

**MISSOURI DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF ENVIRONMENTAL QUALITY  
NPDES DISCHARGE MONITORING REPORT**

31 May 2024

L7387

**Facility:** Hillcrest Residential Care      **Permit No.:** MO-0129305      **Sample Date:** 02 May 2024  
**County:** Hillcrest Residential Care      **Frequency:** Quarterly      **Sample Time:** 11:58 AM  
**Location:** Columbia, Boone County, Missouri      **Sample Loc.:** Effluent      **Sample Type:** Grab Sample  
**Outfall No.:** 1g      **Flow, mgd:** 0.0021      **Sample Temp:** 21 °C  
**Description:** Septic Tank / Lagoon      **Collected By:** ESE      **Weather:** Overcast  
**Monitoring Period:** 01 April 2024 To 30 June 2024      **Report Due:** 28 July 2024

PARAMETER	4964	UNITS	Detection	Method
pH	7.6	units	n/a	4500-H B
Dissolved Oxygen	3.9	mg/L	0.1	4500-O G
Chlorine, Residual	0.93	mg/L	0.025	4500-Cl G

**Comments:** Sample secured and delivered to laboratory by ES&S

Analysis performed in strict accordance with sample holding times & test procedures outlined in "Standard Methods for the Examination of Water and Wastewater", latest edition

**INSTRUCTIONS:**

1. Date & sign one copy & retain for your records.
2. Date & sign one copy & mail to: **Department of Natural Resources**  
 Northeast Regional Office  
 1709 Prospect Drive  
 Macon, MO 63552

**OWNER APPROVAL:** *Ron Worthley owner*      **DATE:** *6/18/24*

x. 0 Ron Worthley  
 0 Worthley, Ron  
 0  
 0

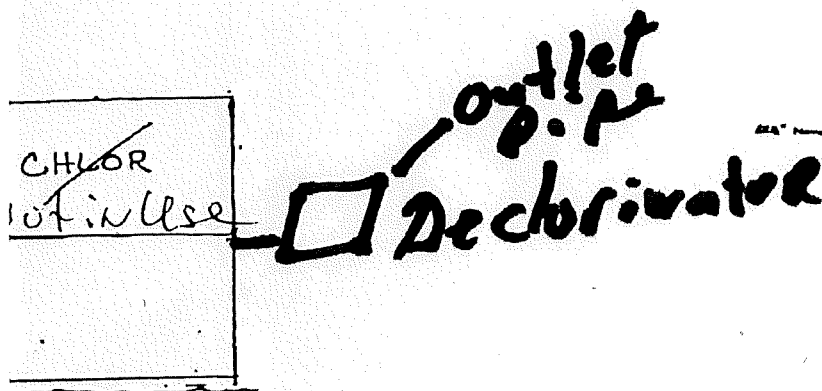
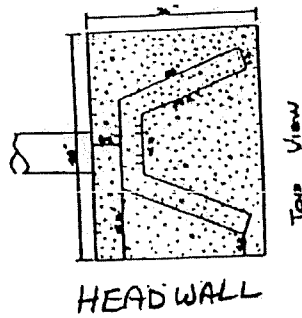
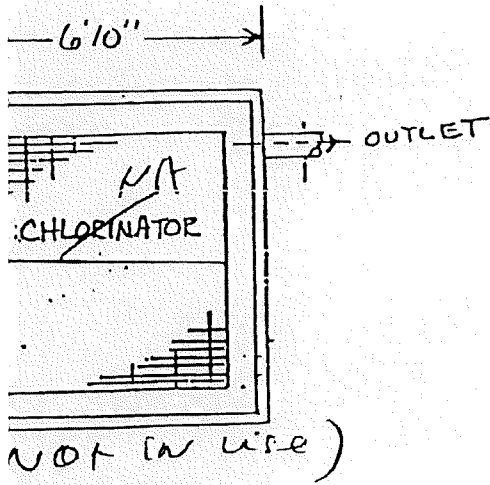
**Engineering Surveys & Services**  
 BY: *Mikaala Rettke*

Hillcrest Residential Care WWTP  
Boone County  
MO0118303

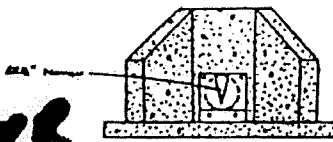
Issue	Permitted Feature	Monitoring Period End Date or Event Due Date	Parameter or Event Type
Effluent Violation	001	3/31/2024	BOD, 5-day, 20 deg. C
Effluent Violation	001	3/31/2024	Nitrogen, ammonia total (as N)
Effluent Violation	001	3/31/2024	Total Suspended Solids (TSS)

The violations listed in the Letter of Warning dated December 29, 2023 and March 29, 2024 have also not been resolved.





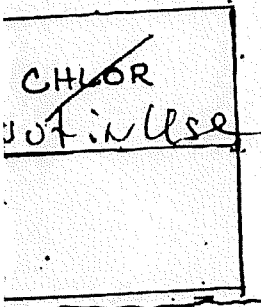
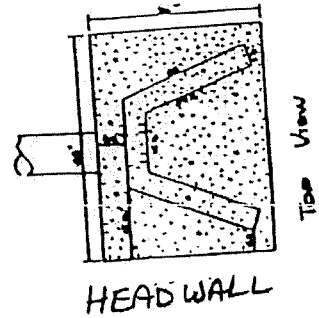
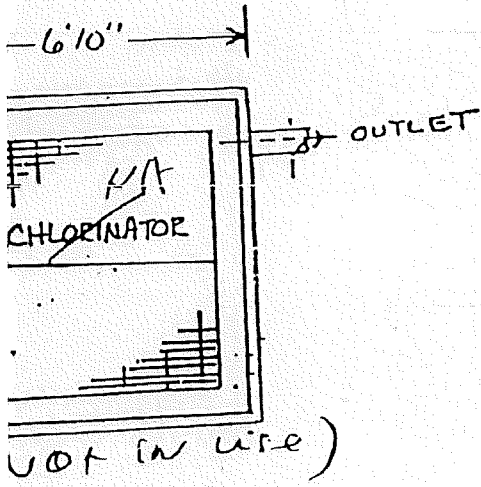
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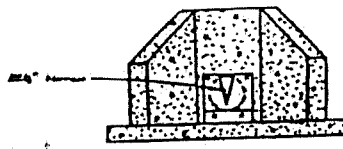
VATED

E VIEW

<p><b>Masterson &amp; Associates</b> SEWAGE TREATMENT &amp; TRANSFER SYSTEMS</p>	<p>EXCAVATION &amp; LAYOUT - 4000 GALLON SEWAGE TREATMENT PLANT</p>
<p>DWN: COULBORN APP: <i>[Signature]</i></p>	
	<p>EA70279</p>



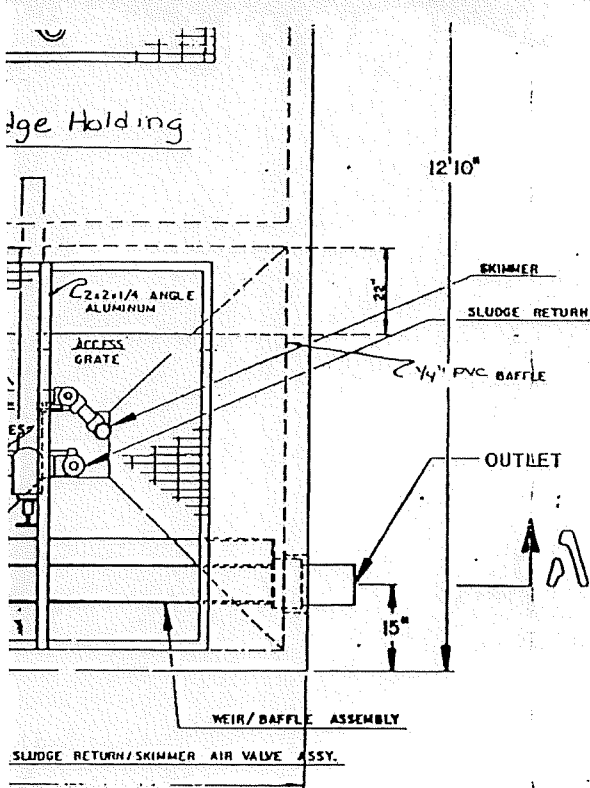
WITH WEIR INSTALLED



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VIEW

<p><b>Masterson &amp; Associates</b> SEWAGE TREATMENT &amp; TRANSFER SYSTEMS</p>	<p>EXCAVATION &amp; LAYOUT - 4000 GALLON SEWAGE TREATMENT PLANT</p>
	<p>EA7027E</p>
<p>OWN: COULBORN</p>	
<p>APP: <i>SJR</i></p>	



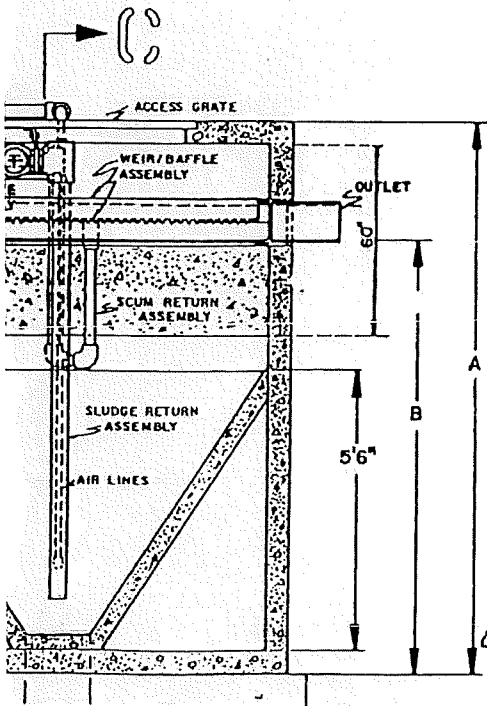
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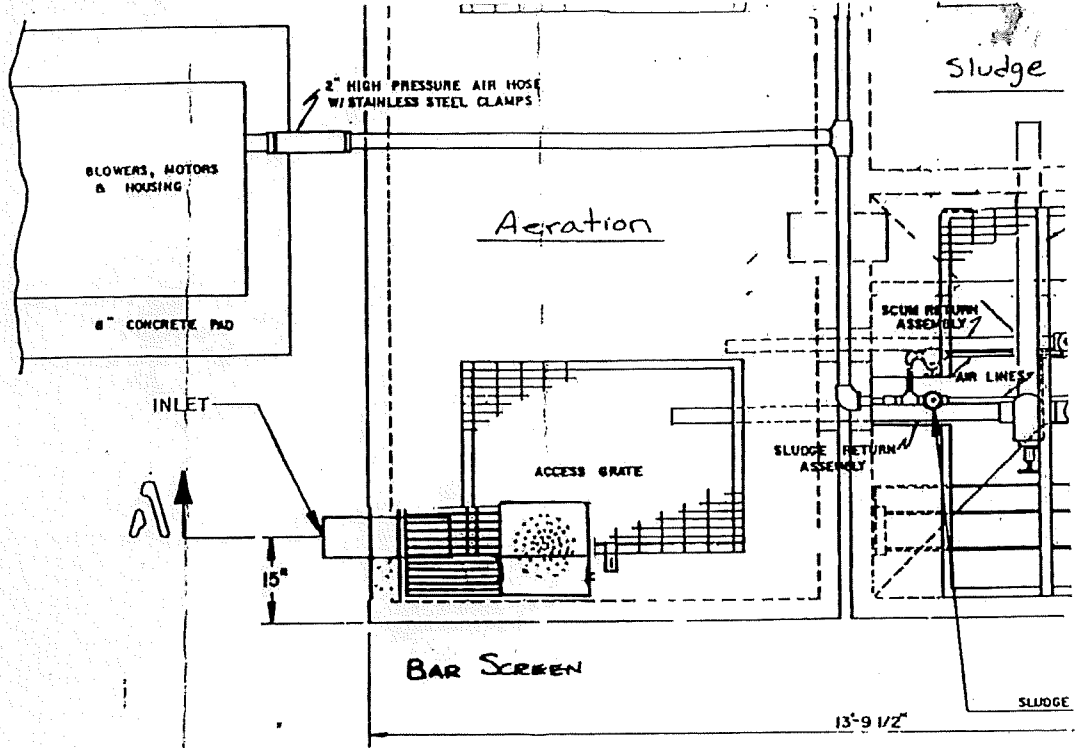
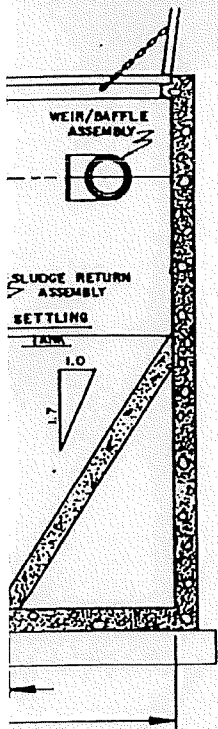
Extended Aeration  
Sewage Treatment Plant

10. ALL GRATING AND PIPING TO BE GALVANIZED STEEL.
  9. SEE DETAIL SHEET FOR LOCATION OF AIR DIFFUSER ASSEMBLY.
  8. CONCRETE BAFFLE TO EXTEND 6" ABOVE WATER LINE.
  7. SETTLING TANK WALLS NOT SHOWN TO SCALE, MINIMUM SLOPE WALLS TO BE 1:7 TO 1:0.
  6. BLOWER ASSEMBLY LOCATED AS SITE DICTATES.
  5. SEE ACCOMPANYING SHEET FOR DETAILS.
  4. DIMENSION "A" MAY BE INCREASED IN 30" INCREMENTS BY ADDITION OF RISERS.
  3. REINFORCING OF TANKS IS SUFFICIENT TO WITHSTAND FULL HYDRAULIC PRESSURE WITHOUT BACKFILL.
  2. ALL TANKS PRECAST CONCRETE WITH MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 4500 PSI.
- ⚠ MINIMUM DIMENSION "C" IS DIMENSION "B" PLUS 2 INCHES.

NOTES



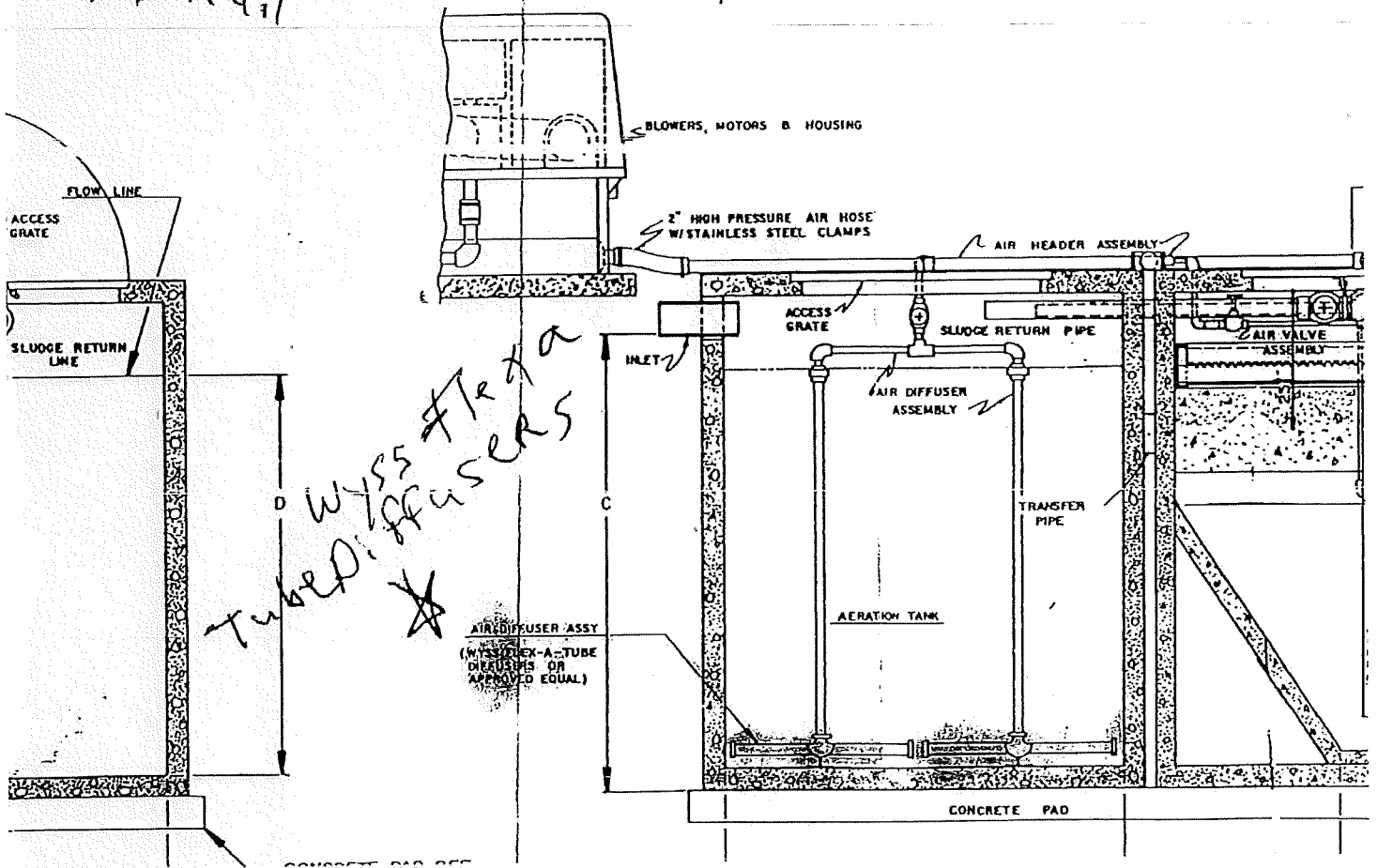
70	7000GAL	13'2"	11'6"	12'2"	11'4"
60	6000GAL	13'2"	10'10"	12'2"	10'8"
50	5000GAL	10'8"	9'0"	9'8"	8'10"
40	4000GAL	10'8"	8'4"	9'8"	8'2"
MODEL	PLANT CAPACITY	A	B	C/A	D



PLAN

E-M 9/1

13





## **Alternative System Requirements**

- A permit is required for the installation of any alternative system.
- An engineer's design is required for any system that is not a lagoon or a conventional septic system. See our list of Approved Engineers
- Permits applications for new alternative system construction must be applied for at Resource Management, Boone County Government Center. The cost is \$480.00. The application may be taken out by the homeowner or contractor.
- The soils report and the engineer's design must be submitted with the permit application.
- The design should be drawn by a licensed engineer that is experienced with on-site wastewater.
- Review of the application will begin once all required documentation is received. Please allow up to seven business days for the review to be completed. Once the review is complete, the permit will be issued and you may schedule a pre-site inspection.
- 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.
- Only certified installers may install alternative systems. A list of certified installers is available at Resource Management or on our website at: [www.showmeboone.com/resource-management](http://www.showmeboone.com/resource-management).
- A footing inspection will not be scheduled until an on-site wastewater pre-inspection has been performed and approved. On-site wastewater pre-site inspections and footings will not be scheduled for the same day.



## **Site Evaluation**

Site inspections must be scheduled 24-hours in advance. Property lines, proposed location of the system and all components of the system, floodplain and/or floodway, stream buffer locations and location of sinkholes must be located and marked. 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 (property lines must be located and marked)
- 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 generally requires 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.

### **At-Grade Systems**

At-grade systems consist of small diameter pipe laterals installed at grade, or on top of the native soil with a gravel bed, geotextile fabric, and a soil cap. These systems require a minimum of 12 inches of group III soils at the top of the soil profile. At-grade systems utilize a linear loading rate rather than a square footage loading rate like other systems. A site with some slope is required in order to load the soils in this linear fashion.

### **Constructed Wetlands**

Constructed wetlands provide secondary levels of treatment, which means that some form of pretreatment such as a septic tank or aeration tank must be used prior to the wetland, as wetlands cannot withstand large influxes of suspended 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.

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 or torpedo 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 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. See the administrative rule for more information on plant selection for a constructed wetland.

### **Other Systems**

Where unusual conditions exist, special systems of treatment and disposal, other than those specifically mentioned in this rule, may be employed. 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. 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.