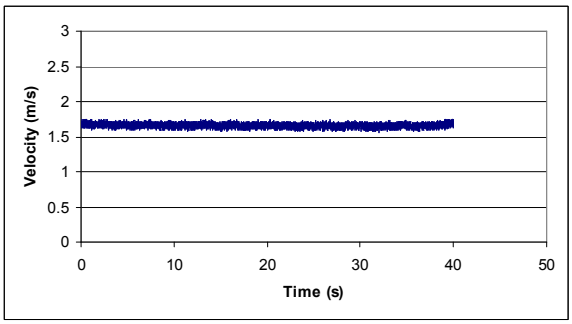
Turbulence in Air Flow from Fans

Fans of various types are used to provide cooling by moving air. While the velocity and volume of air moved are important characteristics of these fans the turbulence of the air flow will also affect the ability of the air stream to penetrate into the room and the level of perceived comfort. Highly turbulent flows are likely to be perceived as buffeting while flows with low turbulence are likely to be perceived as smooth and even.

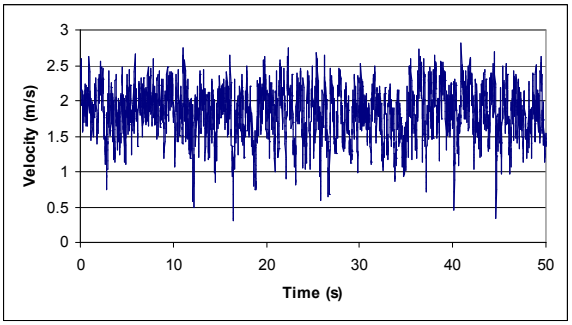
By using a rapid response hot wire probe (Kurz 490) and computer based data acquisition system we are able to gather information on the turbulence of air flows. Figure 1 compares the response of this system to the air flow in a wind tunnel where the air flow is smooth and laminar to that observed in front of a pedestal fan.

Figure 1 Velocity Variations as the Result of Turbulence

Wind Tunnel



Pedestal Fan



The magnitude of the turbulence can be quantified by a parameter known as the turbulent intensity - the standard deviation of the velocity divided by its mean. Measurements on two pedestal fans shown in Figure 2 indicate that the air stream from Fan 2 (a 'bladeless' pedestal fan) is significantly less turbulent than that from Fan 1 (a conventional pedestal fan).

Figure 2 Turbulent Intensity Measurements