



Improving Energy Efficiency in Green Buildings

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Supreme Petrochem Ltd



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A brief profile

- Promoted by Supreme Industries Ltd & R Raheja group
- Largest Polystyrene manufacturer in India with a installed capacity of 272,000 Mtpa.
- Expandable Polystyrene (EPS) beads producer with an installed capacity of 75,000 Mtpa
- First producer of XPS Insulation Boards in India .
- Manufactures Masterbatches, Colour & Specialty Compounds



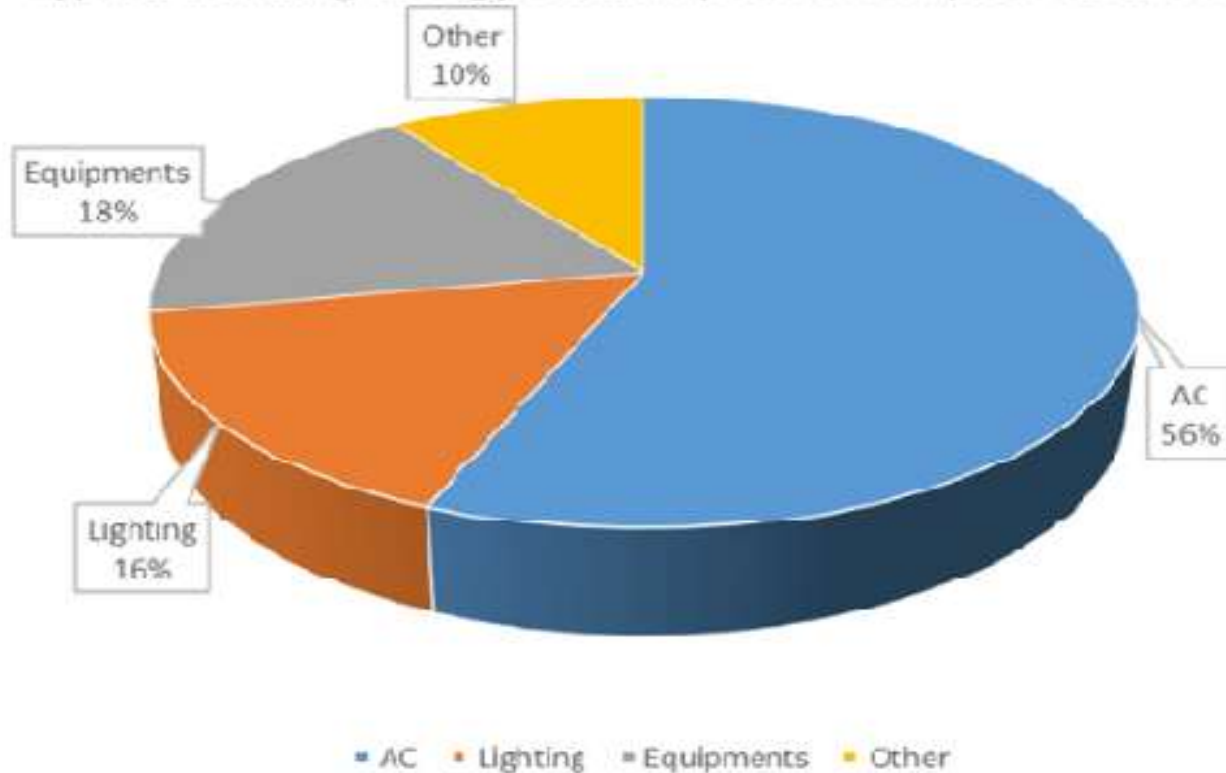
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Typical Building Energy Consumption

Typical Building Energy Consumption in Tropical Countries





Green Building Definition

- Green building refers to both a structure and the application of processes that are environmentally responsible and resource-efficient throughout a building's life-cycle: from planning to design, construction, operation, maintenance, renovation, and demolition.
- The Green Building practice expands and complements the classical building design concerns of economy, utility, durability, and comfort.
- The common objective of green buildings is to reduce the overall impact of the built environment on human health and the natural environment by:
 - Efficiently using energy, water, and other resources
 - Protecting occupant health and improving productivity
 - Reducing waste, pollution and environmental degradation



Energy Efficiency

- **Green buildings often include measures to reduce energy consumption**
 - the embodied energy required to extract, process, transport and install building materials ,and
 - operating energy to provide services such as heating and power for equipment.
- **To reduce operating energy :**
 - reduce air leakage through the building envelope.
 - specify high-performance windows and extra insulation in walls, ceilings, and floors.
 - Orientation of windows and walls and place awnings, porches, and trees to shade windows and roofs during the summer while maximizing solar gain in the winter.
 - provide more natural light and lessen the need for electric lighting during the day.
 - Use of solar energy



Building Envelope

- The term building envelope is given to the physical separation between the inside conditioned space and the outside unconditioned space of a building.
- Envelopes generally have six sides and are composed of four basic elements:
 - **1. water barrier**
 - **2. air barrier**
 - **3. vapor barrier**
 - **4. thermal barrier**
- These four elements need to be selected holistically and work together as a system in order to perform properly and to provide a comfortable, energy efficient, and durable building.



Continuous Insulation

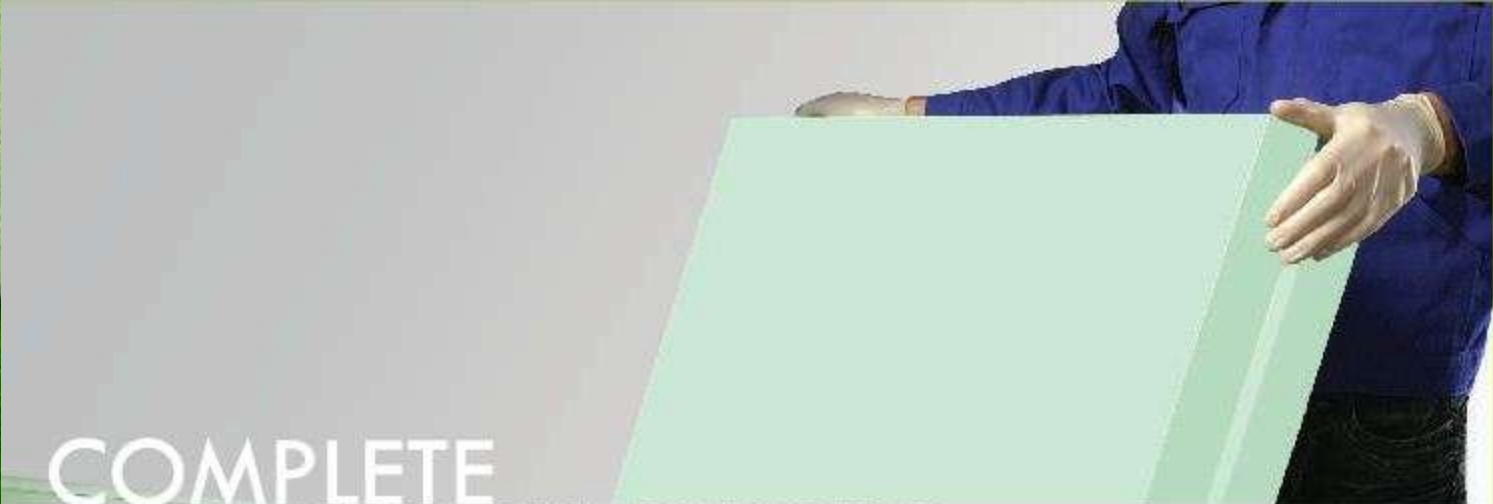
- **CI is insulation that is continuous across all structural members without thermal bridges other than fasteners and service openings.**
- **It is integral to any opaque surface of the building.**
- **CI not only helps to save energy by reducing thermal bridging, but it also helps to reduce damage to the structure and therefore increase the life of building.**
- **Options include:**
 - **1. extruded polystyrene (XPS)**
 - **2. expanded polystyrene (EPS)**
 - **3. mineral wool (also called mineral fiber)**
 - **4. spray polyurethane foam (SPF)**
 - **5. polyisocyanurate (polyiso)**



XPS Insulation Boards



THERMAL INSULATION MATERIAL WITH A
CONCEPT OF ENVELOPE THE BUILDINGS



COMPLETE
BUILDING INSULATION CONCEPT



XPS (Extruded Polystyrene)

- SPL has forward integrated into manufacturing of XPS boards with capacity of 100000 cubic meter per annum
- First manufacturer of XPS boards in India
- XPS boards are premier insulating material for all sorts of buildings due to :
 - Low thermal conductivity
 - Excellent compressive strength
 - Resistance to moisture



XPS - Characteristics

- **Extruded Polystyrene Insulation has a number of unique characteristics that make it an essential component of energy efficient design.**
 - **Closed Cell Rigid Foam Insulation**
Moisture absorption is negligible
 - **Long Term Guaranteed Thermal Performance**
XPS boards maintain its R Value
 - **Life Time Performance:**
A fifty year plus lifecycle.

How many building materials actually contribute to energy reduction for their lifetime?



XPS – Sustainable Building Material

- **Light Weight & Inert- *Safe to handle***
- **Good Insulation – *Saves Energy***
- **No Ageing – *Constant performance for years***
- **Reusable – *No degradation***
- **Recyclable – *Same or other form***

- **Recent Development – *SPL has updated its plant to use CO2 as blowing agent which is in accordance to International requirements***



XPS - Residential Underslab Insulation

- Improved energy efficiency is achieved by using XPS as a thermal barrier under the slab and around the exposed slab perimeter.



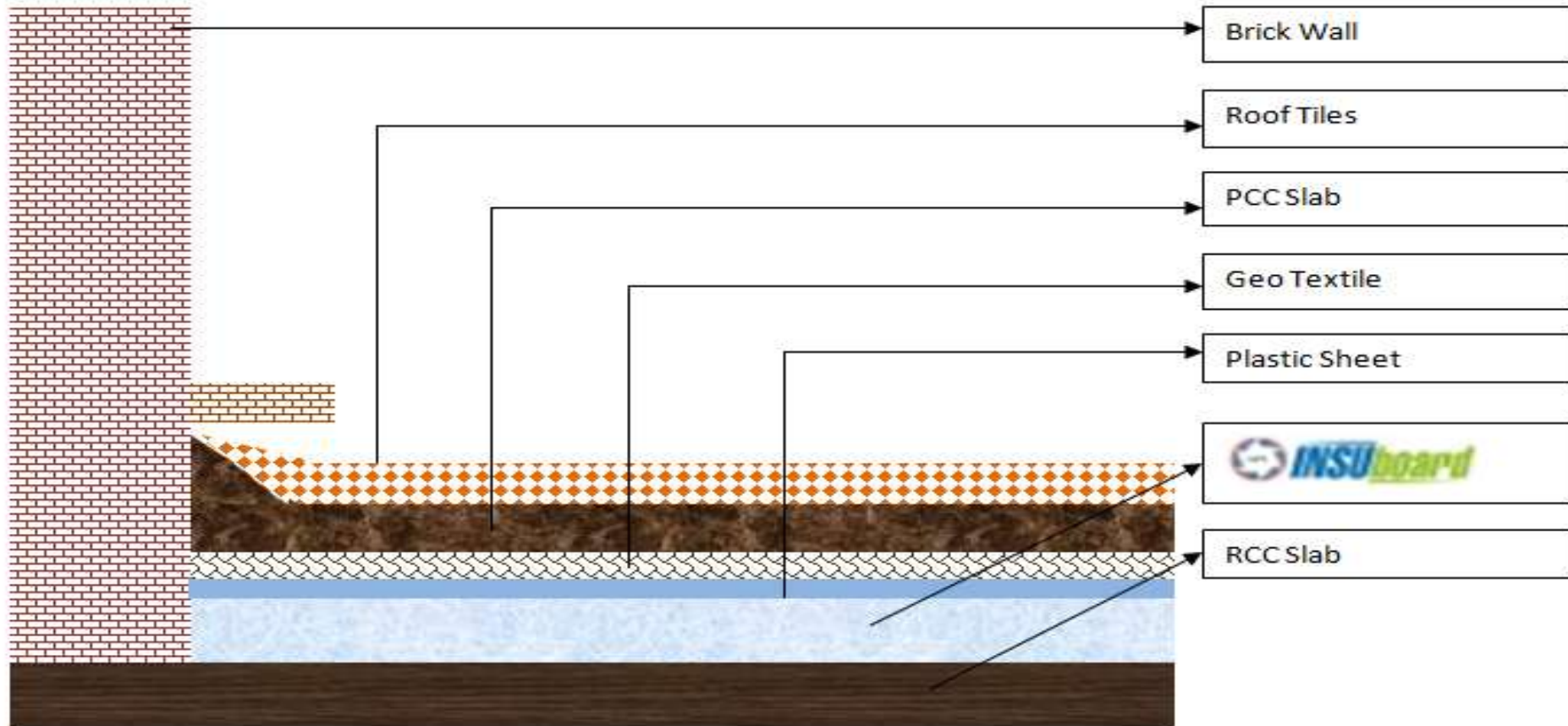


XPS - Concrete Roof Insulation

- **New construction and refurbishment of existing roofs**
- **Protected Roof Membrane Assembly is a method of insulating roofs by placing insulation above the waterproofing membrane, therefore protecting the membrane.**
- **The insulation is held in place with specified ballast, usually gravel or cement pavers.**
- **Unlike most other insulation materials, because XPS has a closed cell structure, it maintains its ability to insulate in the presence of water.**
- **Its high compressive strength make it excellent insulation for all roofing applications.**



Overdeck Insulation



Over Deck applications

Sketch showing INSUboard for OVAR-DECK application



Underdeck Insulation

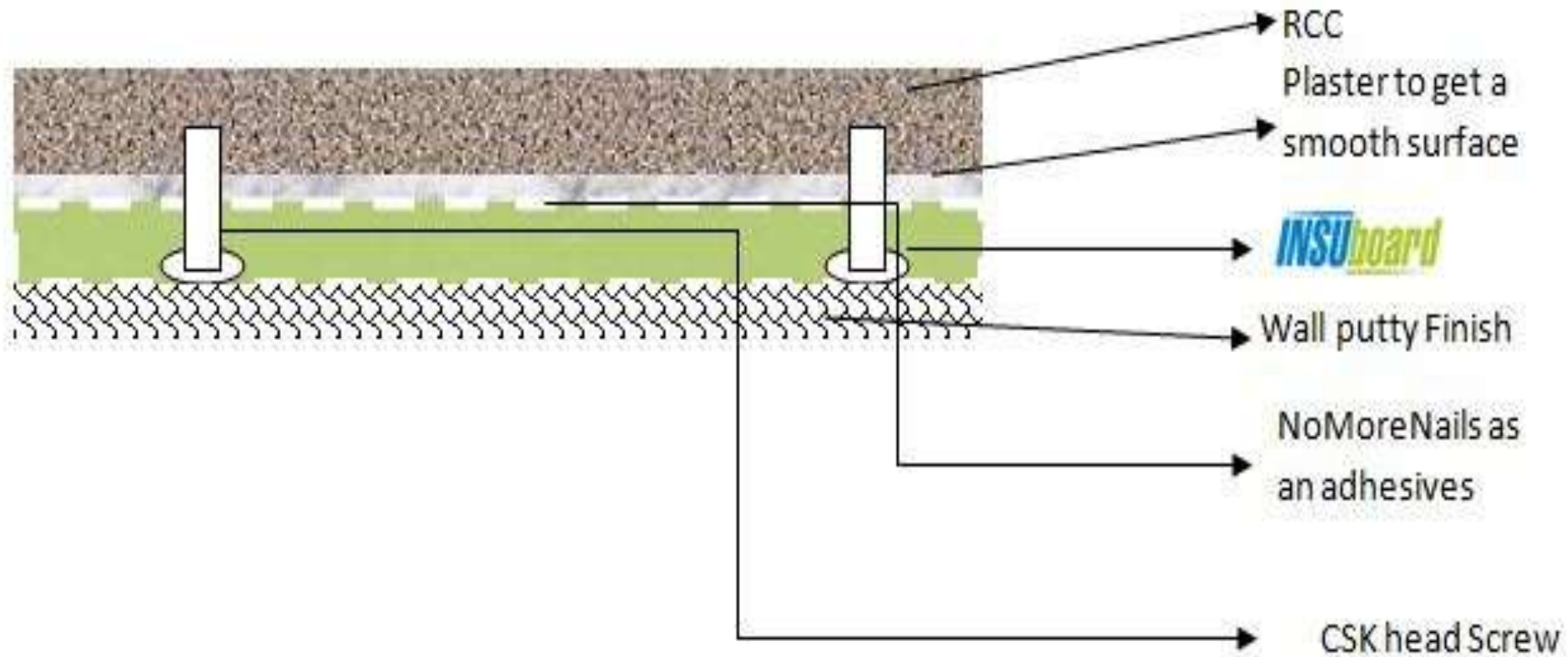


Fig:2 Application of **INSUboard** in Ceiling



XPS - Green Roof Garden Insulation

- Extruded Polystyrene is the ideal insulation for a green garden roof assembly.
- It provides no nutritional value to plants or animals and has a guaranteed long term thermal value.
- Its high moisture resistance and superior strengths makes it ideal for protecting the roofing membrane, increasing the roof's life-cycle, plus reducing maintenance costs and energy demands.
- Un-insulated Green Roofs have a very low thermal resistance value, especially when soil is wet.
- The long term thermal and physical performance increases the energy efficiency benefits of Green Roof Systems.



XPS – Wall Insulation

- **Fixing XPS insulation boards on the walls eliminates the heat movement / thermal bridging**
- **High R Value (R2.67/75m) finished with a new generation Acrylic Render System provides a pleasing aesthetic as well as an energy efficient envelope to the home.**
- **An insulated wall is up to 30% more energy efficient.**



Wall Insulation

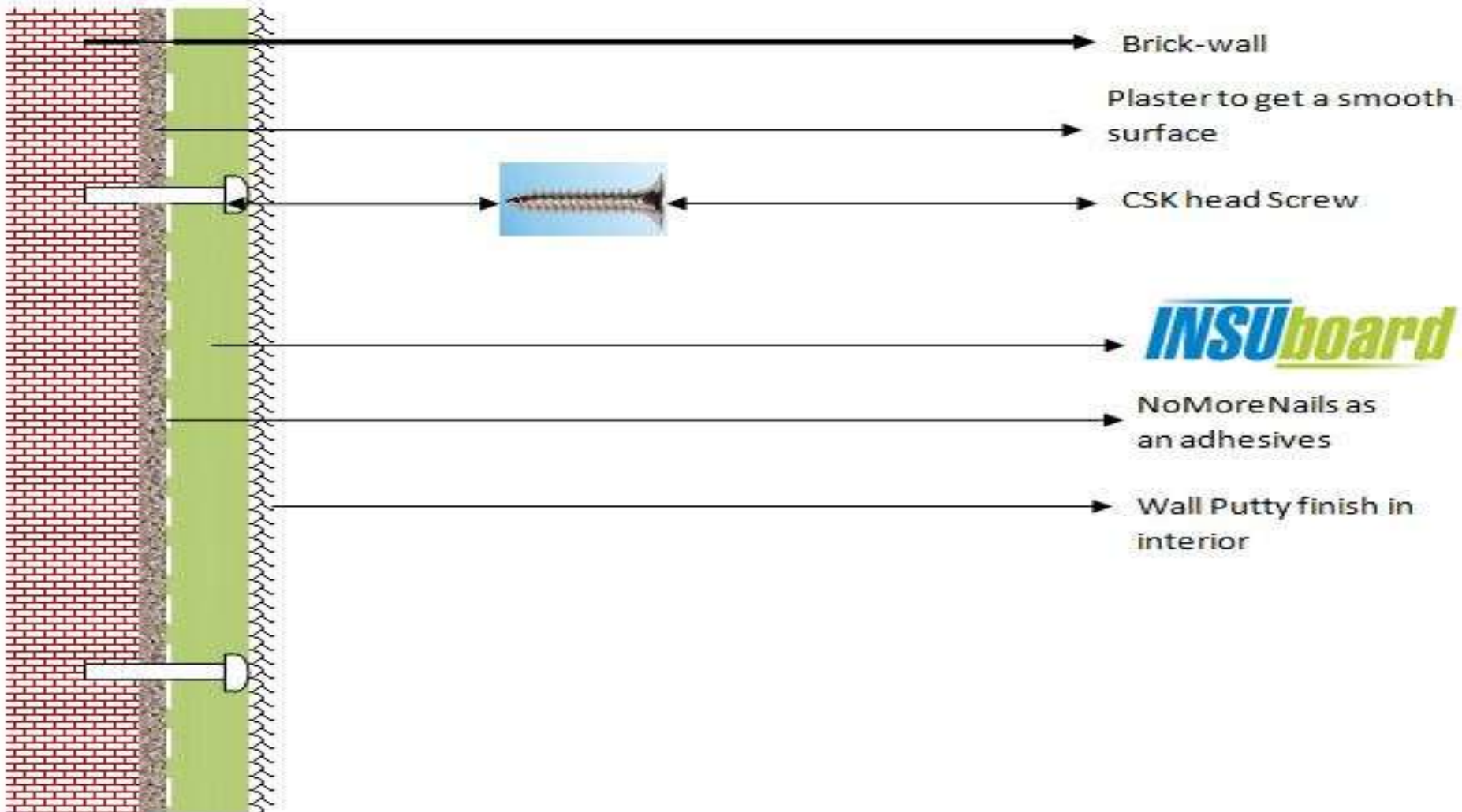
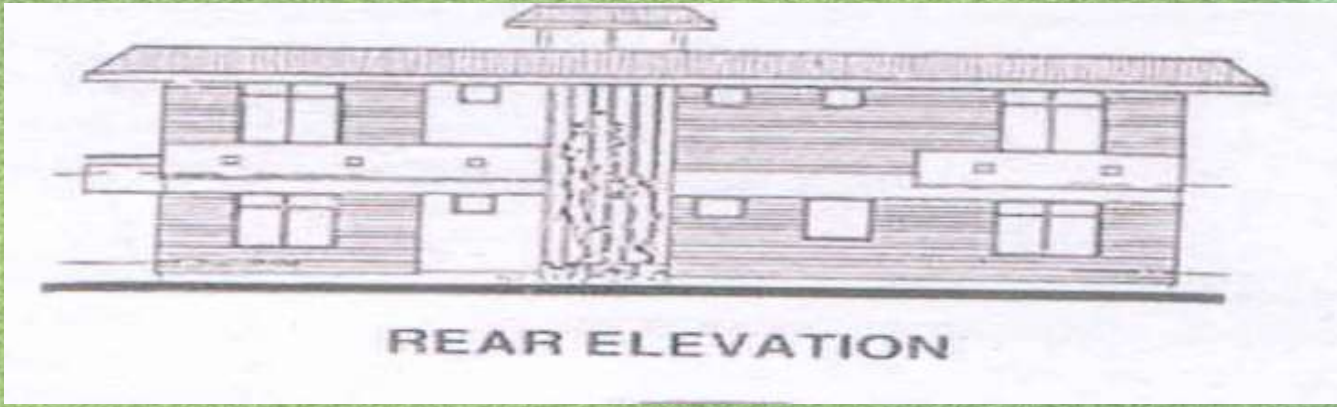


Fig:1 Application of **INSUboard** in Wall



Case study – Saudi Arabia



	Insulation (mm)		Peak Load (KBTU/hr)	Annual Energy (MWh)	Peak Cooling (KW)	Reductio n %
	Roofs	Walls				
0	-	-	206.4	108.8	30.2	-
1	50	30	145	76.5	21.2	29.8
2	70	40	135	71.2	19.8	34.4

A two storey villa with a roof area of 245sq mtr and a wall area of 250 sq mtr
Payback period is 2 years
Smaller A/c units can be installed



EIFS

- **EIFS – External Insulation Finishing System**
- **It can be defined as a non load bearing, exterior wall cladding system that consists of an insulation board attached either adhesively or mechanically, or both, to the substrate; an integrally reinforced base coat; and a textured protective finish coat.**
- **Today EIFS with Drainage system is preferred since it provides a way for moisture that may accumulate in the wall cavity to evacuate.**

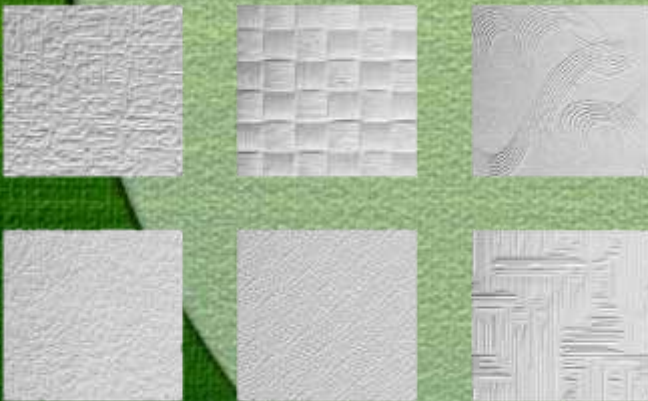
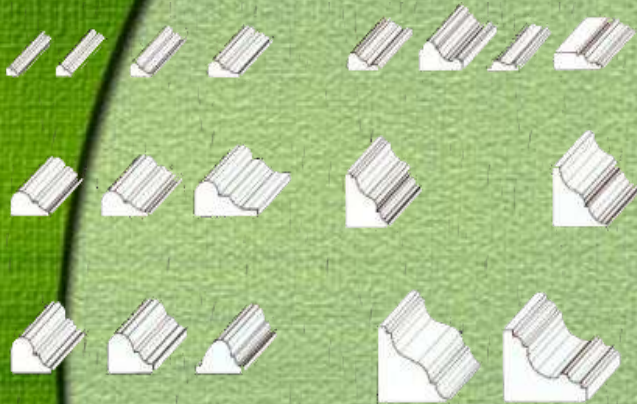


EIFS Components

- **Water – resistive barrier over the substrate (Optional)**
- **Drainage plane – vertical ribbons of adhesive applied between WRB and insulation board**
- **Insulation board typically made of EPS / XPS which is secured with an adhesive or mechanically to the substrate**
- **Glass-fibre reinforcing mesh embedded in the base coat**
- **A water resistant base coat applied on top of the insulation to serve as a weather barrier**
- **A finish coat that typically uses colourfast and crack resistant acrylic or silicon resin.**



EPS Decorations





EIFS – Performance

- **Tested and well researched for more than 50 years**
- **Best performance cladding in relation to thermal and moisture control when compared to brick, stucco and cementitious fibreboard siding**
- **Compliance with modern building codes**
- **Maximum energy saving because of continuous insulation**
- **Improved indoor air quality because of continuous air barrier**
- **Reduced environmental impact over the life of the structure**
- **Unlimited decorative choices – profiles, colour, texture**



EPS – Sustainable Building Material

- **Ideal choice for green building designs**
 - **Energy efficiency**
 - **Indoor environmental quality**
 - **Localized manufacturing**
 - **Reduced jobsite waste and labor costs**
 - **Superior insulating properties**
 - **Improve overall performance of the building envelope**



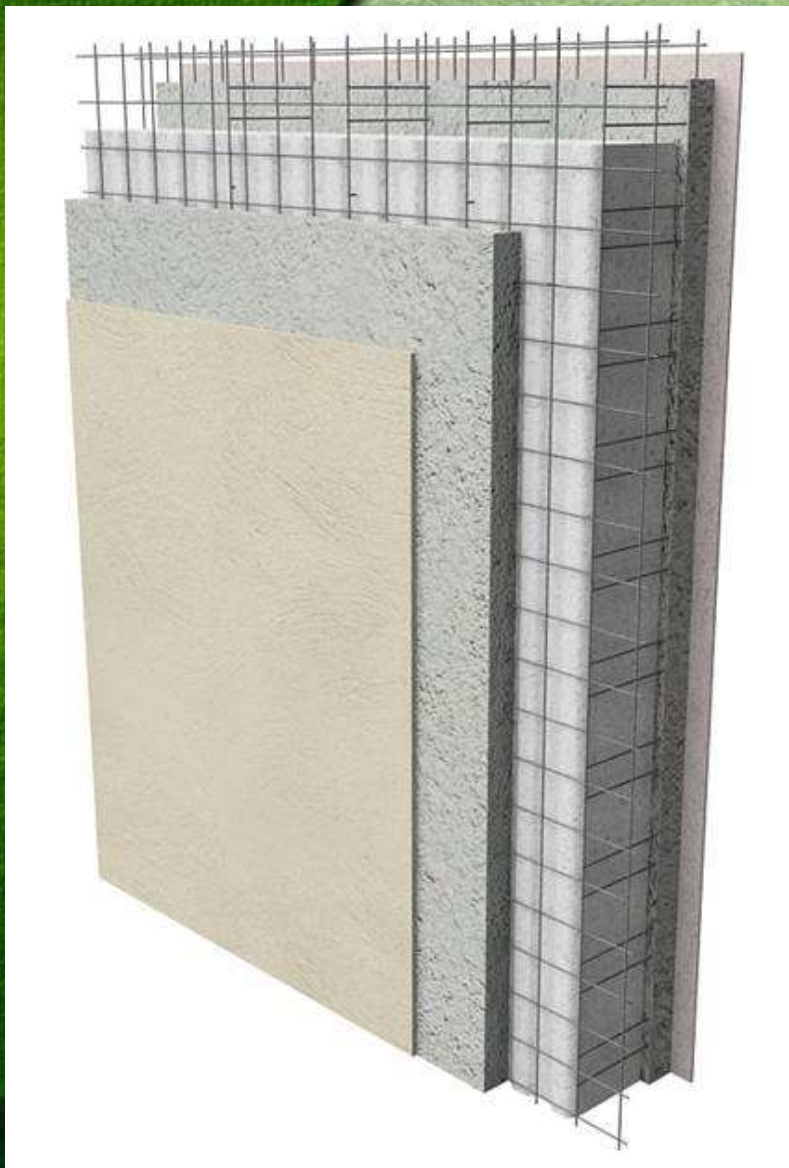
Sandwich Panels

- Simple sandwich structure
- Made up of two major elements :
 - Core of EPS
 - The skin - the outer layers- of Galvanized Steel, Al, PVC, cement fiber board, etc.





SIP (Structural Insulated Panel)



Pre-reinforced sandwich panel with galvanized steel cage

Polystyrene Slab for thermal insulation

3,5 cm Shotcrete on each side for structural resistance

Monolithic building shell

Supports any surface finishing



SIP (Structural Insulated Panel)



SINGLE



DOUBLE



FLOOR - ROOF



STAIRS



Building With SIP





EPS Core Panel System





Application Examples





SOLUTIONS FOR EVERY APPLICATION

RESIDENTIAL



SOCIAL HOUSING



MULTISTORIED LOAD-BEARING



MOBILE HOMES



COMMERCIAL



HOTELS



PUBLIC BUILDINGS



SHAPED SOLUTIONS



FARMING



INDUSTRIAL BUILDINGS





BETTER BUILDING WITH EPS

BETTER CONSTRUCTION



Durable



Fast



Versatile



Cost-effective



Sustainability and Energy Saving



Compatibility with all other existing construction systems

BETTER PERFORMANCE



Earthquake



Blast & Explosion



Hurricane & Tornado



Fire

BETTER COMFORT



Thermal resistance



Acoustic resistance

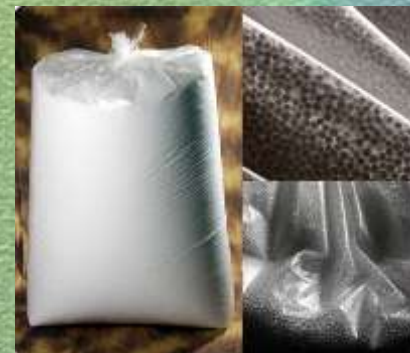
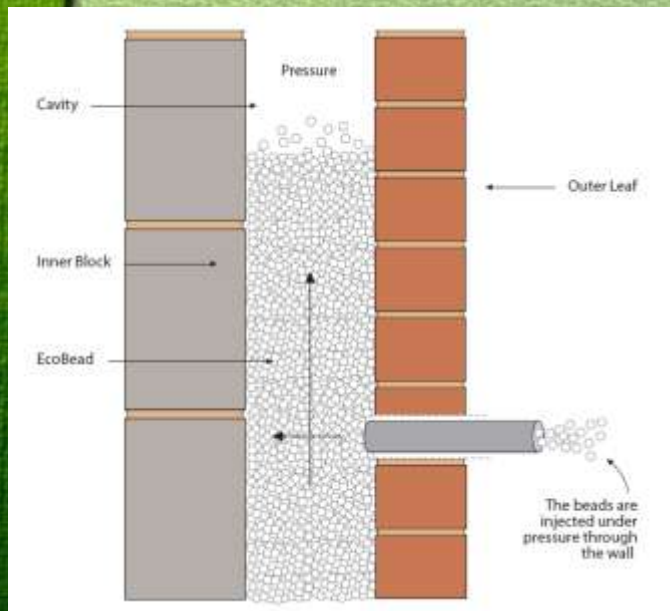
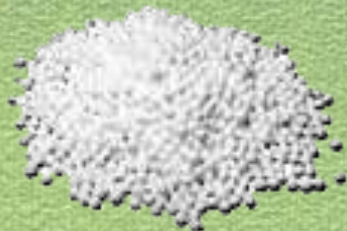


BMTPC Approval





EPS beads/Light Weight Concrete





Summary

- **Building energy consumption will grow with increasing construction activities**
- **Government policies and programs on energy efficient buildings.**
- **New buildings to be designed using energy efficient products and services**
- **Energy inefficient buildings built before need to be retrofit with EIFS**
- **Building Codes and Insulation must be made mandatory**



Thank You



Contact

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