Sustainability, Agri, Food and Environmental Research, (ISSN: 0719-3726), vol 12(2), 2024
http://dx.doi.org/10.7770/safer-V13N1-art463

Designing an Interior Space of Residence using Recycling and Sustainable Materials and reduce the impact of hazardous materials.

Diseñar un espacio interior de residencia utilizando materiales reciclados y sostenibles y reducir el impacto de materiales peligrosos.

Tharaka Rupasinghe

School of Architecture and Design, Lovely Professional University, Punjab, 144411, India.

ABSTRACT

Recycling materials and sustainable materials are two major aspects in Architecture. And when it comes to interior design this can affect more to the human being as well as the indoor environment. It's not just we can use materials in cheaper ways that we generate less pollution and produce good air quality to have well being life cycle around you. The basic output of this project is to identify and study the hazardousness of materials and to reduce its impact and to give solutions and alternatives to use them in a healthy way. The new design era has given energy to the design perspective, many of the modern designs has its own uniqueness, basically including shapes, forms and specially the selection of materials. And as designers we all must have a concern of its nature and how it effect to the health and also to increase the indoor air quality of the particular area. And as one of my main focuses of the project is to use recycle materials you need to have an idea about what kind of materials can be used in addition to the other perspective of the design. Hazardous of the materials has its own properties which can do a real harm and even cost the lives. So as this comes as a part of mine main objective of the project this study and the exercises are depend on the study of those materials and giving them better solutions with reducing the effect on the nature and the environment.

Keywords – Recycling, Sustainable, Hazardous materials

RESUMEN

El reciclaje de materiales y los materiales sostenibles son dos aspectos importantes en la Arquitectura. Y cuando se trata de diseño de interiores, esto puede afectar más al ser humano que al ambiente interior. No se trata solo de que podamos usar materiales de manera más económica, sino que generemos menos contaminación y produzcamos una buena calidad del aire para tener un ciclo de vida de bienestar a nuestro alrededor. El resultado básico de este proyecto es identificar y estudiar la peligrosidad de los materiales y reducir su impacto y dar soluciones y alternativas para utilizarlos de forma saludable. La nueva era del diseño ha dado energía a la perspectiva del diseño, muchos de los diseños modernos tienen su propia singularidad, incluyendo básicamente formas, formas y especialmente la selección de materiales. Y como

diseñadores, todos debemos preocuparnos por su naturaleza y cómo afecta a la salud y también por aumentar la calidad del aire interior de un área en particular. Y como uno de mis principales enfoques del proyecto es utilizar materiales reciclados, es necesario tener una idea de qué tipo de materiales se pueden utilizar además de la otra perspectiva del diseño. Los materiales peligrosos tienen sus propias propiedades que pueden causar daños reales e incluso costar vidas. Como esto es parte del objetivo principal del proyecto, este estudio y los ejercicios dependen del estudio de esos materiales y de darles mejores soluciones para reducir el efecto sobre la naturaleza y el medio ambiente.

Palabras clave – Reciclaje, Sostenible, Materiales peligrosos

INTRODUCTION

Recyclability quantifies the potential of the commodity to be used as an asset in the development of new goods. The selection of the correct materials to plan the interior engineering of a given space is one of the most critical factors in terms of maintenance. Wood boards, glass, metals and gypsum boards are the most commonly known materials (base materials) used for eco-friendly interior design. They can frame the finished surface or they can be the reason for wrapping up. Wood boards are made of molecular board, pressed wood, concrete board and fiberboard. Also, reused glass may be used for expansion to a particular material or for the manufacture of tiles and work surfaces. Metals are represented by higher use of vitality, and it is prescribed to use reused metals that minimize misfortune and add crude material to the reserve funds. There are a variety of options in choosing a story covering.

Manageability has been viewed as a crucial concern in a number of areas, including an internal strategy. Within fashioners have an ethical duty to help ensure, preserve and rebuild the world's biological environment. Manageability in the internal system is becoming an indispensable concern because of the vast assets required for internal use. Economic inhouse practices are operations that reduce environmental impacts and establish a solid state of affairs.

Within architects, customers' desires and concerns, cost considerations, time constraints and creativity are shuffled; supportability adds one more element to this mix. A good venture would combine the sustainability of each phase of the systemic process, its implementation and post-habitation. Numerous inner designers across the globe have become more aware of the need to coordinate supportable strategies in their planning arrangements. The practical inner strategy should penetrate the soul of supportability and be an incentive for improvement. Within planners need unmistakable option metrics for manageable drugs and products, as well as criteria for superior inner structure responses to achieve uprightness in their structure arrangements.

Sustainability, Agri, Food and Environmental Research, (ISSN: 0719-3726), vol 12(2), 2024
http://dx.doi.org/10.7770/safer-V13N1-art463

AIMS

1. Aim is to create a sustainable building which will reduce the cost of maintenance and upkeep of the building. The building can also enhance the quality of life of the people residing in the building.
2. The methodology shall be informed by the traditional materials which shall be enhanced to create a sustainable high-rise building.

OBJECTIVES

1. Use eco friendly materials and traditional methods.
2. To fabricate newer materials to achieve the sustainable development of the building.

ESSENTIALS TO BUILD A CONVENTIONAL BUILDING USING NORMAL MATERIALS

1. Foundation

Establishments Poured has for some time been a staple in the construction industry of establishing concrete and solid square establishments. They have warm mass security and have a long life. Critical changes have been made that reduce the squander delivered nearby and increase the security estimate of these institution structures. Froth sheets or squares are used to contain the solid when pouring, and to improve the compressive strength by preserving the heat generated.

2. Structural Confining

Steel containment is becoming an effective choice in comparison to the wood stud surrounding it in private production. In either case, because steel is more grounded, fewer people are required to help with the same strain. While steel has a high typified vitality content, it can be reused and reused without much of a stretch.

3. Building Envelopes

The compressed wood and the arranged strand board are the standard sheathing materials used to enclose the structures once the edge has been set up. Options, in contrast to wood based sheathing and poisonous gums, are made from agricultural waste. Straw frames, collected with water based cements and fiberglass tape, are available for use as outside sheathing. This replaces conventional materials such as wood, steel and concrete.

4. Structural Envelopes

The most known model is genuine workmanship growth, where stone, block or solid brick work units (CMUs) provide the basic quality of the structure and are not used as facades or infills between wood or metal encircling individuals. Block and CMUs are also primarily used in private or light commercial applications.

5. Impact of Maintainable materials in Inside

Also, Feasible inside structure is defined as a "inside plan in which all structures and materials are designed with a focus on mixing in a whole to limit negative effects on nature and tenants and to increase positive effects on condition.

6. Interior Material

In order to decide the material, the most relevant guidelines are to select the material as shown by the capability highlights. The area can be special and the material should be corporate as appropriate. Especially when selecting the material, we should concentrate more on the solidity and the extravagant use to reduce the misuse of materials.

7. Insulation

Intensive security is perhaps the most ideal way to reduce the utilization of vitality and the construction of work costs. Protection also provides acoustic advantages. In contemporary growth, the safety of natural fiberglass has been improved by the use of high tech polymers and antique cotton.

8. Glazing

Windows and bay windows allow sunlight to reach the inside of the buildings, reducing the need for false light. Operable units help to ventilate and cool, minimize or remove the need for mechanical hardware. In any case, windows are the most fragile part of the structure envelope as far as vitality is concerned, and a lot of research has gone into increasingly sophisticated window frames.

KEY BUILDING MATERIALS AND SOURCES FOR SUSTAINABLE INTERIOR DESIGN

1. Limestone

Limestone is probably the most predominant structural element that has been mined. It is used as a cladding material and plays a significant role in the development of a wide variety of building objects. Cement and mortar are simple examples of limestonedependent items; the use of limestone in the manufacture of steel and glass is more subtle. Sulfide discharges are formed by the ingestion of limestone, a major supporter of corrosive downpour.

2. Steel

Steel includes the extraction of iron metal, shale, limestone, magnesium and other trace components. Initially, iron should be refined from crude minerals to supply steel. Iron metal, along with limestone and coke (heat-refined coal) are piled into an impact heater. Sight-seeing and flares are used to soften the material.

Steel is manufactured by regulating the measurement of carbon in iron by further purification. Limestone and magnesium are added to remove oxygen to make the steel more ground. The most extreme carbon content of 2% is desired. At this point, different metals are often usually used in order to deliver

different combinations of steel. These metals incorporate magnesium, chromium and nickel, which are usually rare and difficult to extract from the outside of the earth.

3. Aluminium

Aluminum, derived from bauxite mineral, requires a lot of raw material to be supplied with a small quantity of a particular object. It could take as many as six pounds of mineral to generate one pound of aluminum. Bauxite is often extracted in tropical rainforests, a process that involves the removal of vegetation and topsoil from large areas of land. When the mining process is completed, the soil is replaced. Aluminum manufacturing is a huge customer of electricity, resulting from the use of petroleum products. The refined bauxite is mixed in with the acidic pop and heated in the oven to create the aluminum oxide. This white powder must then undergo an electrolytic reaction where direct electrical flow is used to separate the oxides and to melt the material into aluminium.

4. Bricks and Tile

Dirt and adobe soil can also be mined. They are usually located in shallow surface stores, and assembly is mostly performed in close proximity, minimizing the cost of extraction and transport. With the exception of adobe, blocks and tiles must be completed in order to be usable structural materials. The closing procedure exposed the framed mud to strong, drawn warmth, producing a hard, waterproof, durable block or tile. The termination process can take hours or even days, and requires a lot of vitality.

5. Petrochemicals

Structure company is highly dependent on materials derived from oil and petroleum gas. They are used in a wide variety of articles, including plastics, compressed wood and particle board adhesives, covered ledges, safety, coatings and paints. The penetration of oil and gas is both unsafe and expensive. Substantial hardware is needed and groundwater and soil defilement is natural.

6. Wood

Wood is the material most widely used in buildings and building objects. Dimensional wood is used to encircle much of the private structures and various business structures. Wood products, such as pressed wood, particleboard and paper, are commonly used in the construction industry. Until years have gone by, the most widely-recognized technique for harvesting wood has been clear-cutting, a method in which all vegetation within a given area is evacuated for handling.

SUSTAINABILITY IN INTERIOR DESIGN ELEMENTS

As a call, structuring within situations can be defined as "deciding the relationship of individuals to spaces dependent on mental and psychical parameters, to improve the personal satisfaction" at the heart of sustainability, these physical parameters gain importance in long-term usage approaches. A strategy in which all structures and resources are designed with a focus on joining together to minimize negative effects on the environment and its inhabitants and improve positive effects on the ecological, financial and social

frameworks over the life pattern of the system." Kang and Guerin described the sustainable internal structure practice in three measurements as: globally manageable.

1) Materials

In order to assess the material, the most critical measure is to select the material according to the capability highlights. Each capability has explicit requirements. For example, the products used in the emergency clinic inside and in the shopping center should be varied due to the angle of disinfection. In particular, a decision should be planned for long-distance use. It is important to use the content at its most extreme capacity to reduce the misuse of properties.

2) Furnishing

Furniture is an essential part of the interior structure. They have a wide variety of materials and shading. As far as supportability is concerned, the materials used in the creation process and the drawn-out use of furniture is relevant guidelines. Wood products are commonly used materials for furniture construction. They should really be reused. In any case, some of the processed materials used in the wood production process cannot be reused.

3) Lighting

Lighting contemplations in the inner framework are for the most part based on reducing the usage of electrical vitality. The vitality used in the inner state of the system is approximately 40half of the total vitality used in the structures. It has a lot of use of vitality. Subsequently, planners should use the most conceivable daily night in indoor conditions. Ecological lighting is also one of the physical parameters affecting the natural indoor efficiency.

ADVANTAGES AND DISADVANTAGES OF DESIGNING AN INTERIOR SPACE OF RESIDENCE USING RECYCLING AND SUSTAINABLE MATERIALS

Advantages:

1. Cost:

The cost of construction may vary depending on the structure and in some ways, due to the necessity of other materials to be used; the predominant cost of the structure may not have too much impact. Since remodeling and destruction will also have a huge impact after the start of the construction structure but will continue to be spent, the normal cost of the structure will not stop after its growth, as cash will be spent on repair, remodeling, operation or even destruction on a regular basis.

2. Efficiency:

This here is divided into two major aspects:-

(1) Water productivity:

Green structures don't have the foggiest idea about the significance of "squandered", they reuse downpour water and dim water and use them for can flushing for example.

(2) Energy Effectiveness:

These structures save more strength than those built out of blocks. They rely solely on all renewable energy source properties, such as sunlightbased electricity, hydropower and wind power, which are used for heat and power and help improve indoor air quality.

(3) Material Productivity:

Green structures are made from normal nonpoisonous and reused materials that do not cost much and eco-friendly, e.g. bamboo, straw, reused metal or cement, etc.

3. Preserving framework:

Effective both in vitality and in the supply of water, these frameworks expand tremendously the boundary of the nearby system.

4. High return for money invested rates:

Bearing in mind that these structures are for the most part, characteristic, they have a colossal rate of profitability, and the assets in these structures sell at considerable cost. Be that as it may, as we as a whole neglect all that is sweet and wonderful. Green systems still remain incomplete and to summarize them, they are as follows:-

Disadvantages:

1. Location:

Since these structures depend on the sun for their vitality, they should be placed in a position to have the best sunlight that may enable them to be set inverse to other neighborhood homes.

2. Availability:

Materials used to assemble such structures may be elusive, especially in urban areas where saving the planet is not the first option for individuals. The supply of these materials would then be able to cost a great deal more than a regular structure.

3. No air cooling highlights:

These structures run on heat to generate electricity, so that they are not designed for hot regions as they do not have any ventilation frameworks, so that climate control systems would be needed to make these structures something other than eco-friendly.

What is energy efficiency?

Energy efficiency is the parameters, methodologies and strategies that are to be used to minimize energy flows in a given region and thereby reduce the harm to nature and the atmosphere by the use of additional resources.

Products and services.

For example, using insulation in a house can help to minimize the energy needed for cooling and heating of the environment. This will help to create an effective, low-emission atmosphere and help to comfort the temperature in the environment.

And this plays a significant role in modern design and architecture, where we can see the principles of green housing. This primarily focuses on environmentally friendly nature, which again aims to make the environment more sustainable and healthier.

The indoor climate relates to the nature of the building environment in relation to health and well-being. This is determined by various factors, and the most important of these factors are,

- Heating
- Lighting
- Ventilation

Heating and lighting are the most crucial factors which is to be considered.

It is important to contemplate, that the products and the other major focuses should be in right direction. When it comes to heating, we need to think about the insulations and provide good quality background for that. And to install quality windows and maintain them in a good condition. And curtains play another major role in heating. Both curtains and drapes keep the air cold and removing the heat outside. Window coverings, blinds and shades control the building temperature as we can open and close them whenever needed.

Carpets are known as excellent thermal insulators, according to evaluations. The carpets can retain much as 10% of room's heat. And then the lighting plays another significant role in energy efficiency. In modern designs even the clients have their eyes on the look and the appearance of the environment than the safety and the healthier of the environment.

Thus we have seen use of more artificial lights with different source of energy; this can be a major drawback of design as we as designers should consider both health as well as the aesthetic value of the area. To save energy spent on lighting a lot can be done by selecting the right colors. Lighter colors more light, while the darker rooms need to be used more artificial lights.

And natural light is the most common lighting source to be considered while designing a space, and to provide good quality daylight and to use less artificial light.

And the ventilation is the other factor to be considered as ventilation has more power to make environment healthier. One thing is to reduce energy and to create well being atmosphere with good ventilation, is to calculate air in the right way. Use of more open areas, providing windows, and other required resources can reduce the harm to the human as compared to the other ventilating systems.

LOW ENVIRONMENT IMPACT

From the sustainability perspective one of the most important aspects is to choose the right materials and products with lowest environment impact. And use of organic material such as wood, wool, and natural stones can be best choices. And providing quickly renewable materials like bamboo can result less harm and can use in responsible way.

Sustainability, Agri, Food and Environmental Research, (ISSN: 0719-3726), vol 12(2), 2024
http://dx.doi.org/10.7770/safer-V13N1-art463

DESIGN FOR LONGEVITY

While choosing the materials and the products its most important to consider the life span of the related materials for better duration and can also reduce the impact for the environment.

Always the best ways to select these materials are

1. Choose quality over quantity
2. Classic over trendy and,
3. Simplicity or functional over adornment

DESIGN FOR HEALTHY ENVIRONMEN

People spend most of times in indoors, so that the health of the environment should be there in the priority list of every designer.

There are several factors to keep in mind while designing a healthy space such as,

- Quality of the air
- Heating
- Ventilation
- Lighting and
- Acoustic

Basically the products and the materials with high level of toxic emission can result in pollution of an environment.

So that it's a must to keep your eyes on low emission of VOC (Volatile Organic Compounds), as it's the most common contaminant of the indoor air.

This can be result in various health effects due to the short term exposure to the VOC's. and that is called "Sick building syndrome", while long term exposure referred as "building related illness" which can damage kidney and liver and lead to cancers and nervous system failures as well.

INTERIOR DESIGN ELEMENTS FOR A BETTER INDOOR QUALITY

The most critical part to remember is the selection of materials in terms of quality and efficiency. Consider incarnated energy and use less incarnated energy for better quality and natural stones. Eventually have less incarnated energy along with other materials such as concrete, steel, plastic, etc. with different quantities of incarnated energy. Use of natural daylight can effect on productivity than artificial in interior environment of a building

WHAT CAN BE DONE TO INCREASE THE INDOOR QUALITY

THERMAL COMFORT

Thermal comfort is the operating temperature that people experience, the energy transfer that a person experiences by Convection (temperature of the air), conduction (temperature of the surface to which they are physically attached) and radiation (energy transfer from surrounding surfaces) In order to have a more productive environment with less harm to humans, the above parameters should be considered as the most critical considerations for thermal comfort.

VISUAL COMFORT

Basically, visual comfort comes with the sight and environment, which is linked to what and how the occupants see. And with the view of the house, the right choice of colors and source of lighting will most influence this.

AURAL COMFORT

All the aspects pertaining to what occupant can hear, including ambience noise from outside the building, and noise levels of inside from the machines, people, ventilation systems or any other sources, can effect on this Most important thing is to use acoustic panels or any other resources to reduce the noise can be an advantage.

INDOOR AIR POLLUTION

In modern households, there are a variety of ways to contribute to indoor air pollution. These factors obviously affect the environment, so we need to look at these factors in order to minimize air pollution. Most significantly, one thing we need to remember is air circulation, which brings the outside light and the air inside to dilute indoor pollution and to carry air contaminants out of the home.

The indoor air pollution can be divided to two parts.

I. Biological pollution

II. Chemical pollution

In our climate, biological contaminants are substances that come from living organisms and can impact on our health. Bacteria, mold, viruses, etc are included. These biological contaminants may be linked to severe health conditions, and airborne transmission of some of the flu and chickenpox can occur. So considering the facts, the biological pollutants can harm the atmosphere and can result some serious illnesses.

CHEMICAL POLLUTANT

Most of the chemicals that pollute the environment are manmade, resulted from various activities in which toxic chemical are used for various purposes.

Sustainability, Agri, Food and Environmental Research, (ISSN: 0719-3726), vol 12(2), 2024
http://dx.doi.org/10.7770/safer-V13N1-art463

HAZARDOUS BUILDING MATERIALS

Any kind of buildings can contain hazardous materials, and these hazardous materials can effect seriously and do the damages to the human body

And the basic hazardous materials includes

- Asbestos
- Lead
- Polychlorinated biphenyls (PCB's)
- Chlorofluorocarbon (CFC's) and
- Heavy metals

ASBESTOS

Asbestos is a group of 6 distinct minerals that are normally present in the world. While asbestos has been used for many years, several diseases have occurred and these diseases started to occur in the early 1990s. And you can still commonly used in developing countries.

COMMON TYPES OF ASBESTOS PRODUCTS

Usually used in many items such as ceiling tile, roofing sealant, duct tape, asbestos plays a crucial role in modern design and architecture. Some of the most common items containing asbestos are often used to repair building mastics and fabrics used to attach HVAC systems. In addition, since the early 90s, new design methods and methodologies have been important factors.

PROPERTIES OF ASBESTOS

- Asbestos naturally existing all over the world
- It can be forced apart into a woody consistency and use as fiber
- It is impervious to heat, electricity and chemical corrosion
- Cannot collapse by the human body once they are inhaled.
- It can cause chronic inflammation build up of scar tissue and cancer.
- Most common products of asbestos are tiles and cement

And it said that if the goods contain less than 1% asbestos, it is not really considered an illegal activity. In a number of bulk construction materials, laboratories are now working to detect asbestos. And multiple planning and research approaches are being used. A simple stereomicroscope technique is often used, which is followed by an examination of Polarized Light Microscopic (PLM) and its findings are usually appropriate for the identification and validation of large asbestos concentrations. Xray diffraction (XPD), Analytical Electron Microscopy (AEM) and gravimetry are additional techniques.

Sustainability, Agri, Food and Environmental Research, (ISSN: 0719-3726), vol 12(2), 2024
http://dx.doi.org/10.7770/safer-V13N1-art463

HOW TO AVOID ASBESTOS EXPOSURE

- Never try to sample it yourself let it done by a professional.
- If something likely to contain asbestos, never

- Drill
- Saw
- Hammer and avoid other damages

- Should never sand or dry buff asbestos containing floor tiles, and only wet stripping methods must be used.

LEAD

- Lead is a toxic to humans which causes many ailments that depending on the situations and the environment can even result death.
- It is to be found common in older oil based paints, piping, solders, batteries and window potty.
- And in ceramic glazes and plastic
- It is soft, meltable heavy metal with a density that exceeds that of most of common materials

-High density

-Low melting point

-Resistance to oxidation and abundance

COMMON LEAD AVAILABLE AREAS

- Stainless glass
- Roofing
- Cornices
- Manufacturing leaded glass
- Stripping of old lead paint
- Lead roofing
- Lead smelting, refining, alloying and casting
- Recycling lead can produce hazardous lead dust which can effect on health.
- Using substitute materials
- Using cold/ mechanical cutting instead of hot cutting
- Wash and clean the surfaces which may have exposed to dust.
- Dispose of contaminated waste supply
- Using lower temperatures , are basic ways to get rid of the lead exposure

LEAD is typically available as

-Rolled led sheets

-Machine cast lead

-Sand cast lead

Even if you minimize some risk this way, but to limit the amount of dust or fume create we can consider using combination of

- Chemical paint striper.
- Wet abrasive paper scraper.
- Infrared equipment or a hot air gun and scraper.

CONCLUSION

The spots that fulfill human needs are inside conditions. To its customers, they are the most cozy conditions. Initially, the need to be willing to render maintainable conditions in the insides should be met. With the aid of professionals, individuals should live in rational circumstances, creators within. In their grasp, the inside originator has a fundamental apparatus that leads to manageable situations and cognizes supportability. The important instruments in making long haul use of feasible situations are the components of the inside strategy. Finally, during the time spent designing, making, forming, using, reusing, reusing and removing, internal structure components should be distinctive properties.

REFERENCES

Asford, P.: The Implication of Energy Efficiency Measures in Reduction of Carbon Dioxide Emission from European Building Stock, Bristol, 1999.

Ayalp N.: Environmental Sustainability in Interior Design Elements, Proceedings of the 7thWSEAS International Conference on Energy & Environment (EE '12), Kos Island, Greece, 2012, p.p. 163-167

Jong-Jin K, Rigdon B.: Sustainable Architecture Module: Qualities, Use, and Examples of Sustainable Building Materials, National Pollution Prevention Center for Higher Education, Michigan, 1998

Moxon S.: Sustainability in Interior Design, Laurence King Publishing, London, 2012.

Pilatowicz, G.: Eco-interiors: A guide to environmentally conscious interior design, Wiley, New York, 1995.

Received: 30th December 2020; Accepted: 30th December 2021; First distribution: 06th January 2024.