

Grenoble, May 14, 2007

Our reference: CPM/07-116/AMP/CP

**TEST REPORT No. CPM 07/260-06505 Part A
EVOLUTION OF THE HEMISPHERIC EMISSIVITY
OF TEST SPECIMENS OF REFLECTING PRODUCT
after conditioning at the temperature
and at the humidity**

This Test Report attests only to the characteristics of the items submitted for testing and does not prejudge the characteristics of similar products. So it does not constitute a product certification in the sense of Article L 115-27 of the Consumer Code and of the Law of June 3, 1994.

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It comprises 6 pages.

REQUESTED BY:

**KdB ISOLATION
2, Avenue Lotz-Cossé
B.P. 47506
44275 NANTES CEDEX 2**

CENTRE SCIENTIFIQUE ET TECHNIQUE DU BATIMENT

ÉTABLISSEMENT DE GRENOBLE | 24 RUE JOSEPH FOURIER | 38400 SAINT-MARTIN D'HÈRES
TÉL. (33) 04 76 76 25 25 | FAX. (33) 04 76 44 20 46 | SIRET 775 688 229 000 50 | www.cstb.fr

SIÈGE SOCIAL > 84 AVENUE JEAN JAURÈS | CHAMPS-SUR-MARNE | 77447 MARNE-LA-VALLÉE CEDEX 2

ÉTABLISSEMENT PUBLIC À CARACTÈRE INDUSTRIEL ET COMMERCIAL | RCS MEAUX 775 688 229 | TVA FR 70 775 688 229

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1. SUBJECT

The purpose is to determine and compare the hemispheric emissivity of test specimens of reflecting product with different production dates, in the control state and after conditioning at the temperature and at the humidity: 70°C and 90% RH.

2. REFERENCE TEXTS

- Standard ASTM E 1175: « Determining Solar or Photopic Reflectance, Transmittance, and Absorptance of Materials Using a Large Diameter Integrating Sphere »
- Standard ASTM E 1585: « Measuring and Calculating Emittance of Architectural Flat Glass Products Using Spectrometric Measurements »

3. TEST DATE

Tests performed from March 29 to May 7, 2007.

4. ITEMS SUBJECTED TO THE TEST

The test specimens were supplied by the KdB ISOLATION company and received at CSTB by carrier on March 21, 2007. There are four of them, dimensions 100 cm x 120 cm, and they are referenced as follows:

CSTB reference	Product reference	Production date
CPM 07/260-06505 A	AIRFLEX	02/23/07
CPM 07/260-06505 B		03/05/07
CPM 07/260-06505 C		03/09/07
CPM 07/260-06505 D		03/15/07

Also, the requester sent the following information concerning the material:
The Airflex roof substructure flexible radiant barrier is constituted as follows:

- Two blister pack films each with two layers of polyethylene. The blister pack film has a nominal thickness of 3.7 mm and the blisters have nominal diameters of 9.5 mm.
- A central polyethylene foam insulating padding sheet, nominal thickness 3 mm, and approximately 25 kg/m³ density.

- Two aluminium films, each constituted by three layers:
 - A protective cellulose lacquer ($< 1 \mu\text{m}$),
 - One layer of aluminium ($30 \mu\text{m}$),
 - One layer of polyethylene, which is used to fix the aluminium film on the blister pack film ($14 \mu\text{m}$).

Made at Grenoble, May 14, 2007

Technical Assistant,
responsible for the tests

Engineer,
responsible for the tests

Anne-Marie PARDO

François OLIVE

5. PREPARATION OF THE TEST SPECIMENS

The test specimens were subjected neither to preparation nor to cleaning but were cut with scissors to a size compatible with the test apparatus (approximately 8 cm x 8 cm).

Since the material is « multi-ply », the two products composing the outside faces are kept and the intermediate product layer is eliminated. The tests are performed on the face in contact with the outside.

For the tests, three samplings from each test specimen (noted 1 to 3), therefore for each production date, are used.

6. CONDITIONING

Conditioning at the temperature and at the humidity

The test specimens are conditioned in an oven at 70°C and 90% RH without UV.

The emissivity is measured on each test specimen before conditioning (control state) and after 28 days in the oven.

7. MEASUREMENT METHOD

The normal atmospheric spectral reflection curves $\rho^{nh}(\lambda)$ are recorded, applying at the infrared range the test method described in Standard ASTM E 1175.

8. TEST APPARATUS

The normal atmospheric spectral reflection measurements are performed with an infrared spectrometer, Fourier transform type, BRUKER brand and EQUINOX 55 model, equipped with an integrating sphere photometer.

The oven is WEISS brand, model 305 SB.

9. CALCULATION OF THE HEMISPHERIC EMISSIVITY

The hemispheric emissivity ε^h is calculated from the infrared reflection spectral curve $\rho^{nh}(\lambda)$ in compliance with Standard ASTM E 1585, by weighted integration from 5 to 23 μm according to the following expression:

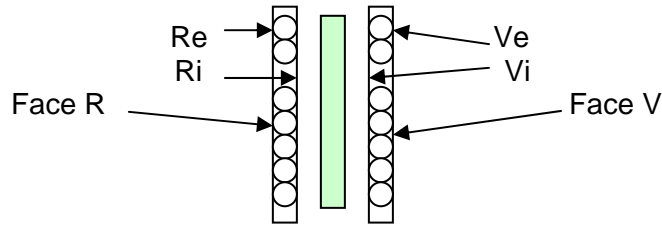
$$\varepsilon^h = \frac{\int (1 - \rho^{nh}(\lambda)) E_{b\lambda} d\lambda}{\int E_{b\lambda} d\lambda}$$

with $E_{b\lambda}$: emission from the black body at wavelength λ and at 300°K.

10. RESULTS

The atmospheric emissivity values for the faces noted Re and Ve (see diagram below) are given as percentages in Table 1 below. They correspond to an average value over three test specimens.

The estimated absolute uncertainty is 3%.



Test specimen reference	Conditioning	Face	Emissivity as a %
CPM 07/260-06505 A	Control	Re Ve	< 3 3
CPM 07/260-06505 B		Re Ve	< 3 < 3
CPM 07/260-06505 C		Re Ve	< 3 < 3
CPM 07/260-06505 D		Re Ve	< 3 < 3
CPM 07/260-06505 A	28 days in oven at 70°C and 90% RH	Re Ve	< 3 6
CPM 07/260-06505 B		Re Ve	6 < 3
CPM 07/260-06505 C		Re Ve	< 3 7
CPM 07/260-06505 D		Re Ve	4 3

Table 1: Hemispheric emissivity as a percentage

REPORT END