

ABSTRACT

Globally buildings are responsible for a huge share of energy, water, electricity and materials consumption. The building sector has the greatest potential to deliver significant cuts in emissions at little or no cost. Buildings account for 9 billion tons of Carbon dioxide annually. If recycled building materials and technologies in construction are not adopted during this time of rapid growth, emissions could double by 2050. As the earth population continues to explode and developing nations begin to use their share of the world’s resources, it is necessary to ascertain how we, as a planet, use our earth’s precious resources. During construction or at the end of useful life, construction materials and components are often discarded with construction debris accounting for nearly 35 percent of landfill waste. The main objective of this paper is to highlight the rising need of using recycled and recyclable content materials for construction in Green Buildings.

KEYWORDS: Resources, Recycled materials, Green Building, Climate protection.

INTRODUCTION

Building materials account for about half of all materials used and about half the solid waste generated worldwide. They have an environmental impact at every step of the building process—extraction of raw materials, processing, manufacturing, transportation, construction and disposal at the end of a building’s useful life. Governments worldwide have responded to the need to reduce waste with regulation and legislation that have framed a market for building materials and products derived from the construction and demolition waste stream. As the population on earth continues to grow, we must be more aware of how we use the earth’s natural resources. Low toxicity, minimal emission, low-Volatile Organic Compounds (VOC), recycled content, local product, resource efficient, and recyclable materials are recommended for green building construction. Use of recycled building material is a fairly a recent trend and gaining worldwide acceptance. The use of recycled material in buildings gains momentum. To make a building Green it is necessary to select building materials to be green since, these material have a good hand in polluting or sustaining the environment. Use of recycled material reduces impacts associated with extraction and processing of new materials and pollution.



Figure: 1 Property circle of green material

There are many building products available today that are manufactured from recycled materials, such as Steel, Bricks, Aluminum, Glass, Tiles, Fly ash Concrete, etc., Most of the recycled material performances are similar or even better than new products such as fly ash bricks, which have higher compressive strength than normal clay brick and have lower thermal conductivity than simple concrete block. The built environment makes a significant contribution to environmental degradation. Buildings including construction, operations and deconstruction impacts, use approximately: 15% of the world's fresh water resources; 40% of the world's energy; and produce approximately 23-40% of the world's greenhouse gas emissions. The main objective of this paper is to highlight the rising need of using recycled and recyclable content materials for Green Buildings for better tomorrow and healthy life of coming generation.

WHY RECYCLING IS IMPORTANT?

Natural resources are limited but construction sector is in rapid growth its impact the supply and demand of the building materials .Recycling is one of the best ways for us to have a positive impact on the world in which we live. Recycling is important to both the natural environment and economical. The main objective of the recycling building products are reduce usage, reuse and recycle C&D (Construction and demolition) wastage and industrial wastage and finally .



Figure: 2 The waste Hierarchy

Based on the widely recognized principles of 'Reduce, Reuse, Recycle', better known as the waste management hierarchy.

RECYCLED CONTENT

Recycle content is an important feature for selection of recycled material. Recycled content is classified into two types based on its origin namely Post Consumer and Pre-consumer or Postindustrial.

Post-consumer recycle content is consumer waste that has already served a purpose. More preference is given to post-consumer waste as post-consumer recycled materials are more likely to be diverted from landfills. The recycle content was generated by commercial, industrial, or institutional end-users and can no longer be used for its intended purpose. Aluminum, paper, plastic, demolished concrete, steel, Glass etc, and are the examples.

Postindustrial recycled content is waste material output or by product from industries which are normally diverted to other industries or land filled. Slag, fly ash bricks, crusher dust, saw dust, tiles etc, are the examples.

SOME OF THE RECYCLED MATERIALS FOR BUILDINGS

The following are some of the recycle materials and their recycle content, they are:

1. Glass: Used glass bulbs, glass bottles and window panes are used in glass.
2. Aluminum: Used window frames, cans are used in Aluminum.
3. Plastic furniture like bollards, barriers, Decking, furniture etc. made from 100% RC plastic.
4. Plastic drain or soil pipes made using recycled plastic (50-100% RC).
5. Cast iron drain pipes made using recycled cast iron (up to 96% RC).
6. Tarmac with crushed glass fill, up to 30% RC.
7. Geo-textiles made from 100% RC plastic.

8. Fly ash concrete and bricks: Fly ash is a waste byproduct of coal-fired power plants. It is used to make bricks and concrete.
9. Steel: used construction wastage, furniture, rails etc.
10. Cement: waste products like fly ash, silica fume, and slag are used in cement.
11. Chipboard, block board :Any forest product using waste timber.
12. ECO surfaces: Tire rubber recycled into indoor/outdoor flooring and surfacing. They are: Slip resistant, Weather resistance, Meets indoor air quality emissions standards.
13. Cellulose Insulation: It is natural insulation material and made from recycled newspaper and other recycled paper products. The recycled content is at least 75% or more. This material is better as a sound insulation for reducing the noise in home.
14. Terrazzo: Terrazzo surfaces are made from recycled glass and cast concrete. The glass use is both post-consumer as well as postindustrial. The final product contains 80% -95% post-consumer recycled content. Terrazzo is as durable as granite and less porous than marble which makes for long lasting and beautiful green.
15. Plastic Bricks: plastic bags were melted and transformed into bricks with a cement mould saving both money and time. These are not only inexpensive but are also easily workable.
16. Recycle ceramic tiles, glass tiles and stone tiles.
17. Precast concrete blocks, Recycled Roads, pavers, kerbs, etc, made using Recycle Concrete Aggregate (RCA) (> 60% RC). Concrete pipes, drains, etc. made using RCA (> 60% RC).

BENEFITS OF RECYCLED BUILDING MATERIALS

Recycled building materials are just as strong and durable as new materials and reusing these products reduces the amount of waste in the landfills and also reduces environmental impacts associated with new material extraction & processing.

Economic Benefits: Recycle material conserves natural resources and reduce energy use and hence these are often less expensive use and hence they are often less expensive than new material which make good economic sense for builder.

Performance Benefits: Recycle content material such as fly ash and slag cement used in making concrete offer significant performance benefit over conventional concrete.

Environmental impact: recycle building materials reduce the amount of waste in the landfill and also reduce the impact on the environment associated with new material extraction and processing. (Table: 1)

Table: 1 Environmental impact of recycling

Material	Energy savings	Air pollution savings
Aluminum	95%	95%
Cardboard	24%	—
Glass	5–30%	20%
Paper	40%	73%
Plastics	70%	—
Steel	60%	—

CHALLENGES

Some of the challenges that are likely with recycle are:

- [1] Lack of knowledge about what can be recycled, or about recycling opportunities.
- [2] Contamination of recyclables due to lack of separation or lack of space for separation.
- [3] Lack of markets for the recycled materials.
- [4] Technological barriers in terms of conversion of waste materials to useful ends.
- [5] Cost of recycling processes making products more expensive than that from virgin materials.
- [6] Alternatives to recycling are less costly.

- [7] Lack of confidence in recycled materials.
- [8] Lack of communication and industry infrastructure.
- [9] Lack of knowledge across industry .
- [10] Low value/low volume products being land filled rather than stored for recycling because it is uneconomic to stockpile.

STRATEGIES TO ENCOURAGE REUSE AND RECYCLING OF CONSTRUCTION AND DEMOLITION WASTE

Some of them are as follow:

- [1]. Regulation by government to require manufacturers to take back product and packaging and to rate product recyclability.
- [2]. Regulation to force builders to separate and recycle C&D materials.
- [3]. Enforce Waste Management Plans or scrap them.
- [4]. Use Government Procurement incentives to drive behavior.
- [5]. Government allocation of temporary land for storage.
- [6]. Implement differential landfill fees to discourage land filling.
- [7]. Allowance for recycled materials use.
- [8]. Provide support for new businesses for recycling and reusing.

CONCLUSION

Recycled green construction material reduces side effects on environment to make efficient sustainable structure as well as will lessens the environmental pollution content and like greenhouse gas emission, resource depletion, soil pollution, health hazards, ozone depletion etc. Many governments worldwide have responded to the need to reduce waste with regulation and legislation that have framed a market for building materials and products derived from the construction and demolition waste stream.

REFERENCE

- [1] <https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data>
- [2] <http://www.worldgbc.org>
- [3] [http://www.bmtpc.org/topics.aspx?mid=55&Mid\(1989\)](http://www.bmtpc.org/topics.aspx?mid=55&Mid(1989))
- [4] <http://www.cgcri.res.in/page.php?id=386> (2016)
- [5] <http://www.unitec.ac.nz/epress/wp-content/uploads/2016/01/Barriers-to-Building-and-Construction-Waste-Reduction-Reuse-and-Recycling-by-Patrick-Zou-Robyn-Hardy-and-Rebecca-Yang>.
- [6] http://www.unwater.org/downloads/Water_facts_and_trends.pdf (2016)
- [7] <http://blog.kiran.me/recycled-materials-for-green-building.html> (2011)
- [8] <http://www.calrecycle.ca.gov/greenbuilding/materials/csiarticle>. (1999)
- [9] <http://www.sustainablebuildingsolutions.co.uk/products/sustainable-materials/recycled-aggregates>
- [10] <http://cbri.res.in/krc/e-database>