

“ A RENEWABLE ENERGY HOME”

JAMES KNAPP AND JUDY VANLIERI
Owners

Arnold T. Berry
ISLAND DRAFTING ENGINEERING AND ARCHITECTURAL
Architect of Record

JEHROME I. ESLUZAR
Designing Architect

CE + S AND PARTNERTS
Structural Designer

Alan Veeran
SMART CONSTRUCTION
Contractor



Design Excellence

The objective is to design a sustainable and energy efficient home while reflecting the owners' preference on minimalist architecture, making use of simple lines and elements that is both beautiful and functional.

By borrowing the motto “ Design big rather than build big”, the design calls for opening up the house layout to get a full view of the canal at the back, at the same time maximizing the use of natural light and ventilation. By incorporating big doors and picture windows that open up outdoors, it extends the sense of space making the house larger than it is and rendering the pool and the dock an integral part of the house rather than a separate area.

Since the lot is restricted, the use of photovoltaic panels were confined to the flat roof area where it can run unimpeded and harness the power of the sun to the maximum to run the house.

As the great Frank Lloyd Wright said “ Form Follows Function”, the function of the building dictates the built form of the structure. Which were somehow lost in today's homes, aesthetics should also serve a purpose rather than superficial enhancement of the building.

Creativity & Innovation

Being in the Caribbean and the sun shining most of the year, the basic application of active and passive cooling must be put into consideration. The use of eaves and sun shading to help abate heat and the use of efficient mechanical devices to aid in maintaining the indoor air quality and environment are just but a few basic design solutions to work in conjunction with the use of solar energy to run the house.

“Design to use less, collaborate with the landscape and design for longevity”, the home is built with these ideals in mind.



Sustainability & Environmental

From the built shell to withstand hurricane strength winds, the use of low maintenance materials, to the use of alternative energy resources to run the house and to the smart use of fixtures and mechanical devices to cut down energy costs, these items were considered immensely to the development of the design solution. Sustainable architecture is not just confined to the use of eco friendly materials, but it also applies to the built house and how it interacts with the environment on a day to day basis.

“Design big rather than build big”, as what is being implemented in the design, packing as much as possible, all the eco friendly available solutions around.

Value

Designing energy efficient homes is not a new trend but it is often overlooked because of the perception that it's far more expensive than building “regular structures”, resorting to building cheap and superficial treatment of exterior elements just to make it appealing.

By changing the way we approach planning and building with prudence towards goals of sustainable design and energy efficiency, we will be able to contribute to reduce waste, carbon footprint and energy usage. The concept of green living should start from home, we should not just talk green, but live green as well. With the ever changing cost of fossil fuels, we need to find alternatives, and design structures with the concept of energy efficiency behind it.

The built house can sustain itself using an alternative source of energy, the sun. Utilizing the power of the sun 365 days a year, clearly justifies the use of these under utilized technologies. It is a big investment surely, but the benefits far outweighs the initial outlay. And should serve as a model for houses in the Cayman Islands.



Buildability

From concept to preliminary design, to the final stages of the plan and to the 3D visualization, the design team worked hand in hand in shaping up the vision of the owners. All the visual presentation is used to help shape the building and that translated to faster turnover and eliminated the costly building issues that the design team and the owners might have overlooked. Project management also played a crucial role in delivering the project on time, as the management team collaborated with the design team on a regular basis, discussing site issues and planning ahead of schedule thereby minimizing costly overruns.

Through this collaboration, despite using conventional methods of construction, the timely finish of the project is observed. Well within the time frame the owner demanded.

Cultural Response

Cayman Islands is rich in natural light, the sun shines throughout the year. It is but logical to harness the full potential of the sun, to its distinct advantage. Being a tiny island with mounting issues with fossil fuels burned day in and day out, greenhouse gas emission from residences and the ever increasing cost of powering homes these days, it is but imperative to completely overhaul how we look at designing homes.

Households are a major contributor of greenhouse gases and waste. By going back to how our ancestors design their houses to shelter from heat, cold and rain, we can get a basic understanding of the fundamental design concept; that is to effectively shelter from the elements with available means possible. With recent trends in technology and a lot of options to consider, it's just a matter of choice which system we are going to use.

Addressing these issues, we have to put in my mind not just the benefit it will give us today but for the future of Cayman as well, we owe it to the next generation, our kids, to leave a society that takes good care of the environment.

None of the ideals of the project will ever be seen by everyone if we are not going to take a look at it and consider. Right now it is the only single residence in the whole of Cayman, that relies solely on solar power, and has the ability to power itself and also multiple homes in a community. It has been 2 years since the house is built and running, and only a few took the lead, it can very well be a template for future "green homes" in the islands, with enough data to help out in the designing.



FLOOR PLAN

This is a single storey 3 bedroom residence with office space and 2 car garage. The total area is 2983 sq.ft. and has 236 sq.ft of covered rear verandah or porch. The house sits atop a canal front at an 11.7 feet elevation from sea level. The house is facing the east and the open planning concept helps a lot in providing natural light and ventilation throughout the day. The house is equipped with an alternative power source, namely solar power to supply the house's energy requirement. Efficient and environment friendly system is used to run and power the home.





FRONT VIEW



REAR VIEW

The James Knapp Residence sits on a canal front located in Grand Harbor, Grand Cayman.

The house is reinforced concrete to withstand the frequent hurricane winds plowing the Caribbean and is 11.7 feet above sea level.

Windows are hurricane rated, double insulated and gas filled with low e-rating (low -emittance) that inhibits heat gain while allowing natural light to filter in and are all operable, which can be opened at certain times to allow natural ventilation.

Sun shading such as blinds in the windows helps control the flow of light inside.

Generous eaves also helps with water runoff abatement as well as shading in certain times of the day. The house has a low maintenance stucco white finish to reflect light and stop heat gain.





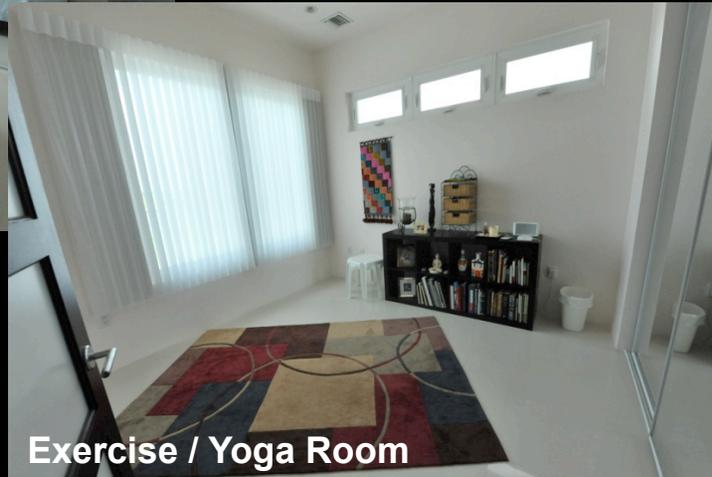
Living Room



Master Bedroom



Guest Bedroom



Exercise / Yoga Room

(Top Left) The picture door at the living area opens up to the shaded rear porch, providing a full view of the pool area and the dock. Thereby making the whole space appear bigger than it looks.

(Top right) The masters bedroom showing the clerestory (transom) windows allowing light to filter in. it is operable and can be opened up at certain times to allow hot air to escape.

(Bottom left and right) Generous use of clerestory to allow north and south light to filter in, big windows from the master bedroom and exercise room are treated with window blinds to control the setting sun's light. All of which are operable and can be opened up in certain times of the year.





View of Front Door and hallway

The house is oriented towards the east and makes abundant use of early morning light.

The main door has a translucent glass panel that lets the light in without exposing the view inside the house and a big operable window in the dining area. That allows plenty of natural light to come in without too much of a heat gain inside. Window blinds controls the amount of light that enters the area.



View of Dining Area from entry foyer

The entire house makes use of around 60 LED lights which are energy efficient lights , longer lasting , non toxic and does not emit any greenhouse gases . Compact fluorescent lamps are sparingly used on storage areas, pantry and closets.





Kitchen view from living area

The kitchen opens up to the living area and are amply lit naturally during the day. The house makes use of energy star rated appliances which consumes less energy than typical appliances. Generous amount of energy saving LED lights are placed to illuminate the interior during the night.



Kitchen view from the hallway





View of Living Room



The view of the entire living area.

The open planning concept helps in letting the natural light in and offers a clutter free view from the living area to the dock facing the west.

If ever natural ventilation is required, the front dining window can be opened as well as the rear picture panel doors to allow the breeze in.

12 ceiling fans are used throughout the house to aid in air circulation, and allow the AC system to work below capacity.





Bathrooms:

(Top) The view of the master bathroom with a big translucent window above the tub to shower the whole area with natural light, but without the view of the outside. Blinds are introduced to control the amount of light getting in.

(Bottom) The view of the common bath adjacent the rear porch which can be accessed from the outside. Translucent window are introduced and the door leading to the inside of the house also has translucent glass panel that allows the light from the window to pass through.



PHOTOVOLTAIC CELLS BY EVP SOLAR



SOLAR PANELS BEING INSTALLED



Energy Source

Photovoltaic cells are scattered on the roof deck and are laid evenly making it like a giant mirror. It also acts as an insulation to the roof deck where it is attached on.

Using the roof deck secures the solar panel in place even with hurricane force winds, at the same time by laying it flat, it avoids the reflection it can create on neighboring homes.

On a good day the system can provide 6-9 kilowatt of power per hour. More than enough to power the house even including the AC system running 24 hours.

Storage batteries are housed in a well ventilated room. These batteries are gel type and can last up to 10 years of continuous use. They store electricity and supply the house at night.





The house uses an efficient air-conditioning unit, the Climate Master Tranquility 27 Series. It uses ozone safe refrigerant providing environmental protection and is engineered for quiet and efficient operation.

The system uses the latest in geothermal technology. Unlike traditional systems that use the air to heat and cool the house, The systems circulate water through a system of sealed underground piping loops that carry heat to and from the earth to the system. In the heating mode, the system uses the heat from the water to warm air that circulates throughout the house. In the cooling mode, the system reverses the process, taking heat out of the house's air and circulating the resulting cool, dehumidified air instead. Basically, free hot water is supplied as long as the system is working.

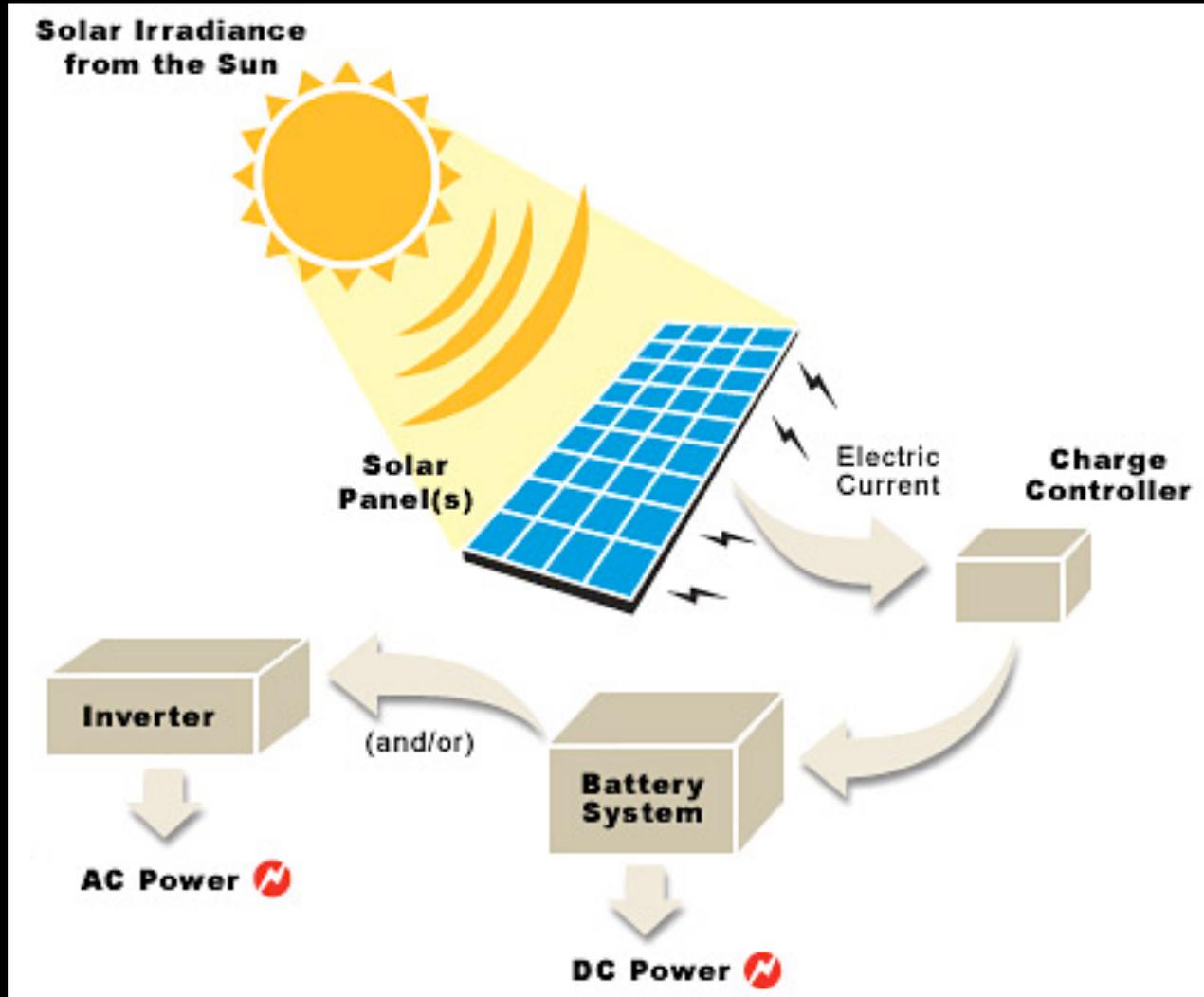


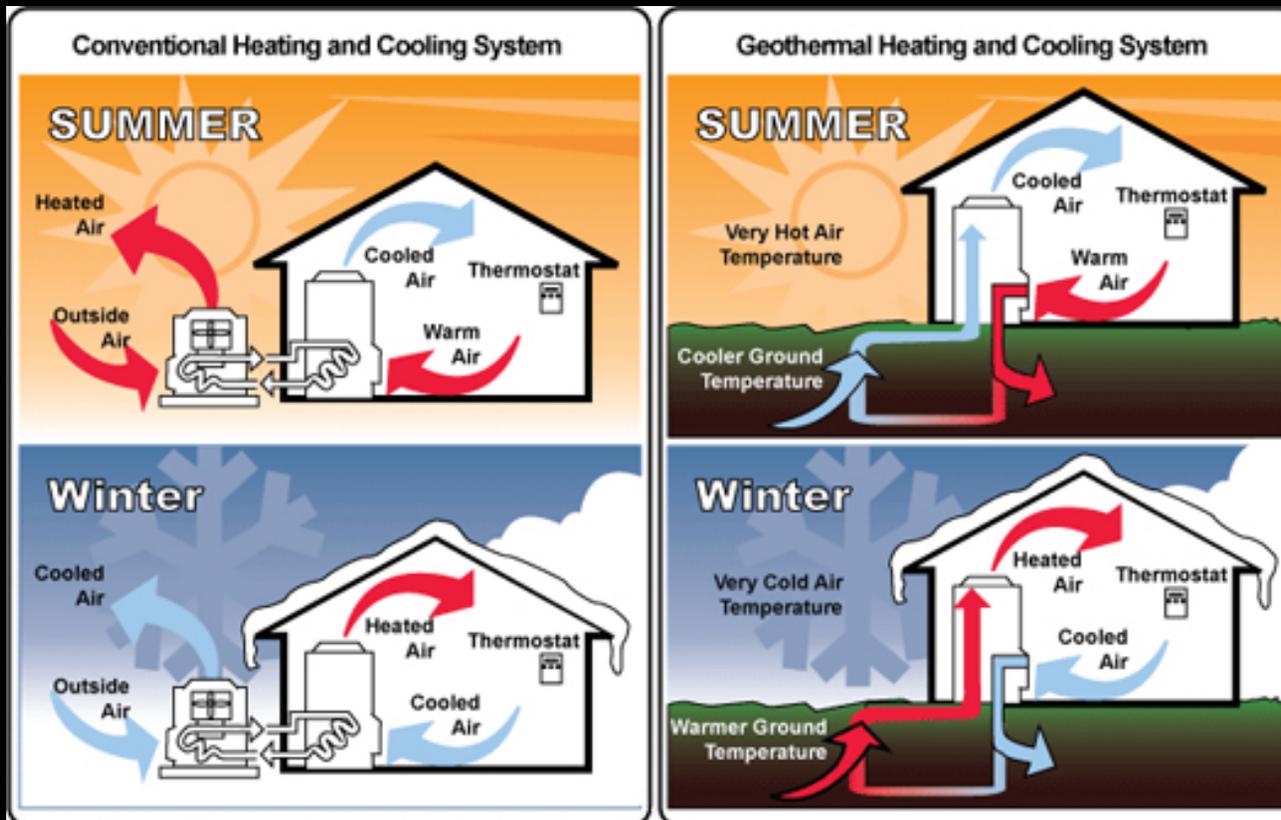
Solar Energy

The diagram shows how the solar panels do its work. Basic layout like this explains how the system run and in turn help the design team come up with a building shell that will work seamlessly with the alternative system. The roof deck is an obvious choice to be utilized for the solar panels, as they can be laid out flat on the slab.

They reflect a lot of light, and the way they are situated, the reflection is confined upwards and does not affect the neighboring properties around.

Also it acts as an insulation to the slab below as no direct heat penetrates the slab membrane. In times of inclement weather and hurricane winds, the slab has parapet walls around that helps abate uplift wind force. Minimizing the damage that can be incurred on the panels.



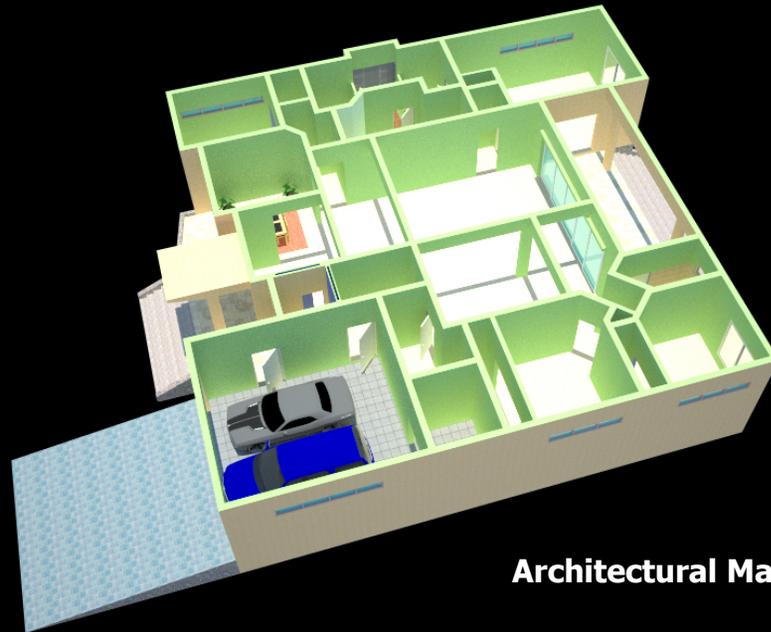


Geothermal heat pumps are the most energy-efficient and environmentally friendly HVAC systems available. It uses a series of sealed piping loops buried in the ground that tap the renewable energy of the earth. These loops create a better heat transfer medium than traditional air source systems.

It can also be used to provide free hot water as long as the system is working.

The system uses Earth Pure, a non-ozone depleting refrigerant and has significant advantages over other refrigerants that harm the environment.





Architectural Massing

Architectural Visualization

The design process entails the use of 3D visualization in aiding the owners and the builders on how it will appear when built. 2D plans helps a lot with all the measurement, but a 3D rendering will allow the design team and the owners to fine tune certain areas that needed adjustment, just before the first block is laid on site.

Eliminating costly changes along the way and correcting construction issues beforehand.

Delays and changes cranks the expenses up. Limiting them to a minimum, can save a lot on materials used and time spent working on the project.

FRONT PERSPECTIVE





Architectural Visualization

Aerial Views of the entire project in 3 different vantage points.

The building design is adhered upon as what is laid out in the 3D presentation. The only major change that was done was the removal of the angle part of the pool.

Safe to say 95 % of the design is followed as laid out on the plans and 3d presentation.

This collaboration with the design team and the builder, through the use of architectural presentations is a big help in minimizing costly overruns.

Correcting issues before any building occurs.



Breaking Ground / Site Images



House Taking Shape





A Renewable Energy Home
From visualization to realization

