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COUNTY

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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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ALTERNATIVE SYSTEMS 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 Department.

1.1.2 Unless a provision under an alternative system provides otherwise, all 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/EnvHealth/Land/IndSepticSys/index.htm. 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 Section 9, Regulation 1, Missoula City-County Health Code (Health Code), sets forth the conditions for approval and use of alternative systems. Available at www.co.missoula.mt.us/EnvHealth/EnvHealthDiv/Regulations/pdfs/REG%201%2010-15-09.pdf

1.2.3 Alternative systems must be designed in accordance with the Department of Environmental Quality (DEQ) Circular 4, "Montana Standards for Subsurface Wastewater Treatment Systems," 2009 Edition (DEQ 4) except when noted otherwise in this manual. Available at http://www.deq.mt.gov/wqinfo/Sub/documents/circular4edition2009.pdf

1.2.4 The 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. Available at: http://www.soils.wisc.edu/sswmp/SSWMP_15.24.pdf

1.2.5 The 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. Approved systems are listed in Appendix A of this manual.

1.2.6 DEQ Circular 2, “Design Standards for Wastewater Facilities”, 1999 Edition (DEQ 2) applies to Wastewater Reclamation and Reuse systems. Available at http://www.deq.state.mt.us/wqinfo/Circulars/DEQ2.pdf

1.2.7 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. Available at http://www.epa.gov/nrmrl/pubs/625181013/625181013FrontMatter.pdf

2. Shallow Drainfields

2.1 Definition

Shallow drainfields are conventional drainfields installed less than 24” deep.

2.2 Use

Shallow 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

2.3.1 **Pressure distribution is required.**

2.3.2 Trenches must be at least 12” deep.

2.3.3 The system must meet the cap requirements of DEQ 4, Section 8.3.2.5.

2.3.4 Soil texture used for the cap must be the same or one textural class finer than the natural topsoil.

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.

2.4 Construction

Unless otherwise stated on the permit, the shallow drainfield system must be constructed as follows:

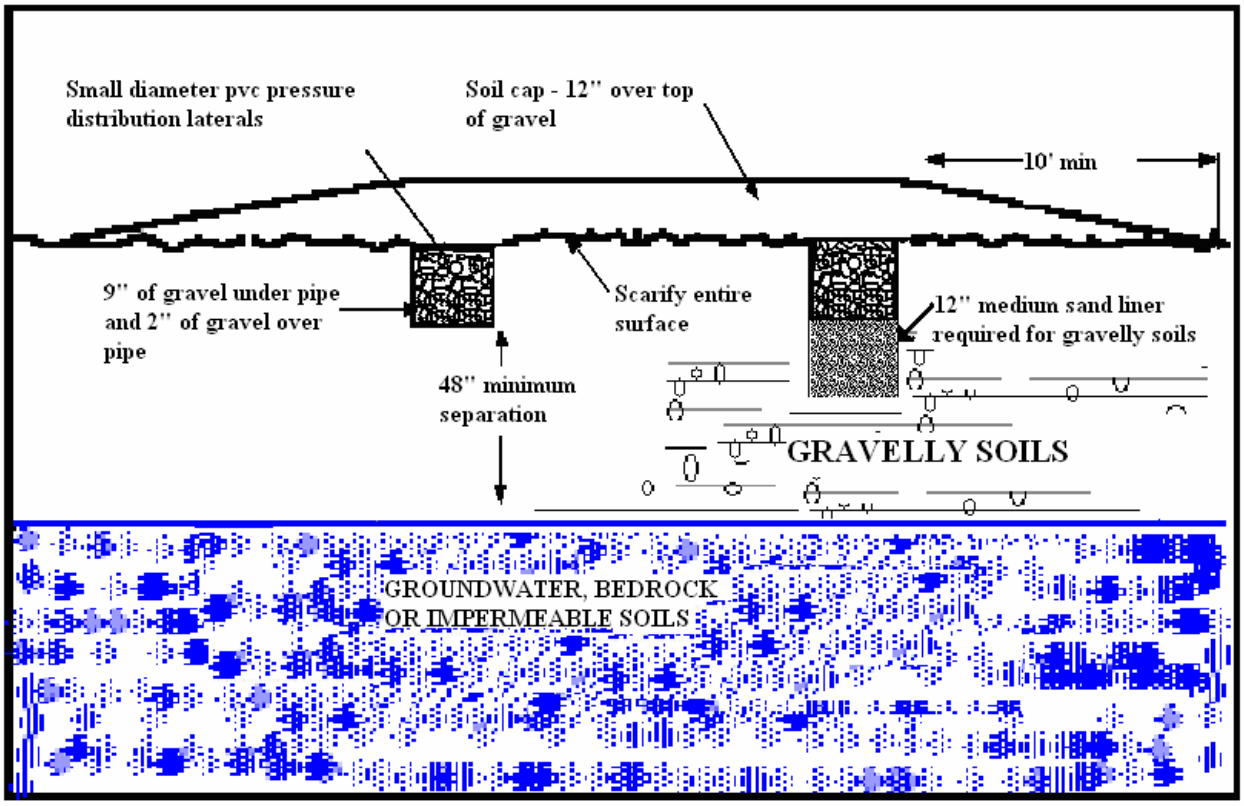
2.4.1 Shallow drainfield systems must be installed during dry weather conditions when the moisture content of the soil is low enough to prevent the loss of soil structure.

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

2.4.3 The fill must be applied to the absorption system site and worked in so that the original soil and fill soil are mixed. The fill material must be evenly graded to a final depth of 16 inches over the drainfield gravel. The trench fill and the cap must be placed over the system at the same time.

2.4.4 The cap must be seeded.

FIGURE 2.1
CROSS SECTION OF SHALLOW DRAINFIELD



2.5 Inspections

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 inches deep, which break through a less permeable soil to a more permeable soil layer below.

3.2 Use

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

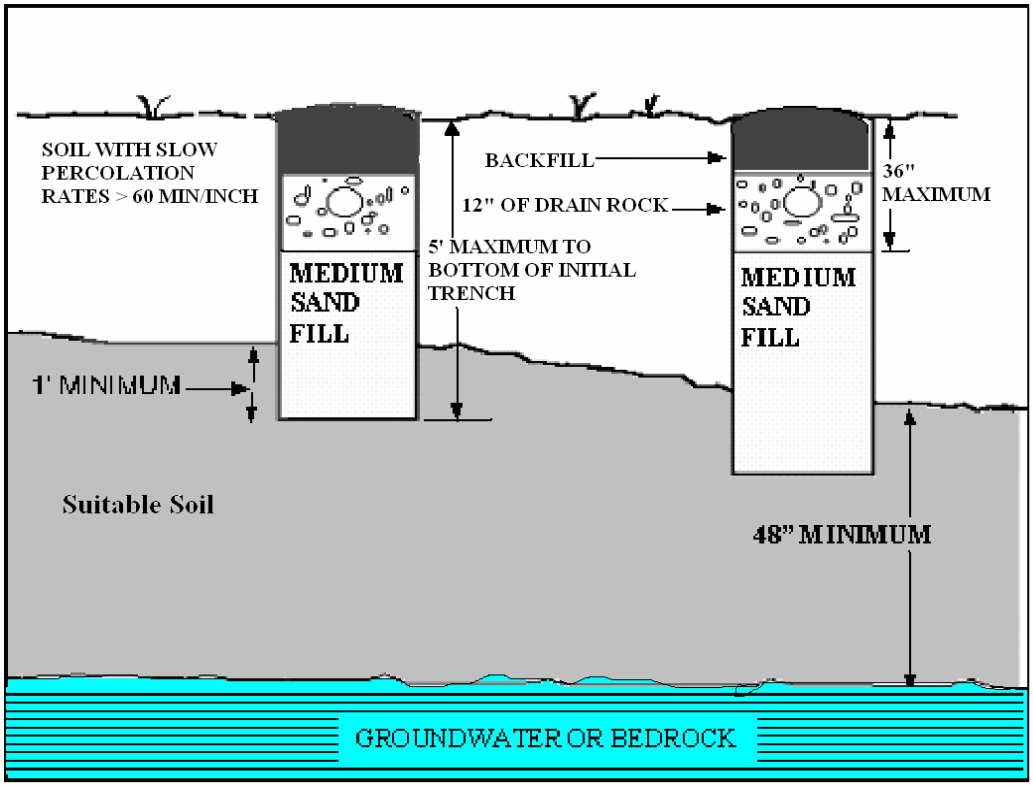
3.3.1 Deep absorption trenches must be constructed using the criteria in DEQ 4, Edition 2009, Chapter 10, in addition to the requirements of this section.

3.3.2 The bottom of the trench may not be more than 5 feet below natural ground surface.

3.3.3 The suitable soil below the less permeable soil must be at least 48" thick above a limiting layer. (See Figure 3.1.)

3.3.4 The trenches must be filled with medium sand to the level of a standard absorption trench.

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

Elevated sand mounds may be used to maintain separation between high seasonal groundwater, bedrock, or impermeable layers when these limiting layers are more than 4 feet and less than 6 feet from the natural ground surface.

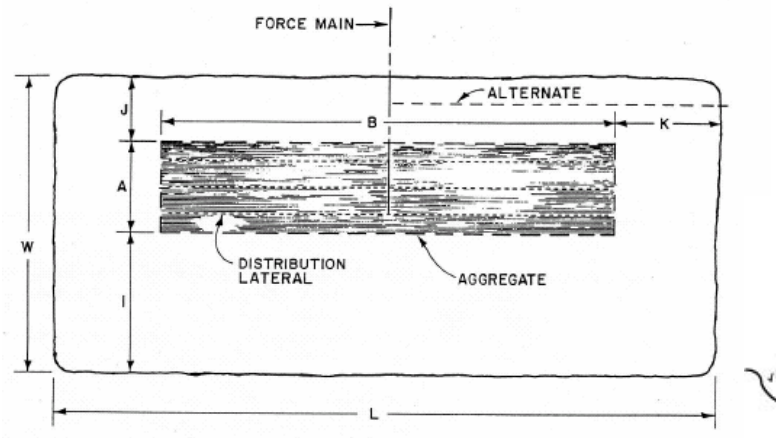
4.3 Design

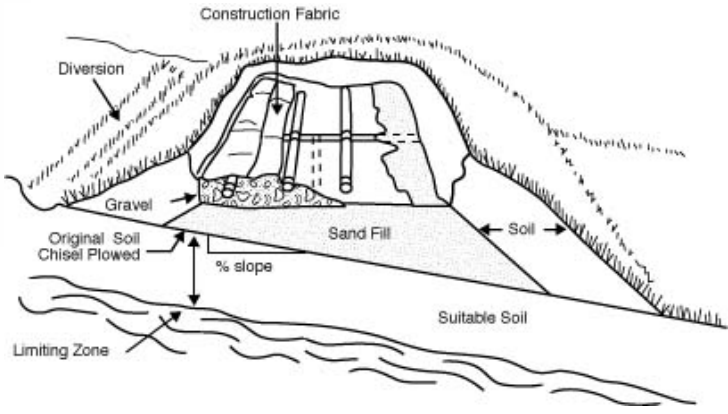
4.3.1 Elevated Sand Mounds must be sited, designed and constructed in accordance with DEQ 4, Edition 2009, Chapter 11 & 14 and the Wisconsin Mound Soil Absorption System: Siting, Design and Construction Manual, January, Edition 2000, in addition to the requirements of this section.

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

4.3.3 The maximum application rate for mound trench design is 0.8 gallons per square foot per day.

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



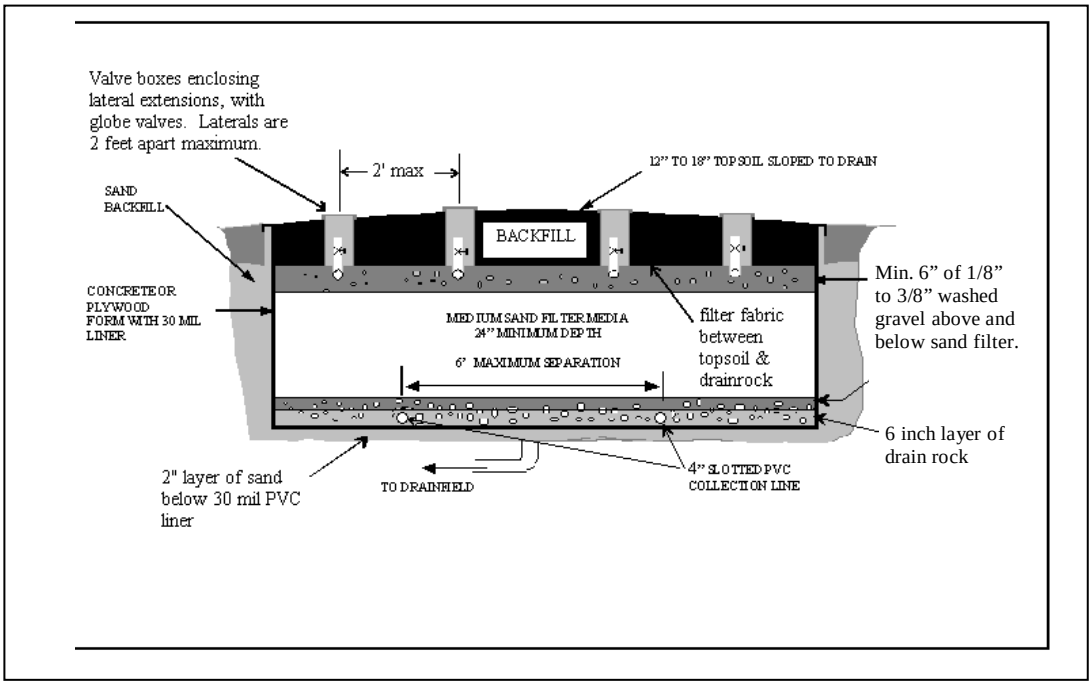


5. INTERMITTENT SAND FILTERS

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

Intermittent Sand Filters may be used for improving effluent quality (including reducing nitrogen when approved by DEQ and listed in Appendix A of this manual) before disposal in any approved system.

5.3 Design

5.3.1 Intermittent Sand Filters (ISF) must be designed in accordance with DEQ 4, Edition 2009, Chapter 15 in addition to the requirements of this section.

5.3.2 No **reduction in drainfield size is allowed for drainfields installed in soil that is finer than silt loam or with an average percolation rate slower than 60 minutes per inch.** These soils include clay, silty clay, sandy clay, silty clay loam, sandy clay loam and clay loam.

5.4 Construction

5.4.1 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.

5.5 Maintenance

5.5.1 Intermittent Sand filters must be operated and maintained to ensure they work as designed. At a minimum:

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

5.5.1.2 Filters must be inspected every year. If effluent begins to pond above the distribution line, the filter media must be replaced. The system must be repaired or replaced before the effluent ponds above the level of the washed drain rock.

5.5.1.3 The distribution system must be inspected every year and flushed when needed.

5.5.2 A maintenance and operation plan is required which ensures maintenance will occur as required by this section and which includes a funding mechanism for repairs and replacement.

5.5.3 Proposed subdivisions with three or more lots that are or will be served with individual, shared, multi-family and community systems with intermittent sand filters 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.

5.5.4 The owner of an individual lot with an intermittent sand filter 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.

5.5.5 Owners of individual lots who apply for a permit for an intermittent sand filter 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. The filing of a deed restriction is not required if previously filed for the same parcel, or where similar language has been shown on an approved and filed subdivision plat.

"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 said property for the purpose of financing the maintenance, repair or replacement of the sand filter system serving said 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. This deed restriction is granted to the County or City of Missoula in exchange for permission to discharge sewage into the ground until such time that public sewer is installed.

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

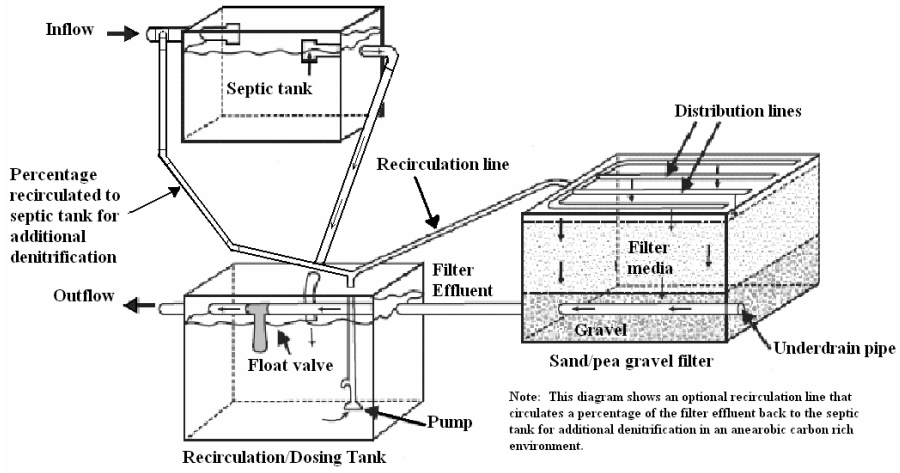
Recirculating Sand Filters may be used for improving effluent quality (including reducing nitrogen when approved by DEQ and listed in Appendix A of this manual) before disposal in an approved system.

6.3 Design

6.3.1 Recirculating Sand Filters must be designed in accordance with DEQ 4, Edition 2009, Chapter 16, in addition to the requirements of this section.

6.3.2 No **reduction in drainfield size is allowed for drainfields installed in soil that is finer than silt loam or with an average percolation rate slower than 60 minutes per inch.** These soils include clay, silty clay, sandy clay, silty clay loam, sandy clay loam and clay loam.

FIGURE 6.1
RECIRCULATING SAND FILTER



6.4 Construction

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.

6.5 Maintenance

6.5.1 Recirculating sand filters must be operated and maintained to ensure they work as designed. At a minimum:

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

6.5.1.2 Filters must be inspected every year. If effluent begins to pond above the distribution line, the filter media must be replaced. The system must be repaired or replaced before the effluent ponds above the level of the washed drain rock.

6.5.1.3 The distribution system must be inspected every year and flushed when needed.

6.5.2 A maintenance and operation plan is required which ensures maintenance will occur as required by this section and which includes a funding mechanism for repairs and replacement.

6.5.3 Proposed subdivisions with three or more lots that are or will be served with individual, shared, multi-family and community systems with recirculating sand filters 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.

6.5.4 The owner of an individual lot with a recirculating sand filter 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.

6.5.5 Owners of individual lots who apply for a permit for a recirculating sand filter 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. The filing of a deed restriction is not required if previously filed for the same parcel, or where similar language has been shown on an approved and filed subdivision plat.

> "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 said property for the purpose of financing the maintenance, repair or replacement of the recirculating sand filter system serving said 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. This deed restriction is granted to the County or City of Missoula in exchange for permission to discharge sewage into the ground until such time that public sewer is installed.

7. RECIRCULATING TRICKLING FILTERS

7.1 Definition

Recirculating Trickling Filters (RTF'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. 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 RTF.

7.2 Use

Recirculating Trickling Filters may be used for improving effluent quality (including reducing nitrogen when approved by DEQ and listed in Appendix A of this manual) before disposal in any approved system.

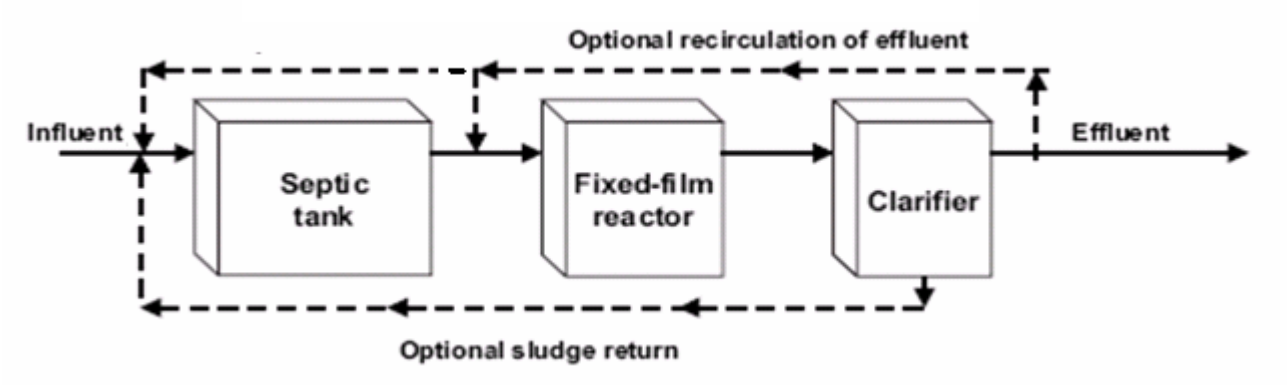
7.3 Design & Construction

7.3.1 Recirculating Trickling Filters (RTF) must be designed and constructed in accordance with DEQ 4, Edition 2009, Chapter 17 in addition to the requirements of this section.

7.3.2 No **reduction in drainfield size is allowed for drainfields in soil that is finer than silt loam or with an average percolation rate slower than 60 minutes per inch.** These soils include clay, silty clay, sandy clay, silty clay loam, sandy clay loam and clay loam.

7.3.3 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 Recirculating trickling filters must be operated and maintained to ensure they work as designed. At a minimum:

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

7.4.1.2 Filters must be inspected every year. If effluent begins to pond above the distribution line, the filter media must be replaced. The system must be repaired or replaced before the effluent ponds above the level of the washed drain rock.

7.4.1.3 The distribution system must be inspected every year and flushed when needed.

7.4.2 A maintenance and operation plan is required which ensures maintenance will occur as required by this section and which includes a funding mechanism for repairs and replacement.

7.4.3 Proposed subdivisions with three or more lots that are or will be served with individual, shared, multi-family and community systems with recirculating trickling filters 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 recirculating tricking filter 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 Owners of individual lots who apply for a permit for a recirculating trickling filter 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. The filing of a deed restriction is not required if previously filed for the same parcel, or where similar language has been shown on an approved and filed subdivision plat.

> "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 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 said property for the purpose of financing the maintenance, repair or replacement of the recirculating trickling filter system serving said 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. This deed restriction is granted to the County or City of Missoula in exchange for permission to discharge sewage into the ground until such time that public sewer is installed.

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

Unsealed pit privies may only serve structures that are not served by a piped water supply.

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 MT DEQ Circular 4, Chapter 26 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

Unsealed pit privies must be abandoned according to the requirements of MT DEQ Circular 4, Chapter 26 dealing with unsealed pit privies.

9. WATERLESS TOILETS

9.1 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.

9.2 Use

9.2.1 Waterless 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 plumbing or a piped water source, another approved wastewater treatment and disposal system must be installed.

9.2.2 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.

9.3 Design

9.3.1 The design and construction of a waterless toilet must meet the requirements of NSF Standard 41.

9.3.2 All materials must be durable, easily cleanable and resistant to corrosion.

9.4 Installation

9.4.1 Waterless toilets must be installed per manufacturer's recommendations.

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

9.4.1.3 Vents must be designed to prevent flies and other insects from entering the system.

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

9.5 Operation and Maintenance

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

9.5.2 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.

10. MEDIUM SAND-FILLED DRAINFIELD SITE

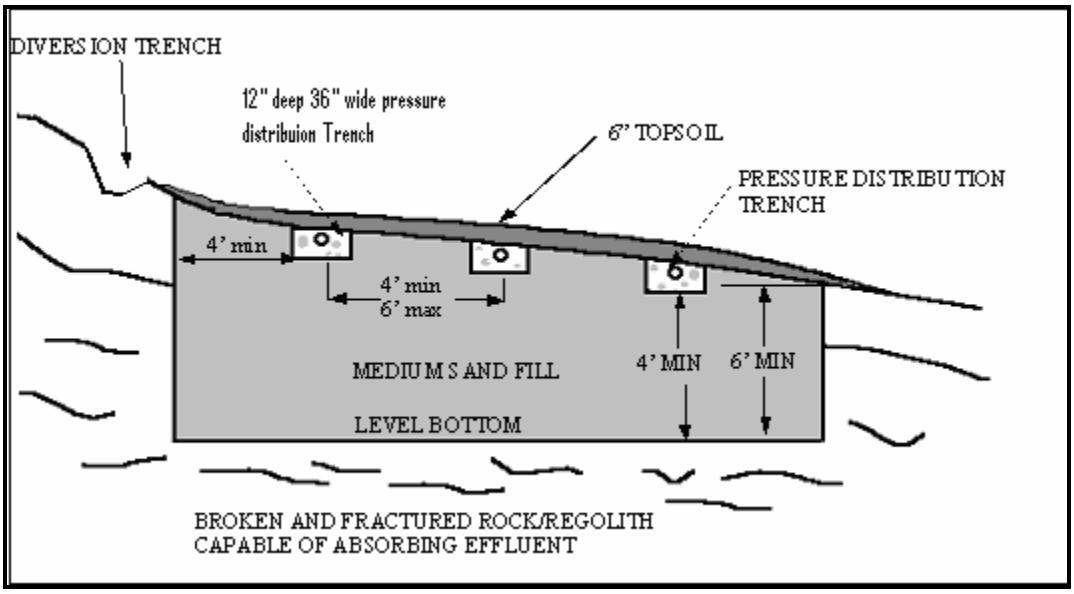
10.1 Definition

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.

10.2 Use

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



10.3 Design

10.3.1 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.

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

10.3.3 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.

10.3.4 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.

10.3.5 The bottom of the excavation must be substantially level.

10.3.6 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.

10.3.7 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.

10.3.8 Pressure distribution is required.

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

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

10.4 Inspections

10.4.1 The Department must inspect the site twice: once after the site has been excavated to ensure adequate fracturing of underlying material and again after the trenches have been installed.

11. Evapotranspiration Absorption Systems

11.1 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.

11.2 Use

Evapotranspiration absorption 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.

11.3 Design

11.3.1 ETA systems must be designed in accordance with DEQ 4, 2009 Edition, Chapter 18 in addition to the requirements of this section.

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

11.3.3 Drain rock (3/4" to 2 ½") must be used for a minimum of 24" below and 2" above the distribution laterals.

11.4 Construction

Construction must be completed in accordance with requirements found in DEQ 4, 2009 Edition, Chapter 18.

12. Evapotranspiration Systems

12.1 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.

12.2 Use

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 effluent discharge.

12.3 Design

12.3.1 ET systems must be designed in accordance with DEQ 4, 2009 Edition, Chapter 19 in addition to the requirements of this section.

12.3.2 Drain rock (3/4" to 2 ½") must be used for a minimum of 24" below and 2" above the distribution laterals.

12.4 Construction

Construction must be completed in accordance with requirements found in DEQ 4, 2009 Edition, Chapter 19.

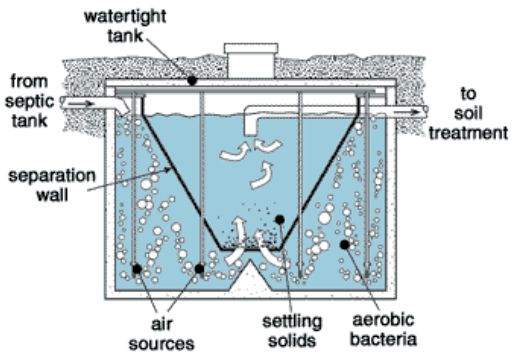
13. AEROBIC WASTEWATER TREATMENT UNITS

13.1 Definition

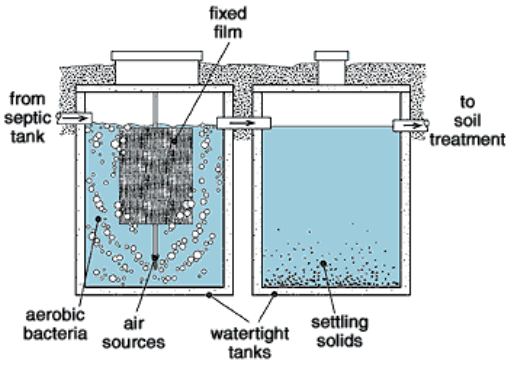
Aerobic Treatment Units (ATUs) refer to a broad category of engineered wastewater treatment devices designed to oxidize both organic material and ammonium-nitrogen (to nitrate nitrogen), decrease suspended solids concentrations and reduce pathogen concentrations. They include units referred to as suspended 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

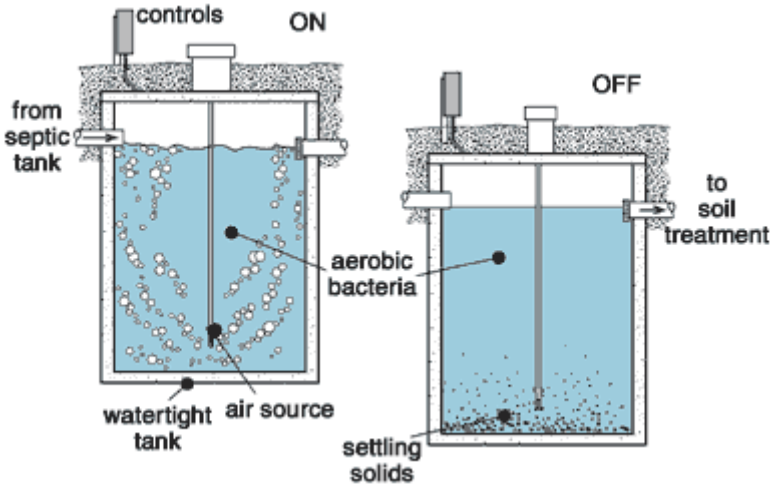
Suspended Growth Reactor



Fixed Film Reactor



Sequencing Batch Reactor



13.2 Use

ATUs may be used for improving effluent quality (including reducing nitrogen when approved by DEQ and listed in Appendix A of this manual) before disposal in any approved system.

13.3 Design

13.3.1 ATUs must be designed and installed in accordance with DEQ 4, 2009 Edition, Chapter 20.

13.4 Maintenance

13.4.1 ATUs must meet the operation and maintenance criteria in DEQ 4, 2009 Edition, Chapter 20, in addition to the criteria in this section.

13.4.2 ATUs must be operated and maintained to ensure they work as designed.

13.4.2 A maintenance and operation plan is required which ensures maintenance will occur as required by this section and which includes a funding mechanism for repairs and replacement.

13.4.3 Proposed subdivisions with three or more lots that are or will be served with individual, shared, multi-family and community systems with ATUs 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.

13.4.4 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.

13.4.5 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. The filing of a deed restriction is not required if previously filed for the same parcel, or where similar language has been shown on an approved and filed subdivision plat.

> "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 said property for the purpose of financing the maintenance, repair or replacement of the ATU system serving said 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. This deed restriction is granted to the County or City of Missoula in exchange for permission to discharge sewage into the ground until such time that public sewer is installed.

14. WASTEWATER LAGOONS AND PONDS

14.1 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.

14.2 Use

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.

14.3 Design

14.3.1 Wastewater lagoons and ponds must meet the requirements of DEQ Circular 2, Chapter 90 dealing with wastewater treatment ponds.

14.3.2 Lagoons or ponds used for the storage or treatment of wastewater or reclaimed water must have a synthetic or clay liner. If a synthetic liner is used, it must either be a photo resistant material or be covered with 12 inches of soil to prevent photo degradation.

14.3.3 The liner must be installed in accordance with manufacturer's specifications.

14.3.4 No more than 200 gallons/acre/day may leach through a liner, based on the area of pond or lagoon. Prior to pond or lagoon operation, the liner must be tested to meet the above leaching limitation

14.3.5 Lagoons and ponds must be pre-filled with clean water prior to receiving effluent.

14.3.6 Lagoons and ponds must be enclosed by chain link fencing.

14.4 Inspection

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.

15. WASTEWATER RECLAMATION AND REUSE REQUIREMENTS

15.1 Use.

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.

15.2 Applicability and Purpose

15.2.1 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.

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

15.2.3 In addition to requirements in this chapter, reclamation plants and use areas must meet the requirements of Section 1(A) and Section 9 of the Missoula City-County Health Code, with the exception of Section 1(A)(2).

15.3 Permitting

15.3.1 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.

15.3.2 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.

15.3.3 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.

15.3.4 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.

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

15.4 Reclamation Plant Design Requirements

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

15.4.2 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.

15.4.3 Flow Meter

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

16. GRAY WATER IRRIGATION SYSTEMS

16.1 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.

16.2 Use

16.2.1 Gray 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.

16.2.2 Gray water from kitchen sources may be used for irrigation only where a waste segregation system is used.

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

16.2.4 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.

16.3 Design & Construction

16.3.1 Gray water systems must meet all requirements of DEQ 4, Edition 2009, Chapter 28, ARM 17.36.919, and the requirements of this section.

16.3.2. Gray water irrigation systems do not have to meet the separation requirements found in Regulation 1, Sections 5 (B) and (C).

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

16.3.4 Gray water systems may not be installed:

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

16.3.4.2 Within 2 feet of property lines; or

16.3.4.3 On slopes greater than 25%.

16.3.5 Calculation of minimum required absorption area to be used in conjunction with DEQ 4, Chapter 28.

16.3.5.1 Systems must have at least the minimum square footage of absorption area based on soil type.
16.3.5.2 Systems must be designed and installed to ensure most of the effluent is absorbed by plants during the growing season.

16.3.5.3 Systems installed on parcels subject to the maximum land application limits in the Missoula City-County Health Code Regulation 1, Chapter 5(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.

16.3.6 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.

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

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

16.3.9 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.

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

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

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

16.3.13 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:
16.3.13.1 A detailed description of the gray water system;
16.3.13.2 A detailed description of any scheduled activities required to operate and maintain the system;
16.3.13.3 Operating dates, and;
16.3.13.4 If monitoring is required, the specific monitoring procedures.

APPENDIX A
DEQ Approved Systems for Nitrogen Reduction

Pursuant to Administrative Rules of Montana (ARM) 17.30.702(9)(10) and (11), DEQ defines three different types of nitrogen-reducing SWTS, level 1a, level 1b and level 2 systems. The definitions from the rule are as follows:

> *(9) "Level 1a treatment" means a subsurface wastewater treatment system (SWTS) that:*
> *(a) removes at least 50%, but less than 60%, of total nitrogen as measured from the raw sewage load to the system; or*
> *(b) discharges a total nitrogen effluent concentration of greater than 24 mg/L, but not greater than 30 mg/L. The term does not include treatment systems for industrial waste. A level 1a designation allows the use of 30 mg/L nitrate (as N) as the nitrate effluent concentration for mixing zone calculations.*
> *(10) "Level 1b treatment" means a SWTS that:*
> *(a) removes at least 34%, but less than 50%, of total nitrogen as measured from the raw sewage load to the system; or*
> *(b) discharges a total nitrogen effluent concentration of greater than 30 mg/L, but not greater than 40 mg/L. The term does not include treatment systems for industrial waste. A level 1b designation allows the use of 40 mg/L nitrate (as N) as the nitrate effluent concentration for mixing zone calculations.*
> *(11) "Level 2 treatment" means a SWTS that:*
> *(a) removes at least 60% of total nitrogen as measured from the raw sewage load to the system; or*
> *(b) discharges a total nitrogen effluent concentration of 24 mg/L or less. The term does not include treatment systems for industrial waste.*

As of the date at the top of this document, the following list shows those SWTS that are designated as level 1a, level 1b or level 2 by DEQ (the date next to each SWTS is the date it was designated for that level of treatment):

Level 2	Level 1a	Level 1b
Recirculating Sand Filter (~1993)		Intermittent Sand Filter (5/1/2005)
Orenco – AdvanTex (8/4/2004)		
Fluidyne – Eliminite (8/5/2004)		
International Wastewater Systems (IWS) model 6000 sequencing batch reactor (7/28/2005)		
Santec-Extended Aeration (7/18/2006) [approved for nitrogen reduction to 14mg/L]		
Bio-Microbics – Micro-FAST and Retro-FAST (11/09/2006)		
HDR Engineering Activated Sludge / Biological Nutrient Reduction Systems (1/24/2007) *[approved for nitrogen reduction to 10 mg/L]*		
International Wastewater Systems (IWS) model 6000 sequencing batch reactor with methanol addition, coagulation and filtration (5/21/2007) *[approved for nitrogen reduction to 7.5 mg/L]*		
NORWECO Singulair Model TNT (12/10/2007)		
HDR Engineering Activated Sludge / Biological Nutrient Reduction / Membrane Filtration Systems (6/16/2008) *[approved for nitrogen reduction to 7.5 mg/L]*		

** NOTE: As of May 1, 2005 elevated sand mounds (ESM) were removed from the level 2 list. They no longer qualify for any level of nitrogen reduction (the effluent concentration for an ESM in the nitrogen dilution calculations is the same as a septic tank/drainfield system, 50 mg/L).*
This list will be updated on a regular basis as it changes. Systems can be both added and removed from the list at any time, check back frequently to insure you are working off of the current list.

From: The Department of Environmental Quality's "List of Subsurface Wastewater Treatment Systems (SWTS) that are Approved as a Nitrogen-Reducing System," October 11, 2005. Available at http://www.deq.mt.gov/wqinfo/nondeg/level2_web_list.pdf