UNIVERSITI TEKNOLOGI MARA

ECS 358
CIVIL ENGINEERING DESIGN PROJECT

REINFORCED CONCRETE BUILDING DESIGN PROJECT

PROJECT BASED LEARNING
(CASE STUDY)

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ACKNOWLEDGEMENT

In the name of Allah S.W.T., the Most Gracious and Most Merciful. All the praises to Allah, the Lord of the worlds, and for those who keep their duty onto Him and here will be no hostility except against wrongdoers. Blessings upon the most honourable Prophet and Messenger, His family and His disciples, and those who believed them in goodness, and I offer my expression of gratitude to Allah, due to His favour and charity, so I have completed this Final Year Project for Civil Engineering Design Project (ECS358).

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Furthermore, I would like to give my special gratitude to my parents for the encouragement and invaluable assistance to complete this project during these hard times. Without their understanding, I might not be able to complete this project successfully throughout Open Distance Learning (ODL). Besides, I would also like to give appreciation to Mr. Sanadi Ramli from AHA Architect who gave his assistance by providing me with architectural drawing in conjunction of the syllabus needed. All the helps from AHA Architect are appreciated for trusting me to use one of their work to complete my project.

Finally, a special thanks to my friends by giving continuous guidance directly and indirectly throughout making of this project. All the moral supports that I have received are highly appreciated. I apologize for all other unnamed who helped me to finish this project and I hope this Final Year Project can help me gain more knowledge about Civil Engineering Design Project.

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1.1 INTRODUCTION

Civil Engineering Design Project (ECS358) is one of the subjects that taken in Semester Five (5) as a fulfilment to complete Diploma in Civil Engineering in UiTM. As for this project, students are required to complete Final Year Project that consists of a structural design using manual calculations as well as by using software. Software that have been assigned for students is PROKON and spreadsheet for design the staircase.

Students are required to design structural key plan from architectural drawing of two-storey house for Ground Floor Plan, First Floor Plan and Roof Floor Plan. Based on the structural key plan, students need to complete manual calculation for structural elements such as slab, simply supported beam, continuous beam, column, pad footing and staircase. The manual calculation is based on the Eurocode 2 as a reference for design procedures. In this step, the reinforcement is designed to construct each of the structural elements and proper detailing is produced by using AutoCAD.

As for this project, selected slab is GS1 as it is a critical slab that has highest load acting on it. Secondly, the chosen simply supported beam is A3 / 1 – 2 while for continuous beam is 2 / A – E. As for the column design, the chosen column is located at gridline 1 / A at Ground Floor – First Floor and designed pad footing is located below the selected column. Lastly, based on the architectural drawing, the type of the staircase is supported by landing.

Besides, PROKON is a software that uses a workflow that output data between analysis, designing and detailing modules. Based on the manual calculation, output from PROKON are compared and justification is made between the two values if there are differences between manual calculations and output from PROKON. The purpose of comparison is to ensure the accuracy of the data calculated.

Lastly, students are required to complete taking off process include producing Bill of Quantities Form. Material calculated consists of concrete, reinforcement formwork and excavation needed. Then, the quantities are multiplied with unit rate based on the current price list for construction material. The purpose of this method is to enhance student's skills to calculate the material required and know the quantity and price of the material to construct the building.

3.0 CONCLUSION

As a conclusion, the projects had been completed successfully. The objective to enhance the student's skills in structural design has been determined. As for this project, students are required to design a structural member in double storey house which is restrained slabs, simply supported beam, continuous beam, column, pad footing and staircase. Manual calculation had taught students about the details of the design which it is important to refer to the EN 1992: Eurocode 2 – Design of Concrete Structure, BS648 – 1964 and BS6399 – 1 1996 as a standard preference during conducting the design phase.

3.1 SUMMARY OF DESIGN WORKS

Based on the slab design analysis, the slab is designed with reinforcement H10-300 at both directions. As for beam, the type of beam is flange beam and reinforcement designed to be 5H12 for simply supported beam (A3 / 1 – 2) and 3H12 midspan and 2H12 at support for continuous beam (2 / A – E). Next, column is designed with 4H12 of reinforcement and for pad footing, the designed reinforcement is H12-262 at both directions. Lastly, staircase that supported by landing is designed for landing and flight.

According to the software used which is PROKON and spreadsheet for staircase, there would be some differences and some output from the software has turn to fails as compared to the manual calculations. From that, summary of justification has been made to compare the output collected from software and manual calculations.

Last but not least, the project also determined the cost estimation for quantity of the materials needed to construct the structural elements of the house. Based on the taking off and bill of quantities, amount needed for slab GS1 is RM692.65, RM200.91 for simply supported beam (A3 / 1 – 2), RM661.99 for continuous beam (2 / A – E), RM184.10 for column and Rm481.95 for pad footing.

3.2 RECOMMENDATIONS / REFLECTIONS

As for this project, it delivered the good input to enhance the skills in structural design. The method of teaching and guidance by lecturers and the weekly supervised progress has helped a good time management for students to complete this project according to the due date. It also exposed students to the real design phase of the house construction for both manual calculation and by using software. This project has taught new soft skills which is the skills to use software for structural design such as PROKON and Spreadsheet. It is suggested to use software for large project to reduce the time consuming for the project.