it away as a Passive House, however:

- The exterior walls will be thicker—in our area, by about 6 to 8 inches.
- Windows will be triple-glazed, with a lot of them facing south and fewer facing north, east and west.
- South facing windows will be protected from summer sun by overhangs, awnings or canopies.
- It will be extremely quiet.
- It will be extremely comfortable, with no air stratification or drafts.
- You won't find a furnace in it.



But won't it be unhealthy to have a house sealed that tight?

To the contrary. the house is designed with products that do not outgas formaldehyde or volatile organic compounds. More importantly, it has a simple but quite sophisticated ventilation system that monitors and manages the amount of fresh air that comes into the house. Here's how it works:

- A small cube about 30" per side—the energy recovery ventilator (ERV)— exchanges stale interior air for fresh exterior air and swaps the heat and humidity between the two streams as the pass by each other.
- Ducts small enough to fit in a stud cavity distribute a small continuous stream of fresh air to the living spaces. Registers in room ceilings are the size of a recessed light fixture.
- Other small ducts collect air in the kitchen and bathrooms and take it out of the house. This means that unlike in a traditional house, where the same air gets recirculated around and around the air handling system, the air in a passive House makes a one-way trip through the house. You breathe it only once.
- A small electric heating coil in the supply duct, about the capacity of a hair dryer, kicks on when necessary for supplementary heat.
- Similarly, a ductless wall-mounted mini-split air conditioning unit provides all the cooling necessary.

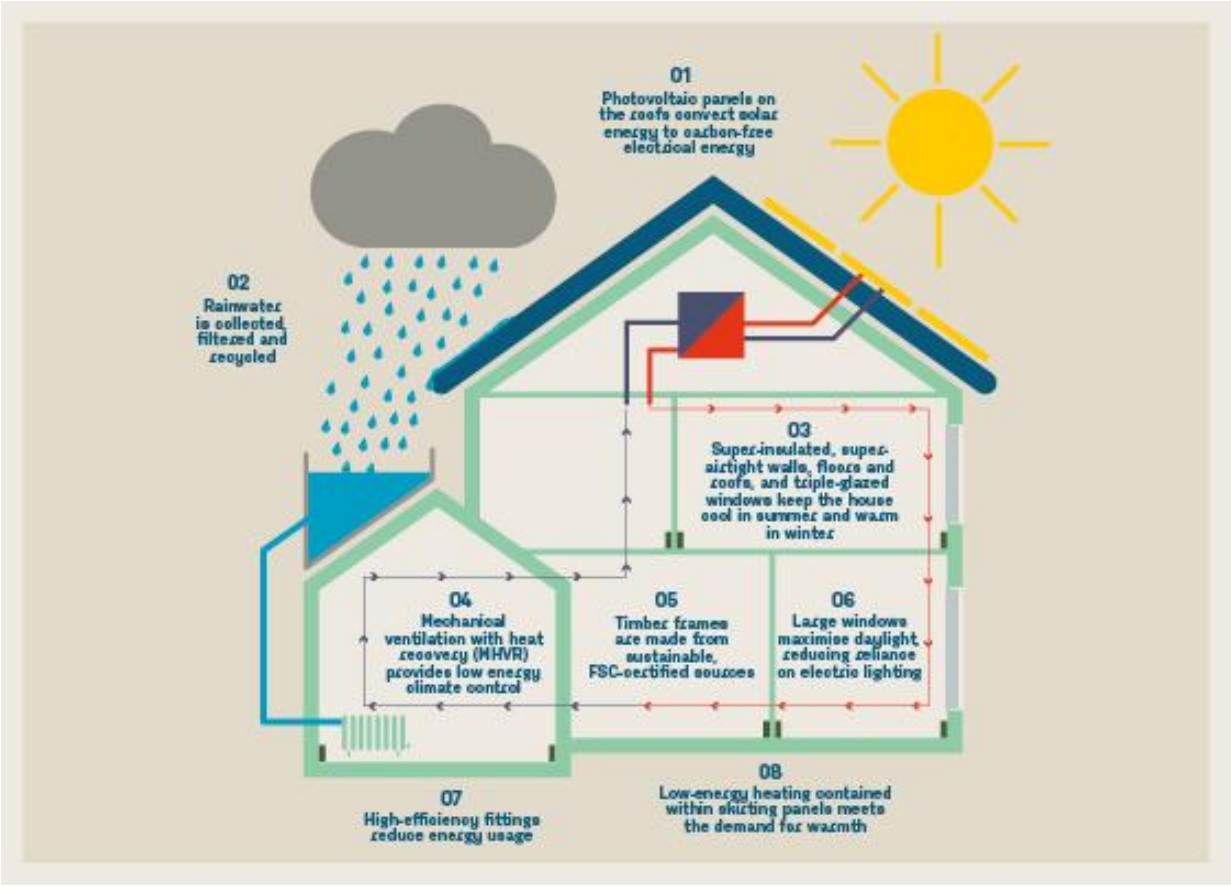
Airtightness: A continuous air infiltration barrier wraps the entire building, making the house nearly airtight. Typical houses lose up to 40% of their energy through air infiltration.

Using the Sun: Maximizing south-facing glass takes advantage of the sun's energy in winter. Deep overhangs over south-facing glass and shading for east and west-facing glass keep out the summer sun.

Super Insualtion: With approximately R40 walls, R65 roof, and R20 floor slab continuously enclosing the entire building envelope, the house has more than double the insulation of a code-built house. Careful detailing of construction joints eliminates virtually all thermal bridging.

Minimal Heating and Cooling System!: All of this makes it possible to virtually eliminate the standard mechanical system. A simple energy recovery ventilator exhausts stale air and continuously brings in fresh air, exchanging heat and humidity between the two streams of air. The winter heating energy required is the equivalent of that of a hair dryer. Summer cooling and dehumidification is provided by one or two mini-split heat pumps.

At this point you have reduced your energy demand to a minimum, but you are still in the red as far as your energy use. Now you must balance the ledger, and generate the amount of energy to equal the demand. Solar panels are the most common answer for electrical power, although small wind turbine technology is making wind power equally attractive in some areas. In addition to photovoltaics, solar power can heat not only the water in your hot water tank, but also your whole house, if you use a radiant hot water heating system. All net-zero houses must have some combination of these energy-harvesting systems. But if you have done the proper planning and made disciplined decisions about where you "spend" your energy, the solar measures will not break the budget and you will arrive at Net Zero.



DON'T BUILD MORE SPACE THAN YOU NEED.

You have probably heard the expression that the greenest building decision you make is in deciding what not to build. This is especially true in a net-zero house. What you don't build, you don't have to purchase very expensive solar panels or wind generators to heat and cool and light. So avoid duplication of spaces; build spaces that are multi-functional; and keep spaces small. The Not So Big House books are excellent in showing clever solutions to making right-size houses that feel right.

BUILD THE MOST EFFICIENT BUILDING ENVELOPE YOU CAN AFFORD.

Your heating and cooling system's basic job is to modify the temperature within your house. If we can make the thermal barrier between inside and outside as formidable as possible, less heat will escape in the winter, less heat will get in the summer, and the system will have to do less work. Less work means smaller equipment and less energy. It is possible—and it has been done— to design a house with an envelope so efficient that the house can be heated all winter with the energy of one light bulb. That wall, however, was actually two walls and was about 18" thick. Not everyone can—or wants to—go that far. We can, however, using SIPS and/or foam insulations, make walls and roofs that go a long way in that direction at a reasonable cost.

Windows and doors are the other big component of your building envelope and here strategy in placement as well as high efficiency is important. The best building envelopes go beyond simply providing a good energy barrier; they are intelligent about it, and are designed to let energy pass though when it is beneficial. Good passive solar design maximizes windows with southern exposures, and minimizes windows facing east and west. The reason is simple. Window and overhangs can be placed on south-facing windows so that the sun can heat the interior in the winter and be kept out in the summer. This kind of control can only be accomplished on east and west facing windows by mechanical means.

REDUCE ENERGY DEMAND.

With reduced size and a good energy envelope you have gone a long way toward reducing your home's energy demand. Appliances, hot water heating, lighting and other electrical equipment are the other big generators of energy demand in your house. They all draw down energy and depending upon their efficiency, they all create additional heat within the building envelope—heat that your mechanical system then has to use energy to remove in summer months.

Just as you have reduced space down to what you really need, reduce the size and number of energy using fixtures and appliances down to what you really need. Then select only those of the highest

efficiency. For example: use color-adjusted warm fluorescent lighting rather than incandescent; use only Energy Star certified appliances.

Most importantly, use the very highest-efficiency mechanical system and hot water heating equipment you can purchase. This part of the project takes the most careful design and coordination of all, if it is to create synergies with the other components in the building system.

One item often overlooked by those doing net-zero houses is “ghost loads”— power used by all those computers, printers, and TV’s and appliances that have LED lights glowing around the clock. In most homes today, ghost loads can account for around 25% of all electrical power use, and most people are not even aware they exist. In a ZNE house, these loads can make or break the project.

AND, OH YEAH, ADD SOLAR.

ABOUT ECO ESTATES

Eco-Estates Custom Homes is amongst the most respected and well-known elegant net-zero energy zero-emission eco-friendly homes builders and in-house renewable energy installation services in North America. We are the leader in eco building and lead the way to a sustainable future. Ever since our inception, we have been dedicated to building spaces that reflect the personality and charm of all our clients. All through the years, our commitment to building the best eco- homes has allowed us to build a solid reputation honesty, trustworthy, dependable and professional where we are trusted by many of our loyal clients.

Being one of the best elegant net-zero energy zero-emission eco-friendly home (eco-home) builders in North America, we take it upon ourselves to make sure that we deliver nothing but the best. The eco-homes that we have designed and built over the years have made it possible for us to be known in the international green building industry as providers of innovative net-zero new homes that truly deliver great value for money. Every single elegant eco-homes that we build reflects upon the high standards of workmanship that we put in.

For more information, contact us for your free home solar audit or let us help you to build your dream home. You may like to stay with the leader of green building and renewable energy system by friend us on Facebook.

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