Onsite Wastewater Concepts, Materials, Regulations & The Application Process Part I

B – Onsite Sewage System Materials

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Course Objective

To give a clear understanding of the materials used in onsite wastewater treatment and disposal systems including the distribution methods, drainfield configurations and alternative drainfield products

Treatment Receptacles

CONSIST OF:

- Septic Tanks, Laundry, Graywater, Grease Interceptors and Dosing Tanks

CONSTRUCTION:

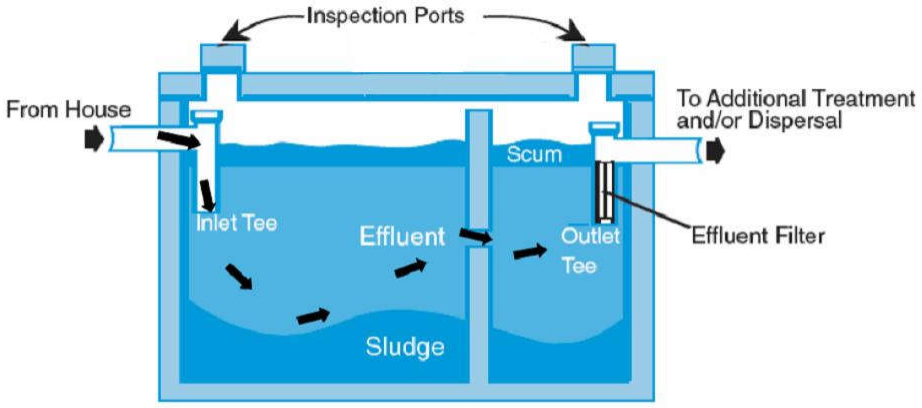
- Concrete, Fiberglass, Polyethylene

Chapter 64E-6.013 – Construction Materials and Standards for Treatment Receptacles

3

4

Typical Septic Tank



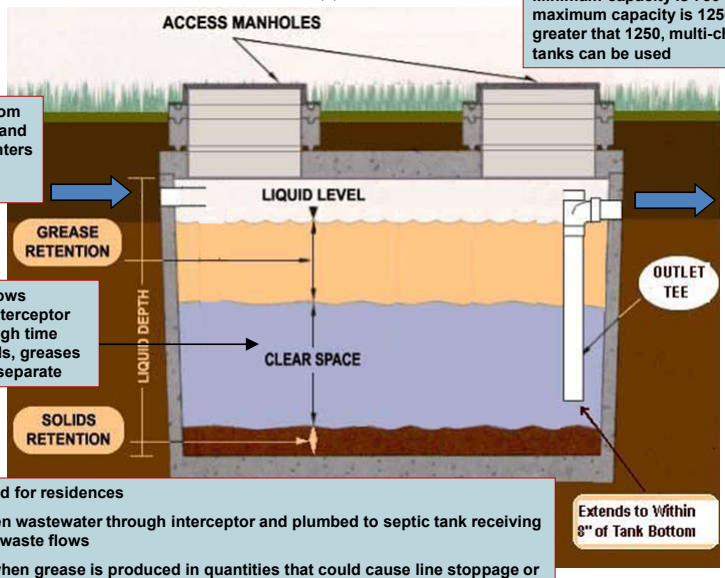
Multi-compartment Septic Tank

5

Grease Interceptor

64E-6.013(7), F.A.C.

Minimum capacity is 750 gallons and maximum capacity is 1250 gallons (if greater that 1250, multi-chambered tanks can be used



Wastewater from kitchen sinks and dishwasher enters the grease interceptor

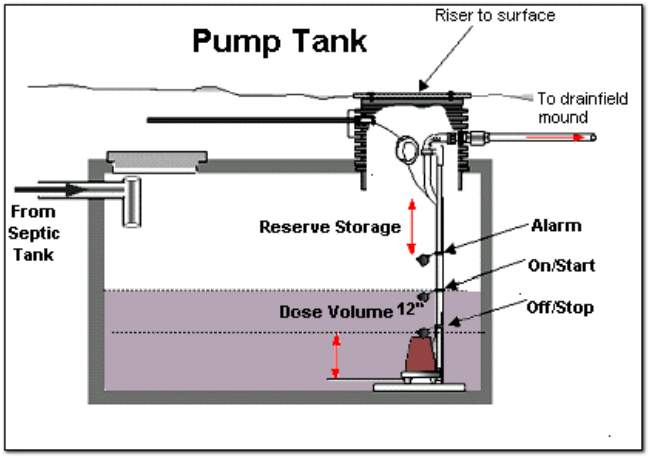
Wastewater flows through the interceptor and with enough time allows fats, oils, greases and solids to separate

Wastewater exits interceptor with lower levels of fats, oils, greases and solids

- **Not required for residences**
- **Only kitchen wastewater through interceptor and plumbed to septic tank receiving combined waste flows**
- **Required when grease is produced in quantities that could cause line stoppage or hinder sewage disposal.**
- **Examples are: food establishments, institutions with food service/cooking etc.**

6

Pump/Dosing Tank



64E-6.013(9)(c), FAC - Proper Connections to Pump/Dosing Tanks

7

Pump/Dosing Tank

Not Correct

The tank has been chipped and mortared to allow the electrical lines to exit. **This is not approved,** and has compromised the structurally integrity of the tank.

A riser should have been installed as in the above example.

8

Treatment Receptacles

- All tanks can have *single* or *multiple compartments*
- If single compartment tanks are used they shall be placed in series to achieve required capacity.

Example:

- 1st compartment or multiple compartment tank or tank in series shall be 2/3 of the required effective capacity,
- 2nd tank shall be at least 1/5 of the first tank and combined effective capacity shall equal or exceed the total.
- 900 gallon septic tank – 1st chamber 600, 2nd chamber 300 gallons

9

Capacity of Treatment Receptacles in gals.

Type	Minimum	Maximum
Septic Tank	900	
Grease Interceptor	750	1250
Graywater	250	
Laundry	225	
Dosing	Residential / Commercial 150 / 225	

Note: For repairs the smallest tank may be 600 gallons

10

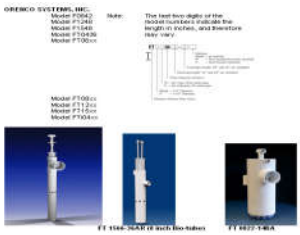
Seals




Check the website under “Product Listings” for approved products.
http://www.myfloridaeh.com/ostds/products/products.html

11

Filters



Check the website under “Product Listings” for approved products.
http://www.myfloridaeh.com/ostds/products/products.html

12

Sealants



Check the website under “Product Listings” for approved products.
http://www.myfloridaeh.com/ostds/products/products.html

13

Legends and Manholes

- Legend-cast, stamped, stenciled or decaled indicating approval number and tank capacity in gallons and category 3 or 4 (2” high lettering)
- Access manholes for each compartment [225 square inches min.]
- Access manholes properly secured

14

Distribution Box

- **Watertight**
- Constructed of durable materials **(adequate structural strength)**
- Sized to accommodate required number of drain line pipes
- Each line individually connected to d-box
- Invert to box 1 inch above outlets
- All **outlets** must be level with respect to each other

15

Distribution Box

16

Header Pipe

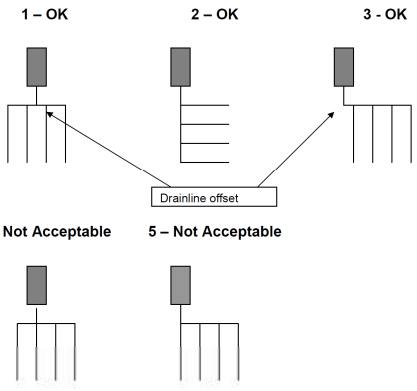
- Materials; PVC, Corrugated Polyethylene
- Header pipe interior - smooth
- 4 inch minimum inside diameter for gravity flow
- Not perforated pipe
- Laid Level and at least 18 inches from tank
- Encased with mineral aggregate (if aggregate is used), supported by soil and **soil tight**

17

Header Pipe Configurations – 8/25/2005
Department of Health, Bureau of Onsite Sewage Programs

64E-6.014(2)(c)
The header pipe shall be laid level with direct connections to each drainfield line and the septic tank outlet pipe. The header pipe shall be designed to distribute effluent as equally as practical to each individual drainline and shall be supported so that the header is laid level.

The following is a diagram of acceptable and unacceptable layouts:



Note: In 1 where there is an odd number of laterals the outlet from the tank may feed to either side of the center lateral or into the one of the ends of the header pipe as described in 2 and 3 above.

18

Drainlines

- Maximum fall of 1 inch per 10 feet
- 4 inch perforated drain pipe for standard gravity aggregate drainfield system
- Material; PVC, Corrugated Polyethylene,
- Connected in continuous circuit in bed, mound, and filled systems
- Distal ends capped or sealed if not looped
- Not required for standard trench systems

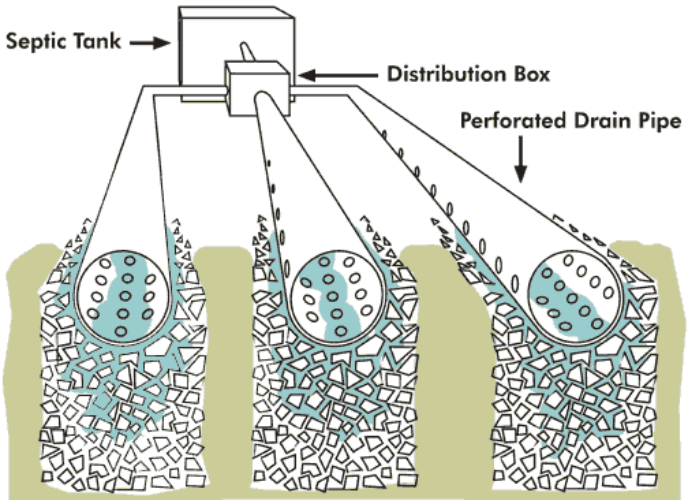
19

Drain Trench

- Drain Trenches maximum width 36 inches
- Trenches 12” or less- min. 12” separation between trench sidewalls
- Trenches 12-**36**”- minimum 24” separation between trench sidewalls
- Maximum Trench Length is 100 feet for all gravity-fed and lift-dosed drainfields
- Total depth of mineral aggregate…min.12”
- Maximum depth to bottom of drainfield is 30”
- Soil cover… 6” min.

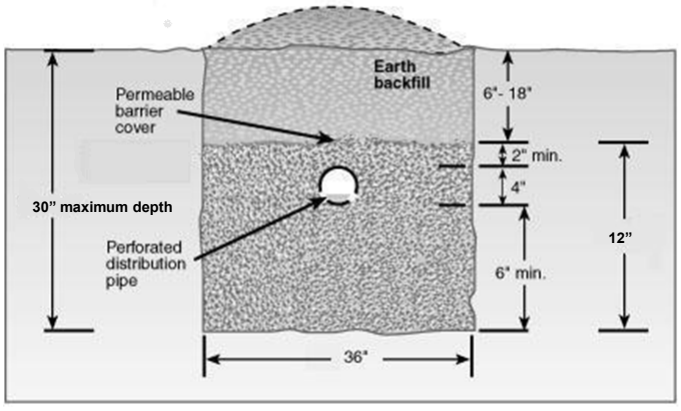
20

Conventional Baseline System



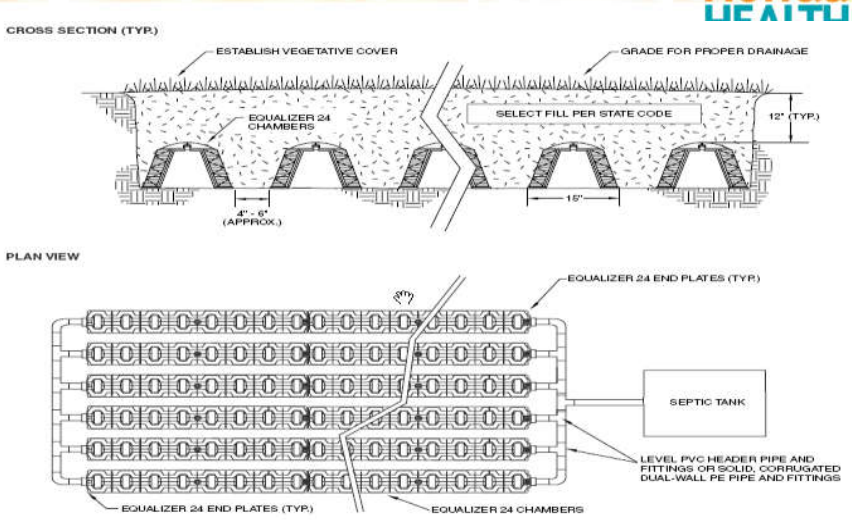
21

Typical Aggregate Trench



22

Typical Bed with Chambers



Absorption Beds

- Maximum area 1500 sq. ft. per bed
- 10 foot separation between sidewalls of adjacent beds
- Maximum length to width ratio
- Total depth of mineral aggregate 12”
- Maximum 36” separation between drainlines
- Distance between bed sidewall and center of outside drain line…6-18”
- No part of drainfield within 18” of treatment or pump tank

25

Gravity Flow

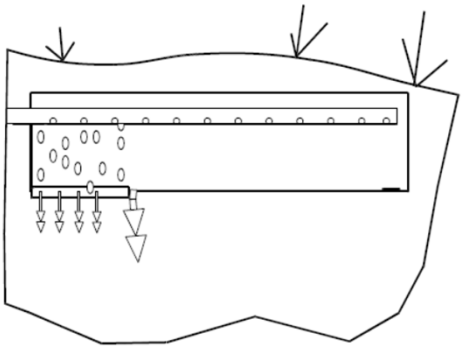
- Only a few holes actually supply effluent
- Infiltrative surface directly beneath these holes gets ALL the effluent(pulls less air)
- Once this area clogs, effluent flows to nearby areas - creeping failure/ progressive clogging
- Once bottom surface clogs, begins using sidewalls

26

Gravity Flow

Gravity Drainfield Trench at Start -up

- Wastewater front loaded at beginning of trench
- Uneven flow
- Chance for localized saturated flow

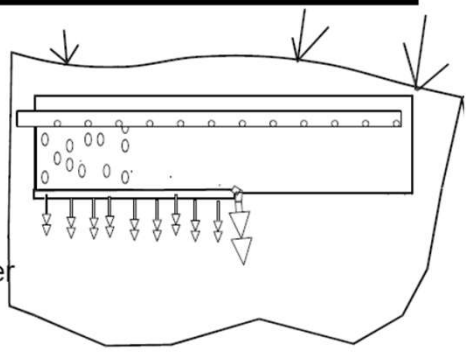


27

Gravity Flow

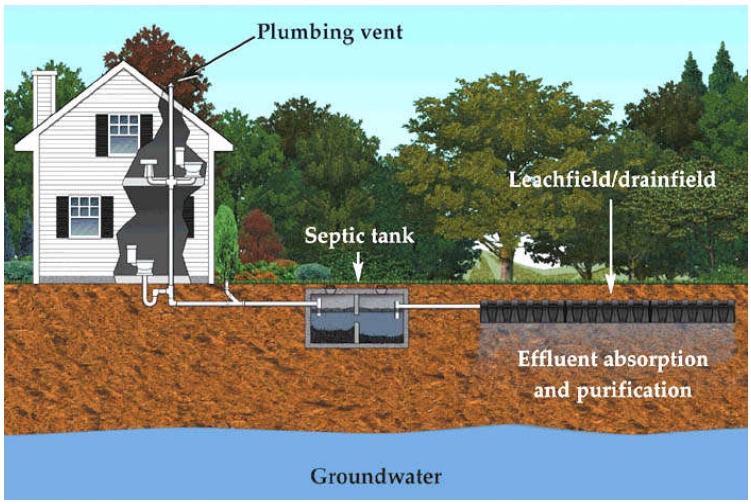
As Drainfield Trench Gets More Flow

- Beginning of trench has developed biomat
- Unsaturated flow occurs through this mat
- Wastewater moves further along trench
- Localized saturated flow may occur in soil where biomat not present



28

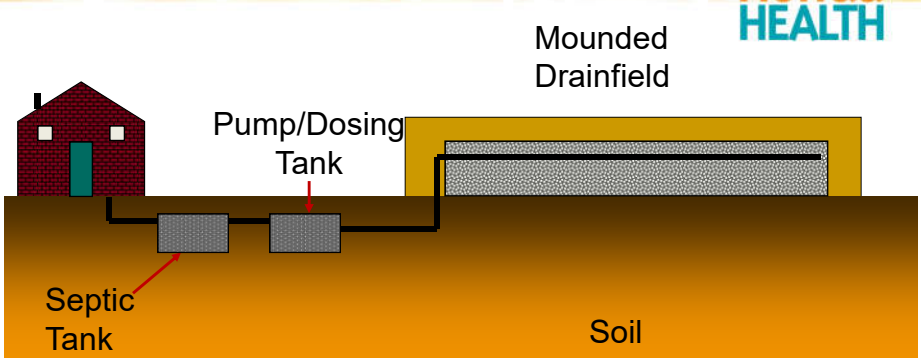
Gravity Flow



29

Courtesy of Infiltrator

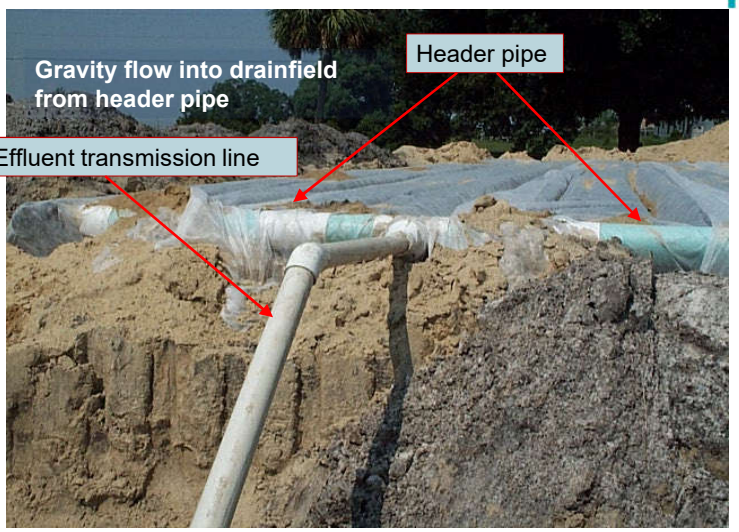
Lift Dosed System



- When septic tank is placed too low for gravity flow to drainfield
- Applies to drainfields = or < 1000 sq. ft. (> 1000 sq. ft. requires LPD)
- Pump/Dosing tank, lifts effluent into header or d-box for distribution by gravity

30

Lift Dosed System



31

Low Pressure Dosing

- 2 inch or smaller diameter schedule 40 PVC with ½ inch or smaller diameter drilled holes
- Dosing systems 1001 to 2000 sq. ft. - one pump (if commercial (non-residential) and flow is >500 gpd two alternating dosing pumps)
- Systems > 2000 sq. ft. - minimum of two alternating dosing pumps
- Drainline length not limited to 100 ft. (additional requirements for commercial systems)

Chapter 64E-6.014(3), F.A.C.

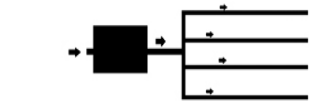
32

Low Pressure Dosing (LPD)

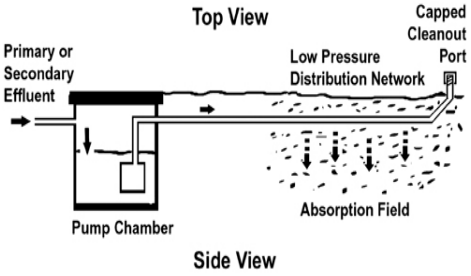
- Required when total drainfield is greater than 1000 sq. ft. or where applicant proposes to use low-pressure dosing.
- In lieu of LPD, may split drainfield when >1000 sq. ft. and less than 2000 sq. ft. and lift dose.
- Drainfields ≥1500 sq. ft. shall be designed by a Florida Licensed Professional Engineer
- Drainfields >1000 sq. ft. and ≤1500 sq. ft. or less shall be designed by either a Florida Licensed Professional Engineer or a Licensed Master Septic Tank Contractor.

33

Low Pressure Dosing



Top View



Side View

34

Pressure Distribution - Advantages

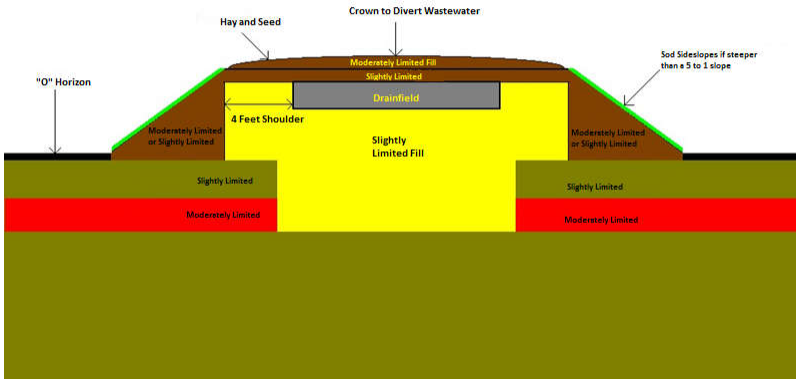
- Entire drainfield gets effluent every dose (pulls more air behind it)
- Better distribution – compared to gravity
- Infiltrative surface alternately wetted and dried
- Rate of clogging reduced

35

Drip Irrigation

36

Mound and Filled Systems

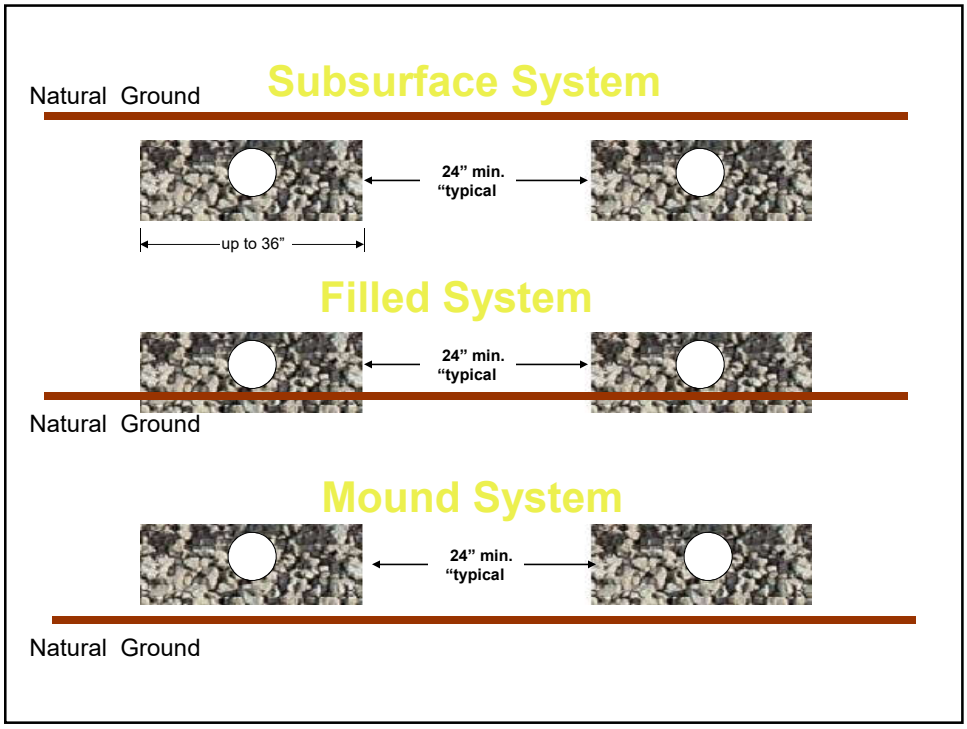


For further details see Chapter 64E-6.009 Alternative Systems

Mound and Filled Systems

- Used to overcome limiting site conditions
- 4 foot separation from drainfield to shoulder of fill
- Slopes, shoulders and soil cap shall be stabilized with vegetation (also synthetic vegetation approved by SHO)
- Minimum slope 2 to 1, steeper than 5 to 1 shall be sodded
- Moderately limited soil material may be used in the construction mound slopes and soil cap
- Low pressure dosing required if moderately limited soils are used in system construction (for shoulders and fill to construct mound)

For further details see Chapter 64E-6.009 Alternative Systems



Aggregate

- Coarse and Fine
- Aggregate - Any Mixture of Minerals or other approved manufactured materials (e.g. crushed concrete, brick chips, expanded clay or tire chips)
- Most variable component of an OSTDS

40

Aggregate

- **Coarse**
  - **A collection of particles larger than 2 mm**
  - (0.079 in and smaller than 64 mm 2.5 in)

- **Fine**
  - **A collection of sand-sized particles**
  - (0.06 mm up to 2 mm or 0.0025 in up to 0.0787 in)

41

Aggregate Uses in OSTDS

COARSE

- Drainfield Construction

FINE

- Replacement material (dig-outs)
- Mound or Filled system
- Sand filters

42

Approved Coarse Aggregate Materials

- Limestone
- Slag
- Quartz Rock
- Granite
- River Gravel
- Recycled Crushed Concrete
- Light-Weight Expanded Clay Aggregates (LECA)
- Other Equally Durable Materials
  - Tire Chips, Brick Chips, Etc.

43

These DOT Size Numbers Automatically Comply With 64E-6 Gradations

- **357**
- **4**
- **467**
- **5**

For coarse aggregate use in drainfield construction

44

Disadvantages of Mineral Aggregate

- Fine particles move downward as we walk on the drainfield.
- Fine particles wash down to infiltrative surface (from effluent or rain).
- Fine particles may form a restrictive layer on the infiltrative surface which can cause premature failure.

45

Alternative Drainfield Products Approved in Florida

46

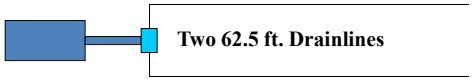
Alternative Drainfield Products

- System reductions are granted with a decrease in sewage strength or sewage flow.
- The current rule provides that reductions for alternative drainfield units shall not be approved except for performance based treatment systems.
- Comparably rated alternative products were approved based on the manufacturer's design and specifications.

47

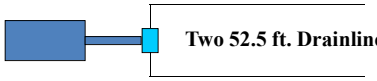
Conventional Mineral Aggregate in Trench

- D.F. = 375 sq. ft. (unobstructed area = 563 sq. ft.)
- 3 ft. wide trenches with a total of 125 linear ft.



Comparable Alternative Drainfield Material in Trench

- D.F. = 375 sq. ft. with comparably rated alternative product
- rated @ 12.5 sq. ft. per 3.5 ft. unit
- 30 units with a total of 105 linear ft.



Unobstructed area is ALWAYS based on conventional aggregate drainfield size. NO REDUCTIONS.

Types of Alternative Drainfield Products

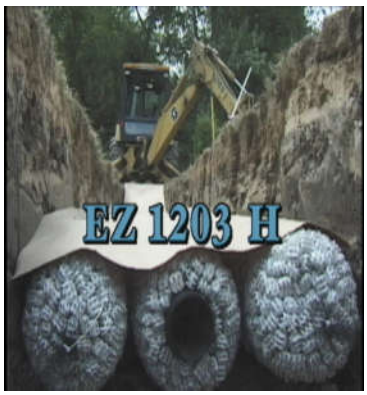
- Polystyrene Bundles (Ezflow, Flowtech)
- Multipipe (Plastic Tubing Industries)
- Chambers (ARC, Bio Diffuser, Cultec, EnviroChamber, Infiltrator)
- Drip Irrigation (Netafim, Geoflow)
- Tire Chips

See product listing on website:

http://www.myfloridaeh.com/ostds/pdfiles/forms/Alternative.pdf

49

Polystyrene Bundle Inspection



- Rated by the linear foot
- Can be cut to any length
- Drainline identified by stripe
- Bundles must be strapped
- Appropriate soil barrier
- Installed according to mfg. installation manual
- Distal ends caped in trenches
- Distal ends looped in bed, mound, or filled

50

Multipipe Inspection

- Rated by the linear foot
- Can be cut to any length
- Drainline identified by stripe
- Bundles must be strapped
- Polyester-bonded filament soil barrier
- Installed according to mfg. installation manual
- Distal ends caped in trenches
- Distal ends looped in bed, mound, or filled

51

Chamber Inspection

- Rated by the chamber unit
- Can be cut according to mfg. installation manual
- Ensure louvers are not blocked
- Infiltrative surface level & free of debris, etc.
- Installed according to mfg. installation manual
- Distal ends caped in trenches
- Distal ends looped in bed, mound, or filled system

52

Drip Irrigation Inspection

- Approved product (ID by color)
- Can be cut to any length (can be >100')
- Line separation
- Supply & Return Headers w/vacuum release valves
- Continuous loop – no dead ends
- Infiltrative area same as required for mineral aggregate
- Installed according to mfg. installation manual
- Trench infiltrative area = 2 ft. X emitter spacing X number of emitters
- Bed extends 1 foot beyond outer emitters
- 6-12 inches of cover

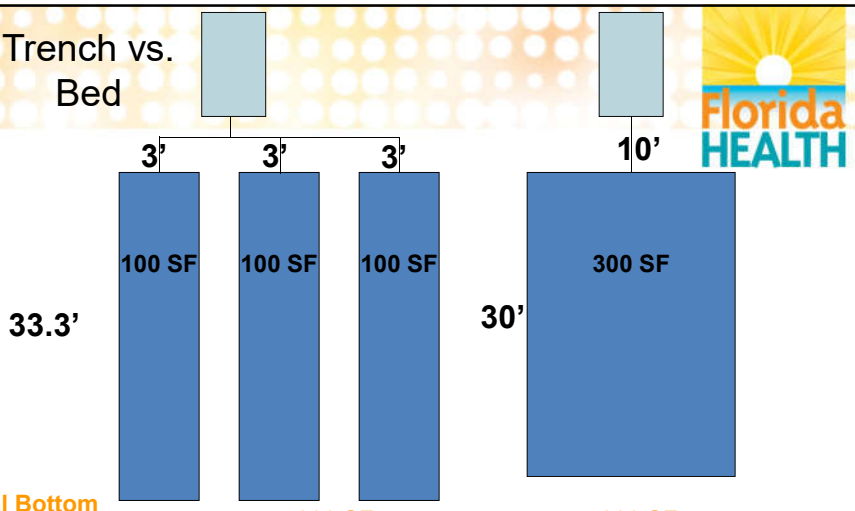
53

Trench vs. Bed Configuration

TRENCH	BED
▪ Smaller Drainfield Required	▪ Larger Drainfield Required
▪ More Sidewall Available	▪ Less Sidewall Available
▪ Maximum 100 linear ft. per line	▪ Maximum 1500 SF per Bed
▪ Normally Longer Lifespan	▪ Normally Shorter Lifespan

54

Trench vs. Bed



Total Bottom surface area		300 SF	300 SF	
Sidewall surface area	(33.3 SF x 6) = 200 SF (3 SF x 6) = 18 SF	218 SF	(30 SF x 2) = 60 SF (10 SF x 2) = 20 SF	80 SF	*(Assuming DF is 1 ft. thick)*
Total Infiltrative Surface		**518 SF**		**380 SF**	

55

Additional Reference Materials

- Chapter 64E-6, Florida Administrative Code
  http://www.myfloridaeh.com/ostds/pdfiles/rule/64E-6.pdf
- EPA Design Manual – Onsite Wastewater Treatment and Disposal Systems, October 1980
  EPA/625/1-80-012
  http://www.epa.gov/nrmrl/pubs/625180012/625180012total.pdf
- EPA – Onsite Wastewater Treatment Systems Manual, February 2002
  EPA/625/R-00/008
  http://www.epa.gov/nrmrl/pubs/625r00008/html/625R00008.htm

56