iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** XII **Month of publication:** December 2021

DOI: https://doi.org/10.22214/ijraset.2021.39293

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 9 Issue XII Dec 2021- Available at www.ijraset.com

Comparative study on Conventional and Smart Building Material in terms of TQC

Siddhesh Gaikwad[1], Anish Sahare[2], Swapnil Deshmukh[3], Shraddha Meshram[4], Prof. Suraj C. Tandale[5]
[1, 2, 3, 4, 5]*Trinity Academy of Engineering, Pune; Department of Civil Engineering*

Abstract: ***There are several new-age „smart" building materials which are cost effective and long lasting and which would help to build or rebuild smart buildings, as a more eco- friendly and sustainable habitat. In India since ancient time construction is done by using conventional building materials. But now a days concept of smart building materials is introduced. These are durable, eco-friendly, cost effective. Still use of conventional materials is more than smart building materials. Due to lack of knowledge about smart building materials we don't use such materials. Control over quality and sustainability of finished building. Justification of the environmental cost of manufactures. So with the help of project i.e. Comparative study between smart and conventional building, there is comparison as per cost, strength, durability. In this, how both buildings are different in their features like long lasting life, implementation of materials, speed of construction, sustainability of materials is shown. For this project there is use of software for developing, analyzing and designing the reinforced concrete building.***
Keywords: smart material, conventional material, cost

I. INTRODUCTION

A. General

Building material is any material which is used for construction purposes. Many naturally occurring substances, such as clay, rocks, sand, and wood, even twigs and leaves, have been used to construct buildings. Apart from naturally occurring materials, many man-made products are in use, some more and some less synthetic. The manufacture of building materials is an established industry in many countries and the use of these materials is typically segmented into specific specialty trades, such as carpentry, insulation, plumbing, and roofing work. They provide the make-up of habitats and structures including homes. Any construction project to begin with starts with the Layout of the building or structure followed by Design and Analysis of the structure which is succeeded by cost estimation and planning for the said project. This project involves the layout, analysis, planning and cost estimation of a G+3 residential building. For completing the project very popular Civil Engineering software's such as AutoCAD, Microsoft Excel for Cost Estimation have been used.

B. Smart Material

The term "smart materials" describes a group of material systems which has unique properties which gives more benefits against conventional materials. Some materials system do not exhibit a shape change, but rather have significant properties are also called smart materials. Now a days, there are no. of building materials invented in market which gives overall cost effective, strength effective, better applicant result etc. As compare to conventional building material. but because of lack of knowledge about smart material, they are not get used so we are going to show actual difference between conventional material building & smart material building with respect to all manners. There are several new-age "smart"building materials which are cost effective and long lasting and which would help build or rebuild smart buildings, as a more eco-friendly and sustainable habitat.

C. Problem Statement

In the recent years, the various materials such as fly ash, silica sand, ceramic dust, steel scrap from lathe, polyurethane foam etc. were used as a smart material to decrease the various problems occur during and after the construction. The present study describes the use of such materials and their importance in the field of civil engineering for sustainable development. Due to urbanization, demand of construction materials increases and brings the need to use alternative materials. The decreasing availability of suitable construction materials is putting pressure on the Engineers and Designers to think for methods of utilizing intelligent materials Conventional Building materials takes more time to construct and quality of conventional building material is poor as compare to smart building materials. Therefore, more maintenance is required this effect on final cost of building.

©IJRASET: All Rights are Reserved

D. Objective

1) To Study various types of Smart building materials.
2) To compare the conventional building material with smart building materials.
3) To estimating & costing of R.C.C. building conventional & smart material building.
4) To analyses difference between conventional material building & smart material building on basis of Time, cost, and Quality of structure.

II. LITRATURE REVIEW

This research aims to study the terms of smart materials and their impact on architecture to investigate the role and function of smart materials as a flexible approach in architectural materials in order to reduce energy consumption which will reduce environmental emissions from the construction. Using analytical-descriptive methods, investigates various aspects of materials in construction and architecture then studies their effect on sustainable environment and reduction of pollution. [1]

In this research they studied that in the recent years, the various materials such as flyash, silica sand, ceramic dust, steel scrap from lathe, polyurethane foam etc. were used as a smart material to decrease the various problems occur during and after the construction. In this research paper they show how much percentage of material is used like Cement and sand can be replaced by good quality fly ash to the extent of 10 – 30 % and 5 – 15 % respectively without any loss of strength.[2]

The research aims to explore the qualities and advantages of smart material systems in the field of architecture, to better understand the impact smart material systems have on the design and construction processes, and to explore the way to create architecture with better adaptive characteristics, to ultimately reach the state of ‘‘adaptiveness”, providing the optimal environment for the users, reflected on the structural, climatic, and architectural performances.[3]

The study aims to discuss the applications of nanotechnology in architecture, especially in Office buildings. Nanotechnology is one of the most important modern applications that directly affect the characteristics and behavior of the smart materials used in the buildings, which have a direct impact on the use of materials in the internal and external environments.[4]

"Smart Materials" have a crucial role in construction technology. These innovative materials constitute an important part of smart building systems that are capable to detect its surrounding so that the smart materials behave similar to living systems. In the process of adapting to their external environment, they involve various energy conversion processes. This mechanical energy is converted into electrical energy and vice versa by smart materials during their functioning. This paper discusses various types of smart materials used in the construction industry, their characteristics and applications in smart infrastructure.[5]

III. PROPOSED METHODOLOGY

A. General

Methodology is way in the form of steps to complete project. In this following flowchart shows the methodology of project.

B. Flow Chart of Methodology

Flow chart of methodology is shown in fig. 3.1 which shows step by step procedure to complete project.

1) Preparation plan of G+3 building on AutoCAD. The layout for the proposed building was prepared, discussed and approved by an architect. The layout was then prepared using AutoCAD. The various layouts were prepared and then later discussed with the architect for error correction.
2) Specification of all conventional & smart material. In this we are going to specify all the building materials that we needed while construction.
3) List of smart materials & prices with their standard specifications. In this we are going to list out all the conventional and smart building materials that we needed while construction.
4) Estimation & costing of smart material building.
5) In this we are going to estimate smart material building as per above.

©IJRASET: All Rights are Reserved

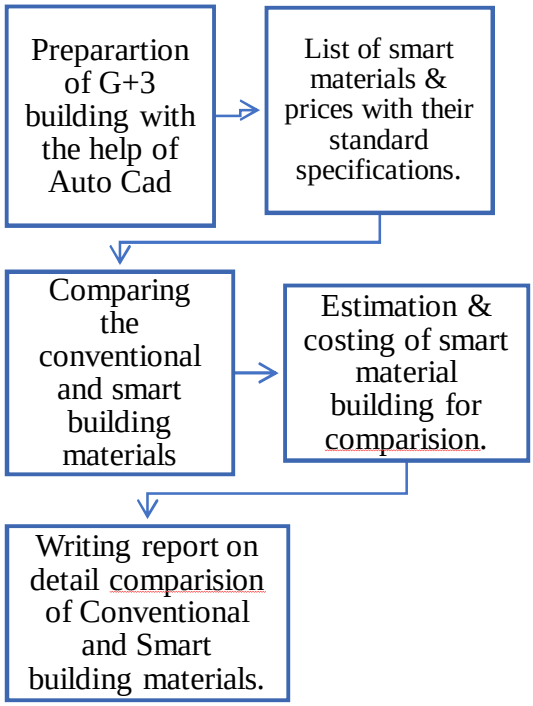


Fig.3.1

IV. OUTCOME OF THE STUDY

A. By this research we know, There were many advantages for smart materials from different sides of buildings construction to occupy.

B. We learn about new technologies used for construction field and how they are developing in this field.

C. Instead of using conventional materials, if we use Smart materials then our cost, time of construction will be reduced.

D. There are number of smart materials that exhibit behavior and can be successfully used in actual projects to reap the benefits of their advanced features.

REFERENCES

[1] S. Y. Mohamed, "Smart Materials Innovative Technologies in architecture; Towards Innovative design paradigm," in Energy Procedia, 2017, vol. 115, pp. 139–154. doi: 10.1016/j.egypro.2017.05.014.

[2] Piyush V Khole and Milind V. Mohod, "Application of Smart Materials in Civil Engineering for Better Tomorrows: A Review," 2016, doi: 10.17950/ijer/v5i3/031.

[3] Y. Mohammadhosseini, "73 Smart Material Systems and Adaptiveness for Beauty of Modern Architecture," 2020. [Online]. Available: http://globalpublisher.org/journals-1004www.globalpublisher.org

[4] H. H. Sameh, G. El-Din, and A. Nasa, "Applications Of Nanotechnology In Office Buildings ," 2019. [Online]. Available: www.feng.bu.edu.eg

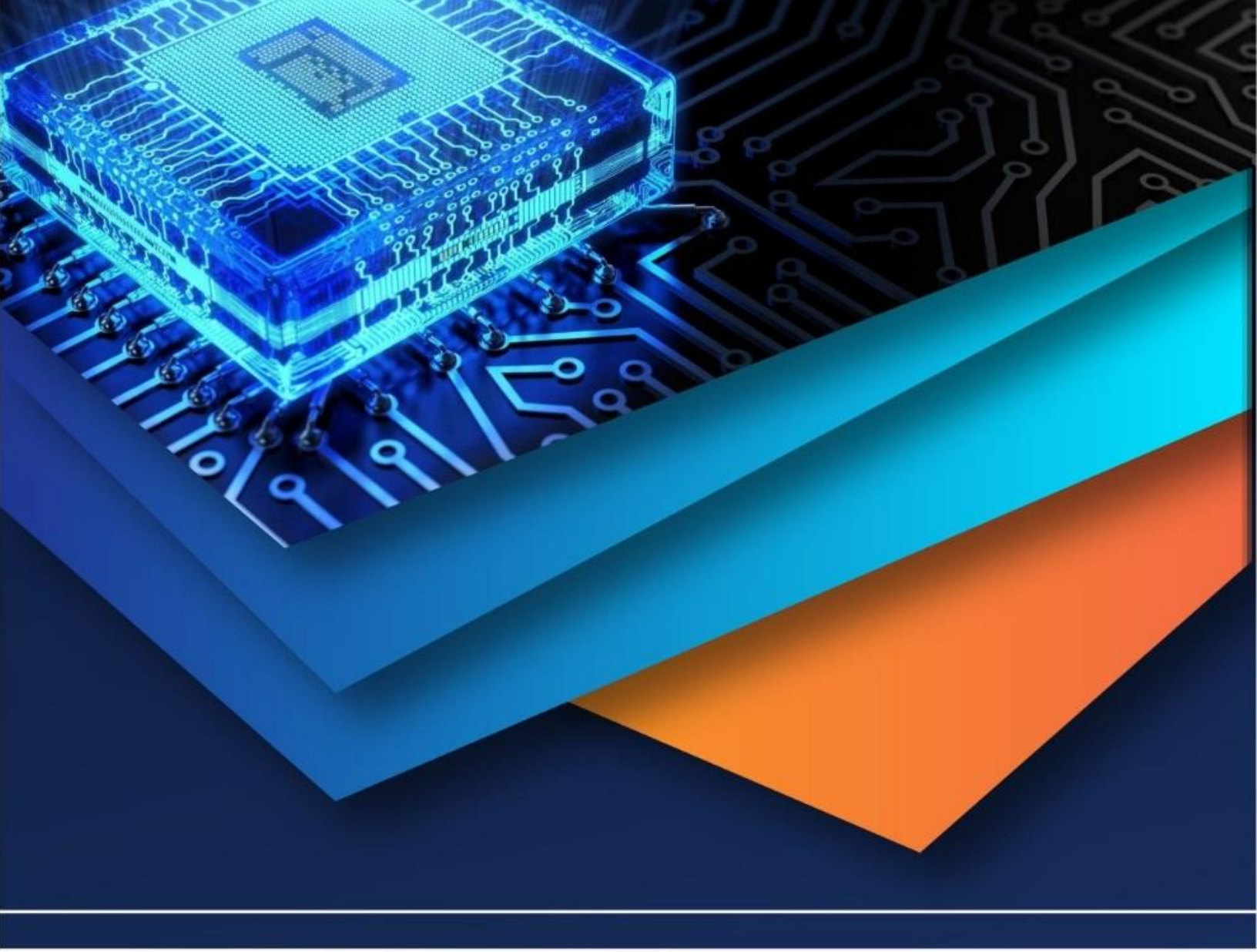
[5] S. Nihalani, U. Joshi, and A. Meeruty, "Smart materials for sustainable and smart infrastructure," in Materials Science Forum, 2019, vol. 969 MSF, pp. 278–283. doi: 10.4028/www.scientific.net/MSF.969.278.

[6] Tabrizikahou, A., Kuczma, M., Nowotarski, P., Kwiatek, M., & Javanmardi, A. "Sustainability of civil structures through the application of smart materials: A review," 2021, In Materials (Vol. 14, Issue 17). MDPI AG. https://doi.org/10.3390/ma14174824

[7] Mohamed, A. S. Y. "Smart Materials Innovative Technologies in architecture; Towards Innovative design paradigm", 2017, Energy Procedia, 115, 139–154. https://doi.org/10.1016/j.egypro.2017.05.014

[8] Taha, H. S., & Hassan, S. A. (2020). The Effect of Smart Low Emission Glass Material on Reducing Energy Consumption for Office Building in Hot Arid Climate. IOP Conference Series: Materials Science and Engineering, 881(1). https://doi.org/10.1088/1757-899X/881/1/012017

©IJRASET: All Rights are Reserved



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)