DABEC DIGEST

volume 2, issue 1 january, 2003

RULE 5-EROSION CONTROL PLANS

As we discussed in our last issue, EPA regulation changes are causing changes in State Rules which impact our local communities. The Phase II rule (See Volume 1, Issue 12) will also cause some changes in 327 IAC 15-5 (Rule 5) here in Indiana. We will discuss some of these proposed changes within this article. (Changes to Rule 5 discussed here will not take effect until the final Rule promulgation is completed, which should be sometime this spring.)

The new Rule 5 permits will still be good for 5 years, but the disturbed area requirement will drop from 5 Acres to 1 Acre. The calculation to determine how much area is actually disturbed is also undergoing a change. The calculation under the new rule will take into account all expected land disturbing activity (including future sections), and uses a 0.5 acre maximum disturbed area for single family lots.

The Notice of Intent (NOI) requirements are also undergoing a significant change. The new NOIs must be submitted at least 30 days prior to any land disturbing activity. Additionally, a copy of the NOI must accompany the Stormwater Pollution Prevention Plan (SWPPP)submitted to the local Soil and Water Conservation District (SWCD) or other designated entity. The SWPPP must also be submitted 30 days prior to any land disturbing activity.

During that 30 day period, the reviewing agency has the opportunity to make comments on the SWPPP. If the SWPPP is noted to be deficient within the 30 days, modifications to the plan and resubmittal must be made and approved prior to any land disturbing activity. (Another 30 day window.) If comment is not made within the first (or second) 30 day window, then earth moving can commence on the 30th day. However, IDEM and the SWCD must be notified at least 48 hours prior to commencement of work.

The SWPPP must contain the legal description of the property and its location in relation to other landmarks. The names of water bodies on, or adjacent to, the site and the receiving waters for the site must be indentified in the plan. The soil classification and types must also be identified along with any unique features found on the property. The proposed improvements to the property including the grading plan, stockpile and borrow areas, the existing and proposed contours, and the drainage plan must also be indicated in the SWPPP. Additionally, the SWPPP must contain an index of plan contents, the hydrologic unit code, a reduced plat of the site, any other state and federal water quality permits that must be obtained, and estimate the peak 10-year storm discharge for pre-construction and post-construction conditions.

You'll notice that nothing in the list above is directly involved in reducing erosion. The erosion control parts of the plan requirments are detailed on the other side of this newsletter.

D. A. Brown
Engineering Consultants Inc.

HOW MUCH TIME DO I HAVE TO ALLOW?

One of the key concerns for developers, municipalities and any other agency planning construction activity under this new rule will be the lag between plan submittal and start of construction. Currently, dirt can be moved the day after filing the NOI. Under the new plan, that will not be the case.

If your design professional is current on the guidelines from IDEM, IDNR and their local representatives, the earliest you can expect to move dirt is 30 days after filing the plan.

If your design professional is not terribly up-to-date on the new regulations, you could be looking at 60, 90, or even 120 days after submission prior to excavation.

The moral of the story is to get the Rule 5 submissions in early to avoid unnecessary delays for your project.

IT'S NOT TOO LATE

If you are interested in attending a locally held one or two day seminar utilizing IDEM personnel to go into more detail on this Rule, or Rule 13 (the new Rule relating to Stormwater Discharge Quality-see Volume 1 Issue 12) please contact us for more information. We will be happy to get this seminar put together now in order to reduce future problems.

potpourri

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

This Issue's Quiz:

1) True or False:

Rule 5 is the verbal abbreviation for 327 IAC 15-5.

2) True or False:

SWPPP is the abbreviation for Storm Water Polution Prevention Plan.

3) True or False:

After promulgation of Rule 13, some SWPPP plans will be reviewed by the local MS4s.

4) True or False

The new Rule 5 will require monthly inspections of the erosion control practices to evaluate their continued effectiveness.

Fax or email your answers to Brian at D. A. Brown Engineering Consultants by Januar 31, 2003 for a chance to win valuable DABEC Merchandise.

RULE 5-EROSION CONTROL MEASURES

As promised from Page 1, we will use this side to detail the erosion control measure requirements for the new Rule 5.

We will split the Performance Standards for the SWPPP into two basic sections: Stormwater Quality Measures and Administrative Practices.

The SWPPP requirements for Stormwater Quality Measures include: minimizing sedimentation offsite, minimizing discharge of other pollutants, discharging off-site without causing erosion, containing waste generated at site, stable ingress/egress points, material handling and storage, stabilization of unvegetated areas, and site clean-up.

The SWPPP requirements for Administrative Practices include: maintenance of a self-monitoring program, posting the SWPPP and records at a publicly accessible location, contractor sign-on to the plan prior to construction, weekly inspections of the practices to verify viability, and submission of a Notice of Termination (NOT) when construction is complete.

The Stormwater Quality Measures are not proposed to be dramatically different in the new Rule. There is some extension of the practices used in the old Rule to include on-site pollutant spills and more emphasis is placed on routine maintenance of the erosion control measures that are in place. The Rule is becoming more specific in vegetating areas not currently under construction, as well. Under the new Rule, any area that remains inactive for 15 days or more will have to be stabilized in a manner appropriate to the season. The stabilization methods will include: seeding, mulch, protective coverings, etc. Additionally, emphasis is being placed on reducing sediment entering the storm water conveyance system.

The Administrative Practices are becoming much more involved. Weekly and post-rainfall event inspections are required and paper work must be on file for review by the inspecting agency and the general public. This paper work must be maintained during the life of the project and includes inspection records as well as any maintenance records for the site's erosion control practices and/or pollutant containment systems.

On a final note, it is important to understand that once Rule 13 passes (see Vol 1, Iss 12), the agency that reviews these plans in your local jurisdiction is likely to change. The MS4s are going to be responsible for review of the Erosion Control Plans within their jurisdictional limits.

D. A. Brown
Engineering Consultants Inc.

702 Goodwin Place
PO Box 128
Kendallville, IN 46755
Phone: (260) 347-5599
Fax: (260) 347-9484
Email: dabec@dabrownengineering.com
Website: www.dabrownengineering.com

DABEC DIGEST

volume 2, issue 2 february, 2003

I'VE GOT THIS PIECE OF PROPERTY.....

We get an awful lot of phone calls in the office that start just like the title of this article. We are going to use the next few newsletters to discuss some of the key elements in the development property, securing approvals for improvements, and navigating through the local permitting process.

The list of potential "deal-breakers" for the development of property continues to get longer each year. Unfortunately, because of the rapidly changing marketplace, there is no one list that can cover all possible circumstances when it comes to determining the development capability of a certain piece of property. We are going to begin this series of articles with a short checklist of major items that should be investigated prior to commencing serious plans to develop any piece of ground.

Location, location, location....everyone is familiar with those three little words that mean so much to the real estate community. Even though this phrase might be overused, it still contains a very important idea for developing property. The physical location of a particular piece of ground plays a huge role in evaluating its development potential. Typically, the location will dictate which types of development can be accomplished successfully on your property. Property which is located close to an industrial facility will probably not reach its full potential being developed into large single-family estates. Conversely, property located out in the middle of nowhere will probably not be effectively used for industrial purposes. It is very important to assess the location of your ground when determining a possible development route for it.

Utilities. The availability of appropriate utilities is critical to determining the development potential of your ground. Note the keyword of the previous sentence, "appropriate." Different development types have different utility uses. For instance, a steel mill will have vastly different electric requirements than a small-animal veterinary clinic. When contacting the various utility companies, accurate information about the design load of your development on their utility is a must. Typical utilities for most developments include: water, sanitary sewer, gas, electric, telephone, and storm sewer. Storm sewer has not always been on the list, but it is not uncommon for some properties to have extreme difficulty in securing approval to discharge the additional storm run-off which usually takes place as a result of development activities. Depending on the proposed development type, lack of one of the preceding utilites can result in excessive expenses to develop a certain piece of ground.

Wetlands can also dramatically impact development capability. We advise our clients to secure the services of a reputable wetlands biologist prior to developing final plans for development. Even in areas

D. A. Brown
Engineering Consultants Inc.

OFF-SITE UTILITY EXTENSIONS

Frequently, the required utilities are not available on, or adjacent to, the property in question. Proper budgeting for the extension of those utilities is crucial in developing a workable business plan for the property. Complete design for the utilities is usually not economically feasible prior to deciding to develop the property, so how does one budget for those utility extensions?

Obviously, when putting together a "rough numbers" budget, you are probably not going to hit every number within 10%. The key is to account for every offsite expense in your budget and hope that the individual numbers, when taken on the whole, approximates your actual expense. So, make sure you account for every possible off-site expense in some way.

Actual numbers for utility extensions vary wildly, but here are some rough numbers you can try:

Water Main Extensions
$50/ft
Small Sewer Extensions
$60/ft
Large Sewer Extensions
$100/ft
Two-Lane Road Cuts
$30,000

For gas, electric, telephone, etc. call the local utility and they should be glad to help.

potpourri

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

This Issue's Quiz:

1) True or False:

Wetlands should only be investigated if there are cattails standing on the property.

2) True or False:

Sub-surface soils can become a problem for construction.

3) True or False:

If a property has a highway access, no additional work will be required.

4) True or False

If there are power poles on the front of the property, no call need be made to the electric company to determine availability of service.

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I'VE GOT THIS PIECE OF PROPERTY...CONT.

that don't appear to have wetlands, it is important to perform the investigation to eliminate them as a source of future construction issues.

Hazardous waste investigations are also recommended to reduce future liability for un-seen problems with a particular piece of ground.

The soil type on your property can be very important. This includes the sub-soil as well as the soil you can see on the surface. Some soil types are very conducive to construction, and some are virtually impossible to work with. Additionally, the sub-soil can make it very expensive to build roads, utilities, and buildings. Merely looking at the surface of the ground is not likely to provide an accurate interpretation of what is going on underground. For instance, if you would like to put a pond in a certain location on your property, it is wise to investigate the sub-soil conditions to make sure that the soil can retain water to the elevation you prefer. Sand and gravel veins in the earth that are totally invisible to people on the surface can ruin any plans to create a pond or lake.

Another important facet to check is the highway access. Virtually all private properties have some kind of access to a public road, but these accesses are generally approved for a specific use. For instance, a farmer might have an access into his field off the highway, but improvement to the property to put in an apartment complex might void that access, or require substantial highway improvements to gain access.

Securing an accurate boundary survey for the piece of ground you are proposing to develop can also prove to be an invaluable tool. An appropriate boundary survey can reveal other potential problems like: gaps, overlaps, encroachments, dedicated easements, regulated drains, approximate flood plain lines, and any questions about ownership. Obviously, any of these items can be big problems for development, but of particular note are the easements and regulated drains. An easement crossing the property can dictate where development can take place, or increase the cost of development to move the affected infrastructure out of the easement. Regulated drains can also be a problem for development for the same reason.

Well, that concludes our short list for questions to answer about the condition of the property, itself. I hope we haven't scared you. Next month, we will begin taking a hypothetical piece of property through the approval process. As always, if you have any questions please give us a call.

D. A. Brown
Engineering Consultants Inc.

702 Goodwin Place
PO Box 128
Kendallville, IN 46755
Phone: (260) 347-5599
Fax: (260) 347-9484
Email: dabec@dabrownengineering.com
Website: www.dabrownengineering.com

DABEC DIGEST

volume 2, issue 3 march, 2003

I'VE GOT THIS PIECE OF PROPERTY.....Article 2

Well, we have located our theoretical development property. We have checked to make sure the location is appropriate, that there are utilities available, that the wetland issues aren't insurmoutable, that any hazardous wastes can be dealt with, that the soil types are appropriate for our use, and that we have a suitable highway access. You would think that checking all of these items would guarantee the development capability of our land. It doesn't. We still have to get through the approval process.

The physical location of the ground will substantially dictate what approval process we will have to follow. For instance, property located within the jurisdictional limits of a city or town will normally be reviewed by entirely different people than a property located in the county's jurisdictional area. There are a significant number of parallels, however, and these are the areas that will get most of our attention.

Zoning is the first hurdle for virtually any development. Almost every county, town, and city in Indiana has an adopted zoning ordinance. The authority for these Ordinances comes from enabling legislation enacted by the State General Assembly. No two ordinances are exactly alike, but there are usually similarities. The general idea behind a zoning ordinance is to coordinate the development activities within the juridictional limits. The ordinance is intended to consider the rights of all property owners, even though that may restrict the development options available on your property. For example, let's say you are pursuing a heavy industrial zoning on your piece of ground. The properties on three sides are all single-family residential and across the road is a large retirement community. The loud, bright, and smelly activities of heavy industry do not blend well with the surrounding uses and re-zoning that piece for that use is not protecting the rights of the property owners that are already there. Without a zoning ordinance, development activities would be very haphazard and unpredictable. Property values would plummet and potentially undesirable conditions would proliferate.

The Master Plan portion of a Zoning ordinance identifies existing land uses and preferred future use patterns. For instance, the Master Plan for a community will probably indicate commercial and industrial uses along major thoroughfares, with residential areas in the secondary and lesser traveled routes. Keeping like uses together helps to protect the safety and welfare of the public.

In the State of Indiana, there are two forms of Plan Commissions. An Advisory Plan Commission makes recommendations concerning rezoning to the Local Legislative Body (Board of County Commissioners or Town/City Council). An Advisory Plan Commission votes to recommend, not recommend, or no recommendation to the Legislative Body. Then the Legislative Body must follow State Statute in voting to pass or not pass an Ordinance amending the existing Zoning Ordinance (in other words,

D. A. Brown
Engineering Consultants Inc.

HOW MANY APPROVALS?

Here is a partial list of departments you may have to contact for your next development:

-Board of Zoning Appeals
-City Plan Commission
-City Council
-County Plan Commission
-County Council
-City Engineering
-City Street Engineering
-City Traffic Engineering
-City Utilities
-New Water and Sewer Dept.
-Water Pollution Department
-Water Pollution Plant
-Fire Department
-Police Department
-Lighting Department
-Landscaping
-Board of Works
-County Surveyor
-County Drainage Board
-County Board of Health
-County Highway Dept.
-Storm Water Control Dept.
-State Dept. of Health
-State Dept. of Transportation
-Dept. of Environmental Mgt.
-Dept. of Natural Resources
-Fed. Emerg. Man. Agency
-Army Corp. of Engineers
-Other Utility Companies

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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:

Re-zoning a potential development property involves a public meeting.

2) True or False:

Proper zoning is required for most developments.

3) True or False:

Once proper zoning is obtained, work can begin on the development.

4) True or False

Area Plan Commissions only make recommendations to the Advisory Plan Commissions for amending the ordinance for re-zoning.

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I'VE GOT THIS PIECE OF PROPERTY...CONT.

to rezone or not rezone property.) An Area Plan Commission makes final decisions on rezoning issues.

The procedure for applying and obtaining re-zoning will vary from jurisdiction to jurisdiction, but the general path will be somewhat predictable. An application for re-zoning must be filed along with supporting documentation. Public notification must occur (certified mailings, newspaper publications, etc.) prior to the scheduled public hearing. The public hearing must be held, and both sides (for and against) must be allowed time to present their case to the commission. According to statute, the commission must prepare a Findings of Fact which becomes the basis for their vote. The commission is then allowed to vote, and they can vote in favor, against, or to table (postpone) the vote until further evidence can be obtained. Re-zoning hearings are generally held only once per month, so you want to have your ducks lined up properly, otherwise you could lose a month of construction (and income).

Of course, securing the proper zoning classification for your property is not the end of the approval process. Once zoning is secure, a Primary Plat or Primary Development Plan is usually the next step. This also commonly involves a public hearing (similar to zoning), but the intent of this hearing is not to determine the best use of the land. The focus of the commission during this phase is on the improvements proposed for the property.

Physical attributes of the proposed plan will be examined. Proposed traffic plans, rights-of-way, easements, building setbacks, lighting, sidewalks, entrances, landscaping, sanitary sewer, water supply, storm sewer, street names, buffer zones, and building classes are the usual points of interest. While the actual engineering calculations for these improvements are usually not reviewed at this point, the practicality of serving the property is. Frequently, letters from the individual departments (e.g., highways, utilities, and emergency services) that will be responsible for servicing this development are required. Public input is also taken into account regarding the specific improvements proposed.

This is a crucial point in the approval process. It is very important to communicate with the staff of the commission reviewing the Primary to determine the most reasonable presentation form and overall use for the property. Additionally, input should be gathered from each of the individual departments that will be evaluating the construction plans that will be submitted after Primary approval. Going to the hearing with a Primary that cannot be built on the property will result in significant delays.

Next month we will continue this series. Call if you have questions.

D. A. Brown
Engineering Consultants Inc.

702 Goodwin Place
PO Box 128
Kendallville, IN 46755
Phone: (260) 347-5599
Fax: (260) 347-9484
Email: dabec@dabrownengineering.com
Website: www.dabrownengineering.com

DABEC DIGEST

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I'VE GOT THIS PIECE OF PROPERTY.....Conclusion

Well, we have located our theoretical development property. We have checked to make sure the location is appropriate, that there are utilities available, that the wetland issues aren't insurmountable, that any hazardous wastes can be dealt with, that the soil types are appropriate for our use, and that we have a suitable highway access.

We have also determined the appropriate route for our approval process, submitted the correct paperwork to the governing agency and received re-zoning after presenting our case in a public hearing. We have also prepared the Primary Plat or Primary Development Plan and secured approval after another lengthy public hearing process. We are finally ready to start moving dirt on our site, right? After jumping all of these hurdles, you are probably dying to see the dirt fly, but we still have a wide variety of approvals to secure regarding the detail-level construction aspects of your plan.

Up to this point, the help of a professional designer is not required. While it is true that a competent engineer or surveyor can be of great assistance through the site investigation and public hearing portions of obtaining a construction permit, it is not a requirement of law. (With the exception of needing a legal description and boundary survey for the property proposed for development.) Some developers will perform most (if not all) of the previously detailed tasks themselves, some will hire an attorney to assist them through the bureaucratic maze of the approval process, and some will use an experienced engineering firm. The point is that an engineering consultant is not a prerequisite until now.

You are now at the stage when a licensed design professional will have to complete the infrastructure plans for your development prior to obtaining permits to begin construction. However, it is almost always in the best interest of a developer to include their design professional in the preliminary stages to help head off any major catastrophes during the design/build phase. Problematic soil types, excessive construction costs, and utility service issues should be obvious to a design professional. These conditions may not stand out to someone uninformed about the technical details of constructing a development.

Selecting a competent, qualified design professional is not as difficult as it may seem. The first thing to keep in mind is that for most development activities the engineering fee is less than 5% of the total cost. Compare that with 30-40% in materials, 30-40% in labor and 10-20% in land cost and you will see that the engineering fee is relatively inconsequential to your total budget. As a developer, you want to make sure that you are getting the best advantage for your 5% investment in engineering.

For example, if two firms have the same fee, but one secures approvals one month faster, which is the better value? Even if the slower firm is 20% cheaper, are you really saving any money? Another costing exercise is to value the engineering in terms of

D. A. Brown
Engineering Consultants Inc.

ENGINEERING SPECIALTIES

Not all that long ago, if you went to the engineering shop you would have found about 4 different disciplines on the shelf. Now, however, there seems to be a specialty for just about every purpose. Here is a short list:

-Aeronautic
-Aerospace
-Biomechanical
-Biomedical
-Civil
-Chemical
-Computer
-Electrical
-Environmental
-Geotechnical
-Hydraulic
-Industrial
-Mechanical
-Nuclear
-Structural
-Transportation

SPECIAL THANKS TO:

A special Thank You goes out to Gary Stair, Albion Town Manager. Gary was kind enough to point out an error in last month's newsletter. There are some distinctions between Area and Advisory Plan Commissions, but the rezoning process is the same. In order to become final, a rezoning petition must be approved by an ordinance passed by the appropriate legislative body.

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:

Once re-zoning and Primary Approvals are secure, development activities can begin.

2) True or False:

Balanced dirt on a property indicates the design uses the minimum amount of excavation.

3) True or False:

The engineering fee is usually the most expensive part of construction.

4) True or False

I knew that Area and Advisory Plan Commissions were incorrectly defined last month, but I didn't say anything.

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I'VE GOT THIS PIECE OF PROPERTY...CONT.

construction expense.

Every design for development is a prototype. No two properties are identical, and no two developments are identical, so comparing the construction cost for the design of one professional against the construction costs for another firm is very difficult. However, it is important to make the effort. Take the earth work as an example: Most people are concerned with whether or not a site "balances." (Has the same amount of excavated earth as filled earth.) The misleading part of this term is that there is only one "balance" point for a property. That is not true. The property is in "balance" before any dirt is excavated. The true measure of a great grading plan is not if it "balances" dirt (which it must), but if it "minimizes" the excavation required for the development. Put into financial context, if your 40 acre development is 0.1' (1.25") higher than the minimum you will spend about $20,000 moving dirt (6,450 cubic yards) you didn't need to move. Similar mistakes can be made in the depth of utility lines, the length of utilities, the property required for detention basins, etc. As you can see, it doesn't take very many minor design excesses to totally pay for the entire engineering fee.

Selecting a design professional is a very important part of completing your development in a timely and profitable manner. It is important to get references from past clients with similar projects. Another way to get information is to talk with the review agencies you will be dealing with. They will probably not tell you if the engineer is good or bad, but you should be able to find out if they regularly review plans submitted by your potential engineer. You can also call contractors in the area to ask questions about the engineer. Ask if they have worked with the firm previously, and how those projects progressed.

There really is no substitute for experience. Ask to see some plans the engineer has prepared in the past. Take the plans to a trusted contractor and ask their opinion (if they haven't worked with the engineer previously).

The engineering fee for your development may only be about 5% of the total construction cost, but it is probably the most important 5% you will spend. Take the time to select your design firm wisely. Make sure they have experience in your type of development and in your geographical area. Ask for references and make your selection based upon the complete picture of the firms in question.

Well, after your engineer secures your approvals you are ready to begin construction. May the weather be favorable and the buyers be many!!!

If you have any questions regarding this, or any other, article, feel free to give us a call. See you next month.

D. A. Brown
Engineering Consultants Inc.

702 Goodwin Place
PO Box 128
Kendallville, IN 46755
Phone: (260) 347-5599
Fax: (260) 347-9484
Email: dabec@dabrownengineering.com
Website: www.dabrownengineering.com

DABEC DIGEST

volume 2, issue 5 may, 2003

ALL THE DIRT ON DIRT (You ever wanted to know.)

We are going to take the next few issues to talk about a topic near and dear to everyone's hearts: "Dirt." Well, actually we're going to talk about soils, but using the title "Dirt" kind of brings the topic home. As the general public, we don't usually think about soils on a day to day basis. It's kind of like air and water, we just take it for granted. We get irritated by the potholes in our streets and having to replace our sidewalks and driveways so soon, but even then we usually don't blame the soils below, just the contractors or maintenance crews that are increasing our daily commute time. It's been said that in order to solve a problem, you have to get to the root of it, and that's what we are going to do here:

To a geotechnical engineer the term *soil* typically means any earthen material other than bedrock. Soil is composed of a combination of solids (loosely bound mineral particles of various sizes and shapes), organic material, water, and gas or air. There are many ways to classify soils; we will mention only four methods. Classification of the soil is important because it helps in predicting how the soil will respond to our activity with it.

One method of classification is by geologic origin: RESIDUAL (derived from the process of decay of underlying rock formations), CUMULOSE (organic accumulations, muck, peat, muskeg, humus), and TRANSPORTED. TRANSPORTED soils have several sub-classifications: Aeolian (wind-born deposits, blow sands, loess, adobe), alluvial (by moving water on flood plains or deltas), marine (in salt water), lacustrine (in fresh water), glacial (moraines, eskers, drift, or glacial till), volcanic (volclay, Dakota bentonite, ash, lava), colluvial (gravity deposits, talus, avalanches, landslides, cliff debris), and fill (manmade deposits, waste, rubbish, engineered fill). All three of the major soil types listed above can be found in Northern Indiana.

A second method of classification is based on COMPOSITION. Listed are some of the more common names: adobe (heavy-textured alluvial clay soil), blow sand (aeolian dune sand), chalk (soft, porous variety of lime rock), gumbo (peculiar fine-grained soils, usually without sand, presence of alkaline compounds causes soils to becomes waxy or soapy when saturated), marl (crumbly deposits with a combination of clay, sand, calcium carbonate, and other carbonaceous materials), muck (thoroughly decomposed organic material, usually black with few fibrous remains, odorous especially when dried or burned, deposits often around ponds and lakes and in swamps or wetlands, may contain some sand or silt), and peat (partially decayed plant material, mostly organic, highly fibrous with visible plant remains). Many of these soil compositions can be found in Northern Indiana.

A third method of classification is based on CONSISTENCY: PLASTIC or COHESIVE (can form true pastes with characteristics of plasticity and flow under pressure, deform under constant shearing stress, very compact and hard when dry) and FRIABLE or

D. A. Brown
Engineering Consultants Inc.

SOIL HORIZON DEFINITIONS

A Soil Profile is often mentioned in certain types of soils reports. The undisturbed soil strata are commonly divided into four Horizons (A, B, C, & D).

"Horizon A" consists the upper or surface layer normally called Topsoil and is normally less than two feet in depth. The upper part (A_0) of this horizon is humus or organic debris. Other indices (A_1, A_2, A_3, etc.) are often used to designate transitional strata within this horizon.

"Horizon B" contains the heavier textured under layer or subsoil. The products of leaching or eluviation from the "A" Horizon are deposited in "Horizon B." Transitional zones are often designated by the same method as mentioned for "Horizon A."

"Horizon C" contains the unweathered or incompletely weathered parent material.

"Horizon D" includes the underlying stratum such as hard rock, hardpan, sand, or clay.

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:

Soil Horizon "A" is not as far west as Soil Horizon "D".

2) True or False:

Silt particles are very large and are porous when combined together.

3) True or False:

The augers on truck-mounted drill rigs are usually hollow to allow for sampling of soils beneath the surface.

4) True or False

Cohesionless soils form pastes when the correct amount of water is added.

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ALL THE DIRT ON DIRT...CONT.

COHESIONLESS (converse of plastic soils, do not form true pastes, increasingly easy to crumble as drying takes place as dry sand does). Both of these consistencies are common in this area.

The fourth method that we will explain is probably the most basic and most commonly used. This classification method is based on particle size or texture: COARSE-GRAINED or GRANULAR (boulders, gravel, coarse sand, fine sand) and FINE-GRAINED (silts and clays). There are at least five organizations that have developed Soil-Separate-Size Limits that are widely accepted: American Society of Testing and Materials (ASTM), American Association for State Highway and Transportation Officials (AASHTO), Massachusetts Institute of Technology (MIT), U.S. Department of Agriculture (USDA), and the Unified Soil Classification System (USCS) by the U.S. Army Corps of Engineers (COE) and the U.S. Bureau of Reclamation (USBR). Each of these systems defines the various particle sizes slightly differently. But on an average the various particle sizes are as follows: boulders >75 mm; gravel <75 mm & > 2 mm; sand <2 mm & >0.06 mm; silt <0.06 mm & >0.005; and clay <0.005 mm.

In order predict the behavior of various soils in response to various conditions it is helpful to know the percentage of each particle size. The particle size impacts the response of the soil to loading conditions, water, and slope conditions. The particle size is determined by performing a sieve analysis (a test specified by the ASTM in which a soil sample is passed through a series of sieves with decreasing opening sizes). Once this analysis is performed a soil may be identified by a combination of terms: sand, sandy loam, loam, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, clay, or silty clay, where each term indicates the range of particle sizes of the soil.

In order to make a classification it is necessary to obtain a sample of the soils being considered. Many important characteristics can be determined by a trained technician on site. But a detailed analysis can be determined only through testing in a properly equipped laboratory in accordance with procedures set out by the ASTM. Samples can be obtained by many methods: manual (shovel or hand auger) or mechanical (excavator or drill rig). In order to perform some of the more important laboratory tests it is necessary to obtain an undisturbed soil sample. This is commonly performed by a truck-mounted drill rig which is equipped with a hollow auger through which a tube (called a split spoon) is lowered and driven into the various strata of the soil. The tube is brought to the earth's surface, and a portion of the core of soil is removed and packaged for delivery to the lab. All of these operations must follow the ASTM specifications in order to obtain uniform and comparable results.

More next month.....

D. A. Brown
Engineering Consultants Inc.

702 Goodwin Place
PO Box 128
Kendallville, IN 46755
Phone: (260) 347-5599
Fax: (260) 347-9484
Email: dabec@dabrownengineering.com
Website: www.dabrownengineering.com

DABEC DIGEST

volume 2, issue 6 june, 2003

ALL THE DIRT ON DIRT (Continued)

Hopefully, you read the previous issue. If you would like another copy before wading into this continuation, give us a call...here goes:

Now that we have determined some useful ways to classify soils, we need to know how to predict the behavior of various soil types in real world conditions. We will start with basic facts and then include some interesting specific factoids.

Gravels and sands are coarse grained which means that individual grains can be seen by eye. They are granular, non-plastic (not flexible as a unit), and cohesionless (the particles don't "stick" to each other). The effect of water is relatively unimportant, and grain size distribution is important in determining engineering behavior, because of the inter-locking capability of the individual grains.

Silts are fine-grained; individual soil particles cannot be seen with the unaided eye. They are granular, non-plastic, and cohesionless. The effect of water is important, and grain size distribution is relatively unimportant in determining engineering behavior, because the range of particle sizes is so small.

Clays are fine-grained; individual soil particles cannot be seen with the unaided eye. They are nongranular, plastic, and cohesive. The effect of water is very important, and grain size distribution is relatively unimportant in determining engineering behavior, because the range of particle sizes is so small.

Shearing strength (the resistance to deformation caused by sliding one portion of the soil mass across another) is a primary means of determining all stability in soils. Granular soils have no cohesion, but they have an internal friction resistance; therefore, their shearing strength increases in relation to the applied load. Clays are cohesive and have no angle of internal friction; their shearing resistance is derived from their cohesive or molecular strength. As a result their shearing strength does not change with the applied load. Common soils are a combination of clays and sands. Therefore, most sands have some cohesion, and most clays have some internal friction. These facts relate to safe slope stability. Because the shearing strength of granular soils increases with applied load, the safe granular slope does not decrease with height. Because the shearing strength of clay soils does not increase with applied load, the safe clay slope decreases with height.

There are many empirical methods for determining the strength of soils. Here are two very general ones used to determine greater strength in soils: 1) heavier unit weight and 2) less voids.

Proper compaction of soils is a requirement of nearly every construction project. Moisture content is important for properly compacting soils. Most soils have an optimum moisture content required to obtain their maximum density.

D. A. Brown
Engineering Consultants Inc.

DO I NEED TO GET A SOIL TEST DONE?

Yes. Absolutely.

Soil boring and testing is probably the cheapest of all required activities for developing properties. On a typical project, consider how much money is directed toward: realtors, lawyers, engineers, surveyors, excavators, construction contractors, inspection fees, submission fees, and landscaping crews. All of this money could be wasted if the soils information is faulty or not available.

I really can't stress this point enough. We have been called in on several projects that were in various stages of development and required tens and even hundreds of thousands of dollars in remediation efforts because the owner didn't want to spend a few hundred dollars for a couple of soil borings up front.

If you are planning a project, a few soil borings will make it much easier to sleep at night during your project's construction cycle.

If you don't know who to call, call us and we will give you a reference.

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:

Silts are a coarse-grained soil type.

2) True or False:

Shear resistance is the ability of the soil to sharpen scissors.

3) True or False:

Soil boring and testing is a frivolous expense that will only drive the cost of your project up and profits down.

4) True or False

The amount of water in a soil has no effect on the physical characteristics of that soil.

Fax or email your answers to Brian at D. A. Brown Engineering Consultants by June 30, 2003 for a chance to win valuable DABEC Merchandise.

ALL THE DIRT ON DIRT...CONT.

Simplistically, the water acts as a lubricant in the compacting process. In general, this optimum moisture may run from 8% for sands, 15% for silts, and 15 - 20% for clays. Different soils and conditions require different compaction equipment and methods. This equipment and methods may include: jetting, flooding, vibratory rollers, static rollers, sheep's foot (studded) rollers, or dynamic compaction. Other methods of stabilizing soils may require grouting or applying a proper mix of stabilizing materials (lime, fly ash, cement, enzymes). Consultation with an experienced, qualified geotechnical engineer is necessary to avoid many of the pitfalls commonly experienced in constructing with soils.

Clays can exhibit interesting characteristics when worked. They are subject to remolding; an apparently stiff clay, when worked, will give off water and become soft. If the clay is allowed to rest, the water will re-adhere to the submicroscopic particles, and the clay will regain some of its stiffness. Freezing and thawing works clay and weakens it, causing expansion and settlement and potential slides. Most damage from frost action occurs at the time of thawing.

Settlement of structures is a common problem and one to be avoided. Clay settlement varies directly with water content and inversely with the cohesive strength. Clays tend to hold free water in addition to their adhered water. They do not drain or dry out rapidly. They are subject to a large amount of shrinkage (maybe 20% in volume), but the time frame is slow. Compressibility of sands and silts varies with density. The denser the sands or silts are, the less they can be compressed. Granular soils do not readily hold water and do not shrink much while drying; but when they shrink they do it more rapidly than clays or silts because the voids in the material tend to be larger.

Pore water pressure is an interesting condition that exists when granular soils are saturated with water that is trapped and are subjected to an applied load. Soils in this condition have no shearing strength because of the excess water lubricating the particle interfaces, and the applied load is being supported by hydraulic pressure. As the trapped water is allowed to escape, settlement will result. Some buildings in Mexico City have changed elevations, both down and up, as a result of this condition.

July's issue should be the last on soils, see you next month....

D. A. Brown
Engineering Consultants Inc.

702 Goodwin Place
PO Box 128
Kendallville, IN 46755
Phone: (260) 347-5599
Fax: (260) 347-9484
Email: dabec@dabrownengineering.com
Website: www.dabrownengineering.com

DABEC DIGEST

volume 2, issue 7 july, 2003

ALL THE DIRT ON DIRT (Continued)

This is our final installment in our series on soils. If you need copies of the previous issues, give us a call.

Capillary action is another mechanism that can affect the performance of soils. Water will rise in some soils in a manner similar to a dry rope or cloth with one end left in water. This action varies with soil types: coarse gravel (none); coarse sand (<12 inches), fine sands and silts (<3 feet), and clay (can be more than 30 feet, but few voids results in small quantity of water).

Everyone in northern Indiana has experienced various effects of the freeze-thaw cycle. With various mixtures of granular soils frost may be aided by capillary action in sucking up water and causing actual ice lenses. As this soil thaws, it is over-saturated and cannot support a reasonable load. A pore water condition may also exist. The frost heave may be less noticeable with clay soils because they are more impermeable and do not suck up water from below. But when they thaw, they lose their strength in a similar way as when they are over worked as mentioned above.

Tests that are commonly performed and their significance:

1. Mechanical Analysis

a) Sieve and Hydrometer Analyses – determines the percentage of individual particle sizes in the sample. Screens and sieves are used first to separate the coarse material. A hydrometer is commonly used to analyze the fine-grained fraction remaining. This test is important for classifying soils, determining their suitability for various applications, and approximating other characteristics (e.g., strength, permeability, capillarity, etc.).

b) Specific gravity – determines ratio of given volume of soil to equal volume of distilled water at a given temperature. The specific gravity is required in order to complete the calculations required for many laboratory tests on soils. Also, the unit weight of moist soil can be calculated from known values of specific gravity, degree of saturation, and void ratio; and it is required to solve most pressure, settlement, and stability problems.

2. Consistency tests and indices (Atterberg Limits)

a) Liquid limit – is defined as the moisture content (percent, dry weight) at which the soil changes from the liquid to the plastic state.

b) Plastic limit – is defined as the border between the plastic and semi-solid states. It is the moisture content (percent, dry weight) at which the soil will crumble when rolled into a thread 3 mm (1/8 in) in diameter.

c) Shrinkage limit – is defined as the delineation between the semi-solid and solid states. It is the moisture content (percent, dry weight) at which there is no further decrease in soil volume with additional drying but at which an increase in water content will cause an increase in volume. In other words, the moisture content required to fill the voids in the soil.

d) Plasticity Index – is the arithmetic difference between the liquid and plastic limits. This results in the range of moisture content over which a soil is in the plastic state.

There are some general guidelines using these indices: 1) Soils with high liquid limits are clays with poor engineering properties; 2) Low plasticity index indicates a granular soil with little or no cohesion and plasticity; and 3) Both the liquid limit and the plasticity

D. A. Brown
Engineering Consultants Inc.

DABEC OPEN ANNOUNCEMENT

It's that time of year, again. We will be hosting our second annual DABEC Open Golf Tournament (Florida Scramble) on September 6, 2003 at 1:00 pm at Noblehawk Golf Links in Kendallville, IN.

The registration fee of $200 per team will secure your foursome's spot on our roster. The fee will cover golf, carts, range balls, prize money, dinner and a chance to win a new vehicle with a hole in one. Skins game is optional. Get registered now to guarantee your position in the field. We are going to have a great time!!!!!

Team Captain:_____

Phone #:_____

Player #2:_____

Player #3:_____

Player #4:_____

___ the check is in the mail

___ the check is enclosed

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:

I have read more about soils in the last three months than all the rest of my life combined.

2) True or False:

Shear test involve cutting dirt with scissors.

3) True or False:

The coefficient of permeability predicts how well water will pass through a soil.

4) True or False

I am already putting a foursome together for the golf outing on September 6, 2003.

Fax or email your answers to Brian at D. A. Brown Engineering Consultants by July 31, 2003 for a chance to win valuable DABEC Merchandise.

ALL THE DIRT ON DIRT...CONT.

index can be used to exclude those granular soils with too many fine-grained particles that have cohesive plastic qualities.

3. Moisture-Density test (Proctor Test)

This test determines the proper moisture content (optimum moisture content) required to obtain the maximum density of the soil. It is assumed that the strength, or shearing resistance, of the soil increases with higher densities. The "standard" moisture-density test uses a constant compactive effort in the laboratory similar to an assumed impact and action of average construction equipment. Because a greater compactive effort will bring an increase in density, the "modified" moisture-density test was developed to emulate heavier construction equipment. Common results for maximum density and optimum moisture from this test are as follows: 1) Clays (90-105 lb/CF; 20-30%); 2) Silty clays (100-115 lb/CF; 15-25%); and 3) Sandy clays (110-135 lb/CF; 8-15%)

4. Shear Tests

By using different pieces of apparatus and specified methods these tests can determine the maximum shearing stresses, cohesion, and angle of internal friction from soil samples.

a) Unconfined Shear Test is a field test for undisturbed clay and clayey soils.

b) Angle of Repose Method is used for sands and free draining deposits of sand to determine the angle of repose which equals the lower limit of the angle of friction.

c) Direct Shear Test (Shear Box Method) is the oldest and simplest shear test and simulates the effect of soils under pressure. It is used for samples at field density of free draining soils, soils above ground water, or for clays to obtain the maximum angle of internal friction.

d) Triaxial Shear Test is one of the most reliable methods for determining shear strength parameters for a given soil sample. The soil sample (approx. 1.5"dia X 3") is encased within a thin flexible membrane and then placed in a chamber usually filled with water. A vertical load is applied to the soil sample while confining pressure is applied by the water. This test can be conducted primarily in three ways: 1) Consolidated-drained test or Drained test (CD test); 2) Consolidated-undrained test (CU test); or 3) Unconsolidated-undrained test or Undrained test (UU). Connections are provided to measure drainage into or out of the sample, and pore water pressure can also be measured.

5. Coefficient of Permeability

It is often important to be able to predict the rate of water flow through fine grained soils subjected to a given hydraulic gradient. This test determines a coefficient that is dependent on the size and shape of soil grains, soil structure, temperature, and void ratio. The coefficient can then be used in various formulas for real world applications.

Well, we made it. Thanks for hanging in there, see you next month....

D. A. Brown
Engineering Consultants Inc.

702 Goodwin Place
PO Box 128
Kendallville, IN 46755
Phone: (260) 347-5599
Fax: (260) 347-9484
Email: dabec@dabrownengineering.com
Website: www.dabrownengineering.com

DABEC DIGEST

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FLOODING TERMINOLOGY

"Floodwaters are expected to peak at 22' on Sunday, making this the worst flood since 1982." We have all heard this (some more recently than others), but the terminology and methods used to determine this information can be confusing. Hopefully, this article will assist you in deciphering many of the common terms and misconceptions regarding flooding conditions.

First of all, what does "Flood Stage" really mean? Most of the time, when you hear "Flood Stage" on the radio or television they are referring to the predicted 100-year storm level of the river, creek, lake, or other body of water. (You will remember from previous issues that a 100-year storm (by definition) has a 1% likelihood of occurring in any given year.) The Flood Stage is predicted for nearly every major drainage conveyance utilizing computer programs, historical rain and flow data, land survey data, and eyewitness accounts. The important thing to note is that these computer models are just predictors and aren't capable of accurately predicting a stream response for every possible storm.

One of the reasons that these models have inherent inaccuracies is the unpredictable nature of weather. The total rainfall amount (inches) is usually unevenly distributed, even within the same storm cell. Additionally, the rainfall intensity (inches/hour) is also extremely variable in nature. Also, the amount of rainfall that fell within the last few days and weeks has a big impact on how much water will run off the property into the streams and lakes. The temperature also plays a big part in the flooding condition of bodies of water. If the majority of the soils in a watershed are frozen, most of the rainfall will be delivered directly to the streams, rather than some of the water soaking into the ground.

Another reason the models have inherent inaccuracies is the variability of the soils within the watersheds in the model. The soils within a watershed are not all likely to be the same, and each different soil type has different properties when it comes to stormwater run-off.

The last major source of error in the models we will discuss is the developed percentage of the watershed being modeled. Most of the stream models are not updated every year, and development within the watershed will usually increase the total volume of run-off into the streams. It is important to note that developments with detention requirements usually reduce the peak run-off rate from the previously un-developed condition. Even adding a large pond or lake to a watershed can significantly change the flooding characteristics of the stream. A lake has a very high run-off coefficient, but it can also store water for a period of time to reduce the peak run-off to the stream (if designed correctly.)

Well, we know now that the models predict the "Flood Stage" for a given stream, but what do they mean by "5' above Flood Stage", and how is it measured? Being "5' above Flood Stage" is a little more complicated than it sounds. The flood stage for a lake or pond is usually a relatively level plane and can be represented by a single elevation (e.g. 900' above sea level.)

D. A. Brown
Engineering Consultants Inc.

TYPICAL STREAM AND LAKE GAGES

The picture shown at the right is one of the real-time gaging stations on Cedar Creek. This particular station is located on the east side of Tonkel Road just north of Hursh Road at the crossing of Cedar Creek in Allen County, IN. This station appears to have a telephone connection (upper left portion of the photo) which enables it to transmit data back to "home base."

The picture below is one of the real time gaging stations on the Maumee River just east of Landin Road near New Haven, IN. This station has a radio antenna (shown to the right of the well), which enables communication. Additionally, please note the light colored line about half-way up the well which indicates that water spends some time on the well in that location (about 10' higher than when this picture was taken.)

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:

When a flood gauge reads 22', that means the entire town is under 22' of water.

2) True or False:

The USDA regulates all flood gaging stations in the USA.

3) True or False:

When rivers are at flood stage, the surface of the water is generally flat for miles along the river.

4) True or False

Gaging stations provide valuable information to a variety of users.

Fax or email your answers to Brian at D. A. Brown Engineering Consultants by August 30, 2003 for a chance to win valuable DABEC Merchandise.

FLOODING TERMINOLOGY, CONT.

The flood stage for a ditch, stream, or river is a little more complicated because it isn't level. In fact, sometimes it is very steep. A good example of a steep river is a waterfall. We don't have very many waterfalls around here, but the principle is the same. It is not uncommon for one of our relatively flat streams to have more than 10' of fall in just one mile at flood stage. So, being 5' above Flood Stage for a stream is a surface parallel to the computer-predicted flood surface, but 5' higher.

Gaging stations placed along a given stream or river provide governmental agencies with valuable information about their current and historical conditions. The National Weather Service (NWS) uses the information from gaging stations to issue warnings which can reduce property losses and even the loss of human life. Water and wastewater utilities use the data in their daily functions. Power generating facilities use the data from gaging stations to efficiently produce power and protect wildlife. Even the general public uses the data to determine when conditions are appropriate for recreational purposes. The Federal Emergency Management Agency (FEMA) uses the current and historical data as a basis for the computer modeling which predicts flooding levels and is used to protect the health and safety of the public.

The United States Geological Survey (USGS) is a partner with various federal, local, and state entities to maintain approximately 7,200 gaging stations nation-wide at this time. Approximately 6,000 of these stations are "real-time", which means they transmit data back to headquarters on their own at regular intervals. These stations form the backbone of the stream data information network in the United States.

You might be wondering what a gaging station looks like. The simplest gaging station is a large ruler stuck into the stream on a solid base. In order to determine the stage of the stream, one simply has to read the measurement on the ruler where the waterline crosses it. Obviously, this form of gaging station has it's drawbacks, but it is relatively inexpensive to install. It becomes expensive when an employee has to be paid to drive around and look at all of them. A "real-time" gaging station is quite a bit more complicated, but it does provide many benefits for the added installation cost. A "real-time" station usually has a mechanical, electronic, or pneumatic device to measure the depth of the water and a sending unit which transmits that data back to base via telephone, satellite, radio or other methods. Using the depth of the water and predetermined cross-section characteristics, the flowrate of the stream can be calculated.

Next month, I think we'll take a look at why streams flood during some rain events and not others.

D. A. Brown
Engineering Consultants Inc.

702 Goodwin Place
PO Box 128
Kendallville, IN 46755
Phone: (260) 347-5599
Fax: (260) 347-9484
Email: dabec@dabrownengineering.com
Website: www.dabrownengineering.com

DABEC DIGEST

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WHY IS MY YARD FLOODED?

That may seem like a stupid question. Obviously, our yards flood because it rained, or the snow melted, or the water main broke, or some other equally self-explanatory reason. On the surface, it does seem obvious why a certain area would be under water, but if that area was never under water before, why is it now? That's really the question, isn't it? Not "Why is my yard flooded?", but "Why is my yard flooded now, when it has never flooded before?"

It is important to maintain an historic perspective when we start using the word "never." Depending on which geologist you contact much of the midwest was completely under water or ice not all that long ago. Additionally, this area has really only been settled for mass inhabitants within the last 250 years, and we have only been keeping rainfall and water level information for the last couple of hundred years (and historic "detailed" weather information is available for much less time than that.) I bring this up only to illustrate that sometimes our perspective is a little more short-term than it should be when it comes to severe weather. In other words, an area that we perceive to be free from flooding may actually be flooded quite regularly in the larger historical perspective.

Well, so far we haven't really discussed why our yard is flooded. Virtually all flooding occurs for the following reason: Water is flowing into the flooded area faster than it is flowing away. Picture in your mind a 5 gallon bucket full of water dumping into a small plastic cup with a small hole in the bottom. If the 5 gallon bucket is poured into the small cup rapidly, the hole in the bottom of the cup will not be able to drain the cup fast enough and it will overflow. Conversely, if the 5 gallon bucket is poured into the small cup very slowly, the hole in the bottom of the cup can keep up with the incoming water and not overflow, no matter how many gallons of water are poured through it.

Most of the time, that is how areas get flooded. Storms drop water on the ground faster than it can be drained by the pipes, ditches, streams, and rivers that provide drainage to the area and the water starts to fill up the lower areas in the watershed. Sometimes, an area can flood due to localized storms and never receive any direct rainfall. A prime example of this occurs regularly in semi-arid country. Dry washes (stream beds) typically run through these areas. These dry washes would be wet year-round, if there was enough rainfall. Instead, when it rains they fill up carrying the water down stream, and then dry up again when the storm passes. Frequently, the storms that cross this type of country are very localized in nature. One part of a county might receive several inches of rain in a short period of time. The stream beds will then carry that run-off water into an area that didn't receive any rainfall, but the low areas along the stream bed will have a flash flood condition. New Orleans is another prime example. The Mississippi River, which has the largest watershed area of any river in the United States, runs right through town. Imagine a large storm front running west to east and covering the northern 2/3 of the continental United States dropping

D. A. Brown
Engineering Consultants Inc.

CALCULATING DETENTION VOLUMES

The general idea behind calculating the required size for a detention basin is really not that complicated. The required detention volume is simply a function of the inflow rate minus the outflow rate times the length of time water is running into the basin.

Here is a simplified example:

Inflow=100 cfs
Outflow= 10 cfs
Inflow duration=12 hours

If the outflow and inflow are constant values (which makes this a whole lot simpler, but never occurs in the real world), we can see that we have a net inflow of 90 cfs for 12 hours.

90 cfs (cubic feet per second) is the same as 324,000 cubic feet per hour. If we then multiply the net inflow rate by the inflow duration we find that the total volume required is 3,888,000 cubic feet. Most of the time, detention volumes are expressed in the volumetric term Acre-feet, which is 43,560 cubic feet (one acre, one foot deep). Therefore, the required detention volume is 89.3 Acre-feet.

In the real world, the inflow is never constant, and in fact peaks for only a very short time. The outflow is not constant, either. Most detention outlets are gravity structures, and the higher the water level gets, the higher the discharge rate. Therefore, for a real detention basin, this calculation would be more complicated, but the idea is the same.

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:

5" of rain falling in 12 hours will cause the same amount of flooding for a given area as 5" of rain falling in 12 days.

2) True or False:

Flooding occurs because the water isn't escaping as fast as it is flowing in.

3) True or False:

The area of a watershed is an important variable used to calculate the run off rate.

4) True or False

Detention basins should never fill up with water.

Fax or email your answers to Brian at D. A. Brown Engineering Consultants by September 31, 2003 for a chance to win valuable DABEC Merchandise.

WHY IS MY YARD FLOODED, CONT.

several inches of rain in a short period of time everywhere within its path. New Orleans may not have gotten a drop of rain, but the Mississippi River Basin is inundated with water and therefore will flood the low areas in and around New Orleans.

So, what does all this mean? The reaction of a particular drainage system to storm water loading is very important in real-life everyday applications. The storm inlets that drain parking lots, streets, and highways all fill a very important role. Water standing on a street or highway can be very dangerous in the short term, and in the long term leads to drastically increased maintenance costs. Water that pools up in parking lots can cause thousands of dollars in damage to the automobiles parked there. Almost every new subdivision, commercial development, or industrial park has a detention basin. A detention basin is essentially an area that we intentionally flood to help reduce the risk of additional flooding downstream. If the detention basin is too small we run the risk of flooding the new development and areas downstream because the detention basin will overtop and mass quantities of water will be released. Therefore, it is important to conservatively estimate the peak flowrate of water coming into the system to ensure that the inlets, pipes, and detention basins can handle the flow without loss of property or life.

How do we conservatively estimate the peak flowrate the system will have to handle? Well, it is both very simple and very complicated. There are four primary variables we have to determine. The first is the run-off coefficient. This coefficient is a function of the surface material and covering on the ground. A sandy soil with heavy natural growth will have a lower run-off coefficient than an asphalt parking lot. In other words, the run-off coefficient is an estimate of how much water will run-off and how much will soak in. The second variable is the time of concentration. This is an estimate of how long it will take run off to go from the farthest reaches of the watershed to the discharge point. The third variable is the rainfall intensity at the time of concentration. Usually, engineers use historical data at different time intervals to determine the peak rainfall for a given time. Lastly, we have to know what the area of the watershed is. Sometimes, that is just the area draining into a single inlet. In other cases, it could be a watershed the size of Indiana, or even larger. The peak flowrate for the watershed is then calculated as the run-off coefficient multiplied by the rainfall intensity at the time of concentration multiplied by the area of the watershed. Keeping the units straight can be tough, but you should end up with flowrate expressed in cubic feet per second (cfs).

Well, hopefully you aren't too confused. As always, if you have any questions, please give us a call. See you next month.

D. A. Brown
Engineering Consultants Inc.

702 Goodwin Place
PO Box 128
Kendallville, IN 46755
Phone: (260) 347-5599
Fax: (260) 347-9484
Email: dabec@dabrownengineering.com
Website: www.dabrownengineering.com

DABEC DIGEST

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WHAT IS A REGULATED DRAIN?

According to IC 36-9-27-2 "Regulated Drain" means an open drain, a tiled drain, or a combination of the two. "Open drain" means a natural or artificial open channel that: (1) carries surplus water; and (2) was established under or made subject to any drainage statute. "Tiled drain" means a tiled channel that: (1) carries surplus water; and (2) was established under or made subject to any drainage statute.

Well, now that we have been exposed to that factoid, who really cares? And what significance could that bit of trivia have on the rest of my life? Why should I have any interest in a state statute originally enacted in 1965--nearly 40 years ago?

We are going to take a Cliff's Notes kind of review of IC 36-9-27 which is commonly referred to as the Indiana Drainage Code and how it impacts our daily lives. It potentially affects anyone owning land, using land, and/or trying to develop land.

Having a reliable means for removing runoff water is a major concern as people inhabit portions of the earth. This is necessary to eliminate or minimize damage from periodic flooding and to remove standing water that prevents or minimizes other uses such as farming.

Many of the settlers moving into the new state of Indiana were farmers, and reliable drainage is essential to raising a good crop. In the hills of southern Indiana with the steep slopes and numerous natural waterways very little additional drainage is required. But in the middle and northern portions of the state with flatter slopes, more depressional areas, and numerous lakes it became necessary to provide better drainage systems in order to settle and use the land.

Indiana has had many statutes relating to drainage. Many different methods were used for new construction, reconstruction, and repairing drains. Jurisdiction was variously placed with the Circuit Court, County Commissioners, Drainage Commission/Commissioners, County Surveyor, etc., etc. Most of these methods were cumbersome, costly, and time consuming.

Many common questions and occurrences were not addressed or very difficult to address: What about a drain affecting more than one county? Who has authority to remove obstructions? Who pays? Who has the right to enter onto the land of others bordering the drain? Who can initiate work? Who is qualified to decide what work needs to be done? How is the work to be financed? What is the basis for determining who pays and how much? Who can object and on what basis? How can a drain be maintained in good condition? Who determines how the drain can be used?

Mr. Bill Sweet, former Allen County Surveyor, is commonly considered as the person instrumental in formulating the major provisions in the 1965 statute. Passage of this legislation resulted in major reform and consolidation of Indiana's method of establishing and maintaining drainage systems.

The Code placed jurisdiction for all Regulated Drains under the County Drainage Board. In most counties this board is comprised of the three County Commissioners, but the Commissioners can appoint one of their own members

DETERMINING ASSESSMENTS

Who is responsible for paying and how much creates most of the controversary in drainage hearings. The Drainage Code identifies 9 factors that the Board "may" consider in determining benefits (assessments) to land for construction, reconstruction, or maintenance:

1) The affected watershed;
2) Number of acres in each tract;
3) Total volume of water and portion contributed by each tract;
4) Land use;
5) Increased value accruing to each tract;
6) Location of each tract (adjacent, upland, upstream, downstream) in relation to the main trunk of the drain;
7) Elimination or reduction of damage from floods;
8) Soil types; and
9) Any other factors affecting the work.

In determining benefits or damages the Board may examine aerial photographs, topographical or other maps, and may visit the site. The Board may also consider percentages used in previous assesment roles for the Drain.

Determining benefits and damages is very difficult and time consuming. The resulting assessment role is one of the most inspected parts of the Surveyor's report and most commonly used basis for remonstrance.

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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:

The 1965 Drainage Code created a right-of-way for all Regulated Drains 150 feet wide.

2) True or False:

Each Regulated Drain in a county is under the jurisdiction of the County Drainage Board.

3) True or False:

The Drainage Code has no impact on persons developing property.

4) True or False

The County Surveyor is to use the standards of design contained in the Drainage Code.

Fax or email your answers to Brian at D. A. Brown Engineering Consultants by October 31, 2003 for a chance to win valuable DABEC Merchandise.

WHAT IS A REGULATED DRAIN?

along with 2-4 other persons as members. The Board is responsible for having regularly scheduled meetings, for holding public hearings, and for various other duties. Although there is one Drainage Code for the state, there are separate interpretations and ways of administering it within each county.

Obviously, in order to work on a drain an easement or right-of-way is required. One of the most controversial provisions of the Drainage Code was the immediate creation of an easement (or right of entry) along all drainage paths defined as "legal drains" (now called "regulated drains"). This right-of-way is 75 feet on each side of the centerline of a tiled drain; and it is 75 feet on each side of open drains as measured from the top edge of each bank of an open drain as determined by the county surveyor. Some counties in southern Indiana have no regulated drains, but others in northern portions of the state have as much as 1000 miles of regulated drains. This right-of-way obviously has a big impact on how many acres of property can be used in those counties. The Drainage Board can grant variances for use within that right-of-way and under certain circumstances may also reduce it to a minimum of 15 feet on each side of a tile or 25 feet on each side of an open drain.

The County Surveyor is to classify all regulated drains in the county as being in need of reconstruction, periodic maintenance, or vacation. The Surveyor may also consider an urban classification under certain conditions. A basic goal of the Code was to get all drains in working order through reconstruction and then create a periodic maintenance fund to keep them working. Reconstruction is costly and difficult to implement, so many counties have established maintenance funds to deal with problems as they arise. This method has severe limitations. All drainage work is paid for by the people who benefit from it; this is interpreted to mean persons within the watershed of the subject drain.

The Code states that the Surveyor is the technical authority on existing and proposed Regulated Drains. It also places many other reponsibilities on the County Surveyor: Investigating and evaluating all drains; Preparing reports, plans, and specifications for proposed work; Preparing standards of design; Supervising all drainage work; Cataloging and Filing drainage records; Reviewing and approving connections to Regulated Drains; and Removing obstructions.

The Code requires that any person "who lays out a subdivision of lots or lands outside the corporate boundaries of any municipality must submit plans and specifications...the drainage board must approve the drainage plan before the person may proceed with development of the subdivision." In an urbanizing area this requirement places a large work load on the Surveyor and Board. Also, all landowners and developers must be aware of this requirement.

Hopefully, we all know more about the significance of Regulated Drains. If you have any questions, please give us a call. See you next month.

D. A. Brown
Engineering Consultants Inc.

702 Goodwin Place
PO Box 128
Kendallville, IN 46755
Phone: (260) 347-5599
Fax: (260) 347-9484
Email: dabec@dabrownengineering.com
Website: www.dabrownengineering.com

DABEC DIGEST

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WHEN I GROW UP..... I WANT TO BE AN ENGINEER.

When I grow up.....we hear that phrase a lot from kids as they are developing dreams and goals for their lives. Most of the time, the occupation listed at the end of the sentence is: fireman, doctor, lawyer, clown, astronaut, cowboy, or some other equally exciting career. But, what if they do want to be an engineer? How exactly does someone become an engineer in the first place? What is an engineer, anyway? Hopefully we can answer some of those questions with this issue, just in case your child, niece, or nephew comes and asks.

Someone once said, "An engineer is someone who can do with one dollar what anyone can do with two." That phrase really sums up an engineer's job description. While an engineer's primary job is to protect the safety of the public, engineers must also protect the investment of their clients. In other words, engineers have to provide safe designs at an economical price.

Engineers come in all shapes and sizes. There are no pre-requisites in terms of personality type, age, race, culture or religion. Some traits that are common to most engineers are: a desire to solve problems, find correct answers, and develop innovative solutions.

DESIRE TO SOLVE PROBLEMS

Solving problems is key to almost any engineering challenge. These problems come in many different forms, and if they didn't exist, an engineer wouldn't have a job. A computer engineer might be facing the problem of interfacing two dissimilar electronic gadgets while a structural engineer is trying to solve the problem of setting foundations under water.

Most future engineers love to get into a problem, diagnose it, and try to solve it. If your young person doesn't love to put their mind into a problem and work away at it until it's solved, they may not enjoy the engineering field as a full-time job.

FINDING CORRECT ANSWERS

You might think that solving a problem involves finding correct answers, and it does sometimes. However, it is possible to solve a problem with an incorrect answer, and that can lead to disastrous results. For an engineer, an incorrect answer is worse than no answer at all. Let me give you an example (completely fictional):

Suppose a young mechanical engineer working for a major transportation company is given the job of sizing the disc brake rotor for a semi-tractor they are manufacturing. This young engineer calculates an answer for the dimensions of the rotor, the company builds a prototype and tests it and everything looks good so they go into production. The first summer the rigs are on the road 10 tractors go out of control on down-grades and crash resulting in several fatalities and a lot of property damage.

D. A. Brown
Engineering Consultants Inc.

NOT A WORD PROBLEM!!!!!

Engineers were those kids that drove you nuts in school because they like word problems. Here is one to refresh your memory: (the names of those participating will be changed to protect the innocent)

Chicago's Union Station and New York's Grand Central Station are 973 miles apart by rail. Train A leaves Grand Central at 1:08 pm Eastern Time headed for Chicago. Train B leaves Chicago headed for Grand Central at 2:13 Central Time. Train A travels at a constant speed of 46 mph (which by the way is impossible, it must accelerate and decelerate, but we are not going to nerd-it-up that much :-) and Train B travels at a constant speed of 38 mph.

1) How far from Chicago's Union Station will the trains meet each other?

2) At what time will the trains meet each other?

3) What time (local) will Train B arrive at Grand Central Station?

4) What time (local) will Train A arrive at Chicago's Union Station?

5) Does Chicago even have a Union Station?

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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:

A new graduate of an accredited Engineering School is a Professional Engineer.

2) True or False:

Engineers take very few mathematics classes.

3) True or False:

The Fundamentals of Engineering test is usually taken right around graduation.

4) True or False

The answer to #5 from the word problem on the front is "yes."

Fax or email your answers to Brian at D. A. Brown Engineering Consultants by November 30, 2003 for a chance to win valuable DABEC Merchandise.

WHEN I GROW UP, CONTINUED.....

The answer the engineer developed was correct in some situations, because the testing proved that the rotors worked, but the rotors wouldn't stand up to summer-time heat and prolonged braking down hills. Finding a correct answer is key to solving problems.

It is also important to note that there can be more than one correct answer. In fact, everything above the safety line is correct. For example, if a 2x4 will safely hold your weight, then a 2x6, 2x8, 2x10, etc. will also work. Each answer is correct, but only one provides the best solution. Which leads us to our third character trait.

DEVELOPING INNOVATIVE SOLUTIONS

This character trait is what separates the "men from the boys," so to speak. An effective, innovative solution provides a high safety margin, a low construction cost, and a low maintenance factor. A truly effective and innovative solution can put an engineer on the map, like Thomas Edison or Henry Ford. Seeking out fresh solutions to old problems and developing them into reality keeps most engineers coming back to work in the morning.

So, how do you "grow up to be an engineer?" During elementary and secondary schools take as many science and mathematics courses as your school offers. If you don't really like science or math, engineering is probably not for you. College education for disciplines like: Civil, Chemical, Computer, Electrical, Geotechnical, Mechanical, and Structural Engineering require loads of science and math. Most engineering students have to take three semesters of calculus, two semesters of differential equations, probability, statistics, and linear algebra. Most colleges assume you already know algebra, geometry, and trigonometry. Science courses in Chemistry, Mechanics of Materials, and Physics are the norm for college majors in engineering, as well.

Once you are ready to graduate from college a standardized test called the Fundamentals of Engineering (FE) is taken by those wishing to pursue a Professional Engineering License (PE). The relatively small percentage of the students that pass the FE can then sit for the PE exam after four years of work experience under the supervision of a PE. Again, a relatively small percentage of those that take the PE exam pass it. Once you have passed the PE exam you are officially an Engineer. (Whew! Finally!)

If you know someone who is interested in pursuing engineering for their life's work, have them give us a call and we would be happy to share our experiences and advice with them. See you next month...

D. A. Brown
Engineering Consultants Inc.

702 Goodwin Place
PO Box 128
Kendallville, IN 46755
Phone: (260) 347-5599
Fax: (260) 347-9484
Email: dabec@dabrownengineering.com
Website: www.dabrownengineering.com

DABEC DIGEST

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MERRY CHRISTMAS, AND HAPPY NEW YEAR!

Since you guys have been sooo good and have stuck with us through all of those brainiac articles this year, we thought it would be nice to give the gift of laughter in our Christmas Issue. We searched the World Wide Web and came up with these little gems that fall under the category of "Stupid Crooks." Have fun!!!

A woman in Grand Forks, North Dakota was testifying at the trial of two men accused of beating her up and robbing her at gunpoint. The woman burst into tears as she described the ordeal. The prosecutor listened intently to the story, paused, then asked "And are the two perpetrators of this terrible crime present in the courtroom today?" immediately, The defendants both raised their hands and said "Here!"

It seems a man, wanting to rob a downtown Bank of America, walked into the branch and wrote: "This iz a stikkup. Put all your muny in this bag." While standing in line, waiting to give his note to the teller, he began to worry that someone had seen him write the note and might call the police before he reached the teller window.

So he left the Bank of America and crossed the street to Wells Fargo. After waiting a few minutes in line, he handed his note to the Wells Fargo teller. She read it and, surmising from his spelling errors that he was not the brightest light in the harbor, told him that she could not accept his stick up note because it was written on a Bank of America deposit slip and that he would either have to fill out a Wells Fargo deposit slip or go back to Bank of America.

Looking somewhat defeated, the man said "OK" and left the Wells Fargo. The Wells Fargo teller then called the police who arrested the man a few minutes later, as he was waiting in line back at the Bank of America.

Police got a call one morning from Dennis Quigly, the owner of a motor home. Dennis had been inside his motor home when he heard weird noises from outside. Apparently, a thief was trying to siphon gas from his vehicle. (Siphoning is when you transport liquid from one place to another, usually using a rubber hose.) You gotta suck on the hose to get the liquid moving, sometimes getting a mouthful. This thief sure got a mouthful - of sewage! He'd sucked from the wrong tank. Police found vomit on the ground beside a young man who was curled up in a ball. No charges were pressed because Dennis thought the dumb thief had suffered enough.

A convicted criminal being escorted to jail in St. Petersburg, Florida, somehow managed to escape and go on the lam. During his escape, however, he suffered several deep cuts to his feet, but even with the loss of blood the criminal was able to vanish into thin air, and the authorities didn't have a clue as to his whereabouts. They got their break from the most unexpected of places — the local hospital. The authorities

D. A. Brown
Engineering Consultants Inc.

HERE ARE TWO MORE STORIES

Oklahoma City: Dennis Newton was on trial for the armed robbery of a convenience store in district court when he fired his lawyer. Assistant district attorney Larry Jones said Newton, 47, was doing a fair job of defending himself until the store manager testified that Newton was the robber. Newton jumped up, accused the woman of lying and then said, "I should of blown your (expletive) head off." The defendant paused, then quickly added, "If I'd been the one that was there." The jury took 20 minutes to convict Newton and recommended a 30-year sentence.

A 22-year-old man was charged with impersonating a sheriff's deputy after he pulled over a pickup truck and then called for assistance when the occupants fled. It appeared that Jeremy Lepianka of Syracuse had been posing as a Onondaga County Sheriff's deputy for about two years and had stopped motorists — and lectured them — on other occasions, police said.

"He told investigators he had been working as a volunteer deputy for about two years. He said traffic violations were his main thing. Hopefully, it didn't go beyond that," Lt. Joe Cecile, a Syracuse police spokesman, said Monday.

"We've never seen anything to this extent. It's one thing to pretend ... but when you call for backup. He had to know he was going to get caught," Cecile said.

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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:

I already have all of my Christmas shopping done.

2) True or False:

Santa drives a sleigh with eight reindeer.

3) True or False:

In the movie "Christmas Vacation", Clark Griswold put up 25,000 twinkling lights on his house.

4) True or False

The shepherds weren't all that impressed with the Heavenly Host's rendition of Silent Night, so they didn't go to see the Child in the manger.

Fax or email your answers to Brian at D. A. Brown Engineering Consultants by December 31, 2003 for a chance to win valuable DABEC Merchandise.

MERRY CHRISTMAS...CONT.

at the hospital got suspicious of their most recent patient — not because of his wounds but because of his words. When asked to fill out the standard hospital forms, on the line about the cause of the injury our escapee wrote, "Escape from jail."

A pair of Michigan robbers entered a record shop nervously waiving revolvers. The first one shouted, "Nobody move!" when his partner moved, the startled first bandit shot him.

Police in Radnor, Pennsylvania, interrogated a suspect by placing a metal colander on his head and connecting it with wires to a photocopy machine. The message "He's lying" was placed in the copier, and police pressed the copy button each time they thought the suspect wasn't telling the truth. Believing the "lie detector" was working, the suspect confessed.

Arkansas: Seems this guy wanted some beer pretty badly. He decided that he'd just throw a cinder block through a liquor store window, grab some booze and run. So he lifted a cinder block over his head and heaved it at the window. When the cinder block hit the window it bounced back and hit the would be thief on the head, knocking him unconscious. The liquor store window was made of Plexiglas. The whole event was caught on videotape.

New York: As a female shopper exited a convenience store, a man grabbed her purse and ran. The clerk called 911 immediately and the woman was able to give them a detailed description of the thief. Within minutes, the police had apprehended the thief. They put him in the police car and drove back to the store. The thief was then taken out of the car and told to stand there for positive ID. To which he replied, "Yes Officer... that's her. That's the lady I stole the purse from."

A Los Angeles super-genius gave himself away during a police line-up. When each man was asked to repeat the words,"Give me all your money or I'll shoot," the man shouted, "Hey that's not what I said."

St. Peters, Missouri - A gunman robbed a 7-11 store, but returned the money minutes later because his car wouldn't start. Amazingly, the store clerks came out to the parking lot and gave the robber's car a jump start. Police Officer David Kuppler commented: "We have a very friendly town out here."

I hope you got a good chuckle out of these stories, I know we did. We want to sincerely thank all of you for your partnership with us this year, we look forward to serving you in 2004. Merry Christmas!!!!!

D. A. Brown
Engineering Consultants Inc.

702 Goodwin Place
PO Box 128
Kendallville, IN 46755
Phone: (260) 347-5599
Fax: (260) 347-9484
Email: dabec@dabrownengineering.com
Website: www.dabrownengineering.com