



# PT ASAHIIMAS FLAT GLASS Tbk

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## EVALUATION OF GLASS ADVANCED PROTECTIVE FILM

### I. Glass Data.

Glass test data as below :

Kind of glass	Size (mm)	Q'ty (pcs)
Dark Grey 5 mm (DGFLS)	300x300	2
Sunergy Clear 5 mm (SNFLS)	300x300	2

All glass is product of PT Asahimas Flat Glass.

### 2. Method.

This test to evaluate whether Glass Advanced protective film caused any changes to glass surface when applied then removed at a later date.

#### 2.1. Kind of test.

Humidity test on chamber with rain fall water . Humidity test chamber without UV Lamp test.



#### 2.2. Preparation sample.

It should be noted that both these samples had previously been treated with the protective film. Protective Film were coated on top surface of Tinted glass and Low-E glass. Kept after coated for 24 hours before done humidity test.

Dark Grey 5 mm



Sunergy Clear 5 mm



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### 2.3. Conditioning.

PT Kajima Indonesia is undertaking these tests for is working on a project of Senayan Hotel in Jakarta Indonesia. The glass was therefore conditioned at a raised temperature and humidity to simulate similar conditions.

Two samples of glass were placed in a sealed container - Humidity Test Equipment. 24 hours per day, temperatures inside the container reached around 30-35°C during the test period.

The relative humidity in the container was raised to approximately 90% using a saturated water.

The samples were left under these conditions for 20 days between the 1st- 20th Apr-13. The samples were sprayed with water every time during this period to simulate rainfall. After conditioning the Glass Advanced film was peeled off by hand prior to testing.

After 10 days, found bubbles on protective film surface. Color of film were change to be white color. Some parts of film peeled off from glass surface.



After conditioning the Glass Advanced film was peeled off by hand prior to testing.



#### 2.4. Visual Inspection .

Both samples were viewed under daylight, artificial fluorescent light and ultra violet light to identify any apparent changes to the surface of the glass. The panels were also exposed to steam to assess any changes in the hygroscopic characteristics.

#### 2.5. Solar Characteristics

The tinted glass and low E properties of glass are determined by measuring the solar characteristics of the glass, i.e. its ability to transmit, reflect and absorb light of different wavelengths. These characteristics were measured using a Hitachi UV4100 Spectrometer with integrating sphere following AMG method which is based on the international standard BS EN 410:1998. In order to fit inside the instrument small sections of glass were removed from each sample, two pieces were measured from each sample. Measurements were carried out with the low E coated side facing the light source as this is consistent with the product in use.

#### 3. Result .

##### 3.1. Visual Inspection.

No differences were observed between the glass test and normal glass panels under humidity test conditions used.

Dark Grey 5 mm

Sunergy Clear 5 mm



Found "brush mark" of painting on top surface when the surfaces were held over a steamer.

Dark Grey 5 mm

Sunergy Clear 5 mm



A build up was noted on the back surface of both panels this was due to the use of saturated water solution to raise the humidity and wiped off using a damp cloth. It is considered to be an artefact of the conditioning method and not to have any impact on the test results.

## 3.2. Solar Characteristic.

Table 1 shows the results of the analysis of the solar characteristics of the glass test and normal glass samples compared to the manufacturer's specification for the glass.

Tinted Glass -Dark Grey Glass 5 mm.

	Sample1	Sample 2	Sample1	Sample 2	AMG
	after humidity		non humidity		spect.
Light transmittance (for illuminant D65)	20.0	20.3	20.6	20.6	20.7
Light reflectance (for illuminant D65)	4.3	4.3	4.6	4.6	4.3
Solar direct transmittance	38.2	38.3	38.5	38.5	36.3
Solar direct reflectance	4.6	4.6	4.8	4.8	4.6
Solar direct absorbance	57.2	57.1	56.7	56.7	59.1
UV transmittance	45.7	45.3	45.0	45.1	44.1

Low-E glass ,Sunergy Clear 5 mm.

	Sample 1	Sample 2	Sample1	Sample 2	AMG
	after humidity		non humidity		spect.
Light transmittance (for illuminant D65)	66.6	66.4	67.1	67.3	68.0
Light reflectance (for illuminant D65)	8.1	7.9	8.1	8.0	9.0
Solar direct transmittance	49.3	49.0	49.6	49.8	55.0
Solar direct reflectance	10.0	10.0	10.1	10.0	10.0
Solar direct absorbance	40.7	41.0	40.3	40.2	35.0
UV transmittance	44.0	43.2	44.2	44.3	40.0

4. Conclusion.

There was no significant difference either visually or in the measured solar characteristics of the glass sample after removal of the Glass Advanced protective film over the test period of exposure to a warm humid environment compared to the control sample without the application of the Glass Advanced protective film.

Based on the sample tested the tinted glass and low E coating appears to be unaffected by the application and removal of Glass Advanced film during the test in a warm humid environment. Brush painting mark on glass was not significant issue for this test because applicator may have applied with roller painting.

Acknowledge,



Sander LS

Quality Assurance Dept.

Reported by

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