

All tests included in this report are implemented according to ISO 9001
 Certified Management system of BBRI

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TEST REPORT

Laboratory	BHC "WOOD AND COATINGS"	O/Reference	DE651XM939 BHC15090 Page 1/4
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Requested by	Renolit Belgium nv Industriepark De Bruwaan 43 9700 Oudenaarde		
Date of the request	17/12/2015	Identification of the samples	S2016-6-12
		Reception of the samples	04/02/2016
Date of the report	17/04/2018		
Tests	Determination of the resistance of roof waterproofing to root penetration of the Alkorplan L – 1.5 mm		
Reference	EN 13948 (version 2007) Flexible sheets for waterproofing. Bitumen, plastic and rubber sheets for roof waterproofing. Determination of resistance to root penetration		

This report contains 4 pages and 1 annex; it may only be reproduced in its entirety. Each page of the original report has been stamped (in red) by the laboratory and initialed by the head of laboratory. The results and findings are only valid for the tested samples.

- No sample
- Sample(s) submitted to a destructive test
- Sample(s) to be removed from our laboratories 30 calendar days after sending of the report, unless a written request is received by the demander of the test

André Delhaye
 Technical cooperation



Ir. Stéphane Charron
 Responsible for the tests



Ir. Benoit Michaux
 Head of division

1 Introduction

The Alkorplan L is a calendared and laminated flexible PVC with glass fiber reinforcing. For this test, 2 membrane rolls and 24 inner corners (Type 81060-003, N° 71004) were delivered to the Limelette station of the BBRI and registered under the lab number BHC 15090.

The figure below shows the description of the provided samples.

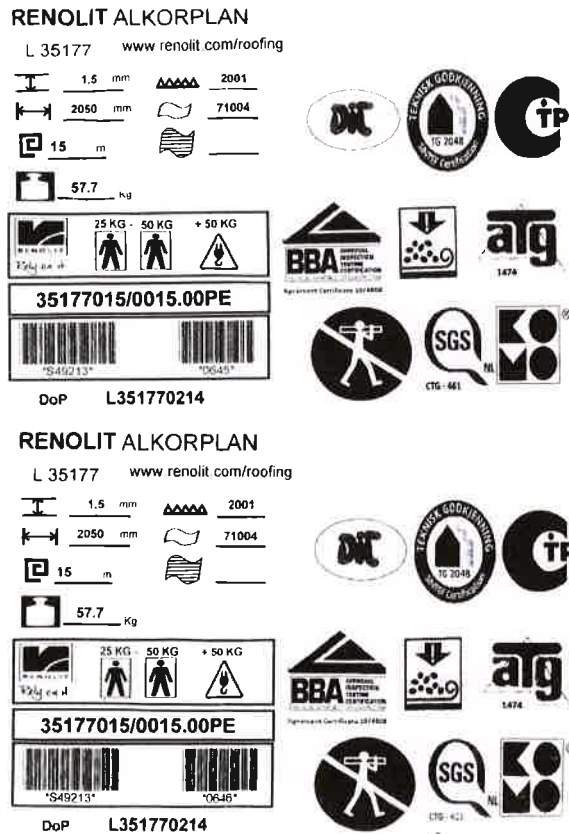


Figure 1 : provided samples

2 Description of the test specimens

2.1 Preparation of the test specimens

The samples were provided in Limelette, where the demander has prepared the six test specimens. Each test specimen has four wall corner joints, two base corner joints and one central T joint in accordance with the standard (see figure 2). These joints are hot-air welded by the demander.

On each wall corner, the demander welded by hot-air inner corners (Type 81060-003, N° 71004).

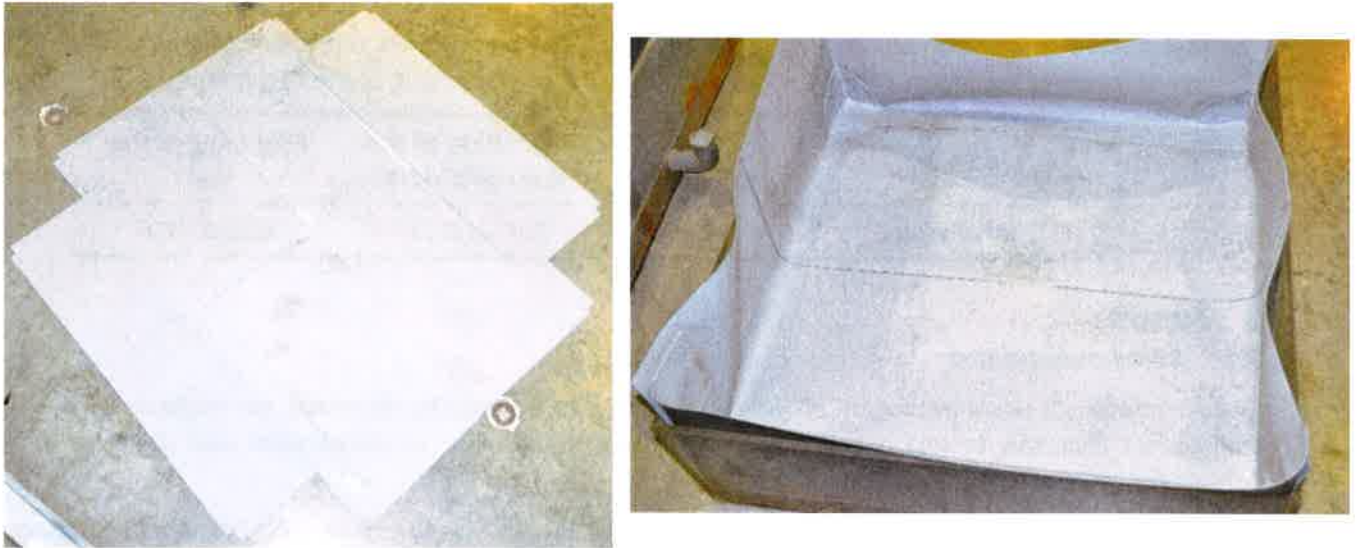


Figure 2 : test specimen

The test specimens were then placed in the test containers (numbered as follows: Z, W, A, I, S, E).

The test containers contain upwards (see figure 3) :

- A transparent base;
- A moisture layer (coarse mineral granulates);
- A pressure distribution layer (fleece);
- The roof waterproofing sheet;
- The growing substrate (70 % by volume barely decomposed peat and 30 % by volume of expanded slate/clay);
- Test plants: *Pyracantha coccinea* 'Orange Charming' – 4 test plants per container.

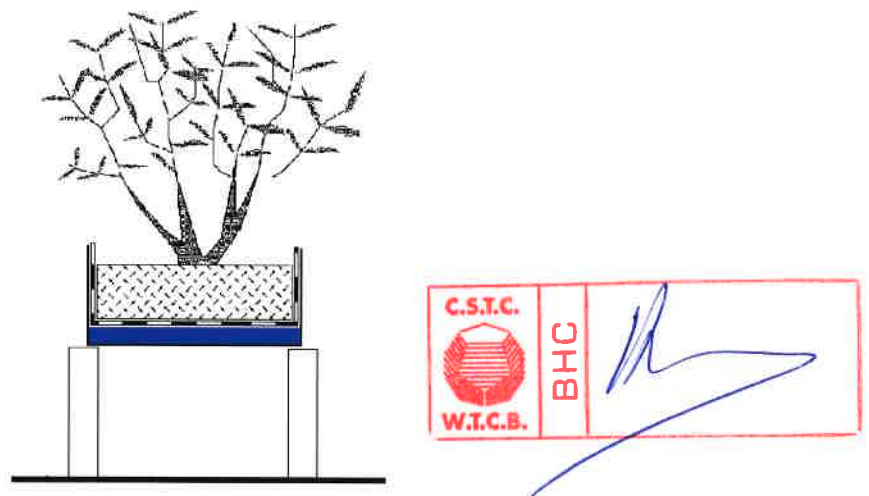


Figure 3 : Test container

The inside dimensions of the test container are 800 x 800 x 250 mm. For the water supply to the moisture layer, the containers have a filler pipe, with a diameter of 35 mm, ending near the base tray.

As recommended by the standard, two additional containers, 'control' containers, (numbered as follows: N and 33) were tested without any membrane to control plant growth.

The test started on 29 February 2016. The university of Louvain-la-Neuve (Earth and Life Institute) answered for the maintenance of the plants and water and manure supplies, according to the regulations of the standard.

Sheet	Test containers	Preparation of the test containers	Beginning of the test
Alkorplan L	6	05/02/2016	29/02/2016

3 Results

3.1 Midterm inspection

Every 6 months, a visual inspection of the membrane is carried out by observing the moisture layer through the transparent base tray of test containers. During these inspections, no penetration was observed in the 6 test containers.

At the end of the first test year (march 2017), plant growth is assessed by measuring height and diameter at 20 cm above the substrate of the longest branches per plant (see Appendix 3).

3.2 Final inspection (March 2018)

At the end of the test period, no dead plant or plants with sicknesses or moulds were observed. The growth difference of the plants between the test containers and the control containers respect the criterion of the standard (see appendix 2). The sheet Alkorplan L has no influence on the growth of the plants.

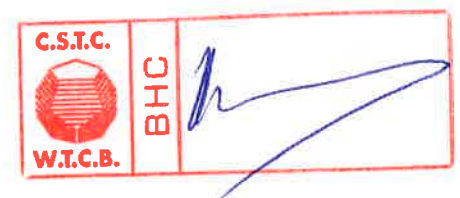
The inspection of the test specimens has shown no penetration according to the standard.

We observed in 2 test containers (E and I) that roots could develop between 2 sheets because of a local defect of the weld. For test container E, the roots developed at the base corner joints (at 2 places) and for the test container I, in a wall corner. However, their development was stopped at the right of a weld properly performed. These are then not considered as penetrations according to the standard.

4 Summary

The sheet "Alkorplan L" was tested of end February 2016 up to early March 2018 by the BBRI in association with the U.C.L - Earth and Life Institute.

At the end of the test, no penetration according to the standard EN 13948 was observed in the 6 test containers.



Annex 1 : Picture

Step 1 : Preparation and installation of the test containers



Step 2 : Growth of the plants in the test containers

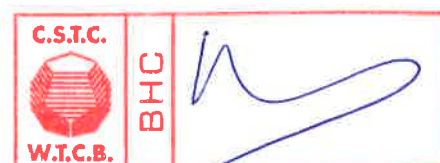
- After 6 months



- After 18 months



Step 3 : Final inspection



Annex 2 : Measurement of plants growth after six months and two years

Membrane "Alkorplan L"

N° container	N° plant	Test containers			
		14 March 2017		14 March 2018	
		Height (m)	Diameter (mm)	Height (m)	Diameter (mm)
Z	1	2.05	8.99	2.30	11.99
	2	2.20	11.15	2.52	13.29
	3	2.30	14.25	2.73	17.50
	4	1.55	8.50	1.90	10.72
W	1	2.00	10.20	2.36	13.37
	2	1.70	10.90	2.33	13.24
	3	1.90	10.90	2.10	13.31
	4	2.00	9.25	2.05	13.76
A	1	2.80	13.00	3.02	14.45
	2	1.90	9.95	2.63	10.40
	3	2.25	9.00	2.40	10.59
	4	2.50	9.85	2.52	10.42
I	1	2.00	10.95	2.30	13.81
	2	2.00	10.15	2.17	13.10
	3	1.90	9.25	2.30	10.63
	4	2.00	10.05	2.69	10.79
S	1	2.55	10.39	2.75	12.70
	2	2.35	15.50	3.07	15.03
	3	2.30	11.99	2.58	12.96
	4	1.40	9.55	1.84	12.34
E	1	2.50	10.15	2.55	11.53
	2	1.95	9.65	2.46	13.04
	3	2.00	8.30	2.45	11.51
	4	2.55	12.42	2.70	14.53

N° container	N° plant	Control containers			
		14 March 2017		14 March 2018	
		Height (m)	Diameter (mm)	Height (m)	Diameter (mm)
N	1	1.5	6.70	1.75	10.45
	2	2.6	11.75	2.75	13.75
	3	2.15	13.05	2.82	13.8
	4	2.15	9.90	2.63	11.78
33	1	2.15	12.30	2.51	14.06
	2	2.05	10.20	2.29	12.29
	3	1.95	10.50	2.28	11.69
	4	2.3	10.20	2.52	10.74

Checking of the increase growth of the plants

	2017		2018	
	Height	% of control plant	Height	% of control plant
Reference	2.11		2.44	
"Alkorplan L"	2.11	100 %	2.45	100 %

	2017		2018	
	Stem diameter	% of control plant	Stem diameter	% of control plant
Reference	10.58		12.32	
"Alkorplan L"	10.60	100 %	12.71	103 %

