Heat Shrinkage

I want to compliment Mr. Barazone on his article on Paving Fabrics (July/August 1990, *GFR*). He has dedicated significant time and effort to its content which provided valuable information to the paving community. It was, however, unfortunate that his proprietary interest as paving equipment manufacturer clouded the issue of heat shrinkage.

Heat shrinkage is not a severe problem in potential failure of the paving fabric system. There is, if any, very limited exposure to excessive asphalt temperature to the paving fabric.

The most important function in the paving fabric system (PFS) is sufficient asphalt and an evenly spread asphalt tack coat. New improved technology, which uses the latest computer heater control distributor trucks, has greatly improved this potential problem. The latest technology in fabric installation combines computerized regulated tack coat quantities, heater recirculation and

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fabric laydown. This new concept—a distributor truck with fabric laydown capabilities—increases the opportunity for a perfect installation and also reduces the total cost of installation.

John M. Cameron
Marketing Manager
Reed and Graham Inc.

Barazone Replies

Mr. John Cameron's letter (November 1990) attempts to divert the engineering issue of heat shrinkage in polypropylene paving fabrics to an installation equipment issue.

This issue was dealt with prior to publication. A member of the GFR article review committee questioned my proprietary interests in bringing up the heat shrinkage issue. He defended the use of oil spreading trunks with installation equipment and questioned if my article was slanted in an effort to eliminate this type of equipment.

All referenced reports were examined and GFR editors spoke personally with Smith, Lancaster and Button prior to determining that the heat shrinkage question was a valid engineering problem and that my proprietary interests in installation equipment was not the issue. The editors took extra care in deleting all references to various patents, manufacturers, equipment types and their problems to assure that no fingers were pointed at any type of installation equipment.

I would like to point out my patents cover any vehicle mounted apparatus for laying paving fabric, whether it is attached to the front of a tractor, the back of an oil spreading truck or a freight train! I manufacture machines for any type of equipment. Oil spreading equipment is a whole new market for me to increase my sales in. It would be to my proprietary advantage to not bring the heat shrinkage issue to light. In bringing heat shrinkage to light I had to choose between my own proprietary financial gain and proper engineering. I choose the later.

Mr. Cameron states that heat shrinkage is not a severe problem, which I assume means that he recognizes that there is a problem. Is this his personal opinion, the opinion of the manufacturer he distributes fabric for, or is he aware of published information from credible, unbiased agencies that would refute the published finding of the The Texas Transportation Institute, Caltrans - Translab and Los Angeles Counties Construction, Materials and Research Division?

Mr. Cameron goes on to discuss asphalt temperature as not being a problem. I agree with him. Asphalt temperature is not the problem, oil temperature is. In my article's first paragraph regarding heat shrinkage, my references point out that once the fabric is oil impregnated, the oil acts as an insulator dissipating much of the asphalt heat that would otherwise damage the polypropylene fabric. This is not true when the fabric is first placed into the oil as there is no insulation to protect it. This is where heat shrinkage problems do occur.

The new technology cited by Mr. Cameron is not really new. It has been experimented with over the past 10 years. In the article, GFR's editors and I diligently tried to avoid pointing out that the heat shrinkage issue did not become a reality until this type of equipment came into use. My experience, along with many of the cited agencies was that polypropylene fabric shrank and was damaged when placed this close to the oil. It was this type of equipment that caused Los Angeles County to change its specification.

When placing fabric with a tractor the operator has the ability to control the shrinkage problem. The operator can stop the fabric placement and wait until the oil has cooled sufficiently to avoid the problem. The problem is doubly complicated when overlaps are taken into consideration. Both fabrics can shrink at the overlap in opposite directions causing a gap between the fabric rather than a specified overlap. A tractor operator can take this into account and assure that this does not happen.

New computer-heated-control oil distribution trucks have had little effect on the "potential problem" as cited by Mr. Cameron. Task Force 25 guidelines call for an oil temperature spread minimum of 290 F, Caltrans is 285 F. These temperature spread rate specifications evolved because oil truck valves begin to clog when the temperature dips below 285 F. This causes streaking and an uneven spread of asphalt tack coat, which reduces the sufficient quantity of tack coat necessary to create the membrane. Mr. Cameron cites in his letter that "The most important function in the paving fabric system (PFS) is sufficient asphalt and an evenly spread asphalt tack coat." The computer controlled trucks would have to sacrifice this most important function to get into a temperature range that would not damage polypropylene fabric. This does not appear to be the answer to a perfect installation

Smith (19 in article references) stated that shrinkage in the field was unlikely when placed by a tractor, as the oil had time to cool prior to the fabric being placed into it. He admits that he would have a serious problem with distributor truck placement. Lancaster points out (11 and 12 in article references) that in the morning when the ground temperature is 50-60 F the oil cools very rapidly and shrinkage is only slightly noticeable. A delay of 30 seconds is probably adequate prior to fabric placement. When the afternoon temperature increases, the ground asphalt temperature can exceed 200 F. The oil cools very slowly and severe shrinkage was seen (article figures 4 and 5). A delay of a number of minutes (not determined yet) is necessary prior to fabric placement.

Mr. Cameron's concern, as a polypropylene fabric distributor, is understandable. A large volume of his sales is to oil spreading truck installers. Should specifications change causing his customers to switch to polyester fabric or cease installations he stands to loose a lot of business. Perhaps he has let his own proprietary sales needs and market share protection cloud his engineering judgment.

Mounque Barazone
Geotextile Apparatus Company

Paving Fabric

Relative to the article written by Mr. Mounque Barazone titled "Paving Fabric Interlayer Membranes and Installation Procedures Over the Past 20 Years" (July/August 1990 GFR) please afford me the opportunity to expand, clarify, and explain my experiences rel-

ative to the use and placement of fabric membrane interlayer systems.

It cannot be over emphasized that a fabric membrane interlayer is a pavement rehabilitation tool and not a "cure all." The performance of a fabric membrane interlayer system is based upon proper design and as Barazone pointed out in his article, proper installation.

Ideal design criteria which need to be considered include: What structural requirements are needed to extend the life of the structural section a minimum of ten (10) years and what treatment(s) are needed to handle pavement deficiencies such as reflective cracking, surface oxidation, and rutting. Often, the governing factor, especially with local governmental agencies, relative to the thickness of overlay and the type of treatment used to handle pavement deficiencies is economics.

Surface preparation was not mentioned in Barazone's article, but to maximize the performance of an asphalt concrete overlay, the pavement surface prior to the placement of the overlay should be clean, dry, and the cracks 1/4" in width and greater filled with a suitable crack filler. This is the case whether a paving fabric is or is not used.

Barazone states "the overlay thickness must not be less than 1-1/2 inches if installed under ideal climatic conditions, 70 F or above. For temperatures between 50 F and 70 F, overlay thickness should not be less than 2 inches." Paving fabrics have been successfully used with overlays less than 1-1/2 inches in thickness, but the installation is more critical the thinner the overlay. This is the case whether a paving fabric is or is not used. A temperature of 50 F (10 C) can be sufficient to satisfactorily place 1" - 1 1/2" asphalt concrete overlays on a paving fabric, and has been used by many agencies. This is good practice especially when a thin overlay is placed on a fabric.

The most serious installation problem has been the spreading of an inadequate amount of asphalt binder or the use of poor binder oil application equipment and not heat shrinkage of the paving fabric as the author suggests. Heat shrinkage of a paving fabric is potentially a problem, but it has been my observation both after viewing installations and inspecting cores of overlays containing a fabric membrane interlayer that this problem is essentially nonexistent. Mr. Barazone suggests a necessary time lag between asphalt binder application and paving fabric installation. This is not necessary if the binder oil is spread at the proper temperature. In fact, millions of square yards of paving fabric are immediately placed into the binder by asphalt distributor trucks having fabric installation equipment mounted on the rear of the truck.

Paving fabrics have been shown to retard cracking associated with fatigue (alligator cracking) more effectively than cracking associated with environmental conditions. Thermal and shrinkage cracking are more evident in a cold climate than a mild climate, and are

more a result of internal stresses in the overlay and are not reflective in nature.

When alligator cracking is a form of distress in a pavement in any climate, the use of a paving fabric is justified. The use of paving fabric is also often justified because of its waterproofing capabilities, i.e., its ability to minimize the vertical intrusion of moisture into a pavement substructure. Consequently, the type of pavement distress and the objective of rehabilitating the pavement need to be studied to determine if a paving membrane interlayer system is a cost effective tool to use. It is not a simple case of paving fabrics performing better in mild climates than cold climates.

Robert H. Manz
Phillips Fibers Corporation

Fabric Use in Cold Climates

In the article ("Paving Fabric Interlayer Membranes and Installation Procedures Over the Past 20 Years, July/August GFR) it is stated that the author feels the effectiveness of fabric use over asphalt is debatable in cold climates. Would you clarify whether this is a typographical error, or has the author changed his opinion about the fabric's effectiveness in these conditions?

Having attended a lecture and also being familiar with Mr. Barazone's original paper on this subject, his conclusions have consistently pointed to a marked improvement in asphalt roads that incorporate fabric overlay in cold climates.

Your article now has us confused and a response to my letter would be greatly appreciated.

Bill Ross
Form and Build Supply Inc..

Editors Note: *After discussion between the author and the editors, the word "debatable" was substituted for "marked" because the published paper pointed toward marked improvement, but did not provide conclusive support.*

Barazone's current paper cites numerous additional references to performance in cold climates with very positive results. He states that increased overlay life, reduction of maintenance and improved ride condition for motorists are all benefits of the use of paving fabric in cold climates.

A Source of Information

We would like to compliment D Robert Koerner on the excellent artic "Preservation of the Environment v Geosynthetic Containment System which appeared in the November 19 issue of Geotechnical Fabrics Repo This article was obviously thorough researched and much valuable inform tion was presented.

We would like to acknowledge t source of "Figure 8" used in the artic This schematic drawing of underwa placement of a PVC geomembrane from an EPI case history written a copyrighted by Daniel B. Reba which was published in the Novem 1989 issue of Geotechnical Fabr Report. We believe that anyone int ested in researching this technolo should be aware of the source of inf mation.

Fred P. Rohe
Environmental Protection, Inc.