



# **NOVAR-WS FLL**

**THE ANTI-ROOT MEMBRANE**

**"FLL" CERTIFICATION - GERMANY**

**"LDA 6/96" CERTIFICATION - AUSTRIA**





## THE USE



Waterproofing situations where materials having high characteristics of resistance to roots penetration are required, are coming more and more common, not only in the typical "Roof Gardens", but also in the waterproofing of underground structures which are going to be covered by green areas.

The advantages of an extensive use of this kind of roofing techniques are not limited to the aesthetical and environmental issues, where they offer a significant improvement of urban areas, by allowing a better control of rain water, fixing dust and fine powder, limiting heat reflection, with a general improvement of the micro climate: besides these aspects, they offer technical and economical advantages to the building itself, because of the following improvements: :

- increase of the thermal insulation characteristics of the roofing;
- increase of the noise deadening properties;
- the materials making up the roofing system are subject to lesser thermal cycles, are protected from UV rays and mechanical actions (hail, ice, etc.), with a resulting much longer life time of the roofing system, which can be estimated between two to three times;
- delaying action of spreading of flames in case of fire.



Like all waterproofing systems, a roof garden must be specifically designed, with special attention to the choice of solutions and components, which must be fully balanced in order to ensure in the long term two essential properties, impermeability and drainage.

While the drainage role is performed by specific materials and their choice and combination will be dictated by the different requirements in terms of the kind of vegetation (intensive or extensive roof garden) which is foreseen on the top, the waterproofing role is wholly performed by the waterproofing membrane alone.

## THE REQUIREMENTS



The peculiar situation where the waterproofing membrane is operating in a roof garden or on an underground structure requires additional properties, compared with the ones exhibited by a common roofing membrane:

- absolute resilience to root perforation;
- resistance to chemical aggressions by acid and alkaline solutions, salts and fertilisers;
- resistance to the attack of micro-organisms (such as fungi, bacteria, moulds, etc.).

## THE PRODUCT



NOVAR-WS FLL is an anti root membrane specifically designed to be used in waterproofing of roof gardens and in all situations where there is the possibility of damages of the waterproofing system by roots penetration.

The innovative concept of the NOVAR-WS FLL is the use of a specially developed, anti root reinforcement, which supercedes any previous anti-root systems so far adopted. The composite, anti-root reinforcement is made with a synthetic, organic component, which can not be penetrated by roots, supported by a non woven polyester, stabilised with glass fibres.

Therefore, in respect to the traditional, mechanical anti root systems, made by coupling a polyester film to a fibreglass carrier, the NOVAR-WS FLL guarantees from any kind of delamination, typical of such kind of membranes, and in the same time offers much higher mechanical and physical properties, typical of the polyester reinforcement.

Furthermore, in respect to the chemically additivated anti-root membranes, NOVAR-WS FLL responds to any environmental concern, avoiding to use chemical additives which may have environmental effects.

## CERTIFICATIONS

  Fachgebiet Landschaftsbau

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Stamm: 16.06.2000

**Prüfbericht**  
über die Untersuchung der  
Durchwurzelungsfestigkeit bei Dachbegrünungen  
nach dem FLL-Verfahren (Stand 1995)

Produktbezeichnung:  
NOVAR-WS

Auftraggeber:  
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Bearbeitung:  
Fachgebiet Landschaftsbau  
Forschungsanstalt Geisenheim  
65366 Geisenheim

Datum des Berichts:  
16. Juni 2000

Der Bericht umfasst 18 Seiten und darf nur in  
ungekürzter Form verwendet werden

VerLab-Ne 1 - Druckbild Geisenheim - Tabellen 1/17 (2) / 1/18 (4) - Tabelle 1/17 (2) / 1/18 (2)

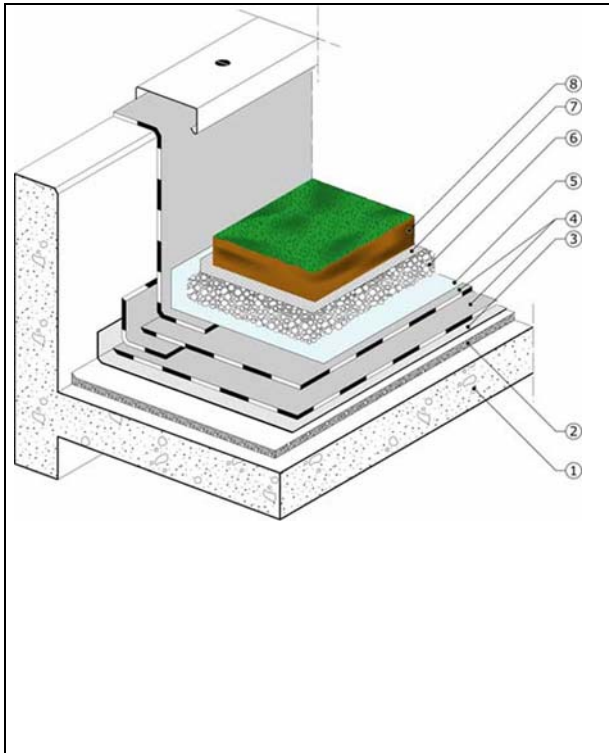
NOVAR-WS FLL has been tested by the FORSCHUNGSANSTALT in Geisenheim according to the Association FLL (Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau) Method, the same testing method on which the forthcoming EN European Norm for determination of resistance to root penetration will be based. The test, the most demanding one in this field, lasted for four years and at the end of the test the NOVAR-WS FLL proved absolute resilience to root penetration.

The membrane complies as well with the requirements set forth by the LDA Austrian Norms.



## TECHNICAL SOLUTIONS

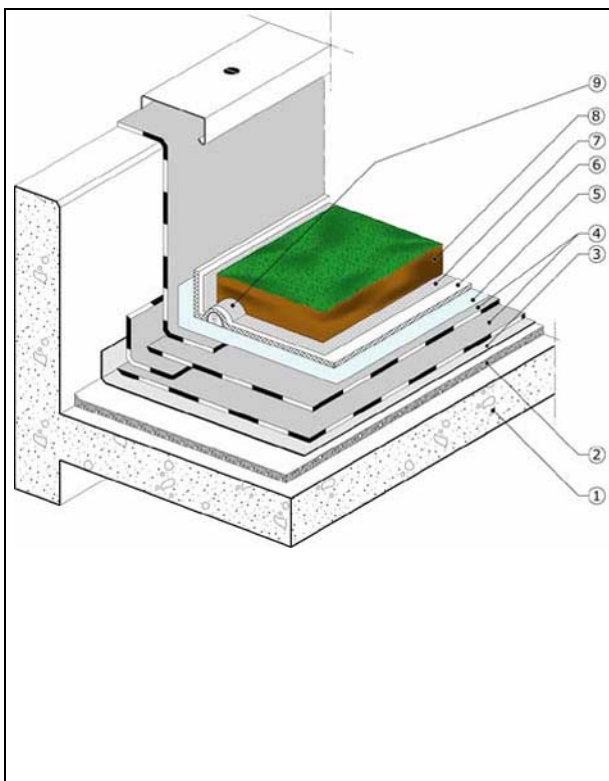
### ROOF GARDENS (WITHOUT INSULATION) System with drainage layer in expanded clay or gravel



1. Substrate
2. Sloping screed (>1 / max. 5%)
3. Sliding layer in bituminised paper felt (400 gr/sqm)
4. Double layer waterproofing system, made of:
  - a) first layer: **NOVABOND** 4 mm, loose laid on the horizontal surface and fully bonded on the verticals up to a height of 15 cm above the level of the soil. Overlaps must be torched respectively 10 cm at the side and 15 cm at the end.
  - b) second layer: **NOVAR-WS** anti-root membrane, **FLL** certified, 4 mm thickness, totally bonded by torching on the first layer and on the verticals.

The membrane must be laid in such way that the side overlapping areas are positioned in the centre line of the first layer. Overlaps must be torched respectively 10 cm at the side and 15 cm at the end.
5. Protective layer made with 0.2 mm thick polyethylene film or 400 gr/sqm non woven material.
6. Drainage layer made of expanded clay or gravel.
7. Filtering layer of compact non woven 200 gr/sqm material.
8. Layer of soil.

### ROOF GARDENS (WITHOUT INSULATION) System with light drainage layer

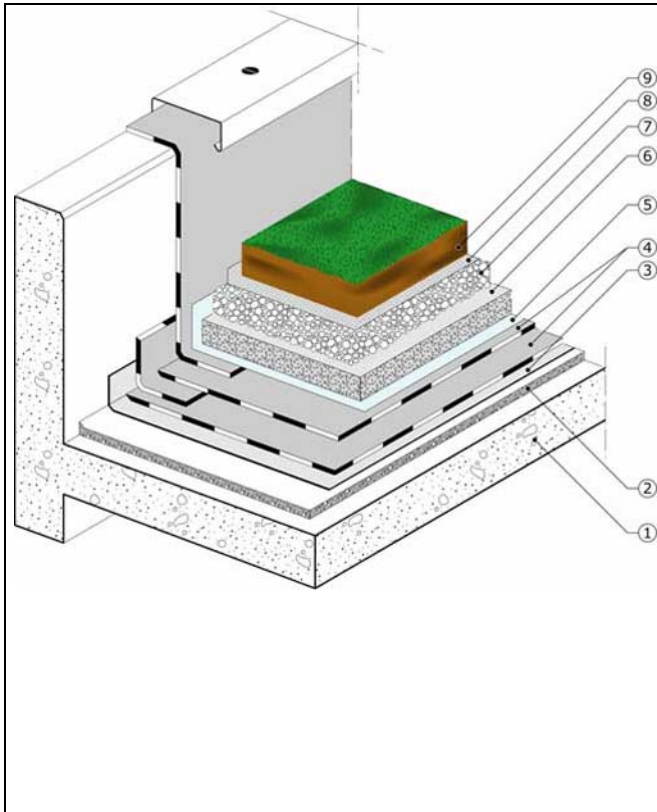


1. Substrate
2. Sloping screed (>1 / max. 5%)
3. Sliding layer in bituminised paper felt (400 gr/sqm)
4. Double layer waterproofing system, made of:
  - a) first layer: **NOVABOND** 4 mm, loose laid on the horizontal surface and fully bonded on the verticals up to a height of 15 cm above the level of the soil. Overlaps must be torched respectively 10 cm at the side and 15 cm at the end.
  - b) second layer: **NOVAR-WS** anti-root membrane, **FLL** certified, 4 mm thickness, totally bonded by torching on the first layer and on the verticals.

The membrane must be laid in such way that the side overlapping areas are positioned in the centre line of the first layer. Overlaps must be torched respectively 10 cm at the side and 15 cm at the end.
5. Protective layer made with 0.2 mm thick polyethylene film.
6. Draining/filtering panel.
7. Filtering layer of non woven 200 gr/sqm material (optional)
8. Layer of soil.
9. Drainage pipe

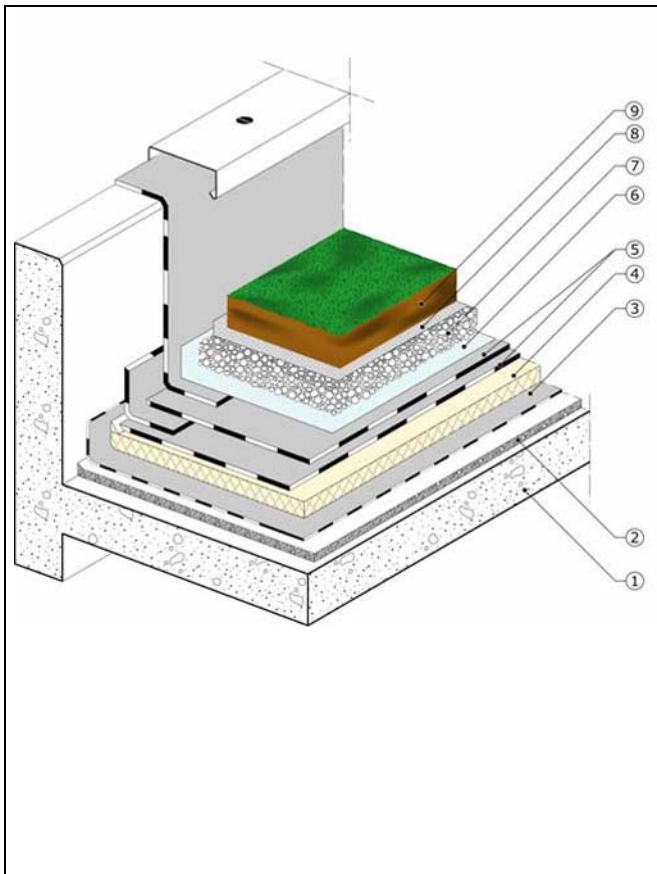


## ROOF GARDENS (WITHOUT INSULATION) System with mechanical protection of the waterproofing



1. Substrate
2. Sloping screed (>1 / max. 5%)
3. Sliding layer in bituminised paper felt (400 gr/sqm)
4. Double layer waterproofing system, made of:
  - a) first layer: **NOVABOND** 4 mm, loose laid on the horizontal surface and fully bonded on the verticals up to a height of 15 cm above the level of the soil. Overlaps must be torched respectively 10 cm at the side and 15 cm at the end.
  - b) second layer: **NOVAR-WS** anti-root membrane, **FLL** certified, 4 mm thickness, totally bonded by torching on the first layer and on the verticals. The membrane must be laid in such way that the side overlapping areas are positioned in the centre line of the first layer. Overlaps must be torched respectively 10 cm at the side and 15 cm at the end.
5. Protective layer made with 0.2 mm thick polyethylene film.
6. Concrete screed, 3-4 cm thick, reinforced with light metallic mesh.
7. Drainage layer made of expanded clay or gravel.
8. Filtering layer of compact non woven 200 gr/sqm material.
9. Layer of soil.

## ROOF GARDENS (WITH INSULATION) System with drainage layer in expanded clay or gravel



1. Substrate
2. Sloping screed (>1 / max. 5%)
3. Vapour barrier with **VELOBIT** 3 mm membrane, totally bonded on the verticals.
4. Insulation panel.
5. Double layer waterproofing system, made of:
  - a) first layer: **NOVABOND** 4 mm, loose laid on the horizontal surface and fully bonded on the verticals up to a height of 15 cm above the level of the soil. Overlaps must be torched respectively 10 cm at the side and 15 cm at the end.
  - b) second layer: **NOVAR-WS** anti-root membrane, **FLL** certified, 4 mm thickness, totally bonded by torching on the first layer and on the verticals. The membrane must be laid in such way that the side overlapping areas are positioned in the centre line of the first layer. Overlaps must be torched respectively 10 cm at the side and 15 cm at the end.
6. Protective layer made with 0.2 mm thick polyethylene film or 400 gr/sqm non woven material.
7. Drainage layer made of expanded clay or gravel
8. Filtering layer of compact non woven 200 gr/sqm material.
9. Layer of soil.

## THE TEST

### EXECUTION PHASES ACCORDING TO THE NORM "FLL" ON THE ANTI-ROOT MEMBRANE NOVAR-WS AT THE FORSCHUNGSANSTALT LABORATORIES OF GEISENHEIM (D)



GEISENHEIM, JUNE 1996, PREPARATION OF THE CONTAINERS FOR THE ANTI-ROOT TEST



APPLICATION OF THE NOVAR-WS MEMBRANE ON THE WALLS OF THE CONTAINERS



PLANTS WITH AGGRESSIVE ROOTS USED FOR THE ANTI-ROOT TEST



INTERNAL VIEW OF THE GREENHOUSE FOR GROWING OF PLANTS



JUNE 2000: AFTER FOUR YEARS THE PLANTS ARE REMOVED





DETAIL OF THE LOWER PART OF THE CONTAINERS



INSIDE VIEW OF THE CONTAINERS AFTER 4 YEARS



DETAIL OF THE CONTAINERS: THE ROOTS OF THE PLANTS HAVE NOT NOTCHED AND/OR PERFORATED THE NOVAGLASS MEMBRANE



ON JUNE 16, 2000 NOVAGLASS RECEIVED THE "FLL" ANTI-ROOT CERTIFICATION FOR THE NOVAGLASS MEMBRANE



## REFERENCES

COUNTRY	LOCATION	DESCRIPTION	SURFACE SQM	YEAR
GERMANY	BERLIN	OFFICES AND SHOPS	600	1997
GERMANY	BERLIN	KÖNIGSSTADT TERRACE	6000	1997
GERMANY	HAMBURG	RIESENER BUILDING	1200	2000
GERMANY	HANNOVER	STUDENT'S HOUSE	525	1999
GERMANY	LEGMO	"A.LINDGREN" SCHOOL	2700	2000
GERMANY	LEOPOLDSHOHE	HAHNENKAMO PARK	1500	1997
GERMANY	LUDWIGSHAFEN	"EKZ" WALZMÜHLE	1200	2000
GERMANY	LUDWIGSHAFEN	WALZMÜHLE LUDWIGSHAFEN OFFICE	530	1999
GERMANY	MAINZ-KASTEL	DEUTSCHE STAEDTE MEDIEN GMBH	1000	2002
GERMANY	MUNICH	DSM	360	2001
GERMANY	MUNICH	LADENANBAU	525	1999
GERMANY	MUNICH MOOSBURG	APARTMENT HOUSE	1024	1999
GERMANY	MUNICH MOOSBURG	DEUTSCHE STADTE MEDIEN GMBH	360	2001
GERMANY	NEUBRANDENBURG	SCHOOL	3500	1998
GERMANY	POING	TECHNOLOGICAL PARK	2030	2000
GERMANY	SCHWERIN	GARAGES	600	1997
GERMANY	SCHWERIN	GÖTZEN BAUMARKT	6070	1997
GERMANY	SINDELFINGEN	DAIMLER CHRYSLER AG FACTORY	15000	2000
HUNGARY	BUDAPEST	MAMMUT SHOPPING CENTER	1200	2001
HUNGARY	BUDAPEST	DOROTTYA UDVAR OFFICE PARK	4000	2001
HUNGARY	BUDAPEST	SIEMENS PARK	1000	2001
HUNGARY	BUDAPEST	APARTMENT HOUSE BP XIV	2000	2001
HUNGARY	BUDAPEST	APARTMENT HOUSE BP XIII	900	2001
HUNGARY	BUDAPEST	APARTMENT HOUSE BP XI	800	2001
HUNGARY	BUDAPEST	STOP & SHOP SHOPPING CENTER	6600	2001
HUNGARY	KOMAROM	NOKIA PERLOS FACTORY	150	2001
ITALY	BOLOGNA	CHILDREN'S VILLAGE	400	2001
ITALY	BRESCIA	S.GIULIA MUSEUM	1300	2003
ITALY	FLORENCE	CAREGGI BUILDING	150	2001
ITALY	ORZINUOVI, BRESCIA	CIVIL HOUSE	150	2001
ITALY	PONTENUOVO, PISTOIA	CIVIL HOUSE	270	2001
ITALY	S.FELICE, PISTOIA	CIVIL HOUSE	440	2001
ITALY	S.VENDEMIANO, TREVISO	CIVIL HOUSE	400	2002
ITALY	SAN FELICE, PISTOIA	CIVIL HOUSE	440	1999
ITALY	TRAVAGLIATO, BRESCIA	CIVIL HOUSE	300	2001
ITALY	VENICE MESTRE	CIVIL HOUSE	800	2002
ITALY	VINCI, FLORENCE	VITOLINI CIMITERY	220	1999
KAZAKHSTAN	ALMA ATA	NATIONAL MINT – NBRK	3000	2001
SWITZERLAND	WITTENBACH	SCHOOL	200	1998



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