

IN CASE OF FIRE

THIS NEW HOME ON A BUSH BLOCK NORTH-WEST OF MELBOURNE MEETS NEW REQUIREMENTS FOR BUILDING IN BUSHFIRE PRONE AREAS, WITHOUT SACRIFICING SUSTAINABILITY OR LIVEABILITY

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PHOTOGRAPHY YVONNE QUMI





A special flexible substrate called Flexene was used to achieve the curve in two directions (www.flexene.com). Artwork above fireplace by Annie Mertzlin.



WHEN THE NEW VICTORIAN STANDARDS for building in bushfire prone areas came into effect in 2009 following that year's devastating fires, Andreas Sederof of Melbourne's Sunpower Design already had the perfect project to take the new requirements through their paces.

Adjoining the Wombat State Forest near Daylesford in country Victoria, the 15 hectare block that clients John and Catherine had bought for their eventual retirement was completely treed, and their preferred house site was rated just under Bushfire Attack Level (BAL) 40 on the new scale [see boxed text on p46]. "We decided to build to BAL-40 requirements anyway," says Andreas.

This led to a choice of a concrete slab, walls of tilt-panel concrete, fire rated double-glazed windows with aluminium frames and a Zinalume roof. The design of the curved two-

level structure fitted into the slope of the site is deliberately simple to minimise opportunities for ember attack during a fire, and all external living spaces are paved rather than decked.

Happily, many of the material and design choices made for bushfire resistance also met the owners' requirement for low maintenance. "We want to be able to live in the house long-term as we get into our older years. The concrete means no external painting, and the guttering has been designed not to clog with leaves," John explains. If it became necessary, John and Catherine could live entirely on the upper level, accessible from outside without steps, and save the downstairs area for visiting family.

Sustainability and energy efficiency were also key parts of the brief. All of the rooms in the house face north to allow passive solar gain, and polished concrete slab floors provide

thermal mass to help regulate the internal temperature. Tall, narrow double-glazed windows are the full height of the house, and can be shaded with remote controlled external blinds. The main living area on the upper level features a set of large folding doors opening to a patio, a small kitchen at one end, and a slow combustion wood heater for use in the region's cold winters. The space is the full width of the house, and Catherine confirms that "the small low windows in the south wall and larger ones in the north ensure really effective cooling cross ventilation"; there's no need for air conditioning.

Rainwater is collected in three tanks totalling almost 80,000 litres, with a fourth tank located up the hill for firefighting. A chemical-free NovaClear aerated membrane filtration system treats both grey and black water to Class A standard. Inside, engineer

John's pride and joy is the combined hot water and hydronic heating system. Heated by evacuated tube solar collectors on the roof and boosted by a wood-fired boiler, hot water is circulated continuously through the four heating panels around the house and to the kitchen and bathrooms. This means that for the cost of a small amount of energy for the pump, hot water is available as soon as the tap is turned on, reducing water wastage. At the moment, the house uses grid electricity, but John and Catherine plan to add a photovoltaic system; the wiring needed has already been installed.

The finished house achieves an energy rating of 8-stars, and requires only metal mesh screens on the opening windows to bring it to full BAL-40 compliance. The owners are very happy with the result. "The house is comfortable in both winter and summer.

And with proper fire preparation and planning, I'd consider staying during a bushfire," John says, "although Catherine might be less keen!" With so many precautions against ember attack and radiant heat, the couple can be confident that the house has an excellent chance of surviving a fire even if they chose to retreat to safer ground.

John and Catherine were keen to find a piece of land that they could "take responsibility for and protect". The treed property adjoins the Wombat State Forest, effectively extending the refuge available to native fauna.



↑ All of the rooms in the house face north to a view of trees over a small dam. Catherine says her favourite thing about the house is "waking up in the morning and seeing the trees out of the window - it's different every day". The bedrooms are floored with plantation sugar gum.

↓ Although a large quantity of concrete was used for the slabs and walls, the mix contained 25 per cent flyash, reducing its Portland cement component and therefore its embodied energy. The wall panels were cast to order, minimising wastage.

The design is deliberately simple to minimise opportunities for ember attack during a fire.

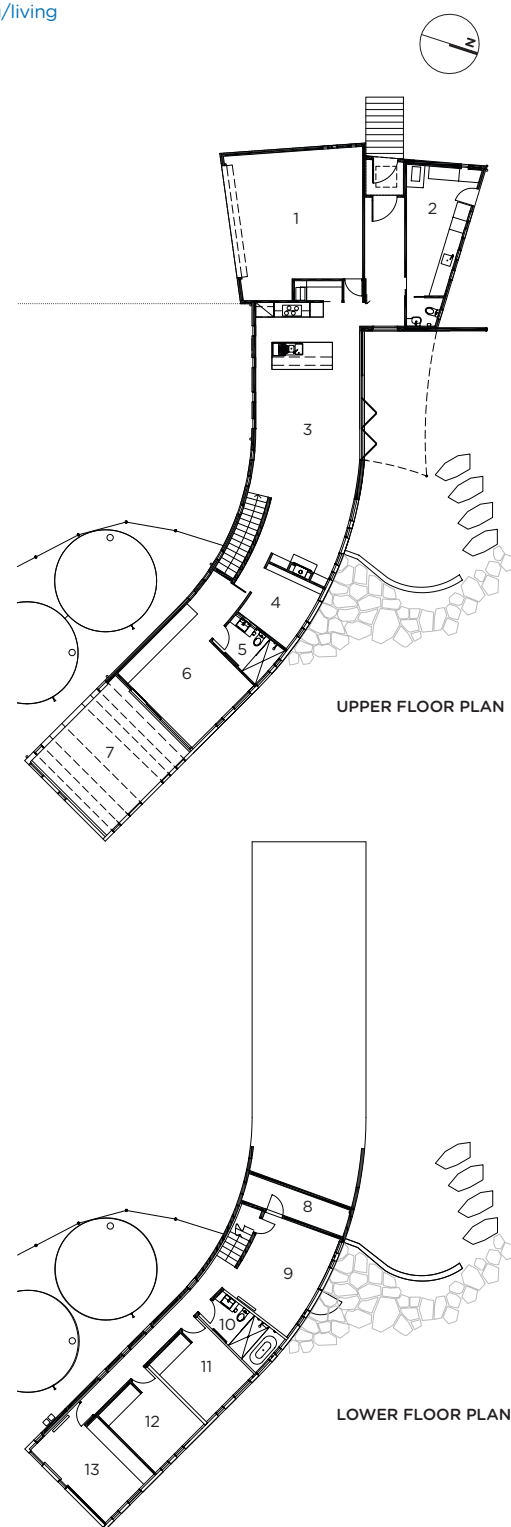


UPPER FLOOR PLAN

- 1 Garage
- 2 Laundry
- 3 Kitchen/dining/living
- 4 Study
- 5 Bathroom
- 6 Main bedroom
- 7 Patio

LOWER FLOOR PLAN

- 8 Cellar
- 9 Living
- 10 Bathroom
- 11 Bedroom
- 12 Bedroom
- 13 Bedroom



BUILDING IN A BAL-40 ZONE

A site's Bushfire Attack Level (BAL) is determined by the area's Fire Danger Index (a measure of the probability of a bushfire starting), the slope of the land, types of surrounding vegetation and its proximity to buildings. The Victorian Building Commission estimates that around 80 per cent of new builds in Victoria will fall into the lowest of the new categories: BAL-LOW, with no special construction requirements. Only 10 per cent fall into the higher categories: BAL-29, BAL-40 and BAL-FZ (Flame Zone). The construction requirements for a BAL-40 site are aimed at protecting the house from ember attack, a fairly high likelihood of flame contact, and radiant heat up to 40 kilowatts per square metre. Main requirements include:

- Subfloor supports: unless enclosed by external walls, must be non-combustible or tested for bushfire resistance
- Floors: must be enclosed by external walls, or protected on the underside with a non-combustible material, or be a concrete slab on ground
- External walls: non-combustible material (masonry, brick veneer, mud brick, aerated concrete, concrete) or timber or steel-framed walls clad with fibre cement or steel sheeting
- External windows: 5mm toughened glass, or protected with bushfire shutters. Openable windows must be screened with steel or bronze mesh [Ed note: this is the only BAL-40 requirement that John and Catherine's house does not meet; however, these screens could be retrofitted.]
- External doors: non-combustible material or 35mm solid timber, tight-fitting into a metal frame with weather strips at base, and protected by bushfire shutter
- Roofs: non-combustible roof covering with roof/wall junctions sealed, openings fitted with non-combustible ember guards, and no roof-mounted evaporative coolers
- Verandahs and decks: must have enclosed sub-floor space or non-combustible supports, and decking must be non-combustible

This is only a summary; for more details, visit www.buildingcommission.com.au and talk to your architect or builder.

MUSK RESIDENCE

DESIGNER

Sunpower Design Pty Ltd

—

WEBSITE

www.sunpowerdesign.com.au

—

BUILDER

Scanbuild Pty Ltd

—

PROJECT TYPE

New build

—

PROJECT LOCATION

Musk, near Daylesford, central Victoria

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SIZE

House 264 sqm; land 15.2 ha



The spectacular inner front door consists of a carved ironwood panel from a Kalimantan longhouse, acquired when John and Catherine lived in Borneo. It was set into a blackwood frame by a local joiner. The gumleaf design for the cor-ten steel outer door is from a photo taken on the block by Catherine; the door was made by Lump Sculpture Studio and is backed with steel mesh for insect and ember protection. www.lump.com.au

SUSTAINABLE FEATURES

Renewable energy

Wiring for future PVs and inverter installed

Hot water/hydronic heating

Dynamic 2500 hydronic wood boiler from Pivot Stove & Heating, and approx 6 sqm of evacuated tube solar collectors, connected to a 450L Edson coil immersed heat exchange tank with additional calorifier coil to increase heating capacity. Provides hot water to taps and space heating via two hydronic panels and two heated towel rails. www.pivotstove.com.au; www.edson.com.au

Water saving

- Rainwater catchment and storage in two 31,700L Polymaster tanks. A backup 13,600L water tank holds overflow from the bigger tanks combined with runoff from the patio and is separately plumbed to the toilets, laundry and outside taps; eventually it will be used for recycled water. Rainwater is used throughout the house. www.polymaster.com.au
- Separate 10,000L tank reserved for firefighting

Passive heating and cooling

- Long, narrow footprint allows all rooms to have a northern aspect and admits sunlight to rear wall in winter
- Small, low windows on south walls and higher, larger windows to the north for cross ventilation
- Ground level slab and second level suspended slab for thermal mass; Ecoblend concrete contains 25% flyash to reduce Portland cement content, and reinforcing is recycled steel www.independentcement.com.au

Active heating and cooling

- Hunter Pacific Concept ceiling sweep fans www.hunterpacific.com.au
- External shade blinds to north and west windows: 95% blackout, recyclable Soltis fabric from Tip Top Blinds www.tiptopblinds.com
- Regency Berwick slow combustion heater to living room www.regency-fire.com.au

Windows & glazing

Fire-rated 5mm double glazed windows with low-E film and filled with argon, in aluminium frames injection filled with foam as a partial "thermal break". Supplied by Westcoast Windows, Newtown, Victoria

Insulation

- R6.0 or more throughout
- 75mm Dow Styrofoam to internal faces of retaining walls and concrete panels www.dctech.com.au
- Recycled polyester batts to roof and in timber framed, metal clad rear wall
- Kingspan Aircell Insulbreak 65 used as reflective barrier in roof and metal clad rear wall www.kingspaninsulation.com.au

Building materials

- Tilt panel concrete cladding with 25% flyash content, supplied by Project Precast, Bendigo, Victoria
- Zinalume Lysaght Klip-Lok to roof and Zinalume corrugated wall cladding to timber framed rear wall www.lysaght.com
- Kitchen cabinets: Laminex "Cherry Cathedral" reconstructed timber veneer doors and drawer fronts, and Eo carcasses www.laminex.com.au

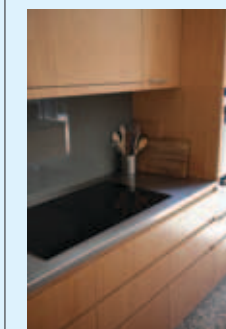


Photo by Anna Cumming

Lighting

Mostly surface mounted compact fluorescent lights. Bricklights in custom made steel mounts in downstairs corridor. Supplied by Richmond Lighting www.richmondlighting.com.au

Paints, finishes & floor coverings

- Wattyl Interior Design i.d low VOC paints www.wattyl.com.au
- SMARTtimbers plantation sugar gum floorboards and stairs sealed with Intergrain Enviropro water based low VOC finish www.smarttimbers.com.au; www.intergrainenviropro.com.au

Other ESD features

Grey and black water treatment: Water Gurus
NovaClear chemical free aerated membrane filtration system www.watergurus.com.au

SUSTAINABLE PRODUCTS

Tilt-panel concrete

With its durability, excellent fire resistance and thermal mass qualities, tilt-panel or pre-cast concrete is worth considering if you're building in a bushfire prone area. It's also very low-maintenance. Although it's more expensive than many alternative construction systems, tilt-panel concrete is also comparatively fast to erect. Panels are cast to size (minimising wastage), trucked to the site and erected by crane. For John and Catherine's house, the panels were installed with 10mm gaps in between, which were filled with a flexible polyethylene-based mastic. Tilt-panel concrete does have high embodied energy, but this can be offset by choosing concrete with an increased recycled or fly ash component.

Nanokote self-cleaning window treatment

Nanokote is a surface treatment product made by Australian company Micronisers, which has been developing nanotechnology for 15 years in conjunction with CSIRO. When sprayed onto glass, Nanokote gives the surface a hydrophobic (water repelling) quality at the molecular level, causing water to run straight off and preventing the buildup of dirt and oil, keeping the glass cleaner. Suitable for DIY, it's abrasion resistant, UV stable and durable, and is good for both interior and exterior applications. John and Catherine tested it on their glazed shower screens, and plan to apply it externally too, to maintain their clear views and minimise the need to balance on ladders to clean their tall windows. It costs around \$80 for enough to treat eight to 10 square metres of glass.

www.nanokote.com.au



↑ The aluminium frames for the windows and glazed doors were injection-filled with foam to reduce the thermal bridge effect that can be a problem with metal frames. External blinds on all north-facing windows block 95 per cent of the UV light, keeping the house cool and shaded in summer.



↑ External living areas are paved with unpolished local Castlemaine marble. Photo by Anna Cumming



↑ Leaves and other debris washing out of the box gutters are shed by angled mesh inserts in the downpipes, minimising maintenance. The captured rainwater is passed through another finer filter before it enters the tanks. Photo by Anna Cumming



↑ All waste water is treated on site. Currently it's used only to water the garden, but the infrastructure is already in place to use the recycled water in the laundry and toilets when legislation permits. Photo by Anna Cumming