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A STUDY OF THE SPATIAL DESIGN OF MOBILE OUTDOOR SEMI-PERMANENT SHELTER BUILDINGS

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This study explores the design, feasibility, and impact of mobile collapsible outdoor shelter spaces, focusing on their potential to address urgent housing needs in the context of disasters and homelessness. The research highlights innovative solutions that balance mobility, durability, and occupant well-being by examining various materials, technologies, and design approaches. Results from simulations and real-world applications demonstrate the shelters' effectiveness in different environmental conditions, underscoring their role in sustainable disaster response strategies. This study contributes to the ongoing discourse on emergency housing, proposing scalable and adaptable designs for immediate and efficient shelter provision.

Keywords: mobile shelter; collapsible design; sustainable housing; disaster response; emergency housing; design innovation

INTRODUCTION

The need for efficient, sustainable, and rapidly deployable shelter solutions has never been more critical. With increasing global incidences of natural disasters and enduring issues of homelessness and displacement, the design of mobile collapsible outdoor shelters represents a key area of innovation in emergency housing. This study situates itself at the intersection of design, sustainability, and humanitarian response, aiming to address the pressing demand for shelters that are quick to deploy and respectful of the environment and the dignity of their occupants. The study explores the potential of collapsible, lightweight structures to provide immediate relief and a pathway towards more resilient communities by rethinking traditional approaches to emergency shelter design.

PURPOSE

The main objective of this design is to promote the innovation and development of emergency shelter design to meet the increasingly urgent housing needs and to provide more humane, efficient and sustainable housing support for disaster-affected and vulnerable populations. Especially in the context of frequent natural disasters and homelessness worldwide, the design of collapsible mobile outdoor shelters should be a key area of innovation in emergency housing.



RESULTS AND DISCUSSION

Designing a portable evacuation space involves careful consideration of versatility, rapid deployment, resilience, and occupant well-being. These spaces serve as temporary refuges during emergencies, such as natural disasters, and thus, their design must prioritise safety, comfort, and efficiency. Below is an outline of the design concept and key features of an ideal portable evacuation space:

Design Concept for Portable Evacuation Space

1. Rapid Deployment and Ease of Transport.

Modular components that are lightweight and compact for easy transportation.

Design that allows for quick assembly/disassembly by minimal personnel or even untrained individuals.

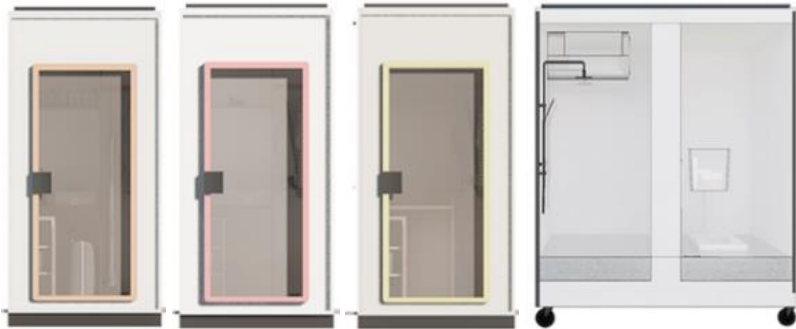


Fig.1. Derivation of functional modules

2. **Durability and Resilience.** Construction materials should be weather-resistant and durable against various environmental conditions, such as strong winds, heavy rains, or seismic activities. The structure should be able to securely anchor to diverse terrains, providing stability during adverse conditions.

3. **Sustainability and Self-Sufficiency.** Solar panels and rainwater harvesting systems should be incorporated to provide power and water supply. Use of environmentally friendly, recyclable or biodegradable materials, minimizing ecological impact.

4. **Safety and Comfort.** Adequate ventilation and insulation to maintain a comfortable interior climate. Features like emergency lighting, fire retardants, and first-aid stations to ensure occupant safety. Design that accommodates people with disabilities, ensuring accessibility for all.

5. **Capacity and Scalability.** The flexible design can be adapted to accommodate varying numbers of occupants, allowing for scalability based on the emergency's magnitude—communal areas for cooking, dining, and social interaction support occupant morale and community building.

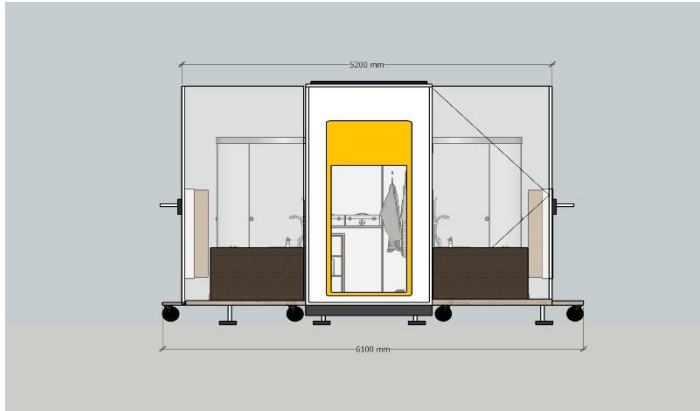


Fig.2. Semi-folded elevation

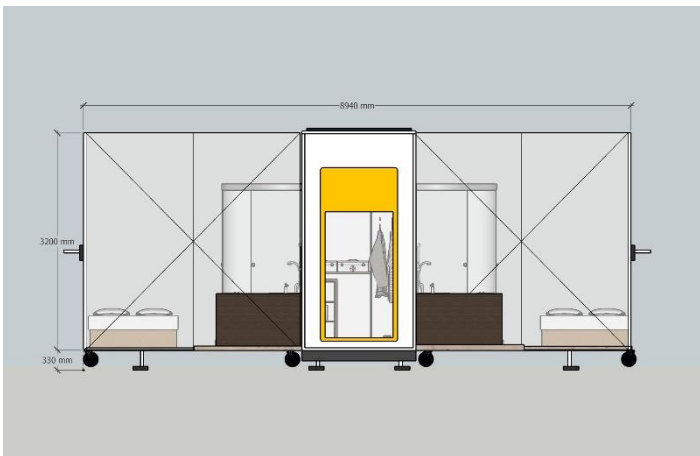


Fig.3. Expanded Elevation

6. Integration of Technology. Use of IoT for real-time monitoring of environmental conditions and structural integrity. Communication tools that allow occupants to stay informed and maintain contact with external emergency services.

7. Psychological Considerations. Color schemes and interior designs that reduce stress and anxiety. Areas designated for privacy, relaxation, and recreation to support mental health during prolonged stays.



CONCLUSIONS

Portable evacuation space is an essential component of emergency preparedness and response strategies. Its design requires a holistic approach that balances functional efficiency and human factors to ensure that such spaces provide physical shelter and support evacuees' psychological well-being. Therefore, the design and application of portable evacuation spaces are of significant research and practical importance. As we delve into the optimization and innovation of portable evacuation spaces in the future, it is essential to follow the principles of ergonomics and convenience, functionality and adaptability, spatial differentiation, aesthetics and design, as well as psychological comfort and accessibility, to provide better solutions for responding to emergencies. These portable spaces can significantly enhance resilience and disaster recovery through innovative design and technology.

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СЮЙ Я., КОСЕНКО Д. ДОСЛІДЖЕННЯ ПРОСТОРОВОГО ДИЗАЙНУ МОБІЛЬНИХ ЗОВНІШНІХ НАПІВПОСТІЙНИХ БУДІВЕЛЬ УКРИТТЯ

У роботі досліджується конструкція, техніко-економічна доцільність і вплив мобільних розбірних притулків на відкритому повітрі, зосереджуючись на їх потенціалі для вирішення термінових потреб у житлі в контексті катастроф і бездомності. Дослідження висвітлює інноваційні рішення, які збалансовують мобільність, довговічність і благополуччя мешканців шляхом вивчення різних матеріалів, технологій і підходів до дизайну. Результати моделювання та застосування в реальному світі демонструють ефективність укриття в різних умовах навколишнього середовища, підкреслюючи їхню роль у стійких стратегіях реагування на катастрофи. Це дослідження робить внесок у поточний дискурс щодо екстреного житла, пропонуючи масштабовані та адаптовані проекти для негайного та ефективного надання притулку.

Ключові слова: мобільне укриття; розбірна конструкція; стійке житло; реагування на катастрофи; аварійне житло; інновація дизайну