AUSTRALIAN
GLASS &
WINDOW
ASSOCIATION

2 June 2025

Queensland Productivity Commission

Via online portal: https://qpc.qld.gov.au/content/inquiries/construction-productivity-inquiry-form.html

Opportunities to Improve Productivity in the Construction Sector

The Australian Glass and Window Association (AGWA), the peak national body for the Australian glass and window industry, welcomes the opportunity to provide a submission on the Queensland Productivity Commission's inquiry into opportunities to improve the productivity of the Queensland construction sector. AGWA is committed to improving compliance, standards, and workmanship across all facets of the glass, glazing and windows industry.

The Australian glass and window industry is well placed to support construction productivity growth in Queensland, noting that windows and glazing are complex construction elements and there is no 'one size fits all' in a state as decentralised and geographically and climatically diverse, especially for wind impact, as Queensland.

The local industry, both nationally and in Queensland, is globally exposed, and like many other industries, has labour force and skills challenges, and is increasingly reliant on global sourcing via extensive and complex supply chains. This global sourcing extends to skilled migration paths. Despite this, encouragingly Queensland has the highest number of apprentices in training of any state in Australia.

A core tenet of productivity improvement comes from capital investment and AGWA notes that nationally the industry has recently invested over $250 million in the products needed to support the evolution of the building code in NCC 2022, as well as the scale and innovation required to drive market improvement. As detailed in AGWA's 7-star research report, the additional cost of moving to 7 star is modest, particularly with the current QDC offsets so easily accessible to many builders and developers. From our extensive work on NCC 2022 Energy Efficiency, residential construction in Queensland overall is not adversely affected by the measures, particularly when straightforward design changes are implemented correctly. Our research has shown that most designs can have modest upgrades to other building elements before addressing window performance to achieve a 7-star rating.

In cases where bespoke architectural homes require enhanced compliance solutions, the investments made across the industry, particularly in high-performance window and glazing systems, are delivering tangible dividends. These performance products are now widely available and capable of meeting complex design and compliance requirements efficiently. However, any move to weaken, pause, or reverse progress on established building code provisions risks undermining this momentum. Regulatory stability is critical to maintaining productivity; each shift away from an agreed compliance trajectory reduces the efficiency of previously made investments and delays the broader uptake of advanced systems already developed to meet those standards.

More critically, prolonged or repeated regulatory uncertainty erodes industry confidence and discourages timely capital investment in modernising plant, upgrading equipment, and adopting new technologies. This results in fragmented uptake of performance-enhancing innovations, poorer long-term building outcomes, and slower progress toward national housing resilience goals. From a productivity standpoint, maintaining a consistent and forward-leaning regulatory environment is essential - deviation not only reduces the returns on sunk investment but also limits future productivity growth across the entire value chain.

AGWA notes that opportunities exist for the Queensland state government to work with industry, education providers and the licensing frameworks to further support the upskilling of the current glazing employment cohort via micro-credentialling. AGWA believes that training and licensing pathways should evolve to allow for micro-credentialling that recognises those with a skill set capable of undertaking an activity (e.g., 4-6 units of a Certificate III qualification). These skills can also lead and contribute towards a more expansive qualification later as their career and employment needs progress. AGWA further contends that adapting licensing and sub-licensing capabilities to recognise these skill sets (e.g., shower screen and retrofit window installation) would better align with attracting and retaining potential workers, improving consumer protection, and support easier transition for school leavers looking to enter the construction sector whilst also supporting skilled labor mobility.

Additionally, without compromising quality and safety outcomes, the ongoing enforcement and oversight of regulatory compliance is crucial to achieving productivity growth. Upholding standards and accountability are paramount. Further, considering other jurisdictions which experience elevated levels of workplace injury, AGWA supports maintaining Queensland's chain of responsibility laws, as well as its robust approach to occupational licensing and contracting. Productivity without compliance is unsustainable and short-sighted.

Naturally, the scope and breadth of this review is large and informed by stakeholder feedback. If the review would like to further to further discuss the items presented or provide feedback on emergent themes, we would welcome the opportunity for further engagement particularly in areas of NCC stringency, trade licensing and product compliance/chain of responsibility. To that end please do not hesitate to contact me directly at the AGWA office should the Commission wish to seek further information or clarification.

Yours sincerely,

Clinton Skeoch
Chief Executive Officer

Queensland

7-STAR ENERGY EFFICIENCY

OPTIMISING WINDOW SELECTION FOR 7-STAR HOMES

POWERED BY

HERO

GrahamEnergy

AUSTRALIAN GLASS & WINDOW ASSOCIATION

COPYRIGHT INFORMATION

Published by Australian Glass & Window Association
Printed in Australia

AKNOWLEDGEMENTS

Australia Glass & Window Association would like to thank the following individuals and companies for the work and assistance on this project:

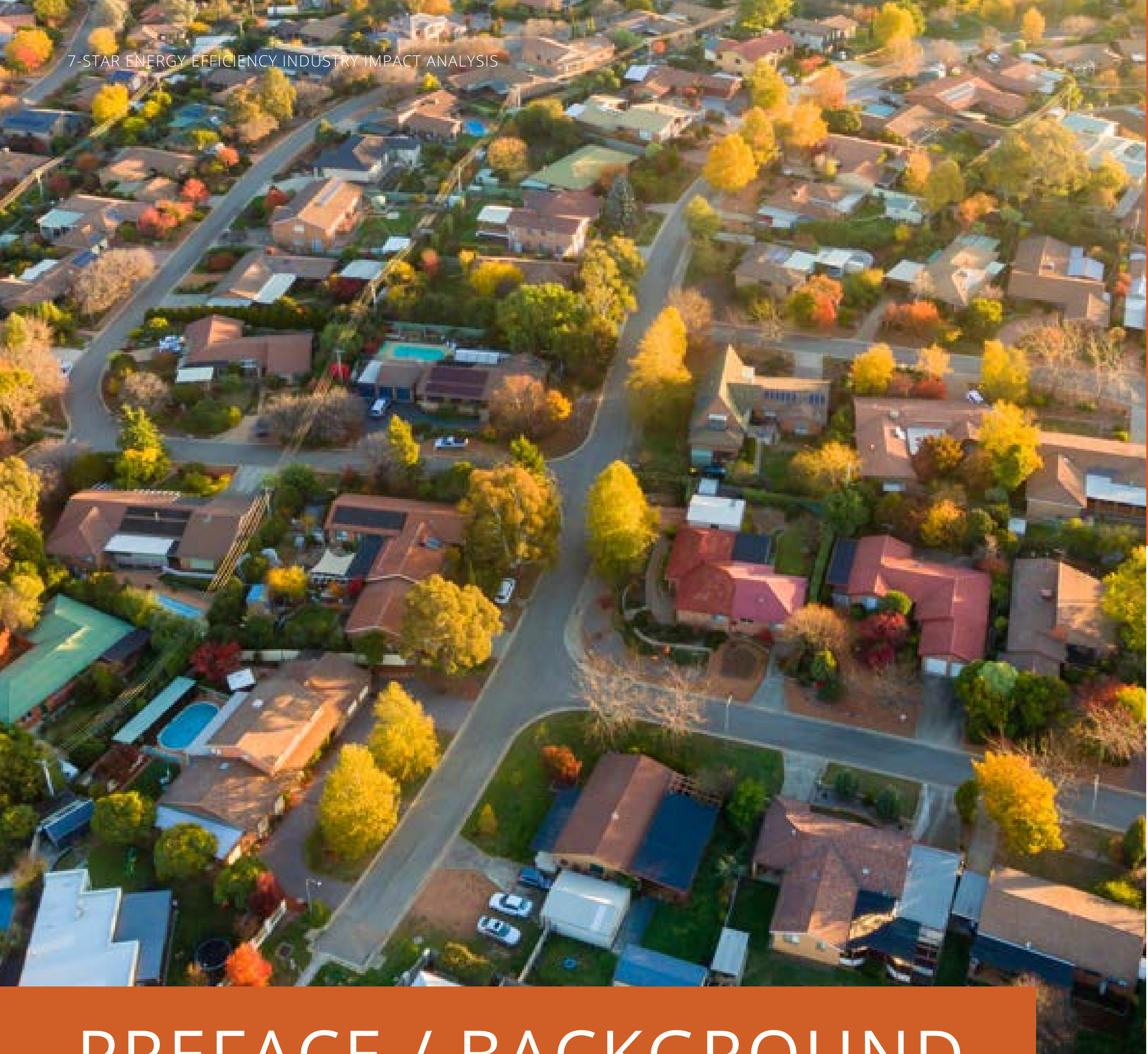
- **Matthew Graham from Graham Energy** as the key independent NatHERS subject matter expert on this project.
- **Nick Bishop from Hero Software**, for the amazing software platform that supported this ground-breaking study.
- **Andrew Hooper from Statewide Group** for the design and development of our two archetype designs.

Without their help, this paper would not have been possible.

Australian Glass & Window Association
Suite 1, Level 1, Building 1/20 Bridge St, Pymble, NSW, 2073, Australia
(02) 9498 2768

CONTENTS

© AGWA



PREFACE / BACKGROUND

According to energyrating.gov.au, up to 40% of the heat loss, and up to 87% of the heat gain in Australian housing is associated with windows. In their paper titled Optimal window designs for Australian houses, Tom Simko and Trivess Moore calculate that windows are responsible for about 96 Petajoules (10^{15} Joules), or 1.5% of Australia's total energy consumption.

The 2022 edition of the National Construction Code introduces improved energy efficiency requirements and delivering energy reductions to the value of between $613 million and $1.5 billion in present value terms of benefits to the economy and reduce greenhouse gas emissions by up to 16 Mt by 2060 [1].

This report has been developed to investigate and quantify, to the extent practical, the impact of adopting a 7-star NatHERS Rating, as the minimum, will have on window and glass selection in concert with changes to other building elements. It provides guidance for AGWA members, energy assessors and builders on achieving 7-Star compliance.

[1] GHG and economic benefits are discussed in the Decision Regulation Impact Statement prepared by ACIL Allen for the Australian Building Codes Board

APPROACH

This investigation seeks to determine the likely market response using appropriate design solutions across a range of scenarios and climates across Australia. The objective of this study is to investigate key variables which drive energy efficiency in house design and develop realistic and practical measures to meet the new 7-star minimum, and accordingly, what impact that will have on window and glass selection.

All simulations used for this study were modelled using Hero v3.0.1.2 (3.21) using CHENATH v3.22 by an accredited industry energy certifier to ensure consistency and adherence to modelling protocols outlined under NatHERS.

In consultation with industry professionals with extensive experience in modern volume-build home design and energy assessment, two distinct house designs were developed for analysis. Theses designs were specifically designed to be typical in every conceivable way and representative of common, contemporary house design, considering variations in the layout, size and number of storeys prevalent across Australia.

In each design scenario, a baseline 6-Star specification was developed using typical building fabric and construction methods.

An orientation analysis was then undertaken to establish the best and worst orientations for each house in each climate zone, and then each model was incrementally modified with various building elements upgraded in-turn, starting with the least costly improvements, to develop an optimised solution based on the worst performing orientation to determine specific building fabric upgrades necessary to achieve 7-Stars in each NCC climate zone including:

- Insulation levels for all elements including roofs, ceilings, walls and floors,
- Average window to floor area ratios and the distribution of window areas across orientations,
- Typical window U and SHGC values,
- Colours of walls, window frames and roofs, and
- The number and location of ceiling fans.

A parametric assessment using a subset of 433 windows, rationalised to be representative of the full performance spectrum of commercially available widows, was ultimately undertaken to determine the relative impact, and sensitivity to, a wide range of glazing solutions on the annual heating, cooling and total energy loads and ascertain the relative performance of the building with each window.

Overall, the study consisted of two archetypes, a single and double storey detached dwelling, with a low (20%) Window to Floor Area Ratio (WFAR) indicative of the lowest glazing area currently seen in market volume builds, and a high (28% for single-storey and 27% for double-storey) WFAR representative of more architectural house designs in 16 orientations across 9 climate zones with 433 window options in each.

All told, this is roughly equivalent to just over 50 000 individual NatHERS simulations.

ARCHETYPES

AGWA 1 is a typical single storey cottage consisting of three bedrooms, two bathrooms, a garage and an open plan kitchen and living area.

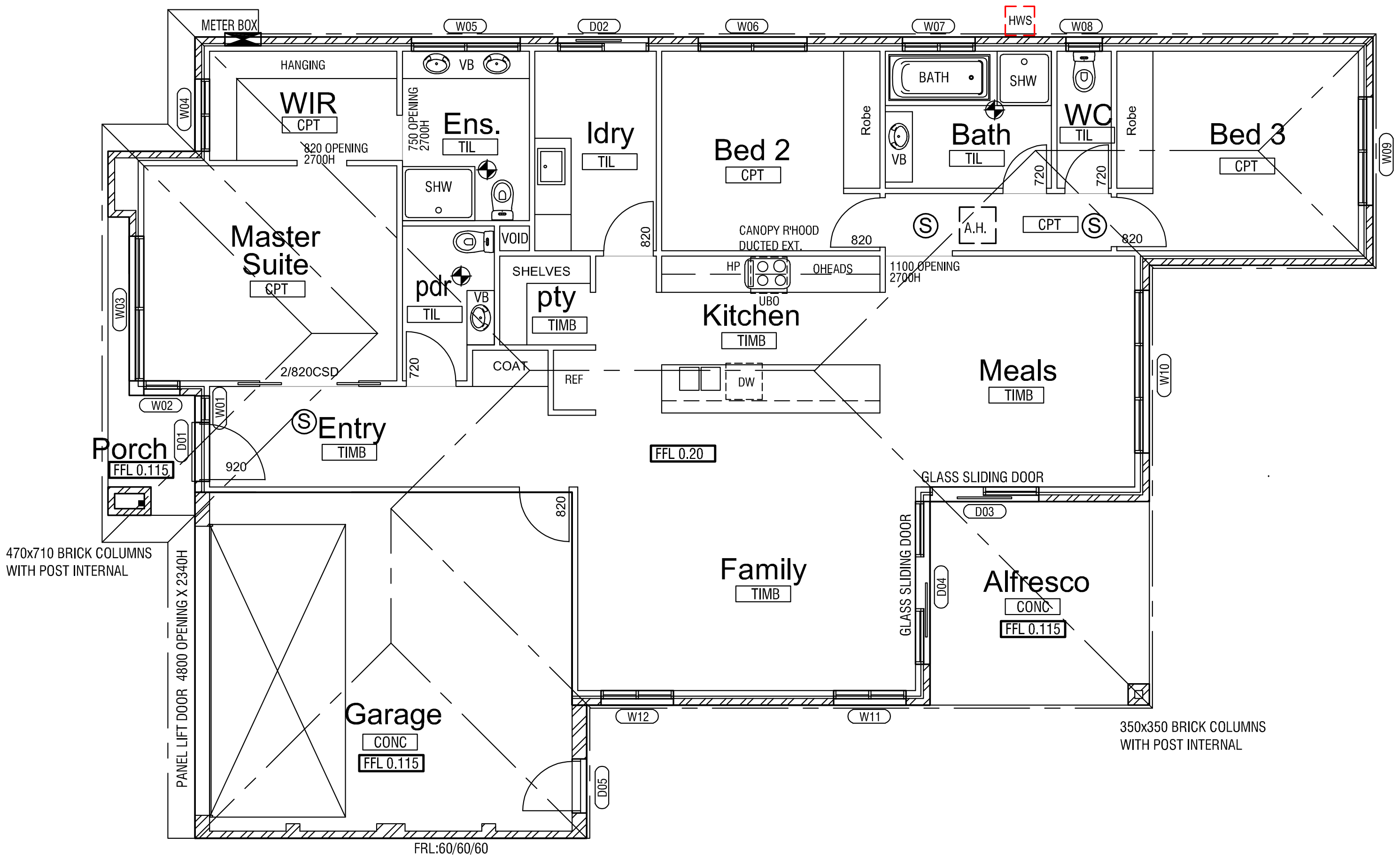
AGWA 2 is a larger two storey home with four bedrooms, two bathrooms, large open-plan kitchen and living areas, upstairs retreat and a cinema or multi-purpose room. Both homes feature an alfresco area at the rear of the property adjoining the main living areas.

AGWA 1

AGWA 2

AGWA 1 Specifications & Floorplan

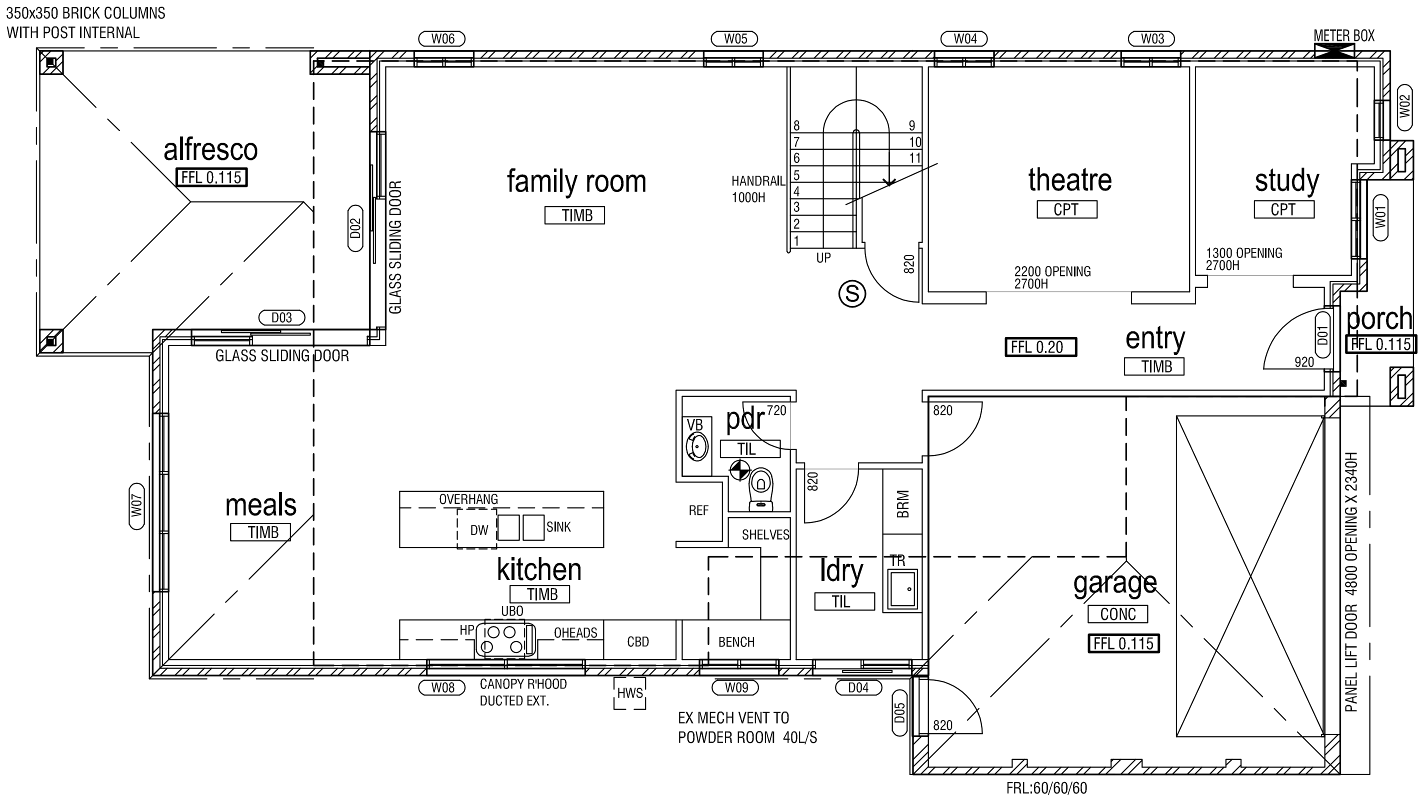
Storeys	2
Number of Bedrooms	4
Number of Bathrooms	2
Conditioned Floor Area	125.9 m²
Un-conditioned Floor Area	14.9 m²
Garage	33.7 m²
Window Area – High	39.5 m²
Window to Floor Area Ratio (WFAR) – High	28%
Window Area – Low	28.5 m²
Window to Floor Area Ratio (WFAR) – Low	20.2%

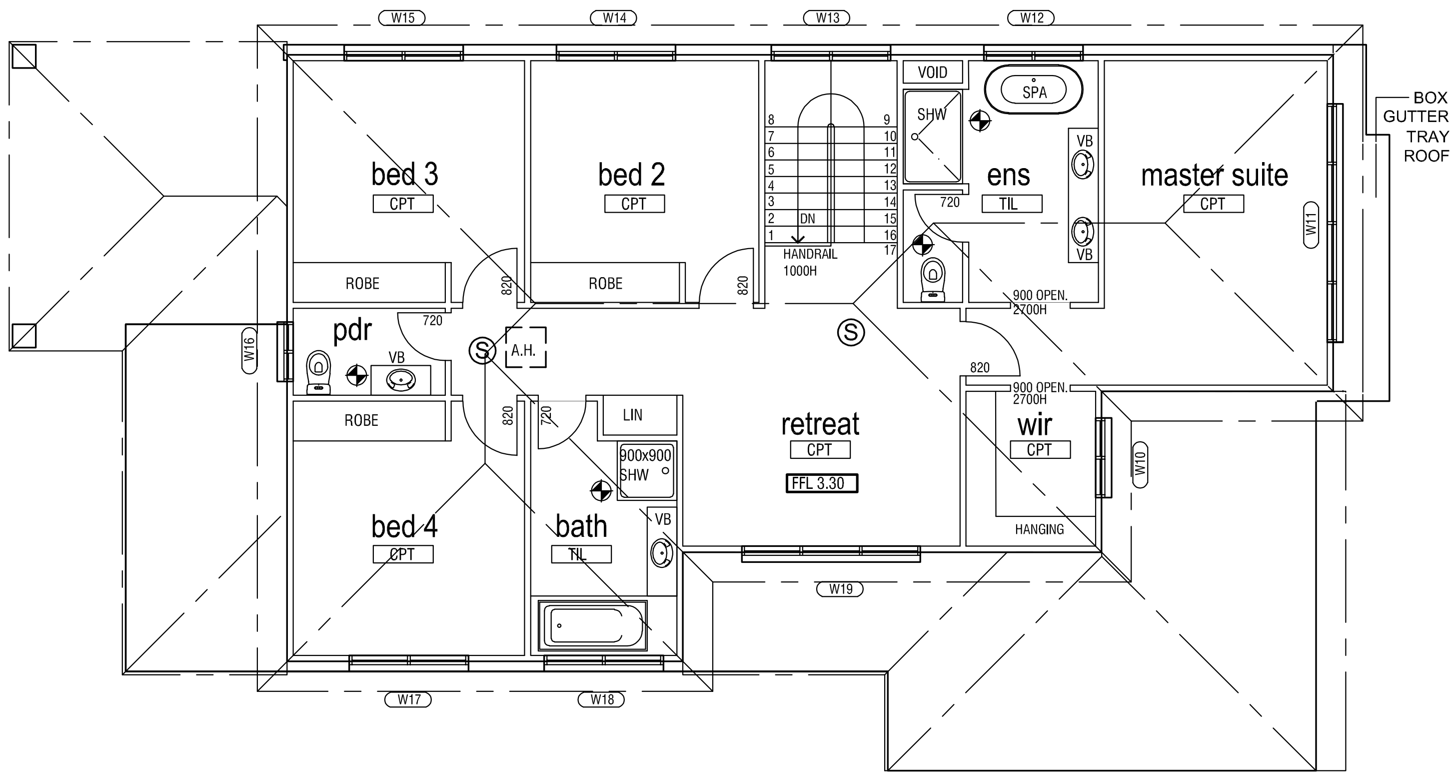


AGWA 2 Specifications

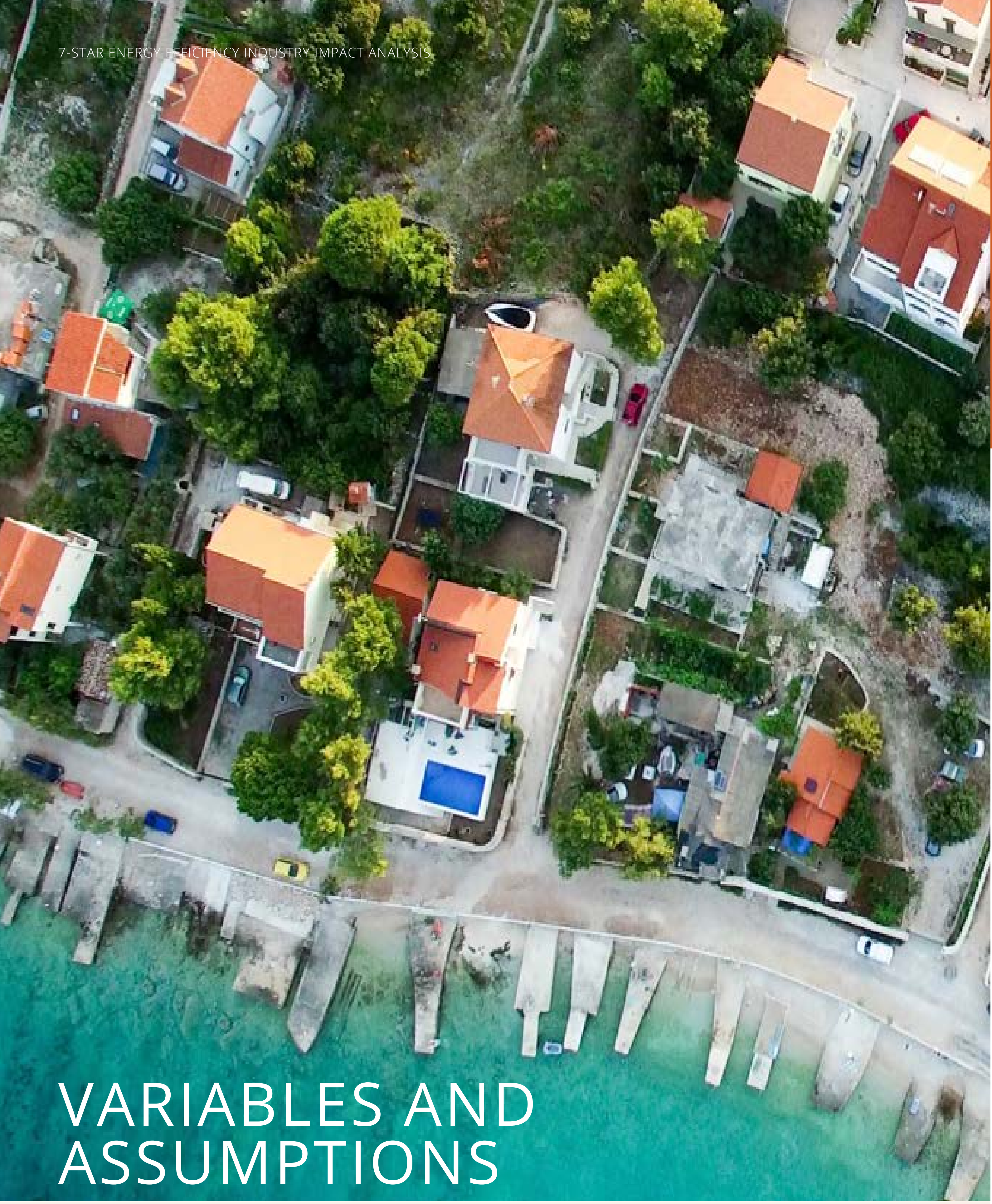
Storeys	2
Number of Bedrooms	4
Number of Bathrooms	2
Conditioned Floor Area	206.6 m²
Un-conditioned Floor Area	16.3 m²
Garage	33.7 m²
Window Area – High	60.2 m²
Window to Floor Area Ratio (WFAR) – High	27%
Window Area – Low	45 m²
Window to Floor Area Ratio (WFAR) – Low	20.2%

AGWA 2 Floorplan





© AGWA



VARIABLES AND ASSUMPTIONS

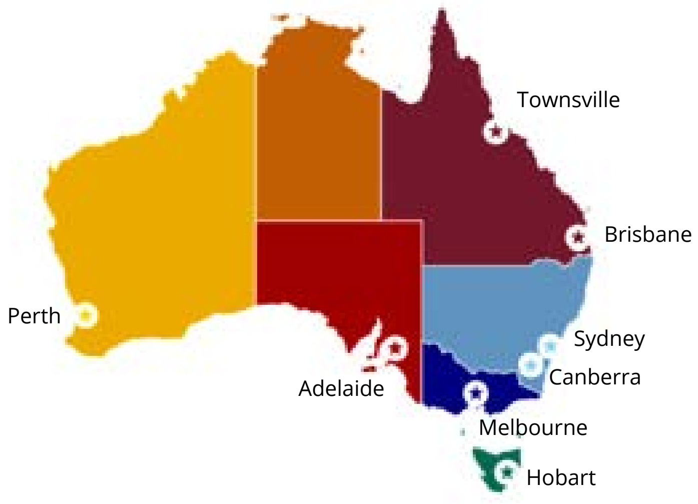
There are a number of inherent assumptions required in conducting a study across such a wide array of variables. Whilst the greatest amount of flexibility possible was maintained to account for design variations, differing construction techniques, and the like, baseline assumptions were made.

CLIMATE ZONES

The National Construction Code divides Australia into 8 distinct climate zones. For the purposes of this study, we have focussed on major metropolitan centres in each climate zone, taking into account regional, and climate specific building practices. Due to State variations in the National Construction Code, not all jurisdictions stipulate a minimum 7-star performance threshold, and some have deferred the introduction of the 7-star requirements.

In order to evaluate the impacts of increasing building fabric performance to meet 7-Star requirements in a variety of climates, a total of 8 locations were considered across NCC climate zones 1 to 7. The table below shows the population centres studied and their corresponding NCC and NatHERS climate zones:

Figure 01: Study locations



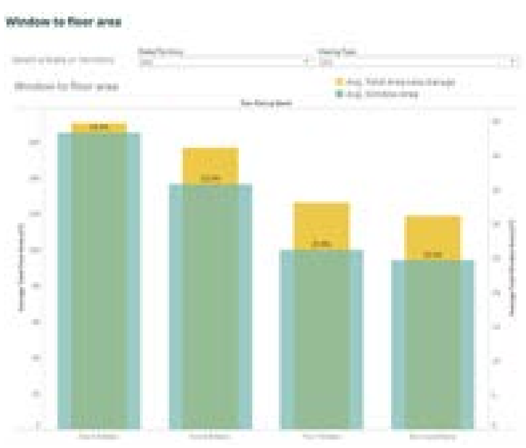
City	State	NCC Climate Zone	NatHERS Climate Zone
Melbourne (Tullamarine)	Victoria	6	60
Sydney (Richmond)	New South Wales	6	28
Brisbane	Queensland	2	10
Canberra	Australian Capital Territory	7	24
Perth	Western Australia	5	13
Adelaide	South Australia	5	16
Hobart	Tasmania	7	26
Townsville	Queensland	1	5

WINDOW TO FLOOR AREA

The Australian Housing Data Portal, produced and maintained by the CSIRO, provides a wealth of information on building and component configurations, including window-to-floor-area-ratios (WFAR)

The following chart from the data portal shows that on average across Australia a general trend of smaller windows in higher performing homes exists, with windows being roughly 15% smaller at 7-Star as compared to 6. The graph also shows that dwelling sizes will decrease by an average 19% between 6 and 7-Stars.

Figure 02: Australian Housing Data Portal - Average Window to Floor Area Ratios (All States)



Whilst both trends are indicators of potential market response to the increase in stringency to 7-Stars, it should not be presumed that correlation equals causality. It is equally valid to suggest that this is simply a reflection that smaller buildings tend to rate better.

Figure 03: Average Window to Floor Area Ratio by State

For the purposes of this study we assumed a baseline 20.2% WFAR to roughly align with the window areas assumed for project homes in the ABCB's Decision Regulation Impact Statement and repeated the exercise with a higher WFAR of 27% for single-storey and 28% for double-storey dwellings being loosely representative of window areas common in more architectural style homes.

Storeys	Low WFAR	High WFAR
AGWA 1	20.2%	27%
AGWA 2	20.2%	28%

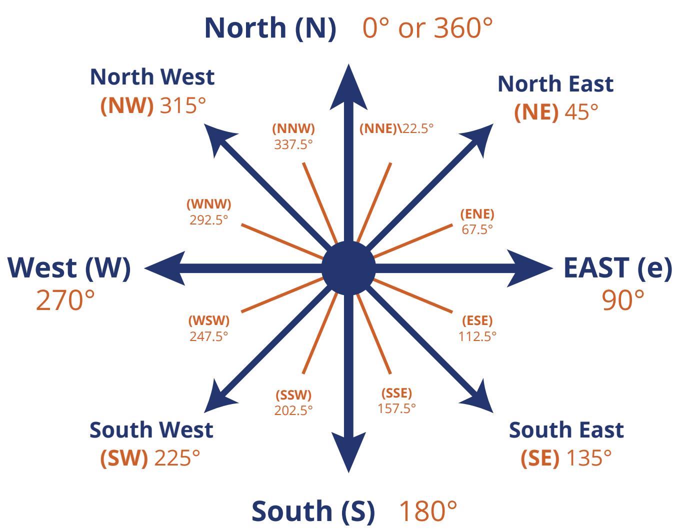
Figure 04: Typical house spacing between adjacent lots - Your Home reccomends optimal spacing between dwellings, to be of 5.5 metres between single storey and 10 metres between double storey which can be challenging in modern development settings.

ORIENTATIONS

It is well established that, for any given house, its annual energy performance for heating and cooling depends on its orientation. Window size, selection and orientation, particularly those in living areas which have the highest energy demand, will substantially influence overall thermal efficiency of a building.

To account for this, within each climate zone, analysis was undertaken to determine the best and worst orientation for each archetype with each house rotated progressively around 16 cardinal directions.

Figure 04: 16-Point Orientation Analysis



OVERSHADOWING

The effect of overshadowing from neighbouring buildings can have a substantial impact on the thermal efficiency of a house. Buildings in colder climates which are overshadowed from adjacent properties will not benefit as much from passive solar gain as those with greater solar access.

In hot climates, the inverse is true; houses which are overshadowed by neighbouring buildings will benefit from lower unwanted solar heat gain.

Nationwide House Energy Rating Scheme (NatHERS) Technote: Requirements for NatHERS assessments Version 1 2022 requires that:

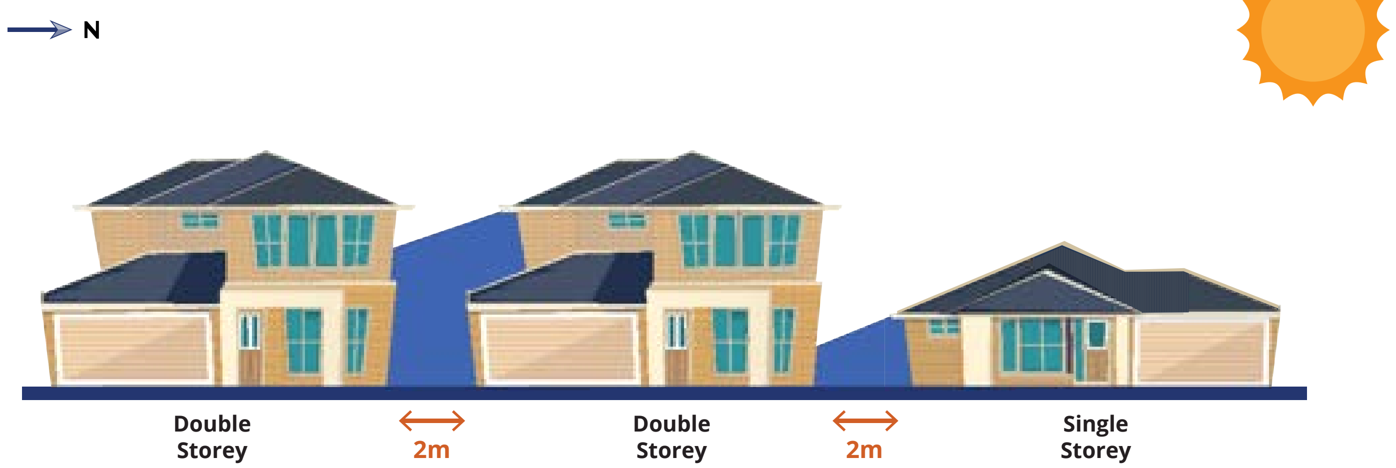
Under Clause 10.4 assessors must model neighbouring buildings and surrounding topographical features that obstruct the sun on level ground.

Assessors must model all single-storey neighbours within 10 m and two-storey neighbours within 20 m of the dwelling. Assessors must consider the impact of level changes and retaining walls when modelling these features.

Under Clause 10.7 where neighbouring buildings are unknown, for example because the dwelling is in a new estate, the neighbouring building is to be assumed to have the same dimensions and setbacks as the one being modelled.

For consistency reasons, the simulations undertaken in the parametric study were modelled in accordance with these provisions on the assumption that the vast majority of homes would have adjoining properties in reasonably close proximity.

Figure 05: Overshadowing from adjacent properties



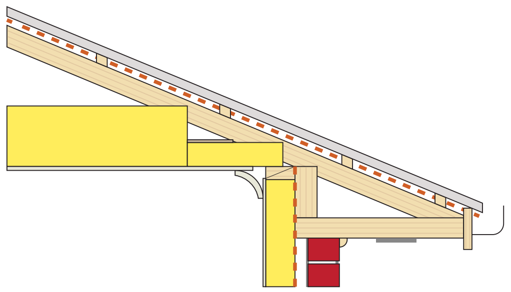
OPTIMISATION AND BUILDING ELEMENT SPECIFICATIONS

6-Star baseline houses were modelled using common and practical construction systems suitable to each climate zone, usually either brick-veneer or hybrid brick-veneer and light-weight clad systems in most climate zones but adapted to suit specific climates such as double-brick in Perth and single-skin masonry in Townsville.

Each baseline design was then systematically upgraded to achieve 7-stars using techniques generally consistent with those that a typical assessor would use to optimise building designs in the field which is somewhat, generally speaking, a process of trial and error to deduce the configuration of building fabric which yields a compliant outcome at the lowest relative cost.

In all climates this required significant modification to the building fabric, typically requiring higher performance wall and ceiling insulation, upgrading floor systems from concrete slab on ground to wafflepod, optimising external fabric colours, and increasing the number of ceiling fans.

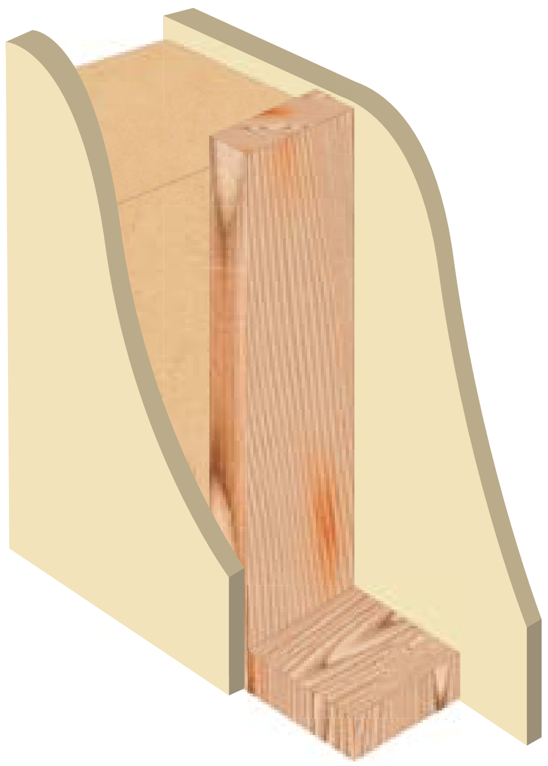
Figure 06: Insulation optimised for walls, roofs and eaves



We determined that in most climate zones it was not feasible to achieve a 7-star compliant outcome without some level of improvement to glazing. In many cases, particularly in colder climates, wall, ceiling and floor insulation levels reach their natural limits, beyond which more expensive options involving less conventional construction techniques (such as transitioning to 140 mm studs for example), which would not be as cost-effective.

Building elements, other than windows, were generally optimised for the worst orientation in each instance.

Figure 07: Insulation maximised for 90 mm stud



PARAMETRIC STUDY

Having calibrated our models to deliver designs optimised to the most cost-effective solution we then sought to gain an understanding of the number, range and composition of commercially available windows which would produce a compliant (greater that 7-star) result in each climate zone and orientation.

Testing over 40 000 windows in each house, across 8 climate zones and in 16 orientations was quite obviously monumentally impractical, but we reasoned that a smaller representative subset could be used to proxy the entire range of windows in the WERSLink database.

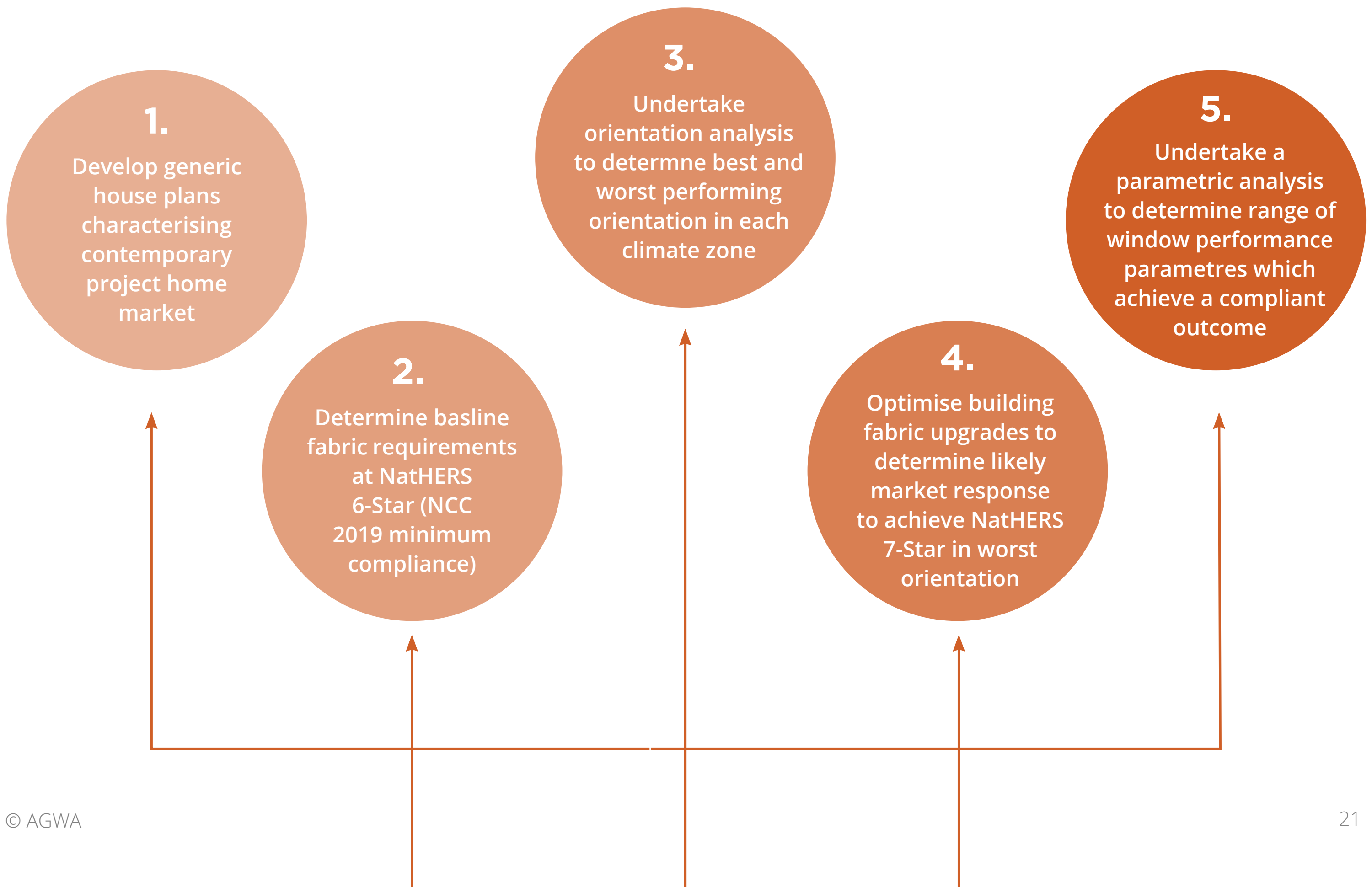
To achieve this, we grouped windows into incremental bands of 0.5 U-value and (+/-) 5% SHGC and subsequently selected a single window representative of each cohort. This yielded a window schedule consisting of 433 windows which could be interchanged in our model and assessed for compliance to 7-stars.

In consideration of the currently defined substitution rules, we determined that the most 'typical' product would be identified as the one with:

- the highest U value, then
- the nearest to mode SHGC, then
- the nearest to median Frame Fraction
- the nearest to the median visible light transmittance (Vt)

Each house was then modelled in each climate zone, in the best and worst orientation with each of the 433 proxy windows and the results tabulated. For simplicity, the same window was assumed to be used throughout the entire house, meaning that the results should be considered as indicative of the average window performance. In practice, optimising window selection by orientation and by zone, particularly for living (day-time) and bedroom (night-time) heating and cooling zones is likely to yield similar outcomes for lower overall cost.

Figure 08: Overview of study



USING THE TABLES

The results of this study are presented as a matrix with U value expressed as a range with the lowest U-value (best performing) on the left to the highest U-value (worst performing) to the right and the spectrum of SHGC performance represented vertically with the highest solar heat gain (clear glass) at the top and lower solar gain (toned and low-e) to the bottom.

The value in each cell represents the overall NatHERS star rating that window achieved. To assist in interpretation, the results are colour coded based on their compliance to NCC 2022 7-star requirements.

There are four tables for each climate zone representing single and double storey homes with both low and high window to floor area ratios.

U Value

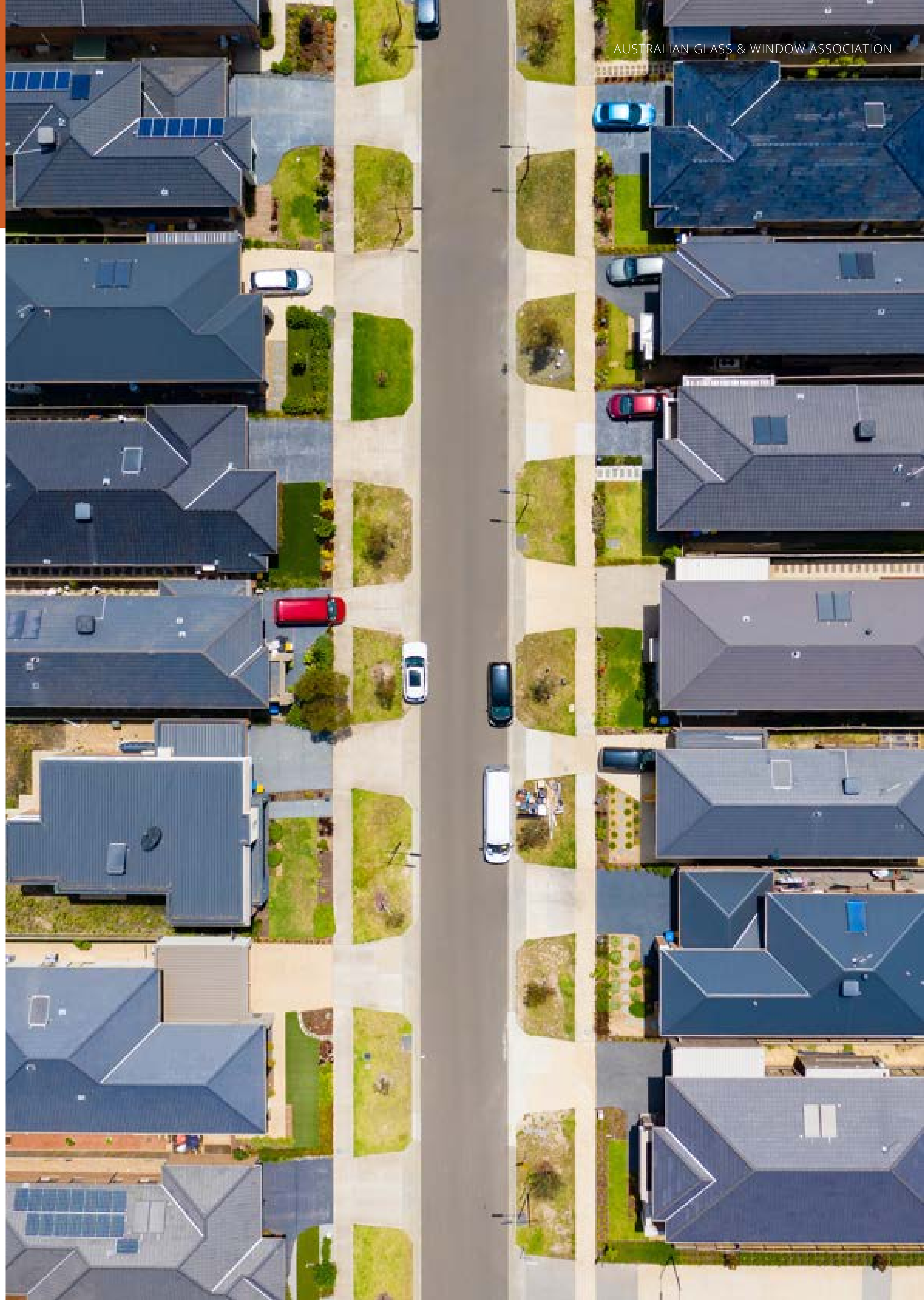
		A	B	C	D	E	F	G	H	I	J	K	L	M	N
	U	Ultra High			High				Medium				Low		
	Value	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7+
	SHGC	0.5-1	1-1.5	1.5-2	2-2.5	2.5-3	3-3.5	3.5-4	4-4.5	4.5-5	5-5.5	5.5-6	6-6.5	6.5-7	"
1	0.815								6.3	6.5	6.4	6.4	6	6.1	
2	0.776								6.6	6.5	6.4	6.4	6.3	6.1	
3	0.739			7.9			7.4	7	*7.2	6.6	6.5	6.3	6.2	6.2	
4	0.704				7.9	7.6	7.4	7.3	7	*7.2	6.6	6.2	6.3	6.3	6.1
5	0.671				7.7	7.6	7.3	7.3	*7.2	6.6	6.4	6.3	6.2	6.1	6.1
6	0.639			7.9	7.9	7.6	7.3	7	*7.2	6.6	6.6	6.4	6.4	6.2	
7	0.608			8	7.8	7.6	7.2	7	*7.1	6.9	6.4	6.2	6.1	6.1	6.6
8	0.579			8.1	7.8	7.6	7.2	7.2	*7.2	6.6	6.3	6.2	6.2	6.1	6.5
9	0.552		8.2	7.9	7.9	7.6	7.4	7.1	*7.3	6.7	6.6	6.1	6.1	6.2	5.9
10	0.526			7.9	7.9	7.7	7.2	7	*7.1	6.6	6.4	6.1	6	5.9	5.9
11	0.501		8.2	7.9	7.8	7.5	7.2	7	*7.2	6.6	6.4	6.2	6.1	5.9	5.9
12	0.477		8.2	7.7	7.8	7.4	7.2	7	*7	6.7	6.4	6.3	5.9	5.9	5.9
13	0.454		8	7.7	7.6	7.4	7	*7.1	*7.1	6.4	6.3	6.3	5.9	5.9	5.9
14	0.432		8	7.9	7.6	7.3	7	*7.1	6.6	6.4	6.2	6.1	5.9	5.8	5.8
15	0.412		7.9	7.8	7.6	7.4	*7.2	*7.2	6.4	6.4	6.4	6.1	5.9	5.8	5.8
16	0.392		8.1	7.9	7.4	7.4	*7.2	*7.2	6.4	6.4	6.3	6.1	5.9	5.8	5.7
17	0.374	8.1	7.9	7.7	7.4	7.2	*7.1	*7.1	6.5	6.4	6.4	6.2	5.8	5.9	5.7
18	0.356		7.9	7.6	7.5	7.3	*7.1	*7.1	6.5	6.7	6.3	6.2	5.8	5.9	5.7
19	0.339		8	7.9	7.5	7.2	*7.1	*7.1	6.4	6.6	6.2	6.2	5.8	5.8	5.7
20	0.323		7.9	7.7	7.3	7.2	*7.1	*7.1	6.4	6.4	6.3	6.2	5.8	5.7	
21	0.307		7.9	7.8	7.4	7.2	7.3	*7	6.6	6.4	6.2	6.1	5.8	5.9	
22	0.293	7.9	7.8	7.6	7.4	7.2	7	*7	6.6	6.3	6.2	5.8	5.8	5.9	
23	0.279	7.9	7.9	7.6	7.3	7.4	7.2	*7	6.7	6.1	6	5.8	5.8	5.8	
24	0.266		7.7	7.6	7.4	7.2	7.1	*7.1	6.6	6.5	6.1	5.8	5.8	5.7	5.6
25	0.253		7.8	7.6	7.5	7.2	7	*7.1	6.8	6.4	6.1	5.9	5.7	5.7	
26	0.241	7.9	7.6	7.6	7.4	7	*7.1	*7	6.9	6.5	6.1	5.9	5.8	5.7	
27	0.229		7.7	7.5	7.2	7.1	*7.1	6.4	6.7	6.3	5.9	5.7	5.8	5.8	
28	0.219		7.7	7.3	7.4	7	6.8	6.7	6.6	6.5	5.9	5.9	5.8	5.6	
29	0.208		7.7	7.4	7.2	7.2	6.7	6.6	6.3	6.4	5.9	5.7	5.7	5.7	
30	0.198			7.4	7.1	*7.1	6.6	6.6	6.4	6.5			5.7		
31	0.189		7.6	7.5	7.1	7.3	6.6	6.4	6.4	6.3	5.9	5.7	5.7		
32	0.180		7.6	7.5	7.3	*7.1	*7	6.4	6.3	6.3			5.8		
33	0.171		7.6	7.4	7.2	7.2	*7.1	6.4	6.4	6.2	6.1				
34	0.163	7.7	7.6	7.4	7	*7	6.6	6.5	6.3	6.2	6.1				
35	0.155		7.4	7.4	7.1	*7	6.6	6.4	6.4	6.1					
36	0.148	7.6	7.5	7.4		7.1	6.7	6.5	6.3	6.2					
37	0.141			7.4	7.2	*7.1	6.7	6.8	6.4						
38	0.134		7.4	7.4	7.1	*7.1	6.5	6.4		6.4					
39	0.128		7.5	7.4	7.2	*7.1	6.8	6.4							
40	0.122			7.3											
41	0.116		7.4	7.3											
42	0.110			7.3											
43	0.105			7.1											

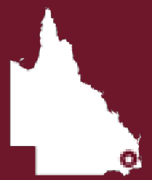
SHGC

	Low	High
Single	Single Storey 20% WFAR	Single Storey 27% WFAR
Double	Double Storey 20.2% WFAR	Double Storey 28% WFAR

Star Rating

5	Non-Compliant in all Orientatons
6	
*7	Best Orientation Only
7	NCC 2022 Compliant in all Orientatons
8	
9	
10	





BRISBANE

HEATING AND COOLING LOADS

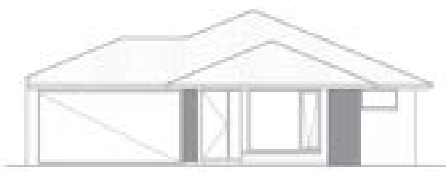
Locality	Brisbane	**Total**	44 MJ/m².annum
NCC Climate Zone	2	**Heating**	16 MJ/m².annum
NatHERS Climate Zone	10	**Cooling**	39 MJ/m².annum

Construction	AGWA 1	AGWA 2
Roof Type	Corrugated Steel	Corrugated Steel
Ground Floor Type	110 mm concrete on 375 mm EPS waffle-pod (R0.64)	
Second Floor Type	N/A	Suspended Timber
External Wall Type	Brick veneer, 90 mm timber stud wall	**Lower storey:** 90 mm timber stud wall brick veneer **Upper storey:** 90 mm timber stud wall direct fix FC sheet cladding
Internal Wall Type	Standard 90 mm stud wall with 10 mm plasterboard sheeting - uninsulated except for walls adjoining internal garage and non-conditioned spaces	
Ceiling Height	2.4 m	

Insulation	AGWA 1	AGWA 2
Roof Insulation/Blanket	Reflective foil	R1.3
Ceiling insulation (inc garage)	R3.0	R6.0
Ceiling Perimeter Insulation	R2.7	R2.7
External Wall Insulation	R2.0	R2.7
Internal Wall Insulation (walls adjoining garage and unconditioned zones)	R2.0	R2.5

Colours	AGWA 1	AGWA 2
Roof Colour	Light (SA = 0.23)	Light (SA = 0.23)
External Wall Colour	Light (SA = 0.23)	Light (SA = 0.23)
Window Frame Colour	Light (SA = 0.23)	Light (SA = 0.23)

Internals	AGWA 1	AGWA 2
Floor Coverings	Carpet in Bedroom zones, timber in living and day areas, tiles for bathrooms and laundry and concrete slab on ground (CSOG) for garage	
Downlights	IC-4	IC-4
Ceiling Fans		
• Kitchen	2 x 1800	3 x 1800
• Living	-	1 x 1800
• Bedroom	-	4 x 1500
• Study	1 x 1500	1 x 1200

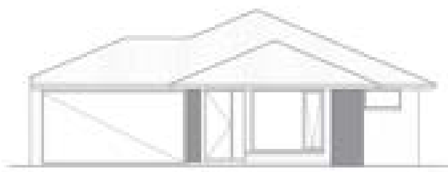


AGWA 1

BRISBANE - WFAR LOW

Window to Floor Area Ratio = 20%

		A	B	C	D	E	F	G	H	I	J	K	L	M	N
	U	Ultra High			High				Medium				Low		
	Value	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7+
	SHGC	0.5-1	1-1.5	1.5-2	2-2.5	2.5-3	3-3.5	3.5-4	4-4.5	4.5-5	5-5.5	5.5-6	6-6.5	6.5-7	"
1	0.815								8.5	8.5		8.1	8.1	7.9	
2	0.776								8.6		8.3	8.2	8.1	7.9	
3	0.739			9.6			8.8	8.8	8.5	8.6	8.3	8.1	8	8	
4	0.704				9.1	8.9	8.8	8.8	8.6	8.6	8.4	8.1	8.1	8.1	8.1
5	0.671				9.1	9	8.9	8.9	8.6	8.6	8.3	8.4	8.1	8.1	8.1
6	0.639			9.3	9.2	8.9	8.9	8.7	8.7	8.4	8.4	8.3	8.2	8.1	
7	0.608			9.4	9.2	9.1	8.9	8.7	8.7	8.6	8.9	8.1	8.1	8.2	8.6
8	0.579			9.4	9.2	9.3	8.9	8.9	8.7	8.5	8.3	8.2	8.3	8.1	8.6
9	0.552		9.6	9.4	9.4	9.1	9.2	8.8	8.7	8.6	8.6	8.1	8.1	8.3	8.1
10	0.526			9.4	9.4	9.3	9	8.9	8.7	8.5	8.5	8.2	8.1	8.1	8
11	0.501		9.8	9.6	9.4	9.2	9.1	8.7	8.8	8.5	8.4	8.3	8.2	8.1	7.9
12	0.477		9.9	9.4	9.5	9.2	9.2	8.9	8.7	8.7	8.4	8.4	8.1	8	8.2
13	0.454		9.7	9.5	9.4	9.3	8.9	8.8	8.7	8.5	8.4	8.4	8.1	8.1	8.2
14	0.432		9.8	9.6	9.4	9.2	8.9	8.8	8.6	8.5	8.3	8.2	8.2	8	8.1
15	0.412		9.8	9.5	9.4	9.2	8.9	8.9	8.5	8.7	8.6	8.1	8.1	8	7.9
16	0.392		9.9	9.7	9.4	9.2	8.9	8.9	8.6	8.8	8.4	8.2	8.1	8	7.9
17	0.374	9.9	9.8	9.6	9.3	9.2	9	8.9	8.7	8.7	8.4	8.4	8.1	8	7.9
18	0.356		9.7	9.5	9.4	9.3	8.9	8.8	8.7	8.7	8.4	8.2	8	8.1	7.9
19	0.339		9.8	9.7	9.6	9.1	9	8.9	8.7	8.6	8.4	8.4	8	8.1	7.9
20	0.323		9.9	9.7	9.3	9.2	8.9	8.9	8.6	8.6	8.6	8.4	8	8	
21	0.307		9.9	9.7	9.4	9	9.4	8.9	8.7	8.5	8.4	8.3	8.1	8.1	
22	0.293	9.9	9.8	9.4	9.4	9.2	9	8.8	8.7	8.6	8.3	8.2	8.1	8.1	
23	0.279	9.9	9.9	9.6	9.3	9.3	9.2	8.8	8.8	8.4	8.3	8	8	8	
24	0.266		9.7	9.6	9.4	9.3	8.9	8.9	8.7	8.6	8.3	8	8	7.9	7.8
25	0.253		9.8	9.5	9.6	9.2	9.1	8.9	8.8	8.4	8.2	8.2	8	7.9	
26	0.241	9.9	9.7	9.6	9.3	9.1	9.2	8.6	8.7	8.5	8.3	8.2	8	7.9	
27	0.229		9.8	9.6	9.2	9.2	8.9	8.6	8.7	8.4	8.3	8	8	7.9	
28	0.219		9.7	9.3	9.4	9.1	8.9	8.8	8.6	8.5	8.3	8.2	8	7.8	
29	0.208		9.8	9.5	9.2	9.2	8.9	8.6	8.5	8.5	8.2	7.9	7.9	7.9	
30	0.198			9.4	9.2	9	8.8	8.9	8.6	8.5			7.9		
31	0.189		9.5	9.4	9.2	9.2	8.9	8.6	8.6	8.5	8.2	7.9	7.9		
32	0.180		9.6	9.4	9.3	9.1	8.9	8.6	8.5	8.4			7.9		
33	0.171		9.6	9.4	9.3	9.2	8.9	8.6	8.6	8.4	8.2				
34	0.163	9.7	9.6	9.4	9.2	8.9	8.7	8.7	8.4	8.2	8.2				
35	0.155		9.4	9.4	9.1	9.1	8.8	8.6	8.4	8.2					
36	0.148	9.6	9.6	9.3		9	8.8	8.6	8.4	8.3					
37	0.141			9.4	9.1	9.1	8.8	8.8	8.5						
38	0.134		9.4	9.4	9.2	9.1	8.7	8.6		8.4					
39	0.128		9.4	9.3	9.2	9	8.9	8.7							
40	0.122			9.3											
41	0.116		9.4	9.3											
42	0.110			9.2											
43	0.105			9.2											



AGWA 1

BRISBANE - WFAR HIGH

Window to Floor Area Ratio = 27%

		A	B	C	D	E	F	G	H	I	J	K	L	M	N
	U	Ultra High			High				Medium				Low		
	Value	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7+
	SHGC	0.5-1	1-1.5	1.5-2	2-2.5	2.5-3	3-3.5	3.5-4	4-4.5	4.5-5	5-5.5	5.5-6	6-6.5	6.5-7	"
1	0.815								7.9	7.7		6.9	7.1	7.1	
2	0.776								7.8		7.3	7.2	7.1	6.9	
3	0.739			8.9			7.7	7.9	7.6	7.8	7.4	7.1	7.1	7.1	
4	0.704				7.9	7.9	7.8	7.8	7.7	7.6	7.4	7.2	7.1	7.2	7.2
5	0.671				8.2	7.9	7.9	7.8	7.7	7.6	7.4	7.4	7.2	7.3	7.3
6	0.639			8.2	8.1	7.9	7.9	7.9	7.8	7.7	7.5	7.4	7.2	7.3	
7	0.608			8.4	8.3	8.2	7.9	7.8	7.8	7.8	7.6	7.4	7.4	7.4	7.3
8	0.579			8.7	8.7	8.4	8.1	7.9	7.8	7.7	7.6	7.4	7.4	7.3	7.2
9	0.552		8.9	8.6	8.6	8.5	8.4	7.9	7.9	7.8	7.6	7.4	7.3	7.4	7.4
10	0.526			8.6	8.7	8.6	8.3	8.1	7.9	7.7	7.7	7.4	7.4	7.4	7.4
11	0.501		9.1	8.9	8.8	8.4	8.4	8.2	8.1	7.8	7.7	7.4	7.5	7.4	7.2
12	0.477		9.2	8.8	8.8	8.4	8.5	8.1	8	7.9	7.8	7.5	7.4	7.3	7.2
13	0.454		9.1	8.9	8.8	8.6	8.3	8	8	7.9	7.8	7.6	7.4	7.4	7.3
14	0.432		9.1	9	8.8	8.7	8.4	8.2	8.1	7.9	7.8	7.6	7.3	7.4	7.3
15	0.412		9.2	8.9	8.8	8.7	8.3	8.4	8.2	8.1	7.9	7.6	7.5	7.4	7.4
16	0.392		9.3	9.1	8.9	8.7	8.5	8.4	8.3	8.2	7.9	7.7	7.5	7.4	7.3
17	0.374	9.4	9.2	9.1	8.8	8.7	8.5	8.3	8.3	8.3	7.9	7.8	7.5	7.5	7.4
18	0.356		9.2	9	8.9	8.7	8.4	8.3	8.3	8.2	7.9	7.8	7.5	7.5	7.3
19	0.339		9.4	9.3	9.1	8.7	8.6	8.4	8.3	8.2	7.9	7.9	7.5	7.5	7.2
20	0.323		9.4	9.2	8.8	8.7	8.4	8.4	8.2	8	7.9	7.8	7.5	7.4	
21	0.307		9.4	9.3	8.9	8.7	8.6	8.5	8.2	8.1	7.9	7.7	7.5	7.5	
22	0.293	9.4	9.3	9	8.9	8.7	8.6	8.3	8.3	8	7.8	7.6	7.4	7.4	
23	0.279	9.4	9.4	9.2	8.9	8.9	8.7	8.4	8.3	8	7.8	7.6	7.3	7.4	
24	0.266		9.3	9.2	9.1	8.9	8.4	8.5	8.2	8.1	7.7	7.6	7.3	7.3	7.2
25	0.253		9.4	9.2	9.1	8.8	8.7	8.5	8.4	8.1	7.8	7.6	7.5	7.4	
26	0.241	9.4	9.3	9.2	8.9	8.7	8.7	8.3	8.3	8.1	7.9	7.6	7.6	7.4	
27	0.229		9.3	9.2	8.8	8.8	8.6	8.3	8.2	8	7.7	7.6	7.6	7.5	
28	0.219		9.3	9.1	9	8.7	8.5	8.4	8.2	8.1	7.7	7.7	7.5	7.4	
29	0.208		9.3	9.1	8.8	8.8	8.4	8.2	8	8.1	7.7	7.6	7.4	7.4	
30	0.198			9	8.8	8.6	8.3	8.3	8.1	8.1			7.5		
31	0.189		9.2	9.1	8.9	8.8	8.4	8.2	8.2	8	7.8	7.6	7.4		
32	0.180		9.2	9.1	8.9	8.7	8.4	8.1	8.1	7.9			7.5		
33	0.171		9.3	9	8.9	8.8	8.5	8.1	8.2	7.9	7.8				
34	0.163	9.3	9.2	9	8.8	8.4	8.3	8.2	8	7.8	7.8				
35	0.155		9.1	9	8.8	8.6	8.3	8.2	8	7.8					
36	0.148	9.3	9.3	9		8.7	8.4	8.2	8	7.8					
37	0.141			9.1	8.7	8.7	8.4	8.4	8.1						
38	0.134		9.1	9.1	8.7	8.7	8.2	8.1		7.9					
39	0.128		9.2	9	8.8	8.6	8.4	8.2							
40	0.122			8.9											
41	0.116		9.1	8.9											
42	0.110			8.9											
43	0.105			8.9											

AGWA 2

BRISBANE - WFAR LOW

Window to Floor Area Ratio = 20.2%

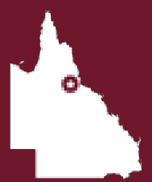
		A	B	C	D	E	F	G	H	I	J	K	L	M	N
	U	Ultra High			High				Medium				Low		
	Value	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7+
	SHGC	0.5-1	1-1.5	1.5-2	2-2.5	2.5-3	3-3.5	3.5-4	4-4.5	4.5-5	5-5.5	5.5-6	6-6.5	6.5-7	"
1	0.815								*7.5	*7.9		*7.4	*7.5	*7.4	
2	0.776								*7.3		*7.6	*7.5	*7.4	*7.3	
3	0.739			7.9			7.5	7.4	*7.3	*7.8	*7.7	*7.4	*7.4	*7.4	
4	0.704				7.3	7.2	7.1	7	*7.9	*7.9	*7.7	*7.5	*7.4	*7.4	*7.4
5	0.671				7.4	7.4	7.1	7.1	*7.9	*7.8	*7.7	*7.7	*7.4	*7.5	*7.6
6	0.639			7.6	7.6	7.3	7.2	7.1	*7.9	*7.9	*7.9	*7.8	*7.6	*7.6	
7	0.608			7.7	7.6	7.6	7.3	7.1	*8	*8	*7.8	*7.5	*7.5	*7.6	*7.2
8	0.579			7.9	7.7	7.6	7.4	7.3	7.1	*7.9	*7.7	*7.7	*7.7	*7.6	*7.2
9	0.552		8.1	7.9	7.9	7.7	7.6	7.4	7.2	7.1	7	*7.6	*7.6	*7.7	*7.6
10	0.526			7.9	7.9	7.8	7.6	7.4	7.2	7	7	*7.7	*7.7	*7.6	*7.6
11	0.501		8.4	8.2	8.1	7.8	7.7	7.4	7.4	7.1	7	*7.9	*7.7	*7.7	*7.6
12	0.477		8.4	8.3	8.2	7.9	7.7	7.4	7.3	7.3	7.1	7.1	*7.7	*7.6	*7.2
13	0.454		8.4	8.2	8.1	7.9	7.7	7.4	7.4	7.2	7	7.1	*7.7	*7.6	*7.3
14	0.432		8.4	8.3	8.1	7.9	7.7	7.4	7.4	7.2	7	7	*7.7	*7.6	*7.3
15	0.412		8.7	8.3	8.2	8.1	7.8	7.5	7.3	7.3	7.1	7	*7.7	*7.6	*7.5
16	0.392		8.7	8.4	8.3	8.1	7.8	7.5	7.3	7.3	7.2	7	*7.7	*7.6	*7.4
17	0.374	8.8	8.7	8.4	8.1	8.1	7.9	7.7	7.4	7.3	7.3	7.1	*7.6	*7.6	*7.5
18	0.356		8.7	8.4	8.4	8.2	7.9	7.7	7.5	7.4	7.3	7.1	*7.6	*7.7	*7.4
19	0.339		8.9	8.8	8.7	8.2	8	7.9	7.5	7.4	7.3	7.2	*7.6	*7.7	*7.4
20	0.323		8.9	8.8	8.3	8.3	8	7.9	7.6	7.4	7.4	7.3	*7.6	*7.5	
21	0.307		8.9	8.9	8.5	8.4	8.2	7.9	7.7	7.5	7.2	7.1	*7.7	*7.7	
22	0.293	9.1	9	8.6	8.6	8.3	8.1	7.9	7.7	7.5	7.1	*7.7	*7.6	*7.6	
23	0.279	9.1	9.1	8.9	8.5	8.6	8.3	8	7.8	7.4	7.1	*7.7	*7.6	*7.7	
24	0.266		9	8.9	8.7	8.5	8.2	8	7.8	7.5	7.1	*7.7	*7.6	*7.6	*7.4
25	0.253		9.1	8.9	8.8	8.4	8.3	8.2	7.9	7.5	7.1	*7.7	*7.7	*7.6	
26	0.241	9.3	9.1	8.9	8.6	8.4	8.3	8	7.9	7.6	7.3	*7.7	*7.7	*7.6	
27	0.229		9.2	9	8.5	8.5	8.3	8	7.9	7.6	7.1	*7.7	*7.7	*7.7	
28	0.219		9.2	8.8	8.7	8.3	8.1	8	7.9	7.8	7.1	*7.7	*7.7	*7.5	
29	0.208		9.1	8.9	8.6	8.6	8.1	7.9	7.8	7.7	7.1	*7.7	*7.6	*7.6	
30	0.198			8.9	8.6	8.6	8	7.9	7.7	7.8			*7.6		
31	0.189		9.2	9.1	8.6	8.6	8	7.9	7.8	7.6	7.3	*7.7	*7.6		
32	0.180		9.2	9.1	8.8	8.4	8.2	7.9	7.8	7.6			*7.7		
33	0.171		9.3	9	8.7	8.7	8.4	7.8	7.9	7.6	7.4				
34	0.163	9.4	9.3	8.9	8.6	8.2	8	7.9	7.7	7.5	7.4				
35	0.155		9.1	9	8.7	8.4	8	7.8	7.8	7.4					
36	0.148	9.4	9.4	9.1		8.7	8.2	7.9	7.8	7.5					
37	0.141			9.1	8.7	8.6	8.2	7.9	7.9						
38	0.134		9.3	9.2	8.7	8.6	8.1	7.9		7.5					
39	0.128		9.3	9.1	8.9	8.5	8.4	7.9							
40	0.122			9.1											
41	0.116		9.3	9											
42	0.110			9											
43	0.105			8.9											

AGWA 2

BRISBANE - WFAR HIGH

Window to Floor Area Ratio = 28%

		A	B	C	D	E	F	G	H	I	J	K	L	M	N
	U	Ultra High			High				Medium				Low		
	Value	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7+
	SHGC	0.5-1	1-1.5	1.5-2	2-2.5	2.5-3	3-3.5	3.5-4	4-4.5	4.5-5	5-5.5	5.5-6	6-6.5	6.5-7	"
1	0.815								*7.7	*7.5		5.1	5.5	5.2	
2	0.776								*7.7		5.4	5.3	5.2	5.2	
3	0.739			*7.5			*7.5	*7.8	*7.2	*7.7	5.4	5.3	5.2	5.2	
4	0.704				*7.8	*7.8	*7.6	*7.6	*7.4	*7.3	*7.1	5.4	5.3	5.3	5.4
5	0.671				*7.9	*7.9	*7.7	*7.7	*7.4	*7.7	*7.5	*7.1	5.4	5.4	5.4
6	0.639			*8	*7.9	*7.8	*7.7	*7.6	*7.5	*7.3	*7.3	*7.1	5.5	5.4	
7	0.608			7.1	*8.1	*7.9	*7.8	*7.6	*7.6	*7.6	*7.4	*7	6	5.4	5.4
8	0.579			7.3	7.2	7	*7.9	*7.8	*7.7	*7.4	*7.1	*7.1	*7.1	5.6	5.5
9	0.552		7.5	7.3	7.3	7.2	7	*7.8	*7.7	*7.7	*7.6	*7.1	*7	5.9	5.6
10	0.526			7.4	7.4	7.2	7.1	*7.9	*7.7	*7.6	*7.5	*7.1	*7.1	5.6	5.5
11	0.501		7.8	7.7	7.5	7.2	7.1	*7.8	*7.8	*7.6	*7.4	*7.3	*7.1	5.6	5.6
12	0.477		7.9	7.8	7.7	7.2	7.2	*7.9	*7.7	*7.7	*7.5	*7.5	*7	5.6	5.6
13	0.454		7.9	7.7	7.6	7.4	7.2	*7.8	*7.8	*7.5	*7.5	*7.4	*7.1	5.7	5.7
14	0.432		8	7.8	7.6	7.4	7.1	*7.8	*7.7	*7.6	*7.4	*7.1	*7.1	5.8	5.7
15	0.412		8.2	7.9	7.7	7.6	7.1	7.2	*7.7	*7.9	*7.7	*7.1	*7.1	5.8	5.8
16	0.392		8.2	8	7.9	7.7	7.2	7.2	*7.7	*7.5	*7.4	*7.2	*7	*7	5.7
17	0.374	8.4	8.3	8	7.9	7.7	7.3	7.1	*7.8	*7.6	*7.6	*7.4	*7.1	*7	5.8
18	0.356		8.2	8.1	8	7.7	7.3	7.2	*7.8	*7.7	*7.6	*7.3	*7.1	*7	5.7
19	0.339		8.4	8.3	8	7.7	7.3	7.3	*7.8	*7.9	*7.4	*7.4	*7	*7	5.8
20	0.323		8.6	8.4	8	7.9	7.6	7.3	*7.8	*7.7	*7.7	*7.6	*7	*7	
21	0.307		8.6	8.6	8.2	8	7.9	7.7	7.1	*7.9	*7.5	*7.4	*7.1	*7.1	
22	0.293	8.8	8.8	8.2	8.1	8	7.9	7.6	7.4	*7.8	*7.4	*7.1	*7.1	*7.1	
23	0.279	8.8	8.8	8.6	8.1	8.2	7.9	7.6	7.4	*7.5	*7.4	*7.1	*7	*7	
24	0.266		8.7	8.6	8.4	8.2	7.9	7.7	7.2	7.1	*7.4	*7.1	*7	6	5.8
25	0.253		8.8	8.7	8.4	8.1	7.9	7.8	7.6	7.1	*7.3	*7.3	*7	6	
26	0.241	9.1	8.8	8.7	8.3	8.1	7.9	7.7	7.6	7.2	*7.5	*7.3	*7.1	6	
27	0.229		9.1	8.9	8.2	8.2	7.9	7.7	7.5	7.2	*7.4	*7.1	*7.1	6.1	
28	0.219		8.9	8.4	8.4	8	7.8	7.8	7.5	7.3	*7.4	*7.3	*7.1	6	
29	0.208		8.9	8.7	8.2	8	7.8	7.6	7.4	7.2	*7.3	*7.1	6	6	
30	0.198			8.8	8.3	8	7.7	7.4	7.2	7.1			6.2		
31	0.189		9	8.9	8.4	8.3	7.7	7.4	7.2	7	*7.5	*7.1	6.1		
32	0.180		9	8.9	8.4	8.1	7.8	7.3	7.2	7			6.2		
33	0.171		9.2	8.9	8.4	8.4	7.8	7.4	7.2	*7.7	*7.5				
34	0.163	9.2	9.1	8.8	8.3	8	7.6	7.4	7.1	*7.6	*7.5				
35	0.155		8.9	8.8	8.4	8	7.7	7.4	7.2	*7.6					
36	0.148	9.3	9.3	8.9		8.4	7.8	7.5	7.3	*7.6					
37	0.141			8.9	8.4	8.2	7.8	7.5	7.4						
38	0.134		9.1	8.9	8.4	8.2	7.8	7.5		*7.3					
39	0.128		9.2	8.9	8.6	8.2	7.9	7.5							
40	0.122			8.9											
41	0.116		9.1	8.9											
42	0.110			8.9											
43	0.105			8.7											



TOWNSVILLE

HEATING AND COOLING LOADS

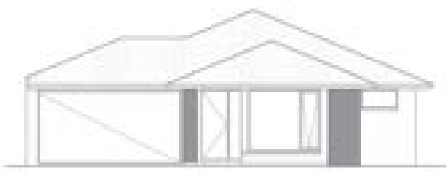
Locality	Townsville	**Total**	117 MJ/m².annum
NCC Climate Zone	1	**Heating**	N/A
NatHERS Climate Zone	5	**Cooling**	N/A

Construction	AGWA 1	AGWA 2
Roof Type	Corrugated Steel	Corrugated Steel
Ground Floor Type	100 mm concrete slab on ground	
Second Floor Type	N/A	Suspended Timber
External Wall Type	Concrete filled blockwork	Concrete filled blockwork
Internal Wall Type	Standard 90 mm stud wall with 10 mm plasterboard sheeting - uninsulated except for walls adjoining internal garage and non-conditioned spaces	
Ceiling Height	2.4 m	

Insulation	AGWA 1	AGWA 2
Roof Insulation/Blanket	Reflective foil	R1.3
Ceiling insulation (inc garage)	R3.0	R3.0
Ceiling Perimeter Insulation	R2.5	R2.5
External Wall Insulation	-	-
Internal Wall Insulation (walls adjoining garage and unconditioned zones)	-	R1.5

Colours	AGWA 1	AGWA 2
Roof Colour	Light (SA = 0.23)	Light (SA = 0.23)
External Wall Colour	Light (SA = 0.23)	Light (SA = 0.23)
Window Frame Colour	Light (SA = 0.23)	Light (SA = 0.23)

Internals	AGWA 1	AGWA 2
Floor Coverings	Carpet in Bedroom zones, timber in living and day areas, tiles for bathrooms and laundry and concrete slab on ground (CSOG) for garage	
Downlights	IC-4	IC-4
Ceiling Fans		
• Kitchen	2 x 1800	3 x 1800
• Living	-	1 x 1800
• Bedroom	-	4 x 1500
• Study	1 x 1500	1 x 1200

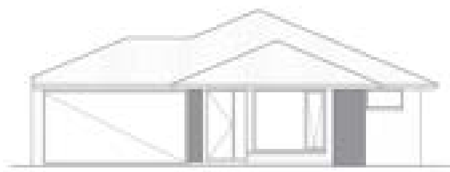


AGWA 1

TOWNSVILLE - WFAR LOW

Window to Floor Area Ratio = 20%

		A	B	C	D	E	F	G	H	I	J	K	L	M	N
	U	Ultra High			High				Medium				Low		
	Value	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7+
	SHGC	0.5-1	1-1.5	1.5-2	2-2.5	2.5-3	3-3.5	3.5-4	4-4.5	4.5-5	5-5.5	5.5-6	6-6.5	6.5-7	"
1	0.815								7	7		*7.4	*7.3	*7.2	
2	0.776								7		7	*7.4	*7.4	*7.4	
3	0.739			7.3			7.1	7.1	7.1	7.1	7.1	*7.5	*7.5	*7.4	
4	0.704				7.2	7.3	7.2	7.2	7.2	7.2	7.1	7	7	7	7
5	0.671				7.4	7.4	7.3	7.3	7.3	7.2	7.2	7.1	7.1	7	7
6	0.639			7.4	7.4	7.4	7.4	7.4	7.3	7.3	7.3	7.2	7.2	7.2	
7	0.608			7.6	7.5	7.6	7.5	7.5	7.4	7.4	7.4	7.3	7.3	7.3	7.1
8	0.579			7.8	7.7	7.6	7.6	7.5	7.4	7.4	7.4	7.4	7.4	7.3	7.2
9	0.552		7.9	7.8	7.7	7.7	7.7	7.6	7.5	7.4	7.4	7.4	7.4	7.4	7.2
10	0.526			8	7.9	7.8	7.8	7.7	7.6	7.5	7.4	7.4	7.4	7.4	7.3
11	0.501		8.2	8.2	8.1	8	7.9	7.8	7.7	7.6	7.5	7.5	7.5	7.5	7.4
12	0.477		8.3	8.1	8.2	8	8	7.8	7.8	7.7	7.6	7.6	7.5	7.5	7.5
13	0.454		8.3	8.3	8.3	8.1	8.1	7.9	7.8	7.8	7.7	7.7	7.6	7.6	7.5
14	0.432		8.4	8.3	8.2	8.3	8.2	8	7.9	7.9	7.8	7.7	7.7	7.7	7.6
15	0.412		8.6	8.4	8.2	8.3	8.2	8.2	8	7.9	7.8	7.8	7.7	7.7	7.7
16	0.392		8.6	8.4	8.6	8.4	8.3	8.2	8.1	8	7.9	7.8	7.8	7.8	7.7
17	0.374	8.7	8.6	8.5	8.5	8.4	8.3	8.1	8.1	8	8	7.9	7.8	7.8	7.8
18	0.356		8.6	8.5	8.5	8.3	8.3	8.2	8.1	8.1	8	8	7.9	7.9	7.7
19	0.339		8.7	8.7	8.6	8.6	8.5	8.3	8.1	8.1	8.1	8	7.9	7.8	7.8
20	0.323		8.8	8.7	8.4	8.7	8.5	8.4	8.1	8.1	8.1	8	7.9	7.8	
21	0.307		8.8	8.8	8.6	8.4	8.7	8.6	8.4	8.2	8.1	8	7.9	7.9	
22	0.293	8.9	8.9	8.7	8.6	8.6	8.6	8.6	8.5	8.2	8.1	8	8	7.8	
23	0.279	8.9	8.9	8.9	8.7	8.8	8.6	8.6	8.5	8.2	8.1	8	8	7.9	
24	0.266		8.9	8.9	8.9	8.8	8.8	8.7	8.4	8.6	8.1	8.1	8	7.9	7.8
25	0.253		8.9	9	8.8	8.9	8.9	8.8	8.7	8.6	8.2	8.3	8.2	7.9	
26	0.241	9.1	9	9	8.6	8.8	8.8	8.8	8.7	8.6	8.4	8.1	8.3	7.9	
27	0.229		9.2	9.1	8.9	8.9	8.9	8.8	8.7	8.5	8.1	8.1	8.3	8.1	
28	0.219		9.1	8.9	8.9	8.8	8.7	8.9	8.8	8.8	8	8.1	8.1	8.1	
29	0.208		9.1	9	8.9	9.1	8.4	8.9	8.3	8.7	8.1	8.3	8.1	8.1	
30	0.198			9.1	8.9	8.9	8.6	8.7	8.5	8.7			8.4		
31	0.189		9.3	9.2	9.1	9.1	8.6	8.6	8.7	8.5	8.5	8.4	8.4		
32	0.180		9.2	9.2	9	8.8	8.9	8.6	8.7	8.6			8.4		
33	0.171		9.3	9.3	9.1	9.1	9	8.7	8.7	8.6	8.7				
34	0.163	9.3	9.3	9.2	9.1	8.8	8.9	8.7	8.7	8.6	8.8				
35	0.155		9.4	9.2	9.1	8.9	8.8	8.8	8.9	8.7					
36	0.148	9.4	9.4	9.4		9.3	8.9	8.8	8.8	8.8					
37	0.141			9.3	9.2	9	8.9	9	8.9						
38	0.134		9.4	9.3	9	9	8.9	8.9		8.9					
39	0.128		9.4	9.4	9.3	9.1	9	8.9							
40	0.122			9.4											
41	0.116		9.4	9.4		9.1									
42	0.110			9.5		9.3									
43	0.105			9.3	9.4										



AGWA 1

TOWNSVILLE - WFAR HIGH

Window to Floor Area Ratio = 27%

		A	B	C	D	E	F	G	H	I	J	K	L	M	N
	U	Ultra High			High				Medium				Low		
	Value	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7+
	SHGC	0.5-1	1-1.5	1.5-2	2-2.5	2.5-3	3-3.5	3.5-4	4-4.5	4.5-5	5-5.5	5.5-6	6-6.5	6.5-7	"
1	0.815								*7	*7		6	5.9	5.9	
2	0.776								*7		6.1	6	6	5.9	
3	0.739			*7.5			*7.1	*7.6	*7.1	*7.7	6.2	6	6	6	
4	0.704				*7.3	*7.4	*7.3	*7.3	*7.3	*7.1	*7	6.2	6.1	6.2	6.5
5	0.671				*7.6	*7.5	*7.4	*7.4	*7.3	*7.2	*7.1	*7.1	*7.1	*7.1	*7.2
6	0.639			*7.6	*7.6	*7.4	*7.4	*7.4	*7.3	*7.3	*7.4	*7.3	*7.2	*7.2	
7	0.608			*7.8	*7.6	*7.7	*7.5	*7.4	*7.4	*7.4	*7.4	*7.4	*7.3	*7.3	*7.2
8	0.579			7.2	7	7	*7.7	*7.6	*7.5	*7.4	*7.2	*7.4	*7.4	*7.4	*7.3
9	0.552		7.4	7.3	7.1	7	7	*7.7	*7.6	*7.4	*7.4	*7.4	*7.4	*7.4	*7.4
10	0.526			7.5	7.3	7.2	7.2	7.2	7.1	*7.5	*7.5	*7.4	*7.4	*7.5	*7.5
11	0.501		7.6	7.7	7.5	7.4	7.3	7.2	7.2	*7.6	*7.6	*7.6	*7.6	*7.6	*7.4
12	0.477		7.7	7.7	7.6	7.4	7.3	7.2	7.1	7	7	*7.7	*7.6	*7.4	*7.2
13	0.454		7.7	7.8	7.7	7.5	7.3	7.1	7.1	7.1	7.1	7	*7.7	*7.7	*7.2
14	0.432		7.8	7.8	7.7	7.6	7.5	7.3	7.2	7.1	7.1	7	7	7	*7.2
15	0.412		8.1	7.8	7.7	7.7	7.6	7.5	7.4	7.3	7.2	7.2	7.1	7.1	7
16	0.392		8.2	8	7.9	7.8	7.7	7.6	7.5	7.4	7.3	7.2	7.1	7.1	7
17	0.374	8.2	8.2	8	8	7.9	7.7	7.6	7.5	7.4	7.3	7.2	7.2	7.1	7.1
18	0.356		8.1	8	8	8	7.8	7.7	7.6	7.5	7.4	7.3	7.2	7.1	7.1
19	0.339		8.3	8.3	8.2	8.1	8.1	7.8	7.7	7.6	7.5	7.4	7.3	7.2	7.1
20	0.323		8.6	8.4	8.2	8.1	8.1	7.9	7.8	7.6	7.5	7.4	7.3	7.2	
21	0.307		8.4	8.4	8.2	8.1	8.1	8	7.9	7.8	7.6	7.4	7.3	7.3	
22	0.293	8.7	8.7	8.4	8.2	8.1	8.2	8.3	8	7.9	7.7	7.5	7.3	7.3	
23	0.279	8.8	8.8	8.8	8.4	8.6	8.2	8.1	8.1	8	7.8	7.6	7.5	7.3	
24	0.266		8.8	8.7	8.7	8.6	8.6	8.4	8.4	8.1	7.9	7.6	7.6	7.2	7.2
25	0.253		8.8	8.9	8.5	8.6	8.6	8.4	8.4	8.2	8	7.7	7.6	7.3	
26	0.241	8.9	8.9	8.9	8.1	8.4	8.6	8.5	8.4	8.3	8	7.8	7.7	7.4	
27	0.229		9	8.9	8.6	8.7	8.8	8.5	8.4	8.2	8.1	7.9	7.7	7.5	
28	0.219		8.9	8.8	8.7	8.6	8.6	8.6	8.6	8.4	8.1	7.9	7.6	7.6	
29	0.208		8.9	8.8	8.7	8.9	8.6	8.7	8.5	8.4	8.2	8	7.8	7.6	
30	0.198			8.9	8.8	8.7	8.7	8.3	8.5	8.4			7.9		
31	0.189		9.2	9.1	8.9	8.9	8.7	8.1	8.4	8.1	8.1	7.8	7.8		
32	0.180		9.1	9.1	8.8	8.6	8.7	8.3	8.4	8.2			7.8		
33	0.171		9.2	9.2	8.9	8.9	8.8	8.4	8.3	8.3	8.4				
34	0.163	9.2	9.1	9.1	8.9	8.5	8.6	8.3	8.4	8.4	8.4				
35	0.155		9.3	9.1	8.9	8.6	8.5	8.4	8.7	8.4					
36	0.148	9.3	9.3	9.3		9.1	8.7	8.5	8.6	8.5					
37	0.141			9.1	9	8.8	8.7	8.9	8.6						
38	0.134		9.4	9.1	8.8	8.8	8.8	8.6		8.6					
39	0.128		9.2	9.2	9.1	8.9	8.8	8.7							
40	0.122			9.4											
41	0.116		9.4	9.2		8.9									
42	0.110			9.4		9.1									
43	0.105			9.2	9.2										

AGWA 2

TOWNSVILLE - WFAR LOW

Window to Floor Area Ratio = 20.2%

		A	B	C	D	E	F	G	H	I	J	K	L	M	N
	U	Ultra High			High				Medium				Low		
	Value	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7+
	SHGC	0.5-1	1-1.5	1.5-2	2-2.5	2.5-3	3-3.5	3.5-4	4-4.5	4.5-5	5-5.5	5.5-6	6-6.5	6.5-7	"
1	0.815								5.9	5.9		5.9	5.9	5.9	
2	0.776								6		5.9	5.9	5.9	5.9	
3	0.739			6.2			6.2	*7.3	6.1	6.1	6	5.9	5.9	5.9	
4	0.704				*7.1	*7.2	*7	*7	*7	6.2	6.1	6	6	6	5.9
5	0.671				*7.3	*7.3	*7.2	*7.2	*7	*7.4	6.2	6.2	6	6.2	6
6	0.639			*7.3	*7.3	*7.3	*7.2	*7.2	*7.1	*7.1	*7.1	*7.1	*7	*7	
7	0.608			*7.4	*7.4	*7.4	*7.3	*7.2	*7.2	*7.2	*7.2	*7.1	*7.1	*7.1	*7.3
8	0.579			*7.5	*7.4	*7.4	*7.4	*7.3	*7.2	*7.2	*7.1	*7.1	*7.2	*7.1	*7.3
9	0.552		*7.6	*7.5	*7.5	*7.3	*7.4	*7.4	*7.3	*7.3	*7.3	*7.1	*7	*7.2	*7.2
10	0.526			*7.6	*7.6	*7.5	*7.4	*7.4	*7.4	*7.3	*7.3	*7.2	*7.2	*7.2	*7.2
11	0.501		7.1	7.1	*7.7	*7.6	*7.6	*7.4	*7.5	*7.3	*7.3	*7.4	*7.4	*7.3	*7.3
12	0.477		7.2	7	7.1	*7.6	*7.6	*7.5	*7.4	*7.4	*7.4	*7.5	*7.3	*7.3	*7.5
13	0.454		7.2	7.2	7.1	7	7	*7.5	*7.5	*7.5	*7.4	*7.5	*7.4	*7.4	*7.5
14	0.432		7.3	7.2	7.1	7.1	7.1	7	*7.5	*7.5	*7.4	*7.4	*7.2	*7.4	*7.5
15	0.412		7.4	7.2	7.2	7.2	7.1	7.1	*7.4	*7.7	*7.6	*7.4	*7.4	*7.4	*7.4
16	0.392		7.4	7.3	7.3	7.2	7.1	7.1	7.1	7	*7.6	*7.6	*7.5	*7.4	*7.4
17	0.374	7.5	7.4	7.4	7.4	7.3	7.2	7.1	7.1	7	*7.6	*7.6	*7.4	*7.6	*7.5
18	0.356		7.4	7.4	7.4	7.3	7.2	7.2	7.1	7.1	7.1	*7.4	*7.3	*7.6	*7.4
19	0.339		7.6	7.5	7.5	7.4	7.3	7.2	7.2	7.2	7.1	*7.4	*7.4	*7.6	*7.4
20	0.323		7.7	7.6	7.5	7.4	7.4	7.3	7.2	7.2	7.1	*7.4	*7.4	*7.4	
21	0.307		7.7	7.6	7.5	7.4	7.4	7.4	7.3	7.2	7.1	*7.5	*7.6	*7.7	
22	0.293	7.8	7.8	7.7	7.6	7.5	7.4	7.4	7.3	7.2	7.1	7.1	*7.5	*7.5	
23	0.279	7.8	7.8	7.8	7.7	7.6	7.5	7.5	7.3	7.2	7.1	7.1	*7.6	*7.7	
24	0.266		7.9	7.8	7.8	7.7	7.6	7.5	7.4	7.2	7.1	7.1	*7.6	*7.7	*7.6
25	0.253		7.9	7.9	7.8	7.7	7.7	7.7	7.5	7.3	7.2	7.1	7	*7.7	
26	0.241	7.9	7.9	7.9	7.8	7.7	7.7	7.7	7.6	7.4	7.2	7.1	7.1	7	
27	0.229		8	7.9	7.8	7.8	7.8	7.7	7.6	7.6	7.3	7.1	7.1	7.1	
28	0.219		7.9	7.9	7.8	7.8	7.8	7.8	7.6	7.6	7.5	7.2	7.2	7.1	
29	0.208		7.9	7.9	7.8	7.9	7.8	7.8	7.7	7.6	7.5	7.3	7.2	7	
30	0.198			8	7.9	7.8	7.8	7.7	7.6	7.5			7.3		
31	0.189		8.1	8	7.9	7.9	7.8	7.7	7.6	7.5	7.4	7.3	7.3		
32	0.180		8.1	8.1	7.9	7.8	7.8	7.7	7.6	7.5			7.3		
33	0.171		8.2	8.2	7.9	7.9	7.8	7.6	7.6	7.5	7.5				
34	0.163	8.2	8.1	8.1	7.9	7.8	7.7	7.6	7.6	7.5	7.5				
35	0.155		8.2	8.1	8	7.8	7.7	7.7	7.7	7.6					
36	0.148	8.2	8.2	8.2		8.1	7.8	7.7	7.7	7.7					
37	0.141			8.1	8	7.9	7.8	7.9	7.8						
38	0.134		8.3	8.2	7.9	7.9	7.9	7.8		7.8					
39	0.128		8.2	8.2	8.1	7.9	7.9	7.8							
40	0.122			8.3											
41	0.116		8.3	8.2		8									
42	0.110			8.3		8.1									
43	0.105			8.1	8.2										

AGWA 2

TOWNSVILLE - WFAR HIGH

Window to Floor Area Ratio = 28%

		A	B	C	D	E	F	G	H	I	J	K	L	M	N
	U	Ultra High			High				Medium				Low		
	Value	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7+
	SHGC	0.5-1	1-1.5	1.5-2	2-2.5	2.5-3	3-3.5	3.5-4	4-4.5	4.5-5	5-5.5	5.5-6	6-6.5	6.5-7	"
1	0.815								5.4	5.4		5.4	5.4	5.3	
2	0.776								5.5		5.5	5.4	5.4	5.4	
3	0.739			5.7			5.7	5.7	5.6	5.6	5.6	5.4	5.4	5.4	
4	0.704				5.8	5.8	5.7	5.8	5.8	5.7	5.6	5.6	5.5	5.6	5.7
5	0.671				5.9	5.9	5.9	5.9	5.8	5.7	5.7	5.7	5.6	5.7	5.8
6	0.639			6	5.9	5.9	5.9	5.9	5.8	5.9	5.9	5.8	5.6	5.7	
7	0.608			*7.1	*7	*7.1	6	5.9	5.9	5.9	5.9	5.6	5.7	5.8	5.7
8	0.579			*7.2	*7	*7.6	*7.1	6.1	6	5.9	5.8	5.9	5.9	5.9	5.8
9	0.552		*7.4	*7.2	*7.2	*7.1	*7.1	*7	6.1	6	6	5.7	5.8	5.9	5.9
10	0.526			*7.3	*7.3	*7.3	*7.2	*7.2	*7.1	6.1	6.1	6	6	6	6
11	0.501		*7.6	*7.6	*7.4	*7.3	*7.4	*7.3	*7.2	6.1	6.1	6.1	6.1	6.1	6
12	0.477		*7.7	*7.5	*7.5	*7.4	*7.4	*7.3	*7.2	*7.2	*7.1	*7	6.1	6	6
13	0.454		*7.7	*7.7	*7.6	*7.5	*7.5	*7.4	*7.3	*7.3	*7.3	*7.2	*7.1	*7.1	*7
14	0.432		7.1	*7.7	*7.6	*7.6	*7.6	*7.4	*7.3	*7.3	*7.1	*7.1	*7.1	*7.1	*7
15	0.412		7.3	7	*7.7	*7.7	*7.6	*7.4	*7.4	*7.4	*7.4	*7.3	*7.2	*7.2	*7.2
16	0.392		7.2	7.1	7.2	7.1	*7.6	*7.5	*7.5	*7.4	*7.4	*7.4	*7.3	*7.2	*7.1
17	0.374	7.4	7.3	7.2	7.2	7.2	*7.7	*7.6	*7.5	*7.5	*7.4	*7.4	*7.3	*7.3	*7.2
18	0.356		7.3	7.3	7.2	7.1	7	*7.6	*7.5	*7.5	*7.5	*7.4	*7.3	*7.3	*7.2
19	0.339		7.4	7.4	7.3	7.2	7.2	7.1	*7.5	*7.5	*7.5	*7.5	*7.4	*7.3	*7.1
20	0.323		7.6	7.5	7.4	7.3	7.2	7	*7.6	*7.5	*7.5	*7.4	*7.4	*7.4	
21	0.307		7.6	7.6	7.5	7.4	7.4	7.2	7.1	*7.5	*7.5	*7.4	*7.4	*7.4	
22	0.293	7.7	7.7	7.6	7.5	7.4	7.4	7.3	7.3	*7.6	*7.4	*7.3	*7.3	*7.3	
23	0.279	7.7	7.7	7.7	7.6	7.5	7.4	7.3	7.2	*7.7	*7.4	*7.3	*7.3	*7.3	
24	0.266		7.8	7.7	7.6	7.6	7.5	7.4	7.3	7.2	*7.5	*7.4	*7.4	*7.4	*7.3
25	0.253		7.9	7.8	7.6	7.6	7.6	7.5	7.4	7.3	*7.4	*7.4	*7.4	*7.4	
26	0.241	7.9	7.9	7.8	7.7	7.6	7.6	7.5	7.4	7.4	7.1	*7.4	*7.4	*7.4	
27	0.229		7.9	7.9	7.7	7.7	7.7	7.6	7.4	7.3	7.2	*7.6	*7.6	*7.6	
28	0.219		7.9	7.8	7.7	7.7	7.7	7.6	7.5	7.4	7.2	7	*7.6	*7.6	
29	0.208		7.9	7.8	7.7	7.7	7.7	7.6	7.5	7.4	7.2	7	*7.6	*7.6	
30	0.198			8	7.8	7.7	7.7	7.6	7.5	7.5			7.1		
31	0.189		8.2	8.1	7.9	7.8	7.7	7.6	7.5	7.3	7.3	7.1	7.1		
32	0.180		8.1	8.2	7.9	7.7	7.7	7.6	7.5	7.3			7.1		
33	0.171		8.3	8.2	7.9	7.8	7.8	7.6	7.4	7.4	7.5				
34	0.163	8.3	8.2	8.1	7.9	7.8	7.7	7.6	7.6	7.4	7.5				
35	0.155		8.3	8.2	8	7.8	7.7	7.6	7.7	7.5					
36	0.148	8.3	8.3	8.3		8.2	7.7	7.7	7.6	7.6					
37	0.141			8.2	8.1	7.9	7.8	7.9	7.7						
38	0.134		8.4	8.2	7.9	7.9	7.8	7.7		7.7					
39	0.128		8.3	8.3	8.2	7.9	7.9	7.8							
40	0.122			8.4											
41	0.116		8.4	8.3		8.1									
42	0.110			8.4		8.2									
43	0.105			8.3	8.3										

AUSTRALIAN
GLASS & WINDOW
ASSOCIATION

Published by Australian Glass & Window Association