

Zero energy house

Standalone housing



OVERVIEW

Example of best practice sustainable building design – uses current best practice passive solar design, low impact storm water design, low energy use building systems and onsite energy generation to have zero net overall energy use.

PROJECT SUMMARY

The Zero Energy house is a two storey L-shaped dwelling located in close proximity to the corner of Mao Road and Tui Street, Point Chevalier. The building has been successfully positioned on the site and designed, to maximize its orientation and zero energy potential, without compromising its duty to address the street frontage in a residential area.

Tui Street is a low density residential street located in Point Chevalier, a suburb found 6km west of Auckland City. The suburb has excellent accessibility to the town centre amenities, public transport and cycling links, reserves, beaches and forests. The site was carefully considered and selected with the specific brief of building a case study zero energy home.

The site is flat topography and northern aspect has allowed the house to use designed-in passive features, including the provision for a north facing private outdoor space and vegetable garden to the rear. This outdoor space is seen as an extension of the internal living areas which have also been positioned to the northern side of the dwelling.

Key to the design process was employing an 'integrated design process' where the engineers have been involved from the outset to enhance the design and zero energy qualities of the proposal, including thorough accurate modelling of various options. The building's bulk has been well integrated with the existing neighbourhood which consists of a mix of one and two storey dwellings.



Looking at the north-east elevation of the detached two storey house – Tui Street in the background.

KEY PROJECT INFORMATION

HOUSING TYPE
DETACHED

DENSITY
16 DW/HA

ARCHITECT & DESIGN TEAM
A STUDIO ARCHITECTS

YEAR COMPLETED
2012

SITE AREA
404 M²

PROJECT TYPE
**NET-ZERO ENERGY
HOUSE**

CLIENT/DEVELOPER
SHAY BRAZIER & JO WOODS

PRICE BAND
MID- RANGE

The site is flat topography with northern aspect

L-shaped dwelling in a residential 5 area

A mid-range project would typically have a current build cost of \$2000-\$3000 per m², exclusive of land costs, professional services and regulatory fees

PARKING
FRONT ACCESS

Three bedrooms with open plan kitchen, lounge and dining area

Stacked garage with integrated access: 2 x car

North facing patio to the rear

Driveway: 1 x car

Dwelling has no balconies

UNDERSTANDING THE NEIGHBOURHOOD

1. The development has excellent proximity to Point Chevalier centre and Balwin Avenue Railway Station. This provides easy and convenient access to public transport that links the site with the City Centre and other city fringe locations.
2. Located east and in close proximity of Sedden Fields, Western Springs and Auckland Zoo.
3. Street trees are a feature of the residential characteristics of the immediate neighbourhood.
4. The site is located on quiet street however is only 250m North of Great North Road and 420m North of North-Western motorway.



Looking towards the eastern elevation of the house from the bottom of Tui Street.

GETTING IT RIGHT PLACING BUILDINGS ON SITE

1. Glazing has been maximised on the North elevation to allow good solar gain during the Winter. Northern (mid-day) sun is also easy to control with the use of overhangs.
2. The Eastern elevation has the second highest percentage of glazing to encourage heat build up over the day in the Winter.
3. The South and West elevations have the least glazing. The South elevation will be the coldest and therefore higher levels of glazing on this elevation lead to greater heat loss.
4. The dwelling optimises the level of glazing on this elevation to allow sufficient opening windows for good cross ventilation, natural ventilation of bathrooms, daylight access and interaction with the street.



Looking at the north-east elevation of the detached two storey house – Tui Street in the background.

GETTING IT RIGHT PLACING BUILDINGS ON SITE

1. The West elevation will be exposed to strong afternoon summer sun, so minimising the glazing on this elevation helps to reduce solar gain in the warmest months.
2. The placement of the house does not compromise its duty to address the street frontage in a typical character residential area.
3. On a typical house the roof is there simply for protection from the elements. The particular roof is designed to capture the amount of solar energy needed to achieve Zero Energy goals.
4. The entire north-facing side of the roof is covered in energy-generating panels, both solar hot water and PV.



Looking towards the south-west elevation of the house from Tui Street.

GETTING IT RIGHT STREET TO THE FRONT DOOR

1. The house is given a sense of individuality by using simple cost effective materials and forms, and is highly articulated to face the street positively.
2. The courtyard in the front of the site is well sheltered from the prevailing SW winds.



Looking towards the south elevation of the house from Tui Street.

GETTING IT RIGHT THE BUILDING

1. As the site faces 30° west of north it maximises solar gain along the north elevation where most of the living spaces are located.
2. Each bedroom is located so that it has access to the sun at some point during the day, i.e. along the north side of the building.
3. Non-treated timber cladding (Macrocarpa panels) have been used to improve the green performance rating of the house. Macrocarpa is one of the most eco-friendly timbers produced in New Zealand. It can be used untreated while having a level of durability similar to H3.1 treated pine. This makes it naturally resistant to rot and insect attack without the need for chemical treatment.
4. Living areas are used mostly in the afternoon or evening, so are located to allow for solar gain during these times of day.
5. Ground floor provides for maximum openness to outdoor space - which provides light, ventilation and a feeling of spaciousness to the house.



Looking towards the north elevation of the house from rear back garden.

GETTING IT RIGHT THE BUILDING

1. Private outdoor living area is not overlooked by the neighbouring houses.
2. A green roof accommodates the main house and the garage. As well as being nice to look at, it provides a stable thermal mass that performs to a similar level as a concrete slab. It is puncture resistant to a level that rivals bituminous membranes, but isn't made from bitumen so it is 100% recyclable.



Looking towards the south-west elevation of the house from side garden.

GETTING IT RIGHT THE BUILDING

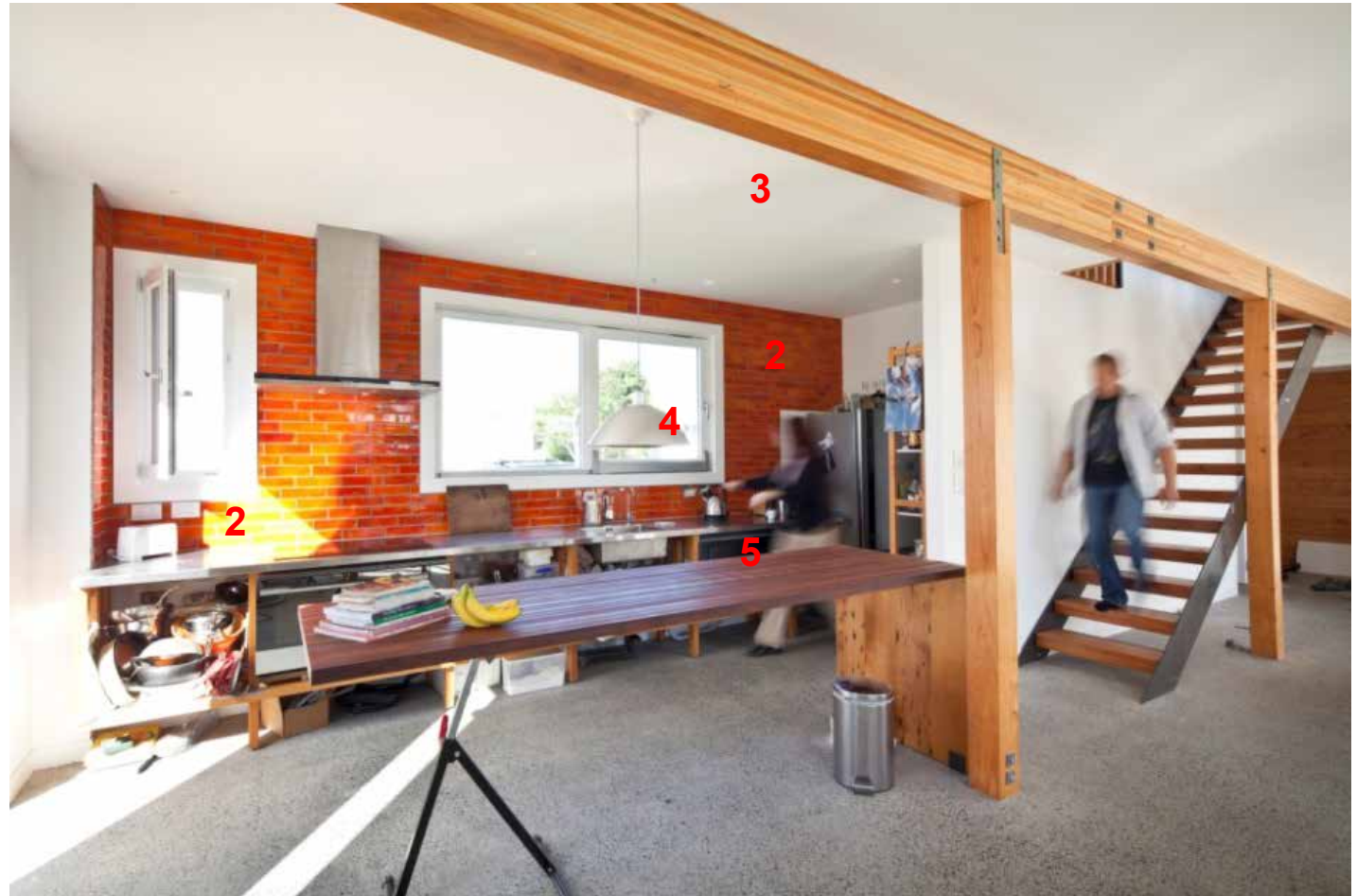
1. Transient or less frequently used spaces where internal temperatures are not so important, such as hallways, bathrooms, laundry etc, are located along the south side of the building.
2. GreenStuf insulation, which is manufactured without the use of fibreglass or formaldehyde, has been used.
3. Each area of the house is lit according to its specific needs, which means the right amount of light is delivered to make each area work as it should.
4. The number of lights and the amount of luminance required for the house is minimised, which reduces the costs of the bulbs themselves, the installation time from electricians, and the operating cost over the life of the house.



Looking towards the upper floor hallway, bedrooms and bathroom.

GETTING IT RIGHT THE BUILDING

1. The Kitchen is located for morning sun to allow a sunny warm space for breakfast.
2. At the Zero Energy House 40 sensors have been embedded during construction to provide data detailing electricity demand and supply, temperatures, humidity, and water flow.
3. Recycled wood has been used where possible (beams, flooring, kitchen cabinetry)
4. Non-PVCAquaTherm pipe work has been used for all house fittings.
5. The kitchen bench has been made from recycled decking timber.



Looking into the ground floor kitchen and staircase which is connected to the open plan living and dining areas to the right.

GETTING IT RIGHT THE BUILDING

1. Living areas are used mostly in the afternoon or evening, so are located for solar gain during these times of day.
2. The Dining area may be used at any time in the day so is located for sun throughout the day and also near the kitchen for convenience.



Looking through to the sunny private outdoor space which is connected with the open plan living and dining area.

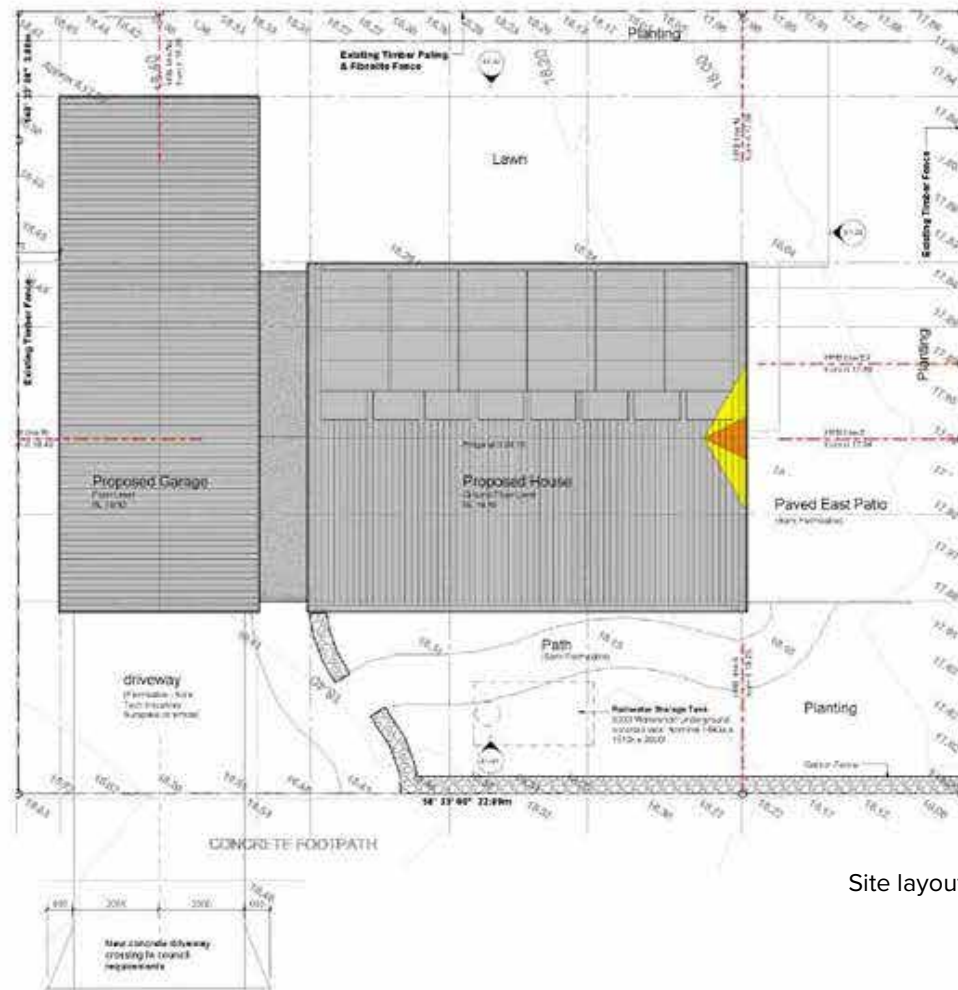
GETTING IT RIGHT ACCOMMODATING THE CAR

1. Stacked garaging allows more design flexibility for the dwelling components of the configuration.
2. The garage has been designed with the intent of it being used as an easily flexible space. In this case the owners are using it as their timber workshop as they do not rely on a car to commute to work. They use public transport instead.



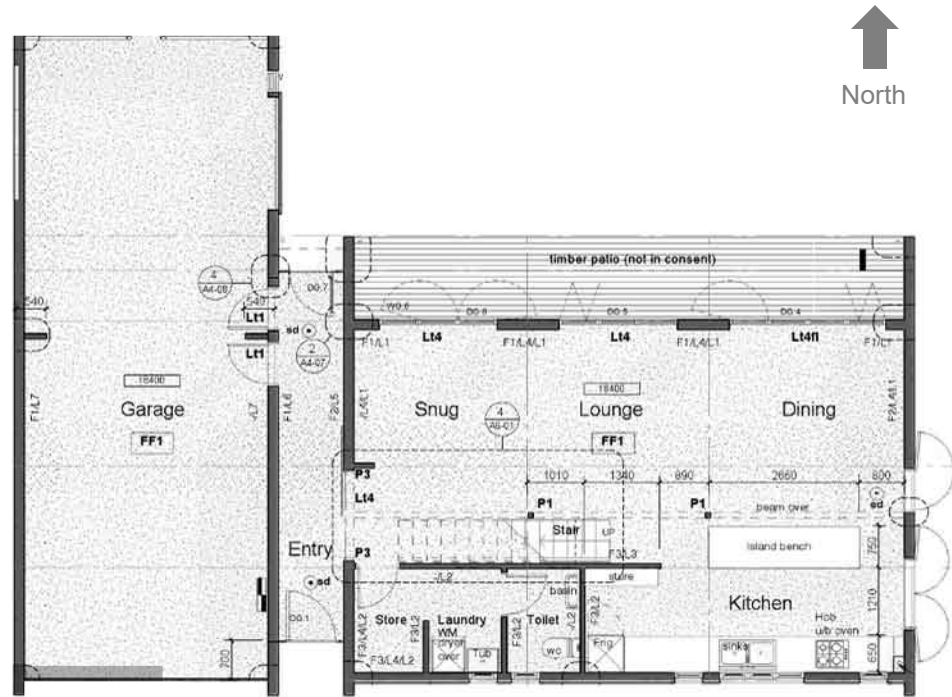
View of the double stacked garage.

GETTING IT RIGHT SITE PLAN



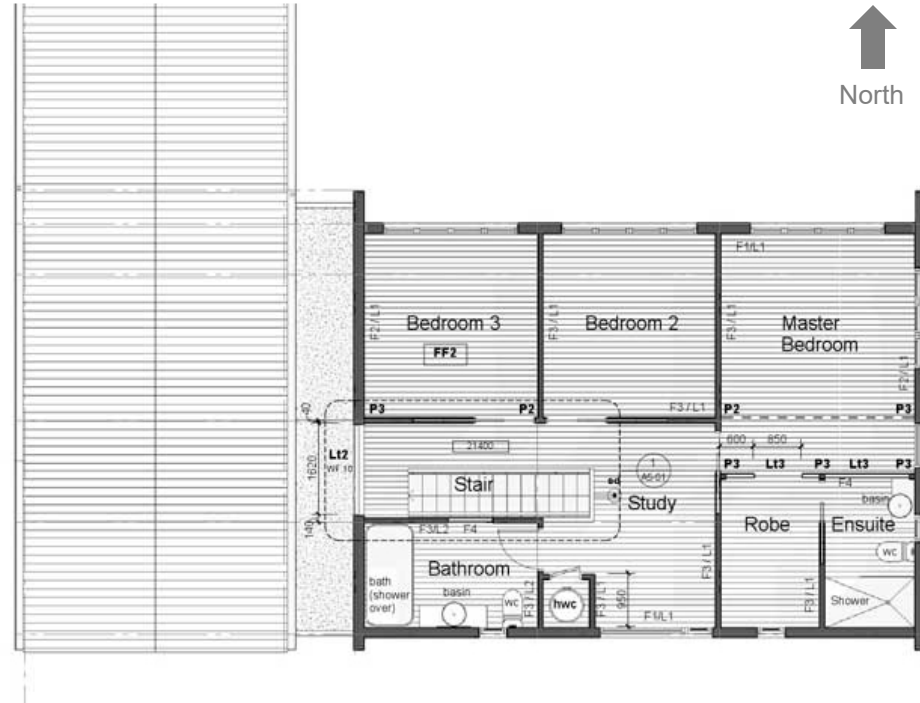
Site layout.

GETTING IT RIGHT FLOOR PLANS



Ground level.

GETTING IT RIGHT FLOOR PLANS



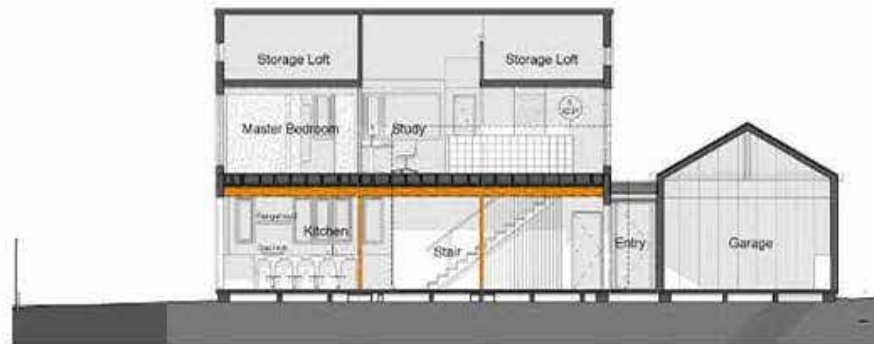
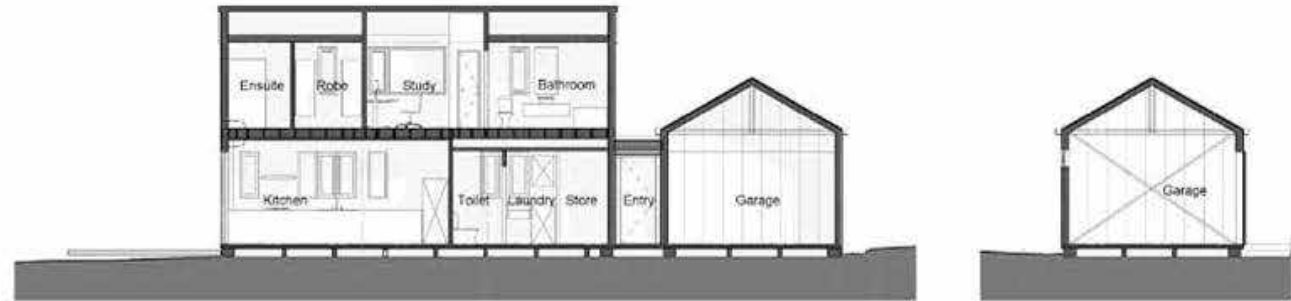
Upper level.

GETTING IT RIGHT ELEVATIONS



Elevational sections of the house.

GETTING IT RIGHT ELEVATIONS



Elevational sections of the house.



For any questions or feedback, please contact us through our email address:
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