

A Review Study on Flexible Housing

Miss. Sabiha Shahajahan Tahasildar¹ Miss. Priti Sachin Vathare² Miss. Nikita Rajendra Chavan³

Miss. Anuja Ashok Bidre⁴ Miss. Sanika Suresh Nirmal⁵

^{1,2,3,4,5}Department of Civil Engineering

^{1,2,3,4,5}Sharad Institute of Technology and Polytechnic, Yadrav, India

Abstract— In the broad definition proposed in this paper, flexible architecture can be understood as any building or building component designed for adaptation to change in its surroundings. In the examples investigated here, responsiveness focuses on either changing usage patterns (the activities of the building's inhabitants) or changes in the (exterior or interior) environment. The rate at which these changes take place provides another means of describing and categorizing types of flexible architecture. The concept of interactive surfaces as an expressive element of the building has been explored in numerous installations, mostly temporary, which have explored the architectural implications of materials capable of change in response to their immediate surroundings. The flexibility in architectural design can solve the area problems and multi-use plan. It could provide many possibilities to change the shape and size of internal space in addition to the economic and social impacts on the housing system.

Keywords: Flexibility, Space Efficiency, Adaptation, Economic, Eco-Friendly

I. INTRODUCTION

The increase in population and migration of humans has led to an increase in the requirement of space for residency. But many people face a lack of space in their dwellings. Cities and towns around the world are composed of static dwellings, which are the dominant model for societies and are based on the principle that dwellings should be stationary. The classical Vitruvian attributes of architecture are identified as utility, solidity, and beauty. Whereas flexible architecture is contrary to the typical solid building concept. Flexible architecture can be defined as buildings that are intended to respond to changing situations in their use, operation, or location. This is an architecture that adapts rather than stagnates; response to change rather than rejects, it is motive rather than static. It is a design firm that is by its essence cross-disciplinary and multi-functional and consequently, is frequently innovative and expressive of contemporary design issues.

II. AIMS AND OBJECTIVES

- To enhance the adaptability of the dwelling to the needs of its occupants and consequently their satisfaction.
- To enable different physical arrangements in the dwelling.
- To encourage inhabitants to take part in the design process of the different possibilities of using their living space.
- To design multi-functional spaces.
- To Design a structure with a light infill partition.
- To obtain maximum effective space with clever design ideas.

III. METHODOLOGY

These flexible houses can be designed in following ways:

- 1) The flexible house will be designed in an area of 550 sq ft.
- 2) This house will be divided in 2 basic units.
- 3) The first unit will be the rigid unit which will include external walls, kitchen and WC.
- 4) Whereas the second unit will be completely flexible.
- 5) The flexible unit will be provided with moveable walls, foldable furniture, multifunctional spaces, as well as multipurpose furniture.
- 6) Designing in such a way that rooms can be regrouped and arranged according to the user's needs at any respective time.
- 7) Creating the design using following principles:
 - Space
 - Construction cost
 - Design for adaptation
 - User requirement
- 8) Comparison between a rigid house and flexible house.
- 9) Material selection and costing.
- 10) Preparing a 3d model of flexible house.

IV. LITERATURE REVIEW

- 1) Siddharth Inani, Ashok Kumar in the year 2007 did their research on the topic, "FLEXIBILITY CONCEPT IN DESIGN AND CONSTRUCTION FOR DOMESTIC TRANSFORMATION". In their research, they discussed that The problem lies in the severe shortage of land at affordable prices to the group for building individual houses and forced to choose the available shelter options not designed suiting to their requirements. The research findings reveal that there are gaps in terms of lack of flexibility and multifunctional living spaces, design and construction of modular units for multistorey apartments suiting to the requirements of the people and the flexibility concept has not been attempted for such segments of the population in India.
- 2) Young-Ju Kim B.A., Architectural Engineering (2001) Korea University, did their research on, "Organism of Options: A Design Strategy for Flexible Space." Where he explains in detail about The need for "flexibility" of architecture has been increasing as recent social demands are rapidly changing. However, many buildings designed in the name of flexibility are blocky, boring, and quite inflexible because of incomplete systems, or simply bad planning. A space is designed and built to fulfill a certain request and to perform properly, the space needs to be equipped with the proper systems such as lighting, acoustics, structural system, etc. At the same time, the segregation of functions, or the blind obedience of spatial organization to functions can potentially eliminate the

true multi-functionality of a space. The double interpretations of spatial flexibility-- for function, for adaptation-- comprise a primary concern for this research.

- 3) Tatjana Schneider & Jeremy Till (2007) discuss in detail in their book, "flexible housing", that, the broad definition of flexible housing is housing that can adjust to changing needs and patterns, both social and technological. These changing needs may be personal (say an expanding family), practical (i.e. the onset of old age), or technological (i.e. the updating of old services). The changing patterns might be demographic (say the rise of the single person household), economic (i.e. the rise of the rental market), or environmental (i.e. the need to update housing to respond to climate change). This definition is deliberately broad. It includes the potential to make changes before occupation as well as the ability to adjust one's housing over time after occupation.
- 4) Ashraf Elmokadem, Osama M. Abo Eleinen(6, June 2019) discussing the topic, "Flexibility, and Sustainability in Architectural Design Concept", the authors study shows that :Throughout history, most architects attempted to renovate buildings from static forms to flexible and dynamic forms to obtain the changing needs of inhabitants. Therefore, they attempted to design spaces and buildings that can adapt and react positively with the environment, such as noise, daylight, wind, temperature, or humidity. This reaction is achieved by using flexible and sustainable concepts during the architectural design process. This paper provides an overview of flexible and sustainable architecture linked concepts and definitions. Then, it summarizes the history of flexible sustainable architecture (FSA). Finally, it presents applying the concept of sustainability through flexible architecture by analyzing and evaluating selected projects through suggested parameters that agree with the flexible sustainable concept.
- 5) Cristiana Cellucci and Michele Di Sivo, "The Flexible Housing: Criteria and Strategies for Implementation of the Flexibility", in this paper the author discussed that The design of housing systems is today challenged by a highly uncertain context, dominated by the rapid development of functional and technological obsolescence in inherited housing models. If flexibility is the ability of a system to be easily modified and to respond to changes in the environment timely and conveniently, it can be considered as the antidote to obsolescence or the characteristic of the system that guarantees slippage over time. Our paper focuses on the concept of flexibility as a fundamental prerequisite for a residential building to extend its life cycle design, through strategies and constructive solutions that ensure both the convertibility of the space in response to changing usage and the use of building materials that encourage the reversibility and the long-term easy maintenance of the technological choices that have been implemented.

V. FUTURE SCOPE

Flexible houses are solutions to problems such as lack of space, low budget for construction, etc. Flexibility can provide ease for the habitants having more number of people living in the same house, make a space multifunctional and reduce the cost of construction.

The future scope of our project is to interpret the above-mentioned problems in the following ways:

- 1) We will design flexible houses that could solve the problems such as lack of space.
- 2) These houses will be constructed under an area of 550 sq ft.
- 3) These houses would have flexible units such as movable walls, Flexible furniture, multi-functional units, etc.
- 4) This project also aims to compare flexible houses and contemporary rigid houses.
- 5) The cost of moveable walls and flexible furniture will also, be calculated.

VI. CONCLUSION

From this paper, flexible sustainable architecture can be presented as a new concept for building design. There are many concepts related to flexible architecture such as intelligent, interactive, responsive, adaptive, and green architecture. Although they may look similar, every concept focuses on a specific point and aims to achieve particular purpose. Then, flexible architecture history and characteristics have been mentioned.

ACKNOWLEDGEMENT

We would like to express our special thanks of gratitude to our teacher Mr. M. K. Chavan to help us throughout the process of doing this wonderful project on the topic of flexible housing, he also helped us in doing a lot of research and we came to know about so many new things. We are really thankful to our teacher. Secondly, we would also like to thank our HOD Mr. A. B. Jadhav, parents, and friends who helped us in this project.

REFERENCE

- [1] Flexible Architecture: The Cultural Impact of Responsive Building Professor Robert Kronenburg, PhD, RIBA.
- [2] FLEXIBLE ARCHITECTURE FOR THE DYNAMIC SOCIETIES Reflection on a Journey from the 20th Century into the Future.
- [3] Flexibility and Sustainability in Architectural Design Concept Ashraf Elmokadem, Osama M. Abo Eleinen , Rania H. Aly , Doria A. EzzEldien.
- [4] The Flexible Housing: Criteria and Strategies for Implementation of the Flexibility Cristiana Cellucci and Michele Di Sivo. Flexible Housing Tatjana Schneider & Jeremy Till.