

THE OFFICIAL JOURNAL OF AIRAH

FEBRUARY–MARCH 2021 · VOLUME 20.1

RRP \$14.95

PRINT POST APPROVAL
NUMBER PP352532/00001

Ecolibrium



Earth angel

Passivhaus goes
mainstream residential.



Earth angel

Located in the pioneering eco residential community of Mullum Creek in Melbourne's outer north-east, the award-winning Earth House features the high performance and build quality for which Passivhaus design is renowned. It's a dwelling in which restraint and subdued elegance work in harmony with nature and the landscape. **Sean McGowan** reports.



note: wall frame segmented
batten screen curved @ radius of 90.1m
refer details

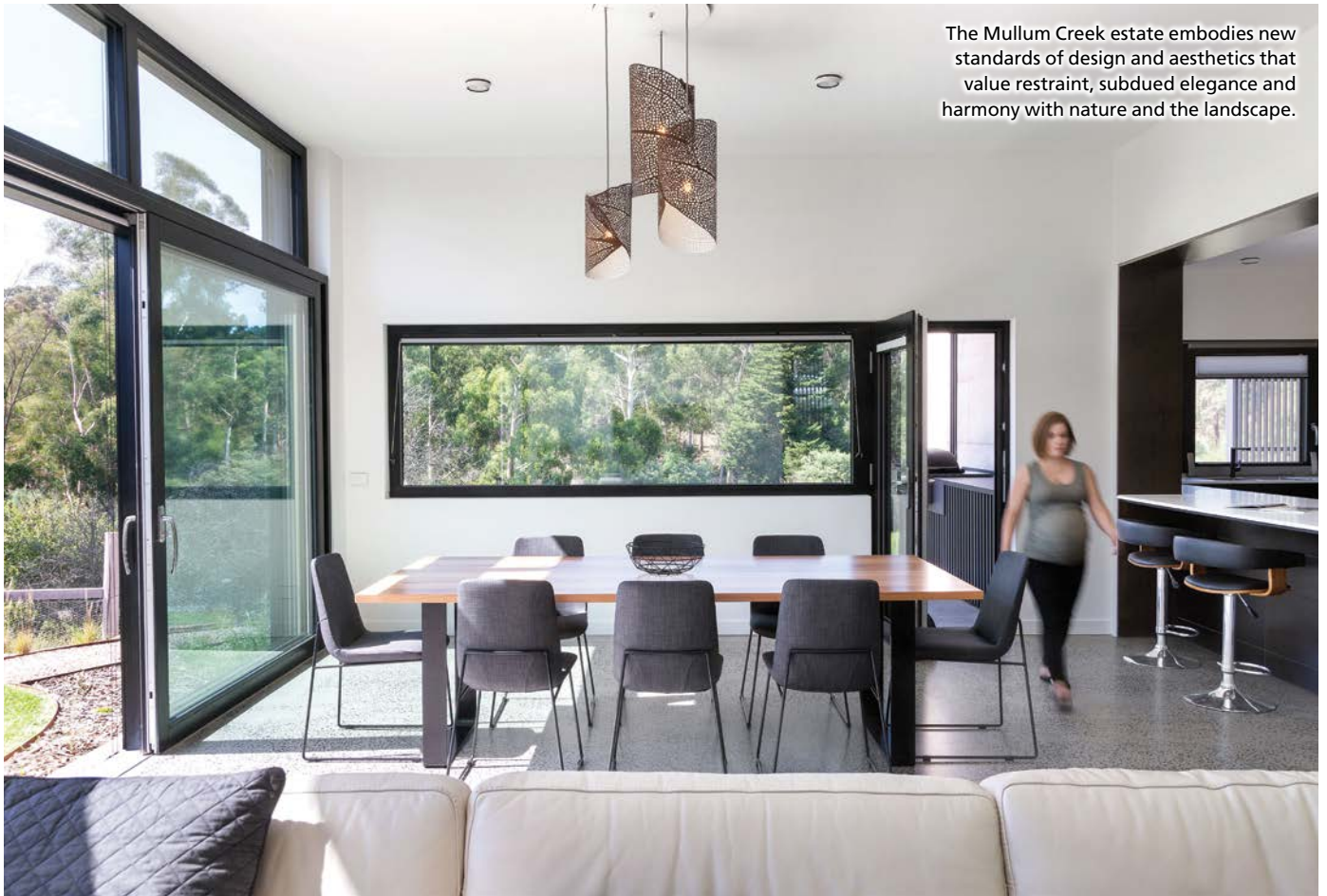
feature wall
finish as per
schedule - f26

hrv & a/c - allow
for drainage

aco 4200 drain
& type 678q iron
intercept grate

floor plan
1:100

The Mullum Creek estate embodies new standards of design and aesthetics that value restraint, subdued elegance and harmony with nature and the landscape.



Mullum Mullum Creek has always been somewhat of a divide, separating the sprawl of Melbourne's suburbia from the semi-rural suburbs of Donvale, Warrandyte and beyond.

It was their attraction to this native bushland setting and a desire to live in a rural environment that led Bob and Rivkah Mathews to move their family to Donvale in 1958.

OPEN SOURCE

All of the research and development conducted by the Mullum Creek Design Review Committee has been made freely available to the public.

Guidelines around building design, materials and finishes – including a detailed *Mullum Creek Timber Products Guide* prepared by Paul Haar Architect – are available on the residential community's website.

Go to www.mullumcreek.com.au for more information.

Building the family's home among the open paddocks, eucalypts and bushland overlooking the creek, the couple planted an apple orchard. Over time they added adjoining parcels of land to their property.

But changes to planning regulations in 1972 saw the land rezoned from rural to residential, and the Mathews family watched as urban development began to encroach. It led Bob to embark on a plan to coordinate the development of neighbouring properties to protect the tranquillity of the area, with a vision of clusters of homes surrounded by the open bushland.

Despite his best efforts, the task proved unsuccessful.

Fast-forward almost 50 years and the Mathews' three adult children – Steve, Danny and Sue – have carried on their father's baton by creating a series of plans that reflect the love of their inherited land and the preservation of its natural state.

In 2011, their Mullum Creek development proposal gained council approval, and a planning permit was subsequently granted the following year.

GROWING UP AT MULLUM CREEK

"There are many things we loved about growing up at Mullum Creek, with its gentle landscapes, streams and rich variety of native trees and animals," says Steve Mathews.

"Now that we are planning for the future of the site, we are eager to preserve as many of these features as possible and pass them on to the next generation of owners."

The Mullum Creek estate extends over 20 hectares, and features 56 lots ranging in size from 1,000m² to over 3,000m². The creek itself forms the eastern boundary of the estate, with its Manna gums providing habitat for a variety of birds and mammals.

Surrounding developments have seen large, imposing homes built. The Mullum Creek estate, meanwhile, embodies new standards of design and aesthetics that value restraint, subdued elegance and harmony with nature and the landscape.

The lots have been carefully oriented to ensure ample access to sunlight

and provide views to the creek edge and bushland reserve.

Valuing quality and economy of design over quantity and size of buildings, the Mullum Creek estate promotes resource efficiency and environmental sensitivity.

AWARD-WINNING DESIGN

It is a philosophy that has struck a chord with design professionals and prospective buyers alike – including one professional couple looking to build their first home.

Engaged in 2015, architect Maxa Design says the client was looking to achieve an energy-efficient home on a relatively small footprint. They were looking for something that was both contemporary and low maintenance.

Having completed Passivhaus projects across the country – from Geraldton to Kangaroo Island, Hobart, Jervis Bay and even Cairns – Maxa Design recognised that a Passivhaus approach was well suited to the Mullum Creek development.

“In our view, the Mullum Creek development sets a new benchmark for sustainable initiatives through land development,” says Sven Maxa, director and principal designer at Maxa Design.



There are some 65 guidelines, all requiring careful consideration

“There are some 65 guidelines, all requiring careful consideration through the design documents and construction drawings in particular.”

These mostly pertain to material provenance, energy efficiency and water preservation; however, social sustainability and land care are a by-product of these.

“We found the guidelines to align well to our own initiatives and aspirations,” Maxa says. “However, we certainly learnt along the way, and as a result, achieved what we think is a great outcome.”



Maxa Design recognised that a Passivhaus approach was well suited to the Mullum Creek development.

For this project, titled Earth House, a Passivhaus approach was embraced about halfway through the design development phase.

“Having conducted several previous designs to Passivhaus standard,” Maxa says, “we felt this project was well suited to the high-performance and high-build-quality outcomes achieved through the Passivhaus approach.”

Upon completion of the Passive House Planning Package (PHPP), the project’s NATHERS rating increased to approximately 8.3 stars – well exceeding the 7.5 star minimum requirement mandated by the Mullum Creek estate.

SEALING THE DEAL

Despite its lofty sustainability aspirations, Earth House is a relatively modest, compact home that truly meets the philosophy of Mullum Creek and the Mathews family.

Featuring a relatively small footprint of 183m² plus garage and storeroom on a 1,204m² sloping block, the home is divided by two “wings” – the east-west living wing and the northern wing with its three bedrooms and bathrooms.

To navigate and integrate the sloping site, an earth-covered, green roof has been incorporated over the east-west wing. This not only provides the home with outstanding insulation to reduce heat loss and energy consumption, but also provides privacy from the neighbouring property.

“With approximately 5m of fall across the land, we were required to do some excavation for the purposes of construction,” Maxa says.

Limited to a 1m maximum excavation depth, dispensation was sought from the Mullum Creek Design Review Committee and local council to excavate further. The aim was to partially submerge the

COVER FEATURE



building with an earth-covered roof in an effort to link the building to the site.

This offered the additional benefits of reducing the heat load on the building, while also improving biodiversity and vegetation outcomes through landscaping.

A 10,000L concrete tank was also submerged under the green roof to facilitate rainwater capture, storage and reuse.

The northern wing is protected from the western street boundary by a long, curved rammed-earth wall that provides both thermal performance and aesthetic appeal.

“The rammed-earth wall on our Earth House has an internal layer of insulation, with thermally broken ties between the faces of earth,” says Maxa.

The home’s living areas open to the north and east boundaries, which overlook open paddocks and bushland along the creek.

To minimise heating and cooling losses as part of the Passivhaus design, the building envelope has been carefully sealed by the home’s builder, CarbonLite.

“In conjunction with the weathertight membrane to the outside of the building structure,” Maxa says, “the internal membrane allows the insulation between these membranes to do its job properly.”

This seal reduces air movement and removes the gaps and cracks typical of traditional construction where services share the insulation zone.

“We see this as one of the large advantages of Passivhaus construction,” Maxa says. “And there is no reason why this can’t be adopted in all Australian projects.”

To this end, he has observed a keen uptake in Passivhaus methodologies across the residential building sector.

“We’ve noticed that almost every builder engaging in a Passivhaus build of ours has completed the Passivhaus training course,” he says. “As such, they are incredibly enthusiastic about using high-performance membranes and installing windows properly.”

The construction of Earth House incorporates the use of prefabricated walls and roof-framing systems. Maxa says these simplify the airtightness and insulation requirements of a high-performance home.

These prefabricated elements also offer the advantages of continuous insulation and speed of construction.

To further enhance the properties of the building envelope, all windows are triple-glazed and Passivhaus certified.

THERMAL MASS

The use of thermal mass is well-documented to reduce temperature swings and variances in an internal space. But it is interesting to note that the Passivhaus standard does not consider it as favourably as a NATHERS assessment might.

So, while the rammed-earth wall feature of Earth House provides some thermal mass to the internal volume, architect Sven Maxa says it is limited, and potentially not enough to have a substantial impact for this particular residence.

Fresh air ventilation one of the five pillars of the Passivhaus standard.



CONSISTENTLY COMFORTABLE

Additional to the home's passive design measures, which allow the home to run slightly cooler, is the use of a heat-recovery ventilation system.

This energy-efficient system provides fresh air and helps maintain year-round internal space temperatures of 20–25°C.

With fresh air ventilation one of the five pillars of the Passivhaus standard, heat-recovery ventilation systems have proven to offer a heat-recovery efficiency of 85 to 90 per cent. The Passivhaus calculations address not only the heating

and cooling losses of these units but also their energy consumption, attenuation, ducting, air volume and speed.

“We’ve found that heat-recovery ventilators provide many benefits for high-performance homes other than fresh air – most notably a shifting of humidity and a stabilisation of temperature differentials across the home,” says Maxa.

Earth House also features a 4kW solar PV array on its roof, sized to achieve a net-zero outcome and meet Passivhaus “premium” certification.

With each design aspect carefully considered and constructed,

LESSONS FROM THE ARCHITECT

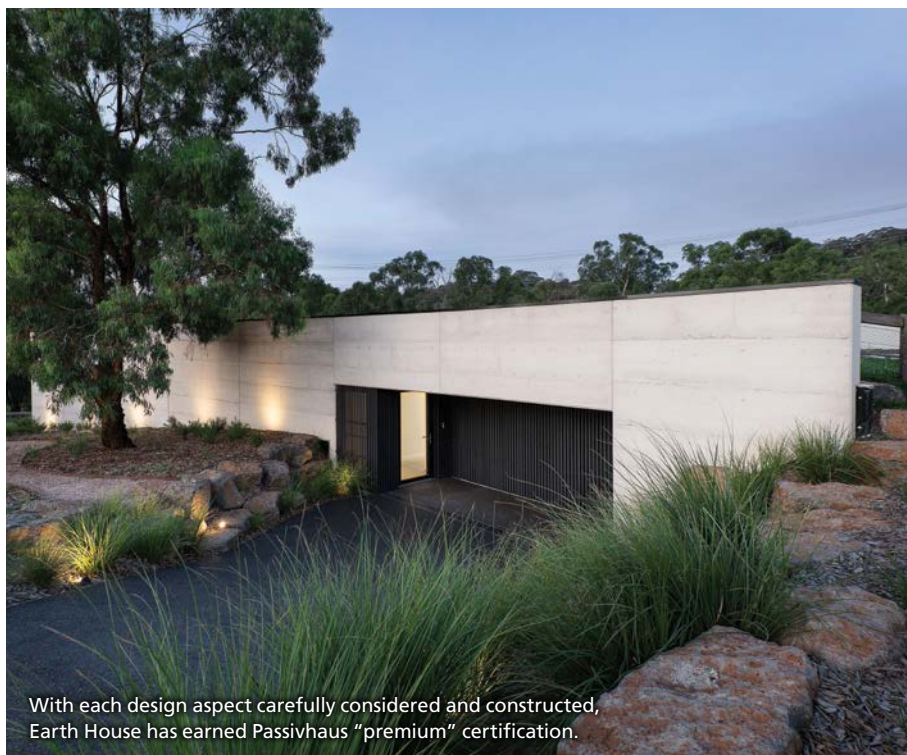
“We learn many things from many of our projects, and that’s probably because each design is unique in our practice,” says Sven Maxa, director and principal designer at Maxa Design.

“We never duplicate designs and rarely replicate the use of materials. Therefore, with every project we’re learning how to apply new ideas within the constraints of our regulatory systems and client requirements.”

Earth House and the Mullum Creek estate represents what can be achieved when developers, architects, builders and owners come together to pursue an outcome beyond the traditional.

It’s an ambition that has earned Earth House and Maxa Design a number of honours already, including the prestigious Building Design of the Year 2020 at last year’s Design Matters Awards.

The project also won awards for Best Residential New Home DesP Passivhaus project. Owl Woods Passive House in Trentham, won Best Residential New Home Design \$0.5m–\$1m. ■



With each design aspect carefully considered and constructed, Earth House has earned Passivhaus “premium” certification.

PROJECT AT A GLANCE

The personnel

- ▲ Architect: **Maxa Design**
- ▲ Builder: **CarbonLite**
- ▲ Design review committee: **Paul Haar Architect**
- ▲ Energy rater: **Floyd Energy**
- ▲ Passive house certifier: **Detail Green**
- ▲ Passive house consultant: **Williams Energy Design**
- ▲ Structural engineer: **R.Biem & Associates**

The equipment

- ▲ Heat recovery Unit: **Fantech**
- ▲ Solar hot water: **Sanden**

(Source: Maxa Design)