

Energy Reports – Landscape Design – Design Solutions
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ENERGY EFFICIENCY REPORT

Comparison Assessment with the Building Code of Australia Deemed-to-Satisfy Provisions

Client: NIC Design

Owner: Huida Unley Park No.1

Address: 392-394 Unley Road, Unley Park SA

Date: 31 May, 2019

Client project number: 19022

Climate zone: 5

Job number: EOD-2638A Residence 9

Assessor: Stephen Cramond MRICS NatHERS Cert IV

ENERGY EFFICIENCY REPORT

NATIONAL CONSTRUCTION CODE 2016 – Volume 2

Building Code of Australia Clause 1.0.5 - Assessment Methods.

The following Assessment Methods, or any combination of them, can be used to determine that a **Performance Solution** or a **Deemed-to-Satisfy** Solution complies with the Performance Requirements, as appropriate:-

- (a) Evidence to support that the use of a material or product, form of construction or design meets a Performance Requirement or a *Deemed-to-Satisfy* Provision as described in 1.2.2.
- (b) Verification Methods such as-
 - (i) The verification Methods in the NCC; or
 - (ii) Such other Verification Methods as the appropriate authority accepts for determining compliance with the Performance Requirements.
- (c) Expert Judgement.
- (d) **Comparison with the *Deemed-to-Satisfy* Provisions.**

In accordance with National Construction Code Volume 2 Clause 3.12.0 (a) (ii),

- Performance Requirement **P2.6.1** for the thermal performance of a building is satisfied by compliance with Parts 3.12.1, 3.12.2, 3.12.3 & 3.12.4.
- Performance requirement **P2.6.2** is satisfied by compliance with Part 3.12.5

In accordance with the Australian Building Codes Board NCC Volume 2 energy efficiency provisions 2016 handbook, Comparison with the DtS provisions is explained as follows:

Comparison with the DtS Provisions

This *Assessment Method* involves a **comparative analysis**, which would demonstrate that a *Performance Solution* is better than, or at least equivalent to, the *DtS Provision(s)*. To carry out this comparison, the applicable *DtS Provision(s)* and *Performance Solution* would both need to be subjected to the same level of analysis using the same methodology. This would provide the building designer and Appropriate Authority with a defined benchmark or level for the *DtS Provision(s)* and the *Performance Solution*.

Following this path, it is possible to determine whether the *Performance Solution* provides the same level of energy efficiency as that resulting from the use of the *DtS Provisions*. **In some cases, technical analysis would be carried out using calculation methods such as computer modelling.** If it is found that the *Performance Solution* is equal to or better than the *DtS Provision*, it can be concluded that the *Performance Solution* proposal satisfies the NCC Performance Requirements.

Note that there is a degree of overlap in the available *Assessment Methods*, for example V2.6.2.2 is a *Verification Method*, which uses a comparative analysis methodology with preset input parameters

Energy Report Methodology

The purpose of this report is to comply with Clause 1.0.5 (d) above by comparing the Deemed-to-Satisfy (DtS) provisions for the building works to ensure compliance with the relevant Performance Provisions P2.6.1 & P2.6.2 of the National Construction Code 2016.

To demonstrate compliance with this part, the building design has been modeled using NatHERS Protocol Software **First Rate 5 – Version 5.2.10b (3.13)** and then two separate assessment runs have been undertaken to provide a set of results that can be directly compared with each other. The parameters for set up of the building model for the two assessment runs are as follows :-

- (a) The heating and cooling load for the Deemed-to-Satisfy building model and the Proposed building model are determined using the same –
 - 1. Calculation Method; and
 - 2. Location specific data, including that of climate and topography appropriate to the location where the proposed building is to be constructed if the data is available, or the nearest location with similar climatic conditions in the same climate zone for which the data is available; and
 - 3. Impact of adjoining structures and features; and
 - 4. Soil conditions; and
 - 5. Orientation; and
 - 6. Floor plan, including the location of glazing; and
 - 7. Ceiling height and number of storeys; and
 - 8. Solar absorptance of external surfaces
 - 9. Roof pitch, roof cladding and roof lights; and
 - 10. Separating walls; and
 - 11. External non-glazed doors; and
 - 12. Intermediate floors; and
 - 13. Floor and floor coverings; and
 - 14. Internal zones; and
 - 15. Internal heat gains including people and appliances
- (b) The calculation method used must be capable of assessing the heating load and cooling load by modeling-
 - 1. The building fabric; and
 - 2. The building glazing; and
 - 3. Air infiltration and ventilation; and
 - 4. The function and use of the building including zoning, hours of occupation, hours of heating and cooling availability and internal heat gains; and
 - 5. Relevant built-environment and topographical features; and
 - 6. Consistent space temperature ranges
 - 7. The sensible heat component of the cooling load and heating load

-
- (c) Climate data employed in the calculation method must be based on hourly recorded values and be representative of a typical year for the proposed location
 - (d) The Deemed-to-Satisfy building model must be modeled using Deemed-to-Satisfy provisions of Part 3.12 in accordance with 3.12.0(a)(ii)

The first building model run (**Deemed-to-Satisfy reference building model**) includes minimum Building Code of Australia *Deemed-to-Satisfy* compliance requirements as set out in parts 3.12.1, 3.12.2, 3.12.3 & 3.12.4 of the Code and in accordance with the Australian Building Codes Board Handbook: NCC Volume 2 Energy Efficiency Provisions 2016 to determine a heating load and cooling load for a complying building modeled under Deemed-to-Satisfy conditions.

The second building model run (**Proposed building model**) alters the first modeling run only in terms of insulation and glazing requirements to demonstrate that the actual building can achieve heating and cooling loads equal to or less than that of the Deemed-to-Satisfy minimum compliance building.

Compliance is achieved where the results of the heating loads and cooling loads of Model 2 (Proposed building model) are compared with the heating and cooling loads for Model 1 (Deemed-to-Satisfy building) and are equal to or less than these loads.

This chronology of this report is as follows::

1. **Heating and Cooling Load Summary**
2. **Building elements summary table for construction purposes**
3. **Notes to be read in conjunction with the building elements summary table**
4. **Glazing summary table for construction purposes**
5. **Report Appendix A:-** Project BCA Part 3.12 deemed to comply requirements – including BCA **Part 3.12.5** requirements for the building
6. **Report Appendix B:-** Heating and cooling loads for Modeling run 1 (Deemed-to-Satisfy building model)
7. **Report Appendix C:-** Heating and cooling loads for Modeling run 2 (Proposed building model)

This energy assessment report is not a star rating report

Heating and cooling load summary table

	<u>Heating load</u> <u>(MJ/m2)</u>	<u>Cooling load</u> <u>(MJ/m2)</u>	<u>Total loads</u>
Deemed-to-Satisfy building model (Refer appendix B)	63.7	56.0	119.7
Proposed building model (Refer appendix C)	54.8	52.9	107.7
Results			Pass

The requirements of BCA P2.6.1 have been achieved

Building elements summary table for energy modeling

Building elements	Proposed building model (Actual) inputs (Minimum values for construction purposes)
Roof insulation	R5.0 Bulk ceiling insulation to all roof areas + Antiglare sarking under all roof cladding
External Wall insulation	R2.5 To all external walls
Internal Wall insulation	R2.0 To all internal walls
Floor insulation	R2.0 To all upper level floors

Notes:-

1. All data used for modeling of the Deemed-to-Satisfy building is located in appendix A of this report. **DO NOT** use any insulation or glazing data from Appendix A of this report for construction purposes
2. Party walls are to be insulated in strict accordance with the manufacturers requirements (R2.0 to each stud leaf has been allowed for modeling purposes)
3. The requirements of the following parts of Appendix A remain applicable:-
 - Part 3.12 (as applicable as noted)
 - Part 3.12.3.1 to Part 3.12.3.5 (as applicable as noted)
 - Part 3.12.4.1 to Part 3.12.4.3 (as applicable as noted)

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- Part 3.12.5.1 to Part 3.12.5.8 (as applicable as noted) – confirming compliance with Performance Requirement P2.6.2

Glazing values to be used for construction purposes (proposed building model results) in the table below

Ground level

Window	Orientation	Height	Width	Glazing type	U Value	SHGC Value
W02	S	2.70	3.30	Double glazed	4.45	0.59
W01	S	2.70	1.10	Double glazed	4.35	0.58

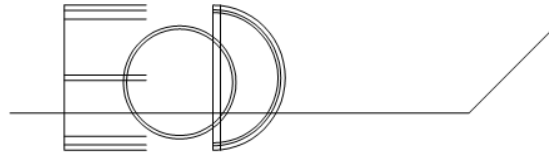
Upper level

Window	Orientation	Height	Width	Glazing type	U Value	SHGC Value
W08A	N	1.90	1.10	Double glazed	4.35	0.58
W08B	N	1.90	3.20	Double glazed	4.35	0.58
W08C	N	1.90	1.20	Double glazed	4.46	0.59
W07	E	1.90	0.50	Double glazed	4.46	0.59
W06	E	1.90	1.00	Double glazed	4.46	0.59
W05	S	2.00	3.20	Double glazed	4.35	0.58
W04	S	1.50	0.90	Double glazed	4.35	0.58
W03	S	1.50	0.90	Double glazed	4.35	0.58

Disclaimer

- 1) This energy efficiency compliance report is based entirely on the documentation stamped approved and attached to this report and as verified with the building designer. Any assumptions used outside of the plans have been verified with the design consultants. Where building services (ie air-conditioning, central heating etc) are not nominated, they have been noted not applicable under this assessment. Any alterations to the design or installation of new building services such as air-conditioning may alter the energy efficiency compliance of the building.
- 2) While all due care has been taken in the preparation of this report, Energy and Outdoor Design ABN 91505034369 does not assume liability for any damage or loss due to misrepresentation of this report and confirms that this report provides general compliance advice to the requirements. All comments and recommendations relate to energy efficiency requirements only. All products used to achieve required R ratings are to be to the manufacturers recommendations and verified by the builder as suitable.
- 3) This is not a structural report. All assumptions and recommendations made within this report are for energy efficiency purposes only and should be verified by a suitably qualified structural expert as required.

Energy and Outdoor Design



South Australian Development Regulations 2008 as amended Regulation 88 Certificate

To: Private Certifier or Council Building Surveyor
Address: 392-394 Unley Road, Unley Park SA
Project Owner: Huida Unley Park No.1
Project: 11 x 2 storey dwellings

I Stephen Cramond of Energy and Outdoor Design hereby certify as an independent technical expert as defined in Regulation 85 of the Development Regulations 2008, that the building has been thermally assessed in accordance with NCC 2016 Volume 2 Section 3.12 and meets the performance requirements of NCC 2016 Volume 2, Part P2.6.1 subject to the conditions set out below

Sections of work covered by this certificate

- Energy efficiency report numbered EOD-2638A

Related Documents

- Architectural drawings numbered: 19002 sheets A2-001, A2-002, A2-021, A2-024, A2-027, A2-030, A2-121, A2-123, A2-125, A2-127, A2-321, A2-321, A2-323, A2-325, A2-327, A3-011, A3-012, A3-013, A5-001, A5-011, A5-012, A5-021 & A6-001 by NIC Design

Documents relied upon

- NCC 2016 Volume 2, Section 3.12 and Part P2.6.1

Conditions

- Nil

In issuing this certificate I duly declare the following to be accurate and true:-

1. I am not the building owner or an employee of the building owner
2. I have not been involved in any aspect of the relevant development (other than through the provision of preliminary advice of a routine or general nature)
3. I do not have any direct or indirect pecuniary interest in any aspect of the relevant development or any body associated with any aspect of the relevant development
4. I have qualifications that qualify me to act as a technical expert under these regulations

This certificate issued on the 30th day of May in the year of 2019

Name: Stephen Cramond MRICS

Qualifications: B.Bldg, NatHERS Certificate IV

Address: 21 Sheoak Drive, Athelstone SA 5076

Phone: 0434 395 762

Email: energyandoutdoor@adam.com.au

Signed:

Appendix A

BCA Deemed to comply data

**Insulation and glazing values in this appendix are for
information purposes only. DO NOT USE for
construction purposes**

BCA 2016 – Volume 2 Deemed to Comply – for verification method assessment

BCA Part 3.12 – Building Fabric

Required

Requirements

Yes

No

N/A

Building fabric thermal insulation **must:-**

Meet AS/NZS 4859.1 requirements

√

Form a continuous barrier including overlapping and maintains thickness / airspace as required (ceilings, walls etc)

√

Must not affect safe operation of building services

√

Is a thermal break required (only for lightweight cladding on steel framing with either no ceiling / wall lining or ceiling / wall lining fixed direct to metal frame). **R0.2 insulation blanket required between lightweight cladding and metal framing**

√

Only if metal framing is used

BCA Part 3.12.1.2 – Roofs

Roof construction is: **Pitched colorbond clad roof**
 Insulation specified: **BCA Deemed to Comply**

Requirements	R Value	Comments
Total R value of roof is required to be:	5.1	Base rating for roof with absorbance value of >0.6 (dark assumed where not specified as worst case)
Less Actual Roof materials R Value:	- 0.39	Pitched metal clad roof
Adjustment Factor for roof venting (0.5 R Value reduction for well vented roofs):	-	
Re-adjustment for loss of ceiling insulation due to downlights / exhaust fans: (see table 3.12.1.1b)	-	
Total minimum R Value of insulation to the roof required after adjustments:	R4.71	Required to all roof areas excluding garage roof. A minimum 50% required insulation to be located at ceiling level

BCA Part 3.12.1.3 – Roof Lights

Type of roof light nominated: **N/A**
 U Value: **N/A**
 SHGC Value: **N/A**

Requirements	<u>Compliance required</u>		
	Yes	No	N/A
Are the roof lights required for BCA Ventilation purposes (habitable rooms and conditioned spaces only)			√
If so, they must have an area not greater than 150% minimum area for BCA ventilation compliance and maximum U Value 2.9 and SHGC value 0.29			√
If not, must have max area of 3% of storey floor area and meet U & SHGC values for rooflights			√

BCA Part 3.12.1.4 – External Walls

External wall / internal envelope wall construction nominated is:

- Wall type 01 – CD01
- Wall type 02 – CD02
- Wall type 03 – CD03
- Wall type 04 – CD04
- Wall type 05 – CD05
- Wall type 06 – CD06
- Wall type 07 – internal wall
- Wall type 08 – CS012 (party wall) – to manufacturers specifications
- Wall type 09 – CD09

Insulation specified:

BCA Deemed to Comply

Requirements		R Value	Comments
Total R value of walls is required to be:		2.80 2.40*	External wall construction Internal fully shaded envelope wall
Less	Actual wall materials R Value:	-	
		0.42	Wall types 01, 03, 05 & 06
		0.48	Wall type 02
		0.91	Wall types 04 & 09
		0.45	Wall type 07
	Adjustment factor for shading:	-	*
	Adjustment factor if the wall exceeds 220kg/m2 density (some types of masonry):	-	-
Total minimum R Value of insulation to external walls required after adjustments:		R2.38	Required to wall types 01, 03, 05 & 06 excluding garage external walls if applicable
		R2.32	Required to wall type 02 excluding garage external walls if applicable
		R1.89	Required to wall types 04 & 09 excluding garage external walls if applicable
		R1.95	Required to wall type 07 between the dwelling and garage only

BCA Part 3.12.1.5 – Floors

Floor construction nominated is

**Concrete slab on ground
Suspended timber floor to upper level
BCA Deemed to Comply**

Insulation specified:

Requirements

Total R value of floors is required to be:

R Value

Comments

1.00

Required to all upper level floor areas where either externally exposed or over a non-conditioned class 10a building (ie garage) below

No specific requirement for concrete slab on ground where not artificially heated or cooled

Less Actual floor materials R Value:

0.51

Suspended timber floor

Added insulation required to achieve compliance:

R0.49

Required to all upper level floor areas where externally exposed or over the garage below

Added insulation required (where floor is suspended, exposed or has in-slab heating / cooling).

N/A

Note: Where in-ground, insulation must be water resistant and to depth of 300mm or full depth of vertical edge of slab

N/A

BCA Part 3.12.1.6 – Attached Class 10 buildings

Requirements	<u>Required</u>			Comments
	Yes	No	N/A	
Have external construction with R Value equivalent or better than the dwelling			√	
Be separated from the dwelling with construction having R value as required for the dwelling external wall / roof	√			1. The garage must be thermally separated from the dwelling (refer parts 3.12.1.4 & 3.12.1.5 of this report)
Where in climate zone 5, is enclosed with masonry walls and separated from the dwelling with masonry wall(s) and has total R value of roof as required for the dwelling and does not have east / west facing garage door except where the glazing for the dwelling is compliant with clause 3.12.2.1 having 15% SHGC value reduction			√	

BCA Part 3.12.2.1 – <u>External Glazing</u>
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*The results of glazing compliance are covered within a copy of the glazing calculator **provided with this report***

Window manufacturer specified

U Value

SHGC Value

Manufacturer (Not specified) – Stegbar window data used to demonstrate compliance—
see required U and SHGC values within the glazing calculator outputs for compliance

-

-

BCA Part 3.12.2.2 – <u>Shading</u>

The building has the following:

Yes

No

N/A

Permanent devices ie eaves, verandahs or the like

√

Semi permanent ie adjustable blinds, adjustable hoods which restrict 80% summer solar radiation

√

BCA Part 3.12.3.1 – <u>Chimneys and Flues</u>
--

Required

Requirements

Yes

No

N/A

A chimney or flue associated with a **solid fuel burning appliance** must have a damper / flap to seal the flue

√

BCA Part 3.12.3.2 – Roof Lights

Required

Requirements

Yes

No

N/A

A roof light must be capable of being sealed by weatherproof seal / a shutter / imperforate ceiling diffuser **if serving a habitable room** (climate zones 4,5,6,7 & 8) or conditioned space

√

BCA Part 3.12.3.3 – External Windows and Doors

Required

Requirements

Yes

No

N/A

External doors and windows must be capable of being sealed from air leakage by a seal (draft seals required to external window and door edges) where serving a habitable room (climate zones 4,5,6,7 & 8) or conditioned space

√

BCA Part 3.12.3.4 – Exhaust Fans

Required if provided

Requirements

Yes

No

N/A

An exhaust fan (if provided) must be capable of being sealed with a self sealing device ie self closing damper if serving a habitable room (climate zones 4,5,6,7 & 8) or conditioned space

√

BCA Part 3.12.3.5 – Construction of Roofs Walls and Floors

Required

Requirements

Yes

No

N/A

Building external fabric items such as roofs, external walls and external floors and any openings ie window frames, door frames etc must be constructed to minimize air leakage if serving a habitable room (climate zones 4,5,6,7 & 8) or conditioned space

√

BCA Part 3.12.3.6 – Evaporative Coolers

Required

Requirements

Yes

No

N/A

Evaporative coolers must be fitted with a self closing damper or the like if serving a habitable room (climate zones 4,5,6,7 & 8) or heated space

√

BCA Part 3.12.4.1 – Air Movement

Achieved

Requirements

Yes

No

N/A

Air movement must be provided to **habitable rooms** at % opening to floor area (climate Zones 4 & 5):-

- Without ceiling fan – 7.5% (10% climate zone 4)
- With ceiling fan – 5%

√

√

As per BCA 3.8.5 – climate zones 6,7 & 8

√

BCA Part 3.12.4.2 – Ventilation Openings

Achieved

Requirements

Yes

No

N/A

Ventilation and breeze paths provided

√

BCA Part 3.12.4.3 – Ceiling Fans and Evaporative Coolers

Required

Requirements

Yes

No

N/A

Ceiling fans / evaporative coolers must be permanently installed and have a speed controller. Note ceiling fans with blade rotation diameter up to 900mm must not exceed 15m² room and 25m² for 1200mm blade rotation diameter

√

BCA Part 3.12.5.1 – Insulation of Services

Required if provided

Requirements

Yes

No

N/A

Thermal insulation for central heating water piping and heating and cooling ductwork must be protected against effects of weather and sunlight, temperatures within service duct / pipe and comply with AS4859.1

√

BCA Part 3.12.5.2 – Central Heating Water Piping

Required

Requirements

Yes

No

N/A

Central heating water piping not within a conditioned space must be thermally insulated (between R0.2 & R1.3 depending on climate zone)

√

BCA Part 3.12.5.3 – Heating and Cooling Ductwork

Required if provided

Requirements

Yes

No

N/A

Heating and cooling ductwork and fittings (apart from those within a conditioned space / insulated by the building envelope) must achieve required R value and be sealed against air loss :

- Climate zones 4,5 & 6 - R1.0 for heating or cooling only systems + evaporative systems
- Climate zone 4 & 6 - R1.5 for combined systems / Climate zone 5 – R1.0 combined systems

✓

✓

BCA Part 3.12.5.4 – Electrical Resistance Space Heating

Required

Requirements

Yes

No

N/A

Electric resistance space heating serving multiple rooms must have separate isolation switching for each room and separate temperature controller and time switch for each group of rooms with common heating needs and a power load not exceeding 110w/m2 – living areas and 150w/m2 for bathrooms

✓

BCA Part 3.12.5.5 – Artificial Lighting

Requirements	<u>Required</u>		
	Yes	No	N/A
Lamp power density or illumination power density of artificial lighting must not exceed 5 W/m² for class 1 buildings, 4 W/m² for verandahs or balconies attached to class 1 buildings or 3 W/m² for class 10 buildings *modification factors may apply	√		
Halogen lamps separately switched from fluorescent lamps	√		
Artificial lighting to the perimeter of a building must be controlled by a daylight sensor or have average light source efficacy of not less than 40 lumens/W	√		
<i>A lighting plan has not been provided for the works</i>			
<i>Downlights have not been specified for the project. If downlights are provided, the clearance zones about each downlight and the ceiling exhaust fans to any roof areas must not exceed 0.5% of the ceiling area of the level or reassessment of the roof insulation requirements for the works will be required to ensure energy efficiency compliance is maintained.</i>			

BCA Part 3.12.5.6 – Water heater in a Hot Water Supply System

A water heater in a heated water supply system must be designed and installed in accordance with Part B2 of NCC Volume 3 – Plumbing Code of Australia

BCA Part 3.12.5.7 & 8 – Heating and pumping of a swimming pool or spa pool

Requirements	<u>Required if provided</u>		
	Yes	No	N/A
Swimming pool heating must be by Solar heating not boosted with electric resistance heating, heater using reclaimed energy, gas, heat pump or a combination of these			√
Spa pool heating where sharing water reticulation with swimming pool to be either solar, gas, heat pump or Combination. Where heating or part is by gas or heat pump, a cover to the pool / spa is required			√
Timed switch is required for all pools / spas greater than 680L			√

Report Summary

Total min. value of roof insulation required	R4.71 Required to all roof areas excluding garage roof area. A minimum 50% required insulation to be located at ceiling level
Total min. value of wall insulation required	R2.38 Required to wall types 01, 03, 05 & 06 (excluding garage external walls where applicable) R2.32 Required to wall type 02 (excluding garage external walls where applicable) R1.89 Required to wall types 04 & 09 (excluding garage external walls where applicable) R1.95 Required to wall type 07 to garage internal walls only. Wall type 08 – party wall is to be insulated in strict accordance with the manufacturers specifications
Total min. value of floor insulation required	R0.49 Required to all upper level floor areas where externally exposed and where over the garage only
Glazing U Value(s) & SHGC Value(s) required	To minimum BCA Deemed to Comply requirements Stegbar window data has been used to demonstrate compliance where a specific glazier has not been nominated.
Draft sealing	Required to new external doors and windows and the door between the dwelling and garage only. All new windows and doors to be fitted with seals and be tight fitting when closed
Skylights	N/A
Ventilation	Complies
Lighting maximum wattage / m2 allowed	5 W/m2 Internally 4 W/m2 Garage / porch
Compliance items not summarized above	Refer to the relevant parts of the energy report for all energy efficiency compliance requirements

NOTE – **insulation and glazing values** contained within this section of the report are
NOT TO BE USED for construction purposes

NCC VOLUME TWO GLAZING CALCULATOR (first issued with NCC 2014)

Building name/description

392-394 Unley Road, Unley Park (Residence 9)

Climate zone

5

CONSTANTS

C_U

13.464

C_{SHGC}

0.134

Storey

ground

Floor Construction

Direct contact

48m²

Air Movement

high

Suspended

48m²

Area of storey

13.2m²

Area of glazing

13.2m²

(28% of area of storey)

Wall insulation option chosen for 3.12.1.4

No wall insulation concession used

ALLOWANCES

C_U (only)

13.5

C_{SHGC} x Area

6.4

Number of rows for table below 2 (as currently displayed)

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS							SHADING		CALCULATION DATA			CALCULATED OUTCOMES - OK (if inputs are valid)				
Glazing element		Orientation		Size		Performance		P&H or device		Exposure		Size	Conductance - PASSED		Solar heat gain - PASSED	
ID	Description (optional)	Facing sector	Height (m)	Width (m)	Area (m²)	Total System U-Value (AFRC)	Total System SHGC (AFRC)	P (m)	H (m)	P/H	Es	Area used (m²)	U x area	Element share	SHGC x	Element share
													/ winter	of % of	Es x area	of % of
													access	allowance used		allowance used
1	W02	S	2.70	3.30		1.77	0.73				0.68	8.91	4.56	37% of 92%	4.4	70% of 99%
2	W01	S	2.70	1.60		6.34	0.73	0.20	3.40	0.03	0.62	4.32	7.91	63% of 92%	1.9	30% of 99%

IMPORTANT NOTICE AND DISCLAIMER IN RESPECT OF THE GLAZING CALCULATOR

The Glazing Calculator has been developed by the ABCB to assist in developing a better understanding of glazing energy efficiency parameters. While the ABCB believes that the Glazing Calculator, if used correctly, will produce accurate results, it is provided "as is" and without any representation or warranty of any kind, including that it is fit for any purpose or of merchantable quality, or functions as intended or at all. Your use of the Glazing Calculator is entirely at your own risk and the ABCB accepts no liability of any kind.

If inputs (including air movement levels) are valid



NCC VOLUME TWO GLAZING CALCULATOR (first issued with NCC 2014)

Building name/description

392-394 Unley Road, Unley Park (Residence 9)

Climate zone

5

	C _U	C _{SHGC}
CONSTANTS	12.118	0.110

Storey Floor Construction Area

Upper

Direct contact

Wall insulation option chosen for 3.12.1.4

Air Movement

Suspended

75m²

No wall insulation concession used

standard

Area of storey

75m²Area of glazing 21.3m² (28% of area of storey)

	C _U (only)	C _{SHGC} x Area
ALLOWANCES	12.1	8.3

Number of rows for table below

8 (as currently displayed)

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS							SHADING		CALCULATION DATA			CALCULATED OUTCOMES - OK (if inputs are valid)				
Glazing element		Orientation		Size		Performance		P&H or device		Exposure		Size	Conductance - PASSED		Solar heat gain - PASSED	
ID	Description (optional)	Facing sector	Height (m)	Width (m)	Area (m²)	Total System U-Value (AFRC)	Total System SHGC (AFRC)	P (m)	H (m)	P/H	Es	Area used (m²)	U x area / winter access	Element share of % of allowance used	SHGC x Area	Element share of % of allowance used
1	W08 (part)	N	1.90	1.10		4.46	0.59				0.82	2.09	0.70	11% of 55%	1.0	12% of 99%
2	W08 (part)	N	1.90	2.60		4.46	0.59				0.82	4.94	1.66	25% of 55%	2.4	29% of 99%
3	W08 (part)	N	1.90	1.20		4.46	0.59				0.82	2.28	0.77	12% of 55%	1.1	13% of 99%
4	W07	E	1.90	0.50		4.46	0.59				1.19	0.95	0.32	5% of 55%	0.7	8% of 99%
5	W06	E	1.90	1.00		3.94	0.35				1.19	1.90	0.57	8% of 55%	0.8	10% of 99%
6	W05	S	2.00	3.20		3.65	0.35				0.68	6.40	1.76	26% of 55%	1.5	18% of 99%
7	W04	S	1.50	0.90		4.35	0.58	1.00	2.50	0.20	0.48	1.35	0.44	7% of 55%	0.4	5% of 99%
8	W03	S	1.50	0.90		4.35	0.58	1.00	2.50	0.20	0.48	1.35	0.44	7% of 55%	0.4	5% of 99%

IMPORTANT NOTICE AND DISCLAIMER IN RESPECT OF THE GLAZING CALCULATOR

The Glazing Calculator has been developed by the ABCB to assist in developing a better understanding of glazing energy efficiency parameters. While the ABCB believes that the Glazing Calculator, if used correctly, will produce accurate results, it is provided "as is" and without any representation or warranty of any kind, including that it is fit for any purpose or of merchantable quality, or functions as intended or at all. Your use of the Glazing Calculator is entirely at your own risk and the ABCB accepts no liability of any kind.

If inputs (including air movement levels) are valid



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Appendix B

Deemed-to-Satisfy Reference Building data

DO NOT Use this section for construction purposes

FirstRate® Provisional Diagnostic Information

Project Information

Mode	New Home
Climate	16 Adelaide (Kent Town)
Site Exposure	suburban
Client Name	NIC Design
Rated Address	392-394 Unley Road UNLEY PARK SA
Accredited Rater	Stephen Cramond MRICS
Date	31 May, 2019
Reference	EOD-2638A Residence 9 (Type B) Reference Building

Energy Usage

Type	Energy MJ/m²
Total	119.7
Heating	63.7
Cooling	56.0

Areas

Area	Size (m²)
Net Conditioned Floor Area (NCFA)	101.7
Unconditioned Room Area	8.9
Garage Area	18.2

Zones

Zone	Area (m²)	Conditioning Type	Conditioned
Kitchen living	46.2	kitchen	Y
Powder room	2.0	dayTime	Y
Garage	18.2	garage	N
Stair lobby	9.9	dayTime	Y
Bedroom 1	11.1	bedroom	Y
Bedroom 2	11.1	bedroom	Y
Bath	8.9	unconditioned	N
Ensuite	6.3	nightTime	Y
Master bedroom / WIR	22.9	bedroom	Y

Walls

Type	Bulk Insulation (R)	Num Reflective Airgaps	Area (m²)
Wall type 08 - CSR012	4.0	0	94.4
Wall type 03 - CD03	2.4	0	21.9
Wall type 06 - CD06	2.4	0	22.4
Wall type 04 - CD04	1.9	0	32.0
Wall type 02 - CD02	2.4	0	6.9
Wall type 07 - Internal wall	0.0	0	85.8
Wall type 03 - CD03	0.0	0	18.3
Wall type 07 - Internal wall	2.0	0	9.0
Wall type 02 - CD02	0.0	0	9.0
Wall type 01 - CD01	2.4	0	30.0
Wall type 05 - CD05	2.4	0	5.8

Floors

Type	Bulk Insulation (R)	Ventilation	Area (m²)
CSOG: Slab on Ground	0.0	encl	66.0
Timber	0.0	encl	55.4
Timber	0.5	elevated	14.6

Roofs/Ceilings

Type	Bulk Ceiling Insulation (R)	Bulk Roof Insulation (R)	Area (m²)
Ceil: Ceiling	0.0	0.0	40.9
Cont:Attic-Continuous	4.7	0.0	77.0
Ceil: Ceiling	0.5	0.0	15.7
Cont:Attic-Continuous	0.0	0.0	2.5

Windows

Type	U-Value	SHGC	Area (m²)
SOV-016-05 W 850 Series Single Hung-Super Spacer 4EA/14Ar/4EA	1.77	0.73	8.91
STG-007-01 A Aluminium Sliding Window SG 3Clr	6.34	0.73	4.32
STG-006-01 A Aluminium Sliding Window DG 3-6-3	4.46	0.59	12.04
STG-001-01 A Aluminium Awning Window DG 3/6/3	4.35	0.58	2.70
STG-001-21 A Aluminium Awning Window DG 4-8-4CGd	3.65	0.35	6.40

Window Directions

Direction	Area (m²)
S	22.3
W	2.8
N	9.2

Air leakage

Item	Sealed	Unsealed
Generic Vent	-	0
Unflued Gas Heater	-	0
Exhaust Fan	2	0
Downlight	41	0
Chimney	0	0
Heater Flue	-	0

Zone Energy Loads

Zone	Heating (MJ/m2)	Total Heating (MJ)	Cooling (MJ/m2)	Total Cooling (MJ)
Stair lobby	189.9	1883.8	238.4	2365.6
Ensuite	43.7	276.1	39.5	249.4
Kitchen living	62.4	2884.9	44.2	2042.5
Master bedroom / WIR	25.4	580.9	27.9	637.2
Powder room	140.9	282.4	1.2	2.4
Bedroom 2	53.1	587.6	48.0	531.5
Bedroom 1	71.2	790.7	51.5	572.0

Appendix C

Proposed Building Data

**All data from this section is confirmed in the front of
the report**

FirstRate® Provisional Diagnostic Information

Project Information

Mode	New Home
Climate	16 Adelaide (Kent Town)
Site Exposure	suburban
Client Name	NIC Design
Rated Address	392-394 Unley Road UNLEY PARK SA
Accredited Rater	Stephen Cramond MRICS
Date	31 May, 2019
Reference	EOD-2638A Residence 9 (Type B) Proposed Building

Energy Usage

Type	Energy MJ/m²
Total	107.7
Heating	54.8
Cooling	52.9

Areas

Area	Size (m²)
Net Conditioned Floor Area (NCFA)	101.7
Unconditioned Room Area	8.9
Garage Area	18.2

Zones

Zone	Area (m²)	Conditioning Type	Conditioned
Kitchen living	46.2	kitchen	Y
Powder room	2.0	dayTime	Y
Garage	18.2	garage	N
Stair lobby	9.9	dayTime	Y
Bedroom 1	11.1	bedroom	Y
Bedroom 2	11.1	bedroom	Y
Bath	8.9	unconditioned	N
Ensuite	6.3	nightTime	Y
Master bedroom / WIR	22.9	bedroom	Y

Walls

Type	Bulk Insulation (R)	Num Reflective Airgaps	Area (m²)
Wall type 02 - CD02	2.5	0	15.9
Wall type 03 - CD03	2.5	0	40.2
Wall type 04 - CD04	2.5	0	32.0
Wall type 08 - CSR012	4.0	0	94.4
Wall type 06 - CD06	2.5	0	22.4
Wall type 07 - Internal wall	2.0	0	94.8
Wall type 01 - CD01	2.5	0	30.0
Wall type 05 - CD05	2.5	0	5.8

Floors

Type	Bulk Insulation (R)	Ventilation	Area (m²)
CSOG: Slab on Ground	0.0	encl	66.0
Timber	2.0	encl	55.4
Timber	2.0	elevated	14.6

Roofs/Ceilings

Type	Bulk Ceiling Insulation (R)	Bulk Roof Insulation (R)	Area (m²)
Ceil: Ceiling	0.0	0.0	56.5
Cont:Attic-Continuous	5.0	0.0	79.5

Windows

Type	U-Value	SHGC	Area (m²)
STG-004-05 A Aluminium Sliding Door DG 5/6/5	4.45	0.59	8.91
STG-001-01 A Aluminium Awning Window DG 3/6/3	4.35	0.58	21.86
STG-006-01 A Aluminium Sliding Window DG 3-6-3	4.46	0.59	2.85

Window Directions

Direction	Area (m²)
S	21.0
N	9.8
E	2.8

Air leakage

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Item	Sealed	Unsealed
Generic Vent	-	0
Unflued Gas Heater	-	0
Exhaust Fan	2	0
Downlight	41	0
Chimney	0	0
Heater Flue	-	0

Zone Energy Loads

Zone	Heating (MJ/m2)	Total Heating (MJ)	Cooling (MJ/m2)	Total Cooling (MJ)
Stair lobby	115.8	1149.2	194.8	1932.4
Ensuite	53.0	334.5	34.2	216.2
Kitchen living	62.4	2882.9	41.7	1924.4
Master bedroom / WIR	31.0	709.6	37.2	849.9
Powder room	151.3	303.2	0.9	1.9
Bedroom 2	26.6	294.4	42.2	467.0
Bedroom 1	53.3	591.7	59.2	657.3

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Assessor's Accreditation Number:

(v) The building orientation

It would not be appropriate to model the *reference building* along the East-West axis or with its façade facing East, and then re-orientate it so that it is located along the North-South axis, or the façade is facing North for the proposed building.

(vi) The floor plan, including the location of *glazing*

To change the configuration of the building, including its floor plan and room types, could significantly change the energy consumption. This particularly applies to the location of *glazing*. The location of *glazing* is to remain constant between the *reference building* and the proposed building, which includes the orientation that the *glazing* faces.

The *glazing* size, openability, the thermal performance of the *glazing* (*Total System U-value* and *Total System SHGC*) and the degree of shading over the *glazing* may be varied between the modelling runs. While the amount of *glazing* may be varied between the software runs, it is not appropriate to assume that *glazing* can be deleted altogether to enable compliance. Further consideration should also be given to the requirements of NCC Volume Two Part 2.4 (and the related *DtS Provisions* of Part 3.8) which contain the minimum requirements for natural lighting and ventilation commonly achieved using *glazing*.

Reminder:

The principle of the *reference building* is that it represents the proposed building had it been designed to comply with the *DtS Provisions*.

(vii) The ceiling height and the number of storeys

Changing the volume of the internal space between modelling runs can impact the energy required to artificially heat or cool the house, as there will be a larger or smaller volume of air inside the house that will require conditioning. Therefore, it would not be appropriate to change this parameter between software runs.

(viii) The solar absorptance of external surfaces

Solar absorptance is related to the colour of surfaces and external finishes such as roofs and walls. The solar absorptance of external surfaces impacts on the amount of the building's heat gain and loss, and thus the amount of energy required for artificial heating and cooling and thus needs to remain consistent between the two runs.