



Polymer Technology  
De Rondom 1  
P.O. Box 6235  
5600 HE Eindhoven  
The Netherlands

TNO report

43/04.010603/sec

Weather resistance of three samples high pressure  
laminate

[www.tno.nl](http://www.tno.nl)

T +31 40 265 00 00  
F +31 40 265 03 01

Date April 6, 2004

Author(s) H.F.N. Fontijn

Number of pages 6

Sponsor Arpa Industriale SPA  
attn. mrs. M. Constantino  
Via Piumati 91  
12042 Bra  
Italy

Project number 00783037/01.05.01

All rights reserved.

No part of this publication may be reproduced and/or published by print, photoprint, microfilm or any other means without the previous written consent of TNO.

In case this report was drafted on instructions, the rights and obligations of contracting parties are subject to either the Standard Conditions for Research Instructions given to TNO, or the relevant agreement concluded between the contracting parties. Submitting the report for inspection to parties who have a direct interest is permitted.

© 2004 TNO

## Contents

<b>1</b>	<b>Introduction.....</b>	<b>3</b>
<b>2</b>	<b>Experimental .....</b>	<b>4</b>
2.1	Samples received.....	4
2.2	Weathering test .....	4
2.3	Colour fastness.....	5
2.4	Gloss .....	5
<b>3</b>	<b>Results .....</b>	<b>6</b>

## 1 Introduction

By order of Arpa Industriale SPA, TNO Industrial Technology determined the weather resistance of three samples of high pressure laminate. The artificial weathering test was performed in accordance with ISO 4892:1994, parts 1 and 2. After exposure times of 0, 1000, 2000 and 3000 hours the color contrast was assessed using grey scales in accordance with ISO 105 A02 and ISO 105 A03, and the loss of gloss was measured.

The investigation was carried out in accordance with the conditions mentioned in the letter 81354/sec dated November 10, 2003.

## 2 Experimental

### 2.1 Samples received

The samples supplied by the client were received and registered on November 12, 2003 by TNO under the sample code number 03.0689 and a sub-code ranging from 1 to 3. In table 2.1 the sub code and description of the samples are given.

Table 2.1 Description of the received samples

description	sub code
4327 Acero italiano, finitura ERRE 6mm BDG"SC" Campione Gratuito	1
1205 Sapelli tris, finitura ERRE 6mm BDG"SC" Campione Gratuito	2
1993 Pero rosso, finitura ERRE 6mm BDG"SC" Campione Gratuito	3

### 2.2 Weathering test

The artificial weathering test was carried out in a Weather-Ometer Ci 4000 apparatus in accordance with ISO 4892, parts 1 and 2. In table 2.2 the weathering conditions are given.

Table 2.2 Conditions in the Weather-Ometer Ci 4000.

Apparatus	Weather-Ometer Ci 4000 (Atlas Electric Devices Company)
Light source	6500 Watt cooled Xenon Arc Lamp
Filter combinations	Inner and outer filter glass type "S" Borosilicate
Replacement schedule lamps and filters	As recommended by the manufacturer
Light intensity (controlled)	0.50 W/m <sup>2</sup> at 340 nm
Test chamber temperature (controlled)	40 °C
Black standard temperature (controlled)	65 °C
Relative air humidity (controlled)	50 %
Spray cycle	Duration of spraying 18 minutes, dry interval between spraying 102 minutes
Mounting of test specimens	Specimen holder type SL-3T or WQPTC-3T, with metal backing
Carrier	Continuous exposure to light

After exposure times of 1000, 2000 and 3000 hours the specimens were evaluated.

Prior to the evaluation the specimens were conditioned for a period of at least 24 hours at a temperature of  $23 \pm 2$  °C and a relative air humidity of  $50 \pm 5$ %.

### **2.3 Colour fastness**

The colour fastness of the samples was assessed by comparing the colour contrast between an exposed specimen and the corresponding reference specimen to one of the nine steps of the grey scales in according with ISO 105 A03 and ISO A02, respectively.

The colour difference between two consecutive steps of the grey scale A02 is less than the colour difference between two consecutive steps of the grey scale A03. This means that at the same colour contrast between an exposed en unexposed specimen the assessed contrast rating with the A02 scale is lower than the assessment based on the A03 scale.

### **2.4 Gloss**

The gloss was measured in accordance with DIN 67530 using a micro TRI gloss device (Byke Gardner). All measurements were carried out using an incident light angle and measuring angle of 85 °.

### 3 Results

In table 3.1 the colour contrast after 1000, 2000 and 3000 hours of the samples is given.

**Table 3.1 Colour contrast according to ISO 105 A03 and ISO 105 A02 of the samples after exposure times of 1000, 2000 and 3000 hours.**

sub code	in accordance with ISO 105 A03			in accordance with ISO 105 A02		
	1000	2000	3000	1000	2000	3000
1	4-5	4-5	4	4-5	4	4 (l)
2	5	5	5	5	5	5
3	5	4-5	4-5	5	4-5	4 (l)

l colour becomes lighter.

In table 3.2 the gloss after exposure times 0, 1000, 2000 and 3000 hours of the samples is given.

**Table 3.2 Gloss of the samples after exposure times of 0, 1000, 2000 and 3000 hours. Measuring angle 85 °.**

sub code	0	1000	2000	3000
1	17.4	18.6	19.5	19.9
2	20.1	17.5	21.2	21.8
3	18.9	17.2	21.1	21.7

None of the exposed specimens showed signs of blistering and delamination.

Project leader

H.F.N. Fontijn

Head Product Evaluation

Dr. J.J. de Vlieger