Instructions for Manikin Tests on Clothing at KSU

Every time you send a set of products for testing, email the **KSU Submission Form for Clothing** file to meredithsksu.edu. Send the file in Word format – not PDF. Only one form is needed for a set of garments; we will prepare one report and invoice. *If you require a separate report and invoice for each test, then prepare separate submission forms for each sample.*

Section 1. Company Information. Enter your company information and contact information on the form.

Section 2. Purchase Order, Invoice, and Payment. If you provide a purchase order number, we will put the PO number on the invoice. 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, indicate this on the form. Invoices are normally sent after the report has been issued.

Section 3. Test protocol and price. Please indicate the type of tests that you want on the submission form. *Note: We have a different submission form for cold weather clothing.*

The insulation value of a clothing system can be measured on an adult thermal manikin according to ASTM F 1291. This is an ISO 17025 accredited test at our laboratory.

There is no manikin standard for measuring the insulation value of children's clothing. We follow the same basic principles in ASTM F1291, modified for a child-size manikin (boy's size 8).

The evaporative resistance of a clothing system can be measured on an adult thermal manikin according to ASTM F 2370. This test is not available on our child-size manikin.

Local resistance values. If you are trying to investigate the effects of changing garment design variables and/or materials in product development, we can isolate the body segments (zones) that are covered by the garments and calculate a *local* total insulation value and/or a *local* total evaporative resistance value. For example, if a jacket completely covers the chest, back, stomach, and arms, these body segments can be used in the calculation. This technique will maximize differences between two jackets. We can also provide a chart with the insulation values for all individual zones. If you want this information, please indicate it on the form.

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.

Section 4. Garment samples – sizing, labeling, and sending samples. Select the clothing size that will fit the manikin properly. Mixing sizes will lead to variability in the results. The manikins' measurements are given in tables at the end of this document.

Label each garment with a simple letter code (A, B, C, etc.) using a permanent felt-tip marker or a hang tag. Please list each ensemble by a code designation, followed by all of the garments in the ensemble and dressing instructions. This information will be copied and put in the report. If a garment is to be tested more than one way, please make this clear in your list of tests. If a clothing system has a hood, hat, or helmet, we will have to cut it to get it around the hook in the manikin's head.

Send the garments to:
Meredith Schlabach
Institute for Environmental Research
Kansas State University
0056 Seaton Hall
Manhattan, KS 66506
Phone: 785-532-2284
email: 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 garments in the order they are received at KSU. We can measure the insulation of one ensemble (all three reps) in a 24 hour period. The evaporative resistance tests take longer because we cannot run overnight. During holidays and campus vacation breaks turn times will be longer.

Test report. A test report will be prepared and emailed as a PDF file with the company's name and technical report number as the file name.

Section 5. Return of garments. Provide your company's preferred shipping company and account number for return shipping (e.g., Federal Express, UPS, DHL) on the form. If the return shipping account is invalid, then you will be invoiced to reimburse KSU for return shipping expenses. Let us know if you require overnight shipping. We can also donate the garments to charity.

Section 6. Export Controls Compliance. 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.

Adult Manikin: Stan's Body Measurements

Measurement Location	Amount	
	cm	**in**
Chest circumference at arm pit level	90.8	35.75
Natural waist circumference	75.6	29.75
Hip circumference (widest point)	92.7	36.5
Arm length from shoulder tip to wrist	61	24
Front length from neck base to natural waist	43.2	17
Back shoulder width from shoulder tip to shoulder tip	44.4	17.5
Inseam length to top of shoe (from crotch to ankle)	78.7	31
Foot length (taken on bottom of foot) **Men's shoe and boot size 12**	26.7	10.5
Height	177.2	69.75

Child Manikin: Sonny's Body Measurements (Boy's size 8)

Measurement Location	Amount	
	cm	**in**
Chest circumference at arm pit level	66.0	26
Natural waist circumference	62.2	24.5
Hip circumference (widest point)	71.1	28
Inseam length to top of shoe (from crotch to ankle)	59.7	23.5
Foot length (taken on bottom of foot) **Kid's shoe size 3.5 and boot size 4**	19.8	7.8
Height	129.5	51

Note: Larger shoe and boot sizes are requested for ease of dressing the manikin.