Washtenaw County
Department of Planning & Environment
Development Services Division

PROCESSING PROCEDURES AND GUIDELINES

INSTALLATION OF SAND FILTER SYSTEMS &
DESIGN OF FINAL ABSORPTION TRENCHES OF SECONDARY TREATED EFFLUENT

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The attached document represents the third generation of sand filter criteria for Washtenaw County. You will find that most of the construction elements for the sand filter unit itself remain unchanged from our original document. The major changes in our approach to sand filter system installations are in the site selection criteria and the process flow. These changes were the result of extensive research and dialogue with the design and regulatory community.

The changes were adopted by the Washtenaw County Public Health Advisory Committee on April 17, 1999.

A special thank you to Steve Manville and Dave Dean for providing valuable comments to this revision.

Majed Ghussaini, P.E.
Public Health Engineer
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I. INTRODUCTION
A sand filter is an alternative on-site wastewater treatment system consisting of a septic tank(s) and a bed of coarse sand through which septic tank effluent passes before discharge to a soil absorption system. There are two types of sand filters, single pass sand filters (intermittent) and multiple pass sand filters (recirculating). The intermittent sand filter is used for residential installations, while the recirculating sand filter is required on all commercial installations. The filtered effluent is then routed to a soil absorption system consisting of a series of shallow trenches.

It is important to note that a sand filter is a non-proprietary device and can be constructed to meet the specifications contained herein. Certain other proprietary devices may be used to provide secondary sewage treatment in lieu of a sand filter. Check with the Department of Planning and Environment, Development Services Division (DPE/DSD) for a list of these devices. For the purpose of this document the disposal requirements for secondary treated effluent are the same no matter what the treatment device is.

II. ACCEPTANCE
A. Alternative sand filter systems are considered only on sites that do not meet the minimum criteria set forth for conventional systems by the Washtenaw County Rules and Regulations for the Disposal of Sewage and Human Excreta.
B. A soil evaluation for locating a conventional system must take place through the DPE/DSD prior to consideration of a sand filter system.
C. A completed application (see next section) for an alternative soil evaluation along with appropriate fees must be submitted.
D. Acceptance of a sand filter system proposal will be contingent upon the availability of a conventional reserve drainfield area. This typically requires a 150’ x 150’ area of uniform 6%-15% slope capable of accommodating a single Modified Fill-Type Drainfield.

III. PLAN PREPARATION AND SUBMITTAL (See Appendix X for preliminary plan example.)
The application is considered complete when plans prepared by a State of Michigan Registered Professional Engineer or Registered Sanitarian are submitted with the application. At a minimum, the plans must show lot boundaries, proposed house location, sand filter location, proposed primary and secondary soil absorption area and any other physical features associated with the property.

IV. SITE EVALUATION
The owner or designer is responsible to stake the four corners of both the proposed primary and secondary soil absorption areas prior to a site visit by a DPE/DSD representative. Failure to do so may result in site denial or additional
inspection fees. At the time of the evaluation, soil conditions as well as slope will be evaluated for conformance with requirements listed below.

If soils and slopes are conducive for installation of the soil absorption system, sufficient site specific topographic information, which addresses the slope criteria, must be submitted prior to issuance of an approval letter.

Please note that prior to final approval and permit issuance by DPE/DSD, the designer must submit a final system layout showing accurate topographic details, along with a properly sized and situated system design for primary and reserve disposal areas.

V. SITE SELECTION REQUIREMENTS FOR SOIL ABSORPTION TRENCHES

A. Soil Criteria
   1. Well-drained (USDA Classification) soil with no evidence of a seasonal high water table (mottles) in the top 36”.
   2. Soils must be undisturbed. Evidence of past filling, cutting activities, traffic or extensive cultivation activities will not be considered.
   3. A minimum permeability of 200 min/in in the upper two (2) feet of soil.
   4. Loam, sandy clay loam or clay loam with good structure may be considered.
   5. Clay, silt loam or clay loam with poor structure will not be considered.

B. Site Criteria
   1. Slope:
      a) The area chosen for the soil absorption trenches shall have a minimum slope of 4% for a distance of at least 100 feet in order to accommodate the trenches and 50 foot greenbelt.
      b) The slope must be continuous, without low spots, from absorption area across the entire green belt area.
      c) Only uniform or convex slopes are accepted. Concave slopes will not be considered.
      d) Slopes greater than 25% will not be considered for soil absorption trenches due to equipment safety concerns.

   2. Size:
      a) The trench sizing requirements are based on the following:
         i. Soil conditions.
         ii. Number of proposed bedrooms.
         iii. Trench width.
TRENCH SIZING CHART

Total Linear Length of Trenches Needed
Based Upon Factors Detailed Below

**GOOD SOIL**

<table>
<thead>
<tr>
<th>No. of bedrooms</th>
<th>2 ft. wide trench</th>
<th>3 ft. wide trench</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 or less</td>
<td>167 LF</td>
<td>113 LF</td>
</tr>
<tr>
<td>3</td>
<td>252 LF</td>
<td>168 LF</td>
</tr>
<tr>
<td>4</td>
<td>336 LF</td>
<td>225 LF</td>
</tr>
<tr>
<td>5</td>
<td>*Not Available</td>
<td>281 LF</td>
</tr>
</tbody>
</table>

**FAIR SOIL**

<table>
<thead>
<tr>
<th>No. of bedrooms</th>
<th>2 ft. wide trench</th>
<th>3 ft. wide trench</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 or less</td>
<td>225 LF</td>
<td>150 LF</td>
</tr>
<tr>
<td>3</td>
<td>338 LF</td>
<td>225 LF</td>
</tr>
<tr>
<td>4</td>
<td>*Not Available</td>
<td>300 LF</td>
</tr>
<tr>
<td>5</td>
<td>*Not Available</td>
<td>375 LF</td>
</tr>
</tbody>
</table>

**Note:** This sizing is based upon mandatory low flow fixtures (including bath/shower fixtures) throughout the home.

*Four trenches are the maximum allowable at 100 LF per trench. Deviation from this policy is dependent on slope and soil conditions of the site in question.

3. **Replacement Area:**

Sufficient area for an adequately sized conventional replacement system must be available and shown on the plans. This typically means an approximate 150’ x 150’ area of uniform 6% -15% slope meeting Modified Fill-Type drainfield criteria.

**NOTE:** See Washtenaw County Engineering Guidelines for Modified Fill-Type Drainfield Criteria

4. **Location:** (See Appendix I for minimum required isolation distances.)
   a) No part of a sand filter system (including greenbelt) may be installed within the 100-year flood plain of a body of water.
   b) Isolation distance from the filter and absorption trenches to a lake, stream, or river shall be a minimum of 50 feet.
   c) The sand filter and absorption trenches must be at least 50 feet from any structure.
d) The septic tanks, pump chamber, and sand filter must be at least 50 feet from any well. The trenches and greenbelt must be at least 100 feet from any well.
e) The filter, trenches and greenbelt area must be wholly located on the property served. **No easements will be allowed.**
f) The trenches must be placed within the top third of the defined area of slope unless otherwise authorized by the DPE/DSD.
g) Grading/drainage must be performed so as to intercept and divert any surface water up-gradient from the trenches.

C. **Special Construction Criteria**
1. A pre-construction meeting is required for all proposed sand filter systems. The builder, property owner, contractor, designer and county representative must be present.
2. Construction of the trenches must take place during dry soil conditions between the dates of **June 1 and October 15.**
3. The trench area, including greenbelt, must be free of traffic before, during and after trench construction.
4. Twenty-four hour advance notice to the Washtenaw County DPE/DSD is required prior to trench installation.
5. The system designer must monitor all phases of construction and upon completion, must certify in writing that the system as installed conforms to the approved plan and to Washtenaw County standards.
6. Final approval of the system will not be granted until a vegetative cover has been established over the soil absorption system and sand filter.

VI. **DESIGN CRITERIA FOR THE SAND FILTER**

A. **Septic Tank(s)/Primary Treatment**
1. A “tank tightness” test is required for all sand filter systems. All tanks, including pump chambers, must be verified to be leak-proof. The testing shall be conducted in accordance with ASTM standard C 1227, Section 9.2 Testing for Leakage.
2. All tanks shall be watertight with precautions taken for anti-buoyancy, as necessary.
3. An effluent filter shall be required on the outlet of the first septic tank in any pretreatment system.

9.2.1 **Vacuum Testing** – Seal the empty tank and apply a vacuum to 2 in. or 50 mm of mercury. The tank is approved if 90% of vacuum is held for 2 minutes.

9.2.2 **Water-Pressure Testing** – Seal the tank, fill with water, and let stand for 24 hours. Refill the tank. The tank is approved if water level is held for 1 hour.) In the event that a tank or chamber fails testing, repairs or replacement shall be required to the extent necessary to resolve the leaking condition.
B. **Dosing Chamber/Pump Components** *(See Appendix II for details of the most commonly accepted design for a dosing chamber and pump installation.)*

1. Schedule 40 PVC pipe, or approved equal shall be used between the tank(s) and the dosing chamber.
2. A separate watertight dosing chamber shall be installed for the wastewater design.
3. Pump size and model shall be determined by the designer and included on the plans along with the pump curve and projected operational discharge rate.
4. A quick disconnect union shall be installed in the riser of the dosing chamber to facilitate pump removal.
5. Consideration for a weep hole may be necessary depending on the distance between the dosing chamber and sand filter. If a weep hole is not installed, the entire force main must be installed below frost (42" below grade) with a check valve in the discharge line.
6. The pump system shall be equipped with both a pump run time meter and a pump cycle event counter. These are used to verify proper system cycling and to aid in pump adjustments and troubleshooting, as needed. A low-level off control must be installed in conjunction with a timer.
7. Recommended volume per dose is between 15 - 30 gallons for the standard residential (intermittent) sand filter.
8. All electrical components and connections must be inspected and approved in accordance with state or local code.
9. Installation of telemetric units are highly recommended but not required.

C. **Sand Filter System Sizing**

1. **Daily wastewater flow - design estimates:**
   a) Residential: For all residential applications, a wastewater design flow estimate of 150 gallons/bedroom/day shall be used.

2. **Sand Filter Sizing:**
   a) Loading Rate (LR) for intermittent sand filters is 1.2 gallons of effluent per square foot per day.
   b) LR for recirculating sand filters is 3 to 5 gallons per square foot per day.
   c) The minimum required sand filter area (SA) is determined by dividing the wastewater design flow (gallons/day) by the loading rate (gallons/day/square foot).

D. **Sand Filter Construction** *(See Appendices III & IV for typical sand filter system schematics.)*

1. **Liner construction:**
   a) Flexible membrane liners (FML) shall be placed against relatively smooth, regular surfaces. Surfaces shall be free of sharp edges, corners, roots, nails, wires, splinters, and other projections that might puncture, tear, or cut the liner. Where a smooth, uniform
surface cannot be assured in the field, filter system plans must include specifications for liner protection.

b) FML materials must have properties that are at least equivalent to 30-mil non-reinforced polyvinyl chloride (PVC).

c) FML materials must have field repair instructions and materials which are provided to the purchaser with the liner.

d) FML materials must have factory fabricated “boots” suitable for field bonding onto the liner to facilitate the passage of piping through the liner in a waterproof manner.

e) The liner’s PVC boot shall permit a watertight penetration of the liner for the transport pipe delivering effluent to the sand filter distribution system. When installing boots, the manufacturer’s installation specifications must be followed exactly, orienting the boot so the clamp is outside the sand filter (See Appendix IV).

f) If any portion of the filter will be above grade, then a “box” must be constructed using lumber to provide adequate support.

g) See liner specifications described in Appendix VIII for detailed information.

E. Underdrain Collector

1. The 4-inch slotted PVC underdrain pipe shall be Schedule 40 (or approved equal) pressure rated. Slots 1/8” wide shall be cut half way through the pipe 4 inches on center. The pipe is laid flat or slightly sloped toward the boot with the slots pointed upward and ends capped.

2. Stone ¼ inch to ½ inch in diameter shall be mounded at least 2 inches over the 4 inch slotted PVC drainpipe. Stone over the underdrain shall meet the following specifications:

   a) 100% passing ½ inch sieve;
   b) 2% or less passing the number 10 sieve;
   c) 1% or less passing the number 200 sieve;
   d) Uniformity co-efficient of 2 or less.

   Note: Do not use the media described above in the upper stone lens of the filter.

3. An observation port shall be provided from the underdrain to the top of the filter to allow easy access for sample collection and observation (See Appendix IV).

F. Sand Filter Media

1. Intermittent Sand Filters:

   a) Moist (not saturated) filter media shall be placed above and in direct contact with the underdrain stone.

   b) Filter media shall meet the particle size criteria detailed below, and a particle size analysis of the actual sand material proposed for use shall be provided prior to placement.

   c) Suitable materials should have an “effective size” (D10) of 0.4 to 0.9 mm and a “co-efficient of uniformity” (D60/D10) of 1 to 4.

      i. D10 = Particle size of which only 10% are smaller
      ii. D60 = Particle size of which 60% are smaller
Recommended Media for Intermittent Sand Filter

<table>
<thead>
<tr>
<th>Sieve</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8 inch</td>
<td>100%</td>
</tr>
<tr>
<td>No. 4</td>
<td>77% - 100%</td>
</tr>
<tr>
<td>No. 8</td>
<td>53% - 100%</td>
</tr>
<tr>
<td>No. 16</td>
<td>15% - 80%</td>
</tr>
<tr>
<td>No. 30</td>
<td>3% - 50%</td>
</tr>
<tr>
<td>No. 50</td>
<td>0% - 1%</td>
</tr>
<tr>
<td>No. 100</td>
<td>0% - 1%</td>
</tr>
<tr>
<td>No. 200</td>
<td>0% - 1%</td>
</tr>
</tbody>
</table>

2. Recirculating Sand Filters:
   a) Media placement shall be done in the same manner as in intermittent sand filters. A particle size analysis of the material shall be provided prior to placement.
   b) Suitable materials should have an effective size of 1.5 – 2.5 mm and a coefficient of uniformity of 1 to 3.

Recommended Media for Recirculating Sand Filter

<table>
<thead>
<tr>
<th>Sieve</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8 inch</td>
<td>100%</td>
</tr>
<tr>
<td>No. 4</td>
<td>70% - 100%</td>
</tr>
<tr>
<td>No. 8</td>
<td>5% - 78%</td>
</tr>
<tr>
<td>No. 16</td>
<td>0% - 4%</td>
</tr>
<tr>
<td>No. 30</td>
<td>0% - 2%</td>
</tr>
<tr>
<td>No. 50</td>
<td>0% - 1%</td>
</tr>
<tr>
<td>No. 100</td>
<td>0% - 1%</td>
</tr>
<tr>
<td>No. 200</td>
<td>0% - 1%</td>
</tr>
</tbody>
</table>

3. Sand Media Installation:
   a) A minimum of 30-inch depth of sand filling material shall be placed in all sand filters.
   b) Filter sand must be placed and compacted to 85% of the dry density to avoid settlement. The top of the sand surface must be flat.

G. Distribution Media
   The distribution stone media on top of the filter shall be comprised of at least 6 inches of clean, washed 6A stone. (Clean stone shall mean no silt, no residue, no fine sands, no chunks of sod, and no muddy footprints to rinse down on top of filter sand material.)
Recommended Stone Media for Distribution System

<table>
<thead>
<tr>
<th>Sieve</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1½ inch</td>
<td>100%</td>
</tr>
<tr>
<td>1 inch</td>
<td>95% - 100%</td>
</tr>
<tr>
<td>½ inch</td>
<td>30% - 50%</td>
</tr>
<tr>
<td>No. 4</td>
<td>0% - 8%</td>
</tr>
<tr>
<td>Loss by wash</td>
<td>0%</td>
</tr>
</tbody>
</table>

H. Distribution Network

1. Piping:
   a) The piping network in the sand filter shall consist of Schedule 40, 1¼" PVC manifolds (Class 200 minimum) connected to Schedule 40, ¾" laterals. Pressure distribution is required and must comply with appropriate design guidelines.
   b) Distribution pipes shall be equipped with a method for periodically cleaning lines. Each line can terminate in a sump and be provided with a removable cap for flushing, or the lines may be connected together with a larger diameter manifold equipped with a flush valve to allow several lines to be flushed at once.
   c) Pressure test: Once the piping network is completed, a system pressure test shall be conducted by the contractor and observed by the PDE/DSD. Pressure in the pipe network should be at least 5 feet and not more than 10 feet of head. A 1/8" orifice at 5' head delivers approximately 0.41 gpm.
   d) See Appendix IV for system layout details.

2. Hole Sizing and Spacing:
   a) The distribution pipe typically has 1/8" holes (orifices) on 2’ centers, but pipe spacings may vary. Spacing 2’ x 2’, or 2’ along the pipe and 2.5’ between the pipes, will provide distribution.
   b) If orifices are in the top of the pipe, orifices shields are required.
   c) Top of the pipe orifices are least susceptible to plugging while orifice shields prevent direct stone interference with the orifice flow.
   d) Hole positioning without shields should be at 3 o’clock or 9 o’clock.

I. Filter Fabric

1. Filter fabric is placed over the final course of stone. The purpose of the filter fabric is to keep soil, silts and fine-grained material from moving down into the sand filter, at the same time allowing air and water to pass freely.
2. Filter fabric used within on-site systems shall meet the following specifications:
   a) Use Non-woven fabric
   b) Weight – Not to exceed 2.0 oz. per square yard
   c) Trapezoidal tear strength -- 11 lbs minimum. (ASTM D 4533-91)
   d) Puncture Strength -- 10 lbs minimum (ASTM D 4833-88)
e) Surface Reaction to Water: hydrophilic.
f) Chemical Properties:
   i. Non-biodegradable
   ii. Resistant to acids and alkalis within a pH range of 4 to 10
   iii. Resistant to common solvents

J. Final Covering
1. The soil cover over an Intermittent Sand Filter must be sandy with no more than 12" of a sandy loam. This is to provide insulation against cold winter temperatures, to allow the free movement of air into the sand filter below, to prevent odors from escaping the sand filter, and to provide a soil base to support a vegetative cover.
2. Final covering of the sand filter shall provide a minimum slope of 1 to 5 to shed surface water and prevent ponding (See Appendix III).
3. For a Recirculating Sand Filter, no covering is recommended. The perimeter of the Recirculating Sand Filter shall be adequately fenced.

VII. SOIL ABSORPTION AREA

A. Designated Trench Area
   Once a designated trench area is identified, barriers to prevent equipment traffic over the absorption and greenbelt areas shall be provided to prevent damage to the upper soils. Absorption areas that are damaged before trench installation will void the wastewater disposal permit issued by the DPE/DSD.

B. Trench Construction
   1. The soil absorption area will consist of trenches unless approval is granted for an alternative. (See Appendices IV & IX.)
      a) Trench width will be 2’ or 3’. (See sizing chart on page 7.)
      b) The trenches will consist of 4" - 6" of 6A stone underneath the pipe, 4" alongside the pipe and 2" over for a total depth of 10" to 12". (See Appendix VI.)
      c) Trenches must be laid level along the contour of the slope. There must be a minimum 10 foot horizontal separation between trench sidewalls.
   2. The bottom of the drainfield stone must be kept at least 24 inches above the seasonal high groundwater table, as established by soil mottling.
   3. The minimum trench depth is 6 inches below existing grade with maximum trench depth of 12 inches below existing grade unless site conditions warrant a deviation. Any deviations must be approved by the DPE/DSD.
   4. The number of trenches shall not exceed 4. Trenches must be installed on the upper third of the sloped area. Surface drainage diversion in the form of swales or interceptor trenches is required.
C. **Observation Ports**
Observation ports at the terminal point of each trench shall be required. This observation port will be needed to review the system’s working condition and allow sample collection. (See Appendix VII.)

D. **Finish Grade and Final Cover**
1. Cover shall consist of 6”-12” of sandy loam or loam soil.
2. Any berm slopes shall maintain a minimum of 1 to 5 slopes and grading shall result in surface water drainage away from the trenches, sand filter and tanks. Establishing a grass cover over the sand filter is necessary to provide system aeration and reduce erosion of the cover.
3. A layer of topsoil is recommended to promote a vegetative cover over the absorption area.
4. Final approval of the permit/system cannot be granted until a vegetative cover has been established and grading is approved.

E. **Moratorium**
Trenches shall be installed between June 1 and October 1 unless specifically authorized by the DPE/DSD. Trenches are only to be constructed under dry weather conditions in order to prevent smearing and soil compaction.

F. **Contractor Responsibility**
It shall be the responsibility of the contractor/installer to obtain all necessary inspections from both the consultant and the DPE/DSD as construction proceeds. A 24 hour advance notice is required prior to installing trenches.

G. **Consultant Certification**
1. Prior to any final system approval by DPE/DSD, the consultant shall provide the DPE/DSD with confirmation that the wastewater treatment system installed meets their design(s). Final certification shall include pump counter and run time meter figures as well as pump discharge rate and drain-back volume (if applicable).
2. If any changes are made to the approved plan, they shall be documented and an as-built plan may be required to reflect those changes prior to final approval.

H. **General Completed Site Considerations**
1. Any field drainage tile shall be kept at a distance away from the system of 25 feet up-gradient and 50 feet down-gradient.
2. The completed system shall be seeded and covered with mulch or straw as soon as possible. A good vegetative covering is essential to the proper operation of this system.
3. Seeding of trench treatment area must be done without compaction of soils.
4. Consideration shall be taken in the design project for the appropriate area to discharge non-sewage wastewater (eave troughs, water softener, sump pump, etc.).
5. No sprinkler systems shall operate in the septic or greenbelt area.

VIII. MAINTENANCE AND SERVICE CONTRACT

A. Written Instructions
   1. The consultant shall provide the homeowner with written instructions on or with the plans regarding operation and maintenance of the proposed wastewater treatment system.
   2. The consultant shall advise the homeowner how to seed the constructed area without compaction of the soils over the filter bed and final disposal trenches, unless seeding is part of the contractor’s work.

B. Consultant and Homeowner Agreement (See Appendix XI for a Sand Filter Evaluation Form.)
   1. The homeowner is required to enter into a yearly agreement with a knowledgeable consultant to test, evaluate and review the working quality of the wastewater treatment system. A report of such an evaluation is to be filed with the DPE/DSD annually for a period of four (4) years.
   2. The contract must provide for an annual inspection of all components of the sewage system, cleaning of the septic tank effluent filter, flushing laterals, testing of the sand filter effluent through a certified laboratory and measurement of the water level in the trenches (from bottom of trench). The sand filter effluent shall be tested for:
      a) Fecal Coliform
      b) BOD’s
      c) Nitrates
      d) Suspended Solids
   3. A copy of the guaranteed 4 year service contact shall be provided to the DPE/DSD before a permit to install the wastewater system is issued.
**APPENDIX I:**

Minimum Required Isolation Distances

<table>
<thead>
<tr>
<th>Feature</th>
<th>Distance to Dosing Chamber, Septic Tank &amp; Sand Filter (in feet)</th>
<th>Distance to Soil Absorption Area Including Greenbelt (in feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private wells</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>surface water</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Drainage swales</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>Pressure water lines</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Suction water lines</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Building footing with footing drains</td>
<td>15</td>
<td>50 ft. to Sand Filter</td>
</tr>
<tr>
<td>Building footing without footing drains</td>
<td>10</td>
<td>50 ft. to Sand Filter</td>
</tr>
<tr>
<td>Property lines (both upgradient and downgradient*)</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

**NOTE:** The force main from the dosing tank to the disposal field should be isolated a minimum of 50 feet from wells and surface waters.

*Downgradient may be referred to as green belt area that must be mowed and maintained as a portion of the lawn.
APPENDIX II:

Pump Chamber Layout
APPENDIX III:

Sand Filter Detail (End View)
APPENDIX IV:

Sand Filter Detail (Top & Side Views)
and Orifice Detail
APPENDIX V:

Underdrain Boot Detail

LINER CARE
- MUST BE WATERPROOF
- DO NOT CREATE ABNORMAL STRESS POINTS
- GLUING MUST BE DONE TO SPECS FROM MANUFACTURES
- PLYWOOD FRAMING MAY BE NEEDED IN UNSTABLE SOILS

UNDERDRAIN BOOT DETAIL
(NOT TO SCALE)
APPENDIX VI:
Final Disposal Trench Detail
APPENDIX VII:
Observation Port Detail
## APPENDIX VIII:

### Flexible Membrane Liner Specifications

#### FLEXIBLE MEMBRANE LINERS FOR SAND FILTERS TREATING SEPTIC TANK EFFLUENT

1. Unsupported polyvinyl chloride (PVC) shall have the following properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Thickness</td>
<td>ASTM D1593, Para 8.1.3</td>
<td>30 mil. minimum</td>
</tr>
<tr>
<td>b) Specific gravity (minimum)</td>
<td>ASTM D792, Method A</td>
<td></td>
</tr>
<tr>
<td>c) Minimum tensile properties (each direction)</td>
<td>ASTM D882</td>
<td></td>
</tr>
<tr>
<td>• Breaking factor (pounds/inch width)</td>
<td>Method A or B, (1 inch wide)</td>
<td>69</td>
</tr>
<tr>
<td>• Elongation at break (percent)</td>
<td>Method A or B</td>
<td>300</td>
</tr>
<tr>
<td>• Modulus (force) at 100% elongation (pounds/inch width)</td>
<td>Method A or B</td>
<td>27</td>
</tr>
<tr>
<td>d) Tear resistance (pounds, minimum)</td>
<td>ASTM D1004, Die C</td>
<td>8</td>
</tr>
<tr>
<td>e) Low temperature</td>
<td>ASTM D1790</td>
<td>-20°F</td>
</tr>
<tr>
<td>f) Dimensional stability (each direction, percent)</td>
<td>ASTM D1204, 212°F, 15 min.</td>
<td>+5</td>
</tr>
<tr>
<td>g) Water extraction</td>
<td>ASTM D1239</td>
<td>-0.35% max.</td>
</tr>
<tr>
<td>h) Volatile loss</td>
<td>ASTM D1203</td>
<td>.7% max</td>
</tr>
<tr>
<td>i) Resistance to soil burial (percent change maximum in original value)</td>
<td>ASTM D3083, Method A</td>
<td></td>
</tr>
<tr>
<td>• Breaking factor</td>
<td></td>
<td>-5</td>
</tr>
<tr>
<td>• Elongation at break</td>
<td></td>
<td>-10</td>
</tr>
<tr>
<td>• Modulus at 100% elongation</td>
<td></td>
<td>+10</td>
</tr>
<tr>
<td>j) Bonded seam strength (factory seam, breaking factor)</td>
<td>ASTM D751</td>
<td>82</td>
</tr>
<tr>
<td>k) Hydrostatic resistance</td>
<td>ASTM D751, Method A</td>
<td>82</td>
</tr>
</tbody>
</table>
APPENDIX IX:
Sample Deed Restrictions and Property Use Agreement

AGREEMENT AND PROPERTY USE RESTRICTIONS
FOR SEPTIC TANK SEWAGE DISPOSAL PERMIT

THIS INDENTURE, made this ____________ day of ____________ 20_____, by and between ____________________ and ____________________, ____________________, whose residence is _________________________, Michigan _______, hereinafter called “Owner(s)”, and the WASHTENAW COUNTY DEPARTMENT OF PLANNING AND ENVIRONMENT, having its principal place of business at 705 N. Zeeb Road, Ann Arbor, Michigan 48107.

WITNESSETH:

WHEREAS, _________________________ is/are the Owner(s) in fee simple of the following described property located in ____________________ Township, Washtenaw County, Michigan.

Legal Description

The above-described premises contain _____ acres, more or less.

WHEREAS, the Owner(s) has/have an application for a sewage disposal system on the property described above; and

WHEREAS, an investigation has been made of the land area and proposed use of said property; and

WHEREAS, the Washtenaw County Health Officer is of the opinion that the available land is not suitable for a permit for a conventional septic tank drainfield system necessary to serve a building on a year-round basis; and

WHEREAS, said Owner(s) have indicated his/her/their desire to construct an experimental septic system to serve a _____ bedroom, _____ bathroom house.

NOW, THEREFORE, in consideration of the covenants and agreements and restrictions contained in this Agreement, the parties mutually agree as follows:

1. That the Owner(s) agree to install an alternative septic system as designed by _________________________, Professional Engineer, and as described in his/her engineering plan and report titled “________________________.”
2. That the design engineer oversees the installation, construction, and monitoring of the system for a period of four (4) years after installation of the system.

3. That the design engineer submits an annual report to the Washtenaw County Department of Planning and Environment which indicates the measurement of water use, observation of the system during February or March of each year by _________________________, a Professional Engineer, and report on the system and how it is functioning.

4. That all construction complies with the sewage permit which the Washtenaw County Department of Planning and Environment will issue and complies with the approved plan and sewage system design as submitted by and approved by the Washtenaw County Department of Planning and Environment.

5. Owner(s) waive all claims he/she/they may have against the Washtenaw County Department of Planning and Environment which may arise as a result of Owner’s installation and use of the experimental septic system.

6. The house size shall not exceed _____ bedroom(s), _____ bathroom(s).

7. At the end of four (4) years, the design engineer or his/her representative shall prepare recommendations on the sewage system design, operation, and maintenance. This report will be submitted to the Washtenaw County Department of Planning and Environment to determine if the system can be accepted as a standard sewage system.

8. In the event of a sewage disposal failure, as determined by the Washtenaw County Department of Planning and Environment, Owners shall:

   ➢ immediately eliminate any health hazard created on the premises or on any neighboring properties; **AND**

   ➢ vacate the property until the soil in the vicinity of the sewage system has dried and a new septic disposal system is built and approved by the Washtenaw County Department of Planning and Environment, or a court determination is made that the sewage disposal system is adequate; **OR**

   ➢ construct the modified fill-type drainfield as approved to be the back-up system for the experimental sand filter system.

5. This Agreement and any required permits, together with the covenants and restrictions, shall run with the land, and shall bind, and inure to the benefit of the heirs, executors, administrators, devisees, successors, legal representatives, and assigns of the respective parties to whom the whole or any part of the land so made subject to said permit shall at any time
become or belong. Any violation of the restrictions and covenants contained in this Agreement shall void any required permits.

6. Failure of the Washtenaw County Department of Planning and Environment to enforce any covenant or restriction contained in this Agreement shall not be construed as a waiver of any further breach of same covenant or restriction in the future.

7. This Agreement and any amendments hereto shall be recorded by the Owner(s) within three (3) calendar days from the date of this Agreement with the Washtenaw County Register of Deeds.

8. This Agreement shall only be modified upon written approval of the Washtenaw County Department of Planning and Environment.

WITNESSES:

__________________________________________  ________________________________
Owner

__________________________________________

__________________________________________  ________________________________
Owner
On this ____________ day of ____________ 20_____, before me a Notary Public, appeared ___________________________________ who being duly sworn stated that the above statements are true to the best of their knowledge and belief.

Notary Public, Michigan
My Commission Expires:

IN WITNESS WHEREOF, the parties hereto have executed this document on the day and year first written above.

WITNESSES:

_______________________________  ________________________
Washtenaw County Department of Planning and Environment
On this __________ day of __________ 20____, before me a Notary Public appeared ______________________ who being duly sworn stated that the above statements are true to the best of his/her knowledge and belief.

____________________________
Notary Public, Michigan
My Commission Expires:

When recorded, please return to:

STAFF NAME
Washtenaw County
Department of Planning and Environment
705 N. Zeeb Road
P.O. Box 8645
Ann Arbor, MI  48107-8645
APPENDIX X:

Typical Preliminary Site Plan
# Appendix XI:
## SAND FILTER EVALUATION FORM

### Site Information:

<table>
<thead>
<tr>
<th>Property Owner Name</th>
<th>Date System Installed</th>
<th>Date of Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Property Address Number, Street/Road</th>
<th>Township/City</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Volume of Septic Tank(s)</th>
<th>Pump Tank Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of Bedrooms</th>
<th>Number of Baths</th>
<th>Number of Occupants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Field Observations:

<table>
<thead>
<tr>
<th>Tank Infiltration</th>
<th>Laters Purged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes No</td>
<td>Yes No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pump Functioning</th>
<th>Effluent Filter Cleaned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes No</td>
<td>Yes No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sand Filter Functioning</th>
<th>Disposal Area/Greenbelt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes No</td>
<td>Yes No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Valves Functioning</th>
<th>Undisturbed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes No</td>
<td>Yes No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Water Level in Sand Filter</th>
<th>General Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes No</td>
<td>Yes No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drainage Improvement</th>
<th>Evidence of Ponding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes No</td>
<td>Yes No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Water Level (inches from bottom of trench):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Level in Trench #1</td>
</tr>
<tr>
<td>Water Level in Trench #2</td>
</tr>
<tr>
<td>Water Level in Trench #3</td>
</tr>
<tr>
<td>Water Level in Trench #4</td>
</tr>
</tbody>
</table>

### General Maintenance:

<table>
<thead>
<tr>
<th>Laters Purged</th>
<th>Effluent Filter Cleaned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes No</td>
<td>Yes No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disposal Area/Greenbelt</th>
<th>Undisturbed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes No</td>
<td>Yes No</td>
</tr>
</tbody>
</table>

### Water Level (inches from bottom of trench):

<table>
<thead>
<tr>
<th>Water Level in Trench #1</th>
<th>Sand Filter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Water Level in Trench #2</th>
<th>Trenches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Water Level in Trench #3</th>
<th>General Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Water Level in Trench #4</th>
<th>General Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes No</td>
</tr>
</tbody>
</table>

### Evidence of Ponding:

<table>
<thead>
<tr>
<th>Sand Filter</th>
<th>Trenches</th>
<th>General Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes No</td>
<td>Yes No</td>
<td>Yes No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trenches</th>
<th>General Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes No</td>
<td>Yes No</td>
</tr>
</tbody>
</table>

### Sample Results:

<table>
<thead>
<tr>
<th>BOD</th>
<th>SS</th>
<th>Nitrate</th>
<th>Bacteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Pump Components:

<table>
<thead>
<tr>
<th>Pump Count</th>
<th>Gallons per Cycle</th>
<th>Total Gallons Used</th>
<th>Avg. Daily Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pump Discharge in GPM</th>
<th>Pump Run Time/Meter Count Hours</th>
<th>Alarms Functioning Properly</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes No</td>
</tr>
</tbody>
</table>

### Comments:


### Design Engineer:

<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
<th>Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Report By:  


### Signature:


