Double Glazing: Demystifying the options

Richard Popenhagen
Eco Design Advisor

Eco Design Advisor

Independent, free personalised advice on how to create a sustainable and healthy home.

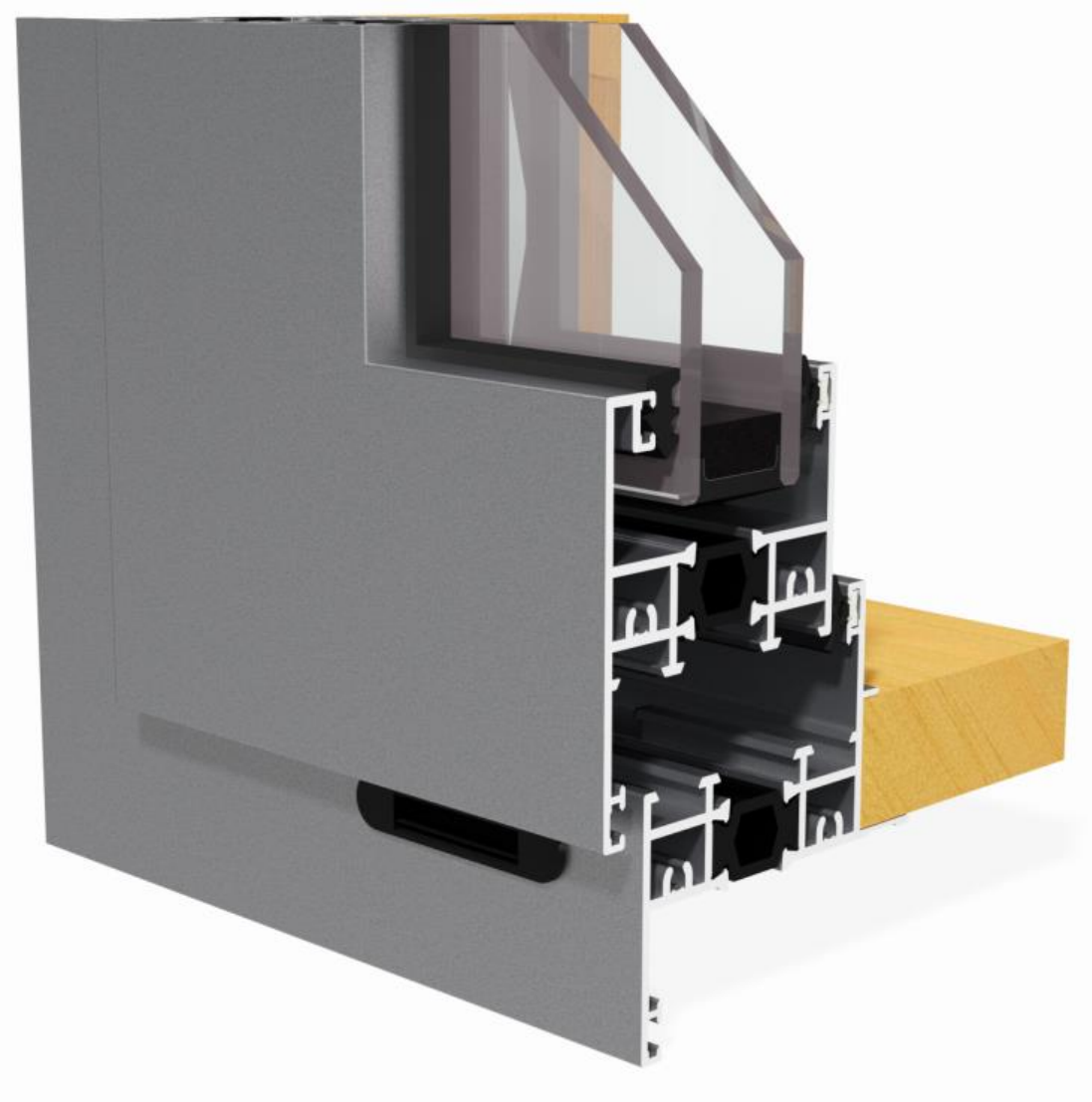
Double glazing components

Window frame

Glass (IGU)

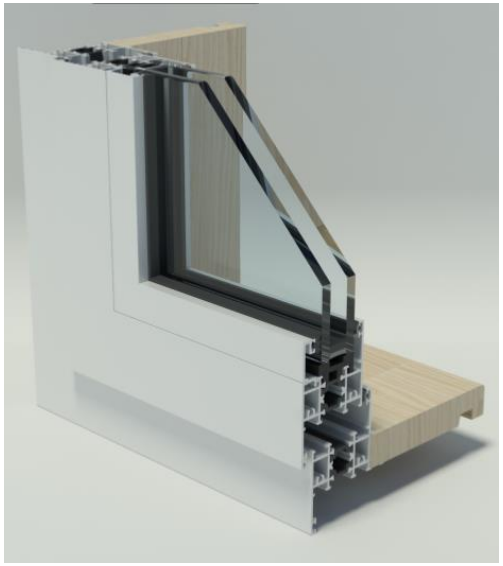
IGU spacers

Gas fill

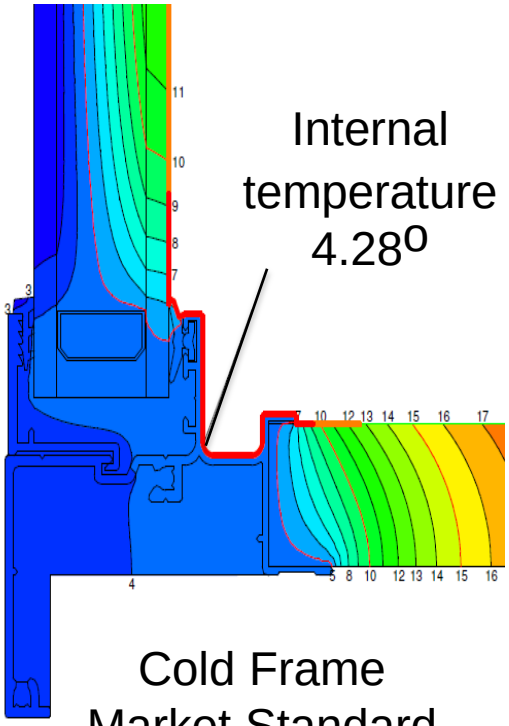


Window frames

- Aluminium
- Thermally broken Aluminium
- Timber
- uPVC
- Steel
- Fibreglass
- Composite



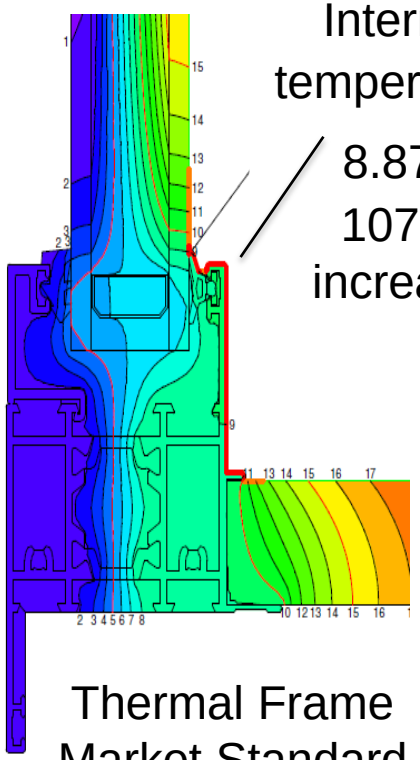
Effect of glass, spacer and frame type



Internal temperature 4.28°

Cold Frame
Market Standard
Aluminium spacer

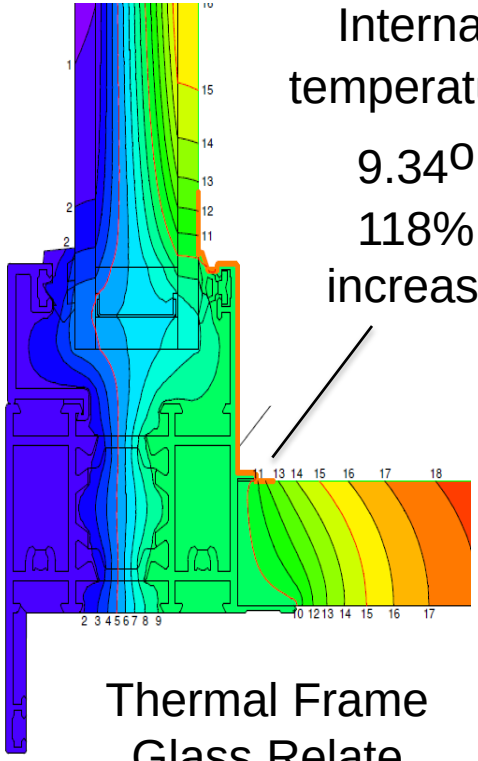
Clear | air | Clear



Internal temperature 8.87°
107% increase

Thermal Frame
Market Standard
Aluminium Spacer

Clear | argon | Low E



Internal temperature 9.34°
118% increase

Thermal Frame
Glass Relate
T spacer premium plus

Clear | argon | Low E

Glass

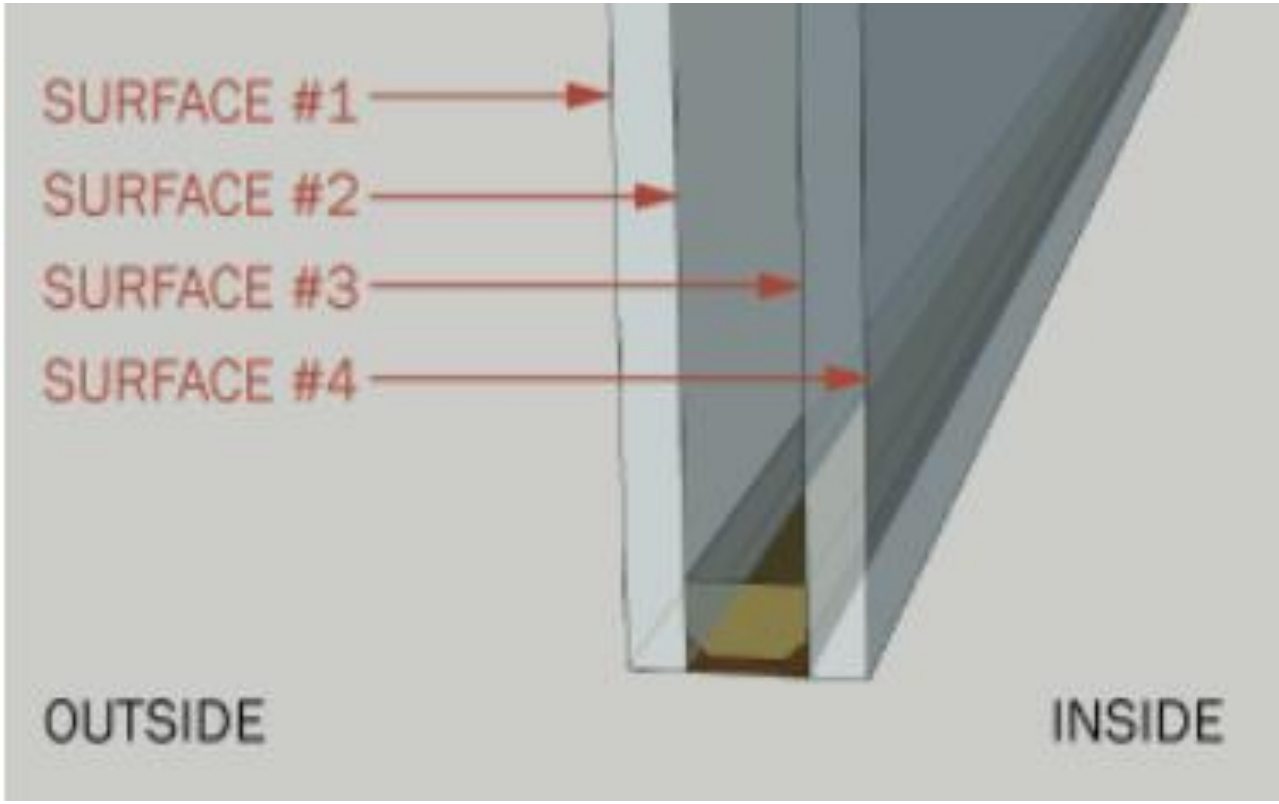
Clear

Low E

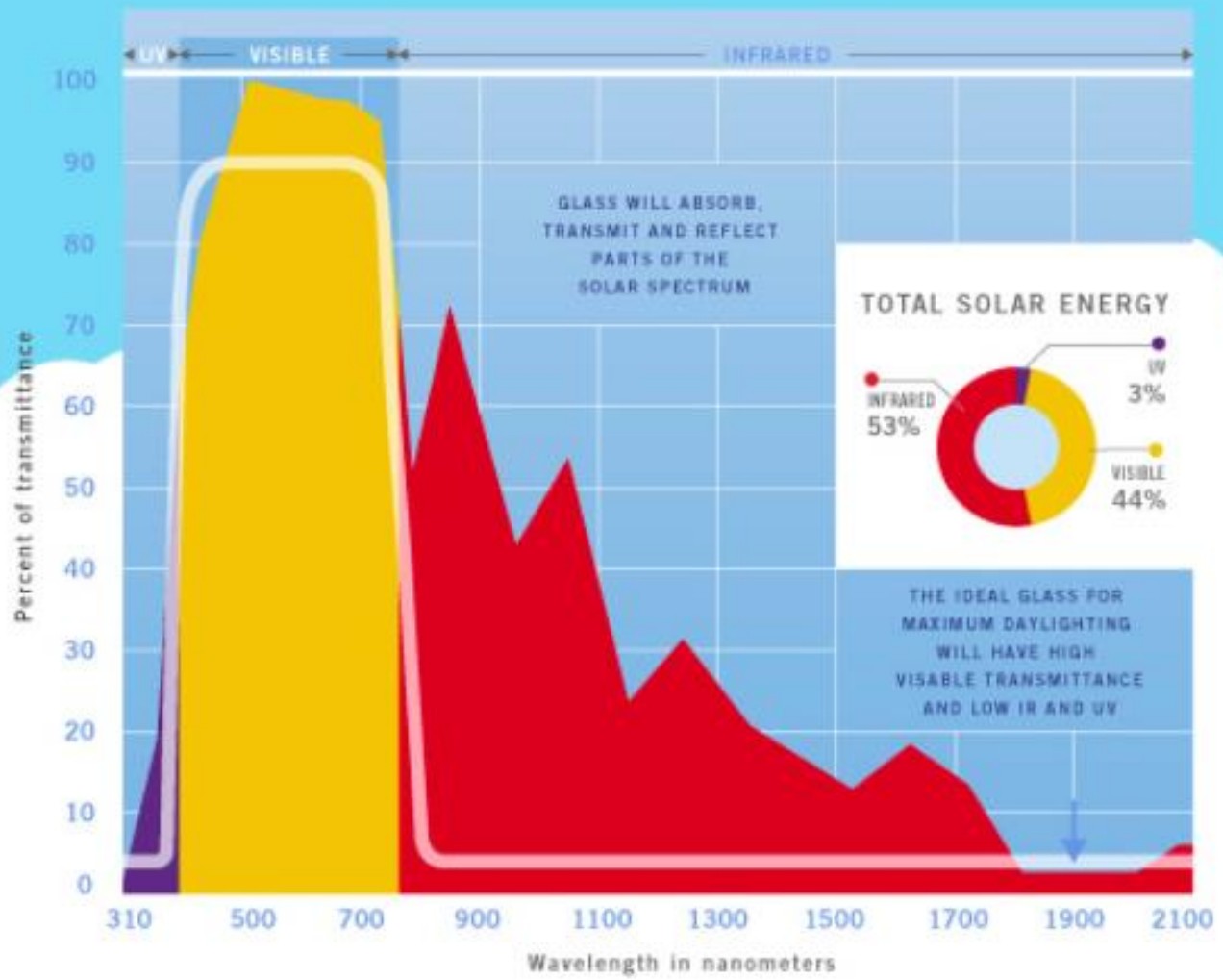
Solar control

Noise control

Safety glass

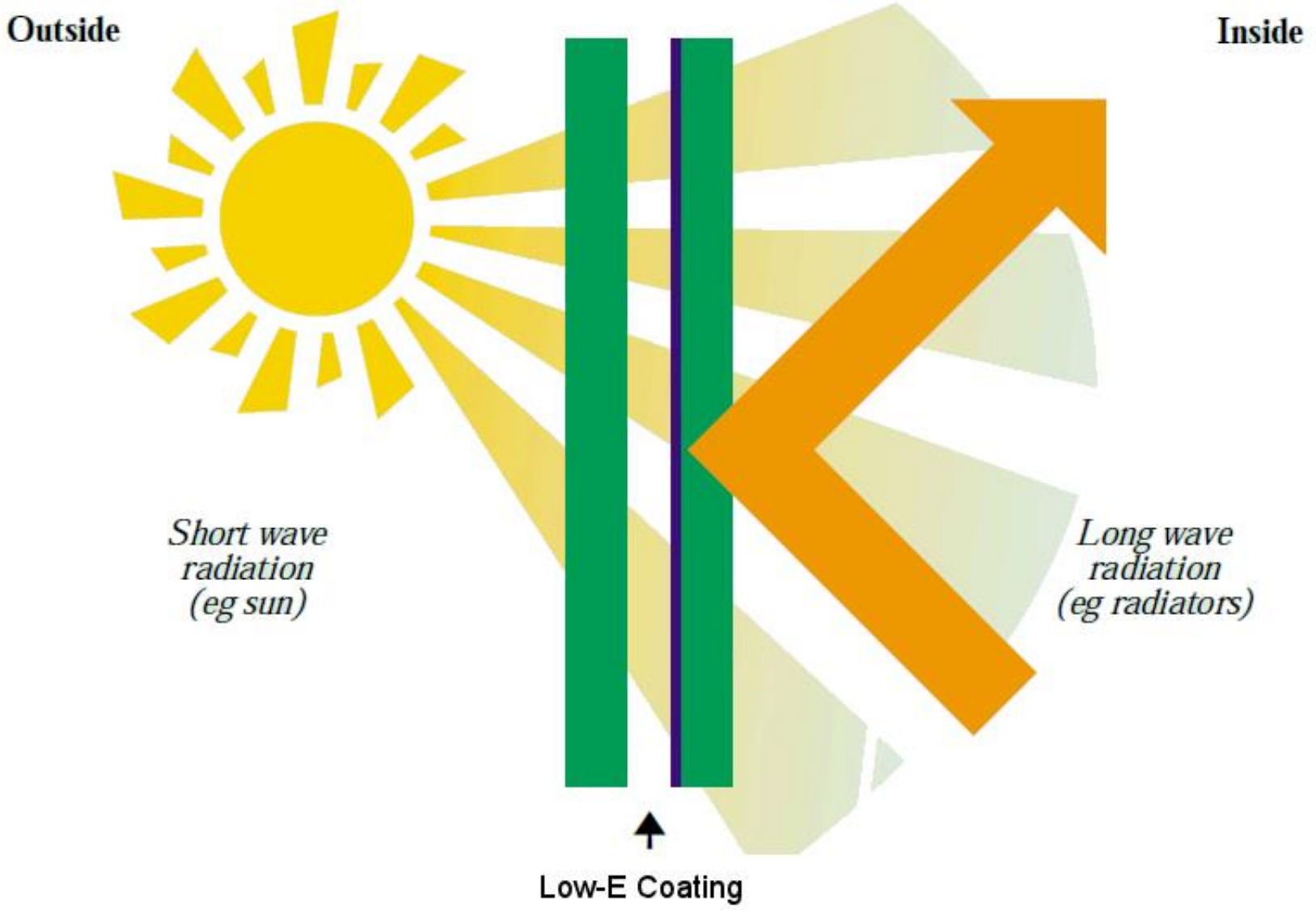


Solar Energy Spectrum

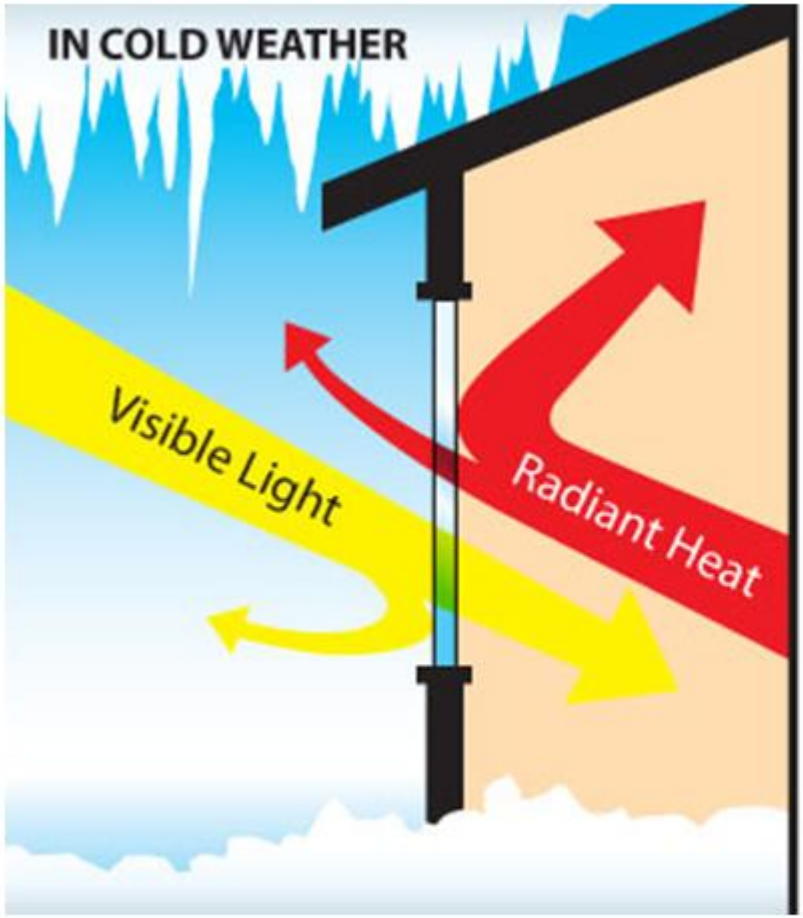


To understand the performance of low-e glass, it helps to have a basic understanding of the **solar energy spectrum**. As you can see from this chart, ultraviolet (UV) light, visible light and infrared (IR) light all occupy different parts of the solar spectrum. They are delineated according to their wavelengths.

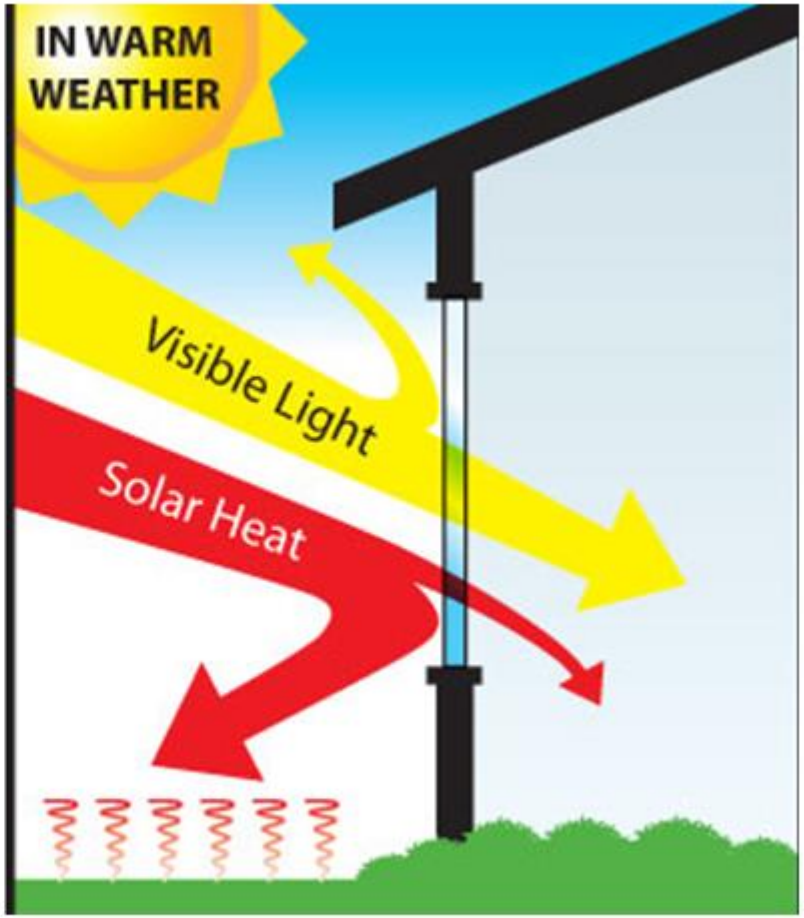
Low E Glass


Outside
Inside
Short wave radiation (eg sun)
Long wave radiation (eg radiators)
Low-E Coating

Low E Glass

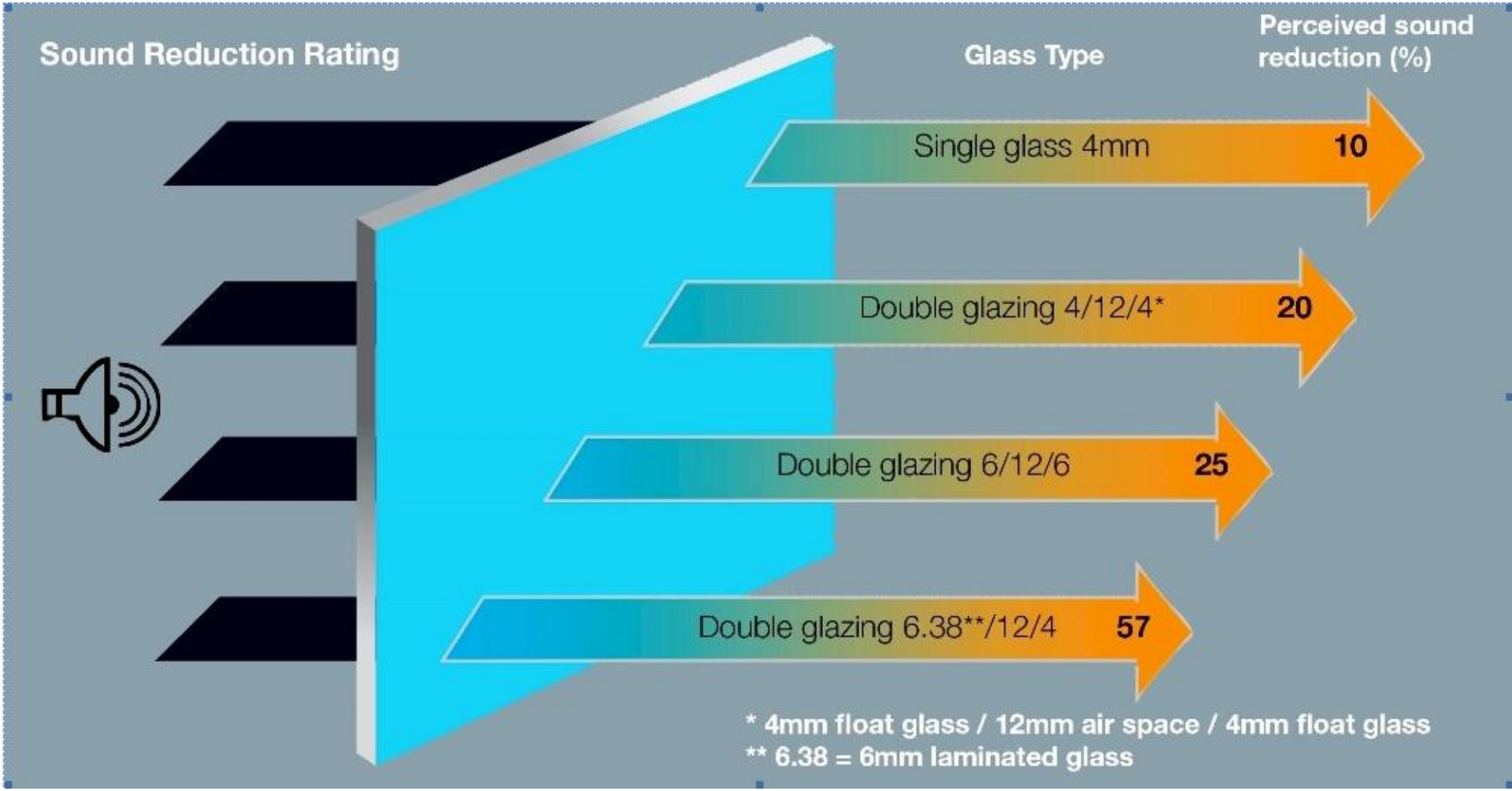


Low E = surface 3



Low E = surface 2

Sound Control



Spacer bars

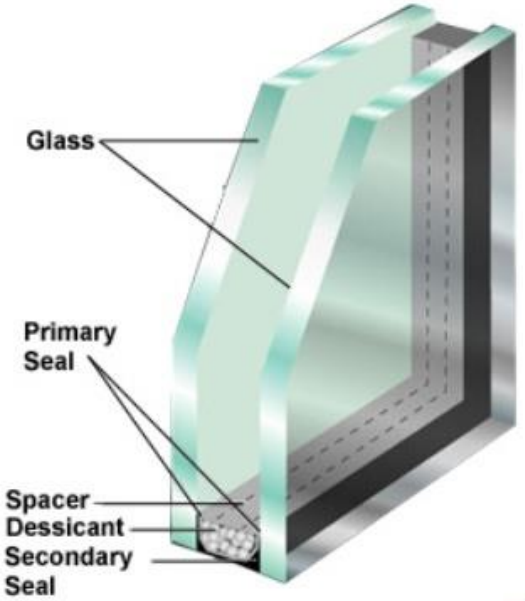
Keep the glass panes apart to provide an insulating air space.

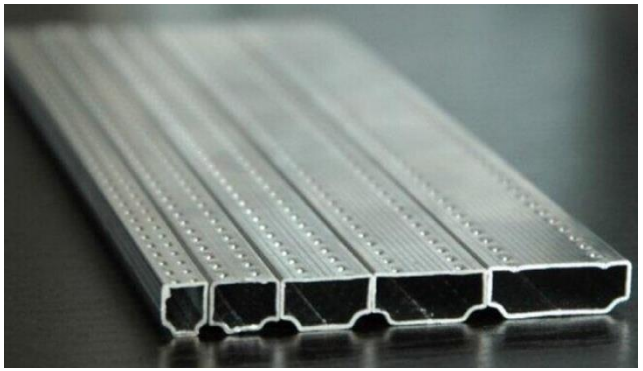
Aluminium

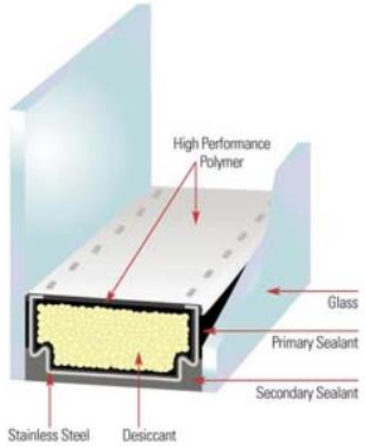
Stainless Steel

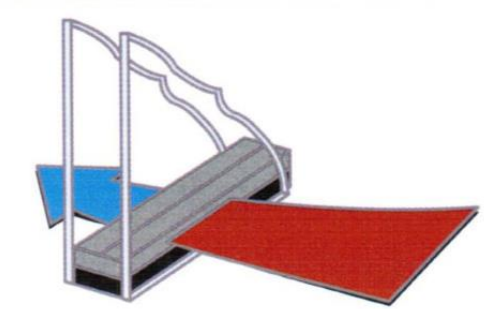
Thermal

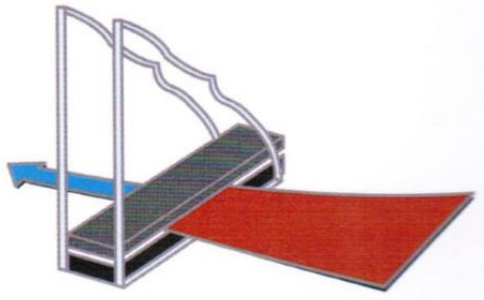
12mm airspace is 15% more efficient than 6mm airspace



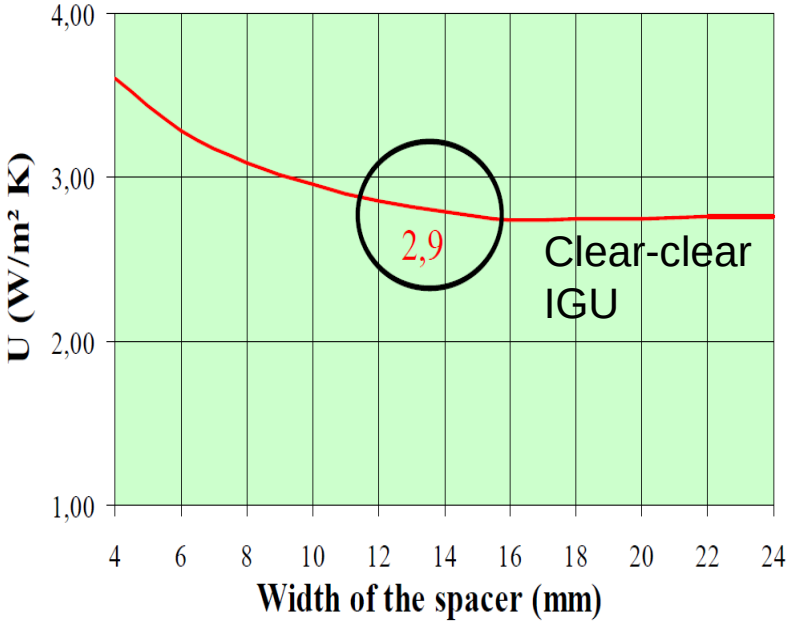




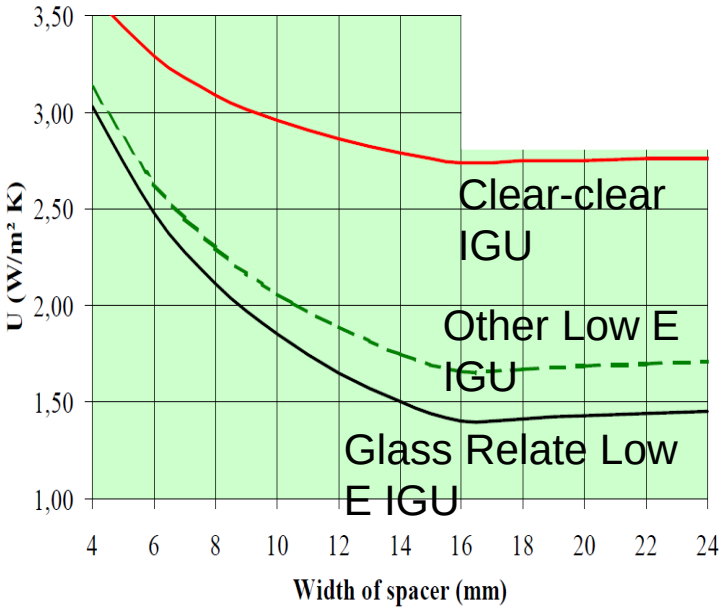




Optimum spacer size



clear-clear IGU
12mm-14mm optimum spacer

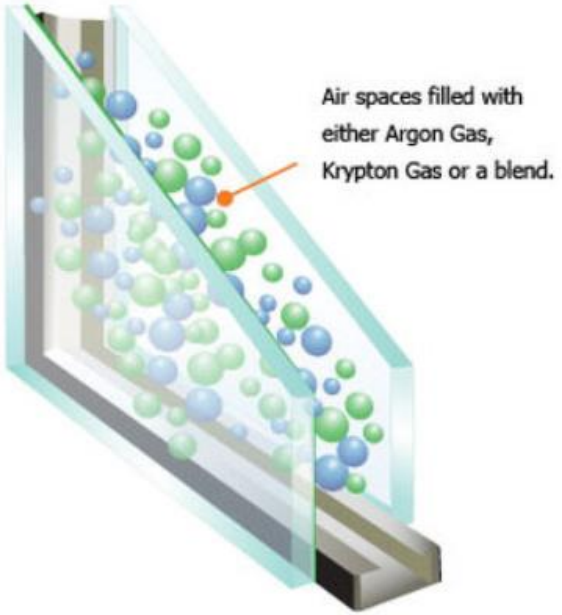


clear-low E IGU
16mm spacer optimum

Gas fills

- Air
- Argon
- Krypton
- Xenon
- Vacuum

- Argon gas is denser than air and acts as a greater barrier to heat loss and heat absorption in the home.



Size does matter!

Small windows- frame and edge seals have bigger effect.

Larger windows – glazing and gas fills have bigger effect

Thermal Performance

NZ Building Code sets minimum requirements

Walls

R1.9 (Zones 1 & 2)
R2.0 (Zone 3)

Windows

R0.26

(will lose 7 times more heat than a wall.)

An old un-insulated wall @ R0.45

WINDOW ENERGY EFFICIENCY RATING SYSTEM

WEERS

Six star rating system

Higher performing windows qualify for ENERGY STAR Mark.

EECA ENERGY STAR available from R0.32 = WEERS 3 stars

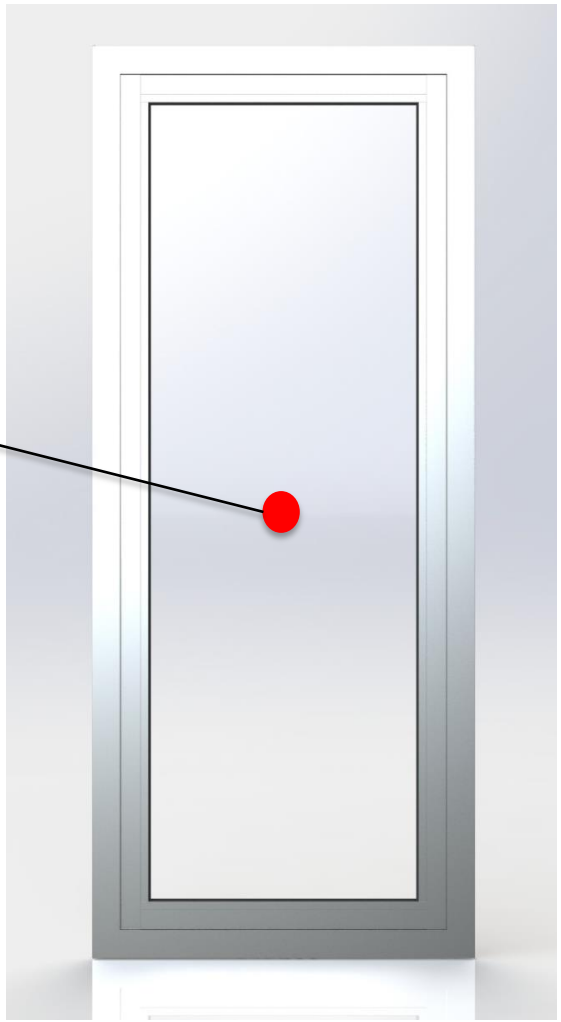
The Total Package

U values

=

Centre of glass

=



R value

=

Centre of glass

+

Spacer type

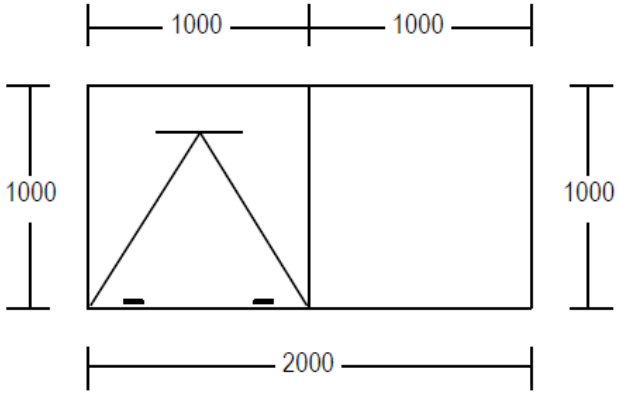
+

Frame type

=

Standard Aluminium Frame

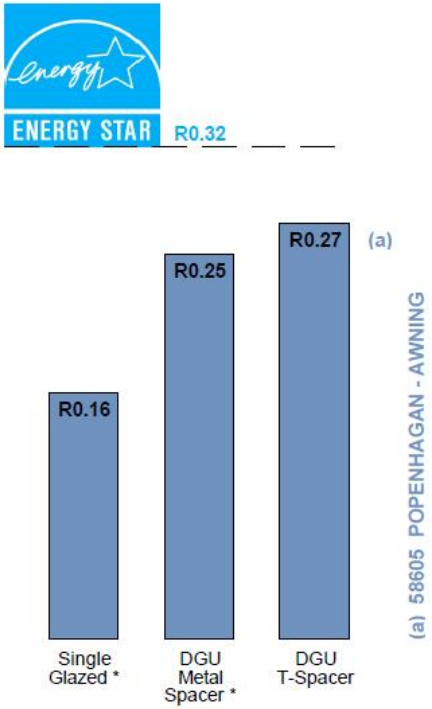
- Single glazed R0.16
- Double glazed – metal spacer R0.25 (Doesn't comply with NZBC)
- Double glazed – thermal spacer R0.27



Performance

R0.02 = 8%

Cost 0% to ?%



58605 POPENHAGAN - AWNING

* These values are representative from 10 WANZ standard house lots using standard aluminium

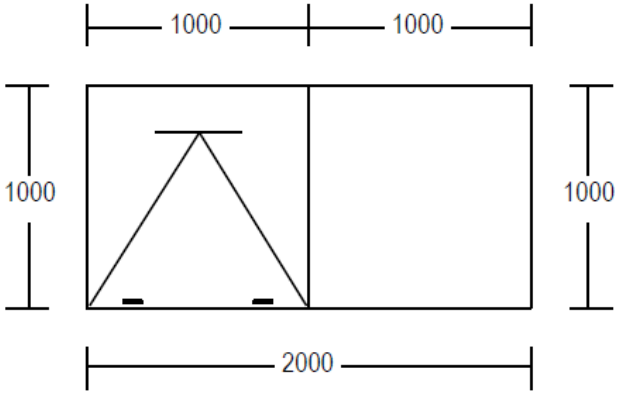
Standard Aluminium Frame

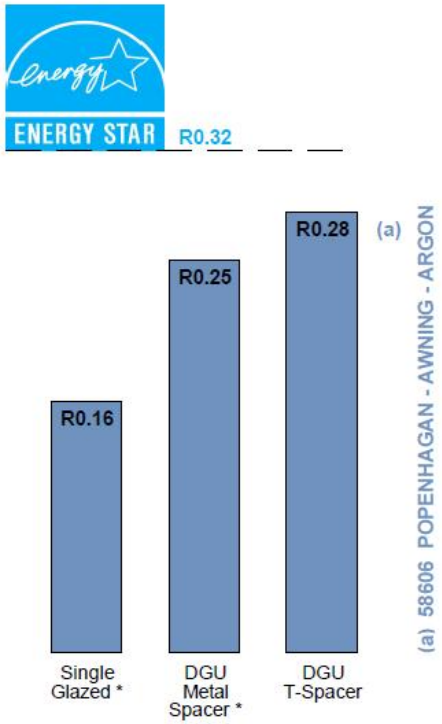
- Single glazed R0.16
- Double glazed – metal spacer R0.25
- Double glazed – thermal spacer R0.27
- Double glazed – thermal spacer plus argon gas R0.28

Performance increase

R0.01 = 3.7%

+$58 = 7.5%



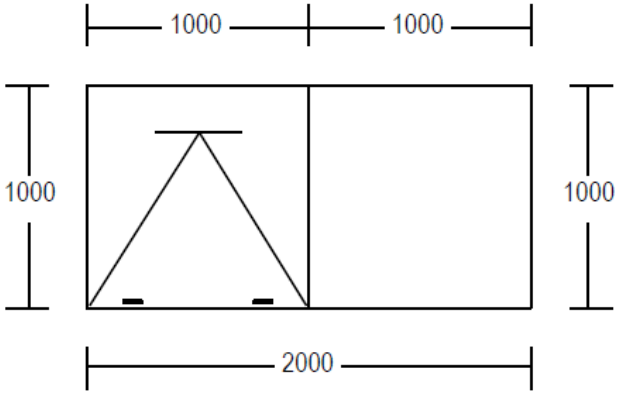


58606 POPENHAGAN - AWNING - ARGON

* These values are representative from 10 WANZ standard house lots using standard aluminium

Standard Aluminium Frame

- Single glazed R0.16
- Double glazed – metal spacer R0.25
- Double glazed – thermal spacer R0.27
- Double glazed – thermal spacer plus argon gas R0.28
- Double glazed – thermal spacer plus argon gas and Low E Glass R0.41



Performance increase

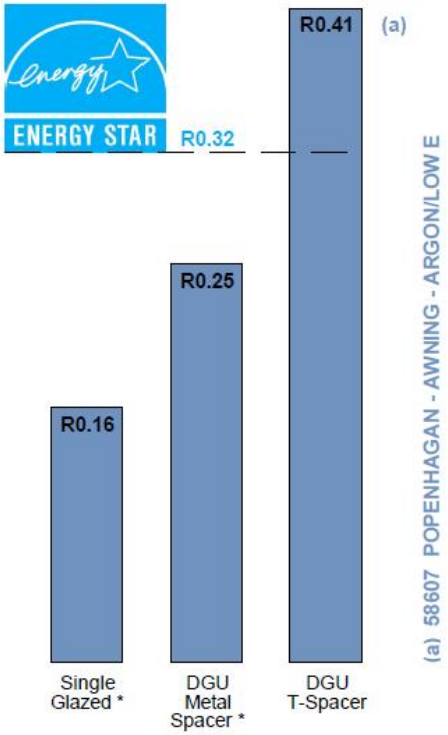
R0.13 = 46%

+$91 = 10.9%

Total Increase

R0.16 = 64%

+$149 = 19%

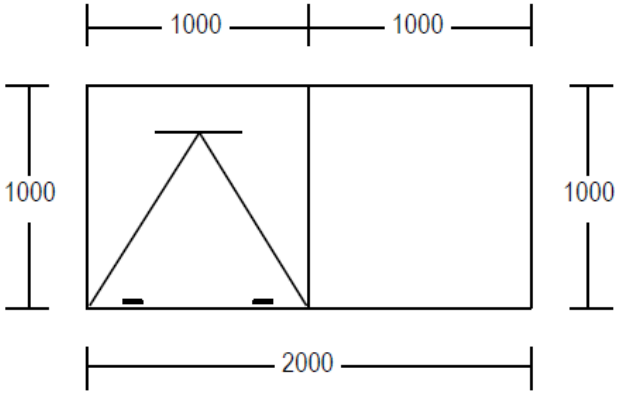


58607 POPENHAGAN - AWNING - ARGON/LOW E

* These values are representative from 10 WANZ standard house lots using standard aluminium

Thermally broken frame

- Double glazed – thermal spacer R0.33

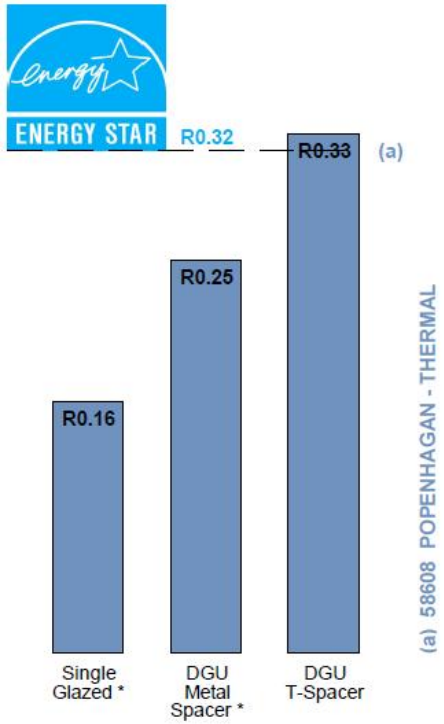


Performance increase

R0.06 = 24%

+$224* = 28%

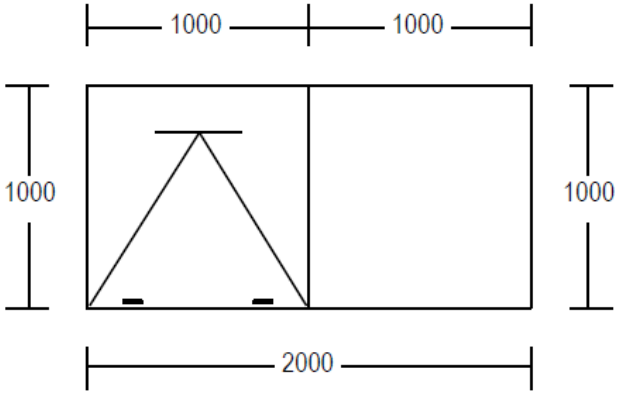
* Expected to reduce to @ 12%



* These values are representative from 10 WANZ standard house lots using standard aluminium

Thermally broken frame

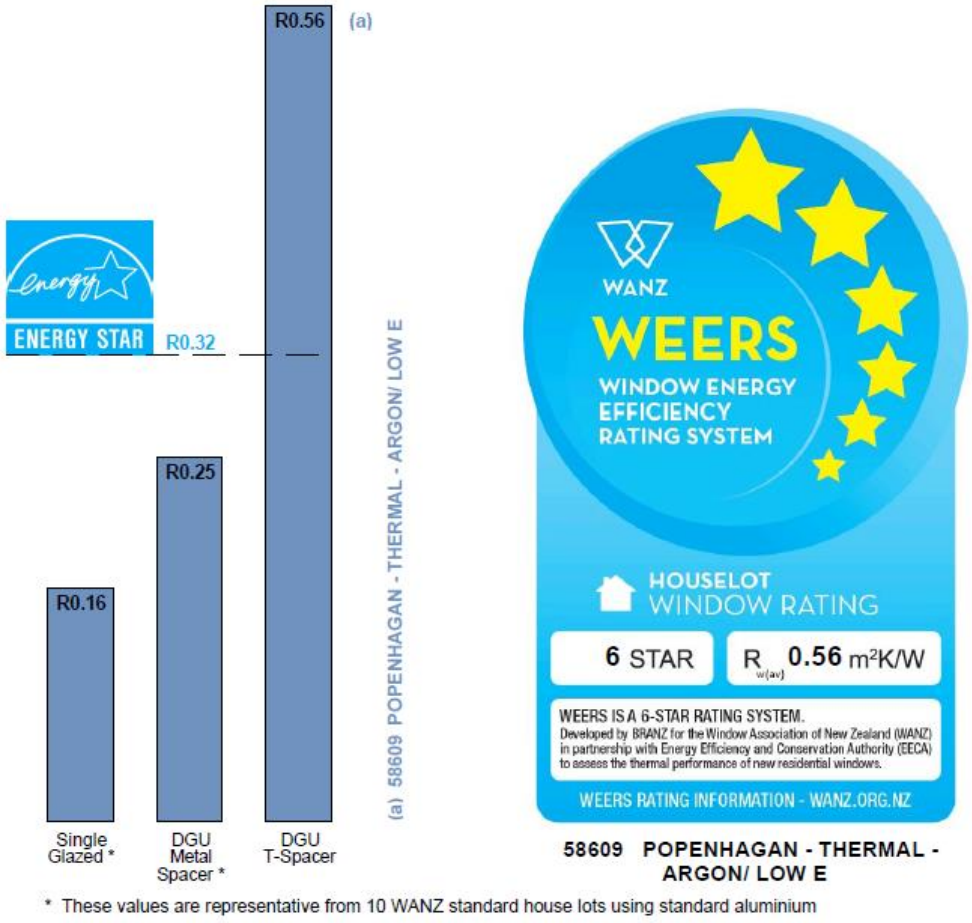
- Double glazed – thermal spacer R0.33
- Double glazed – thermal spacer plus argon gas and Low E Glass R0.56



Performance increase

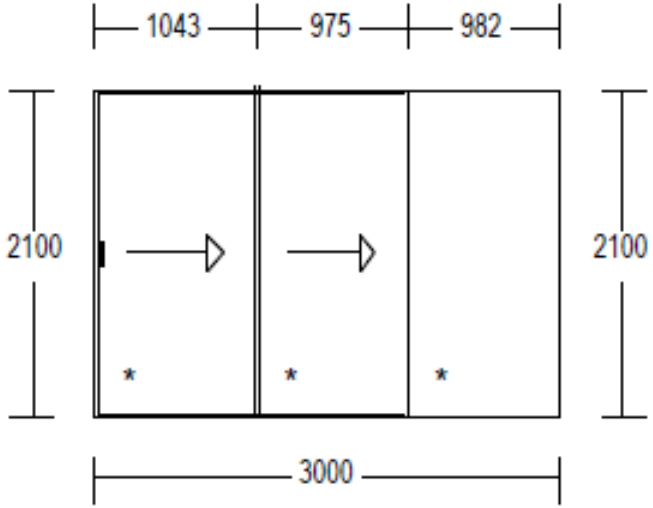
R0.31 = 124%

+$372 = 48%

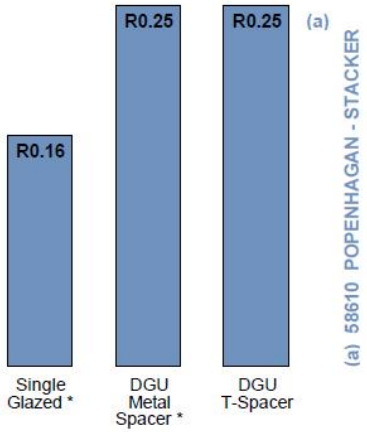


Standard Aluminium Frame

- Single glazed R0.16
- Double glazed – metal spacer R0.25
- Double glazed – thermal spacer R0.25
- Neither comply with R0.26 minimum



ENERGY STAR R0.32

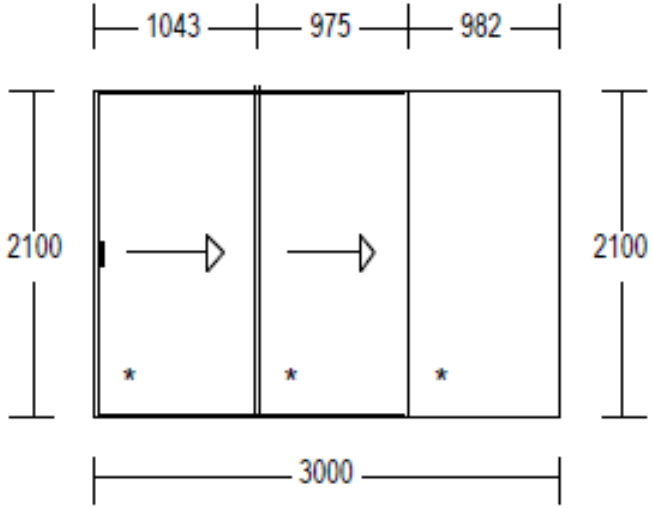


58610 POPENHAGAN - STACKER

* These values are representative from 10 WANZ standard house lots using standard aluminium

Standard Aluminium Frame

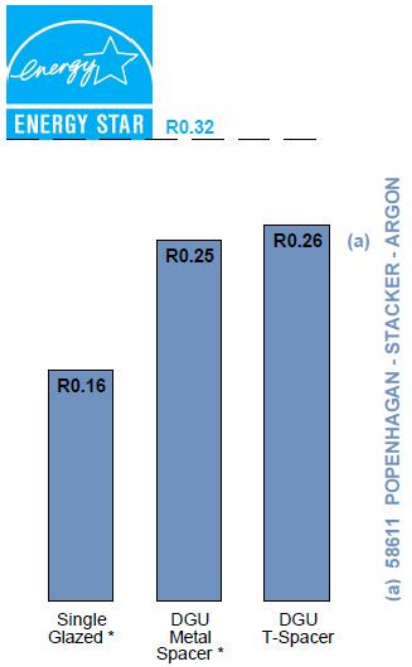
- Single glazed R0.16
- Double glazed – metal spacer R0.25
- Thermal spacer plus argon gas R0.26



Performance increase

R0.01 = 4%

+$87 = 2.8%



58611 POPENHAGAN - STACKER - ARGON

* These values are representative from 10 WANZ standard house lots using standard aluminium

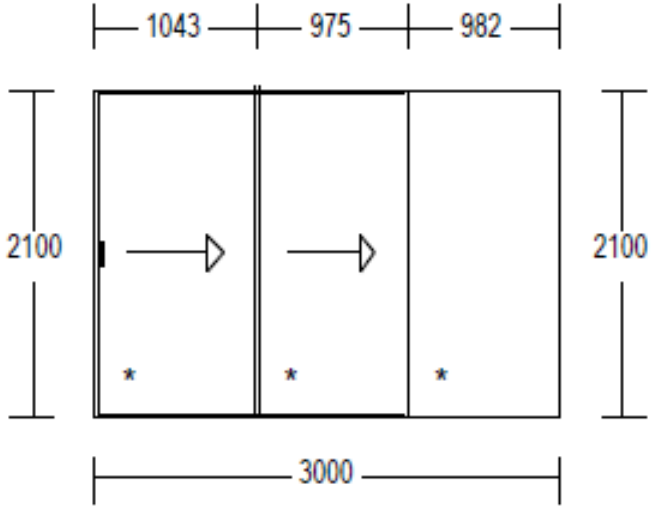
Standard Aluminium Frame

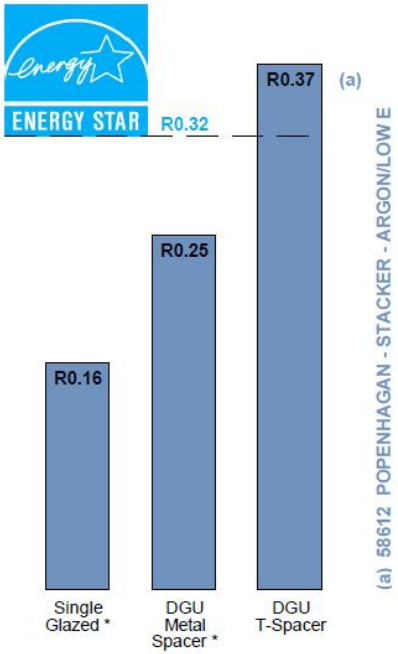
- Single glazed R0.16
- Double glazed – metal spacer R0.25
- Thermal spacer plus argon gas R0.26
- Double glazed – thermal spacer plus argon gas and Low E Glass R0.37

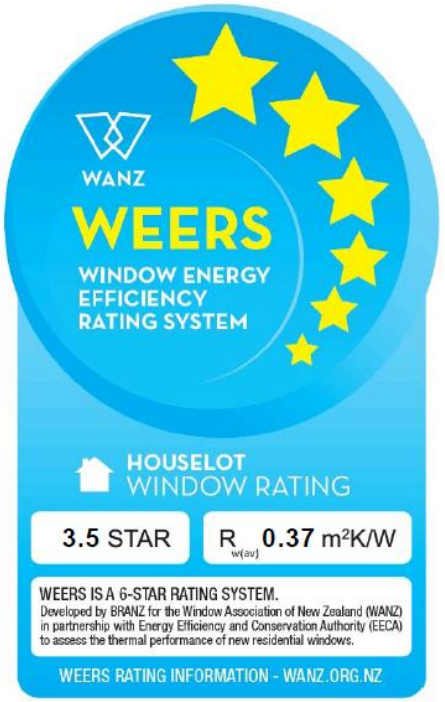
Performance increase

R0.11 = 42%

+$408 = 12.7%





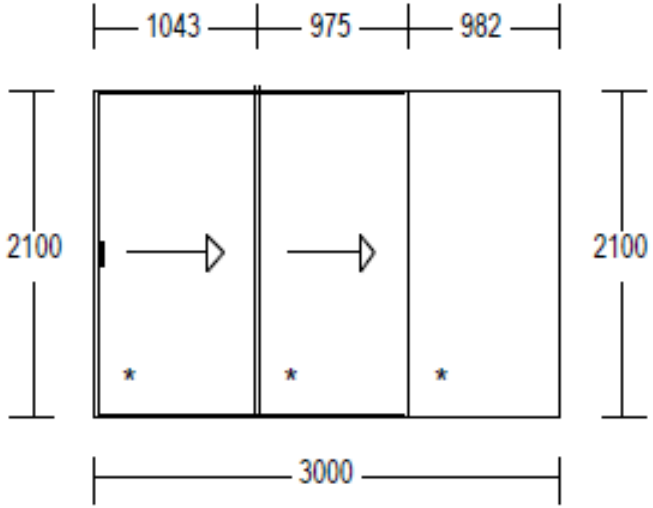


58612 POPENHAGAN - STACKER - ARGON/LOW E

* These values are representative from 10 WANZ standard house lots using standard aluminium

Thermally broken frame

- Double glazed – thermal spacer R0.29

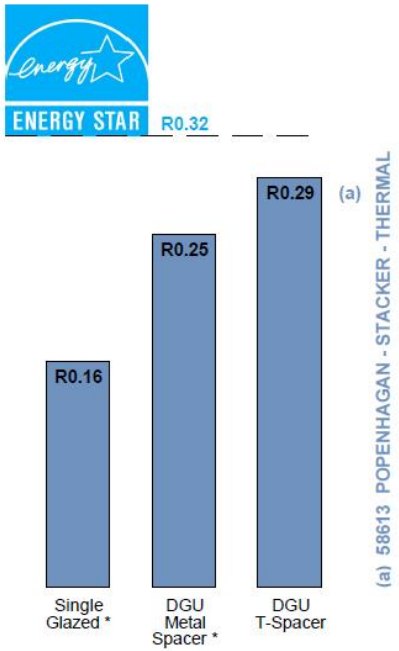


Performance increase

R0.04 = 16%

+$1023* = 32.8%

* Expected to reduce to @ 20%



58613 POPENHAGAN - STACKER - THERMAL

* These values are representative from 10 WANZ standard house lots using standard aluminium

Thermally broken frame

- Double glazed – thermal spacer R0.29
- Double glazed – thermal spacer plus argon gas and Low E Glass R0.47

Performance increase

R0.18 = 62%

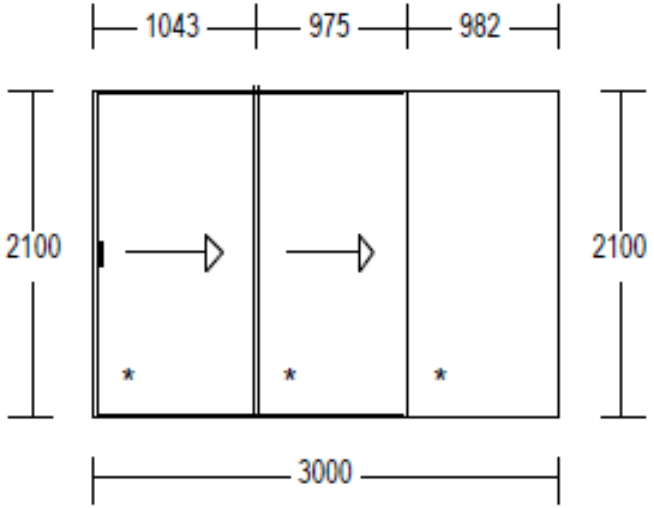
+$461 = 11%

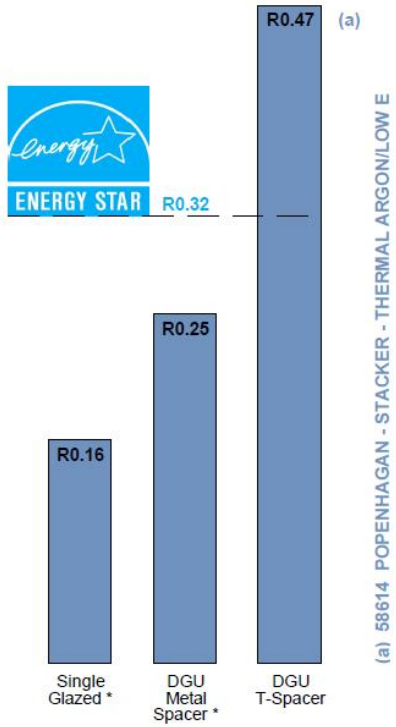
Total Increase

R0.22 = 88%

+$1,484 = 47%*

***Expected to reduce**





58614 POPENHAGAN - STACKER - THERMAL ARGON/LOW E

* These values are representative from 10 WANZ standard house lots using standard aluminium

Summary

Window frames

- Has larger effect on smaller windows

Thermally broken Aluminium frames

- Reduced condensation
- Performance increase 16% to 24%
- Cost 12% to 20%*
- Bigger gains when combined with Low E glass & Argon

***With new suites due to be released**

Summary

Thermal spacers

- Has larger effect on smaller windows
- Reduced condensation
- Performance increase 0% to 8%
- Cost 0% to ?%

Summary

Argon gas

- Has bigger effect on larger windows
- Performance increase 3% to 4%
- Cost 3% to 8%
- Bigger benefit when combined with Low E glass.

Summary

Low E Glass

- Has big improvement on all windows
- Performance increase 42% to 46%
- Cost 11% to 13%
- Reduced condensation

Summary

Combinations:

- Provide large performance improvement over all window sizes

Thermally broken frames, thermal spacers, Low E glass & Argon gas

- Performance increase 88% to 124%
- Cost 48%*

*Expected to reduce

Conclusion

Use WEERS rating system to assess performance.

Aim for the highest level that your budget will allow.

Strive for Energy Star

Questions?

Independent, free personalised advice on
how to create a sustainable and healthy home.