Specified Requirements of Far Infrared Textiles	Document No. FTTS-FA-010
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1.Purpose and Scope

Fiber products for other than medical use.

2. Terminology

Far Infrared textile means the textile products which will absorb and re-radiate the light wave range in wavelength from 3~14 μm.

3. Classification

The processing of far infrared textile includes mixing of raw materials, coating, lamination and submerging. The wash-resistance test would not be necessary for products made of mixing of raw materials as they deliver the same durability as the fiber. While products come of coating, laminating and submerging processes should go through with 10 cycles laundering for wash-resistance test based on AATCC 135 (1) (III) (A) iii prior to conducting the performance test. The far infrared and temperature characteristics criteria of the performance test are given as table 1.

Table 1. Qualification.

Evaluation		Qualification
Far Infrared Characteristics	Far Infrared Spectral Emissivity	The average emissivity is not less than 0.80 determined by Far-Infrared spectrophotometer in wavelength of 3-14μm.
	Re-radiated Characteristics	Difference in temperature between the test sample and reference sample is not less than +0.5℃ and the effective difference is better than the reliable limit of 95%.
	* Meet any criterion given above.	
Temperature Characteristics	Thermograph	Average difference in temperature of skin in specific area while wearing test sample against wearing the reference sample is not less than +0.5℃.
	Monitor Test	
	* Meet any criterion given above.	

4. Test method

Test methods used for the evaluation of the performance of Far Infrared textile are illustrated as table 2.

Table 2. Test methods

Test item		Equipment	Remark
Far Infrared Characteristics	Far Infrared Spectral Emissivity	Infrared Spectrophotometer & Black Body	
	Re-radiated Characteristics	45 Degree Parallel Radiation	
Temperature Characteristics	Skin Temperature	Thermograph	
		Thermal Imager	

Table 3 Sample Specifications

Test item	Sample for testing
Far Infrared Characteristics	• Sample cut from finished or half-finished products (fabric) • At least 5 cm x 5 cm for opaque sample • Triple of the above size for transparent sample
Temperature Characteristics	• Finished products • The difference of fabric weight between testing sample and comparative sample should within 5%.

4.1 Emissivity evaluation

4.1.1 Equipment

Infrared spectrophotometer and Black Body

4.1.2 Testing sample

(1) The testing sample should have the same composition as the final product and without covering of any other material. The shape and volume are restricted to meet the measurement needs.

(2) The area of the testing sample should not less than 5 cm x 5 cm. Opaque samples are measured by one layer, while transparent samples should be folded twice in a four-layer form for measurement.

4.1.3 Testing conditions

Opaque (could be folded) sample with tight construction and no affection on the heat conduction is preferred. Avoid any high heat source around the working area. The sample for testing should not less than 5 cm x 5 cm.

Measure the emissivity between 3-14 μm and compare the emissivity of Black Body at the same temperature to obtain the emissivity of the fabrics. The emissivity should be measured at the sample surface temperature 55±2℃.

4.1.4 Measurements

Far Infrared spectral emissivity should be measured at a specific sample surface temperature above 47℃. Five measurements should be made.

Select the most smooth emission energy curve to obtain the emission value in order to compare with the emissivity of the Black Body.

4.2 Re-radiation characteristics (45 degree parallel)

4.2.1 Equipment

Re-radiation characteristics (45 degree parallel) analyzer.

4.2.2 Testing sample

The sample for testing should have the same composition and shape as the final product. If the shape of sample is not suitable for testing, necessary processes without affecting the composition is acceptable (e.g. cotton fiber→non-woven). The sample used for the comparison with the testing sample should have the same composition, construction and similar color as the testing sample. The difference of fabric weight between testing sample and comparative sample should be within 5%.

4.2.3 Testing conditions

Testing should be conducted in a 20±1℃, 50±10% RH conditioned room or under an environment with such temperature.

4.2.4 Measurements

Five samples should be tested. Average the values obtained from the five samples.

4.3 Test method for Temperature characteristics

4.3.1 Equipment

(1) Thermograph

(2) Thermal Imager (Monitor Test)

4.3.2 Condition setting

(1) Condition setting of subject: The subject should be a healthy adult in standard body weight.
Remark: To reduce the deviation, it is recommended that male in his twenties to thirties.

(2) Stabilized the subject: Keep working and resting ordinarily at least twelve hours.

(3) Precondition: Each subject should keep in the rest status for 60 minutes in the conditioned room. Testing starts at the time before the stabilized subject wearing the sample. The conditioning interval of worn–status is 30 minutes.

(4) Number of subject: Not less than five subjects.

(5) Material: Final product or similarity.

(6) Frequency: Twice testing for each subject.

(7) Environment condition:

Temperature	17-25℃
Relative Humidity	50±10%
Atmospheric pressure	760mmHg

(8) Test Interval: Subjects keep relaxation for 60 minutes in conditioned room then remove the original wearing apparel to adapt to the environment for 20 minutes (i.e. before wearing). The testing material should be taken on for 30 minutes (taking-on) and then be taken off for 20 minutes interval (taking-off).

Detect the skin temperature of the subject at the total eight interval illustrated below:

5 minutes before wearing,

5, 10, 20 & 30 minutes after wearing the testing material, and

5, 10 & 20 minutes after taking off the testing material.

(9) Detecting point of the subject

Fabric: detecting the point on the middle line of left front arm of the subject.

Bedquilt: detecting the point on the left chest.

5. Mark

Table 3. Mark

Type	Qualification
I	Meet the criterion of Far Infrared Characteristics
II	Meet the criterion of Far Infrared Characteristics and Temperature Characteristics

6. Reference

Japan Far Infrared Association