

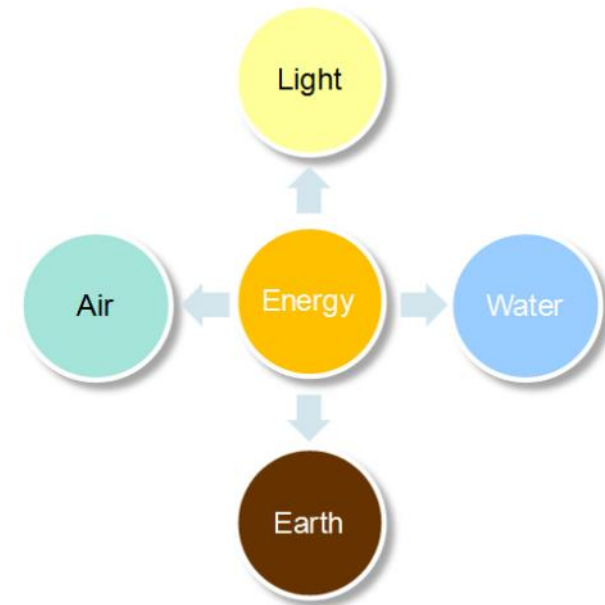


How to Construct a Green Building



SUSTAINABLE BUILDING

- Imagine living in a building that is self-sustained and has no dependency on the outside world for its functioning and at the same time, has lesser operating costs than a conventional building. This in true sense is a 'Green Building'. By definition, a green building is a type of construction designed to be eco-friendly and sustainable, while also focusing on the efficient use of resources such as water, electricity by reducing waste and pollution. We have divided the key elements that make a building green on the basis of 'Pancha bhootas', the five basic elements of Hindu mythology:



Prithvi - Earth



PRITHVI – BUILDING CONSTRUCTION

- The geographical orientation of the building should be such that it is warm during winters and cooler in summers. This is done by giving smaller facades and lesser windows on the east and west side and longer facades and more windows on the north and south side. Additionally, trees need to be planted on the east and west facades to shade the building from the scorching sun. Other solar passive technologies such as skylights on roof, window placement and sizing, overhangs on windows, etc., can further bring down the heat load during summer.



PRITHVI – BUILDING CONSTRUCTION



- Majority of the construction materials such as stone, steel, sand, blocks/bricks, cement, etc., must be locally sourced within a distance of 300-400 km from the site. This reduces the transportation footprint of the building. Usage of virgin materials can be reduced by using recycled materials that are easily available in the market such as recycled glass, steel, aluminum, PPC cement, flyash brick blocks. These recycled construction materials can have either post-consumer or post-industrial recycled content. The furniture and wood sourced is a rapidly renewable material, which have a harvesting cycle of less than 10 years such as bamboo, cork, natural linoleum, MDF board, bagasse particle board, etc. Alternatively, the wood can be sourced from sustainable forestry such as the wood certified by the Forest Stewardship Council (FSC).





PRITHVI – BUILDING CONSTRUCTION

- The walls can be built with either flyash blocks or stabilized soil bricks. The flyash is eco-friendly for two reasons: it is a byproduct of the thermal power industry, which is used as a substitute for cement and it has better thermal insulation. The walls of the building can also be effectively insulated by providing cavity walls or autoclaved aerated concrete blocks.
- The roof is heat insulated by providing a layer of brick-bat coba, RCC and coated with white paint on the outer surface, which reflects the sunlight and makes the building cooler. Alternatively, the roof can also be covered with white mosaic tiles or waste tile chips generated from tiling work in the building, which act as good heat reflecting material.





AGNI – LIGHTING

- While every building must ensure adequate lighting and air circulation, a green building has to ensure maximum usage of natural lighting. The windows and doors are optimally placed and sized such that there is sufficient day lighting and natural ventilation. The window-to-floor ratio has to be maintained at above 15% in bedrooms, 10% in kitchens and 5% in bathrooms. At the same time, windows need to be placed in at least two orientations for each living space to ensure good cross ventilation.





AGNI – LIGHTING

- Low-cost skylights can be installed on the roof of study rooms, dining rooms and common spaces to reduce the dependency on artificial lighting during daytime. Similarly, the windows need to have glass to maximize sunlight. The selected glass glazing must have low Thermal Transmittance (U-value) and low Solar Heat Gain Coefficient (SHGC), but high Visual Light Transmittance (VLT). This means that the window allows sufficient sunlight to penetrate into the building, but reduces the heat from entering through these windows, thus keeping the building cooler.
- All the interior lighting must be fitted with CFL and T8 lights, while LED lamps can be used for exterior lightings. These energy saving lamps reduce the lighting cost by 40-50%.





VAAYU – AIR CIRCULATION

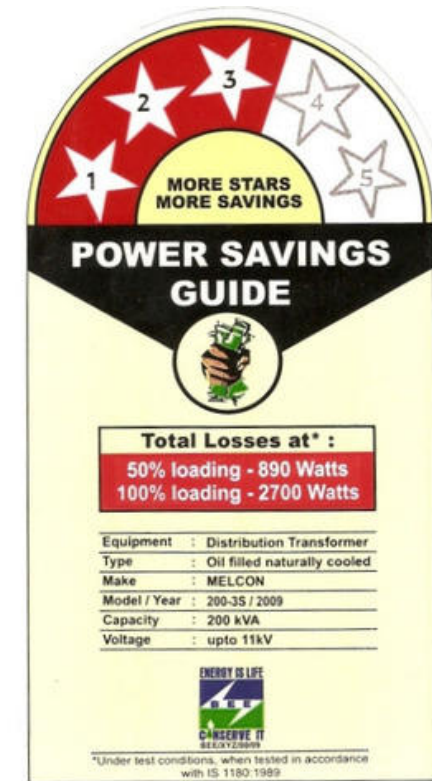
- Circulation of fresh air is crucial and it is the most energy consuming need in any building today. Ideally, a building should have ventilation on all four directions and air should pass through at least two sides. Since we don't live in an ideal world, we have to manage with large buildings that are completely covered from all sides with little fresh air flowing through. Fans and air cooler are more energy efficient and cheaper than ACs. Air coolers are the best option since they moisten and cool the air pumped in, while fans tend to circulate the same stale air. If it is necessary to go for heat ventilation and air conditioning (HVAC), then examine these check points to make sure your office building has optimal air conditioning (AC):





VAAYU – AIR CIRCULATION

- Air-conditioning systems must be rated BEE 3 star or above and the refrigerant used in the ACs must be CFC and HCFC free.
- Proper insulation of all air inlets and outlets in an AC building is essential. For instance, the copper tubes that bring in the cool air inside should be packed tightly with plastic foam insulation. Similarly the heat ducts should be correctly ventilated.
- Close all holes where air could escape so that the cool air remains confined inside. All AC buildings must have insulated glass doors with automatic door shutting mechanism.



VAAYU – AIR CIRCULATION



- A typical mistake is to place heated areas such as kitchen and pantry inside the central AC zone. Efforts should be made place these areas in open spaces with natural airflow.
- Simple solution is to avoid glass covering on the western side of the building to prevent heating and have double glazing of the glasses to ensure thermal insulation.
- Maintain the ambient room temperature at an optimum level of 22-24 degrees centigrade.
- Further, there are some innovative technologies that offer solar powered air conditioning that offers a reduction in carbon emissions as well.

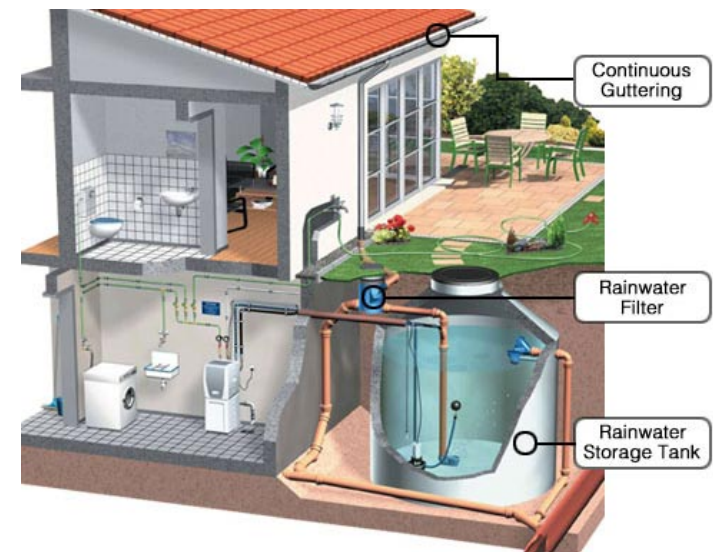


Jal - Water



JAL – WATER

- The rainwater from rooftop should be harvested by passing it through a mesh screen and an activated carbon filter and storing it in an underground water tank. The water stored in sealed tanks is safe to drink for up to 6 months. The excess runoff from the site can be passed through recharge pits dug up along the storm water drains. This improves the water table level of the site and increases the yield of bore-wells. This way the building is no more dependent on the municipal water supply only.





JAL – WATER

- Water taps, closets and showers installed in the building need to be carefully selected according to their flow rates. Water taps need a flow rate of 2-4 liters per minute, showers with a flow rate of 6-8lpm, and dual flush water closets with flush rates of 6/3 or 4/2lpf. Simple aerators and flow restrictors can be fitted in taps to save around 50% water without compromising on the comfort.
- Solar hot water systems installed on the rooftop can meet 100% of the hot water requirement of the building for at least 8 months in a year. The current payback period of a solar water heater is less than 3 years.



Source: --

Akash - Landscaping



AKASH – LANDSCAPING

- There should be ample garden area with native species of plants or Xeriscaping in order to reduce or totally eliminate the water required for irrigation. Select plants that are native to the region and climatic conditions. There should be minimal grass lawns, as they require plenty of water for irrigation. Further, water requirement for gardening can be reduced by installing energy-efficient technologies such as drip irrigation, timer-based controllers for valves, pressure-regulating devices and moisture sensor controllers.





AKASH – LANDSCAPING

- Open grid pavements must be chosen for driveways and walkways instead of cement, tar or paved roads. This type of pavement offers multiple benefits such as:
- Reduces the heat island effect, thereby making the space cooler
- Reduces storm water-runoff by increasing seepage
- Lesser use of virgin building material as compared to cement or paved roads
- Care needs to be taken to preserve topsoil during construction, so that it can be reused later for landscaping. Existing trees have to be protected, and the water runoff from the site needs to be prevented from seeping into neighboring sites by providing soak pits at the lowest elevation point. The site has to be barricaded to prevent construction dust from escaping and all the construction waste materials have to be stored in bins/scrap yards.

Waste Management



WASTE MANAGEMENT

- A mini decentralized sewage treatment plant consisting of a septic tank and a rootzone waste water treatment needs to be constructed next to the building. A septic tank needs to be constructed to deposit and decompose human waste. The tank should have a water outlet connected to a reed plant bed system that can treat the grey water generated from toilets, bathrooms, kitchen and washing machine. The treated water is reused for landscaping and flushing, thereby reducing the overall potable water consumption of the building.





WASTE MANAGEMENT

- Solid waste generated at home must be segregated and stored in separate color coded bins. Dry waste such as paper, plastic, glass, cardboard can be sold to the local scrap dealer. E-waste such as batteries, used mobile phones, TV, cables and hazardous waste such as paint box, used oil cans, should be sent to authorized agencies for recycling and safe disposal. Organic waste from the kitchen and landscape must be treated in an in-house composting system (vermicomposting), which converts the waste into rich organic manure. Large housing complexes can make efforts to generate biogas from the human waste and composting of food and other organic waste. If the waste generated is more than 100 kg, low-cost biogas plant can be installed; the biogas generated can be used to run kitchen stoves.



Chemicals



CHEMICALS

- All the paints and finishes in the interior walls must have Low Volatile Organic Carbon (VOC) content. These eco-friendly paints ensure that there are no carcinogenic fumes emitted from the paints that can irritate your eyes and lungs. Similarly, housekeeping chemicals used for cleaning purpose and fertilizers used in landscaping must be organic and eco-friendly. The chemicals used can be green seal certified, which ensures that the product is safe on us and the environment.





ELECTRIC VEHICLES PARKING

- Electric charging points are provided in the parking area to encourage the building occupants to commute by electric vehicles and the building occupants need to be encouraged to adopt carpooling to reduce their emissions from vehicles. There is a need to build awareness among building occupants on the green design features of the building. The occupants must know the do's and don't's on how to lead a sustainable lifestyle.



Thank You

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