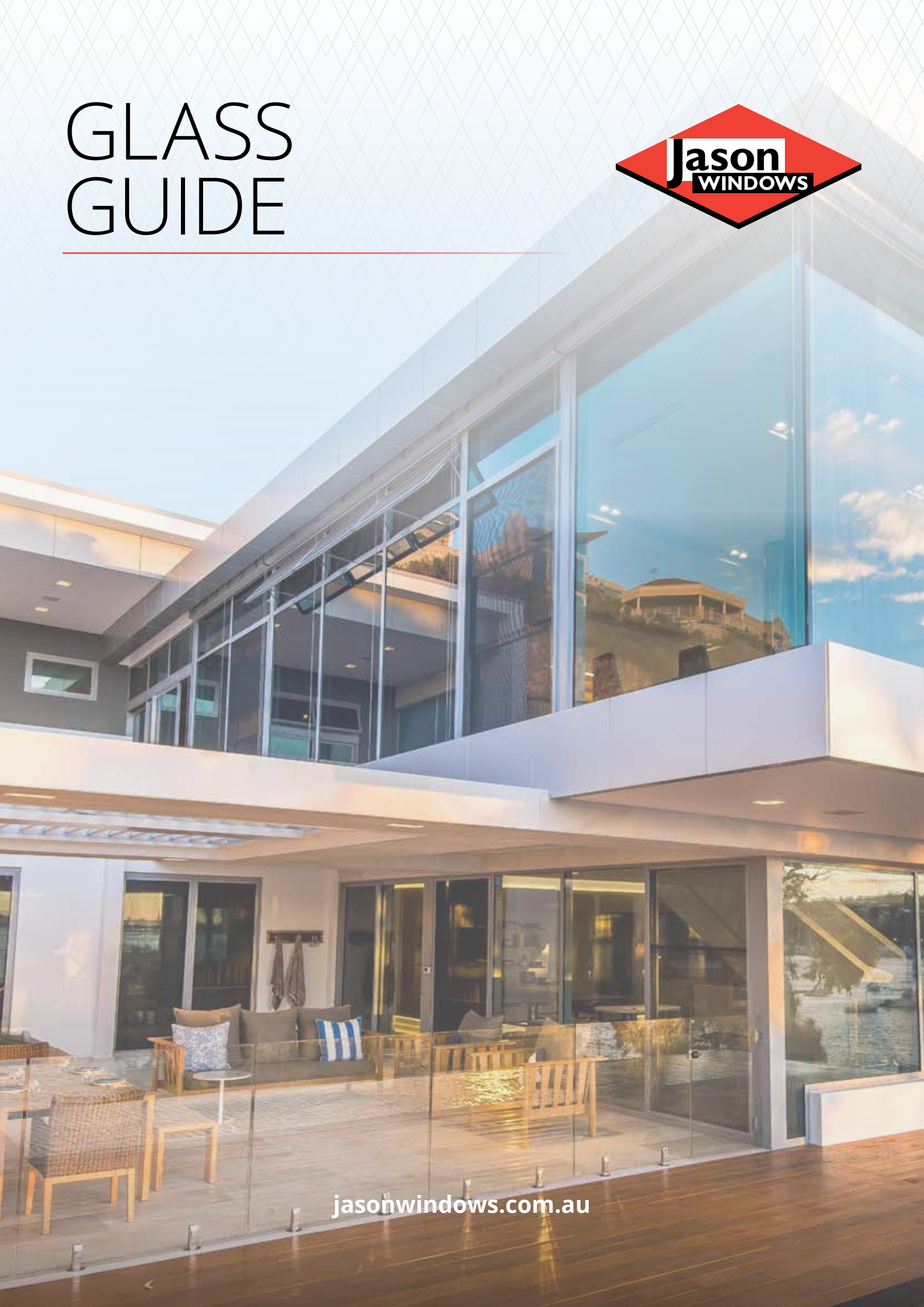
GLASS GUIDE

Jason WINDOWS



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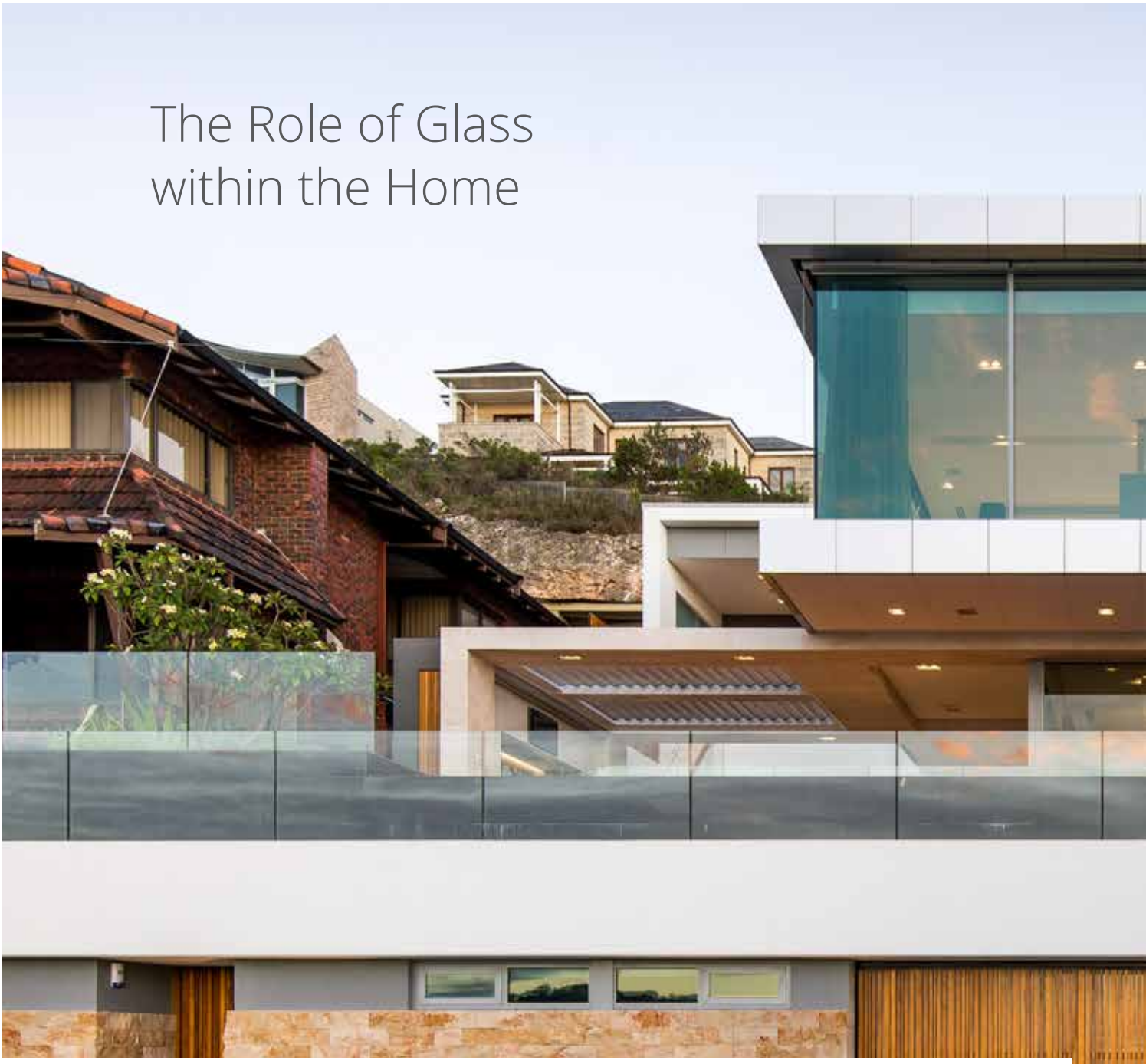
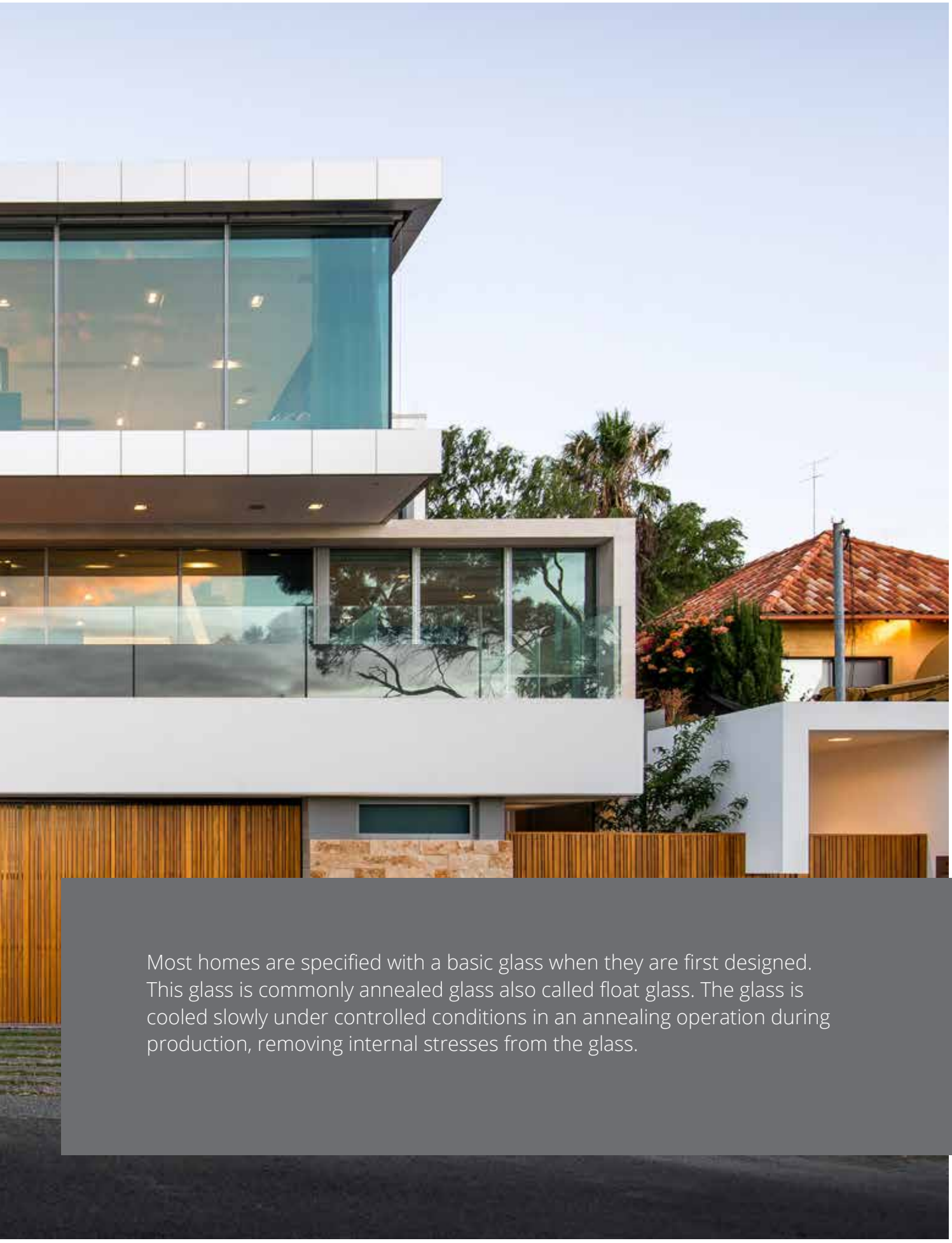
The Role of Glass within the Home



The role glass plays in the ongoing performance and comfort of a home is often overlooked when building or renovating. Glass has a significant impact on the comfort levels, natural light and security of your home. Your home's orientation and your family's needs should be considered when selecting the right glass solution for you.



Most homes are specified with a basic glass when they are first designed. This glass is commonly annealed glass also called float glass. The glass is cooled slowly under controlled conditions in an annealing operation during production, removing internal stresses from the glass.

Annealed Glass

Annealed glass (also known as float glass) is the minimum standard for glass in the home. It's also the base starting material for other glass types - such as Low-E, laminated and toughened glass.

Benefits of Annealed Glass

- Surface strength provides the wind-load performance and thermal-stress resistance needed in most architectural applications
- Excellent visibility
- Available in different tones and opaque options
- Excellent light transmission in clear tone
- Cost effective

Things to Consider

- Tends to break into irregular, sharp pieces when broken
- The strength limitations of annealed glass limit the size of usable pieces. Size limitations are specified by Australian Standard AS1288 - Glass in Buildings - Selection and Installation. Other types of glass that have a specific function are available as upgrade options. These glass types are often referred to as “performance glass” and can improve your energy and acoustic needs

What are the Pros and Cons of Upgrading to Performance Glass?

Pros

- The right glass can greatly improve insulation performance and positively impact your energy bill or improve the acoustic comfort of the home
- Your desired comfort level can be achieved for both the summer and winter months
- Some energy-efficient laminated glass types can offer additional benefits such as security risk management, protection from furniture fading and noise level management
- Can reduce glare
- Can contribute to the resale value of your home. Properties with double glazing are considered more valuable than those without

Cons

- Depending on the volume and type of glass required, the initial investment can be significant. This needs to be considered in terms of overall budget and what the objective is of installing performance glass

Types of Performance Glass for the Home

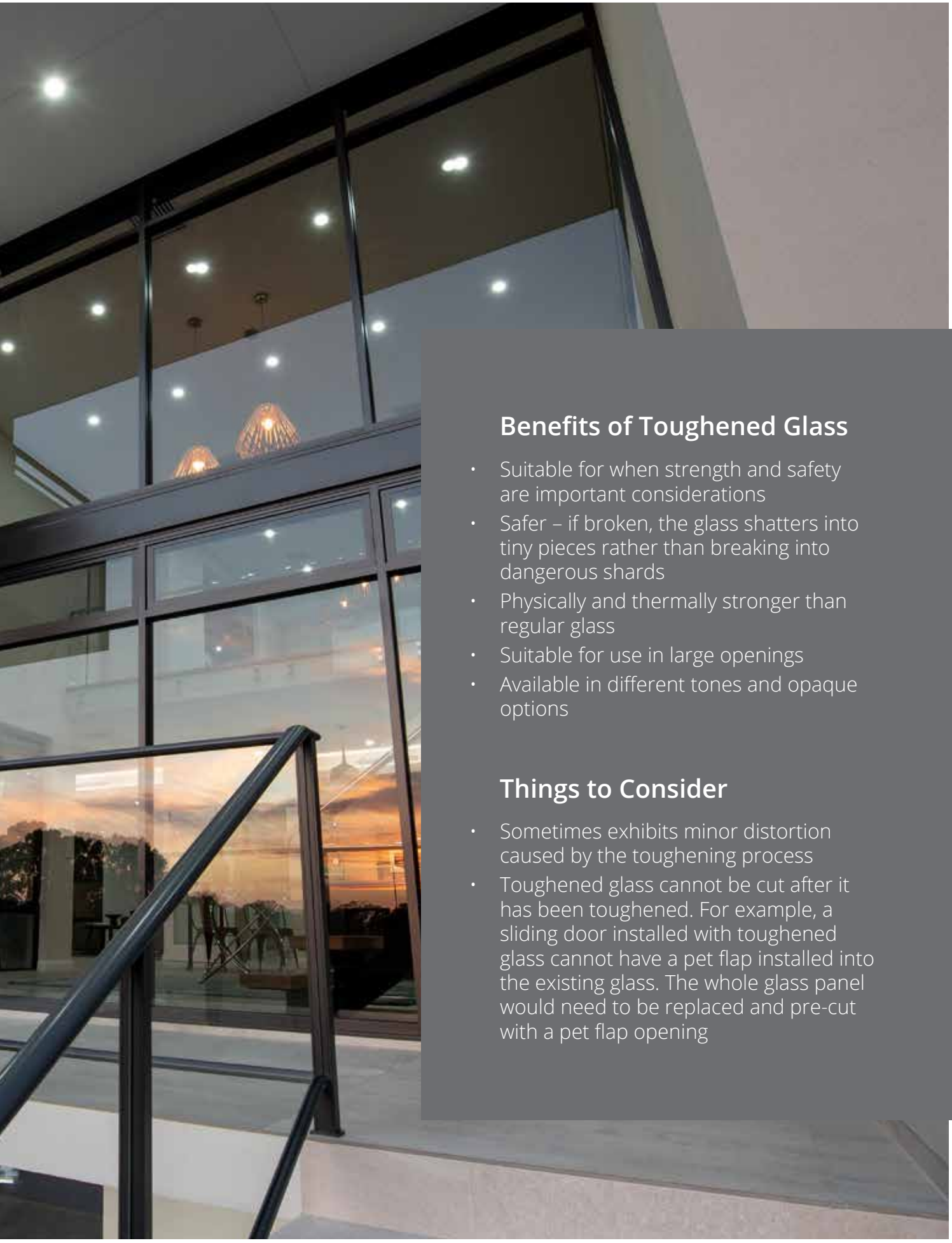
Toughened Glass

Toughened glass is often referred to as safety glass or tempered glass and is classified as Grade A Safety Glass under Australian Standards. Toughened glass is annealed glass, heated in a furnace and then rapidly cooled. This toughening process reduces the risk of cracking. Toughened glass is five times stronger than standard annealed glass of the same thickness. The main purpose of toughened glass is to reduce the likelihood of injuries if broken by human impact.

APPLICATION

Generally, Australian Standards and Building Regulations stipulate Grade A Safety Glass must be used in:

- All glass doors
- Bathrooms (for all areas up to 2m height)
- Door side panels (if less than 300mm away from the door and positioned 1200mm or less above floor level)
- Areas that can be mistaken for openings (eg: full height fixed windows)
- Low level glass if larger than 1.2m². Areas under 1.2m² require a minimum of 5mm thick annealed glass.



Benefits of Toughened Glass

- Suitable for when strength and safety are important considerations
- Safer – if broken, the glass shatters into tiny pieces rather than breaking into dangerous shards
- Physically and thermally stronger than regular glass
- Suitable for use in large openings
- Available in different tones and opaque options

Things to Consider

- Sometimes exhibits minor distortion caused by the toughening process
- Toughened glass cannot be cut after it has been toughened. For example, a sliding door installed with toughened glass cannot have a pet flap installed into the existing glass. The whole glass panel would need to be replaced and pre-cut with a pet flap opening

Types of Performance Glass for the Home

Laminated Glass

Laminated glass, also referred to as safety glass, consists of two sheets of glass permanently bonded together with an interlayer designed to improve acoustics and impact resistance. Laminated glass can be classified as Grade A Safety glass only when it meets the relevant standards.

APPLICATION

Laminated glass is perfect for areas of the home most prone to injury from human impact such as bathrooms, doors and full-length windows. Laminated glass is suitable for sound reduction, energy efficiency, additional security and UV protection.

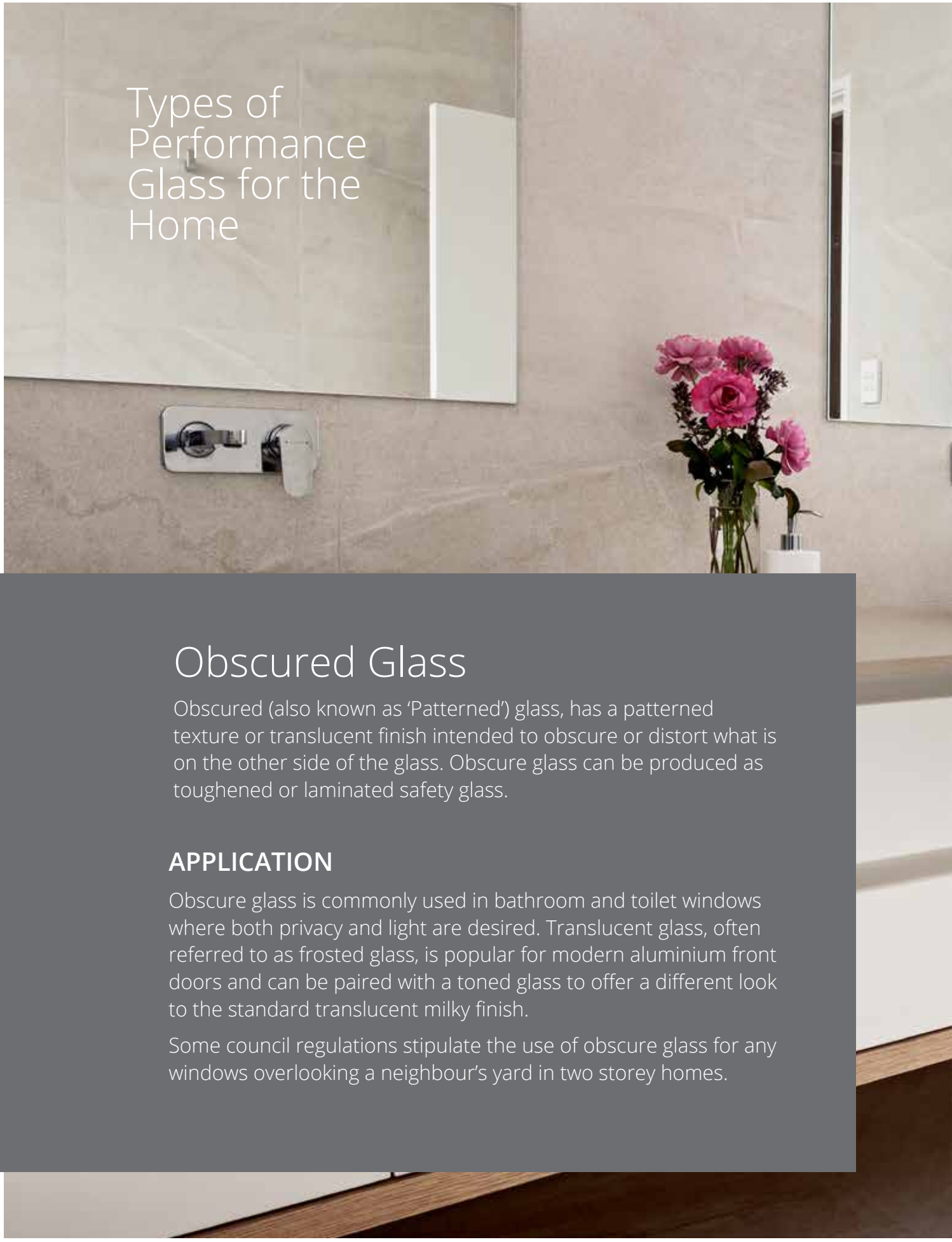
Benefits of Laminated Glass

- Laminated glass can help to minimise some outside noises. Acoustic rated laminated glass will further improve performance.
- Safer – if broken, glass fragments remain in the panel bonded to the interlayer, rather than breaking into dangerous shards
- Improved security
- Standard laminated glass provides better protection against UV rays which can fade furnishings and kitchen benchtops
- Low-E laminated glass can reduce the amount of heat that is conducted through the glass compared to annealed glass. Low-E glass further improves thermal efficiency by reducing glare
- Available in a range of tones and opaque options, such as:
    - Neutral* – lightly toned
    - Grey
    - Green
    - Translucent – smooth milky finish

Things to Consider

- Difficult to break in an emergency

*Neutral is available when specified with Low-E



Types of Performance Glass for the Home

Obscured Glass

Obscured (also known as 'Patterned') glass, has a patterned texture or translucent finish intended to obscure or distort what is on the other side of the glass. Obscure glass can be produced as toughened or laminated safety glass.

APPLICATION

Obscure glass is commonly used in bathroom and toilet windows where both privacy and light are desired. Translucent glass, often referred to as frosted glass, is popular for modern aluminium front doors and can be paired with a toned glass to offer a different look to the standard translucent milky finish.

Some council regulations stipulate the use of obscure glass for any windows overlooking a neighbour's yard in two storey homes.

Benefits of Obscured Glass

- Obscured patterned glass provides privacy without limiting light
- Safer – if broken, toughened obsured glass breaks into fragments rather than into dangerous shards
- Textured obscured glass does not streak easily

Things to Consider

- Depending on the colour selected, pairing obscured toned and obscured translucent glass may reduce light levels

Cathedral

Satinlite

Spotswood

Translucent

AS SHOWN IN THE MAIN PICTURE

RESIDENTIAL AWNING WINDOW WITH GREY TONED GLASS

Toned Glass

A variety of tones are available for all glass types. Glass is toned or tinted by including colouring additives to annealed clear glass during the manufacturing process. The majority of tones are created with shades of grey, bronze, blue or green. Toned glass significantly reduces glare and solar heat gain from the sun. Supertoned glass, also known as supertinted, uses a heavier pigmentation to provide even greater solar heat control. Toned glass should not be confused with tinted film applications for glass.

With the sunlight absorbing properties in toned glass, it is suited to warmer climates when ideal window orientation is not achievable. The coloured tone within the glass absorbs a greater proportion of solar heat in comparison to clear glass. Toned glass is particularly useful for reducing the sun's impact on unshaded windows.

Solar heat gain coefficient (SHGC) is the fraction of solar radiation admitted through the glass either transmitted directly or absorbed and subsequently released as heat inside your home. The lower the SHGC, the less solar heat is transmitted.

Tones can be added to any kind of glass to improve performance further. For example, Low-E laminated glass can be paired with a grey tone to improve energy efficiency further and reduce glare.

Clear

Green

Grey

LAMINATED GREY TRANSLUCENT GLASS IN A JASON TIMBER LOOK CHARCOAL EBONY FRONT DOOR

Benefits of Toned Glass

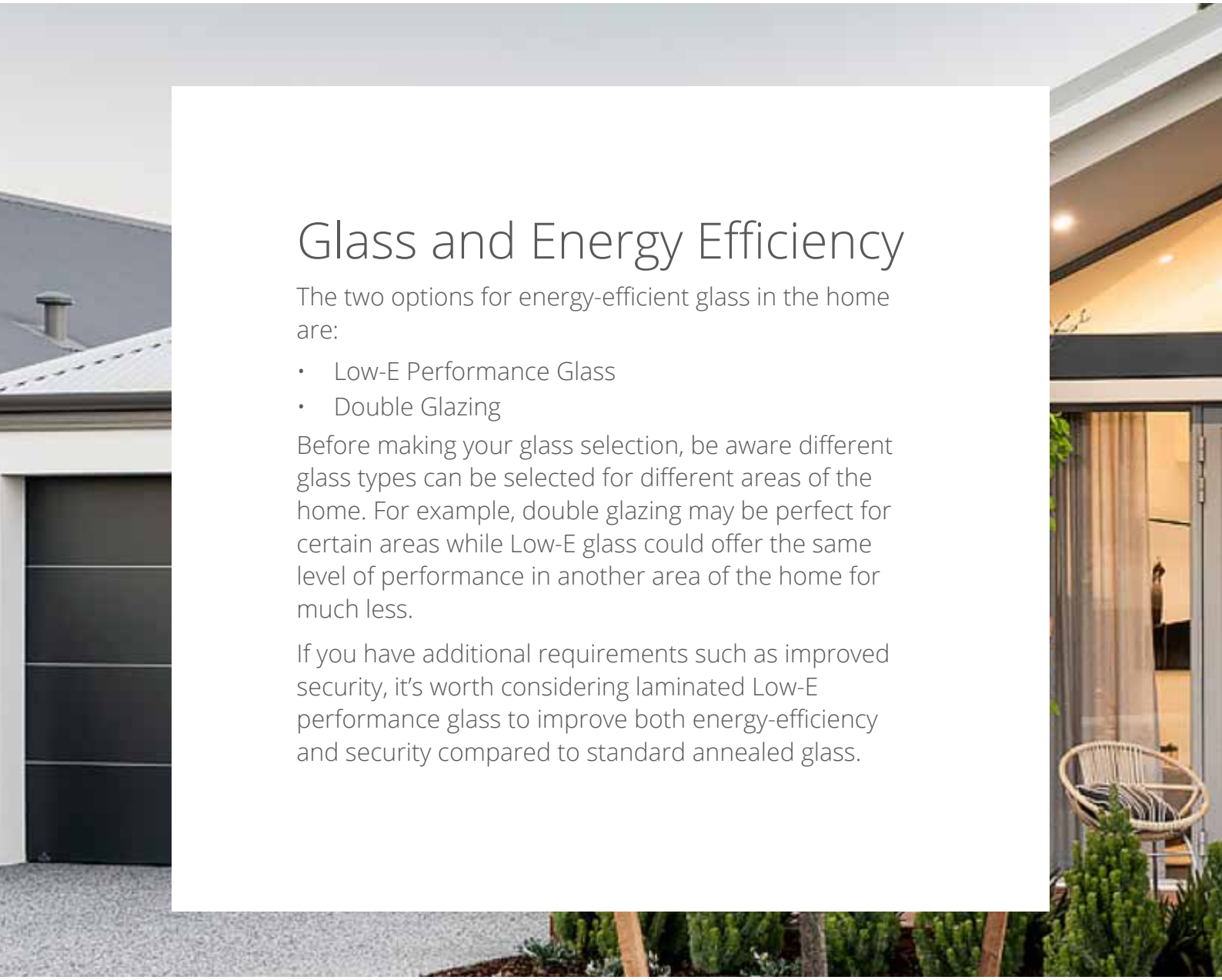
- Reduction in heat and glare
- Reduces furniture fading
- Reduces cooling costs
- Minimal exterior reflection
- Increases privacy during the daylight

Things to Consider

- Outlook visibility could be reduced depending on the tone selected
- Visible light will decrease in thicker glass
- Toned glass will not look the same at night. Lit rooms will be visible from the outside
- Dark tones in smaller rooms can seem claustrophobic
- Light transmittance is reduced

TYPICAL LIGHT TRANSMITTANCE PERCENTAGE FOR VARIOUS GLASS TONE OPTIONS

WINDOW GLAZING MATERIAL	LIGHT TRANSMITTANCE (%)
Clear glazing	82
Bronze toned glazing	56
Green toned glazing	47
Grey toned glazing	41



Glass and Energy Efficiency

The two options for energy-efficient glass in the home are:

- Low-E Performance Glass
- Double Glazing

Before making your glass selection, be aware different glass types can be selected for different areas of the home. For example, double glazing may be perfect for certain areas while Low-E glass could offer the same level of performance in another area of the home for much less.

If you have additional requirements such as improved security, it's worth considering laminated Low-E performance glass to improve both energy-efficiency and security compared to standard annealed glass.

Low-E Performance Glass

Low-E performance glass has a coating that allows natural light through without emitting radiant heat, maximising light and energy efficiency.

Benefits of Low-E Performance Glass

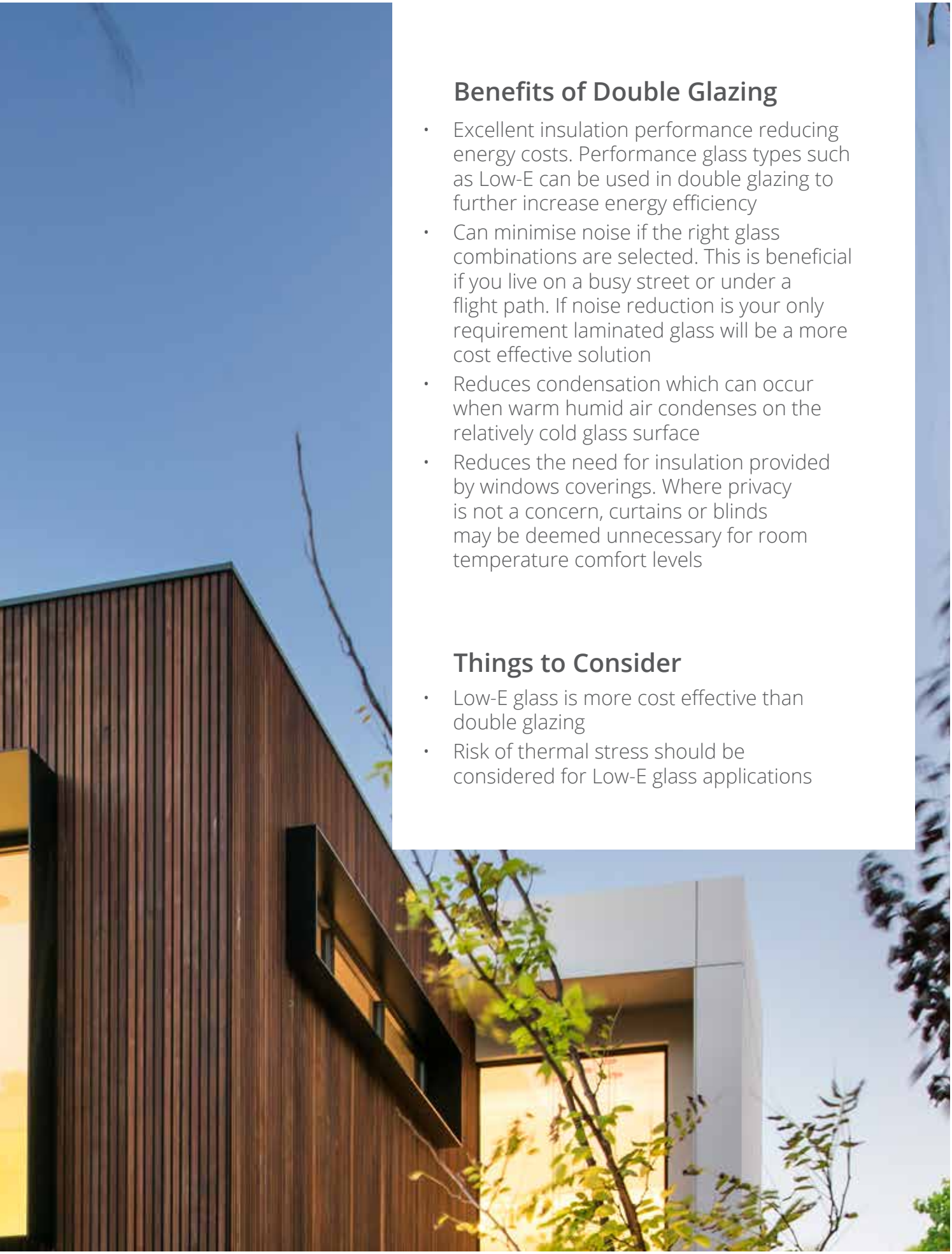
- Provides improved insulation and greater solar control when using tints so you can enjoy a comfortable temperature within your home all year round
- Reduces the rate at which furniture fades by absorbing UV radiation. Performance improves when paired with laminated glass
- Comes in a range of different tones

Things to Consider

- Special care needs to be taken when cleaning Low-E glass
- Has a slightly hazy look from some angles.

Double Glazing

Double glazing consists of two panels of glass which are separated by a layer of air or argon gas and then sealed. Argon gas is known to create a more effective insulation barrier than air by greatly reducing both heat flow and thermal conductivity through the glass. Jason Windows only uses Argon gas in all double glazed products.



Benefits of Double Glazing

- Excellent insulation performance reducing energy costs. Performance glass types such as Low-E can be used in double glazing to further increase energy efficiency
- Can minimise noise if the right glass combinations are selected. This is beneficial if you live on a busy street or under a flight path. If noise reduction is your only requirement laminated glass will be a more cost effective solution
- Reduces condensation which can occur when warm humid air condenses on the relatively cold glass surface
- Reduces the need for insulation provided by windows coverings. Where privacy is not a concern, curtains or blinds may be deemed unnecessary for room temperature comfort levels

Things to Consider

- Low-E glass is more cost effective than double glazing
- Risk of thermal stress should be considered for Low-E glass applications

Energy Efficiency Claims

You may have seen or heard varying and therefore confusing claims guaranteeing energy savings from different Low-E and double glazing providers.

The Australian Glass and Window Association reports as much as 49% of the heat lost during winter and as much as 87% of the heat gained during summer can come from your home's windows.* This information comes from a trusted source and can be used as a general guide. However, the Australian Government website YourHome, outlines why the impact of glazing on your home's energy efficiency is complex to calculate due to varying contributing factors, including:

- Climatic conditions — temperature, humidity, sunshine and wind
- Building design — the orientation, form and layout of your home
- Building materials — the amount of thermal mass and insulation
- Size and location of windows and shading
- Thermal properties of glazing systems

Your home's energy efficient performance is the result of all of the above and will therefore be different for every home.

Thermal Performance Testing

You can seek an independent energy efficiency assessment of your new home or renovation through a thermal performance assessment provider. Based on your plans or existing home, a qualified assessor will determine your home's ability or potential to maintain a comfortable temperature all year round.

Thermal performance assessments are best carried out prior to finalising your plans and submitting a development application. The assessor will provide you with a final list of building materials required to achieve your desired results for discussion with your builder.

Reputable thermal performance service providers can be sourced from the Australian Building Sustainability Association (ABSA).

*Testing results published by the Australian Glass and Window Association www.agwa.com.au, Based on an average house containing 8% area of glazing in the entire building fabric.

Choosing the Right Glass for your Home

Your lifestyle can be impacted by your glass if proper research is not carried out. Here are some questions to consider and help you make a more informed decision

What do you want each room to do?

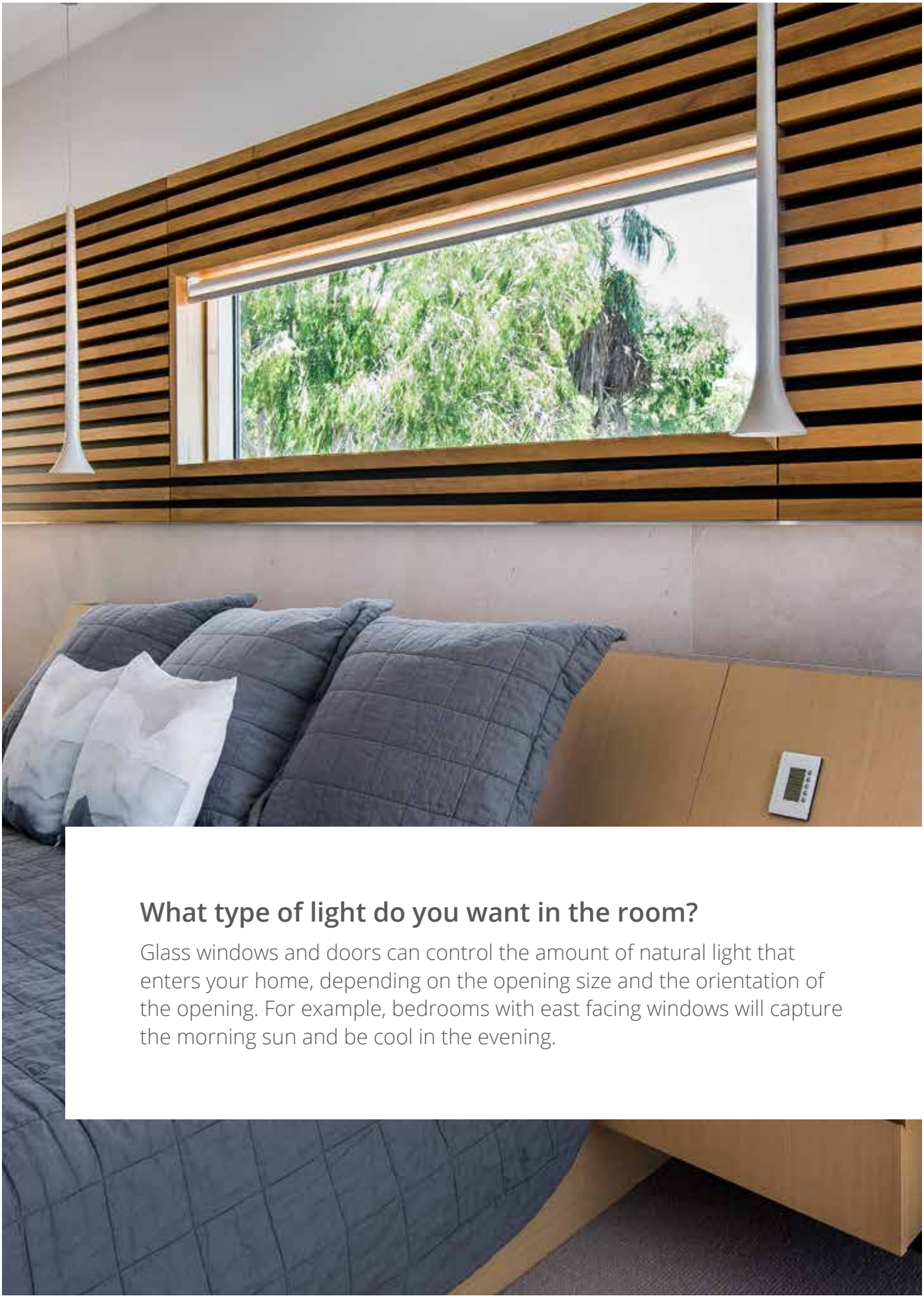
Go through each room in your home or on your plans and make a note of what the main function of that room will be. For example, it might be a living space or perhaps a more private room like a bedroom or bathroom.

Make note of how often the room is likely to be used. You may not wish to invest in performance glass for a spare room or one not used regularly.

Have you chosen a modern, aluminium glass front door?

Aluminium front doors are often seen in display homes with clear glass offering little privacy. If your front door enters into a living space or down a long corridor, you may wish to choose a toned glass or translucent glass for privacy. These glass types can reduce the light level into the home by different rates depending on the tone. This may not be a concern if the area is getting plenty of natural light from other sources.

Alternatively, clear glass front doors work well for small foyers offering a strong first impression.



What type of light do you want in the room?

Glass windows and doors can control the amount of natural light that enters your home, depending on the opening size and the orientation of the opening. For example, bedrooms with east facing windows will capture the morning sun and be cool in the evening.

Do you want to reduce your energy bill?

Glass can be used to naturally warm a room in the winter and keep it cool in the summer, lowering the use of your air conditioner. Poor choice of glass can cause a home's heating energy to be lost in winter and gained in summer. It's worth putting the effort in before building or renovating to ensure you choose the right glass from the start.

By simply choosing a Low-E glass for living spaces facing north, you can improve the insulation of your home significantly.

Is outside noise a concern or do you need to contain noise in any of your rooms?

Acoustic performance glass can be used to reduce outside noise without sacrificing a view. If the home is near a main road, then you may wish to limit traffic noise.

Alternatively, you might consider acoustic performance glass to help keep noise contained in one area of the home such as a theatre room which is close to a neighbouring fence line.

How important is security?

If security is high on your priority list, then it's worth considering laminated glass which provides additional resistance to breakages. Laminated glass allows you to enjoy comfort and safety without limiting natural light or view.

Do you have furnishings you wish to protect from fading?

Curtains and furniture fabrics can fade over time from exposure to UV radiation. If you plan on having furniture or a kitchen benchtop near a large opening, then consider a glass type that offers UV protection.

Can I afford to upgrade my glass?

The three properties of glass which impact the cost are thickness, performance and size. The thicker the glass, the capability of the glass and the larger the panels, the more expensive it will be.

Once you have thought about how you will be using each room in your home, you can then start noting what your main priorities are to help decide which glass upgrade you can live without to meet any budget constraints.

Remember, you can always upgrade glass in further rooms at a later stage.

Glass Regulations

Some factors around glass choice are governed by building regulations and therefore outside of your control. Let's look at some of the glass regulations that apply to homes:

Australian Standards and Building Regulations

All new homes or new renovations need to comply with both Australian Standards and Building Regulations. For example, as a general guide, you must use Grade A safety glass in:

- All glass doors
- Bathrooms – for all areas up to 2m high
- Door side panels – if less than 300mm away from the door and positioned 1200mm or less above the floor
- Areas that can be mistaken for openings (eg: full height windows)
- Low level glass if larger than 1.2m². Areas under 1.2m² require a minimum of 5mm thick glass

Your choice of glass will also be influenced by:

- The location you live in
- Bush fire zones
- Energy efficiency restrictions for new homes

It's advisable to speak with a glass expert to check what regulations are applicable for your new home or renovation.

Orientation & Floor Plan

Your floor plan and block orientation can impact your comfort level and energy bills. Ideally, your floor plan should make best use of sunlight and the direction of cooling breezes while taking into consideration climate patterns for your region, adjacent buildings and existing or future landscaping.

Considered placement of your windows and doors will help maximise energy efficiency and comfortable living all year around. Here are some expert tips and considerations specifically for WA homes.

North Facing

- To maximise natural lighting throughout the year and natural heating in winter, plan for north facing daytime living areas with plenty of windows
- Use glass doors that flow to outdoor spaces with similar orientation

East Facing

- Take advantage of beautiful sunrises and the morning sun with the use of large windows and doors. However, keep in mind the strongest sun is received on the east and west sides
- Toned or energy efficient glass will make summer mornings and evenings more comfortable on unshaded east & west facing glazing
- Large panels of glass will improve natural lighting in the afternoons

South Facing

- As south facing windows and doors receive little sunlight, rooms with minimal light requirements such as a theatre room and garage are best situated south facing
- A row of windows well above eye level can improve light levels by capturing light at different angles. If sliding or awning windows are used, airflow will be improved
- If the northern aspect of your home is flooded with natural light from generous windows and doors, the light can be pulled through to the southern end with the aid of internal french doors, a light interior colour palette and reflective surfaces
- Avoid placing living spaces and bedrooms on the south side of the home to improve comfort levels of your main living spaces

West Facing

- The western side of your home will have the afternoon sun which can be intense in summer particularly when also reflected off water. Any windows or doors on the west side of the home will benefit from toned or energy efficient performance glass

Narrow Blocks

Homes on narrow blocks should ensure they have enough glass on the north facing side for solar heating in the winter.

For north-south blocks, adjacent houses on the east and west side will offer protection from the low eastern/western sun.

Airflow

Use well shaded smaller windows to increase cross ventilation to the south, east and west.

Large openable doors and windows on the north and south sides of the home will improve cross ventilation. If ventilation is required on the east and west elevations, small well shaded windows to minimise the strong low sun is best.

Cross ventilation in rooms with only one window can be improved with a vent above the internal door.

A row of windows well above eye level through the home are ideal for creating convection currents for cooling the home naturally.

Other Considerations

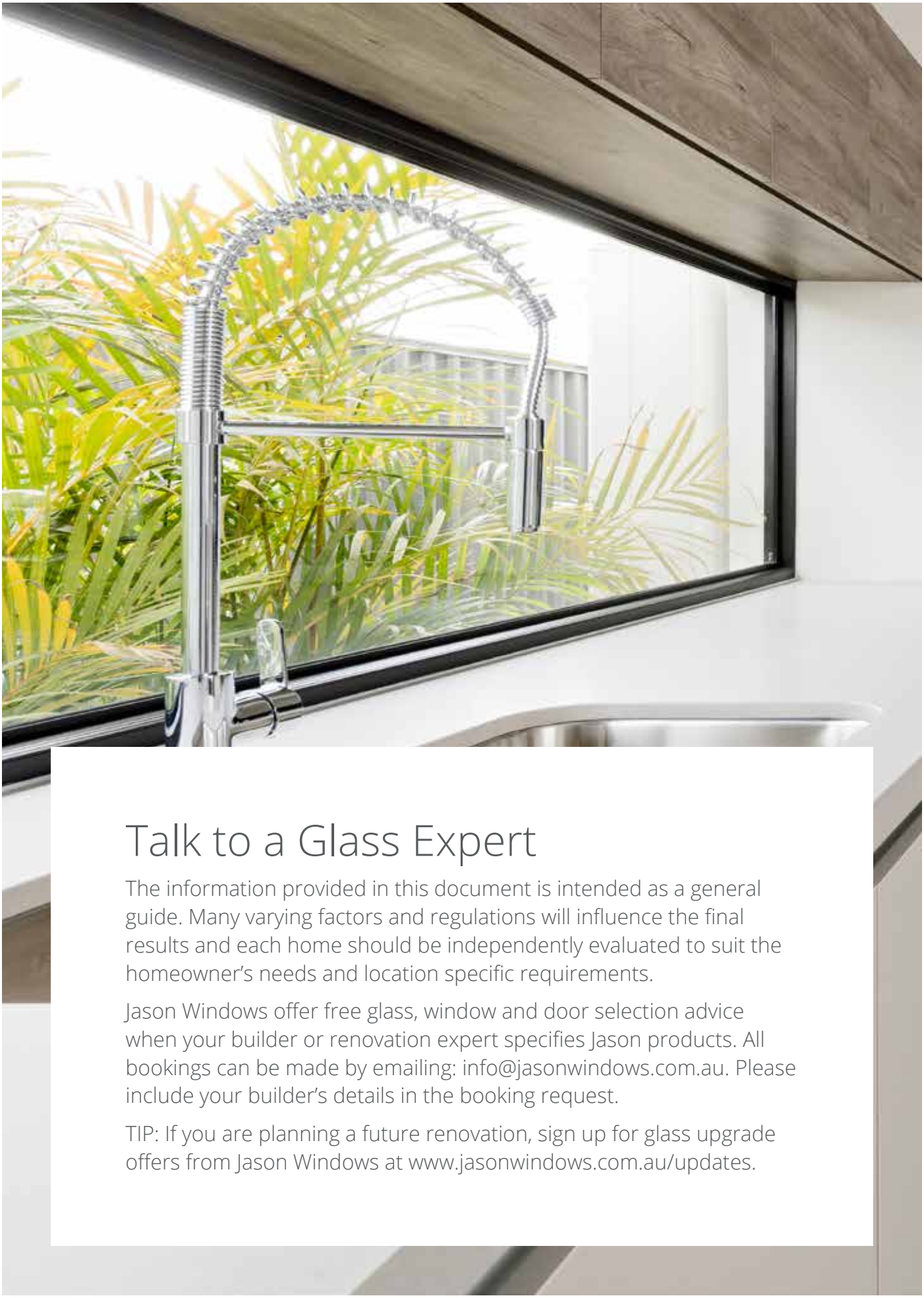
Thermal Stress

Thermal stress, sometimes called thermal fracture, occurs when there is temperature variance in different parts of the glass. If the temperature difference is greater than the strength of the glass, the glass will crack. For example, a window pane exposed to the sun will heat up. Any part of the glass which is shaded stays relatively cool. The hot glass will expand while the shaded glass doesn't. If the cooler part of the glass isn't strong enough to withstand the stress, thermal cracking will occur.

Different glass types have different tolerances to thermal stress. Generally, the more solar energy a glass product absorbs, the higher the risk of thermal stress breakage. Larger panes of glass are also at higher risk.

There are many other factors that can contribute to thermal stress. If you wish to use a glass type that is at higher risk of thermal stress, we recommend you seek the services of an Energy Assessor.

More information about thermal stress can be found on the Australian Glass & Window Association website https://www.agwa.com.au/



Talk to a Glass Expert

The information provided in this document is intended as a general guide. Many varying factors and regulations will influence the final results and each home should be independently evaluated to suit the homeowner's needs and location specific requirements.

Jason Windows offer free glass, window and door selection advice when your builder or renovation expert specifies Jason products. All bookings can be made by emailing: info@jasonwindows.com.au. Please include your builder's details in the booking request.

TIP: If you are planning a future renovation, sign up for glass upgrade offers from Jason Windows at www.jasonwindows.com.au/updates.

Further Resources

Further resources and more detailed research can be obtained via:

1. The Australian Glass and Window Association
   https://www.agwa.com.au
2. The Window Energy Rating Scheme (WERS) provides a scientifically based, fair and credible rating system for the assessment of window and door products for their energy efficiency performance
   a. All data: https://www.awawers.net/res
   b. Jason Windows data: https://www.awawers.net/res/reslist/JASON
3. Your Home. An Australian Government guide offering free advice to anyone building, buying or renovating a home
   https://www.yourhome.gov.au/getting-started/welcome-your-home
4. Efficient Glazing. Online tools created by the Australian Glass and Window Association to help home owners with their purchasing decision
   http://www.efficientglazing.net/
5. Glass Standards & Regulatory Requirements
   a. AS 1288 Glass in Buildings – Selection and Installation
   b. AS/NZS 2208 Safety Glazing Materials in Buildings
   c. AS/NZS 4666 Insulating Glass Units
   d. AS/NZS 4667 Quality Requirements for Cut-To-Size and Processed Glass
   e. AS/NZS 4668 Glossary of Terms Used in the Glass and Glazing Industry
   f. The National Construction Code
   g. AS/NZS 1170 Series Structural Design Actions
   h. AS 4055 Wind Loads for Housing
   i. AS 2047 Windows and External Glazed Doors in Buildings
   j. AS 1926.1 Swimming Pool Safety Part 1 Safety Barriers for Swimming Pools
6. Australian Building Sustainability Association. Offering advice and recommendations for thermal assessment services
   https://www.absa.net.au/
7. If you plan to use film tinting rather than toned glass, Jason Windows recommends an accredited tinter is used from the Window Film Association of Australian and New Zealand
   https://www.wfaanz.org.au/

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