Case Study of Load Sharing in Double Skin Façade Glazing System

John Kilpatrick[1], Samantha Fowler, Sudeesh Kala

The only codified guidelines for the design of DSF systems exist in the Eurocode EN-1991-1-4:2005 Section 7.2.10. However, where air between the outside and inside skin can "see" more than one face of the building, the guidance in the Eurocode is not applicable. Unfortunately, this is the case for most novel DSF systems, and other means of determining design wind loads are necessary. Kilpatrick et al. (2009) presented the results of parametric studies of load sharing between the external and internal skins of a DSF system for various parametric interior cavity/volume configurations using 1:300 scale CAARC model studies. To evaluate the load sharing between skins, the authors compared the Load Ratio. The Load Ratio is the ratio of the peak differential pressure acting on the outer skin to the peak net pressure on a single skin (conventional) façade. It was evident that the edge zones of the outer skin of the CAARC model that a DSF configuration having no flow obstructions between windward and side faces may be subjected to differential loads almost double that of a conventional façade. The CAARC studies also indicated that loads in the central zone of the windward outer skin may be up to 15%-20% higher. Due to the small scale of the CAARC model studies and potential Reynolds number scaling issues, there was some uncertainty in the final predicted Load Ratios.

The results of the parametric studies on load sharing have been re-visited using a 1:75 scale sectional model of an actual double skin façade system. The outer skin of the façade system sits approximately 600mm from the inner skin, and the design permits flow to move freely between windward and side faces of the model. Surface pressures were simultaneously measured on the external and internal façade's, permitting the calculation of differential pressures on the outer skin, allowing comparison of the Load Ratio. Initial results of the studies confirm the results of the parametric CAARC model studies, with differential pressures at the edge zone of the outer skin varying between 1.4 and 1.8 times the peak external pressures on the skin. This result is broadly consistent with the findings of other researchers, and indicates the need for guidance, as DSF systems are becoming more prevalent.

[1] Corresponding author. John.Kilpatrick@rwdi.com RWDI Anemos Limited, Unit 4 Lawrence Way, Dunstable, Bedfordshire, UK LU6 1BD.