

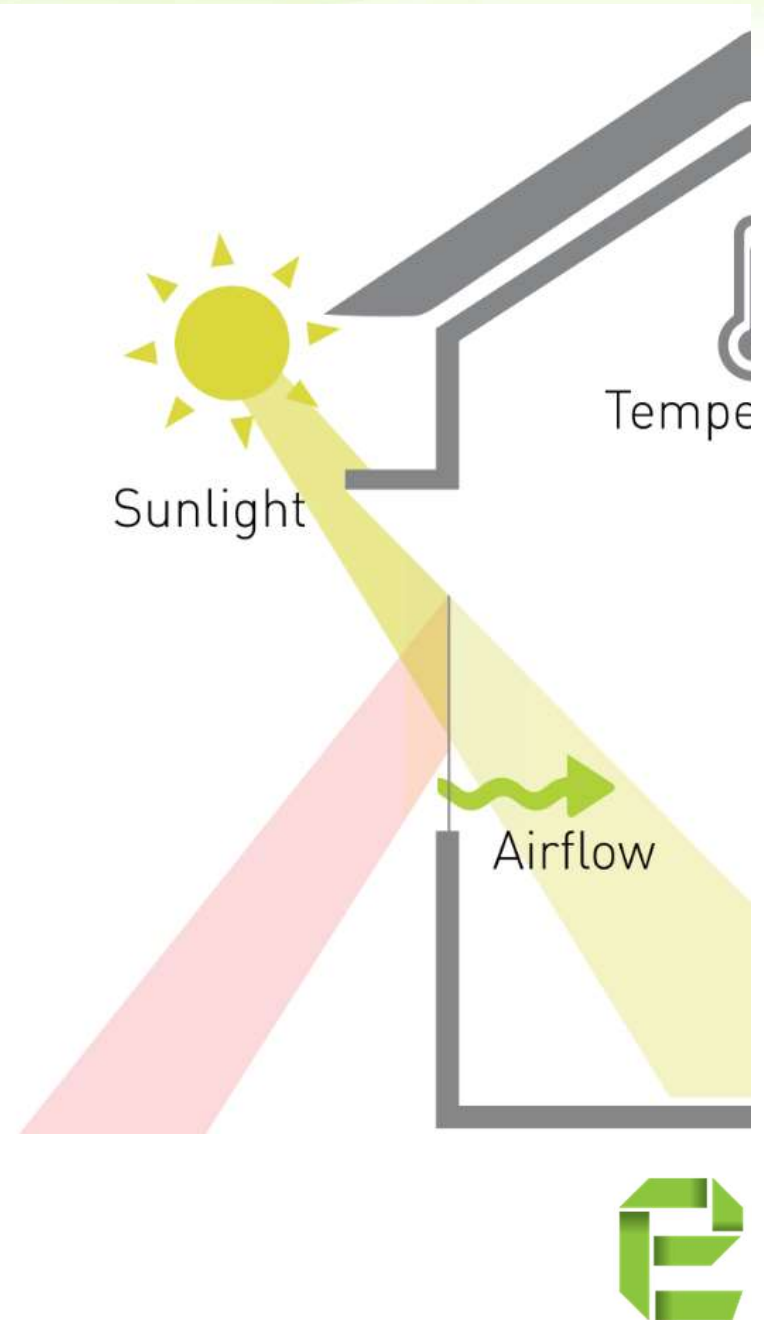
# Case study for solar design



## Case study: Solar Design

Middle of design phase,  
remaining variables are:

1. Shading
2. Glazing type
3. Glazing size



# Solar design

How does heat (energy) move around?

*Heat flows due to:*

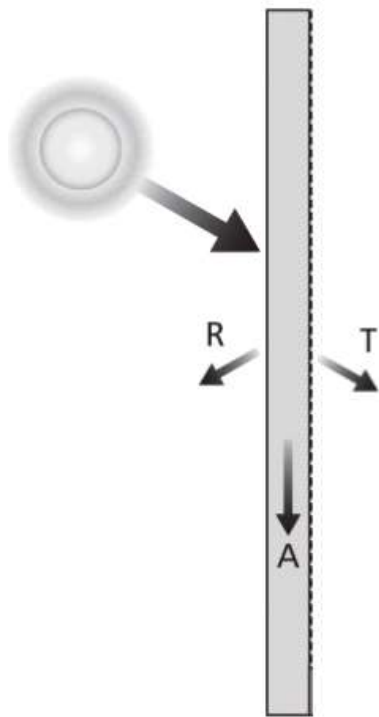
- *conduction (on contact)*
- *convection (through air or liquid)*
- *radiation (like sunshine)*



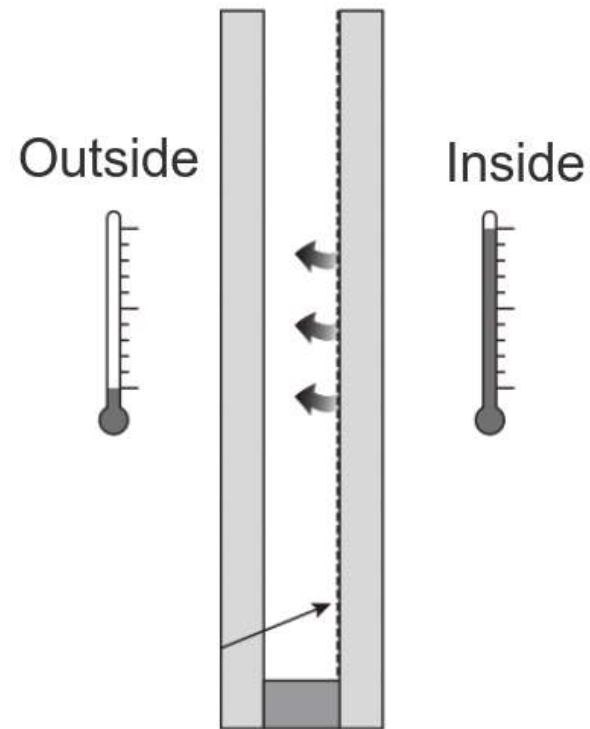
# Solar design

How does heat get in through glass?

*Transmitted  
sunlight  
(heat)*



*Temperature  
differences*



## Glazing types

*Important thermal properties of glass:*

- 1. Solar Heat Gain(SHGC): reduce heat*
- 2. U-value: Temperature difference*
- 3. Visual Light Transmittance(VLT): Daylight*

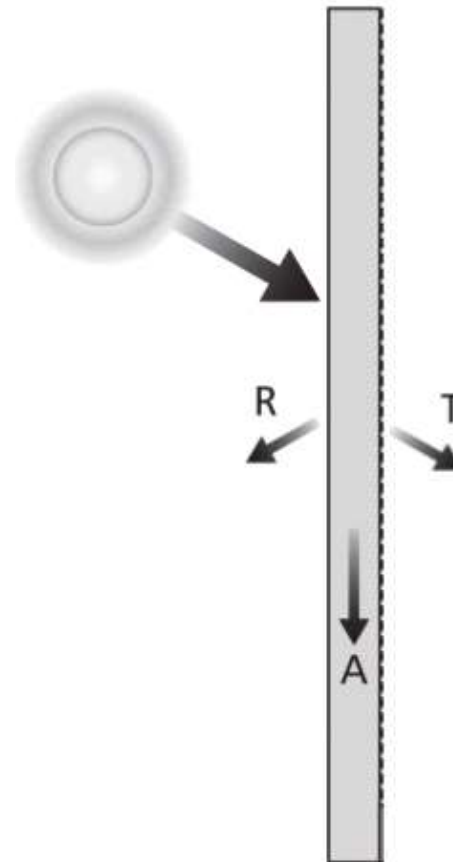
No	Glass Model	SHGC	VLT	U-value
1	NC60E	0.53	0.57	3.8
2	NC55E	0.45	0.7	3.8
3	NC52	0.59	0.54	5.8
4	Clear	0.84	0.89	5.8



## Glazing Property: Solar Heat Gain

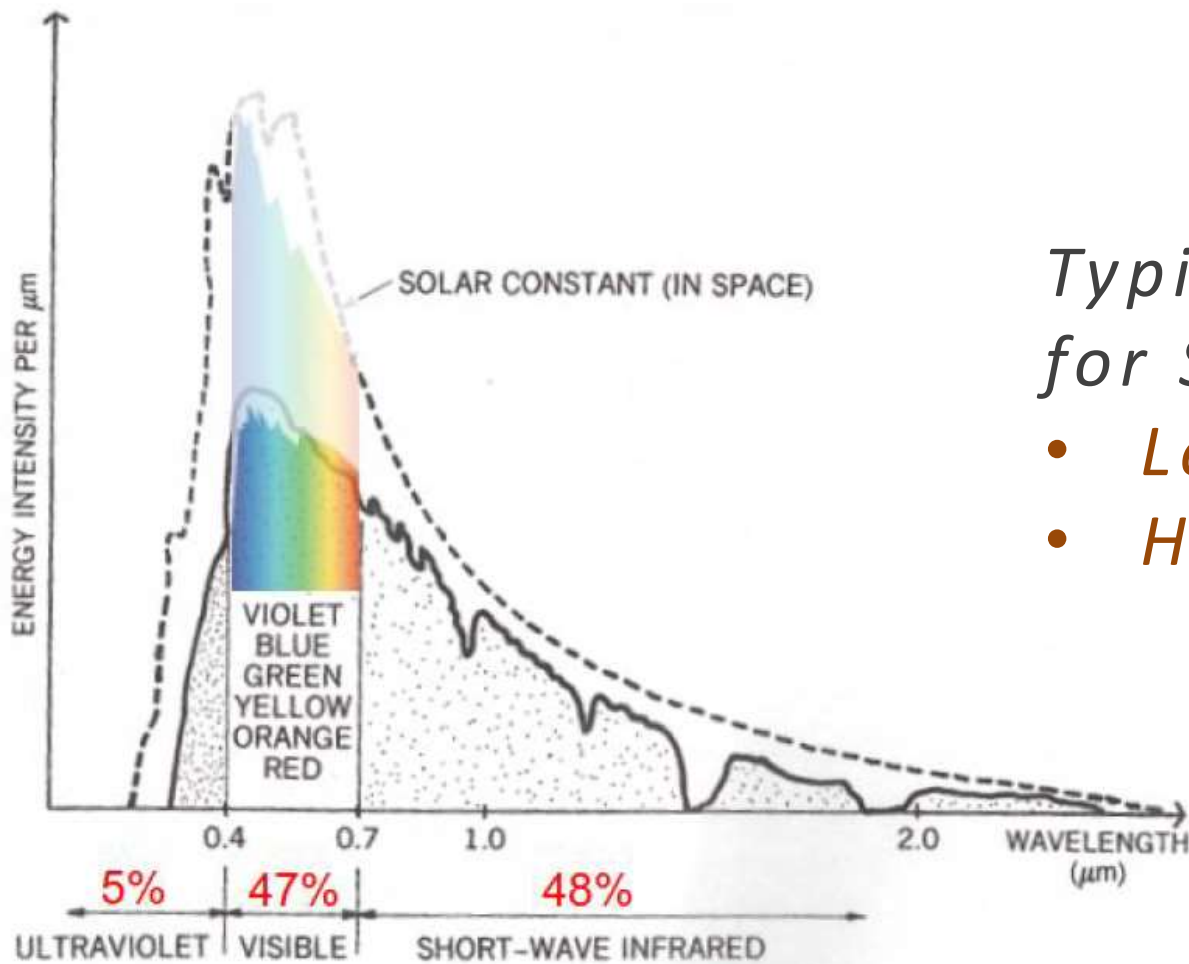
*When sunlight strikes glass, one of three things happen:*

- 1. Reflected*
- 2. Absorbed*
- 3. Transmitted*



# Direct Sunlight (aka shortwave radiation)

*Almost half is visible, and the rest is heat.*



*Typically good for SA climate:*

- *Low SHGC*
- *High VLT*



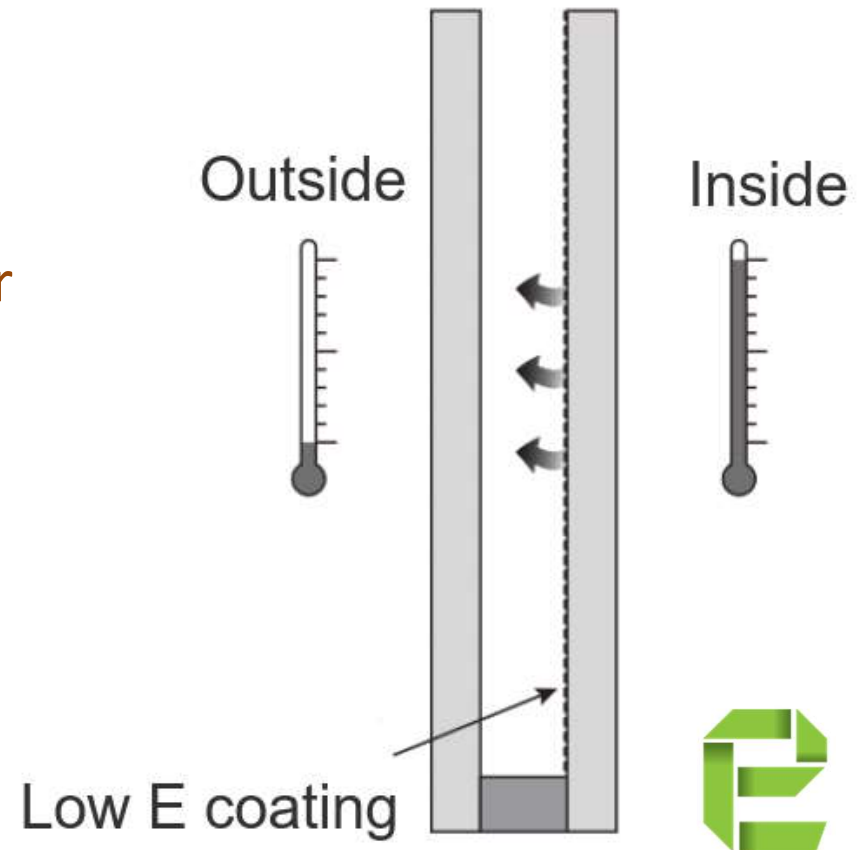
## Glazing property: U-Value

**U-value:** is the insulation of the glass.  
It reduces temperature driven heat transfer (**not** solar radiation)

Options:

- Multiple glass panes
- Low-E
- Vacuum/ gas instead of air

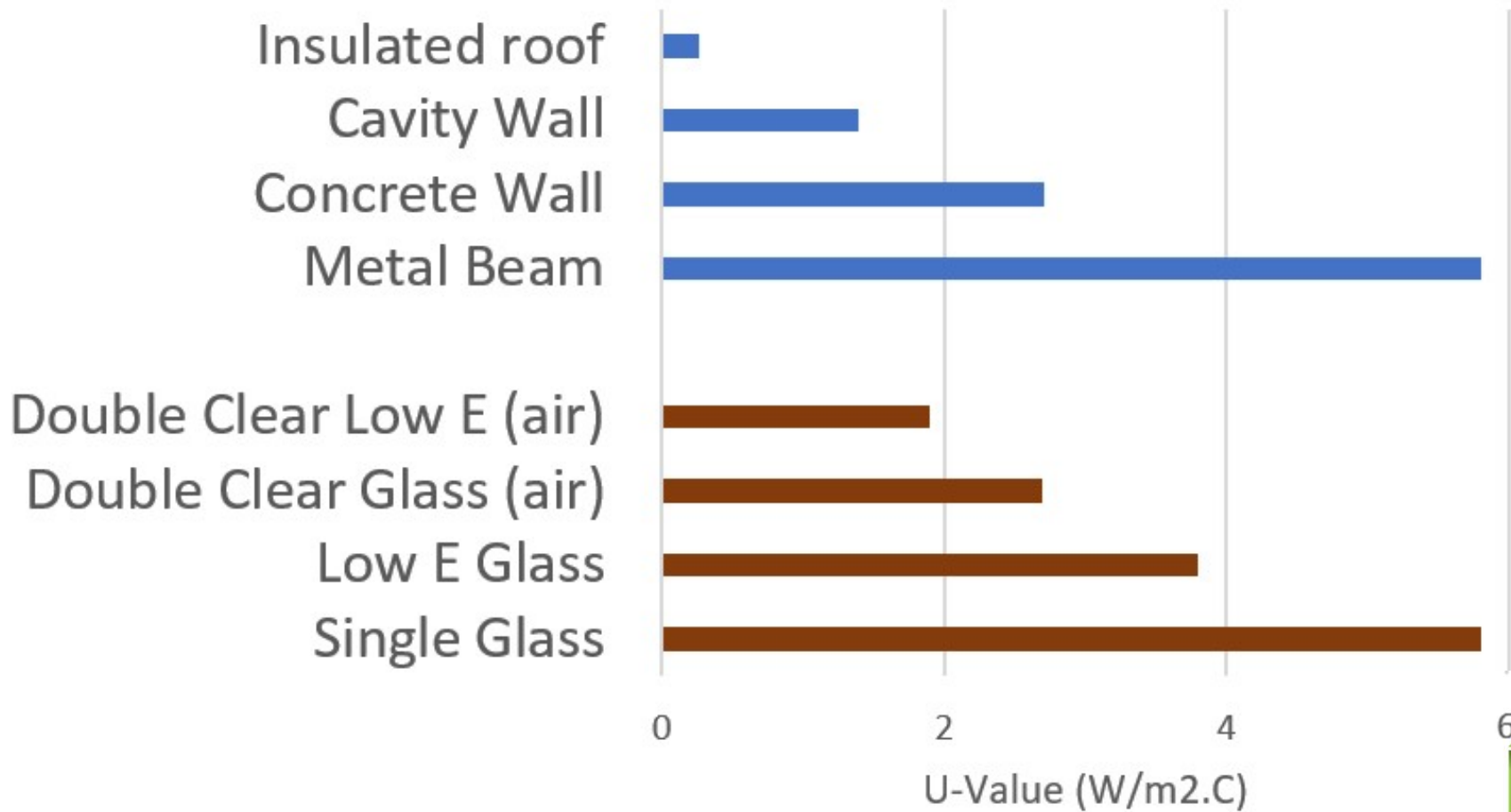
Most useful for spaces that require a lot of heating.





# U-Value in context

U-Value - how well is heat transferred?



## Real Case study

No double glazing was considered.

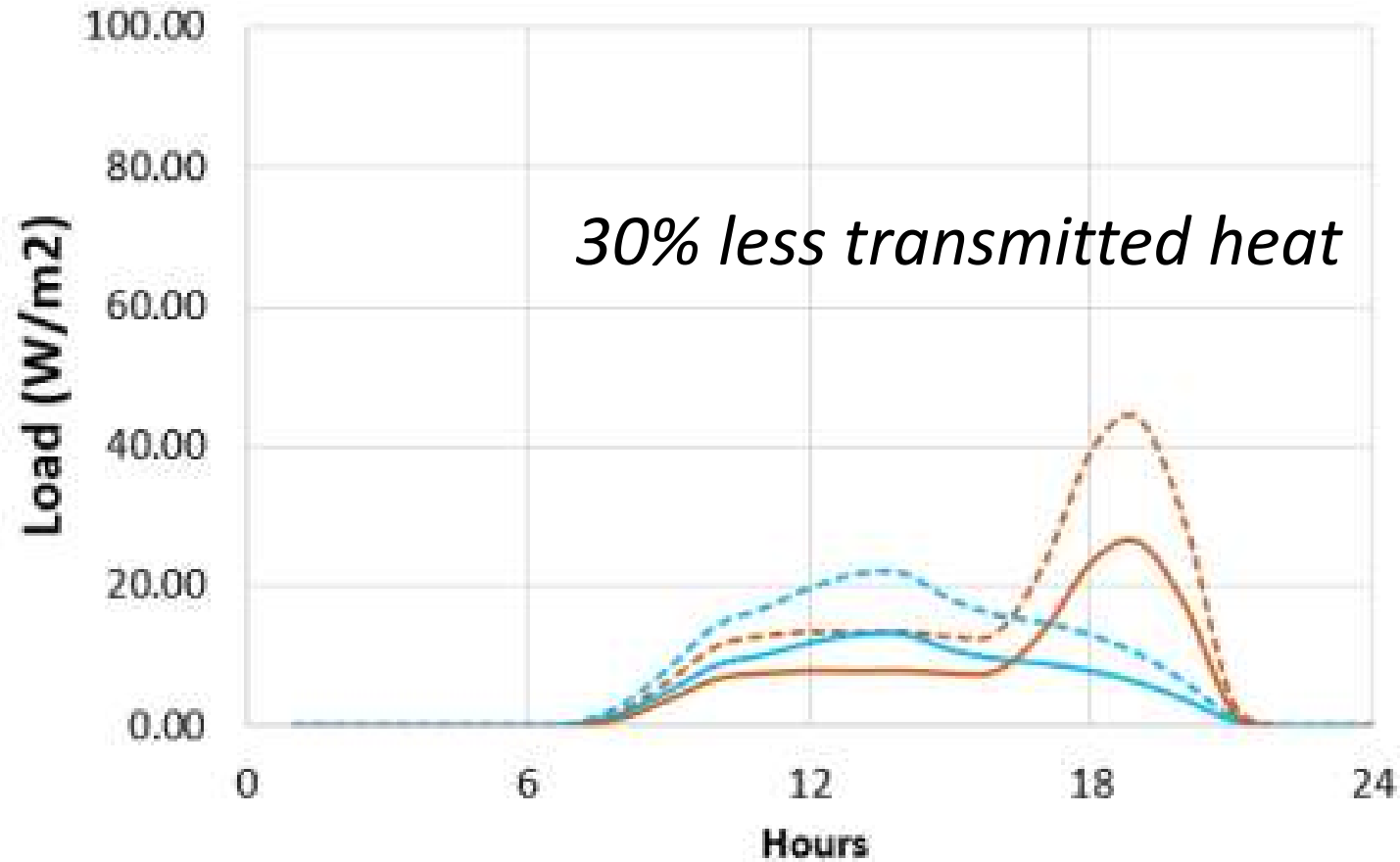
**Most cost effective** single glazing was selected:  
Low SHGC, Reasonable VLT.

No	Glass Model	SHGC	VLT	U-value
1	NC60E	0.53	0.57	3.8
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3	NC52	0.59	0.54	5.8
4	Clear	0.84	0.89	5.8



# Glazing type

## Summer Solar Heat Gain through Windows

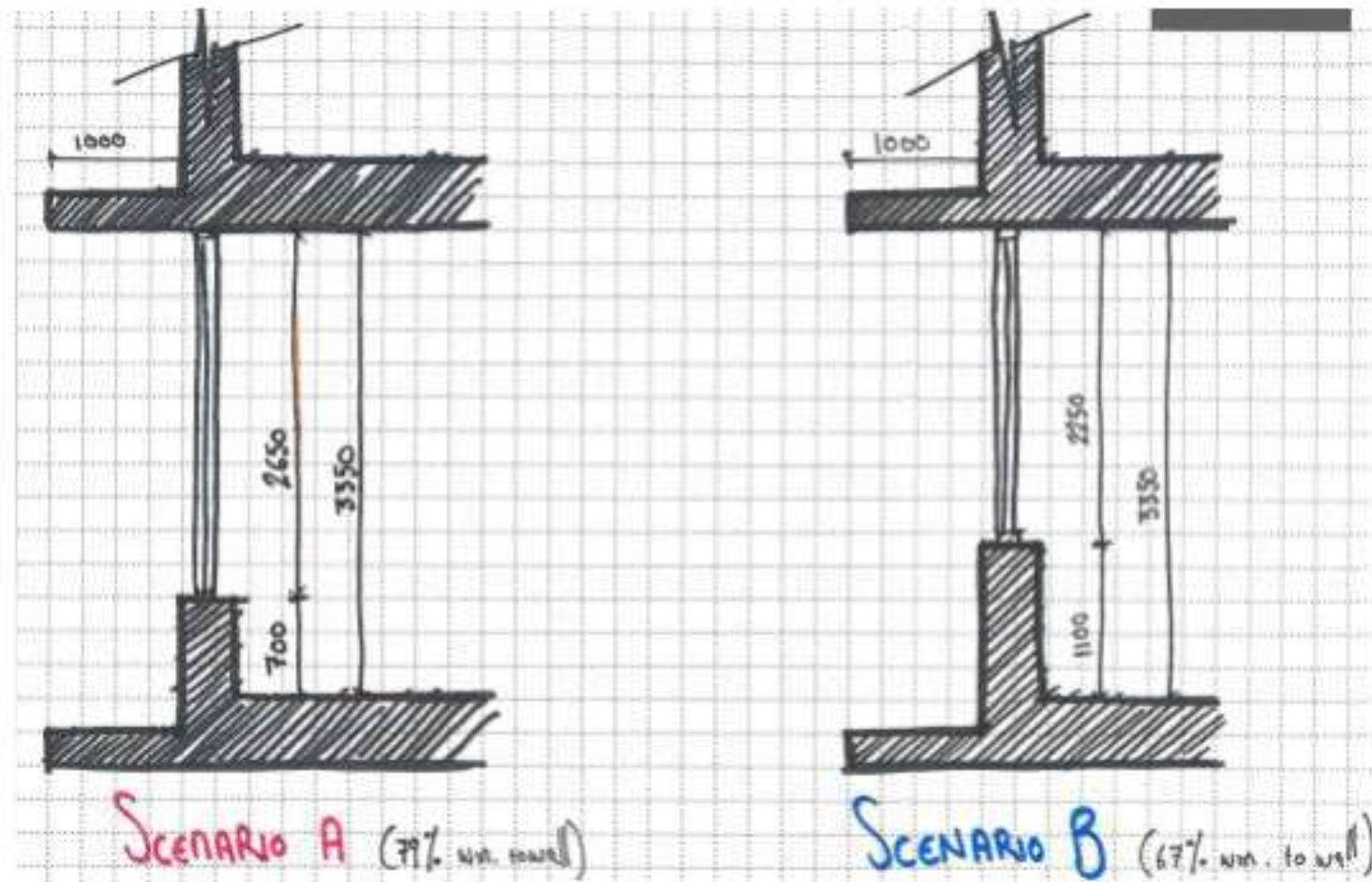


--- North- Clear    --- West - Clear  
— North - NC52    — West-NC52



# Glazing size

A variable glazing ratio was approved (5 options)



## Case Study: Glazing distribution

We discovered the best way to communicate design iterations was to mark up plan drawings.



Colour	Scenario	Glass to Wall %
		%
Red	A	79
Blue	B	67
Green	C	91
Grey	D	55
Yellow	E	100



## Case study: Highlights

- **Owner-occupied** office: more incentive to operate 'green'
- Green Star standard **used**, but no certification.
- **Solar design** used to optimise façade for function, economy, and aesthetics.
- **Marked up drawings** – great way to communicate design iterations between Architect and Energy modeller.
- **Possible improvements**: Consider introducing modelling and sustainable design even sooner: during **concept design**.

