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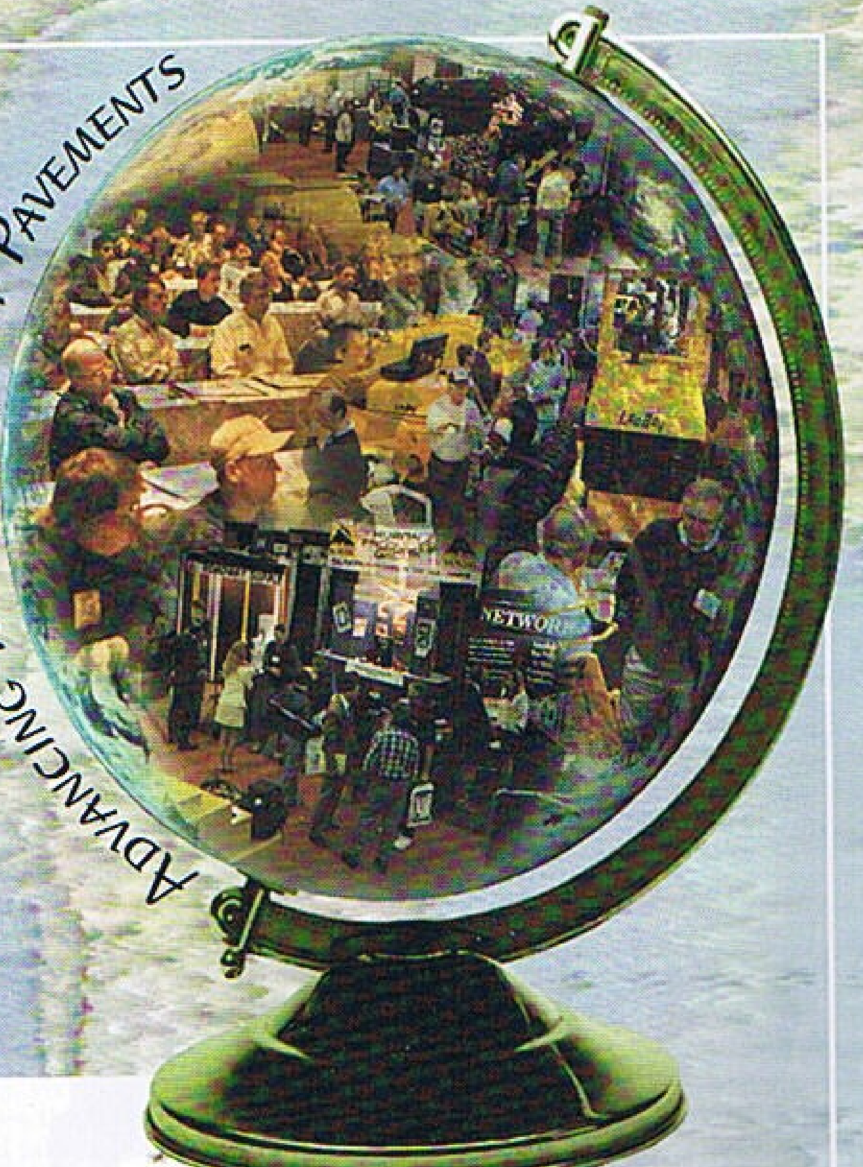

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- Complicated striping in Nebraska
- Successful sealcoating in Maryland
- California sweeping ruling might move east
- Effective use of paving fabrics

Features

Cover: The 1998 National Pavement Maintenance Expo, the industry's premier trade show and conference program, will be held Feb. 11-14 at the Nashville Convention Center, Nashville. Design by Bobbi Burow.

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How to use geotextiles effectively

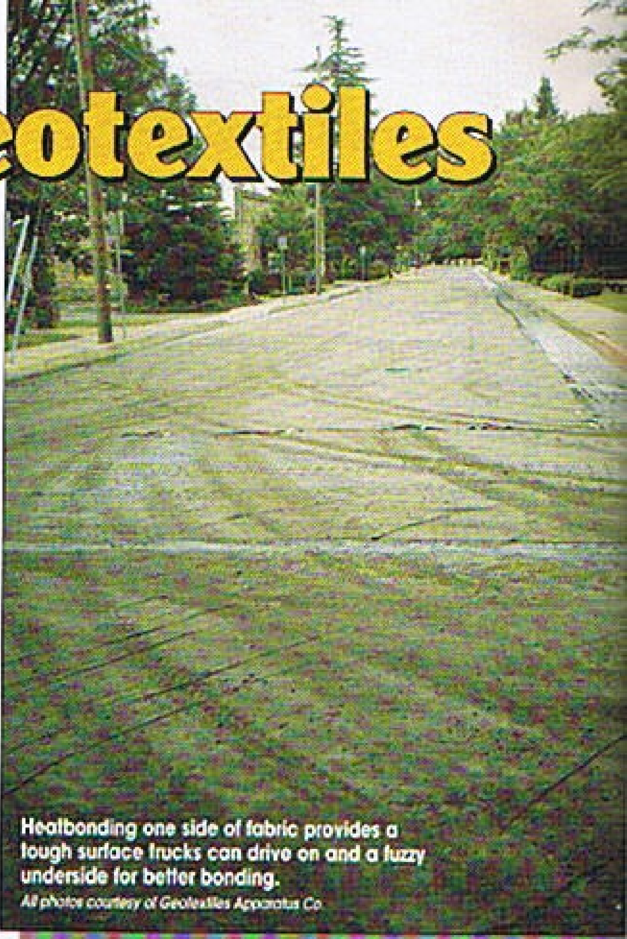
Part I of "The definitive guide to paving fabric and installation"

By Mounque Barazone

Despite Los Angles County's 10 years of success placing more than 50 million sq. yds. of paving fabric through the 1980s, the county's material and construction engineer ceased using fabrics in 1991.

Why? He suddenly began experiencing installation problems. A new Southern California Greenbook specification, engineered and lobbied for by some fabric manufacturers, permitted an acceptable amount of shrinkage (damage to the fabric) during installation.

The specs permitted installation equipment (on the back of oil trucks) that placed fabric within 6- to 12 in. of the oil spray. This method caused fabric shrinkage while other installation approaches — units 5 ft. behind the trucks or mounted on



Heatbonding one side of fabric provides a tough surface trucks can drive on and a fuzzy underside for better bonding.

All photos courtesy of Geotextiles Apparatus Co.

tractors — did not exhibit the same problems.

Unable to control the type of equipment and specifications, the county switched from paving fabrics to rubberized membranes.

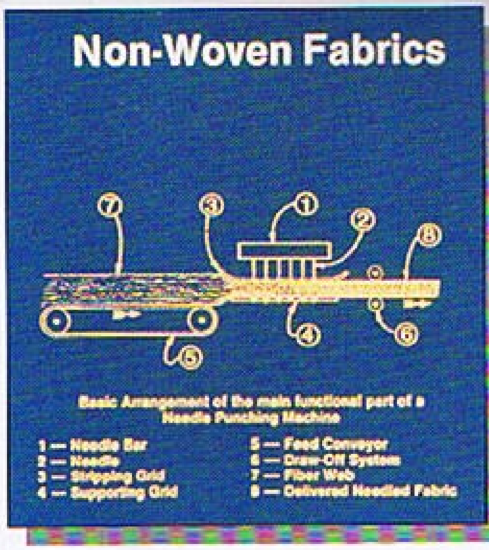
But all indications are that when properly installed, paving fabrics (also known as geotextiles) can cost-effectively extend pavement life.

Using paving fabrics to improve asphalt overlays was first tested in the 1960s. Regular testing and usage began in the mid 1970s, and usage since then has increased from 5 million sq. yds. in 1980 to 100 million sq. yds. in 1996, according to the Industrial Fabrics Association.

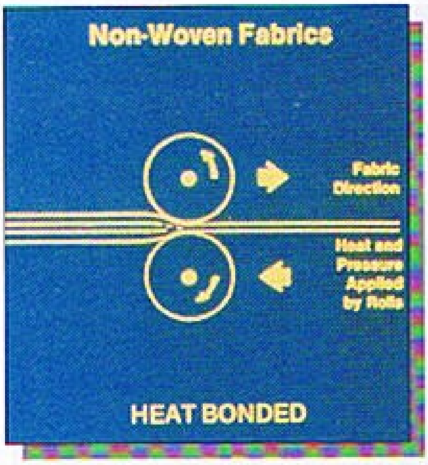
The paving fabric functions as an effective moisture barrier and reflective crack retarder and has been used successfully in almost every asphalt application including highways, city streets, airport runways, parking lots and ponds.

Geotextiles (one type of geosynthetic) are synthetic nonwoven and woven fabrics (or textiles) used in civil engineering applications Geotextiles generally function as membranes, reinforcement (stabilization), filtration (drainage), separation and liner cushioning.

Paving fabric is a nonwoven permeable fabric used in combination with enough bituminous tack coat to throughly saturate the fabric, turning it into an impermeable moisture barrier. There must be enough tack left over to penetrate both the old and new asphalt. Proper construction results in one integral, flexible structural membrane system.



It can be difficult for contractors to determine what information on fabrics and installation is correct and which is not. Different manufacturers with varying proprietary interests suggest various reasons that their fabric is better than the another. Often different installation criteria are recommended or discounted based on the individual fabric's installation advantages and disadvantages. To further complicate matters, there are varying specifications by both public and



The needle-punch process to create nonwoven paving fabrics (left). Once the fabric is made, it can be calendered, or "heat bonded" on one or both sides (above).

private engineers based on their personal experiences and manufacturer exposure. This has caused a wide range of specifications both for the fabric and installation criteria.

Installation is key

Fabric installation is by far the most critical aspect for proper performance. Most fabrics are manufactured from similar processes and perform well when properly installed. In fact, almost every fabric overlay failure has been traced to improper installation.

The costs of installation can make or break the contractor on a fabric project. Understanding the differences, specifications and installation criteria can turn a marginal project into a profitable one.

The purpose of this fabric series is to assist the contractor in understanding the differences between the various types of fabric available, to show proper installation procedures and to help prevent problems that can occur during installation.

Government reports

Numerous states have published dozens of reports with the Federal Highway Administration (FHWA) since 1975 about the use and performance of pavement fabrics under different climatic conditions. Temperatures ranged in excess of 104°F and as low as -30°F. Most reports show great success while some show failures, which in most instances have been traced to improper installation techniques and the fabric chosen.

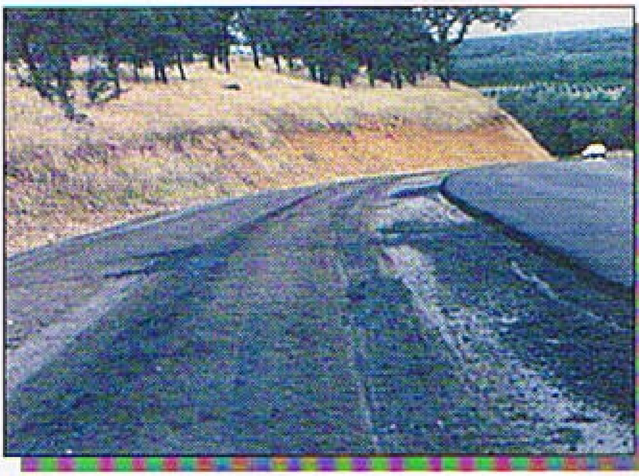
The most extensive studies were by Caltrans, published in 1991 with the FHWA. The three reports by Predoehl studied 24 test and control sections paved over 12 years and concluded: "AC overlays incorporating Paving Fabric Interlayers had less alligator cracking than conventional AC overlays that were up to 0.10 foot thicker... It is recommended that [paving fabric interlayers] be used to replace approximately .10 foot [of asphalt concrete] where additional tensile and flexural stiffness is not required... This results in savings as much as

$1.13/sq. yd. over a thicker overlay...[Paving fabric interlayers] appear to reduce transverse cracking in thinner overlays by .20 - .40 foot over distressed PCC pavement by approximately one transverse crack/100 feet after 8 years of service."

Button and Epps observations in FHWA-Texas report 261-2 were similar to many of Predoehls.

Overall, fabric in cold climates has proven to be effective, though it has not performed as well as fabric used in mild climates. Numerous reports have shown marked improvements in test sections in cold climates with temperatures as low as -30°F.

Donnelly reported five years better performance with an overlay in Colorado on an interstate between Eagle and Dowd. In an FHWA report Wyoming experienced considerably less cracking in the fabric overlay than in the control section with no fabric after one severe winter. Caltrans test sections in the mountains have shown a delay in the cracking of fabric overlays as compared to the non fabric control sections. Texas reported significant improvements after three winters.



According to an FHWA-Texas report, non-heatbonded fabrics are prone to delaminating and fuzzing up in the wheel paths of traffic during construction.

Proper terminology

Various names have been given to the use of fabric in membrane systems. The most common is "Pavement Reinforcement Fabric." This is incorrect terminology, Caltrans' Smith showed in laboratory testing that a fabric interlayer is not a significant tensile reinforcing element in an AC pavement. Reinforcement is obtained from high modulus fabrics (wovens) and geogrids.

Nonwoven fabrics have a high elongation and low modulus. This permits them to work within an asphalt system and remain flexible but provide little or no reinforcement. The proper terminology is changing to Fabric Interlayer Membranes.

Geotextile types and differences

It is necessary to understand fabric differences to choose the fabric that will install the fastest, with the least labor, and fewest problems. Many fabrics meet all the design specifications and are priced similarly, yet some will take longer to install, require more labor and have inherent installation problems.

There are two major manufacturing processes for geotextile fabrics — woven and nonwoven. Both of these can be further broken down into various sub processes which give each fabric individual qualities.

Woven fabrics have been found to be ineffective as they have no interior plane to hold asphalt tack coats to form a membrane. Woven fabrics are used primarily in slope protections, separation, and stabilization applications.

Nonwoven fabrics are primarily used for paving operations, drainage, separation and pond cushioning. The nonwoven fabric provides an interior plane (dimensional thickness) so that a tack coat can saturate the fabric forming a membrane.

Nonwoven fabrics are manufactured from four different processes and use thin filaments of polypropylene or polyester. Polypropylene fabric is slightly more absorbent to oil and is less expensive to manufacture. Its only drawback is that it has a low shrinkage and melt point and can be damaged during installation if placed to close to the oil. Polyester fabric is stronger per ounce and has a much higher shrinkage and melt point making it virtually impossible to damage during installation. It's drawback is that it is more expensive.

Research (Scrimscher of Caltrans and Boring of Asphalt Technology) found both polypropylene fabric and polyester fabric to be recyclable during experimental milling research.

Individual nonwoven fabric specifications may appear to be nearly identical, yet the different manufacturing processes perform very differently during installation. Of the four types of manufacturing processes listed below, only #2 has all of the qualities that are desirable in a paving fabric.

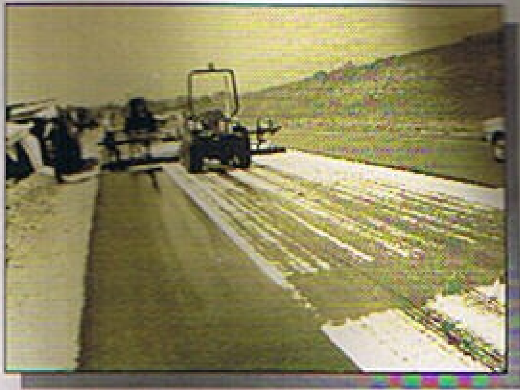
1. Needlepunched (non-heat bonded)
2. Needlepunched and heat bonded (calendared) one side
3. Heat-bonded (calendared) two sides,
4. Resin-bonded

Needle-punched (or entangled) fabrics (Slide 2-F-2) are formed using two types of filaments. One uses long continuous filaments spun together (spunbond process). The other uses short staples of filaments 6 to 12 in. long which are arranged on a carded conveyer system. Barbed needles go up and down through the filaments, entangling the strands together forming the fabric.

A calendering (heat bonding) finish can be applied to fabric at the end of the manufacturing process.

Needlepunched fabric is thicker, fuzzy, softer and more pliable then non-needlepunched fabric. Benefits are that it installs smoother with less wrinkles due to its high elongation (stretch) and seems to bond better to the oil and old asphalt.

Numerous reports state the fabric's fuzzy side, when placed onto the asphalt tack coat on the old pavement surface, provides reinforcement at the interface. The fuzzy side provides a greater effective surface area of the fabric which offers better adhesive and shear strength with far less slippage.

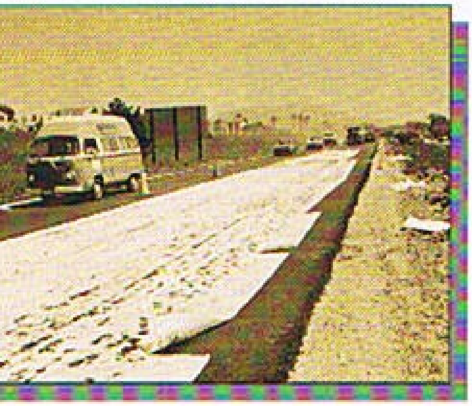


Thin fabric doesn't hold tack coat as easily, resulting in bleed through, which can be hazardous to workers and equipment.

Dual-sided heat-bonded fabrics have installation problems such as wrinkles and folds that transverse the full width of fabric.

Non-heatbonded needlepunched fabrics have inherent installations problems and is not an effective paving fabric.

Installation problems include delimitation and fuzzing during installation. FHWA-Texas report 261-2 mentions problems with non-heatbonded fabrics on every test section, delaminating and fuzzing up in the wheel paths of traffic during construction. These problems result in increased labor costs and slows construction. Other results include reduced long-term performance because damaged fabric leaves little or no



Dual-sided heatbonded fabrics are thin and stiff and have a tendency to curl up when installed by hand.

membrane in the wheel paths.

Heatbonding on one side is a process where one side of the needlepunched filaments are heated to form a tough wearing surface which is necessary in a paving fabric to provide for a tough surface on one side of the fabric for truck traffic to drive on without tearing up the fabric.

The other side remains soft and fuzzy resulting in a better bond. A light heating is called calendaring, which helps the fabric hold up during construction without delamanation or fuzzing.

The only installation problem that can occur is that the fabric can be placed upside down. The heat bonded side must be up and the fuzzy side placed to the tack coat. Otherwise both delamanation and slippage can occur.

3. Dual sided heatbonded fabrics are very thin and stiff. Installation problems with dual sided heatbonded fabrics include: difficulty in placing smoothly, wrinkles and folds transverse the full width of the fabric.

Also, dual-sided heatbonded fabrics have no fuzzy side and have been prone to slippage problems. Also, the thin fabric does not hold tack coat easily and bleed-through occurs causing hazards to the workers and equipment. The fabric is stiff and has a tendency to curl up when installed by hand.

4. Resin-bonded fabrics add a chemical process which forms the fabric. This is similar to gluing and is seldom used in any geotextile anymore. The fabric is thin, stiff and has problems absorbing a tack coat since much of the absorption area is full of the chemical used for bonding.

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Mounque Barazone is president of Geotextile Apparatus Co., San Diego.

Help Out Your Industry!

Watch Your Mail for *Pavement's* **1998 Contractor Ranking Survey,** which will be mailed early in February.