Sustainability with Affordability Through Glass
What we have been doing...

- Extinct Animal & Plant species
- Deforestation
- Loss of glaciers

Technology in every sector  ▷  Investments

Dissatisfaction
Sustainability

Energy Savings  50%
Carbon Savings  30% to 90%
Water Savings   35%
Waste Savings   50%

Annually three billion metric tons of raw materials are consumed to manufacture building materials and products.

The building industry is the second largest consumer of raw materials, after the food industry.
What is Sustainability..?

Collaborative Approach

Social

Economical

Environmental

Sustainability
Drivers of Sustainability

- Social
  - Buyer
  - End User

- Environment
  - Energy savings
  - Natural light

- Economy
  - Capex
  - Opex

Sustainable Development
Development focus started with:

- Thermal comfort
- Health of well being
- Energy efficiency
- Indoor air quality
- Water efficiency

Commercial & Office Buildings

Residential Buildings

Cold-Repair

Buildings and associated uses are responsible for a large part of the environmental load caused by humanity.

- 42% of all energy consumption
- 40% of all atmospheric emissions
- 30% of all raw materials used
- 25% of water usage
- 25% of solid waste
- 20% of liquid waste
Form follows Function

Source: Council of Tall Buildings and Urban Habitat
Development progression

SMART Homes

SMART Workspace

SMART City
Stakeholders involved

- Owner
- Architect
- PMC
- MEP
- Contractors
- End User
- Consultants
- Vendors
Key Stakeholders

New Building

Buyer/Owner

End User

Architect

Do they really want to use the glass..??
Choice Vs Option

What will you choose.?
Happiness Index - Step 1

Buyer

Architect

End User
Issues Related to Conventional Green buildings

Sustainable:

E.P.I = 140 kWh/m²-yr

- The mind set of people focuses towards gaining a status symbol rather than gaining economical and environmental benefits.
- Additional cost of Construction and Installation.
- Additional cost for maintenance.

And affordable:

E.P.I = 140 kWh/m²-yr
Strategic & Tactics

Innovative Products

Innovative techniques

Innovative technologies
With changing Architectural trends the WWR is continuously increasing. And this is why glazed facades become a major source of solar heat gain.
Needless to say...

Glass can not be looked in isolation

- Temperature & humidity,
- Solar radiation,
- Wind speed/direction
- Landform, vegetation, water bodies,
- Open spaces, etc.

- North, South, East & West
- Circular, Rectangular, Square
- Surface-to-volume ratio

- Shading devices,
- Fenestration size,
- Placement of windows

- SHGC & SC
- U-Value
- VLT
360° Approach - Selection Approach

- Reduced heat load
- Energy
- Light
- Daylight & Glare
- Connectivity to the environment
- Acoustics
- Wind
- Structural stability
- Life & Safety
- Preventing life hazards

Selection Approach

Approach - Selection Approach
Relation: Glass and Cost

High cost

Low U-Value
Low SHGC
(Efficient Glass)
High performance glasses are innovative products which are expensive but cost beneficial as the amount of heat gain is less and hence more energy saving.
SMART solutions
## Innovative Techniques

**Technology and Techniques go hand in hand.**
Developing new products and technologies alone cannot solve all the issues, their installation techniques and applications are equally important.

### Case 1: Double Skin Façade

**School, Mumbai**

<table>
<thead>
<tr>
<th>Type</th>
<th>Total Electricity Consumption (Mwh)</th>
<th>Electricity Cost (Annual in lakhs)</th>
<th>Savings (Annual in thousands)</th>
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<tbody>
<tr>
<td><strong>Non-ventilated cavity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base case - 12mm AIS Clear</td>
<td>871</td>
<td>52</td>
<td></td>
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<tr>
<td>12mm Solar Control</td>
<td>884</td>
<td>53</td>
<td>-78.88</td>
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<tr>
<td>12mm Solar Control</td>
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<tr>
<td>Solar Control low e</td>
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<td>-27.80</td>
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<tr>
<td><strong>Ventilated cavity</strong></td>
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<td></td>
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</tr>
<tr>
<td>12mm Solar control</td>
<td>718</td>
<td>43</td>
<td>921.07</td>
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<tr>
<td>Solar Control</td>
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<td>718</td>
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</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.
Glazing on East & South Façade showed that Clear Glass performed as good as the so called “high – performance glasses” and the choice came down to aesthetics.
Case 4: Climate Analysis Office, 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>Savings (Rs.)/Yr</th>
<th>Cost of Glass</th>
<th>Cooling design (Kwh)</th>
<th>Cooling Load In TR</th>
<th>Units</th>
<th>Cost (Cr.)</th>
<th>Saving</th>
<th>Extra Paid for Glass</th>
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</thead>
<tbody>
<tr>
<td>base case clear Glass SGU</td>
<td>7032860</td>
<td>4.21</td>
<td></td>
<td></td>
<td>2750000</td>
<td>3052</td>
<td>862</td>
<td>300tr*3</td>
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<td></td>
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<tr>
<td>Enhance Pine SGU</td>
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<td>4.34</td>
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<tr>
<td>Proposed Glass</td>
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<td>-400191</td>
<td>5750000</td>
<td>2800</td>
<td>790</td>
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<td>Proposed Glass with lighting controls</td>
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<td>2876</td>
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<td>2.01</td>
<td>0.118</td>
<td>1500000</td>
</tr>
</tbody>
</table>

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.
Case 5: Optimum Design Learning center, Mumbai

DESIGN FEATURES:

- Learning centre is optimally designed with louvers on all the glazed facades.
- North light on the roof for capturing daylight.
- The East and West radiations are blocked by creating buffer spaces of service areas and corridors.
Environmental Debate

Grave to Cradle

Glass

Resources

Material processing

End of life

Use

Product manufacturing

Distribution

NO!

YES
AIS Presence

uPVC Doors & Windows

Faridabad

Architectural Glass Plant
(Float & Processed)

Mumbai

Architectural Glass Plant
(Float & Processed)

Roorkee

Architectural Glass Plant
(Processed)

Chennai

AIS Processing Units covering most of the Geography..
New Technology - AIS Renew

Façade Retrofitting for better energy performance:

- Installation takes only 30 to 60 minutes per window.
- The existing glass continues to be used, and so does not require disposal.
Happiness Index - Step 2

Buyer

Architect

End User
Economical aspect

**Capex**
- Selection of glass as per project requirement

**Opex**
- Savings in monthly energy bills (lighting, HVAC etc.)
Ways to look at COST factor

- COST
- ROI
- Benefits
Way forward

Reference standards for mandatory requirement and prescriptive requirements of building envelope, HVAC, lighting levels, Service hot water in building rating system.

Reference standards for lighting levels, HVAC, thermal comfort conditions, natural ventilation and any other building materials and system design criteria.
Choose Wisely & See More....
Thank You

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