An Analysis of Improvements to Building Regulations for Dwellings since the 1990's.

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Aim of the Project

The purpose of this project is the analysis of improvements to building regulations for dwellings since the 1990's. The focus of this project is on the differences between Irish building regulations throughout the years in terms of the energy efficiency of dwellings. This includes research on the specifics of the requirements in the building regulations and the improvements of technology that allows for stricter regulations throughout the years.

Background

This project focuses on the improvements on building regulations throughout the years. The dwelling used for the primary case study was built in the year 2000 which requires the 1997 Building Regulations Part L to be researched. With the 1997 Regulations the latest regulations must also be researched which are the 2022 Building Regulations Part L. A comparison between the requirements set out in the regulations is important to complete in order to have information for completing a DEAP analysis on the dwelling. The method for completing research on this topic was using the official government documents which are a reliable source and there is no better source on the contents of the regulations than the regulations themselves.

To complete a DEAP analysis there is an importance to research the technological improvements that allow for the strict requirements that the 2022 regulations display. Multiple journals were used which described many different types of technologies that are used for improving the energy efficiency of dwellings. This includes improvements to building facades, HVAC systems and renewable energy integration. The most important improvement to research was renewable energy integration because it is considered mandatory in the newest building regulations.

Revit Modelling

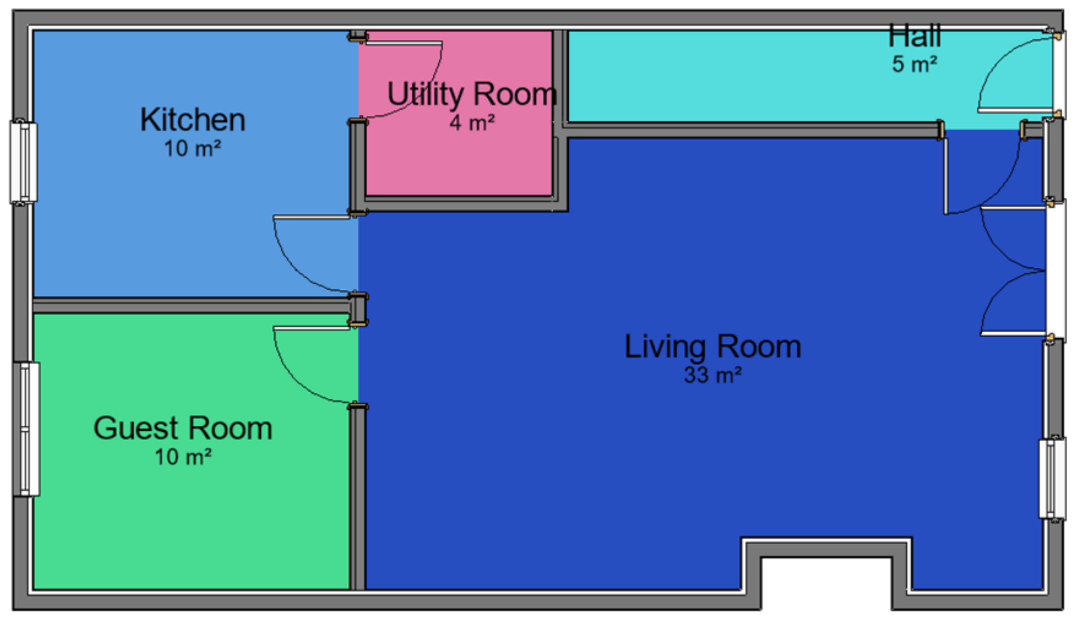

Figure 1: Dwelling Layout

For the purpose of modelling the dwelling used in this project the house had to be measured. The measurements required included the lengths of the inner walls which would allow for an accurate layout of the building in Revit. The measuring tool used for measuring the walls was a tape measure which meant there would be a degree of human error. To counteract this occasional rounding was done when designing the layout to ensure that the ground floor of the dwelling matched the size of the first floor. When inputting values into the DEAP analysis the values and measurements from the Revit model were used to maintain consistency. The dwelling was then modelled in Revit to produce layouts of the two floors in the building along with a 3D model.

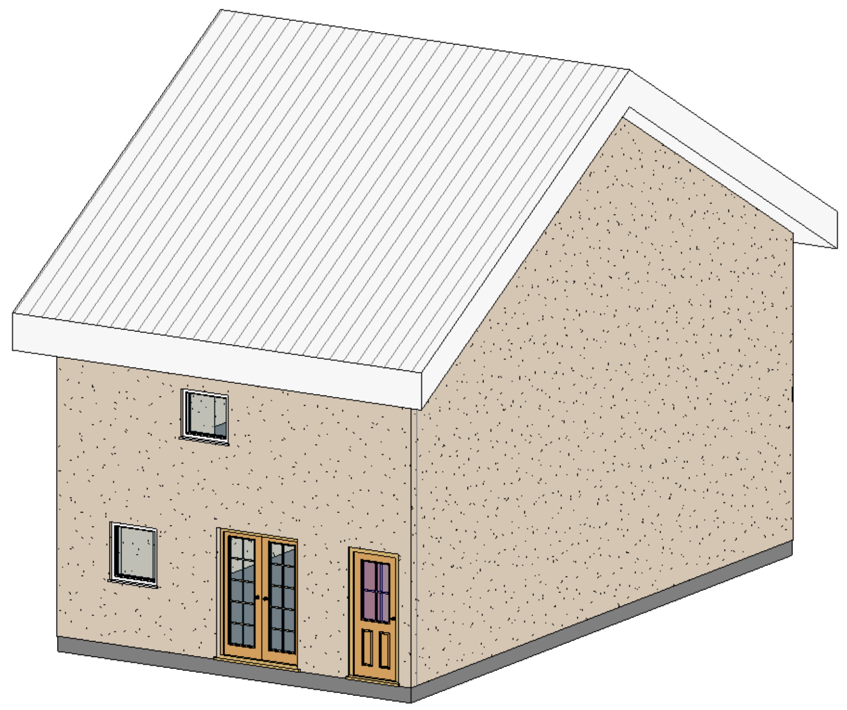

Figure 2: 3D Model

DEAP Analysis

A DEAP analysis is important for checking compliance and energy efficiency of the dwelling. Firstly, a DEAP analysis will be completed on the primary case study. To do this I will use Revit values for calculating areas of spaces and zones to input information into DEAP. The majority of the information inputted into DEAP will be completed by doing visual inspections around the dwelling such as the number of vents, type of heating system etc

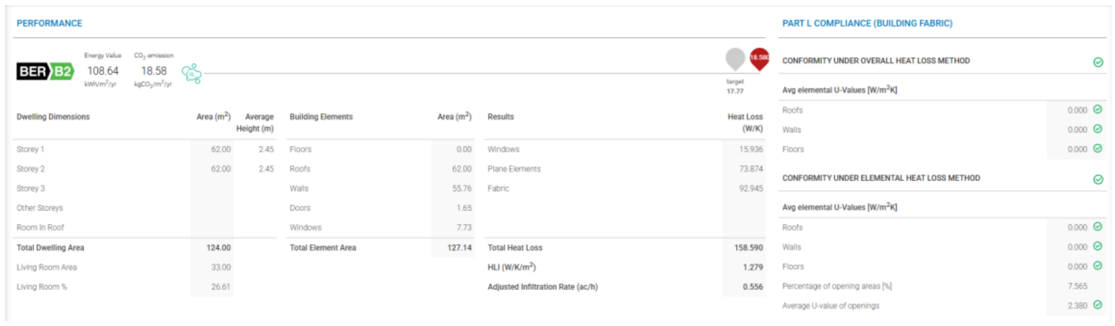

Figure 3: Initial DEAP Analysis

A second DEAP Analysis was completed with the purpose of designing the house if it was built in accordance with the latest building regulations. To complete this analysis values such as the layout of the house and the areas of the rooms were kept the same. Components such as the heating systems, ventilation system, structure and U-values were changed to comply with latest standards. Using the research in the literature review the technologies that are most likely to have the most positive impact on energy efficiency are selected for use in the second DEAP analysis. Both the results were then compared with outside case studies.

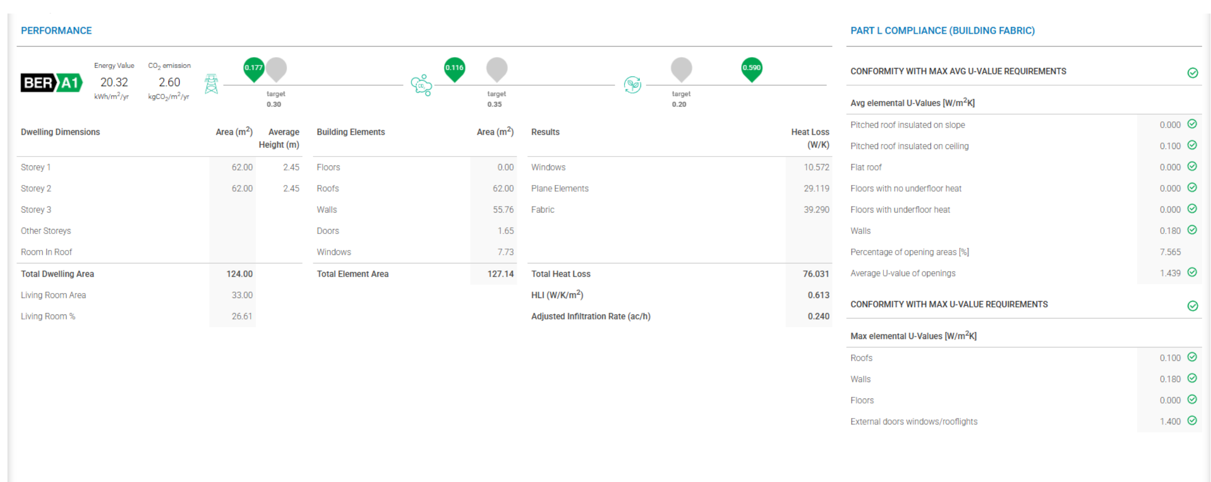

Figure 4: Final DEAP Analysis

Conclusion

Results

	Delivered energy [kWh/y]	Primary energy [kWh/y]	CO_2 emissions [$kgCO_2$/y]
Main space heating system	282	493	63
Secondary space heating system	0	0	0
Main water heating system	678	1187	152
Supplementary water heating system	0	0	0
Cooling	0	0	0
Pumps and fans	1052	1840	236
Energy for lighting	328	575	74
CHP input (individual heating systems only)	0	0	0
CHP electric output (individual heating systems only)	0	0	0
Renewable and energy saving technologies			
Energy produced and saved	900	1575	202
Energy consumed by the technology	0	0	0
Total	1440	2520	323
Per m² floor area	11.61	20.32	2.60
Energy Rating	A1		

Figure 5: Final Energy Results

In conclusion the objectives of the dissertation were achieved however there was room for improvement in the methodology. From the results of this dissertation the best technological improvement for energy efficient housing is PVs however there are other unexplored technologies that were not able to be tested in this dissertation such a BIPVs which were predicted to have positive results. Overall the research done in the literature review had a positive impact on the results of the final DEAP analysis.

References

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