



Edmonton's

# Net Zero Home

For years, people who are concerned about the environment have been advocating for the construction of energy efficient homes that are able to generate all their own energy in an eco-friendly manner. One Edmonton builder, Habitat Studio and Workshop, is making this goal a reality through the construction of a net zero home that operates on solar energy. The term "net zero" refers to the fact that the home is designed to produce and consume all its own heat and electricity. When the solar power system produces **more** electricity than the house requires, the energy is fed back into the electrical grid where it can be used by the neighbours. When the house requires more electricity than the solar system is producing, electricity is used

from the grid. Over the course of the year, the electrical and heat energy coming into and going out of the house will balance out.

Edmonton's first net zero home is currently being constructed in Riverdale, which is located next to Edmonton's river valley. Enviro Kids Guide recently spoke with Gordon Howell, the engineer in charge of the home's solar power system. Gordon points out that "the energy sent back into the grid through electrical wires is always used by the nearest neighbour first, so homeowners with solar power systems are helping to feed their neighbours with their excess electricity."



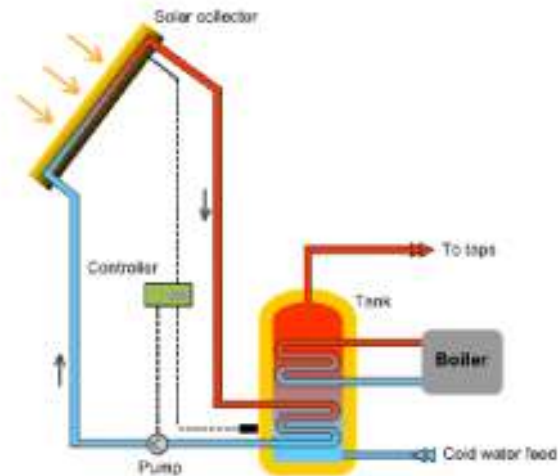
A city dog lives on average three years longer than an country dog.

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## Active Solar Heating

The active solar heating system in Riverdale's net zero home consists of seven solar heating collectors which cover 21 square metres in area, mounted at 90 degrees to maximize the amount of heat production in the winter. There are also pumps, controls, heat exchangers and a 300 litre and a 17,000 litre water storage tank in the basement. This system heats water for both household domestic use and for space heating.

The house is heated using a forced-air fan-coil system. These fan coils are similar to conventional furnaces that circulate warm air throughout a house. But instead of using gas burners to heat the air, the air is heated by hot water flowing through a large radiator, much like the one found in a car. The radiator itself is heated by circulating water from the solar storage tanks.



## Passive Solar Heating

"Passive solar heating" refers to sunlight being absorbed by all the interior components of the house (such as the walls, floors and furniture) and converted into heat. This is a very important heat resource, most houses are heated passively by the sun through their south-facing windows. In the net zero house, 40% of the heat comes from passive solar heating. The net zero house also has 20,000 kg of thermal mass in the house to store the passive solar heat and regulate the temperature inside the house.



During the winter months, the sun is fairly low in the sky. Since the sunlight hits the windows of the net zero home at more of a direct angle, this reduces the amount of sunlight that is reflected from the glass and so helps to generate more passive heating. In the summer, the home is already sufficiently warm, and you don't want additional heating. The sun is much higher in the sky in the summer, though, and the window overhangs on the net zero home lock most of the direct sunlight and keeps it from entering the windows.

## Solar Electrical System

The electricity for the net zero home is provided by its solar electricity generating system which is comprised of 28 solar electric modules that take up 33 square metres in area. The array of solar modules is mounted at a 53° angle which maximizes the amount of electricity produced over the year. This angle helps to ensure that snow won't cover them in the winter. During the rest of the year, rain washes them clear of any dust and debris.



## Insulation

The net zero home is extremely well insulated. There is R-56 cellulose insulation in the walls, R-100 cellulose insulation in the ceiling, and R-24 insulation in the basement floor. By contrast, the average home being built in Edmonton these days has R-20 insulation in the walls, R-40 insulation in the ceiling and **no** insulation in the floor.

The high amount of insulation in a net zero home reduces the amount of energy required to keep the house warm in the winter. At a temperature of -32° Celsius, it would take 20-30 kilowatts of heat to heat most new homes, but only 6.5 kilowatts to heat the net zero home. This is the same amount of energy required to run four 4-slice toasters! The insulation that keeps a house warm in the winter also helps to keep it cool in the summer - and this saves energy by reducing the need for air conditioning.

## Proper Ventilation

One of the concerns consumers have had with well-insulated homes is the fear that these homes can't "breathe" properly. Such homes have an air-tight, highly insulated structure, so people may worry that the air inside the house can get rather stale. It's important to understand, though, that energy inefficient homes don't breathe, they leak! Warm air escapes in the winter and leaks into the house in the summer. Those houses have drafts when it is windy outside because they leak so much and they have stale air when it is calm out because there is no ventilation.



The net zero home, on the other hand, has a ventilation system. This ensures the house's air will be as fresh as the outdoors all the time. Fresh air is brought in from outside, and small airborne particulates (like dust and pollen) are filtered out. For people with allergies, and people who simply hate dusting, this makes for a much cleaner and healthier environment.

The types of building materials used in the construction of the net zero home also contribute to the air quality in the house. Volatile organic compounds (VOCs) are typically used extensively in home products such as cabinets, furniture, paints and carpets. The materials used in the net zero house will have significantly less VOCs and so will contribute to the great indoor air quality.

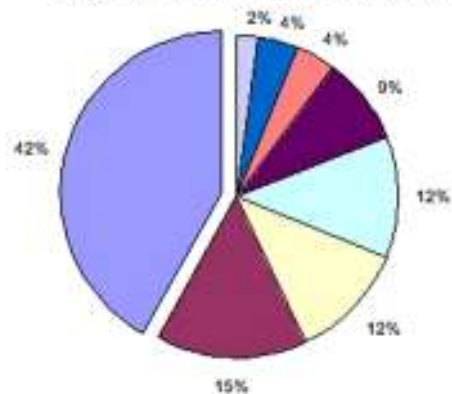
## Appliances & Lighting

The appliances in the Riverdale net zero home are all off-the-shelf models that are available in standard retail stores. Gordon says that "we will be using extremely efficient appliances with the highest EnerGuide rating we can get. But at the same time, we won't be buying expensive prototypes that aren't commercially available to the general public. We want to stress to people that the energy savings and reduced environmental impact associated with efficient appliances are available to any consumer wanting to make their own home more efficient."

Most of the lighting in the home will come from compact fluorescent light bulbs that require 20% of the energy used by old-fashioned incandescent bulbs. Gordon notes that "we will be making use of highly efficient lighting technologies **and** highly efficient lighting strategies. It doesn't matter how efficient a bulb is if you are lighting something that doesn't need to be lit! We will also be using halogen bulbs and LED bulbs in different parts of the house where they will be able to provide better task lighting."

### Where Does the Energy Go in a Typical Home?

Energy Information Administration, Annual Energy Outlook 2004



## Windows

The net zero home is constructed with triple and quadruple glazed windows. The windows have two low-emissivity coatings on them that reduce the amount of heat that they re-emit from inside to outside. The windows also use argon gas between the window glazings to further reduce the heat transfer between the inside and the outside. The result of all the energy efficiency technologies in the windows is that the south-facing windows allow the house to gain more heat from the sun in the winter than the windows lose.