PAVEMENT RESTORATION INSTALLATION GUIDELINES FOR MIRAFI® MPV

General

This document is prepared to help ensure that the pavement overlay fabric, once installed, will perform its intended design function for existing asphalt pavement. For information on Mirafi® MPV for Chip seals, please visit www.mirafi.com. To function properly the paving fabric must be identified, handled, stored, and installed in such a way that its physical property values are not affected and that the design conditions are ultimately met as intended. Failure to follow these guidelines may result in the unnecessary failure in a properly designed application.

Fabrics are used as an interlayer in hot mix asphalt concrete (HMAC) paving in an effort to:

1. Delay cracks in the old pavement from "reflecting" through as cracks in the new overlay. This is accomplished by acting as a stress relief layer.

2. Provide a barrier to keep surface water from entering the Subase. This function increases the base and subgrade resilient modulus values through improvement in moisture and support conditions.

For the fabric to perform as intended, the fabric must be saturated with asphalt and bond sufficiently with both the old pavement and the new overlay.

There are two important product specifications for a successful project, which include the paving fabric and asphalt cement or “tack coat”. Described below are product recommendations for fabric and asphalt with quality-control measures that should help the paving fabric to perform as intended. A quick reference inspection checklist also is provided. This document contains information consistent with generally accepted practices of identifying, handling, storing and installing paving fabrics materials.

Material Identification, Storage and Handling

Care must be taken while unloading or transferring the Mirafi® MPV from one location to another. This will prevent damage to the wrapping, core, label and to the paving fabric itself. If the geosynthetic is to be stored for an extended period of time, the fabric shall be located and placed in a manner that ensures the integrity of the wrapping, core, and label as well as the physical properties. This can be accomplished by elevating the product off the ground and ensuring that it is adequately covered and protected from ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, fire or flames including welding sparks, and human or animal destruction.

Before unrolling, verify the roll identification, length, and installation location with the contract drawings. While unrolling the geosynthetic, inspect it for damage or defects. Repair any damage that occurs during storage, handling or installation.

The Paving Fabric

Mirafi® MPV paving fabric is a polypropylene, needle punched nonwoven fabric heat treated on one side. Our product is manufactured under ISO guidelines to absorb a sufficient quantity of liquid asphalt for the purpose of extending pavement life. We currently manufacture four grades of fabrics to address various pavement conditions and climates listed on Table 1.

Table 1: Climate Condition Selection Chart

Climate Conditions			**Warm**	**Moderate**	**Cold**	**Cold/ Freeze Thaw**
Geographical Area Usage			South	North	North	North
Federal Specifications			AASHTO M288-92	AASHTO M288-00	AASHTO M288-97	Heavy Loadings
Fabric Property	Test Method	Units	**MPV-400**	**MPV- 500**	**MPV- 600**	**MPV- 700**
Grab Tensile	ASTM D 4632	lbs.	90 (400 N)	102 (454 N)	120 (530 N)	160 (730 N)
Grab Elongation	ASTM D 4632	%	50	50	50	50
Trap Tear	ASTM D 4533	lbs.	35 (.15kN)	45 (.20 kN)	50 (.22 kN)	60 (.30 kN)
Puncture	ASTM D 4833	lbs.	60 (.27 kN)	69 (.30 kN)	75 (.33 kN)	80 (.40 kN)
Mullen Burst	ASTM D 3786	psi	180 (1240kPa)	200 (1370 kPa)	250 (1720kPa)	300 (2172 kPa)
Asphalt Retention	TX Dot 3099	gal/sq.yd	0.2	0.23	0.25	0.28
Melting Point	ASTM D 276	degrees F	338(170 C)	338(170 C)	338(170 C)	338(170 C)
Minimum Asphalt Thickness			1.25"	1.5"	2"	2.5"

Use only a geosynthetic, such as Mirafi® MPV, that is produced specifically for used in pavement overlay applications. A request for certification from the manufacture is standard procedures and assures that the proper product is supplied.

Asphalt Tack Coat

This second and very important part of the system must be applied with the correct asphalt liquid and the correct quantity. The asphalt preferred for the tack coat is AR, AC or PG grade of uncut asphalt cement. Suitable asphalt binders are listed below in table 2.

Table 2: General Guide Lines For Asphalt Binders For Mirafi® MPV Paving Fabrics

	Penetration Grade					AC Grades	AR Grades	PG Grades	Modified
	40					AC 40	AR 16000		
Asphalts for Mirafi® MPV	50							PG 70- 22	SBSPG 76-22
		60				AC 20	AR 8000	PG 67- 22	SBSPG 70-22
								PG 64-22	
		70	85			AC10	AR 4000	PG 58-10	
			100					PG 58-28	
				120		AC 5	AR 2000		HPSPG76-10
				150				PG 52-28	
					200	AC 2.5	AR 1000		
					300				

This chart is prepared for use as a guide for liquid asphalt binder for Mirafi® MPV fabrics and is not intended to be an exact comparison of liquid asphalt rate, specific properties of individual grades for use in specific applications. The region of the country and ambient temperatures at the project can influence asphalt binders preference. The above chart is for reference only it is usually recommended that the liquid asphalt that is use in local mix design be used for a binder for the fabric.

Asphalt Emulsion can be used as a binder for the fabric although they are not recommended. If emulsions are used, the engineer prior to beginning the project should approve them. Emulsions are not recommended for Mirafi® MPV 600 and 700. Polymer modified tack coats can be used as a binder for Mirafi® MPV
The amount (gal/sq yd) of tack asphalt placed should be sufficient to:

1) Bond the fabric to the old pavement (or leveling course).
2) Saturate the fabric.
3) Provide enough excess to bond the AC overlay to the fabric.

Too light a tack coat could preclude any of the above. Too heavy a tack coat could result in slippage problems at higher temperatures. Therefore, it is of utmost importance that the proper amount of tack coat be applied. The condition of the existing pavement is one of the determining factors for deviation to tack coat requirement.

Table 3: Conversion of Asphalt Application Rates

Mirafi® MPV Paving Fabric	**400**	**500**	**600**	**700**
Normal Application - Residual Asphalt Rate				
Gallons/Square Yard	0.22	0.25	0.27	0.29
Liters/Square Meters	1.0	1.1	1.3	1.5
Ounces/Square Foot	3.2	3.6	3.9	4.1
Heavy Application				
Gallons/Square Yard	0.25	0.27	0.28	0.30
Liters/Square Meters	1.1	1.3	1.4	1.6
Gallons/Square Ft	3.6	3.9	4.0	4.3

Normal Applications would include slightly porous, slightly oxidized relatively smooth pavement using a standard AR grade Asphalt. If fabric is placed on a leveling course prior to the new overlay the tack coat may be reduced by .02 gallons/square yard. Please note that leveling course should be allowed to cool prior to placing the fabric.
Heavy Applications should be used when pavement surfaces that have been milled, irregular or are porous and oxidized

Table 4: Tack Coat Spread Rates for Different Pavements
Spread Rate = Gal/ Yd2

	0.17	**0.2**	**0.22**	**0.23**	**0.25**	**0.26**	**0.27**	**0.28**	**0.29**
MPV 400	Leveling Course		Smooth Pavement		Rough Pavement	Milled Surface			
MPV 500			Leveling Course		Smooth Pavement	Rough Pavement			
							Milled Surface		
MPV 600				Leveling Course		Smooth Pavement	Rough Pavement		
								Milled Surface	
MPV 700						Leveling Course	Smooth Pavement	Rough Pavement	
									Milled Surface

Tack Coat Spreading

The asphaltic sealant must be uniformly applied at the specified rates with a distributor truck preferably computer controlled application rate with a heated recirculation bar. It its important that spray bars and nozzles are clean adjusted to the proper angle and proper height. If there is a question as to spread rate this can be checked with shallow metal tray exactly one square yard in area or a sheet of heavy cardboard or paper can be used. The tray is weighed and place on the surface to be sprayed. Immediately after the distributor has passed, the tray is lifted and weighed again.

As mentioned above, the tack asphalt must saturate the fabric. This means it must be liquid long enough for saturation to occur. This can happen by either of two methods:
) Where the tack asphalt is applied to a cool pavement, it will assume the temperature of the pavement and stiffen within seconds, In this case, the tack asphalt usually will remain tacky long enough to hold the fabric in place, but saturation will occur only when AC overlay is placed and its heat (250 - 300 F) re melts the tack asphalt, allowing it to infiltrate the fabric, with normal rolling pressures the fabric should become saturated (assuming the tack coat's application rate is correct).

2) Where the tack asphalt is applied to a sun-heated (say 100 F or above) pavement, it often stays liquid enough to saturate the fabric, at least partially, prior to placement of the AC overlay. When the project site temperatures are high, full saturation of the fabric usually will occur in the wheel tracks of vehicles that drive on the fabric, and this is where problems can arise.

The tires of the AC haul trucks can become coated with the tack asphalt and can pick up the fabric as they roll on it. The first reaction is to cut back the amount of tack asphalt being applied in an effort to dry up the operation and eliminate this problem. This should not be permitted, as the long-term performance of the fabric could be sacrificed. The rationale here is that paving fabric requires a fixed amount of asphalt for saturation and bonding. This amount does not change simply because the tack asphalt stays liquid enough to saturate the fabric before placement of the hot overlay. Reducing the amount of tack asphalt applied could result in poor bond between the fabric and the AC and/or failure to create a waterproof membrane.

If fabric-placement problems arise due to general "soupiness" of the fabric/tack asphalt combination, they can be remedied by measures less detrimental than reducing the amount of tack applied. Some of these measures are:

a. Hand spreading a small amount of the AC mix on top of the fabric in wheel paths of vehicles
b. Hand spread small amount of sand in wheel paths
c. Changing to a heavier grade of tack asphalt
d. Prohibiting vehicles (other than AC haul trucks) from traveling on the fabric

Frequent stopping and starting of the tack spreader truck should be avoided as it makes for a non-uniform spread rate resulting in a series of heavy-tack regions.

Table 5: Tack Coat Quantities per Mile

Width Of Rd	Sq Yards	Gallons of Tack Required Spread Rate @Gal/Sq/Yds					
		0.3	0.27	0.26	0.25	0.23	0.22
Lane Mile 12'	7040	2,112	1,901	1,830	1,760	1,619	1,549
Lane Mile 12.5	7333	2,200	1,980	1,907	1,833	1,687	1,613
Lane Mile 10.0	5867	1,760	1,584	1,525	1,467	1,349	1,291

Surface Preparation

Preparation for HMAC (Hot mix asphalt concrete) overlays over existing HMAC surfaces should be placed so that no damage to the fabric will occur. Thoroughly clean the old pavement including removing all dirt, water, oil and foreign materials. Sweeping and/or air blowing will be required to

eliminate dust and cuttings left on the pavement surface Prior to placement of the fabric, all cracks wider than 1/4 inch should be sealed, and potholes should be filled to provide a flat, uniform surface for the fabric and to keep the liquid asphalt tack coat from pooling or "leaking" away. If the old pavement exhibits extensive faulting and step-off at joints or cracks, a thin leveling course should be placed prior to placing the fabric. If a leveling course is used, crack sealing is not necessary.

Preparation for Milled Surfaces

Most milling operations result in an irregular surface to which the tack coat and the paving fabric can readily conform. There are several types of milling procedures. Paving fabrics are appropriate and will give extended life with generally accepted milled surfaces. Paving fabrics will elongate and conform to a milled surface. Paving fabrics meet a minimum elongation specification of 50% in a grab tensile strength test and most milled surface configurations would only mobilize no more than 5 to 20% of the fabric elongation. Mirafi® MPV is manufactured to resist tears, punctures and field stress during construction.

Paving fabrics are quite resistant to damage due to construction traffic even over milled surfaces. The underlying asphalt cement tack coat cushions and mitigate the abrasive forces. Small abrasion type holes in the fabric should not diminish the effectiveness of the paving fabric systems because asphalt also works as a self-sealer. To a large degree, the function of the fabric is to provide a long-lasting fibrous reinforcement to the asphalt cement tack coat, not tensile reinforcement. Sizable tears, i.e. greater than one inch, should be patched. Whenever possible, traffic should be limited to construction vehicles during the paving fabric installation.

The milling process often induces micro cracking in the milled pavement. This cracking, along with the greater susceptibility to surface water intrusion, makes milled surfaces ideal candidates to benefit from the stress absorption and moisture barrier functions of a paving fabric system.

Surface milling is generally used to remove surface ruts, allow for height restrictions or recycling of pavement. The AASHTO guide for Design of Pavement Structures III-135 5.7.6 relays the following on surface milling for design:

> “If the AC surface is to be milled prior to overlay, the depth of milling should be considered in the determination of the effective thickness design. No adjustment is need if the depth of milling does not exceed the minimum necessary to remove surface ruts. If a greater depth is milled, the AC thickness remaining after milling should be use in determining the effective thickness designs.”

In another words, if the pavement is structurally sound removing the existing surface could lessen pavement strength. When fabric is placed over a milled surface the tack coat rate application should be increased to compensate for irregular surface.

The use of paving fabrics and milling of surfaces assist the engineer in obtaining increased pavement life and solve problems with curb height and other limiting factors that would ordinarily restrict an adequate asphalt overlay for road rehabilitations and increase traffic.

Paving Fabric's Placement

Paving fabric usually is placed using a fabric installation tractor with a crew of three. Paving fabric can be place using a distributor spreader truck with a hydraulic fabric laydown apparatus mounted on the rear of the truck. This method works exceptionally well for large projects with a well-maintained modern distributor truck and an experienced driver. The fabric can also be placed with front-end loader using a fabric placement attachment. Manual placement by hand can be done for small project (i.e., without the use of a tractor), but this is quite slow and cumbersome.

The fabric is unrolled so that the bearded (fuzzy) side is unwound into the sealant, thus providing optimum bond between fabric and pavement during the construction process as the fabric is

rolled onto the tack coat, and it must be aligned and smoothed to remove wrinkles and folds. Folds that result in a triple thickness of fabric must be cut with a knife and lapped slightly, the use of a propane torch to cut fabric or smooth wrinkles is not recommend.

Adjacent borders of the fabric should be lapped 1 to 4 inches. This applies to longitudinal joints, as well as end-of-roll transverse joints.

Construction equipment traffic should be kept to a minimum on the fabric, especially in warmer weather (say above 80 F). A small quantity of hot mix spread over the installed fabric will minimize fabric being picked up by the equipment. Rolling equipment may be used to "seat" the fabric in cooler weather where tack coat tends to stiffen and winds tend to displace the fabric. The transverse joints may be “shingled” in the direction of paving to prevent edge pick-up by the paver, this is not always possible because of paving sequence.

Installation on Slopes

Paving fabrics have been placed on slopes of 8 – 13% with success. Current recommendations are up to 8%. Care must be taken with compaction to prevent slippage. Tack quantities must be on the lower range to prevent slippage, emulsion is not recommended. Surface of existing asphalt is a consideration as well as surface course design to insure aggregate-to-aggregate bond

Wet Conditions and Temperature

Rain or water on the fabric will not adversely affect the performance of a paving fabric provided that certain precautions are taken. The most critical area of moisture in the construction process for paving fabric is the surface of the existing pavement. The pavement must be clean and dry for the asphalt tack coat to adhere to the existing pavement.

The AASHTO recommendations for ambient temperature are 50^{o}F and rising. This is a general recommendation for all conditions. This recommendation is made to prevent installation when the surface may be cold and wet. The temperatures should be sufficient to allow the asphalt sealant to hold the paving fabric in place, prior to asphalt mix placement. By adjusting time or distance of fabric placement closer to the asphalt tack spray will allow fabric to be placed at lower temperatures. This can be accomplished at ambient temperature of 40^{o}F and rising. Experienced installers can make this determination biased on the temperature requirements for placement of the asphalt mix.

If rain occurs prior to the placement of the overlay it will not hurt the system, as the fabric will be saturated with liquid asphalt which intern will protect the fabric. Caution is advised if the wet surface is exposed to traffic as skid resistance might be reduced. The area can be sanded and should be signed for caution.

The surface should be allowed to dry prior to the placement of the new overlay. Natural drying can accomplish this or it can be assisted by power or hand broom, which ever is appropriate for the construction project.

If the fabric is installed on a pavement that contains moisture delaminating of the fabric may occur with an appearance of bubbles or footprints. To correct this problem the fabric should be rolled with a pneumatic roller until good bond is achieved.

Construction over Milled Surfaces

Asphalt cement should be used as tack coat over a milled surface. Asphalt emulsions are not recommended because they will tend to run off into the “valleys” of the milled surface prolonging cure time and providing a non-uniform application. In addition the tack coat should be applied 10 to 15% heavier to account for a typically more textured and uneven surface.

A minimum of 1.25 inches compacted asphalt overlay should be placed over all surfaces this is especially important with milling only the curb areas. In some cases milling has penetrated below

the asphalt surface into base or sub base, this damaged area should be restored with hot mix asphalt layer.

In some rare cases the milling may result in deeper grooves with near vertical faces. This type of milled surface is not conducive to direct paving fabric application. With near vertical grooves, neither the asphalt cement tack coat nor the paving fabric can easily and uniformly conform to such a road surface. Before placing a paving fabric on such a surface, a dense graded hot mix asphalt-leveling course must be placed. The comments above also refer to any sharp or vertical edges on the pavement to receive a paving fabric, such as faulted joints, etc.

Motorist Traffic on Paving Fabric

Most cases, light traffic will not damage the exposed paving fabric saturated with asphalt, however, as a safety precaution, it is not recommended. Installed fabric may have less skid resistance than a dry pavement. Improper tack coat, rainfall or other moisture may further reduce skid resistance. Vehicle traffic should not be permitted directly on fabric prior to the overlay due to safety considerations. If local conditions require that traffic should be permitted on the fabric and in the judgment of the engineer safety is not at issue the fabric can be opened to traffic for 24 to 48 hrs. In this case a light sanding of the fabric will increase skid resistance. Signs should warn motorists and/or flaggers that the driving surface might be slippery when wet and speed should be significantly reduced.

Overlay Paving

When the AC overlay is placed on the fabric, two paving variables are usually the key to proper installation of fabric:

1) The temperature of the AC overlay mix at the time of rolling
2) The degree of compacted effort applied to the overlay.

The general recommendation is to begin rolling when the mix temperature is above 250 F and to be finished by the time the mix has cooled to 150 F. These requirements should be adequate to cause the fabric's saturation assuming sufficient "tack" asphalt was applied. However, it should be remembered that a thin overlay would cool quite fast and thereby lose its ability to produce saturation of fabric sooner than a thicker overlay (e.g., 250 F AC mix placed 1 inch thick on a 40 F base will cool to 150 F in about 5 minutes).

References

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Inspection Checklist of Paving Fabric

Preliminary Work

1. Insure that a sufficient quantity of paving fabric has been purchased for the project and request letter of certification from manufacture

2. Store fabric in area protected from sun and water.

3. Determine the brand and grade of tack asphalt to be used, and obtain a sample.

4. Check that tack rate to be used is approved by Agency and the fabric's manufacturer.

Preparation of Old Pavement

1. Sweep surface clean.

2. Seal larger cracks, or place leveling course.

3. Tack-coat Application

4. Check tack-application rate and temperature, and obtain a sample.

5. Watch for poor tack-spread practices such as:
    a) Frequent stops and starts
    b) Excessive spread overlaps
    c) Non-uniform spread.

Fabric Laydown

1. Watch for wrinkles, folds, and bubbles.

2. Prevent excessive overlaps.

3. Insure that fabric follows proper alignment.

4. If bleeding occurs, broadcast AC on fabric to prevent tires' sticking.

Overlay Paving

1. Discourage lengthy windrows of AC.
2. Check temperature of AC behind spreader.
3. Encourage expeditious, thorough rolling of AC overlay.