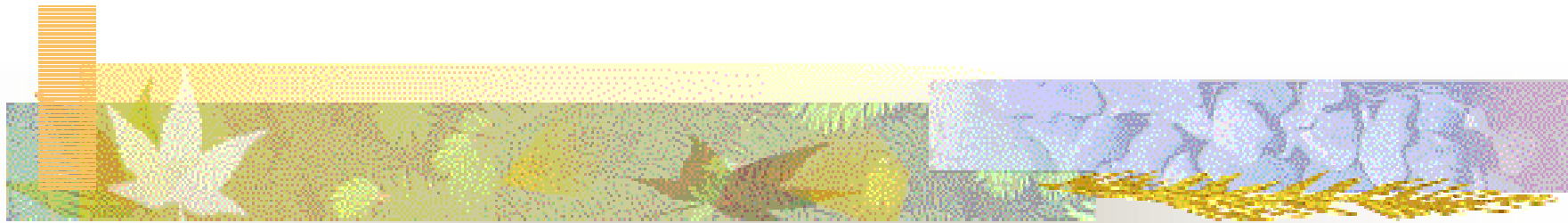


Eco-Friendly Alternative Building Materials



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SCITECH PARK



Eco-Housing Mainstreaming Partnership

- USAID India has initiated this Partnership in collaboration with IIEC
- **Science and Technology** Park, University of Pune is one of the key partner in this partnership





Eco-friendly Alternative Building Materials & Technologies for Pune

- One of the major component of Eco-housing practices is Sustainable Construction Practices.
- Science and Technology Park undertook the study on 'Eco-friendly Alternative Building Materials & Technologies for Pune'

Aim of the study

To understand the building materials market in Pune and recommend alternative eco-friendly materials for use.



Why eco-friendly materials?

- Phenomenal growth in the construction industry that depends upon depletable resources.
- Production of building materials leads to irreversible environmental impacts.





What is Eco-friendly material?

- **Dictionary:** describes a product that has been designed to do the least possible damage to the environment
- **US EPA – EPP program defines as:**
"...products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose..."

Eco-friendly

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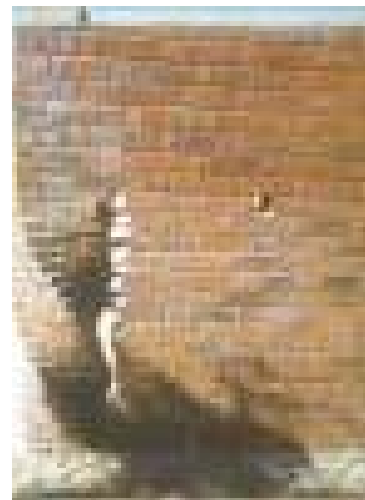
Material

Bamboo

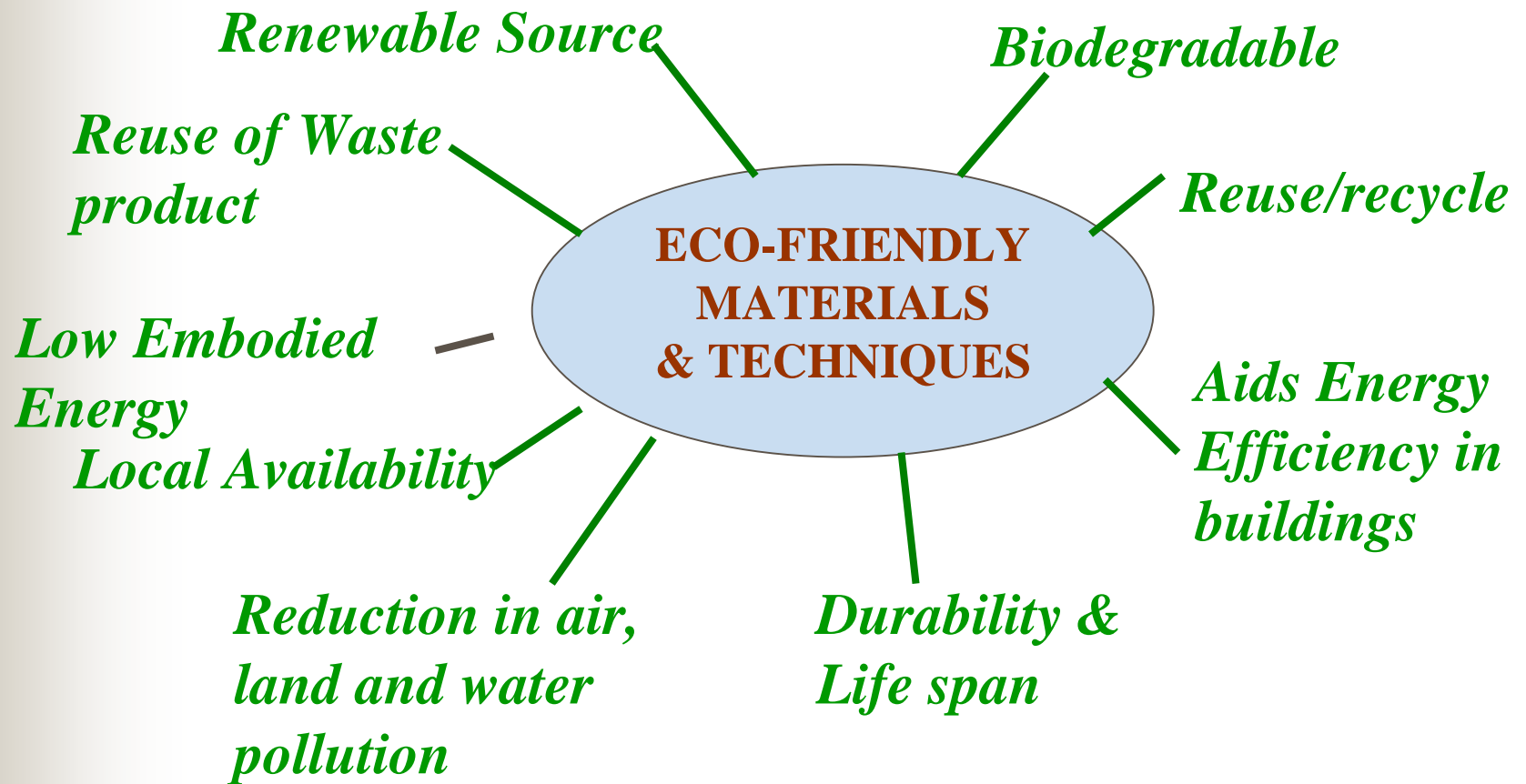


Technique

Rat Trap Bond



Properties



Source of Material

a. Renewable source –

Rapidly renewable sources e.g. *wood from certified forests*

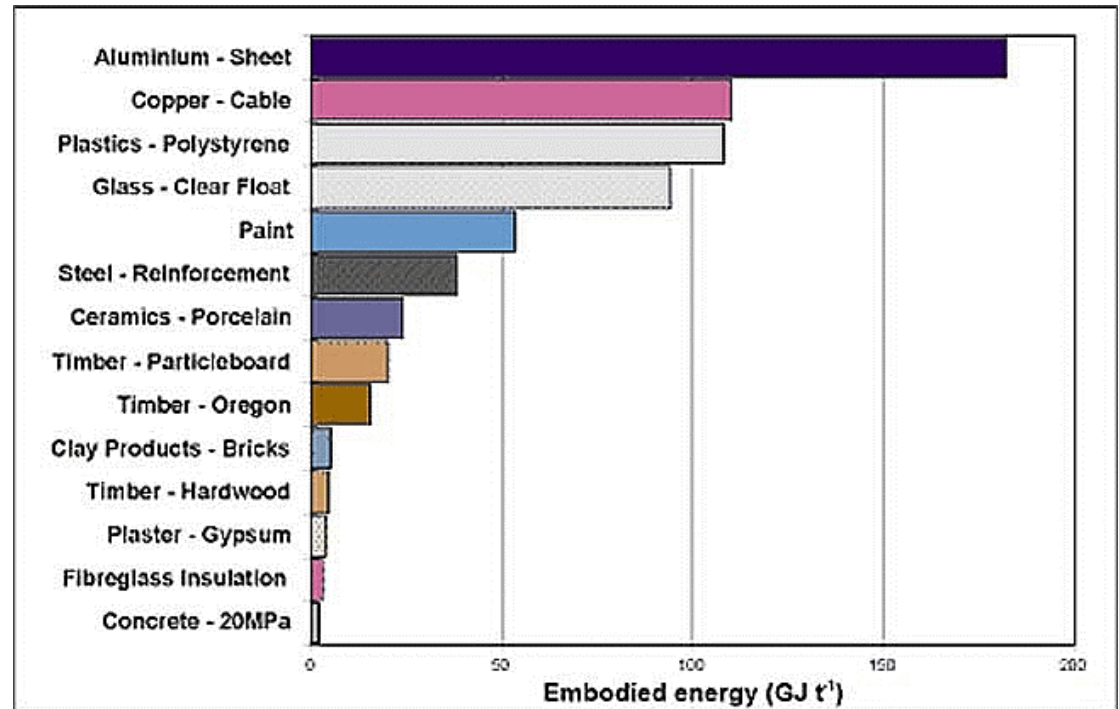


b. Reuse of Waste

- Salvaged products – e.g. *old plumbing, door frames*
- Recycled contents – agriculture/ industrial waste e.g. *Bagasse Board*

Embodied Energy

Scalar total of energy input required to produce the product including transporting them to the building site



Local Availability

Transportation Cost – For materials not available locally the transportation cost can form a significant part of its embodied energy.

S.No	NAME OF MATERIALS	TRANSPORTATION DISTANCE (approx.) unit - km	TRANSPORTATION COST COMPONENT unit - %	TRANSPORTATION ENERGY kwhr/kg	EMBODIED ENERGY kwhr/kg	TRANSPORTATION ENERGY COMPONENT unit - %
1	Ordinary Portland Cement / Blended Cement	200	27.98	0.2670	2.2000	10.82
2	Ready Mix Cement Concrete M30	10	17.09	0.0160	0.4445	3.47
3	Gypsum Plaster	500	26.96	0.5180	1.4666	26.10
4	M.S. Re-bar	50	1.43	0.0670	10.6000	0.63
5	Sand	25	33.34	0.0320	0.0333	49.00
6	Bricks	10	21.06	0.0110	0.8333	1.30
7	Fly-ash Based Bricks	40	22.35	0.0420	0.4000	9.50
8	Ceramic tiles	500	8.05	0.5180	0.8330	38.34
9	Marble / Granite	1200	39.23	1.5980	0.3000	84.19
10	PVC Sheet Plain / Corrugated	20	12.67	0.0380	23.3333	0.16
11	Aluminium Sheet Plain / Corrugated	150	0.58	0.2000	66.6667	0.30
12	A. C. Sheet Plain / Corrugated	20	3.38	0.0270	0.7000	3.71
13	G. I. Corrugated sheet	200	31.65	0.2670	12.6667	2.06
14	G. I. Pipe (100mm diameter)	200	5.60	0.2670	13.0000	2.01
15	A. C. Pipe (100mm diameter)	250	40.96	0.3330	0.8000	29.39
16	C. I. Soil / Rain Water pipe (100mm diameter)	900	30.58	1.1990	10.0000	10.71
17	P. V. C. Pipe (100mm diameter)	20	6.89	0.0630	24.0000	0.26

Reduce Pollution

- **Air Pollution**- Use of materials with low VOC emissions e.g. *Cement*

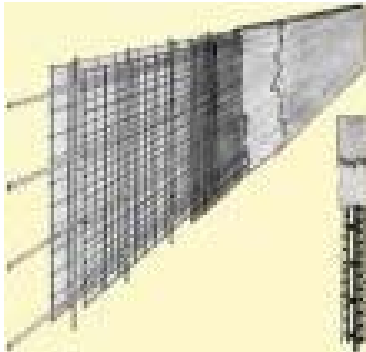


- **Water Pollution** – Materials that prevent leaching.



- **Land Pollution**- Materials that reuse waste that would otherwise have resulted in landfill. e.g. *Flyash Bricks*.

Performance



- Reduce material use
These are energy efficient and also help reduce the dead load of a building. e.g. *Ferrocement*

- Durability & Life Span
Material that are exceptionally durable, or require low maintenance e.g *PVC pipes*.



Energy Conservation

- Materials that require less energy during construction
e.g. precast slabs.



- Materials that reduce the cooling loads- *e.g. – aerated concrete blocks.*

- Products that conserve energy – *e. g. CFL lamps.*



- Fixtures & equipments that help conserve water *e.g. Dual flush cisterns*

Recyclable

- Reuse or Recycle as different product e.g. *steel, aluminum.*



- Biodegradable – that decompose easily e.g. *wood or earthen materials.*

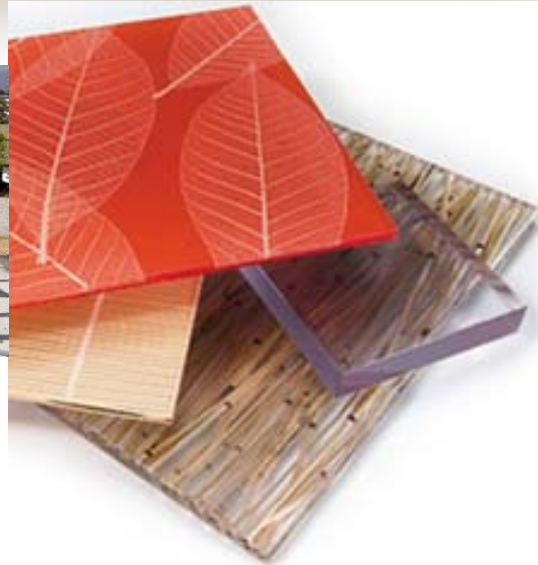
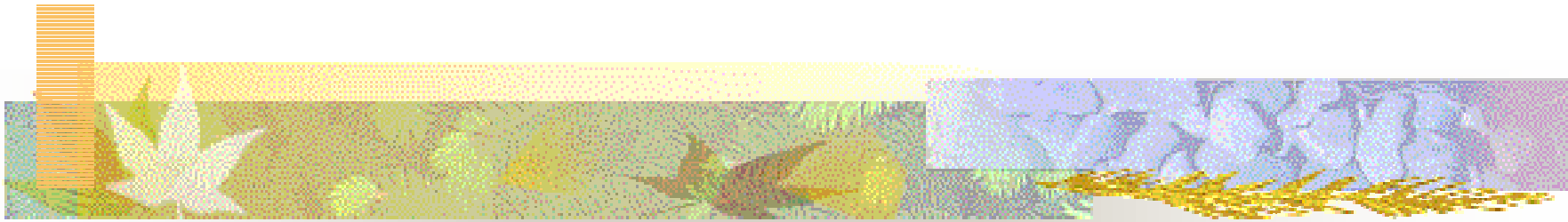




Eco-friendly/ non- eco-friendly

- Fired Clay Brick
- Bamboo
- Granite
- Sand
- Glass
- Timber

Recommended Eco-friendly Materials





EcoHousing Technical Criterias

- Efficient Building Materials has a total of 200 points.
- Use of certain materials is mandatory for a Eco-Housing Project.
- Increased use of other recommended alternatives will provide higher points.
- Verification is dependant on the Bill of Quantities and specifications.

1. Base Materials for R.C.C. & Steel Systems

◆ Use of 25% Pozzolana Material Blended Portland cement (BPC)

- Pozzolana material – Flyash/ Slag/ Calcined Clay
- Increased of Pozzolana material in BPC upto 30-50%



1. Base Materials for R.C.C. and Steel Systems

- Use Sand & aggregate from pulverized debris and /or sintered flyash for concrete and mortar
- Use Recycled steel forms and bars for reinforcement



Alternative Structural System

- Ferro cement and / or Precast components for beams, slabs, staircase, lofts, balconies etc.
- Ready Mix Concrete
- Use Resinous curing agents



2. Masonry

- Fly ash + sand + lime bricks / blocks,



- Pulverized debris + cement bricks/ blocks,
- Industrial waste based bricks / blocks,
- Aerated lightweight BPC concrete blocks,
- Phospho-Gypsum based blocks
- Lato blocks



3. Mortar

- Use of 25% Pozzolana Material Blended Portland cement (BPC)
- Sand from Pulverized debris or sintered flyash
- Increased use of Pozzolona Material content in BPC by direct addition of raw Pozzolona material.



4. Plastering

- Calcium Silicate Plaster /
- Cement Plaster
- Fiber reinforced Clay Plaster/Non erodable Mud Plaster/
Phosphogypsum Plaster
- Use Resinous Curing agents



5. Roofing and Ceiling

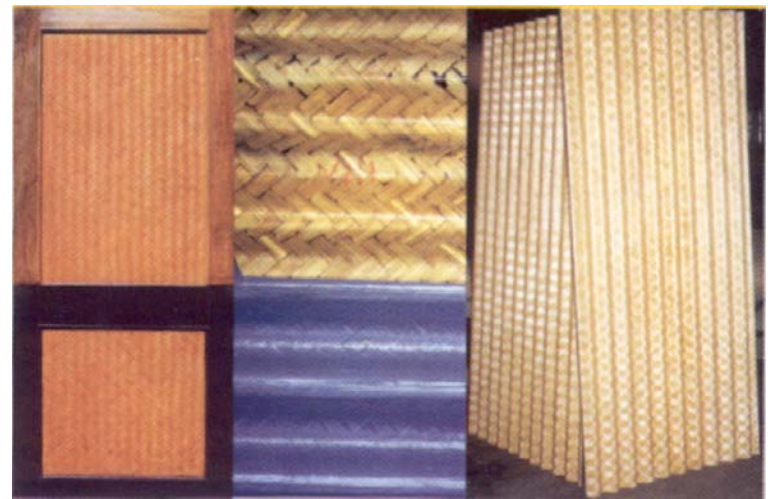
- Terrazzo floor for terraces and semi covered areas

5. Roofing and Ceiling

- Fibre Reinforced Polymer
- Micro Concrete Roofing Tiles

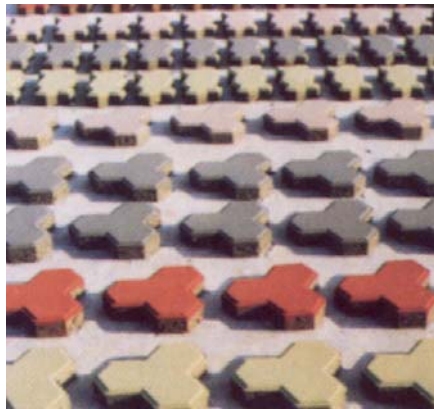


- Bamboo Matt
- Corrugated Roofing Sheets



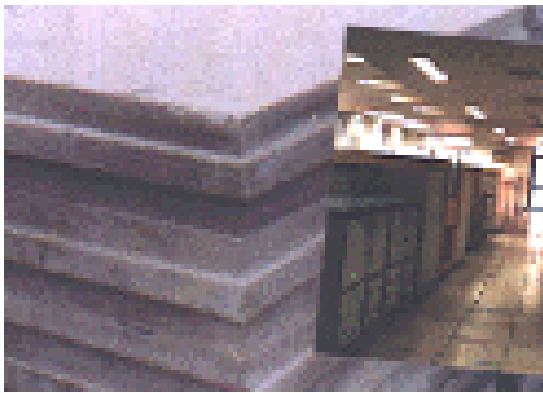
6. Outdoor Paving

- Flyash/industrial waste/pulverized debris blocks in BPC
- Bedding sand to be from pulverized debris
- Terrazo flooring for terraces and semi-open spaces.



7. Flooring

- Use Ceramic tiles (non-vitrified)
- Phospho-Gypsum Tiles



- Bamboo Board Flooring



- Mosaic Tiles
- Cement Tiles



8. Windows, Doors and openings

- Ferro cement and Precast R.C.C. lintel, chajja and jalis instead of RCC
- Ferro cement and Precast R.C.C. Frames/ Frameless Doors/ Bamboo reinforced Concrete Frames.
- Hollow recycled steel channels and Recycled Aluminium Channels



9. Electrical

- Use unplasticised Polyvinyl Chloride (PVC) or High Density Polyethylene (HDPE) products
- Use products with recycled aluminum and brass components



10. Water supply

- ◆ Use R.C.C., unplasticised PVC , G.I., C.I. pipes instead of lead, A.C. pipes
- Use products with recycled aluminium and brass components
- Use Polymer Plastic (Random) for hot/cpld water systems.
- Manholes and covers from precast cement concrete and high strength uPVC.

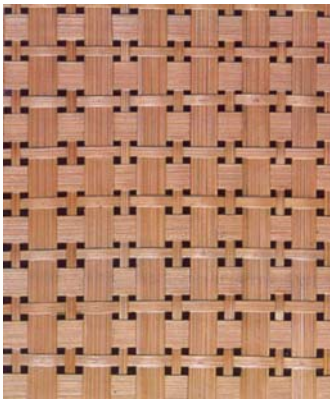


11. Wood work

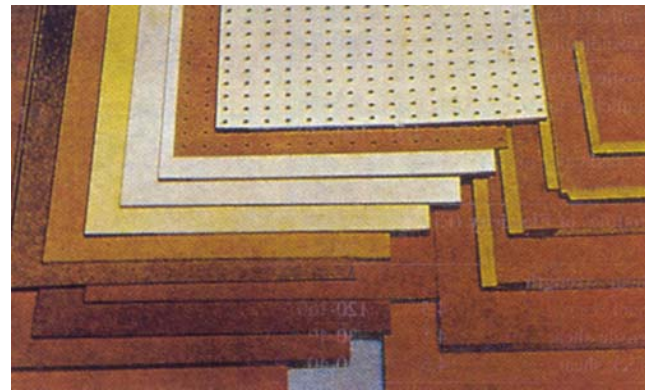
- Timber used must be renewable timber or from salvaged wood.
- Plywood should be phenol bonded and not urea bonded.
- Use MDF Board
- Use Mica Laminates and Veneers on Composite boards instead of natural timber.

11. Wood work

- Bamboo Ply/Mat Board,, Bamboo mat Veneer Composite



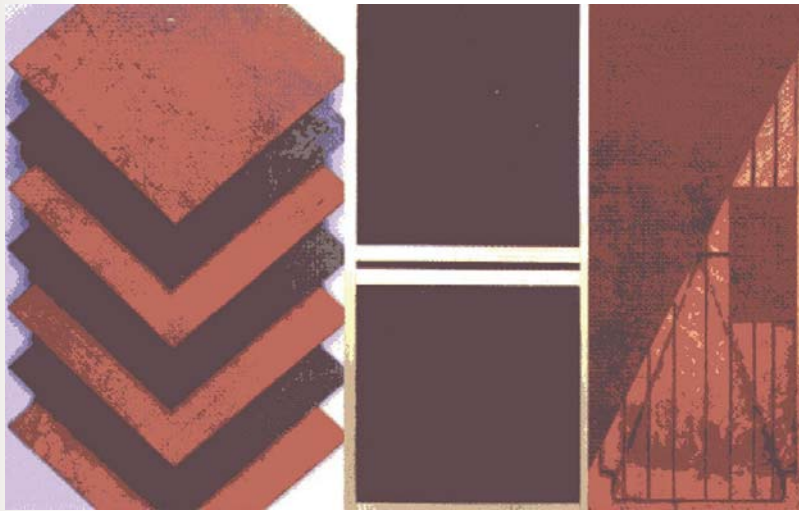
- Fibre Reinforced Polymer Board
- Bagasse Board



- Coir Composite Board

11. Wood work

- Finger Jointed Plantation Timber Board



- Recycled Laminated Tube Board
- Aluminium – Foil + Paper + Plastic Composite Board





12. Water proofing chemicals

- Use of water based chemicals instead of solvent based
- Use Epoxy resins instead of tar felt / pitch



13. Painting

- Use of Cement Paint/ Epoxy Resin Paints for external surfaces
- Use of Water based paints, enamels, primers and polishes.

Thank you



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