



# Nationwide House Energy Rating Scheme (NatHERS)

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## DRAFT NatHERS In Home Software Accreditation Protocol – Testing Methodology and Test Homes

The following is an extract of the NatHERS In Home Software Accreditation Protocol (SAP). The test homes represent the most significant difference between the NatHERS Thermal SAP and the NatHERS In Home SAP. As such only this section of the SAP is included at this stage for stakeholder comment.

The test homes are based on a range of typical house constructions representative of the current Australian detached residential building stock, which was evaluated as part of the Trajectory for Low Energy Buildings. Typical apartments have also been included.

## In Home SAP – Testing Methodology and test homes

The consistency and accuracy of energy performance ratings is fundamental to the objectives of NatHERS.

NatHERS accredited software tools must meet minimum accuracy requirements for accreditation, reaccreditation and updates. The accuracy requirements are assessed relative to the NatHERS In Home Benchmark Tool (AccuRate In Home), which is the commercial software tool developed by CSIRO.

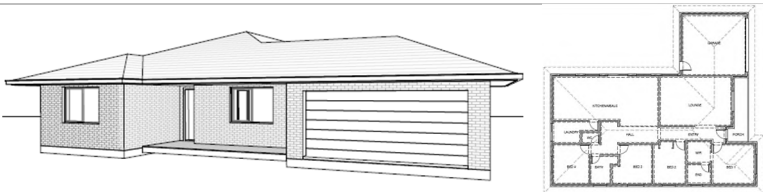
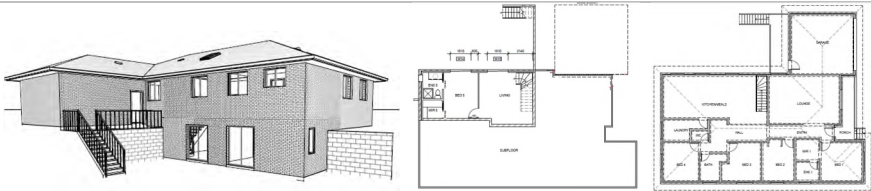
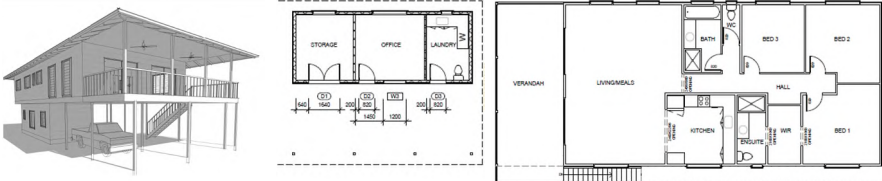


If the Software Provider fails to satisfy the requirements, or where an update of a previously accredited Software is being reaccredited, if testing indicates a significant impact on the rating output of the software tool, the Administrator (on behalf of the NatHERS Steering Committee) may withhold accreditation of the updated software tool.

### 1.1.1. NatHERS In Home test performance dwelling designs

The NatHERS In Home test SAP dwellings consist of three Class 1 and two Class 2 designs (Figure 1).

New accreditation entails modelling all five dwellings, whereas reaccreditation and minor updates are generally limited to two Class 1 and one Class 2 designs.

**Figure 1 — NatHERS In Home test dwelling designs**

<b>110</b> 1990 4-bedroom single level weatherboard construction	
<b>200</b> 2003 5-bedroom split level Rendered brick veneer	
<b>400</b> 1983, 3-bedroom weatherboard clad “Queenslander” / pole house	
<b>610</b> 1-bedroom ground floor apartment	
<b>620</b> 2-bedroom 5 <sup>th</sup> floor apartment	

Each dwelling design (available from the Administrator) has unique specifications to test particular building features. For NatHERS In Home software tools, dwelling designs include some that are of older construction types that provide some representation of the breadth of existing housing stock across the country.

### 1.1.2. NatHERS test dwellings' building shell and major appliance energy consumption

NatHERS In Home software tool accreditation entails calculations of building shell thermal performance and fixed appliances energy performance. Detached dwelling scenarios have designations for pools and solar PV. Apartment simulations focus on heating, cooling and hot water appliances. They do not include pool or solar PV appliances as these are generally on common property, and not allocated to the specific unit or apartment.

The following components are to be tested:

- insulation levels and types
- window types, including glass, frame type and size
- glazing to floor area ratio
- floor construction, ventilation and coverings
- roof construction and colour e.g. attic, hip roof, concrete or flat
- wall construction and colour, solar absorptance, including thermal mass
- internal walls adjacent to subfloors and roof spaces
- internal zoning including, apartment corridors and basements
- orientation
- terrain and exposure (impact of elevation)
- external shading from shade structures and neighbouring buildings
- infiltration e.g. windows, doors, exhaust fans
- shower head flow rates
- ceiling penetrations
- heating and cooling system type and efficiency
- hot water system type and efficiency
- lighting systems and their efficiency
- pool and spa size and heating and pumping system efficiency
- on-site energy production and storage systems.

The following sections detail the five test designs. The remaining detail is within the five architectural drawings for each design available from the Administrator:

- Table 1 lists the five dwellings thermal shell, construction method and other categories
- Table 2 lists the appliance energy performances
- Table 3 lists NatHERS In Home representative climate zones
- Table 12 and 13 detail the dwelling simulation scenarios.

### 1.1.3. Thermal shell, construction and other categories to be tested

**Table 1 — Overview of test dwelling construction features and specifications**

Feature and specification		110 Single storey 4-bed	200 Split-level 5 bed	400 Elevated tropical 3-bed	610 Apartment (ground floor)	620 Apartment mid- level (5 <sup>th</sup> floor)
Air infiltration	Openness, standard	✓		✓	✓	✓
	Openness, ventilated		✓			
	Sealed exhaust fans	✓	✓	✓	✓	✓
	Sealed exhaust fans with heat lamps	✓	✓	✓	✓	✓
	Ceiling fans	✓		✓		

Feature and specification		110 Single storey 4-bed	200 Split-level 5 bed	400 Elevated tropical 3-bed	610 Apartment (ground floor)	620 Apartment mid- level (5 <sup>th</sup> floor)
	Recessed luminaires	✓	✓			
	Sealed windows	✓			✓	✓
	Unsealed windows		✓	✓		
	Sealed external doors	✓	✓	✓	✓	
	Unsealed external doors	✓	✓			
Ceiling fans (in all bedrooms and living space)	1200mm diameter	✓		✓		
Doors external	Solid timber	✓	✓	✓		
	Hollow core	✓	✓	✓		
	Steel	✓	✓			
	Partially glazed			✓		
Eave	Eave projection includes gutter	✓	✓	✓		
	Eave projection does not include gutter				✓	✓
	Eaves included in roof space		✓			
Exposure	Suburban	✓	✓	✓	✓	
	Open					✓
Orientation	North	✓	✓	✓	✓	
	West					✓
Vertical shading schemes	Adjacent neighbours, same height	✓	✓	✓	✓	
Window horizontal offsets	Horizontal offsets from parent wall detailed	✓	✓	✓	✓	✓
Tubular skylights	Default, single glazed with shafts and ceiling diffusers	✓	✓			
Roof window	Fixed	✓				
	Operable		✓			
Window operating type	Awning		✓		✓	✓
	Sliding	✓				
	Louvre			✓		
Glazing		Single	Double	Single	Single	Single
Window frame material		Aluminium	Aluminium	Solid timber	Vinyl	Thermally broken Aluminium
Soffit liner	5mm FIBRE CEMENT SHEET	✓	✓	✓		
Ceiling type	10mm PLASTERBOARD	✓	✓	✓	✓	✓
Insulation	Walls	Glasswool R1.5	none	none	100mm reinforced concrete	100mm reinforced concrete
	Ceilings	Glasswool R2.5 15% displaced	none	Glasswool R1.5 10% displaced	100mm reinforced concrete	100mm reinforced concrete
	Floors	none	none	none	100mm reinforced concrete	100mm reinforced concrete
Shower head flow rate (L/Minute)				All Ensuite – 11 All Bath – 13		
	Sub-floor		✓			

Feature and specification		110 Single storey 4-bed	200 Split-level 5 bed	400 Elevated tropical 3-bed	610 Apartment (ground floor)	620 Apartment mid- level (5 <sup>th</sup> floor)
Unique design features	Floors over open air			✓		
	Internal walls adjacent roof space		✓			
	Internal inter-tenancy walls				✓	✓
	Internal walls adjacent to sub-floor		✓			

### 1.1.3.1. Appliance performance to be tested

**Table 2 – Fixed Appliance Energy Performance – Key Inputs and Settings**  
Summary of appliances and performance levels

Category	Appliance	Performance level
Heating & cooling	Low efficiency (LE) reverse cycle air conditioner	COP 2.5, EER 2.5
	High efficiency (HE) reverse cycle	COP 4.5, EER 4.5
	LE ducted reverse cycle air conditioner	COP 2.5, EER 2.5
Heating only	Gas heater	4 star
	Ducted Gas	4 star
	Resistive heating	COP 1.0
	Slow combustion	0.65
	None	
Cooling only	Air-conditioner	EER 3.5
	Evaporative cooler	EER 4
Hot water system	Electric storage	4 star
	Heat pump	6 star
	Solar hot water – electric boost	6 star
	Solar hot water – gas boost	5 star
	Instantaneous gas – HE	7 star
	Instantaneous gas – LE	5 star
	Gas storage	5 star
	Electric instantaneous	4 star
Lighting	High Efficiency - HE	No Halogens
	Low Efficiency - LE	30 Halogens in living room
Pool pumps	Single speed	2 star
	Dual speed	5 star
	Multi Speed	8 star
Cleaner type	Main filtration	
	Booster pump	
	Robotic	

**Note – Pool cleaning and pumping energy ratings are subject to ongoing discussion and testing**

### 1.1.3.2. Climate zones and categories to be tested

NatHERS representative climate zones have been divided into three categories: cooling dominated, heating dominated and balanced climate. The climate zones in each category are provided in Table 3.

**Table 3 — NatHERS representative climate zones**

Designation	NatHERS climate zone number	NatHERS climate zone name	Postcode	SC Heating	SC Cooling
Cooling dominated	1	Darwin	800	1	1
	3	Longreach	4730	10	39
	4	Carnarvon	6701	10	10
	32	Cairns	4870	5	5
Heating dominated	21	Melbourne RO	3000	21	21
	24	Canberra	2600	24	24
	26	Hobart	7000	24	65
	66	Ballarat	3350	65	60
Balanced	6	Alice Springs	870	56	5
	8	Moree	2400	8	8
	10	Brisbane	4000	10	10
	13	Perth	6043	13	13
	16	Adelaide	5000	16	16
	56	Mascot	2021	56	56
	55	Esperance	6450	16	21

### 1.1.4. Detached dwelling (Class 1) appliance simulation scenarios

Table 4 — Detached dwelling simulation scenarios

Test scenario reference No.	Heating & cooling — living area		Heating & cooling — bedroom		Hot water	Pools			Solar photo voltaic		Lighting
	Heating appliance + (COP)	Cooling appliance + (EER)	Heating appliance + (COP)	Cooling appliance + (EER)	System type & performance level	Pool size (L)	Pump type	Cleaner type	Array size (kW)	Orientation	High Efficiency (HE) or Low Efficiency (LE)
<b>Heating dominated climate category</b>											
H1	LE reverse cycle (2.5)	LE reverse cycle (2.5)	—	—	Electric storage	—	—	—	—	—	HE
H2	HE reverse cycle (4.5)	HE reverse cycle (4.5)	—	—	Electric storage	50000	2-star single speed	Main filtration	—	—	HE
H3	LE ducted reverse cycle (3.75)	LE ducted reverse cycle (3.25)	LE ducted reverse cycle (3.75)	LE ducted reverse cycle (3.25)	Heat pump	50000	2-star single speed	Booster pump	—	—	HE
H4	Gas (4)	Air-conditioner (-4.0)	—	—	Heat pump	50000	2-star single speed	Robotic	—	—	HE
H5	Gas (4)	—	—	—	Solar — electric boost	50000	5-star dual speed	Main filtration	3 kW	N (0°)	HE
H6	Ducted gas (4)	—	Ducted gas (4)	—	Solar — gas boost (5)	50000	5-star dual speed	Booster pump	3 kW	N (0°)	HE
H7	Resistive heating (1)	—	Resistive heating (1)	—	Instant gas - HE (7)	50000	5-star dual speed	Robotic	3 kW	N (0°)	LE
H8	Resistive heating (1)	Air-conditioner (3.5-4.0)	—	—	Instant gas - LE (5)	50000	8-star multi speed	Main filtration	5 kW	NE (45°)	LE
H9	Slow combustion (0.65)	None	—	—	Gas storage (5)	50000	8-star multi speed	Booster pump	10 kW	NE (45°)	LE
H10	—	Evaporative	—	Evaporative	Electric Instant	50000	8-star multi speed	Robotic	10 kW	NE (45°)	LE
<b>Balanced climate category</b>											
H11	Gas (4)	—	—	—	Electric storage	—	—	—	—	—	HE
H12	Resistive heating (1)	Air-conditioner (3.5-4.0)	Resistive heating (1)	—	Electric storage	50000	2-star single speed	Main filtration	—	—	LE
H13	Gas (4)	Air-conditioner (3.5)	—	Air-conditioner (3.5-4.0)	Heat pump	50000	2-star single speed	Booster pump	—	—	LE
H14	LE reverse cycle (2.5)	LE reverse cycle (2.5)	—	—	Heat pump	50000	2-star single speed	Robotic	—	—	LE
H15	HE reverse cycle (4.5)	HE reverse cycle (4.5)	—	—	Solar — electric boost	50000	5-star dual speed	Main filtration	3 kW	N (0°)	HE
H16	Resistive heating (1)	Air-conditioner (3.5-4.0)	—	Air-conditioner (3.5-4.0)	Solar — gas boost (5)	50000	5-star dual speed	Booster pump	3 kW	N (0°)	HE

Test scenario reference No.	Heating & cooling — living area		Heating & cooling — bedroom		Hot water		Pools		Solar photo voltaic		Lighting High Efficiency (HE) or Low Efficiency (LE)
	Heating appliance + (COP)	Cooling appliance + (EER)	Heating appliance + (COP)	Cooling appliance + (EER)	System type & performance level	Pool size (L)	Pump type	Cleaner type	Array size (kW)	Orientation	
H17	LE ducted reverse cycle (3.75)	LE ducted reverse cycle (3.25)	LE ducted reverse cycle (3.75)	LE ducted reverse cycle (3.25)	Instant gas - HE (7)	50000	5-star dual speed	Robotic	3 kW	N (0°)	LE
H18	Slow combustion (0.65)	—	—	None	Instant gas - LE (5)	50000	8-star multi speed	Main filtration	5 kW	NE (45°)	LE
H19	—	Evaporative	—	Evaporative	Gas storage (5)	50000	8-star multi speed	Booster pump	5 kW	NE (45°)	LE
H20	Ducted gas (4)	LE ducted reverse cycle (3.25)	Ducted gas (4)	LE ducted reverse cycle (3.25)	Electric Instant	50000	8-star multi speed	Robotic	5 kW	NE (45°)	LE
Cooling dominated climate category											
H21	Resistive heating (1)	Air-conditioner (3.5-4.0)	Resistive heating (1)	Air-conditioner (3.5-4.0)	Electric storage	—	—	—	—	—	HE
H22	LE reverse cycle (2.5)	LE reverse cycle (2.5)	LE reverse cycle (2.5)	LE reverse cycle (2.5)	Electric storage	50000	2-star single speed	Main filtration	—	—	LE
H23	HE reverse cycle (4.5)	HE reverse cycle (4.5)	HE reverse cycle (4.5)	HE reverse cycle (4.5)	Heat pump	50000	2-star single speed	Booster pump	—	—	HE
H24	LE ducted reverse cycle (3.75)	LE ducted reverse cycle (3.25)	LE ducted reverse cycle (3.75)	LE ducted reverse cycle (3.25)	Heat pump	50000	2-star single speed	Robotic	—	—	LE
H25	—	Evaporative	—	Evaporative	Solar — electric boost	50000	5-star dual speed	Main filtration	3 kW	N (0°)	LE
H26	Resistive heating (1)	Air-conditioner (3.5-4.0)	Resistive heating (1)	Air-conditioner (3.5-4.0)	Solar — gas boost (5)	50000	5-star dual speed	Booster pump	3 kW	N (0°)	LE
H27	LE reverse cycle (2.5)	LE reverse cycle (2.5)	LE reverse cycle (2.5)	LE reverse cycle (2.5)	Instant gas - HE (7)	50000	5-star dual speed	Robotic	3 kW	N (0°)	HE
H28	HE reverse cycle (4.5)	HE reverse cycle (4.5)	HE reverse cycle (4.5)	HE reverse cycle (4.5)	Instant gas - LE (5)	50000	8-star multi speed	Main filtration	5 kW	NE (45°)	LE
H29	LE ducted reverse cycle (3.75)	LE ducted reverse cycle (3.25)	LE ducted reverse cycle (3.75)	LE ducted reverse cycle (3.25)	Gas storage (5)	50000	8-star multi speed	Booster pump	5 kW	NE (45°)	LE
H30	—	Evaporative	—	Evaporative	Electric Instant	50000	8-star multi speed	Robotic	5 kW	NE (45°)	LE



#### 1.1.4.1. Apartment (Class 2) appliance simulation scenarios

Table 5 — Apartment simulation scenarios

Test scenario reference No.	Heating & cooling — living area		Heating & cooling — bedroom		Hot water	Lighting
	Heating appliance + (COP)	Cooling appliance + (EER)	Heating appliance + (COP)	Cooling appliance + (EER)	System type & performance level	High Efficiency (HE) or Low Efficiency (LE)
Heating dominated climate category						
A1	LE reverse cycle (2.5)	LE reverse cycle (2.5)	—	—	Electric storage	LE
A2	HE reverse cycle (4.5)	HE reverse cycle (4.5)	—	—	Electric storage	LE
A3	LE ducted reverse cycle (3.75)	LE ducted reverse cycle (3.25)	LE ducted reverse cycle (3.75)	LE ducted reverse cycle (3.25)	Heat pump	LE
A4	Gas (4)	Air-conditioner (3.5)	—	—	Heat pump	HE
A5	Gas (4)	—	—	—	Solar — electric boost	HE
A6	Ducted gas (4)	—	Ducted gas (4)	—	Solar — gas boost (5)	HE
A7	Resistive heating (1)	—	Resistive heating (1)	—	Instant gas - HE (7)	HE
A8	Resistive heating (1)	Air-conditioner (4.0)	—	—	Instant gas - LE (5)	HE
A9	Slow combustion (0.65)	—	—	—	Gas storage (5)	LE
A10	—	Evaporative	—	Evaporative	Electric Instant	LE
Balanced climate category						
A11	Gas (4)	—	—	—	Electric storage	LE
A12	Resistive heating (1)	Air-conditioner (3.5-4.0)	Resistive heating (1)	—	Electric storage	LE
A13	Gas (4)	Air-conditioner (3.5-4.0)	—	Air-conditioner (3.5-4.0)	Heat pump	LE
A14	LE reverse cycle (2.5)	LE reverse cycle (2.5)	—	—	Heat pump	HE
A15	HE reverse cycle (4.5)	HE reverse cycle (4.5)	—	—	Solar — electric boost	HE

Test scenario reference No.	Heating & cooling — living area		Heating & cooling — bedroom		Hot water	Lighting
	Heating appliance + (COP)	Cooling appliance + (EER)	Heating appliance + (COP)	Cooling appliance + (EER)	System type & performance level	High Efficiency (HE) or Low Efficiency (LE)
A16	Resistive heating (1)	Air-conditioner (3.5-4.0)	—	Air-conditioner (3.5-4.0)	Solar — gas boost (5)	HE
A17	LE ducted reverse cycle (3.75)	LE ducted reverse cycle (3.25)	LE ducted reverse cycle (3.75)	LE ducted reverse cycle (3.25)	Instant gas - HE (7)	HE
A18	Slow combustion (0.65)	—	—	—	Instant gas - LE (5)	HE
A19	—	Evaporative	—	Evaporative	Gas storage (5)	LE
A20	Ducted gas (4)	LE ducted reverse cycle (3.25)	Ducted gas (4)	LE ducted reverse cycle (3.25)	Electric Instant	LE
<b>Cooling dominated climate category</b>						
A21	Resistive heating (1)	Air-conditioner (3.5-4.0)	Resistive heating (1)	Air-conditioner (3.5-4.0)	Electric storage	LE
A22	LE reverse cycle (2.5)	LE reverse cycle (2.5)	LE reverse cycle (2.5)	LE reverse cycle (2.5)	Electric storage	LE
A23	HE reverse cycle (4.5)	HE reverse cycle (4.5)	HE reverse cycle (4.5)	HE reverse cycle (4.5)	Heat pump	LE
A24	LE ducted reverse cycle (3.75)	LE ducted reverse cycle (3.25)	LE ducted reverse cycle (3.75)	LE ducted reverse cycle (3.25)	Heat pump	HE
A25	—	Evaporative	—	Evaporative	Solar — electric boost	HE
A26	Resistive heating (1)	Air-conditioner (3.5-4.0)	Resistive heating (1)	Air-conditioner (3.5-4.0)	Solar — gas boost (5)	HE
A27	LE reverse cycle (2.5)	LE reverse cycle (2.5)	LE reverse cycle (2.5)	LE reverse cycle (2.5)	Instant gas - HE (7)	HE
A28	HE reverse cycle (4.5)	HE reverse cycle (4.5)	HE reverse cycle (4.5)	HE reverse cycle (4.5)	Instant gas - LE (5)	HE
A29	LE ducted reverse cycle (3.75)	LE ducted reverse cycle (3.25)	LE ducted reverse cycle (3.75)	LE ducted reverse cycle (3.25)	Gas storage (5)	LE
A30	—	Evaporative	—	Evaporative	Electric Instant	LE

## 1.2. Testing processes

The testing steps described in this section are a general guide only and in some circumstances may be modified, if deemed necessary by the Administrator.

### Entering dwelling features into the software tool

Testing involves inputting SAP dwelling design specifications (drawings available from the Administrator on request) into the software tool. This is followed by applying the relevant appliance and climate zone scenario settings listed in Table 4 (for detached dwellings) and Table 5 (for apartments) and recording the simulation results for each scenario.

When testing each dwelling, the Software Provider must incorporate NatHERS specifications of a dwelling to allow equal comparison between different dwellings in different NatHERS climate zones (e.g. window values, NatHERS climate zones and weather data, internal hourly heat loads for living spaces, occupancy hours/ thermostat and adjustable shade settings, thermal properties of building materials, infiltration calculations, area correction factor and NatHERS In Home rating metric values).

If a specification may appear ambiguous, refer to the NatHERS In Home Benchmark file, which may clarify the specifications of an item. Please contact the Administrator if the NatHERS In Home Benchmark file does not provide clarification.

### Recording results – test results spreadsheet

For new and reaccreditation testing the Administrator will provide the test result spreadsheet. This is prepopulated with benchmark results, including the whole of home energy results, the NatHERS In Home rating metric result, and the dwelling's conditioned floor area for each dwelling in each climate zone. When the Software Provider enters their simulation results, the spreadsheet will calculate a pass/fail for each component and whether the results fall within tolerances, compared to the NatHERS Benchmark Tool.

For minor updates, the Software Provider will submit the minor update test result spreadsheet.

### Generating certificates

For new and reaccreditation testing, certificates need to be generated to ensure they are correctly designed and populated. The required certificates are itemised in **Error!**

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### Submitting results

Once testing is complete, the Software Provider will submit the test results spreadsheet and, except for the EOI stage, software rating files and beta version to the Administrator at: [admin@nathers.gov.au](mailto:admin@nathers.gov.au).

### New accreditation

Software tools must be tested using up to nine NatHERS dwelling designs in all NatHERS climate zones to determine how the software assesses thermal performance when compared to NatHERS In Home Benchmark tool (the benchmark software).

New accreditation entails two testing phases:

#### EOI phase

The standard test subject is SAP dwelling 110 in all 69 climate zones. Accuracy requirements do not apply to this dwelling, however the Software Provider should attempt to gain results

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as close as possible to the benchmark results. It is an early opportunity for the Administrator and the Software Provider to work together to collaboratively resolve any issues that may arise through the formal accreditation process. The simple design allows Software Providers an opportunity to quickly understand significant deviations from the required test results. It tests a range of modelling features, including the ability of software to follow the NatHERS zoning requirements and check the accuracy of the thermal load, calculations of conditioned and unconditioned zoned areas and the NatHERS Whole of Home metric.

### **Main testing phase**

Testing is conducted by both the Software Provider and the Independent Tester.

The Software Provider must test all SAP dwellings in the nominated NatHERS climate zones (Table 3), during this phase.

The independent tester must submit:

- a conflict of interest declaration
- a written statement that the verification was their work
- a report to the Administrator with the findings and recommendations (if any), including an outline of the methods and assumptions used in testing to verify that software results are within required tolerances
- any other documentation recording data analysis
- completed software test results spreadsheets and
- NatHERS Certificates as specified in ...

### **Reaccreditation**

The Software Provider will test dwellings 200, 400 and 610 in all NatHERS climates. However, the Administrator and Software Provider will need to consult and confirm that the dwellings and climate zones are appropriate to test for the features being corrected/updated. This consultation may need to be repeated if test results reveal changes to the NatHERS In Home rating result in excess of the maximum threshold.

### **Minor updates**

The standard test dwellings are 200, 500 and 610, tested in all NatHERS climate zones. This requirement may be varied and alternative dwellings and/or testing procedures may be specified if these standard designs do not test for the proposed update. In this case, dwelling features may be modified (by agreement with the Administrator), alternative dwellings specified by the Administrator or historic software rating analysis may be used to demonstrate accuracy compliance.

Simulations must be done using the beta version of the tool and results compared to the current public version (in this case the NatHERS In Home Benchmark Tool) simulation results.

Test results must include a dwelling identifier, climate zone number, the NatHERS In Home rating result calculated by the current version on the market and the proposed new version, and the difference of these.

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