ATLAS
MATERIAL TESTING SOLUTIONS

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TOTAL EMITTANCE
and
HEMISPHERICAL SPECTRAL REFLECTANCE TEST REPORT

prepared for:

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1.0 INTRODUCTION

This report presents results of total emmitance and spectral reflectance measurements on the following six coatings on metal coded:

ThermCote/AW
ThermCote/A-5
ThermCote/A-7
ThermCoteA-10
ThermCote/F
ThermCote/A-PW5
ThermCote/AWP

2.0 TEST METHODS AND PROCEDURES

<u>Emittance</u>

Near-normal infrared reflectance measurements were performed in accordance with ASTM E408-71 (reapproved 1990), Method A. A Gier Dunkle Instruments Infrared Reflectometer Model DB 100 was utilized for the measurements.

Inside the detector portion are two semi-cylindrical cavities. One of the cavities is heated by an electrical heater and the other stabilizes at approximately room temperature. Thus, the two cavities are maintained at different temperatures. As the cavities rotate, the sample is alternately irradiated at 13 Hz. A vacuum thermocouple views the sample through an optical system that focuses through slits in the ends of the cavities. The detector receives energy emitted by the sample and energy reflected by the sample. Only the reflected energy contains an alternating component as the sample in alternately irradiated by the hot and cold cavities. An amplifier is synchronized with the cavity rotation to pass only the desired alternating signal, which is then rectified and filtered. The zero and gain are set with standards of know emittance. The calibration is rechecked at several intervals during the measurement.

Near-normal emittance for the client's specimens was calculated from Kirchhoff's Relationship where:

$$p + a + \tau = 1, \quad a = \varepsilon$$

Since these specimens appear to have no τ in the far IR, the preceding equation reduces to

$$p + \varepsilon = 1 \text{ and } 1 - p = \varepsilon$$

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2.0 TEST METHODS AND PROCEDURES (cont'd)

Hemispherical emittance was converted from normal emittance by using equations 4 and 5 provided by the National Fenestration Rating Council in NFRC 301-93.

Reflectance

Hemispherical spectral reflectance measurements were performed in accordance with ASTM Standard Test Method E903-88 (1992). The measurements were performed with a Beckman 5240 Spectrophotometer utilizing an integrating sphere (Fig A1.3 of E903-88 (1992). Total reflectance measurements were obtained in the solar spectrum from 2500nm to 300nm at an incident angle of 15°. The measurements employ a detector-baffled, wall-mounted integrating sphere that precludes the necessity of employing a reference standard except to define the instrument's 100% line. The measurements are properly denoted as being 'hemispherical spectral reflectance'.

Total solar ρ reflectance was obtained by integrating the spectral data against Air Mass 1.5[1] global solar spectrum utilizing 109 weighted ordinates. All spectral data are submitted herewith in the original.

3.0 OBSERVATIONS, DEVIATIONS, AND WAIVERS

All measurements were performed on the uncoded surface. The values reported for emittance represent the average of at four measurements.

An additional report was issued, reference report No. 5017500.

[1] *ASTM E892-87 (1992), Table 1*

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4.0 RESULTS

Emittance:

Specimen Code	Reflectance (ρ) Measured	Near-Normal Emittance (ε) Calculated	Hemispherical Emittance (ε) Calculated
ThermCote/AW[1]	.06	.94	.89
ThermCote/A-5	.06	.94	.89
ThermCote/A-7	.06	.94	.89
ThermCote/A-10	.07	.93	.88
ThermCote/F[2]	.07	.93	.88
ThermCote/A-PW5	.06	.94	.89
ThermCote/AWP	.07	.93	.88

Reflectance:

Specimen Code	% Reflectance
ThermCote/AW[1]	83.0
ThermCote/A-5	83.7
ThermCote/A-7	81.5
ThermCote/A-10	82.7
ThermCote/F[2]	84.2
ThermCote/A-PW5	81.3
ThermCote/AWP[3]	81.7

Footnotes of ProTek-USA:

[1]*marketed as FinalFinish™*

[2]*new, improved version marketed as ThermCote/IC™*

[3]*marketed as DuraFinish™*