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Sustainable Green Building

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Abstract: ***Green building refers to a structure and employing a method that's environmentally accountable and resource economical throughout a building's life cycle. Since buildings consume nearly five hundredth of the world's total energy, inexperienced buildings, on the other hand, consume a minimum quantity of energy with the utilization of energy economical materials. Hence, location of inexperienced buildings within the close proximity would produce an inexperienced zone and supply a far healthier setting with minimum heat island result. In India there are 2 primary rating systems for inexperienced buildings: GRIHA (green rating for integrated surround assessment), LEED (leadership in energy and setting design). Green buildings compared to standard buildings appear specifically similar and conjointly within the building use, however disagree within the operational savings and considerations for human comfort and indoor and atmosphere. inexperienced buildings get pleasure from the advantages of saving 40-50% energy by reducing greenhouse gas emissions into the atmosphere; it conjointly saves concerning 20-30% of water by victimization rain gathering or gray apply techniques. It conjointly reduces VMT (vehicle miles travelled) by selecting the placement near conveyance and conveniences that helps in reduction of petrol consumption. However, on the opposite hand, inexperienced buildings face several barriers just like the high initial investment needed for construction, split incentives.***

Keywords: Green Building, GRIHA, LEED, greenhouse, VMT

I. INTRODUCTION

Green buildings (also called inexperienced construction or property buildings) expand and enhance the building style considerations of economy, utility, durability, and luxury. A green building is one that uses less water, optimizes energy potency, conserves natural resources, generates less waste and provides a healthier area for occupants as compared to traditional buildings. Market estimates recommend that Asian countries are going to be adding eleven. 5 million homes per annum, creating it the world's third largest construction market by 2020. With fast urbanization and a powerful economic process, the development trade is changing into one amongst the quickest growing sectors in Asian countries providing employment to almost eighteen million individuals. This will be useful for those who square measure extremely aware concerning the environmental impact of the buildings and believe energy conservation. Economy is that the major think about any sort of construction work, particularly for residential homes and a lot of specifically once they square measure set within the megacity in an exceedingly developing country like Asian country. There is a requirement of concentrating on an inexperienced home, that is one amongst the foremost vital and one amongst the mentioned topics throughout the world, within the age of world warming and temperature change worldwide. In this situation some middle way is necessary to be found to encourage green construction. The objective of the green building concept is to develop buildings which use the natural resources to the minimum at the time of construction as well as operation. Green buildings are designed to reduce the overall impact on the human health and natural environment by using energy, water and other resources efficiently, and by reducing waste, pollution and environmental degradation. Within the current system of construction, the most key factors square measure cement, water, concrete, electricity, machinery etc and this primarily includes consumptions of our natural very important resources. Thus, living in a world wherever the resources square measure therefore scares, we'd like to own property ideas and parameters to change eudaimonia in our surroundings. Green buildings are one step towards this betterment.

Green building offers a comprehensive set of best practices to help you design and construct efficient, healthy homes that benefit the community, the environment. These six "elements" of the green buildings.

1) Site planning
2) Community
3) Indoor air quality
4) Energy
5) Material
6) Waste

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II. LITERATURE REVIEW

Singh, Surendra & Katiyar, Manoj & Sahu, Ashok & Agarwal, Sanjay. (2020). Analyzing the Affordability of Green Buildings[1] The writers of this study conducted comprehensive research into the financial benefits and drawbacks of green buildings as well as their criteria. Maintainable development has become a driving force for global masterminds and ordinary people alike in recent years. Our possessive greediness can put a halt to the breakneck speed with which we are progressing. Green construction is a basic technique that incorporates man's path for long-term sustainability. It's just another example of his desire to live and let live. The study identifies the various barriers to and prerequisites for bringing this to fruition on a larger scale.

Darko, Amos & Chan, Albert & Owusu, Emmanuel & Antwi-Afari, Maxwell. (2018). Benefits of Green Building: A Literature Review[2] Concerns about the construction industry's negative effects on the natural environment and human health have boosted the popularity of green building (GB) around the world. That is, GB has emerged as a promising means of making the building industry's activities and operations environmentally and human health-friendly. This work fills a research vacuum by conducting a systematic review of chosen academic papers published in construction management (CM) journals between 2000 and 2014.

Raheleh Rostami1, Seyed Meysam Khoshnava, Alireza Ahankoob, Rasoul Rostami.Sustainable Site Planning and Design[3] For decades, sustainability has been a buzzword all across the world. It is a problem that has arisen as a result of a growing awareness of rising populations, economic development, and global climate and environmental changes. As a result, attempts to keep greenhouse gas concentrations in the atmosphere at a level that has manageable repercussions for the global environment, human health, natural resources, and physical infrastructure have increased. Green site design is one of these initiatives.This study aims to introduce green site design, its principles, and tactics, which result in cost savings from reduced water and energy usage and, as a result, improve a new development's sustainability.

Shi, Yingling & Liu, Xinping. (2019). Research on the Literature of Green Building Based on the Web of Science: A Scientometric Analysis in CiteSpace (2002–2018).[4] Since the beginning of the twenty-first century, the concept of green building has progressively gained popularity and been implemented in more nations, making it a prominent direction in the field of sustainability in the construction sector. Many scholars and specialists have conducted substantial research on green building during the last few decades. The goal of this study is to examine and display the current state of green building in a methodical manner.

III. METHODOLOGY

A. Systems To Be Used

1) Piezoelectricity.
2) Grey water Recycling.
3) Rain water harvesting.
4) Building Integrated photovoltaic.

a) Piezoelectricity: Piezoelectric materials can convert mechanical strain and vibration energy into electrical energy. This feature enables the use of renewable and sustainable energy in buildings through power harvesting and self-sustaining smart sensing. Plain cement paste, as the most prevalent construction material, lacks acceptable piezoelectricity and is ineffective at harvesting electrical energy from a building system's ambient vibrations.

- *Working*- When you apply pressure to an object, it produces a negative charge on the enlarged side and a positive charge on the compressed side. Electrical current flows across the material when the pressure is removed.
- *Conditions*- Until the random piezoelectric domains are aligned by a process known as "Poling," piezoelectric ceramic materials are not piezoelectric. Poling is the process of applying a DC voltage to a substance. Under the floor mats, tiles, and carpets, a series of crystals can be installed. For one second, one foot step may create enough electrical current to light two 60-Watt bulbs.

b) Grey Water Recycling: Grey water is wastewater that can be recycled on site, such as from laundry, dishwashing, and bathing. It can be utilised for landscaping and other agricultural uses without being purified. It can be used for bathing, toilet flushing, car washing, and other uses after purification, but not for drinking or cooking. It has a number of advantages, including decreased fresh water extraction and less impact on the treatment facility. According to various studies, an average household produces 140 liter of grey water per day. The various sources and their contribution is categorized in Table 1.1.

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TABLE 1
Sources of Grey Water and their Contributions

Source	Quantity per day per person
Shower	20-30 lit
Washing Clothes	15-20 lit

Although it is normally slightly contaminated with a range of chemicals, such as soap or detergent, grease and microbes, it can be successfully reused for a range of purposes which do not require drinking water quality purity, including: Watering The garden, Flushing Toilets, Car-washing.

c) *Rain Water Harvesting:* Storm water collection and usage. Storm water can be either kept on site for later use or recharged into the underlying aquifer. When it comes to ground water recharge, RWH systems benefit both individuals and society. Reduced runoff, reduced fresh water extraction, less strain on treatment plants, and a rise in the area ground water table. A basic System for harvesting of rainwater consists of three stages:

- *Collection Stage:* Rainwater harvesting begins with this step. Rainwater is collected in a container on roofs, pavements, or the soil surface while it is raining in a catchment region. Rainwater is collected and transported to a storage tank by channels that run all the way around the edge of a sloping roof.
- *Distribution Stage:* Pipelines are the foundation of the distribution system in RainWater Harvesting (RWH). They transport rainwater to the harvesting system from the catchment or rooftop area. They are built of galvanised iron sheet (20 to 22 gauge), PVC, and bamboo and can be semi-circular or rectangular.
- *Storage Stage:* Following collecting and distribution, the most crucial step is the storage system. The storage tank is a standard RWH tank. The storage tank's capacity is determined by rainfall, the length of the dry season, and the projected need. The growing demand for water is causing the groundwater table to drop. Rainwater replenishes the groundwater table. This water can be found in lakes, rivers, ponds, aquifers, and other bodies of water, but it comes from the sea. Rainwater that has been treated can provide the need for domestic water. Water sources are typically located outside of the community.

d) *Building Integrated Photovoltaic:* Solar power is converted into useful electricity using photovoltaic (PV) panels. These PV modules can be mounted on buildings' walls and rooftops. Electricity from a clean (environmentally friendly) source. Reduces the amount of traditional thermal electricity used. In the long run, it proves to be cost-effective.

B. *Materials To Be Used*

1) *Fly Ash Block:* Lime and fly ash mixture. Thermal power facilities produce fly ash as a byproduct. As a result, fly ash, a waste product, is used in building. Fly ash is inexpensive (the only cost is transportation), thus the blocks are as well. High strength, superb finishing, and size consistency reduced the amount of plastering required. Water absorption is low. Blocks are large in size hence, construction becomes faster.
2) *High Volume Fly Ash Concrete:* Fly ash replaces around half of the cement in HVF Concrete, lowering cement use and repurposing waste. When compared to regular concrete, it is less expensive. If the proper balance is maintained, replacing fly ash has little effect on its strength. Workability has improved, as has the ability to eliminate segregation and bleeding. In the long run, a lower W/C ratio means increased strength, less shrinking, and lower hydration heat.
3) *Low VOC Paints:* VOC stands for volatile organic compound, which is a paint drying ingredient that is harmful to people. For years, VOC evaporates off wall surfaces. Low VOC paints contain the smallest amount of VOC possible. Improves indoor air quality, maintains the ozone layer, is less allergenic, dries quickly, and has a minimal odour.
4) *Solar Reflective Glasses:* Reflects the sun's infrared radiation. It allows just visible light to pass through. Maintains a cooler indoor environment, resulting in increased energy efficiency. Temperature insulation of 3°C-4°C is obtained. High resistance to abrasion, wear, and tear on the surface.

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C. Site Information and Plan

These are the visual representation of the ground floor and first floor.

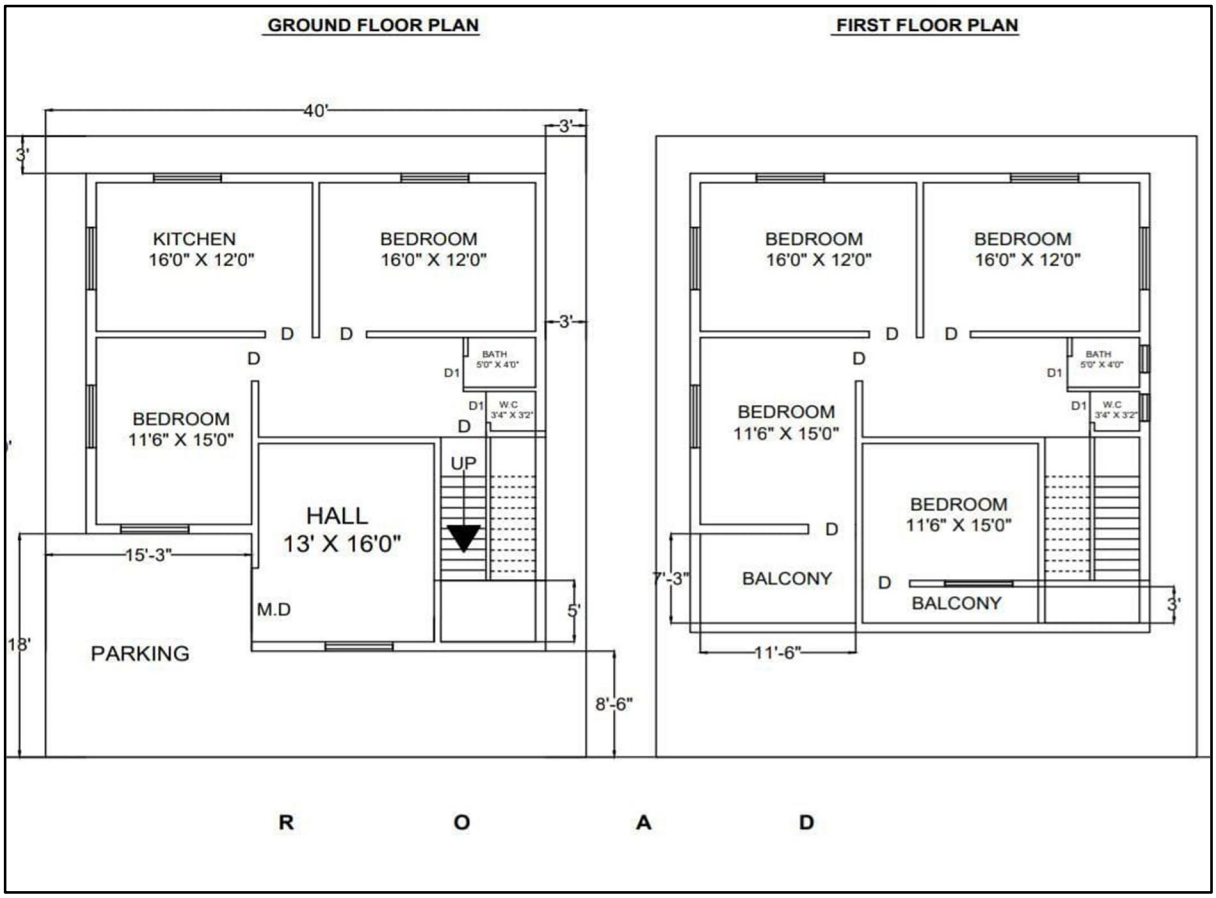


Fig. 1 Location plan

D. Model Presentation

Materials used for making model-

1) Foam cardboard sheets of 5-3mm thickness.
2) Colour papers.
3) Tracing sheets (used for making windows,doors,balcony, and gate)

The scale used for model making is 1cm=0.6feets(6 inches).



Fig. 2 Front view(right) and Side view(left)

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Fig. 3 Back view(right) and Top view(left)

E. Green Building Certifications

TABLE 2

Green Building Certifications

CertificationLevel	RatingPoint
LEEDCertified	26 -32
LEEDCertifiedSilver Level	33 -38
LEEDCertifiedGold Level	39 -51

F. Self-Assessment of Building

TABLE 3

Self-Assessment of Building

Criteria	Factors implemented	Max.Points	Min.Points
Sustainable sites	Ground water recharge and landscaping.	25	8
Water Efficiency	Rain water harvesting and controlled use.	10	6
Energy & Atmosphere	100% solar power for homes.	35	30
Material & Resources	Fly ash bricks, VOC paints, and other available materials.	14	12
Innovations	Building planning and awareness to public	6	4
Indoor Air Quality	Solar Control glass windows and natural ventilation	20	11

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IV. RESULTS

We have assigned points to our green building model as per the LEED certification in the table above with the specified criterion. And as per the given minimum points our model comes under GOLD certification of LEED with minimum seventy one points.

V. CONCLUSION

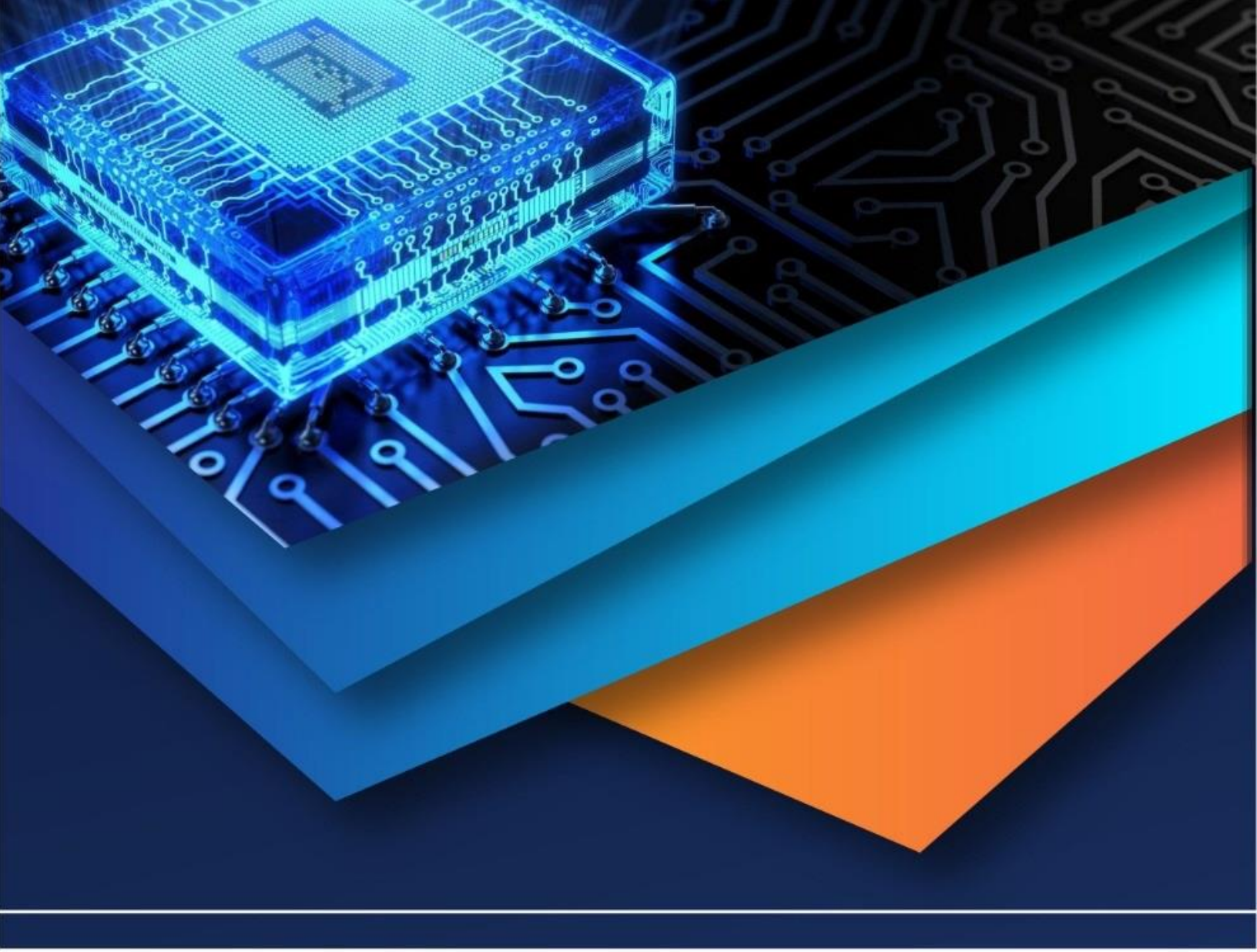
The research aim was to comprehend Green Building, which was accomplished by researching various green building technologies, planning and designing building layouts, and developing plans, elevations, and sections, among other things. Various green construction technologies and materials are offered, along with cost estimates and feasibility studies.

If the goal is to build a new home to live in, it is preferable to choose a green home over a conventional one because a 12.94 percent increase in overall cost is not insignificant when renovating or retrofitting an existing home. More individuals need to accept green building as a financially sound and, above all, environmentally conscientious approach. The LEED rating system was created by the Indian Green Building Council to assist customers, designers, and builders in collaborating to produce buildings that have a low environmental impact.

REFERENCES

[1] Singh, Surendra & Katiyar, Manoj & Sahu, Ashok & Agarwal, Sanjay. (2020). Analyzing the Affordability of Green Buildings. 2. 1-4. 10.5281/zenodo.3662252.
[2] Darko, Amos & Chan, Albert & Owusu, Emmanuel & Antwi-Afari, Maxwell. (2018). Benefits of Green Building: A Literature Review.
[3] khoshnava, m., 2021. Sustainable Site planning and Design. [online] Academia.edu.
[4] Shi, Yingling & Liu, Xinping. (2019). Research on the Literature of Green Building Based on the Web of Science: A Scientometric Analysis in CiteSpace (2002–2018). Sustainability. 11. 3716. 10.3390/su11133716.
[5] Kushagra Varma, T., 2021. Green Building Architecture: A Literature Review on Designing Techniques | IJSRP February 2013 Publication. [online] Ijsrp.org.
[6] Konbr, Usama. (2017). Studying the Indoor Air Pollution within the Residential Buildings in Egypt as a factor of Sustainability. 45. 722-741. 10.21608/jesaun.2017.116874.
[7] Khalid, W & Qazi, Obaidullah & Abdirizak, A & Rashid, Raizal. (2019). Comparison of different waste materials used as cement replacement in concrete. IOP Conference Series: Earth and Environmental Science. 357. 012010. 10.1088/1755-1315/357/1/012010.
[8] Chenyao Shen, Kang Zhao, Jian Ge, "An Overview of the Green Building Performance Database", Journal of Engineering, vol. 2020, Article ID 3780595, 9 pages, 2020. https://doi.org/10.1155/2020/3780595
[9] Kumar Parashar, A., 2021. [online] Ijser.org. Available at: <https://www.ijser.org/researchpaper/Construction-of-an-Ecofriendly-Building-using-Green-Building-Approach.pdf>
[10] Greenspacencr.org. 2021. Elements of Green Building - Greenspace NCR - Supporting growing green communities through green real estate and economic development. [online]
[11] Cengage.com. 2021. 9781111135959 | CengageEMEA. [online] Available at: <https://www.cengage.com/c/estimating-for-residential-construction-2e-pratt/9781111135959/>

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