UNIVERSITI TEKNOLOGI MARA

ECS358

CIVIL ENGINEERING DESIGN PROJECT

TECHNICAL REPORT

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1.1 Introduction

1.1.1. Requirements of building-by-law, fire safety regulations

The fire resistance requirements for a double-storey reinforced concrete (RC) house are critical to ensuring the safety of occupants and the structural integrity of the building during a fire. First, all structural elements, such as columns, beams, and slabs, must achieve a fire-resistance rating of at least 1 to 2 hours, as per UBBL Clause 224. Reinforced concrete is inherently fire-resistant, allowing the structure to maintain its load-bearing capacity during high temperatures, reducing the risk of collapse. Additionally, compartment walls and floors must be constructed to meet the standards outlined in UBBL Clause 213. These walls act as barriers, effectively containing fire within specific sections of the house and preventing it from spreading to other areas. Openings in these walls, such as doorways, must be equipped with fire-rated doors that comply with UBBL Clause 162. These doors should have a minimum fire resistance of 30 minutes to 1 hour and be fitted with automatic closers to ensure they remain shut during a fire, thus maintaining the integrity of the compartments.

Smoke control is another essential aspect of fire resistance. Smoke ventilation systems must be integrated into vertical shafts, such as staircases, to prevent the accumulation of smoke, as outlined in UBBL Clause 196. Additionally, smoke detectors should be installed in strategic locations, such as living areas and near escape routes, to enable early detection and prompt evacuation. To further reduce fire risks, the external walls of the house must adhere to the fire separation distance requirements specified in UBBL Clause 218. This ensures that the house is sufficiently distanced from adjacent buildings, minimizing the risk of fire spreading between properties.

Emergency egress is a vital consideration in fire safety planning. All escape routes must comply with UBBL Clause 165, ensuring that no point within

3.0 CONCLUSION

3.1 Summary of Design Works

The design works for this reinforced concrete (RC) project were conducted in accordance with established engineering standards and codes of practice, such as BS EN 1992-1-1:2004 (Eurocode 2). The process included the structural analysis of elements such as beams, columns, slabs, and foundations to ensure compliance with ultimate limit state (ULS) and serviceability limit state (SLS) requirements.

The manual calculations were validated against software outputs, with percentage errors evaluated to identify potential discrepancies. Key factors such as load combinations, material properties (concrete and steel), and structural behavior under various conditions were considered. The final design aims to achieve structural stability, durability, and optimal performance while adhering to project specifications.

3.2 Consequences to Safety, Construction Practicality, Costing and Economical Aspects of Structure/Building/Project.

Safety:

The RC design ensures the structural integrity and safety of the building under applied loads, including dead, live, wind, and seismic forces. Proper reinforcement detailing prevents brittle failures, ensuring robustness during the building's service life.

Construction Practicality:

The design process incorporates considerations for ease of construction, including standardizing reinforcement bar sizes, simplifying structural elements, and ensuring compatibility with available construction techniques. This minimizes errors and delays during the construction phase.

Costing:

The optimized design reduces unnecessary material use, balancing cost-efficiency without compromising structural safety or quality. Manual and software comparisons