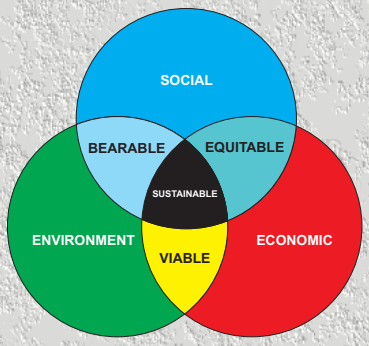
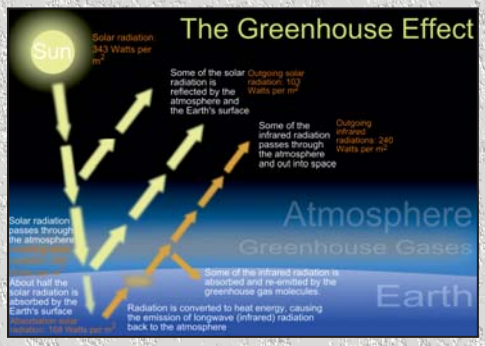
Significance of green buildings

Sustainable development meeting the needs of present without compromising the ability of future generations to meet their needs is the need of the hour.



Sustainable development



Greenhouses gasses

Global warming due to climate change

Sustainable development is advocated because:

1) Increased concentrations of Greenhouses gasses like Carbon-di-oxide, Methane, Nitrous oxide, water vapor etc have led to global warming. It is the biggest challenge that we face today.

2) Global surface temperature increased by 0.74 ± 0.18 °C during the 20th century.

3) Recent IPCC reports suggest the likelihood of 1.1 to 6.4 °C rise in the 21st century.

Effect of Global warming:

Recent environmental changes as heat waves; Ocean warming; Rising sea-level; Coastal flooding, Glaciers melting, Arctic and Antarctic warming, Storms are early indicators for what lies in store if we do not organize NOW.

Hurricane Katrina of 2005

Floods in Mumbai

Red fox affected by rising global temperatures

What is a Green Building?

Building which increases the efficiency of resource utilization i.e. energy, water, and materials, reduces impacts on human health and the environment, creates delight when entered, serenity and health when occupied and regret when departed.

Benefits of Green Buildings:

- Reduces global warming by contributing to environmental protection & mitigating the effect of global warming.
- Enhances asset value
- Increases productivity & health
- Improves corporate Image
- Reduces energy & water cost (25-40%)

Way towards green buildings:

(1) Minimum environmental impact:

- Sustainable site selection & development
- Minimizing heat island effect & green roof
- Effective use of landscaping
- Efficient management of waste.

(2) Healthy & pleasant indoor environment

- Indoor air quality
- Thermal comfort

(3) Energy conservation

- Use of day lighting
- Energy efficient lighting
- Efficient HVAC & passive cooling
- Efficient water pumping
- Efficient vertical transportation
- Building management systems
- Use of renewable energy sources

(4) Efficient use of material resources

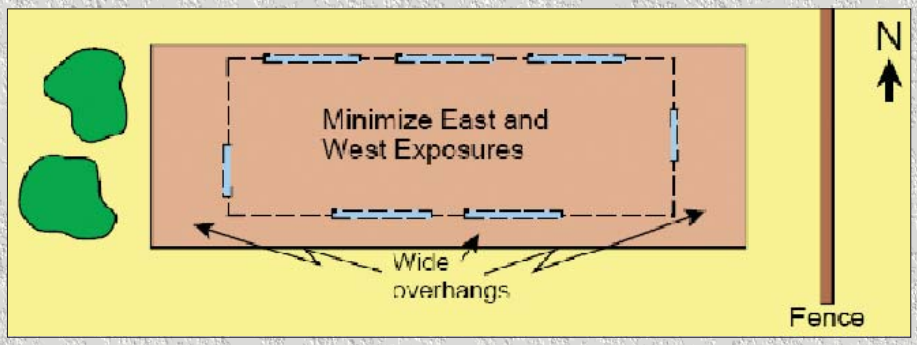
- Use of environmentally friendly building materials & technologies
- Efficient use of materials & minimizing wastage on construction site

(5) Water conservation

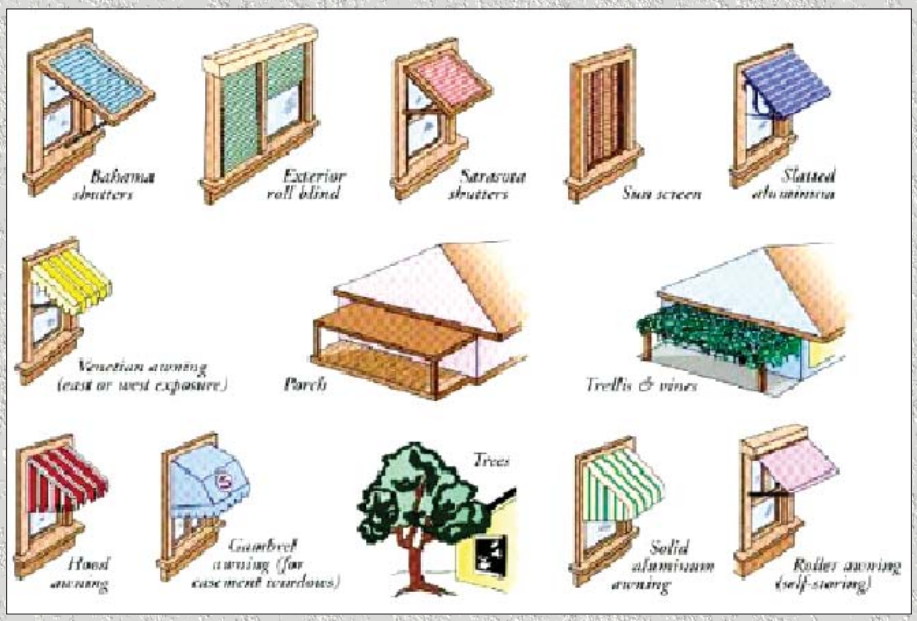
- Efficient use of water
- Rain water harvesting
- Recycling of waste water

(6) Minimum environmental impact:

(A) Building Orientation:



(B) Shading Devices:

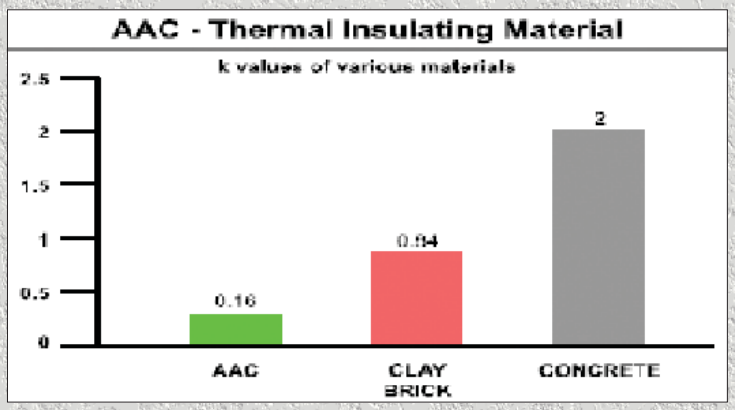


Example showing building orientation and shading devices:

- Low-rise residential building in Ahmedabad (hot and dry climate).
- Shading a window by a horizontal 0.76 m deep chhaja can reduce the maximum room temperature by up to 4.6 °C (from 47.7 to 43.1 °C).
- Moreover, the number of uncomfortable hours in a year with temperatures exceeding 30 °C can be reduced by 14%

(C) Walls & Walling materials:

- Wall thickness, material, & finishes selection based on the heating and cooling needs.
- Appropriate thermal insulation and air cavities in walls reduce heat transmission into the building, which is the primary aim in a hot region.
- Commonly used insulation materials are mineral wool/glass wool, extruded/expanded polystyrene (thermocol), PUF (polyurethane foam), and vermiculite. Hollow concrete /fly ash blocks, autoclaved aerated concrete blocks, etc. with better thermal properties can also be used.
- Thermal properties of air cavity wall reveals that overall heat transmission co-efficient U value of (1) a 27.5 cm brick cavity wall (11.25 cm brick + 5.0 cm air gap + 11.25 cm brick) is 1.63 W/m2 °C while (2) that of a 22.5 cm solid brick wall with 1.25 cm cement plaster on both the side U value is 2.26 W/m2 °C. Here, it is worth emphasizing that the thermal performance of the above cavity wall is slightly better than that of a 35 cm solid brick wall

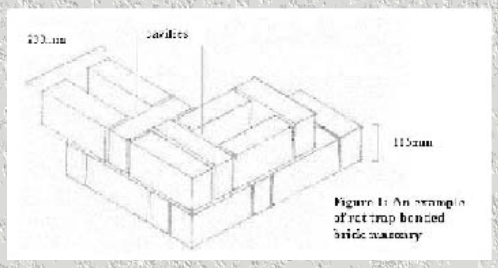


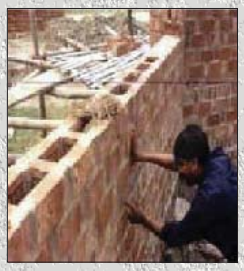
Alternate Walling Materials

- ☐ Hollow concrete blocks
- ☐ Stabilized Mud Blocks (SMB)
- ☐ Flyash bricks
- ☐ Autoclaved Aerated Concrete (AAC) Blocks

Prefabricated Wall Panels

Rat-trap bond wall





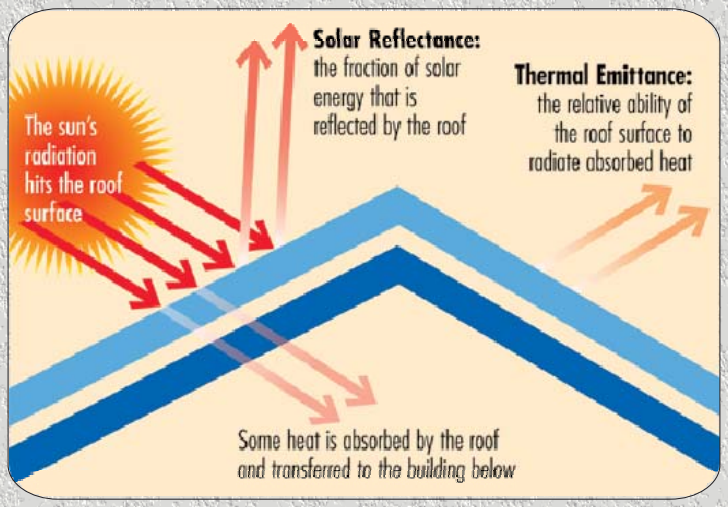
Reduction in the material cost of bricks by 25% and about 10 to 15% in the masonry cost.

In this infolet we shared information about green building, its significance and some way to achieve green building. More ways of making the building green, information about the agencies involved in rating of green buildings and examples of such buildings will be shared in the coming infolets.

Please tell us if you like the infolet. You may send in your queries at:
SAURASHTRA CEMENT LIMITED ● GUJARAT SIDHEE CEMENT LIMITED
'Pelican', 7th Floor, Ashram Road, Ahmedabad - 380 009
Ph.: +91 79 2658 0135 / 37 Fax: +91 79 2658 7265
E mail: **customercare@mehtagroup.com** ● www.hathi-sidheecements.com

Information on green building, its significance and few ways to design green building was shared in the infolet in June 2011 .The infolet concluded with passive cooling techniques (point 6 C). In continuation we detail other techniques for passive cooling:

6 (D) Exterior Surface Solar Reflectance:



Material	Reflectivity (Solar Radiation)	Emissivity (Long Wave Radiation)
Aluminum foil bright	0.95	0.05
Aluminum paint	0.50	0.50
White wash new	0.88	0.90
Grey colour light	0.60	0.90
Grey colour dark	0.30	0.90
Red brick	0.40	0.90
Glass	0.08	0.90

6 (E) Cool Roofs

- Roofs with slopes less than 20° shall have an initial solar reflectance greater than 0.70 and the initial emittance greater than 0.75.

- Some roof protection methods are as under:
  - Inverted earthen pots, a removable cover.
  - White washing before the onset of the summer.
  - Deciduous plants (Figure: 1)
  - Using shining and reflecting material for the rooftop (Figure:2)
  - Roof insulation by using vermiculite concrete (Figure:3):

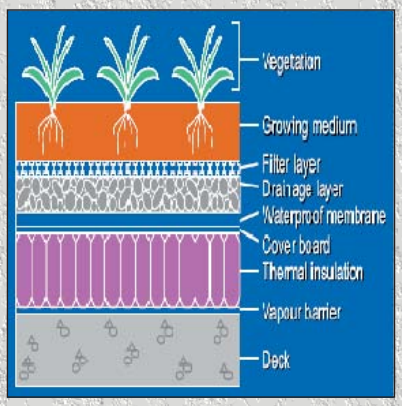


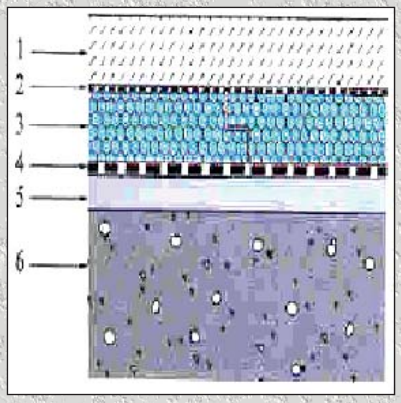
Figure: 1

Figure: 2

Reference

1. Flooring/Concrete
2. Separation layer
3. Insulation
4. Water proof membrane
5. Screed
6. Concrete roof deck

Figure: 3



6 (F) Alternate roofing systems:

(1) Filler slab roofs:

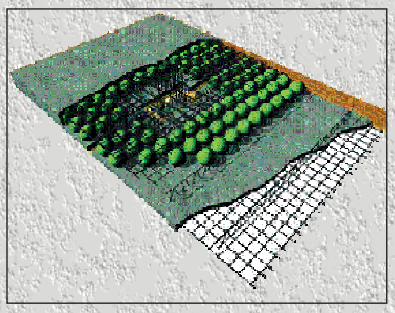
- Filler slab roofs are basically solid reinforced concrete slabs with partial replacement of concrete in the tension zone by a filler material.
- The filler material could be economical / economical and lighter.
- Some alternative materials can be: (a) brick or brick panel (b) Mangalore tile (c) stabilized mud block (d) hollow concrete block (e) hollow clay tile/block, etc. (E) Cool Roofs

Filler slab

Hollow clay blocks

(2) Biaxial slabs (Bubble Deck slab):
Voided biaxial slab, known as bubble deck slab, have been developed which locks ellipsoids between the top and bottom reinforcement meshes, thereby creating a natural cell structure, that acts as a solid slab.

Bubble deck slab

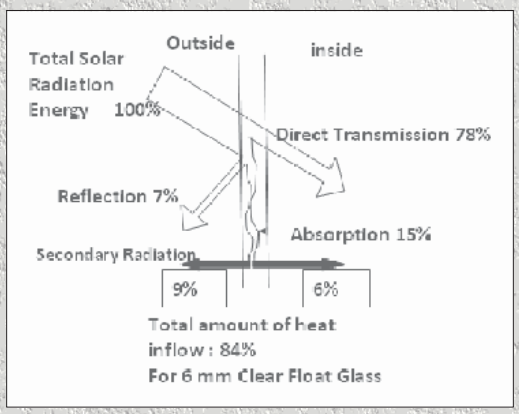


(3) Composite beam and panel roofs: Slabs cast with wood, steel, concrete etc.

6 (G) Use of right quality of glass:

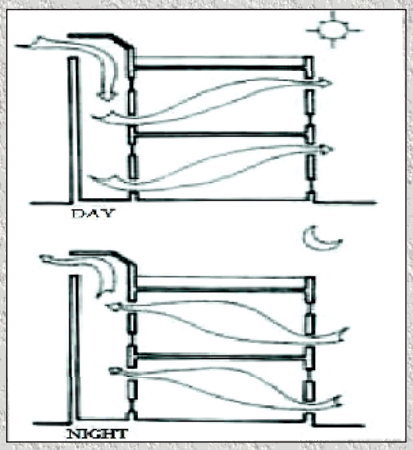
(1) Glazing has a tremendous impact on energy performance of buildings. U-factor, SHGC (Solar Heat Gain Co-efficient) and VLT (Visible Light Transmittance) of glass govern the energy performance of buildings. Direct heat gain component can be as high as 90% vis-à-vis 10% for conductive heat gain; hence

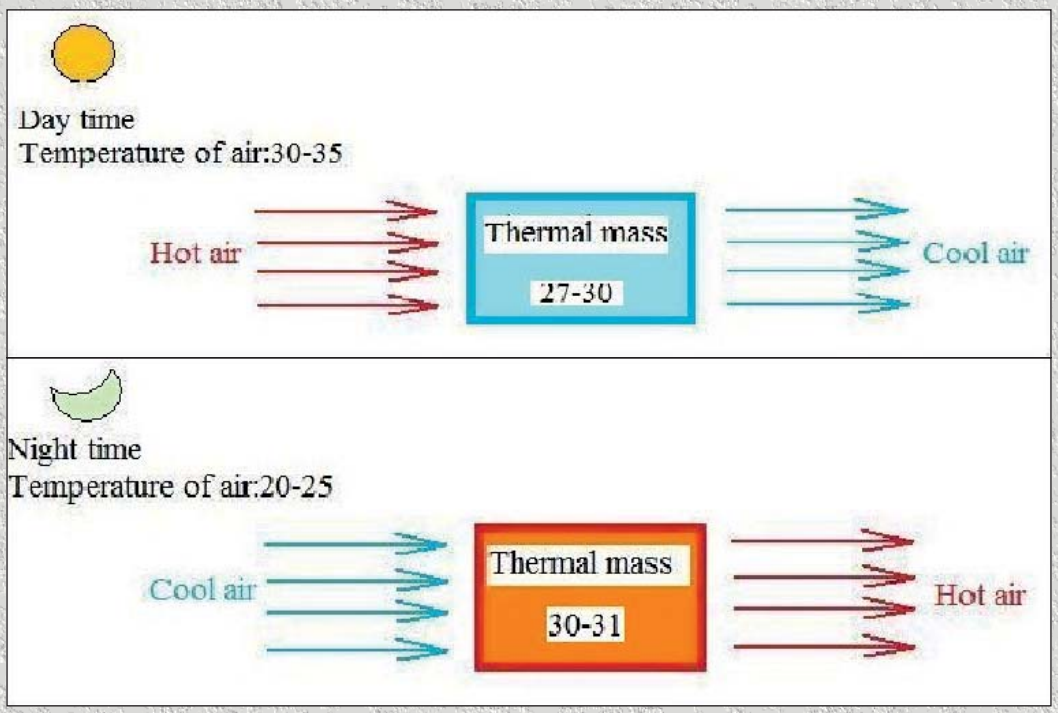
(2) The choice of glass should be done considering U Factor, SHGC and VLT for proper radiation reflection. Example of energy transmission through 6 mm float glass is as under:



6 (H) Wind Tower:

Wind Tower creates natural ventilation in buildings in hot, hot-dry and hot-humid climates. It consists of vertical shafts with vents on top to allow wind to the interior spaces and provide thermal comfort.





In the next infolet, we will come with more passive cooling techniques, environment friendly materials, use of natural / efficient lightings, rainwater harvesting, land scaping, green building rating and agencies involved for rating.

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'Pelican', 7th Floor, Ashram Road, Ahmedabad - 380 009
Ph.: +91 79 2658 0135 / 37 Fax: +91 79 2658 7265
E mail: **customercare@mehtagroup.com** ● www.hathi-sidheecements.com