Glass – A quick background

<table>
<thead>
<tr>
<th>Glass is an amorphous (non-crystalline) solid material</th>
<th>The word ‘Glass’ is derived from the Latin term ‘Glesum’ which means a transparent substance</th>
<th>Glass is typically brittle and optically transparent</th>
<th>The commonly used glass types are Flat glass and Container glass</th>
</tr>
</thead>
</table>

**Flat glass** is a type of glass, initially produced in plane form, commonly used for windows, glass doors, transparent walls and windshields and of two types:
- Sheet Glass
- Float Glass

**Container glass** is a type of glass used for the production of glass containers.
Is Glass Indispensable?

YES.
And for more than one reason!

<table>
<thead>
<tr>
<th>Unmatched aesthetics</th>
<th>No deterioration, corrosion, stains or fading throughout its lifespan.</th>
</tr>
</thead>
<tbody>
<tr>
<td>which allow architects and builders to explore unconventional building shapes.</td>
<td>Transparent to visible light.</td>
</tr>
<tr>
<td>Zero-degeneration and easy maintenance which helps in maintaining a clean environment.</td>
<td>Can be recycled indefinitely as the structure of glass does not deteriorate through the process.</td>
</tr>
<tr>
<td></td>
<td>A Sustainable material.</td>
</tr>
</tbody>
</table>

Glazing Selection Parameters

- Strength
- Security
- Application
- Energy Efficiency
- Sound Insulation
**Myth:** All Glasses are the same.

**Reality:** A single element added to glass can significantly change its properties.

When people think of glass for a house, the first things that come to mind are windows and cookware. That was in the past. With the advancement of technology and science, it is now possible to manipulate glass at a molecular level which makes it take on countless other capabilities making it ideal for more than just windows.
### Reality: Glass has a variety of uses

<table>
<thead>
<tr>
<th>Facades</th>
<th>Commercial</th>
<th>Residential</th>
<th>Industrial</th>
<th>Amenities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structures</td>
<td>• Hotels • Offices • Retail outlet • Malls</td>
<td>• Housing • Hostel</td>
<td>• Automobiles • Pharmaceutical • Other Manufacturing Ind. • Packaging Industry</td>
<td>• Museum • Public Library • Parks • Streetscape</td>
</tr>
</tbody>
</table>

### Strength

**Myth:** Glass is Fragile and Rigid

**Reality:**
**Security**

**Myth:** Glass is Vulnerable  
**Fact:** Glass can be Tough

- Burglar-proof glass
- Bullet-proof glass
- Centriglass
- Fire-proof glass

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**Sound Insulation**

**Myth:** Glass does not trap sound  
**Reality:** Glass can be used for sound insulation

- 6mm = 30 dB reduction
- 6mm +12 mm air gap + 6mm = 32 dB reduction
- 6mm +PVB+ 6mm = 36 dB reduction
- 6mm +12mm air gap + 6mm /PVB/6mm = 42dB reduction

Using different configuration of glass, noise can be reduced by up to 55 to 60 dB
Glass can be used as a building material for energy-efficient architecture, based on its application as well as the following parameters:

- How glass is integrated with facade.
- Building typology
- Climate typology
- Orientation
- Site surrounding
- Design of the structure – Active or Passive

Real-Life Case Studies
How glass is integrated
Double skin facade

A school in Mumbai

<table>
<thead>
<tr>
<th>Type</th>
<th>Total Electricity Consumption (Mwh)</th>
<th>Electricity Cost (in lakhs)</th>
<th>Savings (in thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-ventilated cavity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base case - 12mm AIS Clear</td>
<td>871</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>12mm Ecosense Spring</td>
<td>884</td>
<td>53</td>
<td>-78.88</td>
</tr>
<tr>
<td>12 mm Ecosense Dawn</td>
<td>876</td>
<td>52</td>
<td>-27.80</td>
</tr>
<tr>
<td>SC (Ecosense Dawn)</td>
<td>876</td>
<td>52</td>
<td>-27.80</td>
</tr>
<tr>
<td>SC + LE (Ecosense ClearVision)</td>
<td>876</td>
<td>52</td>
<td>-27.80</td>
</tr>
<tr>
<td>Ventilated cavity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12mm Ecosense Dawn</td>
<td>718</td>
<td>43</td>
<td>921.07</td>
</tr>
<tr>
<td>Ecosense Dawn DGU</td>
<td>718</td>
<td>43</td>
<td>921.07</td>
</tr>
<tr>
<td>Ecosense ClearVision DGU</td>
<td>718</td>
<td>43</td>
<td>921.07</td>
</tr>
</tbody>
</table>

The non-solar heat gets trapped between the perforated aluminium façade and inside skin when using a low-E glass.
Non-solar heat gain is the reason for increase in heat gains.

Inclined Facade

Daylight Analysis:
For a corporate building in Mumbai, daylight analysis was done for Clear Glass (VLT = 78%) and the high performance glass (VLT = 21%). Both the glasses performed identically in terms of achieving the optimal lux levels. Clear Glass, in fact, caused glare in certain portions of the building.

Pink region shows area which will have glare and Grey indicates sub-optimal lighting.
In 2nd case, we can see reduction in glare area without reducing optimum lux level.

- Daylight analysis is important as it prevents overdesigning of the building and at the same time optimizes VLT requirement.
- In the case mentioned, we can use high performance glass which will reduce cooling load without compromising on lighting load.
Climate Analysis

Office Building in Bangalore
Climatic condition of the location is important to select type of glazing as different weather conditions have different impact on glass.

<table>
<thead>
<tr>
<th>Calculations</th>
<th>Total kWh</th>
<th>Cost of Electricity</th>
<th>Savings kWh / yr</th>
<th>Saving's TR / Yr</th>
<th>Cost of Glass</th>
<th>Coating design (kWh)</th>
<th>Coating used in TR</th>
<th>Limits</th>
<th>Cost</th>
<th>Saving Extra Paid for Glass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear and Clear Glass (Old)</td>
<td>7263940</td>
<td>4295732</td>
<td>3790000</td>
<td>3562</td>
<td>350</td>
<td>5.59</td>
<td>25</td>
<td>2.91</td>
<td>31606050</td>
<td>0.10</td>
</tr>
<tr>
<td>Enhanced Film Seal</td>
<td>7585016</td>
<td>4510508</td>
<td>322324</td>
<td>1290</td>
<td>1100</td>
<td>2500</td>
<td>1000</td>
<td>180</td>
<td>2500000</td>
<td>0.10</td>
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<td>2500</td>
<td>1000</td>
<td>180</td>
<td>2500000</td>
<td>0.10</td>
</tr>
<tr>
<td>Proposed Glass</td>
<td>7908500</td>
<td>4659075</td>
<td>546000</td>
<td>2400</td>
<td>2000</td>
<td>1000</td>
<td>500</td>
<td>200</td>
<td>2500000</td>
<td>0.10</td>
</tr>
<tr>
<td>Proposed Glass with lighting control</td>
<td>9132050</td>
<td>5499000</td>
<td>396000</td>
<td>1600</td>
<td>1200</td>
<td>1000</td>
<td>500</td>
<td>200</td>
<td>4000000</td>
<td>0.10</td>
</tr>
<tr>
<td>Proposed Glass with lighting control</td>
<td>9132050</td>
<td>5499000</td>
<td>396000</td>
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Glass with SF of 37 & U-Val – 5.7 was as efficient as a glass with SF of 25 & U-Val – 3.7. The building design & the local weather conditions meant that you can relax the glass values and still be energy efficient.

Orientation

A commercial complex at Navi Mumbai with glazing on the Eastern and Southern façade showed that Clear Glass performed as good as “high-performing glasses” and the choice came down to aesthetics.

Shadow Analysis:

Right orientation reduces the demand for high performance parameters.
**Site Surroundings**

**Shadow Analysis:**
Blue indicates the sun’s path in summer and Red indicates the sun’s path in winter.

Shadow Analysis suggests the optimum requirement of Glazing performance parameter to be used.

**Passive Design**

- A hotel building in Gurgaon had avoided their demand of high-performance glasses just by adding shading devices.

- Correct shading reduces overall solar radiation intake in the building and also optimises light inside the building.
Active Design
Cooling Loads Reduction

<table>
<thead>
<tr>
<th>Type</th>
<th>Electricity Cost Annual (Rs.)</th>
<th>Savings Annual (Rs.)</th>
<th>% saving</th>
</tr>
</thead>
<tbody>
<tr>
<td>SGU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base case - ECBC</td>
<td>23083554.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bronze Brook</td>
<td>18365575.2</td>
<td>472678.9</td>
<td>20.5</td>
</tr>
<tr>
<td>Bronze vision</td>
<td>18229707.1</td>
<td>4862447.0</td>
<td>21.1</td>
</tr>
<tr>
<td>Grey Radiance</td>
<td>17901711.5</td>
<td>5190242.6</td>
<td>22.5</td>
</tr>
<tr>
<td>Gray Lite</td>
<td>17345102.2</td>
<td>5746851.8</td>
<td>24.9</td>
</tr>
</tbody>
</table>

Commercial building, Bangalore
Electricity consumption reduces by 20–25%, if solar control low-E glasses are used.

Things to Note

- The same fenestration behaves differently depending on the specific design.
- It should not be assumed that products with Low U-value and SHGC are the best and universal solution.
- Direct radiation falling on the windows should be minimised.
- For shaded windows, products with lower U-values perform better.
- For windows receiving high amount of solar radiation, products with low SHGC would perform better.
- Hence glazing should be selected after thoroughly considering the design.
Beyond just glass products –
AIS 4G Solutions

Glass Selection – AIS helps in the selection of the right product depending on your requirements.

Glass Products – AIS, with its wide range of products, offers solutions to fulfill all requirements, exteriors as well as interiors, performing well on parameters such as:

Glass Processing – AIS provides all kind of processing of glass as per your requirements.

Glass Integration – AIS fulfills all your needs related to glass as it is present in every part of the value chain, be it glass manufacturing, processing, consultation, interior installation, window solutions and much more.

AIS – An overview

Asahi India Glass Limited (AIS) is the largest integrated glass company in India offering end-to-end solutions across the entire glass value chain.

AIS offers the ideal combination of customised glass solutions, expertise and knowledge of design, installation and retail.

AIS has grown from being a ‘single product, single customer’ company to a world-class integrated company with 13 plants/sub assembly units and global customers.

Today, AIS is broadly structured into four verticals:
- Auto
- Architectural
- Consumer Glass
- Solar Glass
AIS – Strong foundation in the architectural segment

Integrated Supply Chain
- Complete ownership of the value chain
- Uncompromised quality

Distributed Manufacturing
- Flexible delivery schedule
- Reduced logistic costs
- Reduced lead times

Customized Solutions for your Glass Needs
- Energy performance
- Lighting
- Acoustic
- Wind load analysis

Proven Track Record
- Strong customer relationships
- Long list of satisfied customers

Wide Range of Best-in-Class Products
- Highest range of products including new range of high-performance glass added over last 6 months
- Product & services for consumer segment by GX (for individual home owner) and WE (for auto glass)

Ecosense – Made in India. Made for India

The Indian subcontinent is unique in its spread of climatic conditions, and Ecosense has been developed with this in mind. Manufactured with the help of the best coaters and coating development team and leveraging knowledge based on studies of optimum parameters that suit Indian conditions.

Ecosense makes sense in the Indian context not just climatically, but also meets the needs of Indian consumers who traditionally:
- require cooling inside not heating
- want to restrict solar radiation to come inside rather than allowing it
- want glass with optimally medium to low U value rather than very Low U value
- want optimum light to come inside not very high light transmission.
Enhance your facades, enhance your choices with Ecosense Enhance – and combine the best parameters with optical and thermal comfort, also available in unique Blue-Grey Shade.

Ecosense Exceed

Exceed your expectations with the Ecosense Exceed range which offers optimum light transmission and a lower Solar Factor (SF) best suited to Indian climatic conditions, while meeting the prescriptive requirement of energy efficiency codes.
Thank you
for your time