iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** IV **Month of publication:** April 2020

DOI: http://doi.org/10.22214/ijraset.2020.4059

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue IV Apr 2020- Available at www.ijraset.com

A Review on Green Energy and Technology in Construction

Dinesh. S[1], Kirubakaran. K[2], Ranjith Kumar. G[3]
[1]*Lecturer, Department of construction technology and management, Assosa University, Assosa, Ethiopia.*
[2]*Assistant Professor, Department of Civil Engineering, Nadar Saraswathi College of Engineering and Technology/Anna University, Tamilnadu, India*
[3]*Lecturer, Department of Civil Engineering, Assosa University, Assosa, Ethiopia.*

Abstract: ***Today the emerging topic in construction industry is green building, and the technology used to design and build it. The need to go for green building construction is to minimize the wastage of natural resources used in the construction and minimize the environmental pollution. Green building or sustainable building states that, meeting the requirements of society in ways that can continue indefinitely in to the future without depleting or damaging the natural resources. This technology is environmentally friendly, used in such a way to not to disturb the environment. The trends in green technology patents are integration of renewable energy, energy efficient lighting technologies, energy efficient HVAC, efficient home appliances, elevators, efficient end user electric power management, constructional and architectural elements, technologies with potential for greenhouse gas emissions mitigations, total green building patent fillings. This paper reveals about energy efficient building, building automation, nanotechnology in eco-efficient construction, green building rating systems in India.***
Keywords: Green technology in construction, green building rating systems, energy efficient building, Hemp Crete.

I. INTRODUCTION

Green building (also known as sustainable building or green construction) refers to both a structure and the application of processes that are resource-efficient and environmentally responsible throughout a building's life-cycle, that is from the planning to design stage, construction, operation, maintenance, renovation and demolition.
The objective of green building concept is to reduce the overall effect of the built environment on a human health and the natural environment by the following;

A. Efficiently using water, energy and other resources
B. Protecting the occupant's health and improve the employee productivity
C. Reducing pollution, waste and environmental degradation

Every day the people flip on the light and fan switches, turn on their computers and use the energy in many ways in their offices, homes, schools etc. Consuming all these powers will lead to greenhouse gas emissions. So the necessary for green building construction is emerged to minimize environment pollution. The energy efficient buildings can be achieved by bioclimatic factors such as shape and orientation of the building, passive solar systems, solar protections and high performing building envelope through insulation, air-sealed construction, high performance glazing and windows, avoidance of thermal bridges and other factor such as high performance controlled ventilation through heat recovery and mechanical ventilation. The buildings that have been constructed will adopt one or more green features. To label the extent of green features that a building adopts, rating systems have been evolved.

II. NANOMATERIALS FOR CONSTRUCTION

The nanoparticles reinforced materials which can be used in the new generation of materials for national security, clean energy and economic development have proven their superior thermal, mechanical, magnetic, electrical and electromagnetic particles. The best example is a new form of carbon, called Carbon Nanotube (CNT). CNT is several microns long, few nanometers in diameters, and exhibits extraordinary mechanical properties (that is more than 100 times the tensile strength and five times the compressive strength of steel. But CNT has little application to addition to steel due to their graphitic nature, making them tough to bind to the bulk material, inherent slipperiness an also the high temperatures involved in the steel elements production process enriches in the vibration of carbon atoms, leading to defects in nanotubes structures and bond breaking.

A. Nano-Sensors

Nano and Micro Electrical Mechanical Systems (MEMS) sensors to be used in concrete structures for durability monitoring and quality control (to monitor curing of concrete and to measure temperature or shrinkage, moisture, pH, to measure viscosity and concrete density, chlorine concentration, co_2, stresses, reinforcement vibration or corrosion. It ranges from 10-9m to 10-5m. Nano-sensors could be embedded into the structure during the process of construction and can monitor the cracks, internal stresses and other physical forces in the building during their life. The example for nanoparticles reinforced materials are as follow;

Table 2.1. Nano particles as green building material

Nano particles	Green building material	Expected benefits
Carbon Nanotubes (CNTs)	➢ Ceramics ➢ Solar cell ➢ MEMS ➢ Concrete	➢ crack prevention ➢ real-time structural health monitoring ➢ mechanical durability ➢ effective electron mediation ➢ enhanced mechanical and thermal properties
Silicon Dioxide Nanoparticles (SiO_2 Nanoparticles)	➢ Ceramics ➢ Concrete ➢ Window glass	➢ Coolant ➢ fire resistant and flame-proofing ➢ light transmission ➢ anti-reflection ➢ reinforcement in mechanical strength
Titanium Dioxide Nanoparticles (TiO_2 Nanoparticles)	➢ Window glass ➢ Cement ➢ Solar cell	➢ self-cleaning ➢ increased degree of hydration ➢ super hydrophilicity; ➢ fouling-resistance ➢ anti-fogging ➢ non-utility electricity generation ➢ rapid hydration
Iron Oxide Nanoparticles (Fe_2O_3 Nanoparticles)	➢ Concrete	➢ abrasion-resist ➢ increased compressive strength
Copper Nanoparticles (Cu Nanoparticles)	➢ steel	➢ formability ➢ weld-ability ➢ corrosion resistance
Ag Nanoparticles	➢ Coating/ painting	A. Biocidal activity

B. Nano Technology and self-healing Concrete

When the self-healing concrete cracks, embedded microcapsules break and it discharge a healing agent into the damaged region by the capillary action. The discharged healing agent contacts an embedded catalyst, polymerizing to bond the crack face closed. In the fracture tests, self-healed composite is recovered as much as 75% of their original strength. They could increase the life of the structural components by as much as two or three times.

III. HEMP CRETE FOR CONSTRUCTION

It is a unique building material, that is a composite of a bio-fiber (hemp ***hurd*** or ***shiv***) and a (lime) mineral binder. Then these components are mixed together with water, and the moisturized binder coats all the particles of hemp shiv. The chemical reaction happens between the water and the lime binder, resulting in the binder setting and gluing the hurd particles together. Generically, it is called as “bonded cellulose insulation.” When these binder is set and cured and if there any additional water has dry out of the mixture, the resultant material is hemp Crete. A hemp Crete mix has a high percentage of void space in the final mixture. Hemp Crete have a range of desirable structural, thermal and moisture-handling properties that used for an excellent building insulation material. Hemp Crete can be used as the roof, wall or slab insulation. The construction industry does not see many new materials. The materials used to insulate commercial and residential buildings have continued the same for decades, and most have

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue IV Apr 2020- Available at www.ijraset.com

environmental and/or health effects. As we begin to add more insulation to buildings to lesser their energy requirements, the volume of insulating material we use is going to rise dramatically. It creates ecological and financial sense to decrease this volume with materials that are annually renewable, low-impact and, ideally, sourced from waste streams or from by-products from other processes. Hemp Crete meets all of these important criteria, and compares favorably with conventional insulation materials in many ways such as good structural quality, affordable insulation, good carbon sequestration, excellent moisture handling and resistance, non-toxic building material, good but not exceptional thermal performance, good acoustic properties, fire resistance. It is a best choice for builders and owners, who wish to construct a building with following qualities;

A. Durability
B. Low or zero carbon footprint
C. Fire resistance
D. Non-toxic materials and high indoor air quality
E. Good thermal performance and stable indoor temperatures
F. Excellent moisture handling properties

Figure 3.1: The void space in a hempcrete mix creates pockets of trapped air and is part of the reason the material has desirable thermal properties.

Figure 3.2: Hemp with lots of fiber

Figure 3.3: Hemp with bit of fiber

Figure 3.4: Hemp with some fiber

IV. GREEN BUILDING RATING SYSTEM

The key objective of rating system is to bring the changes in the market wherein the user demands green or sustainable building construction.

A. Green Rating for Integrated Habitat Assessment (GRIHA) for India

GRIHA is an India's own rating system jointly established by TERI and the Ministry of New and Renewable Energy, Government of India. It is a green building design evaluation system. The GRIHA Rating System encompasses 34 evaluation criteria with 100 points. These standards have been categorized into (i) Site Planning including conservation and efficient utilization of resources, health and wellbeing during building planning and construction stage (ii) Water Conservation (iii) Energy Efficiency including energy embodied & construction and renewable energy (iv) Waste Management including waste minimization, segregation, storage, disposal and recovery of energy from waste and (v) Environment for good health and wellbeing.

B. Leadership in Energy & Environmental Design India

LEED is recognized as an internationally green building certification system, by providing third-party verification, that a building or community was designed and built using strategies aimed at improving performance across all the metrics that matter most: CO_2 emissions reduction, improved indoor environmental quality, Energy savings, water efficiency and stewardship of resources and sensitivity to their impacts. The Indian Green Building Council has adapted LEED system and has launched LEED India version for rating of new construction.

C. Bureau of Energy Efficiency (BEE)

BEE established its own rating system for the structures based on a 1 to 5-star scale. More stars mean more energy efficiency. It has developed the Energy Performance Index (EPI). The unit of Kilo watt hours per square meter per year is considered for rating the building and especially targets air conditioned and non-air conditioned office buildings.

V. HOW GREEN BUILDING IS DIFFER FROM CONVENTIONAL BUILDINGS

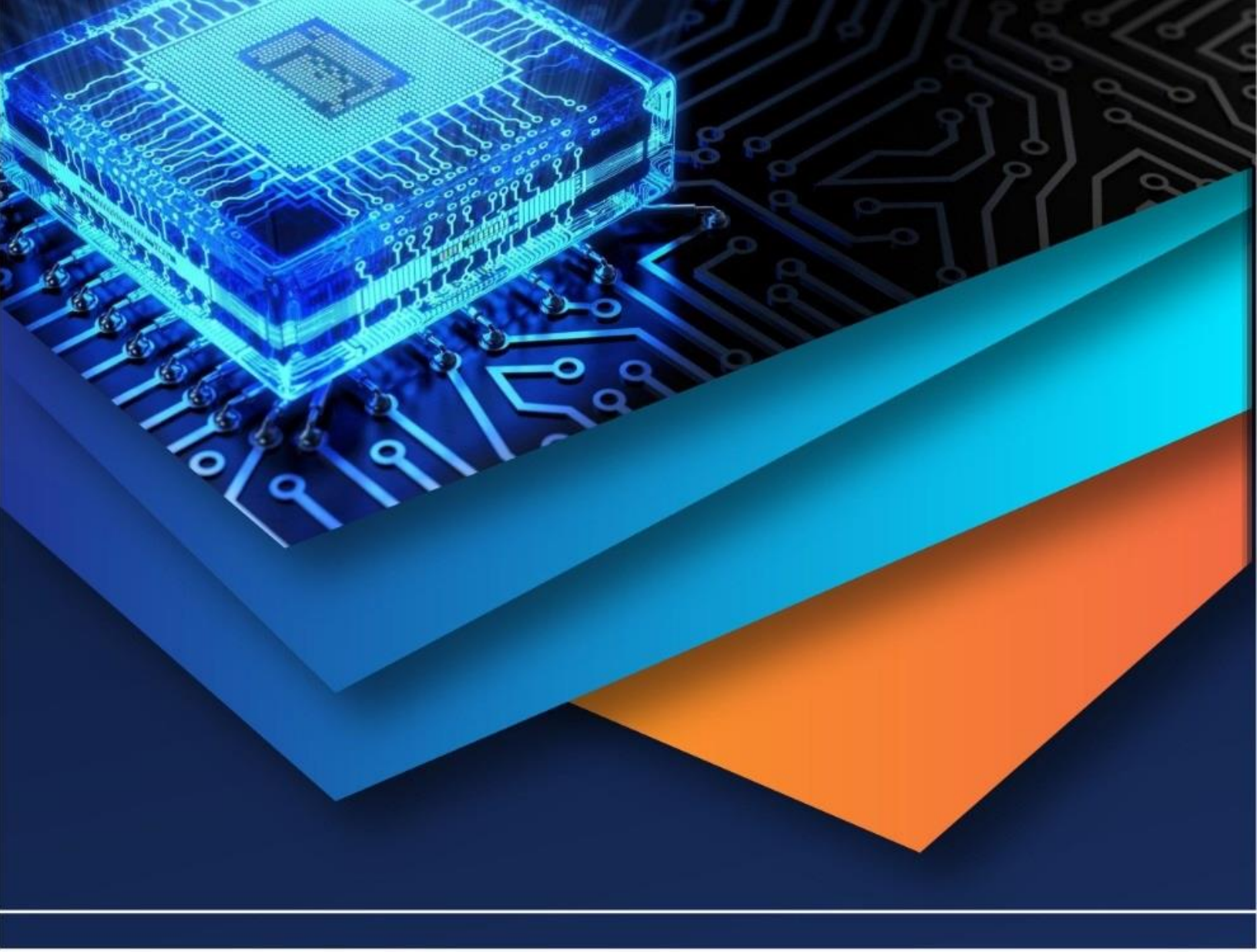
In conventional buildings, the material and the construction techniques, which are used are not concern with material and an energy consumption. So it is essential to use a such kind of construction techniques and material to achieve an economy energy consumption and to provide natural resources maximum. while these practices employed in green building are constantly evolving and may differ from the region to region, fundamental principles persist from which the method is derived: energy efficiency, siting and structure design efficiency, water efficiency, indoor environmental quality enhancement, materials efficiency, operations and maintenance optimization, and toxics and waste reduction.

VI. RECOMMENDATION AND CONCLUSION

By this study, if we go for green building design and construction, we can reduce the greenhouse gas emissions and consuming of natural resources will be get minimized. The green technology and construction is to stay for the benefit of country and individuals. It will lead to new features such as using solar energy for heating and cooling, lighting appliances, recycled aggregates for construction.

REFERENCES

[1] Hana Bedliva, Nigel Isaacs; "Hempcrete – an environmentally friendly material? Advanced Materials Research", Vol-1041, pp.83-86, 2014.
[2] Chris Magwood, "Essential Hempcrete Construction", New Society Publishers, June-, pp.3-10, 2016.
[3] https://en.wikipedia.org/wiki/Green_building
[4] Dinesh Kumar Swarnkar, Dr. Sanjeev Singh; "Investigating the green technology function in construction perspective", International Journal of Engineering Research & Management Technology, Volume 3, Issue-1, pp.144-148, 2016.
[5] JONES.W, "Nanomaterials in construction - what is being used, and where?", Proceedings of the Institution of Civil Engineers: Construction Materials,2016.
[6] Mili Majumdar, "Energy-efficient buildings in India", by Ministry of Non-Conventional Energy Sources and Tata energy research institute(TERI), 2002.
[7] K. S. Jagadish, B. V. Venkatarama Reddy, K. S. Nanjunda Rao, "Alternative building materials and Technologies", by New Age International publishers, New Delhi, pp.20-27.
[8] https://www.isover.com/how-design-and-build-energy-efficient-building
[9] R. Gammampila, P. Mendis, T. Ngo, L. Aye, A. S. Jayalath, and R. A. M. Rupasinghe, "Application of nano materials in the sustainable built environment," in International Conference on Sustainable Built Environment (ICSBE-2010), 2010.
[10] https://en.wikipedia.org/wiki/Hempcrete
[11] http://iasscore.in/ias-prelims/green-buildings-and-their- rating-system-in-india
[12] https://www.designingbuildings.co.uk/wiki/Hempcrete
[13] http://www.glazette.com/green-rating-for-integrated- habitat-assessment-griha-144.html
[14] https://greenbuildingsindia.wordpress.com/2013/02/06/what-is-leed-india/
[15] https://beeindia.gov.in/content/star-labelled-appliances-read-more.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY