

## Net Zero

# ACHIEVING ZERO NET ENERGY IS TO HAVE A BUILDING THAT PRODUCES THE SAME AMOUNT OF RENEWABLE ENERGY ONSITE AS IT CONSUMES

### Insulation

Adding insulation to the ceiling has the largest impact on the energy consumed in a home.

Avoiding thermal bridging through either double stud walls, rigid foam wrap or a combination is another important strategy.

Use surface mounted lights on the ceilings exposed to the outdoors. The nature of heat transfer reduces an otherwise well-insulated R38 ceiling considerably with a small amount, or can lights that do not allow for a proper amount of insulation above the light. An example of this is if you have a 1000 sq. ft roof with R-38 and then have an attic door that is 10 sq. foot that is not insulated, so R-1 your resulting average roof R value is only 27.7.

### Tight Construction

Blower door tests measure the amount of air that escapes a building at a standard 50 Pascals of pressure. In order to achieve a very tight envelope specially formulated tape is commonly used to seal the seams of the plywood during framing.

Another strategy is to use expanding foam sprayed in a thin layer in the wall cavity that is then blown full of fiberglass. The thin layer of foam seals the airflow and the fiberglass keep this option at a reasonable price point, this is commonly referred to as 'flash and fill.'

### Fresh Air

Recommended at a rate of .35 air changes per hour, meaning that all of the air in your house is replaced approximately every 3 hours. If you live in a cold or a hot climate, this essentially means that you are heating or cooling the outdoors. To alleviate the lost energy we use a heat recovery ventilator, HRV or ERV depending on your climate. This mechanism has a heat exchanger that recovers the heat or cold from the exit air and transfers it to the fresh incoming air.

In addition to having fresh air it is important to pay attention to the contents of the materials used, for this reason Method Homes use plywood sheathing and only materials that have NAUF, no added urea formaldehyde as well as low and no VOC adhesives and paints. Windows and doors are an integral part of the thermal envelope and it is therefore important to incorporate high performance options.

Windows are measured with the inverse of the walls R value called U values, the lower the U value the higher the R-value and the better insulated the door or window is.

It is recommended that windows and doors have a .20 U value or less.

Another strategy is to incorporate windows with varying solar heat gain coefficients, SHGC, depending on the orientation and the energy modelling.

### Passive solar design

This strategy incorporates a number of the above-mentioned techniques into a comprehensive whole. This can best be analyzed and fine-tuned with an energy modelling software such as Energy Plus.

This process will illuminate the most cost-effective strategies and give overall estimated energy consumption. Some items that will be looked at include; building orientation, thermal mass, shading and solar access among other things.

### High efficiency hot water heater

As the cost of solar electricity through PV panels has come down, it is now more cost effective to use a high-efficiency air source heat pumps hot water heater rather than have a solar hot water panel installed on your roof, though some people may want this option.

A heat recovery coil that surrounds the drain to the shower known as a GFX or Power pipe recovers the heat from the drain and feeds back into the hot water tank.

### High efficiency heating and cooling system

A ductless mini split that for every watt consumed can produce 2.5-3 watts of heating or cooling, 250-300% efficient. Another efficient option is a heat pump for heating water for hydronic radiant heat; we utilize the Daikin Altherma system.

### High Efficiency Appliances and Lighting

From the refrigerator to the washer and dryer it is important to look for energy star ratings and the specific energy loads of each model. Lighting is best handled by an integrated approach using well placed windows and LED lighting. The final part of building a ZNE home is to install a photovoltaic solar (PV) array that can produce as much energy in a year that you will likely consume in a year. There are various methods to monitor the consumption and production of energy.

