

Report

Resistance of various sheets of High Pressure Laminates (HPL) to artificial weathering according to EN 438-2

Organization: Stylam Industries Limited
Attn. of Mr. Bhatla
SCO 14, Madhya Marg Sector -7C
Chandigarh 160 019
INDIA

Report number: 12452R-89201643

Project number: 89201643

Author: A.M. Agterberg, B.Sc.

Date: 23-10-2012

Number of pages: 10 (including appendices)

Number of appendices: 2 (3 pages)

All rights reserved.

No part of this report may be reproduced, provided to and/or examined by third parties, and/or published by print, photoprint, microfilm, in electronic form or any other means without the explicit previous written consent of TÜV Rheinland Nederland B.V.

In case this report was drafted within the context of an assignment to TÜV Rheinland Nederland B.V., the rights and obligations of contracting parties are subject to the General Terms & Conditions for Advisory, Research and Certification assignments to TÜV Rheinland Nederland B.V. and/or the relevant agreement concluded between the contracting parties.

© 2012 TÜV Rheinland Nederland B.V.

CONTENTS:

1 Introduction	3
2 Investigations	3
3 Results	5
4 Discussion	7
5 Signatures	7

APPENDICES:

Appendix A	Samples
Appendix B	Test pieces with a contrast rating lower than 4 after exposure

1 Introduction

This report describes the determination of the resistance to weathering of 40 different sheets of high pressure laminate according to paragraph 29.4 of EN 438-2.

Mr. Bhatla of Stylam Industries Limited (Stylam) ordered TÜV Rheinland Nederland B.V. (TÜV Rheinland) to execute the investigation by returning a signed copy the TÜV Rheinland offer form 35280, dated March 19th, 2012.

In order to execute the investigations, Stylam provided TÜV Rheinland with 40 samples of the high pressure laminates. The samples are registered at TÜV Rheinland under TRN sample number: 12.0054. Appendix A describes the samples.

2 Investigations

The artificial weathering of the samples was carried out in an Atlas Weather-Ometer Ci 4000 apparatus in accordance with ISO 4892, parts 1 and 2. In table 1 the conditions in the Weather-Ometer are listed which correspond with the procedures of EN 438-2:2005 paragraph 29.4

From each sample three test pieces of size 2.5 x 15 cm were cut to fit the specimen holder. Two test pieces were exposed in the Weather-Ometer, while a third test piece was kept in the dark as a reference.

Table 1, Conditions in the Weather-Ometer Ci 4000.

Apparatus	Weather-Ometer Ci 4000 (Atlas Electric Devices Company)
Light Source	6500 Watt water cooled Xenon Arc Lamp
Filters	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 ² at 340 nm
Test chamber temperature (controlled)	40 °C
Black standard temperature 1)	70 °C
Relative humidity (controlled)	65 %
Spray cycle	Duration of spraying 18 minutes, dry interval between spraying 102 minutes
Mounting of test specimens	Specimens holder type SL-3T, with metal backing
Carrier	Continuous exposure to light

1): Normally and in EN438-2 the black standard temperature is 65 °C. At the time of the test, the Weather-Ometer was operating at a black standard temperature of 70 °C. 70 °C means a slightly higher impact on the samples. Stylam agreed on running the test at the above described conditions.

Test pieces were exposed for 1500 and 3000 hours. After 1500 and 3000 hours of exposure the test pieces were examined for colour contrast and appearance.

Colour contrast

The colour contrast of the specimens was determined according to EN 438-2:2005 paragraph 29.5.1.

The colour contrast between exposed and unexposed specimens was assessed in terms of a grey scale values as defined in EN20105-A02. This scale is numbered in steps ranging from 5, 5/4, 4...up to 1, where 5 stands for no contrast and 1 stand for a very large contrast. An example of the grey scale is given in figure 1

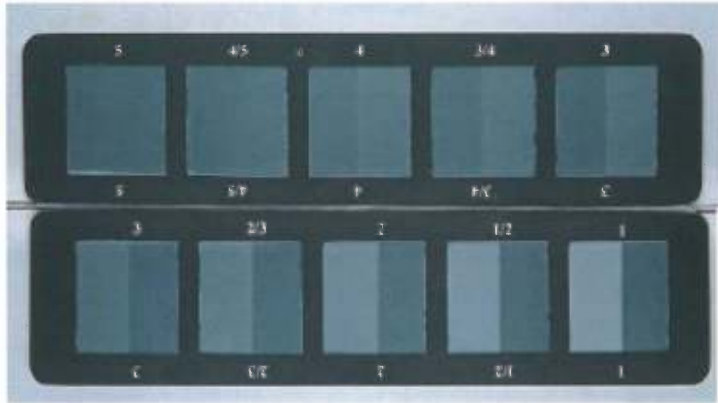


Figure 1, Example of the standard grey scale according to EN 20105-A02.

Appearance

The appearance of the specimens was evaluated as described in paragraph 29.5.2 of EN 438-2:2005. The surface of the specimens was visually assessed at a viewing distance of approximately 50 cm and rated according to the following scale:

- Rating 5: No visible changes (note from the author: excluding changes in contrast and colour)
- Rating 4: Change of gloss only.
- Rating 3: Hairline surface cracks and/or erosion of surface.
- Rating 2: Surface cracks.
- Rating 1: Blistering and/or delamination.

3 Results

The results of the contrast and appearance ratings are summarized in table 2.

Table 2, Resistance to artificial weathering Contrast and Appearance after 1500 and 3000 hours of exposure.

Sample	Design number:	Contrast rating		Appearance rating	
		1500 h	3000 h	1500 h	3000 h
1	107	4-5 L	4-5 L	4	4
2	523	5	4-5 L	4	4
3	538	4 L	4 L	4	4
4	1018	5	5	5	5
5	1023	5	4-5 L	4	4
6	1034	4-5 L	4-5 L	4	4
7	1051	5	4-5 L	5	5
8	1052	5	4-5 L	4	4
9	1053	4-5 L	4 L	5	4
10	1262	5	4-5 L	5	5
11	1355	4-5 L	4 L	5	5
12	1356	5	4-5 L	5	5
13	1357	4-5 L	4 L	5	5
14	1358	5	5	5	5
15	1956	2 L	1 L	5	5
16	1975	1-2 L	1-2 L	5	5
17	1981	4-5 L	4 L	5	5
18	7105	2-3 L	2-3 L	5	5
19	7253	4-5 L	4 L	5	5
20	7305	5	5	5	5

L : Lighter

Table 2, (continuation) Resistance to artificial weathering Contrast and Appearance after 1500 and 3000 hours of exposure.

Sample	Design number:	Contrast rating		Appearance rating	
		1500 h	3000 h	1500 h	3000 h
21	7308	5	5	5	5
22	7410	5	5	5	5
23	7423	5	5	5	5
24	7503	5	5	5	5
25	7506	5	5	5	5
26	7509	5	5	5	5
27	7654	5	5	5	5
28	7703	1-2 L	1 L	5	5
29	7705	5	4-5 L	5	5
30	7712	5	5	5	5
31	7714	5	4-5 L	5	5
32	7805	3 L	1-2 L	5	5
33	7807	5	5	5	5
34	7813	5	5	5	5
35	8109	5	5	5	5
36	8117	5	5	5	5
37	8232	5	5	5	5
38	8504	3 L	2 L	5	5
39	8522	1 L	1 L	5	5
40	8554	4-5 L	4 L	5	5

L : Lighter

4 Discussion

Summarising results of the weathering tests described in this report, the following is concluded:

- Seven out of forty samples showed a major change in colour after exposure (contrast rating < 3).
The photos in appendix B show the samples with a contrast lower than 4.
The photos show the test pieces, from left to right, after storage in the dark, after 1500 h, and after 3000 h exposure.
- Also seven samples showed a contrast rating of 4 after 3000 hours of exposure. In practice this means that a contrast in colour is visible but normally not considered as inconvenient.
- All other samples showed hardly any colour change.
- None of the samples showed changes like cracks in the polymer matrix of the surface, delamination or hairline cracks on the edges.

5 Signatures

Author	Signature
Ton M. Agterberg, B.Sc. Coatings specialist	
Peer review	Signature
René van der Kaaden, B.Sc. Coating specialist	
Approved by	Signature
R. Ditmer, B.Sc. Managing Director	

(This is the end of this report).

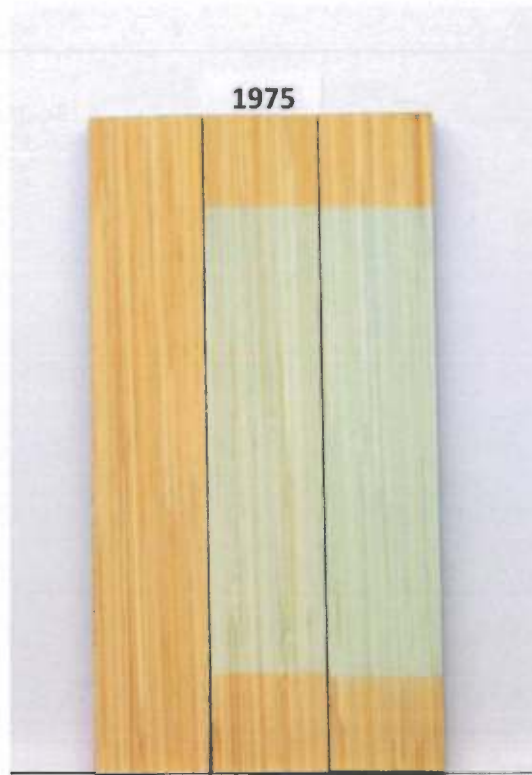
Appendix A, Samples

Design number :	Finish :	Name:
107	suede	Ivory
523	suede	Fruit green
538	suede	Light Grey
1018	suede	Rust brown
1023	suede	Pearl
1034	suede	Aqua blue
1051	suede	Aster grey
1052	suede	Peach
1053	suede	Palm
1262	suede	Yellow oak
1355	suede	Antique copper
1356	suede	Antique wood
1357	suede	Brown
1358	suede	Slate
1956	suede	Teak light
1975	suede	Cryptic bamboo
1981	suede	Orlando walnut
7105	suede	Naina teak
7253	suede	Doughlas pine
7305	suede	Albreta maple
7308	suede	Red maple
7410	suede	Iron oak
7423	suede	Oak graphite
7503	suede	Polished wenge
7506	suede	Crest wenge
7509	suede	Classic wenge
7654	suede	Cedar rich
7703	suede	Jouvenile Walnut
7705	suede	Walnut bronze
7712	suede	Miami walnut
7714	suede	Toronto walnut
7805	suede	Zebra wood
7807	suede	Naked wood
7813	suede	Sweet acacia
8109	suede	Slate grey
8117	suede	Warm grey
8232	suede	Charcoal brown
8504	suede	Golden yellow
8522	suede	Orange
8554	suede	Blood red

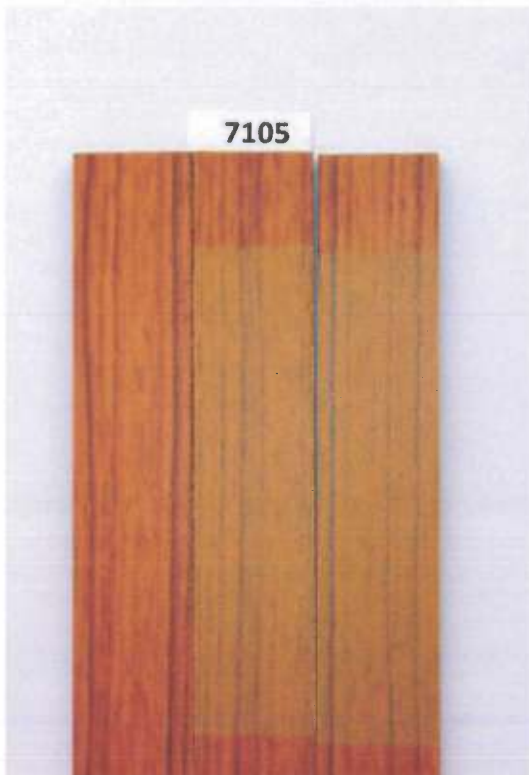
Appendix B, Test pieces with a contrast rating lower than 4 after exposure



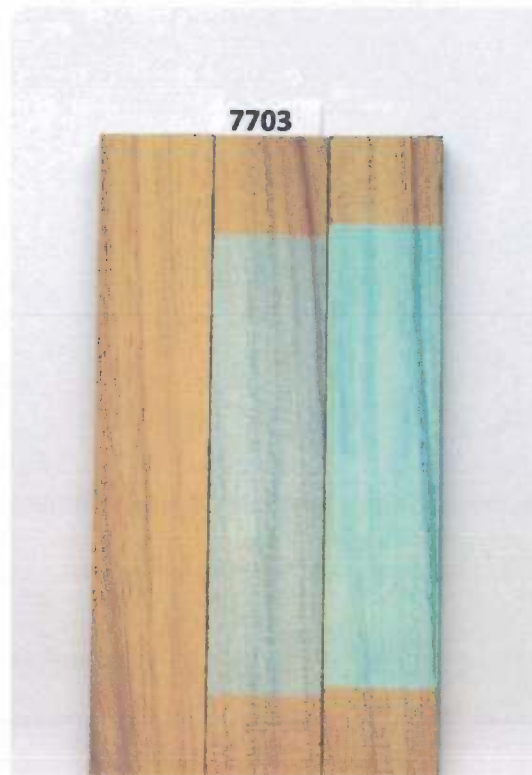
Design: 1956, Contrast rating: 1 L



Design: 1975, Contrast rating: 1-2 L



Design: 7105, Contrast rating: 2-3 L

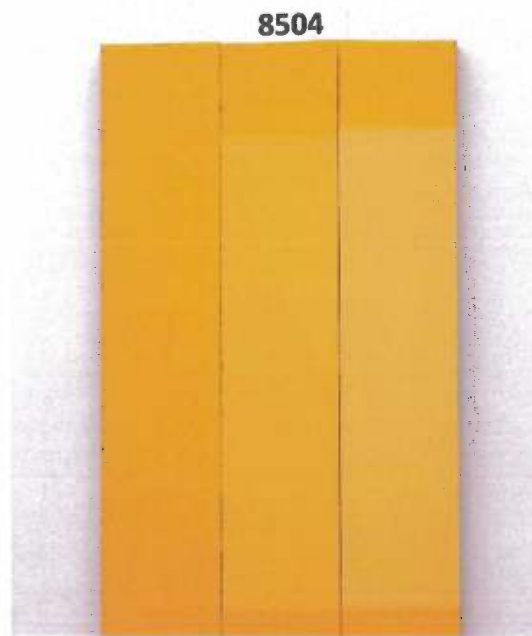


Design: 7703, Contrast rating: 1 L

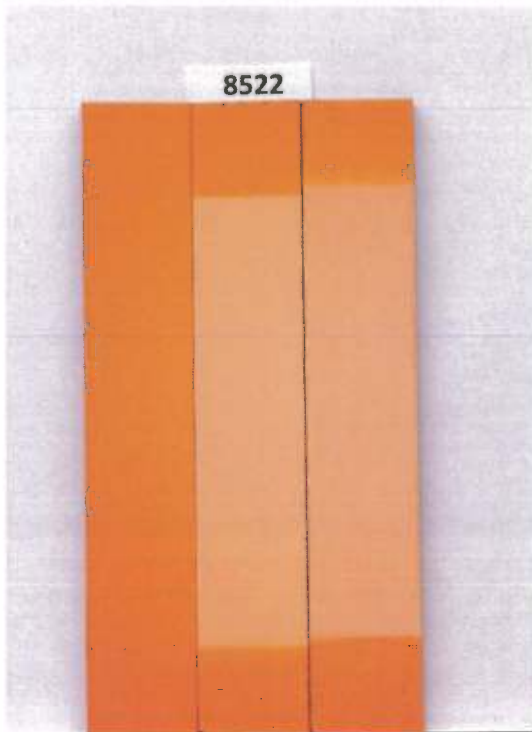
Appendix B (continuation), Test pieces with a contrast rating lower than 4 after exposure



Design: 7805, Contrast rating: 1-2 L



Design: 8504, Contrast rating: 2 L



Design: 8522, Contrast rating: 1 L