Vegetation is often the BMP best suited for curbing erosion; however, not every site contains the best soil, which is crucial for quick seed germination and plant growth. Choosing the right seed can often solve such problems. Plants that tolerate salt are perfect for marshes that take ocean backflows, and drought-tolerant species work well for arid climates or spaces that won’t get frequent watering. Amending the soil can also give plants a competitive edge. Large-scale amending isn’t always possible—but some ingenious professionals have discovered that waste items can be repurposed as great fertilizers.

Sprouting BMP’s

by Janis Keating, contributor to Erosion Control

At the annual TERRA Pave- ment Conference on February 5, Ervin Dukatz, vice president of materials and research at Mathy Construction Co., discussed less commonly cited causes of pavement rutting, raveling, and cracking. He began with a word of caution: “None of the solutions
Letter from the NH LTAP Program Manager

Even though summer is finally in full swing here in New England, the NH LTAP at the Technology Transfer Center has been hard at work planning the fall training course schedule. In just a few short months, our students can expect a season packed full of new courses, as well as the core technical classes! In order to meet the needs of our local audience, the NH LTAP is excited to be offering “Grant Writing for Public Works” and “I’m the Boss...Now What??” These classes will serve as supervisory Roads Scholar credit, and were added to help support the management needs of Public Works Departments. Please take some time to visit our training calendar online for the most up-to-date schedule of courses at www.t2.unh.edu/training-calender. And, if you have any ideas for new classes, or would like to see a workshop offered in your area, please do not hesitate to contact the Center!

Looking back on events held this past spring, the NH Safety Countermeasures Peer-Exchange was one of our most successful. This meeting served as a collaboration between the Technology Transfer Center, NH DOT, and FHWA, each of whom brought great information to the table. Topics discussed were Retroreflective Back Plates for Traffic Signal Heads, Pedestrian Hybrid Beacons, Enhanced Delineation for Curves, and High Friction Surface Treatments. Events like the Peer-Exchange serve as a platform for communicating new information, and aim to help improve the safety of our local infrastructure.

T² is also excited to bring some brand new events to the Center, such as a “Build a Better Mousetrap” competition. This competition, which will make its debut in 2015, is intended to get those creative juices flowing! Have you or any of your fellow crew members recently built an innovative gadget or developed an improved way to do a job? It can be anything from the development of tools, equipment modifications, and/or processes that increase safety, reduce cost, improve efficiency, or improve the quality of transportation. More details about the competition will be announced in the fall, so hold on to those great ideas!

Enjoy the rest of these beautiful summer days, and we’ll see you in the fall!

Sincerely,
Beth Hamilton
NH LTAP Program Manager
Technology Transfer Center
Seasonal Safety Tips

by Alanna Gerton, Technology Transfer Center

As the summer sun slowly but surely finds its way back to New England, we tend to spend much more time out of doors, relishing these precious three months of beautiful weather. As the days grow longer, though, it is important to keep in mind that there are certain dangers associated with excessive sun exposure. From a day at the beach to strenuous physical labor, it’s important to be aware of your body’s reaction to the summer heat. Here are some helpful tips to spot the signs and treat the symptoms of heat-related illnesses!

### HOW TO SPOT HEAT-RELATED ILLNESSES

<table>
<thead>
<tr>
<th>Heat Disorder</th>
<th>Symptoms</th>
<th>What to Do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunburn</td>
<td>Skin redness and pain, possible swelling, blisters, fever, headaches.</td>
<td>Take a shower, using soap, to remove oils that may block pores preventing the body from cooling naturally. If blisters occur, apply dry, sterile dressings and get medical attention.</td>
</tr>
<tr>
<td>Heat Cramps</td>
<td>Painful spasms usually in leg and abdominal muscles. Heavy sweating.</td>
<td>Firm pressure on cramping muscles or gentle massage to relieve spasm. Sip water, but stop if nausea occurs.</td>
</tr>
<tr>
<td>Heat Exhaustion</td>
<td>Heavy sweating, weakness, skin cold, pale and clammy. Weak pulse. Normal temperature possible. Paining, vomiting.</td>
<td>Get victim to lie down in a cool place. Loosen clothing. Apply cool, wet cloths. Fan or move victim to air-conditioned place. Sip water, but stop if nausea occurs. Seek immediate medical attention if vomiting occurs.</td>
</tr>
<tr>
<td>Heat Stroke (Sun Stroke)</td>
<td>High body temperature (106+). Hot, dry skin. Rapid, strong pulse. Possible unconsciousness. Victim will likely not sweat.</td>
<td>Call 911 to get the victim to a hospital immediately. Move victim to a cooler environment; try a cool bath or sponging to reduce body temperature. Use extreme caution. Remove clothing. Use fans and/or air conditioners. <strong>DO NOT GIVE FLUIDS.</strong></td>
</tr>
</tbody>
</table>

### KEEPING HIGHWAY CREWS SAFE

1. Create a temporary shelter
2. Avoid the greatest sun intensity between 10 am and 4 pm by reorganizing the day’s tasks
3. Wear sunglasses/safety glasses that filter out UV rays
4. Try and use water-resistant sunscreen (SPF 15 or higher!)
5. UV radiation bounces off water, sand, concrete, etc. Be mindful of your surroundings, and take extra care when working around these surfaces.

### SPENDING A DAY IN THE SUN

<table>
<thead>
<tr>
<th>Driving</th>
<th>Be aware that vehicles can reach temperatures of 140-190 degrees within 30 minutes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydration</td>
<td>Drink plenty of water and natural juices. Even if you don’t think you’re thirsty, your body loses water due to perspiration faster than it absorbs fluids.</td>
</tr>
<tr>
<td>Pets</td>
<td>Caffeinated and alcoholic beverages should be avoided. These types of drinks cause the blood vessels near the skin to constrict, inhibiting the amount of heat the body can release. Your pets ‘feel’ as hot as you do! This is especially true for dogs, as they don’t sweat. If you wouldn’t want to be out in the sun, your pet probably wouldn’t want to either!</td>
</tr>
</tbody>
</table>

The contents of this article were gathered from the following web sources:

- [http://www.srh.noaa.gov/oun/?n=safety-summer-summersafety](http://www.srh.noaa.gov/oun/?n=safety-summer-summersafety)
- [http://www.nsc.org/safety_home/SafetyObservances/Pages/SummerSafety.aspx](http://www.nsc.org/safety_home/SafetyObservances/Pages/SummerSafety.aspx)
New Hampshire Roads Scholars

The first achievement level is Roads Scholar Level I. To achieve Level I, participants must complete 25 hours of training. Roads Scholar Level II requires 50 hours total, including 25 hours in technical training, 5 hours of supervisory training, 5 hours of tort/liability or safety, and 5 hours dedicated to environmental training. The third achievement level of the program is becoming a Senior Roads Scholar. Senior Roads Scholars have completed 75 hours of training including the requirements for Roads Scholar Level II. Master Roads Scholar is the fourth and highest achieving level of the UNH T² Center Roads Scholar Training Program. To be a Master Roads Scholar, the participant must have completed 100 training hours, including the requirements for Roads Scholar Level II. We congratulate all those who have reached new achievement levels and encourage further training in the future.

Have a question about what level you have achieved or what workshops you have taken? Contact Beth Hamilton at 603-862-1362 or e-mail i2.center@unh.edu to request information regarding your Roads Scholar transcript.

Roads Scholar I

25 training hours in the Roads Scholar Program

Frank Linnenbringer, NHDOT
Mark Beal, Richmond
Gregory Blecharczyk, Merrimack
Matthew Clark, NHDOT
Thomas Cummings, Deering
Joe Feole, Salem
Jon Graichen, Salem
William Lowney, Hampton
James Nave, Moultonborough
Sumner Scott, Farmington
Douglas Urquhart, Hooksett
Andrew Wolanek, Moultonborough

Brian Barney, NHDOT
Robert McCabe, Hopkinton
Ernest Morgan, Farmington
Mark Nelson, Bow
Charles Nichols, Keene
Brian Piroso, Bow
Alan Purrington, Keene
Craig Richardson, NHDOT
Scott Riley, Ossipee
Leo Rondeau, NHDOT
Corey St. Cyr, NHDOT
James Stewart, NHDOT
Scott Walker, NHDOT
Duane Young, NHDOT

Roads Scholar II

50 training hours and Roads Scholar II requirements

Jason Aldrich, NHDOT
Robert Aldridge, Ossipee
Robert Glover, NHDOT
Terry Gordon, New Boston
Chad Jaquith, Concord
Jennifer Perry, Exeter
Jason Rucker, Exeter

William Eldridge, Ossipee
Wallace Daigneau, Moultonborough
William Dow, Moultonborough
Paul Goundrey, Dartmouth Hitchcock
Shawn Littlefield, Dartmouth Hitchcock
Peter Neary, Derry
James Plunkett, Chichester
Mark Schultz, Exeter
Robert Scott, Canaan
Tim Shackford, Conway

Senior Roads Scholar

75 training hours and Roads Scholar II requirements

Mark Beal, Richmond
Gregory Blecharczyk, Merrimack
Matthew Clark, NHDOT
Thomas Cummings, Deering
Joe Feole, Salem
Jon Graichen, Salem
William Lowney, Hampton
James Nave, Moultonborough
Sumner Scott, Farmington
Douglas Urquhart, Hooksett
Andrew Wolanek, Moultonborough

Jason Aldrich, NHDOT
Robert Aldridge, Ossipee
Robert Glover, NHDOT
Terry Gordon, New Boston
Chad Jaquith, Concord
Jennifer Perry, Exeter
Jason Rucker, Exeter

Have a question about what level you have achieved or what workshops you have taken? Contact Beth Hamilton at 603-862-1362 or e-mail i2.center@unh.edu to request information regarding your Roads Scholar transcript.
This past June, we celebrated the graduation of our newest Master Roads Scholars. As of June 2014, we have had 11 new people achieve Master Roads Scholar. To all of you, congratulations! Your dedication to your job, continuing education, and our program is appreciated by the citizens driving on our roads, our staff, and the people of your community.

The Technology Transfer Center has already released a Roads Scholar Directory in early 2014 to highlight all of our Roads Scholars level of achievement. We’ve had more than 70 people achieve new levels in our program in 2014. We are proud of all our students’ achievements and hope to see even more in the future!

If you have a question about what level you are at, what the levels are or what is printed on your transcript, please do not hesitate to call Amy Begnoche at the office at 603-862-2826.
Sprouting BMP’s

continued from page 1

TESTING FOR MULCH-BETTER SUCCESS

Xcel Energy’s Hayden Station, a 450-megawatt electrical generating unit in Hayden, CO, creates ash while burning coal, so the facility also contains an ash landfill. In early 2013, the landfill needed some “landscape,” as some of the hills around the area were causing problems for the firm’s trucks. “We perform vertical expansion—large dirt berms are created at the outside of the landfill, and we fill the interior with ash,” explains environmental analyst Mark Stewart. “We had line-of-sight issues for our trucking company using the landfill; we needed to take out the hillsides.”

A local contractor, Resource Logic LLC, contoured the hills in question and then needed to protect the slopes from erosion. “We replaced the site’s marginal topsoil and prepared to seed and mulch,” Stewart says. “But first, we were approached by Organic Earth Industries about trying its Earth Essence Beta HGM2 fiber mulch. To give it a good test, Resource Logic put traditional mulch and the OEI product side by side.” The test project began in May 2013. Both plots were hydroseeded with upland seed mix from Arkansas Valley Seed.

Each material in OEI’s product was agronomically engineered to meet the immediate demands of a severely impacted area. Earth Essence Beta HGM2 was specifically selected because of its seven different organic fibers, a special blend of growth mediums, and specially formulated soil chemistry materials to improve erosion control, soil development, and immediate plant establishment while improving long-term plant and soil sustainability. Beta provided exceptional vegetation establishment shortly after snowmelt from the 2:5:1 slope with a silt-type soil, as compared to the hydraulic growth medium and wood fiber mulch that was applied. Despite being applied at a lighter application rate (2,500 pounds per acre), Beta provided very effective erosion control. For comparison, the wood fiber mulch was applied at 3,000 pounds per acre, and the hydraulic growth medium was applied at 3,500 pounds per acre.

This Colorado area not only contains marginal, clay-filled soils but also receives little summer moisture. “We usually have to add some moisture to get things to grow. We release our stormwater onto that area,” Stewart says. “However, it wasn’t long before the OEI portion of the hillsides was showing growth. OEI is a little more expensive than traditional mulches, but if I don’t need respraying, as is sometimes necessary with other products, it might be worth it. Plus they’re great guys to work with. Of course, when we see what survived over the winter and returns this spring, that will determine a full success.”

TURNING SLUDGE INTO “BLACK GOLD”?

In addition to managing trash and its daily cover, a landfill operation also has to manage the soil on its site, whether that soil is the final landfill cover, berms that divide cells, or interior access roads. As with most erosion control projects, dealing with bare soils usually involves seeding; however, as landfills are rarely placed in areas with healthy, vibrant soils, getting seeds to sprout and grow can be problematic. In Rougemont, NC, Republic Services’ Upper Piedmont Landfill is investigating whether a landfill ingredient will encourage plant growth.

Upper Piedmont Landfill receives sewer sludge from a local wastewater treatment plant. Traditionally, this material was simply buried in the landfill in its own specific section. But the question was raised: Since the material was nutrient-rich, could it be used as fertilizer for growing soil cover? There was a precedent; sludge had been used on non-food crops for agriculture, and the Milwaukee Metropolitan Sewer District had marketed its Milorganite fertilizer for quite some time.

Landfill/division manager Greg Duhon has the experience to direct this pilot program. “I used to work for a company that managed biosolids from sewer
sludge. There’s a viable business in using sludge. That company would measure nutrients—mostly nitrogen, phosphorus, and potassium—and micronutrients in sludge, so one knows what’s being applied. Then it was applied at agronomic rates on non-food farm fields, such as soybeans grown to create plastics or feed grown for animals.

His former employer applied biosolids that were processed to a Class B standard. “That means the pathogens and organic compounds had been reduced to meet regulatory standards. Biosolids processed to a Class A standard can be used anywhere, even on food crop lands.” These contaminats had already been eliminated by a wastewater treatment plant. “There are strict guidelines on how many metals can be in the wastewater,” he says. “For example, considering the zinc PPM [parts per million] limits—many multivitamins, if thrown on the ground, would not meet standards.”

Upper Piedmont Landfill’s sludge is trucked in from a local wastewater treatment plant. “What it produces doesn’t meet standards, so its sludge goes to a landfill. For me to accept it, any leachate material is pumped out and sent to a water treatment plant. Then at the landfill, biosolids are kept within a controlled area.” However, because merely burying this material takes up valuable landfill space, a new solution was sought.

“Using sludge for a soil amendment is a better method for handling biosolids than putting it in a landfill,” Duhon says. “For one thing, dewatered biosolids go through polymerization, which makes them more permanent in a landfill. By spreading the biosolids over soil to be reclaimed, the radiant heat, winds, and so on dry things out, which reduces contaminants. In this method, there’s eventual uptake of material, which makes it much better than putting it in the landfill, where it would remain for a really long time.

“This is not only allowed, but also actually sort of encouraged by the way the regulations are written in North Carolina,” he continues. “Regulations allow biosolids to be placed on the landfill for soil amendment up to 6 inches thick—but that’s not a viable process, especially if you’re using a bulldozer. Sludge cracks and just sits there. I’m putting sludge down less than an inch thick, and eventually I will be adding to that, but never to 6 inches thick. However, plants will grow right up through it, even at 6 inches.”

Sludge is used where crews are planting grass and legumes to stabilize slopes, as well as on areas of closed landfill. “We want to eliminate erosion,” Duhon says. “We’re growing fescue, clover, and brown top millet, which has a good root system—they’re quick-growing plants. We don’t plant shrubs and trees, as their roots cause problems with our piping systems. The advantages of grass are twofold; first, roots hold the soil. Second, if the grass has height, its blades disperse the kinetic impact of raindrops, which helps slow erosion. This grass is mowed several times a year; we allow it to grow to the 4-to-6-inch range. We also receive a lot of ‘volunteer’ growth. Anything that’s green and doesn’t have a woody bark to it, we let it be.”

When choosing a seed mix for the project, Duhon worked with Pennington Seed of Madison, GA. “I told them what I was looking for; that’s why we have a mixture of seeds. Some seeds are for rapid cover, others are for the next season. We rarely put in single seeds, although there’s a good percentage of a perennial rye strain in there. We considered the application—repeatedly taking the soil off and adding more waste? Might as well use cheaper seeds.”

Thus far, this first-of-its-kind project, which began in late 2013, is working well. “In mid-December, we still had grass that was very green. That was probably some winter rye from the last seeding, around November first.”

Crucial to the project’s success: using the right tools. “This isn’t a job for a bulldozer. Sludge is applied by using agricultural equipment—a manure spreader. A farm tractor pulls the spreader, which has been loaded by a backhoe. Broadcast seeding follows. Portions of the area were hydroseeded. We only spread sludge when we’re not expecting rainfall, as drying adds to the desiccation and also kills fecal coliform.

“Plus, this process follows the sequence of how a landfill is filled. When you’re moving to an adjacent area, you must seed the former area. Landfills are constantly seeded and scraped off. You can’t allow the soil or the sludge to lie fallow; you’ll have items leaching through down to the liner.”

Sludge has an advantage over commercial fertilizer. “Commercial nitrogen is inorganic, which leaches through the soil. Sludge’s organic nitrogen mineralizes in the soil, stays there longer, and also improves the soil’s tilth. The sludge works. We saw significant improvement in growth.”

Duhon is optimistic that when Republic Services sees the project’s results this spring, the program will continue. “As everyone has to deal with biosolids,
other Republic facilities, as well as municipal landfills, are interested in doing the same thing. We meet at seminars and they hear about it; then they want to come out and see this in operation. Municipalities are usually owners of wastewater treatment plants, so they’re very interested.”

**Saving Soil Around the Whole Dam Thing**

In Franklin, VA, the Blackwater River runs next to a paper plant’s aeration ponds. To protect the river, a dam had been built; however, over the years, erosion began eating away at it. Jasen Norge, who co-owns Chesapeake, VA’s Norge Landworks with his wife Frances, was called in between July and October 2013 to fix the problem. “The slopes were rebuilt by Higgerson & Buchanan Inc., then we stabilized the slopes,” he says. “The dam is more like a big berm, a mound that runs about 8,500 feet.”

Norge explains the project: “Before the clearing, we first put in the outboard silt fence to protect the river from sediment. This was a big ordeal for the first 8,500 feet. It took 13 days to put silt fences into the swampy wooded area. We usually can do 3,000 feet a day, but there we could only install 600 feet a day.”

Frances Norge chuckles at her husband’s understatement. “This job was a mess; he was literally knee-deep in the swamp. All of our men wore waders, and they found several snakes. For the first 8,000 linear feet of silt fence, we had to put mats down to get in a mini-excavator to bring in materials. As the crew moved forward, they’d pick up the mats and put them in front of the machine—the ground was just that unstable. This wasn’t just wet land, it was an actual swamp.”

Jasen Norge goes on: “After the slopes were rebuilt, we prepped the bottom for seed and installed another line of silt fence at the slope toe, which was approximately 30 feet from the first run of silt fence, in the swamp. Once we installed the silt fence at the toe, we hydroseeded between the two silt fence lines. We did this process in 1,000-linear-foot increments, then we’d fall back and apply Flexterra to the slope, along with seed, fertilizer, and lime, to complete the stabilization before moving on.”

Pennington Seed’s SlopeMaster Warm Season mixture was applied at a rate of 100 pounds per acre, with an additional 50 pounds of Landscaper’s Choice (80% tall fescue and 20% annual ryegrass) due to the late summer seeding. Because a pre-plant soil test indicated that there was less than 0.5% organic matter in the sandy soil, 80 pounds of Bio Prime and 2.5 gallons of Jump Start were also incorporated. Pennington ProCare 25-5-15 fertilizer, with 100% UMaxx stabilized nitrogen, was added, which provided up to 16 weeks of nutrient release—more than enough time to feed establishing vegetation.

“SlopeMaster blend has a Bermuda grass base, and it includes weeping love, which is low maintenance and good for mining sites or other bad soil sites,” Norge says. “We used about 6 acres of Flexterra over the
UNH Technology Transfer Center Road Business

slope, and there were 8 acres between the silt fences, so we used about 14 acres of seeds in total. We placed regular mulch along the bottom.”

A temperate climate, near a river—water shouldn’t have been a problem, right? “At the beginning, the seeds had moisture. But it seems like the minute you open a bag of seed it stops raining,” Norge chuckles ruefully. “But at the end of the period we got some moisture.” He was thankful he had used Pennington Seed.

“We use it all the time—maybe eight years now. For this project, we used 100 pounds per acre of warm-season SlopeMaster, which has five or six different seeds in itself, then another 100 pounds per acre of 80% tall fescue and 20% rye grass. Lovegrass went in at 15 to 20 pounds per acre; it’s a warm-season, drought tolerant plant, which doesn’t care about pH in the soil, it’s not picky. It doesn’t require very fertile soil and loves sand, which were the soil conditions.”

Frances Norge adds, “We’ve been in business for 10 years, but my husband has more than 15 years of experience. We have fewer than five employees—only three of us are full time. We are woman owned, SWAM certified, DMBE certified, HazMat certified. And now we’re also ‘swamp-certified,’” she laughs.

Seed for Restoring Wetlands

North of San Diego, CA, near the Del Mar Fairgrounds, I-5 crosses the 460-acre San Dieguito Wetlands. A recent $90 million project expanded and restored this area, which has become a boon for wildlife; ocean fish migrate in to use deeper water as hatcheries, and the salt marsh vegetation provides nesting sites for endangered birds. Migrating birds that travel the Pacific Flyway also find San Dieguito a comfortable resting place.

During certain periods between 2010 and 2013, Hydrosprout Inc. of Escondido, CA, seeded 100 acres of the wetlands. “The general contractor, Marathon Construction Corp., did the grading, building berms around the wetland areas,” says Hydrosprout operations manager Mark Webster. “When they were finished with a section, we’d follow up by hydroseeding. Although there’s water onsite, most of the time we applied seed and hydromulch in the fall and winter months to take advantage of the rains.”

The hydroseeding mix included Profile Products’ Terramatrix SFM and a wetlands seed mix from S&S Seeds of Carpinteria, CA. “The project designers came up with the specs for the mix,” Webster explains. “Seeds had to be collected within a 25-mile radius of the project. S&S came up with the mix we needed, which we applied at 22.85 PLS pounds to the acre.”

The wetland mix included four species of saltbush (Atriplex lentiformis lentiformis, Atriplex lentiformis, Artemisia californica, Atriplex canescens); a native primrose (Camissonia cheiranthifolia); Menzies’ goldenbush, from the daisy family (Isocoma mensiesii); an evening primrose (Oenothera elata); desert broom (Baccharis sarothroides); California plantain (Plantago erecta); California buckwheat (Eriogonum fasciculatum); black sage (Salvia mellifera); coyote brush (Baccharis pilularis); heliotrope (Heliotropium curassavicum); deer weed (Lotus scoparius ssp. scoparius); and Cuman ragweed (Ambrosia psilostachya).

Hydrosprout’s work progressed with very few hitchcs. “A couple times during winter rains, the area got a little muddy, so we’d wait. They had water onsite for us to use with the mix, so we didn’t have to truck any in. Everything we did was truck accessible,” Webster says. “In some dredge areas, we had access up to a point, then we had to attach up to 500 feet of hose to spray the area. We had a small problem when working around the I-5 freeway. We had to go under the bridge, and our 3,000-gallon Bowie seeder wouldn’t fit. We had to bring in a 1,500-gallon hydrosooting machine to work that area.”

Few re-dos were necessary. “There were some areas that might not have grown as well, so we did some touchups, and in places that were regraded we had to hydroseed again,” he says. Hydrosprout, which performs jobs of all sorts, from residential to public works and Caltrans projects, has been in business since 1988, and “we’ve used S&S Seeds all that time,” Webster says.

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What Makes Pavements Fail

continued from page 1

I’m going to cover will prevent trouble if the pavement foundation is weak.”

Rutting

Dukatz said incorrect gradation is an important cause of rutting. “Usually we use the 0.45-power graph with the maximum density line plotted to show the mix gradation—but that’s not the only way to characterize gradation,” he added. As alternatives, he showed Individual Percent Retained graphs (Figs. 1 and 2) and said they represent stable gradations.

If you need more air voids in a coarse-graded mix, you remove fine aggregate—whereas in a fine-graded mix, you add fine aggregate to increase air voids, he commented. These are steps that move the gradation curve further away from the maximum density line on the 0.45 gradation graph.

Dukatz said what won’t work is a double-humped gradation (Fig. 3).

The high proportion of sand-sized particles (No. 30 – No. 50) tends to lubricate the mix so it ruts.

How the rock is processed to make sand will affect the amount of angularity in the finished product. More angular is more rut resistant, he explained. The type of crushing can create either angular or rounded particle shapes. A single pass through the crusher results in angular sand good for asphalt mixes, while multiple passes create rounded sand particles useful for workability in PCC. If the gradation has a double hump, the second hump in the sand sizes will tend to make the mix tender and rut-susceptible. In that case, the mix tenderness occurs regardless of particle shape. So, 100% crushed will not solve tenderness/rutting if the mix has a gradation with a double hump.

Dukatz stated rules of thumb for the relationship between changes in gradation and changes in air voids:

- 1% change in minus 200 = 1% change in air voids
voids
  • 3% change in minus 8 = 1% change in air voids
  • 5% change in minus 1/2 inch = 1% change in air voids

**Quality Control Issues at the Quarry**

Dukatz said poor quality control of aggregate stockpiles is another common cause of volumetric problems that can lead to low air voids and rutting. “You need to manage the aggregate piles so you get uniform feed into the plant. Unexpected changes in gradation due to mixed stockpiles result in unexpected mix volumetric changes. In turn, these changes then result in mix problems such as low air voids and rutting or high air voids and raveling.”

He said absorption of asphalt by aggregate is another problem that, if not managed, can lead to pavement problems such as rutting. He showed a comparison of two cores with the same aggregate. One made as WMA had little visible absorption of asphalt into the particles. But the other made as HMA showed considerable absorption of asphalt into the particles. “This changes the amount of effective asphalt in the mix,” said Dukatz, “which is the asphalt holding the aggregate together. So, depending on how hot the mix was produced and tested, the same mix could have high, low, or the correct air void content.” He added that the amount of asphalt absorption also depends on the source of the aggregate.

**Too Much or Too Little Moisture in the Aggregate**

Dukatz discussed how inadequate moisture control in the mix can lead to rutting. “Plants weigh the aggregate as it goes into the mix. But if you don’t account for the aggregate moisture, the plant controls will add enough asphalt for equivalent weight of dry aggregate and you end up with too much asphalt in the mix. If the plant is run too fast and hot, it removes moisture from the surface of the aggregate but doesn’t get the moisture out from the interior of the aggregate. Then in the field, that moisture will make its way to the surface, leading to bleeding.”

**Raveling**

Raveling can result from some of the same problems Dukatz had discussed with regard to rutting: incorrect mix design and production issues. On the latter topic, he commented on how segregation can occur in stockpiles and other places: “You might have good aggregate storage bins with big concrete dividers to prevent stockpile mixing, but you still have to contend with gravity. Any time you make a pile of materials with different particle sizes, the particles with the most mass are going to roll the farthest. The result is segregation in the stockpile, the paver, or the road.”

**Cracking**

With regard to cracking, Dukatz focused on improper paver operation. He said it’s important to avoid segregation in the hopper: “You need to maintain a consistent head of material in the paver hopper all day as well as consistent mix temperature and a consistent paving speed. It’s also important to maintain proper adjustment of the flow gates, auger load, and auger height to prevent thermal segregation.”

Then he discussed problems with RAP and RAS. He showed research illustrating considerable variability in the high and low true temperature grades of RAP and RAS samples taken from different regions of Wisconsin. He summarized studies conducted on the aging characteristics of binders that include RAS. “They found that it’s important to watch the RAS/RAP ratio and the mix results after aging. An unaged mix made with PG 52-34 asphalt, 5.4% RAS, and 5% rejuvenating oil tested the best of several samples in the Texas Overlay tester for cracking resistance. But the same mix with the rejuvenator, after five days of aging, performed as poorly as any of the other RAS combinations tested. All the RAS combination mixes produced poorer results—fewer cycles to failure—than the aged and unaged virgin mixes and the mixes made with RAP. They also tested cores taken from I-94 for shear modulus. Samples with a higher proportion of RAS to RAP tested significantly stiffer than the samples with a lower proportion. Correspondingly, the pavement with the higher percentage of RAS exhibited significantly more cracking than the sections with lower percentages.”

Reprinted with permission from the Minnesota LTAP Technology Exchange Spring 2014.
As I travel the country teaching leadership and management skills, I am often asked if I teach a course on business ethics. My reply is always, “There is no such thing as business ethics.” As you can imagine this always produces that same incredulous response, “What?” So I repeat myself explaining that there is no such thing as business ethics, there is only ethics. People try to use one set of ethics for their professional life, another set for their spiritual life, and still another set for their family life. That kind of multiplicity will only get you into trouble. Aside from the personal confusion, educators, philosophers, theologians, and lawyers have taken what is really a very simple matter and made it very confusing. Living an ethical life may not always be easy, but it need not be complicated. Ethics is ethics! It can’t be that confusing, can it? After all, what’s right is right and what’s wrong is wrong. But that is not what our life’s heroes are showing us. Our sports heroes are using performance-enhancing drugs and lying about it under oath. Our business leaders are making billions of dollars by cheating investors. Our corporations are hiding money offshore so they don’t have to pay taxes on their profits. Our politicians are taking bribes and profiting from selling their votes. In the meantime we are teaching our children that everyone gets a trophy, that honest competition damages our self esteem, and that the nucleus family doesn’t matter as long as we each have our own flat screen in our rooms. How is that confusing? Our collective disgust is now turning to discussion. People want to know: Why is ethics in such a terrible state? Although there are many possibilities as to why our culture is in such a terrible state, I believe there are three basic reasons why people make unethical choices: We do what is most convenient. If we define an ethical dilemma as an undesirable or unpleasant choice to a moral principle or practice, do we do the easy thing or the right thing? We do what we think we must to win. If most people are like me, we hate losing. Our culture drives us to achievement and success. Many of us think we have to choose between being ethical or winning. I believe that few people set out to be unethical but nobody wants to lose. Is that really our only choice? I don’t think so. We rationalize our choices with relativism. Many people choose to deal with such no-win situations by deciding what is right in that moment. It’s called situational ethics, a theory made popular in the 1960s by Dr. Joseph Fletcher. The result has been the ethical chaos that we live with today. As illogical and immoral as this theory is, it is pervasive in our society today. So where are you on the ethics scale? Let’s look at a study done by William Boetcker. Consider the five following statements. Pause and reflect which one applies to you. Then put a check mark next to the statement that best describes you.

- I am always ethical.
- I am mostly ethical.
- I am somewhat ethical.
- I am seldom ethical.
- I am never ethical.

Now that you have given that some thought, here is what Boetcker’s study found as to how people look at ethics: The majority of people place themselves in the top two categories.

**Most of us try to be ethical**

Most people who put themselves in the second category do so because of personal convenience. Practicing discipline is inconvenient. Losing is inconvenient. Paying a high price for success is inconvenient. One rule can move people from “mostly ethical” to “always ethical.” It is based on the Golden Rule that we all learned in kindergarten: “To play nice in the sandbox, always treat people the way you would like to be treated.” Did you scoff? Is this just too simplistic? John C. Maxwell said, “There are only two important points when it comes to ethics. The first is a standard to follow. The second is the will to follow it.” Asking the question, “How would I like to be treated in this
situation?” is an integrity guideline for any situation. So, why should we adopt the Golden Rule? Here are four simple but powerful reasons: The Golden Rule is known and accepted by most people. How do you justify demanding better treatment from others than you are willing to give? The Golden Rule can be used to create common ground with any reasonable person. The Golden Rule is easy to understand. People often have a hard time coming to grips with this issue because it seems so complex and intangible. There are no complicated rules or loopholes here. Most people can come to a reasonable understanding of what to do. The Golden Rule is a win-win philosophy. When you live by the Golden Rule, everybody wins. If I treat you as well as I would like to be treated, you win. If you treat me likewise, I win. Where is the loser in that? The Golden Rule is a compass when you need direction. The Golden Rule does more than just give people wins. It also has an internal value for anyone who practices it. Ted Koppel said, “There’s harmony and inner peace to be found in following an amoral compass that points in the same direction regardless of fashion or trend.”

Who can’t use a little inner peace in their life?

About the Author

Don Bruey can be reached at DbrueyA4@gmail.com. He is the president of NorthStar Group located in Ogden, Utah, and he is a member of the APWA Small Cities/Rural Communities Committee.

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9th Annual Ken Ward Memorial Plow Rally

Save the Date!

Date: September 17th, 2014
Time: 7:30 am—1:30 pm
Location: Hillsborough County 4-H Youth Center in New Boston, NH
More information to come regarding registration for the event!

Register as a competitor or general attendee at:
http://t2.unh.edu/9th-annual-ken-ward-memorial-plow-rally
New Hampshire Public Works Mutual Aid

With record storms, flooding, and most recently Hurricane Irene and the October Noreaster, the need for mutual aid is ever increasing. In times of crisis, a mutual aid agreement allows neighboring communities to provide assistance in the form of labor and equipment to help each other through the disaster. Mutual aid is a FEMA-approved contract and will make the assisting municipality eligible for federal reimbursement.

Mutual Aid is available for only $25 per year and the benefits are innumerable. For more information, visit the T² website at www.t2.unh.edu/ma or contact Beth Hamilton at 603-862-1362.

Minimum Retroreflectivity Compliance Kit

The Technology Transfer Center is now offering one Avery Dennison Minimum Retroreflectivity Compliance Kit on loan for New Hampshire Public Works Departments.

There is no fee for the equipment loan, and municipalities may keep the retroreflectometer for up to four weeks (additional time may be requested).

For more information
www.t2.unh.edu/avery-dennison-minimum-retroreflectivity-compliance-kit
t2.center@unh.edu

Dates

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<tr>
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<td>7/25</td>
<td>Good Roads Show</td>
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<td>8/17-20</td>
<td>APWA International Congress</td>
<td>Toronto, Canada</td>
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<td>9th Annual Ken Ward Memorial Plow Rally</td>
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<td>9/17-18</td>
<td>New England Public Works Expo</td>
<td>Boxboro, MA</td>
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<tr>
<td>9/18-19</td>
<td>5th Annual Construction Career Days</td>
<td>New Boston, NH</td>
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Employment Opportunities

Please see the NH Municipal Association’s website for recent postings for employment opportunities in municipalities across the state.

http://www.nhmunicipal.org/Resources/ClassifiedAds/Employment

Visit the UNH T² website today!

www.t2.unh.edu

- Access to the most up-to-date calendar
- Register for workshops online
- Access to NH Road Salt Database
- See important announcements
- Access to the UNH T² Facebook page

NH LTAP is on Facebook & Twitter!

Want to stay informed of our activities? Want to connect with other professionals who attend our training? Want to look at pictures from our training classes and other events? Then “like” us on Facebook or “follow” us on Twitter to stay connected! We are posting information daily on our activities, new programs, training, local news, and services.

www.facebook.com/nhltap
www.twitter.com/nhltap
Word Search

Be the first to complete this word search and send it to T² any of the following ways to win a FREE T² workshop!

Fax: 603-862-0620
Email: e.hamilton@unh.edu
Mail: Beth Hamilton
33 Academic Way
Durham, NH 03824

Words can be circled either upward, downward, backward, or diagonally. Good luck!

AGGREGATE
BMP
BIOSOLIDS
ETHICAL
BRIBES
CRACKING
CRACKING
EXHAUSTION
HEAT
INTEGRITY
LANDFILL
RAVELING
RUTTING
SOIL
SUNBURN
WETLANDS

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## Fall 2014 Training Calendar

Check out our website for the most up-to-date calendar  
www.t2.unh.edu/training-calendar

<table>
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<tr>
<th>Date</th>
<th>Topic</th>
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