

Mirapave[®] for Pavement Restoration



MIRAPAVE PAVING FABRICS

AN ECONOMICAL SOLUTION FOR PAVEMENT RESTORATION

Problem: Cracked Pavements

Cracked pavements allow surface water to permeate subgrade soils, which saturate and weaken the subgrade. Normal maintenance procedure is to repave with an asphalt overlay. This resurfacing procedure can extend the useful life of a pavement section at a lower cost than a full replacement. However, the extended useful service life of an overlay can be reduced by subgrade saturation/weakening which causes fatigue cracking and propagation of cracks from the original pavement through the existing overlay (reflective cracking).

Solution: Mirapave Paving Fabric

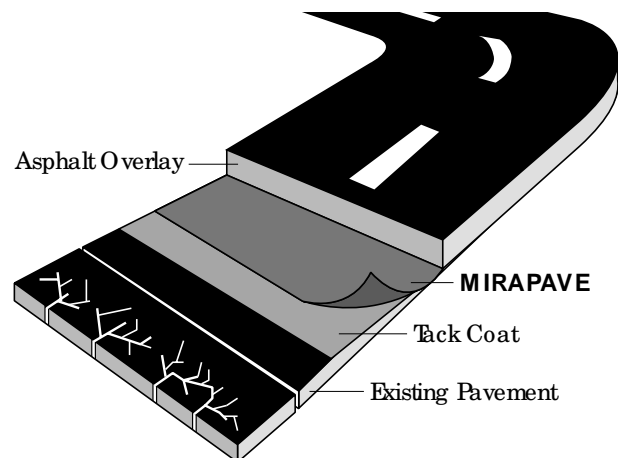
The addition of the correct fabric into a pavement overlay reduces the effect of mechanisms which deteriorate pavements and increases the life of the overlay pavement section.

Mirapave®, needle-punched heatset polypropylene non-woven fabrics with high asphalt absorption, are specifically designed for asphalt overlay applications.

When installed with a proper surface preparation and tack coat, Mirapave® forms an impermeable membrane that prevents the penetration of surface water through the pavement and also provides a stress relieving layer which inhibits reflective crack growth.

Benefits of Mirapave

- Meets AASHTO M288 guidelines for paving fabrics
- Provides a waterproof barrier for subgrade protection
- Improves the fatigue resistance of the new overlay by providing a stress relieving interface
- Retards the propagation of an existing crack through the new overlay (reflective cracking)
- Extends the useful life of the overlay
- Can withstand the high temperature of asphalt, including the new SUPERPAVE mix designs
- Strengthens the entire pavement section
- Can be used over milled surfaces and are millable & recyclable once installed



Mirapave increases pavement life by 50% or more.

Field performance data supports that paving fabric installed in an asphalt overlay can increase overlay life of 50-150% before fatigue or reflective cracking occurs.

State DOT's reported that performance of paving fabric in the pavement system is equal to 1.2 inches of a hot mix Asphalt overlay for reflective crack purposes.



MIRAPAVE PAVING FABRICS



Mirapave as a Moisture Barrier.

Mirapave acts as a moisture barrier within the pavement and prevents water from penetrating the roadway. When Mirapave is saturated with asphalt, binder strength increases substantially as does modulus.

Mirapave With New Mix Designs.

Mirapave has been used successfully in innovative mix designs using SUPERPAVE Mix designs, Stone Matrix Asphalts (SMA), Rubber Asphalt Mixes and Polymer Modified Asphalt Mixes. Mirapave is also used with asphalt tack coats with the PG grading system and has been used with Polymer Modified Asphalt binders.

Not Just for Roads.

Applications for Mirapave aren't limited to roads and highways. Mirapave can be applied to airport runways, bridges and parking lots. Shopping centers, industrial sites and recreational surfaces can also be improved by using a paving fabric.

Chip sealing over fabric.

Mirapave® can also be used with chip seal surface treatments to improve the performance of the rehabilitated pavement, when installed with a tack coat between the pavement and the chip seal. The combination offers a water-resistant barrier and increase bond to the pavement for a longer pavement life.

Benefits of Mirapave under chip seals:

- Increases chip seal pavement life by 60%
- Decreases the need for crack filling
- Eliminates crack filling for future chip seal or overlays

Save up to 100%.

Oklahoma, Texas, South Carolina, Idaho, and California have benefited from chip sealing over fabric. In a 30 year life cycle cost analysis performed by San Diego County, the annual savings of using paving fabric with chip seals was \$24,000 - \$87,000.



MIRAPAVE DESIGN CONSIDERATIONS for climate regions

New overlays are still susceptible to cracking. Temperature and moisture changes cause reflective cracking by vertical and or horizontal movements in the pavement. Even after a new overlay, large temperature changes can cause stress and cracking in the old, underlayer.

Thicker Fabrics for Harsh Conditions. For regions with severe climates, consider using a thicker paving fabric. Laboratory and a field studies have shown that a thicker fabric has a greater retention of asphalt, and may delay cracking longer than a thinner fabric in this environment. With thicker paving fabrics such as Mirapave 600 and Mirapave 700, the asphalt fabric saturation is greater, increasing the ability to blunt the crack tip stress and enhanced waterproofing capabilities.

To calculate design thickness, evaluate the existing pavement using deflection analysis or effective thickness procedures. Paving fabrics should be factor of reflective cracking and moisture control.

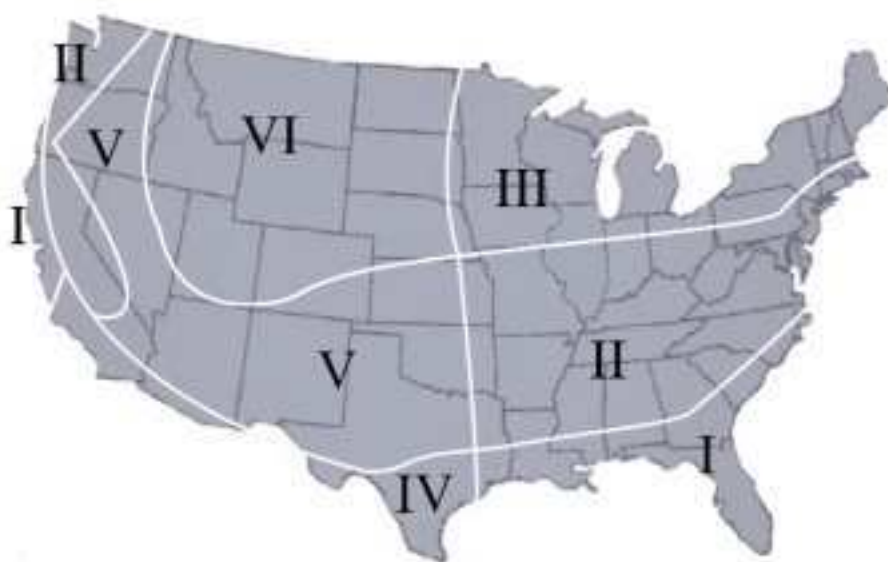
Severe Climates.

Freeze - Thaw cycles cause expansion and contraction of water within the pavement and road construction materials. Common results are quick and severe fracturing of the pavement.



In most cases a paving fabric may not stop these thermal crack from propagating though the pavement over time. They will however delay the cracking and minimize the water damage to the pavement overlay.

In designing an asphalt overlay in severe conditions, special considerations should including mix design, pavement thickness and asphalt binders.



I - Wet No Freeze
II - Wet Freeze, Thaw Cycling
III - Wet Hard Freeze, Spring Thaw

IV - Dry No Freeze
V - Dry Freeze, Thaw Cycling
VI - Dry Hard Freeze, Spring Thaw

MIRATAK PAVEMENT REPAIR MEMBRANES

moisture barrier & crack relief

Miratak® is a unique and cost effective waterproofing membrane comprised of self-adhering rubberized asphalt and durable polypropylene non-woven fabric. A peel-n-stick release paper covers the self-adhesive mastic, and is removed prior to installation.

Miratak® and Miratak® 700 are designed specifically as a moisture barrier for application on existing roadways and airport runways and taxiways to prevent water permeation or penetration through pavement surfaces and the subsequent damage that excess moisture causes in the roadway subbase.

As a pavement ages, imperfections appear, joints become prominent, and cracks occur. Miratak® and Miratak® 700 are engineered, impervious membranes, adding greatly to the durability and extending the life cycle of a pavement system by reducing water percolation and moisture penetration throughout the pavement system into the subbase.

Benefits of Miratak® and Miratak® 700:

- Reduces further structural decay
- Easy and inexpensive to install
- Can be installed in a wide range of temperatures
- Reduce traffic disruption
- Minimize reflective cracking when bridging transverse and longitudinal cracks
- Minimizes reflective cracking between dissimilar surfaces
- Prevents surface moisture intrusion
- Stretches to span cracks without breaking
- Sticks readily to concrete, asphalt, or wood decks

Applications of Miratak® and Miratak® 700:

- Highway and street surfaces
- Transverse and longitudinal highway joints & cracks
- Lane-widening joints
- Taxiways and runways
- Bridge deck restoration



SAMPLE DESIGN OF AN ASPHALTIC OVERLAY WITH PAVING FABRICS

EXISTING PAVEMENT CONDITIONS

Sub grade CBR value:	3	One way daily 18 kips single axle loads:	80
Existing Surface Layer:	2.0 inches	Traffic growth rate:	3%
Asphalt Binder Course:	3.8 inches	Present Serviceability Index:	2.0
Aggregate Base Course:	10.0 inches		

Based on pavement evaluation, i.e. rutting, cracking and fatigue the pavement has reached 2.0 PSI. A PSI of 2.0 means that 85% people who travel the road complain that the ride is unacceptable. PPI ranges from 0 to 5 and 5 means an excellent ride.

EVALUATION OF EXISTING PAVEMENT STRUCTURE

The existing pavement design records show that the pavement was designed by AASHTO procedure based on the following information:

Structural Number for the design: 4.0 SSV based on CBR 3: 1.8

AASHTO design equation: $SN = a_1d_1 + a_2d_2 + a_3d_3$

Where a_1 , a_2 and a_3 are structural coefficients of strength and d_1 , d_2 and d_3 are thickness' of various layers.

$$4.0 = 2.0 \times 0.44 + 3.75 \times 0.44 + 10.0 \times 0.14$$

$$4.0 = 3.9 \quad \text{Design was OK}$$

Structural strength coefficient for new asphaltic concrete: 0.44

Structural strength coefficient for new aggregate base: 0.14

DESIGN FOR AN OVERLAY

Pavement needs to be upgraded to the previous strength

Average traffic one way 18 kip single axle loads 120

Traffic growth 3.0%

Subgrade CBR same 3.0

Structural Number 4.0

According to AASHTO design the structural strength coefficients for the old pavement since it reached a PSI of 2.0 are considered 70% of the original values.

Structural strength coefficients for old pavement:

Asphalt cement concrete $0.44 \times 0.70 = 0.31$ Aggregate Base $0.14 \times 0.70 = 0.098$

By using the latest AASHTO design equation: $SN = a_1d_1 + a_2d_2m_2 + a_3d_3m_3$

Where a and d are same as previously explained and m_2 and m_3 are recommended drainage factors by AASHTO for fair draining base and sub-base which is 0.8 per AASHTO table 2.4. Drainage for this type of base is considered fair. Water is removed within a week from the base. Also part of this aggregate base had been intermixed with sub grade during the service life of the pavement

EVALUATION OF THE EXISTING PAVEMENT FOR STRUCTURAL STRENGTH

$$4.0 = 2.0 \times 0.31 + 3.75 \times 0.31 + 10.0 \times 0.098 \times 0.8$$

$$4.0 = 2.6$$

The pavement needs to be strengthened by at least 1.4 structural numbers: $4.0 = 2.6 + 1.4(3.0 \times 0.44)$

Overlay required = 3.0 inches

By incorporating Mirapave® into the overlay design, drainage factor can be eliminated. The fabric will also provide additional service life.

Mirapave® performs three functions in an overlay:

- Drastically reduce the surface water penetration into base and sub grade
- Increase pavement fatigue life
- Retard reflective cracking

Research done by California Department of Transportation clearly show that performance of paving fabric in the pavement system is equal to 1.2 inches of a Hot Mix Asphalt overlay. Additionally if you evaluate the performance based on cost/benefit ratio on life cycle basis it is very cost effective.

Incorporation of Mirapave® fabric

With Mirapave® use the old AASHTO equation for design

$SN = a_1d_1 + a_2d_2 + a_3d_3 + \text{Mirapave}^\circ \text{ paving fabric}$

$$4.0 = 2.5 \times 0.44 + 2.0 \times 0.31 + 3.75 \times 0.31 + 10.0 \times 0.098$$

$$4.0 = 3.9 \quad \text{Overlay design is OK}$$

Place 2.5 inches of Hot Mix Asphalt overlay with Mirapave® fabric

Mirapave® reduced the design thickness by 0.5 inches and the pavement will perform as equal or better than standard design. At the next overlay cycle fabric will still be providing the same benefits during the design of that overlay.

PAVEMENT FABRIC CONSTRUCTION SPECIFICATION

MATERIALS:

The pavement paving fabric shall be furnished by an ISO approved manufacturer of polypropylene or polyester geosynthetics and is utilized to extend the service life of pavement overlays. The paving fabric shall be needle punched, nonwoven and heat treated on one side and shall conform to the following physical and mechanical properties:

Property	Units	Test Method (MARV)	Minimum Avg. Roll Value
Mass Per Unit Area	oz/yd ² /(gm/m ²)	ASTM D3776	4.1 (140)
Grab Tensile Strength	lb (N)	ASTM D4632	102 (450)
Grab Elongation at Break	%	ASTM D1682	50
Mullen Burst Strength	lb (kPa)	ASTM D3786	200 (1378)
Asphalt Retention	gal/yd ² (l/m ²)	ASTM D6140	0.21 (1.04)

A Certificate of Compliance for the paving fabric used on the project shall be furnished by the manufacturer to the engineer. The paving fabric shall be supplied in protective a cover or wrap that is capable protecting the fabric form ultraviolet rays, abrasion, and water. Mirapave® 500 or approved equal paving fabric should be used. Mirapave® 500 is available from MIRAFL® Construction Products, (888) 795 0808 or (706) 693 2226. www.mirafi.com

Asphalt Sealant: The Engineer shall approve asphalt cement. A grade asphalt of the same type used in the manufacture of the hot mix asphalt for the overlay should be acceptable.

EQUIPMENT:

Asphalt Distributor: The distributor must be suitably metered and capable of spraying the asphalt cement uniformly and at the prescribed application rate. No drilling or skipping shall be permitted.

Fabric Handling Equipment: A tractor or similar mechanical device with mounted laydown equipment that is capable of handling full rolls of fabric shall be used. The equipment shall be capable of laying the paving fabric smoothly without excessive wrinkles and/or folds.

Miscellaneous Equipment: Stiff bristle brooms used to smooth, and scissors (or blades) used to cut the paving fabric shall be provided by the Installer. A pneumatic-tired roller may be needed in some cases to smooth paving fabric into the asphalt cement.

INSTALLATION PROCEDURE:

Surface Preparation: The surface on which the paving fabric is to be placed shall be free of dirt, water, vegetation and other foreign materials. Open cracks $\frac{1}{2}$ inch or larger shall be filled with sand mixed asphalt as directed by the Engineer. Cracks larger than $\frac{1}{4}$ inch or holes shall be filled with cold or hot mix asphalt. The use of a leveling course may be required prior to placing the paving fabric in severe cases.

Application of Sealant: The asphalt cement and binder must be uniformly spray-applied at the specified rate. The quantity required may vary with the surface condition of the existing pavement (e.g. degree of porosity), but shall be applied at a nominal rate of 0.25 gallons per square yard of residual asphalt.

Application of asphalt cement will be performed by truck-mounted distribution equipment whenever possible, with hand spraying kept to a minimum. The temperature of the asphalt cement must be sufficiently high to permit a uniform spray pattern. The minimum recommended temperature for asphalt cement is 290°F, and should not exceed 325°F at the contact surface.

Paving Fabric Placement: The paving fabric shall be placed onto the asphalt cement with a minimum of wrinkles before the asphalt can cool or lose its tackiness. The paving fabric shall be placed so that the non-heat treated (bearded or fuzzy) side is placed downward, into the sealant, thus providing optimum bond between fabric and pavement during the construction process. As directed by the Engineer, wrinkles severe enough to cause "folds" shall be slit and laid flat in the direction of paving operations. Brooming the paving fabric will assist it in making intimate contact with the pavement surface.

Any overlap of the paving fabric should be minimized, although an overlap of 1 to 3 inches is recommended to insure full closure of overlapping layers. Transverse joints should be shingled (overlapped) in the direction of paving operations to prevent edge pick-up by the paver. The contractor installing the paving fabric must prove that they have at least 4 years experience in placing paving fabric.

In the event that asphalt cement should bleed through the paving fabric before the hot mix asphalt is placed, it may be necessary to absorb any visible sealant by spreading sand or hot mix asphalt over those areas. This should minimize the tendency for construction equipment tires to lift the paving fabric when driving over it. Turning of paving equipment and other vehicles on the paving fabric must be kept to a minimum to avoid movement or damage to the fabric.

DESIGN AND SPECIFICATION

Mirafi® Construction Products—Engineered Solutions

Mirafi® Construction Products offers additional design and specification assistance for the following:

Filtration Systems – Mirafi's sales staff can assist in geosynthetics selection for optimum filter fabric/soil compatibility for applications including highway subsurface drainage systems and hard armor revetment systems for shoreline protection.

Slope Stability – Mirafi's sales staff can assist in the design of steepened slope applications utilizing the widest range of reinforcement geosynthetics available anywhere.

Retaining Walls – Mirafi's sales staff can assist in the design of geosynthetic reinforced permanent and temporary retaining walls for residential, commercial, and transportation related applications.

Embankments – Mirafi's sales staff can assist in the design of embankments on weak foundations (dikes, levees, highway embankments) utilizing the highest strength geosynthetics reinforcement selection available.

www.mirafi.com

In North & South America contact:

Mirafi® Construction Products
365 South Holland Drive
Pendergrass, GA 30567
USA

Telephone: 1(706) 693-2226
Fax: 1(706) 693-4400

In Europe contact:

Ten Cate Nicolon Europe
Sluiskade NZ 14
Postbus 236
7600 AE Almelo
The Netherlands

Telephone: +31-546-544487
Fax: +31-546-544490

In Asia contact:

Royal Ten Cate Regional Office
11th Floor, Menara Glomac
Kelana Business Centre
97, Jalan SS 7/2
47301 Petaling Jaya
Selangor Darul Ehsan
Malaysia

Telephone: +60-3-7492 8283
Fax: +60-3-7492 8285



Ten Cate Nicolon