



Glass in Smart Development

We have been talking....

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GST: Green Solution through glass

Glass in Safety: An Oxymoron

Transparency in Healthcare buildings

Smart Development with Smart solutions & investment

Many More....

People know...



Connects to environment
**Positive psychological
impact**



Brings natural light



Aesthetically appealing

Challenges in creating market awareness despite knowing the basic advantages

Misconceptions...

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Glass is not a reliable building material.



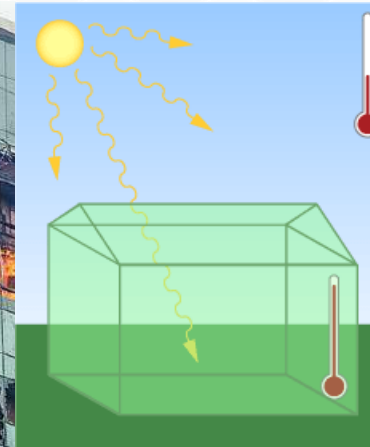
Glass suicide in vertical
facades



No sound insulation



Poor resistor of
fire



Traps heat

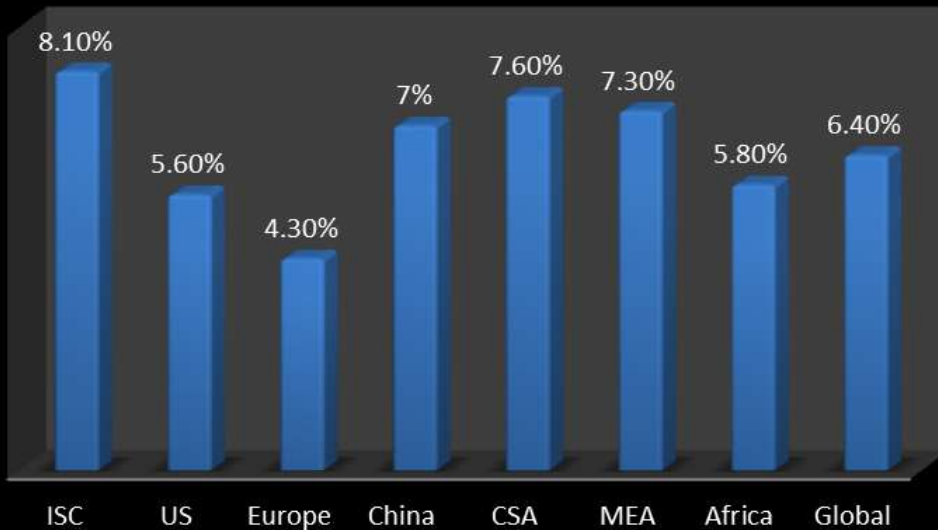


Expensive

Global Statistic says:

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Glass Market CAGR 2015-22



Global market size growth at 6.4% CAGR in 2015-22

Glass market size: Expected growth from 61.33 Million MT to 112.45 MT per annum in next decade.

ISC (Indian Sub Continent, CSA (Central & South America), China & MEA (Middle East Asia) are expected to grow more than global average market.

Asia is expected to be the centre of growth in coming years.

Indian Statistic says:

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Per capita float glass consumption is only 1.1kg, compared to an average of 8-10 kgs in other developing economies.

(Rapid growth in housing and automotive sectors shows tremendous potential)

ISC where India is the focal country is expected to grow at fastest rate @ 8.10% CAGR

(Low per capita glass consumption, favourable political situation, increase in awareness about Green building and energy efficiency.)

Float Glass demand is expected to grow at 7 to 9 % initially and expected to increase in phases

(9-11% in 2018-19 and 12-13% YoY)

Indian Statistic says:

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High performance glass growth is expected to be lower at 6-8%
(Stagnation in IT/ITES sector and pressure on commercial sector.)

Reflective glasses which is majorly used in residential segment is expected to grow at 12-13% in the light of high demand expectation from residential segment as well as moving up in value chain.

Architectural float glass in India is approx. 1.8 Million MT/ annum.
Clear glass accounts approximately 58% of the market share
82% of the float glass demand is met by domestic manufacturers;
rest 17% is supplied by importers from various countries

Extensive use of Glass

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Construction industry has replaced RCC with extensive use of glass without actually understanding glass as a building material.



Market awareness..

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Disadvantages

Advantages

Traps heat

Can't be repaired

100% recyclable
with same quality

Sound insulation

Thermal comfort

Energy cost saving



Glass is a sustainable building material

SMART is the new Buzz..

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Smart
Building

Smart
Phones

Smart
Cities

Smart
????????

Smart
Technology

Smart
??????

Many more..

The Smart development guidelines

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USGBC



IGBC



GRIHA

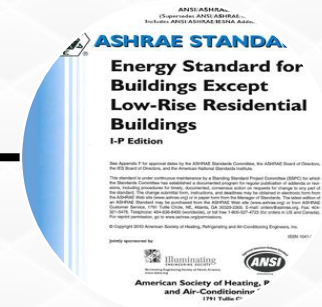
The Smart development guidelines



NBC



ECBC



ASHRAE

The Smart development guidelines



**Development
Mission**

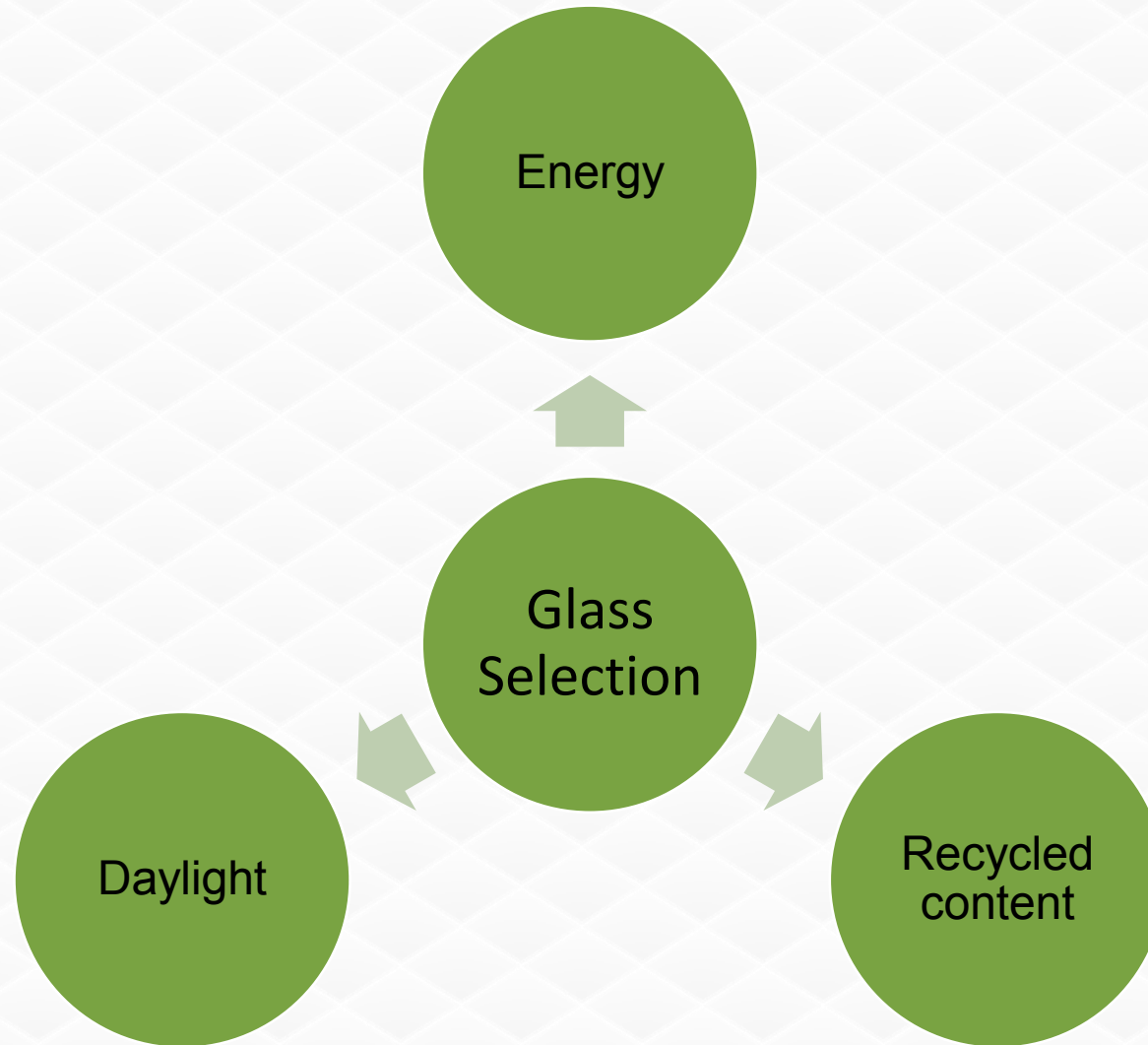


**Smart
City**

Transforming the Nation

One way approach....

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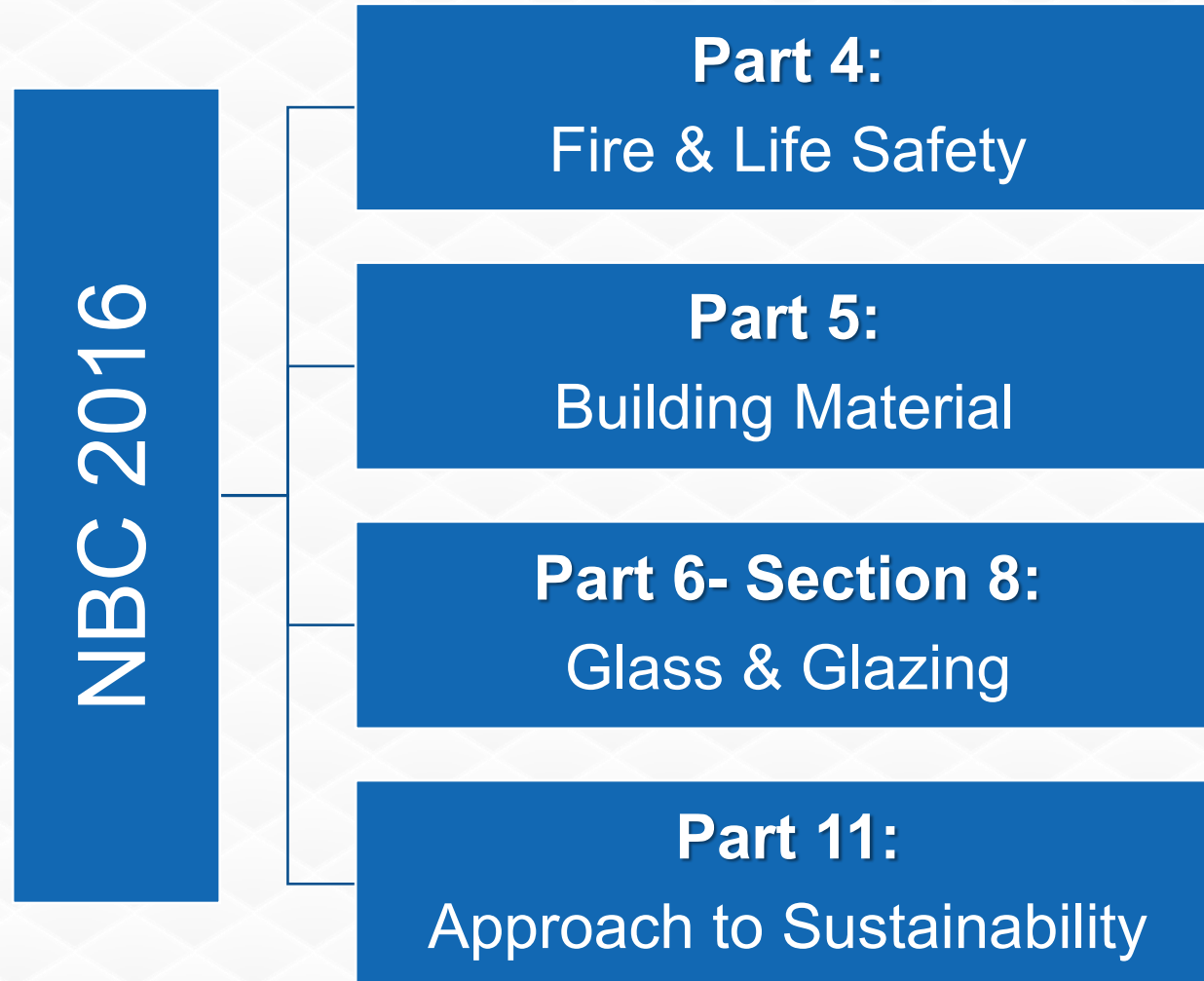


Glass is not only about energy efficiency but Life and Human safety

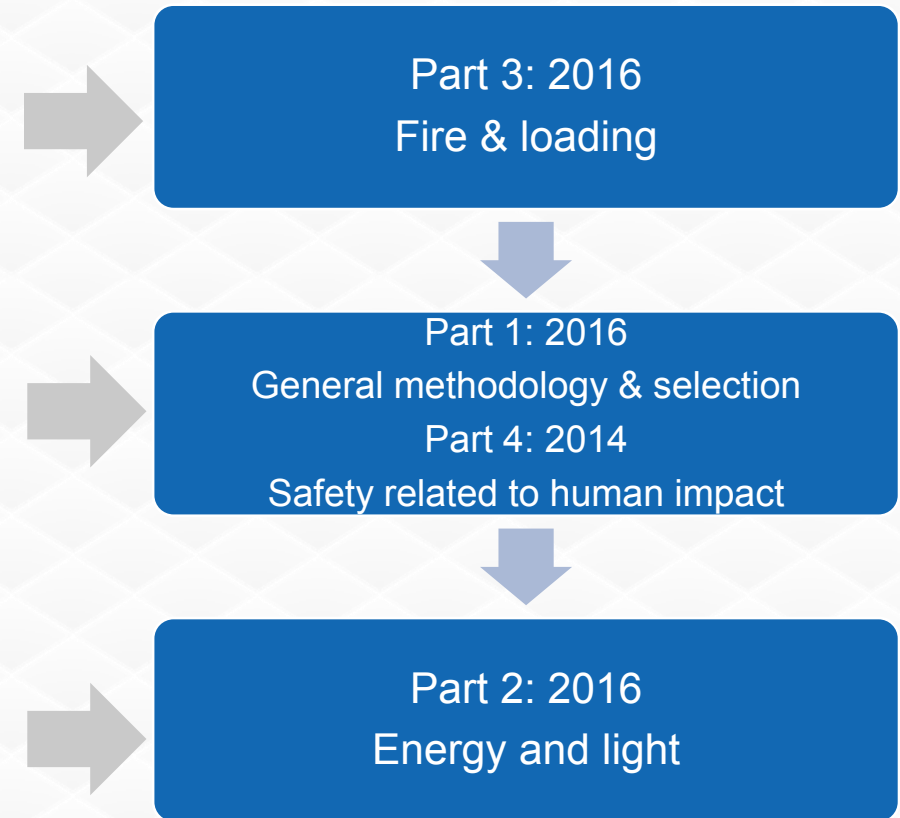
Glass & Glazing in NBC 2016

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Chapters on Glass in NBC-2016

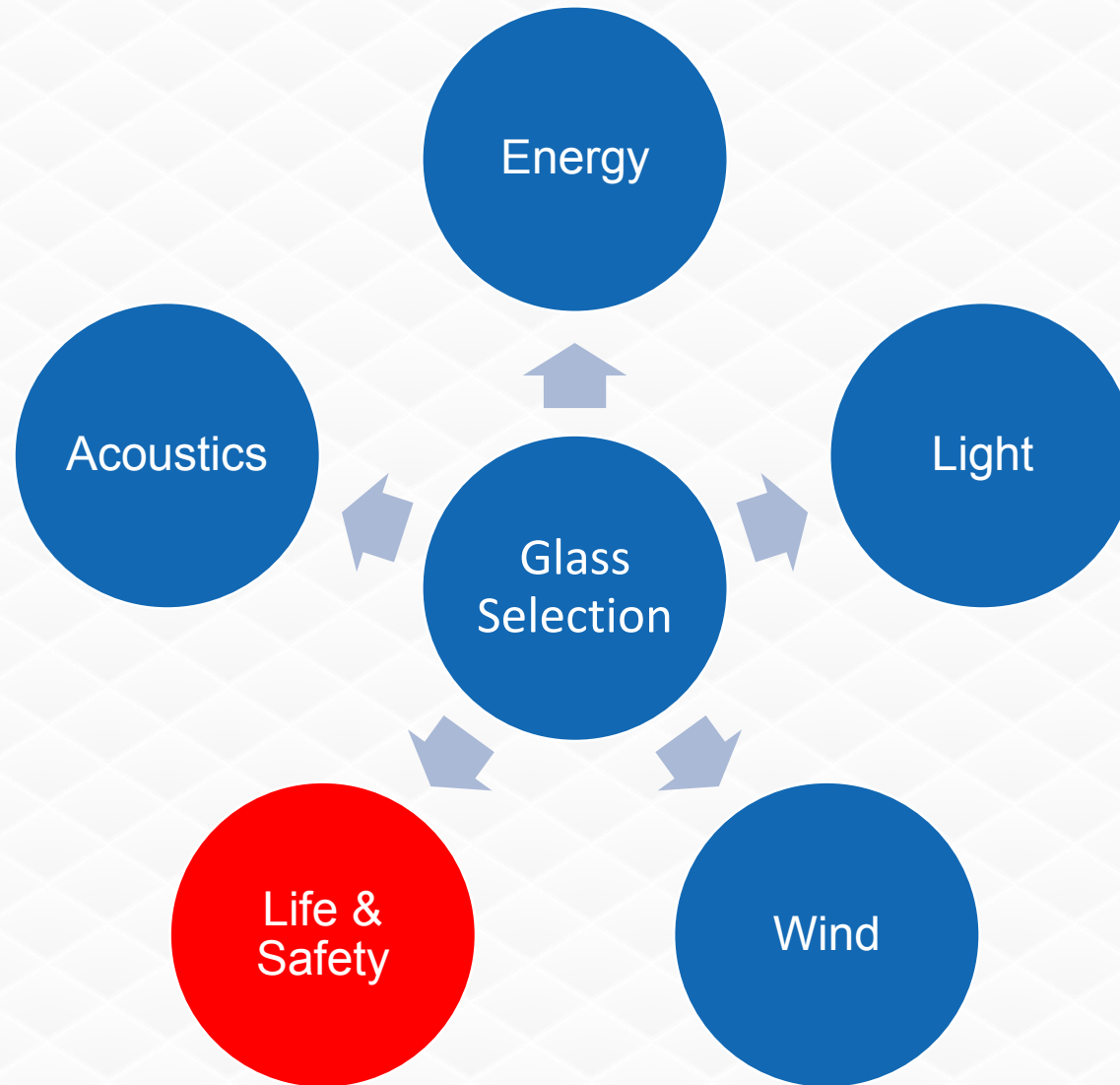


Code of use of Glass in Buildings:
IS 16231



361° Approach

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Glass is an engineered product

Analysis in Glass Selection

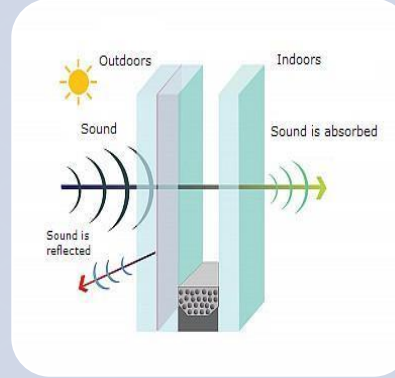
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Simulation approach to derive
savings in cooling loads



Simulation approach to derive
Daylight levels
Savings in artificial lighting



Various tests to derive
optimum thickness or configuration of glass to reduce sound levels



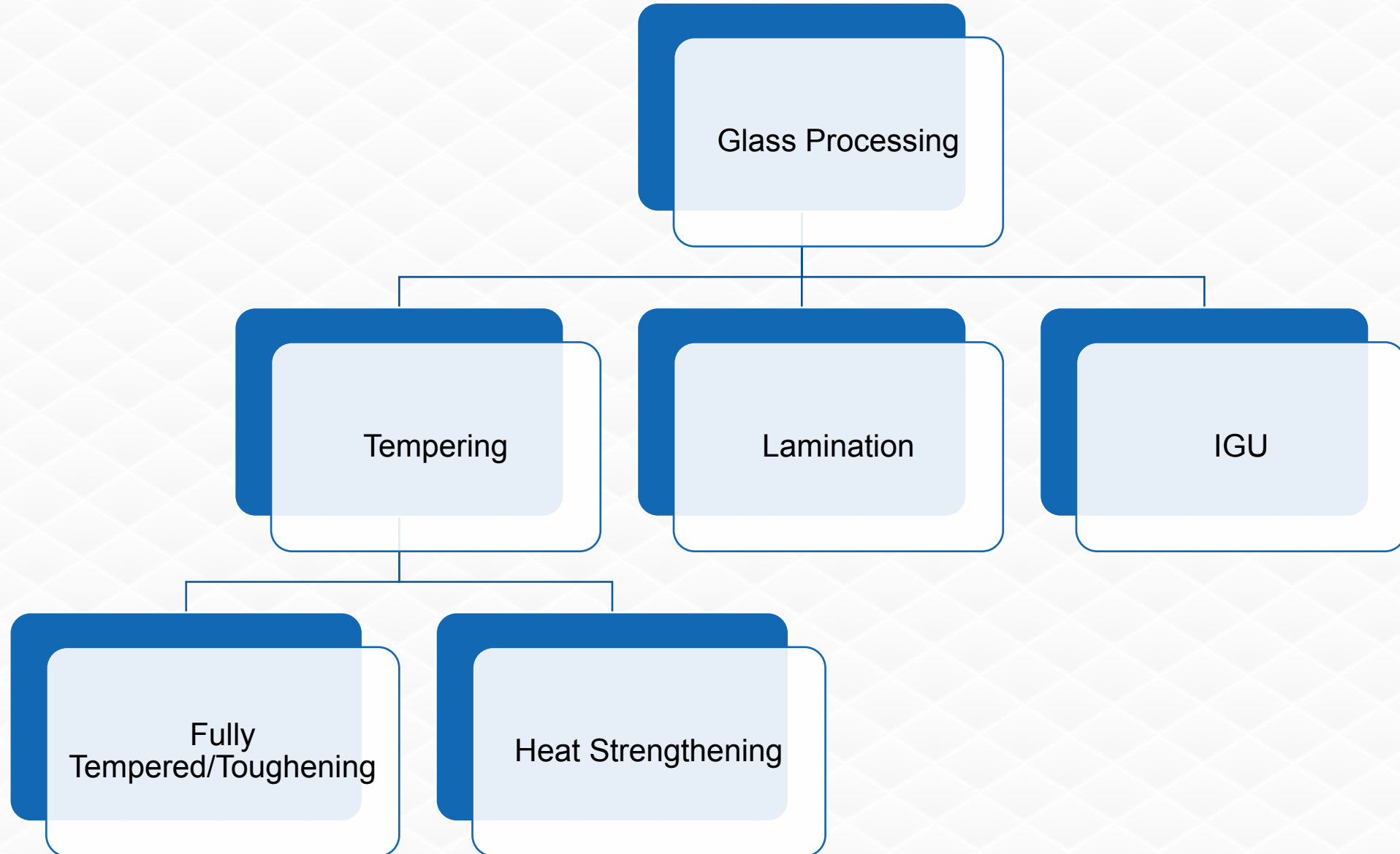
Simulation & ISO standard application to derive
Optimum glass configuration & thickness to with stand Wind at different heights



Various tested product & globally approved products to cater
Fire separation areas & products which can withstand fire & heat as prescribed in latest Codes

Life & Safety: Glass Processing

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Highlights of NBC-16 on Life & Safety

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Table 1 Fire Resistance Ratings of Structural and Non-Structural Elements (minutes)
(Clauses 3.3.1 and 3.3.2)

Sl No.	Structural Element	Fire Resistance Ratings (min) for Type of Construction			
		Type 1	Type 2	Type 3	Type 4
(1)	(2)	(3)	(4)	(5)	(6)
i)	Exterior walls:				
	a) Fire separation less than 3.7 m:				
	1) Bearing	240	120	120	60
	2) Non-bearing	120	90	60	60
	b) Fire separation of 3.7 m or more but less than 9 m:				
	1) Bearing	240	120	120	60
	2) Non-bearing	90	60	60	60
	c) Fire separation of 9 m or more:				
	1) Bearing	240	120	120	60
	2) Non-bearing	60	60	60	60
ii)	Fire separation assemblies (like fire check doors)	120	120	120	120
iii)	Fire enclosures of exits	120	120	120	120
iv)	Shafts for services, lift hoistway and refuse chutes	120	120	120	120
v)	Vertical separation between adjacent tenant spaces	60	60	60	60
vi)	Dwelling unit separation:				
	a) Load bearing	120	120	60	60
	b) Non-load bearing	60	60	30	30
vii)	Interior bearing walls, bearing partitions, columns, beams, girders, trusses (other than roof trusses) and framing:				
	a) Supporting more than one floor	240	120	120	120
	b) Supporting one floor only	180	90	60	60
	c) Supporting a roof only	180	90	60	60
viii)	Walls supporting structural members	180	90	60	60
ix)	Floor construction	120	90	60	60
x)	Roof construction:				
	a) 5 m or less in height to lowest member	120	90	60	60
	b) More than 5 m but less than 6.7 m in height to lowest member	60	60	60	60
	c) 6.7 m or more in height to lowest member	0	0	0	0

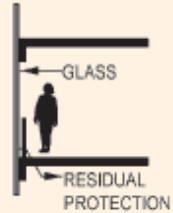
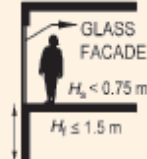
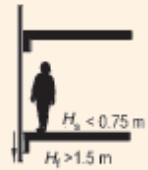


NOTES

1 The above fire resistance rating shall be required to achieve the respective type of construction unless otherwise specified in the respective clauses for different applications/use.

2 In case of lift bank, the partition wall, if any, need not be of fire rating specified in this table.

Fire rating of structural and non-structural elements

Table 30 Type of Glass Suggested for Use at Different Critical Locations/Cases in Buildings
(Clause 7.3)

	CASE 1 Vertical Walls with Residual Protection or $H_c \geq 0.75$ (not Likely to be Subjected to Human Impact) (1)	CASE 2 Vertical Walls $H_c < 0.75$ m and $H_c \leq 1.5$ m (Human Impact but no Risk of Fall) (2)	CASE 3 Vertical Walls $H_c < 0.75$ m and $H_c > 1.5$ m (Human Impact and Risk of Fall) (3)	CASE 4 Horizontal or Sloped Glazing Glass (Risk of Fall) (4)	CASE 5 Glass Acting as a Balustrade/ Railing (Human Impact and Risk of Fall) (5)
	(1)	(2)	(3)	(4)	(5)
					
Type of glass	Any glass ^b	Safety glass	Safety glass ^b	Laminated safety glass	Laminated safety glass
Examples	Residual protection is the safeguard provided to avoid the impact of human being on glass. It is provided on the side of the glass where there are chances of human impact. It can be achieved by providing protection in the form of a sill structure or transom, chair rail or grill work inside	a) Doors b) Side panels c) Curtain walls d) Glazed area e) Doors in bathroom 1) Fully framed 2) Partially framed 3) Frameless f) Façade g) Windows h) Internal partitions and doors j) External facade and doors on ground floor, above floor with terrace outside.	a) Curtain walls b) Façade c) Spandrels d) High activity area e) High risk area f) To avoid risk	a) Roof (Skylights) b) Ceilings c) Bus shelters d) Floors e) Stairs f) Sloped facade	a) Balustrades b) Balcony c) Railings

Safety glass is not mandatory.
Laminated float glass is preferred.

Type of glass suggested at different locations

Life & Safety: Glass Products

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Keeps you safe from fire, heat and smoke for extended period



Ensures protection against radiation and conductive heat transfer



Provides excellent noise reduction from the outside



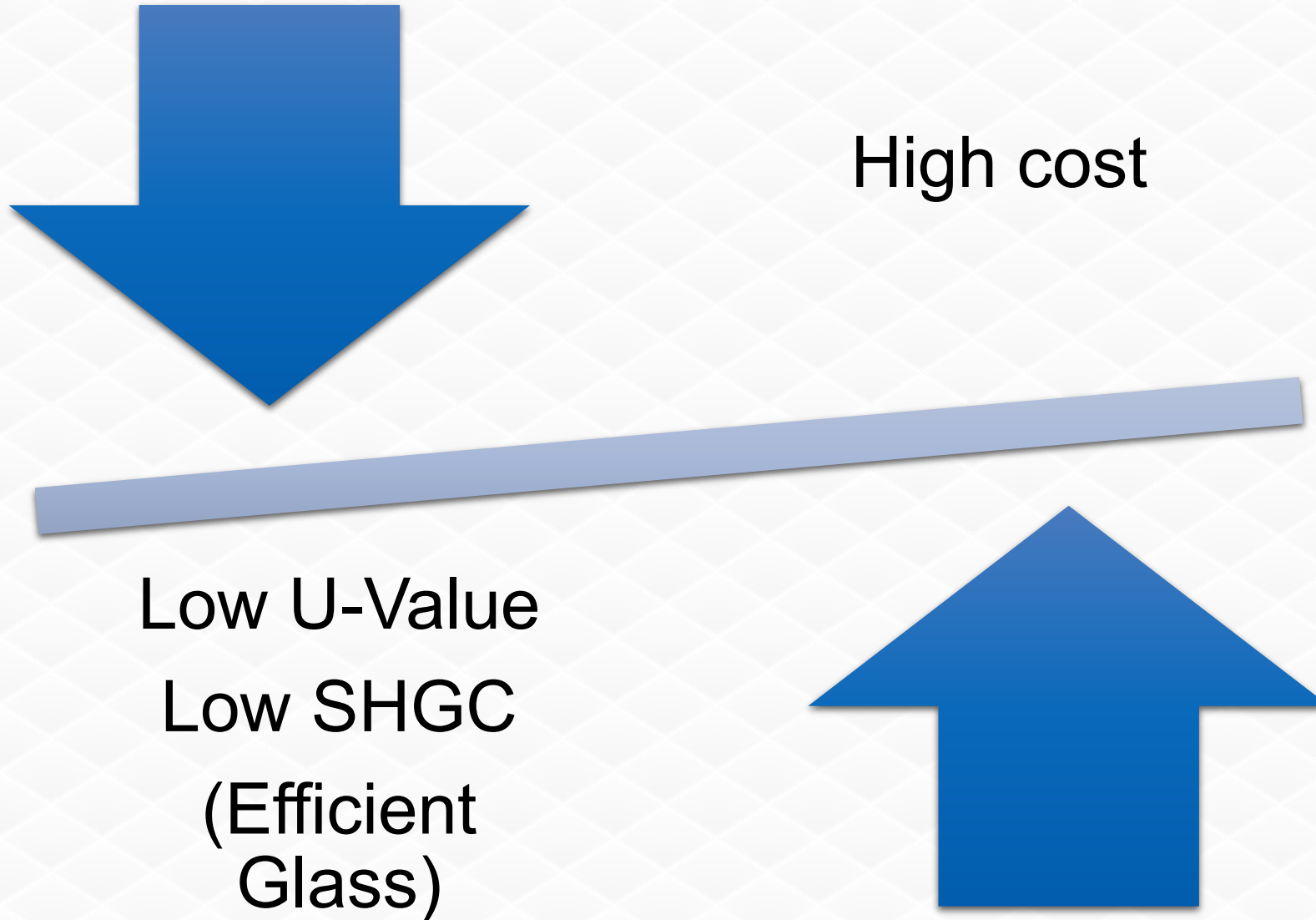
Built to resist extreme levels of pressure, making it almost unbreakable



Safety glass according to EN 12600
Rated EW 30, EW 60, EW 120, EI 130, EI 60, EI 90 and EI 120

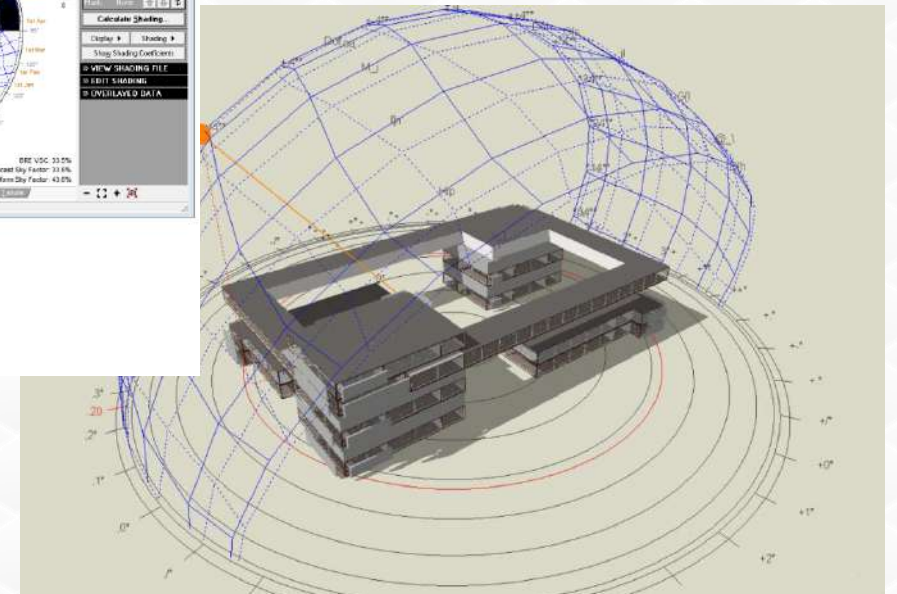
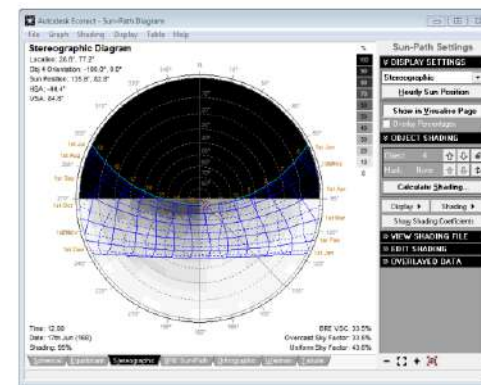
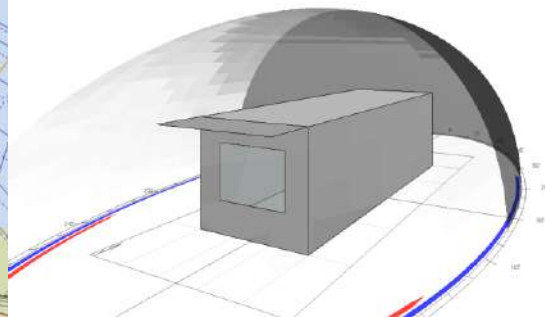
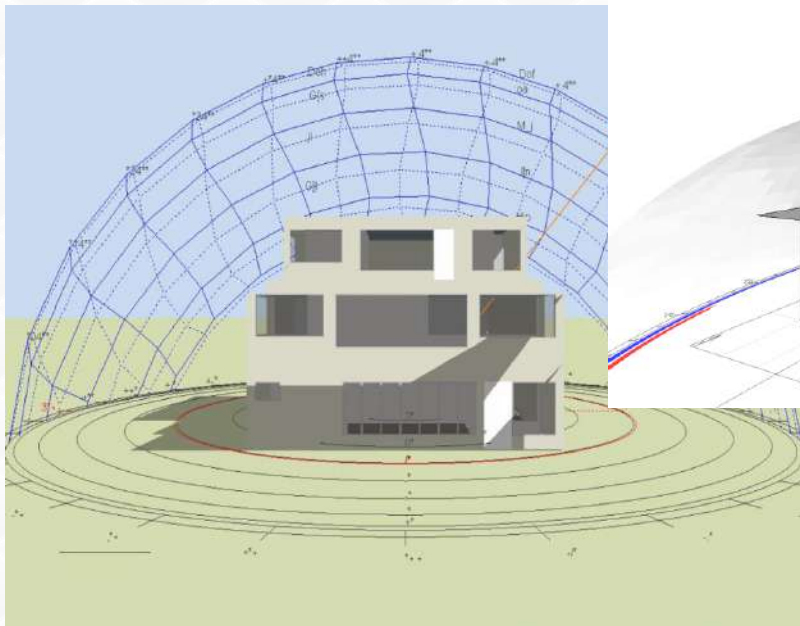
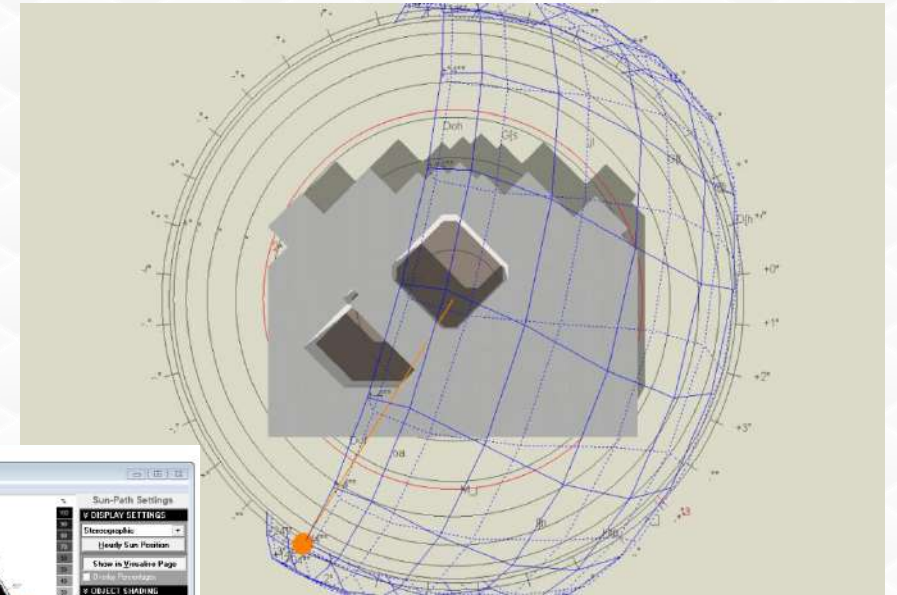
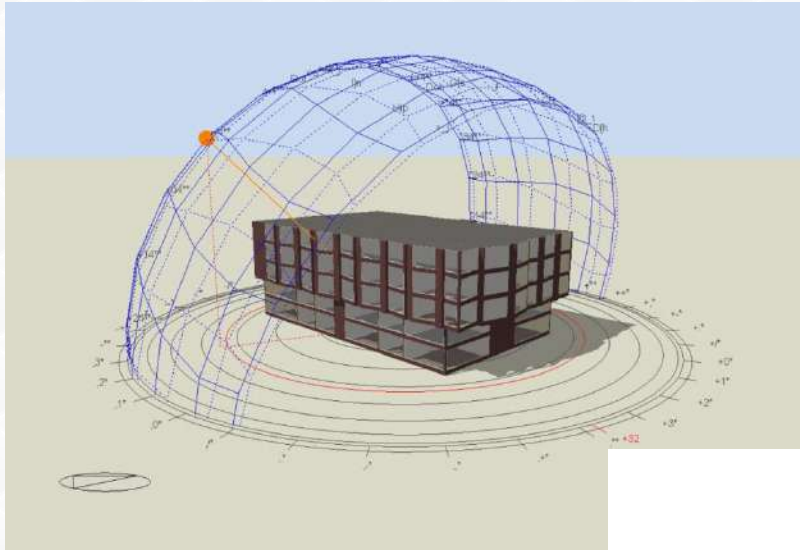
Relation: Glass and Cost

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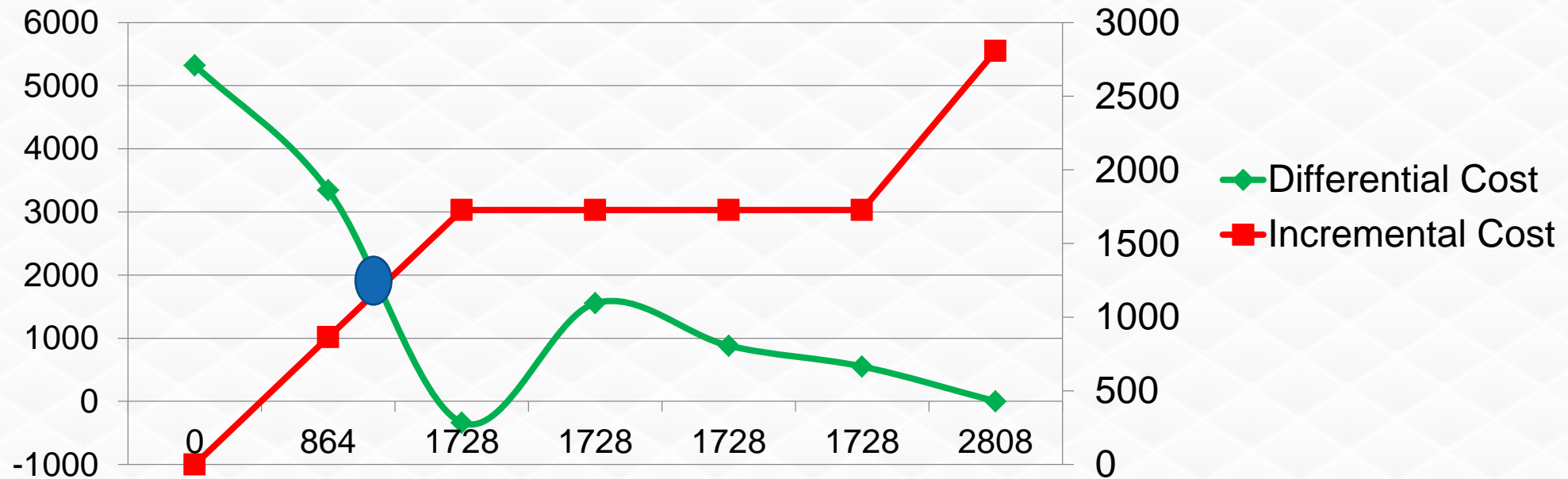
SMART solutions

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Glass in Energy efficiency

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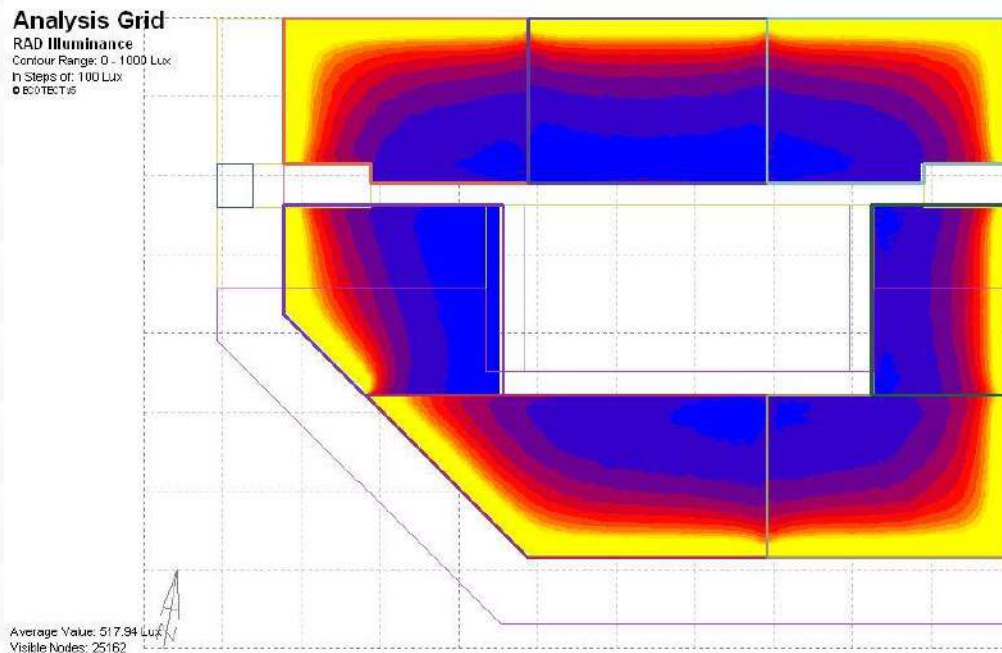


The perfect ROI

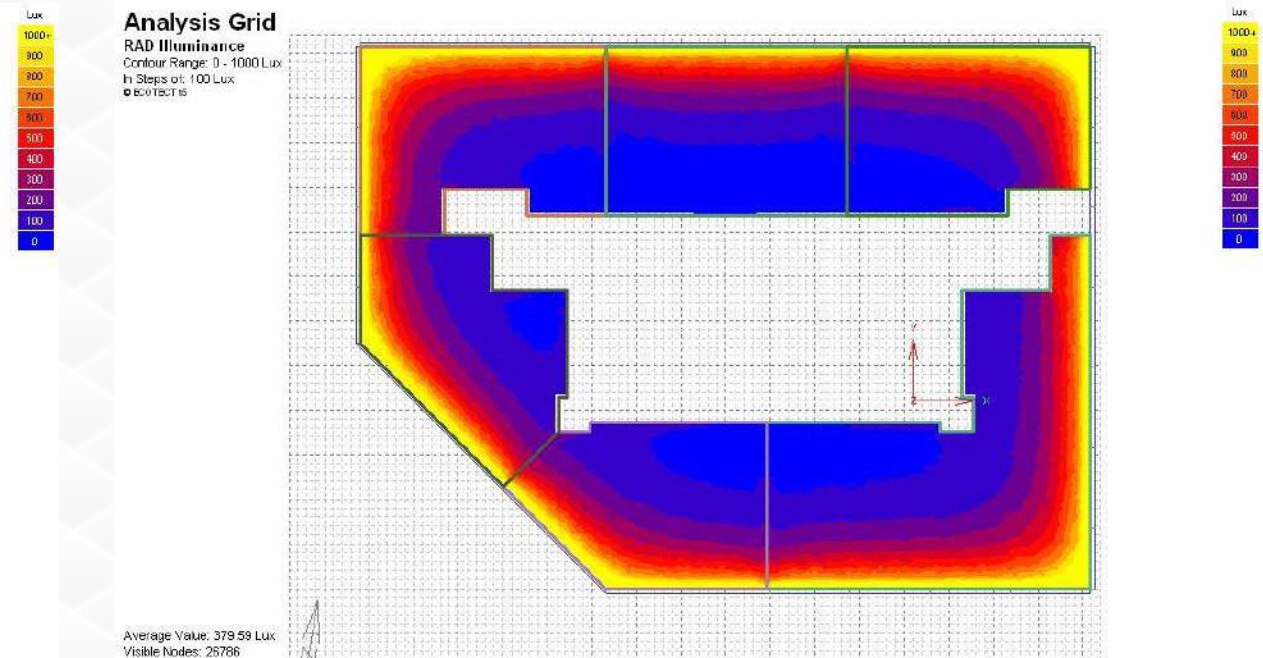
Glass in Daylighting

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WWR – 50% Glass without shading



WWR – 50% Glass with shading



Average lux level achieved is 518 lux

Average lux level achieved is 380 lux

S M A R T

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S

Scientific

M

Measurable

A

Approach

R

Right

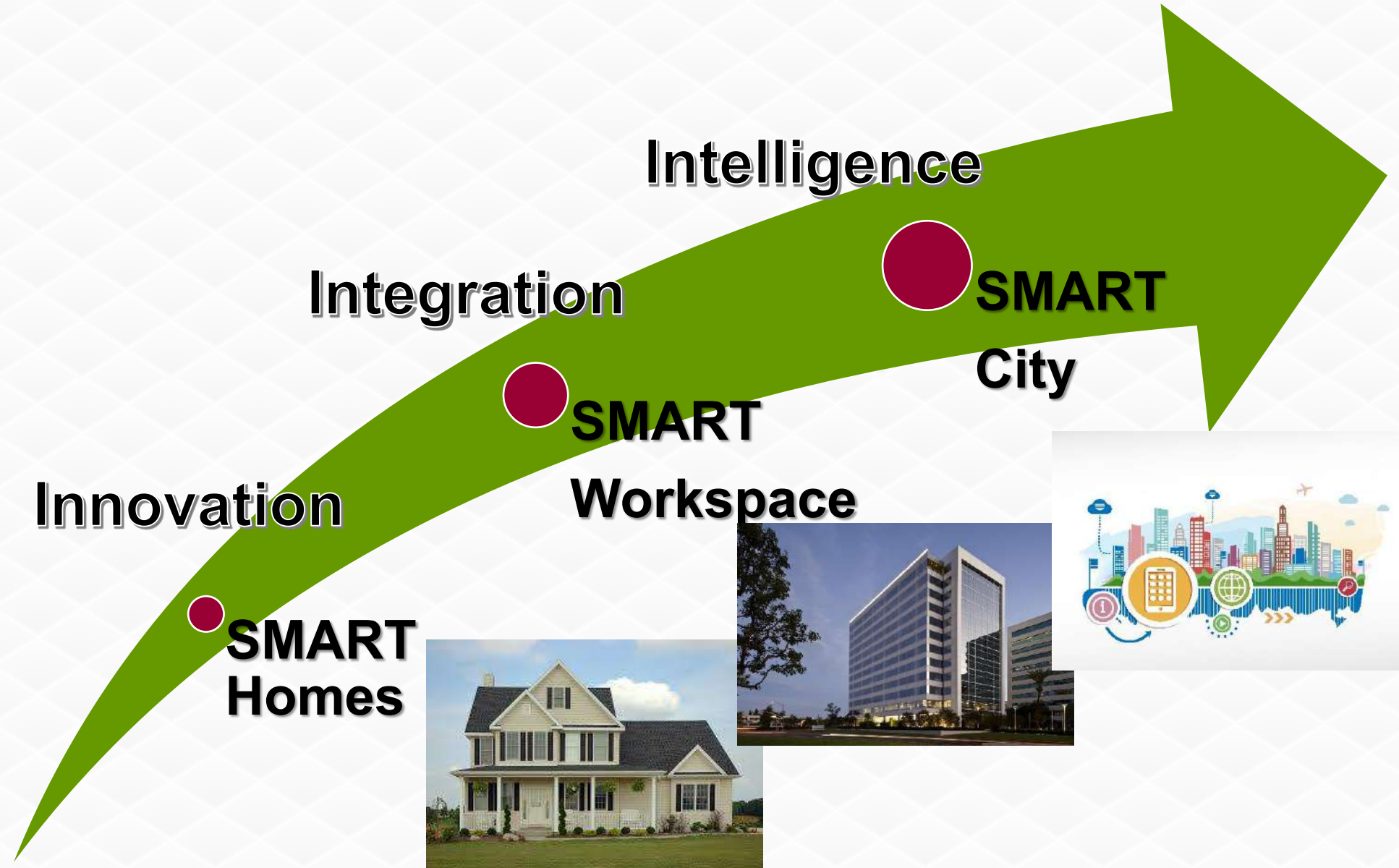
T

Technology

What is not measured can not be controlled and vice-versa

Smart development approach

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What makes you Smart..?

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Attire..??

What makes you Smart..?

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Attitude and Approach..??

An appeal....



Don't be in the dark



See More....



Thank You

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