



Standard Practice for Determining the Temperature Ratings for Cold Weather Protective Clothing¹

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INTRODUCTION

Manufacturers of cold weather protective clothing want consumers to be thermally comfortable when wearing their products. Therefore, they want to indicate the amount of warmth (that is, insulation) their products will provide to consumers at the point of sale. This is often expressed as a temperature rating on product labels and in product descriptions in catalogs. A temperature rating is commonly understood to mean the lowest air temperature at which the average adult person will have an acceptable level of thermal comfort when wearing the product. Although it is not always stated on labels or in catalogs, manufacturers are assuming that consumers will wear the appropriate amount of clothing with the cold weather garments.

Heated manikins are used to measure the thermal resistance (insulation) and evaporative resistance of clothing ensembles in accordance with Test Methods **F1291** and **F2370**, respectively. The thermal insulation value of a cold weather protective ensemble are used in heat loss models to estimate the thermal comfort of people in cold environments. This approach has already been used for sleeping bags (see EN 13537).

1. Scope

1.1 This standard practice covers the determination of the temperature rating of cold weather protective clothing ensembles. It involves measuring the thermal resistance (insulation) value of a clothing ensemble with a heated manikin in accordance with Test Method **F1291** and using a heat loss model to predict the lowest environmental temperature for comfort.

1.2 The predictive model used in this standard estimates the evaporative heat loss from a person wearing cold weather clothing as opposed to measuring the evaporative resistance on a sweating manikin. If a person is active and gets overheated in a cold environment, he/she is usually able to adjust the garments in order to dissipate excess heat.

1.3 The temperature ratings estimated by this standard practice are guidelines for thermal comfort that are designed to protect people from hypothermia when wearing cold weather protective garments. However, localized cooling, discomfort, and even frostbite could still occur at extremely low tempera-

tures because clothing insulation is not evenly distributed over the body surface. In addition, some body parts (for example, ears, fingers, toes) have a high surface area relative to their mass, and consequently lose heat at a faster rate than other parts of the body.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

F1291 Test Method for Measuring the Thermal Insulation of Clothing Using a Heated Manikin

F2370 Test Method for Measuring the Evaporative Resistance of Clothing Using a Sweating Manikin

2.2 Other Standards:

EN 13537 Requirements for Sleeping Bags³

¹ This practice is under the jurisdiction of ASTM Committee **F23** on Personal Protective Clothing and Equipment and is the direct responsibility of Subcommittee **F23.60** on Human Factors.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.