LUND UNIVERSITY

Can a vest provide 83 clo?– serial calculation method revisited

Holmér, Ingvar; Gao, Chuansi; Wang, Faming

[Link to publication](#)

3 Can a vest provide 83 clo?– serial calculation method revisited

Ingvar Holmér, Chuansi Gao, Faming Wang
Thermal Environment Laboratory
Ergonomics/Design Sciences
Faculty of Engineering
Lund University, Lund, Sweden

In both EN 342 and ISO 15831 two methods are presented for calculation of the thermal insulation of an ensemble measured with a thermal manikin. One is the serial method (S) that calculates insulation based a summation of area weighted segment insulation values. The other is the parallel method (P) that determines insulation on the basis of the sum of the area weighted heat exchange values and the temperature gradient.

In a recent study of an electrically heated vest we applied the test procedure according to ISO 15831. The vest is composed of a thin textile layer with four heating elements in pockets – two in front and two on the back. It is powered by two batteries providing 7.4 V. The total weight of the vest including batteries is 0.75 kg. The vest was worn on top of a polyester overall. On top of the vest an insulating vest was worn. Manikin was kept in a climatic chamber at 16 °C.

With heating off the ensemble provides 1.18 (P) and 1,79 clo (S), respectively for the two methods (difference 51 %). When heating is switched on the values become 1.28 and 83 clo, respectively. The difference is more than 6000 %. Obviously, the parallel method gives quite accurate and realistic values with an increase by 0.1 clo (for the whole manikin). With heat on the zones of the torso of the manikin gives low heat exchange and very high local insulation values. By its definition, the serial method adds up these local values and results in unrealistic values.

In conclusion it is obvious that the serial method does not work with extremely heterogeneous clothing ensembles. It is obvious, as well that this calculation method is not scientifically sound and should be excluded from use.