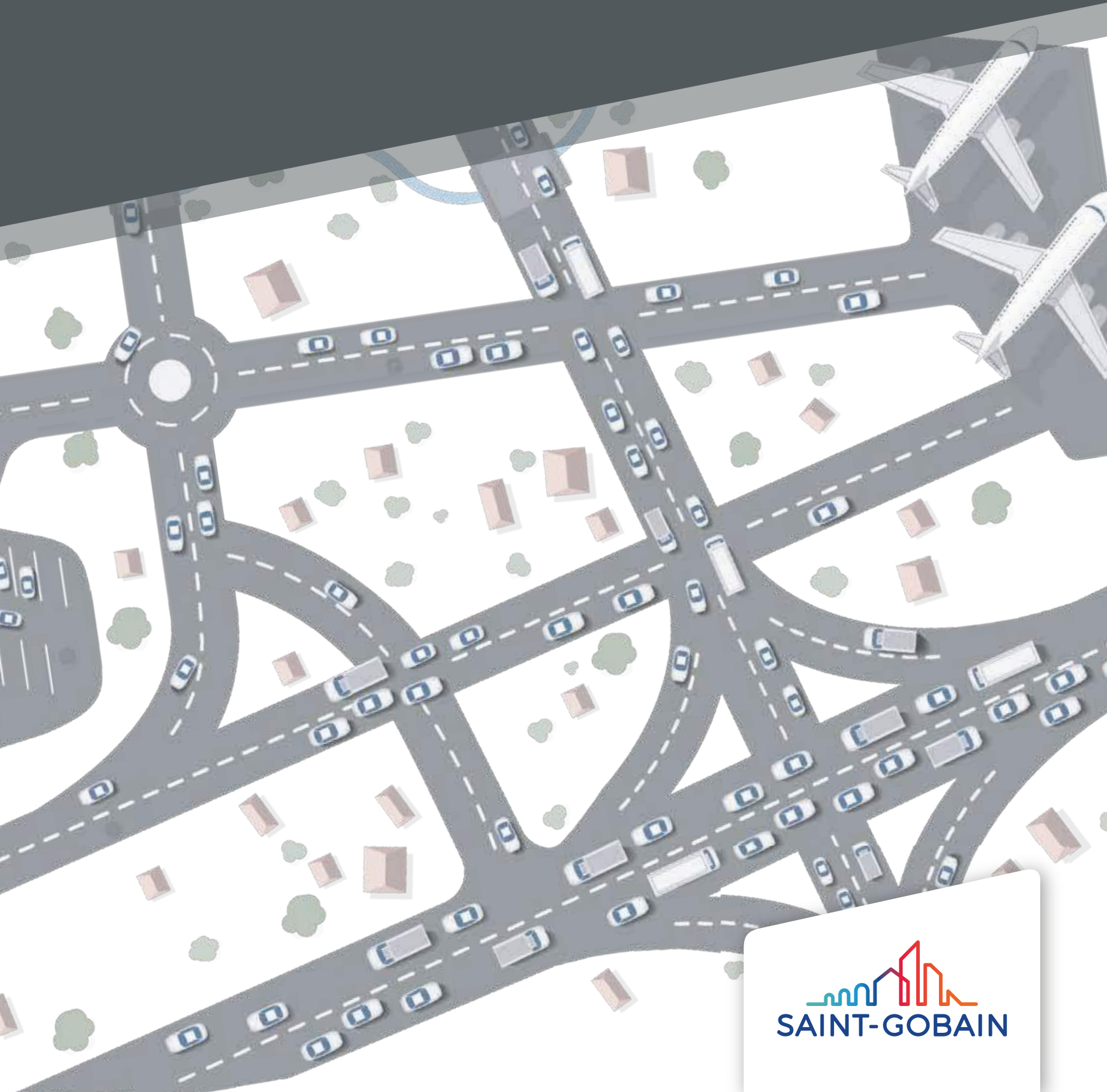


Pavement reinforcement system **GlasGrid®** and other geosynthetic products



The Advantages for You

LIFE

- Improvement of asphalt pavement lifetime by 200–300% due to reflective crack mitigation
- 50% reduction in future investment costs (e.g. maintenance, rehabilitation and use)
- Improved natural ability of asphalt to reduce cracking by up to 3 times by providing a tensile element to the asphalt
- Protection of the base against water penetration and better drainage capabilities of the road by 10%
- Support for reduction of the downward rut depth by 25%
- Structural benefit by about 60% depending on the type of ADFORS GlasGrid and pavement section

INSTALLATION

- Proven extensive asphalt layer bonding requirements by Leutner shear test 12 kN or 15 kN needed in most of EU countries (150 mm cores)
- Improved compatibility with bitumen and damage resistance during construction due to patented polymer coating
- Quick and efficient installation with self-adhesive solution
- Easy cutting
- Edge marking for easy overlapping

REUSE & ENVIRONMENT

- Up to 5x extending cracking resistance of new asphalt layers when milled and partially add as recycled asphalt into the new asphalt mix
- Excellent milling performance
- Unlimited recyclability
- Thermal and chemical stability
- Reduction of CO₂ emissions due to pavement life extension
- Use of natural raw materials

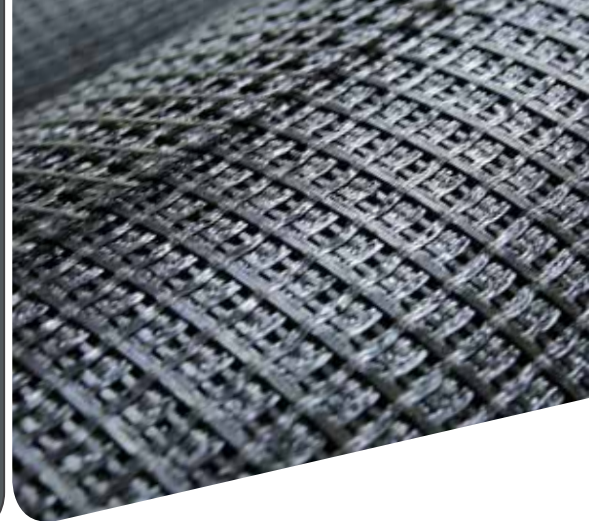
40 YEARS OF PROVEN PERFORMANCE WORLDWIDE

Product Range

ADFORS GlasGrid product line offers several styles of pavement reinforcement grids designed to reinforce asphalt concrete overlays. They retard reflective cracking by a factor of 2 to 3 times by turning stresses horizontally in order to dissipate them.

The grid configuration features fiberglass strands coated with an elastomeric polymer. Each strand has a remarkably high tensile strength, as well as a high modulus of elasticity at low elongation – making ADFORS GlasGrid stronger than steel by weight.

ADFORS also offers other geosynthetic products such as Polypropylene geogrids, Polyester geogrids, Geocells, Geocomposites, nonwoven fabrics for variety of civil engineering applications such as reinforced earth wall, soil stabilization, erosion control, drainage etc.



ROADS



HIGHWAYS



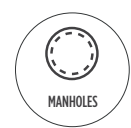
AIRPORTS



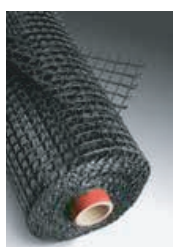
PARKING LOTS



BRIDGES



MANHOLES



GlasGrid GG



GlasGrid CGL



GlasGrid CG



Road Patch



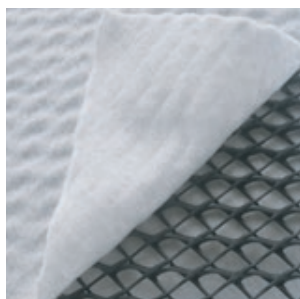
GlasGrid RAPID



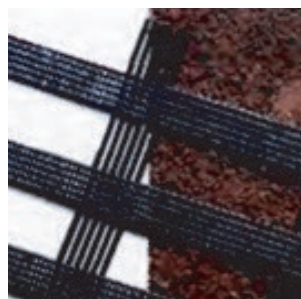
Geotextile



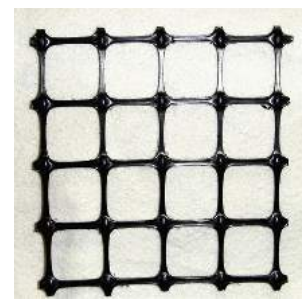
GeoCell



GeoComposite



Polyester Geogrid



Polypropylene Geogrid

Saint-Gobain ADFORS is a part of the Saint-Gobain group, a French Multinational company with operations in 76 countries, nearly 1,66,000 employees and a Global Turnover of 44.2 Billion Euro. Saint-Gobain Adfors is a part of the group and is into manufacturing and supply of Glass based reinforcement for various applications. In addition, there are various range of other geosynthetic products such as Geocell, Geotextiles, Geocomposite, Geogrid products ADFORS supply along with site specific design solutions. These products form core business of ADFORS and addresses the problems related to infrastructure projects such as roads, runways, pavements, buildings etc.

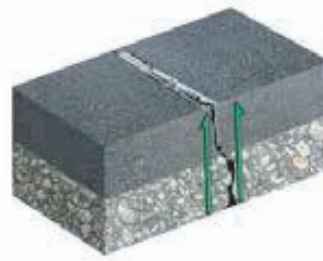
In India, Saint Gobain's ADFORS business operates under the legal entity, Grindwell Norton Ltd., which is owned by the Saint-Gobain group.

The Key Advantages for You

- High-modulus and tensile fiberglass grid due to consistent impregnation of each glass filament
- Patented polymer coating improving compatibility with bitumen
- Made from mineral raw materials
- Excellent layers' bonding
- Quick and efficient installation
- Good trafficability
- Easy cutting
- Excellent milling performance
- Measured unlimited recyclability & enhanced properties in Reclaimed Asphalt Pavement (RAP)
- Edge marking for easy overlapping
- Thermal and chemical stability
- Various strengths available 25 - 200 kN/m

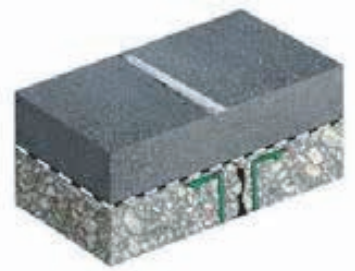
Based on 30 years of successful installations around the world, ADFORS GlasGrid extends pavement life up to 300% and typically provides a 50% reduction in future investment cost (e.g. maintenance, rehabilitation and use costs) over the life of an average road.

ADFORS GlasGrid turns crack stresses horizontally and dissipates the stress.



Without
ADFORS GlasGrid

Stress travels uninterrupted,
causing cracks



With
ADFORS GlasGrid

Stress is redirected
horizontally and is dissipated,
minimizing cracks

IFSTTAR full scale tests on ADFORS GlasGrid reinforced flexible pavements (Greenfield study)



GlasGrid GG100 - 100 kN/m on the performance of a new flexible pavement, with a relatively thin bituminous wearing course (80 mm). For that purpose, one reinforced pavement section, and one reference section, without reinforcement, have been tested on the IFSTTAR accelerated pavement testing facility. They were submitted to a traffic consisting of 1 million dual wheel 65 kN load cycles (representing the French standard axle load), and then 200 000 additional cycles, with loads increased to 70 kN.

The conclusions of the study indicate a very positive effect of the fibreglass grid on the resistance to cracking of flexible pavements:

- Cracking appeared first on section without grid after 800 000 cycles. At the end, 70% of the section was cracked.
- Section with grid presents no cracking until the end of the test (1,2 M cycles).

Milling Performance and Recyclability - RWTH Aachen University

In this test, ADFORS GlasGrid GG200 - 200 kN/m was installed on an existing binder course AC 16 B S and covered with 4cm thick top layer SMA 8 S. The upper part of the binder course including the reinforcement grid were picked up by the milling machine in a single step. No adverse effects were realized and milling depth was not affected.

A second test, the Cycling Tension test, concluded that the partial reuse of milled asphalt granulate (including glass fibers) in a new asphalt mixture improved the fatigue behavior of the recycled asphalt.

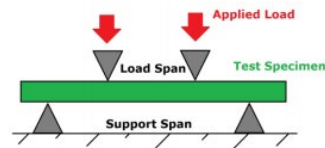
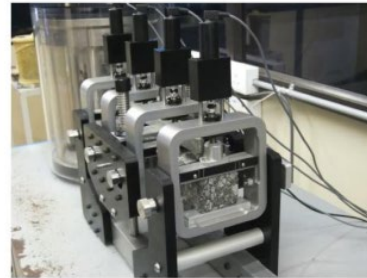
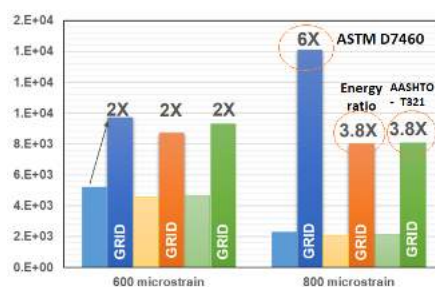


Indian Institute of Technology Madras (2020) - Laboratory fatigue performance

Strain-controlled sinusoidal four-point bending fatigue tests were conducted as per ASTM D7460. Tests at three strain levels – 400, 600 and 800 $\mu\epsilon$ were conducted.

The fatigue tests were conducted using beam samples of bituminous concrete, BC-II mixtures (MoRTH, 2013), with an unmodified binder, viscosity grade - VG 30 (IS:73-2018). The fatigue life of the bituminous mixtures was determined using the energy ratio approach, AASHTO T321 (2007) and ASTM D7460 (2010). The GlasGrid was found to enhance the fatigue life by as much as six times.

Four Point Bending



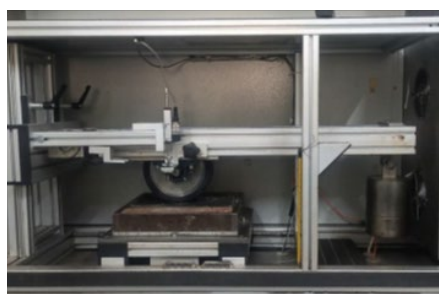
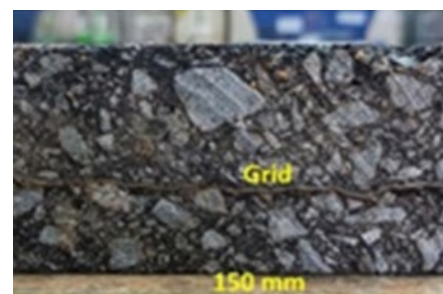
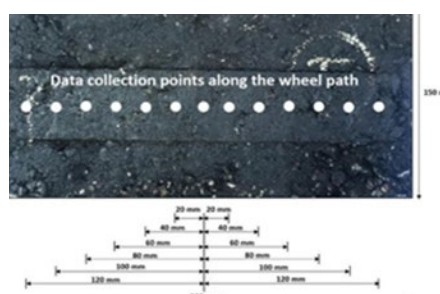
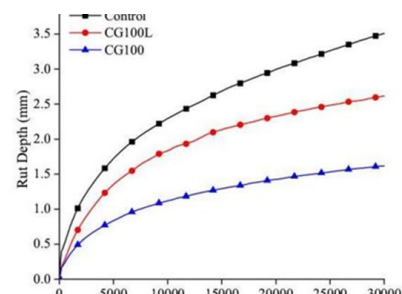
Indian Institute of Technology Madras (2022) - laboratory rutting performance

Wheel tracking test was conducted on bituminous mixtures as per the British Standard (EN 12697-22, 2012). The rutting resistance of asphalt concrete mixes can be qualitatively compared using a dry wheel tracker.

The rutting tests were conducted using bituminous concrete beam specimens of size 300 mm length × 150 mm wide × 50 mm thick. The test matrix adopted was with GlasGrid reinforced (CG100, CG100L) and unreinforced beams. The GlasGrid was placed at a two-thirds height of the beam from the top surface.

A moving load of 700 N is applied through a rubber-hosed wheel of 200 mm diameter and 50 mm width using a dry wheel tracker. The speed is maintained at a frequency of 26.5 ± 1.0 cycles per minute or 53 passes per minute.

The GlasGrid inlaid asphalt concrete beam were having an increase in rutting resistance nearly by 15-45%.



Coating type effectiveness

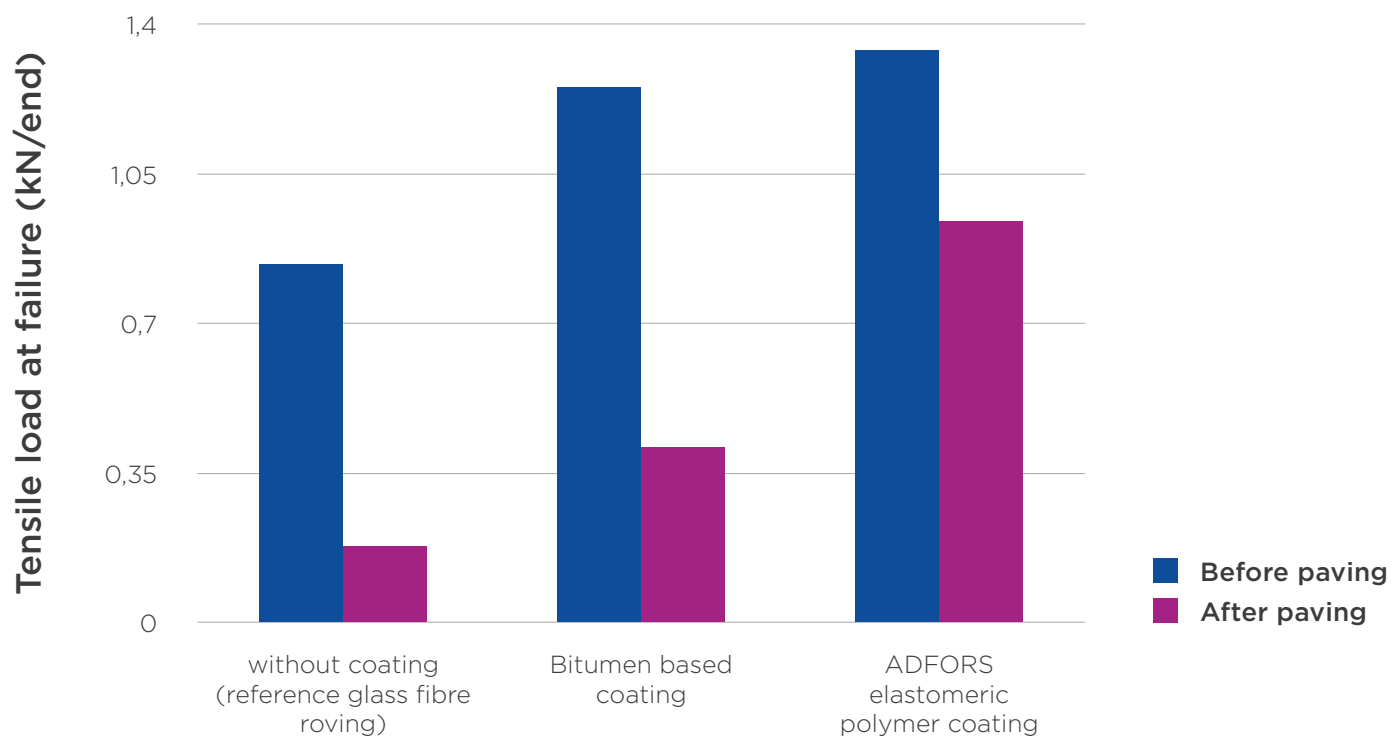
Coating performance was studied and assessed based on mechanical test results and optical microscopy images of the grid cross-sections. The key performance was investigated:

“Effect of ADFORS Thermal Stable Elastomeric Polymer Based Coating vs. Bitumen based coating to glass roving properties before and after simulated field installation was tested.”

Tests aimed to determine the effect of coating on the strength of glass fibre roving. The two coatings used were: ADFORS Thermal Stable Elastomeric Polymer Coating (next text as ADFORS TEP coating) used for existing road reinforcement products, and an asphalt emulsion based coating. Uncoated (greige) glass fibre roving was included in the study as control for coated glass. Extreme condition where chosen to simulate damage during and after paving and simulates the abuse a paving material experiences during compaction using a Marshall compactor. 75 blows from the Marshall hammer mechanism where used. Upon completion of the asphalt system (base course, interlayer, wearing course), samples is broken apart and the roving is carefully removed and tested for its tensile properties.

- Bitumen emulsion based coating only slightly outperforms glass roving without coating by only 12%.
- Compare to ADFORS Thermal Stable Elastomeric Polymer Coating reaching additional tensile retention +49% compare to the glass uncoated roving.
- ADFORS Elastomeric coatings compare to emulsion based coating protects the glass fibre reinforcement more than 2x

Glass fibre roving tensile performance



Performance results of different type of coatings for glass grid protection

NCAT full-scale accelerated pavement testing



The Pavement Test Track is a full-scale, accelerated performance test facility for flexible pavements managed by the National Centre for Asphalt Technology (NCAT) at Auburn University USA. Forty-six unique 60m test sections are installed around a 2,8km oval and subjected to accelerated damage via a fleet of tractors pulling heavy triple trailers. The primary objective of the project is to identify pavements with superior field performance and lower life cycle costs through the application of a design lifetime of truck traffic (10 million equivalent single axle loadings, or ESALs, over 2,6M km) in 2 years. Within one section, NCAT evaluate the installation and performance of ADFORS GlasGrid geogrid reinforced interlayer. **Placement of the section in year 2000, pavement performance was quantified after 20 million ESALs in 2006 and continuing until today.**

- ADFORS GlasGrid self-adhesive with 100kN tensile strength can be installed without significantly hindering the overall construction process or compromising construction quality.
- No change to the standard construction methodology was necessary.
- No damage of ADFORS GlasGrid (even though the test section was in sharp turning of the heavy construction equipment including a material transfer device) was occurred.
- No adjustment was made to production and placement temperatures.
- Fiberglass grid appeared to be in excellent condition 5½ years after it was installed (Figure 27).
- ADFORS GlasGrid reinforced section is crack free compare to the unreinforced section.
- The section containing ADFORS GlasGrid interlayer was left in place, and will continue to be monitored.



Section with ADFORS GlasGrid shows no cracking



Unreinforced section with cracking



ADFORS GlasGrid carefully removed from the pavement after 5½ years with no damage

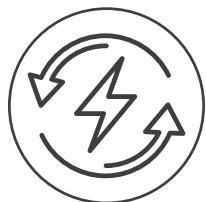


We Care About Our Planet

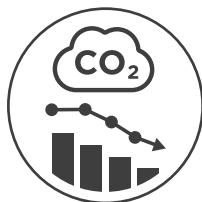
Our company sees sustainable development as a trend that satisfies today's needs while protecting the needs of future generations. Sustainability means finding balance between the economy, the social aspects of life and the environment daily in our work.

HOW DOES SAINT-GOBAIN ADFORS TAKE CARE OF THE ENVIRONMENT?

Between 2010 and 2020, we have reduced:



ENERGY
by 14%



CO₂
by 16%



WATER
by 46%

And that is not all. In line with the objectives of the European Union's Green Deal, our company has set an ambitious target of becoming **carbon neutral by 2050**, a significant commitment to improve the planet's air quality.

**WE HELP IMPROVE
THE CONDITION OF ROADS
AND THE ENVIRONMENT.
LET'S HELP TOGETHER.**

Environmental protection as Saint-Gobain ADFORS priority

ADFORS GlasGrid asphalt pavement reinforcement saves much needed building material

There is currently a shortage of materials for road and motorway construction, mainly asphalt, aggregate and gravel. One of the main advantages of asphalt reinforcement systems is the significant extension of the service life of roadways, which also prolongs maintenance and repair intervals. This saves money on valuable construction materials.

What's more...

The ADFORS GlasGrid product range offers reinforcements for application **without need for tack coat**

- less machinery
- less asphalt binder
- less time
- fewer workers

**AS A RESULT, WE REDUCE CO₂ EMISSIONS
AND THUS CONTRIBUTE TO THE PROTECTION
OF OUR ENVIRONMENT.**

PROVEN!

ADFORS GlasGrid self-adhesive geogrids reduce total CO₂ emissions by approx. 20% per 1 km of EU motorway used over 30 years compared to an unreinforced motorway thanks to fewer repairs!

An independent company from Sweden has evaluated and calculated the positive environmental impact of ADFORS GlasGrid GG self-adhesive geogrid, comparing two **1 km long motorway sections over a 30-year period**. The motorway section repaired without the use of road reinforcement was compared with a section of the motorway maintained using GlasGrid GG. The geogrids reduced total CO₂ emissions by 19%, amounting to **197 tonnes of CO₂** thanks to extended repair intervals of the road surface.



**197 tonnes
of CO₂ emissions**



**112 Paris–New York
return flights**

And that's not all...

Another specific example of a sustainable solution is the largest project in GlasGrid's more than 30-year history. In 2021, ADFORS CZ supplied 540 000 m² of self-adhesive geogrid for the repair of the A1 motorway section from Chirpan to Stara Zagora in Bulgaria.

Imagine...

There are 13 000 km of motorways in Germany. If we applied ADFORS GlasGrid geogrids to every kilometre of German motorways, we would save an incredible 2 561 000 tonnes of CO₂ by reducing the number of repairs and maintenance by at least one repair over a 30-year period!



**2,5 mil tonnes of CO₂
emissions**



**production
of 426 000
midsize
passenger cars**



432 000 kg

less sprayed tack coat



3x

longer motorway service life

The self-adhesive function of the geogrid allows application without nails and sprayed tack coat. This brings advantages:

- Significant reduction in the amount of sprayed tack coat (approx. 60% less) during construction
- Fewer installation workers (approx. 50% fewer)
- Faster application of the reinforcement (approx. 20% less time)

General Description

ADFORS GlasGrid GG Full Lane Width Pavement Reinforcement System is manufactured at a Saint-Gobain ADFORS facility that has achieved ISO 9001:2015 certification and meets the requirements of EN 15381. ADFORS GlasGrid is a high strength, open fiberglass grid custom knitted in a stable construction and coated with a patented elastomeric polymer and self-adhesive glue. Every component of the matrix shall be stabilized against ultraviolet degradation and inert to chemicals normally found in a natural soil environment. ADFORS GlasGrid conforms to the property values listed below, which have been derived from quality conformance testing performed by an accredited laboratory:

Technical Characteristic

Property	GG 50	GG 100	GG 200	Test Method
Tensile Strength (MD x XD) Ultimate	(55 x 55) - 5 kN/m	(115 x 115) - 15 kN/m	(115 x 215) - 15 kN/m	EN ISO 10319 ASTM D6637
Tensile Elongation Ultimate	2,5 ± 0,5 %	2,5 ± 0,5 %	2,5 ± 0,5 %	EN ISO 10319 ASTM D6637
Tensile Resistance @ 2% Strain (MD x XD)	(46 x 46) ± 10 kN/m	(95 x 95) ± 20 kN/m	(95 x 180) ± 20 kN/m	EN ISO 10319 ASTM D6637
Secant Stiffness EA @ 1% Strain (MD x XD)	(2.200 x 2.200) ± 200 N/mm	(4.600 x 4.600) ± 600 N/mm	(4.600 x 8.600) ± 600 N/mm	EN ISO 10319 ASTM D6637
Young's Modulus E	73.000 MPa	73.000 MPa	73.000 MPa	
Mass per Unit Area	205 g/m²	500 g/m²	633 g/m²	EN ISO 9864 ASTM D5261
Melting Point Coating Melting Point Glass	>232 °C >820 °C	>232 °C >820 °C	>232 °C >820 °C	ASTM D276/EN ISO 3146 ASTM C338
Roll Length	150 m	100 m	60 m	
Roll Width	1,0; 1,5; 2,0; 3,0 m	1,0; 1,5; 2,0; 3,0 m	1,5; 3,0 m	
Roll Area	150, 225, 300, 450 m²	100, 150, 200, 300 m²	90, 108 m²	
Adhesive Backing	Pressure sensitive	Pressure sensitive	Pressure sensitive	
Grid Size (Center to Center of Strand)	25 x 25 mm	12,5 x 12,5 mm (type 8501) 25 x 25 mm (type 8511)	25 x 19 mm	
Material	Fiberglass reinforcement with modified polymer coating and pressure-sensitive adhesive backing.			

Properties

- High grid stiffness provides a wrinkle-free installation and a direct load transmission.
- Low elongation
- Thermal and chemical stability
- Excellent milling performance



The values and tolerances given are obtained in our laboratories and in accredited testing institutions. The information given in this data sheet is to the best of our knowledge true and correct. However new research and practical experience can make revisions necessary. We reserve the right to make changes at any time. Statements concerning possible use of our product are not intended as recommendations for their use in the infringement of any patent. No patent warranty of any kind, expressed or implied, is made or intended.

Installation

- Complete all crack sealing, pothole filling, base repairs, leveling course application. Road surface must be dry, clean and dust-free with temperature 5 °C - 60 °C.
- Unroll the geogrid with the sticky side face down on the flat layer/leveling course.
- Respect the overlap of end roll joints 10 – 15 cm and longitudinal joints at minimum 5 cm.
- Press the grid to the layer to activate glue and ensure bonding between the lower surface and grid.
- Apply tack coat per project requirements. (See application tack coat rate formula in Installation manual page 4).
- Permit the tack to completely cure prior to proceeding.
- Apply asphalt over layer.

See document Installation Procedures for detailed steps available on our website or watch the video on YOUTUBE ADFORS TV channel.



Benefit

- Quick and efficient installation due to self-adhesive backing
- High grid stiffness providing a wrinkle free installation
- Easy cutting
- Good trafficability (suppliers, trucks, paver)
- Thermal and chemical stability
- Excellent milling performance
- Measured unlimited recyclability & enhanced properties in Reclaimed Asphalt Pavement (RAP)



In as much as Saint-Gobain ADFORS has no control over installation design, installation workmanship, accessory materials, or conditions of application, Saint-Gobain ADFORS does not warrant the performance or results of any installation or use of ADFORS GlasGrid GG. This warranty disclaimer includes all implied warranties, statutory or otherwise, including the warranty of merchantability and of fitness for a particular purpose. The purchaser and/or user should perform its own tests to determine the suitability and fitness of the product for the particular purpose desired in any given situation.

BANGALORE PLANT (INDIA)

The Hidden Strength in the Runway

Lower lifecycle costs of airfield asphalt overlays by up to 20–30 %

Centralia Airport, Exeter,
Ontario, Canada →



State of the pavement
before the repair in 1992
safety compromised



State of the pavement after
20 years in service
(photo May 2012)

Heathrow International Airport London, UK

Project: Pink Elephant Car Park
Product: ADFORS GlasGrid GG50
Quantity: 45.000 m²
Installation date: June 2005

Overlay design:

40 mm surface course
ADFORS GlasGrid GG50 + fixing coat
30 mm leveling course
Existing PCC panels

Project details:

At Heathrow Airport in London, the PCC pavement of an existing taxiway needed to be converted into an asphalt paved parking lot. The budget was tight, but the client wanted to prevent reflective cracking to maintain the visual conditions and prevent the detrimental effect of moisture ingress in the structure. Using GlasGrid and a fixing coat of Sealoflex® polymer modified bitumen, a limited overlay thickness was provided. Inspection of the project in 2009 showed that this solution was very effective in addressing reflective cracking, as only one crack had reflected.

Atatürk International Airport Istanbul, Turkey

Project: Atatürk International Airport
Runway Rehabilitation
Product: ADFORS GlasGrid GG100
Quantity: 300.000 m²
Installation date: May 2010

Overlay design:

4 cm SMA-19 mm nominal
6 cm HMA-19 mm nominal
6 cm HMA-19 mm nominal
ADFORS GlasGrid GG100
10 cm CRL-19 mm nominal

Project details:

A major overall reinforcement and expansion of the runway, which included significant volumes of fill to correct the pavement profile, needed to be completed. The old PCC was removed and reinstated with GlasGrid reinforced ACC. The result was a longer and wider runway that has the ability to handle heavier aircraft loadings.



Runway - Indian Case Study

PROJECT

Western part of India

APPLICATION

Converting Rigid Runway to Flexible

PRODUCT

Glasgrid 8501

QUANTITY

90000 sqm

INSTALLATION DATE

Mar- July 2016

PROJECT DETAILS

Rigid runway was first covered with 40 mm bituminous surface (levelling course)

Glasgrid was placed on that

Hot bitumen grade 80/100 sprayed on Glasgrid @ .7 to 1 kg/sqm.

Mix was spread on the tacked Glasgrid specially on the wheelpath of paver

Two layers of 80 mm each were laid after that



160 mm Bituminous Layer

Laying of Glasgrid 8501

Spray of Tack Coat of hot Bitumen @ 1kg/sqm
40mm Bituminous layer

Concrete Runway



General Description

ADFORS GlasGrid CompoGrid Pavement Reinforcement System and Moisture Barrier System is manufactured at a Saint-Gobain ADFORS facility that has achieved ISO 9001:2015 certification and meets the requirements of EN 15381. CompoGrid is a composite material consisting of fiberglass reinforcement grid coated in a patented elastomeric polymer, bonded to a non-woven paving geotextile. The non-woven geotextile is a staple fiber, needle punched and manufactured from fibers that are needed to form a stable network and retain dimensional stability relative to each other. CompoGrid is resistant to ultraviolet degradation and to biological and chemical environments normally found in soils. CompoGrid conforms to the property values listed below, which have been derived from quality conformance testing performed by an accredited laboratory:

Technical Characteristics

Property	CG 50	CG 100	CG 200	Test Method
Tensile Strength (MD x XD) Ultimate	(55 x 55) - 5 kN/m	(115 x 115) - 15 kN/m	(115 x 215) - 15 kN/m	EN ISO 10319 ASTM D6637
Tensile Elongation Ultimate	2,5 ± 0,5 %	2,5 ± 0,5 %	2,5 ± 0,5 %	EN ISO 10319 ASTM D6637
Tensile Resistance @ 2% Strain (MD x XD)	(46 x 46) ± 10 kN/m	(95 x 95) ± 20 kN/m	(95 x 180) ± 20 kN/m	EN ISO 10319 ASTM D6637
Secant Stiffness EA @ 1% Strain (MD x XD)	(2.200 x 2.200) ± 200 N/mm	(4.600 x 4.600) ± 600 N/mm	(4.600 x 8.600) ± 600 N/mm	EN ISO 10319 ASTM D6637
Young's Modulus E	73.000 MPa	73.000 MPa	73.000 MPa	
Mass per Unit Area	345 g/m ²	650 g/m ²	763 g/m ²	EN ISO 9864
Melting Point Coating Melting Point Glass	>232 °C >820 °C	>232 °C >820 °C	>232 °C >820 °C	ASTM D276/EN ISO 3146 ASTM C338
Roll Length	100 m	100 m	60 m	
Roll Width	1,0; 1,5; 2,0; 3,0 m	1,0; 1,5; 2,0; 3,0 m	1,5 m	
Roll Area	100, 150, 200, 300 m ²	100, 150, 200, 300 m ²	90 m ²	
Grid Size (Center to Center of Strand)	25 x 25 mm	25 x 25 mm	25 x 19 mm	
Material	Fiberglass reinforcement with modified polymer coating bonded to a non-woven textile specifically engineered for asphalt overlays.			

Properties

- High grid stiffness provides a wrinkle-free installation and a direct load transmission.
- Low elongation
- Thermal and chemical stability
- Excellent milling performance



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Installation

- CompoGrid can be installed on an old asphalt surface or evenly milled surface. Fill cracks and depressions wider than 6 mm. Road surface must be dry, clean and dust-free with temperature 5 ° - 60 °C.
- Apply tack coat per project requirements. (See application tack coat rate formula in Installation manual page 3).
- Unroll the geogrid with the non-woven fabric side face down immediately after tack coat spraying. Respect the overlap of end roll joints 10 - 15 cm and longitudinal joints at minimum 5 cm. Ensure sufficient amount of tack is applied at the overlap, in order that both layers of materials become fully saturated.
- Press the grid to a layer to ensure a saturation of bitumen into the fabric.
- Permit the tack to completely cure prior to proceeding.
- Apply asphalt over layer.

See document Installation Procedures for detailed steps available on our website or watch the video on YOUTUBE ADFORS TV channel.



Benefits

- Universal application on milling surface or over existing pavement surfaces
- Quick and efficient installation
- Efficient moisture barrier due to the non-woven fabrics
- High grid stiffness providing a wrinkle free installation
- Easy cutting
- Good trafficability (suppliers, trucks, paver)
- Thermal and chemical stability
- Excellent milling performance
- Measured unlimited recyclability & enhanced properties in Reclaimed Asphalt Pavement (RAP)



In as much as Saint-Gobain ADFORS has no control over installation design, installation workmanship, accessory materials, or conditions of application, Saint-Gobain ADFORS does not warrant the performance or results of any installation or use of ADFORS GlasGrid CG. This warranty disclaimer includes all implied warranties, statutory or otherwise, including the warranty of merchantability and of fitness for a particular purpose. The purchaser and/or user should perform its own tests to determine the suitability and fitness of the product for the particular purpose desired in any given situation.

BANGALORE PLANT (INDIA)

General Description

The patch repair system ADFORS GlasGrid Rapid is manufactured at a Saint-Gobain ADFORS facility that has achieved ISO 9001:2015 certification and meets the requirements of EN 15381. ADFORS GlasGrid Rapid consists of a high stiffness fiberglass grid coated with a patented polymer coating, a nonwoven fabric and thin self-adhesive bitumen layer. The product is specially developed for very fast repairs with application on all types of surfaces without the need for tack coat saving time, labour and costs. ADFORS GlasGrid Rapid has positive impact on reducing CO2 emissions due to its application and extension of maintenance periods. ADFORS GlasGrid Rapid conforms to the property values listed below, which have been derived from quality conformance testing performed by a laboratory:

Technical Characteristics

Property	Unit	Rapid	Test Method
Tensile Strength (MD x XD) Ultimate	kN/m	(115 x 115) - 15	EN ISO 10319
Tensile Elongation Ultimate	%	2,5 ± 0,5	EN ISO 10319
Tensile Resistance @ 2% Strain (MD x XD)	kN/m	(95 x 95) ± 20	EN ISO 10319
Secant Stiffness EA @ 1% Strain (MD x XD)	N/mm	(4.600 x 4.600) ± 600	EN ISO 10319
Young's Modulus E	MPa	73.000	
Mass per Unit Area	g/m ²	>1000	EN ISO 9864
Melting Point Coating	°C	>232	ASTM D 276
Roll Length	m	20	
Roll Width	m	1	
Roll Area	m ²	20	
Grid Size (Center to Center of Strand)	mm	25 x 25	
Material	Fiberglass reinforcement with modified polymer coating and bonded to a self-adhesive bitumen layer specifically engineered for asphalt overlays.		

Properties

- High grid stiffness provides a wrinkle-free installation and a direct load transmission
- Self-adhesive bitumen layer
- Low elongation
- Thermal and chemical stability
- Excellent milling performance



The values and tolerances given are obtained in our laboratories and in accredited testing institutions. The information given in this data sheet is to the best of our knowledge true and correct. However new research and practical experience can make revisions necessary. We reserve the right to make changes at any time. Statements concerning possible use of our product are not intended as recommendations for their use in the infringement of any patent. No patent warranty of any kind, expressed or implied, is made or intended.

Installation

- Rapid can be installed on an old asphalt surface or evenly milled surface without additional preparation. Road surface must be dry, clean and dust-free with temperature 5 ° - 60 °C.
- Unroll the geogrid removing the protection film on the back and place the geogrid non-woven fabric side face up. Respect the overlap of end roll joints 10 - 15 cm and longitudinal joints at minimum 5 cm.
- Press the grid to a layer to ensure a bonding.
- Apply asphalt over layer.

See document Installation Procedures for detailed steps available on our website.

Benefits

- Universal application on milled surface or over existing pavement surfaces
- Reinforcement of joint superstructures, single cracks and small asphalt areas
- Fast and easy manual installation
- Self-adhesive bitumen layer
- No heating necessary
- High grid stiffness providing a wrinkle free installation
- Easy cutting
- Good trafficability (suppliers, trucks, paver)
- Thermal and chemical stability
- Excellent milling performance
- Measured unlimited recyclability & enhanced properties in Reclaimed Asphalt Pavement (RAP)



In as much as Saint-Gobain ADFORS has no control over installation design, installation workmanship, accessory materials, or conditions of application, Saint-Gobain ADFORS does not warrant the performance or results of any installation or use of ADFORS GlasGrid CG. This warranty disclaimer includes all implied warranties, statutory or otherwise, including the warranty of merchantability and of fitness for a particular purpose. The purchaser and/or user should perform its own tests to determine the suitability and fitness of the product for the particular purpose desired in any given situation.

BANGALORE PLANT (INDIA)

General Description

CompoGrid Lite Pavement Reinforcement System and Moisture Barrier System is manufactured at a Saint-Gobain ADFORS facility that has achieved ISO 9001:2015 certification and meets the requirements of EN 15381. CompoGrid is a composite material consisting of fiberglass reinforcement grid coated in a patented elastomeric polymer, bonded to a non-woven textile. CompoGrid Lite is resistant to ultraviolet degradation and to biological and chemical environments normally found in soils. ADFORS GlasGrid CGL conforms to the property values listed below, which have been derived from quality conformance testing performed by an accredited laboratory:

Technical Characteristics

Property	CG 50L	CG 100L	CG 200L	Test Method
Tensile Strength (MD x XD) Ultimate	(55 x 55) - 5 kN/m	(115 x 115) - 15 kN/m	(115 x 215) - 15 kN/m	EN ISO 10319 ASTM D6637
Tensile Elongation Ultimate	2,5 ± 0,5 %	2,5 ± 0,5 %	2,5 ± 0,5 %	EN ISO 10319 ASTM D6637
Tensile Resistance @ 2% Strain (MD x XD)	(46 x 46) ± 10 kN/m	(95 x 95) ± 20 kN/m	(95 x 180) ± 20 kN/m	EN ISO 10319 ASTM D6637
Secant Stiffness EA @ 1% Strain (MD x XD)	(2.200 x 2.200) ± 200 N/mm	(4.600 x 4.600) ± 600 N/mm	(4.600 x 8.600) ± 600 N/mm	EN ISO 10319 ASTM D6637
Young's Modulus E	73.000 MPa	73.000 MPa	73.000 MPa	
Mass per Unit Area	239 g/m²	535 g/m²	637 g/m²	EN ISO 9864
Melting Point Coating	>232 °C	>232 °C	>232 °C	ASTM D276/EN ISO 3146
Melting Point Glass	>820 °C	>820 °C	>820 °C	ASTM C338
Roll Length	150 m	100 m	70 m	
Roll Width	1,0; 1,5; 2,0; 3,0 m	1,0; 1,5; 2,0; 3,0 m	1,0; 1,5; 3,0 m	
Roll Area	150, 225, 300, 450 m²	100, 150, 200, 300 m²	70, 105, 210 m²	
Grid Size (Center to Center of Strand)	25 x 25 mm	25 x 25 mm	25 x 19 mm	
Material	Fiberglass reinforcement with modified polymer coating and bonded to a non-woven textile specifically engineered for asphalt overlays.			

Properties

- High grid stiffness provides a wrinkle-free installation and a direct load transmission.
- Low elongation
- Thermal and chemical stability
- Excellent milling performance



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Installation

- CompoGrid Lite can be installed on an old asphalt surface or evenly milled surface. Fill cracks and depressions wider than 6 mm. Road surface must be dry, clean and dust-free with temperature 5 ° - 60 °C.
- Apply tack coat per project requirements. (See application tack coat rate formula in Installation manual page 3).
- Unroll the geogrid with the non-woven fabric side face down immediately after tack coat spraying. Respect the overlap of end roll joints 10 – 15 cm and longitudinal joints at minimum 5 cm. Ensure sufficient amount of tack is applied at the overlap, in order that both layers of materials become fully saturated.
- Press the grid to a layer to ensure a saturation of bitumen into the fabric.
- Permit the tack to completely cure prior to proceeding.
- Apply asphalt over layer.

See document Installation Procedures for detailed steps available on our website or watch the video on YOUTUBE ADFORS TV channel.



Benefits

- Universal application on milled surface or over existing pavement surfaces
- Quick and efficient installation
- Optimum asphalt retention of the nonwoven
- High grid stiffness providing a wrinkle free installation
- Easy cutting
- Good trafficability (suppliers, trucks, paver)
- Thermal and chemical stability
- Excellent milling performance
- Measured unlimited recyclability & enhanced properties in Reclaimed Asphalt Pavement (RAP)



In as much as Saint-Gobain ADFORS has no control over installation design, installation workmanship, accessory materials, or conditions of application, Saint-Gobain ADFORS does not warrant the performance or results of any installation or use of ADFORS GlasGrid CGL. This warranty disclaimer includes all implied warranties, statutory or otherwise, including the warranty of merchantability and of fitness for a particular purpose. The purchaser and/or user should perform its own tests to determine the suitability and fitness of the product for the particular purpose desired in any given situation.

BANGALORE PLANT (INDIA)

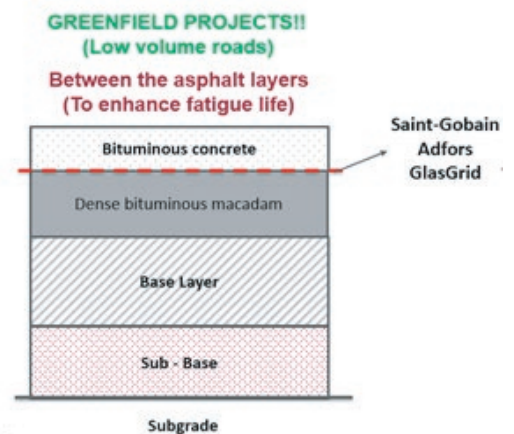
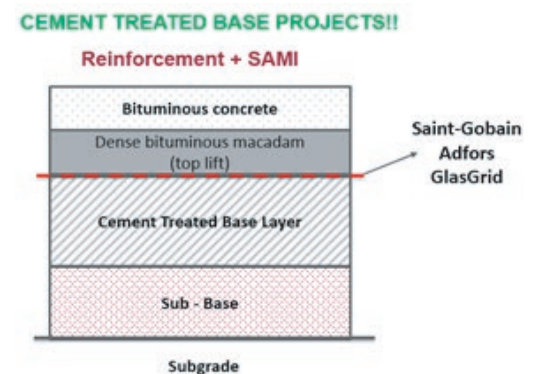
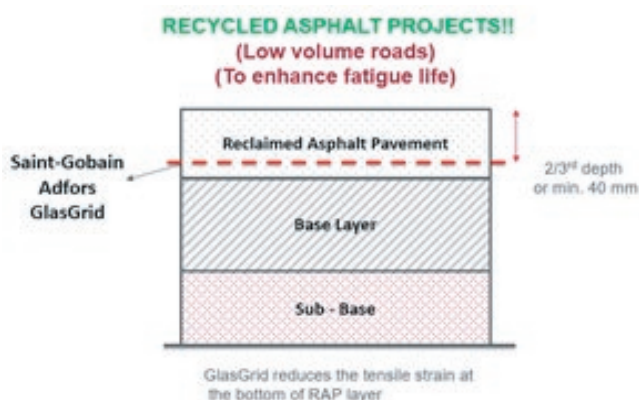
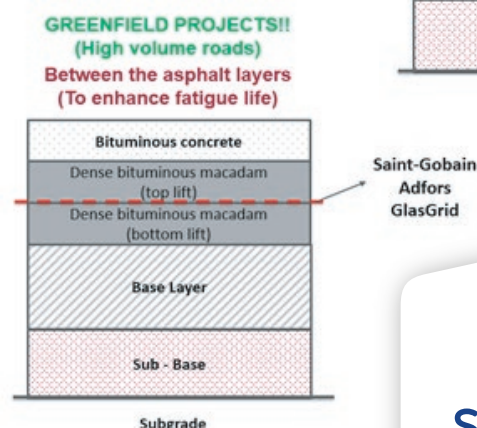
Use of Composite GlasGrid in Greenfield, Deep Rehabilitation, Cement Treated Base & Recycled Asphalt Pavement Projects



Saint-Gobain Adfors GlasGrid CompoGrid Pavement Reinforcement System and Moisture Barrier System is manufactured at a Saint-Gobain ADFORS facility that has achieved ISO 9001:2015 certification and meets the requirements of EN 15381. CompoGrid is a composite material consisting of fiberglass reinforcement grid coated in a patented elastomeric polymer, bonded to a non-woven paving geotextile. The non-woven geotextile is a staple fiber, needle punched and manufactured from fibers that are needed to form a stable network and retain dimensional stability relative to each other. CompoGrid is resistant to ultraviolet degradation and to biological and chemical environments normally found in soils. CompoGrid conforms to the property values listed below, which have been derived from quality conformance testing performed by a laboratory.

APPLICATIONS

- Composite GlasGrid can be placed **between the wearing course and the binder course in greenfield projects** to enhance the fatigue life of asphalt pavements.
- Composite GlasGrid can be placed **between two lifts of Binder course - Dense Bituminous Macadam in deep rehabilitation projects and greenfield projects.**
- Composite GlasGrid can be used as **stress absorbing membrane interlayer (SAMI) above cement treated base or concrete pavements** where an asphalt mixture overlay is applied. This will add an additional advantage of reinforcement of asphalt mixture overlay compared to paving fabric which just acts as a SAMI.
- Composite GlasGrid can be used in **Recycled asphalt pavement (RAP) layer to enhance the fatigue life of RAP mixtures** by reducing the tensile strain at the bottom of RAP mixture.



Use of Polypropylene Geogrid to Reinforce Unbound Pavement layers & Track Bed Stabilization in Railways

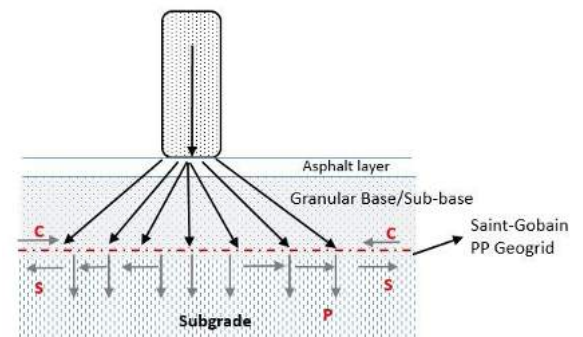


Saint-Gobain Adfors Geogrids is a biaxial geogrids from a superior grades of polypropylene using controlled punching and drawing process. The Polypropylene geogrids has high tensile strength at low strain in both the machine and cross machine direction. It reinforces the unbound granular layers through aggregate confinement, improved modulus, and thereby, overall performance of the pavement.

BASIC MECHANISM OF REINFORCEMENT

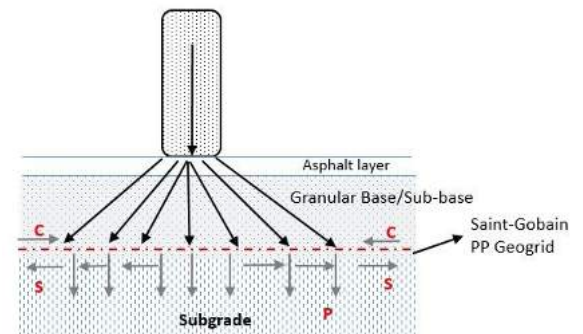
LATERAL RESTRAINT

- Confines aggregate material during loading, and therefore, restricts lateral flow of material beneath the load.
- Aggregates used in pavement system are stress-dependent. Improved lateral confinement results in increased modulus of the base/sub-base course materials.



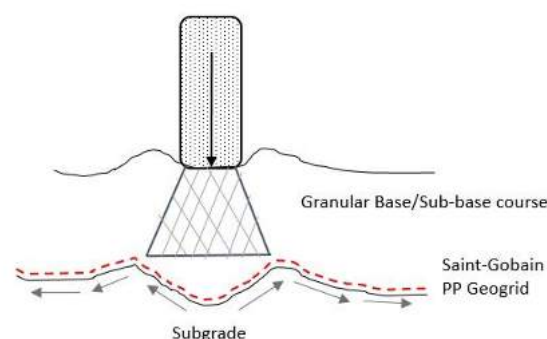
IMPROVED BEARING CAPACITY

- Increased modulus of the base/sub-base course results in improved vertical stress distribution applied to the subgrade.
- Reduces vertical strain on top of subgrade.
- Improved bearing capacity is achieved by shifting the failure envelope of the pavement system from relatively weak subgrade to relatively strong base-course material.



TENSION MEMBRANE EFFECT

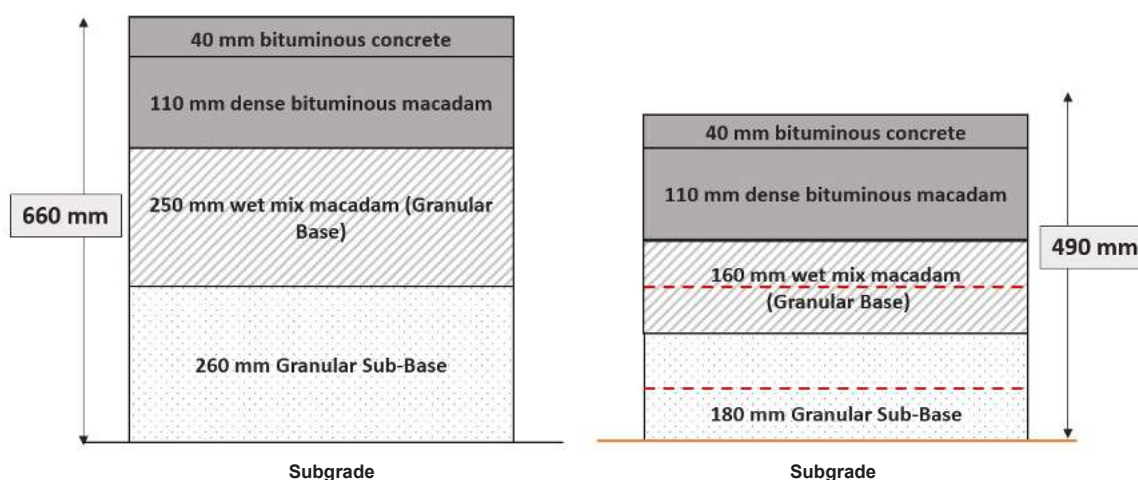
- Tensile stress in a deformed geogrid membrane improves vertical stress distribution.



DESIGN OF GEOGRID REINFORCED FLEXIBLE PAVEMENT (IRC:SP:59 & IRC:37-2018)

- Pavement construction consumes a large quantity of aggregate material from the quarries. Thus, it is of immediate need to reduce the pavement thickness without compromising on the design requirements.
- The usage of geogrids is highly recommended, primarily because of the reinforcement function compared to the conventional methods such as cement stabilization.
- Geogrids reduce the granular layer thickness in pavements by arresting the lateral movement of aggregate materials, sustaining higher loads and providing adequate membrane support over induced loads.
- As per IRC:37-2018 and IRC:SP:59 guidelines, the benefit availed due to geogrid is captured using **layer coefficient ratio (LCR)** or **modulus improvement factor (MIF)**.
- The LCR/MIF values varies from product to product, subgrade and granular layer properties. Certified values shall be used by conducting extensive full scale traffic tests and/or laboratory tests.

DESIGN EXAMPLE (IRC: SP:59-2019) GEOGRIDS PLACED IN SUB-BASE AND BASE LAYER



ADVANTAGES



Technical characteristics

Polymer: Polypropylene.

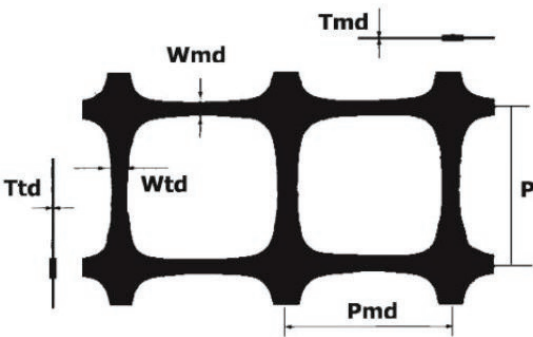
Resistance to Ultra-Violet Light: Resistance to UV is given to Saint-Gobain Adfors geogrids by the incorporation of weathering-grade carbon black (1), well dispersed in the polymer matrix, to give extended lives in exposed conditions.

Chemical and biological resistance: Saint-Gobain Adfors biaxial Geogrids are manufactured from Polypropylene which is unaffected by all chemicals, including acids, alkalis and salts, normally found in soils. Also it is not a nutrient, therefore, these products will not be affected by micro-organisms in soil.

Product	Tensile strength (kN/m) ⁽²⁾		Tensile load (kN/m)				Junctional efficiency (%) ⁽⁴⁾
			2% strain		5% strain		
	MD	TD	MD	TD	MD	TD	
SG2020 PP	20	20	7.0	7.4	14.0	14.6	>=95
SG3030 PP	30	30	11.0	11.0	21.0	21.0	>=95
SG4040 PP	40	40	14.0	4.0	28.0	28.0	>=95

Typical Dimensions

Product	Pitch size		Rib width		Rib depth		Standard roll sizes ⁽³⁾
	Pmd	Ptd	Wmd	Wtd	Tmd	Ttd	
SG2020 PP	20	20	7.0	7.4	14.0	14.6	197.5 m² (3.95 m x 50 m)
SG3030 PP	30	30	11.0	11.0	21.0	21.0	197.5 m² (3.95 m x 50 m)
SG4040 PP	40	40	14.0	4.0	28.0	28.0	197.5 m² (3.95 m x 50 m)



- Note 1:** Carbon Black content ≥ 2%
- Note 2:** All Strength and Load figures are based on test results from the manufacturer’s laboratory in accordance with ISO10319 at the temperature of 21±1 °C. Unless indicated otherwise, values shown are MARV determined in accordance with ASTM D-4759.
- Note 3:** Other roll sizes are available to order.
- Note 4:** Measured by comparing the results of tests in accordance with test methods GRI-GG1 and GRI-GG2.

Use of Polyester Geogrid in pavement Layers, Retaining Earth Wall, Ground Improvement and Other Related Applications

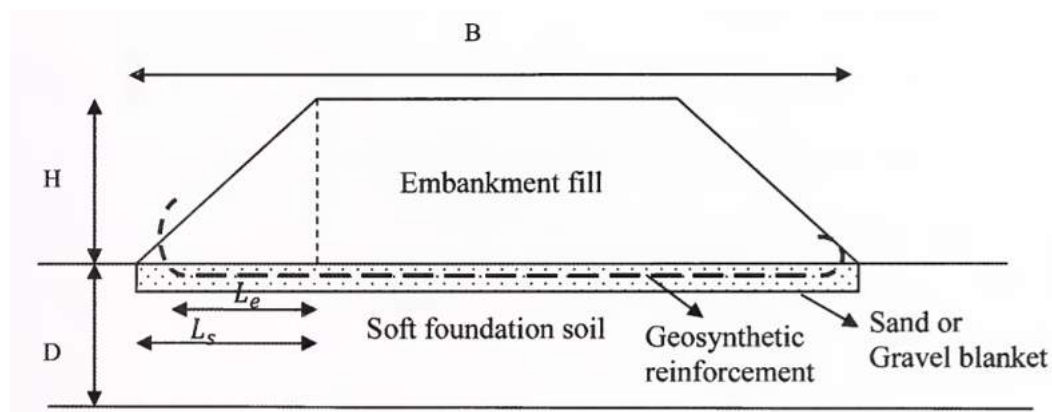


Saint-Gobain Adfors Geogrids are composed of high tenacity multi-filament polyester yarns, warp knitted geogrid with superior junction strength. These geogrids are coated with PVC that offers high resistance to ultraviolet rays.

APPLICATIONS

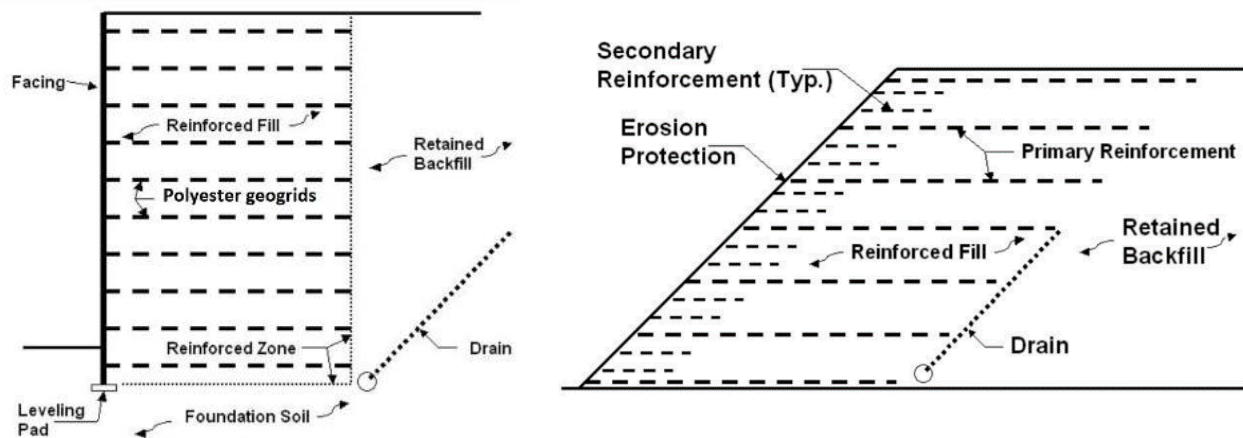
Embankments on soft subsoils (Basal Reinforcement) – IRC:113-2013

- The design of embankment on soft ground is governed by the shear resistance of the foundation. **The resistance to shear failure in the embankment** as well as the soft soil can be enhanced with the **inclusion of polyester geogrid reinforcement**.
- Polyester geogrids have **high tensile strength, low elongation and low creep**, which is a primary requirement for a reinforcement to have a long-term design strength.



Stabilized Retaining Walls and Reinforced Soil Slopes

- Polyester reinforced earth walls are **cost effective soil retaining structures** that can tolerate **larger settlements** than reinforced concrete walls.
- Polyester reinforcing geogrid increases stability of slope.
- Polyester reinforcing geogrid in the soil improves the strength of the soil significantly.



Reinforcement of unbound pavement layers

- Polyester geogrid reinforces the unbound granular layers through aggregate confinement, improved modulus, and thereby, overall performance of the pavement.

Polyester Biaxial Geogrid

Property		Test method	SG-PEB 20-20	SG-PEB 40-40	SG-PEB 60-60	SG-PEB 80-80	SG-PEB 100-100	SG-PEB 120-120	SG-PEB 150-150
Ultimate tensile strength (kN/m)	MD	EN ISO 10139	20	40	60	80	100	120	150
	CD		20	40	60	80	100	120	150
Elongation at maximum load (%)	MD	EN ISO 10139	3						
	CD		3						
Approximate mesh size (mm)			12.7 × 12.7 ; 25.4 × 25.4; 40 × 40						
Roll width (m)			1 - 6						
Roll Length (m)			50 -200						

Polyester Uniaxial Geogrid

Property		Test method	SG-PEU 40-25	SG-PEU 60-30	SG-PEU 80-30	SG-PEU 100-30	SG-PEU 150-30	SG-PEU 200-30	SG-PEU 300-30
Ultimate tensile strength (kN/m)	MD	EN ISO 10139	25	30	30	30	30	30	30
	CD		40	60	80	100	150	200	300
Elongation at maximum load (%)	MD	EN ISO 10139	3						
	CD		3						
Approximate mesh size (mm)			12.7 × 12.7 ; 25.4 × 25.4; 40 × 40						
Roll width (m)			1 - 6						
Roll Length (m)			50 -200						

Note : Customized Polyester Geogrids with specific technical properties and roll sizes (not mentioned in the data sheet) are available on request.

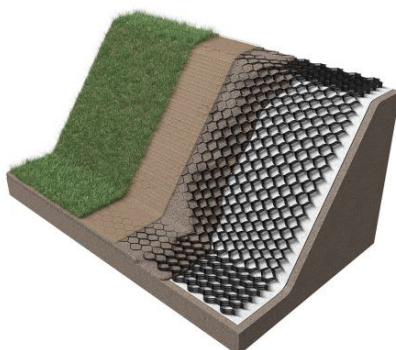
Use of Geocell for Subgrade Stabilization, Erosion Control & Retaining Walls

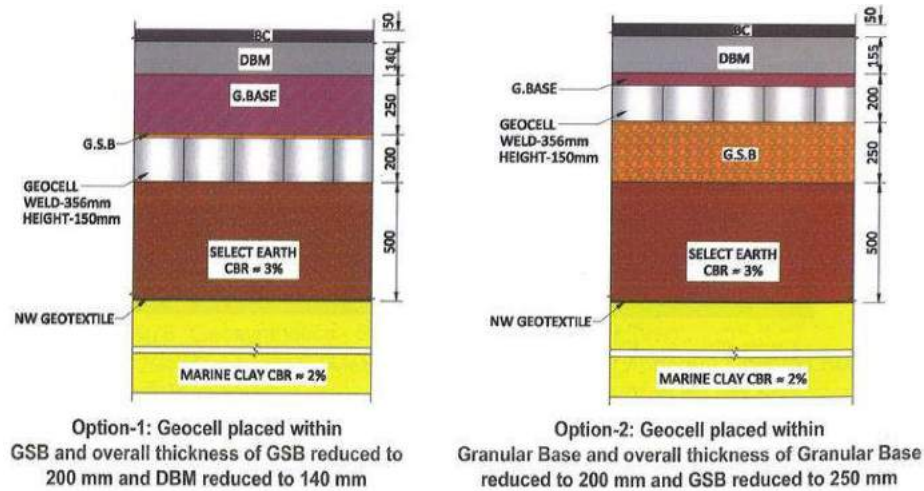


Saint-Gobain Adfors Geocell are three dimensional honeycombed cellular structures that form a confinement system with the addition of in-filled compacted soil/aggregates.

APPLICATIONS

- Geocell serves as load spreader when loads act on the system
- Geocell reduces vertical differential settlement into soft subgrades.
- Geocell improves shear strength and load bearing capacity of soil, thereby, enhancing the service life of pavements.
- Cellular confinement strengthens the aggregate infill, allowing the native local soils and recycled materials to be used.
- Geocell confinement allows construction of steep slopes.
- The retaining wall structure is formed from horizontal layers of Geocell filled and placed one on top of another – cheaper materials and reduced maintenance.
- Geocells can be placed in:
 - Subgrade
 - Granular sub-base layer
 - Base layer
- Suitably reduces thickness of base and sub-base layers using modulus improvement factor as per IRC:SP:59-2019.
- Erosion control.
- Retaining wall.





Technical characteristics

Material Properties		
Polymer Density (ASTM D 1505)	g/cm ³	0.920 – 0.965
Environmental Stress Crack Resistance (ASTM D 1693)	hrs	>3500
Carbon Black Content (ASTM D 1603)	%	Min 1.2 – 2.0
Nominal Sheet Thickness (ASTM D 5199)	mm	1.25 - 1.52
Material	Compound of various Polyethylene and additives	
Texture	The texture of the Polyethylene strip comprises of multiple indentations which are rhomboidal in shape, over the entire strip area on both sides of the strip. The indentations have a surface Density of 11 to 15 per cm ²	
Perforations	The polyethylene strip used for making geocell is perforated with horizontal rows of maximum 10 mm Diameter holes. Perforated cell area is less than 12% of cell surface area	

Adfors Saint-Gobain Geocell

Material Property	Unit	Product code				
Weld spacing (±3%)	mm	SG 330	SG 356	SG 445	SG 660	SG 712
Cell depth (±3%)	mm	75,100,125,150,200,250,300				
Expanded cell Area (±3%)	Width	mm	244	259	320	488
	Length	mm	210	224	287	436
Expanded Cell Area (±13%)		Cm ²	250	289	460	1000
Nominal Expanded Section (±3%)	Width	m	2.44	2.59	3.20	4.88
	Length	m	6.10	6.50	8.32	12.64
Nominal expanded area		m ²	14.90	16.82	26.63	61.70

Cell/Section Properties

Seam Properties	mm	75	100/150	125/200	150	200
Seam Peel Strength	N	1065	1420/2130	1775/2840	2130	2840
(EN ISO 13426-1 method B-Peeling test)						

Note : Customized geocell with specific technical properties (not mentioned in the data sheet) are available on request.

Use of Geocomposites for Drainage and Other Related Applications

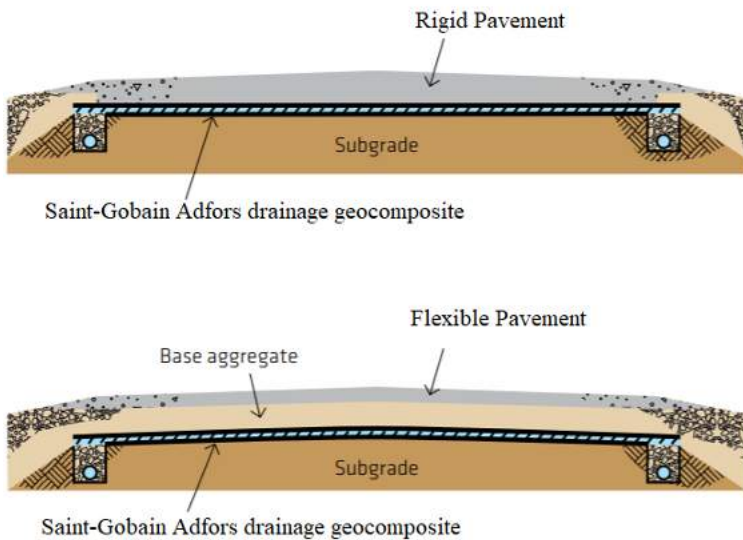
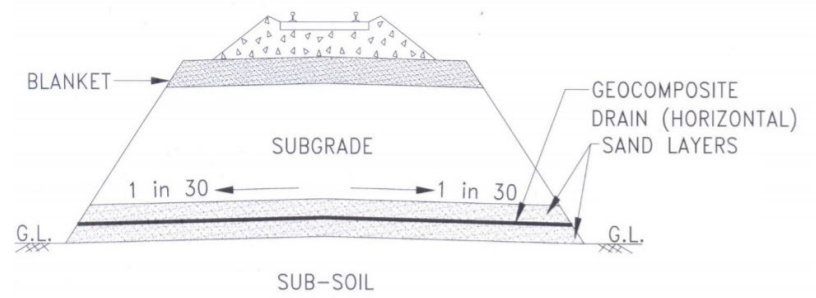


Saint-Gobain Adfors Geocomposite consists of high density polyethylene (HDPE) geonet drainage core with a polypropylene nonwoven fabric bonded on one or both the sides of the geonet. This geocomposites has high compressive resistance and high modulus required to withstand compaction and deformation under loading. It also ensures excellent hydraulic performance.

APPLICATIONS

Embankments on soft subsoils (Basal Reinforcement) – IRC:113-2013

- Water in pavement system is one of the principal cause of pavement distress.
- Incorporating good drainage facility is predicted to extend design life by two to three times.
- Geocomposites drainage layers are tied directly and continuously into an edge drain system.
- Nonwoven geotextile offers separation (avoids intrusion of finer particles into the base layer) and filtration function (allows movement of fluid within the fabric but retains the soil on upstream).
- Geonet ensures high compressive strength.
- Economical solution compared to open-graded drainage aggregate.
- Easy installation – reduces the construction time.
- Roadways, parking lots, paver blocks
 - Under aggregate base course
 - Directly below concrete slab
- Embankments.
- Airport runways and taxiways.
- Railway facilities.
- Replacement to aggregate drainage layer.



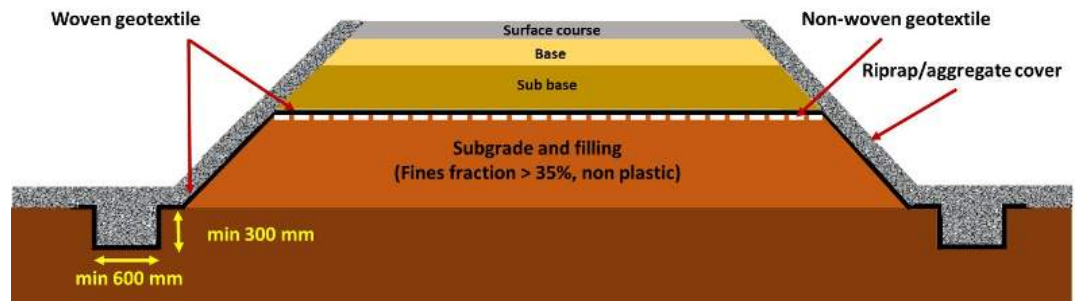
Use of Geocomposite drain over soft sub-soil

Technical characteristics

	Test Method	Unit					
Mechanical Properties - Composite							
Tensile Strength	EN ISO 10319	kN/m	MD/CMD	15.5	20	20	20
Tensile Elongation		%	MD/CMD	35	35	35	35
CBR Puncture Resistance	EN ISO 12236	N	MD/CMD	2500	3300	3300	3300
Hydraulic Properties – Geotextile Filter							
Pore Size – Apparent Opening Size	EN ISO 12956	µm		75	75	75	75
Permeability	EN ISO 11058	l/m2s		50	50	50	50
Hydraulic Properties – Composite (soft platens)							
	EN ISO 12958	l/m.s	i=1@20 kPa	0.30	0.65	0.85	1.9
			i=1@100 kPa	0.20	0.35	0.40	1.3
			i=0.1@20 kPa	0.04	0.07	0.21	0.5
			i=0.1@100 kPa	0.02	0.03	0.08	0.35
Material Dimensions – Composite							
Standard Roll Length		m	25/50/100				
Standard Roll Width		m	2.0/3.8/4.0				
Filter Overlap		mm	100				

Note : Customized geocomposites with specific technical properties and roll sizes (not mentioned in the data sheet) are available on request.

Use of Geotextiles for Separation, Filtration and Erosion Control in Pavements

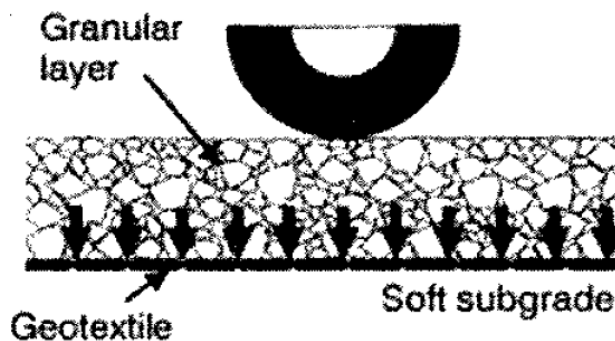
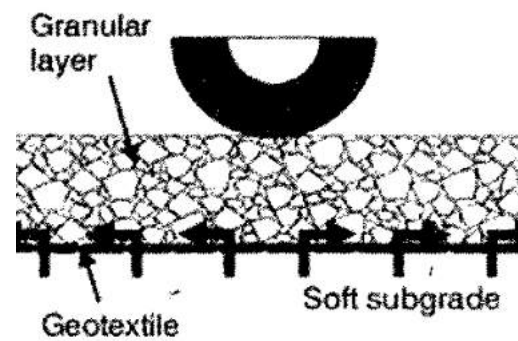


Saint-Gobain Adfors Geotextiles are available as a woven or nonwoven geotextiles. Woven geotextiles are made up of polypropylene materials offering solutions for pavement applications. Nonwoven geotextiles are a needle-punched polypropylene staple fibers that offers better dimensional stability. These geotextiles offer high resistance to ultraviolet rays.

APPLICATIONS

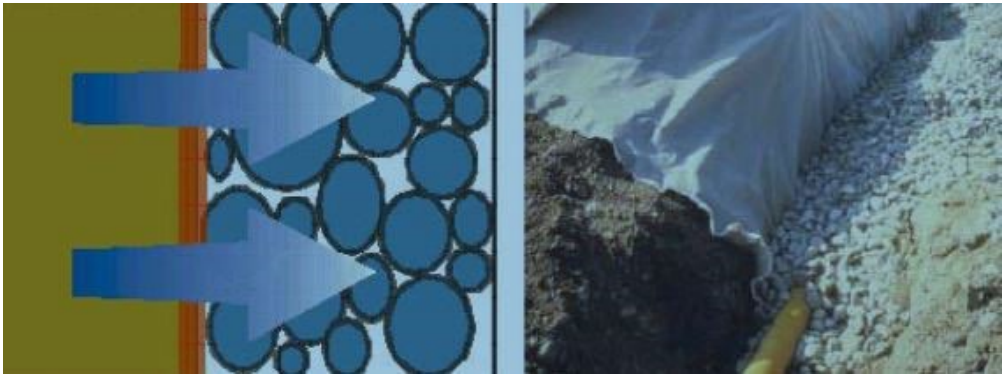
Separation

- **Separation** is a major function of geotextile.
- Geotextile is placed **between a firm subgrade and base course/ballast**.
- Geotextile avoids intrusion of finer particles from subgrade soil into the base layer (IRC:SP:59-2019).
- Geotextile with relatively small openings prevents contamination of the base and sub-base layers of pavement from the subgrade materials.
- Geotextiles **prevent development of pore water pressure in the subgrade**.



Filtration

- Geotextile will prevent in-situ soil from being washed into the system without clogging over time.
- Geotextile **will prevent soils** from **migrating into drainage pipes**/aggregates while maintaining flow through system.



Technical characteristics

Woven Geotextiles - Polypropylene

Product Properties	Test Method	Unit				
POLYMER COMPOSITION , STRUCTURE AND PHYSICAL PROPERTIES						
Polymer	Polypropylene					
Structure	Woven with multifilament yarn in both wrap and weft directions					
Mass per unit area	ASTM D 5261	g/m²	140	240	300	430
MECHANICAL PROPERTIES						
Tensile Strength MD	IS -1969	kN/m	28	57	70	70
Tensile Strength CD	IS -1969	kN/m	28	42	60	70
Elongation at specified Tensile Strength (MD)	IS -1969	%	25	25	25	25
Elongation at specified Tensile Strength (CD)	IS -1969	%	25	25	25	25
Trapezoid Tearing Strength MD	ASTM D 4533	N	300	1100	1500	1500
Trapezoid Tearing Strength CD	ASTM D 4533	N	300	900	1300	1500
Static Puncture Resistance(CBR)	ASTM D 4533	N	2000	3500	4000	6500
HYDRAULIC PROPERTIES						
Water Permittivity	ASTM D 4491	1/m²/s	9	24	18	30
Apparent Opening Size	ASTM D 4751	Micron	75	150	250	425
HYDRAULIC PROPERTIES						
Roll width		m	5	5	5	5
Roll length		m	100	100	100	50

Nonwoven Geotextiles – Polyester

Product Properties	Standard	Unit					
MECHANICAL PROPERTIES							
Tensile Strength	ASTM D 4595	Kn/m	2.0	3	9	18	28
Elongation	ASTM D 4595	%	>50	>50	>50	>50	>50
Grab Tensile Strength	ASTM D 4632	N	150	310	650	1000	1600
Grab Tensile Elongation	ASTM D 4632	%	>55	>55	>50	>50	>50
Trapezoidal Tear Strength	ASTM D 4533	N	60	100	270	480	1000
Puncture Strength(CBR)	ASTM D 6241	N	350	650	1500	2200	4300
HYDRAULIC PROPERTIES							
Flow Water Rate	ASTM D 4491	l/m²/sec	110	100	40	30	20
Apparent Opening Size	ASTM D 4751	µm	212	212	180	120	<75
UV Resistance @ 150 Hrs	ASTM D 4355	% Strength Retained	>70	>70	70	70	70
PHYSICAL PROPERTIES							
Mass/Unit Area	ASTM D 5261	gsm	80	130	300	500	1000
Thickness	ASTM D 5199	mm	0.65	0.9	1.8	2.8	5.0
FORM OF SUPPLY							
Roll Length		m	100				
Roll Width		m	3.0/2.25/4.5				

Nonwoven Geotextiles – Polypropylene

Product Properties	Standard	Unit					
MECHANICAL PROPERTIES							
Tensile Strength	ASTM D 4595	Kn/m	4.0	5.0	7.5	17	23
Elongation	ASTM D 4595	%	>50	>50	>50	>50	>50
Grab Tensile Strength	ASTM D 4632	N	150	250	450	910	1350
Grab Tensile Elongation	ASTM D 4632	%	>50	>50	>50	>50	>50
Trapezoidal Tear Strength	ASTM D 4533	N	80	120	160	340	450
Puncture Strength(CBR)	ASTM D 6241	N	560	800	1150	2800	4000
HYDRAULIC PROPERTIES							
Flow Water Rate	ASTM D 4491	l/m²/sec	110	100	80	40	30
Apparent Opening Size	ASTM D 4751	µm	212	212	212	120	120
UV Resistance @ 150 Hrs	ASTM D 4355	% Strength Retained	>70	>70	>70	>70	>70
PHYSICAL PROPERTIES							
Mass/Unit Area	ASTM D 5261	gsm	80	100	140	300	400
Thickness	ASTM D 5199	mm	0.65	0.75	1.0	2.5	3.0
FORM OF SUPPLY							
Roll Length	-	m	100				
Roll Width	-	m	3.0/2.25/4.5				

Note : Customized geotextiles with specific technical properties (not mentioned in the data sheet) are available on request.

Pothole and Road Patch Repair



EASY. EFFECTIVE. LONG TERM REPAIRS.

**Embeds
into roadway
to form a waterproof seal,
extending the life of repairs.**

Introducing Pothole and Road Patch Repair

Today's current road repair methods do not address the cause of the problem - keeping water out. Traditional repair methods use only fills, which are temporary at best. Saint-Gobain ADFORS Road Patch is the solution! Take the extra step now and avoid repeat repair work later.

Pothole and Road Patch Repair

embeds into the roadway forming a waterproof seal, extending the life of repairs. Unlike traditional methods, Pothole and Road Patch Repair is a cost effective product that properly contains, strengthens, and seals potholes, cracks, and utility cut repairs.



Easy to apply without
special trucks or equipment



High-strength fiberglass
grid reinforced



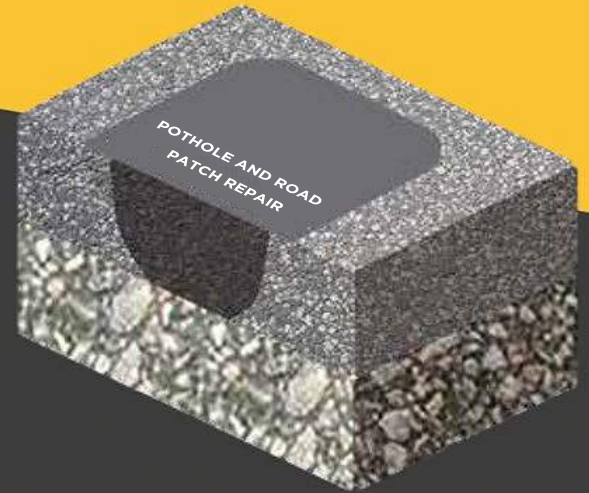
Bonds to both asphalt
or concrete



Plow
resistant



Repairs without
shutting down roadway



APPLICATIONS



Pothole repair



Crack & joint sealing



Seal utility cuts



Manhole & utility surround



Hide/cover unused
road markers



Fix uneven
bridge joints

STOP THE REPAIR CYCLE



Current repair methods
erode over time



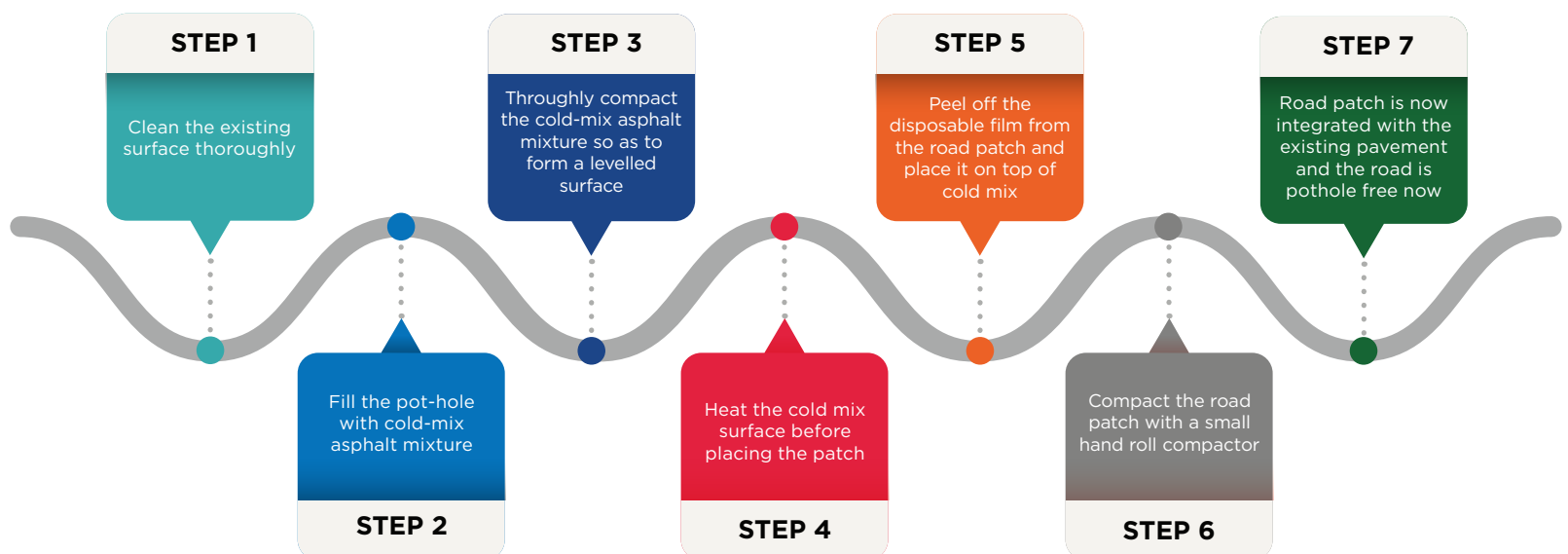
PEEL & SEAL
Pavement Patch
Pothole and Road Patch Repair

Seals, strengthens
& contains repairs



Application instructions for pothole repair:

- Remove broken crumbled asphalt material out of the pothole to where the side and base of the pothole is solid. If base is loose compact the base.
- Clean surrounding surface; remove all dust, debris, etc. If loose dust, debris, etc. remain it will negatively affect the performance of Pothole and Road Patch Repair.
- All moisture must be removed. If any moisture remains it will negatively affect the performance of Pothole and Road Patch Repair. To remove all moisture from, in, or around a pothole, a propane torch can be used to remove the moisture.
- Clean off any other contaminants such as salt, motor oil or anything that would prevent the Pothole and Road Patch Repair product from adhering to the road surface.
- Fill and seal intersection cracks around repair. Water intrusion from cracks can reduce the life of the Pothole and Road Patch Repair.
- Insert into the pothole a cold or hot asphalt fill mix. This material must be compacted so that the surface of the fill is level or slightly above (allowing for further compaction) the surface of the roadway. If hot mix is used, allow the hot mix to cool to below 104 °C before applying Pothole and Road Patch Repair.
- If the ambient temperature during application is equal to or above 24 °C proceed to step 8. However, if the ambient temperature is below 24 °C during application, apply propane torch to roadway surface (asphalt or concrete), where the Pothole and Road Patch Repair will be placed and heat the roadway surface to a minimum of 104 °C. The temperature can be easily measured with a thermal or infrared thermometer. Maintaining the surface temperature around the pothole to 104 °C during the application of Pothole and Road Patch Repair is critical to ensure that the patch adheres to the existing road surface, however avoid heating the road surface above 176 °C as temperatures above this limit can damage the product.
- Cut Pothole and Road Patch Repair to extend beyond the existing pothole by 11 cm on all sides. If 2 or more pieces of Pothole and Road Patch Repair are required to cover the pothole, a minimum of 8 cm overlap on the sides and/or ends must be used. Note: it is easier to cut Pothole and Road Patch Repair from the back/film side vs. the side with granules (aggregate).
- Peel the release film off the back of the Pothole and Road Patch Repair before installing it on the existing road surface.
- Apply the Pothole and Road Patch Repair and roll, tamp or compress the sheet down to the clean, dry road surface.
- Expose to traffic upon completion as additional compaction will aid in the Pothole and Road Patch Repair embedding in the existing road surface.





Saint-Gobain ADFORS

World-class capabilities.
Worldwide reach.

ADFORS GlasGrid is manufactured by Saint-Gobain ADFORS.

Saint-Gobain ADFORS is a global company within the Innovative Materials Branch of Compagnie de Saint-Gobain. We are an industry leader in the manufacture and distribution of a wide range of reinforcement fabrics. We offer a diverse selection of products, including some of the world's best-known reinforcement brand names.

Our worldwide manufacturing plants ensure reliability, quality and cost-effective material supply, while our research facilities and global sales offices deliver world-class service. We are committed to providing innovative solutions to your challenges and to developing breakthrough products.

Final Consideration

The installation of any asphalt reinforcement interlayer shall follow the local regulations for asphalt road construction.

If you have any questions or unique installation parameters, do not hesitate to contact us.

In as much as Saint-Gobain ADFORS has no control over installation design, installation workmanship, accessory materials, or conditions of application, Saint-Gobain ADFORS does not warrant the performance or results of any installation or use of ADFORS GlasGrid. This warranty disclaimer includes all implied warranties, statutory or otherwise, including the warranty of merchantability and of fitness for a particular purpose. The purchaser and/or user should perform its own tests to determine the suitability and fitness of the product for the particular purpose desired in any given situation.

Learn more about how ADFORS GlasGrid Pavement Reinforcement System products can increase the life of your paving projects.

glasgrid.eu@saint-gobain.com
www.glasgrid.com/eu



Geotex business under ADFORS, deals in pavement reinforcement products which have been used in highways/runways construction / maintenance works over the last years in more than 70 countries. Saint-Gobain ADFORS does around 4000 projects every year worldwide.

Glasgrid which is the prominent product in our geotex range has been successfully used in India in last 20 years in the following projects-

- PPP airports like Delhi and Mumbai
- Civil Airports
- More than 42 Defence Airfields
- National Highways/ Expressways
- Other important stretches under state bodies like PWD, state road departments etc...

It should be noted that the usage of these reinforcement products is widespread in EU, USA and other Asian countries whereas in India, it's very limited. Our road reinforcement products are used as "Bitumen Reinforcement Interlayer" which prevents reflective cracking and enhances the fatigue performance thus increasing the service life of the pavement.

GlasGrid Pavement Reinforcement Grids retard reflective cracking by a factor of 2 to 3 times by turning crack stresses horizontally to dissipate the stress. Glasgrid systems extend pavement life by upto 300%. GlasGrid works by reinforcing bituminous concrete overlays in pavement construction. The fiberglass grid is "sandwiched" between the levelling and surface courses of bitumen. GlasGrid helps retard cracking from reflection through a new bitumen overlay to the surface.



GlasGrid Research

Saint-Gobain ADFORS GlasGrid may be the most tested interlayer product on the market. Since its 'introduction in the early 80's, GlasGrid has been tested by numerous facilities worldwide. The details are as follows-

Saint Gobain ADFORS GlasGrid® Performance Evaluation

1986

Texas Transportation Institute (TTI) and Texas A&M University (US)

- Fatigue Testing
- Thermal Cracking Testing

1999

Delft University (Netherlands)

- Thermal Cracking

2000

National Center for Asphalt Technology (NCAT) (US)

- Full scale accelerated test track

2003

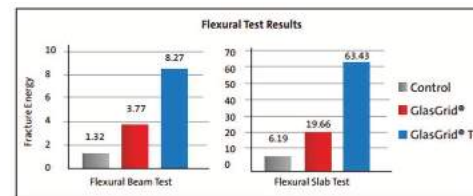
University of Nottingham (UK)

- Fatigue test
- Reflective and thermal cracking test

2011

University of PARMA (Italy)

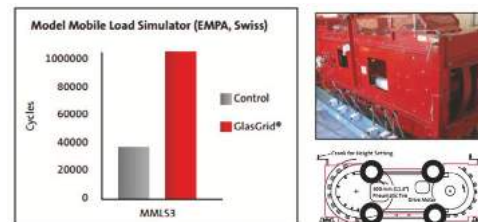
- Flexural beam and slab test



2012

EMPA (Swiss)

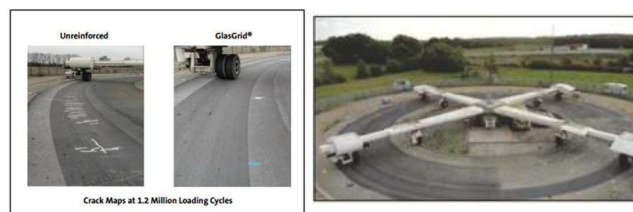
- 1/3 scale accelerated (MMLS) fatigue test



2012

IFSTTAR (France)

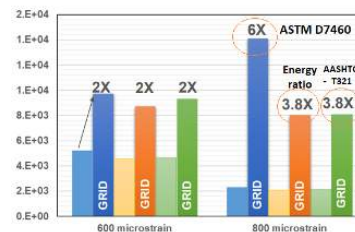
- Full scale accelerated test track



2020

Indian Institute of Technology Madras

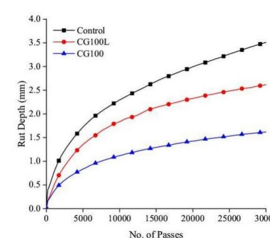
- Four-point bending fatigue test on GlasGrid reinforced asphalt mixtures



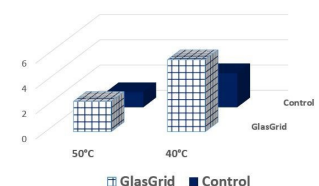
2022

Indian Institute of Technology Madras

- Dry wheel tracker rutting test on GlasGrid reinforced asphalt mixtures
- Interfacial Bond Strength on GlasGrid reinforced asphalt mixtures using Leutner shear test results



Peak Load (Interfacial Bond Strength)



All the above studies suggest that Glasgrid Reinforcement Interlayer System prevents reflective cracking and enhances the fatigue performance thus increasing the service life of the pavement.

Severely cracked roads can be repaired with GlasGrid systems and complete reconstruction can be postponed. The combination of high tensile strength and high modulus of elasticity at low elongation makes GlasGrid, pound for pound, stronger than steel.

GlasGrid has been proven to extend pavement life by upto 300%, in various independent lab tests in some of the prestigious institutes around the world.

For further Details
Please contact

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TROUBLE WITH YOUR ROAD?

Try the GlasGrid app
to fix it!



ADFORS GlasGrid® is manufactured at an ISO 9001:2008 registered facility of Saint-Gobain ADFORS. ADFORS GlasGrid® is a registered trademark of Saint-Gobain ADFORS. U.S. Patent 8,038,364; 8,349,431 and 8.882.385. Additional patents pending.

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BANGALORE PLANT (INDIA)





IKRAM PAVES SDN BHD

PAVEMENT LABORATORY



MS ISO/IEC 17025

TESTING

SAMM No. 762

LABORATORY TEST REPORT COVER PAGE

Report No.: **E2322**

Total Pages : **TWO (Excluding this page)**

Date Issued: **19/7/2022**

Customer **DJX SOLUTIONS SDN BHD**

Prepared For

-

Project Title

PLUS HIGHWAY



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IKRAM PAVES SDN BHD
PAVEMENT LABORATORY



MS 1509:2015
TESTING
SMM No. 762

LABORATORY TEST REPORT

Report No.	E2322	Date Issued:	19-Jul-22
Total No. of Pages	2	Page No.	1 of 2
Name And Address of Customer (As Given By Customer)	DJX SOLUTIONS SDN BHD UNIT 5 - 3, DATARAN MUTIRA, JALAN 7/4 SERDANG JAYA, 43300 SRI KEMBANGAN SELANGOR DARUL EHSAN TEL : 019 9860958 EMAIL: -		
Title of Report (As Given By Customer)	PLUS HIGHWAY		
Request No.	E2322		
Sample Received Date	6/7/2022		
Received by	RACMAWATI BINTI OTHMAN		
Test Commencement Date	6-Jul-22		
Test Completion Date	19-Jul-22		
Tested by	RACMAWATI BINTI OTHMAN		
Particulars Of Sample (As Given by Customer)			
No.	Material (s)	Grade	Type
1	BITUMEN EMULSION	CG-BOND	LIQUID
		Qty.	3 Ltr
		Sample Marking	GC-1, GC-2, GC-3, GC-4, GC-5, GC-6, GC-7, GC-8, GC-9, GC-10 P-1, SP-1
		Pavement Laboratory	Sample ID
			E/S/1/C/1-1/23/22
Laboratory Testing(s)			
Test(s) Carried Out		Test Method(s)	
1 STANDARD TEST METHOD FOR WATER CONTENT*		1. -	
2 STANDARD TEST METHOD FOR SETTLEMENT & STORAGE STABILITY OF EMULSIFIED ASPHALT - OVEN TEST METHOD		2. ASTM: D6930 - 19	
3 STANDARD TEST METHOD FOR SAYBOLT FUROL VISCOSITY*		3. ASTM: D 244 CLAUSE 24-25	
4 STANDARD TEST METHOD FOR SIEVE TEST (RESIDUE ON 850um)*		4. ASTM: D 244 CLAUSE 40-43	
5 STANDARD TEST METHOD FOR PARTICLE CHARGE*		5. ASTM: D 244 CLAUSE 23-26.6	
6 STANDARD TEST METHOD FOR PENETRATION OF BITUMINOUS MATERIALS		6.ASTM:D5 / D5M-20 (2020)	
7 STANDARD TEST METHOD FOR SOFTENING POINT OF BITUMEN (RING AND BALL APPARATUS)		7. ASTM:D36/ D 36M - 14(2020)	
Remarks: 1. * NOT SAMM ACCREDITED SCOPE 2. The test results apply to the sample as received from customer			

IKRAM PAVES SDN BHD (Pavement Laboratory)
Approved Signatory


MOHD NASIR BIN REBU
Technical Manager

STATEMENTS OF CONFORMITY

Statements of conformity (e.g. Pass/Fail/Indeterminate) to specifications are made in the laboratory test report by taking Measurement Uncertainty into account. Where statements of conformity are made in the laboratory test report, the following decision rules are applied:

PASS: Results ± expanded uncertainty within limits/specifications
FAIL: Results ± expanded uncertainty exceeds limits/specifications
INDETERMINATE: Results ± expanded uncertainty overlaps limits/specifications

This laboratory test report covers test samples, which were received and tested by Pavement Laboratory of IKRAM PAVES SDN. BHD. ONLY and this report IS NOT an approval certificate. This laboratory test report, except in full, shall not be reproduced without prior written approval from the General Manager (Pavement Laboratory) of Ikram Paves Sdn. Bhd.

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IKRAM CENTRE OF EXCELLENCE (ICE)
for TOTAL INFRASTRUCTURE SOLUTIONS

LABORATORY TEST REPORT

Test Report No.	E2322	Request No.	E2322
Test Commencement Date:	6-Jul-22	Test Completion Date	19-Jul-22
Title of Report:	PLUS HIGHWAY		

STANDARD TEST METHOD FOR WATER CONTENT*
STANDARD TEST METHOD FOR SETTLEMENT & STORAGE STABILITY OF EMULSIFIED ASPHALT - OVEN TEST METHOD
STANDARD TEST METHOD FOR SAYBOLT FUROL VISCOSITY*
STANDARD TEST METHOD FOR SIEVE TEST (RESIDUE ON 850um)*
STANDARD TEST METHOD FOR PARTICLE CHARGE*
STANDARD TEST METHOD FOR PENETRATION OF BITUMINOUS MATERIALS
STANDARD TEST METHOD FOR SOFTENING POINT OF BITUMEN (RING AND BALL APPARATUS)

Test No.	Material	Sample ID	Specimen Marking	Test	Test Method	Result	Specification own by manufacturer	
							Min.	Max.
1	Bitumen Emulsion CG-BOND	E/S/1/C/1-1/23/22	GC-1, GC-2, GC-3	Water Content, %	-	Avg: 25.0 %	-	40%
2	Bitumen Emulsion CG-BOND	E/S/1/C/1-1/23/22	GC-4, GC-5	Storage Stability 24h, %	ASTM: D-6930-19	0.07 %	-	-
3	Bitumen Emulsion CG-BOND	E/S/1/C/1-1/23/22	GC-6	Saybolt Furol Viscosity (s), 25°C	ASTM: D 244	29.68 s	15	50
4	Bitumen Emulsion CG-BOND	E/S/1/C/1-1/23/22	GC-7	Sieve Test, % (Residue on 850um)	ASTM: D-244	0.026 %	-	0.1
5	Bitumen Emulsion CG-BOND	E/S/1/C/1-1/23/22	GC-8	Particle Charge	ASTM: D244	Positive	Positive	
6	Bitumen Emulsion CG-BOND	E/S/1/C/1-1/23/22	GC-9, GC-10	Settlement, 5 day, %	ASTM: D6930-19(2019)	0.08 %	-	-
7	Bitumen Emulsion CG-BOND	E/S/1/C/1-1/23/22	P-1	Penetration, 25°C, 100g, 5s, dmm	ASTM: D5/D 5M-19a	43.6 dmm	40	90
8	Bitumen Emulsion CG-BOND	E/S/1/C/1-1/23/22	SP-1	Softening Point, 5°C	ASTM: D36	56.0 °C	54	-

Humidity/Temperature during testing (66 % / 28°C).

** The reported Measurement of Uncertainty is based on Standard Uncertainty of confidence level not less than 95% and subject to customer's request

* NOT SAMM ACCREDITED SCOPE

			
Name	: Shahabudin Mohd Saini	Nama	: Mohd Nasir bin Rebu
Designation	: Laboratory Engineer	Designation	: Laboratory Manager / Approved Signatory
Date:	: 19/7/22	Date	: 19/07/2022