Resource optimization for self sufficiency in The New HAREDA Building

A Sustainable Design Approach

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The Elements
Sustainability

Equity

Consumption

Aspirations
Benchmarking

- To reduce water consumption by 40%
- To achieve complete water sustainability
- To reduce lighting energy consumption by 25%
- Use photovoltaic to completely offset the state grid for energy required lighting, computers and fans.

The forecast for energy consumption in similar buildings was
For conditioned buildings – 90kWhr/m²/year (6 days operation per week x 12 month)
For passively or low energy cooled and ventilated buildings – 30 kWhr/m²/year (6 days operation per week x 12 month)
Site and Climatic Data Analysis

- Does the site receive sufficient sunlight and not impact our neighbours?
- Is the site flexible enough to maximize good building orientation?
- Can the prevailing winds be used to maximize the availability and use of natural ventilation?
- Does the site receive consistent rainfall throughout the year to consider collection for re-use?
- Is the site subject to flooding or have any natural water features?
- What is ecological value of site before and after development?
- How can it be improved and linked into overall building performance (e.g. shading, water treatment, etc)
**Climate analysis**

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Conclusions

• Set the indoor temperature little higher than the ASHRAE comfort region.
• Use of Scientific methods in orienting the building
• Always air conditioning the building is not solution for comfort
• Provide openings in the building towards the prevailing wind direction,
• Harvest rain
The habitable spaces (excluding courtyard, lobby, corridor, toilets etc.) are about 4200 sqm. Of these, 1400 sqm are deemed apex at 25 ± 1 °C (apex offices and conference room) to be always a/c, 700 sqm are deemed controlled at 25 ± 3 °C (other offices, training room etc.) to be cooled in summer and 2100 sqm are passive 25 ± 5 °C (workshops, exhibition etc.) to be cooled in summer and ventilated in monsoon.
Rain Water Harvesting

Max rain water can be collected minus runoff

Water requirement for gardening + Domestic (inefficient system)

Water requirement for gardening + Domestic (Efficient system)
Rain Water Tank Optimization

Rain water tank size to become water self sufficient

- No recycling
- Grey water recycling
- Grey & Black recycling

m3
Water Management Strategy

60% reduction in water consumption by having water efficient fixtures.

Completely Water self sufficient building. Achieved by having 6.5 lakhs liters capacity rainwater tank to harvest roof water.
Electricity

- SPV of about 42.5 kW is proposed on the roof of the north wing and on the courtyard cover
- Grid interaction
- Demand side management
  - Optimization of installed load
  - Optimization of running load
- Choice of devices
- Choice of lighting
Lighting

45 % reduction in lighting energy by harvesting daylight

All light fittings are of T5, T8 super lite, CFL and LEDs and are controlled through dimmable ballast and photo sensors
South Face Shade Analysis
Improving Thermal Performance

- Providing cooling supply devices close to occupants
- Designing small thermal zones
- Providing controls which correspond to interior partitioning
- Planning for the careful admission of direct sunlight
- Using thermal mass to regulate temperature variations
- Better insulation for building to improve thermal quality
Passive Features

- Well oriented site and building (cardinal directions)
- Glazing coordinated to take advantage of direction
- Horizontally protected south glazing
- Almost no east and west openings
- Reasonable north glazing with vertical protection
- The courtyard is covered with angled louvers that maximize winter sun on the south face of the north wing and shade the atrium in the summer while allowing diffused daylight in
- The south face has solar chimneys to aid ventilation in some of the non a/c spaces (which are mist cooled)
- All workspaces of the building are daylit
- Maximizing use of fly-ash
For Air Conditioned areas an internal temperature of 24 deg C plus minus 1

For non Air Conditioned areas an internal temperature of 28 deg C plus minus 2
Windows are having double glazed low e glass with UPVC frames.

Walls are insulated, used aerated concrete block

Cavity walls on the east and west with PUF insulation

Thermatek roof tiles ensure a 15 deg. C difference at surface
The ease of construction and maintenance with minimum wastage is termed as buildability. Simplicity of design, standardization and clear communication are the main tenets of buildability. The attempt has been to increase buildability in this project.

- Construction Details
- Choice of Material
- Operating Modes /Use Guidelines
- Capital cost
PART SECTION THROUGH SOUTH WALL SHOWING HORIZONTAL LOUVER ARRANGEMENT

WIDTH OF LOUVERS ARE DESIGNED TO CUT OFF SUMMER SUN & ALLOW WINTER SUN TO COME INSIDE BUILDING ENVELOPE

CUTS OFF SUMMER SUN 70°
FEROCEMENT LOUVERS OVER CENTRAL COURTYARD: ALLOWS WINTER SUN TO COME IN BUILDING ENVELOPE & CUTS OFF WINTER SUN

FERROCEMENT LOUVERS AS DETAIL DESIGNED AT AN ANGLE

SOLAR CHIMNEY AS DETAIL
CONTINUOUS HORIZONTAL MEMBERS AS SHADING DEVICES CLAD WITH WHITE CIMA MOSAIC ON TOP AND RED IN FRONT
FULL HEIGHT GLAZING WITH SOLAR REFLECTIVE GLASS (BLUE)
View of interior courtyard
New “GREEN” office building for HAREDA

ARCHITECTS:
THE ELEMENTS
building with nature
s.c.f.59, first floor, sector-6, panchkula
phone/fax: 580094
e-mail: wigmann@sify.com
Some interesting facts

Building having 55,000 sqft built up area is connected with 70 kW electricity load which amounts to 1.75 W/sqft.

The total simulated energy consumption in the building is 13.5 kWhr/m²/year compared to a conventional building of 140 kWhr/m²/year.

41 kWp Photovoltaic cells (PV) to cater the energy demand which amount to 100% of the yearly energy
## The comparison matrix

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<th>EPI (kWh/m²/yr)</th>
<th>CO₂ PRODUCED (Tonnes)</th>
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<tr>
<td><strong>HAREDA</strong></td>
<td>15</td>
<td>-5</td>
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<tr>
<td><strong>GRIHA Limit for HAREDA project</strong></td>
<td>53</td>
<td>215</td>
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<td><strong>Conventional Building by having 25% AC area and 75% non AC area</strong></td>
<td>71</td>
<td>306</td>
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<td><strong>Conventional Building with Complete AC</strong></td>
<td>150</td>
<td>630</td>
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### Some additional facts

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<td>Hareda energy consumption</td>
<td>15 kwhr/m²/year</td>
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<td>Energy Required by HAREDA</td>
<td>62415 kwhr</td>
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<td>Energy Production from solar PV</td>
<td>67343 kwhr</td>
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<td>Excess Energy Produced</td>
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<td>CO2 Credits</td>
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Cost Comparison

- TERI Retreat = Rs. 1,000.00 /sft without SPV or systems
- CII HQ = Rs 1,500.00 /sft without systems
- AGILENT Systems = Rs 1,500.00 /sft without SPV

- New HAREDA Building = Rs. 2,000 with complete systems and furniture
Troubling Questions

REDUCE vs reuse/recycle?

Real intention behind going 'green'? 

Availability of 'green' materials?

Standard benchmarking figures?

Need for per capita rating