

GEOSYNTHETICS

Pavement Solutions



Protective Fabrics
Space Composites
Aerospace Composites
Advanced Armour

Geosynthetics
Industrial Fabrics
Grass

 **TENCATE**
materials that make a difference

FOR MORE THAN 30 YEARS THE WORLD HAS BUILT ON TENCATE

With very good reason. TenCate develops and manufactures geosynthetics for a variety of applications in modern civil engineering. In addition to our full range of geosynthetics, we develop made-to-measure systems for road and railway construction, hydraulic structures and tunnels, reinforced-soil structures and for special geotechnical application areas.

As an international group of companies based in Linz/Austria, TenCate is one of the world's leading supplier of geosynthetics. In our world-wide network of sales organisations, competent personnel for both sales and technical service is at your disposal. Several production plants in Europe, Asia and the US guarantee full market coverage and short delivery times.

Continual technology development, new-product development, our own software for geosynthetics design, a staff of engineers experienced in geotechnical engineering, synthetics and textile technology – all these are clear signs of TenCate's leading position in the production, design and marketing of geosynthetics.

Service & Quality

Perfect solutions

for geotechnical problems.

First-class quality

Our highest standards are certified.

TenCate Geosynthetics Academy

Know-how transfer and market presence world-wide.

www.tencate.com

Information on-line.

TenCate Design Software

On CD-ROM or on-line.

Our highest standards are certified.

A certified quality-control laboratory allows us to perform regular product testing to the highest standards. Internal quality control and external quality assurance by independent testing institutes such as tBU, ÖFI, ASQUAL, SINTEF and others, guarantee the constant first-class quality of TenCate products.

Know-how transfer and market presence worldwide.

Within the framework of the TenCate Geosynthetics Academy (GSA) we provide our partners and customers with technical know-how and promote the exchange of experience and an open dialogue on a broad, international basis. Our many sales offices world-wide are the basis for close cooperation with local distributors. This ensures world-wide market coverage with short delivery times and efficient, regionspecific technical support.

Optimum solutions for geotechnical problems.

TenCate offers you optimum solutions to geotechnical problems, extending beyond the simple supply of excellent products! Essential components of such solutions are project-specific geosynthetic design, personal technical advice on-site, and site-specific installation guidelines.

www.tencate.com – information on-line.

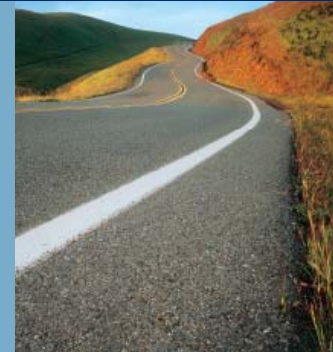
Our Internet Information Platform gives you the opportunity to learn more about geosynthetics. FAQs and Glossary are the first steps here. With on-line technical advisory service, we will work out a solution to your particular problem. And we appreciate your feedback, as it helps us to align our service more precisely with your needs. Our design software is available both on-line and on CD-ROM.

PAVEMENT MAINTENANCE WITH TENCATE

New ways with old roads

Keeping the existing road network in an acceptable condition is one of the major challenges of road authorities world-wide. The focus of attention is therefore on maintenance techniques and refurbishment methods which allow the working life of the basic road structure to be extended in a cost-effective and technically reliable manner.

One method which has been successfully used world-wide for more than 30 years is the maintenance of asphalt and concrete roads using geocomposites and paving felts. This method represents an economic means of considerably increasing the maintenance intervals and thus the working life of the road.



1
Geocomposite as asphalt-reinforcement element.

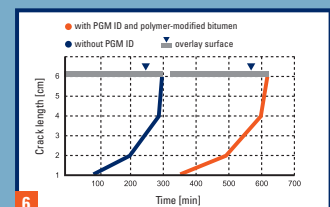
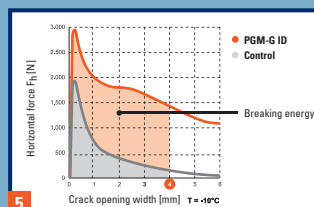
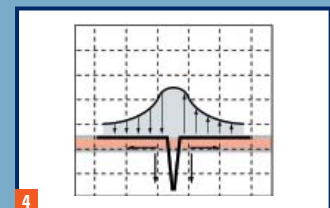
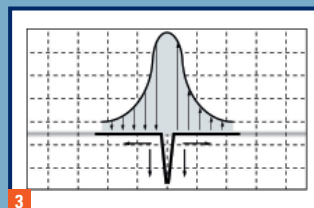
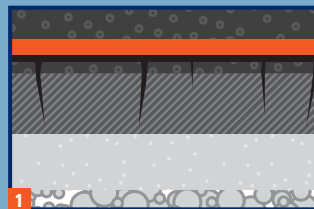
2
Paving felt as stress-relieving interlayer, creating a membrane effect (SAMI).

3
Test result:
Without geosynthetic, high stresses occur at the crack.

4
Test result:
With geosynthetic, the stresses at the crack are significantly reduced.

5
Energy-to-break with PGM-G ID: The area under the load-displacement curve corresponds to the work done at break.

6
Increase in working life of asphalt overlays: Crack development is retarded by a factor of 3 when PGM ID is used as interlayer.



PGM-G ID

PGM-G ID is a high-strength geocomposite consisting of a mechanically bonded continuous-filament nonwoven made of 100 % polypropylene, reinforced with glass filaments.

PGM ID

PGM ID paving felt is a mechanically bonded continuous-filament nonwoven made of 100 % polypropylene with optimum bitumen-retention capacity.



ASPHALT REINFORCEMENT

Giving cracked roads a break

Constant increases in traffic frequency and axle loads place great demands on the existing road network. The horizontal stresses induced between layers soon result in crack formation, and any local differential settlements also lead to cracking of the asphalt layer. These stresses result in crack formation caused by horizontal forces and by local differential settlements.

The geocomposite PGM-G ID is the optimum solution for road authorities. Asphalt reinforcement by high-modulus glass filaments, combined with the sealing and uniform bonding effect of the nonwoven geotextile, provides effective maintenance and prolongs the working life of the road structure.

PGM-G ID



Geocomposite for asphalt reinforcement, combining the excellent reinforcing properties of glass filaments with the optimum bitumen-retention capacity of a mechanically bonded nonwoven.

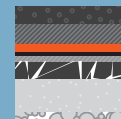
The benefits of PGM-G ID:

- Reinforcement – high load-uptake at low strain (< 3 %).
- Cost effectiveness – PGM-G ID is suitable for local spot maintenance.
- Sealing - Rain and oxygen cannot penetrate into the road structure.
- Longevity – Maintenance intervals are considerably extended.
- Stress relief – PGM-G ID retards crack propagation from the old surface to the new overlay.
- Adhesive bonding – PGM-G ID provides uniform bonding between old and new asphalt layers.
- Installation – easily done by laying machine, without additional fixing.
- Recycling – PGM-G ID can be milled without problem.
- Resistance – PGM-G ID is chemically resistant to road salt.

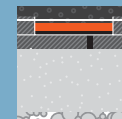
Application:



Complete asphalt reinforcement



Complete asphalt reinforcement of old concrete roads



Partial reinforcement of a longitudinal crack with grinding



Repair of the road surface over excavated ditches

Reference project – asphalt reinforcement

Maintenance of Zurich Kloten International Airport, CH

PGM-G ID, TenCate's high-strength geocomposit for asphalt-reinforcement applications, impressively demonstrated its efficacy in the maintenance of Zurich Kloten International Airport in Switzerland. The composite was developed specially for the repair of trafficked areas subjected to high axle loads, and to prevent crack formation. The nonwoven component ensures even distribution of the bitumen, becoming 100 % watertight in the process. The high-strength, high-modulus glass filaments absorb stresses at just the right moment to prevent crack propagation – at 2 - 3 % asphalt strain. Full-area asphalt reinforcement is ensured thanks to the perfect bond between the geocomposite and the asphalt layers.

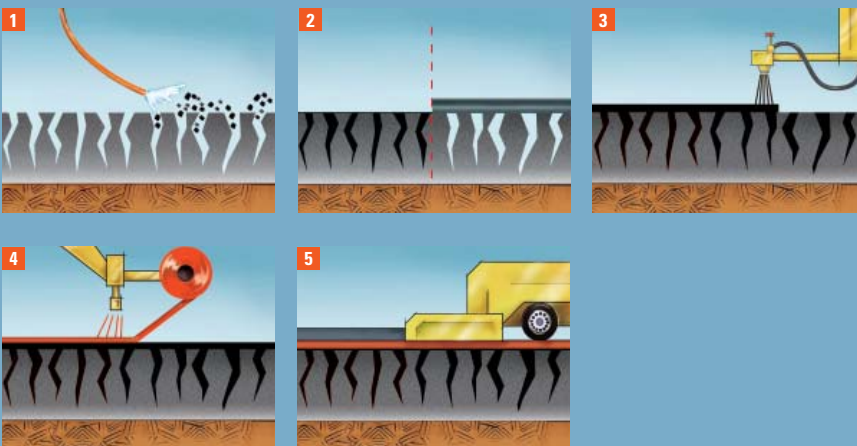




Installation

Hot-rolled asphalt overlays

Bituminous wearing courses are applied onto bituminous base courses in the course of crack-repair works. Depending on traffic load, various types of asphalt can be used. Wearing courses absorb traffic stresses and protect the base course.



Geosynthetic installation with TenCate laying equipment.



1 Cleaning of the road surface.

2 Filling of cracks (> 4 mm) and pot-holes, or application of a regulating layer.

3 The total effective tack-coat quantity of 1.2 kg/m² is evenly applied over the whole area, extending max. 10 cm over the edge of the geocomposite to be installed. The type of the tack-coat depends on the climatic conditions and on the type of asphalt overlay to be used.

4 PGM-G ID is laid into the tack-coat by unrolling using specially designed laying equipment. Pre-tensioning or fixing (e.g. with nails) is not necessary.

5 The hot-rolled asphalt (min. thickness 40 mm) can be installed immediately after the unrolling of PGM-G ID.

- It is recommended to use crawler-type pavers.
- The temperature of the asphalt mix must not exceed 160°C during installation. This normally corresponds to a mixing temperature of max. 190°C.
- At high ambient temperatures, or if an excess of tack-coat bleeds through, sticking of the tyres of the paver of trucks can be avoided by spreading asphalt mix or chippings into the wheel paths.

MEMBRANE EFFECT (SAMI)

More cost effective than classical maintenance methods

Cracks in the road surface enable rain water and oxygen to penetrate the surface, resulting in premature deterioration of the road structure. Usually, maintenance with a new asphalt overlay is of limited duration, as cracks propagate to the new surface due to stress concentrations. This vicious circle can only be broken with professional construction methods.

By installing a „stress-absorbing membrane interlayer“ (SAMI), consisting of PGM ID paving felt and bitumen, stresses in the asphalt layers are reduced considerably, thereby extending the working life of the new overlay.

PGM ID

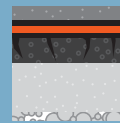


Paving felt with optimum bitumen storage capacity designed to reduce reflective cracking and thus to maintain road structures cost effectively.

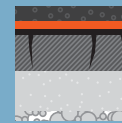
The benefits of PGM ID:

- Sealing – rain and oxygen cannot penetrate into the road structure.
- Stress relief – PGM ID retards crack propagation from the old surface to the new overlay.
- Adhesive bonding – PGM ID provides uniform bonding between old and new asphalt layers.
- Temperature behaviour – PGM ID provides good performance even at low ambient temperatures.
- Recycling – PGM ID can be milled without problem.
- Installation – easily done by laying machine even in curves and on uneven surfaces.
- Longevity – Maintenance intervals are extended considerably, even with low overlay thickness.

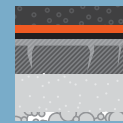
Application:



Maintenance with surface dressing



Maintenance of an old asphalt road without regulating layer

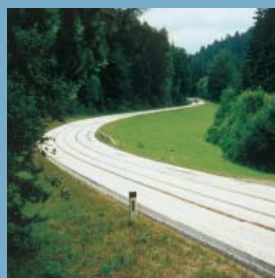


Maintenance of an old asphalt road with regulating layer

Reference project – membrane effect

Sandwich surface dressing application on the B119a, Austria

In the course of the maintenance of the B119a federal road in Austria, a sandwich surface dressing was installed. The construction steps were as follows: Spraying of tack coat to „glue“ the paving felt, installation of PGM ID, first chipping layer (8/11 mm), second tack coat spraying, and finally second chipping layer (4/8 mm). As tack coat, a 70 % polymer-modified emulsion was used. After several months, the road was still in perfect condition: Well compacted wheel paths with coarse surface texture, and an even road surface. After 7 more years, still no major damage was visible – with the wheel paths still being well compacted and showing a coarse surface texture. It can be expected that the total working life of the surface dressing with paving felt will reach the value of a minimum of 15 years, making this maintenance method a great economic success.

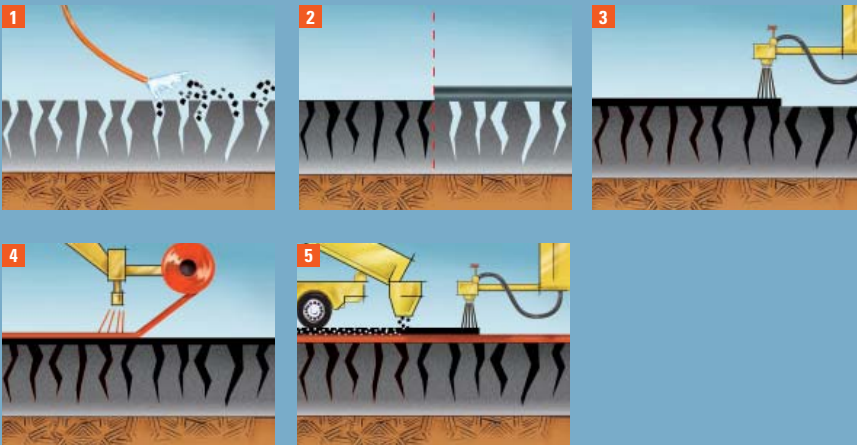




Installation

Surface dressing

Surface dressings are thin bituminous layers, where tack coat and chippings are applied one after the other. In combination with paving felts, this method provides a sealing of the existing road surface and maintains the surface roughness of the road.



Construction methods

a Single surface dressing

Spray tack-coat evenly over the surface, spread chippings and compact with 3 to 5 passes. Remove excessive chippings after initial traffic.

d Sandwich surface dressing

Clean the road surface, spread chippings and compact. Then spray tack-coat and spread second chipping layer with smaller size.

b Single surface dressing with double chip layer

Spray tack-coat evenly over the surface, spread large chippings openly (with gaps), fill gaps with smaller chippings.

e Double surface dressing

Consists of two single surface dressings with different chip size. Larger chips are applied first.

c Makadam (double surface dressing on unbound supporting layer)

Mainly used to pave unbound supporting layers. Spread coarse chippings openly (with gaps) over the surface and compact to achieve interlocking. Single surface dressings with smaller chip size and decreasing tack-coat quantity, up to three times. Third layer can be applied after one year.

1 Cleaning of the road surface.

2 Filling of cracks (> 4 mm) and pot-holes.

3 Even distribution of the tack coat by machine. The first required tack coat quantity (A) amounts to approx. 0.9 kg/m² emulsion (70 %). The type of tack-coat depends on the climatic conditions and on the type of surface dressing to be used.

4 Installation of the paving felt starts after curing of the emulsion has begun, as this small quantity cannot bleed through. PGM ID is laid into the tack-coat by unrolling using specially designed laying equipment. Pre-tensioning is not necessary.

5 Even distribution of the second tack coat quantity (B), consisting of parts B1 and B2:

- B1 is required to saturate the paving felt – approx. 0.8 kg/m² of 70 % emulsion.
- B2 is required to embed the chippings. The quantity to be applied varies according to the recommendations of the emulsion producer, and depends on the quality, quantity, shape and size of the chippings to be used – as for conventional surface dressing applications.
- Immediately after application of the emulsion on top of the paving felt, the required quantity of chippings is spread evenly. This is followed by compaction, preferably with rubber-tyred rollers.
- In the case of double or multi-layered surface dressings, it must be assured that the tack-coat of the second layer is in full contact with the first layer.
- After a period of 1 to 3 days, excess chippings should be removed using appropriate road-sweeping equipment.
- In the case of spot maintenance, the paving felt can be laid into the uncured emulsion, after which the surface is covered with sand to allow temporary traffic.

GEOSYNTHETICS

The information given in this brochure is to best of our knowledge true and correct, however new research results and practical experience can make revisions necessary. No guarantee or liability can be drawn from the information mentioned herein.



BeNeLux	Tel. +31 546 544 811	service.nl@tencate.com
Central Eastern Europe	Tel. +43 732 6983 0	service.at@tencate.com
Czech Republic	Tel. +420 2 2425 1843	service.cz@tencate.com
France / Africa	Tel. +33 1 34 23 53 63	service.fr@tencate.com
Germany	Tel. +49 6074 3751 50	service.de@tencate.com
Italy	Tel. +39 0362 34 58 11	service.it@tencate.com
Near Middle East	Tel. +971 5048 10557	service.nme@tencate.com
Poland / CIS / Baltics	Tel. +48 12 268 8375	service.pl@tencate.com
Romania	Tel. +40 21 322 06 08	service.ro@tencate.com
Scandinavia	Tel. +45 4485 7474	service.dk@tencate.com
Spain / Portugal	Tel. +34 607 499 962	service.es@tencate.com
Switzerland	Tel. +41 44 318 6590	service.ch@tencate.com
UK / Ireland	Tel. +44 1952 588 066	service.uk@tencate.com

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TENCATE GEOSYNTHETICS AUSTRIA GMBH
Schachermayerstr. 18
A-4021 Linz
Austria

Tel. +43 (0)732 6983 0
Fax +43 (0)732 6983 5353
www.tencategeosynthetics.com
service.at@tencate.com

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