

**UNIVERSITI TEKNOLOGI MARA**

**FRAMEWORK OF THE  
ARCHITECTURAL SAFETY DESIGN  
ASSESSMENT (ASDA) THROUGH  
INTEGRATION OF THE  
PREVENTION THROUGH DESIGN  
(PTD) CONCEPT FOR THE  
AFFORDABLE HOUSING  
MAINTENANCE STAGE**

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## ABSTRACT

Occupational Safety and Health (OSH) design for maintainability upkeep remains a prominent concern for Malaysia's housing industry. Although many studies have urged the implementation of Prevention through Design (PtD) as a proactive safety intervention throughout the design process to mitigate maintenance accidents, there has been a very little study that looks into the inclusion of PtD as part of design intervention and how it can provide an architectural view on OSH concerns. As of right now, neither a conceptual framework nor architectural design parameter on the essential safety design aspect for maintainability to attain this issue. Therefore, this research aims to develop a framework that aids in improving the workplace safety design aspect for maintainability, which may assist the architect during decision-making at the initial stage of the affordable housing project, focusing on adequate safety design during the maintenance stage. The research has three research objectives: i) to identify the attributes of architectural safety design criteria that substantially mitigate occupational accidents at the initial design stage of affordable housing maintenance work, ii) to formulate the relative importance score of the architectural safety design attributes to assist in the early architectural decision-making process, and iii) to develop an Architectural Safety Design Assessment (ASDA) framework that can demonstrate architectural design and preventive measures of workplace safety for maintenance work at the initial design stage of affordable housing projects. A mixed-method approach was utilised for this study. The ASDA framework was developed based on the analyses and results of the three rounds of the modified Delphi-AHP method. To summarise, this research was conducted in three main phases: (1) the literature review and content validation for instrument development, (2) the combination of the Delphi method and analytical hierarchy process (AHP), and (3) the development of the ASDA framework. The ASDA framework comprises two main components; architectural safety design attributes (ASDATs) and PtD application checklist. The two rounds of modified Delphi survey results successfully constructed the final list of 43 safety design aspects (SDVs) within five main architectural design variables (ADVs) and 53 preventive measures (PMs) of the workplace safety design. In the subsequent stage, AHP findings have ranked site planning (ADV1) and environmental design parameters (ADV5) are the most crucial ASDATs components that mitigate architectural design risk in the initial design stage. The development process of the framework is formed as the architectural safety design assessment of the workplace design to consider maintainability compliance with OSH prevention design based on the Delphi-AHP findings. The ASDA process consists of three main stages; (1) Design review of the architectural safety design aspect and preventive measures of the workplace safety for affordable housing maintenance stage, (2) Overall score for ASDATs and (3) Workplace safety design classification. The developed framework shows the step undertaken for a design review for the affordable housing maintainability safety design aspect at early design. The proposed framework of ASDA has a significant contribution to analysing and validating the early decisions made to ensure the effectiveness of design controls as an improved proactive measure of the safety design aspect for maintainability from an architectural design perspective.

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# CHAPTER ONE

## INTRODUCTION

### 1.1 Research Background

The housing development goal is not merely a physical appearance but, most importantly, how it facilitates its occupants; its design needs to be safe, easy to maintain and reliable for everyday lifestyle (Noor Hisham & Md Amin, 2020). Enhancing a safer environment in housing development would benefit the building's entire lifecycle and safety performance, especially during the operational and maintenance stage (Husin et al., 2018). Recently, under National Housing Policy (2018-2025) initiatives, governments through the Ministry of Housing and Local Government (KPKT) are very committed to implementing and coordinating affordable housing development for the target groups in tandem to ensure the development of a huge-capable housing sector, to be enjoyed by various levels of society. The Government has developed the planning of one million affordable houses within ten years (2018-2028) to be implemented by federal government agencies, the state government and the private sector to benefit the B40 and M40 target groups.

However, realising the government's desire to provide affordable and safe housing development, there are still universal concerns related to poor reputation related to maintenance work (KPKT, 2019). In the conceptual stage of housing projects in Malaysia, it is common to practise for the client or the designers to address the design brief and design criteria. These criteria should fulfil the standard building requirements such as Uniform Building by-Law (UBBL) and fire requirements. Still, very minimal incorporation of Prevention through Design (PtD) measures in their requirements. While building design does not consider maintainability and maintenance safety at the early design stage, resulting in more difficult structures to maintain, putting workers' safety at risk and costing more to operate (Asmone & Chew, 2020). This is due to the limitation or outdated of the standard safety design guidelines, clients' motivation and contractual terms, tools related to safety prevention and the designer's competency, which affect the architect's capability to implement this concept during the design stage.

PtD concept has been widely used to mitigate any potential hazard and minimise residual risks during the early design stage. Thus, architects and others professional