Missoula Public Health
City-County Health Department

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ALTERNATIVE SYSTEMS MANUAL

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Alternative systems must be designed in accordance with the Department of Environmental Quality (DEQ) Circular 4 except when noted otherwise in this manual.

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1. GENERAL

1.1 General Conditions

1.1.1 This document establishes the allowed uses, the design and installation criteria and operational requirements of alternative septic systems that have been approved by the Missoula City-County Health Board.

1.1.2 Unless a provision under an alternative system provides otherwise, all definitions and rules pertaining to conventional drainfields and septic tanks apply to alternative systems.

1.1.3 Use of an alternative system may preclude future divisions of the property pursuant to State requirements. The applicant and future owners assume responsibility for any restrictions, liabilities or encumbrances that are caused by the use of an alternative system.

1.1.4 All alternative system designs must provide for replacement areas equivalent to those required for conventional systems.

1.2 Applicable Rules and Design Manuals

1.2.1 Applicable rules and design manuals are available at the Health Department at 301 West Alder in Missoula and on the Environmental Health Website www.co.missoula.mt.us. At the time of adoption, the documents were also available at the websites listed below. Copy fees apply to documents picked up at the Health Department.

1.2.2 Alternative systems must be designed in accordance with the Department of Environmental Quality (DEQ) Circular 4, "Montana Standards for Subsurface Wastewater Treatment Systems," 2013 Edition (DEQ 4) except when noted otherwise in this manual.

1.2.3The Wisconsin Mound Soil Absorption System: Siting, Design and Construction Manual, Edition 2000 (Wisconsin Manual), sets forth siting, design and construction requirements for elevated sand mounds.

1.2.4The DEQ "List of Subsurface Wastewater Treatment Systems (SWTS) that are Approved as a Nitrogen Reducing System" (Approved Systems for Nitrogen Reduction) governs which systems can be used for nitrogen reduction.

1.2.5 DEQ Circular 2, "Design Standards for Wastewater Facilities", 2012 Edition (DEQ 2) applies to Wastewater Reclamation and Reuse systems and Wastewater Lagoons and Ponds.

1.2.6 The United States Environmental Protection Agency's (EPA) "Design Manual for Land Treatment of Municipal Wastewater", Chapter 4 (EPA 625/1-81-013) or succeeding documents, applies to Wastewater Reclamation and Reuse systems.

(Informational Only) Links to Above Referenced Manuals and Regulations	
Missoula City-County Health Code	www.missoulacounty.us
DEQ Circular 4	http://www.deq.mt.gov/wqinfo/Circulars.mcpx
Wisconsin Manual	http://www.soils.wisc.edu.sswmp.SSWMP_15.24.pdf
Approved Systems for Nitrogen Reduction	deq.mt.gov/wqinfo/Sub/.../level2_web_list_4_2012.pdf
DEQ Circular 2	http://www.deq.mt.gov/wqinfo/Circulars.mcpx
US EPA Design Manual for Land Treatment of Municipal Wastewater	http://www.epa.gov/nrmrl/pubs/625180113/625181013FrontMatter.pdf

*This table is not regulatory and will be updated as needed by the Department.

2. SHALLOW-CAPPED DRAINFIELDS

2.1 Definition

Shallow-capped drainfields are conventional drainfields installed less than 24" deep.

2.2 Use

2.2.1 Shallow-capped drainfields may be used where depth to seasonal high groundwater, bedrock or any limiting layer is 5 feet or more from the natural ground surface.

2.3 Design & Construction

2.3.1 Shallow-capped drainfields must be designed and constructed in accordance with DEQ 4, Section 6.2 in addition to the requirements of this section.

2.3.2 Pressure distribution is required.

2.3.3 Trenches must be at least 12" deep.

2.3.4 The system must meet the cap requirements of DEQ 4, Section 6.2.3.1.

2.3.5 A minimum of ten (10) feet must separate the edge of the fill and the nearest trench sidewall.

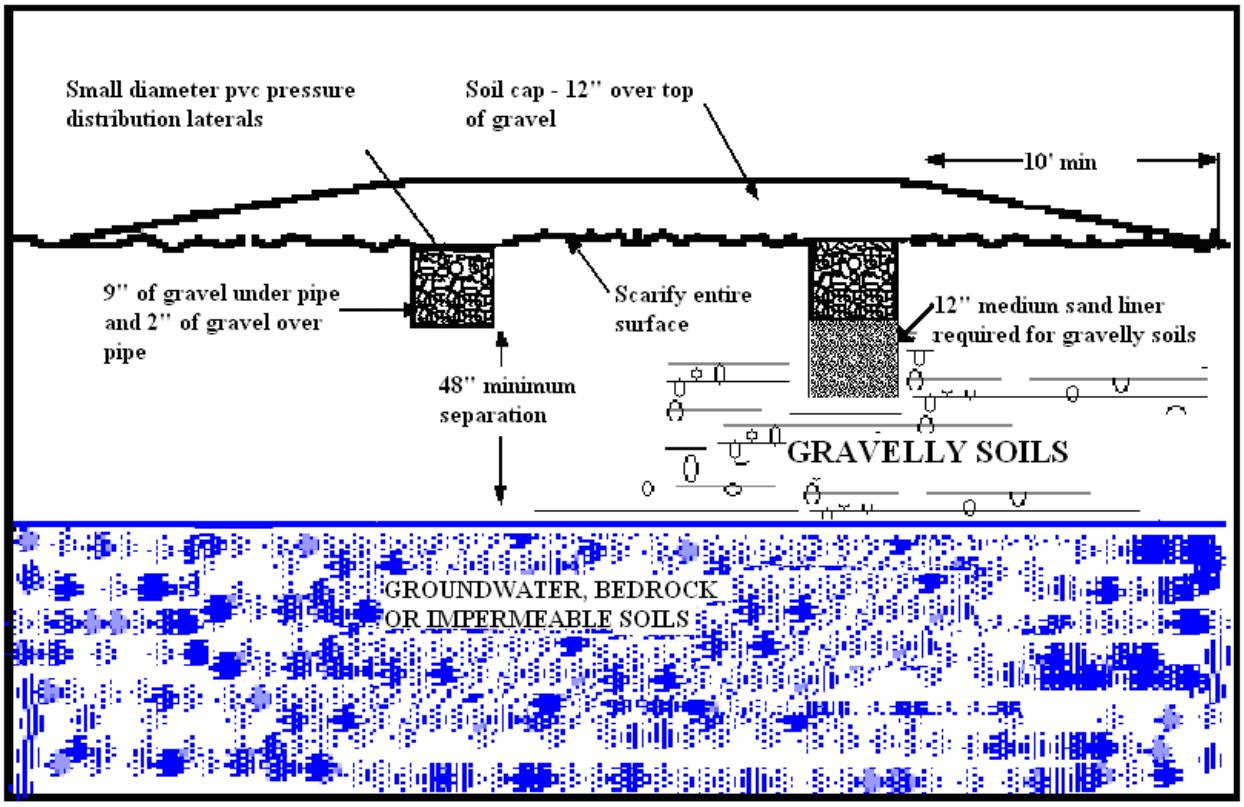
2.3.6 The cap must be fenced from livestock and protected from any potentially damaging conditions.

2.3.7 Shallow-capped drainfield systems must be installed during dry weather conditions when the moisture content of the soil is low enough to prevent the loss of soil structure.

2.3.8 The absorption system site and the site from which the fill material is taken must be scarified to destroy vegetation.

2.3.9 The cap must be seeded.

FIGURE 2.1
CROSS SECTION OF SHALLOW DRAINFIELD



2.4 Inspections

2.4.1 All shallow drainfields must receive a pre-cover inspection of the installed pressure distribution system, scarification areas, and cap material.

3. DEEP ABSORPTION TRENCHES

3.1 Definition

Deep absorption trenches are drainfields with trenches more than thirty-six (36) inches deep, which break through a less permeable soil to a more permeable soil layer below.

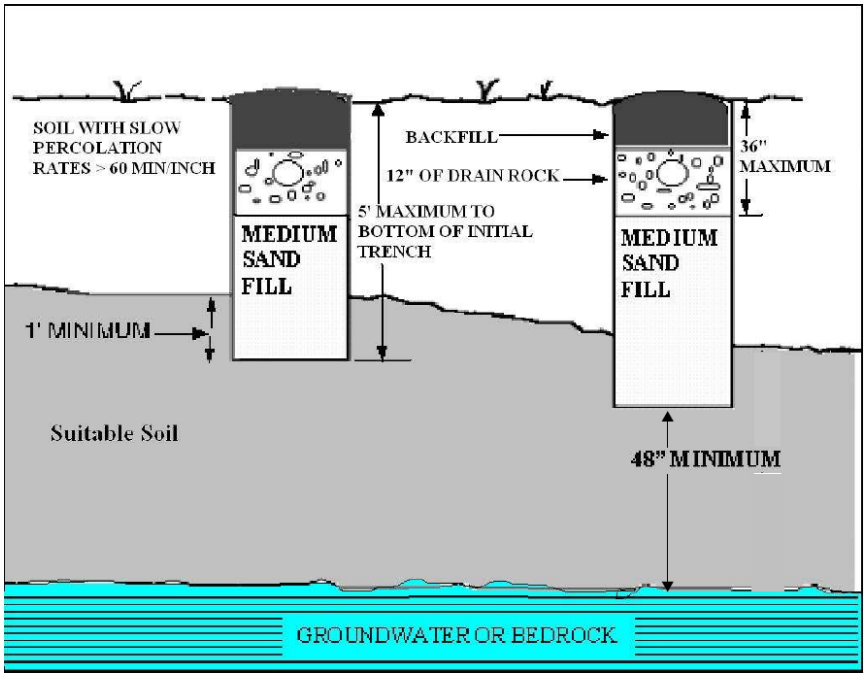
3.2 Use

3.2.1 Deep absorption trenches may only be used to break through a less permeable soil layer and allow effluent to infiltrate a deeper and more permeable soil.

3.3 Design & Construction

3.3.1 Deep absorption trenches must be designed and constructed using the criteria in DEQ 4, Section 6.4, in addition to the requirements of this section.

FIGURE 3.1
DEEP ABSORPTION TRENCH CROSS SECTION



4. ELEVATED SAND MOUNDS

4.1 Definition

Elevated sand mounds are absorption systems installed above natural ground in a mound of medium sand. A typical mound system is depicted in Figure 4.1.

4.2 Use

4.2.1 Elevated sand mounds may be used to achieve separation distance between the treatment system and a limiting layer. Four feet of natural soil must be maintained between the modified site and the limiting layer.

4.3 Design & Construction

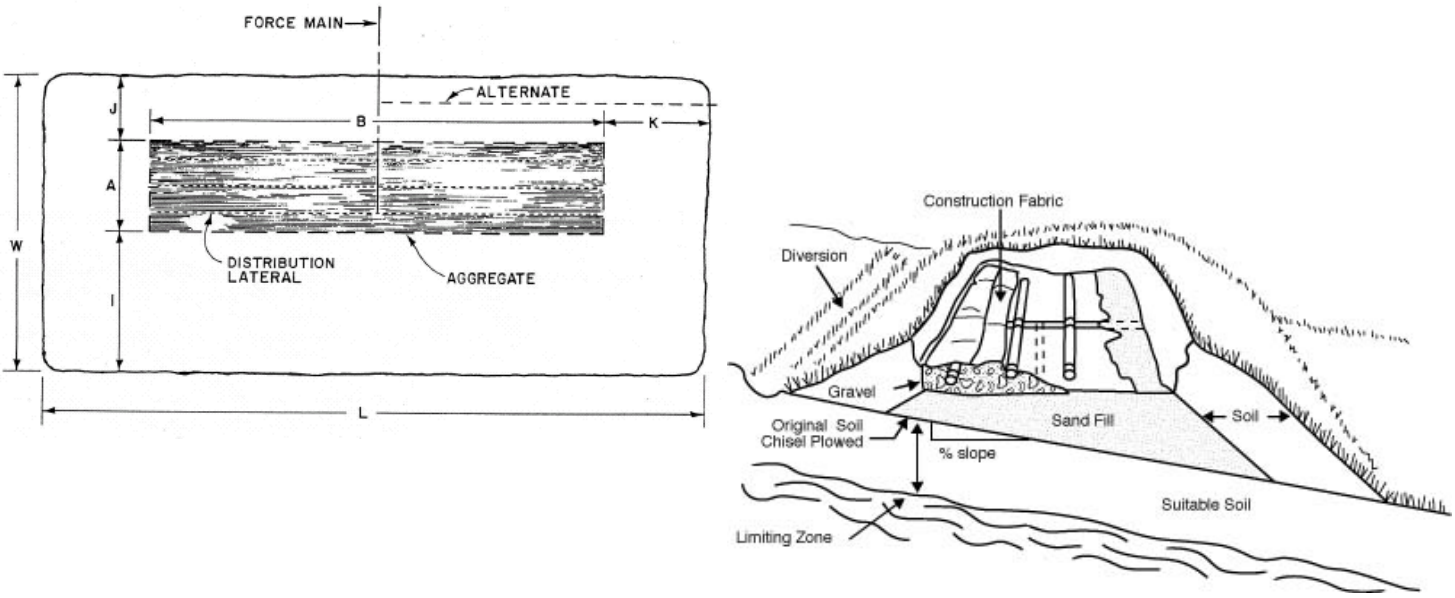
4.3.1 Elevated Sand Mounds must be sited, designed and constructed in accordance with DEQ 4, Section 6.7. and the Wisconsin Mound Soil Absorption System: Siting, Design and Construction Manual, January, Edition 2000, in addition to the requirements of this section.

4.3.2 Linear and basal loading rates from the Wisconsin Manual must be used.

4.4 Certification and As-builts

4.4.1 Certification and as-built plans are required in accordance with DEQ 4, Appendix D.

FIGURE 4.1
ELEVATED SAND MOUND
(as depicted in Wisconsin Manual)

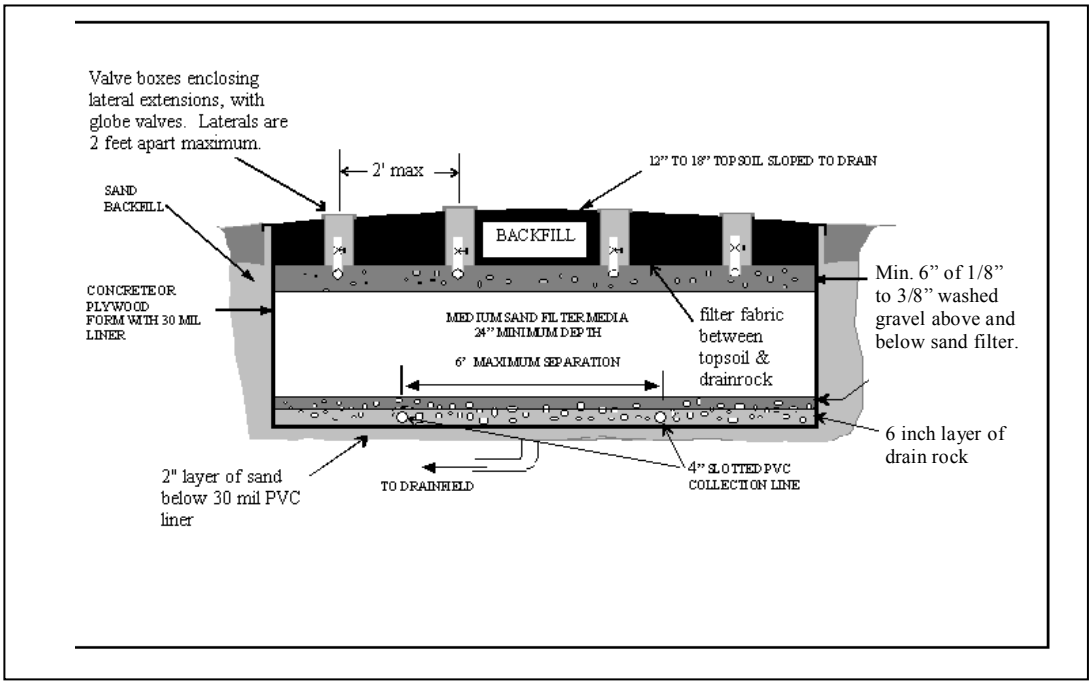


5. INTERMITTENT SAND FILTERS

5.1 Definition

Intermittent sand filters (ISF) are sand-filled chambers or boxes used to filter or treat primary effluent from a septic tank or other type of primary treatment device. The filters are dosed intermittently and the effluent is disposed of in a drainfield or other approved wastewater treatment system allowed by the Health Code. Figure 5.1 depicts the cross section of a typical ISF.

FIGURE 5.1
INTERMITTENT SAND FILTER



5.2 Use

5.2.1 Intermittent Sand Filters may be used for improving effluent quality (including reducing nitrogen when approved by DEQ) before disposal in an approved system.

5.3 Design & Construction

5.3.1 ISF's must be designed and constructed in accordance with DEQ 4, Section 7.2., in addition to the requirements of this section.

5.3.2 A perimeter support frame, made of plywood or concrete, must be used to hold the liner in place during construction. Sand must be placed between frame supports structure supports and the excavated soil while the filter media is being installed to keep the framework and liner vertical during construction. The frame may not have any nails or sharp objects located on the inside where they may puncture the liner.

5.4 Maintenance

5.4.1 ISF's must meet the operation and maintenance criteria in DEQ 4, Appendix D, in addition to the criteria in this section.

5.4.2 ISF's must be operated and maintained to ensure they work as designed. At a minimum:

5.4.3 Septic tanks must be inspected every year and pumped at least every fourth year.

5.4.4 Proposed subdivisions with three or more lots that are or will be served with shared, multi-family and community systems with ISF's must provide a Maintenance Special Improvement District, a Sewer and Water District or other mechanism providing equivalent institutional and financial stability, as approved by the Department.

5.4.5 The owner of an individual lot with an ISF system is responsible for its maintenance and operation. A maintenance and operation plan must be signed by the owner and attached to the septic permit at the time of issuance.

5.4.6 Deed restriction required.

5.4.6.1 Owners of individual lots who apply for a permit for an ISF's must execute a deed restriction requiring on-going operation and maintenance of the system and waiving the option to protest the creation of a Maintenance Special Improvement District, a Sewer and Water District, or other approved mechanism instituted to ensure maintenance of the sand filter system, using the language set forth below.

"I/We, the undersigned, hereby certify that I/we are the owners of the real property located at (legal description) and hereby agree to operate and maintain the intermittent sand filter as stated in the operation and maintenance plan on file with the Missoula City-County Health Department and I/we waive the option to protest an RSID or SID affecting the property for the purpose of financing the maintenance, repair or replacement of the sand filter system serving the property. Further, my/our signatures on this waiver may be used in lieu of my/our signature(s) on an RSID or SID petition for the creation of one or more RSIDs or SIDs for the purpose of financing the maintenance and repair or replacement of the sand filter system used for the above-described property.

5.4.6.2 The filing of a deed restriction is not required if:

a.) previously filed from the same parcel;
b.) similar language has been shown on an approved and filed subdivision plat or certificate of survey; or,
c.) the property is owned by a public entity.

5.5 Certification and As-builts

5.5.1 Certification and as-built plans are required in accordance with DEQ 4, Appendix D.

6. RECIRCULATING SAND FILTERS

6.1 Definition

Recirculating Sand Filters (RSF) are "pea gravel" (or similar material) filled chambers or boxes used to filter or treat primary effluent from a septic tank or other type of primary treatment device. The filter has a tank that circulates the filtered effluent back through the filter using a minimum equivalent of 4 passes through the filter. The effluent is disposed of in a drainfield or other approved wastewater treatment system. Figure 6.1 depicts the cross-section of a typical RSF.

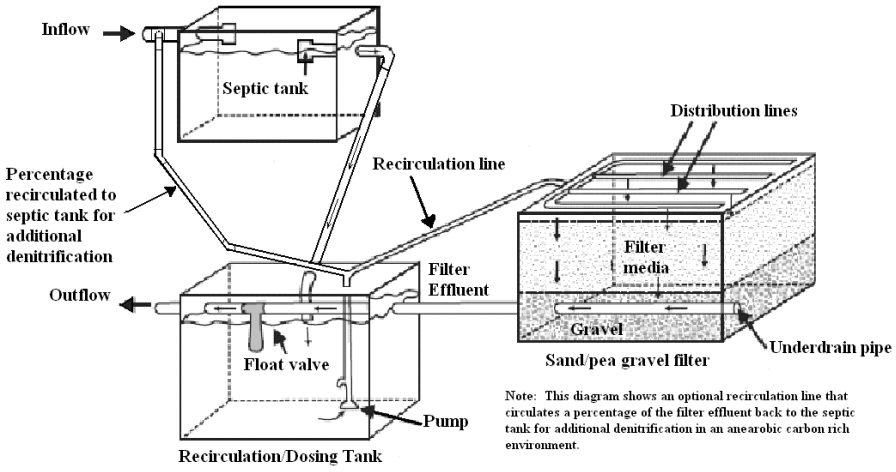
6.2 Use

6.2.1 RSF's may be used for improving effluent quality (including reducing nitrogen when approved by DEQ) before disposal in an approved system.

6.3 Design & Construction

6.3.1 RSF's must be designed & constructed in accordance with DEQ 4, Section 7.3., in addition to the requirements of this section.

FIGURE 6.1
RECIRCULATING SAND FILTER



6.3.2 A plywood or concrete perimeter support frame is required to hold the liner in place during construction. Sand must be placed between structure supports and the excavated soil while the filter media is being installed to keep the framework and liner vertical during construction. The frame may not have any nails or sharp objects located on the inside where they may puncture the liner.

6.4 Maintenance

6.4.1 RSF's must meet the operation and maintenance criteria in DEQ 4, Appendix D, in addition to the criteria in this section.

6.4.2 RSF's must be operated and maintained to ensure they work as designed. At a minimum:

6.4.3 Septic tanks must be inspected every year and pumped at least every fourth year.

6.4.4 Proposed subdivisions with three or more lots that are or will be served with shared, multi-family and community systems with RSF's must provide a Maintenance Special Improvement District, a Sewer and Water District or other mechanism providing equivalent institutional and financial stability, as approved by the Department.

6.4.5 The owner of an individual lot with a RSF system is responsible for its maintenance and operation. A maintenance and operation plan must be signed by the owner and attached to the septic permit at the time of issuance.

6.4.6 Deed restriction required.

6.4.6.1 Owners of individual lots who apply for a permit for a RSF's must execute a deed restriction requiring on-going operation and maintenance of the system and waiving the option to protest the creation of a Maintenance Special Improvement District, a Sewer and Water District, or other approved mechanism instituted to ensure maintenance of the sand filter system, using the language set forth below.

"I/We, the undersigned, hereby certify that I/we are the owners of the real property located at (legal description) and hereby agree to operate and maintain the recirculating sand filter as stated in the operation and maintenance plan on file with the Missoula City-County Health Department and I/we waive the option to protest an RSID or SID affecting the property for the purpose of financing the maintenance, repair or replacement of the recirculating sand filter system serving the property. Further, my/our signatures on this waiver may be used in lieu of my/our signature(s) on an RSID or SID petition for the creation of one or more RSIDs or SIDs for the purpose of financing the maintenance and repair or replacement of the sand filter system used for the above-described property.

6.4.6.2 The filing of a deed restriction is not required if:

a.) previously filed from the same parcel;
b.) similar language has been shown on an approved and filed subdivision plat or certificate of survey; or,
c.) the property is owned by a public entity.

6.5 Certification and As-builts

6.5.1 Certification and as-built plans are required in accordance with DEQ 4, Appendix D.

7. RECIRCULATING MEDIA TRICKLING FILTERS

7.1 Definition

Recirculating Media Trickling Filters (RMTF's) use aerobic, attached-growth treatment processes to biologically oxidize organic material and convert ammonia to nitrate (nitrification). A trickling filter consists of a bed of highly permeable medium to which a bio-film adheres in an unsaturated environment. Wastewater is applied to the top of the bed and it trickles through the media. Microorganisms in the bio-film degrade organic material and may also nitrify the wastewater. An under-drain system collects the treated wastewater and any sloughed solids and transports it to a settling tank, from which it is recirculated through the trickling filter. The effluent is disposed of in a drainfield or other approved wastewater treatment system. Figure 7.1 depicts the cross section of a typical RMTF.

7.2 Use

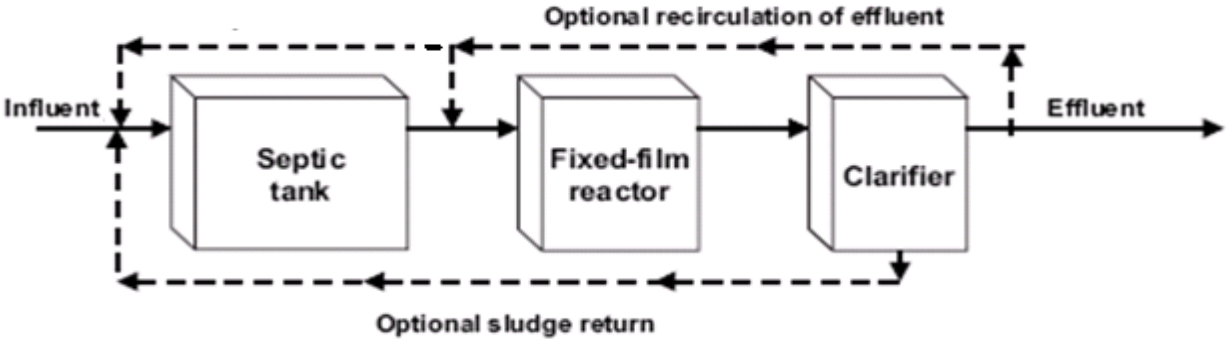
7.2.1 RMTF's may be used for improving effluent quality (including reducing nitrogen when approved by DEQ) before disposal in any approved system.

7.3 Design & Construction

7.3.1 RMTF's must be designed and constructed in accordance with DEQ 4, Section 7.1., in addition to the requirements of this section.

7.3.2 Package designs may be used if engineered specifications are included with the permit application and are approved by the Department.

FIGURE 7.1
RECIRCULATING TRICKLING FILTER



7.4 Maintenance

7.4.1 RMTF's must meet the operation and maintenance criteria in DEQ 4, Appendix D, in addition to the criteria in this section.

7.4.2 RMTF's must be operated and maintained to ensure they work as designed. At a minimum:

7.4.2.1 Septic tanks must be inspected every year and pumped at least every fourth year.

7.4.3 Proposed subdivisions with three or more lots that are or will be served with shared, multi-family and community systems with RMTF's must provide a Maintenance Special Improvement District, a Sewer and Water District or other mechanism providing equivalent institutional and financial stability, as approved by the Department.

7.4.4 The owner of an individual lot with a RMTF system is responsible for its maintenance and operation. A maintenance and operation plan must be signed by the owner and attached to the septic permit at the time of issuance.

7.4.5 Deed Restriction Required

7.4.5.1 Owners of individual lots who apply for a permit for a RMTF's must execute a deed restriction requiring on-going operation and maintenance of the system and waiving the option to protest the creation of a Maintenance Special Improvement District, a Sewer and Water District, or other approved mechanism instituted to ensure maintenance of the recirculating trickling filter system, using the language set forth below.

"I/We, the undersigned, hereby certify that I/we are the owners of the real property located at (legal description) and hereby agree to operate and maintain the recirculating media trickling filter as stated in the operation and maintenance plan on file with the Missoula City-County Health Department and I/we waive the option to protest an RSID or SID affecting the property for the purpose of financing the maintenance, repair or replacement of the recirculating trickling filter system serving the property. Further, my/our signatures on this waiver may be used in lieu of my/our signature(s) on an RSID or SID petition for the creation of one or more RSIDs or SIDs for the purpose of financing the maintenance and repair or replacement of the recirculating trickling filter system used for the above-described property. I/We understand that in lieu of an RSID or SID to finance the maintenance and repair or replacement of the recirculating trickling filter, the real property owner is responsible for any financial requirements of operation, maintenance, or replacement.

7.4.5.1 The filing of a deed restriction is not required if:

a.) previously filed from the same parcel;

b.) similar language has been shown on an approved and filed subdivision plat or certificate of survey; or,

c.) the property is owned by a public entity.

7.5 Certification and As-builts

7.5.1 Certification and as-built plans are required in accordance with DEQ 4, Appendix D.

8. UNSEALED PIT PRIVIES

8.1 Definition

Unsealed pit privies are buildings containing a stool, urinal or seat over an excavation in natural soil For the disposal of non-water carried toilet wastes.

8.2 Use

8.2.1 Unsealed pit privies may only serve structures that are not served by running water or plumbing extending into or out of the structure, except when waste segregation is utilized.

8.2.2 Unsealed pit privies are prohibited on small lots in areas characterized as residential or commercial development.

8.2.3 Unsealed pit privies must meet all setback distances of standard absorption trenches.

8.2.4 Unsealed pit privies may be approved only for use in remote locations that are not accessible to septic tank pumpers.

8.3.5 The use of unsealed pit privies may be further restricted by the Missoula Municipal Code and Ordinances inside of city limits.

8.3 Design

8.3.1 Unsealed pit privies must be designed to maintain at least 4 feet of natural soil between the bottom of the pit and groundwater or other limiting layer.

8.3.2 A site evaluation may be required to determine the depth to groundwater or other limiting layer prior to the construction of an unsealed pit privy.

8.4 Construction

8.4.1 Unsealed pit privies must meet all the construction requirements of DEQ 4, Section 8.3.dealing with unsealed pit privies.

8.4.2 An unsealed pit privy may be constructed by someone other than a Certified Installer.

8.5 Abandonment

8.5.1 Unsealed pit privies must be abandoned according to the requirements of DEQ Circular 4, Section 8.3. dealing with unsealed pit privies.

9. SEALED (VAULT) PIT PRIVIES

9.1 Definition

A sealed pit privy is an underground vault for the temporary storage of non-water-carried wastewater. The vault must be pumped periodically and the wastewater disposed of at a treatment site.

9.2 Use

9.2.1 Sealed pit privies may be used only at public recreational facilities operated by governmental institutions, recreation facilities located on government property operated under lease, licensed campgrounds, or to replace a legally installed, privately owned, unsealed pit privy in an area of high groundwater or fractured bedrock.

9.2.2 The use of sealed pit privies shall cease when the property on which they are located is no longer a public recreation facility operated by a governmental institution, a recreation facility located on government property operated under lease, a licensed campground, or conditions allowing the use of the original sealed pit privy are no longer applicable.

9.2.3 Sealed pit privies may be required as privately owned replacement systems instead of permitting an unsealed pit privy if the Department determines that waste from the pit privy could potentially pollute groundwater or cause a nuisance.

9.2.4 Sealed pit privies may only serve structures that are not served by running water or plumbing extending into or out of the structure, except when waste segregation is utilized.

9.2.5 The use of sealed pit privies may be further restricted by the Missoula Municipal Code and Ordinances inside of city limits.

9.3 Design & Construction

9.3.1 Sealed pit privies must be designed and constructed in accordance with the requirements of DEQ 4, Section 8.2, in addition to the requirements of this section.

9.3.2 Permit applications for sealed pit privies must include plans for the proposed sealed pit.

9.3.3 A sealed pit privy may be constructed by someone other than a Certified Installer.

9.3.4 Sealed pit privies must be located at least ten (10) feet outside the floodplain or any openings must be at least two feet above the floodplain elevation.

9.3.5 Except for floodplain or flood-prone area separation, permanently sealed pit privies must follow the location requirements for septic tanks in section 10(C). This provision does not release the applicant from obtaining required floodplain permits.

9.4 Maintenance and Operation

9.4.1 Sealed pit privies must be maintained and operated in accordance with DEQ 4, Section 8.2, in addition to the requirements of this section.

9.4.2 Sealed pit privies must be emptied as needed by a licensed septic tank pumping service.

10. WATERLESS TOILETS

10.1 Definition

Waterless Toilets typically consist of a toilet seat and cover over a compartment designed to either receive composting materials sufficient to reduce waste by aerobic decomposition or incinerate deposited waste using a gas fired or electric heating system.

10.2 Use

10.2.1Waterless toilets may be used in addition to or in lieu of another approved wastewater treatment and disposal system. If the structure served by the waterless toilet has running water or plumbing extending into or out of the structure, another approved wastewater treatment and disposal system must be installed.

10.2.2 Installation of a waterless toilet does not relieve the applicant of meeting any applicable increased use or enlargement of structure requirements. No reduction in system sizing may be granted for use of a waterless toilet in a structure served by a conventional or other alternative system.

10.2.3 If waste segregation is used, a primary and full sized replacement area for the installation of a wastewater treatment and disposal system properly sized for both black and gray water must be reserved to accommodate future change of use. The reserved area must meet the requirements of the Missoula City-County Health Code Regulation 1, Chapters 10 & 16. The gray water system may be installed within the primary reserved area.

10.2.4 The use of waterless toilets may be further restricted by the Missoula Municipal Code and Ordinances inside of city limits.

10.3 Design & Installation

10.3.1 Waterless toilets must be designed and installed in accordance with DEQ 4, Section 8.5, and per manufacturer's recommendations, in addition to the requirements of this section.

10.3.2 If necessary, odor controls may be required on venting systems.

10.3.3Waterless toilets may be installed by someone other than a Certified Installer.

10.4 Operation and Maintenance

10.4.1 Waterless toilets must be used in accordance with the manufacturer's recommendations.

10.4.2 Wastes generated by a waterless toilet must be: disposed of in a licensed landfill; used as a soil amendment on the owner's property for non-food crops; or disposed of by another method approved by the Department.

11. MEDIUM SAND-FILLED DRAINFIELD SITE

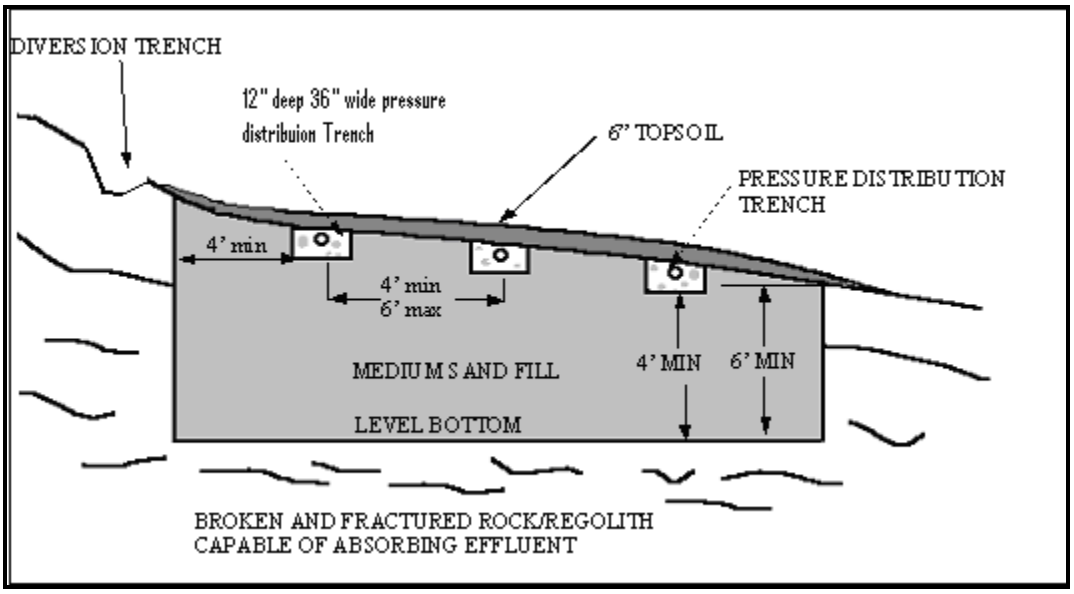
11.1 Definition

Sand-filled drainfield sites are excavations that are filled with medium sand to the extent necessary to provide the minimum separations to limiting layers required for a conventional system.

11.2 Use

11.2.1 Medium sand-filled drainfields may only be used to obtain separation from broken or fractured rock/regolith on existing lots or parcels. Medium sand-filled drainfields are not allowed in solid or unfractured bedrock. Only one system serving a single-family dwelling or structure with a maximum sewage flow of 350 gallons per day is allowed per lot or parcel.

FIGURE 10.1
MEDIUM SAND-FILLED DRAINFIELD SITE



11.3 Design

11.3.1 Three percolation tests evenly spaced throughout the basal (or bottom) area are required for system sizing and ensuring the site is capable of absorbing effluent. The Department may deny a permit for a sand-filled drainfield site if it determines that there is inadequate fracturing of the underlying material or if there is evidence of aquifer contamination in the area.

11.3.2 The effluent application rate for the basal (or bottom) area is determined using the criteria in Table 2 of the Wisconsin Sand Mound Manual.

11.3.3 Trenches must be a minimum of 4 feet and a maximum of 6 feet apart, measured from pipe to pipe. Trenches must be a minimum of 4 feet and a maximum of 6 feet from the side wall, measured from the edge of the trench.

11.3.4 The minimum amount of trench used for distributing the effluent is determined using an application rate of 0.8 gallons/square-foot/day. The Department may require a larger distribution system based on the required bottom area and the maximum separations allowed in 10.3.3.

11.3.5 The bottom of the excavation must be substantially level.

11.3.6 A minimum of 4' of medium sand must surround the sides and ends of the drainfield trench; and a minimum of 4' of medium sand must be placed below the distribution trench bottom.

11.3.7 The medium sand fill (USDA Soils Classification) must be approved by the Department. The Department may require a sieve analysis to ensure the sand meets specifications for medium sand.

11.3.8 Pressure distribution is required.

11.3.9 Water must be diverted away from the site using berms or trenches to prevent infiltration of run-off into the drainfield.

11.3.10 Horizontal setback distances required by Table 2 of the Health Code, Regulation 1 are measured from the edge of the sand fill.

11.4 Inspections

11.4.1 The Department must inspect the site twice: once after the site has been excavated to ensure the excavation is substantially level and there is adequate fracturing of underlying material, and again after the trenches have been installed.

12. EVAPOTRANSPIRATION ABSORPTION SYSTEMS

12.1 Definition

Evapotranspiration absorption (ETA) systems are absorption beds or trenches designed to provide for the absorption and evaporation of effluent. The systems are designed to store effluent through months when evaporation is low until dryer, warmer months when evaporation is high. The systems also use absorption of effluent to minimize the amount of storage required.

12.2 Use

12.2.1 ETA systems may be used in soils with percolation rates that are slower than 120 minutes per inch and where a design is submitted showing that total water lost through evaporation and absorption equals or exceeds the total water gained through precipitation and effluent discharge.

12.3 Design

12.3.1 ETA systems must be designed in accordance with DEQ 4, Section 6.8. in addition to the requirements of this section.

12.3.2 ETA systems installed on land with a slope greater than 6 percent must use maximum 36-inch-wide beds with 4 foot separation between trench sidewalls.

12.4 Construction

12.4.1 Construction must be completed in accordance with requirements found in DEQ 4, Section 6.8.

12.5 Maintenance

12.5.1 All systems must follow the Operation and Maintenance Plan requirements in DEQ 4, Appendix D.

12.6 Certification and As-builts

12.6.1 Certification and as-built plans are required in accordance with DEQ 4, Appendix D.

13. EVAPOTRANSPIRATION SYSTEMS

13.1 Definition

Evapotranspiration (ET) systems are sealed beds designed to provide for the evaporation of effluent. The systems are designed to store effluent through months when evaporation is low until dryer, warmer months when evaporation is high.

13.2 Use

13.2.1 Evapotranspiration systems may be used in soils with percolation rates that are slower than 120 minutes per inch and where a design is submitted showing that total water lost through evaporation equals or exceeds the total water gained through precipitation and wastewater input.

13.3 Design

13.3.1 ET systems must be designed in accordance with DEQ 4, Section 6.8. in addition to the requirements of this section.

13.4 Construction

13.4.1 Construction must be completed in accordance with requirements found in DEQ 4, Section 6.8.

13.5 Maintenance

13.5.1 All systems must follow the Operation and Maintenance Plan requirements in DEQ 4, Appendix D.

13.6 Certification and As-builts

13.6.1 Certification and as-built plans are required in accordance with DEQ 4, Appendix D.

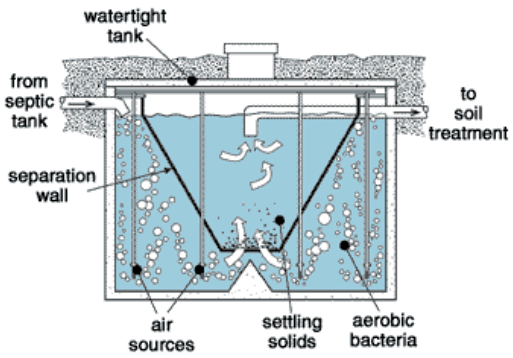
14. AEROBIC WASTEWATER TREATMENT UNITS

14.1 Definition

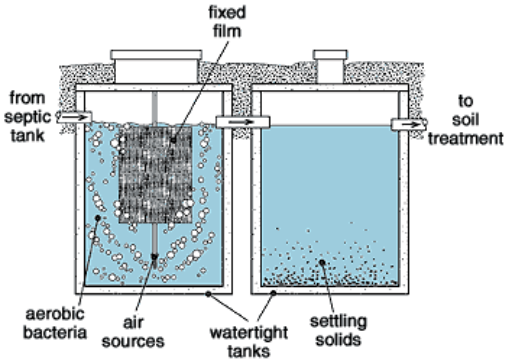
Aerobic Treatment Units (ATUs) refer to a broad category of engineered wastewater treatment devices designed to oxidize both organic material and ammonium-nitrogen (to nitrate nitrogen), decrease suspended solids concentrations and reduce pathogen concentrations. They include units referred to as suspended growth ATUs, fixed film reactor ATUs and sequencing batch reactor ATUs as depicted in Figure 13.1.

Figure 13.1
Suspended Growth, Fixed Film and Sequencing Batch ATUs

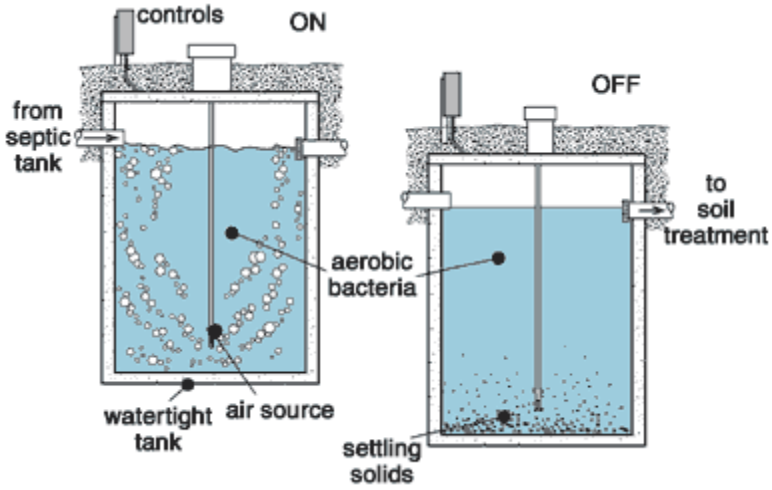
Suspended Growth Reactor



Fixed Film Reactor



Sequencing Batch Reactor



14.2 Use

14.2.1 ATU's may be used for improving effluent quality (including reducing nitrogen when approved by DEQ) before disposal in any approved system.

14.3 Design

14.3.1 ATU's must be designed and installed in accordance with DEQ 4, Section 7.4.

14.4 Maintenance

14.4.1 ATU's must meet the operation and maintenance criteria in DEQ 4, Appendix D, in addition to the criteria in this section.

14.4.2 Proposed subdivisions with three or more lots that are or will be served with shared, multi-family and community systems with ATU's must provide a Maintenance Special Improvement District, a Sewer and Water District or other mechanism providing equivalent institutional and financial stability, as approved by the Department.

14.4.3 The owner of an individual lot with an ATU system is responsible for its maintenance and operation. A maintenance and operation plan must be signed by the owner and attached to the septic permit at the time of issuance.

14.4.4 Deed restriction required.

14.4.4.1 Owners of individual lots who apply for a permit for an ATU must execute a deed restriction requiring on-going operation and maintenance of the system and waiving the option to protest the creation of a Maintenance Special Improvement District, a Sewer and Water District, or other approved mechanism instituted to ensure maintenance of the sand filter system, using the language set forth below.

"I/We, the undersigned, hereby certify that I/we are the owners of the real property located at (legal description) and hereby agree to operate and maintain the aerobic treatment unit (ATU) as stated in the operation and maintenance plan on file with the Missoula City-County Health Department and I/we waive the option to protest an RSID or SID affecting the property for the purpose of financing the maintenance, repair or replacement of the ATU system serving the property. Further, my/our signatures on this waiver may be used in lieu of my/our signature(s) on an RSID or SID petition for the creation of one or more RSIDs or SIDs for the purpose of financing the maintenance and repair or replacement of the ATU system used for the above-described property.

14.4.4.2 The filing of a deed restriction is not required if:

a.) previously filed from the same parcel;
b.) similar language has been shown on an approved and filed subdivision plat or certificate of survey; or,
c.) the property is owned by a public entity.

14.5 Certification and As-builts

14.5.1 Certification and as-built plans are required in accordance with DEQ 4, Appendix D.

15. WASTEWATER LAGOONS AND PONDS

15.1 Definition.

Wastewater ponds and lagoons discussed in this section are designed to receive effluent from either residential or commercial sources and are capable of achieving secondary treatment standards through facultative bacterial action and/or evaporation. Lagoons or ponds used for equalization, percolation, and sludge storage are not included in this section.

15.2 Use

15.2.1 Pond and lagoon systems may only be used for systems with design flows of at least 3500 gallons per day. Commercial and industrial systems with design flows of less than 3500 gallons per day not containing black water wastes may be approved by the Department on a case by case basis.

15.3 Design

15.3.1Wastewater lagoons and ponds must meet the requirements of DEQ Circular 2, Chapter 94 dealing with wastewater treatment ponds.

15.4 Inspection

15.4.1 A minimum of 2 inspections are required for wastewater lagoon and pond systems. One inspection must take place before the liner is installed, and the second inspection must take place after leak testing and the system has been pre-filled prior to use.

16. WASTEWATER RECLAMATION AND REUSE REQUIREMENTS

16.1 Use.

16.1.1 Land application of municipal sewage is an alternative to traditional methods of municipal waste treatment and septic systems. Persons wanting to land apply treated sewage or use it for some other beneficial use must comply with these requirements. This section does not apply to subsurface gray water irrigation of non-food crops.

16.2 Applicability and Purpose

16.2.1 The purpose of Missoula City-County wastewater reclamation and reuse requirements are to protect public health, safety and welfare of those persons who may come in contact with treated wastewater and those using surface and groundwater in Missoula County. The requirements shall be broadly construed to affect their purpose. Wastewater reclamation and reuse systems are alternative treatment systems, as defined in the Missoula City-County Health Code.

16.2.2 These requirements do not relieve a person from the requirements of any other federal, state, or local regulation

16.2.3 In addition to requirements in this chapter, reclamation plants and use areas must meet the requirements of Section 10(A) and Section 13 of the Missoula City-County Health Code, with the exception of Section 10(A)(3).

16.3 Permitting

16.3.1 A permit to operate a reclamation plant or use area must be obtained from the Department before construction of new facilities begins. Existing reclamation plants or use areas must get an operations permit from the Department no later than January 1, 2002. The permit to operate must be renewed annually.

16.3.2 The permit application for a reclamation plant must include an engineering report demonstrating compliance with the requirements of DEQ Circular 2 and any applicable portions of A.R.M. 17.30.

16.3.3 Applications for operating an existing reclamation plant or use area must include detailed information on the current operation of the facility, and describe the requirements of this chapter that are not being met.

16.3.4 A permit may only be issued after review of the permit application and payment of a permit fee. Plan review and permit fees shall be established by the Department. Permits for reclamation or reuse of sewage at facilities may be granted only to municipalities, City or County Special Improvement Districts, or persons which provide for the construction, maintenance, and operation of the facility.

16.3.5 Application of reclaimed water to a use area or operation of a reclamation plant without an operations permit from the Department is prohibited.

16.4 Reclamation Plant Design Requirements

16.4.1 Wastewater reclamation and reuse facilities must meet the requirements of DEQ Circular 2.

16.4.2 The design must include a provision for measuring the volume of wastewater that is land applied. Records of discharge volumes and frequency must be maintained at the facility.

16.4.3 Flow Meter
All reclamation plants must have a flow meter to determine the volume of wastewater treated and reused.

17. GRAY WATER IRRIGATION SYSTEMS

17.1 Definition.

Gray water is wastewater that is collected separately from a sewage flow and does not contain industrial chemicals, hazardous wastes, flows from floor drains, backwash from water softeners, or wastewater from toilets. Gray water irrigation systems may only be used for irrigation of: non-food crops, fruit and nut trees, or landscaping.

17.2 Use

17.2.1Gray water irrigation systems may be used in conjunction with waterless toilets, pit privies, or a separate wastewater treatment and disposal system for black water wastes. Applicants wishing to use an irrigation system in conjunction with advanced treatment systems must demonstrate that the advanced treatment system will meet required treatment performance when gray water is being diverted for irrigation use.

17.2.2 Gray water from kitchen sources may be used for irrigation only where a waste segregation system is used. A primary and full sized replacement area for the installation of a wastewater treatment and disposal system properly sized for both black and gray water must be reserved to accommodate future change of use. The reserved area must meet the requirements of the Missoula City-County Health Code Regulation 1, Chapters 10 & 16. The gray water system may be installed within the primary reserved area.

17.2.3 If municipal sewer is available, the gray water must be diverted to the municipal system from October 1st to April 30th.

17.2.4 Owners must execute a deed restriction stating the structure has a gray water irrigation system which requires maintenance and adherence to an operation and maintenance manual. For properties served by municipal sewer, the deed restriction must also state that the system may only be used from May 1st to September 30th.

17.3 Design & Construction

17.3.1 Gray water systems must meet all requirements of DEQ 4, Section 6.10., ARM 17.36.919, and the requirements of this section.

17.3.2 Gray water irrigation systems do not have to meet the separation requirements found in Regulation 1, Sections 10 (B) and (C).

17.3.3 A minimum vertical separation of 4 feet of natural soil between the point of gray water application and a limiting layer is required.

17.3.4 Gray water systems may not be installed:

17.3.4.1Within 100 feet of: flood plain or flood prone areas, springs, surface water, or wells;

17.3.4.2 Within 2 feet of property lines; or

17.3.4.3 On steep slopes.

17.3.5 Calculation of minimum required absorption area to be used in conjunction with DEQ 4, Section 6.10.

17.3.5.1 Systems must have at least the minimum square footage of absorption area based on soil type.

17.3.5.2 Systems must be designed and installed to ensure most of the effluent is absorbed by plants during the growing season.

17.3.5.3 Systems installed on parcels subject to the maximum land application limits in the Missoula City-County Health Code Regulation 1, Chapter 10(D) may not discharge greater than 700 gallons per usable acre per day of gray water unless the daily design flow of the system is less than or equal to the lowest projected seasonal agronomic uptake rates for the area being irrigated.

17.3.6 All gray water systems must have a filter installed with openings no larger than 40 mesh or another approved device. All gray water must pass through the filter before being discharged to the absorption system.

17.3.7 Orifices must be spaced between 1 and 5 feet, except manufactured designs may use an orifice spacing less than 1 foot.

17.3.8 Pressurized systems must maintain a maximum flow variance of 10%.

17.3.9 Gray water irrigation systems may not be deeper than 12 inches when municipal sewer is available, or 36 inches when municipal sewer is not available.

17.3.10 Systems using gray water from kitchen sources must be buried a minimum of 12 inches.

17.3.11 Other designs may be approved by the Department on a case by case basis.

17.3.12 Gray water systems using manufactured designs or equipment must follow manufacturers' recommendations for construction, operation, and maintenance of the system.

17.4 Maintenance

17.4.1 The owner or operator of a gray water irrigation system must maintain the system as directed in an operation and maintenance manual that will remain with the system. The operation and maintenance manual must include, but is not limited to, the following:

a.) A detailed description of the gray water system;
b.) A detailed description of any scheduled activities required to operate and maintain the system;
c.) Operating dates, and;
d.) If monitoring is required, the specific monitoring procedures.

17.5 Certification and As-builts

17.5.1 Certification and as-built plans are required in accordance with DEQ 4, Appendix D.

18. PASSIVE AEROBIC WASTEWATER TREATMENT SYSTEMS

18.1 Definition

Passive Aerobic Treatment Systems (PATS) refer to wastewater treatment systems designed to oxidize organic material and ammonium-nitrogen (to nitrate nitrogen), decrease suspended solids concentrations, and reduce pathogen concentrations through convection and hydraulically driven aeration in the absorption trenches.

18.2 Use

18.2.1 PATS may be used for improving effluent quality (including reducing nitrogen when approved by DEQ) prior to discharge of the effluent into any portion of the infiltrative surface. PATS may not be used in areas where the absorption system may be subject to flooding or inundation by groundwater.

18.3 Design

18.3.1 PATS must be designed and installed in accordance with DEQ 4, and any system specific deviations issued by DEQ. Approved deviations and sizing criteria can be found in Appendix A.

18.3.2 The Department may approve gravity distribution in place of normal requirements for pressure distribution if it determines pressure distribution will reduce the effectiveness of the system.

18.3.3 Gravity distribution system designs incorporating continuously linked laterals at different elevations do not require a dosing-distribution box.

18.3.4 The Department may approve other deviations from Missoula County Health Code, Regulation 1, Section 12 (Conventional Secondary Treatment) evaluated as necessary to accommodate system specific design/function.

18.3.5 Systems must be designed, installed, and operated according to all manufacturers' specifications unless otherwise prohibited by state or local rule.

18.3.6 For replacement systems, the absorption system must maintain a minimum of 1 foot vertical separation from seasonal high groundwater, and the 100 year floodplain elevation when the absorption system is located within the 100 year floodplain.

18.3.7 Effluent filters on the outlet of the septic tank are required unless it is not recommended by the manufacturer.

18.3.8 Effluent filters are always required when an effluent pump is used in the system.

18.4 Maintenance

18.4.1 PATS must be operated and maintained to ensure they work as designed. At a minimum:

18.4.1.1 Septic tanks must be inspected every year and pumped at least every fourth year.

18.4.1.2 Filters must be inspected and cleaned at least once per year. More frequent cleaning may be necessary based on system usage.

18.4.2 The owner of an individual lot with a passive aerobic treatment system is responsible for its maintenance and operation. A maintenance and operation plan must be signed by the owner and attached to the septic permit at the time of issuance.

18.4.3 The Department may require additional mechanisms to ensure proper maintenance including, but not limited to operating permits, or other specific funding provisions.

19. Subsurface Drip Systems

19.1 Definition

Subsurface drip systems are an efficient method for dispersal of wastewater and/or gray water into the soil in small volume doses throughout the day.

19.2 Use

19.2.1 Subsurface drip systems may be used as the disposal field for systems with Advanced Treatment.

19.3 Design & Construction

19.3.1Subsurface drip systems must be designed and constructed in accordance with DEQ 4, Section 6.9, in addition to the requirements of this section.

19.4 Operation and Maintenance

19.4.1 Subsurface drip systems must meet the operation and maintenance criteria in DEQ 4, Appendix D, in addition to the criteria in this section.

19.5 Certification and As-builts

19.5.1 Certification and as-built plans are required in accordance with DEQ 4, Appendix D.

20. Absorption Beds

20.1 Definition

Absorption beds are excavations filled with washed rock or sand that do not have trench walls separating laterals.

20.2 Use

20.2.1 Absorption beds may be used as replacement wastewater systems on existing lots where there is not adequate room for a drainfield.

20.2.2 Absorption beds may be used when Certificate of Subdivision Approvals require seepage pits.

20.2.3 Absorption beds may not be used on proposed lots unless the system existed before the proposed subdivision, has been in continuous use, and was permitted by the Department.

20.3 Design & Construction

20.3.1 Absorption beds must be designed and constructed in accordance with DEQ 4.

20.3.2 When the bed has been excavated, the sides and bottom of the bed must be raked to scarify any smeared soil surfaces and loose material must be removed. The bed bottom may not be compacted by equipment during construction.

21. Seepage Pits

21.1 Definition

Seepage pits are excavations in which a subsurface concrete ring(s) is placed in drain rock to receive effluent from the septic tank.

21.2 Use

21.2.1 Seepage pits may only be permitted as replacement systems.

21.2.2 Seepage pits can only be used when there is not adequate room for a drainfield or absorption bed.

21.2.3 Seepage pits may only be permitted where groundwater is a minimum of 25 feet below the bottom of the proposed seepage pit.

21.3 Design & Construction

21.3.1 Seepage pits must be constructed in accordance with DEQ 4.

21.3.2 Conventional location requirements in section 10(C) must be used, if possible, for seepage pits.

APPENDIX A
DEQ Deviations for Presby Advanced Enviro-Septic® (AES) Treatment Systems and Sizing Requirements

The Department has recently approved blanket deviations from the Design Standards that may be used by Environmental Consultants and Reviewers when a Presby AES Treatment System is proposed.

Applicability: These deviations can be used for non-public wastewater systems (those that serve less than 25 people for 60 days) with residential strength waste and a design capacity of less than 2,500 gallons per day.

Design Standards: The approved changes to the Design Standards are:

Presby laterals may be placed a minimum of two feet on center with zero distance between trench walls. The centerline-to-centerline distance between the two outermost pipe laterals shall not exceed 14'.

For the purposes of sizing, Presby lateral trenches must not be considered more than 48 inches wide.

Presby lateral trenches may use gravity distribution for widths up to 48 inches.

When installing a Presby system, the absorption system size in square footage per DEQ-4 may be reduced in size by 50 percent for soil percolation rates less than 51 mpi and 25 percent for soil percolation rates between 51 mpi and 120 mpi.

Table A
Application Rates by Soil Texture and Perc Rate

Texture	Estimated Perc Rate In Minutes per Inch (MPI)	Typical Application Rate (gpd/ft²)	AES Application Loading Rate (ALR) (gpd/ft²)
Gravelly Sand or very coarse sands	< 3	0.8	1.60
Loamy sand, coarse sand	3-5	0.8	1.60
Medium sand, sandy loam	6-9	0.6	1.20
Fine sandy loam, loam, silt loam	10-15	0.5	1.00
Very fine sand, sandy clay loam	16-30	0.4	0.80*
Clay loam, silty clay loam	31-50	0.3	0.60*
Sandy clay, clay or silty clay	51-79	0.2	0.266*
Clays, silts, silty clays (Soil is reported throughout the soil profile)(Use EVTA BED)	80-120	0.15	0.20*
Clays or silts, pan evaporation rates do not allow for EVTA use	120+	Not Permitted	Not Applicable

* Percolation (perc) tests may be required to help distinguish between types of clays and compacted silts and their permeability as a result of mineralogy, structure, compactness and other factors. If the local reviewing authority has experience with the soil type encountered, the percolation test may be waived and the application rate provided in the table may be used. If percolation rates are faster than the estimate shown the application rate provided in the appropriate column must be used as the maximum. (In other words, use the most conservative of the two, either soil texture or percolation rates).

Table B
Slope Limitations and AES Pipe Requirements

Perc Rate (MPI)	Minimum Units* AES pipe per bedroom	% System Slope (Maximum)	% Site Slope (Maximum)	Bed Configurations Allowed
1 to 15	5	25	30	All Standard Bed Configurations
16 to 30	6			
31 to 40	7	20	25	
41 to 50		15	20	
51 to 60		10	15	
61 to 120		0	5	Basic Serial or Multiple Beds

* AES pipe is supplied in 10 ft. units