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

CONSTITUTE 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
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.

Minimum capacity is 750 gallons and maximum capacity is 1250 gallons (if greater that 1250, multi-chambered tanks can be used).
64E-6.013(9)(c), FAC - Proper Connections to Pump/Dosing Tanks

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

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

- 1<sup>st</sup> compartment or multiple compartment tank or tank in series shall be 2/3 of the required effective capacity,
- 2<sup>nd</sup> 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 – 1<sup>st</sup> chamber 600, 2<sup>nd</sup> chamber 300 gallons

<table>
<thead>
<tr>
<th>Treatment Receptacles</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Septic Tank</td>
<td>900</td>
<td></td>
</tr>
<tr>
<td>Grease Interceptor</td>
<td>750</td>
<td>1250</td>
</tr>
<tr>
<td>Graywater</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>Laundry</td>
<td>225</td>
<td></td>
</tr>
<tr>
<td>Dosing</td>
<td>Residential / Commercial 150 / 225</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** For repairs the smallest tank may be 600 gallons
Seals

Check the website under “Product Listings” for approved products.

Filters

Check the website under “Product Listings” for approved products.
Sealants

Check the website under “Product Listings” for approved products.

- 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

Legends and Manholes

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
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**

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The following is a diagram of acceptable and unacceptable layouts:

1 - OK
2 - OK
3 - OK
4 - Not Acceptable
5 - Not Acceptable

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 sides of the header pipe as described in 2 and 3 above.
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

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.
Conventional Baseline System

- Septic Tank
- Distribution Box
- Perforated Drain Pipe

Typical Aggregate Trench

- 36" maximum depth
- 6"-18" backfill
- 2" min. for perforated distribution pipe
- 4" for permeable barrier cover
- 6" min. for 12" trench

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

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
Gravity Flow

Gravity Drainfield Trench at Start-up

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

- 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

Lift Dosed System

Lift Dosed System

Gravity flow into drainfield from header pipe

Effluent transmission line

Header pipe

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.
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.
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

Drip Irrigation
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 \textbf{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
### Subsurface System

- **Natural Ground**
- **24” min. typical**
- **Up to 36”**

### Filled System

- **Natural Ground**
- **24” min. typical**

### Mound System

- **Natural Ground**
- **24” min. typical**

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### 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**
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)

Aggregate Uses in OSTDS

**COARSE**
- Drainfield Construction

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

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

- 357
- 4
- 467
- 5

For coarse aggregate use in drainfield construction
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.

Alternative Drainfield Products Approved in Florida
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.

### Alternative Drainfield Products

#### 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:

### 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
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

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
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

Trench vs. Bed Configuration

<table>
<thead>
<tr>
<th>TRENCH</th>
<th>BED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smaller Drainfield Required</td>
<td>Larger Drainfield Required</td>
</tr>
<tr>
<td>More Sidewall Available</td>
<td>Less Sidewall Available</td>
</tr>
<tr>
<td>Maximum 100 linear ft. per line</td>
<td>Maximum 1500 SF per Bed</td>
</tr>
<tr>
<td>Normally Longer Lifespan</td>
<td>Normally Shorter Lifespan</td>
</tr>
</tbody>
</table>
### Trench vs. Bed

<table>
<thead>
<tr>
<th></th>
<th>Total Bottom surface area</th>
<th>Total Infiltrative Surface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trench</td>
<td>3' x 100 SF = 300 SF</td>
<td>300 SF</td>
</tr>
<tr>
<td>Bed</td>
<td>3' x 100 SF = 300 SF</td>
<td>300 SF</td>
</tr>
<tr>
<td></td>
<td>3' x 100 SF = 300 SF</td>
<td>300 SF</td>
</tr>
<tr>
<td></td>
<td>10’ x 300 SF = 3000 SF</td>
<td></td>
</tr>
</tbody>
</table>

**Sidewall surface area**

<table>
<thead>
<tr>
<th></th>
<th>(33.3 SF x 6') = 200 SF</th>
<th>(30 SF x 2) = 60 SF</th>
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</thead>
<tbody>
<tr>
<td>Bed</td>
<td>(3 SF x 6) = 18 SF</td>
<td>(10 SF x 2) = 20 SF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Assuming DF is 1 ft. thick)</td>
</tr>
</tbody>
</table>

**Total Infiltrative Surface**

<table>
<thead>
<tr>
<th></th>
<th>518 SF</th>
<th>380 SF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trench</td>
<td>(30 SF x 2) = 60 SF</td>
<td>(Assuming DF is 1 ft. thick)</td>
</tr>
<tr>
<td>Bed</td>
<td>(10 SF x 2) = 20 SF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Assuming DF is 1 ft. thick)</td>
<td></td>
</tr>
</tbody>
</table>

### Additional Reference Materials

- Chapter 64E-6, Florida Administrative Code
  

- EPA Design Manual – Onsite Wastewater Treatment and Disposal Systems, October 1980
  
  [http://www.epa.gov/nrmrl/pubs/625180012/625180012total.pdf](http://www.epa.gov/nrmrl/pubs/625180012/625180012total.pdf)

- EPA – Onsite Wastewater Treatment Systems Manual, February 2002
  
  [http://www.epa.gov/nrmrl/pubs/625r00008/html/625r00008.htm](http://www.epa.gov/nrmrl/pubs/625r00008/html/625r00008.htm)