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**ECS 358
CIVIL ENGINEERING DESIGN PROJECT**

**REINFORCED CONCRETE BUILDING
DESIGN PROJECT
&
PROJECT BASED LEARNING
(CASE STUDY)**

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1.1.1. Requirements Of Building-By-Law, Fire Safety Regulations

According to By-Law 59, the slab floor must be design according to the load acting on the slab where maximum bending moment and deflection will occur. For this project, the design of the slab will be accordance to the maximum bending moment occurring at midspan and support of the slab panel to make sure that the slab does not fail by providing sufficient reinforcement.

According to By-Law 73, the foundation of the building must be designed to cater the combination of the dead load to the ground such that it will not cause any settlement or movement of the soil. For this project, the foundation will be designed by taking into account the soil bearing capacity so that the load that is transferred from the foundation to the soil will not cause any settlement of the soil.

According to By-Law 80, the structures above the foundation must have the capacity to transfer load to the foundation without each of those structures experiencing any deflection. For this project, the design of structures that is located above the foundation like slab, beam and column will be design so that sufficient number of reinforcements will be provided in order to prevent any of them from deflecting when transferring the load from above down to the foundation below.

According to By-Law 217, structural members of the building must comply with the minimum requirement of fire resistance as stated in the Nineth Schedule. For this project, the structural elements were design to comply with the fire resistance period requirement in order to ensure the safety of the occupant in case of a fire break out. The minimum period requirement for structural elements for a 2-storey building just like this project is 30 minutes. Therefore, to comply with the fire safety regulations, all of the structural members that have the potential of being exposed to fire will be design to withstand the heat of the fire up to 60 minutes to give more time for the occupants to escape the building safely in case fire occur in the building.

3.1. Summary Of Design Works

At the end of this project, the structural elements of the 2-storey bungalow were able to be designed and detailed while at the same time complying with the regulations required. The project schedule of the project was able to be completed using Microsoft Project showcasing every activity involved during the pre-construction, construction and post construction phase of the project. Structural key plans of the ground floor, first floor and roof floor were able to be drawn via AutoCAD by referring to the architectural drawings provided by the architects. From the structural key plans, the selected slab panel, simply supported beam, continuous beam, column, pad footing and staircase were managed to be designed and provided with sufficient reinforcement using manual calculations and software design, namely Prokon, according to the specifications and the loadings acting on the structural elements respectively. The output of both method of designing were then compared with one another to observe that the differences between the two. Not only that, the cost of constructing all of the selected structural members for the project were also managed to be determine using appropriate methods, which are Taking off and Bill Of Quantities. Using the taking of method, the dimensions as well as the quantity of the items required for the construction work of the structure were able to be determine while the Bill Of Quantities helps in calculating the total cost to purchase the items required. Not to mention, both case study which is to determine the soil bearing capacity of the footing as well as designing a flexible pavement were also able to be calculated and completed. Overall, the project has been completed with great success.