



iJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 Issue: IV Month of publication: April 2022

DOI: <https://doi.org/10.22214/ijraset.2022.41222>

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Research Paper on High-Performance Energy Efficient Building

Prof. D. S. Padole¹, Mehul Loya², Prajakta Shahare³, Sahil Vairagade⁴, Shantanu Mankar⁵, Nishant Balbudhe⁶, Hritik Khakre⁷

¹Guide, Department of Civil Engineering KDK College of Engineering, Nagpur

^{2, 3, 4, 5, 6, 7} Students, Department of Civil Engineering KDK College of Engineering, Nagpur

Abstract: Energy is an important tool for the overall development and improvement of the quality of life. To make energy an efficient building means using less energy for doing the same amount of work. The meaning of energy efficiency is to reduce energy consumption, reduce greenhouse gases (carbon emission) and global warming and decrease the dependence on fossil fuel by taking the benefit of natural resources and minimizing the waste of energy. Due to the increase of world population, it is nearly about 40% of the annual energy consumed in the world in building today. In India, buildings are responsible for one-third of total energy consumption today. The use of building energy will be continuously growing by rapid population growth. The case study focuses primarily on three types of bricks: red brick, concrete brick, and autoclaved aerated blocks. We find that Concrete bricks have the highest cooling load and AAC Blocks have the lowest. As a result of this, we can conclude that the peak cooling load has been reduced by 60% in comparison, so it is a more preferred choice than the traditional ones. We determine that AAC Blocks require less cooling to maintain comfortable room conditions, resulting in a reduction in the use of electricity. If we are to meet a sustainable goal then we have to decrease the use of energy for space heating and cooling and in environmental terms, buildings are used to maintain thermal comfort. By making an energy-efficient structure sure. Selecting a proper material and by analyzing in AutoCAD and Autodesk Revit software. Changing the material of the structure and analyzing the thermal insulation of the structure.

Keywords: Energy Efficient building, Thermal Insulation, Energy consumption.

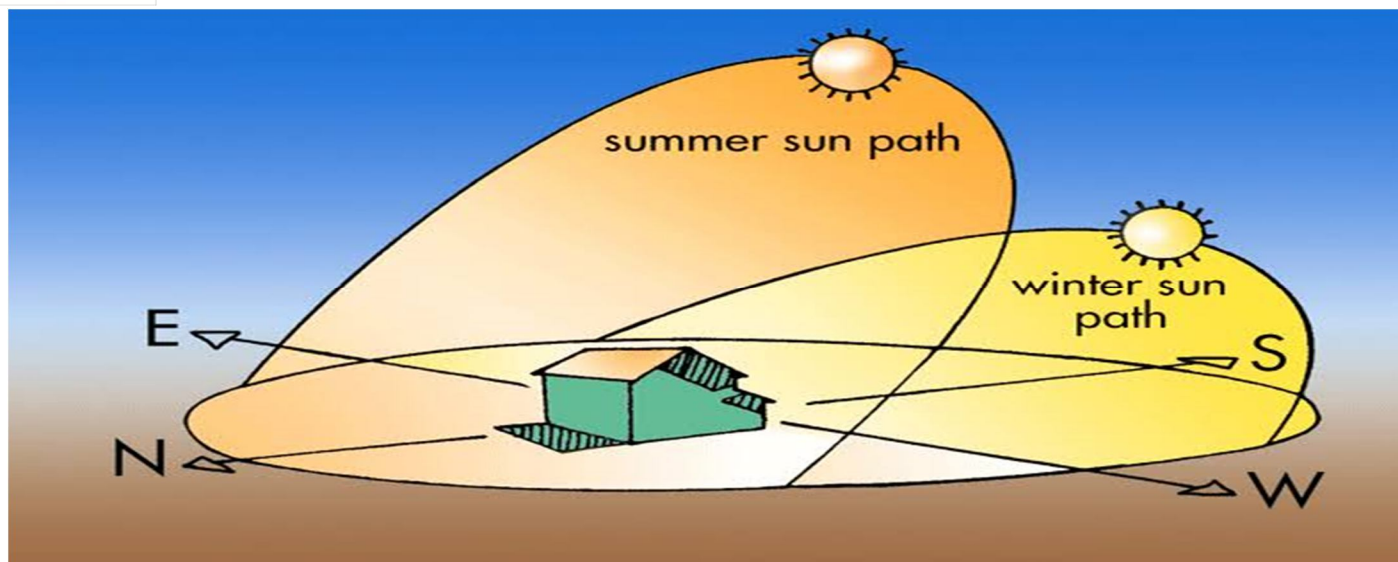
I. INTRODUCTION

In modern instances of a fast infrastructure boom and a looming electricity disaster, there may be a strong desire to deal with and incorporate appropriate practices for green electricity and asset use at the same time as making construction plans, be it for residential or industrial applications. Building Information Modelling (BIM) is a method supported by the aid of numerous tools, technologies, and contracts regarding the era and control of virtual representations of bodily and practical traits of places. Building record models (BIMs) are laptop files (regularly, but now no longer usually in proprietary codecs and containing proprietary data) that may be extracted, exchanged, or networked to aid decision-making concerning a constructed asset. Individuals, businesses, and government businesses that plan to construct operate, and preserve homes and numerous bodily infrastructures, which include water, refuse, electricity, fuel, communication utilities, roads, railways, bridges, ports, and tunnels. Cooling load is the rate at which practical and latent warmth have to be eliminated from the distance to preserve a regular area's dry-bulb air temperature and humidity. Sensible warmth in the distance reasons its air temperature to upward thrust at the same time. As latent warmth is related to the upward thrust of the moisture content material, it affects the cooling load in a building, requiring the use of special warmth switch mechanisms. The SI devices are watts. Homes with high overall performance are the ones that supply a notably better degree of electricity performance. The performance or greenhouse-fuel line discount is less than what's required. Architects, designers, and developers usually layout and construct high-overall performance homes with the use of quite a few strategies, techniques, tools, and substances to make certain that, upon completion, the building will devour a minimum quantity of electricity

II. SUN PATH AND SUN PATH DIAGRAM

The sun's path refers to the apparent significant seasonal and hourly changes in the sun's position (and daylight duration) as the Earth rotates and orbits the sun.

The solar path diagram, as its name suggests, is used to determine the position of the sun in the sky at any time of the day, throughout the year.

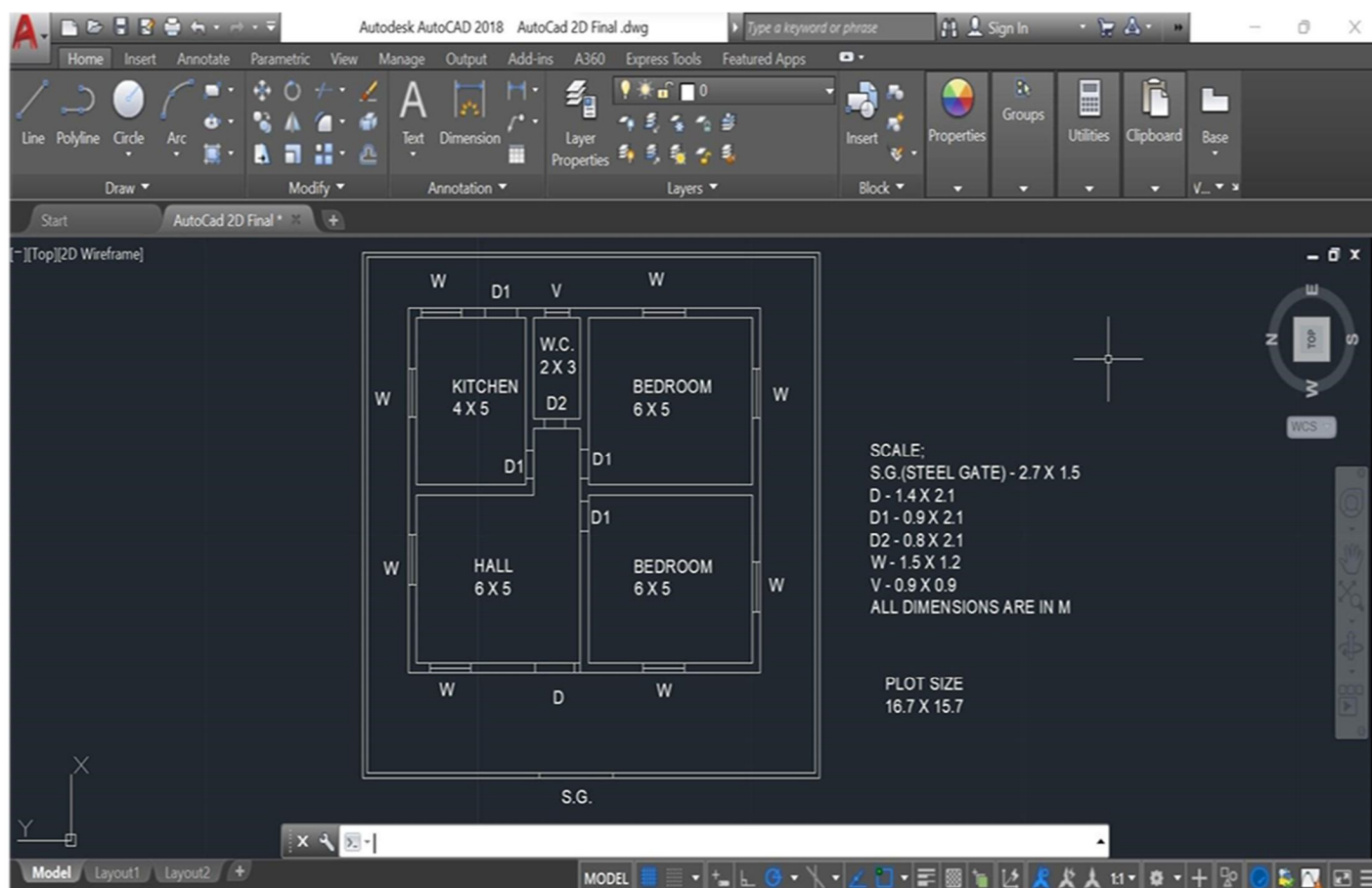


Orientation

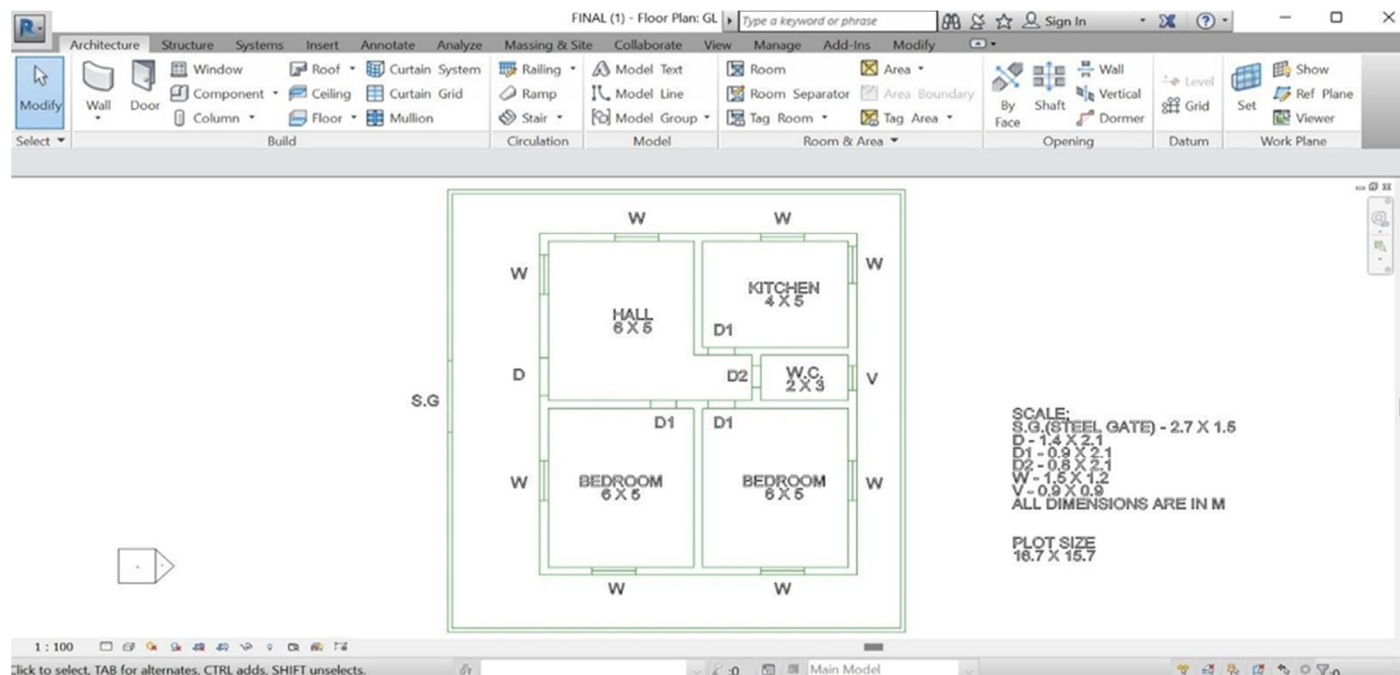
Orientation is the placement of a building around the arch, seasonal variations in the path of the sun, and prevailing wind currents. Good orientation can increase your building's energy efficiency, making it more comfortable to live in and cheaper to operate.

III. CAD DESIGN

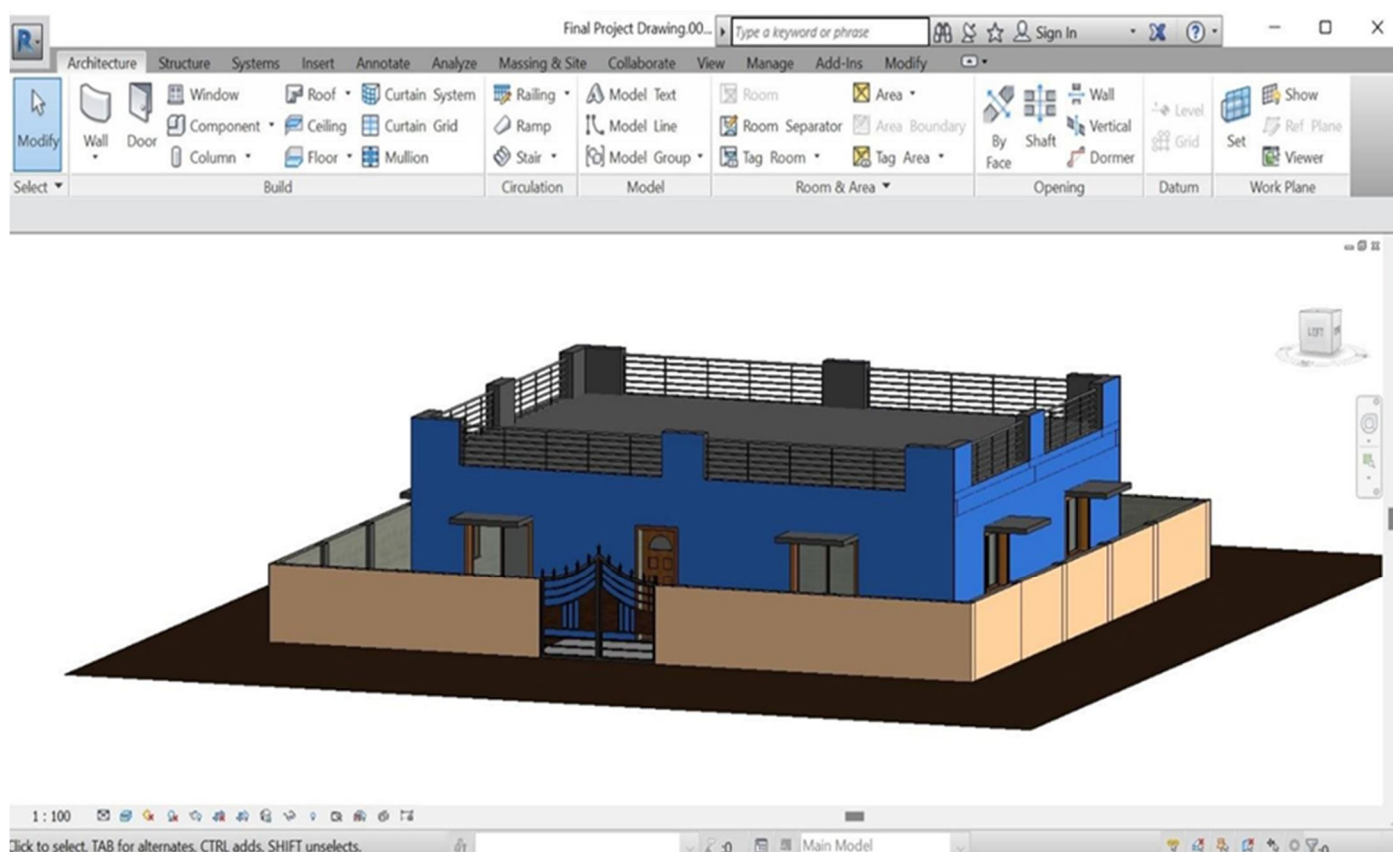
A. AUTOCAD 2D Plan



B. Autodesk REVIT 2D Plan



C. Autodesk REVIT 3D Plan



IV. ENERGY-EFFICIENT MATERIALS

A. Red Bricks

The term brick technically refers to a block made of dried clay, but it is increasingly frequently used popularly to refer to other chemically cured masonry blocks. Mortar, glue, or interlocking are all options for joining bricks. Bricks come in a variety of classifications, types, materials, and sizes that vary by place and age, and they are made in large quantities.

B. Concrete Bricks

Blocks or concrete masonry are the most common names for concrete bricks, which are often pale grey. They're built of dry, small-aggregate concrete that's poured into steel moulds and compacted using either an "egg layer" or a static machine. Rather than being burnt, the completed blocks are cured using low-pressure steam. Concrete bricks and blocks come in a variety of shapes, sizes, and face treatments, many of which are designed to seem like clay bricks. Concrete bricks come in a variety of hues and are manufactured with sulphate-resistant Portland cement or an equivalent. They are suitable for difficult situations such as wet conditions and retaining walls when created with enough cement.

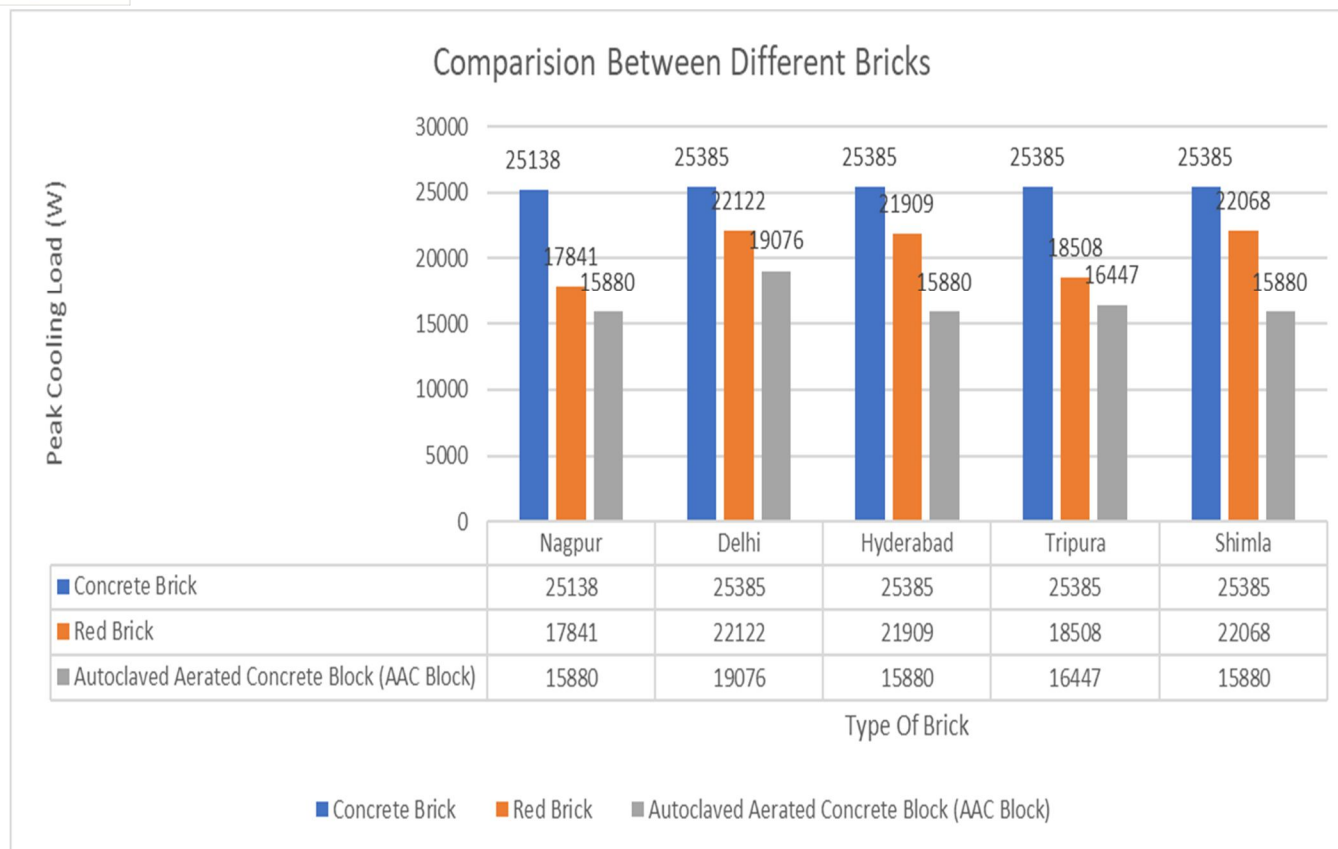
C. AAC Blocks

AAC (autoclaved aerated concrete) is a precast, lightweight foam concrete building material that can be used to make concrete masonry unit-like blocks. AAC products are made up of quartz sand, calcined gypsum, lime, cement, water, and aluminum powder and are cured in an autoclave under heat and pressure. AAC was invented in the mid-1920s and provides structure, insulation, and fire and mold resistance all at the same time. Blocks, wall panels, floor and roof panels, and cladding (façadepanel and lintels) are examples of forms. AAC products can be used for both interior and exterior construction, and they can be covered with siding materials like veneer brick or vinyl siding, or painted or coated with or plaster compound to protect them from the weather. Aside from the fact that they are simple to install.

V. RESULT

Material Used	Nagpur	Delhi	Hyderabad	Tripura	Shimla
Concrete Brick	25138	25385	25385	25385	25385
Red Brick	17841	22122	21909	18508	22068
Autoclaved Aerated Concrete Block (AAC Block)	15880	19076	15880	16447	15880

Material Used	Nagpur	Delhi	Hyderabad	Tripura	Shimla
Concrete Brick	0%	0%	0%	0%	0%
Red Brick	29.02%	12.85%	13.69%	27.09%	13.06%
Autoclaved Aerated Concrete Block (AAC Block)	36.82%	24.85%	37.44%	35.20%	37.44%



VI. CONCLUSION

The present study focuses on the appropriate use of brick as a material. This case study mainly focuses on the three types of Bricks Red Brick, Concrete Brick, and Autoclaved Aerated Blocks. On comparing the peak cooling load of these named bricks we found out that the highest cooling load is of Concrete bricks and that the lowest is of AAC Blocks. From this, we can conclude that AAC Blocks require less cooling to maintain comfortable conditions of the rooms thus reduction in the use of electricity. Hence, the proposed solution for the brick with AAC as a material is energy efficient model than the conventional use of bricks and also complies with current environmental laws.



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