ONSITE CAN GET COMPLEX

LET’S TRY TO KEEP IT SIMPLE
Sam’s Favorite Sayings

- Onsite contractors are not the cesspool guy

- Approved Permit in Hand on the job site

- If you don’t understand the plans stop & call

- If you can’t install per the permit stop & call
MATCHING THE SYSTEM TO THE SOIL AND SITE
APPROVED CONVENTIONAL ONSITE SYSTEMS IN AL

- **Gravel**: in rules-sizing in rules-since 1930’s?
- **Gravel-less Pipe**: in rules-sizing in rules-
  @1989
- **Chambers**: via a Variance with Product Permit-sizing in Variance/Product Permit-1992
- **Polystyrene Aggregate**: via a Variance with Product Permit-sizing in Variance/Product Permit-1992
- **Tire Chips?**
HAVE YOU THOUGHT ABOUT IT?

WHAT DOES IT TAKE BY SOMEONE TO GET AN ONSITE SYSTEM APPROVED: FROM LOT PURCHASE TO INSTALLATION?
Information Needed

- Working knowledge of state and/or local rules
- Wastewater flow and characteristics
- System/site/soil considerations
  - System requirements and performance
  - Site data
  - Soils data
Rules and pertinent information

- State rules and regulations
  - Sizing, construction & installation standards
  - Siting requirements
  - Soil requirements
  - Site conditions and variability
Wastewater flow and characteristics

- Wastewater quantity and quality
- Type of activity, size of facility

Note: The above information will influence what can be done on a given site with given soils
System Requirements and Performance

- Conventional
- Engineered
- Alternative

Advanced treatment:
- Aerobic Units
- Peat
- Sand & Fabric Filters
Site Information

- Available space
  - Set-backs
- Topography
  - Drainage
- Features
  - Well
  - Streams
  - Etc.
- Off site conditions
Soils Data

- Usable depth
- Percolation Rates
- Loading rates
Public Health and Water Quality Issues

- Must allow for aerobic zone beneath field

**HOW DO WE DO THAT?**

- Major options include:
  - Depth of trench bottom (infiltrative surface)
  - Loading rate at several depths in the soil
  - Distribution system
Why Are We Concerned About Wastewater?

- Protection of Public Health
- Protection of the Environment
First signs of plumbing in Scotland

About 8000 B.C. in Scotland where evidence has been found of indoor plumbing pipes or troughs that carried water and wastes out to a nearby creek.
Sewage in Iraq

Approximately 4000 BC in Iraq, man was using the percolation system of drainage of waste as evidenced by what appeared to be round, vertical cesspits under the homes, 30 to 40 feet deep, lined with perforated brick.
Sewage in Pakistan

3000 to 2000 B.C., the inhabitants of Mohenjo-Daro (in modern-day Pakistan) began assigning a separate room in the house to be a latrine room. Here drains were connected to a sewer in the street; ultimately the wastes went to either the Indus River or to large cesspits.
Flush toilets first used circa 3000 B.C. in Crete

On the Isle of Crete, flush toilets, with overhead reservoirs filled and flushed by servants or slaves, were used.
"Cloaca Maxima" - In Rome

Rome work began on a sewer system-the "Cloaca Maxima"- in 735 B.C. and was not finished until 225 years later. But also consider, that same sewer is still being put to some use today.
Rome Falls (& Sewer in Ill Repair) in the Middle Ages

Wastes were thrown into the streets, out doors, and from overhead windows.

It was this habit, that led to the "Dejecti Efflusive Act" in Rome, which allowed one to collect damages from being hit by wastes.
Sewage Etiquette

It was also during this time that, it became polite for the gentleman to walk on the outside of a lady when walking down a street. This way, the gentleman would be more in the line of fire from wastes being thrown from overhead.

Some people think this custom was to protect a lady from being splashed by a passing carriage, but it believed it actually derives from the waste throwing.
Louis M. Mouras of France is generally credited with developing the modern septic tank and in 1881 obtained a patent on a device he named the “Mouras Automatic Scavenger”.

Some Said The invention of the century
In 1881, in Vesoul, France a man by the name of Jean-Louis Mouras applied for a patent for an "automatic and odorless cesspit". Mouras had observed that part of the feces went from the solid state to the liquid state when the waste water from toilets and sinks was allowed to remain in a watertight container. Mouras had discovered that bacteria that did not need oxygen to survive (anaerobic), could liquefy feces when placed in a septic environment. It was quite a discovery because feces always remain solid in the environment of a latrine. Mouras understood that anaerobic bacteria in a septic container (he could not find a name for it) would be more hygienic than the latrines.
The presbytery becomes a testing bench - Jean-Louis Mouras was a lucky man & so are we. Thanks to a parish priest, Mr. Moigno, his discovery became a worldwide success. This good old soul was to be Mouras' most ardent researcher & propagandist. Moigno was curious by nature & was interested in science like many religious men of that period. Intrigued by Mouras' discovery, Moigno built a septic chamber in his presbytery so that he could observe what was happening on a daily basis through a glass wall. It was his aquarium so to speak & his testing bench. His observations attracted the scientific community as well as the ordinary people. For a good reason! Try to imagine the reactions of the poor parishioners who saw their parish priest go from spiritual matters to fecal matters without blinking an eye!
Septic tank was not coined until 1895, when Donald Cameron installed a water-tight covered basin to treat wastewater by anaerobic decomposition. He named his device the "septic tank." The following is a description of the tank.

The tank at Exeter, England, was an underground tank of cement concrete, 65 ft long, 19 ft wide, and with an average depth of 7 ft, and having a capacity of 53,000 gallons. The tank was covered with a concrete arch, and a portion near the inlets was made about 3' deeper than the rest and partially cut off by a low wall, forming a couple of pockets or grit chambers, to retain sand, grit and road washings.
The inlet was carried down to a depth of 5' below the surface, so that air could not make its way down with the sewage, and also so that gases could not escape from the tank back into the sewer. The effluent outlet was also below the level of the liquid, & to avoid currents that might be liable to carry floating matter from the surface a cast-iron pipe was carried across the whole width of the tank 15 inches below the surface, and on the lower side of this pipe was a continuous opening about half an inch in width. An iron pipe about one and a half inches in diameter extended up out of the top of the tank to allow the escape of gases, and the whole tank could be inspected from a central manhole provided with glass window.
What Takes Place in the Septic Tank?
What Takes Place in the Septic Tank?

• All of the wastewaters from the home should flow into the septic tank.
What Happens After the **FLUSH**?

Simply: What does the Septic Tank Do?
What Takes Place in the Septic Tank?

Even waters from the shower, bathtub, & washing machine can contain disease-causing germs or environmental pollutants.
Sources of Household Sewage

<table>
<thead>
<tr>
<th>Source</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Toilet</td>
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</tr>
<tr>
<td>Bathing</td>
<td>30</td>
</tr>
<tr>
<td>Laundry</td>
<td>15</td>
</tr>
<tr>
<td>Kitchen</td>
<td>10</td>
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</tbody>
</table>
SETTLES SOLIDS & FLOATS FATS

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Septic tank cross section

Figure 1
What Takes Place in the Tank?

Wastewater flows into the tank, the heavier solid materials settle to the bottom (forming a sludge layer), the lighter greases and fats float to the top (forming a scum layer), and the liquid (sewage effluent) flows out of the tank.

An outlet baffle (or a sanitary tee at the outlet end) prevents solids from flowing out with the liquids. The tank's primary purpose is to retain the solids while releasing sewage effluent to the drainfield.
WHY DO WE CARE ABOUT SOIL?
Aerobic zone

Well

Groundwater

Aerobic soil
Wastewater Treatment Plant Processes

- Physical
- Biological and Chemical
- Treatment, Disposal or Reuse
WHAT IS THE SINGLE LARGEST WASTEWATER TREATMENT PLANT?

(In the World)
Treats and disperses wastewater for 25% of the United States & 47% of Alabama’s Population
Importance of Soil to On-site Wastewater

- Biological treatment
- Chemical treatment
- Physical treatment
- Dispersal & Disposal
In a septic system, wastewater is treated by a septic tank and an absorption field.
What Happens in the Drainfield and the Soil?

Sewage effluent flows out of the tank as a cloudy liquid that still contains many disease-causing germs and environmental pollutants. The real treatment of the wastewater occurs in the unsaturated soil beneath the drainfield.
What Happens in the Drainfield and the Soil?

Effluent flows into the perforated pipe in the trenches, passes through the holes in the pipe, and then trickles down through the gravel to the soil.
* Or Chambers, Gravel-less Pipe, Polystyrene Aggregate (EPS)
What Happens in the Drainfield and the Soil?

• As effluent enters & flows through the soil, many bacteria that can cause diseases are filtered out.

• Some smaller germs, such as viruses, are adsorbed by the soil until they are destroyed.

• The soil can also retain certain chemicals, including phosphorus & some forms of nitrogen.
Biomat:
The *biological mat* (biomat) is a black, jelly-like mat about one to two inches thick, that forms at the gravel-soil interface at the bottom and sidewalls of the drainfield trench. The biomat is composed of microorganisms (and their byproducts) that anchor themselves to soil and rock particles, and whose food is the organic matter in the septic tank effluent. Since the biomat has a low permeability, it serves as a valve to slow down and control the rate of flow out of the trench into the drainfield soil, and also serves as a filter to provide effluent treatment. Also known as a clogging mat.
Why Install Shallow?

SOIL BIOTA POPULATION

VS

SOIL DEPTH

98.7%

0.9%

0.4%

16 inches

30 inches

Orenco
Why Install Shallow?
UPS TRUCK

In the late 1970’s I Used an OLD Plain Brown UPS Truck in My Training Classes—NOW they’ve Added FLAMES —So AS NOT TO BE BEHIND TIMES-
UPS Racer
UPS
Unsaturated
Permeable
Soil

FIELD MEASUREMENT OF PERCOLATION RATE

Reference Stick
Measuring Stick
Measure Drop Per Hour Here

Gravel
Aerobic zone
ALABAMA ONSITE RULES

http://www.adph.org/environmental/onsitesewage.pdf

AL DEPT PUBLIC HEALTH: ENVIRO SERVICES

http://www.adph.org/environmental/Default.asp?TemplateNbr=0&TemplateId=471&DeptId=94

WISCONSIN: ONSITE HISTORY

CONSORT. INSTITUTIONS DECEN WASTEWATER

http://www.onsiteconsortium.org

NATIONAL SMALL FLOWS CLEARINGHOUSE- Subscribe

http://www.nesc.wvu.edu/nsfc/nsfc_index.htm

PURDUE ONSITE SITE

http://www.ces.purdue.edu/onsite/
HOME INSPECTION WEB SITE

http://www.inspect-ny.com/septbook.htm

EPA: PRINCIPALS & DESIGN OF ONSITE

http://www.epa.gov/seahome/septics/src/title.htm

THE TOILET MUSEUM

http://www.toiletmuseum.com/
NOWRA: NATIONAL ONSITE WASTEWATER RECYCLING ASSOC.

http://www.nowra.org/  JOIN

Canadian Site?

http://fapel.org/english/ansepti.htm