## **UNIVERSITI TEKNOLOGI MARA**

ECS358

## **CIVIL ENGINEERING DESIGN PROJECT**

## REINFORCED CONCRETE BUILDING DESIGN PROJECT

## PROJECT BASED LEARNING (CASE STUDY)

AHMAD AQHRAM BIN SHAIFUL KHARIDAN

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#### **1.1.INTRODUCTION**

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

In the construction industries, all parties involved will have to study and implement the varying requirements of the many Local Authorities. The Uniform Building-By-Law was first implemented in 1963 to avoid confusion and frustrations on having too many local by-laws regulations on buildings. The objectives of the existence of the Uniform Building-By-law is to set a standardized building Set a standardized building regulations for the whole of Malaysia and applicable to all Local Authorities and building professionals, to Clarify line of legal responsibilities for buildings with clear definitions on the Principal Submitting Persons, to regulate architectural, structural, health & safety, fire protection capabilities and constructional requirements of buildings; with clear references to the approved standards, to expedite the processing and building approvals and occupation of buildings.

There are exactly 9 main parts in the Uniform Building-By-Law. *PART I* explains the definitions and interpretations used in the by-laws. *PART II* consists of the procedures for submitting plans to the Local Authorities for their approval for permanent and temporary buildings, advertisements, and perimeter hoardings. *PART III* demands the required space [dimensions], light and ventilation to be provided in buildings which varies to the type of room and space. For example, a room that is used for educational purposes should allow more light coming in compared to a bedroom. Next, *PART IV* consists of the required temporary works during construction. For example, the cancellation of a temporary permit might take place during the construction period. After that, *PART V* involves Structural requirements and considerations. It basically stated all the structural requirements that needs to be fulfilled with specific reasons. Next, *PART VI* explains on the constructional requirement. For example, it emphasizes on the protection against soil erosion during and post construction. As for *PART VII* and *PART VII* explains about the fire protection requirements and finally *PART IX* consists of Miscellaneous definitions and references and, the procedures on reporting on building failures.

#### **3.CONCLUSION**

#### 3.1 Summary of design works

The design works are done on six different structures. Those structures are very essential to the construction of the building. The most critical part of the structure is taken from the design key-plan in order to design the structure with the most suitable dimensions and reinforcements. Therefore, the procedure of the key-plan is crucial in the process of constructing a building. In this case, the construction of a two-storey building is started with the proposal of the project schedule. The project schedule plays a major role on keeping the work process smooth and avoiding any unwanted casualties. The project schedule also helps on reducing the construction period of the building. After the project schedule is finished, the Structural key-plan of the building will take place to acknowledge and determine the positions of the structures in each floor.

The first structure is the slab with the largest area from the key-plan. A two-way restrained slab is analysed to determine the suitable and the most efficient type of reinforcement bars to be used. But first, the permanent load is determined by assuming the thickness of the slab. In this project, the thickness of the slab is 140 mm. The critical moment and the critical shear at midspan and support will also be determined by referring to the design appendix. It is crucial to determine the area or reinforcement bars because an area that is too small or too large can cause major failures on the structure. In this project, the type of reinforcements bar used for the slab structure is H8-300 which means the diameter of the bar used will be 8 mm.

The second structure that will be designed is the simply supported beam and the continuous beam. For simply supported beam, there is only one span of beam that will be analysed and design. The size estimated for the beam in this project is 450 mm in height and 200 mm in width. The design load of the beam will then be determined to obtain the moment and shear value. After that, the main reinforcements, and the shear reinforcements of the simply supported beam will be determined by referring to the design appendix. As for the continuous beam, there are exactly six spans of beams involved and the load analysis of the beam will involves the distribution table method in order to determine the value of moments and shears across the six spans of beams in discussion. This way, the type of reinforcement bars for both main reinforcements and shear reinforcements can be determined.

#### 3.2 Recommendations/reflections

The structural design process of a complete construction project should be divided into three phases. Those phases are planning, design, and construction.

The planning phase will consider a lot of factors that will play a huge influence on the layout and the dimensions of the structures. The decisions being made will be the outcome of the building. A proper planning will make the process a lot easier and a lot faster. There are any factors that can be taken into consideration to obtain the successful results. For instance, taking the aesthetics into account will attracts more people. Other than that, taking the environment factor into account can also benefit all parties.

Next is the design phase. The structural design details of every building structures are determined. This is important because the decisions being made should be able to maximize the investments poured into the project. The site conditions of the project should always be taken into consideration. Some of the parameters that need to be investigated is the bearing capacity of the soil, the maximum load capacity of the soil and the requirement of soil improvements if necessary. Other than that, the loads acting on the structures of the beam is also a crucial part of the process. The dead loads is the load due to the self-weight of structures, plastering or finishing, or brick wall loads. The live load however is loads that can be either static or dynamic in nature.

As for the construction phase, the structural design project will involve a lot of procurement of materials and equipment, labour movement, and the erection process of the structure. Both parties should look for the most efficient equipment and manpower so that the duration of the construction and the cost of the project can decrease.

Designing is fundamental to the introduction of technological innovations. This is to ensure the quality and the rationality of the project is set to a high standard. Shortening the execution period and the lowering the cost is definitely a huge issue in any construction project. The anticipation of issues will help to propose solutions and a more adequate execution towards the issues.