CFD investigation of Atrium & Loft Space

In order to gain further insight into the movement of air through the Dynamic Thermal Analysis alone would not give a sufficiently accurate picture. For this reason computational fluid dynamics (CFD) was used to focus on the internal conditions which would best provide stack effect natural ventilation. The main body of the research centred on the partitioning of the loft room from the stair well and degree of window openings to create sufficient airflow.

The greatest temperatures in the house would undoubtedly be generated by passive solar gain in the highly glazed and un-shaded loft space. The use of this 'hot room' was felt to be critical to induce a stack effect through the atrium. The initial plans showed a partition separating the loft space from the stairwell and the CFD study focused on the effect of several different configurations of partition and roof window openings.

The results are shown as a series of images, which are discussed in the results section of this report.

A Working Definition of Computational Fluid Dynamics

- *Computational - having to do with mathematics, computing*
- *Fluid Dynamics - the dynamics of things that flow*

This is CFD - a computational technology that enables you to study the dynamics of things that flow. Using CFD, you can build a computational model that represents a system or device that you want to study. Then you apply the fluid flow physics and chemistry to this virtual prototype, and the software will output a prediction of the fluid dynamics and related physical phenomena. Therefore, CFD is a sophisticated computationally-based design and analysis technique. CFD software gives you the power to simulate flows of gases and liquids, heat and mass transfer, moving bodies, multiphase physics, chemical reaction, fluid-structure interaction and acoustics through computer modeling. Using CFD software, you can build a 'virtual prototype' of the system or device that you wish to analyze and then apply real-world physics and chemistry to the model, and the software will provide you with images and data, which predict the performance of that design. [1]

[1] Fluent promotional literature – Fluent is the definitive CFD Modelling software