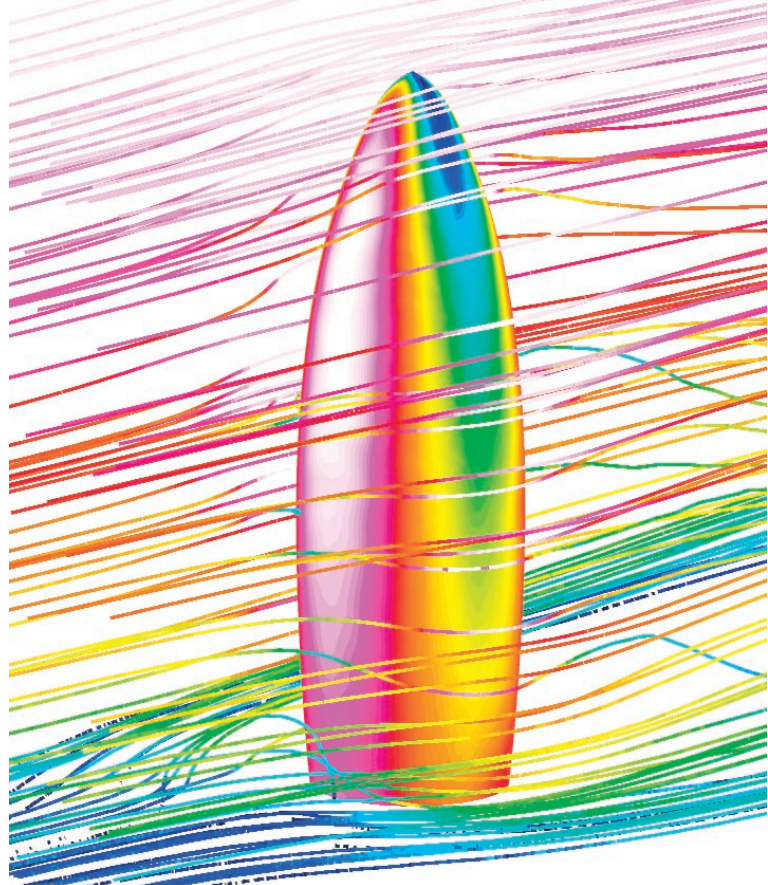


Swiss Re Headquarters Inside & Out

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For a given set of wind conditions (illustrated by pathlines) FLUENT predicts surface pressures (illustrated by contours) on the building exterior and external aerodynamic air flow characteristics



London is home to a striking new building – 30 St. Mary Axe – the UK headquarters of Swiss Re, the international reinsurance company. Designed by Foster and Partners, the building reflects the company's commitment to environmental sustainability. As part of the construction project, Hilson Moran Partnership Ltd., a consulting firm based in England, was contracted to supply mechanical and electrical engineering design services for the building.

The structure has a circular footprint, and each of the 33 circular stories of office space varies in depth from façade to core by 6m to 15m. The ground floor comprises an entrance lobby with three banks of elevators and a separate retail space. The top of the building has private dining rooms, a restaurant, and a multifunction area. Each floor plate has 6 triangular shaped light wells (atria) placed symmetrically around the perimeter of the façade, which rotate by 5 degrees every floor, giving the building a helical look when viewed from the outside.

Hilson Moran started on the design of the mechanical and electrical engineering services for the building in 1997. Planning consent was obtained in 2000 and construction on site started in 2001. The project is due for completion and occupation by Swiss Re in the first quarter of 2004.

CFD was used in conjunction with Dynamic Thermal Modelling (DTM) initially to calculate the thermal performance of the building. The results were used as a basis to undertake further studies and a more detailed analysis of other aspects of the design, including the ventilated façade, the light wells, natural ventilation of the offices, entrance hall, and top of the building dome. CFD has also been used to measure the external conditions prevailing at the top of the building and interpolate these results over the rest of the building to assess natural ventilation potential.

Based on a number of early CFD results, a team decision was made to adopt a "mixed mode" ventilation design, which is not common for a high rise building of this type. Natural ventilation may be used for up to 40% of the year, and when conditions become unacceptable, the building will be sealed to the outside and go into either a cooling or heating mode of operation. The goal with this approach is to maximize the period of natural ventilation, and thereby minimize energy use and carbon emissions.

The natural ventilation is provided by perimeter window openings in each light well, which serve as the lungs of the buildings, breathing when

required. Fresh outside air reaches the office occupants without strong breezes through balcony openings to the light wells. An active façade with solar control blinds was adopted for the office areas and high performance solar glass in the light well areas. CFD was used to examine design issues such as optimum ventilation rates, position of the blinds, and entry and exit points for the ventilation air.

CFD was also used to examine the air flow on the office floors, and ventilation schemes for the lobby, taking into account the high ceilings, the heat generated by various lighting schemes, and drafts from the large revolving doors. The top of the building, with its large glass dome surrounding a restaurant and multifunction mezzanine level, produced a number of design challenges as well. Hilson Moran was involved in several key strategy design decisions for this region, ranging from the type of glass used to the ventilation strategy. In the final design, the ventilation is provided by a displacement system coupled with a chilled floor. CFD analysis was used to examine the thermal performance of the dome in both peak summer and winter periods, and the comfort of the diners and visitors in these areas was evaluated. ■

