

8 November 2011

Nuralite Waterproofing Co Ltd
53A Victoria Street
Onehunga
Auckland

Attention: John Simmons

Dear Sir

Re: Nuraply 3PT, 3PTM and 3PG Membrane Systems

Thank you for providing a report on the above products.

Based on the documents provided Auckland Council accepts Nuraply 3PT, 3PTM and 3PG Membrane Systems complies with the New Zealand Building Code in particular clauses B2, E2 and F2.

When applying for a building consent where these products are to be used, the specifier will need to clearly identify this on the working drawings of the Building Consent application. Relevant details for the product will need to be included as part of the Building Consent documentation. Can you please inform your applicators that if this product has not been approved as part of the issued Building Consent, an amendment to the Building Consent will need to be approved for its use, prior to work commencing. Furthermore the approval is given subject to the following conditions

At the completion of the works and prior to the issue of the Code Compliance Certificate, the applicant shall provide to Auckland City Environments the following documentation to assist Council in establishing compliance with the Building Code.

- 1) Copy of applicators approval certificate from Nuralite Waterproofing Co Ltd
- 2) Copy of Workmanship Statement from the applicator
- 3) Copy of manufacturer's warranty

If any changes to this product occur, please inform Council prior to the changes being implemented. This will allow the Council to determine if it is satisfied the proposed changes will continue to meet the requirements of the Building Code.

Please be aware this approval may change/ be withdrawn as industry knowledge, Building Codes and Acts change. If you wish to re-produce this letter, please ensure it is reproduced in full.

Yours sincerely
Auckland Council



Ian Godfrey
Senior Technical Building Specialist

Antwerp, 11.08.11

To Whom It May Concern:

We, ATAB NV, international expert in production and advice for flexible waterproofing systems, confirm following:

If the Nuraply 3 PG, root-resistant polymer modified bitumen membrane, or Nuraply 3PT or 3PTM are buried then, based on practical experience, ATAB anticipates that the membrane will continue to perform its function for in excess of 50 years.

Sincerely Yours,

Atab n.v.



Luc van Audenhaege
Polygum Roof Engineer

Geisenheim Research Institute

Landscape Gardening Department

Geisenheim Research Institute, POB 1154, D-65358 Geisenheim

ATAB NV
d'Herbouvillekaai 80
B-2020 Antwerp

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Date: **2.7.1999**

Test report on the investigation of resistance to root penetration in roof gardens in accordance with the FLL (German Landscape Research, Development and Construction Society) test (as-at date 1992)

Product description: Polygum Roof Garden T Mec

Customer:
ATAB NV
B-2020 Antwerp

Investigation carried out by:
Landscape Gardening Department,

Geisenheim Research Institute

65366 Geisenheim

Date of report:
2 July 1999

The report contains 18 pages
and may only be used in its complete form

Von-Lade Strasse 1, 65366 Geisenheim, Telephone: 067 22/502-0 Fax: 067 22/50 2212 Email

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Information provided by ATAB NV of 25.5.1999 on the key data and material properties of the test roof and sealing membrane, Polygum Roof Garden T Mec.

- **Product name:** Polygum Roof Garden T Mec
- **Area of application:** roof sealing membrane
- **Material base:** APP bitumen
- **Thickness:** 4 mm
- **Finishing:** polyester fleece 200 g/m²
- **Delivery form:** rolls, 5, 7.5 and 10 m long, 1 m wide
- **Production technology:**
- **Material standards:** DIN 52 133, DIN 52 123
- **Test certificates:** gen. building inspection certificate
P-221640697, test certificate MPA NRW
No. 220774997

- **Year of manufacture:** 1995
- **Layer/insert that provides protection against root penetration:** Outer and/or supporting layer
- **Installation technique at test location, joint separation, overlapping*:**
covering full area, 8 cm seam overlap

- **Joining technique:** flame welding method
- **Manufacturer's declaration on plant-damaging materials contained in the sealing membrane, as well as on compliance with regulations and ordinances on plant protection and environmental compatibility:**

The company that manufactured the test membrane, ATAB NV, hereby confirms that the membrane contains no components that damage plants. Furthermore, the product has been manufactured in compliance with German federal and state regulations and ordinances on plant protection and environmental compatibility.

* Information provided by the author

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1. Problem

A system that is resistant to root penetration must provide permanent protection against damage to the roof sealing membrane from parts of plants that may grow into it or penetrate it. Root barriers must therefore demonstrate a high resistance to attack from plant roots and rhizomes (underground stem shoots). In the test carried out, the product Polygum Roof Garden T Mec from ATAB NV was tested for resistance to root penetration.

2. Test equipment and performance of the test

The investigation was carried out in accordance with the “Test for analyzing protection against root penetration in roof gardens” (FLL, 1992).

The four-year experiment was conducted between 5 May 1995 and 29 June 1999. It involved 8 containers fitted with the test membrane, and 4 containers with a bitumen slab as control.

The containers were placed in a covered vegetation hall that was open on all sides. The sealing membrane was supplied to the Landscape Gardening Department at the Geisenheim Research Institute by ATAB NV and installed in the containers. Staff at the Geisenheim Research Institute prepared the bitumen plates and installed them in the containers.

Reference samples were taken from the test membrane before and after the investigation and these have been stored at the research institute.

The plants used in the test were grey alder, European aspen and, in accordance with the 1992 amendments to the regulations for performing the test, couch grass was used instead of creeping thistle.

The full description of the currently valid method used at the time the membrane was installed can be found in Annex 3 of the present report.

3 Manufacturer’s information on the test membrane

The investigation of the resistance to root penetration is linked to the key data and material properties of the test membrane, as well as to the joint and manufacturing technology. The relevant information from the manufacturer on the test membrane Polygum Roof Garden T Mec is listed on page 2 of this report.

4 Results

4.1 Plant development

Over the entire period of the test, the shrubs planted (2 grey alders and European aspens per container) and the couch grass sown generally developed well. There was no noticeable difference between the control and test containers in terms of plant development.

Information on vitality and growth performance of the test plants can be found in Annex 2.

4.2 Radication and root penetration (see photos in Annex 1)

4.2.1 During the investigation

Numerous roots could already be seen in the transparent bases of the containers at the time of the first vigorous growth in October 1995. This meant that the bitumen plates had been penetrated by roots within six months, indicating considerable root pressure from the plants used. In the case of the test membrane, however, no root penetration was observed at the base of the container throughout the test period. Likewise, no couch grass rhizomes were observed growing into or penetrating the seam overlap, although during the test it was only possible to visually assess the section of the seams that extended above the substrate.

4.2.2 At the end of the test

No. 4	none	none	none	none	none	none
No. 5	none	none	none	1r	none	1r (E)
No. 6	none	none	none	none	none	2r (E)
No. 7	none	none	none	none	none	none
No. 8	none	none	none	none	none	none

*: penetration up to 3 mm
(E): corner seam

A rhizome tip had penetrated the area of the membrane approximately 4 mm into the outer bitumen layer, while a total of 5 roots had penetrated roughly 4 mm into the corner seams. The polyester fleece was undamaged by either penetrating roots or rhizomes.

5 Conclusions

Roots did not penetrate the area or seams of the root protection membrane with the product name Polygum Roof Garden T Mec. The rhizome tips that extended a few mm into the area and corner seams as far as the polyester fleece did not damage the root protection membrane defined by the manufacturer (carrier insert).

In accordance with the FLL test, therefore, the APP bitumen strip with the product name Polygum Roof Garden T Mec, produced by the company ATAB NV, is deemed to be root-resistant.

The investigation of resistance to root penetration is linked to the key data and material properties of the test membrane listed on page 2 of the report, as well as to the joint and manufacturing technology.

Reference samples from the test membrane have been stored in the Landscape Gardening Department of the Geisenheim Research Institute.

The report contains 18 pages and may only be used in its complete form.

[signature]
Dr. Roth-Kleyer
[stamp]

12 August 2011

To whom it May Concern.

**EXPERT OPINION: NURAPLY 3PT, 3PTM AND 3PG AS EXTERNAL TANKING
MEMBRANES**

Nuraply 3PT, 3PTM and 3PG are 3-4mm thick, tough, flexible, non-woven polyester reinforced bituminous waterproofing membrane systems.

The Nuraply systems are installed against external walls and underslabs by heat welding the underside of the membrane to Nuraflux primed surfaces. All joints are heat-welded to seal the membranes together.

Nuraply 3PT, 3PTM and 3PG are recommended in situations where moderate hydrostatic pressure is likely and particularly if underslab tanking is required. The entire systems are positive waterproofing that is watertight immediately upon installation.

Once applied under floor slabs and foundations and to the exterior face of basement retaining walls they prevent water vapour penetrating to the interior face in spaces where moisture may cause damage

Having reviewed Nuralite's literature and test reports, in my opinion, Nuraply 3PT, Nuraply 3PTM and Nuraply 3PG if designed, used, installed and maintained in conjunction with Nuralite's literature, will meet the following provisions of the NZBC:

Clause B2 DURABILITY:

Performance B2.3.1 (a) not less than 50 years product performance expectancy

Clause E2 EXTERNAL MOISTURE:

Performance E2.3.3. Roofs and Walls shall prevent the penetration of water

Clause F2 HAZARDOUS BUILDING MATERIALS:

Performance Substrate Design F2-3-1. Does not pose a hazard to humans

Comparison to existing Compliance Documents

During the E2/AS1 transition period the relevant comparison is with 12.2.2 DPM materials.

The following are acceptable damp-proof membrane materials acceptable solutions:

- a) Mastic asphalt complying with BS 6925, and which is applied in at least two layers to give a membrane thickness of no less than 30 mm under floor slabs and 20 mm on walls,*
- b) Modified bituminous sheet comprising modified bitumen on a polyethylene backing, with or without layers of fabric reinforcement,*
- c) Synthetic rubber sheet,*
- d) Polyethylene sheet having minimum thickness of 0.25 mm, and*
- e) Liquid coatings, such as bitumen or tar emulsions, and those based on epoxies or urethanes.*

Nuraply 3PT, 3PTM and 3PG compare very favorably against clauses c) and d) but are most closely aligned to clause b).

The main difference is that Nuraply 3PT, 3PTM and 3PG lack a polyethylene backing. The backing is not part of the waterproofing, rather it provides some robustness from penetration of foreign materials. The Nuraply membranes are sufficiently robust not to require a backing because:

- They are a minimum of 3mm thick whereas most membranes which qualify under clause b) are between 1 and 1.5mm thick
- They are reinforced with 180g/m² of non-woven polyester whereas most membranes which qualify under clause b) are not reinforced at all.

In my opinion, Nuraply 3PT, Nuraply 3PTM and Nuraply 3PG are very similar to current Acceptable Solutions. The slight differences serve to improve the performance of the Nuraply 3PT, Nuraply 3PTM and Nuraply 3PG systems above The Code requirements and alternative waterproofings.

History of Use

Nuraply 3PT, Nuraply 3PTM and Nuraply 3PG have been used in buried situations throughout New Zealand for over a decade now.

I have reviewed Nuralite's remedial issues file and can confirm that none of these jobs have presented any problems since installation.



Rotorua Hospital



Rippon Vineyard, Wanaka



Bleakhouse Road, Howick



Mace Residence, Bay of Islands



Barley Station, Queenstown



Khandallah Road, Wellington



Waiheke Island Garage



Orakei, Auckland

Having reviewed the test reports, compared the Nuraply systems to Acceptable Solutions and having reviewed historic use of the systems, I have formed the opinion that Nuraply 3PT, Nuraply 3PTM and Nuraply 3PG are suitable solutions to prevent moisture ingress for both walls, foundations and underneath slabs.

Yours sincerely

Philip E. Fry

Managing Director.

Appendices: 4

Appendix: 1.

About Fry Consulting Limited

Fry Consulting Limited is a specialized consultancy focused on providing professional advice to the waterproofing industry or those suffering from waterproofing issues at their property.

The principal, Phil Fry, has over 40 years of experience within the waterproofing industry. He is recognized for his knowledge of membrane waterproofing acquired through decades of involvement in many of the leading waterproofing projects in New Zealand and throughout the Pacific and Asia.

The first waterproofing project Mr. Fry was involved in was Auckland Central Police Station in 1963. Since then some examples of projects where he had a leading technical role are:

- Vector Arena, Auckland.
- The Beehive and Parliament Buildings, Wellington.
- Te Papa, Wellington.
- Starship Children's Hospital, Auckland.
- Whampoa Gardens – Hong Kong
- Samoan Parliament Buildings, Apia.

Grayson Wagner Co Ltd

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9th August 2011

Nuralite Waterproofing Ltd
53A Victoria St
Onehunga
Attention: John Simmons

RE: Analysis of Nuralite's range of waterproofing membranes by **ASTM Standard Test Method D5147**.

Further to your request for Grayson Wagner to analyse the water absorption characteristic of the Nuralite membranes supplied by you on the 15th of July 2011, our report follows.

Supplied Samples:

The eight different waterproofing membranes supplied to us for testing include:

- Nuraply 3P – Bituminous torch on membrane used as a cap sheet
- Nuraply 3PV - Bituminous torch on membrane used as a base sheet
- Nuraply 3PM - Bituminous torch on membrane used as a cap sheet, white mineral surface.
- Nuraply 3PTM - Bituminous torch on membrane used for tanking under slab
- Nuraply 3PG - Bituminous torch on membrane used under garden roofing
- Nuraply 3PB + 3PT - Bituminous torch on membrane used for tanking and as a base sheet.
- Nuratech TPE – Weld-able membrane used for roofing
- Nuraseal – Bituminous peel and stick membrane used for tanking

Standard Test Methods:

- **ASTM Standard Test Method D5147** is equivalent to that of **ASTM Test Method D471** apart from the difference in size and replicate number of samples.
- **ASTM Standard Test Method D5147** was used to analyse the supplied waterproofing membranes' water absorption at 23°C for 1, 4 and 7 days for compliance to **AS/NZS4858-2004**.
- **ASTM Standard Test Method D5147** was used to analyse the supplied waterproofing membranes' water absorption at 50°C for 1, 4 and 7 days for compliance to **ASTM Specifications D6222-08/D6223M-09**.
- Replicates of 5 for each sample of membrane measuring 100cm² were tested at both 23°C and 50°C. Reported results are averages of the 5 replicates for each sample of membrane supplied and ranges of values are also given.

Variation from test method:

- **ASTM Standard Test Method D5147** requires test specimens be dipped in acetone for 1-2 seconds after being removed from the immersion vessel. This step has been omitted from the test method as acetone affects the membranes by slightly dissolving the bitumen.

Maximum Water Absorption

- **AS/NZS4858-2004** states that a membrane must not have a water absorption value greater than 10% w/w when immersed at 23°C for 1 day - tested to **ASTM Standard Test Method D5147**.
- **ASTM Specifications D6222-08/D6223M-09** state that a membrane must not have a water absorption value greater than 3.2% w/w when immersed at 50°C for 4 days - tested to **ASTM Standard Test Method D5147**.
- Grayson Wagner's paper to the NZIA states that a membrane tested to **ASTM Standard Test Method D5147** at 50°C for 7 days, must not have a water absorption value greater than 10% w/w.

Results for membranes tested to ASTM D5147 at 23°C and 50°C for 1, 4 and 7 days are as follows:

Nuraply 3P				
Days	Average Water Absorption @ 23°C (%w/w)	Range in Water Absorption @ 23°C (%w/w)	Average Water Absorption @ 50°C (%w/w)	Range in Water Absorption @ 50°C (%w/w)
0	0	0	0	0
1	0.4	0.4-0.6	0.8	0.6-1.0
4	0.4	0.3-0.7	1.1	1.0-1.4
7	0.6	0.4-1.0	1.6	1.4-2.0

Nuraply 3P:

- The samples of Nuraply 3P tested to **ASTM D5147** at 23°C in this analysis comply with **AS/NZS4858-2004**.
- The samples of Nuraply 3P tested to **ASTM D5147** at 50°C in this analysis comply with **ASTM D6222-08/D6223M-09**.
- The samples of Nuraply 3P tested to **ASTM D5147** at 50°C in this analysis comply with requirements set out in Grayson Wagner's paper to the NZIA dated June 2011.

Nuraply 3PV				
Days	Average Water Absorption @ 23°C (%w/w)	Range in Water Absorption @ 23°C (%w/w)	Average Water Absorption @ 50°C (%w/w)	Range in Water Absorption @ 50°C (%w/w)
0	0	0	0	0
1	0.3	0.2-0.4	0.7	0.6-0.8
4	0.4	0.4-0.5	0.7	0.7-0.8
7	0.6	0.5-0.8	1.3	1.0-1.5

Nuraply 3PV:

- The samples of Nuraply 3PV tested to **ASTM D5147** at 23°C in this analysis comply with **AS/NZS4858-2004**.
- The samples of Nuraply 3PV tested to **ASTM D5147** at 50°C in this analysis comply with **ASTM D6222-08/D6223M-09**.
- The samples of Nuraply 3PV tested to **ASTM D5147** at 50°C in this analysis comply with requirements set out in Grayson Wagner's paper to the NZIA dated June 2011.

Nuraply 3PM				
Days	Average Water Absorption @ 23°C (%w/w)	Range in Water Absorption @ 23°C (%w/w)	Average Water Absorption @ 50°C (%w/w)	Range in Water Absorption @ 50°C (%w/w)
0	0	0	0	0
1	0.6	0.4-1.1	0.7	0.6-0.7
4	0.9	0.6-1.2	0.9	0.9-1.0
7	0.9	0.7-1.1	1.2	0.9-1.6

Nuraply 3PM:

- The samples of Nuraply 3PM tested to **ASTM D5147** at 23°C in this analysis comply with **AS/NZS4858-2004**.
- The samples of Nuraply 3PM tested to **ASTM D5147** at 50°C in this analysis comply with **ASTM D6222-08/D6223M-09**.
- The samples of Nuraply 3PM tested to **ASTM D5147** at 50°C in this analysis comply with requirements set out in Grayson Wagner's paper to the NZIA dated June 2011.

Nuraply 3PTM				
Days	Average Water Absorption @ 23°C (%w/w)	Range in Water Absorption @ 23°C (%w/w)	Average Water Absorption @ 50°C (%w/w)	Range in Water Absorption @ 50°C (%w/w)
0	0	0	0	0
1	0.2	0.1-0.2	0.4	0.3-0.5
4	0.1	0.1-0.2	0.5	0.4-0.5
7	0.2	0.1-0.2	0.7	0.6-0.8

Nuraply 3PTM:

- The samples of Nuraply 3PTM tested to **ASTM D5147** at 23°C in this analysis comply with **AS/NZS4858-2004**.
- The samples of Nuraply 3PTM tested to **ASTM D5147** at 50°C in this analysis comply with **ASTM D6222-08/D6223M-09**.
- The samples of Nuraply 3PTM tested to **ASTM D5147** at 50°C in this analysis comply with requirements set out in Grayson Wagner's paper to the NZIA dated June 2011.

Nuraply 3PG				
Days	Average Water Absorption @ 23°C (%w/w)	Range in Water Absorption @ 23°C (%w/w)	Average Water Absorption @ 50°C (%w/w)	Range in Water Absorption @ 50°C (%w/w)
0	0	0	0	0
1	0.3	0.3-0.3	0.4	0.4-0.5
4	0.4	0.3-0.5	0.5	0.4-0.5
7	0.4	0.3-0.4	0.8	0.8-0.9

Nuraply 3PG:

- The samples of Nuraply 3PG tested to **ASTM D5147** at 23°C in this analysis comply with **AS/NZS4858-2004**.
- The samples of Nuraply 3PG tested to **ASTM D5147** at 50°C in this analysis comply with **ASTM D6222-08/D6223M-09**.

- The samples of Nuraply 3PG tested to **ASTM D5147** at 50°C in this analysis comply with requirements set out in Grayson Wagner's paper to the NZIA dated June 2011.

Nuraply 3PB + 3PT				
Days	Average Water Absorption @ 23°C (%w/w)	Range in Water Absorption @ 23°C (%w/w)	Average Water Absorption @ 50°C (%w/w)	Range in Water Absorption @ 50°C (%w/w)
0	0	0	0	0
1	0.3	0.2-0.3	0.3	0.2-0.5
4	0.2	0.2-0.3	0.2	0.1-0.3
7	0.1	0.0-0.2	0.1	0.0-0.3

Nuraply 3PB + 3PT:

- **Note:** Membranes lost small amounts of surface granules
- The samples of Nuraply 3PB/3PT tested to **ASTM D5147** at 23°C in this analysis comply with **AS/NZS4858-2004**.
- The samples of Nuraply 3PB/3PT tested to **ASTM D5147** at 50°C in this analysis comply with **ASTM D6222-08/D6223M-09**.
- The samples of Nuraply 3PB/3PT tested to **ASTM D5147** at 50°C in this analysis comply with requirements set out in Grayson Wagner's paper to the NZIA dated June 2011.

Nuratech TPE				
Days	Average Water Absorption @ 23°C (%w/w)	Range in Water Absorption @ 23°C (%w/w)	Average Water Absorption @ 50°C (%w/w)	Range in Water Absorption @ 50°C (%w/w)
0	0	0	0	0
1	0.6	0.6-0.6	1.3	1.3-1.4
4	1.0	1.0-1.0	1.6	1.6-1.7
7	1.1	1.0-1.1	1.8	1.7-1.8

Nuratech TPE:

- The samples of Nuratech TPE tested to **ASTM D5147** at 23°C in this analysis comply with **AS/NZS4858-2004**.
- The samples of Nuratech TPE tested to **ASTM D5147** at 50°C in this analysis comply with **ASTM D6222-08/D6223M-09**.
- The samples of Nuratech TPE tested to **ASTM D5147** at 50°C in this analysis comply with requirements set out in Grayson Wagner's paper to the NZIA dated June 2011.

Nuraseal				
Days	Average Water Absorption @ 23°C (%w/w)	Range in Water Absorption @ 23°C (%w/w)	Average Water Absorption @ 50°C (%w/w)	Range in Water Absorption @ 50°C (%w/w)
0	0	0	0	0
1	0.0	0.0-0.0	Test under progression	-
4	0.0	0.0-0.0	Test under progression	-
7	0.1	0.1-0.1	Test under progression	-

Nuraseal:

- The samples of Nuraseal tested to **ASTM D5147** at 23°C in this analysis comply with **AS/NZS4858-2004**.
- The 5 samples of Nuraseal being tested to **ASTM D5147** at 50°C are still currently under analysis.

Conclusions:

- All waterproofing membranes tested in this analysis comply with **AS/NZS4858-2004** and **ASTM D6222-08/D6223M-09**.
- All membranes tested in this analysis fall within the requirements set out in the Grayson Wagner NZIA paper dated June 2011.

If you have any questions or queries regarding the content of this report then please contact us.

Yours Faithfully

C Williams BSc MNZIC