

Resilient and sustainable

Building back after bushfires and floods

Progress has been slow after the 2009 Black Saturday bushfires, yet some people are now living in new homes built to higher standards, often with renewable energy systems designed to provide more backup in an emergency. We profile new homes in Yarra Glen and Marysville, plus, see how one Queensland flood rebuild is pushing hard for better standards on page 34. By Jacinta Cleary.

Left with just one shed standing after the Black Saturday bushfires destroyed their home, a year later Scottish couple Janet and Scott McLean installed a 2.1kW solar power system on its roof and called the shed home while their new improved dwelling was being built.

The grid-interactive system was installed with future fires in mind, with a battery backup to ensure electricity supply during a blackout. The system now fulfils most of their energy needs in the new house, although the true status of their bill, and usage, remains a mystery due to Tru Energy's long billing delays.

The improvements don't stop there, with the entire rebuild showing a greater resilience to future bushfires with the bonus of improved energy efficiency.

Learning from the past

The old home was a single-storey brick veneer with a W-roof profile that Janet describes as a perfect ember trap, single-glazing to the west and was like an oven inside in summer. "We had a big wooden deck which probably went up in flames quite nicely. We knew it was a risk but we were a bit naïve perhaps and didn't think a fire would come through, or that it would be that severe."

After losing everything it was difficult to know where to start with rebuilding. Two things helped shape their rebuild



Photos: Janet McLean

Early stages at the building site, where the old concrete slab was used for the rebuild.

though: a meeting with architect Ian Weir and visiting open days at other sustainable homes.

They'd first seen Ian on television and discovered that he offered free consultations to people affected by the Black Saturday bushfires. His advice was to keep the building shape as simple as possible with few nooks and crannies to limit the places for embers to gather.

Visiting a house in Healesville, Janet grew to love a unique construction duo of rammed earth and scyon, a thick but lightweight cement composite cladding

which looks just like weatherboard. "The house felt solid and inside it felt grounded and safe." The couple engaged the designer of that house for their rebuild, heeding Ian Weir's advice to simplify the shape and opting for a flat, slightly angled roof profile that the embers would slide off. After all, the roof had been a weakness in the old house.

Knowing the weather patterns at the site helped the reconstruction. "Because we lived there before, we knew which way the sun travelled and where the

wind came from. We knew we needed minimal windows to the west as that's the direction the fire came from, being the Kinglake National Park. When we rebuilt that's the side we put all the rammed earth on, along with the north, with very few windows on that western side."

During construction Janet would pay close attention to where the leaves would gather in the wind, noting that they headed straight for the front door. She promptly switched to a double-glazed front door instead of timber.

The couple built to a much higher Bushfire Attack Level (BAL) than required, with their own measurements suggesting it was BAL 29, but given an official rating of BAL 19, which Janet says might have been because all the vegetation had been burnt and yet to regrow. The new house would probably meet a BAL 40 or maybe BAL Flame Zone (FZ) though, being well sealed against ember attack with robust cement and rammed earth building materials, paving around the house (no more timber decking!), aluminium-framed double glazing and built on the concrete slab from the old home. There's basically nothing combustible onsite.

In terms of energy efficiency, the house naturally warms in winter with good rammed earth thermal mass on the northern side, and keeps cool with strategically placed louvre windows, wide eaves and high levels of insulation with R3.5 batts in the roof, R2.5 in the external walls and R1.5 in the internal walls. Ceiling fans throughout aid airflow while a wood fire burns fallen timber in winter.

Renewable energy

The solar power system which helped the couple during the long shed-year was stand-alone during that time. "It was wonderful on sunny days and awful on miserable days and we had to buy a generator," says Janet. When it was time to move into the main house the system was connected to the grid, albeit with



Top: The versatile grid-connect PV system can also operate independently thanks to a battery backup. Bottom: Beautiful and fire-resistant rammed earth walls on the western and northern sides during construction.

major delays from their electricity retailer. The system includes a Selectronic SP Pro 3500 watt, 24 volt interactive inverter, with 12 Narada EosG400 VRLA 2 volt gel batteries providing 6.7kWh of storage. This is understandably a bit of a security blanket for the couple if bushfires visit again, or just during regular blackouts.

A large rainwater supply also provides backup if there are future bushfires, including one concrete tank that survived the fire and two new ones, with a 57,000 litre capacity in total. One of the new steel tanks is placed at a higher level on the property, meaning it can gravity feed should the fuel-powered water pumps fail. Janet comments that lots of

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locals recommend a sprinkler system; on Black Saturday the properties that were watered extensively in the morning fared better, despite the moisture sapping winds all day. Understandably many householders chose to conserve water for later instead, but ended up with pump or hose failures rather than a lack of water. Just to be sure, there's an additional 30,000 litres of rainwater near the house in the lap pool.

The new house also features a 320 litre solar hot water system with electric boost, with the couple not using bottled gas to avoid having combustible gas cylinders on the property.

Janet has seen all sorts of new construction in the area, with different priorities for householders. Their's was to be as bushfire resistant as possible with reduced running costs. She observes that others are not all rebuilding to high BAL levels but there could be a myriad of reasons for that, including financial constraints. With the introduction of compulsory Bushfire Attack Levels in Victoria, the new regulations meant that the couple received an extra \$50,000 in insurance to build to new standards, unlike flood-affected households in Queensland where houses are insured to be built to the same standard (see Qld floods article on page 34).

All round resilience

The resilience doesn't end with the house, with Janet planning to create several small garden areas rather than one large area covered in lots of combustible mulch that could go up in flames rapidly. For a couple of Scots living in Australia, Janet and Scott have come through difficult times to be ready for all situations in this extreme climate. *

Top: A flat roof offers better resistance to ember attack in the future; Middle: Simple paving around the house offers more fire protection; Bottom: Rammed earth features inside the house along with louvres for better airflow.



7.5 Star homes for old Marysville

Bruno's Art and Sculpture Garden, Marysville

With all but 14 of over 400 buildings destroyed in Marysville on Black Saturday, nearly three years later some homes have been rebuilt. Two of those are sustainable rebuilds by building designer First Angle, including a new home and gallery for Bruno Torfs, owner of a popular Marysville art and sculpture garden.

Mark Iscaro, a frequent visitor to Marysville, cancelled a trip to Bruno's garden on Black Saturday when he saw the extremely hot and windy forecast. A short time later his company offered to design Bruno's new home and gallery for free after learning both had been destroyed in the fires. The rebuild has happened thanks to donations from near and far, including Bruno's home country of Belgium, a fundraiser benefit in Perth and government assistance packages. Builders, tradespeople and engineers also gave their services for free, ensuring that a \$800,000 home and gallery project was completed for half the price—unlikely back in 2009 with a small insurance payout. Bruno, determined to restore his gardens, gallery, home and livelihood, carried the difficult project as owner-builder for two years.

The new home is the same shape as the original much-loved fibro cottage, although a completely different lighter and brighter style, and constructed to cope with future extreme weather conditions, including possible bushfires. Although the footprint is larger the home still has a Home Energy Rating of 6.5 Stars, as does the gallery (difficult for such a large airy space) and meets the relatively high Bushfire Attack Level of BAL 29.

To make the home and gallery more



Cement sheet construction with an earth render help meet a BAL 19 rating.

resistant to future bushfires, and to be generally more energy efficient, the home and gallery is built on a concrete slab, with the main construction being concrete blocks and cement sheeting (or blueboard) with an earth render applied by Bruno. The windows are double glazed with aluminium frames, with commercial windows sourced at cost from the manufacturer Southern Star Windows. At the time, there were limited residential windows available to meet the fire rating, although this has changed (see windows article pg 38).

The large windows are north facing to help heat winter thermal mass with a thick batch of woollen insulation to retain coolness and warmth. Natural cooling is aided via the vaulted ceilings with highlight windows providing a thermal chimney for hot air to be pushed out in summer. The louvres incorporate low-E thermal glazing.

Energy use is kept to a minimum with LED downlights in the home

and a solar hot water system. With a large sculpture garden to maintain, the property is as self-sufficient as possible for water, with a large rainwater supply including 10,000 litres in the basement and a greywater treatment system.

Along with the various volunteer tradespeople, Bruno did a lot of the labour himself over his two years as an owner builder, including laying heavy concrete blocks. Holmesglen College students, featured in *ReNew 111* for their work on a bushfire-resistant Venus Bay home, constructed the hand-crafted roof trusses at their school in Melbourne, delivered on a truck to Marysville.

Both the house and gallery have a very crafty look and feel through the use of salvaged materials wherever possible, including a beautiful tree inside, felled in the fires and now used as a support post for part of the roof load. A batch of old posts from the old Princess Pier, left lying near the Westgate Bridge, have

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been put to good use in the gallery to hold the vaulted roof. The front door is relatively fire-resistant, made from salvaged sheet metal.

With a love for art and nature the buildings and gardens are a work in progress for Bruno, with much detail and woodwork constantly added. Nearly three years after the fires the sculpture gardens and gallery officially reopened in early November, a grander yet more energy efficient and fire-ready structure than stood before.

7.5 Star Marysville home

First Angle designed another Marysville rebuild, described as “a very easy project”, no doubt a relief for the owners after the trauma of losing their home. The path of the bushfire in homeowner John’s street was unpredictable, destroying his house, leaving his neighbour’s standing, and the next one gone. The original home was a weatherboard cottage, with the owners deciding on a modern, sustainable rebuild.

The new home is larger than the last

but holds a 7.5 Star Home Energy rating thanks to a range of passive solar design features such as good thermal mass and high levels of insulation. Natural cooling features include a thermal chimney, where high-level windows flush hot air, thanks to significant air flow created by 5.5 metre vaulted ceilings. Dowell louvre windows were selected over double glazed units to allow natural air flow throughout, although double glazed windows would have pushed the home energy rating even higher. Sustainable timbers have been used throughout, including reclaimed Brush Box timber.

Non-combustible materials have been used where possible to meet a BAL 19 rating including scyon linea weatherboard made from low-density cement, and concrete blocks. The roof and floors are well sealed against embers, with the wide 700mm eaves lined and sealed with cement sheets. Windows are

largely north facing, for the views and thermal benefits, and have been kept to a minimum elsewhere, particularly on the west.

The only heater is quite deliberately a wood burner to avoid having bottled gas on the property, with exploding gas cylinders a problem on Black Saturday. A fan at the top of the chimney pushes the heat to a back room, and with an already high home energy rating the home stays naturally warm.

A 5kW grid-connected solar power system provides all of the electricity needs and there’s a solar hot water system installed. A large rainwater tank capacity for use in the garden and toilets provides some independent rainwater supply, along with a greywater treatment system.

“This home encapsulates drive for change in the community with its high energy efficiency and use of solid earthy materials,” says Mark. *

More information

Bruno’s Art and Sculpture Garden, Marysville www.brunosart.com
First Angle www.firstangle.com.au

Top: The bushfire-felled tree post in Bruno’s new home. Bottom: This Marysville rebuild features cement-lined eaves to protect against future ember attack.

