

UNIVERSITI TEKNOLOGI MARA

**SAFETY EVACUATION FOR
ELDERLY EVACUEES RESIDENT IN
PUBLIC MULTI-STOREY
RESIDENTIAL BUILDING IN
MALAYSIA**

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ABSTRACT

The main concern of this study is on the increase in the elderly population living in multi-storey residential buildings. The second concern is on these elderly's safety aspects including slow speed, physical mobility and fall prevention. Only a few studies were found to have assessed the needs and safety measures of elderly during emergency situations. Coupled with the rapid development of high-rise buildings, the safety of elderly has fast become a major concern as they fall under the vulnerable group of people due to their slower walking speed and limitations to their physical mobility capability. Thus, the first objective of the study is to identify the reactions and perceptions of elderly occupants towards evacuation safety procedures in PPR buildings. It was found that elderly behave similarly with adults, but concerns over personal belongings could cause hesitations during the evacuation process. Then, the second objective is to evaluate experts' opinions on the safety measures implemented in public multi-storey residential buildings in Malaysia. The survey results revealed that the passive design scored the highest mean in terms of evacuation efficiency. The next step of this research was conducting analysis using the Pathfinder software to answer the next objective, which is to analyse the variants in escape route design and the effect of evacuation efficiency on both elderly and adult occupants. As public multi-storey residential buildings only follow the minimum requirements set according to the UBBL 1984, these buildings are viewed as a suitable subject to be studied. Before the simulation process was conducted, the study conducted a case study on three public multi-storey residential buildings. All three building layouts showed similar issues that contribute to longer evacuation time. Then, a simulation was conducted with three main focuses in order to understand the effect of staircases' physical condition towards the evacuation process, the effect of the elderly's dwelling position on their speed of movement, and the effect of varying distances and widths of escape route elements (corridor, staircase and exit) on the evacuation time. The results firstly showed a high dependency on staircases as they have a significant contribution towards evacuation time, and that crowd dispersal patterns contribute to issues of stagnation at staircases. The results also showed that elderly occupants who occupy units on the lower levels experience faster and shorter evacuation times without affecting other evacuees. Lastly, the results show that increasing the staircases' width to 1500mm can significantly decrease the total evacuation time. The findings helped the study develop an evacuation safety model to suit the increasing number of elderly occupants in public multi-storey residential buildings which is the fourth objective of the study. The model is subdivided into four categories which are fire safety awareness, equipment and evacuation skills, maintenance and management, and fire safety design. The outcomes of the study contribute to the understanding of the elderly's behaviour during emergency situations and safety implementation in terms of building design based on experts' view, highlight the common issues arising in public multi-storey housing, and contribute to the knowledge on crowd dispersal in public multi-storey residential buildings.

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CHAPTER ONE

INTRODUCTION

1.1 Introduction

Safety evacuation has been a topic of interest in research over the years. It started as a form of observational study and data survey which sought to understand the behaviour of evacuees during an emergency situation. Many theories have since been developed from those humble beginnings. Subsequently, a computer simulation tool was introduced to provide faster computation and better handling of complexities in parameters, thus minimising the cost and duration of research studies. The computer simulation tool was developed based on mathematical modelling and established theories from previous research. The data collected are closely related to how humans behave during an emergency situation. However, this scope of study is still new in Malaysia; this opens up a research gap that needs to be filled. In-depth research in safety evacuation would provide new research insights which contribute new knowledge and could prove to be beneficial towards the enhancement of building safety in Malaysia.

The rapid increase of urban population is evident with the increase of multi-storey residential buildings. In turn, the increase of elderly population living in multi-storey buildings has raised concerns on safety during emergencies due to their slower response and speed of walking.

Chapter One discusses the research background of the study by focusing on the changing demographics in Malaysia that lead to the issue of addressing elderly occupants' needs, especially in residential areas. The chapter continues with a discussion on the problem statement where the section discusses the issues affecting public multi-storey residential buildings and elderly occupants – this discussion then leads to the identification of research gaps. Next, the chapter focuses on questions related to the research gaps to identify the aim and objectives of the study. The research methodology and research framework are then summarised and illustrated in Figures 1.1 and 1.2. Then, the significance of study, scope of research, and limitations of study are presented. The chapter ends with detailed explanation on the organisation of the thesis where it summarises the content of each chapter of the thesis.