

# DABEC DIGEST

volume 3, issue 1

january, 2004

## WHERE DO ALL THESE POTHOLES COME FROM?

In the middle of the darkest nights, an army of gnomes wielding pickaxes and shovels work feverishly to scar and dig into the surfaces of our best roads, causing mayhem and alignment damage wherever they go.

You probably have guessed that gnomes aren't the real mechanism of pothole formation, but sometimes it seems that way. On one day, the road is fine with no visual evidence of a pothole forming, and the next day it's like driving through a mine field.

The formation of potholes is really a function of the pavement type. Virtually all pavements can be separated into two types: Flexible and Rigid/Structural. The names are somewhat self-explanatory. Flexible pavements are designed and implemented to flex or deflect when loaded by traffic and other methods. Rigid/Structural pavements are designed and implemented to remain essentially un-deflected under loading conditions. Asphalt pavements are generally flexible and concrete pavements are generally rigid/structural.

Asphalt pavement is basically just gravel "glued" together with a bituminous mixture. It feels solid to the touch and driving on it doesn't result in ruts or tire marks (usually), but the "glue" never really sets up and that results in a pavement that is flexible.

Flexibility can be a good thing, too. Catastrophic failures rarely occur with flexible pavements. As

the earth moves below the pavement, the pavement moves with it, resulting in a pavement surface that may be a little uneven, but is still driveable. Expansion and contraction of the pavement due to temperature differences don't impact flexible pavements as seriously as they do rigid pavements. As the pavement grows and shrinks, flexible pavements do just that, they flex.

Concrete pavements are different. Concrete is not flexible. In fact, if you try to bend concrete it will simply break (once you put enough load on it.) Properly designed concrete pavements are capable of "bridging" gaps in the sub grade and carrying vehicles across these small voids without breaking. If the earth moves too much and the voids become excessive, the pavement will break, sometimes catastrophically. Expansion and contraction due to temperature changes can have a serious impact on concrete pavements, too. As the pavement grows and shrinks due to temperature changes it must have room around it to do so in order to avoid pushing and pulling on the adjoining concrete pavement. If there is no room to grow and the forces within the pavement become great enough, entire sections of concrete pavement can be thrust up in the air, creating a ramp in the street. The next time you drive across a bridge on an Interstate highway, look at the pavement and the ends of the bridge and notice the



### HUM AND THUMP IN CONCRETE PAVEMENT

Have you ever noticed the "hum" that your tires make when driving on concrete pavement? It is particularly noticeable when the road you are driving on transitions from an asphalt surface to a concrete surface. You may also notice a regular "thump" as you drive along concrete pavement. The "hum" and the "thump" come from two different, yet equally important sources.

An important attribute of a driving surface is the friction factor. If the surface is frictionless, it would be impossible to start and stop. If the friction factor is too high, the tires on your vehicle could wear out too soon. Concrete can be finished to a degree that results in a very low friction factor, which would be unsafe for driving. In order to avoid this, the surface of a concrete pavement is marked with tiny grooves running perpendicular to the direction of travel. When your tires travel over these grooves, sound is made. Hence the "hum."

The "thump" is created by the expansion joints placed in the pavement to allow for growth and shrinkage of the pavement due to temperature. These joints are generally placed at regular intervals and sound like a "thump" when your tires hit them.

The travel lanes in an asphalt pavement usually have neither of these.

## potpourri

Congratulations go out to last month's winners. Get your answers in for your chance to win!!!!

### This Issue's Quiz:

#### 1) True or False:

**Concrete pavements are classified as Flexible Pavement Systems.**

#### 2) True or False:

**Asphalt pavements have expansion joints at close, regular intervals.**

#### 3) True or False:

**Asphalt pavements are cut on the surface to promote friction.**

#### 4) True or False

**Weigh stations and scales are used to prevent empty trucks from using the highway system.**

**Fax or email your answers to Brian at D. A. Brown Engineering Consultants by January 31, 2004 for a chance to win valuable DABEC Merchandise.**

# WHERE DO ALL THESE POTHoles COME FROM?

air gap between the bridge deck and the bridge approaches. This air gap is one form of expansion joint and it allows for the growth and shrinkage of the pavement due to temperature.

"So," you may be asking, "what does that have to do with anything? Where are all these potholes coming from?"

You may have noticed while you are driving around that there are a lot more potholes in asphalt pavements than in concrete pavements. This is a key point in finding the root of the problem and the mechanism by which potholes are formed.

The answer is found in the word "Flexible." Even though asphalt pavements are "flexible" by definition and design, they are not olympic gymnasts. If they are flexed or stretched too far, they break. Repeated over-flexing of the pavement results in cracks in the over-stressed area. These cracks weaken the pavement's integrity and the pavement begins to separate. As the pavement separates, continued loading by traffic results in pieces of the pavement coming loose and being thrown from the area by the tires. The more pieces that get tossed out, the deeper the hole becomes. As the hole gets deeper the tires begin to dip down into it and

impact the front of the hole. This impact force is much greater than just driving over it, so the pieces are thrown out more rapidly and the pothole gets really big, really fast.

What causes the pavement to "over-flex" in the first place? Poor sub-grade is the usual culprit. If you recall from our Soils Series last year, the bearing and shear capacities of most soils drops drastically when they become wet. If the subgrade under the pavement becomes saturated, the strength of the subgrade reduces. The reduction of the bearing capacity of the subgrade results in additional deflection of the pavement, itself. Design engineers and contractors attempt to reduce this potential problem by installing sub-surface drainage systems under the pavement so that the water won't remain on the subgrade and weaken the soil. If the sub-surface drainage systems fail, potholes will almost surely form.

Over-flexing of the pavement can also be caused by excessive wheel loading, which is why you see so many weigh stations along major truck routes to make sure they aren't overloaded.

Well, that is a "crash" course in potholes. As always, please give us a call if you have any questions. See you next month.



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# DABEC DIGEST

volume 3, issue 2

february, 2004

## WINTER-WEATHER HOME PROBLEMS

As we enter early spring (let's keep hoping) some home-maintenance problems are likely to raise their ugly heads once again. In the next few issues, we are going to discuss some of the more common problems with suggestions you can use to eliminate these yearly maintenance headaches.

### ICE FORMATIONS ON THE ROOF

Who hasn't seen this problem? The giant pile of snow on your roof miraculously turns into a giant iceberg and water begins to leak through the ceiling in your living room.

Well, the transformation of the pile of snow into a giant ice cube isn't really a miracle. Ice dam formation is really more a matter of thermodynamics. Generally, these ice formations can be traced back to heat losses from the house below and poor ventilation of the roof above. Let me explain:

Believe it or not, the life expectancy of your roof is greatly dependent on the amount of air circulation that takes place just below it. In the summer time, the shingles on the roof absorb incredible amounts of radiant energy from the sun. When the binding agent in shingles gets too hot it actually turns into a liquid. Obviously, having your shingles turn into a liquid is not a good thing, so the underside of the roof sheathing is very carefully ventilated in order to keep the roof as cool as possible in the summer. By

the same token, this ventilation is very important in the winter to prevent the shingles from warming up from the underneath. You might be wondering what difference it makes to the shingles if they warm up a little from underneath in the winter. Well, it doesn't hurt the shingles in normal circumstances, but warming them up a little does affect the snow piled on the roof.

A little heat applied to the underside of the snow drift will melt the snow touching the roof during the warmer daytime hours. At night (when the temperature drops) the portion of the snow drift that turned into slush freezes again, and this time it's not snow, it's ice. The next day when the cycle repeats there is even more water formed, but it can't flow down off the roof because the ice block that formed in the middle of the night is stuck in the way so the water pooled on the shingles starts to find a way between the shingles, through the sheathing and into your house. When the temperature drops again, any water left over becomes part of the iceberg forming on your roof.

In the worst case scenario, the ice formation on the roof can gain enough weight to cause structural problems. It can also begin to slide off the roof tearing off pieces of your house on the way down.

So, what can we do to prevent this problem? First of all, if you have a giant ice cube on the roof of your house, it is not a good idea to



### FORT WAYNE FREEDOM TICKETS

Fort Wayne Freedom is our local professional Indoor Football League (IFL) team. I attended one of their games last year with my sons and we had a really good time.

This year we will be giving away two tickets to the winner of each drawing for each home game. If you are interested in entering the drawing, simply fax or email me your contact information and we will notify you if you win. Our seats are on the fifth row at the ten-yard line.

Here is their home schedule:

Sunday	3/14/04	4:00 pm
Saturday	3/20/04	7:00 pm
Saturday	4/10/04	7:00 pm
Saturday	4/24/04	7:00 pm
Saturday	5/08/04	7:00 pm
Friday	5/21/04	7:00 pm
Saturday	6/26/04	7:00 pm

You may indicate that you prefer to only be selected for a particular date, but your odds of winning will go down.

The drawing for each game will take place 10 days prior to each game and the winner (two tickets) will be notified immediately. Entries for the drawing will be accepted until 6/15/04.

If you have additional questions please contact me or visit the Freedom webpage at [www.fwfreedom.com](http://www.fwfreedom.com).

Good luck, Brian.

## potpourri

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### This Issue's Quiz:

#### 1) True or False:

**I read the announcement about the football tickets on the front page.**

#### 2) True or False:

**Ice formations on the roof are not likely to cause any damage.**

#### 3) True or False:

**It is normal to develop three feet of ice on the roof of a house in a normal winter.**

#### 4) True or False

**Using ice picks, axes, and shovel on the ice is a good way to remove the ice from the roof.**

**Fax or email your answers to Brian at D. A. Brown Engineering Consultants by February 29, 2004 for a chance to win valuable DABEC Merchandise.**

# WINTER-WEATHER HOME PROBLEMS (CONT)

climb up there and start hacking away with ice picks, shovels, axes, or any other utensil you might have seen people use on America's Funniest Videos.

In the short term, you might have to try applying heat (warm water, etc.) to the ice on the roof in an attempt to reduce the mass. In truly desperate circumstances an ice melting compound could even be used (but you must be careful to use only substances that won't harm the shingles or kill your flower bed or pets).

The easiest way to get rid of these ice dams is to prevent them. Make sure your attic space is insulated sufficiently. Also make sure your roof ventilation system is installed properly and functioning correctly. One quick check is to look through the attic for any place the insulation is touching the roof sheathing. Wherever the insulation gets close to the roof sheathing you should see baffles that keep the insulation off the roof and allow air flow from the drip edge up to the peak of the roof.

Another inspection can be done from outside the house. Right after a light snow or heavy frost periodically inspect all of the roof to look for areas that melt off before the rest. These melting areas usually indicate an area where the heat from the house is escaping to the roof and melting the snow or frost.

One more note about the formation of ice dams. It is perfectly normal and expected for the snow on the roof to melt when the temperature approaches 32 deg F. Radiant heat loading from the sun will cause the shingle temperature to rise in much the same way as pavement melts snow and ice when the temperature gets close to freezing. Your downspouts and gutters can become a problem when this happens. The water running off the roof (in small quantities) is very close to its freezing temperature and your gutter temperature may even be below freezing. Ice will begin to form in the gutter and then block any future flow of water, causing an ice dam at the dripline of your roof.

Gutter ice dams can be reduced by ensuring that your gutters have lots of slope (which causes the water to move more quickly, preventing it from freezing) and that you have a sufficient number of downspouts to get the water out of the gutter. Additionally, it is very important to keep your gutter free from debris which slows down the water making it more likely to freeze, and keep the ends of your downspouts open.

Hopefully, you won't have to worry about any of this this spring. See you next month.



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# DABEC DIGEST

volume 3, issue 3

march, 2004

## SPRING-WEATHER HOME PROBLEMS

As a continuation of last month's issue, we will again explore some common problems for home owners that come about at this time of the year.

### WHERE DID MY DRIVEWAY GO?

Most city-dwellers may not have experienced this problem, but if you live in the country and have a relatively long gravel driveway you are very familiar with this phenomenon. In the early spring your beautiful limestone driveway turns into an ugly, muddy monster. Giant mudholes may begin to form and it can be difficult to even get back to the house. This may go on for up to a month when all of a sudden, the muddy monster tames and your driveway returns (although it's probably a little worse for the wear.)

What causes this phenomenon? It's really quite simple. During the winter months when the temperatures remain below freezing for an extended period, the surface of the earth freezes. This frost in the ground makes the dirt virtually impenetrable to water. In the springtime when the sun begins to warm the surface again, the frost melts out of the first couple of inches and the snow melts, which results in super-saturated dirt and stone on the surface. The next few inches of earth still have the frost that formed during the winter, which acts like a sheet of plastic, preventing the surface water from soaking in and drying the

saturated dirt. As we all know from previous Issues of the DABEC Digest, most soils lose their strength when they get wet. Therefore, your driveway loses its strength in the same way and your tires begin to rut it up and potholes begin to form. (Whew! Maybe it's a little more complicated than I led you to believe.)

So, how can we fix the problem? Well, one key to maintaining your driveway is to provide adequate drainage. Typically, wet soils have less strength than dry soils, so getting the surface water and melting snow and frost out of the subsoils is very important. Most of the time, using larger stones for the base of the drive will permit water to trickle between the stones and escape from under the driveway.

Another important way to reduce the maintenance expense for your gravel driveway is to understand the nature of how a gravel driveway works. Everyone knows that if you don't have a driveway and you drive across your grass all the time you will soon end up with a dirty car. The question is why doesn't that happen with a gravel driveway, as well? After all, your car is driving on stones that are sitting on dirt. What is so magical about stones that they don't rut out and get your car all dirty?

Well, stones aren't magical. In fact, they're not even tricky. If you can imagine one of the great



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### This Issue's Quiz:

#### 1) True or False:

**Frozen soil is easily permeated by water.**

#### 2) True or False:

**Once the frost leaves the soil, it generally firms up quickly.**

#### 3) True or False:

**Stones spread out the load from tires to the subgrade and reduce the soil pressure.**

#### 4) True or False

**Perimeter sub-surface drains are not required to have a properly functioning septic field in seasonally high water table areas.**

**Fax or email your answers to Brian at D. A. Brown Engineering Consultants by March 31, 2004 for a chance to win valuable DABEC Merchandise.**

# SPRING-WEATHER

## HOME PROBLEMS (CONT)

pyramids in Egypt I can give you a pretty good idea how a stone driveway works in keeping your car out of the mud.

As your tire presses down on the top layer of stones, each one of those stones presses down on the stones below. Only they don't press straight down. Each stone pushes on all of the stones underneath and the edge of the impacted area moves outward at an angle, kind of like the edge of the pyramids. If you stand on the very top of one of the pyramids your weight will be transferred by the entire structure to the ground, spreading it out over a huge area. The stones in your driveway do the same thing. The weight of your car is spread out over a larger area to the dirt underneath, which reduces the amount of pressure on the soil and thereby reduces the rutting action.

It stands to reason then, that one way to reduce the maintenance on your driveway is to make sure you have a nice thick layer of stones. The taller a pyramid is, the bigger the base. The bigger your base is, the lower the ground pressure from your vehicle. The lower the ground pressure, the less likely you are to rut up your driveway.

### WHY DOES MY YARD SMELL LIKE A TOILET?

A seasonal high water table is just what it sounds like. During certain times of the year the ground water (water that is resident within the soil) may be higher than at other times. Early spring is a prime time to have more water in the soil than at other times of the year.

Septic systems function by slow trickling water back into the soil from the leach field. If the soil is exceptionally wet, that trickling action can stop and the leach field becomes full of water (and some of that water was in your toilet not too long ago.) When that happens, sewage water actually can come up through the sod and lay on the ground or run-off over to the neighbors yard, depending on local conditions. Obviously, the smell from that water is not going to be too pleasant and it poses a substantial health risk for the neighborhood.

Engineers combat seasonally high water with perimeter subsurface drains located outside the septic field that draw the water table down and discharge it into area ditches or tiles. Another method is to place the septic field above ground in a sand mound (and use the subsurface drains also) in order to provide proper leaching action. We'll spend some time talking about septic systems at a later date. Enjoy the sunshine, see you next month.....



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# DABEC DIGEST

volume 3, issue 4

april, 2004

## HOW DOES A SEPTIC SYSTEM WORK?

I'm sure you all have been sitting on pins and needles, waiting anxiously for this issue about septic systems. I felt like we had let the suspense build long enough, so here goes:

### WHAT IS A SEPTIC SYSTEM?

The words "septic system" are commonly used by most people to describe all "on-site" sewage disposal systems. So, what's an "on-site" sewage disposal system? Simply put, it is a system that safely treats liquid waste "on-site" or nearby. The alternative to an "on-site" sewage disposal system is a central wastewater treatment plant, which is the type of system most commonly used by residents in this area. On-site sewage treatment is typically reserved for rural areas that can not be economically served by central systems at this time. On-site sewage disposal systems typically have three major components: a septic tank, a distribution box, and an absorption field (leach field.)

### THE SEPTIC TANK

Most septic tanks that are installed now are made of concrete and are rectangular in shape. Other materials such as fiberglass, polyethylene, and steel have been used but concrete is most commonly used because of its structural strength, resistance to corrosion, and stability due to its weight. Typical sizes for septic tanks range from 1000 gallons to 2500 gallons.

The size of the septic tank plays an important role in its primary

function. Septic tanks could also be called settling tanks. The general purpose of the septic tank is to separate the water from the solids, fats, and oils in the waste stream and collect the solids, fats, and oils for eventual removal by a pumping truck. Removing the majority of the solids from the waste stream is very important. The remainder of the system downstream is actually quite delicate and introducing large amounts of solids to it can cause the system to fail.

While these solids are in the tank anaerobic bacteria go to work on them, reducing the total volume by digesting them and reducing the solids into liquid and gas form. The gas these bacteria produce does not have a pleasant aroma. The waste gases are released from the septic tank back up the waste line toward the house. The water in the waste traps on the toilets and sinks prevent the gases from coming into the house and the vent stacks going out the roof allow the gases to escape from the system (without assaulting your nose.)

The fats and oils are also supposed to be collected by the septic tank. These components of the waste stream are less dense than water, so they "float" on the surface of the water in the tank. Baffles in the tank prevent them from going downstream to the rest of the system in normal operating conditions. If they are passed downstream the system can experience a failure.



### SEPTIC SYSTEM PERIODIC MAINTENANCE

A septic system can be a very good way to dispose of liquid waste from certain users under the correct operating conditions. If the system was designed and built correctly, and if maintenance of the system takes place regularly, a septic system should provide very good service for a long time. Here are some things to do to prolong the life of your septic system:

- Limit the solid waste loading of the system, do not use a garbage disposal or flush items other than toilet paper.

- Do not plant trees or other deep-rooted vegetation on the leach field. The roots from these plants can invade the leach field and reduce the capacity of the pipes.

- Do not direct drainage from the house or parking areas onto the leach field. Reducing the surface water on the field increases its capacity to assimilate the waste water.

- Maintain a nice lawn on the leach field. The grass will help to eliminate the water in the soil.

- Do not drive heavy equipment over any portion of your septic system. This can cause the underground systems to break.

- Have your septic tank inspected annually by a qualified system specialist to determine if pumping of the tank is required. (It will probably need to be pumped every 3-5 years, but each household is different.)

## potpourri

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### This Issue's Quiz:

#### 1) True or False:

**Correct installation of a septic tank allows for the discharge of the tank to go directly to a lake.**

#### 2) True or False:

**Leeches in the leach field eat the solids left over in the waste stream.**

#### 3) True or False:

**The distribution box usually has a computer control center.**

#### 4) True or False

**I should have my septic tank inspected annually to see if the solids need to be pumped out.**

**Fax or email your answers to Brian at D. A. Brown Engineering Consultants by April 30, 2004 for a chance to win valuable DABEC Merchandise.**

# HOW DOES A SEPTIC SYSTEM WORK (CONT)

## THE DISTRIBUTION BOX

The Distribution Box has a very simple job. It must divide the flow from the septic tank evenly into the leach field pipes. While this job could probably be done with multiple sensors, multiple valves, a number of tiny pumps, and a small computer system we generally just let gravity take care of it. Since water takes the path of least resistance due to the forces of gravity, if every discharge pipe from the Distribution Box is at the same elevation, every pipe will receive the same amount of flow. Therefore, it is essential that the Distribution Box is placed level during the construction of the system.

## THE LEACH FIELD

The primary function of the leach field is to scrub the effluent water prior to its return to the naturally occurring groundwater supply. An improperly functioning leach field will result in environmental contamination and pollution in the water. Wastewater contains dangerous bacteria, solid wastes, and nitrogen and phosphorous, which act as fertilizers to algae in surface waters. The combination of these elements can result in streams and lakes that cannot support fish, stink like crazy and cause illness to animals and humans from exposure to the water.

A properly functioning leach field is loaded with aerobic bacteria which digest the remaining solids in the waste stream. Then the surrounding soil acts as a giant filter to remove the harmful particles before the effluent water can return to the groundwater in the area. If the groundwater levels are too high, the entire leach field goes under water and the aerobic bacteria may die, the dirty water enters the groundwater as soon as it exits the Distribution Box, your yard will smell very bad, and pollutants will enter the local ecosystems. In areas with very high water tables the leach field may actually be above ground in a sand mound, which is usually fed by a pump, rather than gravity flow.

If too many solids pass through the septic tank into the leach field, the additional burden of the solids on the bacteria in the field will be too great and the soil and rocks in the trench will become coated with a slime that does not allow the water to percolate into the ground. When the water levels get too high, your yard becomes wet (again), the drains in your house may back up, and everything will smell. See the periodic maintenance section on page 1.

We might hit septic systems a little harder next month, see you then.....



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# DABEC DIGEST

volume 3, issue 5

may, 2004

## MY SEPTIC SYSTEM ISN'T WORKING

Last month we talked about the functionality of the components of a typical septic system and some common causes of failure for septic systems. This month we will talk about failures and what you can do to fix your septic system.

### IS THIS REALLY A PROBLEM?

Approximately 40% of the new homes in the United States use a septic system for their sewage treatment. That's right, "new" homes. If that statistic holds true for northeastern Indiana, then approximately 1000 septic systems were installed last year in the four-county area around (and including) Fort Wayne. And that's just in one year, folks. There are approximately 200,000 homes in the same geographical area, which equates to approximately 80,000 septic systems (if the national average holds true.) Obviously, if a healthy percentage of those septic systems are failing or not treating household waste properly, major environmental impacts could be observed.

### THE PROBLEM WITH SEPTIC SYSTEMS

In 1997 the USEPA and Congress officially recognized that septic systems are not just a short-term, stop-gap measure, but that septic systems are a reliable long-term means of treating sewage wastes. This finding is contrary to many people's previous opinions that septic systems were used only as a temporary measure that would be replaced with municipal off-site

treatment as soon as it became available to the area. In any event, the problem with septic systems is not that they are temporary fixes to a permanent problem.

The root of most septic field problems can be traced back to one (or more) of three major causes: Design, Construction, and/or Maintenance of the System.

### DESIGN OF THE SYSTEM

The standards by which we design septic systems are much more stringent now than they were just a few years ago. If you look back 40 years or so you would find an entirely different (and much looser) standard of design and practice.

The design standards for residential septic systems of today typically project a system life of about 30 years (with appropriate construction and maintenance.) Additionally, most jurisdictions require the homeowner to purchase enough property so the septic field can be moved or reconstructed on a different portion of the property in the future, if the need arises.

If the design is done improperly and the tank isn't large enough, insufficient trench area is allocated, or there is a seasonally high water table that isn't accounted for, problems with the system will arise. It won't matter how well constructed the system is, or how well you keep up with the periodic maintenance, the system will fail prematurely.



### SEPTIC SYSTEM PERIODIC MAINTENANCE

A septic system can be a very good way to dispose of liquid waste from certain users under the correct operating conditions. If the system was designed and built correctly, and if maintenance of the system takes place regularly, a septic system should provide very good service for a long time. Here are some things to do to prolong the life of your septic system:

-Limit the solid waste loading of the system, do not use a garbage disposal or flush items other than toilet paper.

-Do not plant trees or other deep-rooted vegetation on the leach field. The roots from these plants can invade the leach field and reduce the capacity of the pipes.

-Do not direct drainage from the house or parking areas onto the leach field. Reducing the surface water on the field increases its capacity to assimilate the waste water.

-Maintain a nice lawn on the leach field. The grass will help to eliminate the water in the soil.

-Do not drive heavy equipment over any portion of your septic system. This can cause the underground systems to break.

-Have your septic tank inspected annually by a qualified system specialist to determine if pumping of the tank is required. (It will probably need to be pumped every 3-5 years, but each household is different.)

## potpourri

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### This Issue's Quiz:

#### 1) True or False:

**Septic system problems typically occur from incorrect design, construction, or maintenance.**

#### 2) True or False:

**Approximately 4% of all new homes in the USA are using septic systems for sewage treatment.**

#### 3) True or False:

**It is good to have tree roots growing into the pipe fingers in the absorption field.**

#### 4) True or False

**Once the system fails, you have to build a new one.**

**Fax or email your answers to Brian at D. A. Brown Engineering Consultants by May 31, 2004 for a chance to win valuable DABEC Merchandise.**

# MY SEPTIC SYSTEM ISN'T WORKING (CONT)

## CONSTRUCTION OF THE SYSTEM

Just like the design phase, the construction of septic systems has improved over the years. New machinery has been developed that reduces the impact of the heavy equipment to the soil during construction. Materials used for the system itself have changed over the years to provide more consistent and longer-lived septic system.

And also just like the design phase, if the system is incorrectly installed the design and maintenance of the system will not be able to overcome the poor construction. The system will fail prematurely.

## MAINTENANCE OF THE SYSTEM

Please refer (again) to the side-bar on the first page. Septic systems require periodic maintenance to achieve their full design life. Just as you wouldn't expect your car to make it 100,000 miles without changing the oil, rotating the tires, flushing the radiator, and changing the transmission fluid, you can't expect your septic system to continue operating without a hitch if it isn't properly maintained.

## REMEDICATION OPTIONS

If your septic system is making your yard soggy and stinky, there might be a way to fix it without digging up the whole yard and starting over. You need to call a reputable septic system installer and pumper. If you don't feel comfortable with the company that comes out first, keep calling others until you are comfortable. Obviously, pumping the tank should be on the list of things to consider. Additionally, you could dig up the distribution box and pump out the field (as much as possible). Some companies have equipment available that can jet out the fingers of the absorption field to clean the pipes and the stone (to a certain degree), which should help if the system is overladen with solids. Some septic fields have tree roots growing into the leach field pipes, which reduces their capacity. In those cases machines are available that can cut the roots off inside the pipe without digging up the yard. This will only be temporary fix, unless the tree dies.

If the field must be replaced, make sure you obtain all necessary permits and that the new field is properly designed, installed, and maintained. Building the system correctly will probably cost more money for installation, but it will save you (and the environment) cost in the long run.

Have a great month, see you in June.



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# DABEC DIGEST

volume 3, issue 6

june, 2004

## GOLF, PHYSICS AND ENGINEERING



Now, if that doesn't sound like a fun title for a newsletter, I don't know what is.

Engineering is really just the practical application of all those formulas and theories from school to everyday life. I thought it would be fun to take some of the mystery out of golf in this issue, so here goes:

### WHY DO PUTTS BREAK DOWNHILL?

The root answer to that question is quite simple. Gravity. Obviously, loose objects have a tendency to slide, roll, or slip down hills due to the force of gravity. The real question on the golf course is how far will the ball break downhill. If you know how far it will break downhill, you will know how far uphill to start the ball so it will break down into the cup near the end of its rolling path.

The distance a ball will "turn" downhill is dependent on several factors. This is where the joy of physics comes into the realm of golf. The most important factors are: the slope of the green, the speed of the ball, the surface condition of the ball and green, the spin of the ball and the distance of the putt.

### THE SLOPE OF THE GREEN

This factor is pretty self-explanatory, but its roots are deeply imbedded in physics and Newton's law of gravity. Everything we walk on, sit on, drive on, or slide down is holding us up. If the surface of the earth did not exist under your feet right now, you would plunge toward the center of the earth at an alarming

rate. The same is true for your poor little golf ball. If the surface of the green is perfectly horizontal (level), all of the effects of gravity are counter-acted by the dirt and the ball will not roll in any direction without an additional push. As the green gets steeper, the force of gravity is not completely counteracted by the dirt and some fraction of the gravitational pull will act along the surface of the green, pulling the ball down the hill. If the green is steep enough the ball will roll down the hill immediately once you let go of it.

### THE SPEED OF THE BALL

We just finished talking about the force of gravity. In engineering, one of the key components to any force is acceleration, and one of the key components to acceleration is time. Imagine falling off a six inch curb. Your velocity when you hit the pavement will be relatively low. If you fall off a six-story building and hit the same pavement, you probably won't care what your velocity was when you hit the pavement. The key point is that gravity's acceleration is relatively constant, but the length of time it had to work on your body was substantially different. If you accelerate at the same rate for a long time you will be going very fast.

What in the world does that have to do with the speed of the ball? Well, a ball traveling at a high velocity will reach the hole in less time than a ball traveling at a low velocity. Since gravity has less time

### DABEC GOLF INVITATIONAL

Some of you probably thought I forgot about our tournament this year. I'm ashamed to admit that I have been too busy with work this year to focus much time on golf (is that even possible?). However, by popular demand, we will be hosting the Fourth Annual DABEC Invitational on Thursday July 29, 2004 at 1:00 pm at Noble Hawk Golf Links in Kendallville, IN.

The format for the tournament will be 4 person Florida Scramble and it will cost \$200 per team to enter. Team winners will be paid in cash, there will be proximity prizes all over the course and dinner will be provided after the tournament. Use the registration form below to register your team. Registrations and entry fees must be received by July 22, 2004.

#### TEAM MEMBERS

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PHONE: \_\_\_\_\_

I am interested in sponsoring a hole for the tournament.

## potpourri

Congratulations go out to last month's winners. Get your answers in for your chance to win!!!!

### This Issue's Quiz:

#### 1) True or False:

**Fast greens break less for the same slope and distance than do slow greens.**

#### 2) True or False:

**The length of time it takes the ball to reach the hole impacts how much it breaks.**

#### 3) True or False:

**As the ball slows down, the amount of influence a slope will have on it increases, until it stops moving.**

#### 4) True or False

**Now that I know physics and engineering are involved in golf, I will never play the game again.**

**Fax or email your answers to Brian at D. A. Brown Engineering Consultants by June 30, 2004 for a chance to win valuable DABEC Merchandise.**

# GOLF, PHYSICS, AND ENGINEERING (CONT)

to work on the ball, it won't be able to bring it down the hill as far.

## THE SURFACE CONDITION OF THE GREEN AND BALL

As discussed above, time is a critical element in the putting equation. The less time a ball spends traveling from the putter to the hole, the less it will break. So what green type causes a ball to spend more time moving from the putter to the hole? It might surprise you to find out that slow greens require less time for the same distance traveled than fast greens do. Here's why: the ball will initially have a higher velocity because it has to be struck more forcefully to travel the same distance and it will slow down more rapidly at the end of its journey due to the resistance of the grass on the ball. On a fast green the initial velocity is relatively low and the deceleration due to resistance from the grass is much lower. (If you're still having mental problems with this one, imagine a ball rolling down a long hill on a very fast green, barely turning over. The same slope on a slow green will require a ball to be rolling very quickly to overcome the force of the grass and it will stop rapidly near the hole in much less time.)

## SPIN ON THE BALL

Very small amounts of left or right spin will counteract or enhance the effect of gravity on the ball. A ball that naturally breaks a little to the left will break a lot to the left if left spin is imparted to the ball when it is struck. Hopefully, you put a pure top spin on the ball when you putt. If you don't, it will be worth the practice to develop that stroke.

## THE DISTANCE OF THE PUTT

We come back to time here folks. During the course of a long putt, the amount of time that gravity's acceleration has to work on the ball is increased and the ball will break more distance left or right. It is important to note, however, that the velocity of the ball will vary greatly over the course of a long putt. If the first few feet of a putt cross a side hill, you shouldn't have to allow for a lot of break there. Remember that the length of time the ball spends in that portion of the putt path will be relatively small compared to the same few feet at the end of the putt. A mild break at the end of a long putt will likely bend the path of the ball more than a severe break at the very beginning of the putt path.

Have fun on the course and remember that engineering and physics are your friends! Don't forget to check the side bar on the first page, we'd like to meet a lot of you at our golf tournament this year.



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# DABEC DIGEST

volume 3, issue 7

July, 2004

## FLOODING PROBLEMS IN JULY????

We're going to take a few minutes this month to talk about the National Flood Insurance Program (NFIP) and some recent changes to NFIP policy. Chances are these changes will impact you or someone you know.

### WHAT IS THE NFIP?

If you don't live in a flood hazard zone, you may not have ever heard of the NFIP. The NFIP was created in 1968 by Congress in order to reduce the tax-payer burden of recovery to damage by floods. In other words, prior to 1968 if flooding occurred in Melville, IL, taxpayers all over the country paid a small portion each to remediate the damage. The goal of the legislation was to have those people who were most likely to flood pay for the flood damage of others (and themselves). Every year the premiums paid by those insured by the NFIP are used to pay the salaries of those working for the NFIP and the damages of those rate-payers who are flooded.

The NFIP is managed by the Mitigation Division of the Federal Emergency Management Agency (FEMA). The Mitigation Division does a lot of other important work, as well. In addition to managing the NFIP, the Mitigation Division also manages the National Dam Safety Program, the National Earthquake Hazards Reduction Program, the National Hurricane Program, Safe Rooms and Community Shelters, Mitigation Grant Programs, and other public information services.

You can probably tell by their name and the names of the programs they administer that their mission goes beyond just running an insurance program. Their focus is on reducing the risk to human life and property due to natural disasters.

You can visit the Mitigation Division of FEMA's webpage at:

<http://www.fema.gov/fima/>

### DO I HAVE TO BUY INSURANCE?

If you are getting secured financing (a mortgage) to buy, build or improve a structure in a federally designated Special Flood Hazard Area (SFHA) you must (by law) purchase flood insurance from the NFIP. The only way you can avoid purchasing flood insurance is to demonstrate (through proper means) that the structure is not in an SFHA. This typically requires the services of a surveyor and/or flood modelling specialist.

It is important to note that all areas of the United States can flood. Some areas are just more likely to flood. In fact, approximately 25% of all flood claims occur in the low-to-moderate risk areas. (see the NFIP website) As a result, anyone can buy flood insurance from the NFIP, and in fact they recommend it. The premiums are adjusted for the risk level of the buildings that the policy will cover, so if you're in a low risk zone your premium will be relatively low. That is a pretty good lead in to the next topic and the main reason for this newsletter:



### DABEC GOLF INVITATIONAL

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#### TEAM MEMBERS

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PHONE: \_\_\_\_\_

I am interested in sponsoring a hole for the tournament.

## potpourri

Congratulations go out to last month's winners. Get your answers in for your chance to win!!!!

### This Issue's Quiz:

#### 1) True or False:

**NFIP stands for New Focus in Property Management.**

#### 2) True or False:

**Anyone can buy flood insurance for their house, even if it isn't in a SFHA.**

#### 3) True or False:

**SFHA stands for Special Flood Hazard Area.**

#### 4) True or False

**I think the government uses acronyms for most of its departments and programs just to confuse people and make it difficult to figure out what they're talking about.**

**Fax or email your answers to Brian at D. A. Brown Engineering Consultants by July 31, 2004 for a chance to win valuable DABEC Merchandise.**

# FLOODING PROBLEMS

## IN JULY (CONT)

### WHAT IS THE BIG CHANGE?

The Bunning-Bereuter-Blumenauer Flood Insurance Reform Act (The Act) of 2004 is the Big Change. Since the name of the Act is so self-explanatory I probably don't even have to go into any details about this new law, but I will anyway.

The Act started as a bill intended to reform the NFIP to make it more financially stable and less dependent on tax payers in the event of major flooding. The basic idea is to encourage building owners that repeatedly flood out to either mitigate their property by raising the building(s) or moving completely out of the SFHA. Incentive funds are going to be available to sweeten the pie even more for those property owners that flood repeatedly. In an average year less than 1% of all NFIP insured properties claim 25% of all payments, so there appears to be a lot of room for improvement.

Property owners that are Repetitively Flooded (four or more payments over \$5000 each with the cumulative amount exceeding \$20,000 or two or more claims payments that cumulatively exceed the value of the property) will be offered this mitigation assistance. Those that chose not to take the mitigation assistance and continue to live in these flood prone areas will be subject to gradual increases in their premiums to cover the actuarial cost of the insurance. (In other words, their premiums will sky-rocket.) The rate increases are only triggered when mitigation is refused.

Most of the mitigation offers will involve elevation assistance. In cases where a buyout option is warranted, the purchase offer will be generous and will be subject to appeal.

The Act passed the House on November 20, 2003, the Senate on June 15, 2004 and was signed by President Bush on June 30, 2004 to become effective immediately. (<http://blumenauer.house.gov/issues/LegislationSummary.aspx?NewsID=899&IssueID=7> was used as the source for much of this section)

So, if you live (or know someone who does) in an area that floods regularly and have received claims checks from the NFIP for those flooding problems on several occasions in the past, plan on doing some remodeling or moving in the near future.

Take care, we'll see you next month.

Don't forget to register your golf team for the outing shown on the first page.



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# DABEC DIGEST

volume 3, issue 8

august, 2004

## WHAT ARE THEY DOING TO ALL THE ROADS?

Road repair is a topic that is near and dear to all of our hearts. When the road is in a state of disrepair we love to complain about it, and when it is under construction to be repaired we love to complain even more. We're going to talk about some common repair methods and equipment in this issue and the next time you drive by a construction site you will have a good idea what is taking place.

### PATCHING/RESURFACING

The methods used for patching and resurfacing can be very different, but the idea is the same. Patching the road usually involves a single truck loaded with cold-patch (an asphaltic pavement that is not hot) and a couple of workers who shovel the cold-patch into the holes in the surface of the road. The idea behind patching is to prevent further damage to the road (and the cars on the road) from tires impact loading the pavement at the down-traffic end of the hole. If you have driven down a road that has been recently patched you probably noticed small particles of the cold-patch sticking to your tires and being thrown up against your vehicle (where they stick again). Patching holes in pavement is a short-term fix.

Resurfacing a pavement has a longer life expectancy than just patching. Resurfacing usually involves a fairly substantial segment of pavement and usually covers at least one entire travel lane. Most resurfacing projects involve a

machine that grinds and removes the surface of the pavement to a predetermined depth (a milling machine). Removing the surface layer of pavement helps ensure that the finish pavement is smooth and covers the base pavement with a regular thickness.

After the surface has been removed and swept to remove loose stones and other objects, a tack coat is sprayed onto the base asphalt. The tack coat is like glue. It bonds the new surface course of asphalt to the old base course. If the tack coat is not applied properly the surface may peel off the base like the skin on an orange.

After the tack coat is applied, trucks loaded with hot asphalt will arrive from the plant to load the paving machine. The paving machine levels (screeds) the hot asphalt mix to the appropriate depth above the milled surface of the base course. Behind the paving machine rolling compactors will apply force to the relatively loose asphalt surface to compact it to a uniform density and provide for a smooth driving surface. After the surface has been compacted, lines are typically repainted or applied and traffic resumes.

### EDGE DRAINS

Draining the water from the underside of pavement is critically important to maintaining the durability of a road way. As you should remember from previous issues of this newsletter, wet dirt is



### SOME POSITIVE FINANCIAL NEWS

Last week I was listening to the news and heard about a major drop in the Dow Jones Index following the less-than-spectacular employment news that fewer new jobs had been created than expected. From the lead-in to the story I thought we were experiencing another major catastrophe on Wall Street, so I was surprised that the actual drop they revealed at the end of the news to be 163 pts (or so).

I get really tired of people crying "wolf" all the time, so I thought I would include some news from Wall Street in my own way, with a positive twist on it:

The drop we experienced last week wasn't even half of the tenth largest drop recorded in DJIA history. (Number 10 is 374.27 pts)

Even with the drop from last week the DJIA is up approximately 2,652 points from its recent low on October 9, 2002.

Four of the ten largest single day gains recorded for the DJIA have all occurred since the terrorist attacks of 9/11/2001 and the smallest of these four gains was 346.86 pts.

I imagine if we heard financial news like that more often we would be less likely to have recessions in the first place.

Here's to keeping a little perspective in our news coverage.

## potpourri

Congratulations go out to last month's winners. Get your answers in for your chance to win!!!!

### This Issue's Quiz:

#### 1) True or False:

**Sealing pavement is important because the cracks and holes in the pavement surface aren't very attractive.**

#### 2) True or False:

**Water on the subgrade of a pavement can lead to damage of the pavement.**

#### 3) True or False:

**Edge drains typically run down the centerline of the pavement.**

#### 4) True or False

**Milling machines turn the waste pavement into attractive fabric to be used for evening wear.**

**Fax or email your answers to Brian at D. A. Brown Engineering Consultants by August 30, 2004 for a chance to win valuable DABEC Merchandise.**

## WHAT ARE THEY DOING TO

### ALL THE ROADS? (CONT)

typically not capable of sustaining the same loads as dry dirt. One way engineers try to combat the effects of water on the subgrade under pavement is to prevent that water from ever getting to the subgrade. This can be accomplished by elevating the roadway above the drainage ways (ditches) and providing edge drains to keep water from entering under the pavement and to drain water that may already be under the pavement. Edge drains are typically trenched in under the edge of the pavement (hence the name) and consist of stone backfill over perforated pipe. Water that hits this trench will fall through the stone to the perforated pipe and is conducted to strategically-placed discharge points in the ditches on either side of the road. Most asphalt pavements have a layer of stone under them which can transmit the water that gets through the pavement to the edges where it also ends up in the edge drain. Water that gets *through* the pavement? Water is transmitted through the pavement in a variety of means, but cracks and holes in the pavement are generally responsible for the majority of the water that gets through, which leads us to our last topic for this month:

#### SEALING

Sealing the surface of pavement to prevent water from leaking through it into the subgrade is very important. Pavement sealing construction activity can look very different from project to project. If you are trying to seal up your driveway or parking lot a bucket of sealing compound and a squeegee from a home supply company may be all you need. For a road project the area that is going to be sealed needs to be cleaned of all loose debris. The cleaning process could be a jet of compressed air to blow out the loose particles, or a jack hammer to remove the particles that are loose but stuck in a crack in the pavement. In either case, the loose material must be removed to allow for the sealing agent to bond with the pavement and provide a good seal against moisture.

Typically, a crack sealer is applied to the cracks in the road and sand is sprinkled on the sealant to prevent it from sticking to the tires of the cars driving over it. Preventing the sealant from sticking to the tires is not done to aid the motorists, but rather to keep the sealant on the road surface.

Usually, a road project will consist of more than one type of construction. The next time you're out driving, try to figure out which of these processes the construction crew is trying to complete.

Be safe driving, and we'll see you next month.



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# DABEC DIGEST

volume 3, issue 9

september, 2004

## LAND USE LAW IN INDIANA-PART I

What is land use law in Indiana and how does it affect me? I would guess that most people have no idea or think that it doesn't affect them. Well, it does affect each one of us in many important ways each day. If I mention the terms Zoning, Plan Commission (PC), or Board of Zoning Appeals (BZA), you might get an idea of this month's topic.

Providing for the "peace, safety, and well-being" of the people is the purpose of government according to Article I of the Indiana Constitution. In order to promote public health, safety, and welfare, it is necessary for the state to regulate, or limit, individual conduct which includes the use of land. This sovereign power of the state to legislate these rules, or regulations, protecting the public welfare is called the Police Power. Both the U.S. and Indiana constitutions limit the police power and reserve fundamental rights for individuals.

The concept and proper application of zoning rules has been consistently upheld by the courts. Proper implementation and application are essential for every ordinance and jurisdiction. In their findings the courts have made comments such as the following: "A regulatory zoning ordinance, which would be clearly valid as applied to the great cities, might be clearly invalid as applied to rural communities"; "one should use his property in a manner as to not injure that of another"; "...whether a

particular thing is a nuisance, is to be determined, not by an abstract consideration of ...the thing considered apart, but by considering it in connection with the circumstances and the locality..."; and "A nuisance may be merely the right thing in the wrong place – like a pig in the parlor instead of the barnyard."

In Indiana local communities are empowered to enact and enforce planning and zoning regulations by IC 36-7-4 (Local Planning and Zoning). You can access this statute on the web at [www.in.gov/legislative/ic/code/title36/ar7/ch4.html](http://www.in.gov/legislative/ic/code/title36/ar7/ch4.html) (It takes 90 pages to print it.) Although this enabling legislation grants broad powers to local communities, it still sets the guidelines, or parameters, required to establish local authority. This statute is divided into 15 sections covering specific aspects of the process. Local authority is required to prepare and adopt three documents by ordinance: 1) The Comprehensive Plan; 2) The Zoning Ordinance; and 3) The Subdivision Control Ordinance.

The Comprehensive Plan (sometimes called the Master Plan) is the foundation document for the local zoning, or land use, process. It identifies how the locality views itself today, how it wants to look in the future, and how it intends to get to that future appearance. IC 36-7-4-502 requires the Comprehensive Plan to have at the least the following elements (statements): objectives for



### SOME TYPICAL ZONING CLASSIFICATIONS

Page two of this newsletter talks about the need to re-zone property if the proposed use is not permitted for the zoning classification of the property in question. Here is a partial list of zoning classifications one might find within our area:

- Exclusive Agricultural
- Agricultural
- Flood Hazard
- Estates
- Suburban Residential
- Lake Residential
- Two-Family Residential
- Multiple Family Residential
- Manufactured Housing Residential
- Planned Residential
- Professional and Personal Services
- Business and Technology
- Limited Commercial
- Planned Shopping Center
- General Commercial
- Roadside Commercial
- Commercial Interchange
- Drive-In Facilities
- Planned Commercial
- Light Industrial
- General Industrial
- Heavy Industrial
- Industrial Park
- Planned Industrial

## potpourri

Congratulations go out to last month's winners. Get your answers in for your chance to win!!!!

### This Issue's Quiz:

#### 1) True or False:

**Local Plan Commissions are federally appointed and derive their powers from the US Constitution.**

#### 2) True or False:

**Re-zoning property requires a public hearing because it involves a change to the zoning ordinance.**

#### 3) True or False:

**The Subdivision Control Ordinance sets the rules and procedures for subdividing land.**

#### 4) True or False

**I wish everything didn't have to be so complicated.**

**Fax or email your answers to Brian at D. A. Brown Engineering Consultants by September 30, 2004 for a chance to win valuable DABEC Merchandise.**

# LAND USE LAW IN INDIANA- PART I (CONT.)

future development; policy for land use development; and policy for development of public ways, public places, public lands, public structures, and public utilities. IC 36-7-4-503 includes a list of over two dozen other things that may be considered and included. Unfortunately, in most communities the Comprehensive Plan document is largely forgotten and becomes quickly outdated.

The Zoning Ordinance must designate the geographic area under the PC's jurisdiction and include zone maps by reference. In Section 601 the statute specifies four purposes for the Zoning Ordinance that must be considered and a list of items that may be included. A typical ordinance includes the following: 1) a list and definitions of the various zoning districts (e.g., agricultural, commercial, industrial, residential, special, or unrestricted); 2) explanation of how real property is developed, maintained, and used; 3) designation for zoning districts having development problems or needs; 4) provision for Planned Unit Development (PUD); and 5) explanation of how subdivision of land may occur.

Because all areas within a PC's jurisdiction are "zoned" upon adoption of the ordinance, any change requires a "rezoning" which requires a change in the ordinance. Even though passage of ordinances is the responsibility of the local legislative body (e.g., Board of County Commissioners or City Council), the PC must hold a public hearing on the rezoning petition. To most people this is often a confusing and emotional process. Public notice as specified in the statute must be given before a public hearing is held by the PC. The PC hears the evidence and makes a recommendation to the local legislative body: favorable, unfavorable, or no recommendation.

The third document that must be adopted is the Subdivision Control Ordinance (SCO). This ordinance sets the rules and procedures for subdividing land. Subdividing usually requires platting which in turn requires primary and secondary approvals. Primary approval almost always requires a public hearing with public notice being given. Secondary approval does not by statute require a public hearing. The PC has exclusive control over the approval of all plats and replats. The SCO specifies the process of platting and approval, the information that must be provided on all plats, the improvements (e.g., streets, utilities, grading, and drainage) that must be constructed within the development, and the rules for determining if the improvements have been completed.

Next month we'll continue with more of this topic. Be safe 'til then.



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# DABEC DIGEST

volume 3, issue 10

october, 2004

## LAND USE LAW IN INDIANA-PART II

As we discussed last month, we will be continuing the article about Land Use Law in Indiana this month. We will also throw in a couple of related topics at no additional charge. So, without further ado, here goes:

The local authority must also establish two boards: 1) The Plan Commission (PC); and 2) The Board of Zoning Appeals (BZA). Depending on local factors the PC and the BZA may be Advisory (the most common), Area, or Metropolitan. In addition to the items we have already mentioned, the PC is typically involved in Improvement Location Permits (ILP's) and Development Plans.

Because of the important function of these boards it is vital to avoid even an appearance of impropriety. Members may not participate in any matter in which they have either a direct or indirect financial interest. A member of the PC may not represent another person in a zoning matter. Both boards are to establish published rules – not in conflict with the Zoning Ordinance – governing their operational procedures.

The BZA is a quasi-judicial body in its function. None of the members of a BZA may hold other elective or appointive office. No one is permitted to communicate with a member of the BZA before a hearing “with intent to influence the member’s action.” The BZA hears appeals concerning the decisions, orders, or actions of a hearing officer, administrator, or staff person. It also deals with items that

don’t fit the rules: special exceptions, special uses, contingent uses, conditional uses, and variances (variance of use or variance from development standards). The BZA must make its decision upon a finding of fact based on five criteria (36-7-4-918.4) greatly condensed here: 1) Not injurious to the public health, safety, morals and general welfare of the community; 2) Use and value of adjacent property not affected in substantially adverse manner; 3) Need arises from some condition peculiar to the property; 4) Strict application of Zoning Ordinance constitutes an unnecessary hardship; and 5) Approval does not interfere substantially with the Comprehensive Plan. In order to withstand a potential appeal it is important that these items are included in the discussion and minutes of the BZA hearing.

The Indiana State enabling legislation also contains several other Series that relate specifically to local governance and provide the authority for local jurisdictions to handle special circumstances. Here is a brief synopsis:

The 1000 Series of the statute contains various methods for appeal and enforcement. Because of the underlying concept of protecting the public health, safety, morals, and general welfare most of these methods are given a priority status for prompt response. Most violations can be classed as a nuisance and subjected to a daily fine. Some decisions are subject to review by



*certiorari* in the circuit or superior court of the same county, but the review may not be by *trial de novo*. The court may reverse, affirm, or modify the decision of the board. All ordinances adopted under the statute are presumed to have been validly adopted. All courts and BZA's are instructed to take judicial notice of such ordinances.

Miscellaneous Provisions are explained in the 1100 Series. Although local government is given broad powers through the Local Planning and Zoning statute, those powers are considered to be supplemental to and do not abrogate the powers extended to state agencies, bureaus, departments, commissions, divisions, or officials. This includes various entities such as state educational institutions, memorials, or monuments and the state's right to exercise eminent domain. Rules and guidelines are established on how Comprehensive Plans and Ordinances deal with manufactured homes. This series also deals with children's homes and child care homes.

The 1200 Series - Township Joinder describes how a township may join a municipality with an advisory plan commission. The 1300 Series - Impact Fees is a lengthy portion of the statute and describes the process of establishing and adopting impact fees, impact zones, and an Impact Fee Ordinance for collecting fees to pay for various

## potpourri

Congratulations go out to last month's winners. Get your answers in for your chance to win!!!!

### This Issue's Quiz:

#### 1) True or False:

**BZA stands for "Board of Zoning Appeals."**

#### 2) True or False:

**Everyone that wants to develop a piece of property will have to go to the BZA in order to get approval.**

#### 3) True or False:

**The PC and the BZA are independent boards that serve two separate functions.**

#### 4) True or False

**I still wish everything didn't have to be so complicated.**

**Fax or email your answers to Brian at D. A. Brown Engineering Consultants by October 31, 2004 for a chance to win valuable DABEC Merchandise.**

# LAND USE LAW IN INDIANA- PART II (CONT.)

infrastructure improvements.

If the local entity wishes to implement a development plan review and approval process, it must follow the guidelines in the 1400 Series - Development Plans. The zoning ordinance must designate zoning districts in which a development plan is required. The PC has exclusive authority to approve or disapprove a development plan, but may designate PC staff or a hearing examiner or committee. The ordinance must specify development requirements, necessary supporting documentation, and procedures for submission and review. In granting approval the PC may place conditions, accept commitments from the applicant, and require acceptable surety for completion of any public improvements.

Finally, the 1500 Series - Planned Unit Development (PUD) describes the process for establishing PUD districts in the zoning ordinance. PUD development can accommodate unusual circumstances and provide for creative solutions. However, it seems to be largely misunderstood and incorrectly applied in many situations.

Most planning department staff are very helpful in assisting individuals through the PC or BZA process. For many procedures the statute requires the local entity to have forms available with filing instructions that a lay person can understand. It is essential to comply with all rules concerning filing deadlines, executing applications, application fees, proper notification, and supporting material. Procedural errors are fatal to the process and must be avoided at all costs. Some projects require extreme attention to timing and sequencing. For example, a shopping center may require a rezoning to some commercial classification (which also requires ordinance passage by the local legislative), but it may also be considered by definition to be a special use which requires a hearing before the BZA. Additionally, platting may be required before the PC along with a development plan. The development plan may reveal the need to go back to the BZA for variances (of use or of standards), contingent use, or conditional use. Each of these petitions before the PC and BZA must be done in the correct sequence and may take several months to obtain final approval(s). While the PC staff may be helpful, they are not responsible for understanding the needs or scope of the petition or application. It is necessary for the applicant to have an experienced, knowledgeable team of professionals to help guide the project through the approval process.

Enjoy the fall weather. We'll be back next month.



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# DABEC DIGEST

volume 3, issue 11

november, 2004

## CONSTRUCTION PIPES- MATERIAL CHOICES

I'm sure you have all noticed big piles of pipe laying on the ground at construction sites or traveling down the road on trailers. Perhaps you have wanted to impress your spouse or significant other with your incredible knowledge of those pipes. Perhaps you haven't. In any event, after you read this article you will be able to impress or even astound them.

### PIPE MATERIALS

Appropriate materials must be used for each intended use of pipe. These materials change as technology changes. For instance, some of the earliest pipes used in the United States were made of hollowed-out logs. While a hollowed-out log is a better pipe than no pipe at all it is a material choice that has been phased out by technological advances over the years.

**Plastic** is one such material. Plastic has a relatively short history, but it is a prevalent choice for a wide variety of construction applications today.

Plastic pipes have several advantages. Plastic is relatively light-weight which makes it easier to ship and handle on site. Plastic is also relatively inert, which makes it resistant to many corrosive uses. Plastic is also smooth which reduces the amount of energy required to push fluids through it.

Plastic pipes also have several disadvantages. Plastic is a flexible material, which lowers it's ability to

withstand stress without failure and requires more care during installation than the more rigid pipe choices. Plastic has a low tolerance for heat (melt) and cold (brittle) which reduces it's ability to be used in extreme environments.

The plastic materials typically used for construction materials are PVC (poly vinyl chloride) and HDPE (high density poly ethylene). An interesting factoid about HDPE is that HDPE is a thermosetting plastic, which means it can be melted and fused together in the field. Butt-fused HDPE pipe is used in most small-diameter horizontal directional drilling applications.

In general, plastic pipe materials are used for: gravity sanitary sewer service, gas lines, force mains, water mains, and storm sewer service. (In other words, just about everything.)

**Concrete** pipes have been around in one form or another a lot longer than plastic. Modern-day concrete pipes are typically reinforced with steel mesh (or even bars) to add structural strength and are known as "Re-inforced Concrete Pipes" (RCP). Incidentally, most manholes and inlets are also made of RCP and can look a lot like a load of pipe on a trailer.

While plastic pipes generally come only in round cross-sections, RCP can be delivered in: round, square, rectangular, elliptical, and arch configurations.



Concrete also has several advantages. As you might guess it is very strong, relatively inert, and comes in a variety of cross-sections.

Concrete's disadvantages are its weight, its relatively high friction coefficient which increases the amount of energy needed to push fluids through it, and its relative inability to be used in a pressurized fluid situation (the joints in concrete pipe can leak under pressure.)

Concrete pipes are typically used on construction sites for: storm sewer (more frequently), gravity sanitary sewer mains (less frequently), and in high loading applications (under pavements, loading docks, railroads, etc.)

**Metal** pipes are probably the oldest material type to still be in use today. Metal pipes include: steel, cast iron (gray and ductile), and aluminum.

Steel pipes have the advantage of extremely high pressure and temperature use. Joints in steel pipe can be mechanical, gasketed or welded. Steel pipes have the disadvantage of being relatively susceptible to corrosive atmospheres (unless you use stainless).

Steel pipes are typically used on construction sites as casings under pavements for other carrier pipes, for pressure works in lift stations and other places where mechanical plumbing is required, and corrugated metal pipes (CMP-usually steel, but

## potpourri

Congratulations go out to last month's winners. Get your answers in for your chance to win!!!!

### This Issue's Quiz:

#### 1) True or False:

**HDPE stands for High Density Polyethylene.**

#### 2) True or False:

**Plastic pipes have a very high resistance to extreme temperatures.**

#### 3) True or False:

**Concrete pipes are re-inforced with steel mesh to provide additional strength.**

#### 4) True or False

**Concrete pipes come in many cross-sections. Cross-sections that look like squares or rectangles are usually called box culverts.**

**Fax or email your answers to Brian at D. A. Brown Engineering Consultants by November 30, 2004 for a chance to win valuable DABEC Merchandise.**

# CONSTRUCTION PIPES- MATERIALS (CONT.)

also aluminum) are used for storm sewer systems and culverts. Steel and aluminum can come in the virtually the same cross-sections as concrete.

Cast iron pipes do not have the pressure and temperature rating of steel pipes, but they typically do better in extreme conditions than plastic. Cast iron enjoys the advantages of being relatively durable, capable of sustaining pressure applications, and being relatively inert. Cast iron's disadvantages are its' weight, lining requirements for water supply and relative brittleness during installation. Ductile cast iron is used much more frequently than gray cast iron today.

Cast iron pipes are generally used for water supply and pumping station piping on construction sites.

### WHAT KIND OF PIPE IS THAT?

Well, now that you know the common materials used for piping systems on construction sites, it might be nice to be able to tell them apart.

Plastic is the hardest one, so that is the one we'll start with. Pipe manufacturers in conjunction with review agencies, maintenance departments and inspectors have developed a common coloring scheme for some of the plastic pipes to help tell one pipe type from another. Green pipe is generally used for sanitary sewer applications. Blue pipe is generally used for water supply applications. Yellow pipe is generally used for gas lines. Black pipe is something of a guessing game. Smooth exterior and interior black pipe with a stripe of some other color on it is probably HDPE pipe. That pipe can be used for water, sewer, or storm sewer applications. Black pipe with ribs on the outside and smooth interior in relatively large diameters (10" or much larger) is generally also HDPE, but it is used for storm sewer applications. Black plastic pipe that is coiled up is almost always drainage tile used to lower the ground-water table around buildings, in yards, or in farm fields.

Concrete pipe should be easy to spot. It will be a whitish color with a relatively thick (2" or thicker) wall. Concrete pipe can come in a variety of cross-sections, including square or rectangular. Those cross-sections are commonly referred to as "box-culverts" and will almost always be used to transport storm water.

Steel and cast iron are also easy to spot. If it looks like metal it is one or the other. Cast iron will typically have an inside liner and a bell on one end. Steel will be smooth on inside and outside, or be corrugated.

We'll talk about pipe sizes next month. Be safe.



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# DABEC DIGEST

volume 3, issue 12

december, 2004

## CAN YOU BELIEVE IT'S DECEMBER?

Last month when I was writing this newsletter I planned on spending the space in this month's newsletter talking about pipe sizing criteria. I typed in the date several times last month, so my fingers knew it was November, but my brain never quite grasped the idea that the next month would be December. As has been our tradition over the last couple years, we are going to give your brains the month off and not talk about engineering theory. I'm sure you are all very disappointed, but you'll just have to wait for January to learn about pipe sizing.

It's actually a lot easier for us engineering types to write about pipe sizing than other, perhaps more interesting, topics. We spend most of our time imbedded in the details of physics and design that other (more rational) people would prefer not to spend any of their precious time worrying about.

Time is such an interesting concept. There are a wide variety of people in this world. Short people, tall people, thin people, not-so-thin people, rich people, poor people, people with different colored skin, people with different colored hair. Some people are differently abled. Some people are easy to get a long with. Some aren't. Some are heavily educated and some have never even seen a book, but do you know one thing that every one of them has in common?

Everyone gets 24 hours a day.

Some people have more days than others, but the measure of a day is the same in length for everyone on earth. How we spend that time is up to us.

Notice the phrase "spend that time." Every now and then you'll hear someone use the phrase "saving time." (e.g. I'm saving time by taking this short cut to work.) If you think about it, you really can't save time. You can squeeze a two hour job into one hour, but there are no bank accounts for time. That hour you "saved" will tick by at the same rate as the hour you "spent." In other words, all time is spent. The bad thing about time is that we all have to spend it at the same rate. Your hours and my hours have the same duration, no matter how hard we try to stop it, speed it up, or save it.

In my opinion, since we have to spend all of our time anyway, the smart thing is to spend it wisely. Time is a precious, non-renewable resource. I believe recognizing this fact about time is the first step in determining what is the best use of our time. Trading time for something you don't really want or need is not a wise use of time. After all, we wouldn't trade one hundred dollars for something we don't really want or need, would we? And when you get right down to it, how much is one hour (or one day) of your life really worth? When you compare what you're trading your



time for it can get pretty depressing, can't it? After all, some of my time is traded for milk, bread, eggs, and other assorted food. Is one hour of my life really worth three gallons of milk, or five gallons of gas? At first blush, it certainly isn't. However, for my evaluation I have to consider the fact that my kids are eating that food and my wife is driving the van, taking care of my family. When I think about it that way, it isn't depressing at all.

I was just thinking this weekend about how much time I have been wasting this year. Then I got to wondering if any time is truly "wasted." It is all spent, of course, but can you truly "waste" time? Is sleeping wasting time? After all, sleeping is one of the important facets to maintaining our bodies (like eating and exercise) that can ultimately extend the number of days we have. Is sitting in the easy chair watching football with friends and family wasting time? If sleeping isn't, I don't know how resting and being with friends and family at the same time could be. I believe the closest we can come to wasting time is when we spend it at direct odds to our priorities in life. For example, if one of your priorities is family and you spend your time doing things that hurt your family, you are coming pretty close to wasting your time here on earth.

How we spend our time really

## potpourri

Congratulations go out to last month's winners. Get your answers in for your chance to win!!!!

### This Issue's Quiz:

#### 1) True or False:

**Santa Claus' reindeer team consists of 9 reindeer.**

#### 2) True or False:

**Santa Claus' doesn't exist and therefore he has no reindeer team.**

#### 3) True or False:

**Jesus was born in Bethlehem in a stable.**

#### 4) True or False

**I knew there was a mistake in last month's newsletter when HDPE pipe was referred to as a "thermoset" instead of a "thermoplastic," just like Bryce Cordell from Kurtz Excavating.**

**Fax or email your answers to Brian at D. A. Brown Engineering Consultants by December 31, 2004 for a chance to win valuable DABEC Merchandise.**

## CAN YOU BELIEVE IT'S

### DECEMBER (CONT.)

defines who we are as a person, doesn't it? A person that spends the majority of time at work is referred to as a workaholic. A person that spends the majority of time at the bar is referred to as an alcoholic. What do you call someone that spends the majority of their time with their spouse and children? Or with their friends? Or grandchildren? Why don't we have names for people like that?

By now, you're probably wondering why I am droning on and on about time this month, when we should be having fun. (After all, it is December.) Well, there is a simple explanation. This is the season of the year when all of us think about time to some extent. TV specials come on re-telling us all of the "important" things that happened during 2004. Socially significant people are chosen as the "Man of the Year", "Person of the Year", etc. We begin to consider "New Year Resolutions", (which are all essentially aimed at more appropriate time spending, when you boil them down.) We may also be spending some of our time remembering loved ones that will not be with us this year, and wishing we had spent more of our time with them in the past. Most of us will be considering the birth of Christ, and the time He invested with us here on earth, teaching us ways to wisely spend the time we have here. For all those reasons and more, most of us will consider time during the Holidays. Let me encourage you to review your time budget for 2005. Spend your time on your highest priorities whenever you can. After all, we only get 24 hours a day. Merry Christmas, and Happy New Year to everyone from us here at D. A. Brown Engineering Consultants.



Left-Right-Back Row: Todd, David, Larry, Duane, Casey, Daniel, Brian  
Left-Right-Front Row: Matt, Dave, John, Vinnie, Lynne, Grant, Eric  
Not Pictured: Rachel, Heather, Jack, Jared, Bill  
See You Next Year!!!



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