Building Materials and Housing

UNIT V: Current Trends in Building Materials

Construction materials have come a long way over the years. From the use of timber and concrete to cigarette butts and cardboard, builders are looking for newer and more effective materials for their projects. Builders are taking advantage of innovative solutions that will reduce the time and cost of designing new structures.

To keep up with the trend, here are nine new construction materials that you could explore:

1. Mass Timber

Over the years, the use of timber steadily decreased in commercial construction projects. Concrete and steel have been the preferred option due to their strength and fire resistance. However, timber is making a comeback in 2019 in the form of mass timber, which is essentially solid wood that has been laminated and panelised to increase strength and durability.

Using mass timber allows builders to lower the carbon footprint of buildings by trapping carbon from the atmosphere, and to reduce the cost of building materials.

2. Cigarette Butts

Cigarette butts are another innovative material that can be used in construction. They can be infused into bricks, where they provide durability and efficiency to building materials.

Because cigarette butts result in millions of tons of waste every year, using them as a construction material helps clean up the environment and reduce material costs. The bricks made from cigarette buts are often lighter, more convenient to use, and highly energy efficient.

3. Air-cleaning Bricks

New construction materials are also improving the quality of indoor air. Because air quality is always a top concern for commercial structures, using passive air filtration systems can significantly benefit builders and building owners.

Air-cleaning bricks are innovative construction materials that can filter incoming air to remove pollutants. These bricks are placed on the outside of a building and they filter heavy air particles as air flows indoors.

4. Illuminating Cement

Illuminating cement is a new material that will influence road construction in 2019. This cement traps light from the sun during the daytime and releases it at night.

Illuminating cement creates a glowing surface that allows builders to save on lighting costs. This material can also be used to light up swimming pools, footpaths and roadways; reducing dependency on street lighting.

5. Cooling Bricks

Cooling bricks (also called hydro-ceramic bricks) are perhaps one of the most innovative materials to explore this upcoming year. These bricks are made from clay and hydrogel, and they’re typically positioned to line the outside of buildings.

As air comes in, the hydrogel material absorbs water and stores it within the bricks. This water can be released to cool the building on a hot day. Cooling bricks have great potential to reduce energy consumption in commercial structures.

6. Self-healing Concrete

Cracks in concrete have been a long-standing problem in the construction industry. A small crack often becomes larger and wears away the structure over time. Self-healing concrete can be used to solve this challenge. This innovative building material consists of living spores and water capsules within the mixed concrete. When damage occurs, the capsules crack open and mix with water. This mixture produces calcite, a material that fills the damaged area and later solidifies in place.

By using self-healing concrete, structures such as tunnels, buildings and bridges will cost less to build and maintain.

7. Strand Rods

Carbon fibre is now being used in many different applications. From vehicles to aeroplanes and household items, this material is becoming more relevant by the day. In the construction industry, carbon fibre is being used to retrofit buildings against earthquakes.

Thermoplastic carbon fibre is used in the form of a material called CABKOMA. CABKOMA is five times lighter than metal and it has an aesthetically appealing look on buildings. It also has excellent durability and strength to protect buildings against earthquakes.

8. Cardboard

Recycled cardboard is another useful construction material to watch out for. Cardboard can be used to create a cellulose-based insulation for both residential and commercial buildings.

For structures that are built in cold or hot climates, cardboard creates a higher quality insulation material than many other options in the market.

9. Programmable Cement

In an effort to make concrete structures more durable, programmable cement can be used to achieve water and chemical resistance. Programmable cement is essentially a form of cement that can be designed to achieve less porous and more chemically resistant shapes. These innovative shapes limit damage to concrete and increase the durability of structures.

When considering the use of new construction materials, it is important to consider both the new innovations available on the market and the costs of implementing them to your projects. Accurate cost estimates are essential to ensure costs are adequately allowed for, so you can maintain profitability.

Eco-Friendly Building Materials

What are Eco-Friendly Building Materials used in Construction?

A new generation of stronger, lighter and more sustainable building materials is coming to solve the construction industry's main challenges. From natural disasters and sheer costs to environmental concerns and inefficiency, the industry struggles to keep up with demand while maintaining its output. Building projects consume 50% of our resources from nature, often leading to added costs, delayed construction times, and wasted materials.

To address some of these challenges, many innovative firms are developing a generation of new building materials. Materials are being engineered to be smarter, stronger, self-sustaining, sleeker, and easier on the environment.

Categorization of Building Materials

Categorized based on Activity and Vendor Specific

1. Civil materials
2. Waterproofing and Chemical additives
3. Paving, flooring, dado and similar finishes
4. Paints, colors, white washing, distempering and wood finishes
5. Wood work
6. Roofing and ceiling
7. Doors and windows
8. Water supply and sanitary fittings
9. Electrical works
10. Fire fighting system
11. Miscellaneous
12. Excavation work
13. Road works

Evaluating Eco-friendly Materials

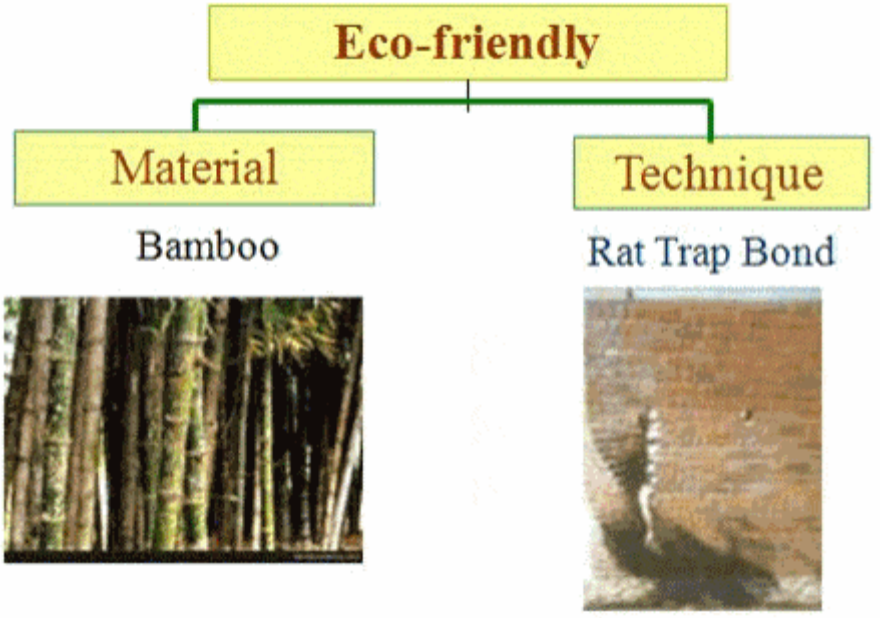
Why eco-friendly materials?

- Phenomenal growth in the construction industry that depends upon depletable resources.
- Production of building materials leads to irreversible environmental impacts.
- Using eco-friendly materials is the best way to build a eco-friendly building.

Stone quarrying leads to eroded hills, like this picture showing the site of makarana marble quarry, brick kilns in the fringes of the city lead to denudation of topsoil, dredging for sand damage the river biodiversity etc.

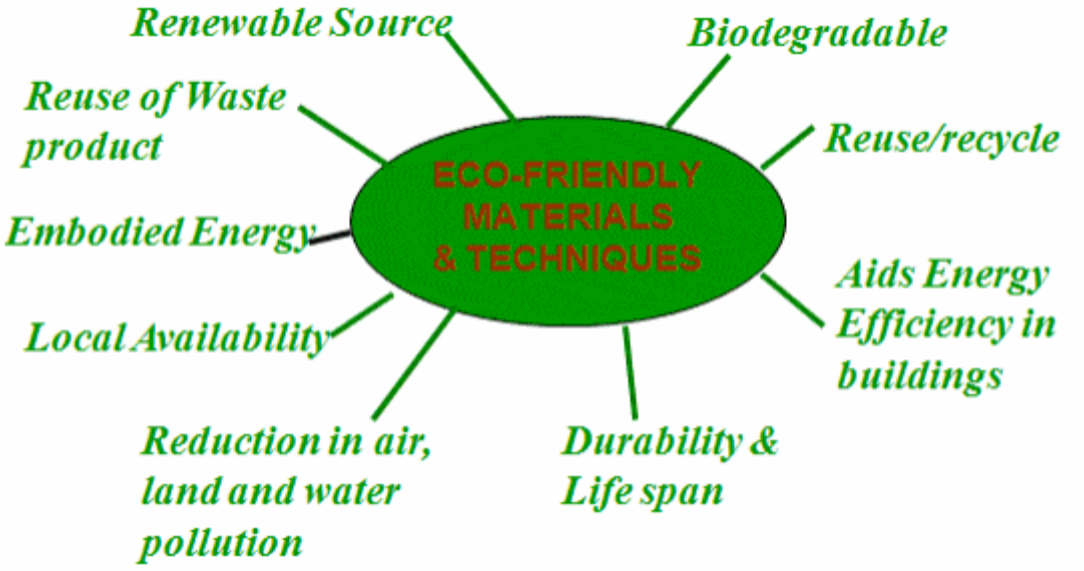
What is Eco-friendly material ?

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" Thus we talk of two issues – one that it does the least possible environmental damage and two that it is a comparative scale as there are very few materials that are completely eco-friendly.



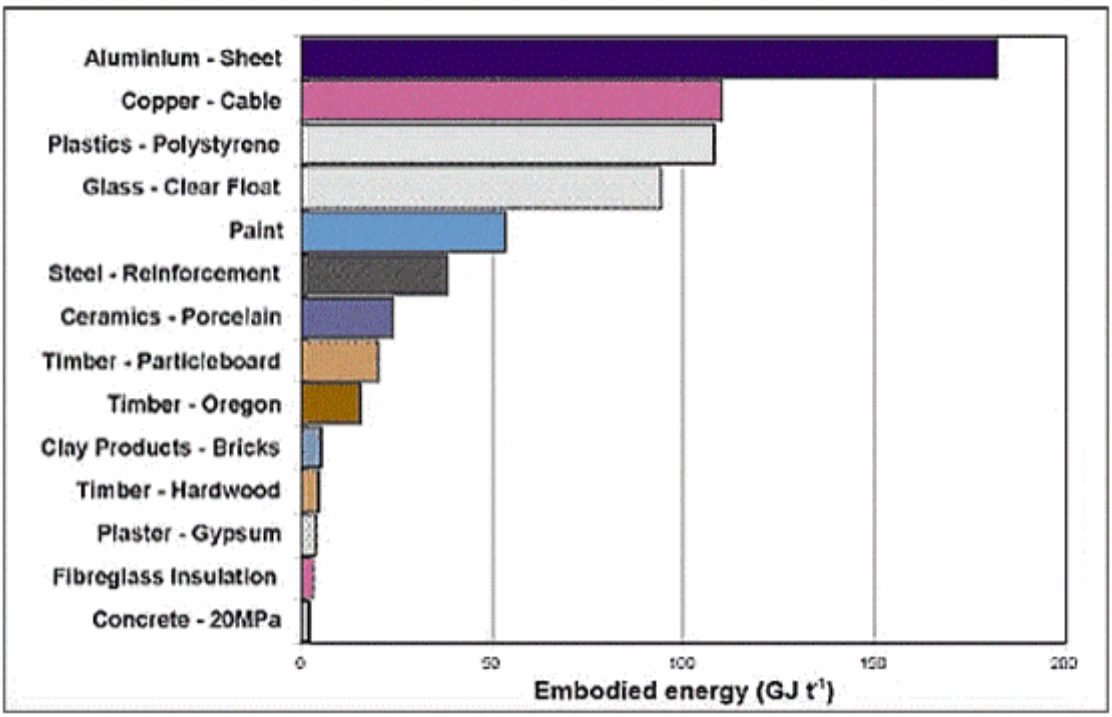
One more point to note when we talk of eco-friendly construction is that it consist of two parts – Material and Technique. A material by itself can be eco-friendly, e.g. Bamboo. Or Even conventional materials can become eco-friendly based on the construction technique that is used. e.g. rat trap bond developed by Lauri Baker, which require less number of bricks and are more heat insulating than normal walls and therefore eco-friendly.

Properties of Eco-Friendly Building Materials



The various properties of the Eco-friendly materials and techniques are – Materials can be eco-friendly also if they can assist in reduction of the energy used in the building during operation and maintenance. it is difficult to get a material that has all these properties, and it thus becomes a comparative assessment to identify eco-friendly materials. **Source of Material a. Renewable source** Rapidly renewable sources e.g. wood from certified forests

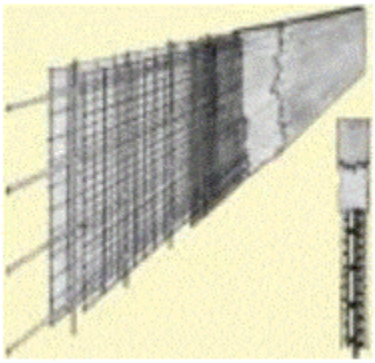
b. Reuse of Waste Salvaged products –e.g. old plumbing, door frames Recycled contents – agriculture/ industrial waste e.g. Bagasse Board **Embodied Energy** Scalar total of energy input required to produce the product including transporting them to the building site



Aluminium and steel has the most embodied energy because to the high energy required to produce them. Compared to timber that requires very less energy for production. **Reduce Pollution Air Pollution**- Use of materials with low VOC emissions e.g. Cement Paints

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. Materials can be eco-friendly based on how they perform. Use of certain material or techniques can reduce the amount of material required. Durability – The longer the life of a material the lesser it is required to replace and thus reduces the quantity required to produce. **Energy Conservation** Materials that require less energy during construction e.g. precast slabs.

Materials that help 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.

Organic Building Materials

Organic building materials and their benefits

Organic building materials are a new-age remedy for battling the environmental pollution to whom we are exposed all the time.

The amount of energy that is used daily, and the contamination created in the process of using man-made construction materials is astounding and terrifying at the same time. Harmful chemicals used in growing all the time, lead to many people becoming sick or allergic.

Hence the need for eco friendly building materials as the alternative, and if you want to know what eco friendly construction materials we refer to and what are their benefits, be sure to read the rest of the blog.

Features of natural building materials

The eco building materials, also known as organic building materials are grown from seeds and their main feature is to absorb carbon dioxide while they grow. After harvesting, their special property is to isolate the greenhouse gas, instead of releasing it into the atmosphere.

The usage of natural building materials leads to healthier buildings thanks to their ability to to "breathe" by absorbing and giving off moisture for a healthy indoor environment. Materials such as wood, straw, cellulose, bamboo, natural plants, oils and waxes are used to create more energy-efficient buildings, that are solid and safe, but at the same time, better for the environment.

Given the fact that the emphasis is on the energy efficiency and sustainability, it is no wonder that eco friendly building materials are meant to pave the way to a more natural approach in construction, and here are some of them.

1.Straw bale

Why did we say that?

Well, the thing with straw bale as an eco friendly material, is that was used a long time ago, and now this technique is reintroduced and updated for the 21st century.

Straw bales are made from the waste of the agricultural industry, as lumber substitutes, with an ability to isolate carbon.

Homes made from straw bales have thicker walls than it might seem at first, offering a great insulation and fire resistance, matching your favorite aesthetic at the same time. Straw bale homes keep warm in the winter, and cooler in the summer, which is makes them a great choice at all times.

2.Rammed earth - one of the oldest eco building techniques

Earth construction has been known for ages, so it is wonder it is still used today, given it is one of the most durable construction techniques.

The practical features of the rammed earth are their use as a thermal storage, which allows the sun to warm it during the day, and then slowly release that warmth in the evenings.

This low-carbon technique functions in a way where soil and binder are placed in layers, and are pressured afterwards, allowing it to create a hard and durable surface, that is now often seen in luxury homes with dramatic and durable walls that resemble sedimentary rock.

3.Bamboo sustainable building material - an alternative for wood

Not only that bamboo resembles wood aesthetically, but it also belongs to the grass family, meaning it can regenerate fairly quickly in comparison to trees. Bamboo is one of the fastest growing plants on the planet, with an ability to grow up to three meters per day, depending on the type.

Bamboo might just be the perfect alternative for wood, and it's not just the speedy growth rate that makes it so. Since we are talking about eco building materials for construction purposes, bamboo can be harvested up to every 3 years, while that period being very prolonged in case of trees, going up to 25-50 years in case of some species.

Bamboo is a perfect sustainable alternative even when it comes to applications - it can be used for tiles, flooring, lumber, decking and countertops. So, not only does it help forest regenerate thanks to its' rise in popularity, but also enables you to be creative and use it however you want.

4.Mycelium - futuristic mushroom insulation

Even though it sounds as something that comes straight from a sci-fi movie, among the organic building materials known as biocomposites (products derived from plants, bacteria, animals and fungi), mycelium is a champion when it comes to bioplastics that can be used in construction purposes.

Mycelium is mushroom-based organic building material that can be used in creating construction materials stronger than concrete, more insulated than fiberglass and completely disposable.

Mycelium comprises the root structure of fungi and mushrooms, and can be encouraged to grow in the composite of other natural materials such as ground up straws or molds. They can also be air-dried to create lightweight, but very strong bricks or other shapes.

5.Tree bark as a sustainable material

Sustainable forestry is all the rage now, and we couldn't be happier about it!

New practices involve using tree bark as a sort of organic building material. In its' essence, bark is a highly durable, attractive, economical, and it goes without saying - sustainable option for siding and shingling.

In case of sustainable construction, the bark used comes only from the trees that are already cut, for usually it's tossed away as debris, burned or used to make mulch.

Siding made from bark can last 75 up to 100 years, without any regular maintenance required, painting or sealants, which also means there is no chemical runoff. After it's removed from the trees, bark is kiln dried - sterilized against fungus and pests.

This sterilization technique involves no pesticides or any other harmful chemicals, but also, it will never warp or shrink upon installation.

We could say that the future of sustainable organic building materials is secured, or it gets more so at an amazing rate.

Prefabricated Materials :

Prefabricated building materials are used for buildings that are manufactured off-site and shipped later to assemble at the final location same of the commonly used prefabricated building materials are aluminum steel, wood, fiberglass and concrete.

Prefabricated metal buildings use galvanized Steel and galvalume as the chief materials for building. Galvalume is a form of Steel coated with aluminum Zinc.

This is to protect the building against corrosion-rust and fire. It also provides a sturdy and protective covering to the prefabricated building. Almost all the components of a metal building such as beams, frames, columns, walls & roofs are made of steel. Most prefabricated military buildings use steel or aluminum frames.

(Synthetic materials are used for the walls & roofs. To provide enhanced security a combination of both metal and cloth materials are used. Plastic flooring materials can be quickly assembled and are very durable)

- Prefabricated, building materials used for small prefabricated buildings are steel, wood, fiberglass. Plastic or aluminum materials. These materials are cheaper than regular brick and concrete buildings. Materials like steel, fiberglass, wood and aluminum are used as prefabricated building materials for sports buildings. These materials provide flexibility and are preferred for making structures and accessories like stands and seats for stadium and gyms.

- For making low cost housed, prefabricated materials like straw bale, Ferro cement calcium silicate. Products, campsites and other cheap wood based materials are currently being used calcium silicate bricks are strong and durable. Ferro cement

consists of a cement matrix reinforced with a mesh of closely-spaced iron rods or wires. In this type of construction, the techniques used are simple & quick.

- Using Prefabricated materials one can make durable water and fire resistant and cheap prefabricated buildings. Most of the prefabricated building materials are eco-friendly & affordable.