

HEAT AND MOISTURE TRANSMISSION MEASUREMENTS WITH A SWEATING CYLINDER

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The thermophysiological properties of clothing materials are estimated with a sweating cylinder, which simulates the heat and moisture production of the human body. As the cylinder can be placed in different environments, according to the wear situation of the clothing, the effects of environmental parameters (temperature, wind, etc.) on the physical properties of the clothing materials can be studied.

The cylinder surface is electrically heated to a predetermined value (+35 °C). A controlled amount of water is supplied to the cylinder surface, where it evaporates and leaves the cylinder as water vapour. The heat input, temperatures at different points, and changes in weights are recorded during the test, and thermal resistance and water vapour transmission values are calculated.

Due to the water vapour resistance of the clothing materials and to the temperature gradient from the cylinder surface to the environment, the water vapour partly condensates within the materials and is only partly transmitted to the environment. Particularly in cold environments this becomes a problem, as the evaporative heat loss no more is efficient and the thermal resistance decreases with the wettedness of the clothing. Materials, which are permeable to water vapour in a warm environment, might not be so when the temperature drops below 0 °C.

The sweating cylinder has been developed within the Nordic Connelia project. For testing of thermophysiological properties of footwear, a sectional sweating foot with the same principle as the cylinder has been constructed.