



Industrie Service

**Add value.
Inspire trust.**

Test report

Order no.: 3229268
Expert: Mindl

Client: Windt Corporation Kft.
Labanc str. 7/A
1021 Budapest

Date of order: 06.01.2020

Date: 2020-07-23

Order reference: Mr. Windt

Our reference:
IS-AN5-MUC/md-kr

Document:
Windt-md-3229268-2-GWR-
artificial weathering.docx

Report No. 3229268-2

This Document consists of
9 Pages.
Page 1 of 9

Purpose of order: 3000 h Artificial weathering on
GWR Nano Insulation

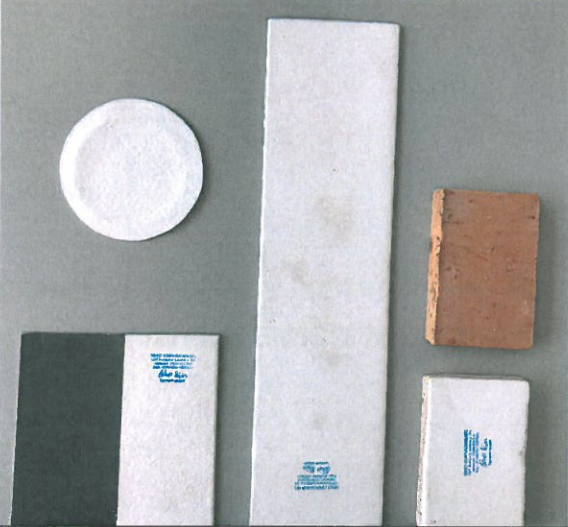

Excerpts from this document
may only be reproduced and
used for advertising purposes
with the express written approval
of
TÜV SÜD Industrie Service
GmbH.

The test results refer exclusively
to the units under test.

1. Procedure and purpose

The Windt corporation commissioned the TÜV SÜD Industrie Service GmbH, Institute for plastics, with the testing of artificial weathering on GWR Nano Insulation.

2. Test object

Prüfling Sample	Bild Picture
<p>Samples of GWR Nano Insulation 1 mm thickness on</p> <ul style="list-style-type: none"> - <i>metal sheet</i> - <i>concrete brick</i> - <i>free films</i> 	
<p>specimen in delivery box</p>	



Industrie Service

3. Testing

3.1 Paints and varnishes –Methods of exposure to laboratory light sources –Part 2: Xenon-arc lamps (ISO 16474-2:2013); German version EN ISO 16474-2:2013

Parameters:

Time:	3000 hours
Cycle:	102 min dry, 18 min rain exposure
Blackstandard (SST):	65 °C ± 3 °C
Rel. humidity:	50 % rel. ± 10 % (Trockenphase)
Irradiance:	0,51 ± 0,02 W/m ² (340Nm)

3.2 Paints and varnishes – Methods of exposure to laboratory light sources – Part 3: Fluorescent UV lamps (ISO 16474-3:2013); German version EN ISO 16474-3:2013

Parameters:

Time:	up to 3000 hours
Conditioning period:	8/4; 480 min. UV / 240 min condensation
Temperature:	Blackstandard (60 ± 3) °C
Irradiance:	0,76 W/(m ² * nm) bei 340 nm

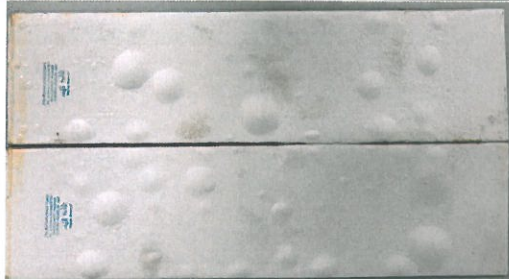

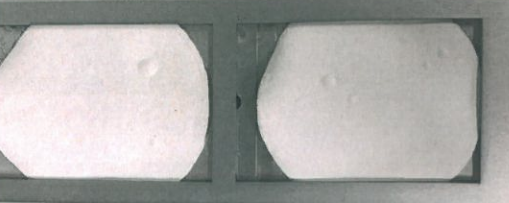


Industrie Service

4. Testing equipment

Testing equipment	QS-Number	Manufacturer	Status	Nächste Kal. Next cal.
Q-SUN Xe-3	00402945	Q-Lab	cal	2020-10
Radiometer CR 20 / 340	00402942	Q-Lab	cal	2020-07
QUV Spray	00403025	Q-Lab	cal	2020-10
Radiometer CR 10 / 340	00402942	Q-Lab	cal	2020-07

5. Intermediate results and summary after 720h

Prüfling Sample	Optische Bewertung visual evaluation	Bild Picture
metal sheet	small bubbles* on the surface during UV test no color changes no issue on Xenon test	
concrete brick	no bubbles no color changes	
free films	small bubbles* on the surface during UV test no color changes no issue on Xenon test	

*bubbles could be caused by high temperatures ≥ 50 °C and humidity ≥ 95 % rel h. during condensation phase

6. Results and summary after 3000h

The following figures show a comparison between the different methods of exposure to the laboratory light sources UV and Xenon-Arc after 3000h.

6.1 GWR NANO INSULATION applied on metal sheet

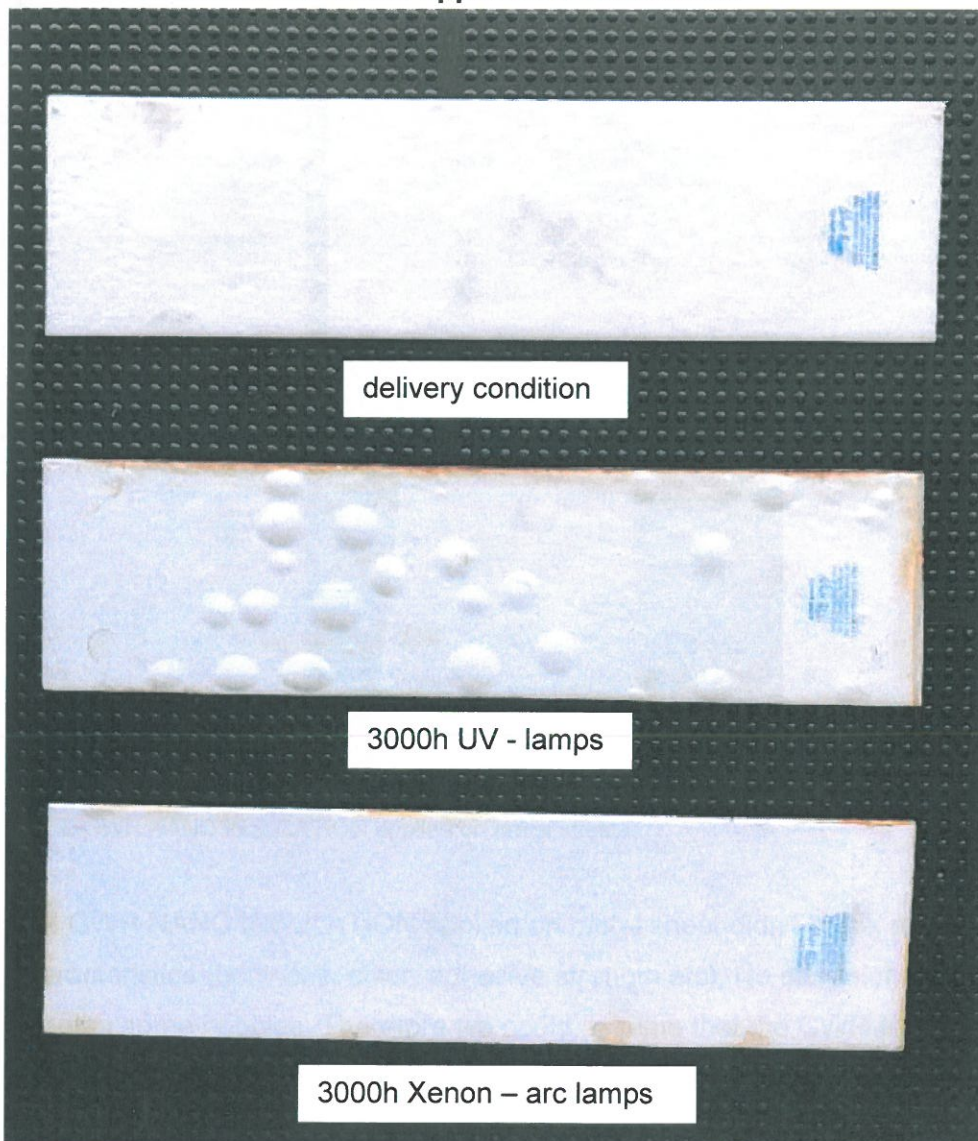


Fig. 1: Comparison GWR NANO INSULATION applied on metal sheet

Conclusion: No measurable color change compared to the delivery condition, no flaking or adhesive strength after 3000h with both exposure to light methods. During UV test blistering occurred already after 720h of exposure but the effect didn't deteriorate after 3000h.

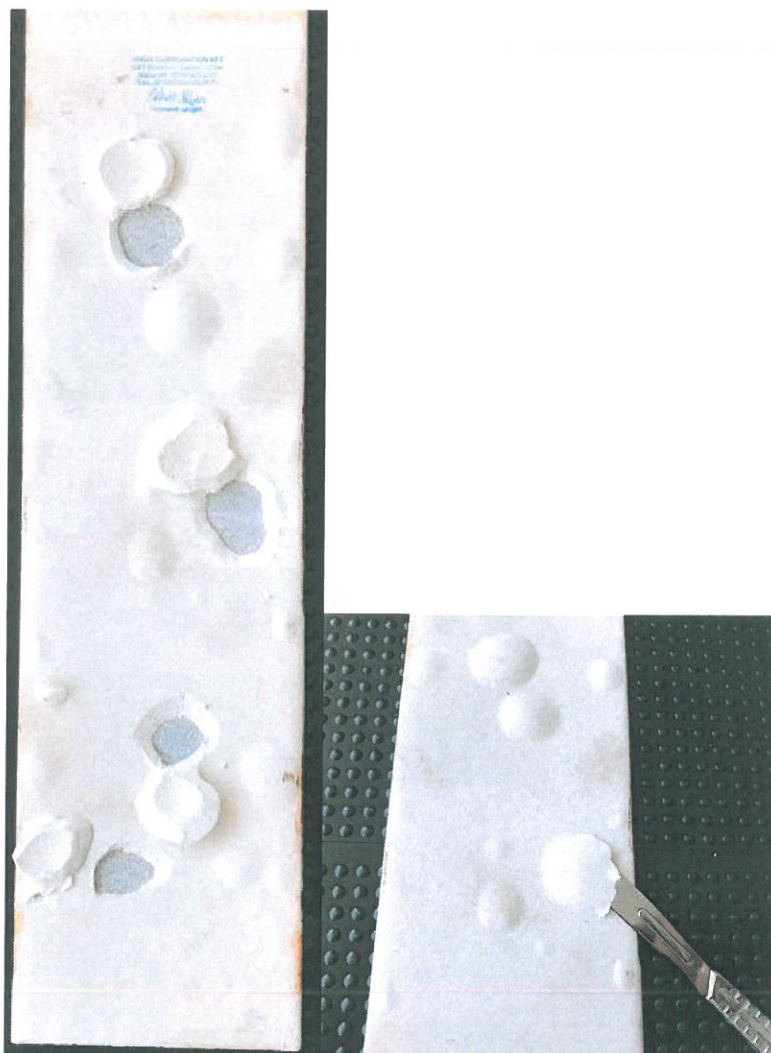


Fig. 2: GWR NANO INSULATION applied on metal sheets

The GWR NANO INSULATION applied on metal sheet didn't break open or change its characteristics (brittleness, color, adhesive strength etc). No corrosion was detected after opening some bubbles. Therefore we could assume that the GWR NANO INSULATION wasn't correctly applied to the metal sheet. GWR NANO has a pretty high water-vapour transmission rate (see report *Determination of the vapour transmission coefficient (sd-value) on GWR NANO INSULATION coating*) which could lead to water accumulation in small voids between GWR NANO and the metal sheet (the metal sheet is a water diffusion resistant barrier) during the condensation phase. In the UV cycle the accumulated water between the layers evaporates and forms the blisters. TÜV SÜD strongly recommends to follow the producers' application instructions to avoid this kind of behaviour.

6.2 GWR NANO INSULATION free films

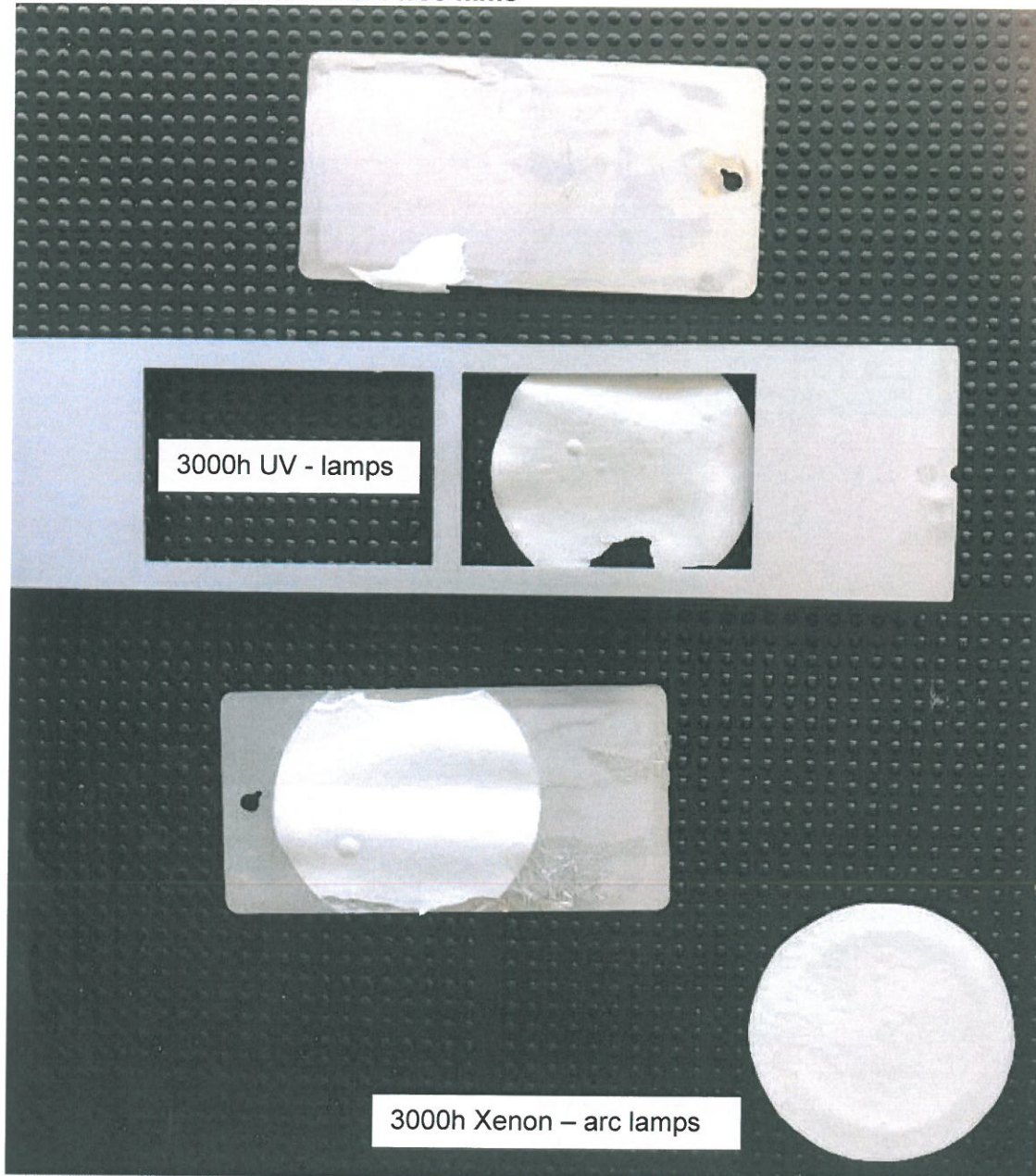


Fig. 3: GWR NANO INSULATION free films

Fig.:3 shows the same effect of blistering during the UV test whereas no remarkable changes were observed during the xenon arc test. The free films agglutinated to the alloy support bracket and showed a higher level of brittleness. As this test is only informal, TÜV SÜD didn't investigate the mechanism behind this effect.

6.3 GWR NANO INSULATION applied on concrete brick surface

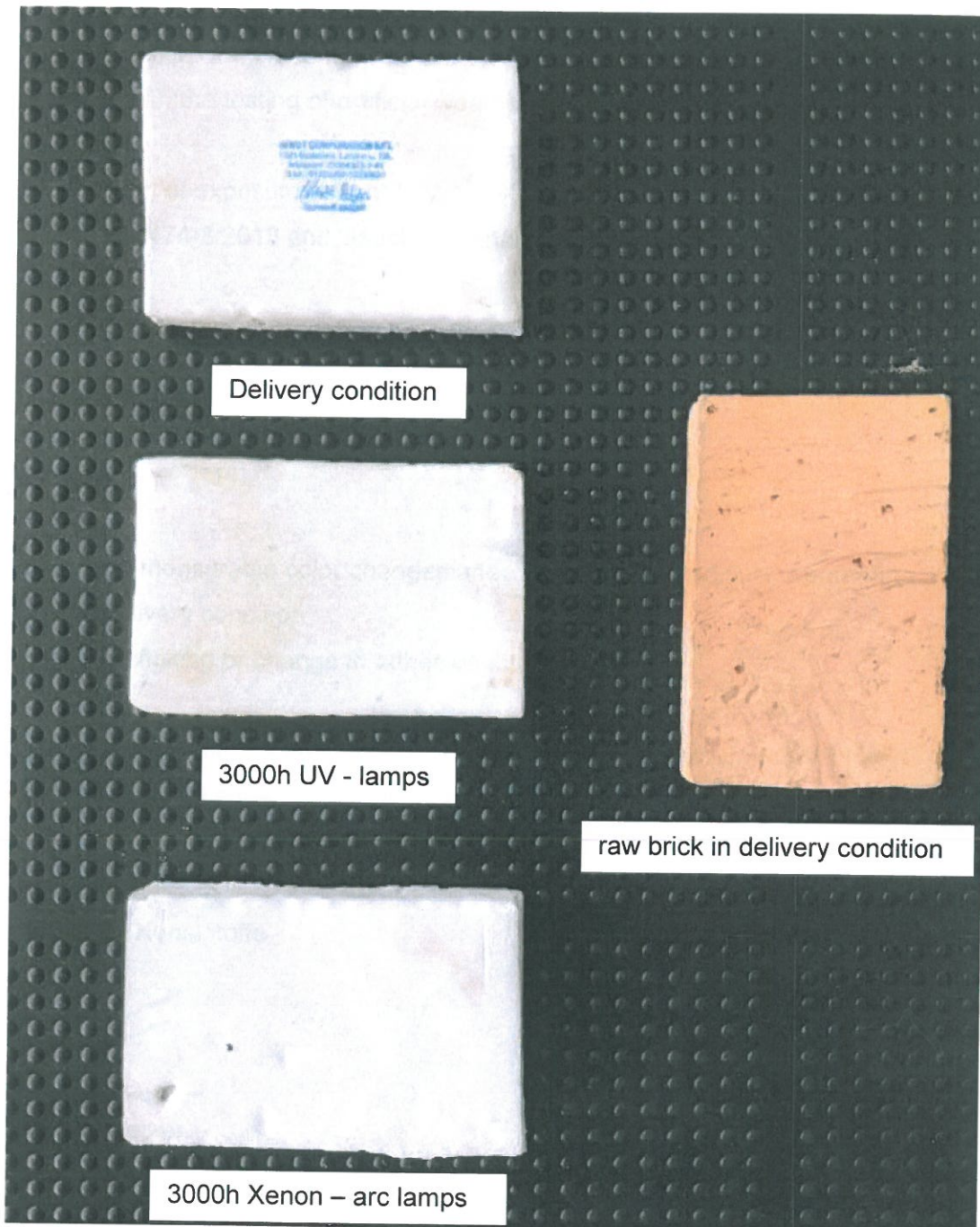


Fig.4: Comparison GWR NANO INSULATION applied on concrete brick surface

Conclusion: No measurable color changes after 3000h compared to the delivery condition with both exposure to light methods. No flaking or change in adhesive strength. The slight discoloration can be easily removed by cleaning with water.



Industrie Service

7. Summary and Evaluation

The Windt corporation commissioned the TÜV SÜD Industrie Service GmbH, Institute for plastics, with the testing of artificial weathering on GWR NANO INSULATION.

After 3000h of exposure to light (UV and Xenon Arc) according to EN ISO 16474-2:2013 and EN ISO 16474-3:2013 and visual examination the GWR NANO INSULATION applied on

- metal sheets
- concrete bricks
- free films

showed

- no measurable color changes after 720h & 3000h artificial weathering compared to the delivery condition
- no flaking or change in adhesive strength

During the UV test blistering already occurred after 720h only on GWR NANO Insulation applied on metal sheets. The effect described under point 6.1 didn't deteriorate after 3000h.

Institut für Kunststoffe


i. A. Schweizer



The Expert


Mindl