



PROTOCOL FOR HOUSE ENERGY RATING SOFTWARE

For residential buildings

Version 2006.1

AUSTRALIAN BUILDING CODES BOARD

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PUBLIC COMMENT DRAFT

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Foreword

The Australian Building Codes Board (ABCB), a joint initiative of all levels of Australian Government in cooperation with the building industry, is responsible for the provisions of the Building Code of Australia (BCA) including those for energy efficiency.

On 1 January 2003, minimum energy efficiency measures for houses were introduced into BCA Volume Two. The measures include a Verification Method that allows suitable house energy rating software, based on climate regions, to be used to demonstrate compliance with BCA Performance Requirement P2.6.1.

On 1 May 2005, minimum energy efficiency measures for other residential buildings were introduced into BCA Volume One. The measures include a Verification Method that allows suitable house energy rating software, based on climate regions, to be used to demonstrate compliance with BCA Performance Requirement JP1, other than for a building's services.

In 2004 the ABCB published a Protocol for house energy rating software which was revised in 2005 (current version 2005.1 of May 2005) to facilitate the use of software under the Nationwide House Energy Rating Scheme as a BCA Verification Method. The Scheme was substantially changed in 2006 and this version of the Protocol (version 2006.1 of May 2006) accommodates those changes. This Protocol facilitates the use of what is termed 2nd generation house energy rating software.

As is the case with a number of revised BCA reference documents, two different versions can be referenced simultaneously for a period thereby providing time to change to the revised document. In this case, to provide time for software manufacturers to upgrade their software and for industry to change over to the new software. Note that BCA can be amended annually and so BCA reference documents can also be changed in the same timeframe.

This Protocol contains a testing regime for simulation software but does not contain a testing regime for correlation software. Therefore, to be accepted for use, correlation software manufacturers will need to provide suitable evidence that demonstrates that results using their software reasonably correlates with the results from simulation software.

Need for a Protocol

The suitability of any software will depend on it being of an appropriate standard and providing results that are repeatable. In order to ensure that these objectives are met, and that results are consistent using different software, a Protocol for House Energy Rating Software was considered necessary.

Background

The BCA is recognised in all States and Territories as the minimum technical standard for the construction of buildings.

Energy rating software has been available for some time under the Nationwide House Energy Rating Scheme, which provides a standardised approach for energy rating of houses throughout Australia. Although the Scheme is not mandated, its 'Star Rating' system is now recognised as one means of demonstrating compliance with the BCA Performance Requirements for the energy efficiency of the fabric of dwellings.

The Scheme was developed by the State and Territory energy agencies and the Australian Government, in conjunction with the CSIRO. It is administered by the Energy Efficiency

Working Group (EEWG), on behalf of the Ministerial Council on Energy, through the Australian Greenhouse Office (AGO) of the Department of Environment and Heritage which is the Scheme's National Administrator.

In 2005 the Scheme was substantially upgraded to incorporate modelling calculations that reflect the increased computing capacity of modern computers. This upgrade has enabled better modelling of energy flows and increased accuracy in describing how spaces in a building interact with each other and with the outside environment.

The energy loads and the associated star ratings specified in this Protocol were developed for, and set by, the EEWG.

The ABCB, in conjunction with the State and Territory building control Administrations, maintains and develops the BCA which is given legal status by the State and Territory Building Acts and Regulations. Any document referenced in the BCA needs to be clearly identified and described as it also has legal status under the Building Acts and Regulations. This Protocol has been prepared for referencing by the BCA, in order to describe the software acceptable in demonstrating compliance with the BCA and to provide a process for demonstrating the acceptability of new software and revisions to existing software.

Aims of the Protocol

The primary aim of the Protocol is to provide a legal basis for allowing the use of house energy rating software to demonstrate compliance with Performance Requirements JP1 of BCA Volume One, other than for a building's services, and P2.6.1 of BCA Volume Two, both via the Verification Method route.

A further aim of the Protocol is that it be neutral to all software in accordance with the national competition policy.

The Protocol is not intended to be used as a driver for implementing the Nationwide House Energy Rating Scheme (a responsibility of the energy agencies), or for changing the Scheme. The energy loads and associated star ratings in this Protocol provide a set benchmark for determining compliance with the BCA.

The Scheme, including the energy star rating figures, may be subject to revision from time to time as the Scheme is improved and developed. The Protocol may, therefore, be amended as necessary.

Suitability of software

Software suppliers or their agents may need to provide an assurance, with supporting evidence that their software complies with this Protocol. Accepting this assurance is the responsibility of the appropriate authority.

Any assurances or evidence of compliance the ABCB Office may receive are forwarded to the State and Territory building control Administrations.

Process for revising the Protocol

Due to the separation of responsibilities for housing energy efficiency matters between the State and Territory energy agencies and the building control Administrations, any changes to the Nationwide House Energy Rating Scheme that involve changes to the BCA Protocol should be:

- developed in consultation between the energy agencies and the building control Administrations within each State and Territory;
- documented by the Scheme's National Administrator;
- reflected in the 'Protocol' prepared by the ABCB;
- assessed for regulatory impact, in accordance with the requirements of the Office of Regulation Review (ORR) - public consultation is required by the ORR for significant regulatory changes; and
- referred to building control Administrations for agreement to amend the Protocol and the specific BCA reference.

Other matters

In addition to the processes and criteria contained in this Protocol, some States and Territories may have additional requirements for house energy rating software, or manufacturers, agents or assessors of software in order to assure the reliability of the outcomes. These may include the following-

- **Contact details** for the software company, or agent, that is responsible for the software including matters relating to software validation, support, testing, documentation and updates.
- **Software validation** and a quality assurance framework for integrating feedback and concerns of software accuracy.
- **Testing** that incorporates a quality assurance program for rectifying software faults and inaccuracies, and an undertaking for carrying out version control.
- **Instructions** for the use of the software, including:
 - general software operating instructions and rating procedures (how to input the data) for all required building scenarios; and
 - details of all software functions and settings, and any software limitations.
- **Software support** including:
 - support for software use and rating procedure clarification, documentation of all technical limitations, and a help desk to provide timely information to users and other interested parties; and
 - a procedure for the timely definition and publishing of rating procedures not included in the software documentation; and
 - a procedure for the timely definition and incorporation of proprietary materials and material systems not included in the software.
- **Documentation** for any State or Territory-based:
 - examination schemes that States, Territories or industry may require the examination of candidates in the use of mandated house energy rating tools for accreditation purposes; and
 - auditing schemes that State or Territories may require for ensuring that a sufficient sample of ratings carried out is audited for quality control of accredited assessors.

ABCB PROTOCOL FOR HOUSE ENERGY RATING SOFTWARE

1. Scope

This Protocol describes the essential elements of suitable software, including the energy star rating referred to in the BCA Verification Methods JV1 of BCA Volume One and V2.6.2.1 of BCA Volume Two, as well as general requirements for software development and use such as documentation, testing, quality assurance and user training. These Verification Methods can be used to demonstrate BCA compliance of Housing (Class 1 and 10 buildings), the sole-occupancy units of Class 2 buildings and Class 4 parts of buildings.

2. Purpose and context of use

This Protocol has been developed to specify the requirements for any house energy rating software that is used as the thermal calculation method in the BCA Volume One Verification Method JV1 and the BCA Volume Two Housing Provisions Verification Method V2.6.2.1. Software that complies with this Protocol can be used to demonstrate compliance with BCA Performance Requirements JP1 of BCA Volume One, other than for a building's services, and P2.6.1 of BCA Volume Two. House energy rating software includes both simulation software and correlation software.

3. Features of the software

3.1 General

All elements addressed by the software must be classified as either minimum features (see Clause 3.2) or optional features (see Clause 3.3).

All features must have appropriate instructions to enable the user to implement the features.

3.2 Minimum features

Details of the following elements, including the materials, their properties and orientation, must be addressed or alternatively listed as 'limitations' if not addressed-

- Floor and floor enclosure assembly.
- External walls, including the angle to the horizontal.
- Roof and ceiling assembly, including the configuration and angle to the horizontal.
- Glazing, including the angle to the horizontal and shading.
- Roof lights.
- Sealing against infiltration.
- Internal walls.
- Air movement through ventilation openings and breeze paths; internal sensible and latent heat loads.
- Overshadowing by building elements and adjacent structures.

3.3 Optional features

Details of the following elements should be addressed where there are provisions for the elements-

- Doors.
- Special construction elements.
- Zoning.
- Heating equipment.
- Cooling equipment.
- Heating and cooling distribution systems.
- A control system.

3.4 Climate data

Climate data employed must be based on hourly recorded values and be representative of a typical year for the proposed locations.

Climate data must be for the 69 climate regions listed in Table 1. Where the software does not include all locations, the limitation must be stated.

Appropriate climate data (such as Test Reference Year or Weather Year for Energy Calculations) must be obtained from the Australian Bureau of Meteorology.

3.5 Dwelling operational details

Details of how the dwelling is operated must include the following-

- Internal sensible and latent heat loads based on the values given in Table 2, with suitable adjustments for the house size and the area of each space.
- For living spaces, heating and cooling being available from 0700 to 2400.
- For sleeping spaces, heating and cooling being available from 1600 to 0900.
- For living spaces (including kitchens and other spaces typically used during the waking hours): a heating thermostat setting of 20 deg. C.
- For sleeping spaces (including bedrooms, bathrooms and dressing rooms, or other spaces closely associated with bedrooms): a heating thermostat setting of 18 deg. C from 0700 to 0900 and from 1600 to 2400; and a heating thermostat setting of 15 deg. C from 2400 to 0700.
- A cooling thermostat setting that varies according to the climate region, as given in Table 3. The cooling initiation is to be based on the Effective Temperature method of calculating thermal comfort and include the effect of air movement in that space.
- All external openings being operable at all hours, although a factor restricting the operation of external and internal openings may be incorporated to reduce the number of operations to one per each three hour period.

Note that the above loads, hours of operation and thermostat settings are only for standard testing and validation purposes and are not intended to reflect the actual use of any particular house.

4. Methods of assessment

The BCA Energy Efficiency Verification Methods (JV1 and V2.6.2.1) are available as a means for assessing compliance with Performance Requirements JP1, other than for a building's services, and P2.6.1 respectively. The definition of the nominated thermal calculation method permits the use of a software-based calculation model.

Any software used in the Verification Methods must be based on well-established models that are in accordance with the principles of thermodynamics and fluid mechanics. The calculation method used in the software must be documented and be available for inspection.

Sources of reference data on the thermal properties of building materials, insulation etc. must be identified and be from test results or authoritative data sources such as The Australian Institute of Refrigeration, Air-Conditioning and Heating or The American Society of Heating, Refrigerating and Air-Conditioning Engineers.

5. Output presentation

For the purposes of this Protocol, the outputs must be presented in terms of energy loads of the building adjusted for house size as stated below for any particular climate region of Table 1 and expressed as:

- heating and cooling loads separately, in MJ/m² of conditioned floor area per annum (sensible and latent cooling loads where available); and
- total heating and cooling load, in MJ/m² of conditioned floor area per annum, with associated 'star rating' in accordance with Table 4.

The energy loads are to be adjusted by a factor that increases the energy load for buildings larger than 200 m² conditioned floor area and reduces the energy load for buildings smaller than 200 m² conditioned floor area, in proportion to the surface area to floor area ratios of a range of houses.

Inputs and outputs must be included on the documentation produced to demonstrate compliance with Verification Methods JV1 of BCA Volume One, other than for a building's services, and V2.6.2.1 of BCA Volume Two.

6. Testing, Validation and Quality Assurance

Energy rating software, including any update or new version, is required to undergo appropriate testing, validation and quality assurance before being used for regulatory purposes. Records of testing and quality assurance must be kept and made available.

Simulation software must be validated in accordance with ANSI/ASHRAE Standard 140-2001 'Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs'. The outcomes should be within the range of results from programs that are generally accepted as indicated in the Standard. While outcomes that fall outside this range are not necessarily incorrect, the sources of the differences must be investigated, documented and made known to the appropriate approval authorities.

Correlation software, or software based on correlating the results from complying simulation software, must undergo an appropriate testing regime to demonstrate its correlation to the complying simulation software.

7. Training of users

A training program for users must be available. This program must include training in the use of the current version and any proposed new version of the particular software as well as an understanding of the basic principles of residential building thermal performance. Evidence of training must state the software name and the version.

8. Evidence of suitability of software

A declaration must be provided that the software complies with this Protocol. This must be accompanied by evidence that:

- a) the star ratings comply with Table 4;
- b) the software has undergone appropriate testing and quality assurance; and
- c) a training program is available for users.

The status of the software, such as whether it has been approved by an appropriate authority, must also be clearly indicated.

9. Process for validating and upgrading software

Energy rating software used to demonstrate compliance with BCA Performance Requirements JP1 of BCA Volume One, other than for a building's services, and P2.6.1 of BCA Volume Two, must meet the requirements of this Protocol.

The software providers are responsible for validating the software, upgrading the software when needed, and validating the upgrade.

The ABCB should be advised, in writing, of any new validated software and validated revisions to software, to ensure that building control Administrations, and in turn building officials, are adequately informed. Correspondence should be sent to:

The General Manager
Australian Building Codes Board
GPO Box 9839
CANBERRA ACT 2601

Any revisions, updates or new versions must be identified by a unique number or other form of designation. The status of any software revisions, updates or new versions, such as whether it has been approved by an appropriate authority, must also be clearly indicated.

Table 1. Climate regions

Climate region No.	Location	Latitude	Longitude
1	Darwin Airport	12.4 S	130.9 E
2	Port Hedland	20.4 S	118.6 E
3	Longreach	23.4 S	144.3 E
4	Carnarvon	24.9 S	113.7 E
5	Townsville	19.3 S	146.8 E
6	Alice Springs	23.8 S	133.9 E
7	Rockhampton	23.4 S	150.5 E
8	Moree MO	29.5 S	149.9 E
9	Amberley	27.6 S	152.7 E
10	Brisbane	27.4 S	153.1 E
11	Coffs Harbour MO	30.3 S	153.1 E
12	Geraldton	28.8 S	114.7 E
13	Perth	31.9 S	115.9 E
14	Armidale	30.5 S	151.7 E
15	Williamtown AMO	32.8 S	151.8 E
16	Adelaide	34.9 S	138.6 E
17	Sydney RO	33.9 S	151.2 E
18	Nowra RAN	35.0 S	150.5 E
19	Charleville	26.4 S	146.3 E
20	Wagga AMO	35.2 S	147.5 E
21	Melbourne RMO	37.8 S	145.0 E
22	East Sale	38.1 S	147.1 E
23	Launceston	41.4 S	147.1 E
24	Canberra Airport	35.3 S	149.2 E
25	Cabramurra	35.9 S	148.4 E
26	Hobart	42.8 S	147.5 E
27	Mildura AMO	34.2 S	142.1 E
28	Richmond NSW	33.6 S	150.8 E
29	Weipa	12.7 S	141.9 E
30	Wyndham	15.5 S	128.1 E
31	Willis Island	16.3 S	150.0 E
32	Cairns	16.9 S	145.8 E
33	Broome	18.0 S	122.2 E
34	Learmonth	22.2 S	114.1 E

Table 1. Climate regions (Continued)

Climate region No.	Location	Latitude	Longitude
35	Mackay	21.1 S	149.2 E
36	Gladstone	23.9 S	151.3 E
37	Halls Creek	18.2 S	127.7 E
38	Tennant Creek	19.6 S	134.1 E
39	Mt Isa	20.7 S	139.5 E
40	Newman	23.4 S	119.7 E
41	Giles	25.0 S	128.3 E
42	Meekatharra	26.6 S	118.5 E
43	Oodnadatta	27.6 S	135.5 E
44	Kalgoorlie	30.8 S	121.5 E
45	Woomera	31.2 S	136.8 E
46	Cobar AMO	31.5 S	145.8 E
47	Bickley	32.0 S	116.1 E
48	Dubbo Airport	32.2 S	148.6 E
49	Katanning	33.7 S	117.6 E
50	Oakey	27.4 S	151.7 E
51	Forrest	30.8 S	128.1 E
52	Swanbourne	32.0 S	115.8 E
53	Ceduna	32.1 S	133.7 E
54	Mandurah	32.5 S	115.7 E
55	Esperance	33.8 S	121.9 E
56	Mascot AMO	33.9 S	151.2 E
57	Manjimup	34.2 S	116.1 E
58	Albany	35.0 S	117.8 E
59	Mt Lofty	35.0 S	138.7 E
60	Tullamarine (Melbourne Airport)	37.7 S	144.9 E
61	Mt Gambier	37.8 S	140.8 E
62	Moorabbin	38.0 S	145.1 E
63	Warrnambool	38.3 S	142.4 E
64	Cape Otway	38.9 S	143.5 E
65	Orange Air Port	33.4 S	149.1 E
66	Ballarat	37.5 S	143.8 E
67	Low Head	41.1 S	146.8 E
68	Launceston Airport	41.5 S	147.2 E
69	Thredbo Valley	36.5 S	148.3 E

Table 2. Internal sensible and latent heat loads

The heat loads in Tables 2a and 2b are for a 160 m² dwelling with two adults and two children, with a floor area split of 80 m² for all the living areas and 80 m² for all the bedroom areas. Suitable adjustments should be made for houses with different total areas, and for individual spaces with different areas.

The load is for the one hour period up to the time stated i.e. a time of 1:00 am indicates the period between midnight and 1:00 am.

Table 2a Internal sensible and latent heat loads - For living spaces, including kitchens					
Time	Sensible heat load (Watts)				Latent heat load (Watts)
	Appliances and cooking	Lighting	People	Total	
1:00 am	100	0	0	100	0
2:00 am	100	0	0	100	0
3:00 am	100	0	0	100	0
4:00 am	100	0	0	100	0
5:00 am	100	0	0	100	0
6:00 am	100	0	0	100	0
7:00 am	100	0	0	100	0
8:00 am	400	180	280	860	400
9:00 am	100	180	280	560	200
10:00 am	100	0	140	240	100
11:00 am	100	0	140	240	100
Noon	100	0	140	240	100
1:00 pm	100	0	140	240	100
2:00 pm	100	0	140	240	100
3:00 pm	100	0	140	240	100
4:00 pm	100	0	140	240	100
5:00 pm	100	0	140	240	100
6:00 pm	100	300	210	240	150
7:00 pm	1100	300	210	1610	750
8:00 pm	250	300	210	760	150
9:00 pm	250	300	210	760	150
10:00 pm	250	300	210	760	150
11:00 pm	100	0	0	100	0
Midnight	100	0	0	100	0

Table 2b Internal sensible and latent heat loads - For living spaces that do not include a kitchen

Time	Sensible heat load (Watts)				Latent heat load (Watts)
	Appliances and cooking	Lighting	People	Total	
1:00 am	0	0	0	0	0
2:00 am	0	0	0	0	0
3:00 am	0	0	0	0	0
4:00 am	0	0	0	0	0
5:00 am	0	0	0	0	0
6:00 am	0	0	0	0	0
7:00 am	0	0	0	0	0
8:00 am	180	280	460	140	180
9:00 am	180	280	460	140	180
10:00 am	0	140	140	70	0
11:00 am	0	140	140	70	0
Noon	0	140	140	70	0
1:00 pm	0	140	140	70	0
2:00 pm	0	140	140	70	0
3:00 pm	0	140	140	70	0
4:00 pm	0	140	140	70	0
5:00 pm	0	140	140	70	0
6:00 pm	300	210	510	105	300
7:00 pm	300	210	510	105	300
8:00 pm	300	210	510	105	300
9:00 pm	300	210	510	105	300
10:00 pm	300	210	510	105	300
11:00 pm	0	0	0	0	0
Midnight	0	0	0	0	0

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Table 2c Internal sensible and latent heat loads - For bedrooms				
Time	Sensible heat load (Watts)			Latent Heat load (Watts)
	Lighting	People	Total	
1:00 am	0	200	200	100
2:00 am	0	200	200	100
3:00 am	0	200	200	100
4:00 am	0	200	200	100
5:00 am	0	200	200	100
6:00 am	0	200	200	100
7:00 am	0	200	200	100
8:00 am	0	0	0	0
9:00 am	0	0	0	0
10:00 am	0	0	0	0
11:00 am	0	0	0	0
Noon	0	0	0	0
1:00 pm	0	0	0	0
2:00 pm	0	0	0	0
3:00 pm	0	0	0	0
4:00 pm	0	0	0	0
5:00 pm	0	0	0	0
6:00 pm	0	0	0	0
7:00 pm	0	0	0	0
8:00 pm	100	0	100	0
9:00 pm	100	0	100	0
10:00 pm	100	0	100	0
11:00 pm	100	200	300	100
Midnight	0	200	200	100

Table 3: Cooling thermostat settings

Climate region	All conditioned spaces (°C)	Climate region	All conditioned spaces (°C)
1	26.5	36	26.0
2	27.0	37	27.0
3	27.0	38	27.0
4	26.0	39	27.0
5	26.5	40	28.0
6	26.5	41	27.5
7	26.0	42	28.0
8	26.0	43	27.0
9	26.0	44	26.0
10	25.5	45	26.0
11	25.0	46	26.5
12	25.0	47	24.5
13	25.0	48	25.0
14	24.0	49	24.5
15	25.0	50	25.0
16	25.0	51	25.5
17	25.5	52	25.0
18	24.5	53	24.5
19	27.0	54	25.0
20	25.0	55	24.0
21	24.0	56	24.5
22	23.0	57	23.5
23	22.5	58	23.5
24	24.0	59	23.0
25	23.0	60	24.0
26	23.0	61	23.5
27	25.0	62	24.0
28	24.5	63	23.0
29	26.0	64	23.0
30	27.5	65	23.0
31	26.5	66	23.5
32	26.5	67	23.0
33	27.0	68	23.5
34	26.5	69	22.5
35	26.0		

Table 4: Nationwide House Energy Rating Scheme star criteria (energy loads in MJ/m² conditioned floor area.annum)

Climate region	Location	Star rating																			
		0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
1	Darwin	853	773	706	648	598	555	516	480	446	413	381	349	317	285	253	222	192	164	140	119
2	Port Hedland	643	569	507	455	411	373	340	310	284	260	237	215	194	172	151	131	111	93	76	62
3	Longreach	654	550	465	396	340	294	257	226	200	178	159	141	124	107	90	74	58	43	29	18
4	Carnarvon	209	181	157	137	120	105	93	82	73	66	59	53	47	41	36	31	27	22	18	14
5	Townsville	337	309	283	259	238	218	200	183	168	153	140	127	114	103	92	81	71	61	52	44
6	Alice Springs	681	562	464	385	321	269	228	196	170	148	130	113	99	84	70	56	43	29	17	7
7	Rockhampton	344	295	255	222	194	171	152	136	122	110	99	90	80	71	63	54	46	38	31	24
8	Moree	597	481	388	315	258	214	180	155	135	119	106	94	83	71	60	47	35	24	14	7
9	Amberley	407	334	275	226	187	157	132	113	97	85	75	67	59	52	45	38	31	24	18	12
10	Brisbane	245	203	167	139	116	97	83	71	62	55	48	43	38	34	30	25	21	17	13	10
11	Coffs Harbour	286	232	188	153	125	103	86	73	63	55	49	44	39	34	29	24	19	15	11	7
12	Geraldton	349	285	233	191	158	132	112	96	83	73	64	57	50	43	36	29	22	16	10	5
13	Perth	483	387	311	251	204	167	139	118	102	89	79	70	61	52	44	34	25	17	9	4
14	Armidale	801	661	545	451	375	314	266	227	195	169	147	128	110	93	76	60	43	27	13	1
15	Williamstown	429	349	284	232	191	159	133	114	98	86	76	67	58	50	42	34	26	19	12	6
16	Adelaide	584	480	394	325	270	227	192	165	143	125	109	96	83	70	58	46	33	22	11	3
17	Sydney East	286	230	184	148	120	98	81	68	58	50	44	39	35	30	26	22	17	13	9	6
18	Nowra	517	423	346	284	235	195	164	140	121	105	92	81	70	60	50	40	30	20	12	5
19	Charleville	525	434	359	298	249	209	177	151	131	114	100	87	76	66	56	45	35	26	17	9
20	Wagga	804	663	548	455	380	321	273	235	204	178	156	137	118	100	82	64	47	30	15	3
21	Melbourne	676	559	462	384	321	271	230	198	171	149	131	114	98	83	68	54	39	25	13	2
22	East Sale	791	653	541	449	376	317	269	231	201	175	153	133	115	98	80	63	46	30	15	2
23	Launceston	895	740	615	513	431	366	314	272	237	208	183	160	138	117	95	74	53	33	15	1
24	Canberra	957	792	657	547	458	387	330	284	247	216	189	165	142	120	99	77	56	35	17	2
25	Cabramurra	1666	1404	1188	1012	870	753	658	580	513	454	401	352	303	255	208	160	114	71	33	1
26	Hobart	876	723	598	498	417	354	303	262	229	202	177	155	134	113	92	71	51	31	14	0
27	Mildura	660	541	444	367	305	256	218	187	163	143	126	110	96	81	67	53	38	25	13	3
28	Richmond	555	450	365	298	245	203	171	146	127	112	99	87	77	66	55	44	34	23	14	7
29	Weipa	830	743	671	611	560	517	479	445	414	384	355	326	296	266	237	207	179	153	130	111
30	Wyndham	1229	1071	943	839	754	685	626	576	530	488	447	406	364	321	278	234	192	154	121	95

Table 4: Nationwide House Energy Rating Scheme star criteria (energy loads in MJ/m² conditioned floor area.annum) (Continued)

Climate region	Location	Star rating																			
		0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
31	Willis Island	427	391	359	330	305	282	261	242	224	207	191	176	160	146	132	118	105	93	81	71
32	Cairns	330	302	276	253	232	214	197	181	167	153	140	128	117	105	94	84	74	64	56	48
33	Broome	732	652	585	531	486	448	416	387	360	335	310	285	260	234	208	182	157	134	115	99
34	Learmouth	511	439	379	330	290	256	228	204	184	166	149	134	119	104	89	74	60	47	35	25
35	Mackay	275	248	224	202	183	165	150	136	123	112	102	92	83	75	68	60	53	47	40	34
36	Gladstone	220	191	167	146	129	114	101	90	81	73	66	59	53	48	42	37	32	28	23	19
37	Halls Creek	755	649	563	492	434	387	348	315	286	259	235	211	187	162	138	114	90	69	50	34
38	Tennant Creek	631	545	473	414	366	325	291	262	236	213	191	170	150	129	109	89	70	52	36	22
39	Mt Isa	656	560	481	417	363	320	284	253	227	205	184	164	145	126	108	90	72	55	40	28
40	Newman	631	527	442	373	318	273	237	207	183	162	144	127	111	95	80	64	49	35	22	11
41	Giles	517	429	357	298	252	215	185	161	142	126	111	98	86	73	61	49	36	25	15	7
42	Meekatharra	437	358	293	241	200	167	141	120	104	91	79	70	60	52	43	34	25	17	10	4
43	Oodnadatta	596	495	412	344	289	244	208	179	155	135	118	103	90	77	64	51	39	27	16	7
44	Kalgoorlie	490	396	320	259	211	173	144	122	105	91	80	70	61	52	43	34	25	17	9	3
45	Woomera	552	446	362	295	243	203	172	148	130	115	102	90	79	67	55	43	31	20	10	3
46	Cobar	580	469	379	308	253	210	176	151	131	115	101	89	78	67	55	44	32	21	11	4
47	Bickley	595	485	397	325	269	224	189	161	140	122	107	94	82	70	58	46	34	22	12	4
48	Dubbo	627	513	421	347	288	241	205	176	153	134	118	103	90	76	63	49	36	23	12	3
49	Katanning	664	537	436	354	290	241	202	172	149	130	114	100	87	74	61	48	34	22	11	2
50	Oakley	485	391	315	256	210	174	147	126	110	98	87	78	69	60	50	41	31	22	14	8
51	Forrest	498	401	324	262	213	175	146	124	107	93	82	72	63	53	44	35	25	16	8	2
52	Swanbourne	284	231	187	152	124	102	84	71	60	51	45	39	34	29	25	20	15	11	7	3
53	Ceduna	499	406	331	271	223	186	157	134	116	101	89	78	68	58	47	37	27	17	9	2
54	Mandurah	412	332	269	218	179	148	125	107	93	82	73	65	57	49	41	33	25	17	10	5
55	Esperance	430	351	286	233	191	158	132	111	95	82	71	62	54	46	38	30	22	14	7	1
56	Mascot	352	284	230	186	151	125	104	88	75	66	58	51	45	39	32	26	20	14	9	5
57	Manjimup	687	565	465	384	318	266	224	191	164	143	124	108	93	79	65	51	38	24	12	2
58	Albany	558	457	374	307	253	210	176	149	127	110	95	83	71	60	50	39	29	19	9	1
59	Mt Lofty	1173	987	833	706	603	518	448	391	342	301	264	230	198	166	136	105	76	48	22	1

Table 4: Nationwide House Energy Rating Scheme star criteria (energy loads in MJ/m² conditioned floor area.annum) (Continued)

Climate region	Location	Star rating																			
		0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
60	Tullamarine	797	663	552	462	388	328	280	241	209	182	158	138	118	100	82	64	47	30	15	2
61	Mt Gambier	849	702	582	484	405	341	290	250	216	189	165	144	124	105	86	67	48	31	15	1
62	Moorabbin	742	615	511	426	357	301	256	220	190	165	144	125	108	91	75	58	43	27	13	1
63	Warrnambool	867	716	593	493	413	349	298	258	224	197	173	151	130	110	90	70	51	32	15	2
64	Cape Otway	708	593	497	418	353	301	257	222	193	168	146	127	109	92	76	59	43	28	14	2
65	Orange	1156	964	807	679	575	492	424	369	324	285	250	219	189	159	130	101	72	46	22	2
66	Ballarat	1045	874	734	618	525	448	386	335	293	257	225	197	169	143	117	91	66	42	20	2
67	Low Head	668	554	460	384	322	273	233	201	175	153	133	116	100	85	69	54	39	24	11	0
68	Launceston Air	1048	867	719	600	505	428	367	318	278	245	215	188	162	137	112	86	61	38	17	0
69	Thredbo	1471	1238	1045	888	759	655	569	499	439	387	341	298	257	216	176	136	98	61	28	1