INSTALLER BASICS

DISCLAIMER:
The use of trade names or images in this training presentation does not constitute an endorsement or recommendation by the Arkansas Department of Health.

All references to trade names or use of product images are for educational purposes only.

Act 402 of 1977
• Individual Sewage Disposal Permits
• Subdivision Review
• Licenses for:
  Installers
  Designated Representatives
  Septic Tank Manufacturers
  Certified Monitoring Personnel
• Ten Acre Exemption:
  200 Foot Setback from Boundaries
  Does not apply to ADEQ requirements
• Fees
• Violations are a misdemeanors that may result in maximum fines of $1,000.
Rules and Regulations Pertaining to Onsite Wastewater System

- Found on ADH Website
  www.healthy.arkansas.gov
- Copy in Installer Packet
- Last Revision August 2019

Arkansas Department of Environmental Quality (ADEQ)
- Individual Treatment Facilities ARG550000
- Modification Effective Date: July 1, 2019 increase size of treatment unit to 1500 gpd
- Effective Date: July 1, 2019
- Expiration Date: June 30, 2024

Onsite Wastewater System utilizing Surface Discharge (i.e. ATU, PMF, Sand filter)

* ADEQ ARG550000 Permit Required (regardless of acreage)

INSTALLER LICENSING REQUIREMENTS

- Pass Licensing Test
- Annual Training Course
- $100 Annual License Fee
- License Expires December 31
- License Renewable January 1
- 50% Late Fee After March 1
- Delinquent for more than one year, requires retesting
THE APPROVED PERMIT

- Individual Onsite Wastewater System Application (EHP-19)
- Completed by Designated Representative (DR)
- Soil & Site Information
- Signed on Line 21 by Environmental Specialist
- Good for 1 year without Revalidation
- No Changes or Substitutions without DR’s Authorization
- Installation Inspection and Permit for Operation
THE PLAT DRAWING
Plan(s) Attached to the Permit Form
Drawing Shows:
• House, Property Lines, & Setbacks
• Septic Tank Location
• Pump Tank Locations (if any)
• Solid Pipes, Cleanouts, & Distribution Box
• Absorption Trenches on Contour
• Other Important Details

OTHER DOCUMENTS
• Pump Curves & Specification Sheets
• Memorandum of Agreement
• Monitoring Contracts
• Installation Instructions
• Vicinity Map
NEW PRODUCTS
Reviewed & Authorized by
Onsite Wastewater Product
Review Committee

Listed On:
Authorized Onsite Wastewater Products List
Agency Website
www.healthy.arkansas.gov/programs-
services/topics/onsite-wastewater
Grouped by Categories

IMPORTANT POINTS

! 24 Hour Notice to EHS Required
Before Installation Begins
Sec. 4.7

! Licensed Installer Must Be On Site
During Entire Installation
Sec 14.1

SYSTEM INSPECTIONS

EHS May Authorize Designated
Representative To Make Final Inspection
Final Inspections May Be Conducted by:
• Environmental Health Specialist
• Designated Representative

If no final inspection, installer completes Part 2 of the
EHP-19 and signs the System Installation Verification
Section.
In addition, installer must sign and submit the
Installation Specification Sheet (EHP-6) to the local
health unit within 5 working days!
MINIMUM SET BACKS

HORIZONTAL DISTANCES FROM ALL SEWAGE SYSTEM COMPONENTS

- 300 Feet From High Water Mark of Lakes If Within One Quarter (¼) Mile of Water a Supply Intake Structure
- 300 Feet From Any Spring Used as a Source of Domestic Water
- 100 Feet From a Domestic Water Well
- 100 Feet From High Water Mark of Streams & Lakes
- 100 Feet from Ponds on Other Property or 50 feet from Ponds on the Same Property
- 10 Feet From Dwellings
- 10 Feet From Property Lines
- 10 Feet From Water Service Lines
Recommendations Before Final Bid on an Installation

- Review permit completely for all construction details
- Site Visit and Review
- Locate Stub Out (if applicable)
- Take elevations (if concerned)
- Locate required supplies and suppliers
- When in doubt, ask for assistance!
- Signed Contracts with homeowner (optional)

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BENCHMARK

The Reference Point For The System

Established By The DR
Shown On Permit
Permanent Location

Either:
- Arbitrary Elevation (Example: Benchmark 100')
- Actual Ground Elevations

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Leveling Rods

Two Types are available

- “Architects” (graduated in feet, inches and eighths of an inch)
- “Engineers” (graduated in feet, tenths, and hundredths of a foot), *Tenths Grade Rod*
Architects Leveling Rod

3 feet 2 ¾ inches

2 feet 11 inches

Engineers Leveling Rod

2.50 ft.

2.59 ft.

2.55 ft.

Rod Reading Conversions

Convert Tenths of Foot to Inches

Multiply the (tenths of foot) by 12.

Example:
The rod reading is 5.2 feet.
Calculation: 0.2 foot x 12 inches/foot = 2.4 inches
Converts to 5 feet 2.4 inches.
Rod Reading Conversions

Convert Inches to Tenths of Foot

- Divide the (inches) by 12.

Example:
The rod reading is 3 feet 6 inches (3’6”).
Calculation: 6 inches ÷ 12 inches/foot = 0.50 foot
Converts to 3.50 feet.

SITE PREPARATION

Find Primary Absorption Field Area
- Look For DR’s Flags
- Locate Benchmark
- Check Soil Moisture
- Avoid Soil Compaction
- Avoid Smearing Trench Walls

Keep Heavy Equipment Off of Both Primary & Secondary Absorption Field Sites
- Use Low Impact Tracked Equipment When Possible
- Minimize Vehicle Traffic

Soil Smearing

Smearing of sidewalls and bottoms reduces the absorption rate

Two critical factors: How wet is the soil?
What is the soil’s clay content?

Roll the soil between your thumb and index finger. If the soil forms a ribbon it is too wet to install the lateral field
### Soil Compaction

When soil particles are compressed, the void spaces in the soil are eliminated. This also damages the soil structure. The result is less storage in the soil and reduced hydraulic conductivity.

Use low impact track equipment whenever possible. All traffic on the absorption site should be avoided during wet conditions.

![Soil compaction image](image)

### SITE CLEARING & GRUBBING

Have A Specific Plan For Each Site

- Leave Top Soil
- Cut Trees Flush To Ground
- Only Remove Roots That Interfere With Trenches
- Remaining Roots Will Rot
- Use Stump Grinder On Stumps

Rake Smeared Sidewalls to Depth of 1 Inch

### HOUSE SEWER LINE

Septic Tank Inlet & Outlet Pipes Must Be Schedule 40 PVC

- Slope On “Inlet” Pipe min. $\frac{1}{8}$ Inch Per Foot
- 4 Inch Cleanout Required Before Entering Tank Every 100 Feet
- Changes In Direction > 45°
SEPTIC TANK
Primary Wastewater Treatment

- Separates Solids From Liquids
  - **Scum Layer**: Floats to surface and may contain Fats, Oils & Grease
  - **Sludge Layer**: Solids sink to the bottom and may contain Heavier Organic & Inorganic Materials
- Start of Biological Process Using Anaerobic Bacteria
- Stores Solids For Future Removal

Profile of a typical septic tank

SEPTIC TANKS
Size Specified on Application Form (EHP-19 line 20a)
Concrete, Fiberglass, or Plastic
Minimum Size 1000 Gallons
Designated Representative Specifies:
Tank Manufacturer
Size (Gallons)
Material
Location on Lot
Outlet Flow-line

NO CHANGES WITHOUT DR’s OK!
Concrete Septic Tank

Plastic & Fiberglass Septic Tanks

SEPTIC TANK SIZE

Residential
1, 2, & 3 Bedrooms  1000 Gallons
4 Bedrooms  1250 Gallons
250 Gallons for Each Additional Bedroom

Commercial Establishments
Capacity Equal to 48 Hour Flow min.
**SEPTIC TANK DETAILS**

- Minimum of 10 Feet From House
- Inlet Baffle Extends 6 Inches Below Liquid Level
- Outlet Baffle Must Extend 35%-45% of Liquid Depth
- Risers Required Over Both Inlets & Outlets
- DR May Specify Effluent Filter

**ALL SEPTIC TANKS MUST BE WATER TIGHT**

Potential Problems During a Significant Rain Event and/or Wet Season

Ground Water Infiltration:
- Hydraulic Overload of the Absorption Field
- Excessive Pump Run Time
- Groundwater Contamination
Follow manufacturers directions for proper fit of pipe into seal.

SEPTIC & PUMP TANK INSTALLATION

DR Selects:
All Tank Locations
Tank Depths

• Tank Holes Must Be Large Enough for Backfilling
• Tanks May Need to be Bedded on Sand or Gravel
• Fill Tanks With Water To Prevent Floating
• All Tanks Must Be Watertight

CALCULATING INSTALLATION DEPTH

The system design calls for the septic tank outlet to be installed at ground level. The outside dimensions of Ernie’s 1000 gallon septic tank are:

Length 103 inches  Width 54 inches  Height 64 inches

Inlet height 55 inches  Outlet height 52 inches

Include the gravel used to bed the tank (example 3 inches).

How deep should the tank hole be?
### CALCULATING INSTALLATION DEPTH

<table>
<thead>
<tr>
<th>Outlet height</th>
<th>52 inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravel bedding + 3 inches</td>
<td></td>
</tr>
</tbody>
</table>

**55 total inches**

The tank hole needs to be **55 inches deep**

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### SEPTIC TANK BAFFLES

**Inlet & Outlet Baffles Supplied By Manufacturer**

**Check For Correct Length**

**Inlet Baffle**
- Measure Drop between Tank Inlet & Outlet
- Add 6 Inches

**Outlet Baffle**
- Measure From Floor of Tank to Bottom of Outlet
- Multiply by 0.35 or 0.45

**HINTS:**
1. Do All Measurements In Inches
2. Flow Line Means Bottom of Pipe

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### EXAMPLES

**Inlet Baffle**
- 3 inch drop across tank + 6 inch baffle length = 9 inches

**Outlet Baffle**
- 43 inches floor of tank to outlet $\times 0.35 = 15.0$ inches
- $\text{or}$
- 43 inches floor of tank to outlet $\times 0.45 = 19.4$ inches

Outlet baffle may be between **15.0 & 19.4 inches**

! **HINT:** Do All Measurements In Inches!
CALCULATING WATER DEPTH

The inside dimensions of Ernie’s 1000-gallon septic tank are:

- Length 97 in.
- Width 48 in.
- Height 59 in.
- Inlet height 52 in.
- Outlet height 49 in.

The installation instructions provided with the tank indicate a minimum of 350 gallons of water is needed as a ballast (in case of a rain event or high seasonal water tables, prevents the tank from “floating”).

What is the minimum depth of water needed to meet this requirement?

CALCULATING WATER DEPTH

Volume of 1 inch of Water (gallons) = \(\frac{\text{Inside Length} \times \text{Inside Width} \times \text{Depth}}{231 \text{ inches}^3 / \text{gallon}}\)

1 Inch of volume = \(\frac{97 \text{ in.} \times 48 \text{ in.} \times 1 \text{ in.}}{231 \text{ in.}^3 / \text{gallon}} = 20.2 \text{ gal.}\)

\(\frac{350 \text{ gallons}}{20.2 \text{ gal. / in}} = 17.3 \text{ in. depth}\)
Secondary Wastewater Treatment

Removes dissolved and suspended biological matter. Secondary treatment is typically performed by indigenous water-borne micro-organisms in a managed habitat.

Examples:
- RSF (Recirculation Sand Filter)
- RGF (Recirculation Gravel Filter)
- **ABG (Aerobic Biological Generator)
- **ATU (Aerobic Treatment Unit)
- **PMF (Proprietary Media Filter)
  *Proprietary Components

High Strength Effluent Reduction or Dispersal Field Remediation Devices

- Gravity Distribution
- Pumped Distribution
GRAVITY DISTRIBUTION

- Distribution Box
  (Key: equal distribution)

- Serial Distribution

DISTRIBUTION BOXES
EFFLUENT FLOW CONTROL DEVICES
AKA: Diversion Devices

DISTRIBUTION BOX
Materials
Concrete
Plastic
Bedded on Undisturbed Earth, Gravel, or Concrete
Must Be Level
All Lines Feed the Same
Use Flow Control Devices
4 Inch PVC Solid Pipe In & Out
Schedule 40 PVC
SDR-35 PVC
NO PERFORATED PIPE FOR 5 FEET
ABSORPTION TRENCHES

- Installed On Contour
- Minimum spacing between the trenches shall be 6 feet between the trenches and 8 feet center to center
- 18 Inches Deep Unless Otherwise Specified by the Designated Representative
- Horizontal separation of 5 feet between the absorption area and tight line trench
- Barrier Material Over Media
  - Geo-Textile
  - Building Paper (Not Roofing Felt)
  - Authorized Media (Follow Manufactures Instructions)

ABSORPTION TRENCH CROSS-SECTION

- Overfill
- Backfill
- Barrier Material
- 4-Inch Perforated Pipe
- 6 Inches
- 1/2 - 1 1/2 Inch Washed Gravel

Absorption Trench
Installed on Contour
With Barrier Material In Place
(Geo-Textile)

Note: Contour line.
**ABSORPTION TRENCHES**

Minimum Number of Trenches is 2
Maximum Length 100 Feet
Min. 8 ft. center to center

Bottom of Trench Level & On Contour
(Level is preferred but tolerant slope on perforated pipe 0-2 Inches/100 Feet)

DR Design May Include:
- Diversion Device
- Serial Distribution
- Over Fill To Allow For Settling

**ABSORPTION TRENCH MEDIA**

Gravel Trench
Washed Gravel
(no fines)

¼ - 1½ Inch Diameter
2 Feet Wide & 1 Foot Deep

4-Inch ASTM-2729 or F-810 Perforated Pipe 6 Inches Above Bottom

Authorized Gravel Substitute
Listed On Authorized Products List & Website
Installed As Specified By Manufacturer

Designated Representative Specifies Media
**TRENCH GRAVEL VOLUME**

\[
\text{Volume in Cubic Feet} = \left( \text{Number of Trenches} \times \frac{\text{Length in ft. of Trenches}}{2} \times \text{Width of trench} \times \text{Depth of gravel} \right) \div 27\text{ ft}^3/\text{Yard}
\]

**EXAMPLE**

Design States 5 Absorption Trenches @ 60 Feet Long

\[
5 \text{ trenches} \times 60\text{ ft} \times 2\text{ ft} \times 1\text{ ft} = 600\text{ ft}^3
\]

\[
600\text{ ft}^3 \div 27\text{ ft}^3/\text{yd} = 22.2\text{ yards}
\]

This Is The Minimum Amount, Get Extra For:
- Spillage
- Bedding Tank(s)

**MAXIMUM STORAGE INSTALLATION AND CONSTRUCTION**

Construction technique where the placement of the distribution box or septic tank flowline allows for maximum storage within a trench as well as the surrounding soil.

The two types of maximum storage installations are:
- Flat or Sloping
Maximum Storage on Flat Ground

- The slope across the drain field starting from line 1 to the last line is < 6 inches.
- The outlet flow line of the septic tank is at or above the highest ground elevation within absorption area.
- Distribution box height is not critical.

Maximum Storage on Sloping Ground

- Elevation change from line 1 to last line is ≥ 6 inches.
- Outlet flow line of D-box is at or above the ground elevation of line 1.

Interceptor Drain (3% or greater slope)

- Trench Width 6”-24” inches
PUMPED DISPERSAL

- Distribution Box
- Low Pressure Distribution (LPD)
  *(Key: equal distribution in small doses)*
- DR Designs Distribution System

Effluent Filters

PUMP TANKS

Large Enough For:
- Dose Volume Specified by DR
- Ballast (to prevent floating) 1/4
- Reserve (surge capacity) 1/3 daily usage

Electrical Connections Protected From Corrosive Gasses
CALCULATIONS
(Rectangular tank)

60 in. X 36 in. X 1 in. = 2160 in³

2160 in³ ÷ 231 in³ / gallon

1 inch = 9.35 gallons

30 gal (dose) ÷ 9.4 gal/in = 3 inch drawdown

HINT: Do All Measurements In Inches

CALCULATIONS
(Round tank)

Dimensions: 50 inches in diameter

Volume = π r²h

V = 3.14 x 25² x 1

V = 3.14 x 625 x 1

V = 1962.5 in³

V = 1963 in³ ÷ 231 in³ / gal≈ 8.49 gal / inch

30 gal dose ÷ 8.5 g / in≈ 3.5 inch drawdown

HINT: Do All Measurements In Inches

FILTERED PUMP VAULTS

• 250 Gallon Larger Septic Tank Required

• Maximum drawdown per Dose Cycle is 3 Inches

• Pump Vault Inlets Between 35%–45% of the Liquid Depth of Tank

• Pumped Effluent Line Goes Out Through Septic Tank Outlet Riser
ELECTRICITY 101

- Watertight connections
  Butt Connectors with heat shrink
  Encapsulated Wire Nuts
- “Seal Off” Kit
- Control Panel Placement (Eye Sight or lockout breakers)
- Pump Curve (TDH, GPM)
- Circuit Disconnect
Example: An Onsite Wastewater System’s control panel requiring 30 amps that is 20 feet from the power source will require a minimum 10 gauge wire.

Important Information:
Fuses and circuit breakers are needed to protect circuits, power components and loads. Fuses and circuit breakers have one main purpose: to break the electrical circuit if the current (amps) flowing in that circuit exceed the rating of the device. Any size fuse may be used safely with the fuse rating being lower than the maximum ampacity of the smallest wire in the circuit. Fuses and circuit breakers are typically able to allow three times their rated current for a few seconds; this is for handling the surge necessary for the starting of motors. In the event of a short circuit, which can cause the sudden draw of hundreds or even thousands of amps through the circuit, the fuse will melt or the circuit breaker will open before the wire catches on fire.

**WIRE SIZE CHART**

<table>
<thead>
<tr>
<th>WIRE SIZE</th>
<th>LOAD AMPS - 120 volts</th>
<th>SINGLE PHASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWG</td>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td>14</td>
<td>56</td>
<td>60</td>
</tr>
<tr>
<td>12</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>10</td>
<td>92</td>
<td>115</td>
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<td>8</td>
<td>117</td>
<td>144</td>
</tr>
<tr>
<td>6</td>
<td>147</td>
<td>192</td>
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</table>

**WIRE SIZE CHART**

<table>
<thead>
<tr>
<th>WIRE SIZE</th>
<th>LOAD AMPS - 240 volts</th>
<th>416 volts</th>
<th>600 volts</th>
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</thead>
<tbody>
<tr>
<td>AWG</td>
<td>14</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>12</td>
<td>148</td>
<td></td>
</tr>
<tr>
<td>12</td>
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<td>103</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>167</td>
<td>129</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>233</td>
<td>187</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>699</td>
<td>336</td>
<td></td>
</tr>
</tbody>
</table>

DOSED DISTRIBUTION BOX

Inlet Pipe 1½ or larger Schedule 40 PVC
Outlet Pipes 4 Inch Schedule 40 PVC
OR SDR-35 PVC
Baffled For Even Flow To All Lines
DR Specifies Construction & All Components
When the soil absorption field is located below the elevation of the pump tank, measures must be taken to prevent the effluent from being siphoned into the absorption field.

**HOW CAN THIS BE PREVENTED?**

1/8 inch hole at head works

**LOW PRESSURE DISTRIBUTION**

Effluent Pump Located In:
- Pump Tank or
- Filtered Pumped Vault

Distribution Grid
- 1¼ to 2 Inch Schedule 40 PVC Pipe
- \(\frac{3}{16}\) to \(\frac{1}{8}\) Inch Holes
- Orifice Shields

DR Specifies Construction & All Components
SQUIRT TEST

Gate Valves

Clean outs

Pressure Manifolds

Orifice Disk must be sized according to the specification found in the permit. Accurate drill size is important when the manifold is used with uneven length lines.
GATE VALVES

Used to ensure equal distribution (squirt height) in a low pressure distribution system

Located at Manifold / Lateral Line Junction

Allow Adjustment During Squirt Test

Require Box or Cover

Dosed or Pumped Distribution

Need to know:

- Tank size (60” x 36”)
- Dose Volume (30 gallons)
- Total Dynamic Head (TDH) (31 ft.)
- TDH = Elevation Head + Friction Loss + Residual Head

Cool factor! 1 gallon of water = 231 cubic inches
FLOW RATE FOR ONE ORIFICE

<table>
<thead>
<tr>
<th>ORIFICE HEAD</th>
<th>FT.</th>
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<tbody>
<tr>
<td>ORIFICE DIAMETER</td>
<td></td>
</tr>
<tr>
<td>1/8&quot;</td>
<td>0.32</td>
</tr>
<tr>
<td>5/32&quot;</td>
<td>0.50</td>
</tr>
<tr>
<td>3/16&quot;</td>
<td>0.72</td>
</tr>
</tbody>
</table>

ORIFICE

<table>
<thead>
<tr>
<th>ORIFICE</th>
<th>DIAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8&quot;</td>
<td>0.32</td>
</tr>
<tr>
<td>5/32&quot;</td>
<td>0.50</td>
</tr>
<tr>
<td>3/16&quot;</td>
<td>0.72</td>
</tr>
</tbody>
</table>

EXAMPLE

5 ft.... squirt height
3/16" orifice size
75 orifices total
5" squirt from a 3/16 orifice is .72 gpm
.72 gpm x 75 orifices =
54 gallons per minute

SELECTING THE PUMP

#1. Plot the point where 54 GPM intersects 31.0 ft.... TDH on the pump curve(s) chart

#2. The point must be below the pump curve

#3. Select the pump best suited for the job.
## SETTING the PUMP TIMERS

### Need to Know:
1. **Dose Volume (step 1)** ------- 30 gal.
2. **Number of Doses per Day** ---- 12.3
   (Assume 370 gpd for daily flow)
   \[\frac{370 \text{ gpd}}{30 \text{ gal}} = 12.3 \text{ doses per day}\]
3. **Dose Interval**

## Calculating Dose Interval

60 min. per hour x 24 hrs = **1440** min. per day

Dose Interval is **Pump On + Pump Off**

\[\frac{1440 \text{ min. per day}}{12.3 \text{ doses per day}} = 117.0 \text{ minutes between doses (Dose Interval)}\]

Pump On = 30 gal per dose @ 54 gpm = 0.56 minute or 33 seconds ((30/54)60)

Timer is set for the pump to run for **33 seconds and be off for 116 minutes and 27 seconds**

## LPD Design Issues

<table>
<thead>
<tr>
<th>Increase in orifices #</th>
<th>Decrease residual head</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in orifice spacing</td>
<td>Increase residual head</td>
</tr>
<tr>
<td>Increase in orifice size</td>
<td>Decrease residual head and increase dose volume</td>
</tr>
<tr>
<td>Decrease in orifice size</td>
<td>Increase residual head and decrease the dose volume</td>
</tr>
</tbody>
</table>
The Four “K’s” For Proper Installation

- Keep It Dry
- Keep It Natural
- Keep It Level
- Keep It Shallow