

## **Benchmark studies in the new Nottingham ABL wind tunnel: wind regime**

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### **Abstract**

The University of Nottingham has recently built a new atmospheric boundary layer (ABL) wind tunnel. The tunnel has an open return section with a "blow down" configuration. It has a fetch of 12 m and a working section of 2.4 m by 1.8 m. The tunnel has been designed to have an operating speed of 0 - 15 m/s.

Having designed and built the tunnel, a series of tests have been carried out in order to demonstrate the flow regime is suitable for experimental studies and that an appropriate scaled atmospheric boundary layer can be simulated. First, the flow field in the working section was carefully mapped using a hot wire probe to measure the vertical and horizontal wind speed profiles without any boundary layer generation. Then spires, a fence and roughness elements were introduced to generate a boundary layer with a full scale depth of 400m and a power law coefficient of 0.28. The velocity and turbulence profiles were then re-measured in the working section.

The results show a good agreement between the design profile and the simulated profile in the wind tunnel. The flow regime in the working section is shown to be appropriate for the tunnel to be used for investigations into the flow around building structures and for predicting wind loads on structures.

A final series of experiments were then performed using a scale model of the CAARC building on a high frequency base balance. Predictions of wind loads on this model structure agree well with those in the literature.