



## Double Skin Building Envelopes Building Energy Performance and Architecture

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### Introduction

The energy issue is without doubt one of the greatest problems with which our society is confronted with. The proportion of worldwide energy consumption which is **directly** attributable to buildings is approximately 50%. If one takes into account the proportion in the remaining 50% (transport and industry sectors) which are **indirectly** attributable to buildings then the impact of buildings on energy consumption worldwide is far greater than 50%. Solutions to this problem will only partly be found in the discovery and development of new energy sources and the optimisation of mechanical and electrical systems in buildings. While both approaches are valid and necessary, of far greater importance is the need to reduce specific energy **consumption**. It would be naïve to consider that this reduction be accompanied by a lowering of the standard of living in the developed world. It would be equally naïve to imagine that the developing world will not aspire to achieving an standard of living equivalent to that in the developed world.

Energy efficient architecture needs to be conceived as a triad comprising minimal energy consumption, optimal indoor climate and architectural quality. In new-build developments the form and construction of our buildings need to be so optimised in design so as to provide optimal thermal comfort and optimal air quality with a minimum of energy input. The remaining energy demand should be satisfied by the exploitation of renewable energy sources located in the immediate environment of the building. Existing buildings need to be renovated and adapted to meet state-of-the-art technical standards of energy efficiency. In urban design, strategies need to be developed to reduce energy consumption of both buildings and transport. We need to be careful when reducing the energy consumption of buildings, not to repeat the mistakes made in the past related to poor indoor air quality.

"Sick Building Syndrom" is no longer a phenomenon known only to medical and technical experts. Although this problem is known since the 70's health problems and complaints attributable to poor indoor climate conditions are unfortunately still prevalent. We spend more and more time indoors. The air quality in our buildings therefore must be of the highest quality. The economic importance of the relationship between thermal comfort and productivity is also being increasingly recognized. In the economic framework of today's corporate companies energy costs pale into insignificance when compared to staff costs.



It is demonstrable that improved internal environmental conditions in the working environment lead to improved productivity which under present conditions is of far greater economic importance for most firms than significant reductions in energy costs.

My talk will provide a brief overview of the ongoing research being carried out at the Institute for Buildings and Energy at Graz University of Technology to find solutions to the problems and issues outlined above and describes in more detail the results of a recent research project carried out into the use of high performance double skin building envelopes and their impact on the HVAC systems and the energy efficiency of buildings. In the closing section of my talk a brief insight into current research activities at the institute will be given.