DANISH
TECHNOLOGICAL
INSTITUTE

INDICATIVE TEST

Product:
PVC-U pipes for underground drainage and sewerage
Comparison between sun whitened pipes and freshly produced pipes

Size group 1
Pipes d 160 SN8

Applicant:
Nordisk Wavin A/S
Wavinvej 1
DK-8450 Hammel

Manufacturing site:
Nordisk Wavin A/S
Wavinvej 1
DK-8450 Hammel

Date:
4 August 2011

Contact person:
Kent Lemming, Product Manager

Order No.:
441913

Testing according to:
EN 1401 and own specification

Energy and Climate

TEST Reg. No. 300

DANISH TECHNOLOGICAL INSTITUTE

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Test report

Date: 4 August 2011
Order No.: 441913
Initials: VSP/KLE/MRI
Number of appendices: 3

Applicant:
Nordisk Wavin A/S
Wavinvej 1
DK-8450 Hammel

Manufacturing site:
Nordisk Wavin A/S
Wavinvej 1
DK-8450 Hammel

Danish Technological Institute has carried out testing of the following product(s):
PVC-U pipes for underground drainage and sewerage

in compliance with the specifications stated in:
EN 1401 and own specification

Result:
The requirements in the above specifications were met.

Conditions:

Accredited testing was carried out in compliance with current guidelines laid down by DANAK (Danish Laboratory Accreditation Scheme), please see www.danak.dk, and in compliance with Danish Technological Institute's General Terms and Conditions regarding Commissioned Work Accepted by the Danish Technological Institute, February 2009.

The test results apply to the tested products only.

This test report may be reproduced in extract only if the Laboratory has approved the extract in writing.

Division/Section: Energy and Climate
VA Testing and Inspection

Signature:

Kent Lemming
Product Manager

Indicative test

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Product:	PVC-U pipes for underground drainage and sewerage
Certification body:	-
Samples taken by:	Danish Technological Institute/KLE
Place of sampling/inspection:	Nordisk Wavin A/S
Date of sampling/inspection:	11 October 2010
Date of receipt:	14 March 2011 and 25 July 2011
Date of reply:	4 August-2011
Testing site:	Nordisk Wavin A/S (NW)/Danish Technological Institute (DTI)

Test programme in accordance with: EN 1401 & INSTA SBC 1401			Testing site	Table No.	Requirements met		Accredited		Sub contractor Accreditation No.
					Yes	No	Yes	No	
SBC	Table 5	K-value	NW	1	X		X		
4.1		PVC content	NW	1	X		X		
4.2	Table 1	Resistance to internal pressure	NW	2	X		X		
5.1		Appearance	DTI	3	X		X		
6.2 and 6.4	Tables 3 and 4	Dimensions	DTI/NW	4	X		X		
7.1.2	Table 10	Impact resistance, pipes	NW	5 - 6	X		X		
8.1	Table 12	Vicat softening temperature	NW	7	X		X		
8.1	Table 12	Resistance to dichlorometane	NW	8	X		X		
12.2	Table 16	Marking, pipes	NW	9	X		X		
9.1.1	Table 15 EN 13476-2	Ring stiffness	NW	10	X		X		
		Pictures	NW	Appendix 2	X				
		Material certificate	Shin Etzu	Appendix 3	X				

Foreword

It is a well-known fact that when PVC-U pipes are stored in open air for long periods of time, the UV rays from the sun light "whiten" the surface of the pipes. Therefore, it is generally advised that pipes should not be stored in open air for more than one year.

It is often said that the whitened layer will form a barrier so that the UV rays will be blocked when the layer has a certain, but not declared, value.

Now and then the effect of the whitening is disputed between users and suppliers.

This report informs about the technical influence on essential standard characteristics of the whitening of a pipe stored in open air for 25 months compared to a freshly produced pipe of the same size, stiffness class and material composition, 160 mm, SN 8.

A summary of the results is shown in the table below.

Characteristic	Test results		Standard requirement	Requirements met
	Fresh pipe	Whitened pipe		
Resistance to internal pressure, 60 °C, 10 MPa	>1300 h *)	>1300 h *)	>1000 h	Yes
Resistance to internal pressure at 50 % higher stress, 60 °C, 15 MPa	1517:29 h	1669:21 h	No standard requirement is given, but the time to failure is longer than required for the 33 % lower stress level	Yes
Dimensions, outside diameter and wall thickness	Within the specified tolerances	Within the specified tolerances	Within the specified tolerances	Yes
Impact resistance	H 50 2775 mm and lowest break 2700 mm	H50 2793 mm and lowest break 2700 mm	H50 ≥ 1000 mm and max. 1 break below 500 mm	Yes
Thickness of the whitened layer	-	0.16 mm	No standard requirement given	-
Vicat softening temperature	83.99 °C	83.69 °C	≥ 79 °C	Yes
Resistance to dichloromethane	No attack	No attack	No attack	Yes
Ring stiffness	10.22 kN/m^2	10.87 kN/m^2	≥ 8 kN/m^2	Yes

*) Test stopped after 1300 hours. None of the pipes were broken.

As a comparison must be based on time to failure, an additional resistance to internal pressure test was started with a 50 % higher stress level in order to obtain a shorter time to failure.

Conclusion

For the standard resistance to internal pressure (60 °C/10 MPa/1000 h) the test shows that both pipes more than meet the standard requirements.

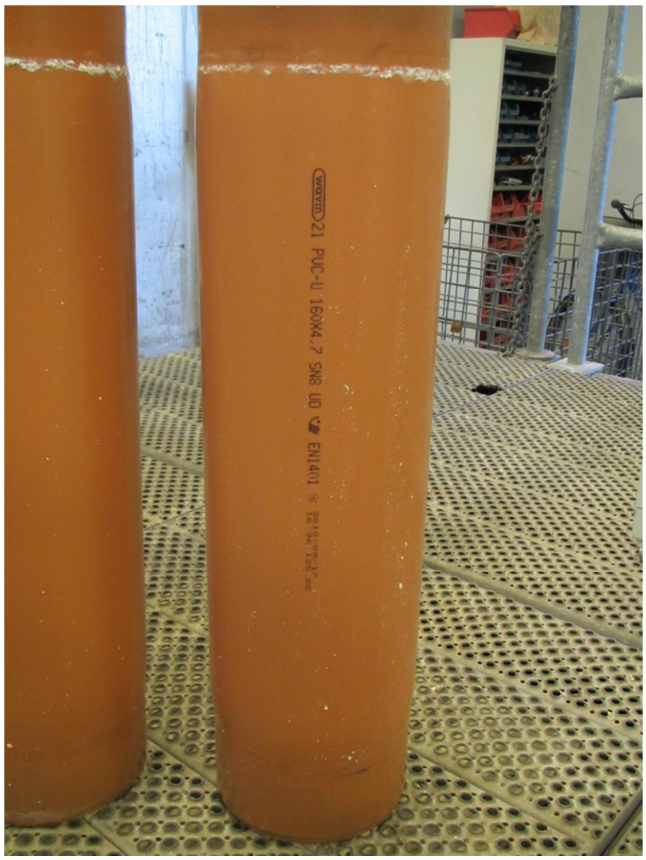
In order to obtain a comparative result on the characteristic “resistance to internal pressure”, an extra test was set up with a 50 % higher stress level in order to obtain a relative short time to failure. This test shows that the time to failure for the two pipes is on the same level.

The results of the other tested characteristics indicate that the significant whitened pipe has same the level of performance for the tested characteristics.

The deviations found in the test results are within the expected statistical spread of results for the test methods used.

The test results show that the whitening of a PVC-U pipe has no significant influence on its performance when tested for the characteristics covered by this report.

The details of the testing and test pieces are reported below.



Fresh pipe after the pressure test of 1300 hours.

Sun whitened pipe after the pressure test of 1300 hours.