SUSTAINABLE DESIGN ASSESSMENT

GUIDANCE SDA

EXAMPLE PROJECT

UPDATED JUNE 2022

Three Unit Development

Contents

Disclaimer

This material is provided purely for general advice and guidance purposes only and only addresses environmental sustainable design (ESD) requirements. It is not to be relied upon as construction documentation or detailed design advice. When applying this guidance material to a planning application it should be done by a suitably qualified professional and should be adapted to site specific circumstances. No warranty is provided on the accuracy of this material or any omissions from the material and Moreland City Council and Akay Architects accepts no liability for any loss or damages incurred in connection with this guidance material.

Environmentally Sustainable Design Initiatives

This Sustainable Design Assessment has been prepared to support the Environmentally Sustainable Design initiatives proposed in the BESS Assessment. Each of the initiatives have been incorporated into the design and have been clearly documented on the plans to ensure they are to be implemented during the construction and are also noted in the BESS assessment attached to the end of this document.

BESS Assessment Details

Property Address	Example project, Pascoe Vale, 3044	
Project Number	# 21B44174	72 % BESS score

Management Category

Pre-application meeting	Not applicable
Preliminary NatHERS rating	NatHERS assessments have been provided for all three dwellings. See preliminary NatHERS assessment at the end of this report
Building Users Guide	Yes The Building User Guide will contain the following information. - Porous paving maintenance manual - Raingarden maintenance manual - Rainwater tank maintenance manual. - Waste reduction and opportunities for recycling and diversion - How to make use of natural ventilation - How and when to operate adjustable shading devices - Efficient use of appliances - Electrical infrastructure that is available for the future installation of a car charger See Council's 'Sample Building User Guide' https://www.moreland.vic.gov.au/building-and-business/planning-and-building/planning/environmentally-sustainable-design/#autoAnchor0, Sustainability Management Plan, ESD - SAMPLE-Building Users Guide – BUG.')

Water Resources

Water Profile	Rainwater tanks to be provided to each of the dwellings.
Rainwater Tanks	2000 or 3000 litre rainwater tanks have been provided for each dwelling as per the Water Sensitive Urban Design Plan. Rainwater tanks are to be connected to the • Toilets • Washing machines • Irrigation system Connection of the rainwater tank to the washing machine increases the efficiency of the rainwater harvesting, therefore an extra bedroom has been included in the STORM report for each of the dwellings to reflect this increased efficiency. Areas of the in-ground drip irrigated systems has been shown on the WSUD Plan and the Landscape plan. Areas identified in the BESS assessment are as follows. Dwelling 1 – 6.6 m2 Dwelling 2 – 12.5 m2 Dwelling 3 – 14.9 m2
Showerheads	4 star WELS (>4.5 but <=6.0)
Bathtub	Medium Sized Contemporary Bath (where applicable)
Kitchen taps	5 star WELS
Bathroom taps	5 star WELS
Dishwashers	Default (3 stars WELS)
Toilets	4 star WELS (Plumbing connected to Rainwater tanks)
Washing machines	Occupant to install (Plumbing connected to Rainwater tanks)
Water Efficient Landscaping	A drip irrigation system connected to Rainwater Tanks with programable timers and rain sensors is to be installed as noted in the Landscape Plan. Drought tolerant plants are specified on the Landscape Plan.

Energy Efficiency

Solar Photovoltaic system	The system size will meet the recommendations of Zero Carbon Moreland Solar Photovoltaic Systems Metric 1: Medium Density Developments (townhouse and standalone dwellings). Refer to appendix. https://morelandzerocarbon.org.au/wp-content/uploads/2021/10/MZCDG_SOLAR_PV_SYSTEMS-1.pdf Each townhouse is to accommodate: • A minimum3 kW for each 1-2 bedroom dwelling, and • An additional 1kW for each additional bedroom Each panel to be 1050 x 1700 mm with a power rating output of 340 W is assumed. The solar photovoltaic system installed into the development will be equipped with a multi-string micro-inverter due to the two directions the solar panels will be facing. **Dwelling 1 is to have 16 solar panels – 5.44 kW** North facing: 13 panels x 340 watts = 4.42 kW West facing: 3 panels x 340 watts = 1.02 kW **Dwelling 2 is to have 12 solar panels – 4.08kW** North facing: 9 panels x 340 watts = 3.06 kW West facing: 3 panels x 340 watts = 1.02 kW **Dwelling 3 is to have 9 solar panels – 3.06 kW** North facing: 2 panels x 340 watts = 0.68 kW West facing: 7 panels x 340 watts = 2.38 kW For further information on the Technical Study for Solar, refer to Moreland City Council Renewable Energy Standard. https://morelandzerocarbon.org.au/wp-content/uploads/2021/06/Moreland-Renewable-Energy-Solar-PV-Report-compressed.pdf

Renewable energy system	Not applicable
Gas supply	No gas connection
Thermal Performance	Minimum 7.0 stars NATHERS Rating has been achieved
Heating System	Reverse Cycle Air Conditioning Minimum of 4 stars
Cooling System	Reverse Cycle Air Conditioning Minimum of 4 stars
Hot Water System	Electric Heat Pump
Clothes drying facilities	Clotheslines Clothesline to be provided in each courtyard. No clothes dryer has been specified for this development.
External Lighting	External lighting sensors have been shown on the ground floor plan.
Illumination	4 watts / sqm Lighting throughout the habitable rooms will be through the use of LED downlights as specified on the NatHERs assessment. All other lighting will be energy efficient fluorescent lighting.

Stormwater Management (Water Sensitive Urban Design)

Rainwater Tanks	Each dwelling will be provided with either a 2000-3000 litre rainwater tank that will be used for rainwater harvesting for toilets, washing machine and the irrigation of garden beds in each of the backyards. The total catchment area directed to the rainwater tanks is 234.7m2 which will be through charged systems with the overflow connected to the legal point of discharge.
Planter Box Raingardens	Two above-ground raingardens have been provided within the development along the common driveway to pick up the roof catchment that falls on the opposite side of the rainwater tank. The planter box raingardens are to be located 300mm away from the footing of the adjacent building and is to pick up a minimum roof catchment area of 25m2 each per 1m2 raingarden. A total of 62.7m2 of roof catchment will be directed to the raingardens.
Untreated roof	Where the roof catchment area falls to the opposite side of where the rainwater tank is located, the downpipes are to be gravity fed to the legal point of discharge through the retention system.
Concrete driveway	Half of the common driveway will be concrete which will remain untreated. It will be graded to fall to the engineer designed retention system.
Permeable surface	The front portion of the common driveway will be trafficable permeable concrete. The secluded private open spaces for all dwellings will have permeable surfaces. Portions of the POS will be lawn, permeable pavers, ground cover, lilydale topping or mulch within the garden beds. All finished surfaces have been identified on the plans. For the Permeable Paving Maintenance Schedule, refer to pages 40-45 of the Melbourne Water "WSUD Maintenance Guideline" extracted in the appendix. https://www.melbournewater.com.au/sites/default/files/WSUD-Maintenance-manager-guidelines.pdf

Indoor Environmental Quality

Cross Ventilation	All habitable rooms have an opening equivalent to at least 2% of the floor area, with a cross path of less than 15m between one habitable room to another passing through one door only.
Double Glazing	Double glazing will be provided to all habitable room windows as per the NatHERS assessments which has been identified in the plans and elevations.
Shading Devices	Shading devices have been provided to all north, west and east facing windows. The type of shading device proposed has been indicated on the plans along with a diagram of the shading device.
Building orientation	At least 50% of living areas are orientated to the north.

Transport

Bicycle parking	Bike racks are located at the back of the garages or a dedicated space has been allocated outside the "Clearance to car parking" as detailed in Clause 52.06
Electric Vehicle (EV) Infrastructure	The electric vehicle infrastructure provided will meet the recommendations of Zero Carbon Moreland Electric Vehicle Infrastructure Metric 1: Medium Density Development (townhouse and standalone dwellings). Refer to appendix. https://morelandzerocarbon.org.au/wp-content/uploads/2021/10/MZCDG_EV_INFRASTRUCTURE.pdf Each dwelling is to include: • Infrastructure and cabling to each garage or carport that can support Level 2 (Mode 3) 32 Amp EV car charging. * • Load management systems that ensure that: – EV charging occurs outside of peak electricity demand hours; and – The EV infrastructure does not adversely impact the site's maximum demand. * The inclusion of an EV charger unit (Active EV Charging) is not expected. For further information on the Technical Study for Electric Vehicles, refer to Moreland City Council Low Emission and Electric Vehicles Standard. https://morelandzerocarbon.org.au/wp-content/uploads/2021/06/Moreland-Low-Emission-Electric-Vehicles-Report.pdf

Waste Management

Construction Waste	Not applicable
Food & garden waste	Organic waste bin collection services are available for this property. Each dwelling has an area dedicated to accommodate the following bins x1 - 80 litre bin for Garbage x1 - 120 litre bin for FOGO (food organic and garden organic) x1 - 120 litre bin for Glass x1 - 240 litre bin for Recycling Bins located in common area are screened from public view. Refer to Speediewaste website for bin sizes. https://www.speediewaste.com.au/bin-sizes.php

Urban Ecology

Vegetation	Area covered with vegetation such as lawn, canopy cover, garden beds and ground cover is 31% of the site and is shown on the Vegetated Area Plan. It excludes permeable non-vegetated areas such as lilydale topping, gravel and permeable pathways.
Taps in courtyards and balcony	Taps have been provided on the ground floor plan as well as the landscape plan to encourage the growth of plants in the backyards.
Food production	Each courtyard accommodates at least 1m2 of space for food production. Raised garden beds provided in the backyards that are at least 300mm high.

Appendix

- BESS Assessment
- STORM Report
  - Melbourne Water WSUD Maintenance Guidelines (pages 40-45)
- NatHERS Assessments
  - Unit 1
  - Unit 2
  - Unit 3
- Moreland Zero Carbon Development Guidelines
  - Solar Photovoltaic Systems
  - Electric Vehicle Infrastructure

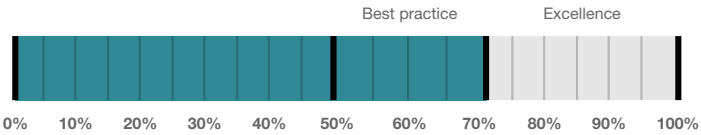
BESS Report

Built Environment Sustainability Scorecard

This BESS report outlines the sustainable design commitments of the proposed development at [redacted] Pascoe Vale VIC 3044. The BESS report and accompanying documents and evidence are submitted in response to the requirement for a Sustainable Design Assessment or Sustainability Management Plan at Moreland City Council.

Note that where a Sustainability Management Plan is required, the BESS report must be accompanied by a report that further demonstrates the development's potential to achieve the relevant environmental performance outcomes and documents the means by which the performance outcomes can be achieved.

Your BESS Score

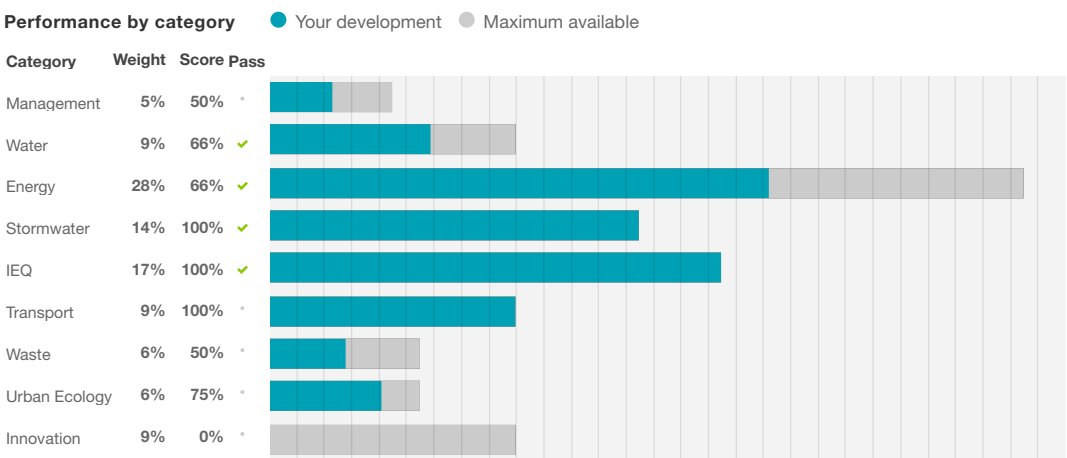


72%

Project details

Address	[redacted] Pascoe Vale VIC 3044
Project no	21B44174-R1
BESS Version	BESS-6
Site type	Multi dwelling (dual occupancy, townhouse, villa unit etc)
Account	
Application no.	
Site area	696.00 m²
Building floor area	321.10 m²
Date	20 June 2022
Software version	1.7.0-B.386

Performance by category



Dwellings & Non Res Spaces

Dwellings

Name	Quantity	Area	% of total area
Townhouse			
Townhouse 1	1	138 m^2	43%
Townhouse 2	1	106 m^2	32%
Townhouse 3	1	77.2 m^2	24%
Total	**3**	**321 m^2**	**100%**

Supporting information

Floorplans & elevation notes

Credit	Requirement	Response	Status
Water 3.1	Water efficient garden annotated		-
Energy 3.3	External lighting sensors annotated		-
Energy 4.5	Floor plans showing location of photovoltaic panels as described.		-
Stormwater 1.1	Location of any stormwater management systems used in STORM or MUSIC modelling (e.g. Rainwater tanks, raingarden, buffer strips)		-
IEQ 2.2	Dwellings meeting the requirements for having 'natural cross flow ventilation'		-
IEQ 3.1	Glazing specification to be annotated		-
IEQ 3.2	Adjustable shading systems		-
IEQ 3.3	North-facing living areas		-
Transport 1.1	All nominated residential bicycle parking spaces		-
Transport 2.1	Location of electric vehicle charging infrastructure		-
Waste 2.1	Location of food and garden waste facilities		-
Urban Ecology 2.1	Vegetated areas		-
Urban Ecology 2.4	Taps and floor waste on balconies / courtyards		-
Urban Ecology 3.1	Food production areas		-

Supporting evidence

Credit	Requirement	Response	Status
Management 2.2	Preliminary NatHERS assessments		-
Energy 3.5	Provide a written description of the average lighting power density to be installed in the development and specify the lighting type(s) to be used.		-
Energy 4.5	Specifications of the solar photovoltaic system(s).		-
Stormwater 1.1	STORM report or MUSIC model		-
IEQ 2.2	A list of dwellings with natural cross flow ventilation		-
IEQ 3.1	Reference to floor plans or energy modelling showing the glazing specification (U-value and Solar Heat Gain Coefficient, SHGC)		-
IEQ 3.2	Reference to floor plans and elevations showing shading devices		-
IEQ 3.3	Reference to the floor plans showing living areas orientated to the north.		-

Credit summary

Management Overall contribution 4.5%

50%

1.1 Pre-Application Meeting	0%	
2.2 Thermal Performance Modelling - Multi-Dwelling Residential	100%	
4.1 Building Users Guide	100%	

Water Overall contribution 9.0%

Minimum required 50% | 66% | ✔ Pass

1.1 Potable water use reduction	60%	
3.1 Water Efficient Landscaping	100%	

Energy Overall contribution 27.5%

Minimum required 50% | 66% | ✔ Pass

1.2 Thermal Performance Rating - Residential	50%	
2.1 Greenhouse Gas Emissions	100%	
2.2 Peak Demand	0%	
2.3 Electricity Consumption	100%	
2.4 Gas Consumption	N/A	Scoped Out
		No gas connection in use
2.5 Wood Consumption	N/A	Scoped Out
		No wood heating system present
3.2 Hot Water	100%	
3.3 External Lighting	100%	
3.4 Clothes Drying	0%	
3.5 Internal Lighting - Residential Single Dwelling	100%	
4.4 Renewable Energy Systems - Other	N/A	Disabled
		No other (non-solar PV) renewable energy is in use.
4.5 Solar PV - Houses and Townhouses	100%	

Stormwater Overall contribution 13.5%

Minimum required 100% | 100% | ✔ Pass

1.1 Stormwater Treatment	100%

IEQ Overall contribution 16.5%

	Minimum required 50%	100%	Pass
2.2 Cross Flow Ventilation		100%	
3.1 Thermal comfort - Double Glazing		100%	
3.2 Thermal Comfort - External Shading		100%	
3.3 Thermal Comfort - Orientation		100%	

Transport Overall contribution 9.0%

		100%
1.1 Bicycle Parking - Residential	100%	
1.2 Bicycle Parking - Residential Visitor	N/A	Scoped Out
		Not enough dwellings.
2.1 Electric Vehicle Infrastructure	100%	

Waste Overall contribution 5.5%

		50%
1.1 - Construction Waste - Building Re-Use	0%	
2.1 - Operational Waste - Food & Garden Waste	100%	

Urban Ecology Overall contribution 5.5%

		75%
2.1 Vegetation	100%	
2.2 Green Roofs	0%	
2.3 Green Walls and Facades	0%	
2.4 Private Open Space - Balcony / Courtyard Ecology	100%	
3.1 Food Production - Residential	100%	

Innovation Overall contribution 9.0%

		0%
1.1 Innovation	0%	

Credit breakdown

Management Overall contribution 2%

1.1 Pre-Application Meeting	0%
Score Contribution	This credit contributes 50.0% towards the category score.
Criteria	Has an ESD professional been engaged to provide sustainability advice from schematic design to construction? AND Has the ESD professional been involved in a pre-application meeting with Council?
Question	Criteria Achieved ?
Project	No
2.2 Thermal Performance Modelling - Multi-Dwelling Residential	100%
Score Contribution	This credit contributes 33.3% towards the category score.
Criteria	Have preliminary NatHERS ratings been undertaken for all thermally unique dwellings?
Annotation	NatHERS assessments have been provided for all three dwellings. See preliminary NatHERS assessment at the end of this report
Question	Criteria Achieved ?
Townhouse	Yes
4.1 Building Users Guide	100%
Score Contribution	This credit contributes 16.7% towards the category score.
Criteria	Will a building users guide be produced and issued to occupants?
Annotation	Yes The Building User Guide will contain the following information. - Porous paving maintenance manual - Raingarden maintenance manual - Rainwater tank maintenance manual. - Waste reduction and opportunities for recycling and diversion - How to make use of natural ventilation - How and when to operate adjustable shading devices - Efficient use of appliances - Electrical infrastructure that is available for the future installation of a car charger See Council's 'Sample Building User Guide' https://www.moreland.vic.gov.au/building-and-business/planning-and-building/planning/environmentally-sustainable-design/#autoAnchor0, Sustainability Management Plan, ESD - SAMPLE-Building Users Guide – BUG.')
Question	Criteria Achieved ?
Project	Yes

Water Overall contribution 6% Minimum required 50%

Water Approach	
What approach do you want to use for Water?:	Use the built in calculation tools

Project Water Profile Question	
Do you have a reticulated third pipe or an on-site water recycling system?:	No
Are you installing a swimming pool?:	No
Are you installing a rainwater tank?:	Yes

Water fixtures, fittings and connections	
Showerhead: All	4 Star WELS (>= 4.5 but <= 6.0)
Bath:	
Townhouse 1 Townhouse 2	Medium Sized Contemporary Bath
Townhouse 3	Scope out
Kitchen Taps: All	>= 5 Star WELS rating
Bathroom Taps: All	>= 5 Star WELS rating
Dishwashers: All	>= 3 Star WELS rating
WC: All	>= 4 Star WELS rating
Urinals: All	Scope out
Washing Machine Water Efficiency: All	Occupant to Install
Which non-potable water source is the dwelling/space connected to?:	
Townhouse 1	RWT 1
Townhouse 2	RWT 2
Townhouse 3	RWT 3
Non-potable water source connected to Toilets: All	Yes
Non-potable water source connected to Laundry (washing machine): All	Yes
Non-potable water source connected to Hot Water System: All No	

Rainwater Tanks	
What is the total roof area connected to the rainwater tank?:	
RWT 1	68.4 m²
RWT 2	59.3 m²
RWT 3	113 m²
Tank Size:	
RWT 1	3,000 Litres
RWT 2	3,000 Litres
RWT 3	2,000 Litres
Irrigation area connected to tank:	
RWT 1	6.6 m²
RWT 2	12.5 m²
RWT 3	14.9 m²

Is connected irrigation area a water efficient garden?:	
RWT 1	Yes
RWT 2	Yes
RWT 3	Yes
Other external water demand connected to tank?:	
RWT 1	-
RWT 2	-
RWT 3	-

1.1 Potable water use reduction	60%
Score Contribution	This credit contributes 83.3% towards the category score.
Criteria	What is the reduction in total potable water use due to efficient fixtures, appliances, rainwater use and recycled water use? To achieve points in this credit there must be >25% potable water reduction.
Output	Reference
Project	500 kL
Output	Proposed (excluding rainwater and recycled water use)
Project	394 kL
Output	Proposed (including rainwater and recycled water use)
Project	288 kL
Output	% Reduction in Potable Water Consumption
Project	42 %
Output	% of connected demand met by rainwater
Project	76 %
Output	How often does the tank overflow?
Project	Very Often
Output	Opportunity for additional rainwater connection
Project	94 kL

3.1 Water Efficient Landscaping	100%
Score Contribution	This credit contributes 16.7% towards the category score.
Criteria	Will water efficient landscaping be installed?
Annotation	A drip irrigation system connected to Rainwater Tanks with programable timers and rain sensors is to be installed as noted in the Landscape Plan. Drought tolerant plants are specified on the Landscape Plan.
Question	Criteria Achieved ?
Project	Yes

Energy Overall contribution 18% Minimum required 50%

Dwellings Energy Approach	
What approach do you want to use for Energy?:	Use the built in calculation tools
Project Energy Profile Question	
Are you installing any solar photovoltaic (PV) system(s)?:	Yes
Are you installing any other renewable energy system(s)?:	No
Gas supplied into building:	No gas connection
Dwelling Energy Profiles	
Below the floor is: All	Ground or Carpark
Above the ceiling is: All	Outside
Exposed sides:	
Townhouse 1 Townhouse 3	3
Townhouse 2	2
NatHERS Annual Energy Loads - Heat:	
Townhouse 1	90.9 MJ/sqm
Townhouse 2	90.5 MJ/sqm
Townhouse 3	89.3 MJ/sqm
NatHERS Annual Energy Loads - Cool:	
Townhouse 1	8.7 MJ/sqm
Townhouse 2	9.4 MJ/sqm
Townhouse 3	6.9 MJ/sqm
NatHERS star rating:	
Townhouse 1 Townhouse 2	7.0
Townhouse 3	7.1
Type of Heating System: All	D Reverse cycle space
Heating System Efficiency: All	4 Star
Type of Cooling System: All	Refrigerative space
Cooling System Efficiency: All	4 Stars
Type of Hot Water System: All	C Electric Heat Pump
% Contribution from solar hot water system: All	-
Is the hot water system shared by multiple dwellings?: All	No
Clothes Line: All	D Private outdoor clothesline
Clothes Dryer: All	A No clothes dryer
Solar Photovoltaic systems	
System Size (lesser of inverter and panel capacity):	
Dwelling 1	4.4 kW peak
Dwelling 1	1.0 kW peak
Dwelling 2	3.1 kW peak
Dwelling 2	1.0 kW peak
Dwelling 3	0.7 kW peak
Dwelling 3	2.4 kW peak

Orientation (which way is the system facing)?:	
Dwelling 1	North
Dwelling 1	West
Dwelling 2	North
Dwelling 2	West
Dwelling 3	North
Dwelling 3	West
Inclination (angle from horizontal):	
Dwelling 1	22.5 Angle (degrees)
Dwelling 1	22.5 Angle (degrees)
Dwelling 2	22.5 Angle (degrees)
Dwelling 2	22.5 Angle (degrees)
Dwelling 3	22.5 Angle (degrees)
Dwelling 3	22.5 Angle (degrees)

1.2 Thermal Performance Rating - Residential	50%
Score Contribution	This credit contributes 33.3% towards the category score.
Criteria	What is the average NatHERS rating?
Annotation	Minimum 7.0 stars NATHERS Rating has been achieved
Output	Average NATHERS Rating (Weighted)
Townhouse	7.0 Stars

2.1 Greenhouse Gas Emissions	100%
Score Contribution	This credit contributes 11.1% towards the category score.
Criteria	What is the % reduction in annual greenhouse gas emissions against the benchmark?
Output	Reference Building with Reference Services (BCA only)
Townhouse	28,582 kg CO2
Output	Proposed Building with Proposed Services (Actual Building)
Townhouse	6,139 kg CO2
Output	% Reduction in GHG Emissions
Townhouse	78 %

2.2 Peak Demand	0%
Score Contribution	This credit contributes 5.6% towards the category score.
Criteria	What is the % reduction in the instantaneous (peak-hour) demand against the benchmark?
Output	Peak Thermal Cooling Load - Baseline
Townhouse	33.8 kW
Output	Peak Thermal Cooling Load - Proposed
Townhouse	32.4 kW
Output	Peak Thermal Cooling Load - % Reduction
Townhouse	4 %

2.3 Electricity Consumption		100%	
Score Contribution	This credit contributes 11.1% towards the category score.		
Criteria	What is the % reduction in annual electricity consumption against the benchmark?		
Output	Reference		
Townhouse	28,022 kWh		
Output	Proposed		
Townhouse	6,018 kWh		
Output	Improvement		
Townhouse	78 %		
2.4 Gas Consumption		N/A	Scoped Out
This credit was scoped out	No gas connection in use		
2.5 Wood Consumption		N/A	Scoped Out
This credit was scoped out	No wood heating system present		
3.2 Hot Water		100%	
Score Contribution	This credit contributes 5.6% towards the category score.		
Criteria	What is the % reduction in annual energy consumption (gas and electricity) of the hot water system against the benchmark?		
Output	Reference		
Townhouse	10,179 kWh		
Output	Proposed		
Townhouse	2,874 kWh		
Output	Improvement		
Townhouse	71 %		
3.3 External Lighting		100%	
Score Contribution	This credit contributes 5.6% towards the category score.		
Criteria	Is the external lighting controlled by a motion detector?		
Annotation	External lighting sensors have been shown on the ground floor plan.		
Question	Criteria Achieved ?		
Townhouse	Yes		
3.4 Clothes Drying		0%	
Score Contribution	This credit contributes 5.6% towards the category score.		
Criteria	What is the % reduction in annual energy consumption (gas and electricity) from a combination of clothes lines and efficient driers against the benchmark?		

3.5 Internal Lighting - Residential Single Dwelling		100%	
Score Contribution	This credit contributes 5.6% towards the category score.		
Criteria	Does the development achieve a maximum illumination power density of 4W/sqm or less?		
Annotation	Lighting throughout the habitable rooms will be through the use of LED downlights as specified on the NatHERs assessment. All other lighting will be energy efficient fluorescent lighting.		
Question	Criteria Achieved?		
Townhouse	Yes		
4.4 Renewable Energy Systems - Other		N/A	⊘ Disabled
This credit is disabled	No other (non-solar PV) renewable energy is in use.		
4.5 Solar PV - Houses and Townhouses		100%	
Score Contribution	This credit contributes 11.1% towards the category score.		
Criteria	What % of the estimated energy consumption of the building class it supplies does the solar power system provide?		
Output	Solar Power - Energy Generation per year		
Townhouse	15,455 kWh		
Output	% of Building's Energy		
Townhouse	256 %		

Stormwater

Overall contribution 14% Minimum required 100%

Which stormwater modelling are you using?:	Melbourne Water STORM tool
1.1 Stormwater Treatment	100%
Score Contribution	This credit contributes 100.0% towards the category score.
Criteria	Has best practice stormwater management been demonstrated?
Annotation	Rainwater Tanks Each dwelling will be provided with either a 2000-3000 litre rainwater tank that will be used for rainwater harvesting for toilets, washing machine and the irrigation of garden beds in each of the backyards. Connection of the rainwater tank to the washing machine increases the efficiency of the rainwater harvesting, therefore an extra bedroom has been included in the STORM report for each of the dwellings to reflect this increased efficiency. The total catchment area directed to the rainwater tanks is 234.7m2 which will be through charged systems with the overflow connected to the legal point of discharge. Planter Box Raingardens Two above-ground raingardens have been provided within the development along the common driveway to pick up the roof catchment that falls on the opposite side of the rainwater tank. The raingarden is to be located 300mm away from the footing of the adjacent building. A total of 62.7m2 of roof catchment will be directed to the raingardens. Untreated roof Where the roof catchment area falls to the opposite side of where the rainwater tank is located, the downpipes are to be gravity fed to the legal point of discharge through the retention system. Concrete driveway Half of the common driveway will be concrete which will remain untreated. It will be graded to fall to the engineer designed retention system. Permeable surface The front portion of the common driveway will be trafficable permeable concrete. The secluded private open spaces for all dwellings will have permeable surfaces. Portions of the POS will be lawn, permeable pavers, ground cover, lilydale topping or mulch within the garden beds. All finished surfaces have been identified on the plans.
Question	STORM score achieved
Project	100
Output	Min STORM Score
Project	100

IEQ Overall contribution 16% Minimum required 50%

2.2 Cross Flow Ventilation	100%
Score Contribution	This credit contributes 20.0% towards the category score.
Criteria	Are all habitable rooms designed to achieve natural cross flow ventilation?
Annotation	All habitable rooms have an opening equivalent to at least 2% of the floor area, with a cross path of less than 15m between one habitable room to another passing through one door only.
Question	Criteria Achieved ?
Townhouse	Yes

3.1 Thermal comfort - Double Glazing	100%
Score Contribution	This credit contributes 40.0% towards the category score.
Criteria	Is double glazing (or better) used to all habitable areas?
Annotation	Double glazing will be provided to all habitable room windows as per the NatHERS assessments which has been identified in the plans and elevations.
Question	Criteria Achieved ?
Townhouse	Yes

3.2 Thermal Comfort - External Shading	100%
Score Contribution	This credit contributes 20.0% towards the category score.
Criteria	Is appropriate external shading provided to east, west and north facing glazing?
Annotation	Shading devices have been provided to all north, west and east facing windows. The type of shading device proposed has been indicated on the plans along with a diagram of the shading device.
Question	Criteria Achieved ?
Townhouse	Yes

3.3 Thermal Comfort - Orientation	100%
Score Contribution	This credit contributes 20.0% towards the category score.
Criteria	Are at least 50% of living areas orientated to the north?
Annotation	At least 50% of living areas are orientated to the north.
Question	Criteria Achieved ?
Townhouse	Yes

Transport Overall contribution 9%

1.1 Bicycle Parking - Residential	100%
Score Contribution	This credit contributes 50.0% towards the category score.
Criteria	How many secure and undercover bicycle spaces are there per dwelling for residents?
Annotation	Bike racks are located at the back of the garages or a dedicated space has been allocated outside the “Clearance to car parking” as detailed in Clause 52.06
Question	Bicycle Spaces Provided ?
Townhouse	3
Output	Min Bicycle Spaces Required
Townhouse	3

1.2 Bicycle Parking - Residential Visitor	N/A Scoped Out
This credit was scoped out	Not enough dwellings.

2.1 Electric Vehicle Infrastructure	100%
Score Contribution	This credit contributes 50.0% towards the category score.
Criteria	Are facilities provided for the charging of electric vehicles?
Annotation	Each dwelling is to include: • Infrastructure and cabling to each garage or carport that can support Level 2 (Mode 3) 32 Amp EV car charging. * • Load management systems that ensure that: - EV charging occurs outside of peak electricity demand hours; and - The EV infrastructure does not adversely impact the site’s maximum demand. * The inclusion of an EV charger unit (Active EV Charging) is not expected.
Question	Criteria Achieved ?
Project	Yes

Waste Overall contribution 3%

1.1 - Construction Waste - Building Re-Use	0%
Score Contribution	This credit contributes 50.0% towards the category score.
Criteria	If the development is on a site that has been previously developed, has at least 30% of the existing building been re-used?
Question	Criteria Achieved ?
Project	No

2.1 - Operational Waste - Food & Garden Waste	100%
Score Contribution	This credit contributes 50.0% towards the category score.
Criteria	Are facilities provided for on-site management of food and garden waste?
Annotation	Each dwelling has an area dedicated to accommodate the following bins x1 - 80 litre bin for Garbage x1 - 120 litre bin for FOGO (food organic and garden organic) x1 - 120 litre bin for Glass x1 - 240 litre bin for Recycling
Question	Criteria Achieved ?
Project	Yes

Urban Ecology Overall contribution 4%

2.1 Vegetation	100%
Score Contribution	This credit contributes 50.0% towards the category score.
Criteria	How much of the site is covered with vegetation, expressed as a percentage of the total site area?
Annotation	Area covered with vegetation such as lawn, canopy cover, garden beds and ground cover is 31% of the site and is shown on the Vegetated Area Plan. It excludes permeable non-vegetated areas such as lilydale topping, gravel and permeable pathways.
Question	Percentage Achieved ?
Project	31 %

2.2 Green Roofs	0%
Score Contribution	This credit contributes 12.5% towards the category score.
Criteria	Does the development incorporate a green roof?
Question	Criteria Achieved ?
Project	No

2.3 Green Walls and Facades	0%
Score Contribution	This credit contributes 12.5% towards the category score.
Criteria	Does the development incorporate a green wall or green façade?
Question	Criteria Achieved ?
Project	No

2.4 Private Open Space - Balcony / Courtyard Ecology	100%
Score Contribution	This credit contributes 12.5% towards the category score.
Criteria	Is there a tap and floor waste on every balcony / in every courtyard?
Annotation	Taps have been provided on the ground floor plan as well as the landscape plan to encourage the growth of plants in the backyards.
Question	Criteria Achieved ?
Townhouse	Yes

3.1 Food Production - Residential	100%
Score Contribution	This credit contributes 12.5% towards the category score.
Criteria	What area of space per resident is dedicated to food production?
Annotation	Each courtyard accommodates at least 1m2 of space for food production. Raised garden beds provided in the backyards that are at least 300mm high.
Question	Food Production Area
Townhouse	3.0 m^2
Output	Min Food Production Area
Townhouse	2 m^2

Innovation Overall contribution 0%

1.1 Innovation		0%
Score Contribution	This credit contributes 100.0% towards the category score.	
Criteria	What percentage of the Innovation points have been claimed (10 points maximum)?	

Disclaimer

The Built Environment Sustainability Scorecard (BESS) has been provided for the purpose of information and communication. While we make every effort to ensure that material is accurate and up to date (except where denoted as 'archival'), this material does in no way constitute the provision of professional or specific advice. You should seek appropriate, independent, professional advice before acting on any of the areas covered by BESS.

The Municipal Association of Victoria (MAV) and CASBE (Council Alliance for a Sustainable Built Environment) member councils do not guarantee, and accept no legal liability whatsoever arising from or connected to, the accuracy, reliability, currency or completeness of BESS, any material contained on this website or any linked sites

STORM Rating Report

TransactionID: 1395028
Municipality: MORELAND
Rainfall Station: MORELAND
Address:

Pascoe Vale
VIC 3044
Assessor: Akay Architects
Development Type: Residential - Multiunit
Allotment Site (m2): 696.00
STORM Rating %: 100

Description	Impervious Area (m2)	Treatment Type	Treatment Area/Volume (m2 or L)	Occupants / Number Of Bedrooms	Treatment %	Tank Water Supply Reliability (%)
Unit 1 to RWT1	68.40	Rainwater Tank	3,000.00	4	170.00	82.00
Unit 2 to RWT2	53.00	Rainwater Tank	3,000.00	3	170.00	82.00
Unit 3 to RWT3	113.30	Rainwater Tank	2,000.00	3	114.00	89.30
Unit 1 to RG1	34.60	Raingarden 100mm	1.00	0	131.15	0.00
Unit 2 to RG2	28.10	Raingarden 100mm	1.00	0	132.00	0.00
Unit 1 untreated roof	15.70	None	0.00	0	0.00	0.00
Unit 2 untreated roof	13.50	None	0.00	0	0.00	0.00
Concrete driveway	93.50	None	0.00	0	0.00	0.00

Date Generated: 20-Jun-2022 Program Version: 1.0.0

5 Permeable pavements

Permeable pavements allow stormwater runoff to infiltrate to underlying soils rather than running off hard surfaces and into the stormwater drainage system. Permeable pavements are used for a wide range of purposes including:

- Reducing stormwater runoff volumes
- Reducing sediment and pollutant loads discharged to local waterways
- Enhancing groundwater recharge
- Retarding stormwater runoff (where underdrains are present)
- Water harvesting and re-use.

Two types of permeable pavement are commonly used to infiltrate stormwater runoff (refer Figure 14).

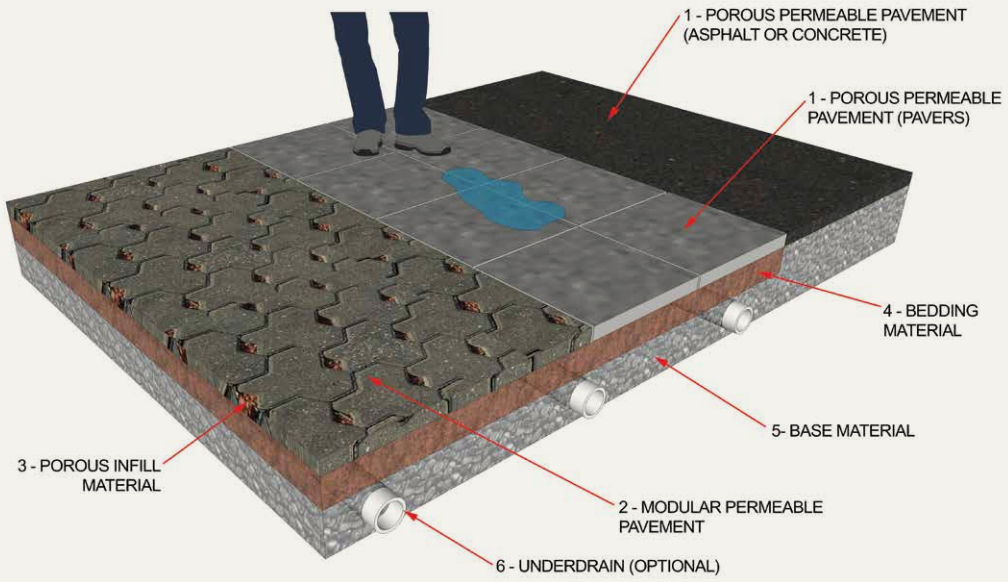
1. **Porous permeable pavement –** comprises permeable asphalt or concrete surfaces, or pervious modular pavers that allow water to pass through the paving surface into the subsurface layers.
2. **Modular permeable pavement –** comprises of non-permeable interlocking pavers with gaps present between each paver that allow water to infiltrate into subsurface layers.

The other key elements of permeable pavement systems include:

3. **Porous infill material –** comprises of permeable material (usually fine sand or gravel) that facilitates infiltration of stormwater between the pavers.
4. **Bedding material –** permeable sand or fine aggregate layer used to bed the paving material and facilitate primary infiltration.
5. **Base material –** aggregate layer that functions both as a support base, filter layer and water storage (by acting as a temporary detention volume).
6. **Underdrain (optional) –** present under some permeable pavements, usually consists of a porous drainage pipe surrounded by coarse aggregate. Functions to convey infiltrated stormwater away from the site.

Note: The variation in design of permeable pavement systems makes it challenging to provide standard maintenance guidelines. It is recommended that manufacturer maintenance guidelines are adhered to.

Figure 14 Cross-section of porous permeable pavement and modular permeable pavement showing the main elements for maintenance



5.1 PERMEABLE PAVING SURFACE

The most important maintenance issue concerning permeable pavements is clogging of the surface due to sediment build-up. Clogging of permeable pavements can reduce infiltration rates and results in increased stormwater runoff.

Whilst permeable pavements can trap up to 90% of total suspended solids (particulates), particulates gradually accumulate over time in the pavement (or between the pavers), and consequently, the permeable pavement slowly clogs.

Porous permeable pavements are particularly susceptible to blockage, as fine sediment fills pore spaces and reduces the ability for water to travel through the pavers.

Porous permeable pavements need to be periodically swept (manually or with a wet vacuum) or pressure hosed to prevent clogging.

Modular paving systems generally use a porous infill material between the pavers to facilitate infiltration. The infill material may be prone to clogging, particularly where fine sediment/clay material is present in the stormwater runoff. Severe clogging of the infill material may require it to be replaced.

Inspection and maintenance activities include:

- Checking for sediment accumulation
- Removing sediment
- Monitoring ponding of water following rainfall events
- Sweeping, wet vacuuming or pressure hosing of the surface of the pavers to remove clogging material
- Checking that the infill material is present between pavers.

5.2 BEDDING MATERIAL LEVELS

The sub-grade materials used largely determine whether pavers remain level. Uneven pavement surfaces may result in variable infiltration rates across the permeable pavement surface, and potential diversion of stormwater flows away from the pavement surface. If the pavement surface is uneven, the sub-grade material may need to be re-graded and the pavers re-laid (rectification).

Inspection and maintenance activities include:

- Checking level of the pavement surface.

5.3 UNDERDRAIN

Some permeable pavements may be designed with underdrains. Underdrains are slotted pipes that run underneath the permeable pavements and convey infiltrated stormwater from the site.

The underdrain (where fitted) can be flushed in a similar way to the inspection opening on a raingarden. This will remove any sediment or debris which may cause the system to clog.

Inspection and maintenance activities include:

- Checking for sediment accumulation (via inspection openings – where provided)
- Flushing of the underdrain to remove sediment.

5.4 INSPECTION AND MAINTENANCE SCHEDULE

This is an example schedule to guide the timing of your inspection and maintenance activities. This schedule outlines the average service the assets require, but you can adjust these timings to suit your assets. This schedule and the "Inspection and Maintenance form" (see over page) have been designed to be copied and used on site.

Responsibility of assets	
Example: Regular inspections should be carried out every 3 months. The inspection and maintenance of the permeable pavement including all civil and landscape components is the responsibility of Council/contractor.	The operation and maintenance of adjacent stormwater infrastructure, pathways and road surfaces is the responsibility of Council.

Item	What to check for	Action	Frequency
Civil components – Permeable pavement			
Permeability	Pavement area is free draining (i.e. no clogging of the pavement surface). Clogging is generally evident by water ponding on the surface of the permeable paving more than 2 hours after rainfall.	Sweep or wet vacuum the surface of the pavement to remove clogging material. **Modular permeable pavements:** Note: check that infill material between pavers is intact following wet vacuuming. Replace infill material as required. If water ponding persists – remove pavers and check that the sub-layers (base material and bedding material) and underdrain are free draining. If necessary, replace the sub-layer material or flush the underdrain system using low pressure water jet to remove accumulated sediment. **Permanent permeable pavements:** If water ponding persists – the pavement surface or sub-layers (base material and bedding material) may need to be replaced.	Storm events 3 months
Pavement surface	No uneven paver surface (i.e. pavement surface lifting and rutting). No physical damage to the pavement surface – look for cracks and holes.	The surface of pavement may need to reset. **Modular permeable pavements:** May require removing the pavers and re-grading the sub-layers (base material and bedding material). **Permanent permeable pavements:** The pavement surface or sub-layers (base material and bedding material) may need to be replaced. Rutting or vehicular damage to pavement surface may require management of vehicles accessing the site.	Annually
Infill material (modular permeable pavements)	Infill material is present between pavers. No scour occurring.	Replace infill material. Re-sow turf if required.	3 months
Landscape components – Permeable pavement			
Weeds (modular permeable pavements)	Less than 10% of infill surface area (where present) covered by weeds.	Remove weeds from infill surface area.	3 months

5.5 INSPECTION AND MAINTENANCE FORM

This form should be used during inspection and maintenance, as it provides a checklist of the key inspection elements and a permanent record of the maintenance activities undertaken.

This form should be submitted to the asset manager following every inspection and maintenance event, so that any persistent problems or issues requiring further investigation can be identified and responded to.

Permeable pavements inspection and maintenance form			
Asset ID			
Location			
Inspection officer's name			
Date		**Date of last rainfall**	
Photos of site (explanatory notes) **1.** **2.** **3.** **4.** **5.**			
General comments, sketches, description of maintenance undertaken			

Item	What to check for	Inspected	Maintenance undertaken	Further action required or comment
Civil components – Permeable pavement				
Permeability	Pavement area is free draining (i.e. no clogging of the pavement surface). Clogging is generally evident by water ponding on the surface of the permeable paving more than 2 hours after rainfall.			
Pavement surface	No uneven paver surface (i.e. pavement surface lifting and rutting). No physical damage to the pavement surface – look for cracks and holes.			
Infill material	Infill material is present between pavers. No scour occurring.			
Landscape components – Permeable pavement				
Weeds	Less than 10% of infill surface area (where present) covered by weeds.			

Nationwide House Energy Rating Scheme
NatHERS Certificate No. 9P9CSDGH6D

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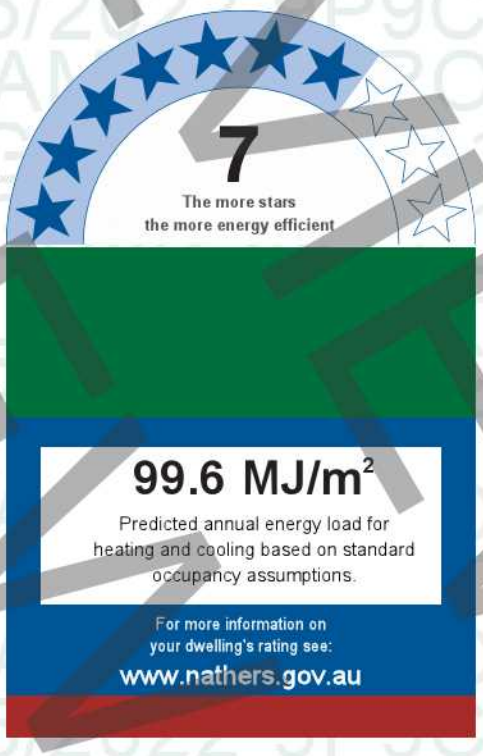

Property

Address	1, Dwelling 1, Example Project, Pascoe Vale, VIC, 3044
Lot/DP	-
NCC Class*	Class 1a
Type	New Home

Plans

Main plan	24/05/2022
Prepared by	Akay Architects- Revision A

Construction and environment

Assessed floor area (m²)*	
Conditioned*	107.8
Unconditioned*	45.9
Total	153.7
Garage	34.9

Exposure type
suburban

NatHERS climate zone
60 Tullamarine

Thermal performance

Heating	Cooling
90.9 MJ/m²	8.7 MJ/m²

About the rating
NatHERS software models the expected thermal energy loads using information about the design and construction, climate and common patterns of household use. The software does not take into account appliances, apart from the airflow impacts from ceiling fans.

Accredited assessor

Name	Berna Akay
Business name	Akay Architects
Email	info@akayarchitects.com.au
Phone	0393065539
Accreditation No.	DMN/10/0065
Assessor Accrediting Organisation	Design Matters National
Declaration of interest	Declared, refer to "Additional Notes" on page 2

Verification

To verify this certificate, scan the QR code or visit When using either link, ensure you are visiting www.FR5.com.au.

National Construction Code (NCC) requirements

The NCC's requirements for NatHERS-rated houses are detailed in 3.12.0(a)(i) and 3.12.5 of the NCC Volume Two. For apartments the requirements are detailed in J0.2 and J5 to J8 of the NCC Volume One.

In NCC 2019, these requirements include minimum star ratings and separate heating and cooling load limits that need to be met by buildings and apartments through the NatHERS assessment. Requirements additional to the NatHERS assessment that must also be satisfied include, but are not limited to: insulation installation methods, thermal breaks, building sealing, water heating and pumping, and artificial lighting requirements. The NCC and NatHERS Heating and Cooling Load Limits (Australian Building Codes Board Standard) are available at www.abcb.gov.au.

State and territory variations and additions to the NCC may also apply.

Certificate Check

Ensure the dwelling is designed and then built as per the NatHERS Certificate. While you need to check the accuracy of the whole Certificate, the following spot check covers some important items impacting the dwelling's rating.

Genuine certificate

Does this Certificate match the one available at the web address or QR code in the verification box on the front page? Does the set of NatHERS-stamped plans for the dwelling have a Certificate number on the stamp that matches this Certificate?

Ceiling penetrations*

Does the 'number' and 'type' of ceiling penetrations (e.g. downlights, exhaust fans, etc) shown on the stamped plans or installed, match what is shown in this Certificate?

Windows

Does the installed window meet the substitution tolerances (SHGC and U-value) and window type, of the window shown on this Certificate? Substituted values must be based on the Australian Fenestration Rating Council (AFRC) protocol.

Apartment entrance doors

Does the 'External Door Schedule' show apartment entrance doors? Please note that an "external door" between the modelled dwelling and a shared space, such as an enclosed corridor or foyer, should not be included in the assessment (because it overstates the possible ventilation) and would invalidate the Certificate.

Exposure*

Has the appropriate exposure level (terrain) been applied? For example, it is unlikely that a ground-floor apartment is "exposed" or a top floor high-rise apartment is "protected".

Provisional* values

Have provisional values been used in the assessment and, if so, noted in "additional notes" below?

Additional Notes

External Walls

- Brick veneer walls with R2.7 insulation (with light colour walls)
- Weathertex (light colour) with R2.5 insulation with vapour permeable sarking behind a 20mm ventilation cavity

Roof Type

- Custom orb (with light colour roof)
- Ceiling insulation with R7.0 insulation with perimetre of ceiling consisting R2.5 insulation
- Flat roof with R2.5 insulation (for Dwelling 2)

Floor Type

- Waffle pod construction
- R2.5 floor insulation to first floor

Windows

- uPVC window frames
- Double glazing argon filled windows for all habitable room windows as per window schedule
- Shading devices as per town planning drawings

Light

- LED downlights as shown on the plans with a maximum Illumination Power Density of less than 4watt/m2 for living spaces
- Energy efficient fluorescent lighting for all bedrooms and non-habitable rooms

Window and glazed door *type and performance*

Default* windows

Window ID	Window description	Maximum U-value*	SHGC*	Substitution tolerance ranges	
				SHGC lower limit	SHGC upper limit
PVC-006-01 W	uPVC B DG Argon Fill Clear-Clear	2.6	0.53	0.5	0.56
PVC-005-01 W	uPVC A DG Argon Fill Clear-Clear	2.6	0.5	0.48	0.53

Custom* windows

Window ID	Window description	Maximum U-value*	SHGC*	Substitution tolerance ranges	
				SHGC lower limit	SHGC upper limit
No Data Available					

Window and glazed door *Schedule*

Location	Window ID	Window no.	Height (mm)	Width (mm)	Window type	Opening %	Orientation	Window shading device*
Open Plan	PVC-006-01 W	W6	600	3250	sliding	50.0	S	No
Open Plan	PVC-006-01 W	W1	1120	1810	sliding	90.0	E	Yes
Open Plan	PVC-006-01 W	W2	2150	370	fixed	0.0	E	No
Open Plan	PVC-006-01 W	W5	2150	3010	sliding	33.0	N	Yes
Kitchen	PVC-006-01 W	W3	1120	1810	sliding	90.0	E	Yes
wc	PVC-005-01 W	W4	600	600	awning	90.0	E	No
Bedroom 1	PVC-005-01 W	W12	1200	2100	awning	10.0	N	No
WIR	PVC-005-01 W	W13	950	750	awning	10.0	S	No
Ensuite	PVC-005-01 W	W14	600	750	awning	90.0	S	No
Stairs	PVC-005-01 W	W11	600	2100	awning	10.0	N	No
Bath	PVC-005-01 W	W15	850	1200	awning	90.0	S	No
Bedroom 3	PVC-005-01 W	W16	400	1800	awning	90.0	S	No
Bedroom 3	PVC-005-01 W	W8	1200	1800	awning	10.0	E	Yes
Bedroom 2	PVC-005-01 W	W9	1200	2100	awning	10.0	E	Yes
Bedroom 2	PVC-005-01 W	W10	400	1800	awning	90.0	N	No

Roof window *type and performance value*

Default* roof windows

Window ID	Window description	Maximum U-value*	SHGC*	Substitution tolerance ranges	
				SHGC lower limit	SHGC upper limit
No Data Available					

Custom* roof windows

Window ID	Window description	Maximum U-value*	SHGC*	Substitution tolerance ranges	
				SHGC lower limit	SHGC upper limit
No Data Available					

Roof window *schedule*

* Refer to glossary.

Location	Window ID	Window no.	Opening %	Area (m²)	Orientation	Outdoor shade	Indoor shade
No Data Available							

Skylight *type and performance*

Skylight ID	Skylight description
No Data Available	

Skylight *schedule*

Location	Skylight ID	Skylight No.	Skylight shaft length (mm)	Area (m²)	Orient-ation	Outdoor shade	Diffuser	Skylight shaft reflectance
No Data Available								

External door *schedule*

Location	Height (mm)	Width (mm)	Opening %	Orientation
Garage	2150	5520	100.0	S
Garage	2150	870	100.0	N
Open Plan	2100	970	100.0	E
Ldy	2100	820	100.0	W

External wall *type*

Wall ID	Wall type	Solar absorptance	Wall shade (colour)	Bulk insulation (R-value)	Reflective wall wrap*
1	A - Double Brick	0.3	Light		No
2	A - Single Brick	0.3	Light		No
3	A - Brick Veneer partywall	0.3	Light	Glass fibre batt: R2.5 (R2.5)	No
4	A - Brick Veneer	0.3	Light	Glass fibre batt (k = 0.044 density = 12 kg/m3) (R2.7)	No
5	A - Weatherboard	0.3	Light	Glass fibre batt: R2.5 (R2.5)	No
6	FR5 - Internal Plasterboard Stud Wall	0.5	Medium		No

External wall *schedule*

Location	Wall ID	Height (mm)	Width (mm)	Orientation	Horizontal shading feature* maximum projection (mm)	Vertical shading feature (yes/no)
Garage	1	2870	6037	S	0	Yes
Garage	1	2870	1569	E	0	Yes
Garage	1	2870	5519	N	0	Yes
Garage	2	2870	1325	W	4567	Yes
Garage	3	2870	4686	W	0	No
Stairs	4	2700	1017	S	0	Yes
Open Plan	4	2700	6853	S	779	Yes
Open Plan	4	2700	2226	E	594	Yes
Open Plan	4	2700	2704	E	1791	Yes
Open Plan	4	2700	4978	N	694	Yes

* Refer to glossary.

Open Plan	4	2700	468	W	568	Yes
Kitchen	4	2700	2797	W	0	Yes
Kitchen	4	2700	236	S	2787	Yes
Kitchen	4	2700	2797	E	541	Yes
Kitchen	4	2700	491	N	541	Yes
Ldy	4	2700	1600	W	0	Yes
Ldy	4	2700	1825	N	0	No
wc	4	2700	1300	N	0	No
wc	4	2700	1600	E	566	No
Bedroom 1	5	2550	3193	W	487	Yes
Bedroom 1	5	2550	1110	E	0	Yes
Bedroom 1	5	2550	4531	N	522	Yes
WIR	5	2550	2353	W	493	Yes
WIR	5	2550	1522	S	0	No
Ensuite	5	2550	2341	S	606	No
Stairs	5	2550	4856	N	600	Yes
Stairs	5	2550	2110	S	508	No
Bath	5	2550	1859	S	512	No
Bedroom 3	5	2550	4325	S	531	No
Bedroom 3	5	2550	3242	E	530	Yes
Bedroom 2	5	2550	2687	W	636	Yes
Bedroom 2	6	2550	165	W	0	Yes
Bedroom 2	5	2550	562	S	546	Yes
Bedroom 2	5	2550	3982	E	590	No
Bedroom 2	5	2550	3550	N	503	No

Internal wall *type*

Wall ID	Wall type	Area (m²)	Bulk insulation
1	A - Internal Plasterboard Stud Wall	43.6	Glass fibre batt (k = 0.044 density = 12 kg/m3) (R2.7)
2	FR5 - Internal Plasterboard Stud Wall	67.9	

Floor *type*

Location	Construction	Area (m²)	Sub-floor ventilation	Added insulation (R-value)	Covering
Garage	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	28.3	Enclosed	R0.0	none
Garage	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	6.6	Enclosed	R0.0	none
Stairs	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	3.3	Enclosed	R0.0	Carpet
Open Plan	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	31.2	Enclosed	R0.0	Timber
Open Plan	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	4.3	Enclosed	R0.0	Timber
Kitchen	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	0.4	Enclosed	R0.0	Timber
Kitchen	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	10	Enclosed	R0.0	Timber
Ldy	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	1.5	Enclosed	R0.0	Tiles

Ldy	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	1.4	Enclosed	R0.0	Tiles
wc	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	0.9	Enclosed	R0.0	Tiles
wc	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	1.2	Enclosed	R0.0	Tiles
Bedroom 1	FR5 - Timber	9.1	Enclosed	R2.5	Carpet
Bedroom 1	FR5 - Timber	4.1	Enclosed	R2.5	Carpet
WIR	FR5 - Timber	1.7	Enclosed	R2.5	Carpet
WIR	FR5 - Timber	1.9	Enclosed	R2.5	Carpet
Ensuite	FR5 - Timber	4.2	Enclosed	R2.5	Tiles
Ensuite	FR5 - Timber	1.3	Enclosed	R2.5	Tiles
Stairs	FR5 - Timber	0.6	Enclosed	R2.5	Carpet
Stairs	FR5 - Timber	3.3	Enclosed	R2.5	Carpet
Stairs	FR5 - Timber	8.5	Enclosed	R2.5	Carpet
Stairs	FR5 - Timber	0.6	Enclosed	R2.5	Carpet
Bath	FR5 - Timber	5	Enclosed	R2.5	Tiles
Bath	FR5 - Timber	1	Enclosed	R2.5	Tiles
Bedroom 3	FR5 - Timber	11.7	Enclosed	R2.5	Carpet
Bedroom 3	FR5 - Timber	2.3	Enclosed	R2.5	Carpet
Bedroom 2	FR5 - Timber	0.3	Enclosed	R2.5	Carpet
Bedroom 2	FR5 - Timber	11.8	Enclosed	R2.5	Carpet
Bedroom 2	FR5 - Timber	2	Enclosed	R2.5	Carpet

Ceiling *type*

Location	Construction material/type	Bulk insulation R-value (may include edge batt values)	Reflective wrap*
Garage	FR5 - Timber	R2.5	No
Garage	Plasterboard	R2.5	No
Stairs	FR5 - Timber	R2.5	No
Open Plan	FR5 - Timber	R2.5	No
Open Plan	Plasterboard	R2.5	No
Kitchen	FR5 - Timber	R2.5	No
Ldy	Plasterboard	R6.0	No
Ldy	Plasterboard	R2.5	No
wc	Plasterboard	R7.0	No
wc	Plasterboard	R2.5	No
Bedroom 1	Plasterboard	R7.0	No
Bedroom 1	Plasterboard	R2.5	No
WIR	Plasterboard	R7.0	No
WIR	Plasterboard	R2.5	No
Ensuite	Plasterboard	R7.0	No
Ensuite	Plasterboard	R2.5	No
Stairs	Plasterboard	R2.5	No
Stairs	Plasterboard	R7.0	No

* Refer to glossary.

Stairs	Plasterboard	R7.0	No
Stairs	Plasterboard	R2.5	No
Bath	Plasterboard	R7.0	No
Bath	Plasterboard	R2.5	No
Bedroom 3	Plasterboard	R7.0	No
Bedroom 3	Plasterboard	R2.5	No
Bedroom 2	Plasterboard	R7.0	No
Bedroom 2	Plasterboard	R2.5	No

Ceiling *penetrations**

Location	Quantity	Type	Diameter (mm)	Sealed/unsealed
Open Plan	12	Downlights	50	Sealed
Kitchen	1	Exhaust Fans	200	Sealed
Kitchen	4	Downlights	50	Sealed
Ldy	1	Exhaust Fans	200	Sealed
Bedroom 1	4	Downlights	50	Sealed
WIR	2	Downlights	50	Sealed
Ensuite	1	Exhaust Fans	200	Sealed
Stairs	2	Downlights	50	Sealed
Bath	1	Exhaust Fans	200	Sealed
Bedroom 3	4	Downlights	50	Sealed
Bedroom 2	4	Downlights	50	Sealed

Ceiling *fans*

Location	Quantity	Diameter (mm)
No Data Available		

Roof *type*

Construction	Added insulation (R-value)	Solar absorptance	Roof shade
Cont:Attic-Continuous	0.0	0.3	Light

Explanatory Notes

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While the figures are an indicative guide to energy use, they can be used as a reliable guide for comparing different dwelling designs and to demonstrate that the design meets the energy efficiency requirements in the National Construction Code. Homes that are energy efficient use less energy, are warmer on cool days, cooler on hot days and cost less to run. The higher the star rating the more thermally efficient the dwelling is.

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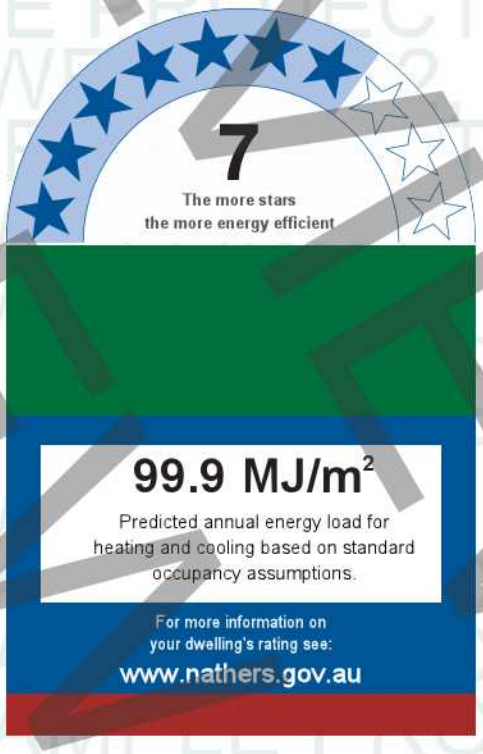
Shading device	a device fixed to windows that provides shading e.g. window awnings or screens but excludes eaves.
Shading features	includes neighbouring buildings, fences, and wing walls, but excludes eaves.
Solar heat gain coefficient (SHGC)	the fraction of incident solar radiation admitted through a window, both directly transmitted as well as absorbed and subsequently released inward. SHGC is expressed as a number between 0 and 1. The lower a window's SHGC, the less solar heat it transmits.
Skylight (also known as roof lights)	for NatHERS this is typically a moulded unit with flexible reflective tubing (light well) and a diffuser at ceiling level.
U-value	the rate of heat transfer through a window. The lower the U-value, the better the insulating ability.
Unconditioned	a zone within a dwelling that is assumed to not require heating and cooling based on standard occupancy assumptions.
Vertical shading features	provides shading to the building in the vertical plane and can be parallel or perpendicular to the subject wall/window. Includes privacy screens, other walls in the building (wing walls), fences, other buildings, vegetation (protected or listed heritage trees).

Nationwide House Energy Rating Scheme
NatHERS Certificate No. 4NWGDX22R2

Generated on 26 May 2022 using FirstRate5: 5.3.2a (3.21)



Property

Address	2, Dwelling 2, Example Project, Pascoe Vale, VIC, 3044
Lot/DP	-
NCC Class*	Class 1a
Type	New Home

Plans

Main plan	24/05/2022
Prepared by	Akay Architects- Revision A

Construction and environment

Assessed floor area (m²)*	
Conditioned*	84.3
Unconditioned*	29.7
Total	114
Garage	23.5

Exposure type
suburban

NatHERS climate zone
60 Tullamarine

Thermal performance

Heating	Cooling
90.5 MJ/m²	9.4 MJ/m²

About the rating
NatHERS software models the expected thermal energy loads using information about the design and construction, climate and common patterns of household use. The software does not take into account appliances, apart from the airflow impacts from ceiling fans.

Accredited assessor

Name	Berna Akay
Business name	Akay Architects
Email	info@akayarchitects.com.au
Phone	0393065539
Accreditation No.	DMN/10/0065
Assessor Accrediting Organisation	Design Matters National
Declaration of interest	Declaration completed: no conflicts

Verification

To verify this certificate, scan the QR code or visit When using either link, ensure you are visiting www.FR5.com.au.

National Construction Code (NCC) requirements

The NCC's requirements for NatHERS-rated houses are detailed in 3.12.0(a)(i) and 3.12.5 of the NCC Volume Two. For apartments the requirements are detailed in J0.2 and J5 to J8 of the NCC Volume One.

In NCC 2019, these requirements include minimum star ratings and separate heating and cooling load limits that need to be met by buildings and apartments through the NatHERS assessment. Requirements additional to the NatHERS assessment that must also be satisfied include, but are not limited to: insulation installation methods, thermal breaks, building sealing, water heating and pumping, and artificial lighting requirements. The NCC and NatHERS Heating and Cooling Load Limits (Australian Building Codes Board Standard) are available at www.abcb.gov.au.

State and territory variations and additions to the NCC may also apply.

Certificate Check

Ensure the dwelling is designed and then built as per the NatHERS Certificate. While you need to check the accuracy of the whole Certificate, the following spot check covers some important items impacting the dwelling's rating.

Genuine certificate

Does this Certificate match the one available at the web address or QR code in the verification box on the front page? Does the set of NatHERS-stamped plans for the dwelling have a Certificate number on the stamp that matches this Certificate?

Ceiling penetrations*

Does the 'number' and 'type' of ceiling penetrations (e.g. downlights, exhaust fans, etc) shown on the stamped plans or installed, match what is shown in this Certificate?

Windows

Does the installed window meet the substitution tolerances (SHGC and U-value) and window type, of the window shown on this Certificate? Substituted values must be based on the Australian Fenestration Rating Council (AFRC) protocol.

Apartment entrance doors

Does the 'External Door Schedule' show apartment entrance doors? Please note that an "external door" between the modelled dwelling and a shared space, such as an enclosed corridor or foyer, should not be included in the assessment (because it overstates the possible ventilation) and would invalidate the Certificate.

Exposure*

Has the appropriate exposure level (terrain) been applied? For example, it is unlikely that a ground-floor apartment is "exposed" or a top floor high-rise apartment is "protected".

Provisional* values

Have provisional values been used in the assessment and, if so, noted in "additional notes" below?

Additional Notes

External Walls

- Brick veneer walls with R2.7 insulation (with light colour walls)
- Weathertex (light colour) with R2.5 insulation with vapour permeable sarking behind a 20mm ventilation cavity

Internal Walls

- R2.7 insulation to stud wall between garage and dwelling
- R2.7 insulation to bathroom walls

Roof Type

- Custom orb (with light colour roof)
- Ceiling insulation with R7.0 insulation with perimetre of ceiling consisting R2.5 insulation
- Flat roof with R2.5 insulation (for Dwelling 2)

Floor Type

- Waffle pod construction
- R2.5 insulation to first floor

Windows

- uPVC window frames
- Double glazed agron filled windows for all habitable room windows as per window schedule
- Shading devices as per town planning drawings

Light

- LED downlights as shown on the plans with a maximum Illumination Power Density of less than 4watt/m2 for living spaces

- Energy efficient fluorescent lighting for all bedrooms and non-habitable rooms

Window and glazed door *type and performance*

Default* windows

Window ID	Window description	Maximum U-value*	SHGC*	Substitution tolerance ranges	
				SHGC lower limit	SHGC upper limit
PVC-005-01 W	uPVC A DG Argon Fill Clear-Clear	2.6	0.5	0.48	0.53
PVC-006-01 W	uPVC B DG Argon Fill Clear-Clear	2.6	0.53	0.5	0.56

Custom* windows

Window ID	Window description	Maximum U-value*	SHGC*	Substitution tolerance ranges	
				SHGC lower limit	SHGC upper limit
No Data Available					

Window and glazed door *Schedule*

Location	Window ID	Window no.	Height (mm)	Width (mm)	Window type	Opening %	Orientation	Window shading device*
Kitchen	PVC-005-01 W	W4	1120	1810	casement	90.0	N	No
Open Plan	PVC-005-01 W	W3	2150	3010	sliding	33.0	N	Yes
Open Plan	PVC-006-01 W	W2	1040	1810	sliding	90.0	S	No
Stairs	PVC-006-01 W	W1	600	1210	fixed	0.0	S	No
Bedroom 1	PVC-005-01 W	W5	950	1500	awning	10.0	S	No
Bedroom 1	PVC-005-01 W	W11	1050	1800	awning	10.0	N	No
Stairs	PVC-005-01 W	W6	950	900	fixed	0.0	S	No
Bath	PVC-005-01 W	W7	950	900	awning	90.0	S	No
Bedroom 2	PVC-005-01 W	W8	950	1500	awning	10.0	S	No
Bedroom 2	PVC-005-01 W	W9	1050	1800	awning	10.0	N	No
Study	PVC-005-01 W	W10	900	1500	awning	10.0	N	No

Roof window *type and performance value*

Default* roof windows

Window ID	Window description	Maximum U-value*	SHGC*	Substitution tolerance ranges	
				SHGC lower limit	SHGC upper limit
No Data Available					

Custom* roof windows

Window ID	Window description	Maximum U-value*	SHGC*	Substitution tolerance ranges	
				SHGC lower limit	SHGC upper limit
No Data Available					

Roof window *schedule*

* Refer to glossary.

Location	Window ID	Window no.	Opening %	Area (m²)	Orientation	Outdoor shade	Indoor shade
No Data Available							

Skylight *type and performance*

Skylight ID	Skylight description
No Data Available	

Skylight *schedule*

Location	Skylight ID	Skylight No.	Skylight shaft length (mm)	Area (m²)	Orient-ation	Outdoor shade	Diffuser	Skylight shaft reflectance
No Data Available								

External door *schedule*

Location	Height (mm)	Width (mm)	Opening %	Orientation
Open Plan	2100	970	100.0	S
Garage	2100	820	100.0	N
Garage	2150	3130	100.0	S

External wall *type*

Wall ID	Wall type	Solar absorptance	Wall shade (colour)	Bulk insulation (R-value)	Reflective wall wrap*
1	A - Brick Veneer	0.3	Light	Glass fibre batt (k = 0.044 density = 12 kg/m3) (R2.7)	No
2	A - Double Brick	0.3	Light		No
3	A - Single Brick	0.3	Light		No
4	A - Weatherboard	0.3	Light	Glass fibre batt (k = 0.044 density = 12 kg/m3) (R2.7)	No

External wall *schedule*

Location	Wall ID	Height (mm)	Width (mm)	Orientation	Horizontal shading feature* maximum projection (mm)	Vertical shading feature (yes/no)
Kitchen	1	2700	1568	E	541	Yes
Kitchen	1	2700	2910	N	523	Yes
Open Plan	1	2700	823	E	541	Yes
Open Plan	1	2700	823	S	0	Yes
Open Plan	1	2700	183	E	0	Yes
Open Plan	1	2700	4619	E	0	No
Open Plan	1	2700	4588	N	1260	Yes
Open Plan	1	2700	2372	S	1671	Yes
Open Plan	1	2700	2119	S	569	Yes
Stairs	1	2700	1666	S	541	Yes
Stairs	1	2700	1059	W	541	Yes
Garage	2	2870	3646	N	550	Yes

* Refer to glossary.

Garage	3	2870	6146	W	0	No
Garage	2	2870	4139	S	550	Yes
Bedroom 1	4	2550	5177	W	537	No
Bedroom 1	4	2550	3132	S	947	Yes
Bedroom 1	4	2550	3135	N	546	No
Stairs	4	2550	1031	W	600	Yes
Stairs	4	2550	1413	S	510	No
Bath	4	2550	1647	S	498	No
Bath	4	2550	611	E	521	Yes
Bedroom 2	4	2550	3018	S	521	Yes
Bedroom 2	4	2550	5031	E	513	Yes
Bedroom 2	4	2550	3761	N	1133	Yes
Study	4	2550	2400	N	552	No
Study	4	2550	578	E	4344	Yes

Internal wall *type*

Wall ID	Wall type	Area (m²)	Bulk insulation
1	FR5 - Internal Plasterboard Stud Wall	59.1	
2	A - Internal Plasterboard Stud Wall	40.3	Glass fibre batt (k = 0.044 density = 12 kg/m3) (R2.7)

Floor *type*

Location	Construction	Area (m²)	Sub-floor ventilation	Added insulation (R-value)	Covering
Kitchen	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	4.9	Enclosed	R0.0	Timber
Kitchen	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	2.7	Enclosed	R0.0	Timber
Open Plan	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	23.5	Enclosed	R0.0	Timber
Open Plan	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	3.9	Enclosed	R0.0	Timber
Open Plan	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	1.6	Enclosed	R0.0	Timber
WC	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	2	Enclosed	R0.0	Tiles
Hall	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	1.5	Enclosed	R0.0	Timber
Laundry	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	1.4	Enclosed	R0.0	Tiles
Stairs	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	2.2	Enclosed	R0.0	Timber
Garage	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	14.9	Enclosed	R0.0	none
Garage	FR5 - 300mm waffle pod, 85mm concrete (R0.63)	8.5	Enclosed	R0.0	none
Bedroom 1	FR5 - Timber	10.5	Enclosed	R4.0	Carpet
Bedroom 1	FR5 - Timber	1.1	Enclosed	R2.5	Carpet
Bedroom 1	FR5 - Timber	0.3	Enclosed	R2.5	Carpet
Bedroom 1	FR5 - Timber	4.3	Enclosed	R4.0	Carpet
Stairs	FR5 - Timber	2.6	Enclosed	R2.5	Timber
Stairs	FR5 - Timber	1	Enclosed	R2.5	Timber
Bath	FR5 - Timber	5	Enclosed	R2.5	Tiles
Bath	FR5 - Timber	1.2	Enclosed	R2.5	Tiles

Bedroom 2	FR5 - Timber	11.6	Enclosed	R2.5	Carpet
Bedroom 2	FR5 - Timber	4.3	Enclosed	R2.5	Carpet
Study	FR5 - Timber	6.5	Enclosed	R2.5	Carpet
Study	FR5 - Timber	1.3	Enclosed	R2.5	Carpet

Ceiling *type*

Location	Construction material/type	Bulk insulation R-value (may include edge batt values)	Reflective wrap*
Kitchen	FR5 - Timber	R2.5	No
Kitchen	Plasterboard	R2.5	No
Open Plan	FR5 - Timber	R2.5	No
Open Plan	FR5 - Timber	R2.5	No
Open Plan	Plasterboard	R2.5	No
Open Plan	Plasterboard	R2.5	No
WC	FR5 - Timber	R2.5	No
Hall	FR5 - Timber	R2.5	No
Laundry	FR5 - Timber	R2.5	No
Stairs	FR5 - Timber	R2.5	No
Garage	FR5 - Timber	R4.0	No
Garage	Plasterboard	R2.5	No
Bedroom 1	Plasterboard	R7.0	No
Bedroom 1	Plasterboard	R7.0	No
Bedroom 1	Plasterboard	R2.5	No
Stairs	Plasterboard	R7.0	No
Stairs	Plasterboard	R2.5	No
Bath	Plasterboard	R7.0	No
Bath	Plasterboard	R2.5	No
Bedroom 2	Plasterboard	R7.0	No
Bedroom 2	Plasterboard	R2.5	No
Study	Plasterboard	R7.0	No
Study	Plasterboard	R2.5	No

Ceiling *penetrations**

Location	Quantity	Type	Diameter (mm)	Sealed/unsealed
Kitchen	1	Exhaust Fans	200	Sealed
Kitchen	3	Downlights	50	Sealed
Open Plan	12	Downlights	50	Sealed
WC	1	Exhaust Fans	200	Sealed
Hall	1	Downlights	50	Sealed
Laundry	1	Exhaust Fans	200	Sealed
Bedroom 1	5	Downlights	50	Sealed
Bath	1	Exhaust Fans	200	Sealed

* Refer to glossary.

Bedroom 2	5	Downlights	50	Sealed
Study	1	Downlights	50	Sealed

Ceiling *fans*

Location	Quantity	Diameter (mm)
No Data Available		

Roof *type*

Construction	Added insulation (R-value)	Solar absorptance	Roof shade
Cont:Attic-Continuous	0.0	0.3	Light
Framed:Flat - Flat Framed (Metal Deck)	0.0	0.3	Light

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Shading device	a device fixed to windows that provides shading e.g. window awnings or screens but excludes eaves.
Shading features	includes neighbouring buildings, fences, and wing walls, but excludes eaves.
Solar heat gain coefficient (SHGC)	the fraction of incident solar radiation admitted through a window, both directly transmitted as well as absorbed and subsequently released inward. SHGC is expressed as a number between 0 and 1. The lower a window's SHGC, the less solar heat it transmits.
Skylight (also known as roof lights)	for NatHERS this is typically a moulded unit with flexible reflective tubing (light well) and a diffuser at ceiling level.
U-value	the rate of heat transfer through a window. The lower the U-value, the better the insulating ability.
Unconditioned	a zone within a dwelling that is assumed to not require heating and cooling based on standard occupancy assumptions.
Vertical shading features	provides shading to the building in the vertical plane and can be parallel or perpendicular to the subject wall/window. Includes privacy screens, other walls in the building (wing walls), fences, other buildings, vegetation (protected or listed heritage trees).

Nationwide House Energy Rating Scheme
NatHERS Certificate No. EH23EA61JU

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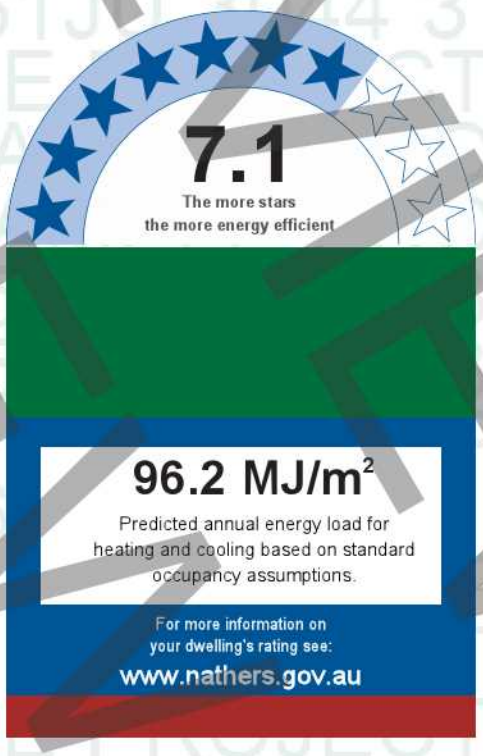


Property

Address	3, Dwelling 3, Example Project, Pascoe Vale, VIC, 3044
Lot/DP	-
NCC Class*	Class 1a
Type	New Home

Plans

Main plan	24/05/2022
Prepared by	Akay Architects- Revision A

Construction and environment

Assessed floor area (m²)*	
Conditioned*	60.2
Unconditioned*	26.7
Total	86.9
Garage	22.2

Exposure type
suburban

NatHERS climate zone
60 Tullamarine

Thermal performance

Heating	Cooling
89.3 MJ/m²	6.9 MJ/m²

About the rating
NatHERS software models the expected thermal energy loads using information about the design and construction, climate and common patterns of household use. The software does not take into account appliances, apart from the airflow impacts from ceiling fans.

Accredited assessor

Name	Berna Akay
Business name	Akay Architects
Email	info@akayarchitects.com.au
Phone	0393065539
Accreditation No.	DMN/10/0065
Assessor Accrediting Organisation	Design Matters National
Declaration of interest	Declared, refer to "Additional Notes" on page 2

Verification

To verify this certificate, scan the QR code or visit When using either link, ensure you are visiting www.FR5.com.au.

National Construction Code (NCC) requirements

The NCC's requirements for NatHERS-rated houses are detailed in 3.12.0(a)(i) and 3.12.5 of the NCC Volume Two. For apartments the requirements are detailed in J0.2 and J5 to J8 of the NCC Volume One.

In NCC 2019, these requirements include minimum star ratings and separate heating and cooling load limits that need to be met by buildings and apartments through the NatHERS assessment. Requirements additional to the NatHERS assessment that must also be satisfied include, but are not limited to: insulation installation methods, thermal breaks, building sealing, water heating and pumping, and artificial lighting requirements. The NCC and NatHERS Heating and Cooling Load Limits (Australian Building Codes Board Standard) are available at www.abcb.gov.au.

State and territory variations and additions to the NCC may also apply.

Certificate Check

Ensure the dwelling is designed and then built as per the NatHERS Certificate. While you need to check the accuracy of the whole Certificate, the following spot check covers some important items impacting the dwelling's rating.

Genuine certificate

Does this Certificate match the one available at the web address or QR code in the verification box on the front page? Does the set of NatHERS-stamped plans for the dwelling have a Certificate number on the stamp that matches this Certificate?

Ceiling penetrations*

Does the 'number' and 'type' of ceiling penetrations (e.g. downlights, exhaust fans, etc) shown on the stamped plans or installed, match what is shown in this Certificate?

Windows

Does the installed window meet the substitution tolerances (SHGC and U-value) and window type, of the window shown on this Certificate? Substituted values must be based on the Australian Fenestration Rating Council (AFRC) protocol.

Apartment entrance doors

Does the 'External Door Schedule' show apartment entrance doors? Please note that an "external door" between the modelled dwelling and a shared space, such as an enclosed corridor or foyer, should not be included in the assessment (because it overstates the possible ventilation) and would invalidate the Certificate.

Exposure*

Has the appropriate exposure level (terrain) been applied? For example, it is unlikely that a ground-floor apartment is "exposed" or a top floor high-rise apartment is "protected".

Provisional* values

Have provisional values been used in the assessment and, if so, noted in "additional notes" below?

Additional Notes

External Walls

- Brick veneer walls with R2.7 insulation (with light colour walls)

Internal Walls

- R2.7 insulation to walls between garage and dwelling and bathroom walls

Roof Type

- Custom orb (with light colour roof)
- Ceiling insulation with R7.0 insulation with perimetre of ceiling consisting R2.5 insulation

Floor Type

- Waffle pod construction

Windows

- uPVC window frames (light colour)
- Double glazing argon filled windows for all habitable room windows as per window schedule
- Shading devices as per town planning drawings

Light

- LED downlights as shown on the plans with a maximum Illumination Power Density of less than 4watt/m2 for living spaces
- Energy efficient fluorescent lighting for all bedrooms and non-habitable rooms

Window and glazed door *type and performance*

Default* windows

Window ID	Window description	Maximum U-value*	SHGC*	Substitution tolerance ranges	
				SHGC lower limit	SHGC upper limit
PVC-006-01 W	uPVC B DG Argon Fill Clear-Clear	2.6	0.53	0.5	0.56
PVC-005-01 W	uPVC A DG Argon Fill Clear-Clear	2.6	0.5	0.48	0.53

Custom* windows

Window ID	Window description	Maximum U-value*	SHGC*	Substitution tolerance ranges	
				SHGC lower limit	SHGC upper limit
No Data Available					

Window and glazed door *Schedule*

Location	Window ID	Window no.	Height (mm)	Width (mm)	Window type	Opening %	Orientation	Window shading device*
Bedroom 2	PVC-006-01 W	Opening 8	2150	1810	sliding	45.0	W	Yes
Open paln	PVC-006-01 W	Opening 7	2150	2410	sliding	30.0	N	No
Open paln	PVC-005-01 W	Opening 6	1060	1200	casement	90.0	N	Yes
Open paln	PVC-005-01 W	Opening 5	2150	970	sliding	30.0	W	Yes
Open paln	PVC-006-01 W	Opening 9	1200	1330	sliding	45.0	S	No
Bedroom 1	PVC-006-01 W	Opening 4	1290	1450	sliding	90.0	W	Yes
bath	PVC-006-01 W	Opening 3	600	2650	sliding	45.0	E	No

Roof window *type and performance value*

Default* roof windows

Window ID	Window description	Maximum U-value*	SHGC*	Substitution tolerance ranges	
				SHGC lower limit	SHGC upper limit
No Data Available					

Custom* roof windows

Window ID	Window description	Maximum U-value*	SHGC*	Substitution tolerance ranges	
				SHGC lower limit	SHGC upper limit
No Data Available					

Roof window *schedule*

Location	Window ID	Window no.	Opening %	Area (m²)	Orientation	Outdoor shade	Indoor shade
No Data Available							

Skylight *type and performance*

Skylight ID	Skylight description
No Data Available	

Skylight *schedule*

Location	Skylight ID	Skylight No.	Skylight shaft length (mm)	Area (m²)	Orient-ation	Outdoor shade	Diffuser	Skylight shaft reflectance
No Data Available								

External door *schedule*

Location	Height (mm)	Width (mm)	Opening %	Orientation
Garage 2	2150	3130	100.0	S
entry	2150	920	100.0	E

External wall *type*

Wall ID	Wall type	Solar absorptance	Wall shade (colour)	Bulk insulation (R-value)	Reflective wall wrap*
1	A - Brick Veneer	0.3	Light	Glass fibre batt (k = 0.044 density = 12 kg/m3) (R2.7)	No
2	A - Double Brick	0.3	Light		No
3	A - Single Brick	0.3	Light		No
4	FR5 - Internal Plasterboard Stud Wall	0.5	Medium		No

External wall *schedule*

Location	Wall ID	Height (mm)	Width (mm)	Orientation	Horizontal shading feature* maximum projection (mm)	Vertical shading feature (yes/no)
Bedroom 2	1	2700	3032	W	648	Yes
Bedroom 2	1	2700	2338	E	0	No
Bedroom 2	1	2700	4451	N	0	No
Garage 2	2	2870	3524	S	600	Yes
Garage 2	3	2870	6374	E	0	No
Garage 2	3	2870	339	E	0	No
Garage 2	4	2700	124	N	0	Yes
Open paln	1	2700	1555	W	651	Yes
Open paln	1	2700	4801	N	627	Yes
Open paln	1	2700	3435	W	520	Yes
Open paln	1	2700	1690	N	600	Yes
Open paln	1	2700	2473	W	0	Yes
Open paln	1	2700	2033	S	2058	Yes
entry	1	2700	1382	E	1858	Yes
Bedroom 1	1	2700	3010	W	0	Yes
Bedroom 1	1	2700	3806	S	0	Yes
bath	1	2700	1518	S	0	Yes
bath	1	2700	2999	E	614	Yes

Internal wall *type*

Wall ID	Wall type	Area (m²)	Bulk insulation
1	A - Internal Plasterboard Stud Wall	39.5	Glass fibre batt (k = 0.044 density = 12 kg/m3) (R2.7)

* Refer to glossary.

2	FR5 - Internal Plasterboard Stud Wall	22

Floor *type*

Location	Construction	Area (m²)	Sub-floor ventilation	Added insulation (R-value)	Covering
Bedroom 2	FR5 - 375mm waffle pod, 85mm concrete (R0.65)	7.5	Enclosed	R0.0	Carpet
Bedroom 2	FR5 - 375mm waffle pod, 85mm concrete (R0.65)	5	Enclosed	R0.0	Carpet
Garage 2	FR5 - 375mm waffle pod, 85mm concrete (R0.65)	6.8	Enclosed	R0.0	none
Garage 2	FR5 - 375mm waffle pod, 85mm concrete (R0.65)	15.4	Enclosed	R0.0	none
Open paln	FR5 - 375mm waffle pod, 85mm concrete (R0.65)	24.5	Enclosed	R0.0	Timber
Open paln	FR5 - 375mm waffle pod, 85mm concrete (R0.65)	1.7	Enclosed	R0.0	Timber
Open paln	FR5 - 375mm waffle pod, 85mm concrete (R0.65)	7	Enclosed	R0.0	Timber
entry	FR5 - 375mm waffle pod, 85mm concrete (R0.65)	0.9	Enclosed	R0.0	Timber
entry	FR5 - 375mm waffle pod, 85mm concrete (R0.65)	2.1	Enclosed	R0.0	Timber
Bedroom 1	FR5 - 375mm waffle pod, 85mm concrete (R0.65)	7.5	Enclosed	R0.0	Carpet
Bedroom 1	FR5 - 375mm waffle pod, 85mm concrete (R0.65)	3.9	Enclosed	R0.0	Carpet
bath	FR5 - 375mm waffle pod, 85mm concrete (R0.65)	1.9	Enclosed	R0.0	Tiles
bath	FR5 - 375mm waffle pod, 85mm concrete (R0.65)	2.7	Enclosed	R0.0	Tiles

Ceiling *type*

Location	Construction material/type	Bulk insulation R-value (may include edge batt values)	Reflective wrap*
Bedroom 2	Plasterboard	R7.0	No
Bedroom 2	Plasterboard	R2.5	No
Garage 2	Plasterboard	R2.5	No
Garage 2	Plasterboard	R7.0	No
Open paln	Plasterboard	R7.0	No
Open paln	Plasterboard	R7.0	No
Open paln	Plasterboard	R2.5	No
entry	Plasterboard	R2.5	No
entry	Plasterboard	R7.0	No
Bedroom 1	Plasterboard	R7.0	No
Bedroom 1	Plasterboard	R2.5	No
bath	Plasterboard	R7.0	No
bath	Plasterboard	R2.5	No

Ceiling *penetrations**

Location	Quantity	Type	Diameter (mm)	Sealed/unsealed
Bedroom 2	4	Downlights	50	Sealed
Garage 2	1	Exhaust Fans	200	Sealed
Open paln	1	Exhaust Fans	200	Sealed
Open paln	15	Downlights	50	Sealed
entry	1	Downlights	50	Sealed

* Refer to glossary.

Bedroom 1	4	Downlights	50	Sealed
bath	1	Exhaust Fans	200	Sealed

Ceiling *fans*

Location	Quantity	Diameter (mm)
No Data Available		

Roof *type*

Construction	Added insulation (R-value)	Solar absorptance	Roof shade
Cont:Attic-Continuous	0.0	0.3	Light

Explanatory Notes

About this report

A NatHERS rating is a comprehensive, dynamic computer modelling evaluation of a home, using the floorplans, elevations and specifications to estimate an energy load. It addresses the building layout, orientation and fabric (i.e. walls, windows, floors, roofs and ceilings), but does not cover the water or energy use of appliances or energy production of solar panels.

Ratings are based on a unique climate zone where the home is located and are generated using standard assumptions, including occupancy patterns and thermostat settings. The actual energy consumption of a home may vary significantly from the predicted energy load, as the assumptions used in the rating will not match actual usage patterns. For example, the number of occupants and personal heating or cooling preferences will vary.

While the figures are an indicative guide to energy use, they can be used as a reliable guide for comparing different dwelling designs and to demonstrate that the design meets the energy efficiency requirements in the National Construction Code. Homes that are energy efficient use less energy, are warmer on cool days, cooler on hot days and cost less to run. The higher the star rating the more thermally efficient the dwelling is.

Accredited assessors

To ensure the NatHERS Certificate is of a high quality, always use an accredited or licenced assessor. NatHERS accredited assessors are members of a professional body called an Assessor Accrediting Organisation (AAO).

Australian Capital Territory (ACT) licensed assessors may only produce assessments for regulatory purposes using software for which they have a licence endorsement. Licence endorsements can be confirmed on the ACT licensing register

AAOs have specific quality assurance processes in place, and continuing professional development requirements, to maintain a high and consistent standard of assessments across the country. Non-accredited assessors do not have this level of quality assurance or any ongoing training requirements.

Any questions or concerns about this report should be directed to the assessor in the first instance. If the assessor is unable to address these questions or concerns, the AAO specified on the front of this certificate should be contacted.

Disclaimer

The format of the NatHERS Certificate was developed by the NatHERSAdministrator. However the content of each individual certificate is entered and created by the assessor to create a NatHERS Certificate. It is the responsibility of the assessor who prepared this certificate to use NatHERS accredited software correctly and follow the NatHERS Technical Notes to produce a NatHERS Certificate.

The predicted annual energy load in this NatHERS Certificate is an estimate based on an assessment of the building by the assessor. It is not a prediction of actual energy use, but may be used to compare how other buildings are likely to perform when used in a similar way.

Information presented in this report relies on a range of standard assumptions (both embedded in NatHERS accredited software and made by the assessor who prepared this report), including assumptions about occupancy, indoor air temperature and local climate.

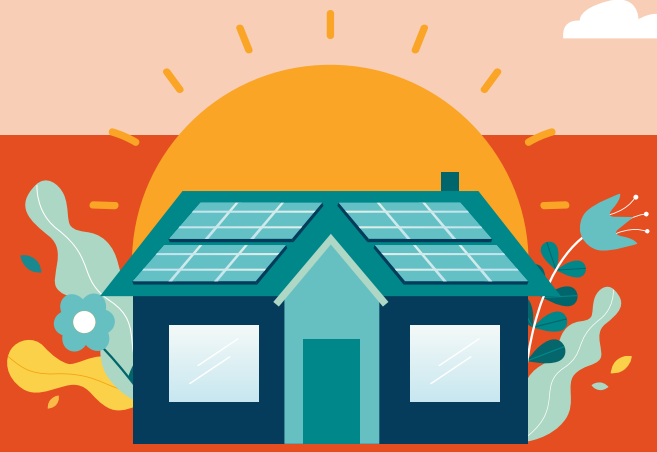
Not all assumptions that may have been made by the assessor while using the NatHERS accredited software tool are presented in this report and further details or data files may be available from the assessor.

Glossary

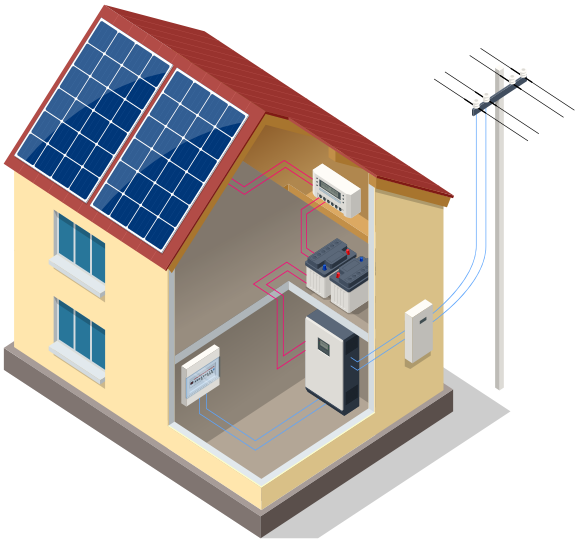
Annual energy load	the predicted amount of energy required for heating and cooling, based on standard occupancy assumptions.
Assessed floor area	the floor area modelled in the software for the purpose of the NatHERS assessment. Note, this may not be consistent with the floor area in the design documents.
Ceiling penetrations	features that require a penetration to the ceiling, including downlights, vents, exhaust fans, rangehoods, chimneys and flues. Excludes fixtures attached to the ceiling with small holes through the ceiling for wiring, e.g. ceiling fans; pendant lights, and heating and cooling ducts.
Conditioned	a zone within a dwelling that is expected to require heating and cooling based on standard occupancy assumptions. In some circumstances it will include garages.
Custom windows	windows listed in NatHERS software that are available on the market in Australia and have a WERS (Window Energy Rating Scheme) rating.
Default windows	windows that are representative of a specific type of window product and whose properties have been derived by statistical methods.
Entrance door	these signify ventilation benefits in the modelling software and must not be modelled as a door when opening to a minimally ventilated corridor in a Class 2 building.
Exposure category - exposed	terrain with no obstructions e.g. flat grazing land, ocean-frontage, desert, exposed high-rise unit (usually above 10 floors).
Exposure category - open	terrain with few obstructions at a similar height e.g. grasslands with few well scattered obstructions below 10m, farmland with scattered sheds, lightly vegetated bush blocks, elevated units (e.g. above 3 floors).
Exposure category - suburban	terrain with numerous, closely spaced obstructions below 10m e.g. suburban housing, heavily vegetated bushland areas.
Exposure category - protected	terrain with numerous, closely spaced obstructions over 10 m e.g. city and industrial areas.
Horizontal shading feature	provides shading to the building in the horizontal plane, e.g. eaves, verandahs, pergolas, carports, or overhangs or balconies from upper levels.

National Construction Code (NCC) Class	the NCC groups buildings by their function and use, and assigns a classification code. NatHERS software models NCC Class 1, 2 or 4 buildings and attached Class 10a buildings. Definitions can be found at www.abcb.gov.au.
Opening Percentage	the openability percentage or operable (moveable) area of doors or windows that is used in ventilation calculations.
Provisional value	an assumed value that does not represent an actual value. For example, if the wall colour is unspecified in the documentation, a provisional value of 'medium' must be modelled. Acceptable provisional values are outlined in the NatHERS Technical Note and can be found at www.nathers.gov.au
Reflective wrap (also known as foil)	can be applied to walls, roofs and ceilings. When combined with an appropriate airgap and emissivity value, it provides insulative properties.
Roof window	for NatHERS this is typically an operable window (i.e. can be opened), will have a plaster or similar light well if there is an attic space, and generally does not have a diffuser.
Shading device	a device fixed to windows that provides shading e.g. window awnings or screens but excludes eaves.
Shading features	includes neighbouring buildings, fences, and wing walls, but excludes eaves.
Solar heat gain coefficient (SHGC)	the fraction of incident solar radiation admitted through a window, both directly transmitted as well as absorbed and subsequently released inward. SHGC is expressed as a number between 0 and 1. The lower a window's SHGC, the less solar heat it transmits.
Skylight (also known as roof lights)	for NatHERS this is typically a moulded unit with flexible reflective tubing (light well) and a diffuser at ceiling level.
U-value	the rate of heat transfer through a window. The lower the U-value, the better the insulating ability.
Unconditioned	a zone within a dwelling that is assumed to not require heating and cooling based on standard occupancy assumptions.
Vertical shading features	provides shading to the building in the vertical plane and can be parallel or perpendicular to the subject wall/window. Includes privacy screens, other walls in the building (wing walls), fences, other buildings, vegetation (protected or listed heritage trees).

Solar Photovoltaic Systems



Moreland City Council has an objective to achieve a zero carbon community by 2040. This guideline assists with incorporating Solar Photovoltaic (Solar PV) renewable energy systems into the design of new development.



What is a Solar PV system?

Solar Photovoltaic (PV) is technology that converts sunlight into electrical energy. The complete combination of individual elements such as panels, mounting, wiring, safety switches and inverters make up a solar PV system.

What factors influence a Solar PV system's performance?

The output of a solar PV system will vary depending on several factors such as climate, roof pitch, roof orientation, shading or obstruction, the system size and the quality of the installation. Each of these elements will affect the solar system's performance and the potential renewable energy benefits.

What are the benefits of including a Solar PV system in the initial design of a development?

The design and location of solar PV interrelates with other planning and design considerations directly or indirectly, such as visual amenity, spatial constraints, passive design and overshadowing. Incorporating on-site solar PV systems during the planning approval stage therefore elevates issues that can arise later in the building stage that can impact the efficiency of a system. This includes considering roof design by ensuring sufficient space and area, shape and orientation of the solar PV panels, and overshadowing of the solar PV panels by structures or trees. Considering such elements will also ensure that the design of the solar PV system does not have a negative impact on the overall aesthetics of the building to help create attractive streetscapes.

Will including a Solar PV system achieve a net zero carbon emissions building?

While renewable energy is an important element to achieve net zero emission development, another imperative element is energy efficiency. Regardless of how many solar panels can be installed, if energy efficiency is not at the core of the development, net zero emissions may never be realised.

With good thermal performance, energy efficient services and behavioural awareness, the medium density development (townhouses, units and dual occupancies) have the potential to achieve net zero emissions from the proposed metric.

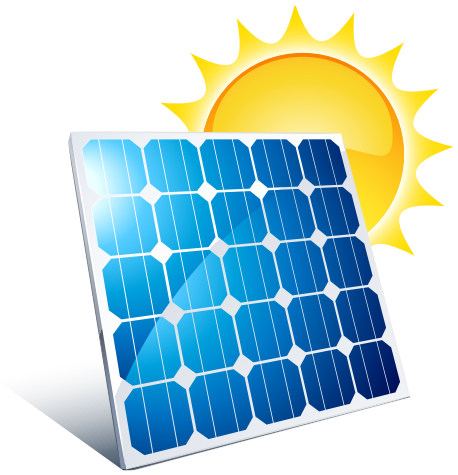
Apartment buildings however may not achieve net zero emissions from on-site renewable and energy efficiency alone. Off-site renewable energy purchasing may be required to complement the metric proposed to achieve a net zero emissions building.

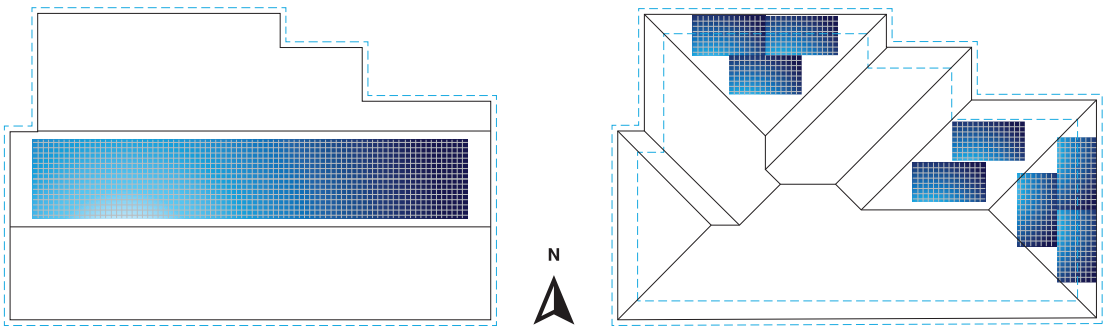
Industrial development very much depends on its usage and whether any energy intensive process would be taking place, but generally, and due to a large roof area, many warehouses can potentially achieve net zero emissions from on-site renewable energy generation.

Moreland Solar PV Metrics

Supported by Moreland City Council's zero carbon agenda, new development within the City of Moreland are encouraged to include on-site renewable energy in the form of solar PV systems.

The size, design and location of the solar PV system differs depending on the building typology. Therefore, 3 various solar PV metrics have been developed to assist new development with incorporating solar PV systems.



METRIC 1: **Medium Density Development (townhouse and standalone dwellings)**	
Metric Specifications	Provide the following solar PV system for each dwelling: • A minimum 3 kW for each 1-2-bedroom dwelling; and • An additional 1 kW for each additional bedroom
Design Guidance	Roof design is the most critical element in the dwelling's design to achieve the solar PV metric for medium density development. A solar friendly roof design includes: • Pitched and flat roofing to allow the solar panels to be placed continuously facing North, East or West (or any direction in between). • Panels placed on no more than two roof orientations (A). • A roof that includes large amounts of valleys and changes in direction cannot accommodate enough solar PV modules to achieve the metric (B).  A. B.
Elements to include on plans	• A roof plan showing the location of the solar PV panels • The pitch angle of all roofs. • Spatial provision for any future battery storage solutions in accordance with AS/NZS 5139:2019.

METRIC 2: **Apartments**	
Metric Specifications	• Provide a solar PV system with a capacity of at least 25 W per square meters of the development's site coverage*; or • 1 kW per dwelling. *Capacity of solar PV system in kW = $\frac{\text{Site coverage (m}^2\text{) x 25 (W/m}^2\text{)}}{\text{1,000 (W/kW)}}$
Design Guidance	The solar PV system must be located: • On a suitable roof, balcony or other area that can facilitate substantial energy generation from solar PV panels. • Within areas that will not be shaded by adjacent structures and positioned so not to self-shade. • In an area other than a void or lightwell, skylight, green roof, roof terrace, mechanical plant, drone landing pad, or other plant to be installed (unless the solar panels are installed over part of the green roof, roof terrace or plant). This can include the top of the lift shaft (lift overrun) and stair shafts, where suitable. • Be readily accessible for cabling. A pergola may also be used, on top of a roof terrace, that assists with balancing competing outcomes. Solar modules may also be located in areas other than the roof such as vertical solar PV panels on walls and building integrated PV (BiPV) systems.
Elements to include on plans	A roof plan that includes: • The roof area in metres square (m^2). • The location of the solar PV panels, dimensions, tilt angle and capacity. • Green roof or roof terrace. • Mechanical and other plant equipment. • The pitch angle of all roof forms. • Spatial provision for any future battery storage solutions in accordance with AS/NZS 5139:2019.

METRIC 3: **Industrial**	
Metric Specifications	• All roofs must be structurally designed to be able to accommodate full solar PV coverage, excluding areas set aside for plant equipment or areas significantly shaded by other structures; and • Include a solar PV system that is: – Sized to meet the energy needs of the building's services (lightning, air-conditioning, industrial processes); or – Maximised based on the available roof area; or – Where no industrial process is proposed, a minimum of 1.5 kW per tenancy plus 1 kW for every 150 m^2 of gross floor area.
Design Guidance	• Within areas that will not be shaded by adjacent structures and positioned to minimise self-shading. • In an area other than a void or lightwell, skylight, green roof, roof terrace, mechanical plant, drone landing pad, or other plant to be installed (unless the solar is installed over part of the green roof, roof terrace or plant) and can include the top of lift and stair shafts where suitable. • Be readily accessible for cabling
Elements to include on plans	A roof plan that includes: • The location of the solar PV panels, dimensions, tilt angle and capacity. • Green roof or roof terrace. • Mechanical and other plant equipment. • The pitch angle of all roof forms.

Source: Solaris (2021)

Other Design Guidance for all PV systems

Solar PV layout and angles

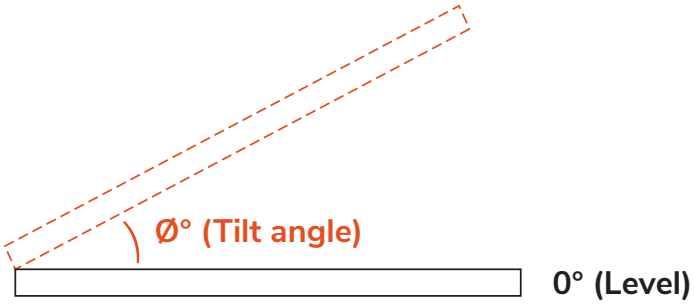
When designing the roof and placing the solar PV panels, a 1050 x 1700 mm sized solar PV module with a power rating output of 340 W can be assumed. Larger panels of 1050 x 2100 mm with a power rated output of 400 W may be utilised however will need to be specified within the design and annotated on plans. Manufacturer specifications can differ and it is encouraged to request information regarding a panel's size, power rating output, effective capacity, and installation requirements and limitations (e.g. racking and cabling on a roof).

Smaller buildings, such as townhouse developments, should place panels to face 1-2 different directions only (e.g. East and West) and therefore generally operate with only one inverter. When panels are facing two directions the inverter must have two Maximum Power Point Terminals (MPPTs). System designs with more than two directions will require micro-inverters installed at the back of each panel.

Please note that modules in series will have the electrical current of the least productive module whereby strings in parallel will have the same voltage as the least productive string. For this reason, the above has been specified.

Large developments, such as apartment and industrial buildings can have a larger solar PV system that may require multiple inverters. When multiple inverters are used, the solar PV system can accommodate panels facing more than two directions.

The tilt angle, being the angle between the horizontal plane and the panel, must be at least 10 degrees to allow for self-cleaning. In Melbourne, a tilt angle equal to the latitude (38 degrees) results in the highest annual energy production.



The system however may be designed to suit different requirements, limitations and usage profile.

Shading

Solar PV panels should not be shaded. Partial shading may impact the energy output of the system. Shading can be caused by trees, nearby buildings, and structures on the rooftop.

Self-shading is inflicted when the tilt of the front row of the solar PV panels overshadow the rear solar PV panels behind them. Therefore, clearance (a gap) between the strings (the rows of panels) must be considered and be appropriate for the tilt angle to improve the solar PV system's performance.

Alternative solutions

Where it is demonstrated that a metric cannot be met, an alternative solution and design approach may be appropriate. The alternative solution will need to be discussed on a case-by-case basis and must be supported by Council Officers.

Further Information

For additional guidance and details, please refer to:

Moreland City Council Renewable Energy Standard (Moreland City Council, 2021)

Moreland Zero Carbon Planning

Moreland City Council 90 Bell Street, Coburg 3058 **www.moreland.vic.gov.au**

Moreland Language Link

廣東話 9280 1910
Italiano 9280 1911
Ελληνικ 9280 1912

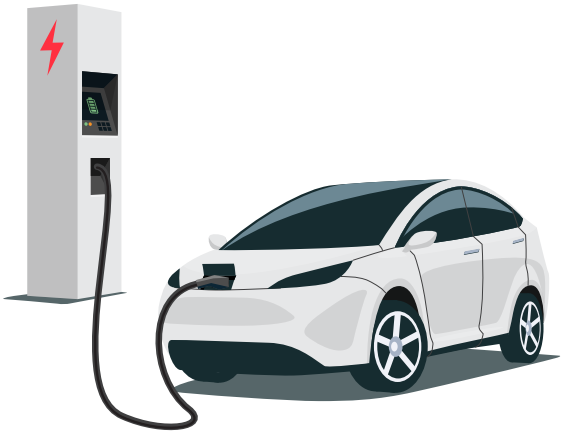
عربي 9280 1913
Türkçe 9280 1914
Tiếng Việt 9280 1915

हिंदी 9280 1918
普通话 9280 0750
ਪੰਜਾਬੀ 9280 0751

All other languages
9280 1919

Electric Vehicle Infrastructure

Moreland City Council has an objective to achieve a zero carbon community by 2040. This guideline assists with incorporating Electric Vehicle (EV) Infrastructure into the design of new development.



What is an Electric Vehicle (EV)?

In the context of this guideline, an electric vehicle is a battery electric vehicle (BEV) which requires recharging using electrical outlets. This also includes plug-in hybrid (PHEV). However, it does not include fuel cell electric vehicles (FCEV) as such vehicles use hydrogen as an energy source.

What is EV Infrastructure?

EV infrastructure includes the electrical components required to recharge the car; from the main switchboard to the charger. It does not include the charger itself which is generally considered an 'Active' system, as opposed to, 'EV Ready'. Depending on the development type, EV infrastructure may include, however is not limited to: distribution boards, load management systems, metering communication, wiring, circuit breakers, and cable trays.

How does EV infrastructure contribute towards achieving zero carbon emissions?

When charged with 100% renewable electricity, EVs may be considered zero emissions vehicles. With zero or low tailpipe emissions, EVs also contribute towards improved air quality.

Why should new development be built with EV infrastructure – termed 'EV ready'?

Industry, including the car industry, have identified that EVs are the way of the future to meet the growing need to address car emissions contribution to climate change, with many car manufacturers outlining plans to phase out conventional fuel vehicles. With knowledge of this expected change, future proofing infrastructure is becoming increasingly important. The availability of charging infrastructure is key to accelerate EV uptake. This is especially in apartment buildings where retrofitting existing infrastructure may prove increasingly difficult and costly.

What are the charging parameters and industry standards?

Charging is described by several parameters: namely 'level' and 'mode' which respectively describe the charging infrastructure used, as well as, 'type' which describes the plug configuration. The parameters originate from North American and European standards.

- Charging 'levels' are used to categorise the rated power, voltage and current of the charging system. There are 3 different EV charging levels (as defined by SAE International J1772 and IEC 62196-2).

Different levels of charging in North America: SAE configurations

Level 1
- Supply from household outlet
- Portable EV charging cable
- 120 V 1 phase AC; 12-16 Amp
- Charging power 1.4 kW or 1.9 kW

Level 2
- Supply from household outlet or EV charge point
- Portable EV charging cable
- 208-240 V 1 phase AC; 12-80 Amp (**Typ. 30 Amp**)
- Charging power 2.5 kW to 19.2 kW (**Typ. 7 kW**)

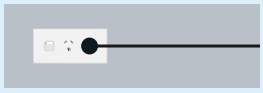
Level 3
- Supply from 208-600 V 3 phase AC
- Stationary EV charging cable
- 400 Amp (Typ. 60 Amp)
- Charging power up to 240 kW (Typ. 50 kW)

Source: E-Mobility Simplified (2019)

- Charging 'modes' are used to categorise the mode of power delivery, protection installation and communication/ control of charging system. There are 4 different EV charging modes (as defined by IEC 61851-1). Modes 3 is currently considered the most suitable for charging EVs in multi-dwelling developments.
- Charging 'types' detail the physical shape of an EV plug and charging capabilities. Most EVs in Australia have a type 2 plug. A CCS2 is another form of type 2 plug that enables fast charging using Direct Current (DC).

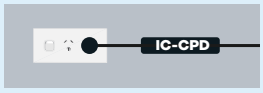
Different modes of charging

Household Outlet (230 W)



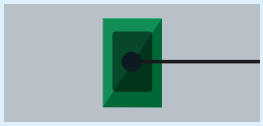
Mode 1
- Alternating Current (AC) charging
- Regular household outlet
- Un-safe – not recommended to use

Household Outlet (230 W)



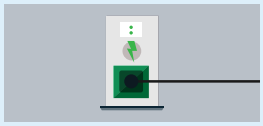
Mode 2
- AC charging
- In-cable control and protection (IC-CPD)
- Limited to 3.7 kW (16 Amp) in residential use or 7.4 kW (32 Amp) for industrial

Dedicated EVSE



Mode 3
- AC charging
- Control, communications and protection functions incorporated in the charge point (Electric Vehicle Supply Equipment – EVSE)
- Wide range of charging: 3.7 kW to 43 kW

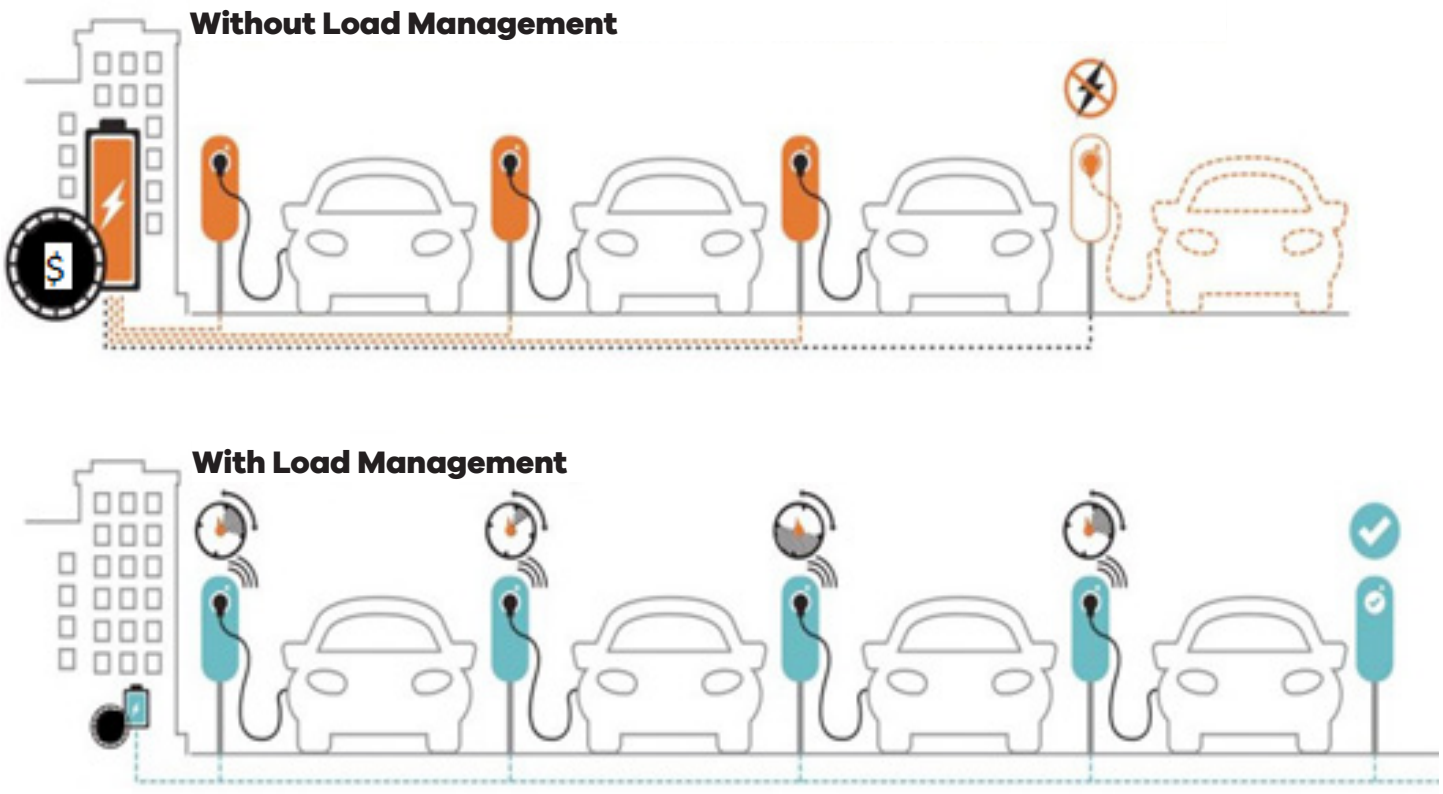
DC Charger



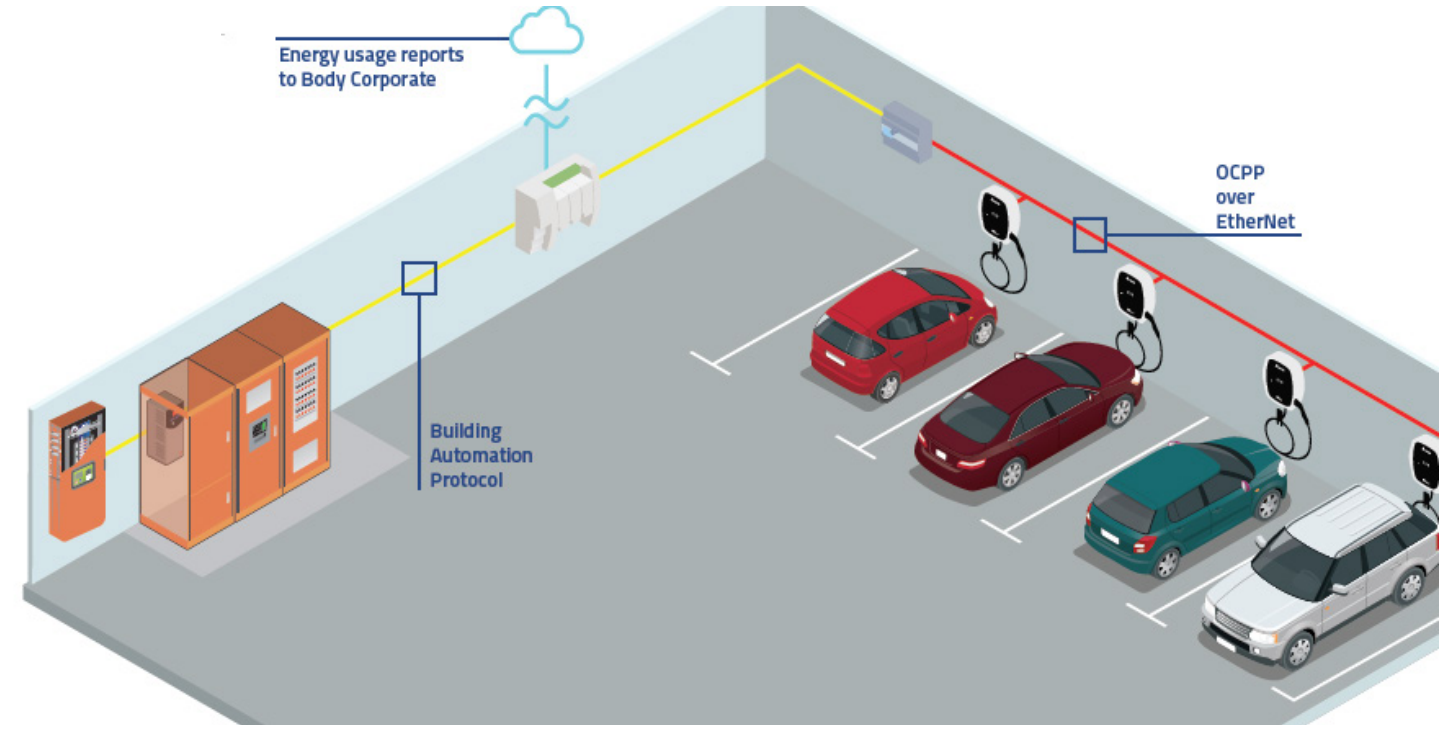
Mode 4
- Direct Current (DC) charging
- Option of either CHAdeMO or Combined Charging System (CCS)
- For public and commercial charging applications
- Wide range of charging capabilities – over 150 kW

What is load management?

Load management is simply defined as the scheduling of charging EVs. Incorporating a load management system within a development reduces the maximum electricity demand to a building and provides better grid stability. Load management is a key element that supports a cost effective and stable EV charging system and can be facilitated in various forms; from simple timers to a more sophisticated smart and dynamic controlled system.



Source: WATT Consulting Group (2018)



Source: NHP (2020)

Moreland EV infrastructure Metrics

Supported by Moreland City Council's zero carbon agenda, new development within the City of Moreland are encouraged to include EV charging infrastructure. The design and requirements of the EV infrastructure differs depending on the building typology and are reflected in the two EV metrics provided.

METRIC 1: **Medium Density Development (townhouse, dual-occ, and standalone dwellings)**

Metric Specifications

Provide the following EV infrastructure to each dwelling that includes:

- Infrastructure and cabling to each garage or carport that can support Level 2 (Mode 3) 32 Amp EV car charging.*
- Load management systems that ensure that:
  - EV charging occurs outside of peak electricity demand hours; and
  - The EV infrastructure does not adversely impact the site's maximum demand.

* The inclusion of an EV charger unit (Active EV Charging) is not expected.

Design Guidance

Base EV infrastructure for each dwelling includes:

- A dwelling switchboard ('load centre') with a dedicated circuit sufficient to supply 1 x 7 kW 32 Amp electric vehicle charging station.
- Cabling capped off at an isolator in readiness for a future 7 kW 32 Amp electric vehicle charging station. An active 15 Amp General Power Outlet (GPO) may be installed in the interim that may later be converted to an EV charging unit.
- Clear signage placed next to the junction box, isolator, or GPO that indicates that the circuit cabling can accommodate charging an EV at 32 Amp.
- A pre-set timer to ensure EV charging does not occur during peak demand hours. Peak demand generally occurs during weekdays from 6am to 9am in the morning and from 4pm to 10pm in the evening.

Maximum Demand

Adding EV charging infrastructure will increase the maximum demand of the dwelling, which in some typologies and locations is an acceptable outcome. In other typologies (such as 5-10 unit development), increasing the maximum demand may prove costly due to network connection fees.

Australian Standard AS/NZS 3000:2018 (Wiring Rules) Section 2.2.2 specifies multiple methods to determine the maximum demand. Relevant methods include (a) Calculation and (b) Assessment which are applied as follows with respect to the following Options:

Behind-the-Meter Load Management

Option 1:

Available Capacity (preferred)

- 2.2.2(a): Calculation: which is based on adding all the loads and their diversity factors. When using this method, the 32 Amp associated with the EV infrastructure must be added to the maximum demand on the basis of 100% usability rate. This increases the maximum demand of each unit by 32 Amp and that of a block of up to 5 units by 32 Amp per unit. In some locations, this means a higher network connection fee, in this case, method 2.2.2(b) may be more feasible.

METRIC 1: **Medium Density Development (townhouse, dual-occ, and standalone dwellings)**	
Design Guidance	**Option 2:** **Load Shedding (preferred)** • 2.2.2(b) Assessment: which can be based on demand management. Demand management may consist of monitoring and control devices such as – A load shedding contactor; – A contactor and current transformer/sensor; – A current limiting device; – A Programmable Logic Controller (PLC); – A building management system; or – An approved charge control module which supplies the EV charger only when there is spare capacity within the dwelling, ensuring that the maximum demand of the dwelling (as per the mains breaker) is not exceeded. This method allows the load to be managed behind the meter and within the boundary of each private dwelling. This means that the maximum demand of the block will be that of all dwellings added together, or in the case of a load management strategy (e.g. rotational delayed start), maximum demand may be less than that which would be the case under a 'charging always available' arrangement. **Site-Wide Load Management** When behind-the-meter methods lead to a maximum demand for the block that is higher than the maximum allowance of the street's infrastructure as determined by the DNSP, another dynamic site-wide load management method may be considered. **Option 3:** **Owners' Corporation EV Circuit Control** • A device capable of disconnecting each EV charger from its supply in the dwelling (contactor) may be controlled by a signal from a master controller. • The master controller may be installed on common property and managed by the owners' corporation. • The installation of a master controller ensures that EV charging may only occur when there is sufficient spare capacity within the site. • A low voltage instrumentation wire runs from the master controller to the load centre of each dwelling and is connected to the EV circuit breaker. • Metering requirements may not necessarily be required for the owners' corporation. • Additional capacity may not necessarily be required for the site.
Elements to include on plans	EV infrastructure specifications need to be detailed and demonstrated on relevant plans. *As part of your technical drawings needed for building compliance, the electrical plans will need to include the design of all EV infrastructure demonstrating that it will deliver the electricity demand to serve EV charging to the development site.

METRIC 2: **Apartments**

Metric Specifications

Provide the following EV infrastructure to each apartment development:

Capacity and Load Management

- Dedicated EV distribution board(s) in each carpark storey that is capable of:
  - Supplying a minimum Level 2 (Mode 3) 7 kW, 32 Amp single phase dedicated circuit to all residential car parking spaces; and
  - Managing the maximum demand load of the development so that it does not exceed the site capacity, while providing a minimum average of 12 kWh of charge to each car parking space (particularly during off peak periods).
- Dedicated space for cable trays to support the future installation of EV cabling from the distribution board to the edge of each car parking space.
- Additional EV infrastructure, as required, which may include power use metering and communication systems, and conduit installations.

Motor cycle, moped, electric bicycle or scooter parking

- A 10-15 Amp charging outlet to every 6 bicycle parking spaces.
- Prominent, accessible and secure locations for the bicycle parking and other personal mobility devices.

Shared or Communal Space EV Charging

- A minimum of 1 Active EV charging unit should be installed at a shared or communal parking space, where relevant.
- Shared or communal EV charging spaces should be located in highly visible, priority locations, to encourage EV uptake.
- Clear signage must be provided to indicate that EV charging is available at the shared or communal spaces.

Parking Facilities

Parking facilities for low and zero emission vehicles should be located in a prominent, accessible location to encourage easy access by building occupants and visitors, ahead of larger and emission intensive vehicles.

METRIC 2: **Apartments**

Design Guidance

Base infrastructure for an apartment building includes:

- 1 or more distribution boards provided to each car parking level with a capacity to meet the future charging capacity of the level required. The location of the distribution boards should be centrally located at the parking spaces to reduce individual cabling costs for EV owners.
- An approved power use metering system.
- Cable trays and/or conduit installed to service each residential parking space to accommodate future EV cabling (power and communications).

The location of EV charging units

- Whether the design includes EV charging units ('Active') or is EV Ready, the design should ensure that infrastructure will be readily accessible and not obstructed.
- Where storage cages are provided in, and around, car parking spaces, ensure that future charging will be feasible and EV infrastructure is not obstructed.

Designs that include EV charging units (Active EV Units)

- Electricity supply to EV charging units may utilise common property electricity rather than electricity individually metered to a dwelling, with metering of individual circuits to each EV space via a NMI pattern (installed in, or adjacent to, the distribution board).
- Metering should be in a location that is accessible locally by an owners' corporation representative or appointee, and should have a means for communicating the kW consumed (e.g. pulse output or communications protocol) so that if a remote meter reading solution is desired by the owners 'corporation in the future, it can be implemented.
- Spatial provisioning for NMI metering within load centres should be included until regulations are clarified.

Load Management

- The load management system can be physical or cloud based systems.
- Load management should be designed to manage the predicted increase demand when using future EV charging to prevent exceeding the maximum electricity capacity for the site.
- The development should include site wide load management that can operate EV charging circuits within and between relevant spaces that comprises either:
  - Static load management – a system that charges all vehicles at the same time, which equally allocates a reduced load managed charge;
  - Rotational (time-shared) load management – a system that equally allocates charging based on a fixed schedule; or
  - Active/dynamic load management – a smart, communications-based and controlled charging system that responds to the energy requirements of the development and supplies EV charging to vehicles based on availability.
- The load management system (whether a separate system or in-built in charger types) should be scalable so that it can accommodate an increasing number of EVs as they are introduced to the building over time, up to the point where the development can accommodate EV charging to all residential parking spaces, as a minimum.

Elements to include on plans

EV infrastructure specifications need to be detailed and demonstrated on relevant plans.

* As part of your technical drawings needed for building compliance, the electrical plans will need to include the design of all the EV infrastructure demonstrating that it will deliver the electricity demand to serve EV charging to the development site. This includes the size and location of each cable tray and/or conduit to be installed to service each residential car parking space.

Other Design Guidance

Engaging the relevant expert to prepare the design

An electrical engineer has the expertise to design the base infrastructure and load management system within an apartment and mixed use development. EV charging infrastructure must be designed by a suitably qualified electrical engineer and installed by a licensed electrician. All works must be undertaken in accordance with the wiring rules and any other State or Federal regulations.

Protocol for ongoing management

The ongoing management of EV infrastructure and the EV system should be kept in mind when embedding relevant infrastructure within a development. New owners should be made aware of such systems, as well as, the owners' corporation.

Communicating the availability of such systems and resources within a development will ensure that responsibilities and protocols can be established that enables ongoing effective load management, metering and cost allocation, as well as, the equitable use of shared or common charging stations.

Alternative solutions

Where it is demonstrated that a metric cannot be met, an alternative solution and design approach may be appropriate. The alternative solution will need to be discussed on a case-by-case basis and must be supported by Council Officers.

Further Information

For additional guidance and details, please refer to:

Moreland City Council Low Emission and Electric Vehicles Standard (Moreland City Council, 2021)

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