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ON THE COVER:
FLANKED BY HER CREW, BROTHERS (FROM LEFT) ISAIAH, ELIAS AND JEDIDIAH, AND FATHER LLOYD (MIDDLE), SOAPBOX DRIVER DAMARIS MARKLEY PROUDLY SITS BY HER TEAM ASPHALT RACER. SEE PAGE 20 TO FIND OUT HOW THIS YEAR’S FPO-SPONSORED ENTRY FARED.

Flexible Pavements of Ohio is an association for the development, improvement and advancement of quality asphalt pavement construction.

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One of my favorite subjects to talk about is roads, especially of the asphalt variety. I suspect the reason for that is largely because asphalt roads do more than enamor me, they also butter my bread. I normally reserve this opportunity to speak about the abounding attributes of asphalt roads and the initiatives the asphalt industry has undertaken to ensure our customers’ success. Here lately, though, with the new thinking that’s coming out of Washington, it seems folks could use some reminding of the positive aspects of roads. So, I figure it’s time to speak out on the behalf of roads in general, particularly the black ribbons of smoothness I hold dear. So here’s one for THE ROAD.

Some people, it seems, believe roads are a source of societal ills. Fallen to the blame of roads is everything from the perceived environmental catastrophe of global warming to the behavioral abnormality called “road rage” – which in my youth was called a lack of self control. Nowadays we hear from Washington that what we really need is transportation that encourages healthy lifestyles and pollutes less. No problem there, but it seems roads are not part of the equation to make us prosperous in a healthy sort of way.

They are called “livable communities,” this new initiative espoused by those in the know in Washington that promises cleaner air and a better and healthier life. It is a life where people live in a more densely populated area — where groceries, work and entertainment are just a walk, a jog, a bicycle trip or bus ride away; and for long commutes you ride the rails. In a “livable community” there is less need for an automobile and as such less need for roads.

And so I ask you, are we better off with less roads or more roads? Might I suggest that as thickness is to the performance of pavement so are more roads to the health of our state and nation, and our personal safety and prosperity.

**If It Weren’t For THE ROAD …**

If it weren’t for roads where would we be?

Have you ever stopped to think just how we would fare in times of natural disaster were it not for THE ROAD? Isn’t it THE ROAD that allows us to most quickly flee to safe harbor? Certainly during a disaster, be it natural or other, isn’t mobility among one of the greatest necessities, and isn’t it THE ROAD that provides to us the most of this necessity? THE ROAD says … “Here I am, escape to safety!”

If it weren’t for THE ROAD, what would we do when the inevitable family emergency strikes in the wee hours of night and getting medical care is urgent? Some of you know of what I am speaking. The trusted hand of the EMT ministers to your need as the ambulance whisks you along THE ROAD to healing.

Cruisin’ the Shoreway with your sweetie or motorcycling a scenic byway with the buggies, because of THE ROAD we can enjoy the majesty of Ohio’s engineering wonders and the beauty of Ohio’s natural diversity.

On faraway ventures we travel to places where the sky is BIG and THE ROADs are long. The beauty of our nation we behold as we travel THE ROAD. And where does THE ROAD take us, but to places where buffalo roam, where deer and antelope play, where no discouraging word is heard and smooth riding is enjoyed all the day.

If it weren’t for THE ROAD what would we do? To the reservation goes THE ROAD. To the inner city goes THE ROAD. To paradise and to the impoverished goes THE ROAD. THE ROAD is the agent of pleasure, and it is an agent of mercy.

**HERE’S ONE FOR THE ROAD!**
THE ROAD, it’s where the farm connects to the market. It’s the conveyance through which sustenance and opportunity flow. Food finds its way to the grocer’s shelf by way of THE ROAD. THE ROAD permits the delivery of products that dad and mom manufacture and cultivate for consumption by smiles that they will likely never see. It takes Junior to college and places him on THE ROAD to prosperity.

THE ROAD means jobs; jobs for those who build them and jobs for those who travel them. A mountain of inventory rides THE ROAD; just-in-time do the parts arrive, just as the logisticians predicted. It is because THE ROAD was there to carry the load in the inextricable links of commerce.

PROSPERITY AND THE ROAD ...
IF IT WEREN’T FOR THE ROAD WHERE WOULD WE BE?

As blood courses through a body’s arteries bringing vitality and health so are THE ROADS the circulatory system of commerce and prosperity.
Flexible Pavements of Ohio (FPO) participated in the Transportation Construction Coalition’s (TCC) 2010 Legislative Fly-In to urge Congress to proceed with the reauthorization of the long overdue federal transportation funding bill.

FPO staff and several member companies joined the TCC’s efforts, including Cook Paving and Construction Co., Hanson Aggregates Mideast Inc., Kokosing Construction Co. Inc., The Shelly Co. and Shelly & Sands Inc. In addition to FPO, more than 20 people from Ohio attended the TCC representing organizations such as the Ohio Department of Transportation (ODOT), the Ohio Contractors Association, the Ohio Aggregates and Industrial Minerals Association, the International Union of Operating Engineers Local 18 and the Ohio Council of Carpenters.

The previous transportation funding legislation expired in 2009, and the Highway Trust Fund (HTF) has been operating on a series of temporary extensions ever since. The coalition advocated for the passage of a well-funded multi-year highway bill and briefed Congress on the impact of continued inaction to the nation’s economy and infrastructure. The current interim measure expires in December and has caused considerable uncertainty for the state and local governments that depend on the stable, predictable flow of funds to maintain the nation’s transportation infrastructure.

Meeting directly with all 20 members of Ohio’s Congressional delegation or their senior staff, the coalition expressed support for the immediate consideration of a new bill with additional revenue to address the needs of an increasingly congested and aging transportation system. A $450 billion draft transportation bill, which would achieve these goals, has been proposed by Congressman Jim Oberstar but there appears to be little support for it. Challenges such as competing legislative priorities, election year politics and the insolvency of the HTF have made the probability of reauthorization in the near-term increasingly remote.

The most pressing question in all conversations concerning reauthorization is the fact the revenue generated by the federal gas tax simply does not support the current or proposed spending levels of the Oberstar bill. A recent bi-partisan congressional commission reported a 10-cents per-gallon federal gas tax increase is necessary to obtain short-term solvency while transitioning to a more stable funding source and innovative financing mechanisms. Although a general consensus appears to have been reached recognizing the need to invest more dollars into the transportation system, the question as to the source of these funds is hotly debated.

In addition to reauthorization, the coalition advocated for the continuation of the traditional user fee concept for transportation funding. This decades-old system dedicates all revenue generated by the use of the transportation system to the maintenance and expansion of the transportation infrastructure. The coalition specifically expressed opposition to language in the American Power Act that diverts funds generated by the transportation system to other uses. Sponsored by Senators John Kerry and Joe Lieberman, this legislation establishes a national “cap” on greenhouse gases and requires industry to “purchase” allowances corresponding with the forecasted emissions produced by their respective activities. Of particular concern is the fact the Kerry-Lieberman Bill would require the oil industry to purchase allowances for the production of transportation fuels. This increased cost to producers would unquestionably be passed onto consumers at the pump and effectively serve as a federal gas tax increase.
The coalition argued that revenue generated from fuel production as part of the Kerry-Lieberman Bill should be directed to the HTF in accordance with longstanding federal policy. However, the majority of this revenue is slated to be directed to a variety of non-transportation purposes, such as debt relief and subsidies for the development of alternative energies. This creates a twofold issue of the erosion and the sanctity of the user fee concept and further complicates any effort to increase the federal gas tax as recommended by the recent congressional commission report. The future of the Kerry-Lieberman Bill appears to be very much in doubt, but it remains unclear if support will grow for this legislation.

As the reauthorization debate continues, ODOT has reported a piece of positive news for Ohio’s construction industry. With the close of state fiscal year 2010, ODOT announced the completion of a record $2 billion construction program. This represents a 30-percent increase in state construction spending and is forecasted to be repeated in state fiscal year 2011. Attributed largely to stimulus funds provided by the American Recovery and Reinvestment Act, this record investment in Ohio’s transportation infrastructure will provide a brief respite as the push for transportation reauthorization continues.

This letter from Congressman Pat Tiberi is an example of the positive feedback and support that FPO received for its advocacy efforts from many members of Ohio’s Congressional delegation.
INVESTING DURING A DOWN MARKET? YES, WHEN IT COMES TO FPO SCHOLARSHIPS PROGRAM

Asking someone to invest during the current economic downturn could produce a lot of surprising reactions – even “Yes.”

“Yes,” was the response Flexible Pavements of Ohio (FPO) member companies and individuals gave earlier this year when it came to further contributing to the FPO Hot Mix Asphalt Scholarships Program. FPO members’ graciousness not only fulfills the investor’s mantra that “investment is the critical determinant of long-run economic performance,” it also will provide funding for 27, $1,000 scholarships for the 2010-2011 academic year.

While the earlier generosity of FPO members’ contributions to the National Asphalt Pavement Association’s Research & Education Foundation (NAPAREF) produced $21,000 in scholarships for the 2010-2011 academic year, additional contributions by Barrett Paving Materials, Burgett Family/Kokosing Construction Co., Dine Comply Inc., Erie Blacktop Inc., Gerken Paving Inc., John R. Jurgensen Co./Valley Asphalt Corp., Northstar Asphalt Inc., Shelly & Sands Inc. and The Shelly Co. increased the total amount of scholarships to $27,000.

In the 15 years of the scholarships program, FPO members have provided 310 scholarships totaling $374,000.

Instead of looking at it as spending money during hard times, FPO members continue to look at contributions to the scholarships program as investing in people and the future of the hot mix asphalt industry. Open to universities in the state offering courses in asphalt pavement technology, FPO’s scholarships program will assist students from five schools for the 2010-2011 academic year. Students must be U.S. citizens enrolled in a full-time civil engineering, construction management or construction engineering curriculum, and entering either their junior, senior or fifth year of a Bachelor’s Degree program. This year there was one repeat recipient, University of Akron’s Joseph Bersuder, of an FPO Hot Mix Asphalt Scholarship. FPO has also offered scholarships to graduate students specializing in asphalt pavement technology.

Among the considerations in awarding an FPO scholarship are academic performance, potential, leadership, participation in school, community and extracurricular activities, work experience, career and educational aspirations in the transportation industry and personal and family circumstances.

For further information on the FPO Hot Mix Asphalt Scholarships Program and to find out about the application period for the 2011-2012 program, visit www.flexiblepavements.org/scholarship/cfm.
GOAL ORIENTED, GOAL ACHIEVED

Established 15 years ago when the FPO Hot Mix Asphalt (HMA) Scholarship Program began, these four initial objectives and goals continue to propel the success of the program:

- Provide an incentive for students to gain knowledge in HMA by requiring each student receiving a scholarship to take at least one course in HMA
- Provide an incentive for colleges/universities to offer training in HMA by creating a student demand for the course
- Establish close ties between the asphalt industry and universities, to raise the awareness of HMA
- Provide a workforce trained in asphalt technology

The FPO HMA Scholarship Program is administered through the National Asphalt Pavement Association’s National Research and Education Foundation.

2010-2011 FPO HOT MIX ASPHALT SCHOLARSHIPS RECIPIENTS
The support of more than 30 FPO member companies and individuals has made the association's 2010-2011 scholarships program bigger and better. Here are the FPO members and individuals contributing to this year's program:

- Osama Abdulshafi
- Barrett Paving Materials Inc.
- Bowers Asphalt & Paving Inc.
- Burgett Family/Kokosing Construction Co.
- Columbus Bituminous Concrete Corp.
- Columbus Equipment Co.
- Cunningham Asphalt Paving Inc.
- Dine Comply Inc.
- Erie Blacktop Inc.
- Bill Fair
- Fred & Teresa Frecker
- General Insurance Co.
- Gerken Paving Inc.
- Hardrives Paving & Construction Inc.
- Hy-Grade Corp.
- John R. Jurgensen Co./Valley Asphalt Corp.
- Kenmore Construction Co.
- The Koski Construction Co.
- M&B Asphalt Co. Inc.
- The McLean Co.
- Martin Marietta Aggregates
- Meeker Equipment Co. Inc.
- Northeastern Road Improvement Co.
- Northern Ohio Paving Co.
- Northstar Asphalt Inc.
- Ohio Cat & Caterpillar Inc.
- Shelly & Sands Inc.
- The Shelly Co.
- Schloss Paving Co.
- H.P. Streicher Inc.
- Thomas Asphalt Paving Co.
- Valley Paving Co.
Applying a tack coat to an existing pavement is such a simple and inexpensive process that its importance is often overlooked. In many specifications, the tack coat is considered to be an incidental expense, so it is not paid for directly, but is included in the cost of other items in the contract.

The proper application of a tack coat, however, is critical to the performance of an asphalt pavement. “When you apply a tack coat correctly, it can significantly improve the bond between the pavement layers,” says consulting engineer Jim Scherocman, an experienced expert on the subject. “The tack coat can reduce the tendency for the surface layer to slide on the underlying layer under the force of accelerating or decelerating traffic. And the tack coat may reduce top-down cracking in the surface course layers.”

**Residual Amount of Binder**

Scherocman says the application rate of the tack coat is not nearly as important as the residual amount of asphalt binder – the material remaining on the surface after the tack coat has “set.” The residual amount normally does not cover the entire pavement surface. “In the vast majority of paving situations, Scherocman says the tack coat should be distributed over only 90 to 95 percent of the existing surface. That leaves 5 to 10 percent of the surface visible after the tack coat has been applied.

The amount of desired residual coating is up for debate, says Don Etnyre, sales manager for E.D. Etnyre & Co., a manufacturer of tack application equipment. “Some people like to cover 100 percent, and some people like streaks,” he says. Scherocman says it depends on the pavement surface.

If the existing pavement surface is porous, you should have 100 percent coverage, says Joe Button, senior research fellow at the Texas Transportation Institute, Texas A&M University. You need 100 percent coverage because some of the material will seep into the pores.

Too little tack coat may result in a significant reduction in the strength and durability of the pavement structure, says Scherocman. Too much tack coat will create a slip plane between the layers and cause the upper pavement to slide on the lower layer.

**Type of Material**

Typically an asphalt emulsion is used for the tack coat, and it can be a rapid-set or a slow-set material. For the rapid-set emulsions, usually an RS-1, RS-1h, CRS-1 or CRS-1h material is specified. For the slow-set emulsions, the most common grades are SS-1, SS-1h, CSS-1, and CSS-1h. For some high-traffic roadways, the asphalt emulsion may be polymer modified.

In some areas, asphalt binder is used for the tack coat instead of emulsion. In that case, the tack coat material is 100-percent asphalt; usually the grade of binder selected is the same as the grade contained in the hot mix overlay.
Most grades of asphalt emulsion contain approximately 60 to 65 percent asphalt binder, and the remainder is water and emulsifying agent. After the tack coat or emulsion, has been applied, the residual asphalt content remains on the surface after the water has evaporated. For practical purposes, you can assume that an emulsion is two-thirds binder and one-third water.

Tack coats are applied at 0.04 to 0.10 gallons per square yard, says Scherocman. Based on an applied rate of 0.06 gallons of emulsion per square yard, the residual asphalt binder in an undiluted emulsion would be 0.06 X 2/3, or 0.04 gallons per square yard.

If an emulsion is diluted 1:1 with water, then the residual amount of asphalt binder is only one-third of the application rate. So, a diluted emulsion has to be applied at twice the application rate compared to an undiluted emulsion to achieve the same residual amount on the road. For a diluted emulsion, to achieve a residual amount of 0.04 gal/sq. yd., it would be necessary to apply 0.12 gal/sq.yd. (0.12 X 1/3 equals 0.04 gal/sq.yd.).

The following chart gives Scherocman’s recommended residual application rates for various pavement surfaces:

<table>
<thead>
<tr>
<th>Existing Pavement Condition</th>
<th>Residual Rate (gal./sq. yd.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New asphalt layers</td>
<td>0.02-0.03</td>
</tr>
<tr>
<td>Old, oxidized asphalt</td>
<td>0.04-0.06</td>
</tr>
<tr>
<td>Milled asphalt surface</td>
<td>0.05-0.07</td>
</tr>
<tr>
<td>Milled PCC surface</td>
<td>0.05-0.07</td>
</tr>
<tr>
<td>Portland Cement Concrete</td>
<td>0.04-0.06</td>
</tr>
</tbody>
</table>

Recent research, says Scherocman, indicates that you may not need to place a tack coat on a milled asphalt surface. That’s because the roughened surface helps provide a mechanical, shear-resistant bond between the two layers. In that case, you need to make sure the milled surface is very clean, says Button. Sweeping with a rotary broom will not be enough; you need to use pressurized air or water, he says. Merely sweeping will leave debris in the texture of the milled surface.

**Common Mistakes**

Uniform tack coat application depends on the size of the nozzles used on the distributor spray bar. Don’t make the mistake of applying tack coat with the same nozzles you use for a chip seal, says Scherocman. The nozzles for a chip seal have much larger holes than you need for a tack coat, because application rates for a chip seal are much greater. If you use chip seal nozzles, the holes will be too large, and the emulsion will come out in longitudinal streaks. You will not get uniform coverage.

A chart is usually supplied with each distributor to provide information on the proper nozzle size to use for different application rates. Don’t neglect the pump pressure or the ground speed of the distributor – both must match the desired application rate of the tack coat.
Next, you need to make sure that all nozzles on the spray bar are set at the correct angle and are functioning properly. The nozzle opening, or slot, should be set at an angle of approximately 30 degrees to the axis of the spray bar. If all of the nozzles are not set at the same angle, you will not get a uniform application of tack coat.

If the distributor has not been used for some time, it is a good practice to do a trial run on an unused area. In addition, the trial run can be used to judge the uniformity of application and confirm the proper application rate. If you want to, you can calibrate the distributor application rate according to ASTM D 2995.

If the existing pavement surface is dusty, Scherocman warns, the application of the tack coat may not provide a bond between the layers of asphalt. It is extremely important to clean the existing surface before the tack coat is applied. It may be necessary to sweep or flush the existing pavement with high-pressure water to remove any dust film.

**Pick up on Truck Tires**

When an asphalt emulsion breaks, the asphalt binder particles separate from the water. When the water has evaporated, which takes place in 15 minutes to two hours, the emulsion has “set.” Once the emulsion has set, it is ready to have the fresh asphalt placed on it. Between the tack coat emulsion break time and the set time, the tack coat is very sticky and will adhere to the haul truck tires and be carried away.

“That obviously defeats the purpose of applying a tack coat in the first place,” says Scherocman. However, the pick up of the tack coat on truck tires can be reduced by driving over the asphalt emulsion before it has broken. If that can’t happen, then the only way to prevent the tack coat pick up problem is to assure that the coat completely sets before driving the haul trucks on it. That can significantly delay the placement of the asphalt mixture.

The pick up problem can be minimized by using the following techniques:

- Minimize the tack coat application rate
- Achieve uniform tack coat application across the pavement by using the proper nozzle size, nozzle angle, and spray bar height
- Use an asphalt binder for the tack coat
- Apply the tack coat as far ahead of the paver as is feasible, depending on traffic safety requirements

Research has shown that even a set tack coat material will cut down the friction available to a vehicle tire, especially if the surface is wet. Use caution in placing the tack coat ahead of the paver. If rain is imminent, the amount of tack coat placed ahead should be controlled. And if the tack coat is exposed to traffic, you might apply a light layer of sand to the tack coat.

The main purpose of a tack coat is to provide a bond between the existing pavement surface and a new layer of asphalt. The bond reduces the possibility of a sliding failure between the new and the old pavement layers.
The tack coat need not completely cover the underlying surface — only 90 to 95 percent of the surface area needs to be covered to achieve a bond. Too little or too much tack coat material is detrimental to the performance of the pavement.

The residual amount of asphalt binder is of primary importance. When using undiluted emulsions, you should calculate the residual amount of tack coat based on the applied rate times two-thirds (the percentage of binder in the emulsion).

Tips when applying emulsion, Scherocman says, include the following:

- Make sure all nozzles on the spray bar are open and fully functioning
- All nozzles should be set at the same angle to the axis of the bar and all the fans should be in the same direction
- The height of the spray bar above the ground should provide for a double or triple overlap of the fans

The proper uniform application of an asphalt tack coat will contribute greatly to the durability of the new asphalt layers.

"Tack Coats: Setting the Record Straight," is a copyrighted article being reprinted with the permission of the National Asphalt Pavement Association (NAPA). The article appeared in the March/April 2010 issue of NAPA publication HMAT.

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“We are your Source for Specialty Asphalt Products”
Win the War on Cracks – Part III

(Editors note: This is the third of a series of articles appearing in Ohio Asphalt intended to give pavement owners and engineers the knowledge needed to ensure their asphalt pavement designs result in successful performance. Part I of the series, “War on Cracks,” appeared in the Summer/Fall 2009 issue, while Part II, “Low Strain, Long-Life Pavements,” appeared in the Fall/Winter 2009 issue.)

Subdrainage

Building low-strain pavements builds success. During the past two articles, we’ve learned that cracks start bottom-up after stress and strain exceeds strength and stretch. So it’s important to provide a low strain bottom (the asphalt pavement’s bottom). We’ve emphasized that deep-strength designs, like Perpetual Pavement, when built on a solid, properly drained subgrade, guarantee success. That’s the best battle plan to win the war on cracks.

The most recent article in this series, “Low-Strain, Long-Life Pavements” (Ohio Asphalt, Fall/Winter 2009) focused on subgrade soils – an immensely important subject. And we discussed water’s bad habit of dissolving otherwise strong, cohesive, clay bonds. But this article will give you a new perspective about our persistent, stealthy enemy – sneaky, invisible subsurface water. We intend to raise your awareness too.

But as a preliminary matter, most of Ohio has clay and silty-clay soils, of course. Yet small parts of Ohio have granular soils that are naturally free draining and moisture stable. This article focuses on moisture-sensitive clay and silty-clay soils.

Water can come from the top-down, and/or from the bottom-up. Most water damage, however, comes from bottom-up. Here in Ohio, strident subsurface attacks come primarily in the winter and spring. Difficult winter drying and wet spring weather unfortunately wreaks havoc with many pavements; groundwater tables are highest and our enemy’s resources the greatest. When your lawn is saturated, (chances are) the subsoils beneath your street have high moisture too. Even subdrains aren’t perfectly effective. But we’ll get to that later.

So if subsurface water can submarine marginal pavements in wet weather, what about dry weather? Many may feel that pavements are safe from summer attacks. Not always true. Our invisible enemy has a fleet of stealthy B-1 Bombers that fly under the bold banner called “capillary action.”

“Capillary” comes from the Latin word meaning narrow tube. But the term simply describes the water molecule’s attraction to soil particles. A paper towel, for example, will wick-up water and seemingly defy gravity. We’ve all seen it before, but how does it really work?

That’s what Albert Einstein wanted to know. Gravity, of course, was his favorite subject. And Einstein knew that defying gravity was a tough trick. Even without paper towels, he was still very interested in capillary action.

Einstein’s first physics paper was titled “Conclusions Drawn from the Phenomena of Capillarity” (Folgerungen aus den Capillaritätserscheinungen), Annalen der Physik (1901). Einstein was captivated by any mysterious force, and history shows that capillary action was clearly on his radar screen. Although generally taken for granted, we’re actually surrounded by capillary action.

Here are some more examples:

- The upward transport of fluids within plants – as water is released through leaves, the roots draw-up more water to replace it
- Frost-heave – as water feeds ice crystal growth, and frozen water expands 9 percent (giving our stealthy enemy more punch)
Our point, by the way, is that invisible, often-ignored, subsurface capillary action softens clay soils more than most realize. Pavements are under sustained attack. So how do we fight a fleet of invisible, stealthy bombers loaded with capillary bombs?

**The Classic Defensive Shield – Subdrains**

Although far from perfect, subdrainage systems are a must-have. They come in different sizes and shapes and invite creative custom designs too. ODOT typically uses a 4-inch or 6-inch perforated polyethylene pipe surrounded by a narrow trench filled with #8 aggregate. This narrow subdrainage system is defensively positioned slightly behind the curb (to shield both street sides).

The subdrain elevation is critical. Make sure it’s below the top of the subgrade — or undercut. When undercutting soft subgrade, and stabilizing with gravel, make sure that the subdrain elevation is below the undercut. Otherwise you’ll create a “bathtub” (put the bathtub drain at the lowest point).

Subdrainage theory is simple: deflect our enemy’s capillary action by wicking-off excess moisture during dry periods, and intercepting free water during wet periods. Subdrains are essential for long-life pavements. Some engineers believe they are just cheap insurance. Not us — we see subdrains as essential, defensive-ambush arsenal. The following story underscores this point and has a lesson.

The story of Morgan shows that the Conservancy District values defensive shields and their action now vigilantly protects the Miami Valley. There’s another lesson here: The Conservancy District, along with their specialized Chicago design firm, does not recommend geosynthetic subdrain filter fabrics, because they believe that geosynthetics clog. But other agencies specify geosynthetic socks around the subdrain. Most engineers feel, however, that geosynthetic filters are a good idea. As long as the subdrain has a fail-safe, positive outlet, clogging is unlikely.

**Parking Lot Subdrainage**

As a result of cracks in the parking lot pavement, subsurface water seeps out the surface.

Thus far, we’ve discussed *highway* subdrainage. But what about parking lots? Unfortunately, parking lots generally get neglected, so this is a prime reason why parking lot pavement failures are so universal.

The typical parking lot pavement section lacks two things:

1. **An effective subdrainage system**
2. **A low-strain pavement design**

A traditional 2-foot x 2-foot (2x2) catch basin, for example, makes a good subdrainage system backbone. Perforated drain pipe — with an aggregate trench — can be extended radially from all four sides of a 2x2 catch basin; these are called “spider drains.” Naturally, the 2x2 catch basins are connected to positive outlets, while the spiderring subdrains are shielding parking lots from attack.
Spider drains, when specified, typically extend 25 to 50 feet in all four directions (the longer the better). In this fashion, they're used to protect the subgrade at low points only. While that's good, it's not best. A few parallel subdrains, on the other hand, spaced at reasonable intervals offer big benefits (running full length of the lot). The benefit-cost ratio is more attractive than many realize, and that's why we mention it here. It doesn't matter if it's highway pavement or parking lot pavement — the concept is the same — and so is the enemy.

**Free-Draining Bases**

According to the American Association of State Highway and Transportation Officials (AASHTO) pavement design methodology, the more free-draining the aggregate base, the higher the strength assigned to it. An AASHTO-style draining base will offer significantly more structure compared to a poor draining base. Added moisture in unbound aggregate base can reduce stiffness 50 percent or more (moisture lubricates).

R.B. Jergens built an experimental free-draining-base project for ODOT District 8 in 2005. The standard section is geosynthetic fabric on subgrade, then 18 inches of Type D aggregate base, then another layer of fabric to choke the Type D, then 6 inches of 304 (well-graded aggregate). Finally, 8 inches of 302 big-rock asphalt base, and 1½-inch intermediate and 1½-inch surface courses. Even before installing the asphalt layers, heavy equipment caused no elastic reaction.

R.B. Jergens recently built another free-draining base project for ODOT District 7. It used geosynthetic fabric on subgrade, then a combination of 10 inches of #2 stone, and 6 inches of 304 for the aggregate-base system. Please note that both designs feature the same AASHTO concept — a free-draining aggregate base on the bottom, and a well-graded aggregate base on top (creating a smooth paving platform).

For comparison, when it comes to asphalt compaction, the three most important factors are, and in this order: (1) temperature, (2) temperature and (3) temperature. But when it comes to good road construction, it's: (1) drainage, (2) drainage and (3) drainage.

**Conclusion**

Water is the ultimate universal solvent. It dissolves cohesive soil bonds with the greatest of ease. It lubricates soil particles propelling instability and movement. It has buoyancy power. Lurking deep in its earthy, subterranean environment, water is invisible, pervasive and even gravity defying. Understanding its nature, at least, gives us some control. Remember that subdrainage systems aren't perfect. And because they're not perfect, stabilizing the subgrade is absolutely essential. That's rule No.1.

Rule No.2: find bad subsoils that are especially susceptible to moisture and ruthlessly undercut them (remember Arthur Morgan's battle cry). Replace the bad soils with free-draining aggregate. Make sure that the subdrain itself is low enough to drain undercuts, which act like bathtubs. Deploy a low-cost perimeter subdrainage system as a defensive shield for highways, and an interior subdrainage system for parking lots (spider drains and parallel drains).

Our next article, “Winning the War on Cracks, Part IV,” will discuss pavement design coefficients. Then you can compare different pavement sections quantitatively (and you'll see that deep-strength design makes good math).

*(Vic Roberts, P.E., is the former city engineer for the City of Englewood and now serves as vice president for R.B. Jergens Contractors.)*

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*To keep a pavement edge strong it may be necessary to capture sheet flow off the pavement edge. In this photo, drainage is retrofitted using 4-inch perforated pipe placed approximately 12 inches below subgrade and backfilled with #8 stone — in this case to the surface.*
SOME THINGS ACTUALLY GET BETTER WITH AGE – INCLUDING ASPHALT PERPETUAL PAVEMENTS.

The pavement structure lasts indefinitely. Every 18 to 20 years, the surface is milled up and recycled; an overlay is placed during off-peak hours; and road users get a good-as-new highway. There’s no need for the entire highway to be removed and replaced from the ground up. Perpetual pavement is a pavement that remains a permanent asset; a pavement that our grandchildren’s grandchildren will be able to use. A pavement that’s infinitely reclaimable, reusable and renewable.

Think smart. Decide diligently. Perpetual pavements make sense.

ASPHALT. AGE 40.

The Ohio Department of Transportation (ODOT) won its third APA Perpetual Pavement Award in 2007 for a section of U.S. Route 30 in Stark County. This section was originally built in 1970. Now, after 40 years of service, it’s still going strong – with only a single-course overlay in 1987, spot mill and fill in 2001, and a general mill and fill in 2007.

Congratulations to ODOT on an asphalt base pavement that has stood the test of time with minimal maintenance, while providing outstanding value to the citizens of Ohio.
On a blistering-hot June morning, Team Asphalt suits up and enters the grid to compete in the 2010 Columbus Soap Box Derby. With enthusiasm and a smile that can’t be beat, Team Asphalt driver Damaris Markley takes her place on the Derby Hill grid. Below her ASPHALT RACER lies more than 900 feet of smooth asphalt pavement just waiting to see who will champion it and advance to Derby Downs in Akron.

Across the world, children ages 8 to 17 are testing their metal and living out the dream of competing for an opportunity to race at Akron’s famed Derby Downs. Team Asphalt had that opportunity in July 2009, when driver Elias Markley won the Columbus Soap Box Derby and advanced to Akron where he finished 17th in the world for his class. This year would be little sis Damaris’ shot at being first down Derby Hill. Located in Big Metro Park, the Columbus Soap Box Derby’s Derby Hill measures 954 of pure asphalt excitement.

Dubbed “The Greatest Amateur Racing Event of the World,” the Soap Box Derby has been held since 1934. Though synonymous with Akron, the Soap Box Derby actually started in Dayton. It was christened back in 1933, when a Dayton Daily News photographer encountered three boys racing homemade, engineless cars down an inclined brick street. The first All-American race was held in Dayton in 1934, and the following year the race was moved to Akron because of its central location and hilly terrain.1
In addition to the thousands of youth who have competed in the Derby, such celebrities as Air Force ace Capt. Eddie Rickenbacker, General Jimmy Doolittle, actor Jimmy Stewart, former heavyweight boxing champion Jack Dempsey and President Ronald Reagan have also experienced the thrill of speeding down Derby Downs.¹

Each year since, with the exception of World War II, youngsters from throughout the United States and several foreign countries have come to Akron with the racers they have built and driven to victory in their home communities. And over the many years, thousands of dollars in scholarships have been taken home by contestants to further their opportunity in life.¹

The goals of the Soap Box Derby program have not changed since it began in 1934. They are to teach youngsters some of the basic skills of workmanship, the spirit of competition and the perseverance to continue a project once it has begun.

Competing in the big event in Akron starts out on the local level with children who dream the dream of winning the Derby. Children ages 8 to 17 compete in various classes — Stock, Super Stock and Masters. A fourth division, “Special Kids,” is for children having physical or mental disabilities. Soap Box Derby races are held in cities all around the nation and in some foreign countries. The winners of the events all converge on a July day in Akron for a race down Derby Downs.

**A Valiant Effort by Team Asphalt**

One such local event is the Columbus Soap Box Derby. On this day in June the largest gathering of children ever for a Columbus Derby competed for a chance to go to Akron. In all, 47 contestants would vie for championships in three classes; the most competitive being the one in which Team Asphalt would participate — 28 racers. Team Asphalt would be comprised of driver Damaris, brothers and crew hands Jedidiah, Isaiah, Elias and Lloyd — who doubles as dad.

Team Asphalt would not clock the fastest time this day but would bring home from the first of Damaris’ Columbus Soap Box events a very respectable 4th place. A trophy standing almost as high as Damaris is tall speaks to her meritorious effort.

Donning their ASPHALT caps, Damaris, fans and friends celebrate a well-earned trophy. Thanks to our friends at the Asphalt Pavement Association of Iowa (APAI) for the caps.

Just like you would expect from anyone associated with asphalt, Damaris is making plans for even greater accomplishments, setting her sights for Derby Downs in 2011. Flexible Pavements cheers on Damaris and Team Asphalt as they race the ASPHALT RACER to future victories on the fastest pavement on Earth . . . ASPHALT!

Footnote: ¹ All-American Soap Box Derby
Mark Your Calendars

Mark your 2011 calendars for these conferences, meetings and expositions. Visit http://www.flexiblepavements.org/events.cfm for further details and to register.

Ohio Asphalt Paving Conference
February 2-3, 2011, Columbus

The 2011 Ohio Asphalt Paving Conference (OAPC) is scheduled for February 2-3, in Columbus at the Fawcett Center located on the campus of The Ohio State University. This conference will be held in conjunction with the Annual Hot Mix Asphalt Technical Conference of the North Central Asphalt User Producer Group (NCAUPG). Additional conference updates will be provided as information becomes available. For additional information regarding NCAUPG, visit the group’s website at http://cobweb.ecn.purdue.edu/~spave/NCAUPG/.

FPO Annual Meeting & Equipment Exposition
March 8-9, 2011, Columbus

FPO’s 2011 Annual Meeting & Equipment Exposition is scheduled for March 8-9, at the Polaris Hilton Hotel in Columbus. A block of rooms has been reserved at the Hilton Hotel Polaris for March 6-9 at special conference rates. For additional information, visit FPO’s website at www.flexiblepavements.org or visit us on Facebook.

Obituary

James F. Graham, chairman of the board for Shelly & Sands Inc., passed away Aug. 10, 2010. Graham, 80, served as chairman of several other family businesses and was senior partner in the Graham & Graham Law Firm in Zanesville.

Memorial contributions on behalf of Graham can be made to the Muskingum County Community Foundation, 534 Putnam Ave., Zanesville, OH 43701.

Flexible Pavements of Ohio staff and members extend their sympathy to the Graham family and friends.

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