CITY OF COLUMBIA/BOONE COUNTY, MISSOURI

DEPARTMENT OF PUBLIC HEALTH AND HUMAN SERVICES
DIVISION OF ENVIRONMENTAL HEALTH

Alternative System Requirements

- An engineer's design is required for any system that is not a lagoon or a conventional septic system.
- The design should be drawn up by a licensed engineer that is experienced with on-site wastewater.
- The soils report and the engineer's design must be submitted to the Health Department for approval before the site evaluation is conducted.
- Any on-site sewage system for an establishment that is not a single family dwelling must be designed by an engineer.
- Alternative designs are generally used for sites that have poor soil or limiting conditions. They generally contain a higher degree of pretreatment than standard type septic systems.
- A permit is required for the installation of any alternative system.
- Permits for new alternative system construction that are tied to a building permit must be taken out at Resource Management at the Boone County Government Center. The cost is $335.00. The permit may be taken out by the homeowner or contractor.
- Permits for new alternative system construction for an existing home with no building permit may be taken out at the Health Department, 1005 W. Worley Street. The cost is $335.00.

Updated 2015

Site Evaluation

All proposed sites for on-site sewage treatment and disposal systems shall be evaluated for the following:

- soil conditions, properties and permeability as determined by a soil morphology examination
- slope, the existence of lowlands, local surface depressions, rock outcrops and sinkholes
- setback distances as required
- surface water flooding probability and depth to water table
- location of easements and underground utilities
- amount of available area for the installation of the system and an area for replacement
- location of home site or dwelling as well as management of surface runoff water from those buildings
- any other cultural feature, such as roads, streets and the like in surrounding areas which influences surface and subsurface flow of water on or near the proposed site
- any significant groundwater contamination potential

A soils morphology conducted by a certified soil scientist is required.

Alternative Systems

The intent of this section is to provide minimum standards for the design, location, installation, use and maintenance of alternative sewage disposal systems in areas of limiting soil characteristics, where a standard system cannot be installed or a standard system is not the most suitable treatment. Where these systems are employed, they shall comply with all local codes and ordinances and should be subject to timely

inspections to assure adherence to specifications.

Drip Absorption

Wastewater going to a drip absorption system must have a high degree of pretreatment prior to entering the drip field. Drip lines shall be placed two feet apart in a parallel arrangement. Emitters shall be placed in the drip lines every two feet so there will be a two-foot by two-foot grid pattern. Other configurations and spacing of the drip line and emitters may be used; however, each emitter will be considered to cover four square feet of absorption area.

Drip soil absorption systems may be allowed at sites where the soil is classified as being in group IVb. A minimum separation distance of twelve inches shall be maintained between the drip lines and emitters and a high ground water table or other limiting condition. The maximum application rate for IVb soils shall be from 0.05-0.10 gpd/square foot of absorption field.

Constructed Wetlands

Constructed wetlands provide secondary levels of treatment, which means that some form of pretreatment (septic tank, aeration tank, lagoon, etc.) must be used prior to the wetland, as wetlands cannot withstand large influxes of suspended solids. The pretreatment used must be capable of removing a large portion of these solids. Effluent from wetlands must be contained on the owner's property using a reduced lateral field based on the site and soils morphology.

Submerged flow wetlands have channels that are filled with shallow depths of rock, gravel or sand. The depth of the porous media is usually less than eighteen inches. The porous media supports the root systems of the emergent aquatic vegetation. The water level is to be maintained below the top of the porous media so that there is no open water surface.

The configuration of a wetland for an individual home should consist of two cells in series, depending upon the soil properties at the site. Larger systems may consist of multiple cells in parallel or series in order to provide more management options.

Rock with rounded edges, such as creek gravel, shall be used in the first cell. Rock must be thoroughly washed to remove fines which may cause plugging. Rock substrate size should be one inch diameter, while rock to be used around inlet and outlet pipes may be two to four inches in diameter to reduce potential clogging. A three to four inch layer of washed pea gravel may be used on top of the one inch substrate for decorative purposes. Coarse sand should be used in the second cell.

All piping shall be SDR35 sewer pipe, Schedule 40 PVC DWV pipe, or material of equivalent or stronger construction. Piping shall be four inch diameter.

If effluent from the septic tank flows to the wetland by gravity, a distribution box should be placed ahead of the wetland so that flow can be controlled to individual cells. If effluent is pumped, the pumping rate shall not exceed twenty-five gallons per minute and no more than one-third of the daily flow shall be pumped at one time.

Water level in a wetland shall be controllable. The range of control shall be from two inches above the surface of the rock to complete draining of the wetland. Maximum water level in the wetland shall be a minimum of twelve inches below the outlet of the septic tank so that water does not back up into the septic tank.

To conveniently check the water level relative to the gravel surface, a four inch diameter perforated pipe may be placed in the bottom of the wetland, through the channel embankment, and then elbowed up to the elevation of the top of the channel. Water level control may be obtained by use of swivel standpipes or collapsible tubing.

Surface water shall be kept out of the wetland. This may be accomplished by diverting runoff away from the wetland or constructing an earthen berm around the wetland. Berms shall be a minimum of six inches above the surface of the porous media.

Table 11 - Plant Growth Data after one growing season

Plant Species	Wet Weight	Dry Weight	Top Dry	Root Dry	Top/Root	Root Depth
Softstem Bulrush *(Scirpus validus)*	(lbs./sq. ft.) 9.74	(lbs./sq. ft.) 4.20	3.20	1.00	3.20	(inches) 7.0
Horsetail *(Equisetum hyemale)*	1.90	0.55	0.20	0.35	0.57	11.0
Water Iris *(Iris pseudacorus)*	3.28	0.66	0.31	0.35	0.90	8.0
Pickerel Rush *(Pontederia cordata)*	6.24	1.30	0.50	0.80	0.63	15.0
Arrowhead *(Sagittaria latifolia)*	2.25	0.35	0.17	0.18	0.94	10.0
Cattails *(Typha latifolia)*	7.89	3.00	1.90	1.10	1.73	8.0
Soft Rush *(Juncus effusus)*	3.00	1.05	0.65	0.40	1.62	18.0
Flowering Rush *(Butomus umbellatus)*	0.30	0.07	0.01	0.06	0.18	12.0

Table 12 - Characteristics of Emergent Aquatic Plants

Plant Species	Bloom Date	Type of Bloom	Bloom Color	Plant Height	Growth Pattern	Initial Spacing
Softstem Bulrush *(Scirpus validus)*	June–July	Oblong Spikelets	Gray	(inches) 40–60	Spreading	(feet) 3
Horsetail *(Equisetum hyemale)*	July–Aug.	Oblong Spikelets	Brown	30–40	Spreading	3
Water Iris *(Iris pseudacorus)*	May–Aug.	Flower	White-Lt. Blue	10–18	Bunches	2–3
Pickerel Rush *(Pontederia cordata)*	July–Sept.	Flower	Purple	10–18	Bunches	2
Arrowhead *(Sagittaria latifolia)*	June–July	Hanging Bulbs	Green-White	6–10	Spreading	2–3
Cattails *(Typha latifolia)*	May–June	Oblong Spike	Brown	48–72	Spreading	3
Soft Rush *(Juncus effusus)*	June–July	Flower	Brown	18–30	Bunches	2

Other Systems

Where unusual conditions exist, special systems of treatment and disposal, other than those specifically mentioned in this rule, may be employed. These systems may include at-grade systems, modified mound systems or LPP systems. These special systems may be used provided:

- reasonable assurance of performance of the system is presented to the administrative authority;
- the engineering design of the system is first approved by the administrative authority;
- adequate substantiating data indicate that the effluent will not contaminate any drinking water supply, groundwater used for drinking water or any surface water;
- treatment and disposal of the wastes will not deteriorate the public health and general welfare;
- the system complies with local codes and ordinances, and all applicable requirements of sections 701.025-701.055 and Chapter 644, RSMo.

Pumps

Two types of pumps are usually used in the forced distribution of sewage into an alternative system: effluent and turbine pumps. Effluent pumps can handle very small amounts of solids and give a high volume at a low head. They are good pumps to pump to gravity distribution. Turbine pumps are made to start and stop many times per day as is required for the artificial media and other secondary treatment methods. They emit low volumes at a high head and must receive filtered effluent. This pump is made of stainless steel.

Pumps are sized based on the desired operating pressure, the estimated friction losses and the elevation differences**.** These will vary from site and to site and application. The certified engineer will calculate these losses and determine the total dynamic head. Pump manufacturers supply pump curves for the various pumps that they make. The engineer will calculate a system curve for the system, and ensure that it is at least slightly above the pump curve for the chosen pump.

Pump Vaults

Pump vaults may be used in a standard, properly sized septic tank to pump out of. The vault should be made of proper strength and corrosion resistant materials. The vault filter will need to be cleaned. The vault should be able to be easily removed from the tank for cleaning and repair. The pump can be starved and burned out if the filters are not cleaned regularly.

Float Switches

Float switches work in pump tanks to let the pump know when to kick on. The switches work by opening and closing a wire circuit. In one position, the switch is off, the circuit is not complete. In the other position, the switch is on and current can flow through the circuit to the control panel or pump. The activation can be by means of mercury or mechanical means.

Switches will be rated as signal or motor. This will designate if the switch is used to directly start the pump or activate the control panel to start the pump. If the switch is used to directly start the pump, it must be able to handle the same amount of current that will pass through the pump. It will be motor rated. A switch that is signal rated will signal the control panel to activate with a much smaller current flowing through them. This makes them last longer than the motor rated switches.

Float switches should be assembled on a float tree, which is a piece of PVC pipe to which the floats can be tethered to. They should not be attached to the discharge pipe as it can vibrate and dislocate the floats. The float tree can be easily removed for inspection or float replacement. The drawdown amount will be determined by the amount of time that the pump operates. This will be controlled by the length of the tether on the on/off float. The float manufacturers have charts that give the tether lengths and drawdown inches.

Splice Boxes

An electrical splice box is used to house spliced wire connections in the riser between equipment such as pumps, float switches and the control panel. The splice box enables all electrical equipment to be easily removed. The splice box, cord grips and other components must be non-corrosive and rated as water resistant. All splices must be waterproof. If these components are allowed to take on water, it can cause the alarm to go off and the pumps to fail.

Adequate size wire must be used to ensure no voltage drop which will degrade pump performance. The longer distance that is traveled to the power supply, the higher the gauge of wire that must be used.

Control Panels

Control panels act as the brains of many complicated systems. Components of a standard control panel consist of a programmable timer, motor starter contactor, toggle switch, current limiting circuit breakers, fuse disconnect, audio alarm, visual alarm, redundant off/low level alarm relay, terminal blocks, panel enclosure, and latch.