Updated 4/2024

**Instructions for Sleeping Bag Manikin Tests at KSU**

The manikin test measures the insulation (clo) value of a sleeping bag or sleeping bag system (i.e., bag, clothing, pad, etc.) according to ASTM F 1720 or ISO 23537 (which replaces EN 13537). We put the insulation value into a body heat loss model to predict the temperature rating for comfort. These methods are designed for adults. However, we now have a **child manikin**, and we have developed models for predicting the temperature ratings for children’s sleeping bags for children of different ages. (See other instructions and submission form.)

Every time you send a set of products for testing, please email the **KSU Submission Form for Bags** file to [merediths@ksu.edu](mailto:merediths@ksu.edu). Please send the file in Word format – not PDF. Once you fill out the form, the only thing that should change is the product list. Only one form is needed for a set of bags; we will prepare one report and invoice. ***If you require a separate report and invoice for each test, then prepare separate submission forms.***

**1. Company Information.** Please enter your contact information on the form.

**2. Purchase Order, Invoice, and Payment.** Please enter your purchase order number on the form (if you have one) or indicate that a PO will be sent. We will put the PO number on the invoice that is sent to you. Companies may pay by check, wire transfer, or credit card. Instructions are given on the invoice. If you want the invoice sent to someone other than the company contact, please indicate this on the form.

**3. Test Protocol.**

A. ASTM F 1720 – Option #1: Bag Alone. Nude manikin is placed in the bag on a thin cot for testing; 5 cm opening at face (or full closure for the military).

B. ASTM F 1720 – Option #2: Bag System. Bag is tested with auxiliary products. This method is often selected as the basis for predicting temperature ratings. The manikin is tested with clothing, pad, pillow, bivy sack, etc. as indicated by the sponsor or military specification. If you choose Option #2, please list the items in the sleeping bag system on the form and provide dressing details for the manikin. ***Indicate if you will provide them or if IER should use its auxiliary products – a 1.5 inch self-inflating pad, thermal underwear, and socks.***

C. ISO 23537. For mummy bags, the manikin is dressed in thermal underwear, socks, and a face mask and is placed in the bag on a 1.5 inch pad on a suspended board. For rectangular bags without a hood, the facemask is removed and the head is exposed. IER has the auxiliary products called for in the standard, and is certified to conduct the test. We tested the new set of calibration bags for certification in 2019. The prediction models for temperature in the standard are for adult bags only. Note: To provide more heat flux for measurements this test is routinely performed at an ambient temperature below 5°C, which is lower than the temperature specified in ISO 23537.

**Replications.** We have changed our policy and will now offer all types of replications for the same price. Selection A – 3 reps in a row on one sample – is the fastest method. Manikin system variability is reflected in this protocol. Selection B – 3 independent reps on one sample – also reflects variability in dressing the manikin. Selection C – 3 independent reps on 3 identical bag samples – also reflects sample variability.

**Thermal imaging.** A FLIR E5-XT infrared camera will be used.Thermal imaging is only available as an add-on service to manikin testing. Images are considered supplemental information. Due to issues with emissivity and reflectivity of different surfaces, associated temperature scales will not be provided. Color scales of different photos/samples may not match.

**Local insulation values.** Indicate whether you would like to have the local insulation values reported for the manikin’s 13 body segments in addition to the overall insulation value for the body.

**Bag weight.** We will provide this information upon request.

**4. Bag samples – sizing, labeling, and sending samples.** Label each bag with a letter or number code using a permanent felt-tip marker on a piece of masking tape or sticky label. Place the tape label on the draw cord at the neck or on the bottom of the footbox. Please list the bag descriptions on the form. This information will be copied and put in the report. Example: Bag 1. Pinnacle, Style 2568, Fill: 28 oz. of 800 fill power down.

**Bag size and manikin measurements.**  Send bags that are all the same size – preferably “regular” size. Larger size bags may produce a slightly higher insulation value due to the entrapment of more still air around the motionless manikin. Shorter styles for women may need to be sized-up to fit the manikin. The manikin’s measurements are given in the following table.

**Simon's Circumference and Length Body Measurements**

|  |  |  |
| --- | --- | --- |
| **Measurement Location** | **Amount** | |
|  | **cm** | **in** |
| Chest circumference at fullest part | 91.4 | 36 |
| Waist circumference | 73.7 | 29 |
| Full hip circumference | 91.4 | 36 |
| Circumference of torso and arms at shoulders (51 in. from feet) | 122.6 | 48.25 |
| Circumference of torso and arms at elbow level (40 in. from feet) | 122.6 | 48.25 |
| Circumference of torso and arms at hand level (30 in. from feet) | 123.2 | 48.5 |
| Width at knees (19 in. from feet) | 30.5 | 12 |
| Width at feet | 29.2 | 11.5 |
| Height | 176.0 | 69.3 |

**Send the bags to:**

Meredith Schlabach  
Institute for Environmental Research   
Kansas State University   
0056 Seaton Hall

Manhattan, KS 66506

Office Phone: 785-532-2284

email: [merediths@ksu.edu](mailto:merediths@ksu.edu)

*If you are sending products from a country other than the United States, please make sure that you pay all customs duties and brokerage fees associated with the shipment.*

**Timing.** We test bags in the order they are received at KSU. During holiday times and campus vacation breaks, our lab closes down.

**Test report.** A test report will be prepared and saved as an electronic PDF file with the company’s name and technical report number as the file name (example: LLBean17-145 bag report).

**5. Return of bags.** Please provide us with your company’s preferred shipping company and account number for return shipping (e.g., Federal Express, UPS, DHL) on the form. If you want overnight shipping, please indicate this on the form. If you want us to donate the bags to a charitable organization like the Boy Scouts or Girl Scouts, let us know. They really appreciate it.

**6. Export Controls Compliance.** Please indicate if you are contracting, working, or acting for or on behalf of a national government. Include information about the agency or the branch of a national government that you are associated with.