



## 12.1 Case 1 – Auckland

### 12.1.1 Step 1: Determine requirements

#### Heating/cooling requirements

- Primarily for heating.
- Auckland region, open site.
- New home.
- Family room is to be heated by the heat pump.

#### Checklist of building conditions

- North facing.
- Good solar access.
- Areas of windows, floors and external walls calculated for the space.
- Complies with current Building Code (2008 onwards) – high levels of insulation and double glazing.

### 12.1.2 Steps 2 and 3: Determine design temperature and heat load requirement

Climate		
Region:	Auckland	
Design Temperature: (PTO for table)	4°C	
Heater Sizer		
Factor	Score	Room
(A) Climate index (PTO for table)		0
(B) Room type		2
Bed, Hall (16°C):	0	
Dining (18°C):	1	
Lounge (20°C):	2	
(C) Insulation (select one)		1
Very High:	0	
NZBC 2008 onwards:	1	
NZBC 1978–2007:	2	
Ceiling and/or floor insulation:	3	
Uninsulated:	4	
(D) Number of external walls		3
One:	1	
Two:	2	
Three:	3	
(E) Window size in this room (% of exterior wall area)		2
Small: ~ 25%:	1	
Medium: ~ 40%:	2	
Large: ~ 60%:	3	
Very Large: ~ 80%:	4	
(F) Total score = (A) + (B) + (C) + (D) + (E)		8
(G) Multiply room area ( 45.1 ) x 8 [m <sup>2</sup> ]		360.8
(H) = (G) + (100) =		460.8
<b>Heater Size in Watts = (F) x (H) =</b>		<b>3686.4 W</b>

### 12.1.3 Step 4: Determine system requirements and options

- High wall inverter unit.
- Single-split.
- Non-ducted.
- High star rating for good energy efficiency performance.

### 12.1.4 Step 5: Select system/model to suit all requirements

In this case, a high wall indoor unit with low indoor and outdoor noise could be selected. The table below gives sample data for heat pumps – installers will need to use product-specific data. The design temperature is 4°C, and the heat required is 3.7 kW. Therefore Model A, which has an output of 3.8 kW at 2°C, is sufficient.

Always round down to the nearest design temperature there is performance data for.

Model A: Capacity 4.0 kW rated output															
Indoor (°C)	Outdoor (°C)														
20	-10			-5			0			2			7		
	Output	Input	COP	Output	Input	COP	Output	Input	COP	Output	Input	COP	Output	Input	COP
	2.4	0.77	3.12	2.88	0.91	3.15	3.7	1.1	3.31	3.8	1.12	3.4	4.1	1.18	3.5
Model B: Capacity 6.0 kW rated output															
Indoor (°C)	Outdoor (°C)														
20	-10			-5			0			2			7		
	Output	Input	COP	Output	Input	COP	Output	Input	COP	Output	Input	COP	Output	Input	COP
	3.6	1.3	2.76	4.32	1.54	2.8	5.1	1.71	2.98	5.2	1.75	3.0	6.1	1.9	3.2

### 12.1.5 Step 6: Locate the units

#### Outdoor unit

There are a few options for the outdoor unit. It would be best to avoid the area around the double doors as it is used for outdoor living. Outside the kitchen is appropriate as long as the occupants don't have an issue with it being close to their front door – see location on plan at A. Another option is on the bathroom or laundry wall. In this case, pipework needs to be planned at the design stage of building.

#### Indoor unit

The indoor unit can be placed on the external wall on the family side of the kitchen. It is important not to have steam from cooking underneath the unit – in this case, this is not likely, so will be OK.

## 12.2 Case 2 – Wellington

### 12.2.1 Step 1: Determine requirements

#### Heating/cooling requirements

- Primarily for heating.
- Wellington city, located in a valley with little sun.
- New home.
- Family room is to be heated by the heat pump.

#### Checklist of building conditions

- North facing.
- Poor solar access to the family room.
- Areas of windows, floors and external walls calculated for the space.
- Complies with current Building Code (2008 onwards) – high levels of insulation and double glazing.

### 12.2.2 Steps 2 and 3: Determine design temperature and heat load requirement

Climate		
Region:	Wellington	
Design Temperature: (PTO for table)	0°C	
Heater Sizer		
Factor	Score	Room
(A) Climate index (PTO for table)		3
(B) Room type		+
Bed, Hall (16°C):	0	2
Dining (18°C):	1	
Lounge (20°C):	②	
(C) Insulation (select one)		+
Very High:	0	1
NZBC 2008 onwards:	①	
NZBC 1978–2007:	2	
Ceiling and/or floor insulation:	3	
Uninsulated:	4	
(D) Number of external walls		+
One:	1	3
Two:	2	
Three:	③	
(E) Window size in this room (% of exterior wall area)		+
Small: ~ 25%:	①	2
Medium: ~ 40%:	2	
Large: ~ 60%:	3	
Very Large: ~ 80%:	4	
(F) Total score = (A) + (B) + (C) + (D) + (E)		11
(G) Multiply room area ( 45.1 ) x 8 [m <sup>2</sup> ]		360.8
(H) = (G) + (100) =		460.8
<b>Heater Size in Watts = (F) x (H) =</b>		<b>5060 W</b>

### 12.2.3 Step 4: Determine system requirements and options

- High wall inverter unit.
- Single-split.
- Non-ducted.
- High star rating for good energy efficiency performance.
- Low noise.

### 12.2.4 Step 5: Select system/model to suit all requirements

In this case, a high wall indoor unit with low indoor and outdoor noise could be selected. The table below gives sample data for heat pumps – installers will need to use product-specific data. The design temperature is 0°C and the heat required is 5.1 kW. Model B is sufficient in this case, as it provides a heating output of 5.1 kW.

Model A: Capacity 4.0 kW rated output															
Indoor (°C)	Outdoor (°C)														
20	-10			-5			0			2			7		
	Output	Input	COP	Output	Input	COP	Output	Input	COP	Output	Input	COP	Output	Input	COP
	2.4	0.77	3.12	2.88	0.91	3.15	3.7	1.1	3.31	3.8	1.12	3.4	4.1	1.18	3.5
Model B: Capacity 6.0 kW rated output															
Indoor (°C)	Outdoor (°C)														
20	-10			-5			0			2			7		
	Output	Input	COP	Output	Input	COP	Output	Input	COP	Output	Input	COP	Output	Input	COP
	3.6	1.3	2.76	4.32	1.54	2.8	5.1	1.71	2.98	5.2	1.75	3.0	6.1	1.9	3.2
Model C: Capacity 8.0 kW rated output															
Indoor (°C)	Outdoor (°C)														
20	-10			-5			0			2			7		
	Output	Input	COP	Output	Input	COP	Output	Input	COP	Output	Input	COP	Output	Input	COP
	4.8	1.85	2.59	5.65	2.05	2.75	6.2	2.25	2.8	6.4	2.4	2.7	8.1	2.6	3.1

### 12.2.5 Step 6: Locate the units

#### Outdoor unit

There are a few options for the outdoor unit. It would be best to avoid the area around the double doors as it is used for outdoor living. Outside the kitchen is appropriate as long as the occupants don't have an issue with it being close to their front door – see location on plan at A. Another option is on the bathroom or laundry wall. In this case, pipework needs to be planned at the design stage of building.

#### Indoor unit

The indoor unit can be placed on the external wall on the family side of the kitchen. It is important not to have steam from cooking underneath the unit – in this case, that is not likely.

## 12.3 Case 3 – Dunedin

### 12.3.1 Step 1: Determine requirements

#### Heating/cooling requirements

- Primarily for heating.
- Already have a wood burner that they are keeping and will use during the colder parts of winter in the family room – see location on plan at B.
- Dunedin, sloping site with good solar access.
- New home.
- Family room is to be heated by the heat pump.

#### Checklist of building conditions

- Good solar access to the family room.
- Areas of windows, floors and external walls calculated for the space.
- Complies with current Building Code (2008 onwards) – high levels of insulation and double glazing.

### 12.3.2 Steps 2 and 3: Determine design temperature and heat load requirement

Climate		
Region:	Dunedin	
Design Temperature: (PTO for table)	-1°C	
Heater Sizer		
Factor	Score	Room
(A) Climate index (PTO for table)		5
(B) Room type		+
Bed, Hall (16°C):	0	2
Dining (18°C):	1	
Lounge (20°C):	②	
(C) Insulation (select one)		+
Very High:	0	1
NZBC 2008 onwards:	①	
NZBC 1978–2007:	2	
Ceiling and/or floor insulation:	3	
Uninsulated:	4	
(D) Number of external walls		+
One:	1	3
Two:	2	
Three:	③	
(E) Window size in this room (% of exterior wall area)		+
Small: ~ 25%:	①	2
Medium: ~ 40%:	2	
Large: ~ 60%:	3	
Very Large: ~ 80%:	4	
(F) Total score = (A) + (B) + (C) + (D) + (E)		13
=		
(G) Multiply room area ( 45.1 ) x 8 [m <sup>2</sup> ]		360.8
(H) = (G) + (100) =		460.8
<b>Heater Size in Watts = (F) x (H) =</b>		<b>5990.4 W</b>

### 12.3.3 Step 4: Determine system requirements and options

- High wall/floor-mounted unit.
- Single-split.
- Non-ducted.
- High star rating for good energy efficiency performance.
- Low noise.

### 12.3.4 Step 5: Select system/model to suit all requirements

In this case, a high wall or a floor-mounted indoor unit with low indoor and outdoor noise could be selected. The table below gives sample data for heat pumps – installers will need to use product-specific data. The design temperature is -1°C and the heat required is 6 kW. Model B has sufficient capacity for the heating required with an output of 6.2 kW at 5°C.

Model A: Capacity 8.0 kW rated output															
Indoor (°C)	Outdoor (°C)														
20	-10			-5			0			2			7		
	Output	Input	COP	Output	Input	COP	Output	Input	COP	Output	Input	COP	Output	Input	COP
	4.8	1.85	2.59	5.65	2.05	2.75	6.2	2.25	2.8	6.4	2.4	2.7	8.1	2.6	3.1
Model B: Capacity 10.0 kW rated output															
Indoor (°C)	Outdoor (°C)														
20	-10			-5			0			2			7		
	Output	Input	COP	Output	Input	COP	Output	Input	COP	Output	Input	COP	Output	Input	COP
	5.5	2.12	2.6	6.2	2.25	2.8	6.8	2.45	2.8	7	2.55	2.7	9.2	2.7	3.4

### 12.3.5 Step 6: Locate the units

#### Outdoor unit

There are a few options for the outdoor unit. It would be best to avoid the area around the double doors as it is used for outdoor living. Outside the kitchen is appropriate as long as the occupants don't have an issue with it being close to their front door – see location on plan at A. Another option is on the bathroom or laundry wall. In this case, pipework needs to be planned at the design stage of building.

#### Indoor unit

The indoor unit can be placed on the external wall on the family side of the kitchen. Alternatively, the unit could be on external wall elevation A between the windows. Both locations allow for easy drainage of the condensate drain to outside.