## Subject: # 08-12 Drainfield Loading Rates

**Issue:** Current loading rates in Florida are significantly higher than loading rates for similar soils in other states.

*Issue First Raised at 1/24/08 TRAP*

**Issue Originated By:** Florida Onsite Wastewater Association (FOWA)

**Justification:** Reducing loading rates by approximately 20 percent while reducing unobstructed area from 2X to 1.6 X drainfield size thus enlarging drainfield while keeping the unobstructed area approximately unchanged.

**Proposed Rule Change:** The specific rule language is posted on the DOH/TRAP website.

*Note – DOH rule language in handout does not match FOWA proposal exactly*

**Summary:** Reducing loading rates by approximately 20 percent while reducing unobstructed area from 2X to 1.6 X drainfield size.

**Possible Financial Impact:** Cost of systems will increase with larger drainfield size but impact on space occupied will be negligible. Could save money in long run by extending life of system before repair is required.

Roxanne Groover, FOWA.

# Relationship Between Drainfield Size and Failure Rates

**Examining Failures of Onsite Sewage Treatment Systems in Florida**

Kevin M. Sherman, R. Wade Varnadore, and Robert W. Forbes*

ABSTRACT

The authors conducted three independent analyses of repair data collected in their jurisdictions. Two of the analyses came from repair permit databases in counties with large numbers of installations. The third analysis came from a survey of repair permit data statewide.

Florida has required mandatory repair permits for failing onsite sewage treatment and disposal systems since 1992. The permits capture information on the date of original system installation, size and location system components, site features and cause of failure.

Sarasota County tracked many thousands of repair permits since 1975 and performed detailed analysis. Marion County chose 50 systems at random in 1990 and followed them in time. The analysis of statewide data shows causes of failure and the influence of drainfield size and aggregate type on failure rate.

All three studies use average age of system at time of failure as an index of system longevity. Secondly, a multi-modal phenomenon is routinely observed. The authors contend that system failures early are most often the result of hydraulic overload. Later in life in Florida, root clogging is most often the cause of system failure. Finally, all three studies have similar mean ages at failure, 18.01 years in Sarasota County, 18.35 years in Marion County, and 18.53 years state wide. A ten year increase in the mean age at failure in Sarasota County (to age 28.44 years) is credited to a county ordinance enacted in 1983.

**Keywords.** Failure, Repair, Analysis, Onsite septic systems, Florida

1998 ASAE

# Onsite Failure Rate Study in FL

- Statewide failure data were collected from county health departments and analyzed with regard to mean age of failure (445 systems were examined).
- The results showed consistent life spans of just over ***18 years***.
- While not discussed in the study, this compares with an experience of ***25 to 30 years*** in other states such as Georgia, Alabama and Kentucky that have lager drainfield sizes.
- A ten year increase in this life expectancy (28 years) was found in Sarasota County and attributed to a change in county ordinance.
- This ordinance **increased drainfield sizes from 10 to 30 percent.**
- Prior to enactment of this ordinance, failure rates in Sarasota were similar to the rest of the state (18 years).

# FOWA Soil Loading Rate Proposal Impact

**Comparison of Sizing in Nearby States:**

Area (Square Feet) Comparison of Gravel Drainfield System Sizing (3 Bedroom System) between Florida and Neighboring States:

| Soil Type (gpd/sf) | Florida (current) | **Florida (proposed)** | Georgia (current) | Alabama (current) |
|---|---|---|---|---|
| 1.2 soils | 250 | 313 | 282 to 375 | 600 |
| 0.9 soils | 334 | 418 | 409 to 600 | 750 |
| **0.65 soils** | **462** | **577** | **642 to 1154** | **900** |
| 0.35 soils | 857 | 1071 | 1169 to 1233 | 1620 |

***Florida drainfields (for a given soil type and dwelling size) are roughly half the size of drainfields in neighboring states .***

# Lifestyle Changes to Consider Relative to System Size

- Multi head showers.
- Large capacity garden tubs.
- Use of grease emulsifiers in cleansers “Dawn”.
- Scented oils and other personal care products.

# USEPA Onsite Manual Rates (2001)

**Table 2 (Continued)** -Some Historical Perspectives Concerning $HLR_D$ Guidance for Sizing

| Texture | Structure | | Hydraulic loading ($gal/ft^2$-day) |
|---|---|---|---|
| | Shape | Grade | BOD=150 |
| Coarse sand, sand, loamy coarse sand, loamy sand | Single grain | Structureless | 0.8 |
| Fine sand, very fine sand, loamy fine sand, loamy very fine sand | Single grain | Structureless | 0.4 |
| Coarse sandy loam, sandy loam | Massive | Structureless | 0.2 |
| | Platy | Weak | 0.2 |
| | | Moderate, strong | |
| | Prismatic, blocky, granular | Weak | 0.4 |
| | | Moderate, strong | 0.6 |
| Fine sandy loam, very fine sandy loam | Massive | Structureless | 0.2 |
| | Platy | Weak, mod., strong | |
| | Prismatic, blocky, granular | Weak | 0.2 |
| | | Moderate, strong | 0.4 |
| Loam | Massive | Structureless | 0.2 |
| | Platy | Weak, mod., strong | |
| | Prismatic, blocky, granular | Weak | 0.4 |
| | | Moderate, strong | 0.6 |
| Silt loam | Massive | Structureless | |
| | Platy | Weak, mod., strong | |
| | Prismatic, blocky, granular | Weak | 0.4 |
| | | Moderate, strong | 0.6 |
| Sandy clay loam, clay loam, silty clay loam | Massive | Structureless | |
| | Platy | Weak, mod., strong | |
| | Prismatic, blocky, granular | Weak | 0.2 |
| | | Moderate, strong | 0.4 |
| Sandy clay, clay, silty clay | Massive | Structureless | |
| | Platy | Weak, mod., strong | |
| | Prismatic, blocky, granular | Weak | |
| | | Moderate, strong | 0.2 |

# Florida Rates - Trenches (gal/sf/day)

| Texture | Existing | FOWA Proposed |
|---|---|---|
| Coarse Sand & Loamy Coarse Sand | 1.2 | 0.96 |
| | EPA – 0.80 | |
| Loamy Sand, Sandy Loam, Coarse Sandy Loam, Fine Sand | 0.90 | 0.72 |
| | EPA – 0.2 to 0.80 | |
| Fine Sandy Loam, Silt Loam, Very Fine Sand, Very Fine Sandy Loam, Loamy Fine Sand, Loamy Very Fine Sand, Sandy Clay Loam | 0.65 | 0.52 |
| | EPA – 0.2 to 0.4 | |
| Clay Loam, Silty Clay Loam, Sandy Clay, Silty Clay, Silt | 0.35 | 0.28 |
| | EPA – 0.2 to 0..4 | |

# DOH Proposal (from DOH website)

**6.005**

(4) Suitable, unobstructed land shall be available for the installation and proper functioning of the system. ~~At least 75 percent of the unobstructed area must meet minimum setback requirements of subsections (1) and (3) above to allow for drainfield repair or system expansion.~~ The minimum unobstructed area shall:

(a) Be at least 1.6~~2~~ times as large as the drainfield absorption area required by rule. For example, if a 200 square feet drainfield is required, the total unobstructed area required, inclusive of the 200 square feet drainfield area, would be ~~400~~320 square feet. Unobstructed soil area between drain trenches shall be included in the unobstructed area calculation.

(b) Be contiguous to the drainfield.

(c) Be in addition to the setbacks required in subsection (2) above.

FOWA Recommends 1.5 multiplier (instead of 1.6) if 75% language is eliminated to maintain "footprint" size of drainfields

**6.008**

**TABLE III**
**For Sizing of Drainfields Other Than Mounds**

| U.S. DEPARTMENT OF AGRICULTURE SOIL TEXTURAL CLASSIFICATION | SOIL TEXTURE LIMITATION (PERCOLATION RATE) | MAXIMUM SEWAGE LOADING RATE TO TRENCH & BED ABSORPTION SURFACE IN GALLONS PER SQUARE FOOT PER DAY | |
|---|---|---|---|
| | | TRENCH | BED |
| Sand; Coarse Sand not associated with a seasonal water table of less than 48 inches; and Loamy Coarse Sand | Slightly limited (Less than 2 min/inch) | ~~1.20~~0.80 | ~~0.80~~0.60 |
| Loamy Sand; Sandy Loam; Coarse Sandy Loam; Fine Sand | Slightly limited (2-4 min/inch) | ~~0.90~~ 0.80 | ~~0.70~~0.60 |
| Loam; Fine Sandy Loam; Silt Loam; Very Fine Sand; Very Fine Sandy Loam; Loamy Fine Sand; **Loamy Very Fine Sand;** Sandy clay loam | Moderately limited (5-10 min/inch) | 0.65 | 0.35 |
| Clay Loam; Silty Clay Loam; Sandy Clay; Silty Clay, Silt | Moderately limited (Greater than 15 min/inch but not | 0.35 | 0.20 |

**FOWA Proposal – Decrease all loading rates by 20%**

| | |
|---|---|
| 0.96 | 0.64 |
| 0.72 | 0.56 |
| 0.52 | 0.28 |
| 0.28 | 0.16 |

# DOH Proposal (from DOH website)

64E-6.009(3)

(d) Where the soil material underlying a mound system is of a similar slightly limited textural material as that used in system construction, the mound drainfield size shall be based on estimated sewage flows as specified in 64E-6.008, F.A.C., Table I and upon the quality of fill material utilized in the mound system. When estimated sewage flows are calculated to be less than 200 gallons per day, specifications for system design shall be based on a minimum flow of 200 gallons per day. Maximum sewage loading rates for soils used in mound construction shall be in compliance with the following:

| Fill Material | Maximum Sewage Loading Rate to Mound Drain Trench Bottom Surface in gallons per square foot per day | Maximum Sewage Loading Rate to Mound Absorption Bed Bottom Surface in gallons per square foot per day |
|---|---|---|
| Sand; Coarse Sand; Loamy Coarse Sand | ~~1.00~~0.80 | ~~0.75~~0.60 |
| Fine Sand | 0.80 | ~~0.65~~0.60 |
| Sandy Loam; Coarse Sandy Loam; Loamy Sand | 0.65 | 0.40 |

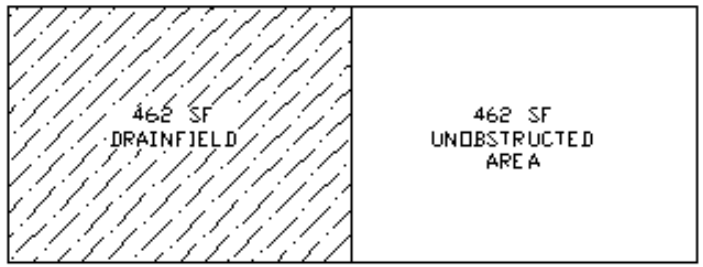
**FOWA Proposal – Decrease all loading rates by 20%**

| | |
|---|---|
| 0.80 | 0.60 |
| 0.64 | 0.52 |
| 0.52 | 0.32 |

Example: 3 Bedroom System - Mound in a Bed Configuration with Fine Sand Fill.

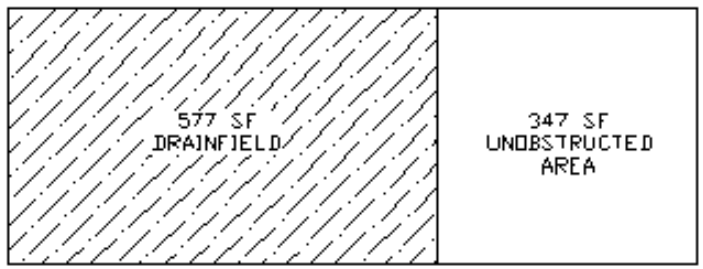
Current Requirement Per 64E-6.009(3)(d)

Design Flow = 300 gal/day, Sewage Loading Rate = 0.65 gal/day/sf. Drainfield area = 462 sf. Total unobstructed "footprint" is 924 sf (2.0 times required drainfield area).




A. Decrease sewage loading rates by 20% (use 0.52 gal/day/sf instead of 0.65 gal/day/sf)

B. Decrease required suitable unobstructed area by 20% (total area must be 1.6 times the required drainfield area instead of 2.0 times the area)




**RESULT: Initial drainfield area is increased by 25% and total footprint remains constant**

# Additional Cost Estimates

Installers were asked to estimate the selling price of a typical 3 bedroom system in their area. Then they were asked to estimate the price if the drainfield increased by 25 – 30% in size.

*(Note: FOWA proposal increases size by 25% in all soil types, DOH proposal increases size from 0% to 50%)*

| | **North FL** | **Central FL** | **South Florida** |
|---|---|---|---|
| **Conventional** | 3538 | 3143 | 5125 |
| w/new rule | 4948 | 3981 | 6625 |
| $ increase | 1410 | 838 | 1500 |
| % increase | 40 | 27 | 29 |
| | | | |
| Mound | 7100 | 5096 | 8595 |
| w/new rule | 9100 | 6847 | 11140 |
| $ increase | 2000 | 1750 | 2545 |
| % increase | 28 | 34 | 30 |

# Summary

Impacts of Proposed Change

- Improves protection of public health and the environment (significantly reduce risk of system malfunction)
- Improve value of home (improves market value of systems built under this new standard)
- Minimum increased annualized cost will significantly increase system life (increased from 18 year to 28 year mean life in Sarasota)
- Brings Florida closer to standards already in place for onsite systems in nearby states and USEPA recommendations

**Recommendation: Approve DOH language with modification to unobstructed area multiplier (change 1.6 to 1.5)**

Thank You Very Much for Your Consideration