



CONVERTIBLE RAMP-STAIR FOR LIMITED SPACE ACCESSIBILITY

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ABSTRACT

Universal Design (UD) in architecture ensures accessibility and functionality for all users, including individuals with disabilities, the elderly, parents with strollers, and workers transporting goods. However, incorporating UD into multi-level structures with limited space remains a challenge due to the floor area required by traditional ramps and stairs. Inspired by Chan Wen Jie's convertible stair concept, this study explores the development of a convertible ramp-stair system that enhances accessibility while optimizing space efficiency. The research focuses on identifying suitable materials, detailing the construction process, and assessing the system's durability and loading capacity. The structure was built from metal bars (flat, angle, square), welding rods, steel matting, a construction platform, a 12V wiper motor assembly, bearings, switches, electrical wires, bolts, nuts, and a 12V car battery. Durability and load capacity tests showed that the structure could support up to 513 kg, which is more than the standard stair limit of 454 kg. Even at the highest weight, the structure stayed intact, proving it is strong and stable. Each step could also hold up to 200 kg, much more than the minimum required for each step of the stairs. This study explores the potential

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of the convertible ramp-stair system as a solution for enhancing accessibility in space-constrained environments. By examining its feasibility, the research provides architects and professionals with insights into designing adaptable, multi-purpose structures that integrate accessibility without compromising space efficiency.



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