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Sealex Consultancy
Att. Mr. L. Schaap
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1019 KE AMSTERDAM

Your ref.: Enclosure: 1 Date: July 5th, 2006

Our ref.: BvdV/mm/06.643
Handled by: B. van de Velde, B.Sc.
E-mail: b.vandevelde@shr.nl
Concerning: Report “Resistance to water and abrasion of oil treated flooring" (project no. 6.033)

Dear Mr. Schaap,

Enclosed you will find, in duplicate, the report of our research on “Resistance to water and resistance to abrasion of oil treated flooring”.

Presuming to have informed you sufficiently,

Yours sincerely,
SHR TIMBER RESEARCH

B. van de Velde, B.Sc.
Project manager

Principal: Sealex Consultancy
attn. Mr. L. Schaap
C. van Eesterenlaan 340
1019 KE AMSTERDAM

Project manager: B. van de Velde, B.Sc.

1. Introduction

1.1 Assignment: Research on the resistance to water and abrasion of oil treated flooring

1.2 Date assignment: February 14th, 2006

2. Materials and methods

2.1 Tested product: Oil finished oak panels, supplied by the principal and additionally conditioned for 14 days at 23°C en 50 % relative humidity (RH).

2.2 Product description

Sample code	Description
1	Monocoat Oil Pure
2	Trip Trap Pure Natural
3	Mist Monocoat 0il
4	Walnut Monocoat Oil
5	Monocoat Oil Black (dark brown)
6	Monocoat Oil Mist 5
7	Trip Trap Black (dark brown)
8	Aquamarijn
9	Floor Service
10	Osmo
11	Leha Nuance VL 16 Wit
12	Leha Accent VL 96 Wit
13	Leha Accent VL 95 Transparant

2.3 Test methods

The supplied panels were submitted to and evaluated accorded to the following methods for resistance to water and abrasion:

Resistance to water

Resistance to (staining of) water was determined according to EN 13442:1999 'Wood and parquet flooring and wood panelling and cladding - Determination of the resistance to chemical agents". For 24 hours a damp cloth, covered with a Petri dish, was put in contact with the surface of the test panel. Test results are assessed in terms of a descriptive (5) numerical rating code, with"1" meaning "strong mark with the structure of the surface being changed or surface material being removed" and "5" meaning "no visible changes (no damage)".

Resistance to abrasion
The method for determination of the resistance to abrasion was based on de Dutch Standard NEN 2072 'Lamelparket – Beproevingsmethoden en keuring (*lamella parquetry – test methods and examination*)'.

For this test a Taber Abraser and CS 17 sanding wheels were used. In order to avoid contamination (become silted up) of the sanding surface of the wheels, these surfaces were cleaned after every 200 revolutions by rotating them over S11 sanding paper for 35 revolutions.

Unlike the use of a lacquer (coating) on a wooden floor, treatment with an oil does not lead to a solid (closed) layer on top of the wood surface. Therefore the following method and evaluation was used:
The specimens were examined for abrasion after 100, 200, 300, 400, 600, 800 and 1000 revolutions. Evaluation was done by determining whether Basantol-brown liquid (BASF) could penetrate through the oiled surface and spread throughout the vessels of the wood. The following rating was used:

- green minor penetration (< 5 points of penetration per cm^2)
- yellow average penetration (some wood vessels partly filled, > 5 points of penetration per cm^2)
- orange medium penetration (most wood vessels partly filled)
- red strong penetration ((nearly) all wood vessels filled)

For each oil treatment two specimens were tested and evaluated. Furthermore the contact angle of a drop of water on the surface was measured prior to the test and after every 200 revolutions.

3 Results

Resistance to water
Results of the test are shown in table 1.

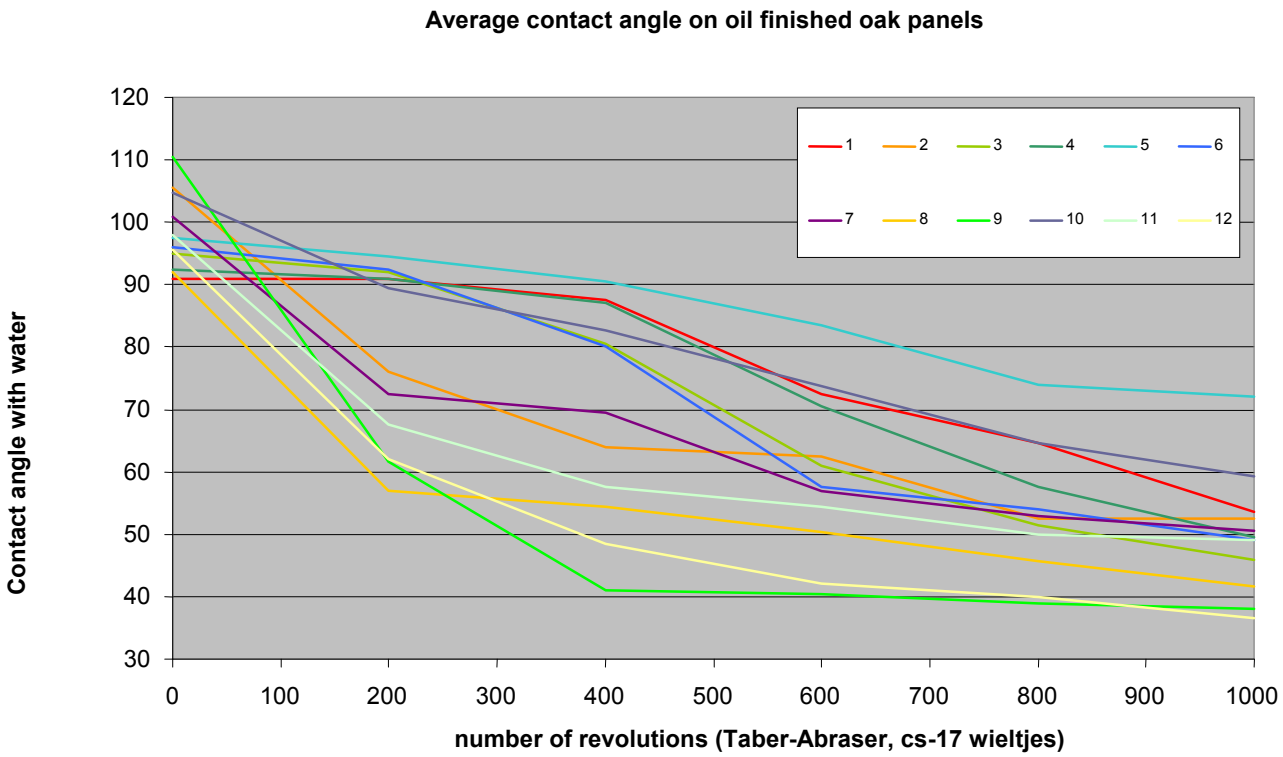
Table 1: Results of resistance to water

Sample code	Rating class	Remarks
1	5	no visible or sensible changes
2	3	white abrasion circle visible
3	5	no visible or sensible changes
4	5	no visible or sensible changes
5	4	minor changes
6	5	no visible or sensible changes
7	5	no visible or sensible changes
8	5	no visible or sensible changes
9	1*	very clear abrasion of the surface

10	5	no visible or sensible changes
11	3	abrasion circle clearly visible
12	3	abrasion circle clearly visible
13	3	abrasion circle clearly visible

* after 6 weeks, test was repeated on this specimen. The result was evaluated as class 4.

Resistance to abrasion

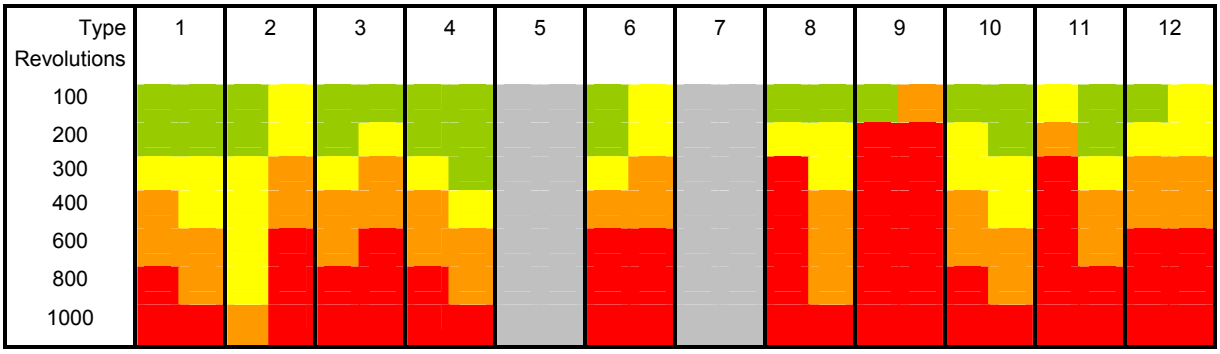


The contact angle between water and the oil treated surface during the abrasion test, is shown in the figure above. The angle mentioned is an average of s duplicate measurement of two specimens of each type of oil treatment.

Results show that shortly after starting the test, the contact angle is reduced rapidly for oil types 2, 7, 9, 8, 11 and 12 and consolidates afterwards. For other types of oil finishing the opposite effect could be observed: a consolidation of the contact angle in the first phase of the test and a reduction of the contact angle after 300-400 revolutions. In practice, this will result in a better protection of the wood surface. The surface of specimens finished with oil no. 5 maintained its contact angle for the largest amount of revolutions and performed best.

Results of penetration of Basantol-brown in the wood vessels is shown in figure 2.

Figure 2: Schematic reproduction of amount of penetration of brown liquid trough wearied oil treated surface



Evaluations of the penetration of brown liquid was difficult for oils no. 5 and 7 because these oils contained brown pigments themselves. Results of oil types 2 and 11 show large differences in resistance to abrasion between both test specimens. This is probably caused by variations in the wooden substrate.

Especially oil type 9 had minimum resistance to abrasion resulting in large penetration of the brown staining liquid after a minimum amount of revolutions. Oil types 8, 11 and 12 showed a similar effect after a somewhat higher amount of revolutions. Oil systems 1, 2 4 and 10 maintained their resistance to abrasion for a larger amount of revolutions.

B. van de Velde, B.Sc.
Project manager

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