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Case study: Nightingale 2.0 – Fairfield

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Cover image. Nightingale 2.0 – Fairfield (Image: Rory Gardiner).

Project summary

Nightingale 2.0 in Fairfield by Six Degrees Architects, is the second Nightingale Housing project to be completed, and has been awarded at both state and national levels in the categories of both sustainability and landscape. The goal of each Nightingale project is to provide quality urban housing to owner occupiers, with high sustainability and social outcomes, at an affordable price (see Integration below).

Fundamental passive design principles are embedded into the building through open walkways, cross ventilation, engaged thermal mass, sun shading, orientation and air tightness.

The apartments achieve an average of 8.7 star NatHERS (Commonwealth of Australia 2021), with some achieving over 9 stars. The building has 15kW of photovoltaic (PV) cells, no cars, no gas, no air-conditioning and uses an embedded network and centralised heat pump to enable the use of 100% green power, at wholesale rates, to ensure the use of no fossil fuels in operation.

The building showcases sustainability initiatives and technologies, seeking to provide an exemplar high density affordable residential environment, actively promoting ideas around community, shared spaces and sustainability. This is a project that delivers quality homes to a diverse community, as affordably as possible.

Project details	
Project name	Nightingale 2.0 - Fairfield
Project type	Multi-residential and retail
Procurement type	Nightingale Model
Year of design completion	2017 (tender)
Year of project completion	2019 (construction completion)
Location • Land + nation • Climate zone • Bioregion	 - Wurundjeri - Melbourne – Zone 6 - Southern Volcanic Plane
Site area	524 sqm
Gross floor area m2	2435
Net Saleable area m2 (apartments)	1386
Net lettable area m2 (retail tenancies)	259
Number of levels	Ground + four + roof top laundry and amenities
Number of residents, occupants, visitors	16 x 2 bed apartments, 4 x 1 bed apartments, approx. 40 residents Three commercial tenancies - wine bar, landscape architect, ice creamery
Sustainability benchmarks and ratings achieved	Average NatHERS rating of 8.7 stars, with some apartments achieving above 9 stars

Project team	
Owner(s) / client(s)	Nightingale 2.0 Development Pty Ltd undertook the development. Now a strata title building, each apartment is owned by individual owner-occupiers.
Architect(s)	Six Degrees Architects
Consultants	Development Manager / Project Manager: Hip V.Hype Town Planner: Hansen Partnership Landscape Architects: SBLA Studio Structural & Civil: Irwinconsult Acoustics: ARUP Building Surveyor: Steve Watson & Partners DDA: Morris Goding Access Consulting ESD: Hip V. Hype Sustainability Fire Engineer: Dobbs Doherty Services: Lucid Consulting Australia Traffic: Traffix Waste: Leigh Design
Builder	Atelier Projects

Integration

Nightingale Housing (2021) is a not-for-profit organisation that delivers apartments that are socially, financially and environmentally sustainable. Nightingale is based on the idea of removing costs and living simply, and seeks to deliver well-built, sustainable homes that are minimal and honest. Second bathrooms, individual laundries and basement carparks are removed, to reduce the cost of construction. Priority is given to passive solar design, double glazing, excellent insulation and 100% certified Green Power – things that are important for the creation of healthy, comfortable, sustainable homes that are inexpensive to run and maintain.

Sites are chosen for their proximity to public transport and local services, and relationships have been formed with car-share companies (see Discovery), to help enable the residents to live without the cost of car ownership. Real estate agents fees, display suites and marketing costs are all removed, with sales happening via ballot from a database that has built by word of mouth as the projects have been delivered.

The first few Nightingale projects were run and developed directly by the architects, in this case Six Degrees, with the assistance of a development manager. However Nightingale Housing has since been established to take on the role of finding the sites, managing the finance, communicating with the resident community and engaging the consultants. The architects still play a central role in the engagement with the residents but have been relieved of the development management aspects of the projects.

The aspirations of Nightingale Housing provided the basis for the design and project concept. This building has been designed to provide homes for the occupants that are sustainable, comfortable, affordable and enabling of community.

Equally important is how the development sits in its street context and wider community, as discussed below.

Figure 1. Street view of Nightingale 2.0, designed by Six Degrees Architects and delivered in collaboration between HIP V. HYPE and Six Degrees Architects in accordance with the Nightingale Housing Values (Image: Tess Kelly).

Community

The site was selected for its location close to public transport, shops and community amenities. Adjacent to Fairfield Station and located within Fairfield shopping precinct, the location has a walkability score of 91 in accordance with Walk Score.

The ground floor of the building has been designed to encourage activation of the street and support the development of the Railway Place precinct (Figure 1). Three new tenancies of varying sizes are introduced to the precinct and the scale and articulation of the architectural expression at the ground floor is purposefully more intricate. The street wall is carved and textured, the footpath is widened in places, and concertina windows, public seating and landscaping are introduced – all of this with the aim of facilitating better street interaction for the tenancies and engaging with the pedestrians and local community.

Open walkways on the upper floors provide access to the apartments, visual connection to the street below and allow natural light and cross ventilation to all apartments. These walkways, with planter boxes integrated into the balustrading, offer an active and verdant wall to the street.

The rooftop (Figure 2) provides skyline activity, much of it visible from the street below. Shared laundry facilities, open walkways and rooftop gardens all help to provide incidental opportunities for interaction between residents to facilitate the building of this vertical community. Clothes lines are provided to the western roof, while the eastern roof hosts productive and recreational garden space, BBQ facilities, a fireplace and outdoor dining areas. Pergolas and planter boxes offer ample space for vegetation to thrive and provide further planting visible from the street below.

The design approach taken has been to treat the site as an active vertical community, engaging with the street both at ground level and from above, and providing opportunity for community to flourish and the building to become a dynamic addition to the precinct.

Figure 2. The rooftop (Image: Rory Gardiner).

Country

The site sits on unceded Wurundjeri land and is a part of the Southern Volcanic Plane, with basalt 400mm below the surface. Previously unutilised Victrack land, the site, when purchased, was mostly cleared with various self-seeded weed species trees along the northern boundary. With the exception of a 6 sqm fern garden at the entry, the new building takes up the entire footprint of the site.

Landscape Architects SBLA were given a design brief suggesting 'perched planting overtaking a ruin'. Their plant selection takes inspiration from windy, mountainous Australian landscapes - treating the building as a microclimate. Dry sclerophyll planting sits on the rooftop, whilst Australian rainforest species cascade down the south side of the building into a welcoming arrival garden. This cool, shaded entry garden hosts ferns and palms, while staghorn climb the light well wall creating a vertical green 'crack', a geological fracture (Figure 3). Planter boxes scattered along the open walkways provide both climbing and falling species, and large planter beds on the rooftop hold a wide range of Australian species selected for their seasonality, scent, colours and ability to attract insects and birds. The rooftop also hosts productive garden beds for the residents and steel pergolas covered with ornamental grape, for the shade they provide in summer, for the seasonal change in colour and for the reference to the more recent immigrants to the area.

Importantly, all of this is visible from the street below softening the building and providing seasonality to the urban environment.

Water

Efficient water use is an important aspect of residential design, and relatively easy to achieve. At Nightingale 2.0 water efficient fittings and appliances, including those in the communal laundry, are used throughout. All rainwater is collected and stored for use in rainwater tanks (7000L), with plumbing connection to service the toilets of the ground floor commercial tenancies and irrigation of the landscaping throughout the building. More extensive use, and a larger tank, was examined but due to the small footprint of the building, found to be untenable. Australian drought tolerant species were selected by SBLA for the landscape, both for their suitability to the microenvironment and for their low water needs.

The harvesting of grey water and blackwater was not explored and, in our opinion, is considered an unsuitable option in a high-density urban environment such as this.

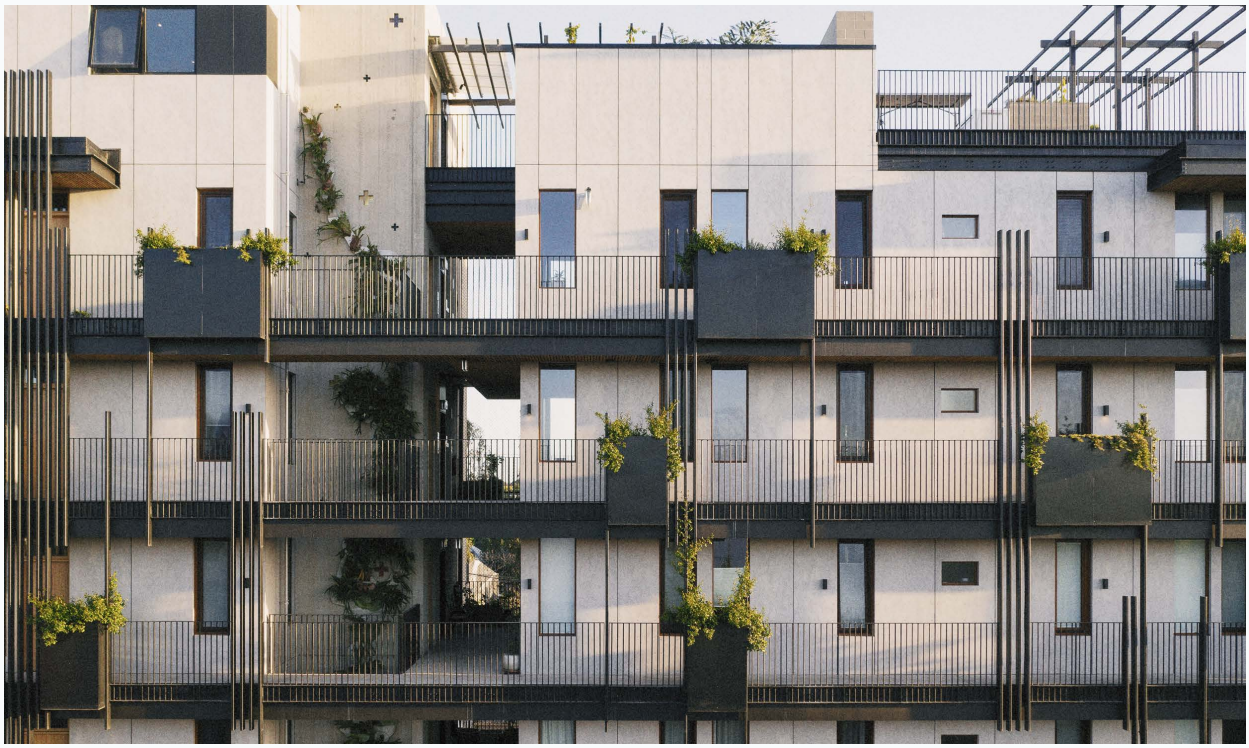

Figure 3. The 'Crack' (Image: Rory Gardiner).

Economy

The site cost approximately $3,250/sqm, with a further $900,000 spent on difficult servicing issues, such as undergrounding high voltage power lines and getting sewer and water to the site. These servicing costs, when added to the construction contract puts construction costs at approximately $3,100/sqm of Gross Floor Area. Construction costs of comparable apartment buildings tend to be in the order of $3,500/sqm of Gross Floor Area.

Cost savings for the project were achieved through the following mechanisms:

- no carparking
- no second or third bathrooms
- shared, instead of individual, laundry
- no air-conditioning
- no marketing
- no real estate agent fees – sales through Nightingale Housing purchaser data base
- no display suites.

Cost savings were passed on to the purchasers, enabling apartments to be sold at approx. 10% below market rate.

Where possible local, regional and Australian products and materials were specified, and in particular Melbourne artisans were involved in details such as the leadlight (Adadaz Leadlighting) (Figure 4) and the typography (Stephen Banham of Letterbox) (Figure 5) used for wayfinding.

Energy

The development sits on land adjoining the Fairfield Station platform (Figure 8) and, apart from a small heritage signal box, has no neighbouring buildings. The orientation of the site enabled the design to make use of the long northern boundary – living rooms to all apartments were situated to receive excellent access to northern sunlight. Open walkways, that run along the site's southern edge, enable light and ventilation to the bedrooms that are located to the south, away from the noise of the rail. This arrangement allows all apartments to have at least two aspects, with the ones at either end having three and enables cross ventilation of the apartments when purging summer heat.

Figure 4. Leadlighting by Adadaz (Image: Dave Kulesza).

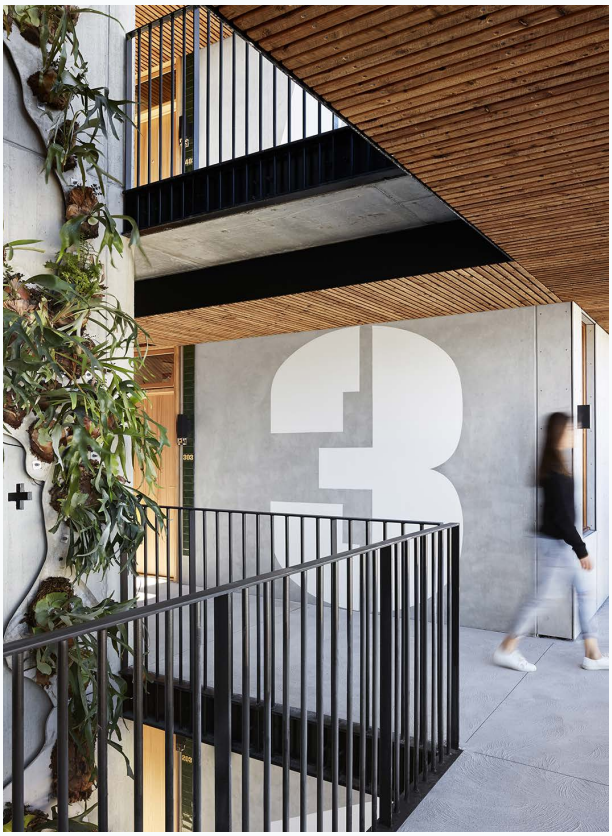

Figure 5. Typography by Letterbox in Nightingale 2.0, designed by Six Degrees Architects and delivered in collaboration between HIP V. HYPE and Six Degrees Architects in accordance with the Nightingale Housing Values (Image: Tess Kelly).

European style tilt-and-turn windows are used to create well sealed openings, both for acoustics and for thermal performance. These, along with the lift-and-slide doors to the balconies, seal tightly against gaskets to improve their performance.

The thermal mass of the structure is engaged through exposed concrete ceilings which, along with orientation, good insulation and ceiling fans, mean the building has low heating and cooling requirements.

The building has no air-conditioning and uses no gas, with underfloor hydronic heating, hot water and cooking all powered by electricity. Despite this, the apartments utilise between 10-20% less electricity, and as much as 35-40% less energy overall, than comparable apartments in the area.

15kW of rooftop PV was installed, with roof space available for this to be further expanded by the Owners Corporation at a later date. Approximately 10% of the building's energy currently comes from this roof top solar with the remainder purchased off the grid, as 100% green power, at wholesale prices, enabled through the use of an embedded network.
An embedded network enables the building, through the Owners Corporation, to act as the purchaser of power from the electricity supplier. As the building is made up of 20 apartments and three retail tenancies, power can be purchased in bulk at wholesale rates. Through this mechanism residents get access to green power at a rate less than they would pay for retail black power, were they to purchase it as an individual residence. The embedded network also enables the power produced onsite by the PV array to be distributed on site as it is needed throughout the day to the tenancies, when most residents are at work, while still sharing the savings made by the PV array equitably, and making it unlikely that any power is returned to the grid at the low rates currently offered.

Finally, a simple but effective feature of the apartments is a 'kill switch', at each front door allowing residents to turn off all non-essential power when leaving.

Well-being

The open walkways mean that all apartments have at least two aspects, enabling all rooms to have excellent access to light and ventilation. All habitable rooms have tilt-and-turn windows, allowing them to be either swung inwards as a casement or, for better security when out, tilted slightly inwards from the top. Sliding doors to balconies operate on a lift and slide mechanism, meaning that, unlike most sliding doors, when closed they lower onto a gasket and seal tightly both thermally and acoustically – important next to a railway line. The cross ventilation enables all apartments to be purged of heat on summer nights, or when a cool change comes through.

The engaged thermal mass of the concrete structure and ceiling (Figure 6) takes out the peaks and troughs of temperature variation in the extremes of winter and summer. Low radiant heat from the underfloor hydronic heating, sitting beneath the engineered timber flooring, provides a comfortable winter temperature boost when needed. Post-occupancy evaluation (discussed further under Discovery) has indicated that the apartments stay comfortable through summer heatwaves without air-conditioning, and warm through the winter months with very little heating.

The residents, introduced to each other early in the project, were kept involved throughout the design, planning and construction of the project. They quickly set up a shared social media page to share their thoughts and, following occupation, have formed an active community with groups that look after different aspects of the building and garden, and socialise in fine weather on the roof top (Figure 2). The garden spaces throughout the building have become established and provide delight and seasonal change to the outdoor environments.

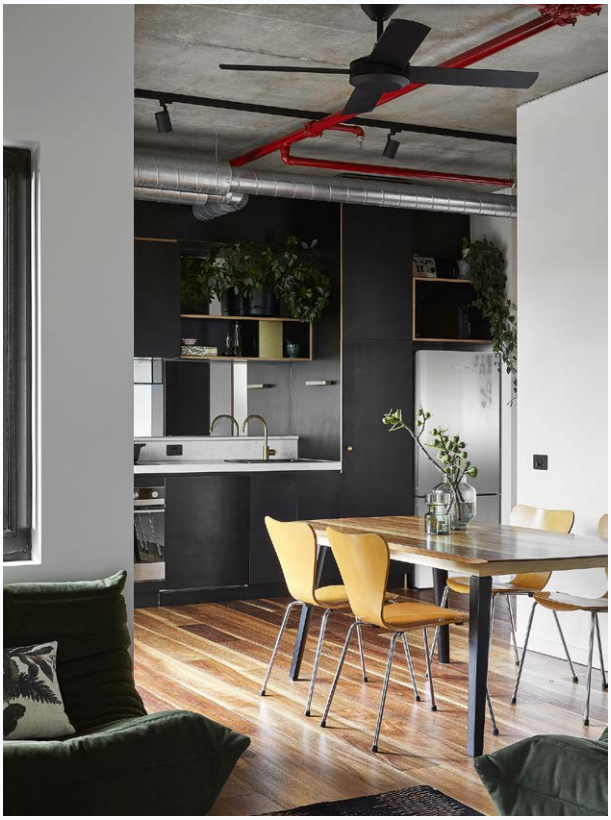

Figure 6. Engaged thermal mass of concrete ceiling (Image: Dave Kulesza).

Figure 7. Simple robust finishes in Nightingale 2.0, designed by Six Degrees Architects and delivered in collaboration between HIP V. HYPE and Six Degrees Architects in accordance with the Nightingale Housing Values (Image: Tess Kelly).

By building adjacent to a railway station, bus routes and bicycle path networks, the project was able to eliminate the need for carparking, in turn fostering alternative transport options. Ample and easily accessible bicycle storage is incorporated into the ground floor.

Resources

During design and documentation Cross Laminated Timber (CLT) was investigated with the contractor as a construction methodology. This technology allows the capture and storage of carbon in the building structure, through the use of plantation timber. It also enables a greater speed of construction than more typical construction methods. For various reasons, unfortunately it was not deemed a viable option for this project.

Instead the approach taken was to use a more typical concrete construction for structure, walls and floors. Concrete has high embodied energy but is robust, long lasting, low maintenance and contributes significantly to thermal comfort if its thermal mass is engaged. Alternative concrete additives with lower embodied energy, such as flyash, were investigated but were discounted for various reasons when discussed with the structural engineer and the builder, mainly due to curing times, cost and lack of familiarity for the trades involved.

While concrete, through its plasticity, can be expressive it was also important to provide contrast through warmer and more tactile materials. Exposed timber and tiling are incorporated into the design, along with hand crafted elements such as stained glass.

Exposing the concrete slab as a ceiling within the apartments meant that sound mediation between floors needed to be managed within the floor makeup. This was achieved through the use of a slightly raised timber floor, enabling insulation and hydronic heating pipes to be run between the concrete slab and the engineered flooring. While the final outcome is excellent, the process was extremely difficult for the contractor to manage during construction. The hydronic pipework needed to be protected before the flooring went down and then, when putting down the flooring, care had to be taken not to accidentally puncture the pipework with the fixings used for the flooring. Unfortunately, when the hydronic heating was commissioned there were some leaks that then had to be found, the flooring taken up and repairs made. We would be unlikely to use this system again for the reasons outlined above.

To encourage good management of construction materials, waste stream management requirements were written into the construction specification. Waste was required to be separated and no more than 20% of the waste stream to go to landfill.

Materials specified were carefully considered and, where possible, selected through certifications such as:

- Ecospecifier Green Tag Certified
- Australian Forestry Standard (AFS) or Programme for the Endorsement of Forest Certification (PEFC) certified sources
- low formaldehyde emissions (E1 maximum).

Now that the residents have moved in, all ongoing organic food waste is separated and collected by a service that then delivers compost back to the residents for use on the gardens. This is managed through the Owners Corporation.

Change

The project has been carefully designed to perform as well as possible with the least energy use. To date, it has performed well through cold winters and the occasional summer heat wave, with apartments staying comfortable without the need for air-conditioning. Undoubtedly, there will be the occasional protracted heatwave that will mean that comfort levels within apartments are less than ideal. Proximity to the railway line will also mean that there will be noise discomfort for some, in night purging the apartments at these times (as noted above, bedrooms were located away from the rail side of the building). While there is nothing preventing the residents installing air-conditioning systems, the performance of the building to date and the willingness of the resident community to put up with the very occasional discomfort of a hot night, has meant that this has not eventuated.

The building is an apartment building and will likely remain an apartment building into the future. There was not a great deal of consideration given to flexibility in changing future uses other than for the three tenancies on the ground floor.

One of the key drivers was to understand the requirements of the owner occupiers who would make up the new community, rather than the opinion of real estate agents used to thinking of investors' requirements.

Through this process, design decisions and money spent could be focused on aspects of the building that provide the best outcomes for current and future residents.

Discovery

A key discovery is the willingness shown by some cohorts in the community to happily live without personal car ownership – although this is still a point of contention for some town planners and local residents. The landscape of transportation within our cities is rapidly changing and likely to change further in the following decade. Uber, Didi, car-share, along with increased bicycle use and infrastructure have all enabled a new generation of residents to live without a car. Full autonomous driving capabilities are on the near horizon and likely to further impact this landscape.

Figure 8. Fairfield Railway Station (Image: Dave Kulesza).

It is certainly worth questioning whether two levels of underground parking should be built on projects such as this, when situated so close to public transport. What will underground parking be used for in a future with less need for private car ownership?

In this project, through discussions with council and carshare operators, a Go-Get vehicle is located directly outside the building for use by the occupants and the surrounding community. A green travel plan, administered by the Owners Corporation managers, provides both a carrot and stick to discourage the use of private cars by the residents. Under the green travel plan each apartment pays an annual fee of $500 per bedroom to the Owners Corporation and all residents with a driving licence gain free membership of Go-Get car share. Residents are then able to claim this money back through expenses met through green travel, including car-share, public transport, and bicycle repairs and purchase. Funds that are not claimed are not refunded.

A research group at RMIT (Moore et al. unpublished) have undertaken post-occupancy evaluation and ongoing air quality measurements via equipment installed with the permission of the residents.

An interesting discovery has been that the building is so well sealed that, at certain times of the year, if windows and doors are kept tightly shut, CO2 and moisture levels increase to less than ideal concentration. This has led some of the residents to retro-fit heat-exchange mechanical fresh air supply. In retrospect, and in future projects, this would be appropriate for the base build.

The project has been designed to help demonstrate that high amenity, excellent sustainability and high performance is possible to achieve in high density, multi-residential apartment buildings, with modest budgets.

Learnings from each Nightingale project are shared with future Nightingale projects, and with whomever is interested, through regular tours of completed projects. Without doubt, Nightingale has influenced the development industry in Melbourne, and a great deal more consideration of the residents, rather than investors, now seems to be gaining traction.

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Moore T, Andamon MM and Woo J (unpublished) *Pre and post occupancy evaluation of an exemplar apartment development in Melbourne*, RMIT University.

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About the Author

James Legge

One of the founding directors of Six Degrees Architects, James has developed the practice, with his partners, over the past 30 years into a nationally recognised design firm. James has taught at the University of Melbourne, regularly undertakes guest lectures, and has served on numerous AIA awards juries. James is a Fellow of the Australian Institute of Architects, sits on the Human Research and Ethics Committee for the Eye & Ear Hospital, is a foundation member of the Nightingale Housing Board and is a panel member of the Victorian Design Review Panel for the Office of the Victorian Government Architect. James has developed expertise in sustainability in the built environment and is keenly interested in ground plane activation and place making. James has an ongoing interest in exploring the possibility of different housing models within the Australian context, and how they can best foster community.