Improving Accuracy of Heat Loss Calculations in Ireland - The Development of Analyses that Facilitate Thermal Upgrade through Adjustment Factors

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As we reach zero carbon standards for newly constructed domestic buildings from 2016, Ireland must prepare to reach its 20-20 targets by 2020. Earlier research by the authors has identified a large percentage of residential dwellings pre-date building regulations which has resulted in poor energy and thermal performance, thus high levels of carbon emissions through elevated energy usage. It is very clear that low carbon retrofit will bear a vast role in achieving carbon emission targets set in legislation. In preparation for retrofit, upgrade works to these existing buildings should commence. This research is a detailed study on the performance of external walls in Dublin, Ireland. It is aimed at providing a framework solution which will enable designers to determine the appropriate thermal upgrade system for a dwelling in Dublin taking into account wall type, climatic conditions and orientation. It details the current policy drivers towards thermal upgrade within the residential housing market, dwelling figures, analyses and determines the commonalties between them and illustrates this in an academic manner. It also highlights current design standards as applied to external wall design to comply with national buildings regulations, identifying critical factors not included as part of the calculation methodologies within these design standards. The methodology used in the research to date is very much a quantitative design. There has been a plethora of data collection and analysis through past and present research by others, along with policy design standards, recorded climate data, dwelling figures, common external wall constructions, standard design calculation methodologies and non-standard yet required design calculation methodologies. To date the main findings have been the determination of highest residential dwelling figures within Leinster which refined the study to Dublin, Ireland. Following this, the most prevalent residential dwelling design and construction type within Dublin was identified and modelled in 3D format, and presented for future use within the research. Climate conditions over an extended period have been acquired, charted and interpreted. The report has identified critical climatic and material factors which are not present in calculation methodologies within current design standards and presents charted results of the influence of each. This research is intended to progress to the next phase which will address climatic factors, including moisture transfer hygrothermal response. It is also intended carry out 3 No. case studies of identified typical residential dwelling types to verify theoretical calculations versus documented performance values. The final results will be evaluated, interpreted and documented, resulting in a thermal upgrade framework design tool.

Key Words: Climate, Emissions, Framework, Hygrothermal, Thermal