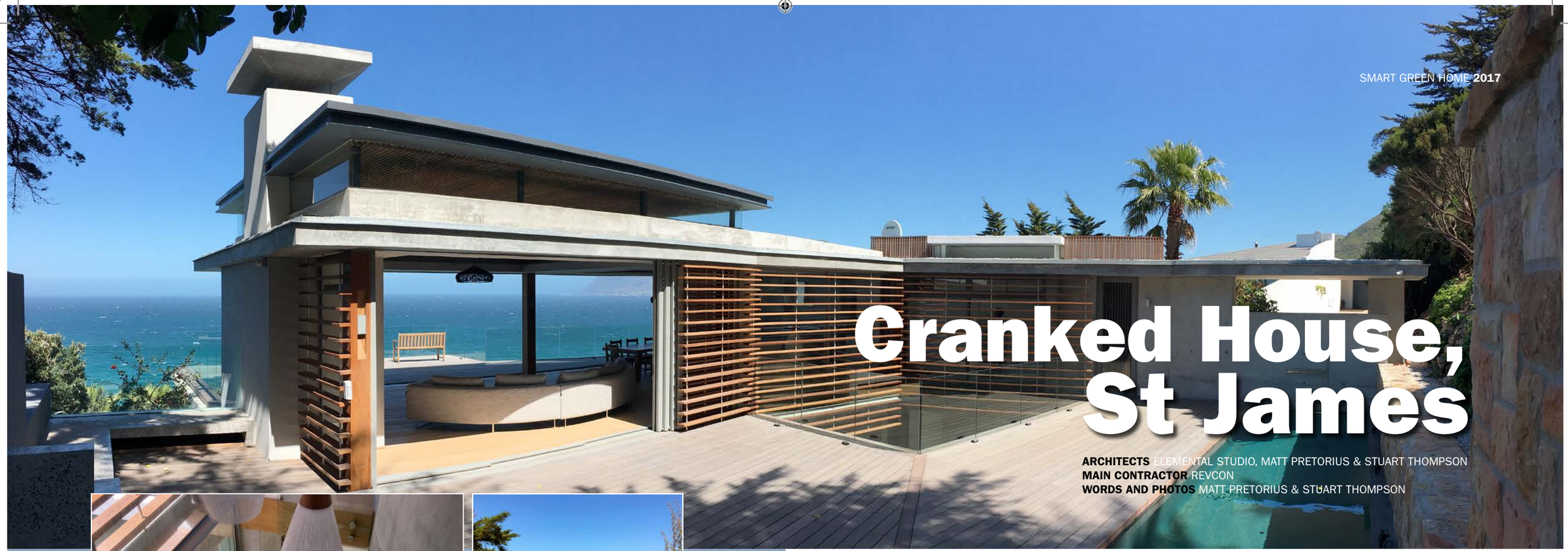

# Cranked House, St James

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**MAIN CONTRACTOR** REVCON
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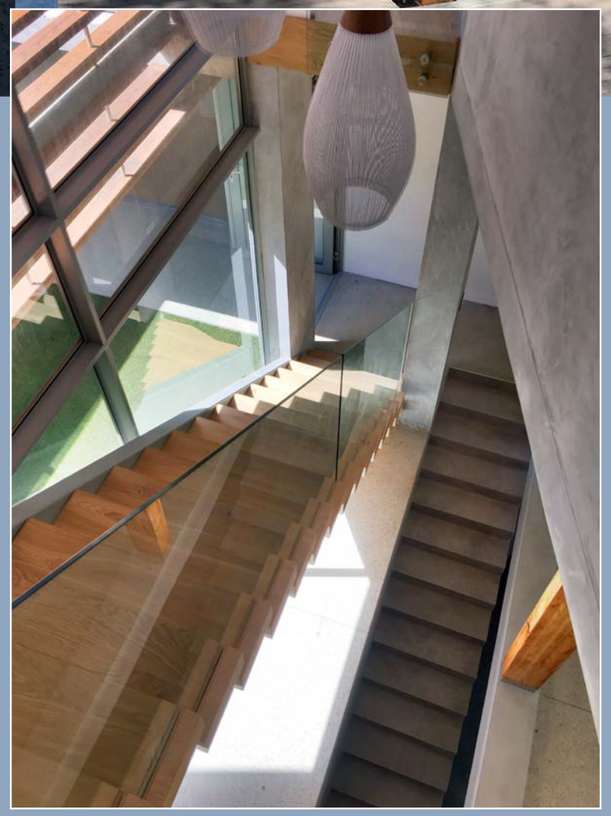
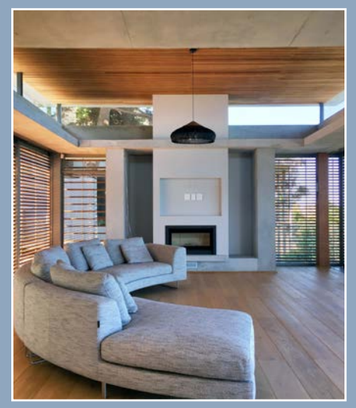




## Location

The House is situated on a long narrow steep site in St, James on the north side of a watershed ravine. Like most properties in this neighborhood its down slope orientation is due South East towards the sea views across False bay with steep mountains behind to the North West. The mountains overshadow the property blocking the sun early – making for cool summers and chilly winters. The steep North Slope makes it difficult for houses in the area to create north facing courtyards that are wind protected from the prevailing South Easter.

## Orientation

The main body of the old house was maintained and recycled. The old roof was removed and the existing two storeys were repurposed with a complete new open plan kitchen-dining-living level built on top requiring minimal expansion of the new build off the old footprint. To add to the already challenging existing orientation the original house was crank further southwards towards the views of Simonstown harbor. The orientation of the new upper level was therefore cranked back to South East – off grid to the existing floors below – to line up with the site boundaries and to pull the SE facade back to maintain the adjacent neighbor's oblique views across to Simonstown and Kalk Bay Harbour.

## Form, light & ventilation

This crank has a ripple effect on the building finding its expression on the undulating facades and the roofscape and is most noticeable at the central atrium where the filtered afternoon sun and the clash of geometries come together at the floating staircase. At one end of the house the study cantilevers out into the stone cedars giving it a distinctly suspended "birds nest" feel, while at the other end of the house the balconies slice off the main geometry and float off into the sea views. The crank also made the vertical reticulation of services very challenging as these could only occur where the main walls crossed over each other and continuous vertical routes could be located. Following the cranked plan – a contemporary architectural language enabled the design to be opened up extensively to natural light and ventilation and views, providing each bedroom with breathtaking vistas of False Bay from Hangklip to Simonstown. Flat concrete roofs keep the profile long and low while pop up roofs bring light deeper into the living room and cloakroom. Looking down on the house, a bird's eye view of the interplay of these roofs becomes the fifth elevation. The low roofs keep the new profile within the zoning height restriction and have been designed to be

### Elemental Studio, Matt Pretorius & Stuart Thompson

Elemental Studio, an architectural workshop co-founded by Matt Pretorius and Stuart Thompson, is a studio collective focussing on contemporary design excellence in architecture. Located in the South Peninsula, the studio is involved in a number of residential, commercial and mixed-use projects in Cape Town and further afield. Conservation and leveraging sustainability within the local context and the pursuit of a greener building practice are core pillars of the Studios design ethos, coupled with fresh thinking approaches to providing affordable and site specific solutions tailored to the clients brief. The team is passionate about building design, seeking innovation and the delivery of an elegant contemporary solution.

planted, with Astroturf laid in the interim as protection of the waterproofing. Site depressions and cavities existed in the slope behind the old house which provided pockets of space which were exploited, with minimal cut and fill, to create the elusive north facing pool court and the central light well that brings north light and ventilation down to the second storey bedrooms and the ground floor flat through the floating stair in the central atrium. From the new wind protected north court the pool and braai activities can live through the house to False Bay beyond.

## Repurposing

In addition to repurposing the existing floors and minimizing extension of the old house's footprint, existing materials were recycled wherever possible and the staff living quarters were maintained throughout construction. The lam-beams from the old lounge roof were cut and used as the wood posts alongside the existing stair on the bedroom level. All the old wood doors were re-used in the ground floor flat and all the new stone retaining walls were cut from site quarried stone. Wherever possible the cut was retained for fill, which was challenging at times and constrained the site operations.

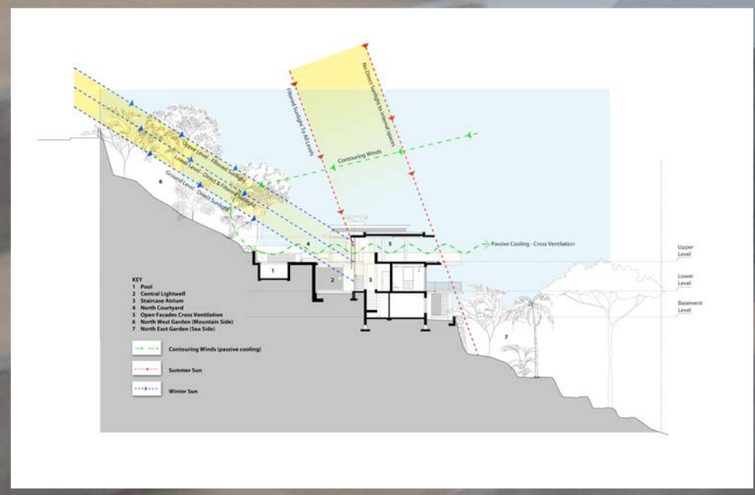
## Energy Modeling

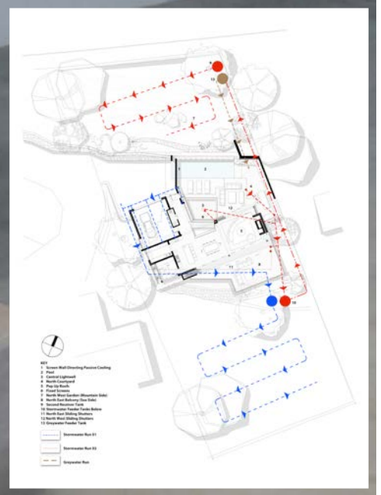
The energy modeling of the house on certified software ensures that the thermal performance of the structure in conjunction with its orientation and the nature of its openings is such that it complies with the energy efficiency requirements of the National Building Regulations, SANS 10400 part XA. The actual building is modeled and compared to a reference building "on the basis of annual energy consumption and maximum energy demand. This comparison is made on the basis of the energy required to maintain a set temperature range in both the actual and the reference buildings. In order to facilitate this comparison, both buildings are simulated as being air-conditioned spaces, with a controlled temperature range of 19-25°C. If the energy intensity (annual energy consumption per square meter) values for the actual building are below those of the reference building, the building is deemed to be compliant."

The electrical load on the house is reduced with the use of gas cooking, a heat pump to augment the hot water supply, biomass ducted heating, extensive natural lighting with low energy LED lighting throughout the house. The main electrical distribution board is also wired to be Solar PV ready. Once the house's annual consumption is assessed phase 2 is to retro fit a solar photovoltaic panel array on the garage roof with the inverter and battery storage in the garage. The new concrete roof has rigid foam insulation between the slab and screed, the pop-up roof and all dry walls have fibrous insulation and all external brick walls have a cavity. Together with the optimal solar orientation for this site, roof overhangs and the additional fixed screens and shutters the house has an energy intensity of 71,42 (KWh/$m^2$) which is just lower than the reference model. This energy efficient performance was also achieved using single glazing and aluminium frames, which indicates some that good early planning and considered design can generate a simple but smart green home.

## Passive heating and cooling

Passive warming of the house is facilitated by opening up to the rising sun in the mornings and then as the day progresses – controlling penetration of the afternoon sun into the light well with cranked overhangs, fixed screens and sliding screens while blocking the chilly South Easter as it picks up into the afternoon. Night time heating is by biomass via a high output closed combustion wood burning fireplace in the main living area that is ducted to the bedrooms below - all insulated with wood flooring. Passive cooling in summer is achieved through opening the house up on both sides at the upper level providing extensive cross ventilation and warm air discharge. Typically from Kalk Bay to St. James in summer, under certain conditions the South Easter can be howling whereas locally a positive pressure cell forms and resulting contour winds can blow offshore from the mountainside, across the pool to cool the house.



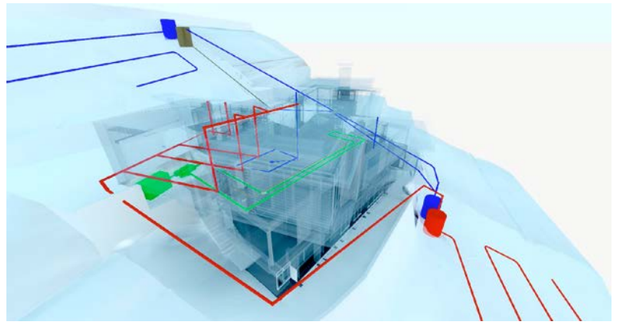
## Rainwater Harvesting

The house sits midway between the upper and lower landscaped gardens – both terraced with old and new stone walls cut from the same stone on site and planted with indigenous water wise local species. All aliens were removed and the old growth established decades ago was protected throughout construction. Hairpin paths weave their way in between terraces and come to rest on small platforms with views out from between the flora. Rainwater for this enchanted garden is harvested from all decks and roofs and reticulated off to concealed water tanks which are positioned on a platform above the lower garden. From here water is pumped up to a second set of tanks on the uppermost section of the upper garden above the house. The two respective gardens are then irrigated from these tanks across the steep slope with gravity providing pressure.

Extra upper level tanks are planned to gravity feed rainwater directly into the low usage cisterns for flushing and to the laundry for clothes washing. The staff and self contained flat on the lower level has the grey water from basins and showers reticulated to discharge directly into the garden via a linear soak away.

## Hot water supply

The domestic hot water supply is to comply with the requirements of SANS 10400XA section 4.1 where at least 50% of the annual average domestic hot water must be provided by heat pumps or solar collectors. The original thinking was to try and improve on this with the supply of hot water via a solar thermal system, but upon investigation it was found that the overshadowing of the mountain peak meant the solar gain would be compromised in summer and minimal in winter – making the solar panels on such a system redundant. In addition the owner's usage patterns are to occupy the house mainly during summer with peak family activity in December and January which meant that a heat pump system would be better suited to the low solar environment and to a usage pattern with quite periods without water flow in the system. To boost functionality the hot water is reticulated by an pumpedring main insulated with 25mm polyurethane foam and fitted to the underside of the slab on the middle level – making for short runs that tee off to the various bathrooms with minimal wastage of "red" water (cold water typically wasted before the hot runs). The most efficient hot water arrangement for the house layout and usage was to have one large 7.8kw heat pump supplying two insulated 200L hot water cylinders linked in series. These were placed out of site in the garage undercroft where they could be grouped and easily serviced and the heat pump is open to the surrounding air.



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