The Riley County Sanitary Code

Riley County
Planning and Development

Environmental Health

Adopted
February 20, 2020

TABLE OF CONTENTS

CHAPTER I

ADMINISTRATIVE PROCEDURES

ARTICLE 1 AUTHORITY AND POLICY

Section

1-1.1 Legal Authority. This code is adopted under the authority granted to The Board of County Commissioners by K.S.A. 19-3701 et. seq., K.S.A. 19-101a, or K.S.A. 12-3301, as amended.

1-1.2 Declaration of Finding and Policy. The Commissioners find that the provision of adequate and reasonable control over environmental conditions in the county is necessary and desirable because the control and prevention of surface and groundwater pollution is fundamental to the health, safety, and welfare of the public. A sanitary code establishes standards to eliminate and/or prevent the development of environmental conditions that are hazardous to health and safety, and promotes the economical and planned development of the land and water resources of the county. For these reasons and objectives, it will be the policy of the Board of County Commissioners to adopt and amend a sanitary code to provide current regulation of practices that affect health and safety.

1-1.3 Purpose. The purpose and intent of this chapter is to prescribe the administrative procedures to be followed in administrating this sanitary code or any amendments thereto; and to prescribe rules and regulations for controlling practices to minimize health and safety hazards.

1-1.4 Title. This code shall be known and referred to as the Riley County Sanitary Code.

1-1.5 Applicability. This Code and all authorized rules, regulations, and restrictions authorized by this Code shall apply to the unincorporated area of Riley County, Kansas, and to all persons, property, establishments, and business activities located or conducted therein, regardless of ownership. This Code does not apply to any tract of land under one ownership, which exceeds 600 acres in area and is used only for agricultural purposes, except for residences located thereon.

1-1.6 Separability. If any clause, sentence, paragraph, section, or subsection of this Code shall for any reason, be adjudged by any court of competent jurisdiction to be unconstitutional and invalid, such judgment shall not affect, repeal, or invalidate the remainder thereof, but shall be confined to the clause, sentence, paragraph, section, or subsection thereof so found unconstitutional and invalid.

1-1.7 Effective Date. This Code shall become effective from and after its approval by KDHE, the date of adoption by the Board of County Commissioners and publication of notice as required by law.

ARTICLE 2 DEFINITIONS

The following words, terms, and phrases appear in more than one chapter of this Code and thus have general application and usage. Words, terms, and phrases appropriate or applicable to specific chapters within this Code may be found in that particular chapter.

Section

1-2.1 Administrative Agency means the entity authorized to implement and enforce the provisions of this Code. The Administrative Agency for Riley County is the Riley County Planning and Development Department.

1-2.2 Administrative Rules means those rules and regulations contained in Chapter I of this Code which prescribe general procedures to be followed in the administration of the Sanitary Code adopted by the county.

1-2.3 Agricultural Purposes means a purpose related to the production of livestock or crops.

1-2.4 Authorized Representative means any person who is designated by the Administrative Agency to administer this Code.

1-2.5 Board of County Commissioners means the Board of County Commissioners of Riley County, Kansas.

1-2.6 Board of Health means the Board of County Commissioners of Riley County, Kansas.

1-2.7 Effluent means outflowing treated wastewater.

1-2.8 Environmental Health Specialist means the person authorized by the Board of County Commissioners of Riley County, Kansas to enforce this Code.

1-2.9 Existing System means an installed private or public water system or wastewater disposal system, whether lawful or unlawful.

1-2.10 Hearing Officer means a qualified, neutral individual, not regularly employed by the Riley County Planning and Development Department, appointed by the Board of County Commissioners, to hear appeals from decisions relating to the enforcement and administration of this Code. The hearing officer shall be paid from funds of the Riley County General Fund.

1-2.11 Person means an individual, corporation, partnership, association, state or political subdivision thereof, federal, state agency, municipality, commission, interstate body, or other legal entity recognized by law as the subject of rights and duties.

1-2.12 Premise means any lot or tract of land and all buildings, structures, or facilities located thereon.

1-2.13 Sanitary Code means rules, standards, and regulations adopted by the county designed to minimize or control those environments and environmental conditions that may adversely affect the health and wellbeing of the public. Such environments and environmental conditions may include but are not restricted to: wastewater and wastewater disposal; water supply. Whenever

the term "Code" is used herein, such reference shall be to the Riley County Sanitary Code.

1-2.14 KDHE means the Kansas Department of Health and Environment.

1-2.15 Structure means anything constructed or erected with a fixed location on the ground; including buildings, walls, signs, towers, and bins.

1-2.16 Variance means an exception to any provision of this Code authorized by the Board of County Commissioners of Riley County, Kansas pursuant to an appeal under this Code.

1-2.17 Waiver means an exception to any provision of this Code authorized by the Administrative Agency pursuant to this Code.

ARTICLE 3 ADMINISTRATIVE POWERS AND PROCEDURES

Section

1-3.1 Right of Entry. Authorized representatives of the Administrative Agency may, at any reasonable time, enter upon, examine and/or survey all such premises, establishments and buildings, as he or she shall deem necessary for the enforcement of this Code. In the event that the owner or person lawfully in control of the premises refuses to consent to such entry, then, upon application by the authorized representative, any court of competent jurisdiction shall issue an ex parte order requiring the owner or person lawfully in control of the premises to permit entry upon the premises and permitting the authorized representative, when accompanied by an officer from the Riley County Police Department, to enter forcibly upon the premises and conduct the examination and/or survey.

1-3.2 Notices, Orders, Appeals

1-3.2.1 Notice of Violations. When the Administrative Agency determines that there has been a violation of any provision of this Code, notice of such violation shall be issued to the person responsible. The notice shall:

(a) be in writing;
(b) identify the code violation and the factual basis thereof;
(c) specify necessary corrective action;
(d) allow a reasonable period of time for performance of any work required by the notice; and
(e) be properly served upon the owner, agent, or occupant, provided that such notice shall be deemed properly served upon such owner, agent, or occupant when a copy thereof has been sent by certified mail to the last known address of the owner, agent, or occupant as identified on the latest county tax rolls.

1-3.2.2 Appeal for Hearing. Any person aggrieved by any notice or order issued by the Administrative Agency under the provisions of this Code may request, and shall be granted, a hearing on the matter before a Hearing Officer; provided such persons shall file with the Administrative Agency within fifteen working days after the date of issuance of the notice or order, a written petition requesting a hearing and setting forth the grounds upon which the

request is made. The filing of the request for a hearing shall operate as a stay of the notice or order, except as provided in Section 1-3.3.

1-3.2.3 Conduct of Hearing. Upon receipt of such petition, the Administrative Agency shall confer with the Hearing Officer and set a time and place for such hearing and shall give the petitioner written notice thereof. At such hearing, the petitioner shall be given an opportunity to show why such notice or order should be modified or withdrawn. The hearing shall be commenced no later than ten working days after the date on which the petition was filed. Upon request of the petitioner, the Administrative Agency may postpone the hearing for a reasonable time beyond such ten-day period, when in the Agency's judgment the petitioner has submitted justifiable reason for such postponement.

1-3.2.4 Report of Hearing. Within ten working days after such a hearing, the Hearing Officer shall submit the findings of the hearing in writing to the Board of County Commissioners. The findings shall include a recommendation that the order be sustained, modified, or withdrawn. Upon the receipt of the report of the Hearing Officer, the Board of County Commissioners shall consider the report and issue an order, confirming, modifying or withdrawing the notice or order at their next regularly scheduled meeting, and shall notify the appellant in the same manner as is provided for in Section 1-3.2.1 within 30 calendar days. The decision of the Board of County Commissioners may be appealed to the District Court.

1-3.2.5 Proceedings of Hearings. The proceedings of all hearings shall be recorded. The recordings, findings, and decisions of the Hearing Officer and a copy of every notice and order related thereto shall be filed with the Administrative Agency. Transcripts of the proceedings of hearings need not be transcribed unless a judicial review of the decision is sought. Tapes will be kept for at least two (2) years unless an appeal is filed. Tapes may be destroyed after any appeal is completed.

1-3.3 Emergencies

1-3.3.1 Emergency Orders. Whenever the authorized representative finds that an emergency exists which requires immediate action to protect the public health, he or she may, without notice or hearing, issue an order reciting the existence of such an emergency and require that such action be taken, as he or she may deem necessary to meet the emergency, including the suspension of the permit. Notwithstanding any other provisions of this Code, such order shall be effective immediately and shall be enforceable in Riley County District Court.

1-3.3.2 Work Stoppage. Whenever any work is being performed on a private wastewater disposal system contrary to the provisions of this Code, the authorized representative may order the work stopped immediately by issuing an emergency order and serving it on any persons engaged in the doing or causing such work to be done, and any such person shall forthwith stop such work until authorized by the Administrative Agency to proceed with the work.

1-3.3.3 Compliance. Any person to whom an emergency order is directed shall comply therewith immediately, but upon written request filed within five (5) days of issuance, shall be afforded a hearing before a Hearing Officer as soon as possible. Such a hearing shall be held within ten (10) days of the issuance of such emergency order.

1-3.4 Disclaimer of Liability. This Code shall not be construed or interpreted as imposing upon the County or the Administrative Agency, or officials and employees of either: (1) any liability or responsibility for damages to property; or, (2) any warranty that any system, installation or portion thereof that is constructed or repaired under permits and inspections required by this Code, will function properly. In addition, any employee charged with the enforcement of this Code, acting in good faith and without malice in the discharge to his or her duties, shall not thereby be personally liable and is hereby relieved from personal liability for damage that may occur to any person or property as a result of any act required by this Code in the discharge of his or her duties.

1-3.5 Violations and Penalties

1-3.5.1 Unlawful Conduct.

The following acts shall be unlawful:

(a) Obstruction of Authorized Representative. No person shall willfully impede or obstruct an authorized representative of the Administrative Agency in the discharge of his or her official duties under the provisions of this Code.

(b) Operation without a Permit or License. No person shall do any act or engage in any activity for which a permit or license is required by this Code unless first obtaining such permit or license. The existence of emergency conditions may be a defense to this provision.

(c) Failure to comply with Emergency Order. No person shall fail or refuse to comply with an emergency order of the Administrative Agency issued under Section 1-3.3 of this chapter.

(d) Failure to comply with Permit or License. No person shall fail to comply with the specified terms or conditions of any permit or license issued under this Code nor do any act or engage in any activity or conduct regulated by this Code without a valid permit or license, nor continue activities or conduct subject to any permit or license which has expired, been suspended or been revoked by this Code.

(e) Failure to comply with Regulations. No person shall do any act or engage in any activity which is regulated by an Article, Section, or Chapter of this Code except as authorized and permitted under the Code, and no person shall knowingly operate any activity regulated by this Code in any manner which does not comply with the requirements of the conditions and regulations specified in this Code.

(f) Falsification and Misrepresentation. No person shall falsify nor misrepresent any fact, information, product, or data provided, required, or submitted for any application, permit, license, inspection,

examination, investigation, report, record, test, or other determination required under this Code.

(g) Improper Discharge. No person shall cause nor permit any wastewater or sewage to be discharged to or upon the ground surface, the ground water, or other natural water course which creates or causes a health hazard or unlawful pollution, and no person shall cause nor permit any effluent from any private wastewater disposal system to be so discharged, or to leak, seep or otherwise escape from the system such as to create or cause a health hazard or unlawful pollution.

1-3.5.2 Enforcement Procedure. The County Attorney shall enforce all criminal provisions of this code. The County Counselor will file actions of injunction, relief, restraining orders, and other civil matters necessary to enforce this Code, and shall be governed by the provisions of the Kansas Code of Civil Procedure.

1-3.5.3 Penalties. In addition to, and independently of, the enforcement procedures provided herein, any violation of any provision of this Sanitary Code or of any unlawful conduct described herein shall be deemed to be a misdemeanor and punishable by a fine not to exceed two hundred dollars ($200) for each offense. Each day's violation shall constitute a separate offense.

1-3.6 Property Resale, Existing Systems Evaluation. Upon request of the property owner or contract buyer, the Administrative Agency shall provide an inspection of existing private water and private wastewater systems and verification of connection to public water and public wastewater systems at a fee established by the Board of Health. Any inspection provided under this section shall not constitute nor be deemed a warranty, and neither the Administrative Agency nor any other official of the County shall be held liable for claims arising out of the inspection. Upon completion of the inspection a written report will be issued to the applicant.

ARTICLE 4 PERMIT AND LICENSE REQUIREMENTS

Section

1-4.1 Application for Permits and Licenses. Every person required by this Code to obtain a permit or license shall make application for such permit or license to the Riley County Planning and Development Department on standard forms provided for that purpose.

1-4.2 Approval of Permit Application. After receipt of an application and appropriate fees as required by this Code, the Administrative Agency shall conduct such investigations as are deemed necessary to determine whether the permit application should be approved. The Administrative Agency has fifteen (15) working days, weather permitting, to complete the required investigative procedures after all requirements of the applicant have been completed. In wet or freezing weather, the Administrative Agency may extend the time permitted but shall inform the applicant when investigations will begin. The Administrative Agency shall approve or deny the permit application within one week of completion of all required investigative

procedures. If the permit application is not denied within one week of completion of such procedures, it shall be automatically approved unless the Administrative Agency, after giving notice to the applicant, requests from the Board of Health, for good cause, an extension of the time period. If the permit application is denied, the Administrative Agency shall send the applicant a written notice and state the reasons for rejection. Denial of a permit application by the Administrative Agency is subject to the appeal process as detailed in Section 1-3.2.2.

1-4.3 Special Requirements. To protect public health and safety, the Administrative Agency may make more stringent requirements for the issuance of a permit in specific instances, provided:

(a) The requirements shall be set forth on the permit.

(b) When the applicant and the Administrative Agency agree that the requirements are necessary, the applicant shall note approval by the applicant's signature on the permit.

(c) If the applicant does not agree with the more stringent requirements, the applicant may request a written rationale from the Administrative Agency. Such written rationale will be provided to the applicant within ten (10) calendar days from the date of the request. The applicant may appeal such requirements at a hearing as provided in Section 1-3.2.2.

1-4.4 Approval of License. After receipt of an application and appropriate fees as required by this Code, the Administrative Agency shall conduct such investigations as are deemed necessary to determine whether the license should be issued. The Administrative Agency has fifteen (15) working days to complete the required investigative procedures after all requirements of the applicant have been completed. The Administrative Agency shall issue or deny the license within one week of completion of all required investigative procedures. If the license is not denied within one week of completion of such procedures, it shall be automatically issued. If the license is denied, the Administrative Agency shall send the applicant a written notice and state the reasons for rejection. Denial of a license by the Administrative Agency is subject to the appeal process as detailed in Section 1-3.2.2.

1-4.5 Permit or License Transferability. No license required by this Code shall be transferable. Permits issued under this Code shall transfer to a new property owner.

1-4.6 Errors and Omissions. The issuance of a permit shall not prevent the Administrative Agency from thereafter requiring the correction of errors in plans and specifications or from preventing construction activity being carried on thereunder when such activity would be in violation of this Code or of any other Code or resolution or from revoking any permit or license when issued in error. The Administrative Agency may, in writing, suspend or revoke a permit or license issued under provisions of this Code if the permit or license was issued in error, or on the basis of incorrect information provided by the applicant, or for noncompliance or misrepresentation.

1-4.7 Permit or License Expiration. Permit applications approved under this Code will expire one year after approval unless the Administrative Agency approves a request for extension prior to the expiration date. All licenses will be issued for the current calendar year and will expire on December 31.

1-4.8 Standard Fees. The Board of Health shall adopt a schedule of fees for all procedures, permits, and licenses required by this Code, and said fees shall be paid into the Administrative Agency. The Administrative Agency shall not process any application for a procedure, permit, or license until the required fee has been paid. Any fees required and paid are not refundable unless approved by the Director of the Riley County Planning and Development Department.

1-4.9 Records

1-4.9.1 Permit Applications. Applications for permits or licenses required by this Code shall be filed with the Administrative Agency.

1-4.9.2 Official Actions. A written record of all official actions taken on applications for permits and licenses required by this Code shall be kept on file with the Administrative Agency.

CHAPTER II

ON-SITE WASTEWATER MANAGEMENT

ARTICLE 1 PURPOSE AND INTENT

Sewage is a potential source of disease, water pollution, and a hazard to the health, safety, and welfare of the public. It is the purpose of this chapter to provide minimum standards for the location, design, construction, maintenance, and use of on-site wastewater systems, and the removal and disposal of materials from such facilities within the legal boundaries of Riley County. All onsite wastewater systems shall be designed, constructed and operated in accordance with standards set forth in KDHE Bulletin 4-2 "Minimum Standards for Design and Construction of Onsite Wastewater Systems" published March, 1997, as amended, by KDHE and Kansas State University Agricultural Experiment Station and Cooperative Extension Service. KDHE Bulletin 4-2 is hereby adopted by reference and is included as Appendix B.

ARTICLE 2 DEFINITIONS

Section

2-2.1 Alternative Wastewater Disposal System – Active means a private wastewater disposal system, approved by the Administrative Agency, which uses mechanical or electrical components or moving parts to effectively pre-treat the wastewater to reduce the levels of pollutants before discharge to an approved underground soil distribution system.

Alternative Wastewater Disposal System – Passive means a private wastewater disposal system, approved by the Administrative Agency, which does not use any mechanical or electrical components or moving parts but uses passive components and specified materials to effectively pre-treat the wastewater to reduce the levels of pollutants before discharge to an approved underground soil distribution system.

2-2.2 Cesspool means a drywell that receives solely untreated sanitary waste, and which sometimes has an open bottom or perforated sides.

2-2.3 Domestic Wastewater means sewage which is normally generated by residential activity, not commercial or industrial, and which originates primarily from kitchen, bathroom and laundry sources, including waste from food preparation, dishwashing, garbage grinding, toilets, baths, and showers.

2-2.4 Lawful Private Wastewater Disposal System means an existing private wastewater disposal system lawfully installed prior to the effective date of this Code; and a system that is not in violation of this Code and: (a) was constructed prior to May 1, 1963; or (b) was constructed, altered, or extended with the required permit any time after May 1, 1963; or (c) has been issued

an Administrative Agency permit based on an evaluation of existing construction.

2-2.5 Nuisance means conditions or activities on properties both public and private, which have or threaten to have a detrimental effect on the environment or the health of the public.

2-2.6 Private Wastewater Disposal System means any system along with attendant pipes and appurtenances designed and constructed to collect, store, treat, and dispose of domestic wastewater, which is not required to hold a Kansas Water Pollution Control Permit. (See KSA 65-165, 65-166, 65-166a)

2-2.7 Privy means a water-tight vault made of concrete or other acceptable material designed to receive, store and provide for periodic removal of non-water carried waste from the human body.

2-2.8 Public Wastewater Disposal System means any system along with attendant pipes and appurtenances designed and constructed to collect, store, treat, and dispose of wastewater, which is required to hold a Kansas Water Pollution Control Permit. (See KSA 65-165, 65-166, 65-166a)

2-2.9 Sanitary Service means the pumping out and or removal of sewage, sludge, or human excreta from privies, vaults, septic tanks, or private wastewater disposal systems, and the transportation of such material to a point of final disposal.

2-2.10 Seepage Pit means a subsurface vertical shaft lined with un-mortared stone or other material, which is filled with rock, or gravel and receives septic tank effluent.

2-2.11 Septage means the liquid or solid material removed from a septic tank, privy, portable toilet, or other component of a private wastewater disposal system that only receives domestic wastewater.

2-2.12 Sewage means any substance that contains any of the waste products or excrementitious or other discharges from the bodies of human beings or animals, or chemical or other wastes from domestic sources, manufacturing, or other forms of industry.

2-2.13 Vault/Septic Tank means a watertight receptacle for the retention of sewage either before, during, or after treatment.

ARTICLE 3 PROHIBITED PRACTICES

Section

2-3.1 Use of Non-approved Private Systems. No person shall use, or cause to be used, any private wastewater disposal system until it has been inspected and approved by the Administrative Agency, or if it:

(a) has been enjoined as a public health nuisance by a court of competent jurisdiction; or

(b) fails to comply with the provisions of this Code, and written notice thereof has been given by the Administrative Agency; or

(c) discharges onto the surface of the ground, or waters of the state as defined in K.S.A. 65-161 (a), or into a seepage pit or cesspool; or

(d) receives non-domestic wastewater, causes vector breeding, produces offensive odors or any condition that is detrimental to health and comfort; or

(e) uses a vault/septic tank which is not a water-tight receptacle.

2-3.2 Use of Private Wastewater Disposal Systems within 400 Feet of Public Sewer. No private wastewater disposal system shall be constructed, repaired, or modified within 400 feet of an existing public sewer, unless the Administrative Agency finds that connection to such a sewer is not reasonably feasible and that a private wastewater disposal system meeting the requirements of this Code can be constructed on that property.

2-3.3 Location of Private Wastewater Disposal Systems below Full/Flood Pool. No portion of a private wastewater disposal system shall be located on property covered by water at the flood pool elevation of any reservoir, unless written approval is obtained from the Administrative Agency and the United States Corps of Engineers. No portion of a private wastewater disposal system shall be located on property covered by water at the full pool elevation of any pond, lake, or water supply reservoir, unless written approval is obtained from the Administrative Agency. This does not preclude use and repair of existing systems, provided other requirements of this Code are met.

2-3.4 Location of Private Wastewater Disposal Systems within a 100 Year Flood Plain. No portion of a private wastewater disposal system shall be constructed within the 100 year flood plain (as established by the Federal Emergency Management Agency) of any stream, river, or water course unless written approval is obtained from the Administrative Agency. This does not preclude repair of existing systems, provided other requirements of this code are met.

2-3.5 Multiple connections to a Private Wastewater System. No more than one residence shall be connected to a private wastewater disposal system. This does not preclude continued use or repair of a lawful private wastewater disposal system.

2-3.6 Use of Cesspools, Seepage Pits. Cesspools, seepage pits, and other wastewater disposal methods not described as acceptable in this code or by the references adopted by this code, are illegal and shall be removed from operation immediately upon notification of the owner by registered mail. Any replacement wastewater disposal system shall be constructed in accordance with this Code.

ARTICLE 4 ALTERATION, REPLACEMENT, OR RECONSTRUCTION OF EXISTING STRUCTURES

Section

2-4.1 Non-Conforming Lots.

(a) In no case shall a structure, served by a private wastewater disposal system and located on a lot that does not meet size and separation requirements of this Code, be altered, replaced, reconstructed, or enlarged in such a manner that would enable an increase in the number of persons residing in said structure or otherwise produce an increase in the volume of wastewater; and

(b) repairs, maintenance, or reconstruction of said structure shall be limited to those items necessary to keep the structure in sound conditions; and

(c) use of said structure shall not be changed in any manner, which increases the volume of wastewater used.

2-4.2 Conforming Lots. Plans to alter or enlarge any structure served by a private wastewater disposal system must be submitted to the Administrative Agency for approval if such modification would enable an increase in the number of persons residing in said structure or otherwise produce an increase in the volume of wastewater. The Administrative Agency may require the existing private wastewater disposal system to be improved or enlarged to accommodate the potential increase in wastewater volume.

2-4.3 Reconstruction of Damaged Structures. In the event that the existing structure is damaged, by any means, to the extent of more than 50% of its value, restoration of the property shall not be allowed unless the premise contains a lawful private wastewater disposal system. An evaluation of the premise shall be conducted by the Administrative Agency before approval for the restoration can be granted.

ARTICLE 5 REQUIREMENTS FOR PRIVATE WASTEWATER DISPOSAL SYSTEMS

Sections

2-5.1 Approval of Plans. After adoption of this code, no person shall develop any private wastewater disposal system until the plans and specifications for such system have been approved by the Administrative Agency. All private wastewater disposal systems shall conform to current state minimum standards for design and construction of onsite wastewater systems (KDHE Bulletin 4-2; See Appendix B). Other references regarding private wastewater disposal systems may also be used as a guide by the Administrative Agency in reviewing and approving plans for these systems. (See Appendix A for a list of these approved references.) The Administrative Agency may develop compaction standards for wastewater stabilization ponds based upon Kansas Department of Transportation's "Type B" compaction requirement. The Administrative Agency may require plans to be submitted by a registered professional engineer or other recognized professional with experience designing private wastewater disposal systems.

2-5.2 Application for Permit Required. No person shall construct, repair, or modify, or allow to be constructed, repaired, or modified, any private

wastewater disposal system until a permit application has been received and approved by the Administrative Agency.

2-5.3 Use Permit Required. No person shall operate a private wastewater disposal system without a permit issued by the Administrative Agency. The permit shall be issued after construction has been approved.

2-5.4 Use of Existing Systems. Lawful private wastewater disposal systems are exempt from meeting the lot size and separation requirements of this Code. This exemption may be used to allow the repair of existing private wastewater systems if approval is obtained from the Administrative Agency. Any premise, which does not contain a lawful private wastewater disposal system, is subject to all restrictions and requirements of this Code.

2-5.5 Construction Approval. All private wastewater disposal systems constructed, repaired, or modified after the effective date of this code must be inspected and approved by the Administrative Agency for compliance with the approved plans; and no portion of the system shall be covered or made inaccessible to inspection prior to approval. Private wastewater disposal systems shall not be put into use until the construction is approved and the permit issued.

2-5.6 Proper Maintenance and Operation. All private wastewater disposal systems shall be maintained in accordance with standards established by the Administrative Agency. Approved references listed in Appendix A may be used by the Administrative Agency to help establish these standards.

2-5.6.1 Additional Maintenance Requirements for Septic Tanks. Septic tanks shall be pumped and inspected a minimum of every five (5) years to verify that the tees are in place and that the tank has not deteriorated. If the tank is no longer structurally sound or is not watertight, it must be replaced.

2-5.6.2 Additional Maintenance Requirements for Alternative Private Wastewater Disposal Systems.

(a) Any person owning or installing an alternative private wastewater disposal system shall maintain the system in accordance with the manufacturer's instructions and requirements of the Administrative Agency as outlined in the "Riley County Environmental Health Administrative Standards for Alternative System Inspection and Maintenance" on file in the office of the Administrative Agency and on the Riley County website at www.rileycountyks.gov.

(b) All Alternative Private Wastewater Disposal Systems - Active shall be subject to an annual inspection performed by either the Riley County Environmental Health Specialist, a licensed Alternative Private Wastewater Disposal System Installer or a licensed Alternative Private Wastewater System Maintenance Provider, selected by the alternative system's owner, authorized to perform work on alternative systems as outlined in Section 2-8.1. The annual inspection shall be conducted as outlined in the "Riley County Environmental Health Administrative Standards for Alternative System Inspection and Maintenance" on file in the office of the

Administrative Agency and on the Riley County website at www.rileycountyks.gov. The alternative system's owner, or the owner's designated agent, also may conduct the annual inspection, provided the Environmental Health Specialist is present to contemporaneously observe and document the results of each step in the inspection on the inspection report(s) required by the "Riley County Environmental Health Administrative Standards for Alternative System Inspection and Maintenance", identified above.

(c) The annual inspections of Alternative Private Wastewater Disposal Systems - Active shall begin on the effective date of this Code.

2-5.7 Septic Tanks. All newly installed septic tanks shall have an effluent filter approved by the Administrative Agency. Whenever a private wastewater disposal system with a septic tank is repaired or modified, an approved effluent filter shall be installed.

2-5.8 Privies. No privy shall be constructed or reconstructed on any premise served by a public water supply, or on which water is delivered to any building under pressure, unless special permission for use of a privy is obtained from the Administrative Agency. No privy shall be constructed less than 300 feet from any dwelling other than that of the owner of the privy.

ARTICLE 6 STANDARDS FOR SITE APPROVAL-NEW CONSTRUCTION

No private wastewater disposal system shall be constructed unless the following minimum standards are met:

Section

2-6.1 Lot Size

2-6.1.1 Soil Absorption Systems. Any lot platted after December 1993 must meet the size requirements in Chapter IV of this Code and must meet the separation requirements listed in Table I, (page 24). Any lot, which is a part of a recorded subdivision or a parcel of land, the deed to which was recorded prior to December 1993 shall contain one acre of land exclusive of roads and meet separation requirements listed in Table I except distance from a private wastewater disposal system, or shall contain an area suitable for construction of a private wastewater disposal system that meets all of the separation requirements listed in Table I.

2-6.1.2 Wastewater Stabilization Ponds. No wastewater stabilization pond shall be constructed on any lot or combinations of recorded contiguous lots with less than three acres of area.

2-6.2 Percolation Rates

(a) Soils with percolation rates of 0 to 5 minutes/inch are not acceptable for construction of standard lateral fields.

(b) Percolation rates of 60 minutes/inch or less may allow construction of a single lateral field, a double lateral field with diversion valve, or an alternative wastewater disposal system.

(c) Percolation rates of 61 to 120 minutes/inch necessitate construction of a double lateral field with a diversion valve, or may allow an alternative wastewater disposal systems or wastewater stabilization pond.

(d) Percolation rates in excess of 120 minutes/inch necessitate construction of a wastewater stabilization pond or may allow an alternative wastewater disposal system.

(e) No wastewater stabilization pond shall be constructed on soils which are suitable for standard septic tank – underground soil absorption systems.

2-6.3 Soil Profiles

(a) No underground soil absorption field receiving effluent from a septic tank shall be constructed in soils which reveal evidence of seasonal water table intrusion, rock ledges, shale, or other impervious materials within four feet of the bottom of the excavation.

(b) No mounds shall be constructed on soils, which reveal evidence of seasonal water table intrusion, rock ledges, shale, or other impervious materials within two feet of the natural ground surface.

(c) The Administrative Agency will determine the suitability of a proposed site for installation of an absorption field serving an alternative wastewater disposal system. No alternative wastewater disposal system shall be constructed on a site where restrictive layers are likely to prevent the system from functioning as designed. The Administrative Agency may require soil and site analysis by a recognized professional.

2-6.4 Slopes

(a) Standard construction practices for wastewater disposal soil absorption systems are limited to slopes no greater than fifteen (15) percent. A design proposal for construction on slopes in excess of 15 percent shall be submitted by a registered professional engineer for approval by the Administrative Agency.

(b) Standard construction practices for mound systems are limited to slopes no greater than fifteen (15) percent. A design proposal for construction on slopes in excess of 15 percent shall be submitted by a registered professional engineer or other recognized professional for approval by the Administrative Agency.

(c) Standard construction practices for wastewater stabilization ponds are limited to slopes no greater than twenty five (25) percent. A design proposal for construction on slopes in excess of 25 percent shall be submitted by a registered professional engineer for approval by the Administrative Agency.

ARTICLE 7 SANITARY SERVICES

Section

2-7.1 Septage Haulers License Required. No person shall remove or transport any wastes from any private wastewater disposal system or privy, unless that

person holds a valid Septage Haulers License from the Administrative Agency. A license shall be issued only to persons:

(a) Operating properly designed and maintained equipment which has been inspected and approved by the Administrative Agency; and

(b) Complying with all provisions of this Code.

2-7.2 Contracting with Unlicensed Persons Prohibited. No person responsible for operating a private wastewater disposal system or privy shall contract with any person for sanitary service unless that person providing the service holds a valid Septage Haulers License from the Administrative Agency.

2-7.3 Standards for Sanitary Service Equipment. All equipment used for rendering of sanitary service shall be of watertight construction and maintained in good working condition. All materials removed from private wastewater disposal systems or privies shall be transported to an approved point of disposal without spillage of the waste.

2-7.4 Disposal of Septage. All septage shall be properly disposed of by discharge to: (1) a municipal sewage treatment facility; (2) a properly managed landfill that accepts septage; or (3) a permitted and properly managed land disposal site as described in 2-7.5. The Septage Hauler shall maintain logs of operation, which reflect date, source, disposal site, and any other relevant data. Logs shall be kept for at least three years and shall be available for review upon request by the Administrative Agency.

2-7.5 Land Disposal of Septage

2-7.5.1 General Requirements. When land application is the desired method for disposal of septage, U.S. Environmental Protection Agency 503 Septage Management Rules (40 C.F.R. 503) must be complied with. In addition, land application sites shall comply with the County requirements in 2-7.5.2.

2-7.5.2 County Requirements. Landowners desiring to operate a land disposal site shall apply for a permit to the Administrative Agency. The site shall be evaluated by the Administrative Agency to determine that the side is not subject to flooding, is tillable ground suitable for cropping, and will not create any nuisance. The site shall be posted at entrances to forbid unauthorized personnel.

2-7.6 Inspection Reports. Septage Haulers shall submit inspection reports to the Administrative Agency for all private wastewater disposal systems pumped. Reports shall be submitted in a format approved by the Administrative Agency and no more than one month after the service.

ARTICLE 8 PRIVATE WASTEWATER DISPOSAL SYSTEM INSTALLERS

Section

2-8.1 License Required. No person shall install, repair or modify any private wastewater disposal system unless that person holds a valid license issued by the Administrative Agency. A license shall be issued only to persons:

(a) Demonstrating knowledge of this Code and proper wastewater disposal system installation techniques by passing an exam offered by the Administrative Agency; and

(b) complying with all provisions of this Code; and

(c) obtaining a minimum of two hours of approved continuation training each calendar year. The training, to be approved, must be directly related to the knowledge requirements listed in paragraph (a) above. Attendance at a workshop conducted, sponsored or approved by the Administrative Agency or any applicable professional association shall satisfy the requirements of this section.

The Administrative Agency shall require an advanced Private Alternative Wastewater Disposal System Installer license for installing, repairing or modifying alternative systems.

The Administrative Agency shall require an advanced Private Alternative Wastewater Disposal System Maintenance Provider license for servicing or inspecting alternative systems as outlined in the Riley County Environmental Health Administrative Standards for Alternative System Inspection and Maintenance, 2016.

2-8.2 Contracting with Unlicensed Installers Prohibited. No person responsible for operating a private wastewater disposal system shall contract with any person for construction, repair, or modification of a private wastewater disposal system, unless that installer holds a valid license.

TABLE I

LOCATION OF PRIVATE WASTEWATER DISPOSAL SYSTEM

TO CLOSEST:	MINIMUM SEPARATION
Private wastewater disposal system	100 ft.
Public or Private Water Well	100 ft.
Public or Private Water line from a well	25 ft.
Streams, lakes, and ponds	100 ft.
Property boundary	*50 ft.

*May be waived to no less than 10 feet if other separations can be maintained and the adjoining property is zoned for non-residential and non-commercial use or if written permission is obtained from the adjoining property owner (shall not be waived to less than 50 feet for wastewater stabilization ponds.) When the adjoining property is a road right-of-way, half of the right-of-way may be considered part of the separation distance.

CHAPTER III

PRIVATE WATER SUPPLIES TYPE I AND TYPE II

ARTICLE 1 PURPOSE AND INTENT

The provisions of this chapter are for the purpose of regulating and controlling the development, maintenance, and use of all water supplies which are or may be intended for domestic use, other than public water supplies, in Riley County, Kansas, in order that public health will be protected and the contamination and pollution of the water resources of the county will be prevented.

ARTICLE 2 DEFINITIONS

Section

3-2.1 Domestic Use means the use of water by any person or family unit or household for household purposes, or for the watering of livestock, poultry, farm and domestic animals used in operating a farm, or for the irrigating of lands not exceeding a total of two acres in area for the growing of gardens, orchards, and lawns.

3-2.2 Private Water Supply means all water supplies for domestic use, which do not meet the definition of a public water supply system in KSA 65-162a.

3-2.3 Private Water Supply Type I means private water supply for domestic use, containing no more than two (2) service connections and serving fewer than twenty-four (24) people per year.

3-2.4 Private Water Supply Type II means a private water supply for domestic use, containing three (3) to nine (9) service connections and serving no more than twenty-four (24) people per year.

3-2.5 Public Water Supply means a system for the provision to the public of piped water for human consumption, if such system has at least ten (10) service connections or regularly serves an average of at least twenty-five (25) individuals daily at least sixty (60) days out of the year.

3-2.6 Service Connection means any single connection between a water supply system and a single tract of land or lot for the purpose of supplying water for domestic or commercial use on the tractor lot regardless of the number of users or hydrants.

ARTICLE 3 REQUIREMENTS FOR PRIVATE WATER SUPPLY TYPE I AND TYPE II

Section

3-3.1 Permits. No well serving a Type I or Type II private water supply shall be drilled without first obtaining a well drilling permit from the Administrative Agency.

Section

3-3.2 Approval of Plans. After adoption of this code, no person shall develop any private water supply Type II until the plans detailing locations of facilities, specifications of equipment, proposed operating standards, and reports of bacteriological and chemical tests have been approved by the Administrative Agency.

3-3.3 Application for Permit Required. No person shall construct any private water supply Type II until an "Application for a Private Water Supply Type II" has been received and approved by the Administrative Agency.

3-3.4 Use Permit Required. No person shall use any private water supply Type II constructed after adoption of this Code without a "Private Water Supply Type II Use Permit" issued by the Administrative Agency. No person shall use or lease any private water supply Type II without a "Private Water Supply Type II Use Permit" issued by the Administrative Agency. The "Private Water Supply Type II Use Permit" shall be issued only after construction has been approved.

3-3.5 Private Water Supply Type II Requirements. All private water supplies Type II shall meet the following requirements:

(a) have a designated individual or service company as operator of the system. This name shall be submitted to the Administrative Agency; and

(b) test for bacteriological quality of the water supply using a laboratory certified by the State of Kansas, at least every three months; and

(c) test for nitrate content of the water supply using a laboratory certified by the State of Kansas, at least once each year; and

(d) maintain logs to verify bacteriological and chemical quality; and

(e) immediately: (i) notify all users of the water and the Administrative Agency should bacteriological and chemical quality of the water supply exceed the United States Environmental Protection Agency's (EPA) maximum contaminant levels; and (ii) immediately bring the bacteriological and chemical quality of the water supply within the EPA maximum contaminant levels, to the satisfaction of the Administration Agency.

3-3.6 Location of Wells. Wells constructed after adoption of this code shall be separated from the specified sources of pollution by distances equal to or greater than those shown in Table II (page 27). Such distances may be increased by the Administrative Agency in situations where the well may need additional protection to prevent contamination.

3-3.7 Construction of Wells. Well construction shall be regulated in accordance with K.A.R. 28-30-1 through 28-30-10 et seq., as amended.

3-3.8 Abandoned Wells. Abandoned wells as defined in K.A.R. 28-30-2, as amended, are to be plugged as specified in K.A.R. 28-30-7, as amended.

3-3.9 Water Well Records. Within 30 days after construction or plugging of a water well, the water well contractor shall submit a copy of the water well record, form WWC-5 for construction or form WWC-5p for plugging, to the Administrative Agency.

TABLE II

LOCATION OF WELLS
FOR
PRIVATE WATER SUPPLY TYPE I AND TYPE II

AREA	MINIMUM SEPARATION
Private Wastewater Disposal System ……..……	100 ft.
Privy ……..…….……..	100 ft.
Septic Tank ……...…..	100 ft.
Barn yards, Stables, Manure piles, Animal pens, etc. …….....	50 ft.
Sewer lines, not constructed of cast iron or other equally watertight construction.…..…	100 ft.
Sewer lines constructed of cast iron or other equally watertight construction …….…..	30 ft.
Dwellings, Structures, which might be treated for termite infestation ……..….	50 ft.
Fuel or Chemical Storage …….……..……...….	150 ft.
Other Existing Wells for Private Water Supply Type I and Type II ……...	50 ft.
Streams, Lakes and Ponds …….…..100 ft.	

CHAPTER IV

SUBDIVISION DEVELOPMENT

ARTICLE 1 PURPOSE AND INTENT

The provisions of this chapter are for the purpose of regulating and controlling the development of property which will be served by either a public or private water supply and either a public or private wastewater disposal system, in order that public health will be protected and the contamination and pollution of the water resources of the county will be prevented.

ARTICLE 2 DEFINITIONS

Section

4-2.1 Subdivision means the dividing of any land into two or more lots or tracts either of which contains 20 acres or less.

ARTICLE 3 REQUIREMENTS FOR SUBDIVISION DEVELOPMENT

Section

4-3.1 Approval of Plans. After adoption of this Code no person shall develop any subdivision until the plans and specifications for private water supply and private wastewater management have been approved by the Administrative Agency.

4-3.2 Application for Approval Required. Any person seeking to subdivide land shall apply to the Administrative Agency for approval. The following standards will apply:

4-3.2.1 Site Requirements. Unless served by public wastewater disposal system, each lot shall meet the minimum standards for site approval as specified in Sections 2-6.1 through 2-6.4.

4-3.2.2 Lot Size Requirements. Subdivisions shall meet one of the following minimum lot size requirements:

(a) Each lot must have two (2) acres of land exclusive of roads and streets if the lot contains or will contain a private water supplies Type I or Type II well and a private wastewater disposal system;

(b) Each lot must have one and four-tenths (1.4) acres of land exclusive of roads and streets, if the lot contains or will contain a private wastewater disposal system and no private water supplies Type I or Type II well is or will be provided within the lot;

(c) Each lot must have eight-tenths (0.8) acre of land exclusive of roads and streets, if the lot contains or will contain a private water supplies Type I and Type II well and all sewage is collected and disposed of by a public wastewater disposal system;

(d) Each lot must have the minimum lot size required under the Riley County Zoning Regulations if the lot will be served by a public water supply and a public wastewater disposal system.

4-3.2.3 Existing System Requirements. Existing private water supplies Type I and Type II and private wastewater disposal systems must comply with this Code and any connection to a public water supply and/or a public wastewater disposal system must be verified by the Administrative Agency before a subdivision may be approved.

APPENDIX A: APPROVED REFERENCES

Minimum Standards for Design and Construction of Onsite Wastewater Systems, Bulletin 4-2. March 1997. State of Kansas, Department of Health and Environment Bureau of Water – Nonpoint Source Section and K-State Research and Extension cooperating.

Environmental Health Handbook, Second Edition, 2002, Kansas Association of Sanitarians, Kansas Department of Health and Environment, and K-State Research and Extension cooperating.

Wisconsin Mound Soil Absorption System Siting, Design, and Construction Manual. Small Scale Waste Management Project, January 1990. University of Wisconsin – Madison, Wisconsin 53706.

Residential Onsite Wastewater Treatment Systems: An Operation and Maintenance Service Provider Program, Second Edition, Consortium of Institutes for Decentralized Wastewater Treatment, 2008.

Standard Methods for the Examination of Water and Wastewater, American Public Health Association, the American Water Works Association, and the Water Environment Federation.

K.A.R. 28-5-2 to 28-5-9 and 28-30-1 to 28-30-10 June 7, 2013, Kansas Administrative Regulations, Kansas Department of Health and Environment.

NSF International Standard / American National Standard, NSF / ANSI 40 -2012, Residential Wastewater Treatment Systems, prepared by the NSF Joint Committee on Wastewater Technology.

Handbook Septage Treatment and Disposal, United States Environmental Protection Agency, October 1984.

EPA Onsite Wastewater Treatment Systems Manual, United States Environmental Protection Agency, 2002.

EPA Design Manual, Onsite Wastewater Treatment and Disposal Systems, United States Environmental Protection Agency, 1980, Chapter 6, Section 6.2.7.

A Minnesota Regulator's Guide to the Venhuizen Standard Denitrifying Sand Filter Wastewater Reclamation System, Copyright 1997 by David Venhuizen, P.E.

Septic Tank Maintenance, Karen M. Mancl and Brian Slater, The Ohio State University Extension – College of Food, Agricultural, and Environmental Sciences, Publication #AEX-740, Last Updated: 2016.

Riley County Environmental Health Administrative Standards for Alternative System Inspection and Maintenance, 2016.

Kansas Department of Transportation, Standard Specifications for State Road and Bridge Construction, Division 150 Equipment, Section 151 Compaction Equipment, Edition 2015; Standard Specifications for State Road and Bridge Construction, Division 200 Earthwork, Section 205 Excavation and Embankment for Highways, Edition 2015.

EPA Domestic Septage Regulatory Guidance, A Guide to the EPA 503 Rule, 1993.

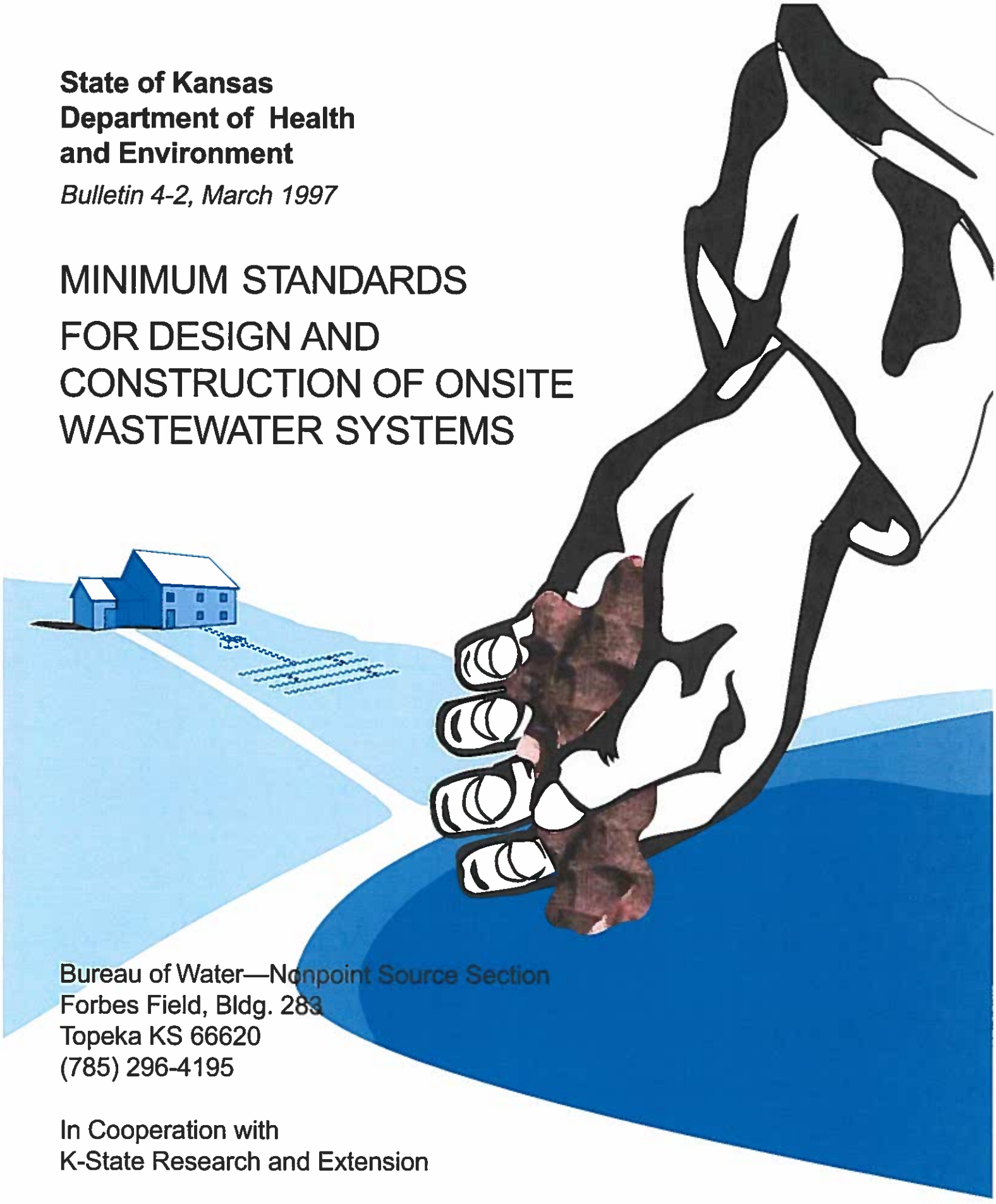
APPENDIX B:

State of Kansas Department of Health and Environment
Bulletin 4-2, March, 1997, Minimum Standards for Design and Construction of Onsite Wastewater Systems,
Bureau of Water-Nonpoint Source Section,
In Cooperation with K-State Research and Extension

State of Kansas
Department of Health
and Environment

Bulletin 4-2, March 1997

MINIMUM STANDARDS FOR DESIGN AND CONSTRUCTION OF ONSITE WASTEWATER SYSTEMS



Bureau of Water—Nonpoint Source Section
Forbes Field, Bldg. 283
Topeka KS 66620
(785) 296-4195

In Cooperation with
K-State Research and Extension

Table of Contents

Tables

Figures

Introduction

Kansas Administrative Regulations (K.A.R. 28-5-6 to 9) authorize the Kansas Department of Health and Environment (KDHE) to establish minimum standards for septic tank–lateral fields. KDHE bulletin 4-2: *Minimum Standards for Design and Construction of Onsite Wastewater Systems* fulfills that purpose. The minimum standards presented in this document are intended to ensure domestic wastewater is managed so that:

- Quality of surface and groundwater is protected for drinking water, recreation, aquatic life support, irrigation, and industrial uses.
- A breeding place or habitat will not be created for insects, rodents, and other vectors that may later contact food, people, pets, or drinking water.
- Wastewater will not be exposed on the ground surface where it can be contacted by children and/or pets, creating a significant health hazard.
- State and federal laws and local regulations governing water pollution or wastewater disposal will be met.
- Nuisance conditions or obnoxious odors and unsightliness will be avoided.

Bulletin 4-2 is not intended to provide an in-depth discussion of the rationale for these standards. For more information, see the *Environmental Health Handbook* and resources identified therein as well as other references in Appendix B (page 16). Most county health departments have a copy of this handbook, or copies are available at cost from Kansas State University, Extension Biological and Agricultural Engineering (see Appendix B).

Local governments have the authority to adopt minimum requirements (codes) for onsite wastewater management systems, to approve individual plans, to issue permits for construction, to issue permits for operation, and to grant variances. County sanitary (environmental) codes specify local design and permitting requirements. Compliance with these requirements helps prevent illness caused by environmental contamination and protects surface and groundwater.

Some local requirements, such as those in wellhead protection or sensitive groundwater areas, may be more stringent than those established in Bulletin 4-2. Often, these stricter requirements provide greater protection of public health and the environment, especially where water resources are vulnerable to contamination.

Sanitary codes are adopted and administered by local government usually through county health departments. The local administering authority should always be contacted before any time or money is invested in system design, plans, installation, or repairs.

If there is no local code, landowners are required to comply with Kansas Administrative Regulations (K.A.R.) 28-5-6 to 9 and minimum standards in this bulletin. If no assistance is available from the health department or other local authority, contact your county Extension Office or KDHE, Bureau of Water, phone (785) 296-4195, or the nearest KDHE District Office (see inside back cover).

K.A.R. 28-5-6 stipulates that all domestic wastewater shall be discharged to an approved sewage collection system or an approved lagoon, septic system, or alternative system. Domestic wastewater means all waterborne wastes produced at family dwellings in connection with ordinary living including kitchen, toilet, laundry, shower, and bath tub wastewater. It also includes similar type wastewater, produced at businesses, churches, industrial, and commercial facilities or establishments.

Wastewater from a home shall be discharged to a properly designed and maintained septic tank-soil absorption field or wastewater pond, an approved alternative treatment and disposal system, or a permitted sewage treatment plant. Seepage pits, cesspools, and dry wells (rat holes) are not permitted. This bulletin provides information on conventional soil absorption fields, wastewater ponds, and alternatives that may be considered when conventional absorption fields or ponds are not suitable.

Bulletin 4-2 covers five basic elements of proper septic tank-lateral field system design:

1. wastewater flow,
2. soil and site evaluation,
3. septic tank standards, for design, construction and installation,
4. lateral field design and construction, and
5. system maintenance.

This bulletin also addresses basic principles for wastewater ponds.

This bulletin is intended to provide information on treatment of domestic wastewater. Domestic wastewater excludes surface runoff from roof, paved areas, or other surfaces; subsurface drainage from springs, foundation drains, and sump pump; or cooling water. Industrial or commercial wastewater (from shops, manufacturing, car washes, etc.) is not permitted to be discharged to an onsite soil absorption system, so it shall not be mixed with domestic wastewater.

By following the standards established in Bulletin 4-2 and your county's sanitary code, you actively contribute to protecting the environment and quality of life for your family, your neighbors, your community, and other Kansans. Your contribution is appreciated!

Wastewater Flows

One major concern in the design of household wastewater systems is the quantity of wastewater generated daily. The system must have enough capacity to accommodate and treat this total flow. Normal contributions to this flow will come from bathroom, kitchen, and laundry facilities. Kansas regulations require that all domestic wastewater be treated and disposed through the onsite system. Surface runoff from roofs and paved areas, subsurface drainage from footing drains and sump pumps and cooling water are not domestic wastewater and must be excluded from soil absorption systems. Such water may be used to help maintain the operating water level in wastewater ponds.

Design flow is estimated by multiplying the number of household bedrooms by 150 gallons per day (gpd). This is based on 75 gallons per person per day for two people in each bedroom[1]. This accounts for the number of people that can occupy the home for extended periods rather than how many actually live there when the system is installed. Houses frequently experience a change in ownership or occupancy over the life of the wastewater system. When calculating wastewater flow, note that a water softener may increase water use by as much as 10 gallons per capita per day or possibly more where water is very hard.

Site and Soil Evaluation

Although the septic tank is important for removing solids from the wastewater, more of the wastewater treatment is provided by the soil. Microorganisms living in the soil profile feed on organic matter in the wastewater, treating and purifying the water as they grow. Four feet of aerated soil below the bottom of the absorption field is necessary to ensure adequate treatment of the wastewater before it reaches the water table or flows laterally due to a restrictive condition.

In sandy soil, it is recommended that as much vertical separation as possible be provided. An understanding of the soil is necessary to assess the ability of the site to provide good wastewater treatment. Soil must absorb the septic tank effluent, treat the wastewater, and transmit treated wastewater away from the soil absorption areas.

The site evaluation begins by reviewing available information such as a published soil survey and then evaluating the soil on site. County soil survey reports are usually available from the local Natural Resource Conservation Service (NRCS, formerly Soil Conservation Service). Contact your local NRCS office, county conservation district or Extension office for a copy of the report.

The soil survey provides general information and serves as a guide to the soil conditions. Sites characterized by slow permeability, restrictive subsoil layer, shallow soil over rock, high groundwater, poor drainage, or steep slopes, as identified in the soil survey, have moderate to

TABLE 1—Soil Limitation Ratings Used by NRCS For Wastewater Absorption Fields

	LIMITS			
Property	**Slight**	**Moderate**	**Severe**	**Restriction or Feature**
USDA Texture	–	–	Ice	Permafrost (not found in Kansas)
Flooding	None, Protected	Rare	Common	Flood water inundates site
Depth to Bedrock (in.)	>[2] 72	40-72	<[3] 40	Bedrock or weathered bedrock restricts water movement or reduces treatment capacity
Depth to Cemented Pan (in.)	> 72	40-72	< 40	Reduces water and air movement
Depth to High Water Table, (ft. below surface)	> 6	4-6	< 4	Saturated soil, poor aeration, anaerobic soil, restricted movement
Permeability, (in./hr.)				
24-60 in. layers	2.0-6.0	0.6-2.0	< 0.6	Slow perc rate, poor drainage
less than 24 in. layers	–	–	> 6.0	Poor filter
Slope, (percent)	0-8	8-15	> 15	Difficult to construct and hold in place
Large stones greater than 3 in., (percent by wt.)	< 25	25-50	> 50	Restricted water and air movement results in reduced treatment capacity

[1]The 150 gallons per bedroom, or 75 gallons of wastewater produced daily by each person, assumes at least some water using appliances such as clothes washer, dishwasher, water softener, etc.
[2]> means greater than
[3]< means less than

severe restrictions for conventional septic tank–soil absorption systems and other options may be preferred or required.

A site and soil evaluation should be completed in order to locate the area to be used for the absorption field, to verify the soil characteristics, and to size the system. Areas with slopes steeper than about 20 percent will cause considerable difficulty during construction and are not recommended for lateral field installations. Rock outcroppings warn of shallow soils and may suggest the probable direction of groundwater flow. The range of values for each of several properties that cause the soil to be placed in slight, moderate, and severe limitation rating for soil absorption systems is shown on Table 1.

The wastewater system area should be chosen prior to any construction on a site and should be an integral part of the homesite design and development. A soil profile analysis is highly recommended to ensure suitability of the area and to establish the loading rate so that adequate space is available for the absorption field and its replacement.

To perform a soil profile analysis, an excavator is usually used to open a pit, which exposes the soil profile. The soil evaluation, performed by a trained and qualified person[4], includes examining the soil profile, determining the soil texture, structure, color, consistence, measuring soil depth, and looking for evidence of a high or perched water table or other restrictions. The soil profile should be analyzed to a depth of at least 4 feet below the bottom of the absorption area or at least 6 feet below the surface.

Because OSHA regulations require shoring for trenches deeper than 5 feet for some soils, it is recommended that the pit be constructed so a person is not required to go deeper. Soil below 5 feet can be examined from cuttings, observation from a distance, and by shovel or auger without entering a deeper pit.

At least three pits should be dug surrounding the area to establish the range of soil characteristics that are present on the site, and to determine the best location for the absorption field. Sanitarians, usually through local health or environmental departments, or environmental health specialists, are available to assist in the site and soil

TABLE 2—Design Septic Tank Effluent Loading Rates for Various Soil Textures and Structures

Group	Soil Characteristics	Wastewater Loading (in/day)	(cm/day)	(gpd/ft²)
I.	Gravelly coarse sand and coarser.	Not Recommended for conventional soil absorption system[5]		
II.	Coarse sands (not cemented).	1.8	4.6	1.1
III.	Medium sand with single grain structure and loose to friable consistence (not cemented).	1.5	3.7	0.9
IV.	Other sands and loamy sands with single grain or weak structure (not extremely firm or cemented consistence).	1	2.5	0.6
	Sandy loams, loams and silt loams with moderate or strong structure (except platy and loose to friable consistence).			
V.	Sandy loams, silt loams and loams with weak structure (not of extremely firm or cemented consistence).	0.7	1.7	0.4
	Sandy clay loams, clay loams and silty clay loams with moderate to strong structure (not of platy, of firm, or of cemented consistence).			
VI.	Sandy clay loams, clay loams and silty clay loams with weak structure (not massive, not of firm, or of cemented consistence.)	0.4	1	0.25
	Some sandy clays, clays and silty clays with moderate and strong structure (not platy, not of firm, or of cemented consistence).			
VII.	Other soils of high clay content with weak or massive structure, extremely firm or cemented consistence or platy, clay pan, fragipan, and caliche soils.	Not Recommended for conventional soil absorption system[6]		

NOTE: The above descriptions are estimates and assume that the soil does not have large amounts of swelling clays. Soils with platy structure, massive, compacted or high density should be used with extreme caution or avoided.

[4]A trained and qualified person would include a soil scientist, such as one working for NRCS, environmental health specialist, sanitarian, or other person who has received appropriate soil training and through experience is competent.
[5]Soil is too coarse for conventional soil absorption designs, use pressure distribution dosing or other alternative system to prevent too rapid infiltration.
[6]Soils with these conditions may be acceptable for wastewater stabilization ponds or possibly other alternative systems. (See Table 6).

evaluations. A few consultants, either engineers or design/installation contractors, also provide this service.

Table 2 gives the recommended loading rates based on soil texture, structure, and consistence information. These loading rates are based on research that has shown that soil characteristics provide a strong basis for wastewater system design loading rate. Results show system design should be based on the most limiting soil texture found in the first 4 feet of soil below the bottom of the proposed absorption lateral.

Once the wastewater flow (number of bedrooms) and loading rate for the soil are known, the absorption field area needed for the lateral system can be calculated. It is highly recommended that the absorption field and an equal area reserved for future use be marked and fenced so they will not be disturbed during construction. Required setback distances to property lines, wells, surface water, and buildings must be checked and included in the site plan.

Where evaporation substantially exceeds precipitation, as in central and western Kansas, a reduction in soil absorption area may be used when the soil is well suited to wastewater absorption. A well suited soil has medium to coarse texture, perc rates less than 45 minutes per inch and wastewater loading rates of 0.5 gallons per square foot per day or more. For marginal, high clay, soil that has low loading rates, no reduction should be used regardless of location in Kansas. Recommended allowable soil absorption system reductions and percent of total absorption area for central and western Kansas is shown on Table 3.

Since about 1970 considerable research about onsite wastewater systems has occurred. New information, including design procedures, operating characteristics, and many new products, has been and continues to be developed to help improve onsite wastewater systems.

The soil profile evaluation provides a comprehensive assessment of soil characteristics and is the preferred

TABLE 3—Recommended Absorption Reductions

	Western Kansas	Central Kansas	Eastern Kansas
Actual absorption area (in percent)	65	80	100
Recommended reduction (in percent)	35	20	0

TABLE 4—Soil Absorption Field Loading Rate and Area Recommendation for Septic Tank Effluent Based on Perc

Perc Rate (minutes/inch)	Recommended Absorption Area (ft^2/bedroom)	Loading Rate (gpd/ft^2)
Less than 5 minutes	Not recommended for conventional soil absorption system[5]	
5-10 minutes	165	0.91
11-15 minutes	190	0.79
16-30 minutes	250	0.6
31-45 minutes	300	0.5
46-60 minutes	330	0.45
Greater than 60 minutes	Not recommended for conventional soil absorption system[6]	

TABLE 5—Minimum Required and Minimum Recommended Separation Distances for Onsite Wastewater Systems

Separation Distances	Minimum Distance (ft.) Required	Recommended[7]
Septic Tank to foundation of house or other buildings	10	10
Soil Absorption System to dwelling foundation	20	50
Any part of a wastewater system to:		
public potable water line	25[8]	25
private potable water line	10	25
property line	10	50
public water supply well or suction line	100[9]	200
private water supply well or suction line	50[9]	100
surface water course	50	100
Wastewater Lagoons to:		
property line	50[10]	200
dwelling foundation	50[10]	200

[5]Soil is too coarse for conventional soil absorption designs, use pressure distribution dosing or other alternative system to prevent too rapid infiltration.
[6]Soils with these conditions may be acceptable for wastewater stabilization ponds or possibly other alternative systems. (See Table 6).
[7]These recommended separation distances help assure a minimum of problems, but are no assurance that problems will not result.
[8]The minimum distance specified by KDHE guidelines for public water supplies
[9]The minimum distance required by KAR 28-30-8(a).
[10]When lot dimension, topography, or soil condition make maintaining the required 50 feet separation distance impossible, a written variance from the affected property owners shall be obtained and filed with deeds.

method for determining the suitability of the soil to accept and treat wastewater and establish the design loading.

Some local sanitary codes require the perc test and other codes require both a perc test and a soil profile evaluation. "Perc" is short for percolation and has become the preferred term for this test to evaluate soil suitability to accept wastewater. Percolation means water movement through a soil. Since the driving force is gravity, most of the movement will be downward. The perc test really measures an infiltration rate for water into a wet but unsaturated soil at the depth of expected system placement. The procedure for doing a perc test is described in Appendix A (page 14). Once the perc rate is known, refer to Table 4 to determine the loading rate and absorption field area, or use another method specified by the local sanitary code.

Separation of the soil absorption field from buildings, structures, and boundaries is essential to maintain system performance, to permit repairs, to maintain required separation from wells, and to reduce undesirable effects of underground wastewater flow and dispersion. The structures and boundaries to consider include easements, buildings, property lines, utilities, wells, and components of the wastewater disposal system. Minimum required and recommended separation distances for private wastewater systems are given in Table 5.

Many soils, especially in eastern Kansas, have properties that restrict their suitability for soil absorption fields. When limiting properties occur in the soil profile, a variation of conventional laterals, wastewater ponds or alternative treatment systems may be used to compensate for the limiting condition. Variations and alternatives that may be considered are summarized in Table 6. When possible, sites with these restrictive conditions should be avoided due to higher cost, larger land area, and greater maintenance requirements for the alternative systems.

TABLE 6—General Alternative Option Guide for Moderate or Severe Limiting Soil Conditions

I. Shallow Permanent, Perched or Seasonal Groundwater
- Subsurface drainage system at least 50 feet from the soil absorption area to lower the water table—suitable for moderate or more permeable soil conditions. This alternative creates drainage that must be discharged away from the area
- Variation of conventional lateral trench
  - Shallow in-ground trench—suitable for groundwater at 4¾ feet or deeper
  - At-grade lateral system—suitable for groundwater at 4 feet or deeper
- Enhanced wastewater treatment[11] by rock-plant filter[12], sand filter[13], or aerated tank[14] or other equivalent system[15] followed by shallow soil absorption or wastewater pond
- Wisconsin (engineered) mound—suitable for groundwater or other restriction at 1 foot or deeper
- Rock-plant filter[12]—suitable for ground water at 1 foot or deeper followed by soil absorption

II. Shallow Bedrock
- Wastewater pond—suitable for sites with bedrock at any depth when overexcavated and at least 1½ feet of compacted clay lining is installed
- Variation of conventional lateral trench
  - Shallow in-ground trench system— suitable for bedrock at 4¾ feet or deeper
  - At-grade lateral system—suitable for bedrock at 4 feet or deeper
- Enhanced wastewater treatment[11] options (see I above) followed by shallow soil absorption
- Wisconsin (engineered) mound—suitable for bedrock at 1 foot or deeper

III. Rapid Perc Rate (< 5 mpi) or very permeable soil (> 20 in/hr)
- Pressurized distribution dosing system to uniformly distribute wastewater throughout the absorption field
- One foot lining using loam soil to bottom and sides of the trench to limit water absorption rate

IV. Slow Perc Rate (60 to 120 mpi) or "slow" soil permeability (0.2-0.6 in/hr)
- Dual shallow lateral systems in permeable surface soils (each with 60% to 80% of conventional lateral area) with a diversion valve and alternating use of systems
- Wastewater pond provided sufficient site area is available to meet all setback requirements
- Wisconsin (engineered) mound—suitable for nearly level sites with more permeable surface soil
- Enhanced wastewater treatment[11] options (see I above) followed by shallow soil absorption into permeable surface soil

V. Very Slow Perc Rate Soil (> 120 mpi), "very slow" soil permeability (< 0.2 in/hr)
- Wastewater pond—suitable for sites with enough site area to meet all setback requirements
- Wisconsin (engineered) mound—suitable for level sites with permeable surface soil
- Enhanced wastewater treatment[11] options (see I above) followed by shallow soil absorption into permeable surface soil

[11]Enhanced treatment is higher quality than septic tank effluent and may be equivalent to secondary treatment in wastewater treatment terminology, or in some cases even higher quality, comparable to advanced wastewater treatment
[12]Rock-plant filter provides a higher level of treatment than septic tanks. Due to higher quality effluent, the soil absorption field size may be smaller than for a conventional absorption field system.
[13]Sand filters provide a very high level of treatment. Due to this high quality effluent, the soil absorption field may be smaller than that required for a conventional absorption field.
[14]Aerobic tanks have poor operating records so an operating/maintenance agreement with a reliable supplier is strongly recommended to ensure system performance.
[15]Promising technology is underdevelopment that may meet enhanced treatment requirements.

Septic Tank

The septic tank separates the settleable and floatable solids, contains an anaerobic environment where bacteria partially decompose the solids, and provides storage for the accumulated sludge and scum. The septic tank is sized so that wastewater flow through the tank takes at least 24 hours even with sludge and scum accumulation. This detention time permits the settling of solids heavier than water and allows scum, grease and other materials lighter than water to float to the surface before the water is discharged to the absorption field.

Septic tanks are designed to handle all the daily flow a household will normally produce and must have sufficient capacity for the minimum recommended volume of at least two times the daily wastewater flow. Larger capacity tanks usually mean less carryover of solids, resulting in prolonged life of the soil absorption field. Larger tanks require less frequent cleaning and allow for future expansion of the home or times when guests visit. They also have a good cost-benefit return. Table 7 gives minimum and recommended capacities for sizing septic tanks.

Less solids exiting the septic tank helps extend the life of the soil absorption field because less clogging of the soil pores will occur. Septic tank effluent filters are effective in reducing solids and providing an added measure of protection for the soil absorption field so their use is highly recommended.

TABLE 7—Minimum and Recommended Septic Tank Capacities Based on the Number of Household Bedrooms.[16]

Number of Bedrooms	Septic Tank Capacity (gallons)[17]	
150 gpd/bedroom	Minimum	Recommended
1-3	1,000[18]	1,350
4	1,200	1,800
5	1,500	2,250

Two compartment tanks or two tanks in series also may help. If a multiple compartment tank is used, the first compartment shall be sized to contain from one-half to two-thirds of the total tank capacity. The total tank capacity is important and should be sized to retain at least two-to-three times the total daily wastewater flow as shown in Table 7. Figure 1 shows a design concept for a two compartment septic tank.

Tanks shall never be closer than 50 feet from any water supply and greater distances are preferred if possible. However, a 100-foot separation is required if the water source serves a public water supply. The septic tank shall not be located closer than 10 feet from any building, in swampy areas, or in areas located within the 100 year flood plain. Table 5 gives minimum required and recommended separation distances for onsite wastewater systems.

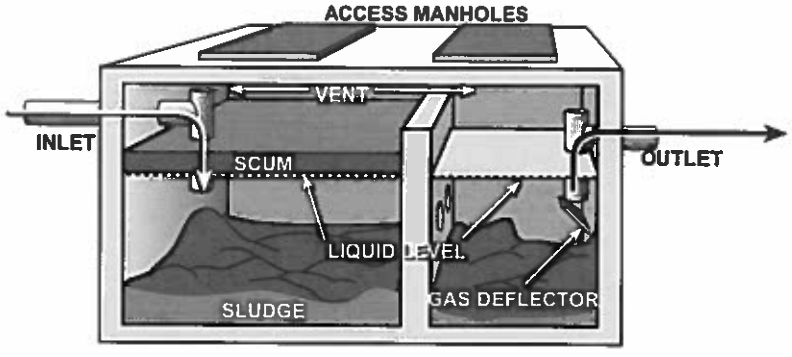
There shall be no permanent structure (patio, building, driveway, etc.) over the tank, lateral or other part of an onsite wastewater system. Consideration should also include easy access of trucks and equipment for pumping, maintenance, and repair. To avoid damage to the system, heavy equipment should not have to cross any portion of the wastewater system when servicing the septic tank.

A sketch of the wastewater disposal system as constructed, showing measurements should be made and delivered to the homeowner for future reference, and filed with the permit at the county health department. Figure 3 shows an example septic system reference sketch.

Septic tanks and soil absorption systems are an expensive and long-term investment. Material selection, design, and construction should be done with long life in mind. When located in suitable soil, well designed, properly constructed, and adequately maintained, they should last several decades.

All abandoned or unused septic tanks, cesspools, seepage pits or other holes that have received wastewater shall be emptied and plugged following procedures described in K-State Research and Extension bulletin MF-2246.

Figure 1—Compartmentalized Septic Tank



[16]For each additional bedroom, add 300 gallons to the minimum value and 450 gallons to the recommended value.
[17]Volume held by the tank below the liquid level (invert of the outlet pipe).
[18]Minimum tank size is 1,000 gallons.

Septic Tank Design/Construction Specifications[19]

General Requirements

Figure 2 shows the dimensions included in this section for a typical precast concrete septic tank. The following factors are required of all septic tanks regardless of the construction material:

A. The septic tank including all extensions to the surface shall be watertight to prevent leakage into or out of the tank. It shall be structurally sound and made of materials resistant to corrosion from soil and acids produced from septic tank gasses. Because of corrosion, steel tanks are not acceptable.

B. The tank liquid depth (distance from outlet invert to bottom of tank) shall be at least 3 feet but shall not exceed 6½ feet. The effective inside length of tanks shall not be less than 1.5 nor greater than four times the effective inside width.

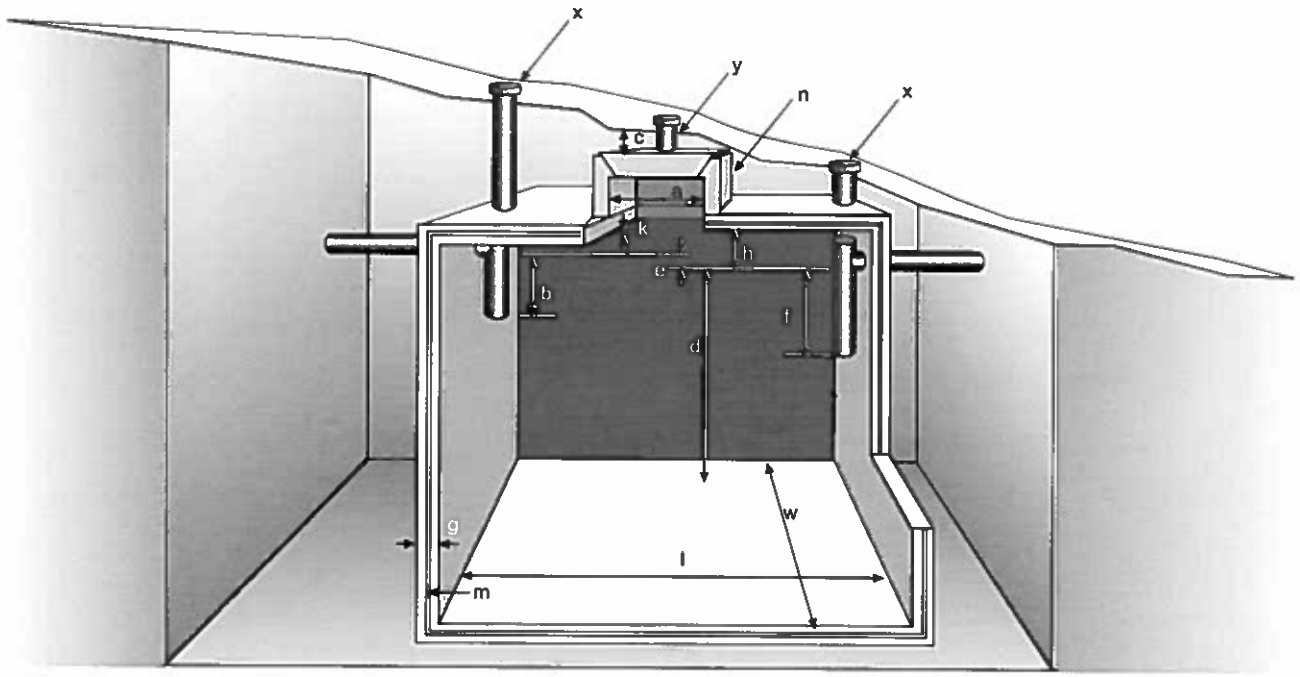
C. The minimum septic tank capacity is two times the daily wastewater flow using 150 gallons per bedroom or 1,000 gallons, whichever is larger. See Table 7 for minimum tank sizes. Tanks sized at three times daily flow are recommended and shall be required when garbage disposals are used.

D. The top of all tanks shall be designed and constructed to support a minimum uniform load of 400 pounds per square foot plus 2,500 pound axle load. When buried more than 2 feet deep, the tank, especially the top, shall support an additional 100 pounds per square foot for each foot of soil or portion thereof in excess of 2 feet.

E. If the tank is placed in an area subject to any vehicular traffic it shall be certified to meet H-20 highway loading by a Kansas licensed structural engineer.

F. Space above the liquid line is required for that portion of the scum that floats above the liquid. For vertical sidewall tanks, the distance between the top of the tank and the outlet invert should be at least 15 percent of the liquid depth with a minimum

Figure 2—Design Details for a Precast Concrete Septic Tank



Name	Measurement	Min.	Max.
a. access manhole	smallest dimension	20"	–
b. inlet baffle	penetration	8"	0.2 × d
c. cover[20]	surface to manhole	surface	12"
d. liquid depth	outlet to tank bottom	3'	6½'
e. difference	inlet to outlet inverts	3"	4"
f. outlet baffle	outlet to bottom	0.35 × d.	
g. thickness	wall	2½"	–

Name	Measurement	Min.	Max
h. open space	outlet invert to top	7"	0.15 × d
k. space	gap	1"	–
l. tank length	inside of walls	6'	4 × w
m. reinforcement	per engineering design		as needed
n. extension riser length[20]		to ≤ 1' from surface grade	
w. tankwidth	inside of walls	4'	
x. inspection riser	inside diameter	6"	
y. location riser	inside diameter	1½"	

[19]Where locally available products cannot presently meet these requirements, manufacturers will have until July 1, 2002 to comply.
[20]If tank is deeper than 12" add extension riser as shown so top of riser is no more than 12" from surface

of 7 inches. In horizontal, cylindrical tanks, an area equal to approximately 12½ percent of the total volume should be provided above the liquid level. This condition is met if the space above the liquid level (distance from outlet invert to top of tank) is 15 percent of the tank diameter .

G. Sewage lines carrying solids from the source to the tank should have sufficient slope to maintain velocities that keep solids moving. For household size lines, a slope of between 1 percent (⅛ inch per foot) and 2 percent (¼ inch per foot) is usually best. The last 15 feet of sewer line preceding the tank shall not slope more than 2 percent (¼ inch per foot).

H. The inlet and outlet baffle or tee and compartment baffle should extend above the liquid level to one inch below the top of the tank. This space at the top of the tank is essential to allow gas to escape from the tank through the house stack vent.

I. The invert of the inlet pipe shall be located at least 3 inches above the invert of the outlet when the tank is level. This space allows for temporary rise in liquid level during discharges to the tank, and prevents liquid from standing in the sewer line between the house and the septic tank, which may cause stoppage or backup.

J. The septic tank or pumping tank inlet shall be a sanitary tee, elbow or long sweep elbow with low head inlet or baffle to direct incoming sewage downward and prevent flow from disturbing the floating scum layer. It should extend at least 8 inches below the liquid level, but should not penetrate deeper than 20 percent of the liquid depth.

K. The outlet tee or baffle prevents scum from being carried out with effluent, but limits the depth of sludge that can be accommodated. The outlet device should generally extend below the liquid surface a distance equal to 35 percent of the liquid depth. For horizontal, cylindrical tanks, this distance should be reduced to 30 percent of liquid depth.

Example: Horizontal cylindrical tank 60 inches in diameter, liquid depth = 52 inches, outlet tee penetrates 52 × .30 = 15.6 inches below liquid level.

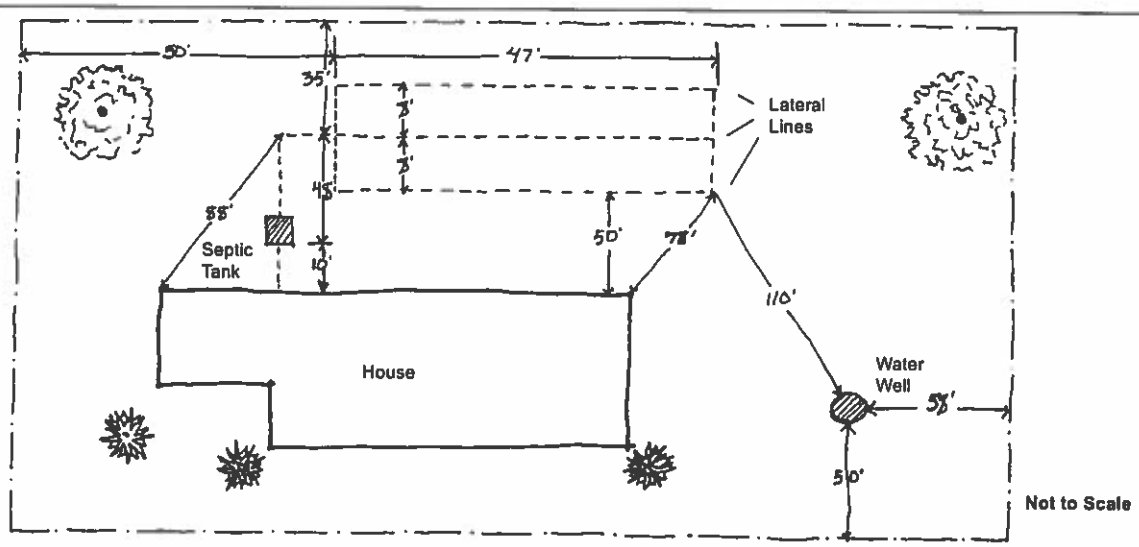
L. Inlet and outlet openings shall be designed and constructed to be water tight for at least a 20-year life of the system.

M. The dividing baffle in two compartment tanks shall extend from the bottom of the tank to at least 6 inches above the liquid line. The opening in the dividing baffle may be any shape and shall be at least 2 inches minimum dimension with a total area of at least 12 square inches. The baffle opening is to be centered 35 percent of liquid depth (30 percent for cylindrical tanks) below the liquid level.

N. Septic tanks shall have an access manhole with 20 inches minimum dimension for each compartment. If the manhole does not extend to surface grade, a small diameter (at least 1½ inch diameter) pipe shall extend to surface from the cover to mark the location of the manhole. This pipe shall not penetrate the lid of the tank. Inspection risers at least 6 inch diameter shall extend to surface grade centered over the inlet and outlet tees. All below grade attachments to the tank, connections, riser, extensions and lid shall be water tight. When any opening larger than 8 inches extends to the surface, that opening shall be child and tamper resistant. Ways to accomplish this include lids weighing at least 65 pounds, locks, or anchors that are not removable without special tools .

O. The sewer line from the house to the tank, all fittings and pipe in the tank, all extensions to the

Figure 3—Septic System Reference Sketch



surface from the top of the tank and the first 10 feet exiting the tank shall be schedule 40 pipe or heavier.

P. Septic tanks shall be designed for at least a 20-year life. They shall be designed and constructed to withstand extremes in loads resulting from adverse conditions without excessive deflection, deforming, creep, cracking or breaking. Change in shape shall be limited to 5 percent. Loads shall be based on 62.4 pounds per cubic foot for water and water saturated soil. Top loads for design shall be in uniform 400 pounds per square foot plus 2,500 pound axle point load. Design shall be based on a 2 foot placement depth to top of the tank. If the tank will be placed deeper than 2 feet or subject to vehicular traffic over the tank, a design by Kansas licensed structural engineer shall be done for the specific conditions.

Special Considerations for Concrete Tanks

The anaerobic environment of a septic tank produces gases that combine with moisture to produce acids. Concrete above the liquid level is subject to corrosion and deterioration from these acids. This corrosion is best resisted by high quality concrete mix. Concrete septic tanks shall meet the following requirements in addition to those above:

A. The concrete design mix shall be for a compressive strength of at least 4,000 pounds per square inch at 28 day cure. The water-cement ratio shall not exceed 0.45.

B. Baffles or other interior concrete units shall not be used for precast or poured in place concrete septic tanks unless they are cast or built into the tank wall at the time the tank is constructed.

C. Air entrainment additives shall be added to 5 percent volume. Other chemical admixtures are encouraged to reduce water content, improve cement placement in forms and wet handling of incompletely cured concrete.

D. Concrete tanks and lids shall receive proper care during the hydration (hardening) period by: 1) monitoring and controlling temperature of the concrete and gradients (i.e. maintain 50 to 90 degrees Fahrenheit for conventional cure and up to 140 degrees Fahrenheit under low pressure steam cure.) 2) monitoring and controlling humidity to prevent adverse moisture loss from fresh concrete (i.e. prevent or replenish loss of essential moisture during the early relatively rapid stage of hydration.)

E. Reinforcing steel shall be placed as designed by a Kansas licensed structural engineer to ensure floor, wall, and top do not crack from moisture, frost, soil load, water loads, axle loads, or other stresses. Loads as specified above shall be used for the design condition. Reinforcing steel shall be covered by a minimum of 1 inch of concrete and shall be placed within ± ¼ inch.

F. Pouring the floor and walls of the septic tank at the same time (monolithic pour) is the preferred construction procedure. Very large tanks are often cast in 2 pieces and assembled in the field. All tanks shall meet the same structural strength standard as specified earlier. Two piece tanks shall have permanently sealed structurally sound joints and shall be water tested after assembly. A Kansas Licensed structural engineer shall determine if the tank meets the strength specification.

G. In areas of high sulfate water (greater than 250 mg/L) more acid producing gases are likely and additional corrosion resistance is appropriate. Recommended measures include ASTM C150 Type II cement (moderate sulfate resisting), ASTM C150 Type V cement (highly sulfate resisting), or coating interior concrete surfaces above the water line. Coatings that provide additional protection of the concrete include asphalt, coal tar, or epoxy. The product used should be acid resistant and provide a moisture barrier coating for the concrete. The product must not bleed into the water and thus risk groundwater contamination.

H. Manufacturers are strongly urged to follow guidelines and meet standards of American Concrete Institute, National Precast Concrete Association, and American Society for Testing and Materials. Manufacturers should identify and advertise their products that meet applicable standards.

Special Considerations for Fiberglass, Fiberglass Reinforced Polyester, and Polyethylene Tanks

A. All tanks shall be sold and delivered by the manufacturer completely assembled.

B. Tanks shall be structurally sound and support external forces as specified above when empty and internal forces when full. Tanks shall not deform or creep resulting in deflection more than 5 percent in shape as a result of loads imposed.

C. Tanks and all below grade fittings and connections shall be water tight.

Septic Tank Placement Specifications

A. During the process of placing the septic tank, avoid causing compaction in the absorption field by not entering the absorption field area.

B. Where natural soil is not suitable tanks shall be placed on a bed of at least 4 inches of sand, pea gravel, or crushed granular noncorrosive material for proper leveling and bearing. Material shall be no larger than 2 inches in diameter and bed depth shall be at least four times the largest material diameter.

C. Access manholes should be at surface grade, but shall not be more than 12 inches below surface grade. Where top of the tank must be more than 12 inches below surface grade, a water tight extension collar shall be added as required to raise the cover. Inspection openings placed over inlet and outlet tees or baffles shall be at least 6 inches in diameter and extend to the surface to permit easy tank inspection, cleaning of effluent filter, checking condition of tee or baffle and sludge accumulation.

D. Septic tanks should not be placed into the water table (including perched or seasonal water table) because of the tendency of the tank to float, especially when empty, as when pumped for maintenance. In any area subject to high water table or seasonally high water table, plastic and fiberglass tanks shall not be used unless precautions are taken to drain groundwater.

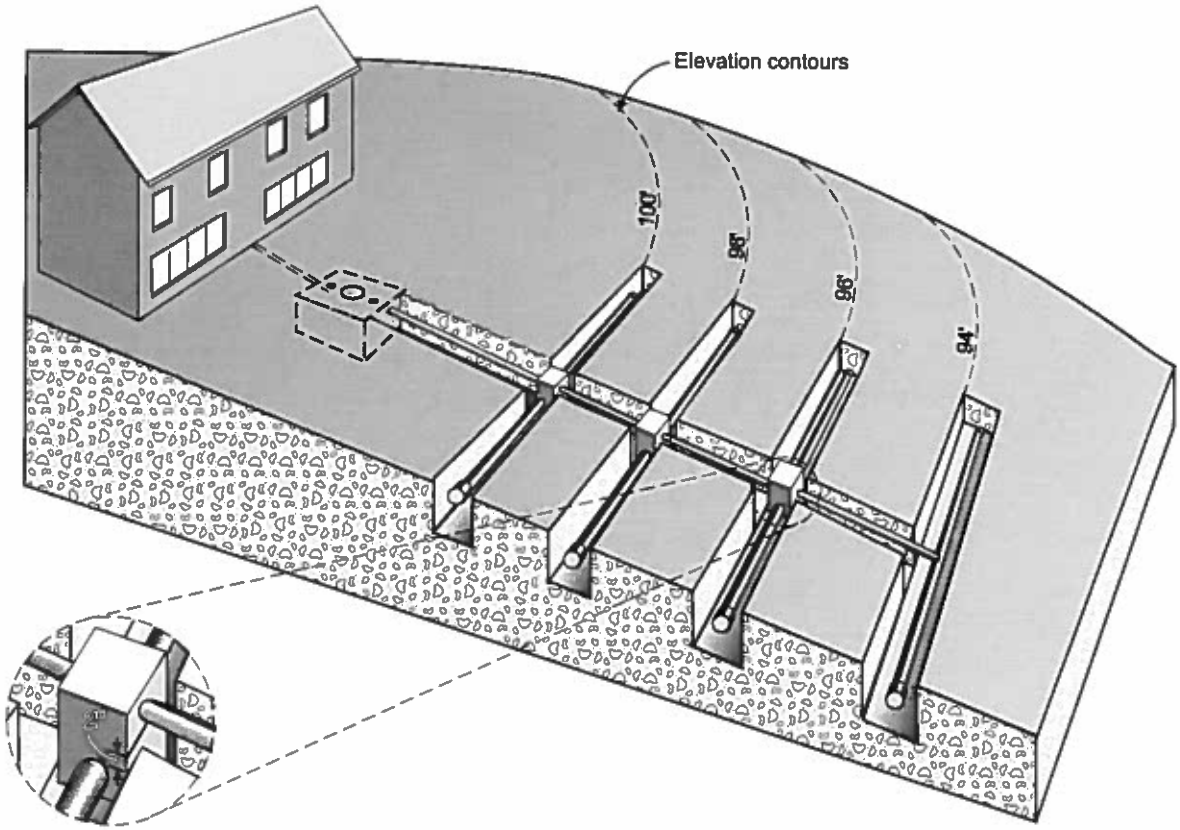
E. Septic tanks shall be water tight. An adequate test for water tightness is to fill the tank with water and let it stand for 8 hours to allow concrete to absorb water and plastic tanks to adjust. Then the tank is topped off and an initial measurement made with a hook gauge with vernier scale. After an hour, another measurement is made. Any loss is cause to reject the tank. Observations of the outside of the tank can also give clues about leakage losses. Any trickle, ooze, or exterior wet spot is reason to reject the tank. Precast one piece tanks are best tested at the plant before delivery. Two piece tanks that are assembled on-site must be tested following placement but before back filling.

F. The hole that the tank is placed into shall provide ample space around the tank for access to do compaction. Backfill shall be in uniform, compacted layers not exceeding 2 feet thick and surrounding the tank. Because of potential soil collapse, it is unsafe and may be illegal for a person to enter a trench deeper than 5 feet without adequate shoring. Compaction should be done from the surface without entering trenches deeper than 5 feet.

Absorption Field Size

Absorption field area is dependent on two factors: wastewater flow and soil loading rate. The wastewater design flow is based on the number of bedrooms allowing 150 gpd per bedroom (75 gpd per person) as discussed previously. The wastewater flow assumes the house is fully occupied with two persons per bedroom.

Figure 4. Typical Step Down or Serial Distribution System



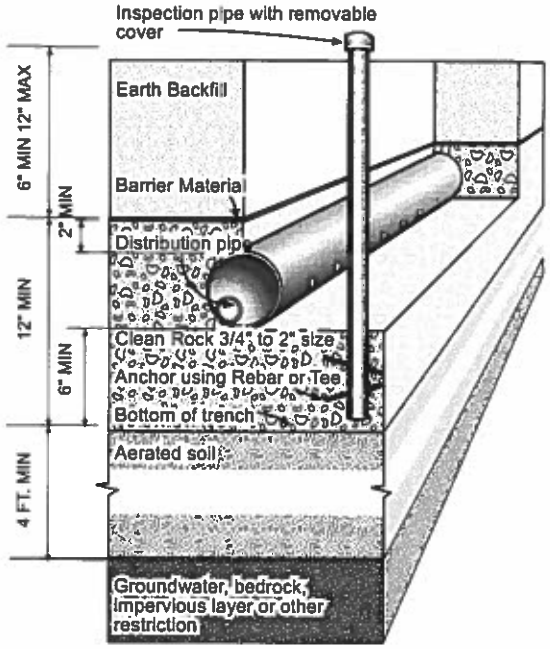
The site and soil evaluation previously discussed in that section is essential for good design. The loading rate is determined from the soil profile using Table 2 or from the perc rate using Table 4 or by using another method as specified in the local code. The soil absorption area is obtained by dividing the wastewater flow in gallons per day (gpd) by the loading rate (gpd per square foot (ft^2)).

The maximum gravity lateral run shall not exceed 100 feet and preferably should be less than 60 feet. If a lateral is supplied from the center, the total length shall not exceed 200 feet (100 feet to each side) and a maximum of 120 feet is preferred. Lateral systems on level sites with all laterals on the same elevation shall be connected at each end with a level manifold or connector pipes as shown in Figure 3 so there are no dead ends.

Table 8—Trench Separation Distances

Trench Width (inches)	Recommended Minimum Distance Between Trench Centerline (feet)
18-24	8.0
24-30	8.5
30-36	9.0

Figure 5—Standard Lateral Trench Design



Loading rate example

The following example illustrates how to choose and use the loading rate for design:

- four-bedroom home
- Harney soil. Light silty clay loam with medium subangular blocky structure at 17 to 40 inches
- greater than 6 feet to restrictions of rock or perched water table
- perc rate 40 minutes per inch
- trench width 3 feet
- undisturbed soil width between trenches is 6 feet

Wastewater flow

Size of house (number of bedrooms) × flow rate (gpd) per bedroom = total daily wastewater production

4 bedrooms × 150 gpd/bedroom = 600 gpd

Loading rate

From soil evaluation Table 2 = 0.4 gpd/ft^2 and from perc test using Table 4 = 0.5 gpd/ft^2

Use the smaller of these or 0.4 gpd/ft^2 for design.

Absorption Area

Wastewater flow ÷ loading rate = absorption area

$$\frac{600 \text{ gpd}}{0.4 \text{ gpd/ft}^2} = \frac{600 \text{ ft}^2}{0.4} = 1{,}500 \text{ ft}^2$$

Trench Length

Absorption area ÷ trench width = length of trench

$$\frac{1{,}500 \text{ ft}^2}{3 \text{ feet}} = 500 \text{ lineal feet of trench length}$$

Field Area

Only the bottom area of the trench is considered in determining absorption area. The absorption trench width should be 18 to 36 inches, preferably 24 inches. For 3 feet wide trenches as in this example, the total lateral length needed is 500 feet. If trenches are 2 feet wide, the total lateral trench length is 750 feet. Assuming that a 3 feet wide trench will be used and 100 feet is the length of each trench, 5 trenches, 100 feet long will be needed for 1,500 ft^2 total trench bottom. To calculate the total area necessary for the field, include the minimum 6 feet of undisturbed soil between trenches. For this example the total width is (5 × 3 ft) + (4 × 6 ft) = 15 ft + 24 ft = 39 feet The total field area is 39 × 100 or 3,900 ft^2. An area equal to this same size should be reserved for future expansion and/or replacement.

For sites that slope more than about 1 percent, a level lateral system installed without shaping the surface often requires more than a half foot difference in soil cover from one side of the area to the other. On slopes greater than 1½ percent there is enough slope to use a step down (or serial) distribution. This results in the top lateral

being filled before effluent builds up and flows to the next lateral down slope. Step down or serial distribution as shown in Figure 4 is recommended for all sites that slope 1½ percent or more and/or result in more than 6 inches difference in cover for a level lateral system.

Adjacent absorption field trenches should be separated by at least 6 feet of undisturbed soil. Table 8 shows the minimum spacing for trench widths ranging from 18 to 36 inches. Individual trenches should be constructed on contour with the surface grade and with a level trench bottom to keep the trench cover a uniform thickness.

A minimum of 6 inches of rock or gravel shall be placed in the trench under the distribution pipe, followed by enough gravel to cover the pipe by 2 inches. The soil cover over the trench should not be less than 6 inches to provide adequate water holding capacity for grass nor more than 12 inches to maximize water and nutrient use by vegetation. Generally, the total trench depth should be as shallow as possible, but not less than 18 inches. Perforated distribution pipe shall be used and, where pressure dosing is not required, 4-inch diameter pipe is adequate. See standard lateral trench design and dimensions shown in Figure 5. Where pressure dosing is required, the pipe size should be just large enough to avoid excessive pressure loss (no more than 10 percent) in the distribution lines.

Variations from the standard lateral design described above allow the designer additional flexibility in some restrictive soil situations and are discussed in the site and soil evaluation section and included in Table 6. Many soils in eastern Kansas have a friable, moderately permeable surface soil layer of up to 15 to 18 inches in thickness. Many subsoils have high clay contents and a very restricted permeability. Laterals placed into the tight, very slowly permeable subsoil frequently do not perform satisfactorily.

Shallow in-ground laterals dug 6 to 12 inches into the surface soil layer and covered with imported topsoil may be a viable option to achieve a workable soil absorption system for some soil conditions. Shallow in-ground systems may overcome marginal conditions such as groundwater or rock over 4½ feet but less than 6 feet required for conventional laterals.

The shallow, rock-filled trench shall be covered with a synthetic geotextile barrier material (at least 3 ounce nylon or 5 ounce polypropylene nonwoven filter fabric) before the lateral and interval between laterals is covered with top soil brought to the site.

In soils with still more restrictive or shallow soil conditions (4 to 4½ feet to restrictions) an at-grade lateral system may be an option. The at-grade lateral involves preparing the soil surface on a level contour in strips much as the first step in constructing a Wisconsin mound. The rock, normally placed in a trench, is placed on the surface. Pressure dosing distribution is used to ensure even water distribution and help prevent horizontal flow at the natural soil surface resulting from temporary ponding in the lateral. The rock lateral shall be covered with barrier material before the lateral and interval space is covered with top soil brought to the site.

Loading rates and other design criteria are basically the same for shallow in-ground and at-grade systems as for conventional lateral trenches. The at-grade lateral requires tilling the soil strip under the lateral on a level contour. A pressure dosing system shall be included as a part of the at-grade design. Distribution lateral line pressure should not exceed 5 feet of head. Orifices in the pipe shall be sized and spaced to evenly distribute flow throughout the lateral system. If the area is too large to pressurize the entire system, a multizone design and sequencing valve shall be used to dose zones in sequence.

The use of an effluent filter on the septic tank outlet is strongly encouraged to prevent solids from plugging the absorption field. This will prolong the life of the absorption field and improve performance of the system. It also helps reduce the strength of wastewater effluent.

Absorption Field Material Specifications

Rigid PVC or corrugated polyethylene plastic pipe meeting American Society for Testing and Materials (ASTM) standard ASTM D2729-93 and ASTM F405-93 or latest edition respectively meet minimum standards for use as solid or perforated gravity distribution lines. All materials used in the plumbing, wastewater line, and lateral fields shall meet standards specified by ASTM. In gravity lateral pipes, perforations are circular, ½ inch diameter and are placed at 4 and 8 o'clock positions on the pipe circumference. In no circumstance is slotted pipe acceptable as the narrow slot openings plug easily.

Washed gravel or crushed stone is commonly used as the porous media for the trench. The media gradation shall be ¾ inches to 2 inches in diameter, with the smaller sizes preferred to reduce masking of the infiltration surface. Uniform size is preferred because more void space is created. Rock having a hardness of three or more on the Moh's Scale of Hardness is required. Rock that can scratch a penny without crumbling or flaking generally meets this criterion. Larger diameter and smaller diameter material, or soft aggregate such as calcite limestone are not acceptable and shall not be used.

Fines should be eliminated as much as possible. Fines shall not exceed 5 percent by volume, so unwashed material is generally unacceptable. A simple test is to wash a volume of material into a clear container of the same diameter and measure fines (5 inches of gravel should produce no more than ¼" of fines).

When suitable rock or gravel is not locally available, is expensive, or access to the site is restricted, gravelless chambers are good choices for laterals. They have the advantage of more liquid storage capacity, reducing the effect of high flows or loadings on weekends or holidays. Chamber systems are lightweight making installation easier at sites with restricted heavy equipment access. Chambers also may be recovered for reuse in the future. Before using chambers, consult the local authority to identify requirements.

Chunks of recycled tires are a suitable substitute for rock. Ninety percent of the pieces should be ½ to 4 inches in size with no fines. Wire strands shall not extend more than ½ inch from the pieces.

The porous media shall be covered with a filter fabric (at least 3 ounce nylon or 5 ounce polypropylene) before backfilling to prevent soil from sifting through the media. Traditional untreated building paper or 3-inch layer of straw are inferior second choices or are not recommended. Filter fabric is required when tire pieces are used as the porous media. Materials relatively impervious to air and moisture are not permitted.

Field Construction Specifications

Protection of the absorption field area begins before any activity on the site. The site and soil evaluation identifies the best lateral field area and reserve area. Heavy equipment, such as loaded trucks, should be kept away from the absorption field by marking the site. The weight of such equipment can permanently alter soil characteristics due to compaction. Excessive equipment or foot traffic can compact even relatively dry soils.

Construction of septic tank-lateral field systems when the soil is too wet causes compaction and smearing of the soil structure, greatly reducing the water absorption and treatment efficiency of the system. A good test for this is to work the soil into a ball and roll between the hands. If it can be rolled out into a soil wire ¼ inch in diameter or smaller without falling apart, it is too wet and construction should not proceed.

Before beginning construction, contours should be determined and level lateral locations should be marked by flags or stakes on the contour. Trenches shall not be excavated deeper than the design depth or wider than the design width. Following excavation, the trench sides and bottom shall be raked to remove any smearing and graded to assure a bottom with no more than 1 inch difference in elevation along the entire lateral length or the complete field for a level system. The lateral pipe and rock cover shall not vary more than 1 inch in elevation along the lateral length using a surveyor level or laser.

The trench bottom should then be immediately covered with at least 6 inches of rock or the chamber. Distribution pipes are carefully placed on the rock, and leveled with perforations at 4 o'clock and 8 o'clock positions. Rock is placed around and over the pipe to a cover depth of at least 2 inches.

After rock and pipe have been placed in the trench the filter fabric or other barrier shall be placed to protect from soil movement into the rock. Finally, earth backfill shall be carefully placed to fill the trench cavity. The backfill shall be mounded above the trench about 20 percent of the soil fill height to allow for settling. If a variation in the trench depth is used, topsoil also must be placed between laterals as well as over the lateral to level the site.

Maintaining Onsite Wastewater Systems

The homeowner's responsibility for onsite wastewater treatment and disposal does not end when the backfill is placed over the trench lines and wastewater introduced. Maintenance of the system is a critical factor to ensure long life and continued effectiveness of the system. Minimum annual maintenance criteria include:

- check the sludge and scum in the tank to determine pumping requirements; tanks need to be pumped regularly depending on wastewater flow and tank size, (often 3 to 5 years),
- check the baffles or tees to ensure they are intact, secure, and in good condition,
- check the septic tank and soil absorption area monthly for indications of leaks or failure,
- check observation ports in each lateral to ensure effluent is reaching all parts of the system,
- check effluent filter and clean as needed.

Refer to K-State Research and Extension bulletins listed at the end of this document for additional information. A file containing records of repairs, pumping, site plan of the system, annual checklist, and other pertinent information should be maintained for easy reference and for information when ownership changes.

Wastewater Stabilization Ponds

Wastewater ponds, sometimes called lagoons, are a viable sewage treatment method and should be considered for individual household wastewater where soil conditions have severe limitations for conventional lateral absorption field systems. Single family wastewater ponds should not be considered if septic tank-lateral field systems are feasible as determined by local requirements or recommendations contained in this bulletin. Wastewater ponds are especially applicable on sites with very restrictive permeability, high clay subsoil, (i.e. slow perc rates) or shallow bedrock where adequate area is available.

A wastewater pond is a small pond with a maximum 5-foot operational water depth, which receives domestic wastewater. Size, as in a soil absorption field, is deter-

mined by the number of occupants and thus the wastewater flow, the soil, and evaporation.

Wastewater enters the pond by a pipe outlet near the bottom close to the center of the lagoon. All private wastewater ponds must be nondischarging and must be fenced. Wastewater ponds require a sizable area, including water surface, embankment, and separation distances. Maintenance is required to remove vegetation at the water's edge, to mow vegetation on embankments, and to remove trees that will shade the pond. Odors from a properly designed, installed, and maintained pond are infrequent and minimal.

Individuals considering wastewater ponds for sewage treatment should first check with county or other local authorities to determine requirements. Proceed with any private sewerage facility only when public sewers are not available and all applicable local requirements are met. Refer to K-State Research and Extension bulletins on wastewater ponds for more information and guidance.

Alternative Systems Guidelines

Kansas Administrative Regulations (K.A.R. 28-5-9) authorize county health departments, or other authorized local agency, in counties that have local codes, to grant a variance for alternative onsite wastewater treatment and disposal systems. Most county codes contain a variance clause that authorizes the local administrative agency to grant requests for variances provided that certain conditions are met. The request for variance is filed with the county administrative agency. The local agency can consult with KDHE for technical assistance in evaluating the system, but has the authority to issue the variance locally if there is a local code.

No private onsite wastewater system shall have a surface discharge.

When there is no local code KDHE is authorized by regulation to grant a variance. Onsite wastewater treatment options that might be considered for variance include enhanced wastewater treatment options such as aerated tank, sand or media filter, rock-plant filter, or other equivalent system. Design, construction, operation, and maintenance criteria or guidelines are planned but are not yet available for use in Kansas.

Some county codes require that design and specifications for alternative systems be completed by a licensed professional engineer. Engineers should be adequately trained or have experience under adequate supervision, before designing alternative systems. Results show that design by an inexperienced engineer can not produce a more reliable or long life alternative than conventional systems. Some alternative systems involve complex design and specific construction criteria that can result in dramatic failure when violated.

Appendix A

Conducting a Perc Test

Water movement through soil in response to gravity is called percolation. For wastewater soil absorption field evaluation, the absorption of water from a post-type hole is a method for the evaluation for soil suitability and loading rate design. The absorption of water from this hole involves water movement in 3 dimensions and forces other than gravity. The term "perc" test is applied to this evaluation. The purposes of this test include:

- Obtaining the rate at which wet, unsaturated soil will absorb water,
- Helping assess suitability of soil on a specific site to absorb septic tank effluent,
- Helping select from among alternative onsite sewage systems and establish a design loading rate.

To ensure the best evaluation, all available soil information should be utilized. This would include assessment of restrictive conditions such as high water table, perched water table, shallow depth of soil, and restrictive layers such as clay pan; soil profile evaluation from the site, including history of high water tables; and description of soil profiles from county soil surveys.

Brief Description

A minimum of four to six holes are placed throughout the proposed site of the absorption field and at the depth of the proposed laterals and soaked with water until the clay is swelled, usually for at least 24 hours. The perc rate is measured in each hole and reported as the number of minutes it takes for an inch of water to be absorbed in the hole. The optimum time to conduct a perc test is in the spring when the soil is normally wet. An accurate perc test during a dry period when the soil is cracked may not be possible.

Materials Needed to Conduct the Perc Test

1. Site plan including proposed absorption field and location of tests. Dimensions help ensure the test holes are properly located in and around the field.
2. One batter board—1 inch by 2 inch board of 18 inches long for each perc test hole.
   A. Number each board so that each test hole will be distinguishable.
   B. Mark a center line on the side of each batter board. This will provide a consistent reference point for the measuring device.
3. Durable measuring device (1 to 2 feet long) and a way to reproducibly locate the water surface, such as a pointed hook or float on a stiff wire or rod.
4. An adequate supply of water to soak the hole and conduct the test. Water usually has to be transported to the site. Two hundred to 300 gallons is usually adequate.

Procedure

1. **Identify Proposed Site of Absorption Field**—The site preferably should be located downslope from the septic tank. If effluent will not flow by gravity, an effluent pump may be used to move effluent to a suitable absorption field. For new homesites, the proposed area reserved for future use should also be checked for suitability.
2. **Number and Location of Tests**–Locate a minimum of four to six holes uniformly over the proposed absorption field site. If the site is sloping, it is especially important to have test holes at all elevations to be used so that any differences in soil will be evaluated.
3. **Type of Test Hole**–Dig or bore each hole to the depth of the proposed trench (usually 18 to 24 inches) and with a consistent diameter (8 inches is recommended). All test holes shall be the same size to help ensure consistency in results.
4. **Prepare the Test Hole**–Scratch the sides and bottom of the hole to eliminate any smeared or compacted soil surfaces and remove loose material from the hole. Place 2 inches of washed gravel in the bottom of the hole. The gravel can be contained in a mesh bag for easy removal and reuse at other sites. This gravel protects the bottom of the hole from erosion, scouring, and sediment as water is introduced.
5. **Wet Hole to Allow for Soil Swelling**–Saturation means that the voids between the soil particles are filled with water. This happens fairly quickly for soil immediately surrounding the portion submerged in water. Swelling is caused by intrusion of water into the clay particles and can take many hours and possibly days when the soil is quite dry.
   A. Carefully add 12 to 14 inches of water. Using a hose will prevent soil washing down from the sides of the hole.
   B. Maintain the water level for at least 24 hours to allow for swelling to occur. In most cases it will be necessary to add water periodically from a reservoir. A float supplied by a hose from a reservoir simplifies the procedure.
   C. If the soil appears to be sandy or initially very dry, plan to check the condition of the hole wetting after 12 hours or overnight. If there is no water left in the hole and the reservoir is dry, refill the reservoir and holes. After the full 24 hours have passed since soaking was initiated, begin measuring as described in #6.
6. **Perc Measurement**
   A. Remove the apparatus used to add water to the hole.
   B. Place the batter board across the top of each hole and secure with weights, spikes or attach to stakes. Be sure that the centerline mark is centered over the hole and each board is numbered.
   C. Align the measuring rule with mark on the board and use the hook gauge or the float and rod to read the level when it just touches the water surface. Record the measurement and time. Fill the hole to about 6 inches over the rock and make the initial measurement.
   D. Measure at 30-minute intervals (does not have to be exact) recording both level and time. If the water level in the hole drops too rapidly, it will be necessary to reduce the time interval for measurement. The time interval should be short enough that the water level should not drop more than 25 percent of the wetted hole depth.

   Note: If the water drops more than 1 to 2 inches in 30 minutes, it will be necessary to add water to the hole after each reading until it is the same depth as recorded initially. Be sure to record the measurement of the refilled perc hole.
7. **Calculate Perc Rate**. Divide time interval by drop in water level to find the perc rate in minutes per inch (mpi).

Examples:

If the drop is ⅝ inches in 25 minutes:

$$\frac{25}{\frac{5}{8}} = 25 \times \frac{8}{5} = 40 \text{ mpi}$$

If the drop is 1½ inches in 12 minutes:

$$\frac{12}{1\frac{1}{2}} = \frac{12}{\frac{3}{2}} = \frac{12 \times 2}{3} = 8 \text{ mpi}$$

   A. Continue measurements until each of three consecutive calculated rates varies by no more than 10 percent from the average of the three rates. Use the average of three rates as the value for that hole

   Example:

   Rates of 26.0, 28.0, and 30.5 mpi average 28.2 mpi

   B. Measure and calculate the rate for each hole in the application field. Average the rates for all holes as the value to use for loading rate and bottom area sizing.
8. **Compare with Permeability in the NRCS Soil Survey**. The field measured perc (mpi) should be no smaller than about one third the inverse of the permeability rate shown in the table of physical and chemical properties of soils in the soil survey report. If it is, suspect a problem with the perc test, soil mapping or other cause. A well aggregated, undisturbed soil may have a good perc rate.

Appendix B

Sources of Additional Information

Kansas State University, Agricultural Experiment Station and Cooperative Extension Service Bulletins[21] (except as noted)

Wastewater Systems and Related Information

Design of Submerged Flow Wetlands, Special Report 457, Missouri Small Flows Education and Research Center, Agricultural Experiment Station, University of Missouri, Columbia, MO 65211

Environmental Health Handbook, First Edition, Aug 1992, Kansas Association of Sanitarians, KDHE, and K-State Research and Extension cooperating, available from K-State, Extension Biological and Agricultural Engineering, Cost: $20.00[22]

Get to Know Your Septic System, MF-2179

How to Run a Percolation Test, FO-0583-C, (Revised 1993), Minnesota Extension Service, University of Minnesota, St. Paul, MN 55108

Onsite Domestic Sewage Disposal Handbook, MWPS-24, Midwest Plan Service, Iowa State University, available from K-State, Extension Biological and Agricultural Engineering, Cost: $6.00[22]

Plugging Cisterns, Cesspools, Septic Tanks, and Other Holes, MF-2246

Rock-Plant Filter Design and Installation, expected 1997

Rock-Plant Filter Operation, Maintenance and Repair, expected 1997

Septic Tank Maintenance, MF-947

Septic Tank–Soil Absorption System, MF-944

Soil Evaluation for Home Septic Systems, MF-945

Wastewater Pond Design and Construction, MF-1044

Wastewater Pond Operation, Maintenance, and Repair, MF-2290

Why Do Septic Systems Fail? MF-946

Your Wastewater System Owner/Operator Manual, S-90 For sale bulletin, cost 35¢

Other Helpful Bulletins

Kinds and Types of Levels, LR-17[22]

Land Judging and Homesite Evaluation, S-34

Operating, Checking and Caring for Levels, LR-101[22]

Safe Domestic Wells, MF-970

Soil Water Measurements: An Aid to Irrigation Water Management, L-795

Using a Level, AF-19[22]

Standards Related to Onsite Wastewater System Materials and Procedures

ACI[23]212.3R Chemical Admixtures for Concrete

ACI 350R Environmental Engineering Concrete Structures

ASTM[24]C150-95 Standard Specification for Portland Cement. Vol. 04.01

ASTM C267-82 Standard Test Method for Chemical Resistance of Mortars, Grouts, and Monolithic Surfacings. Vol 04.05

ASTM C452-95 Standard Test Method for Potential Expansion of Portland Cement–Cement Mortars Exposed to Sulfate. Vol. 04.01

ASTM C890-91 Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures. Vol. 04.05

ASTM C1227-94 Standard Specification for Precast Concrete Septic Tanks. Vol. 04.05

ASTM D1600-94 Standard Terminology for Abbreviated Terms Relating to Plastics. Vol. 08.04

ASTM D2321-89 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications. Vol. 08.04

ASTM D2729-93 Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings. Vol. 08.04

ASTM F481-94 Standard Practice for Installation of Thermoplastic Pipe and Corrugated Tubing in Septic Tank Leach Fields. Vol. 08.04

ASTM F405-93 Standard Specification for Corrugated Polyethylene (PE) Tubing and Fittings. Vol. 08.04

ASTM F412-94a Standard Terminology Relating to Plastic Piping Systems. Vol. 08.04

ASTM F449-93 Standard Practice for Subsurface Installation of Corrugated Thermoplastic Tubing for Agricultural Drainage or Water Table Control. Vol. 08.04

ASTM D3385-94 Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer. Vol. 04.08

ASTM F789-89 Standard Specification for Type PS-46 Poly(Vinyl Chloride) (PVC) Plastic Gravity Flow Sewer Pipe and fittings. Vol. 08.04

ASTM F810-93 Standard Specification for Smoothwall Polyethylene (PE) Pipe for Use in Drainage and Waste Disposal Absorption Fields. Vol. 08.04

ASTM ASTM F949-93a Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings. Vol. 08.04

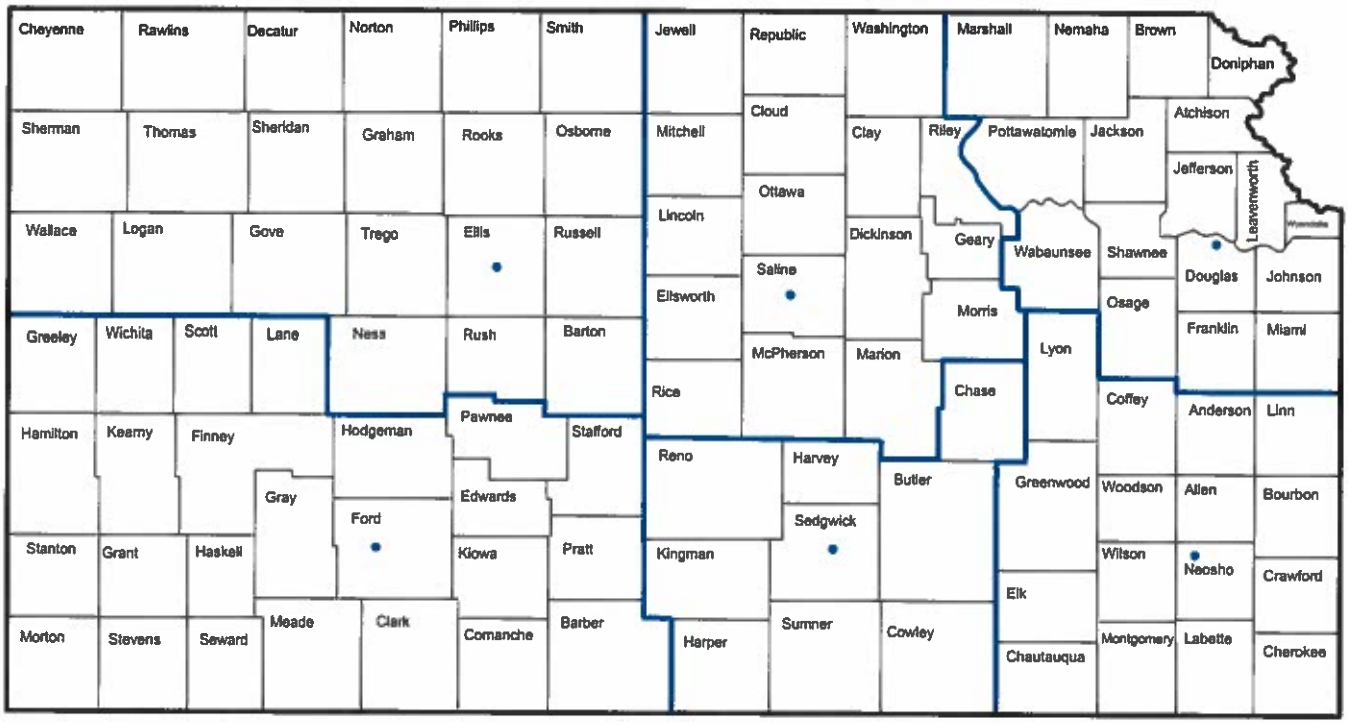
NPCA[25] Durable, Watertight Precast Concrete, TECH notes, April 1996

NPCA Septic Tank Manufacturing: A Best Practices Manual. Anticipated by Summer 1998

NPCA Underground Watertight Systems (video)

[21] *Production Services/Distribution, Kansas State University, 28 Umberger Hall, Manhattan, KS 66506-3402, Phone: (785) 532-1150*
[22] *Available through Extension Biological and Agricultural Engineering, Kansas State University, 237 Seaton Hall, Manhattan, KS 66506-2917, Phone: (785) 532-5813*
[23] *American Concrete Institute, P.O. Box 9094 Farmington Hills, Michigan 48333, Phone: (810) 848-3808*
[24] *American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 Phone (610) 832-9500*
[25] *National Precast Concrete Association, 10333 North Meridian Street, Suite 272, Indianapolis, Indiana 46290 Phone (317) 571-9500*

KDHE District Boundries and District Offices



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Kansas Dept Health & Environment
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RILEY COUNTY ENVIRONMENTAL HEALTH ADMINISTRATIVE STANDARDS FOR ALTERNATIVE SYSTEM INSPECTION AND MAINTENANCE

Introduction and Purpose

These Administrative Standards for Alternative System Inspection and Maintenance (Administrative Standards) are supplemental to the Riley County Sanitary Code (Code). They provide the standards necessary to comply with the provisions of the Code relating to alternative system inspection and maintenance. These Adminstrative Standards are organized by those types of alternative systems currently approved for use in Riley County.

Authorization and Amendments

These Administrative Standards have been approved by the Board of County Commissioners (Board). Any amendments to these Administrative Standards shall be submitted by staff to the Board for consideration and approval.

Approved Alternative Private Wastewater Disposal Systems in Riley County

The following types of alternative private wastewater disposal systems are currently approved for use in Riley County. Additional types of alternative private wastewater disposal systems may be approved by the Board of County Commissioners using the standards listed below. Once approved, that type of alternative system will be included in these administrative standards.

Standards for Alternative Private Wastewater Disposal Systems:

1. The system must contain the National Science Foundation (NSF) and/or the Underwriter's Laboratory (UL) certification for a residential wastewater treatment system and must meet minimum design standards acceptable for use in the State of Kansas as authorized by the Kansas Department of Health and Environment, Kansas Administrative Requlations (28-5-2 through 28-5-9); Bulletin 4-2, March 1997; Enviromental Health Handbook, Second Edition, 2002; Residential Onsite Wastewater Treatment Systems, 2008, Second Edition, Consortium of Institutes for Decentralized Wastewater Treatment; Riley County Sanitary Code, Chapter I, Article 4, Section 1-4.3, Chapter II, Article 2,

Section 2-2.1, Chapter II, Article 5, Section 2-5.1 through Section 2-5.7, Chapter II, Article 6, Section 2-6.2, Section 2-6.3; and

2. Recommendations for approval or denial of the NSF and/or UL approved system from the Riley County Environmental Specialist will be presented to the Board of County Commissioners based on the following:

    a. The alternative system must have adequate access for inspection, routine maintenance and repair work *(Residential Onsite Wastewater Treatment Systems, 2008, Second Edition, page 111-112, Consortium of Institutes for Decentralized Wastewater Treatment).*
    b. Tank access risers must be at grade *(Residential Onsite Wastewater Treatment Systems, 2008, Second Edition, page 111-112, Consortium of Institutes for Decentralized Wastewater Treatment).*
    c. Tank riser lids must be securely fastened with safety screws and not be so heavy as to make them inaccessible *(Residential Onsite Wastewater Treatment Systems, 2008, Second Edition, page 111-112, Consortium of Institutes for Decentralized Wastewater Treatment).*
    d. Any documented failures of that type of proposed alternative system will be introduced to the Board of County Commissioners for review and determination of that type of alternative system's reliability and durability.

Bio Microbics "FAST" and the Pentair "DELTA" Environmental Alternative Private Wastewater Disposal Systems

Inspection and maintentance of aerated systems are outlined in those systems' service manuals. A copy of the "Fast" system manual is attached as Appendix I. A copy of the "Delta" system manual is attached as Appendix II. Based on those respective service manuals, and other approved references within the Riley County Sanitary Code, the following is a step-by-step procedure for inspection and maintenance of both systems:

STEP 1: Make quick overview of system looking for system damaged due to excessive weight loading on the system. Listen for excessive noise from the system. A constant humming noise much like a household refigerator should be heard. *(Appendix I, Bio Microbics "FAST" Service Manual, page 5 and 6); (Appendix II, " Delta" Environmental, Installation, Operation, and Maintenance Manual, page 26.)*

STEP 2: Check for proper function of the blower and clean the inlet air filter element. Measure and record the dissolved oxygen level in the aeration chamber. *(Appendix I, Bio Microbics "FAST" Service Manual, page 5 and 6); (Appendix II, "Delta" Environmental, Installation, Operation, and Maintenance Manual, page 5,13 and 16); (Residential Onsite Wastewater Treatment Systems, 2008, Second Edition, page 112, Consortium of Institutes for Decentralized Wastewater Treatment)*

STEP 3: Verifiy the alarm panel by turning the blower off. The audible alarm will sound approximately 10 seconds later. To silence the alarm, press the "silence" button. *(Appendix I,*

Bio Microbics "FAST" Service Manual, Page 5 and 6); (Appendix II, "Delta" Environmental, Installation, Operation, and Maintenance Manual, page 5,13 and 16.)

STEP 4: Clean the vent(s) and blower housing intakes of any obstructions. A musty, earthy-type odor is normal from the aeration unit; however, a rotten egg smell indicates a system failure. *(Appendix I, Bio Microbics "FAST" Service Manual, page 5 and 6); (Appendix II, " Delta" Environmental, Installation, Operation, and Maintenance Manual, page 13 and 16.)*

STEP 5: Check the effluent discharge from the aeration tank. It should be clear and odorless. (*Appendix I; Bio Microbics "FAST" Service Manual, page 5 and 6); (Appendix II, "Delta" Environmental, Installation, Operation, and Maintenance Manual, page 13.)*

STEP 6: Remove a test sample from the aeration basin and check for pH and conduct a 30 minute settleability test. Note: pH outside the 6.0 to 9.0 reading will not allow the activated biomass to form correctly. Settleability readings less than the 200 ml level indicate an operational problem which can be corrected by a measured wasting of the activated sludge mixed liquor. Levels above 600 ml can indicate a young activated sludge mixed liquor or growth of a filamentous organism. *(Standard Methods for Examination of Water and Wastewater, 22nd edition, page 2-89 through 2-91, American Public Health Association, American Water Works Association, and Water Environment Federation); (Residential Onsite Wastewater Treatment Systems, 2008, Second Edition, page 112, Consortium of Institutes for Decentralized Wastewater Treatment); (NSF International Standard / American National Standard, NSF / ANSI 40-2012, Residential Wastewater Treatment Systems, prepared by the NSF Joint Committee on Wastewater Technology, page 13, 8.5.2.1.3 pH);* (*Appendix I; Bio Microbics "FAST" Service Manual, page 9); (Appendix II, "Delta Environmental, Installation, Operation and Maintenance Manual, page 6 and 7)*

STEP 7: Pump solids from the tank when it reaches 18" deep in the primary settling tank and 4" in the aeration tank or a settleability of 600 ml or 60%. (*Appendix I, Bio Microbics "FAST" Service Manual, page 5 and 6); (Appendix II; "Delta" Environmental, Installation, Operation, and Maintenance Manual, page 6, 13,and 14)*; (*Residential Onsite Wastewater Treatment Systems, 2008, Second Edition, page 112, Consortium of Institutes for Decentralized Wastewater Treatment)* **NOTE*: This is not a septic tank and does not require pumping on a (5) year schedule.***

STEP 8: If the alternative system utilizes drip irrigation, obtain and record lateral field operational pressures. An increase in pressure from the previous reading indicates the emitters are not delivering the flow efficiently to the bed. Make sure the air release valves are operating correctly. Look for short circuit leaks in the lateral field. Flush laterals and install a new pump filter. (*Appendix I, Bio Microbics "FAST" Service Manual, page 7); (Residential Onsite Wastewater Treatment Systems, 2008, Second Edition, page 167-172, Consortium of Institutes for Decentralized Wastewater Treatment)*

STEP 9: Record and report above findings on the "Riley County Alternative Private Wastewater Disposal System Inspection Report" attached as Appendix III.

ORENCO Sand/Shale Alternative Private Wastewater Disposal System

Inspection and maintentance of ORENCO systems are outlined in the ORENCO systems service manual, a copy of which is attached as Appendix IV. Based on that service manual, and other approved references in the Riley County Sanitary Code, the following is a step-by-step procedure for inspection and maintenance:

STEP 1: Make quick overview of system looking for system damaged due to excessive weight loading on the system. *(Minimum Standards for Design and Construction of Onsite Wastewater Systems, Bulletin 4-2, March 1997, page 13, State of Kansas Department of Health and Environment in Cooperation with K-State Research and Extension)*

STEP 2: Pump the septic tank at a minimum once every five (5) years. **NOTE:** ***This system contains a septic tank and requires pumping on a five (5) year schedule.*** *(Riley County Sanitary Code, Chapter II, Article 5, Section 2-5.6.1; EPA Onsite Wastewater Treatment Systems Manual, United States Environmental Protection Agency, 2002, page 4-45; EPA Design Manual, Onsite Wastewater Treatment and Disposal Systems, United States Environmental Protection Agency, 1980, Chapter 6, Section 6.2.7, page 110; Minimum Standards for Design and Construction of Onsite Wastewater Systems, Bulletin 4-2, March 1997, State of Kansas Department of Health and Environment, Bureau of Water – Nonpoint Source Section, in cooperation with K-State Research and Extension, page 13; A Minnesota Regulator's Guide to the Venhuizen Standard Denitrifying Sand Filter Wastewater Reclamation System, Copyright 1997 by David Venhuizen, P.E., page 20; Septic Tank Maintenance, Karen M. Mancl and Brian Slater, The Ohio State University Extension – College of Food, Agricultural, and Environmental Sciences, Publication #AEX-740, Last Updated: 2016, page 2 and 3.)*

STEP 3: Inspect the tank pump system and verify no obvious holes or leaks are in the system. All float cords should be neatly wrapped in the riser so as not to interfere with the operation of the floats. *(Appendix IV, Orenco Operation and Maintenance Manual, page 13 and 17)*

STEP 4: Verify operation of the high water alarm by lifting the top float up. Check that the maximum normal height within the tank has not been exceeded by looking for a high water mark indicator. *(Appendix IV, Orenco Operation and Maintenance Manual, page 13, 16 and 17)*

STEP 5: With the liquid level above the middle "timer off" float, turn the pump on by flipping the "manual or automatic" switch in the control panel to "manual". Watch the liquid level inside the screened vault as the pump is runnng for about 30 seconds. Return the switch to "automatic". Observe the level inside the screened vault. If it drops very quickly and activates the low level alarm, the pump's trash screen (Biotube® cartridge) may need to be cleaned. *(Appendix IV, Orenco Operation and Maintenance Manual, page 13)*

STEP 6: Record the values from the time meter and/or cycle counter, located in the control panel, on the "Riley County Sand/Shale Filter Alternative Private Wastewater Disposal System Inspection Report" for later troubleshooting reference. *(Appendix IV, Orenco Operation and Maintenance Manual, page 13)*

STEP 7: Determine the programmable timer setting is correct and has not changed from the last inspection. If the settings have changed, correct as necessary to obtain optimal setting for

wastewater loading on the filter. *(Appendix IV, Orenco Operation and Maintenance Manual, page 13)*

STEP 8: Next, flush the manifold lateral lines of accumulated solids. Failure to perform lateral flushing will eventually lead to clogging of the sand filter media. At the end of each lateral remove the lid on the flushing valve enclosure. Thread the flushing elbow onto the valve and open the valve. In the control panel, set the (manual/off /auto) switch to "manual" and flush the line until clear. Shut the valve and move the elbow to the next line. Repeat this process until the effluent is clear on all lateral lines. When complete, turn the control panel switch back to "auto". *(Appendix IV, Orenco Operation and Maintenance Manual, page 14)*

STEP 9: Check residual pressure to determine if the orifices are clear of solids. A ten (10) foot long, ¾ inch diameter, clear PVC pipe with a male adapter glued to one end is necessary to perform these steps accurately. (Note: If this test is being done by only one person, turn the pump on before screwing the pipe into the flushing valve.) Open the flushing valve. Have someone turn the pump on. Set the control panel switch to "manual" and screw the clear PVC pipe onto the elbow at the end of the lateral line in a vertical position. Maintain the clear pipe in a vertical position. Letting the pipe fall unsupported to the ground may damage the flushing assembly. Have someone turn the pump on. Open the valve and, using a tape measure, measure the distance from the bottom of the flushing elbow to the top of the liquid surface in the clear PVC pipe. This is referred to as the "squirt height" or system residual head and shall be recorded on the system inspection report form. Continue the process for all lateral lines and then return the control panel switch to the "auto" position. (Note: If this test is being done by one person, first shut off the flushing valve, then slowly unscrew the clear pipe and allow the effluent in the clear pipe to flow into the flushing valve box before turning off the pump.) Turn off the pump. Close the flushing valve. Compare the measured "squirt height" with the value documented during the system's initial installation. That initial value should be written on the front page of the owner's system manual. It might also be found in the control panel or on the underside of the fiberglass lid covering the septic tank pump system. The "squirt height" measured at the time of inspection should be at least equal to the initial value from the start-up of the system, but no more than 20% higher. *(Appendix IV, Orenco Operation and Maintenance Manual, page 15)*

STEP 10: If the "squirt height" is within acceptable limits, be sure all flushing valves are turned off , remove the clear PVC pipe, close all flushing valve box lids and proceed to STEP 12. Excessive "squirt height" indicates that too many of the orifices in the distribution manifold are plugged and require clearing. Proceed to STEP 11.

STEP 11: **NOTE:** ***This step will not be performed by the Environmental Health Specialist. This step involves maintenance of these systems and is recommended to be performed by a business that specializes in installation and maintenance of these systems*** *(Appendix IV, Orenco Operation and Maintenance Manual, page 13).* Clearing of the orifices can be accomplished by one of the following methods: 1. Turn the control panel switch to "off" and push a stiff bottle brush connected to a cleaning snake down each lateral line through the flushing valve assembly. 2. Using a high pressure washer, feed a small diameter "bullet nozzle" through each lateral. The high pressure water coming out of the nozzle will help pull it through the lateral. Upon completion of the lateral line flushing, in the presence of the Environmental Health Specialist retest the lateral lines as in Step 9 above once more to ensure the cleaning was successful. *(Appendix IV, Orenco Operation and Maintenance Manual, page 15)*

STEP 12: Record and report above findings on the "Riley County Sand/Shale Filter Alternative Private Wastewater Disposal System Inspection Report" attached as Appendix V and double-check to ensure the control switch in the control panel has been returned to the "auto" position.

Eljen Geotexile Sand Filter (GSF)
Alternative Private Wastewater Disposal System

Inspection and maintentance of the GSF system is outlined in the system's Kansas Design & Installation Manual. A copy of the GSF system manual is attached as Appendix VI. Based on the GSF manual, and other approved references within the Riley County Sanitary Code, the following is a step-by-step procedure for inspection and maintenance of the GSF system:

STEP 1: Make quick overview of system looking for system damaged due to excessive weight loading on the system and/or surfacing of wastewater. *(Minimum Standards for Design and Construction of Onsite Wastewater Systems, Bulletin 4-2, March 1997, page 13, State of Kansas Department of Health and Environment in Cooperation with K-State Research and Extension)*

STEP 2: Pump the septic tank at a minimum once every five (5) years. **NOTE:** ***This system contains a septic tank and requires pumping on a five (5) year schedule.*** *(Riley County Sanitary Code, Chapter II, Article 5, Section 2-5.6.1; EPA Onsite Wastewater Treatment Systems Manual, United States Environmental Protection Agency, 2002, page 4-45; EPA Design Manual, Onsite Wastewater Treatment and Disposal Systems, United States Environmental Protection Agency, 1980, Chapter 6, Section 6.2.7, page 110; Minimum Standards for Design and Construction of Onsite Wastewater Systems, Bulletin 4-2, March 1997, State of Kansas Department of Health and Environment, Bureau of Water – Nonpoint Source Section, in cooperation with K-State Research and Extension, page 13; A Minnesota Regulator's Guide to the Venhuizen Standard Denitrifying Sand Filter Wastewater Reclamation System, Copyright 1997 by David Venhuizen, P.E., page 20; Septic Tank Maintenance, Karen M. Mancl and Brian Slater, The Ohio State University Extension – College of Food, Agricultural, and Environmental Sciences, Publication #AEX-740, Last Updated: 2016, page 2 and 3.)*

STEP 3: Inspect the septic tank and verify an effluent filter is installed. Examine area around tank to determine if there are any signs of leakage. *(Appendix VI, Eljen GSF Kansas Design & Installation Manual, page 6, Section 1.12)*

STEP 4: If system includes a pressure dosing component, inspect the tank pump system and verify no obvious holes or leaks are in the system. All float cords should be neatly wrapped in the riser so as not to interfere with the operation of the floats. Observe pump activation and determine pump is working properly. If alarm is present, verify it is working properly. *(Appendix VI, Eljen GSF Kansas Design & Installation Manual, page 20, Section 5.0)*

STEP 5: If system includes ventilation, inspect the air vent verify they are not obstructed or broken. *(Appendix VI, Eljen GSF Kansas Design & Installation Manual, page 22, Section 7.0)*

Appendix I

Bio Microbics “FAST” Environmental Alternative Private Wastewater Disposal System Service Manual

BIO MICROBICS
BETTER WATER. BETTER WORLD.

FAST® Service Manual

FOR USE WITH

(NSF Std 40 & 245)	**MicroFAST® 0.5, 0.625, 0.75, 0.9, 1.5**
(non-NSF certified)	**MicroFAST® 3.0, 4.5, 9.0**
(ETV/EPA tested)	**RetroFAST® 0.150, 0.250, 0.375**
	NitriFAST® 0.5, 0.625, 0.75, 0.9, 1.5, 3.0, 4.5, 9.0
	HighStrengthFAST® 1.0, 1.5, 3.0, 4.5, 9.0

SERVICE MANUAL

FOR USE WITH FAST® SYSTEMS:

(NSF® Std 40/245 cert.)	MicroFAST® 0.5, 0.625, 0.75, 0.9, 1.5
(Non-NSF cert.)	MicroFAST® 3.0, 4.5, 9.0
(ETV/EPA tested)	RetroFAST® 0.150, 0.250, 0.375
	NitriFAST® 0.5, 0.625, 0.75, 0.9, 1.5, 3.0, 4.5, 9.0
	HighStrengthFAST® 1.0, 1.5, 3.0, 4.5, 9.0

GENERAL INFORMATION

All FAST® products are ETL certified for safety (electrical, environmental, etc.). One or more of the following patents protects this process: 3,966,599; 3,966,608; 3,972,965; 5,156,742. Certified by NSF International, the MicroFAST® 0.5, 0.625, 0.75, 0.9 and 1.5 systems meets NSF Standard 40, Class 1 and Standard 245 certifications for wastewater treatment devices. If you have questions regarding any Bio-Microbics products, please contact us:

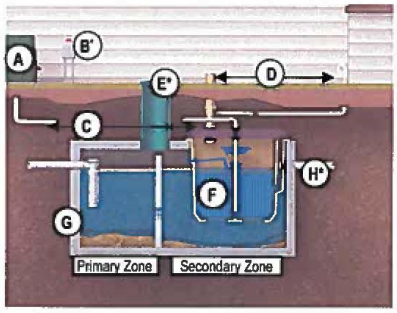
800-753-FAST (3278) or (913) 422-0707

e-mail: onsite@biomicrobics.com

About FAST®: The FAST® (Fixed Activated Sludge Treatment) system uses naturally occurring bacteria (biomass) to treat sewage for dispersal into the environment. This continuous process provides the biomass with waste (food) and air in a suitable environment. Dead bacteria and non-biodegradable waste settle and accumulate in the bottom of the tank for periodic removal.

The FAST® process consists of the treatment module and blower. The blower provides air to the system via the air supply pipe. The air supply pipe and draft tube create an air lift. The air lift mixes oxygen and waste throughout the media inside the tank. Bacteria grows on the media and digests the waste. A vent pipe expels harmless vapors created by the process.

- A. Blower and Housing
- B. Control Panel
- C. Air Line Piping
- D. Vent(s) and Observation Port
- E. Access
- F. FAST® Unit
- G. Tank
- H. Outlet to Drain field

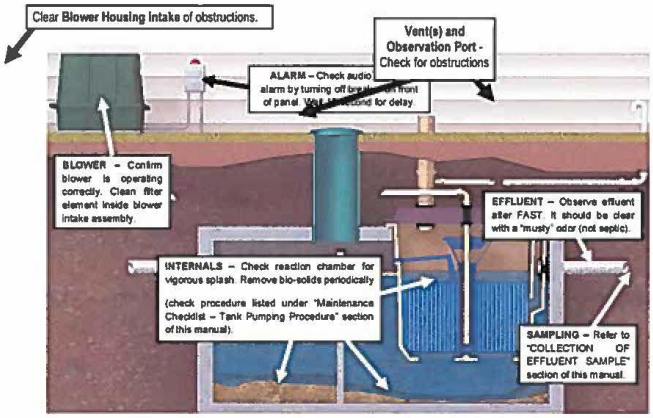


GENERAL LAYOUT

**PLEASE NOTE: Adequate pump out must be provided for primary and secondary zones. There may be ancillary equipment associated with your system: pump(s) (before and/or after the FAST® unit), a distribution box, a disinfection system, an irrigation system, a remote alarm, or auto dialer, etc.*

REGULAR SERVICE MAINTENANCE

⚠ WARNING *Always secure all access covers to prevent unauthorized people from entering the tank. Only qualified service personnel should open access ports and/or covers. Infectious organisms exist in a septic tank. If any contact with wastewater occurs, immediately wash and disinfect all exposed areas and contact personal physician. Failure to do so could result in severe sickness or death. DO NOT use an open flame or cause a spark near a septic tank's access points. Gases emanating from septic tanks can explode if ignited or deadly if inhaled.*

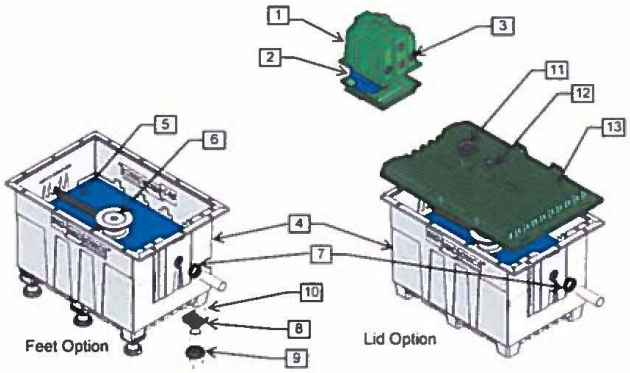


SYSTEM COMPONENTS

SUPPLIED EQUIPMENT

Please refer to the Installation Manual for a list of your system's original supplied parts. Picture shown is the MicroFAST® standard parts diagram.

If replacement parts are needed please have the serial number ready and call the local distributor listed on the control panel or Bio-Microbics.



COMMON NAME

1. Blower Housing
2. Blower (with blower I/O piping, Inlet Filter Assembly, blower and housing screws not shown)
3. Louver
4. Liner
5. Recirculation Trough
6. Air Lift
7. 4" Outlet Gasket
8. Foot Top (foot option)
9. Foot Bottom (foot option)
10. Foot Screws (foot option)
11. 6" Observation Port Gasket (lid option)
12. 2" Air Line Gasket (lid option)
13. Lid ***(Optional)*** (Not with MCF 4.5 or 9.0)

DO'S & DON'TS.....*What can I put down the drain?*

Please refer to the list below for important info on how to keep your treatment system performing as it should.

⚠CAUTION *Introducing harmful or damaging substances into the FAST system may void the warranty.*

DO NOT PUT THESE ITEMS DOWN THE DRAIN:

FOOD WASTES	ANIMAL BONES / COFFEE GROUNDS / CORN COBS / EGG SHELLS / SKIN / FRUIT PEELS / MELON RINDS / HOME BREWERY WASTE
PERSONAL PRODUCTS	BANDAGES / CONDOMS / SANITARY NAPKINS / WET WIPES / DISPOSABLE DIAPERS
CHEMICALS/ TOXINS	AUTOMOTIVE FLUIDS / CAUSTIC CLEANERS / DRUGS / FLOOR STRIPPER HARSH DETERGENTS / HERBICIDES / MEDICATIONS / PAINTS (OIL-BASE / PESTICIDES / AMMONIUM CHLORIDE CLEANERS / SOLVENTS / THINNE
OTHER PRODUCTS	CAT LITTER / CIGARETTE BUTTS / CLOTH TOWELS / FILM DEVELOPING WASTE / METAL OBJECTS / MODELING CLAY / PAPER TOWELS / SCRAPS / PLASTIC BAGS / PLASTIC OBJECTS / RAGS / RV WASTE

RECORD KEEPING

Keep copies of all system drawings/plans of the site/installed equipment/service records with all other home appliance documents. Record all applicable information.

LAUNDRY

Spread wash loads throughout the week. Instead of liquid fabric softener, dryer sheets should be used. Use low-suds, biodegradable and low phosphate detergents, like Mighty Mike® from Scienco/FAST (www.sciencofast.com).

LEAKY FIXTURES

Large quantities of water are added to your wastewater system when you have leaking fixtures. Timely detection and repair can help to maximize the life of your system, especially the drain field.

WATER SOFTENERS

The FAST® process may tolerate discharge from properly operating softeners that backwash as needed based on water usage (DIR) vs. timer operated systems, if allowed by your local regulatory authority. However, these discharges can possibly damage other parts of the septic system.

FOOD WASTES

Garbage disposal waste is acceptable - if allowed by your local regulatory authority. However, it may lead to more frequent removal of solids from your septic tank. Please dispose of large quantities of food in the garbage.

FATS, OILS & GREASE

Too much grease (i.e. animal fats, vegetable oils, lard, etc) put down the drain may overload the system and prevent the bacteria from fully breaking down the waste.

DISINFECTANTS/CLEANERS

Use citric acid, chlorine, or biodegradable cleaners according to the manufacturer's recommendations. Products containing ammonium chloride compounds or pine oil-based cleaners should not be used. Use drain cleaners as a last resort to unclog pipes.

GARAGE & WORKROOM

Drains from work areas should be diverted away from your system; petroleum-based products and saw dust should not enter the septic system.

MEDICATIONS

DO NOT FLUSH UNUSED MEDICATIONS DOWN THE DRAIN. Please dispose properly by returning unused medication to the pharmacy/doctor.

NOTE: The human body absorbs ≤20% of typical medications, please notify service provider of medications taken frequently or used intermittently in the house; this could ease disruption of service for your system.

SEPTIC ADDITIVES/ENZYMES

The wastewater in the system typically contains all the required bacteria for proper operation. Commercial additives are most often unnecessary; and may do more harm than good.

PAPER PRODUCTS

Use single- or double-ply, non-quilted, white toilet paper products. Some color dyes in the paper cannot be eaten by natural bacteria. Non-bleached paper (brown in color) takes longer to break down and can therefore increase the pump out frequency of your tank. Avoid flushing paper towels, napkins, wipes, or other thick paper material.

MAINTENANCE CHECKLIST

⚠ WARNING *Always secure all access covers to prevent unauthorized people from entering the tank. Only qualified service personnel should open access ports and/or covers. Infectious organisms exist in a septic tank. If any contact with wastewater occurs, immediately wash and disinfect all exposed areas and contact personal physician. Failure to do so could result in severe sickness or death.*

⚠ WARNING *DO NOT use an open flame or cause a spark near a septic tank access points. Gases emanating from septic tanks can explode if ignited or deadly if inhaled*

NORMAL OPERATING CONDITIONS	
SOUND	The FAST® system's blower makes a constant humming noise, much like a household refrigerator. Under normal conditions, the blower should last 5+ years without need for replacement. If an unusual noise is heard, refer to the **Trouble-Shooting Guide.**
ODOR	A musty, earthy-type of odor is normal. However, if a sewage odor (rotten egg smell) is detected, refer to the **Trouble-Shooting Guide.**
SIGHT	A properly loaded and operated FAST® system will produce effluent that looks like tap water. If the effluent is turbid, opaque, or suddenly changes, refer to the **Trouble-Shooting Guide.**

☐ **TRAFFIC** Ensure that the FAST® system has not been damaged due to excessive weight loading (>1,750 lb. point load.) Only normal yard traffic (lawn mowers, etc.) is acceptable. Traffic bearing (H-20) tanks can be made for use with FAST® (w/ feet). Consult local distributor or the factory for guidance.

☐ **BLOWER OPERATION** DO NOT turn off the blower (unless testing alarm). Treatment quality and drain field life could be reduced. Check the blower for proper function. Clean the blower's inlet air filter element. The blower can be operated by a timer in certain situations. Contact your local Bio-Microbics distributor for more information. If the blower is malfunctioning please refer to the "Troubleshooting Guide" or Blower Replacement Section located in this manual.

☐ **ALARM PANEL AND ALARM SOUNDS** The alarm has a ~10 second built-in delay. Test the audible alarm by turning the blower OFF. To silence the alarm, use the "Silence" button on the panel's front. If the alarm is activated for an unknown reason, please refer to the "Troubleshooting Guide" located in this manual.

☐ **VENTS, ODORS, AND INTAKES** Clear the vent(s) and blower housing intakes of any obstructions. Please refer to the "Troubleshooting Guide" located in this manual if you detect septic odors coming from the FAST® vent as this may indicate a problem with the system.

☐ **WATER QUALITY** effluent should be clear and odorless. All FAST® systems are capable of exceeding the USEPA standard for secondary wastewater treatment (40CFR, part 133.102) depending on how they are applied, sized, installed and operated. If samples are required please refer to the "Collection of Effluent Sample" section below.

☐ **BIO-SOLIDS (SLUDGE) LEVELS** Scheduling sludge removal depends on the size and design of the septic tank. Check the sludge levels in both tanks/compartments by inserting a sludge-measuring instrument and taking measurements in multiple locations in each compartment of the tank(s). Pump both compartments/tanks if the sludge is:

1. 18" deep in the primary settling tank or is within 6" of the connection point between the settling tank and the secondary/treatment zone; and/or
2. Within 3"-4" of the bottom of the FAST® unit in the treatment tank.

To determine the proper measurement for #2 above, measure the total liquid depth of the treatment tank (containing the FAST® unit) using a sludge-measuring instrument. Take that value and subtract the height of the FAST® product (in the table below). The result is the total sludge storage height available in the tank.

FAST® Models	Module Height
ALL RetroFAST®	27" [68.5 cm]
FAST® Models 0.5, 0.625, 0.75, 0.9, 1.5, & 4.5	31" [79 cm]
FAST® models 3.0 & 9.0	55" [140cm]

All stricter, applicable regulations supersede these operational directions.
Always pump out both zones, even if only one zone may require it.

TROUBLESHOOTING GUIDE

Contact factory or local distributor for all other issues: (913) 422-0707

PROBLEM	SITUATION	POSSIBLE CAUSE / SOLUTION
Alarm is activated (sounding)	Blower is NOT running *Please check the following. If problem persists, call service provider*	➢ **Breaker has tripped** – turn blower switch ON. If the switch will not stay ON, *see next steps...*
		➢ **Breaker trips after 2-3 seconds** – blower is over amping – electrician needs to check blower wiring.
		➢ **Breaker trips immediately** – electrical system has a short – electrician must investigate
		➢ **Blower is seized** – cooling fan will not spin freely with power OFF – replace blower – call service provider
	Blower is running *Please check the following. If problem persists, call service provider*	➢ **Water Level is high** – check the water level in the unit. Water level should be 2-3 inches above the media. Water level high? **YES:** consult distributor **NO:** Go to next step.
		➢ **Liquid Level Switch Present – NO:** Go to next step. **YES:** Check if wired in the same conduit as 90 VAC or higher wires (a violation of electric code NEC/IEC). **If YES:** Wires will need to be separated.) – **If NO:** Switch may need adjusting. Turn switch's Allen screw clockwise, wait ~10 seconds for alarm to "catch up".
		➢ **Current Sensor Present – YES:** Open panel and find "Diagnostic LED's" in the upper right hand corner. Note which light is lit and consult the distributor. **NO:** Consult distributor
		➢ **Vent is undersized or Vent(s) or airline is blocked or broken** – Check specifications for vent sizing requirements. Remove blockage or repair vent(s) or airline.
Waste is backing up from tank	Blockage in pipe network.	➢ **Check all piping for blockage,** including all interior tank piping and effluent piping.
	Mechanical failure of ancillary equipment	➢ **Pump is not running** – have qualified person check pumping system for mechanical and/or electrical failures.
		➢ **Pump's Level Controls** are improperly set, have failed, or pump too much volume per dose. Have service provider check/adjust pumping system.
System emits odor (rotten egg smell)	Mechanical failure/ Air line break	➢ **Blower operating** – **NO:** check "blower is not running" above, **YES:** *see next step*
		➢ **Proper splash** in reaction chamber – **NO:** air line is broken, **YES:** *see next steps*
	Multiple issues can contribute; the cause is usually due to oversized settling tank. Multiple solutions possible.	➢ **Decrease settling tank volume** – easiest done with a pumping system which can then pump the tank
		➢ **Move vent** – re-locate the vent to a location where the prevailing winds will catch odor.
		➢ **Place a carbon filter** on the end of the vent pipe – only use a filter that will create less than 0.1 psi of back pressure.
		➢ **Create bio-filter vent** - create a remote vent by placing a well perforated vent line in a trench with shredded bark mulch - contact local installer
Blower runs backwards	3-Phase installed incorrectly power out of phase or	➢ **Switch any two** "hot legs" at the panel or blower AFTER turning OFF the power. Only a QUALIFIED electrician can do this work. After rewiring, it may be necessary to dry the blower's internal parts.
	Single-Phase (which can run counter-clockwise) installed incorrectly	➢ **Some blowers** have wires numbered "5" and "8". After turning OFF the power, switch these two wires. Only a QUALIFIED electrician can do this work. After re-wiring, it may be necessary to dry the blower's internal parts.
Blower is noisy	Blower noise is an annoyance at site	➢ **Blower housing** can be supplemented with additional sound reducing measures, contact your service provider.
		➢ **Blower may be re-located** from its current location and can be placed up to 100 ft away from unit.
	Blower is shaking or makes a loud, whiny noise	➢ **Vibration between** the blower & housing–tighten or place rubber washers in mounting screws between blower & housing
		➢ **Blower bearings** are going bad - replace blower now or wait for it to seize up
Effluent is dirty	Many solids detected in effluent	➢ **Toxic substance** in system, check for even growth in reaction chamber
		➢ **Pump out required** – refer to "Bio-Solids Levels" under "Maintenance Checklist" section
		➢ **Other** – call service provider
Water in blower/ housing	Water entry from outside	➢ **Move blower** above flood level
	Blower is siphoning	➢ **Check blower rotation** – see "Blower runs backwards" section above
		➢ **Move blower** to location higher than the FAST system

TANK PUMPING PROCEDURE:

⚠ WARNING *Only qualified service personnel should open access ports/covers. If any contact is made with wastewater, immediately wash and disinfect all exposed areas and contact personal physician. Failure to do so could result in severe sickness or death.*

⚠ CAUTION *Avoid pumping down after periods of heavy rain or when the ground water is likely to be above the bottom of the concrete tank. Emptying the tank under these conditions could cause the tank to float up and become dislodged.*

1. Open the access ports/cover(s) and insert the hose. Always pump out both settling and treatment chambers of the system, even if only one side requires it.
2. Once the unit has been pumped out, immediately refill the tank with clean water to reduce the risk of the tank floating and to minimize the impact on treatment. Close the access ports/cover(s) making sure it is watertight.
3. Properly dispose of the solids removed in compliance with local and state regulations.

COLLECTION OF EFFLUENT SAMPLE

Please contact your local distributor or Bio-Microbics for a copy of the **"Testing Protocol"** document. ***Important:*** All samples must be collected, stored, transported and tested according to the "Testing Protocol" document by Bio-Microbics and the most current version of **Standard Methods**.

OTHER SYSTEM COMPONENTS (if applicable)

☐ Check **LIXOR® PRE-AERATION DEVICE** blower, inlet filter, blower housing, and air delivery system for proper function.

☐ Check **INFLUENT BIOSTEP® PUMP(S)** for proper function. Clean the screening device by using built in swab or other method.

☐ Check **SANITEE® EFFLUENT SCREEN (FILTER)** or other screening device. Clean by using the built in swab or other method.

☐ **DISPERSAL SYSTEM** (not by Bio-Microbics) Follow manufacturer's recommendation.

SEASONAL/INTERMITTENT USE PROPERTIES

The FAST® System will function normally even if there is no wastewater flowing during short periods of vacancy. Examples of seasonal/intermittent use and suggested operational procedures:

- **Summer use property** (shut down all winter) - blower should be turned off at end of summer and restarted at least a week before returning. Please contact your local service provider to restart the system and check with local regulations.
- **Weekend property** (used at least once every three weekends) - maintain normal operation or utilize FAST's SFR® blower timer feature on control panel.

Important: Consult your service provider and local regulations prior to any system changes.

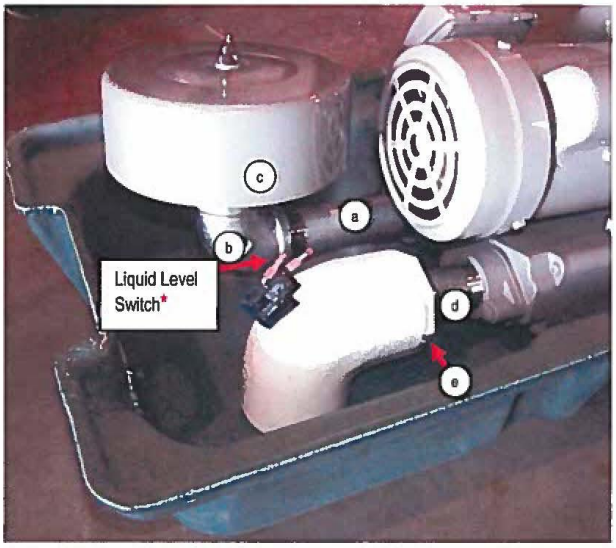
BLOWER REPLACEMENT

⚠ WARNING *All electrical work shall be properly performed by a qualified electrician per all applicable codes. Failure to do so may result in severe bodily injury or death.*

⚠ WARNING *Hazards exist in confined spaces such as a septic tank. All confined space precautions must be followed if entering a tank. Always keep tank openings covered during storage and installation*

When replacing a blower follow the steps below. If relocating the blower run the electrical supply conduit from the control panel to the desired blower location. Air line piping from the blower to the FAST® unit may NOT exceed 100 ft [30.5m] in total length and must have ≤ 4 elbows. The total electrical supply should NOT exceed 150 ft [45 m]. The blower and blower housing must be mounted on a solid base such as concrete to avoid settling.

CONNECT SUPPLIED PIECES (refer to picture below)



a. Longest steel pipe
b. Steel elbow
c. Air filter assembly
d. Shortest steel pipe
e. PVC reducer bushing

SECURE BLOWER ASSEMBLY to housing base using four supplied #14 x 1½" self-tapping screws. Drill screws directly into blower base.

RECONNECT AIR LINE from FAST® unit to blower outlet using required piping. **A "quick disconnect" is highly recommended to be installed in this location if it is not currently in place.**

NOTE: ALL CONNECTIONS MUST BE AIR AND WATER TIGHT

CONNECT INCOMING POWER to the blower at junction box. Follow the **FAST® Installation Manual** for further instruction. Common wiring diagrams are located at the end of this manual.

***(OPTIONAL) LIQUID LEVEL SWITCH** – NOT required for most new systems. AMI control panel with current sensor replaces this switch. To replace this switch:

a) Drill a $^{3}/_{8}$" hole in the blower outlet pipe.
b) ***IMPORTANT***: Connect low voltage wires to switch before mounting in pipe.
c) Insert the switch into the $^{3}/_{8}$" hole (nipple first), then glue into place with PVC glue.
d) Install low voltage pressure switch wiring back to the control panel according to applicable codes (must not be inside high voltage blower wiring).

CONTROL PANEL REPLACEMENT

CAUTION *Always have all utility lines and equipment marked by a locating service prior to performing any work.*

WARNING *All electrical work shall be properly performed by a qualified electrician per all applicable codes. Failure to do so may result in severe bodily injury or death.*

The FAST® systems, including all electrical parts, are ETL (UL equivalent) certified for electrical safety. The control panel meets NEMA4X standards for all weather use (not explosive or submerged environments). The total electrical supply should NOT exceed 150 ft [45m].

Bio-Microbics also manufactures control panels that can control other systems, such as UV and sewage pumps. Call your distributor or Bio-Microbics for more information.

When replacing a panel follow the steps below. If relocating the panel run the electrical supply conduit from the control panel to the blower location. Keep in mind the electrical supply line should NOT exceed 150 ft [45 m] total.

1. Turn all Power OFF.
2. Examine wiring directions inside the supplied FAST® control panel (also found at the end of this Manual).
3. A dedicated breaker is required in the building's master electrical panel. Make connections between the master panel and FAST® control panel.
4. Make connections between the blower and FAST® control panel per the electrical diagram.
5. For systems requiring the Liquid Level Switch- connect the switch to the control panel terminals labeled "FLOAT" or "HI Press Input". The newest AMI control panel with current sensor can be used to replace this switch.

CERTIFICATIONS

WARNING *Only authorized service personnel should service a septic system and its components. Deadly hazards such as lethal gases and high voltage electricity are associated with the system.*

MicroFAST® 0.5, 0.625, 0.75, 0.9, and 1.5 systems are tested and certified to NSF®/ANSI® Standards 40 (Class I) and 245

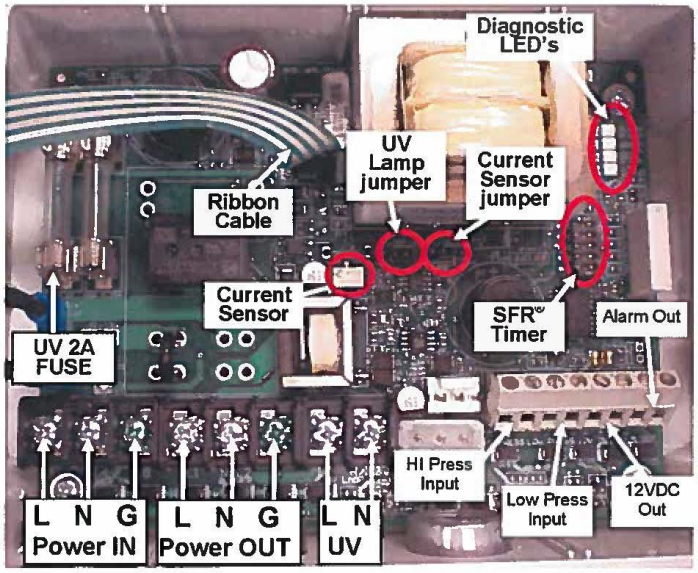
NSF
Certified to NSF/ANSI Standard 40

PARAMETER		LIMIT
CBOD5	30 day avg.	25 mg/L
	7 day avg.	40 mg/L
TSS	30 day avg.	30 mg/L
	7 day avg.	45 mg/L
pH		6-9 s.u.
Total Nitrogen		50% reduction of influent

ELECTRICAL WIRING DIAGRAMS

Only the MicroFAST® 0.5, 0.625, 0.75, and 0.9 system diagrams are displayed here. Information for larger FAST® systems accompanies those units and can be obtained from Bio-Microbics.

AMI 110/220 PANEL



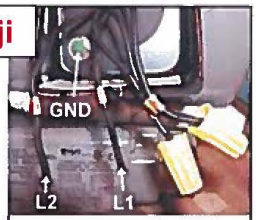
TIMING MODES DIP SWP OS. (S1)					BLOWER MINUTES	
5	4	3	2	1	ON	OFF
Off	Off	Off	Off	Off	30	15
Off	Off	Off	Off	On	15	15
Off	Off	Off	On	On	30	30
Off	Off	On	Off	Off	60	15
Off	Off	On	Off	On	60	30
Off	Off	On	On	Off	120	30
On	On	On	On	Off	TEST	
On	On	On	On	On	∞	
TEST = 15 SEC ON, 20 SEC OFF						
∞ = ALWAYS ON						

BLOWER DIAGRAMS

ATTENTION: Please refer to side of shipping box for correct Blower.

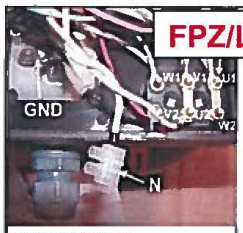
Fuji

Model: FUJI VFC 209, 100P, 300P
Power: 110VAC
- L1 to P1
- N to T2, T4
- T1 & T3, cap together



Model: FUJI VFC 209, 100P, 300P
Power: 220V 1ø
- L1 to P1
- L2 to T4
- T2 & T3, cap together
- T1, cap off

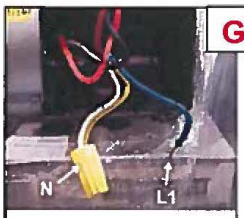
FPZ/Lafert



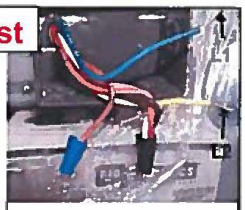
Model: FPZ SCL06
Power: 110VAC
- Jumper U2 to V1
- Jumper W2 to U1
- L1 to "terminal block"
- N to white connector

Model: FPZ SCL06
Power: 220VAC, 1ø
- L1 to "terminal block"
- L2 to V1
- Jumper W2 to U2

Gast



Model: GAST R2103, R4P115, R1102
Power: 110VAC
- L1 to P1
- N to 2,4
- P2,5,3 cap together



Model: GAST R2103, R4P115, R1102
Power: 220VAC 1ø
- L1 to P1
- L2 to 4
- 5, 3 and 2, cap together
- P2 cap off

LIMITED WARRANTY

Bio-Microbics, Inc. warrants every new residential FAST® system against defects in materials and workmanship for a period of two years after installation or three years from date of shipment, subject to the following terms and conditions, (Commercial FAST system for a period of one year after installation or eighteen months from date of shipment, whichever occurs first, subject to the following terms and conditions):

During the warranty period, if any part is defective or fails to perform as specified when operating at design conditions, and if the equipment has been installed and is being operated and maintained in accordance with the written instructions provided by Bio-Microbics, Inc., Bio-Microbics, Inc. will repair or replace at its discretion such defective parts free of charge. Defective parts must be returned by owner to Bio-Microbics, Inc.'s factory postage paid, if so requested. The cost of labor and all other expenses resulting from replacement of the defective parts and from installation of parts furnished under this warranty and regular maintenance items such as filters or bulbs shall be borne by the owner. This warranty does not cover general system misuse, aerator components which have been damaged by flooding or any components that have been disassembled by unauthorized persons, improperly installed or damaged due to altered or improper wiring or overload protection. This warranty applies only to the treatment plant and does not include any of the structure wiring, plumbing, drainage, septic tank or disposal system. Bio-Microbics, Inc. reserves the right to revise, change or modify the construction and/or design of the FAST system, or any component part or parts thereof, without incurring any obligation to make such changes or modifications in present equipment. Bio-Microbics, Inc. is not responsible for consequential or incidental damages of any nature resulting from such things as, but not limited to, defect in design, material, or workmanship, or delays in delivery, replacements or repairs.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED. BIO-MICROBICS SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. NO REPRESENTATIVE OR PERSON IS AUTHORIZED TO GIVE ANY OTHER WARRANTY OR TO ASSUME FOR BIO-MICROBICS, INC., ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF ITS PRODUCTS.

Contact your local distributor for parts and service.

FAST® System Serial Number: _____

System Designer Name: _____

Designer Phone: _____

Health Official Name: _____

Health Official Phone: _____

Manufacturer Name: Bio-Microbics, Inc.

Manufacturer Phone: 1-800-753-FAST (3278)

Installed By: _____

Installer Phone: _____

Maintenance Provider Name: _____

Maintenance Provider Phone: _____

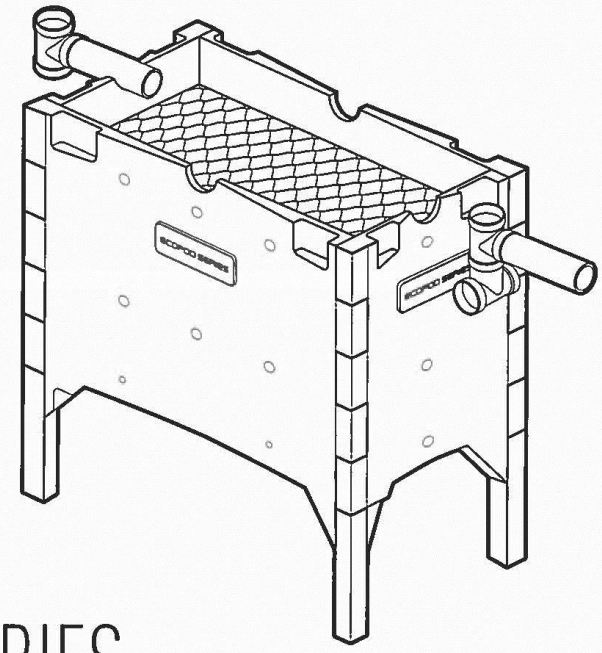
BIO MICROBICS
BETTER WATER. BETTER WORLD.
8450 Cole Parkway • Shawnee, KS 66227 • USA
Ph: 913-422-0707 • Fax: 913-422-0808
800-753-FAST (3278) • www.biomicrobics.com

Appendix II

Pentair “DELTA” Environmental Alternative Private Wastewater Disposal System Service Manual

PENTAIR

DELTA ENVIRONMENTAL®



ECOPOD-N® SERIES
FIXED FILM WASTEWATER TREATMENT SYSTEM
INSTALLATION, OPERATION AND MAINTENANCE MANUAL

NOTE! To the installer: Please make sure you provide this manual to the owner of the equipment or to the responsible party who maintains the system.

Part # K4509 | © 2013 Pentair Ltd. | 05/06/13

TABLE OF CONTENTS

DISTRIBUTOR AND HOMEOWNER NOTES

1. The Delta Environmental Model E50N has been tested by NSF International and conforms to NSF/ANSI Standard #40 & #245, class 1 effluent requirements. All other E series models are certified based on provisions in the standard for certification of a series of plants of the same model varying only in rated treatment capacity and materials of construction.
2. State and/or local regulations govern the installation and use of individual Aerobic Wastewater Treatment Systems and must be complied with.

Consult your local Sanitarian/Environmentalist prior to installation.

HOMEOWNER RECORDS

S/N: _____ DATE: _____

INSTALLED BY: _____

DISTRIBUTOR: _____

_____

_____

This booklet provides operations, installation and warranty information on the **TREATMENT PLANT ONLY**. Other components that you may have, such as dosing equipment, drip irrigation or other components, require additional operations booklets and carry separate warranties.

Be sure that you have all of the correct booklets for each of the component pieces in your system.

Contact your installer or call 1-800-219-9183.

Post in a Service/Utility Area

ECOPOD-N® TREATMENT SYSTEMS NOTICE

This home is served by an Individual Wastewater Treatment System. This system will serve you well only if it is properly maintained. Your system comprises

_____

Your system is located

_____

You should not build or fill over this area, or allow heavy traffic. Do not allow water to stand over this area, avoid using strong chemicals, cleaning fluids, etc., which will kill helpful bacteria in the system. You should also avoid flushing grease, food scraps, cigarette butts, sanitary napkins, and other inorganic waste down the drain.

You should have your system serviced (pumped out) every 3 to 5 years. Your service technician can advise you if you need more frequent or additional service.

To have your system serviced, or for additional information, contact _____ at _____ .

All of the details regarding system operation can be found in your homeowner's manual, which you should have received at installation. If you did not receive a copy, call 1-800-219-9183 and we will send you one at no charge.

Keep a Record of Service Below:

DATE	SERVICE PERFORMED	SERVICE TECHNICIAN

INTRODUCTION

A WORD ABOUT YOUR DELTA AEROBIC WASTEWATER TREATMENT SYSTEM AND HOW IT WORKS

The ECOPOD-N Fixed Film Wastewater Treatment System that you have purchased produces high quality water suitable for various disposal methods. It is used to enhance your on-site wastewater disposal system. You can be proud that in purchasing your ECOPOD-N System, with a minimum amount of maintenance you can directly contribute to a cleaner, safer environment.

All wastewater treatment systems of this type work by using bacteria that nature has provided. By pumping air into the system, the bacteria grow and thrive in much larger amounts than would occur naturally. The overpopulation of bacteria speeds up the process of breaking down domestic wastewater, making it safe for release into the environment. This entire process takes place within the walls of your specially designed, self-contained ECOPOD-N Treatment System.

The result of this process is a clear, odorless discharge, which meets or exceeds state water quality standards.

By following the few simple steps that you will find in this manual, your ECOPOD-N Fixed Film Wastewater Treatment System will provide you with years of service and the knowledge that you are doing your part to protect public health, our groundwater, lakes, rivers, and streams.

The ECOPOD-N Fixed Film Wastewater Treatment System may be only one of several components required by your health department to provide a complete on-site system.

CALIFORNIA PROPOSITION 65 WARNING:

⚠WARNING This product and related accessories contain chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

PROCESS DESCRIPTION

Water enters a pretreatment/settling tank similar to conventional septic tanks. In this tank, debris and settleable solids settle to the bottom and are decomposed by anaerobic bacteria.

The effluent enters the ECOPOD-N Fixed Film Wastewater Treatment System from the primary tank where it is introduced into an oxygen rich environment. In this oxygen rich environment, a colony of bacteria, called the biomass, develops and is capable of digesting (breaking down) biodegradable waste into carbon dioxide and water. This is a continuous process as long as the biomass is supplied with incoming wastewater and oxygen. The ECOPOD-N is a specially designed containment device that houses an engineered plastic media specifically designed to treat domestic wastewater. The ECOPOD-N is submerged in a tank of liquid, which operates as a dilution zone. An external air compressor is connected to the tanks to provide the necessary air to the system. There are no moving mechanical parts or filters in the ECOPOD-N.

In this system, conditions are favorable only to attached growth bacteria. This means that the most common disadvantages of other types of systems are eliminated. No rising sludge, floating sludge or washouts can occur.

In addition to CBOD and TSS reduction, ammonia nitrogen is one of the contaminants. Wastewater nitrification of the ammonia and denitrification of nitrates occur within the bacteria masses. A 50%+ removal rate of total nitrogen is common without any type of recirculation or cycling of the blower.

HOMEOWNER CARE AND OPERATION INSTRUCTIONS

The ECOPOD-N Fixed Film Wastewater Treatment System has been designed and built to provide long term, reliable and efficient service.

Once the unit has been installed (see installation instructions), the unit will operate with a minimum amount of attention.

Please reference the system's Data Plates that are located on the tank, air pump, and the alarm panel in the event that a problem arises or service is required.

The following should be accomplished as checks for system failure:

Daily

- Observe the warning device, which comes on when the power to the air pump has been interrupted, when the air supply system has malfunctioned, or there is a high water level in the treatment plant. If the alarm is activated, check for a blown fuse or thrown circuit breaker. Check the air pump to be sure it is operating. Once accustomed to the soft humming sound of a properly operating unit, any unusual noise is an indication of malfunction. If an unusual noise is detected or total failure is observed, call an authorized Delta dealer/distributor.

Weekly

- Check the treatment plant for offensive odor. If such a condition should develop, call an authorized Delta dealer/distributor.

Every 3 Months

- **The air filter on the air pump should be cleaned.** Rinse with warm water if necessary. (See installation instructions.) Do not use oil or other solvents.

Every 6 Months

- Inspect and make any necessary adjustments to mechanical and electrical components.
- Inspect effluent quality's color, turbidity and check for any odor.
- Take a sample from the reactor tank to check the sludge level described in the "Solids Removal" section.
- **The homeowner must be notified in writing if any improper operation is observed and cannot be corrected at the time of service.**

Note: To keep maintenance to a minimum and ensure high effluent quality, see the next section.

The following should not be used or disposed of into the system:

- Greases, fats, oils, pesticides, herbicides, or any other toxins.
- Garbage disposal should be used sparingly. Dispose of food waste, grease, etc., in the solid waste bin. Food waste represents additional loading the Fixed Film Wastewater Treatment System would have to digest, increasing pump-out intervals.
- Paints, household chemicals, automobile fluids, etc. – do not discard mop water into the system.
- Nonbiodegradable items such as cigarette butts, disposable diapers, feminine hygiene products, condoms, hair, coffee grounds, rags, paper towels, bandages, latex, plastic or metallic objects, etc.

- Wash loads must be spread out over the week. Once a week multiple loads or half loads are not recommended.
- Citrus products, oranges, lemons, grapefruit, etc.
- Additives for septic systems – they do more harm than good.
- Hydraulic overload due to excessive water from other sources.
- Home brewery waste, strong medicines, antibiotics and antibacterial soaps should be avoided.
- Strong disinfectants or bleaches. Laundry products such as Lysol, Pine-Sol, Tidy Bowl, or discharge from water softeners.
- Recommended detergents are powdered, low-sudsing, low phosphates and biodegradable washing soda ingredients such as Gain, Arm & Hammer, Fresh Start, and Dash Bright. Fabric softener dryer sheets are recommended.
- Recommended cleaning products are non-chlorine, biodegradable and nontoxic such as Ivory & Sunlight dish washing liquids, Cascade & Sunlight powdered dishwasher detergents, Comet & Biz powdered cleaners, baking soda.

SYSTEMS REQUIRING PUMPOUTS DUE TO THE ABOVE VIOLATIONS ARE NOT COVERED BY THE WARRANTY.

The ECOPOD-N Fixed Film Wastewater Treatment System is designed to handle domestic wastewater; nothing else should go into it. For anything other than domestic wastewater, contact Delta Environmental.

Safety Warnings

THE PROPER OPERATION OF THIS OR ANY OTHER HOME SEWAGE SYSTEM DEPENDS UPON PROPER ORGANIC LOADING AND THE LIFE OF THE MICROORGANISMS INSIDE THE SYSTEM. DELTA IS NOT RESPONSIBLE FOR THE IN-FIELD OPERATION OF A SYSTEM, OTHER THAN THE MECHANICAL AND STRUCTURAL WORKINGS OF THE PLANT ITSELF. DELTA CANNOT CONTROL THE AMOUNT OF HARSH CHEMICALS OR OTHER HARMFUL SUBSTANCES THAT MAY BE DISCHARGED INTO THE SYSTEM BY THE OCCUPANTS OF A HOUSEHOLD; WE CAN ONLY PROVIDE A COMPREHENSIVE OWNER'S MANUAL THAT OUTLINES SUBSTANCES THAT SHOULD BE KEPT OUT OF THE SYSTEM.

HYDRAULIC OVERLOADING (FLOWS IN EXCESS OF DESIGN FLOW) MAY CAUSE THE SEWAGE TREATMENT SYSTEM NOT TO PERFORM TO THE FULLEST CAPABILITIES.

ANTS HAVE BEEN SHOWN TO BE DESTRUCTIVE TO THE AIR PUMP. REGULAR CARE SHOULD BE TAKEN TO PREVENT INFESTATION OF ANTS NEAR THE SYSTEM. DAMAGE OR DESTRUCTION BY ANTS IS NOT COVERED UNDER MANUFACTURER'S WARRANTY.

YOUR STATE OR LOCAL HEALTH DEPARTMENT MAY REQUIRE OTHER PIECES OF EQUIPMENT TO FUNCTION SEPARATELY OR IN CONJUNCTION WITH EQUIPMENT MANUFACTURED BY DELTA ENVIRONMENTAL. DELTA IS NOT RESPONSIBLE FOR THE MECHANICAL OR ELECTRICAL SAFETY OF EQUIPMENT IT DOES NOT MANUFACTURE OR SUPPLY WITH ITS FIXED FILM WASTEWATER TREATMENT SYSTEM. PARTICULAR CARE SHOULD BE USED IN EVALUATING THE ELECTRICAL OR MECHANICAL SAFETY OF EQUIPMENT MANUFACTURED BY OTHERS. THIS MAY INCLUDE BUT IS NOT LIMITED TO ELECTRICAL CONTROL PANELS OR AIR PUMPS.

IF ELECTRICAL SERVICE HAS NOT BEEN INSTALLED FOR CHECKING AIR DISTRIBUTION SYSTEM DURING INSTALLATION, AND IF AN EXTENSION CORD IS USED TO TEST THE AIR PUMP, NEVER LEAVE THE EXTENSION CORD PLUGGED IN. REMOVE IT AFTER TESTING IS COMPLETED.

DUE TO A POSSIBLE FIRE HAZARD, DO NOT PLUG INTO SERVICE EQUIPMENT ON POWER POLE AND DO NOT USE EXTENSION CORDS. ALL ELECTRICAL WORK PERFORMED BY THE INSTALLER OR OTHERS MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND LOCAL CODES.

SOLIDS REMOVAL

The ECOPOD-N Fixed Film Wastewater Treatment System is designed to provide years of trouble-free operation.

Determination of the need for solids removal can be done through a simple test. A one quart sample should be pulled from the reactor tank and can be done so through the 4" sample port. Allow the sample to settle in a clear one quart jar for one hour. If the solids content exceeds 25 percent of the total volume after settling or more than 13 inches of sludge, the treatment plant should be pumped out. Call your local authorized sewage disposal service to have the tank contents pumped out and disposed of properly.

The method of pumping out should be as follows:

- Remove all of the solids from both the reactor tank and primary tank.
- The air pump should be in the off position.

After the pumpout process is complete, fill the tank with fresh water to normal operating level.

Refer to the "Installation Procedure" to get the treatment plant back into operation.

Should indication of improper operation be observed at any time, contact your local authorized Delta dealer/distributor.

NOTE: THE COST ASSOCIATED WITH PUMPING THE TREATMENT SYSTEM IS NOT COVERED UNDER WARRANTY AND IS NOT INCLUDED IN THE SERVICE POLICY.

SEASONAL USE GUIDELINES OF ECOPOD-N FIXED FILM WASTEWATER TREATMENT SYSTEM

These guidelines are for conditions as outlined below and apply for systems that are not in use for periods of time indicated. Site conditions not covered by the following must be forwarded to Delta for recommended guidelines to meet the particular site conditions.

1. System not in use for more than one month and less than three months. Electrical power is left on and there are no frost conditions.
   - Leave air pump on and system running.
2. System not in use more than three months. Electrical power is turned off and there are not frost conditions.
   - Remove all materials and liquid from tank.
   - Refill with clean water.
   - Turn off air pump.
3. System not in use more than three months. Electrical power is on and there are not frost conditions.
   - Leave air pump on and system running; OR
   - Remove all material and liquid from tank.
   - Refill with clean water.
   - Turn off air pump.

TANK PUMPING PROCEDURE:

⚠ WARNING *Only qualified service personnel should open access ports/covers. If any contact is made with wastewater, immediately wash and disinfect all exposed areas and contact personal physician. Failure to do so could result in severe sickness or death.*

⚠ CAUTION *Avoid pumping down after periods of heavy rain or when the ground water is likely to be above the bottom of the concrete tank. Emptying the tank under these conditions could cause the tank to float up and become dislodged.*

1. Open the access ports/cover(s) and insert the hose. Always pump out both settling and treatment chambers of the system, even if only one side requires it.
2. Once the unit has been pumped out, immediately refill the tank with clean water to reduce the risk of the tank floating and to minimize the impact on treatment. Close the access ports/cover(s) making sure it is watertight.
3. Properly dispose of the solids removed in compliance with local and state regulations.

COLLECTION OF EFFLUENT SAMPLE

Please contact your local distributor or Bio-Microbics for a copy of the **"Testing Protocol"** document. ***Important:*** All samples must be collected, stored, transported and tested according to the "Testing Protocol" document by Bio-Microbics and the most current version of **Standard Methods**.

OTHER SYSTEM COMPONENTS (if applicable)

☐ Check **LIXOR® PRE-AERATION DEVICE** blower, inlet filter, blower housing, and air delivery system for proper function.

☐ Check **INFLUENT BIOSTEP® PUMP(S)** for proper function. Clean the screening device by using built in swab or other method.

☐ Check **SANITEE® EFFLUENT SCREEN (FILTER)** or other screening device. Clean by using the built in swab or other method.

☐ **DISPERSAL SYSTEM** (not by Bio-Microbics) Follow manufacturer's recommendation.

SEASONAL/INTERMITTENT USE PROPERTIES

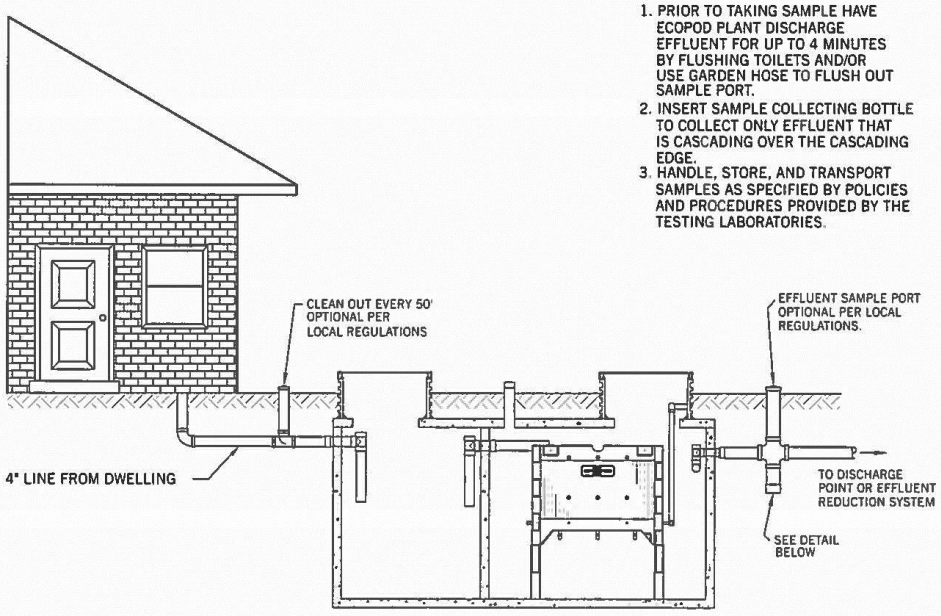
The FAST® System will function normally even if there is no wastewater flowing during short periods of vacancy. Examples of seasonal/intermittent use and suggested operational procedures:

- **Summer use property** (shut down all winter) - blower should be turned off at end of summer and restarted at least a week before returning. Please contact your local service provider to restart the system and check with local regulations.
- **Weekend property** (used at least once every three weekends) - maintain normal operation or utilize FAST's SFR® blower timer feature on control panel.

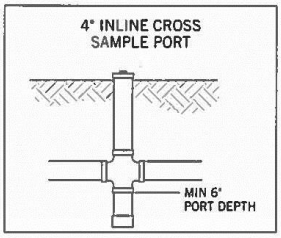
Important: Consult your service provider and local regulations prior to any system changes.

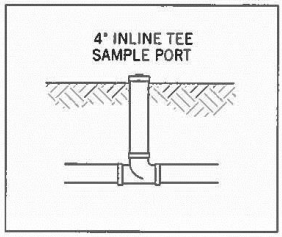
SAMPLE PROCEDURES:

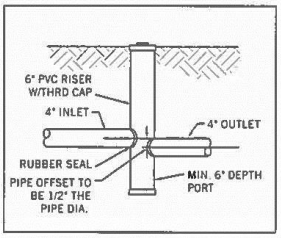
1. PRIOR TO TAKING SAMPLE HAVE ECOPOD PLANT DISCHARGE EFFLUENT FOR UP TO 4 MINUTES BY FLUSHING TOILETS AND/OR USE GARDEN HOSE TO FLUSH OUT SAMPLE PORT.
2. INSERT SAMPLE COLLECTING BOTTLE TO COLLECT ONLY EFFLUENT THAT IS CASCADING OVER THE CASCADING EDGE.
3. HANDLE, STORE, AND TRANSPORT SAMPLES AS SPECIFIED BY POLICIES AND PROCEDURES PROVIDED BY THE TESTING LABORATORIES.



EXAMPLES OF SAMPLE PORTS







REV.	DATE	REVISION DESCRIPTION	BY

PENTAIR
DELTA ENVIRONMENTAL'

SAMPLE PORTS

PLOT SCALE	DRAWING NUMBER	DRAWN BY	DATE	SHEET	REV
NTS	EP SAMP PORTS	D.WRIGHT	10/31/07	1 OF 1	A

INSTALLATION INSTRUCTIONS ONLY FOR USE BY CERTIFIED, LICENSED INSTALLERS

1. Prepare an excavation, having a diameter approximately one foot larger than the tank and a depth that will allow approximately 3 inches of the inspection port to extend above normal ground level. Backfill with a 6 inch layer of sand or gravel if otherwise unable to provide a smooth, level, compact base. We recommend that the hole be roped off in some fashion to prevent injury to passersby.
2. Using lifting lugs provided, place the plant in the excavation so that the inlet and outlet line up with the sewer piping. The inlet line should slope down toward the plant and the outlet line should slope down away from the plant. The plant should be level within 1/2 inch, edge to edge.
3. Position inlet and outlet lines and make connections as necessary, depending upon construction materials. The inlet line should be inserted and glued into the inlet elbow and the discharge line should be inserted and glued into the outlet coupling.

   Note: Open inspection port and make sure discharge tee assembly is level and centered in clarifier prior to attaching discharge piping. Fill the tank with water until water flows from the discharge before backfilling. Backfill around plant, up to the bottom of the discharge connections.
4. Do not install the air pump(s) in a low lying area where water may accumulate. The air pump should be installed near the control panel and within 100 ft. of the tank. The air pump can be installed outdoors or in a clean, well ventilated area, such as a tool room, garage, etc.
5. Mount the control panel in an area such that the alarm can be heard and be readily observed. A 3-wire grounded GFI circuit is required for safety. Install a disconnect switch near the panel to visually disconnect the control panel from the power source. All electrical work shall be done according to NEC and local code requirements. The control panel must be grounded. Connect the source ground wire to the ground location in the panel.
6. The control panel is rated for indoor and outdoor use and contains a fuse or circuit breaker for the air pump. An electrical malfunction in the air pump or wiring to the air pump will cause the fuse or circuit breaker to blow. The control panel also contains a pressure switch and visual and audible alarm. Loss of air pressure caused by air pump system malfunction or a high water level in the treatment plant will cause the alarm to sound and light to illuminate.
7. Attach control panel to suitable mounting surface using all four mounting holes on back of box. Use proper screws of sufficient length to ensure a secure and permanent mounting.
8. Control panel is rated for outdoor service; however, do not place it where it can be immersed in rising water or where runoff water such as from a roof will fall on it. Do not mount it where it is subject to wetting from sprinklers, hoses, etc.
9. The control panel must never be connected to a circuit that is not properly grounded. Never connect the unit to a nongrounded circuit. If there is doubt, have a qualified electrician check for proper grounding. The control panel must be connected to a 20 amp maximum electric source equipped with a ground fault interrupter (GFI) circuit breaker. A standard circuit breaker can be replaced with a GFI circuit breaker which can be obtained from almost any store that sells electrical supplies.
10. After the control panel is properly mounted, connect conduit and install wiring as shown on drawings bound herein.

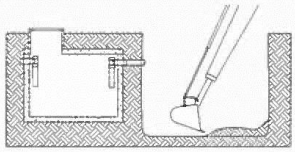
11a. Install float switch wire from the control panel to the treatment plant. Wire can be direct burial type UF 600 volt or can be installed in schedule 40 PVC conduit. Use type THWN, 600 volt if installed in conduit. Wire must be buried in accordance with NEC table 300-5. If in doubt, bury 24" deep. Keep sufficient distance or depth from air line to avoid confusion of pipes or damage to wiring during installation or repair of air piping. Connect to the float switch normally open contacts using underground rated compound filled wire nuts.

11b. If using the dual pressure switch panel, ignore 11a. To set the high level pressure switch that detects high water level in the unit, follow these instructions: Bring plant to operating water level with compressor turned on. Using properly sized screwdriver, turn high level alarm adjustment screw clockwise until alarm occurs. Then turn the screw counterclockwise until alarm stops.

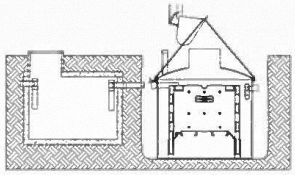
12. Connect the pressure air tubing to the 1/8" barb-fitting in the air piping system. The air tubing should be protected by conduit as shown on drawing.
13. Install a minimum 2" schedule 40 PVC piping between air pump and treatment unit. A minimum of 12" ground cover is recommended.
14. Turn power on to control panel. Air pump should start.
15. Check air piping joints for leakage using a soapy water solution. Repair if necessary and then carefully backfill air line and inlet and discharge piping and cover plant to grade level.
16. Recheck water level in the tank.
17. Plant is ready to receive incoming sewage. No special start-up procedures are required. The process is naturally occurring and does not require any special additives.
18. Test alarm circuit by momentarily squeezing air tubing and allowing air pressure to decrease. This should take a few minutes. Alarm should occur. Release air tubing and alarm should stop. Lift float in tank to horizontal position. Alarm should occur. Release float. Alarm should stop. The audible alarm can be turned off by flipping the toggle switch on the panel front door to the left.
19. Close cover on control panel and lock if necessary.
20. In the event that a fuse blows, replace with time delay or slow blow, 125 volt minimum voltage rating and the same amp rating as the existing fuse.
21. The distribution of air to all droplines must be uniform. If the air flow is not evenly distributed, check the air pump or the main air line.
22. Spend time with your customer whenever possible. Review operation instructions. Be sure that the customer has a manual to keep. This saves valuable time avoiding return visits.
23. Retain these instructions for future reference.
24. **⚠ WARNING: CONTROL PANEL CONTAINS HIGH VOLTAGE AND MUST BE INSTALLED AND SERVICED ONLY BY QUALIFIED PERSONNEL.**

DELTA ENVIRONMENTAL
RECOMMENDED INSTALLATION PROCEDURE

1. EXCAVATION:
Dig hole from the side for accurate sizing. This reduces the bridging distance between the tank and undisturbed soil and provides good support for inlet and outlet pipes. The bottom of the hole should be undisturbed and level. If leveling is necessary due to overexcavation, use sand for fill.

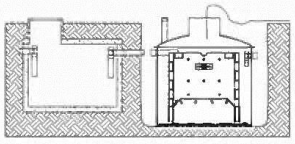


NOTE: Never place tank directly on rock. Place at least six inches of sand bedding between the tank and rock surface.



2. TANK PLACEMENT:
Use the backhoe to set the tank. Lifting lugs are furnished to lift the tank.

CAUTION: A small amount of soil or sand should be used around the bottom of the tank to hold it in place. Sand is best. If excavated soil is used, tamp it underneath the tank to provide a good base.



3. FILL TANK WITH WATER:
Place hose in 24" manway or 6" inch riser. Begin filling tank with water.

REV.	DATE	REVISION DESCRIPTION	BY

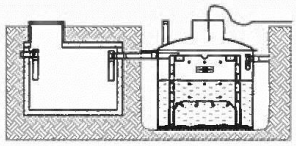
PENTAIR
DELTA ENVIRONMENTAL

INSTALLATION PROCEDURE

PLOT SCALE	DRAWING NUMBER	DRAWN BY	DATE	SHEET OF	REV
NTS	DEP034	D.WRIGHT	10/30/07	1 OF 3	A

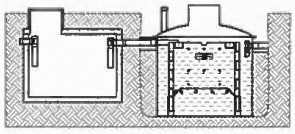
4. GFI CONTROLS AND AIR PUMP
Install duplex or quadruple GFI or GFI protected receptacles at the selected location of the air pump. Mount control panel and install fittings, tubing and piping to tank location.

CAUTION: Do not plug anything but the air pump into the control panel.



5. INLET/OUTLET AND AIR CONNECTIONS
Properly make solvent cemented inlet, outlet and air connections.

6. FILLING THE TANK
Finish filling tank with water until it drains out of outlet. Begin backfilling with natural soil or a good backfill material.

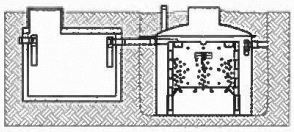


7. AIR DISTRIBUTION
Turn the air pump on and check all air connections and piping for air tightness.

NOTE: If electrical GFI receptacle has not been installed for checking air distribution system during installation, use an extension cord to run the air pump. Never leave the extension cord plugged in. Remove it after inspection is completed.

WARNING: Possible Fire Hazard

Do Not plug into main service equipment on power pole.



Do Not use extension cords.

8. FINAL BACKFILLING
Backfill should be mounded above grade slightly to allow for settling. Tamp the backfill beneath the inlet, outlet and air piping to provide good support.

REV.	DATE	REVISION DESCRIPTION	BY

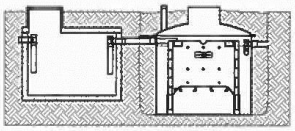
PENTAIR
DELTA ENVIRONMENTAL

INSTALLATION PROCEDURE

PLOT SCALE	DRAWING NUMBER	DRAWN BY	DATE	SHEET OF	REV
NTS	DEP034	D.WRIGHT	10/30/07	2 OF 3	A

9. TRIM INSPECTION RISERS

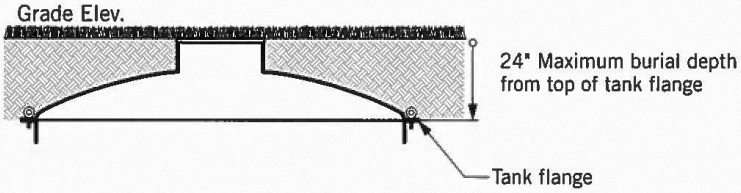
Trim inspection risers to proper length. The 4" aeration inspection riser also serves as a vent for the tank.

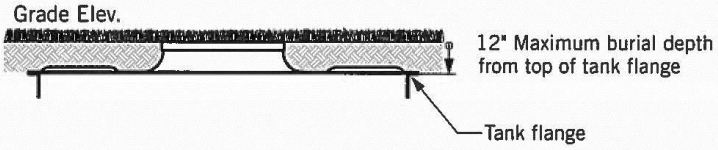


CAUTION: The bottom of the 4" aeration riser must be above the water level for both visual inspection and ventilation. Both of the optional 6" and 4" top caps must be above ground level to prevent groundwater from entering the risers.

CAUTION: Care must be taken not to push the optional 6" Clarifier Inspection Riser down too far. This may cause damage to the effluent discharge tee assembly and the clarifier.

CAUTION: Maximum burial depth for Delta fiberglass tanks – 2 feet from top of tank flange with dome or 24" manways and 1 foot from top of tank flange with flat lids. For burial depths beyond 2 feet, contact the factory. For further details refer to the installation manual.





REV.	DATE	REVISION DESCRIPTION	BY

PENTAIR

DELTA ENVIRONMENTAL

INSTALLATION PROCEDURE

PLOT SCALE	DRAWING NUMBER	DRAWN BY	DATE	SHEET OF	REV
NTS	DEP034	D.WRIGHT	10/30/07	3 OF 3	A

TROUBLESHOOTING GUIDE

Air Supply Malfunction

1. Check to be sure air distribution is working properly. This will be evident in the reactor as the liquid will be forcefully agitated. A septic (rotten egg) odor could mean that the system is not getting enough air. If the air system is not working, partially working or working very little (slight bubbles), check the following:
   a. Check to be sure the air pump is working.
      - Check timer if one is used.
      - Bypass timer temporarily and connect directly to source.
      - Check the electrical source.
      - If electrical source is okay, check service guide on pump unit for troubleshooting information.
      - Wash air filter on pump.
      - Consult manufacturer for servicing information.
   b. Check to be sure tank is not severely out of level. Air follows a path of least resistance. The pressure differences can be enough to restrict air flow.
   c. Check for broken or cracked air lines both outside and inside the tank.
   d. Ants will destroy an air pump. Check to see if there is an ant nest around the air pump.
   e. Air pump should be protected from rising water.
   f. Always check to see if inlet and outlet lines are correctly installed.

Internal Assembly Malfunction

1. Primary treated wastewater from the primary tank should not enter directly into the dilution zone because of improperly installed or loose seals or gaskets where pipe goes through the tank wall. Check the size of holes to be sure that there is no clearance for matter to pass through the wall around the piping.
2. Check to be sure all internal piping and connections are tight.

Design Overload

1. The system could be hydraulically overloaded (there is too much water going through the system for the size of the system).
2. The system could be biologically overloaded (there is too much waste for the size of the system).

Improper Installation or Settling

1. You should follow the manufacturer's installation procedures very carefully.
2. Where settling is common, approximately 2" of sand should be placed and tamped in the bottom of the hole.
3. Proper installation is the first step in preventing callbacks for service problems.
4. Whenever possible, it is important to spend time with the homeowner. Be sure they have an operations book. A few minutes invested in the beginning will avoid service calls later.

No Harsh Chemicals Should Be Put into the System

1. Water in the reactor tank should be relatively clear in both the reactor and dilution zones. Blue or gray/blue water indicates heavy use of detergents or other chemicals. If water appears sudsy there is too much detergent being used.
2. Water in the dilution zone should be clear. Water is discharged into the discharge tee at a minimum of 6–8 inches below water surface. You MAY NOT be able to see clear water by looking into the tank. Samples must be taken at the sample port.
3. Oils and grease should be kept to a minimum. Grease tends to form in white balls.

Troubleshooting Electrical System

1. Air pump does not run:
   a. Check main service for power.
   b. Check and/or replace fuse with same rating as in control panel.
2. Alarm does not occur when air pump is off:
   a. Malfunctioning pressure switch – replace.
   b. Malfunctioning light or buzzer – replace.
3. Alarm occurs continuously even when air pump is running:
   a. Air leak in main air system or air tubing to pressure switch – repair leak or replace air line.
   b. Malfunctioning pressure switch – replace.
   c. High water level in tank – inspect for cause.
   d. Short in float switch wire or float switches – repair or replace.

NOTE: ALL REPLACEMENT PARTS ARE AVAILABLE FROM YOUR LOCAL DISTRIBUTOR.

⚠ CAUTION: ELECTRICAL SHOCK OR HAZARD MAY OCCUR IF UNIT IS NOT SERVICED PROPERLY. THE MANUFACTURER RECOMMENDS THAT A LICENSED ELECTRICIAN BE CALLED WHEN ELECTRICAL PROBLEMS OCCUR.

COMPONENT REPLACEMENT PROCEDURE

1. **Air Pump** – Follow the same procedure as outlined in the "Installation Instructions."
2. **Float Switch** – Remove Treatment Plant's Riser or 24" cover. Locate float switch cable. Untie knot. Cut float switch cable. Slip float switch cable through rubber grommet into the plant. Replace with exact replacement float switch. Reinstall by reversing the procedure. Reconnect float switch wires using underground rated compound filled wire nuts. **See Float Switch Mounting Details. (Applicable only with float switch option.)**
3. **Pressure Switch** – Turn all power off to the control panel. Remove screws securing pressure switch as well as connectors and tubing. Reverse procedure to install new pressure switch.
4. **Buzzer** – Turn all power off to the control panel. Remove screw attaching buzzer to back plate as well as connectors. Reverse procedure to install new buzzer.
5. **Lamp Holder** – Turn all power off to control panel. Remove lock nut securing lamp holder to door as well as connectors. Remove lamp holder. Install new lamp holder with gaskets furnished. Continue with reverse procedure.

6. **Lamp** – Turn all power off to control panel. Remove red lamp cover from front of control panel. Remove and replace lamp, which is a push-in type. Replace lamp cover and cover gasket.
7. **Fuse** – Turn all power off to control panel. Pull top of fuse holder outward. Remove and replace fuse. Push fuse back into place.
8. **Buzzer Switch** – Turn all power off to control panel. Remove rubber boot on switch. Remove hex nut from switch on panel front as well as connectors on switch. Reverse procedure to install new switch.

GENERAL COMMENTS

1. Only factory approved equipment can be used for replacement on individual treatment systems.
2. If the decision is made to pump out a system, be sure to contact a licensed waste hauler.
3. If a chronic problem develops and all items have been checked, consult with the factory.
4. Taking pictures of systems when troubleshooting will help document activity in the field.
5. Keep good records.

NOTE: IF THE ENTIRE COVER NEEDS TO BE REMOVED ON ANY ONE OF THE VARIOUS MODEL TREATMENT PLANTS, THE EXISTING SILICONE OR STRIP SEAL MUST BE REMOVED AND REPLACED WITH A NEW ONE. THIS WILL PROVIDE A POSITIVE SEAL WHICH WILL NOT ALLOW ANY INFILTRATION INTO OR OUT OF THE TREATMENT PLANT.

ECOPOD-N Unit Specifications

Treatment Plant	Treatment Capacity (GPD)	Minimum Primary Tank Total Volume (Gal)	Reactor Tank Volume (Gal)	Reactor Tank Dilution Volume (Gal)	Media Size	Air Requirements
E50N	500	500	710	590	2'x2'x4'	12 CFM
E60N	600	600	916	736	3'x2'x4'	14.4 CFM
E75N	750	750	1090	910	3'x2'x4'	18 CFM
E100N	1000	1000	1405	1165	4'x2'x4'	24 CFM
E150N	1500	1500	2100	1740	6'x2'x4'	36 CFM

MATERIALS OF CONSTRUCTION

Suffix FF	Reactor Tank	Fiberglass
	Cover	Fiberglass
	Media Container	Fiberglass / Polyethylene
Suffix CA	Reactor Tank	Concrete
	Cover	Concrete
	Media Container	Fiberglass / Polyethylene

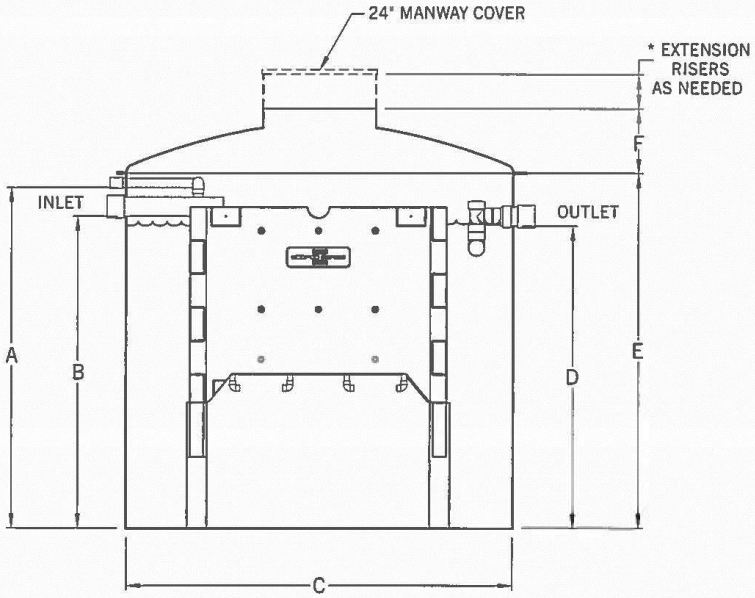
These are standard production units. Other configurations are available upon request.

ECOPOD-N Electrical Requirements

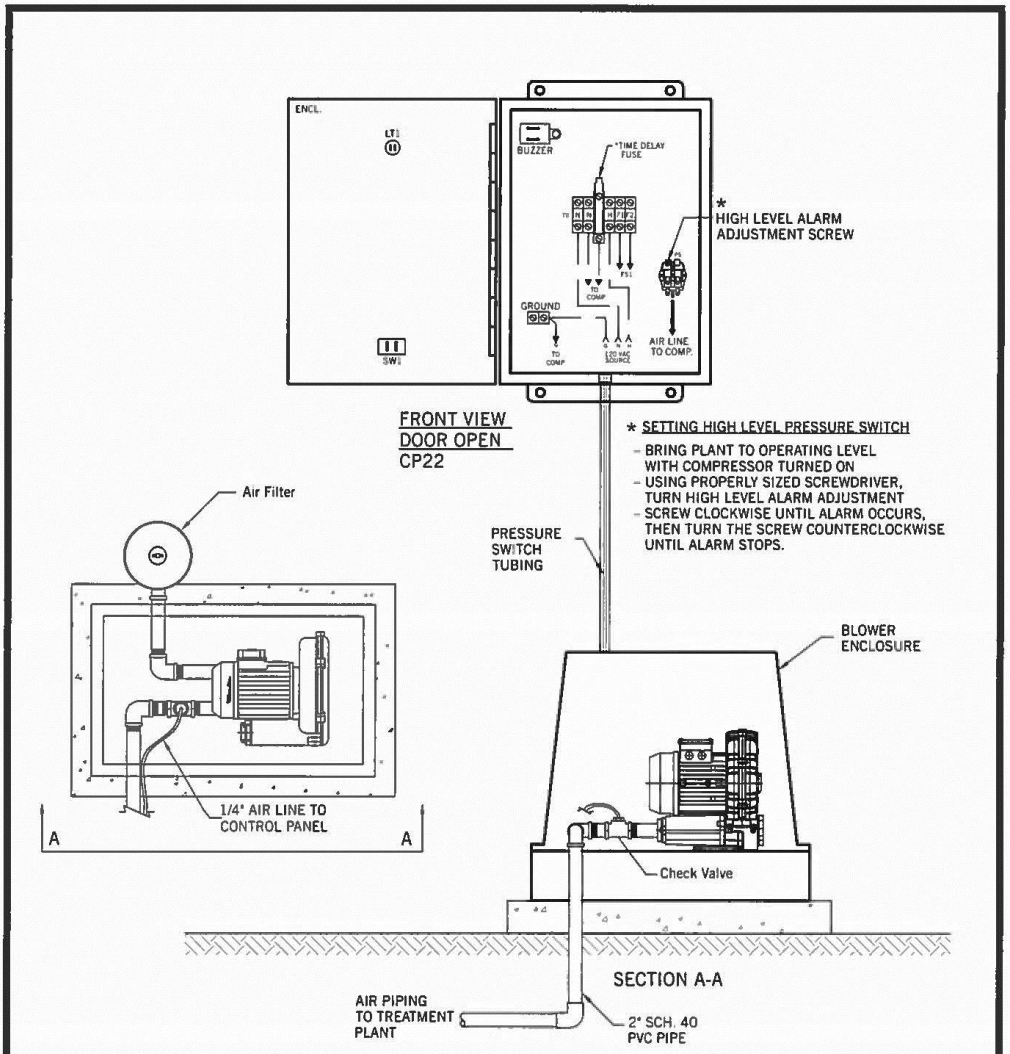
Model	Compressor	Motor Full Load Amps	Measured Operating Watts	Electrical Requirements
E50N	Delta Model 06	3.5	185	115 volt – single phase
E60N	Delta Model 06	4.7	280	115 volt – single phase
E75N	Delta Model 06	4.7	280	115 volt – single phase
E100N	Delta Model K03	7.1	475	115 volt – single phase
E150N	Delta Model K03	7.1	475	115 volt – single phase

ECOPOD-N Dimensions

Treatment Plant	A	B	C	D	E	F
E50N	4' 10"	4' 2"	5' 6"	4' 0"	5' 0"	1' 5"
E60N	4' 10"	4' 6"	6' 0"	4' 4"	5' 0"	1' 5"
E75N	5' 7"	4' 11"	6' 3"	4' 9"	5' 9"	1' 6"
E100N	6' 0"	5' 5"	6' 9"	5' 3"	6' 2"	1' 6"
E150N	6' 2"	5' 9"	8' 0"	5' 7"	6' 4"	1' 9"



* REFERENCE SHEET 3 OF INSTALLATION PROCEDURE FOR MAX BURIAL DEPTH



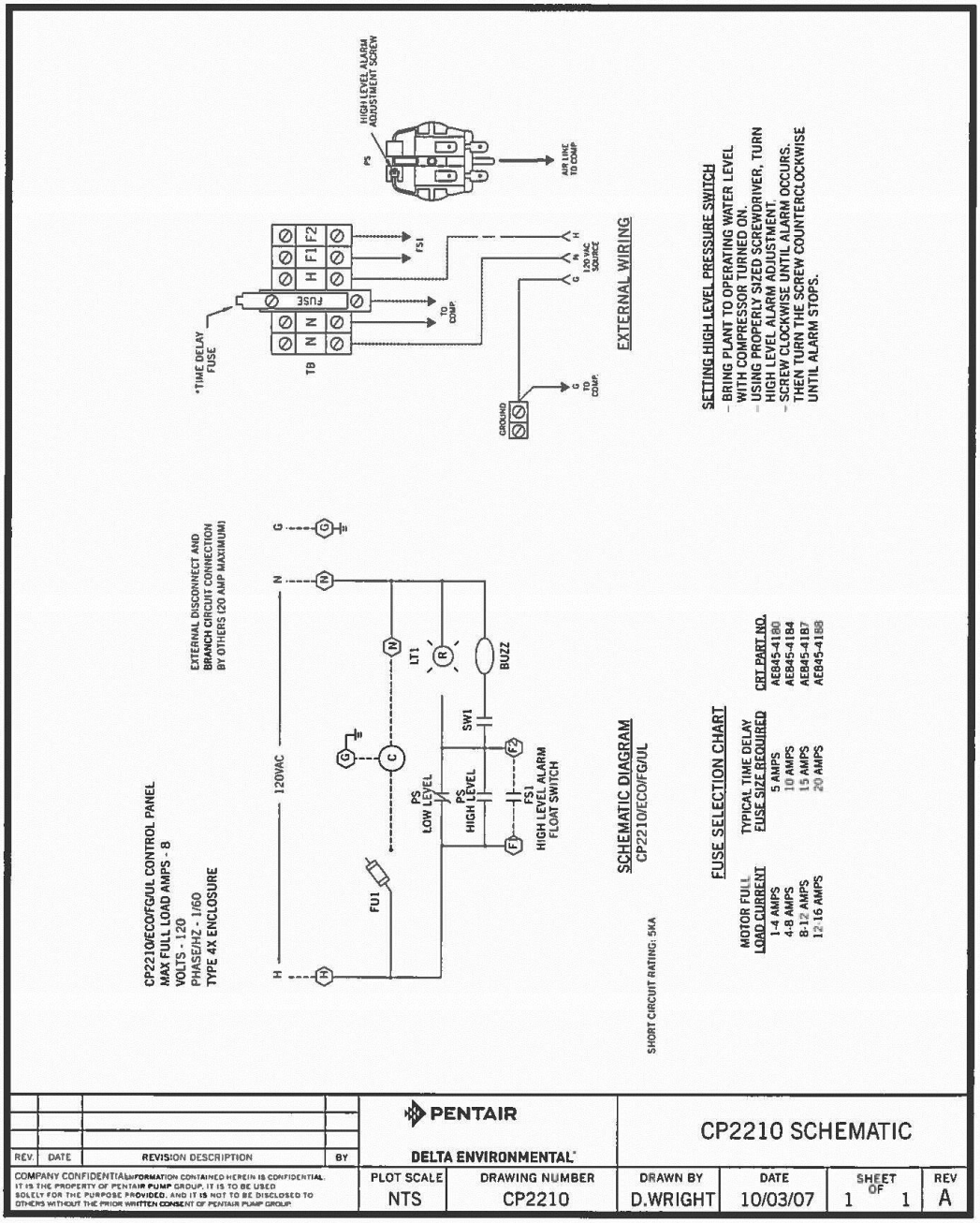
REV.	DATE	REVISION DESCRIPTION	BY

PENTAIR

DELTA ENVIRONMENTAL

CONTROL PANEL CONNECTION

PLOT SCALE	DRAWING NUMBER	DRAWN BY	DATE	SHEET	REV
NTS	CP CON REGEN	D.WRIGHT	10/31/07	1 OF 1	B

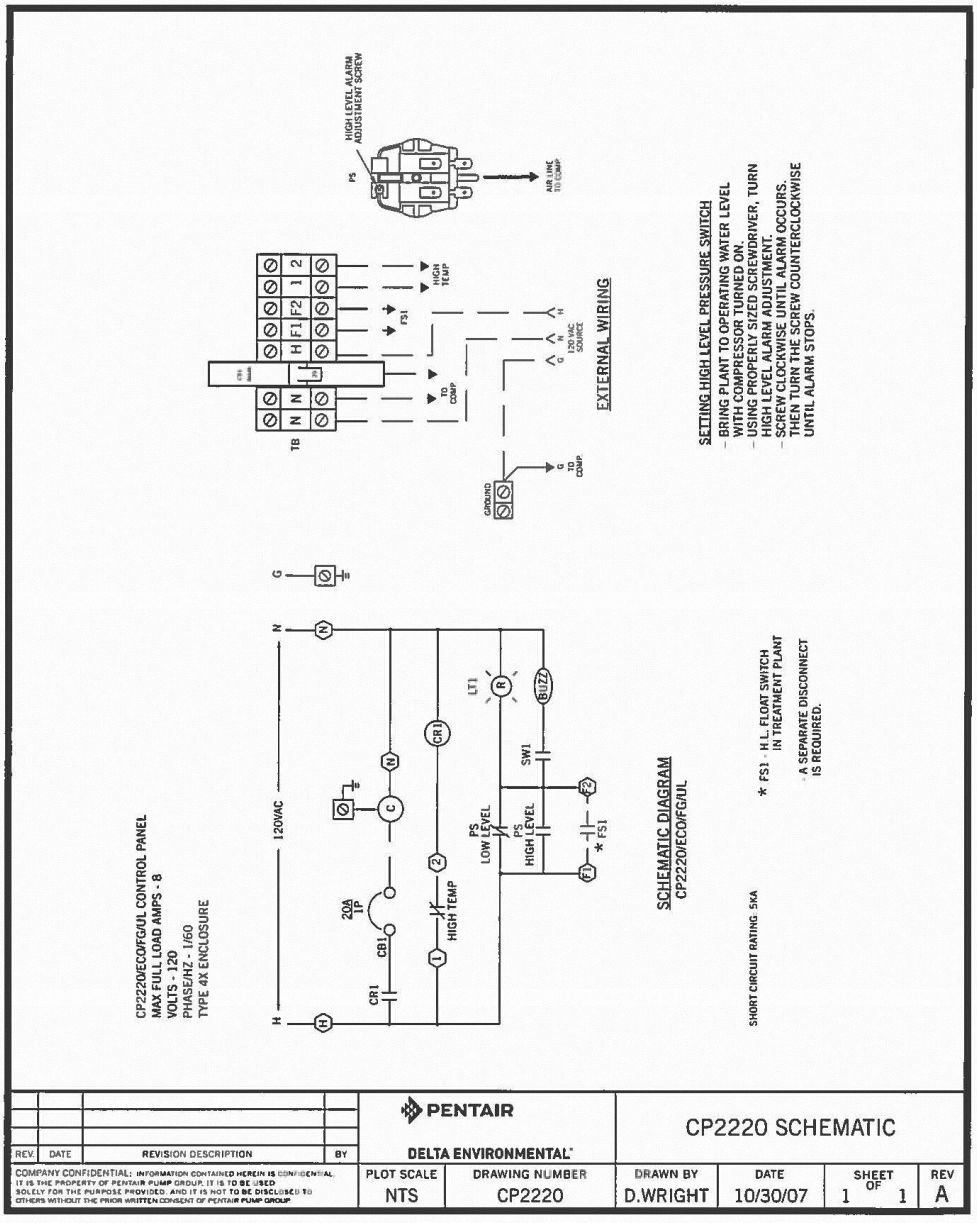


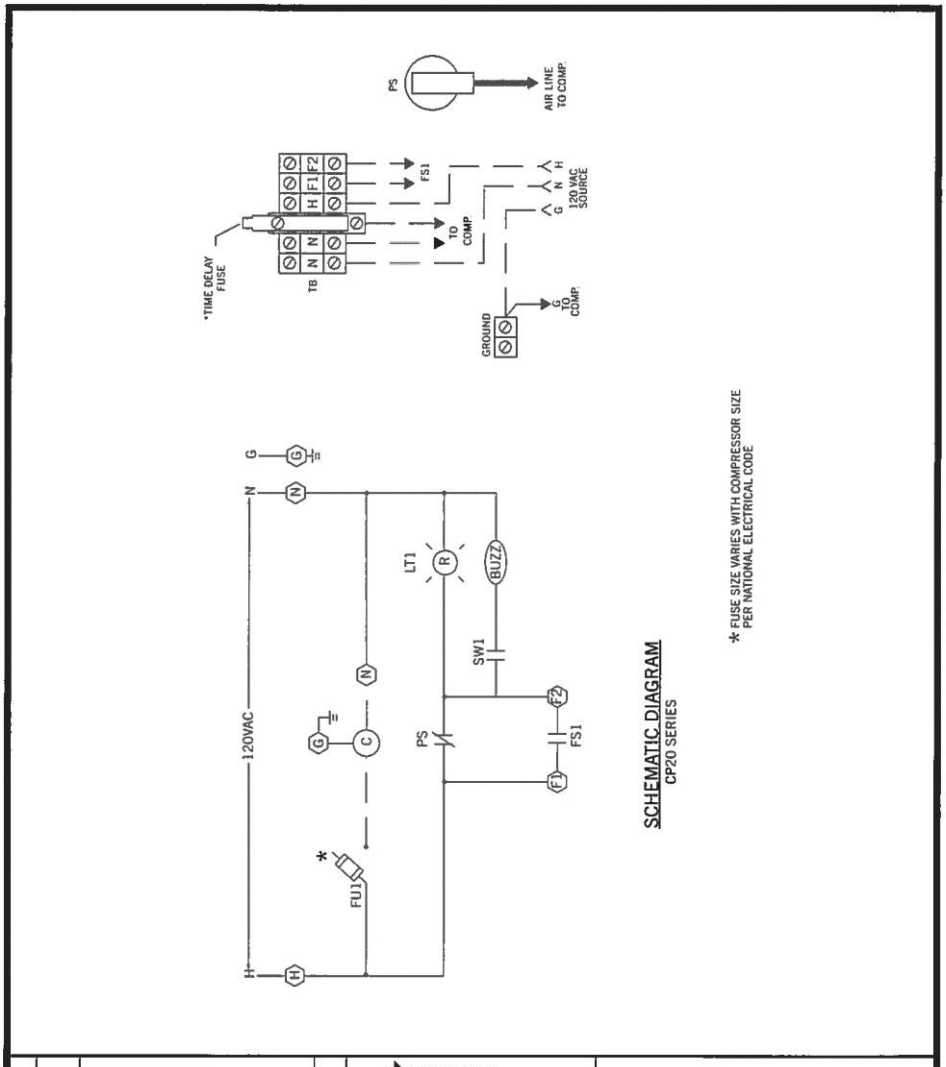
REV.	DATE	REVISION DESCRIPTION	BY

PENTAIR
DELTA ENVIRONMENTAL®

CP2210 SCHEMATIC

PLOT SCALE	DRAWING NUMBER	DRAWN BY	DATE	SHEET	REV
NTS	CP2210	D.WRIGHT	10/03/07	1 OF 1	A


CP2220/ECO/FG/UL CONTROL PANEL
MAX FULL LOAD AMPS - 8
VOLTS - 120
PHASE/HZ - 1/60
TYPE 4X ENCLOSURE
120VAC
SCHEMATIC DIAGRAM
CP2220/ECO/FG/UL
EXTERNAL WIRING
SETTING HIGH LEVEL PRESSURE SWITCH
- BRING PLANT TO OPERATING WATER LEVEL WITH COMPRESSOR TURNED ON.
- USING PROPERLY SIZED SCREWDRIVER, TURN HIGH LEVEL ALARM ADJUSTMENT SCREW CLOCKWISE UNTIL ALARM OCCURS. THEN TURN THE SCREW COUNTERCLOCKWISE UNTIL ALARM STOPS.
* FS1 H.L. FLOAT SWITCH IN TREATMENT PLANT
- A SEPARATE DISCONNECT IS REQUIRED.
SHORT CIRCUIT RATING: 5KA
PENTAIR
DELTA ENVIRONMENTAL
CP2220 SCHEMATIC
REV. DATE REVISION DESCRIPTION BY
COMPANY CONFIDENTIAL: INFORMATION CONTAINED HEREIN IS CONFIDENTIAL. IT IS THE PROPERTY OF PENTAIR PUMP GROUP. IT IS TO BE USED SOLELY FOR THE PURPOSE PROVIDED AND IT IS NOT TO BE DISCLOSED TO OTHERS WITHOUT THE PRIOR WRITTEN CONSENT OF PENTAIR PUMP GROUP
PLOT SCALE NTS
DRAWING NUMBER CP2220
DRAWN BY D.WRIGHT
DATE 10/30/07
SHEET 1 OF 1
REV A

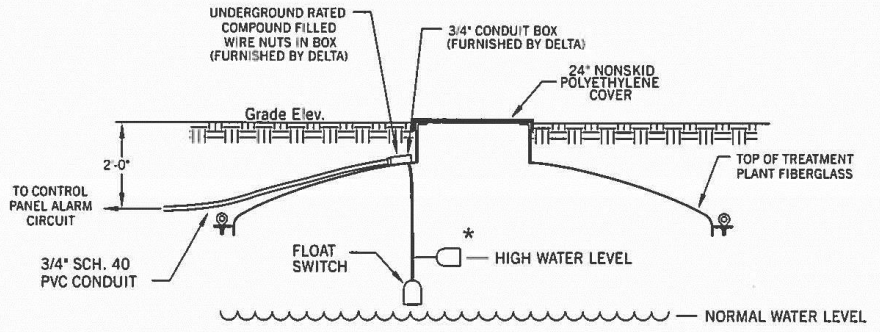


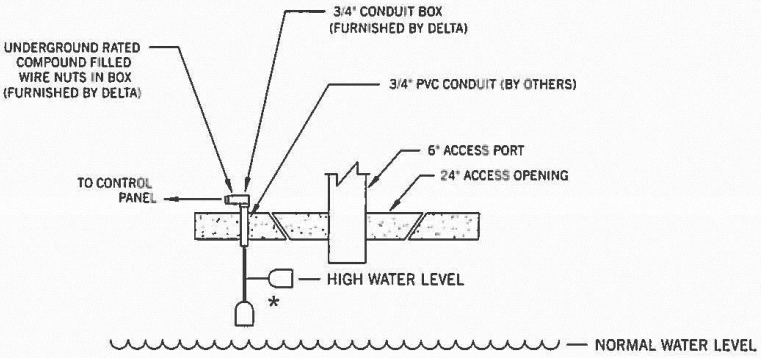
REV.	DATE	REVISION DESCRIPTION	BY

PENTAIR
DELTA ENVIRONMENTAL

CP20 SCHEMATIC

PLOT SCALE	DRAWING NUMBER	DRAWN BY	DATE	SHEET	REV
NTS	CP20	D.WRIGHT	04/09/03	1 OF 1	A





ENTRANCE INTO CONCRETE TANK

NOTES:

1. GROMMET TO BE SELECTED FOR TIGHT FIT AROUND CABLE AND IN LID.
2. WIRE TO CONTROL PANEL TO BE 18 GAUGE AND RATED FOR DIRECT BURIAL SERVICE. WOODS WIRE-886 OR EQUAL.
3. WIRE NUTS TO BE RATED FOR UNDERGROUND SERVICE IDEAL-DB PLUS MODEL 60 OR EQUAL.
4. FLOAT SWITCH TO BE NORMALLY OPEN MDI-2900-B8S13B OR EQUAL.
5. SMALL ACCESS PORT SHOWN ON DRAWING; LARGE ACCESS PORTS MAY BE SUPPLIED.
6. MINIMUM AMOUNT OF CONDUIT SHOWN ABOVE IS REQUIRED EVEN WITH TYPE UF CABLE.

* HIGH LEVEL FLOAT NOT REQUIRED WHEN USING CP22 SERIES CONTROL PANELS

REV.	DATE	REVISION DESCRIPTION	BY

PENTAIR
DELTA ENVIRONMENTAL®

FLOAT SWITCH MOUNTING (TO USE W/ CP20 PANEL)

PLOT SCALE	DRAWING NUMBER	DRAWN BY	DATE	SHEET OF	REV
NTS	DWG NO	D.WRIGHT	05/18/09	1 OF 1	A

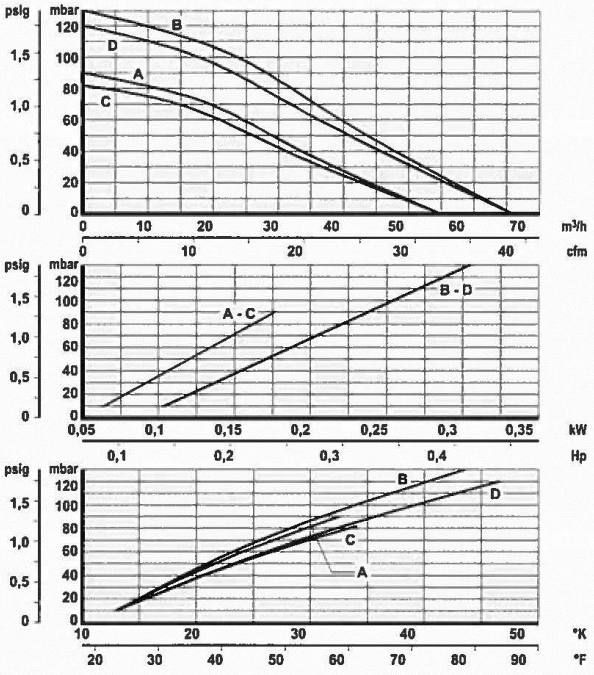
F.P.Z. GmbH
Killanstraße 142
90425 NÜRNBERG
Tel. 0911.36.76.68.00
Fax 0911.36.76.68.01
E-mail deutschland@fpz.com

effepizeta

LATERAL CHANNEL BLOWERS - EXHAUSTERS

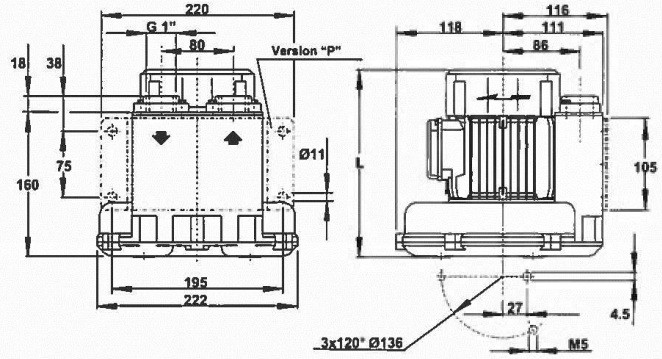
SCL 06 MOR

SN 1750-0



	P (1) kW	Δp (2) mbar	psig	Q (3) m³/h	cfm
COMPRESSOR					
A	50 Hz - 2900 rpm				
	0.2	90	1.30	0	0
B	60 Hz - 3500 rpm				
	0.23	80	1.16	32	19
	0.4	130	1.88	0	0
EXHAUSTER					
C	50 Hz - 2900 rpm				
	0.2	82	1.18	0	0
D	60 Hz - 3500 rpm				
	0.23	80	1.16	28	16
	0.4	120	1.74	0	0

kW 50 Hz - 60 Hz	H	m Kg
0.2 - 0.23	235	6.5
0.4	235	7.1



MAXIMUM NOISE LEVEL	Lp dB(A)
50 Hz - 2900 rpm	58
60 Hz - 3500 rpm	59

To allow the perfect performing of the machine, it has to be equipped with the INLET FILTER and the SECURITY VALVE AT LEAST; other accessories available on request.

(1) Installed power.
(2) Maximum differential pressure referred to installed motor.
(3) Inlet flow at max differential pressure per installed motor.

The characteristics data given, refer to the handling of gas with inlet temperature of 15°C, normal density of 1,23 kg/m³ and absolute pressure of 1013 mbar in suction in case of performing as compressor, in discharge in case of performing as exhauster. Dimensions in mm. Noise level measured at 1 m distance with in/outlets piped. Tolerance on given values ±10% - unbinding and can be changed without prior notice.

® **FPZ, Inc**
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Saukville, WI 53080 - U.S.A.
Tel. (262) 268-0180
Fax (262) 268-0415
E-mail usa@fpz.com

REGENERATIVE BLOWERS - **PRESSURE**

SCL K03 / K04 / K05 / K06

MS SERIES - MOR RANGE

SN 1874-8 1/2

TECHNICAL CHARACTERISTICS

- Aluminum alloy construction
- Smooth operation
- High efficiency impeller
- Maintenance free
- Mountable in any position
- Recognized TEFC - cURus motor

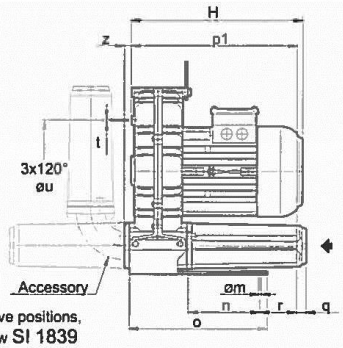
OPTIONS

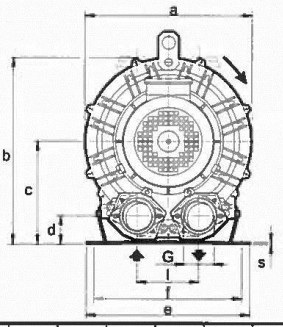
- Special voltages (IEC 38)
- Surface treatments

ACCESSORIES

- Inlet and/or inline filters
- Additional inlet/outlet silencers
- Safety valves
- Flow converting device
- Optional connectors

Dimensions in inches.
Dimension for reference only.





Possible alternative positions, please refer to drw SI 1839

Model	a	b	c	d	e	f	G	l	m	n	o	p1	q	r	s	t	u	z
K03-MS	9.49	10.55	5.79	1.69	9.06	8.07	1"1/4 NPT	3.39	0.39	3.27	5.59	8.07	0.71	2.95	0.16	M6	5.51	0.47
K04-MS	11.22	12.40	6.77	1.93	10.04	8.86	1"1/2 NPT	4.02	0.47	3.74	6.73	8.74	0.71	2.76	0.16	M6	6.89	0.71
K05-MS	12.87	14.37	7.87	2.13	12.60	10.24	2" NPT	4.72	0.59	4.53	10.43	12.60	0.71	3.86	0.16	M8	7.87	0.75
K06-MS	14.80	15.47	8.07	2.13	12.80	11.42	2" NPT	4.92	0.59	5.51	10.71	13.15	0.71	3.35	0.16	M8	9.45	0.75

Model	Maximum flow Scfm		Installed power Hp		Maximum differential pressure △p (In WG)		Noise level Lp dB (A) (1)		Overall dimensions H	Weight
	60 Hz 3500 rpm	*50 Hz 2900 rpm*	60 Hz 3500 rpm	*50 Hz 2900 rpm*	60 Hz 3500 rpm	*50 Hz 2900 rpm*	60 Hz 3500 rpm	*50 Hz 2900 rpm*	Inches	Lbs
K03-MS	52	*43*	3/4	*3/4*	64	*60*	62.0	*60.0*	10.43	24.30
			1	*1*	95	*77*	62.3	*60.3*	11.97	26.50
K04-MS	98	*81*	1 ½	*1 ½*	58	*80*	64.8	*62.8*	11.65	36.40
			2	*2*	85	*100*	65.0	*63.0*	13.78	43.00
			3	-	120	-	65.2	-	13.78	49.60
K05-MS	156	*129*	2	*2*	52	*70*	70.5	*68.5*	13.20	51.80
			3	*3*	90	*110*	70.8	*68.8*	13.20	58.40
			4	*4*	128	*120*	71.1	*69.1*	14.40	67.20
K06-MS	216	*179*	3	*3*	50	*65*	73.0	*71.0*	13.54	68.70
			4	*4*	75	*95*	73.3	*71.3*	14.17	71.65
			5 ½	*5 ½*	110	*140*	73.6	*71.6*	14.17	77.60
			6 1/5 (2)	-	132	-	73.9	-	14.45	77.60

(1) Noise measured at 1 m distance with inlet and outlet ports piped, in accordance to ISO 3744.
(2) No cURus motor

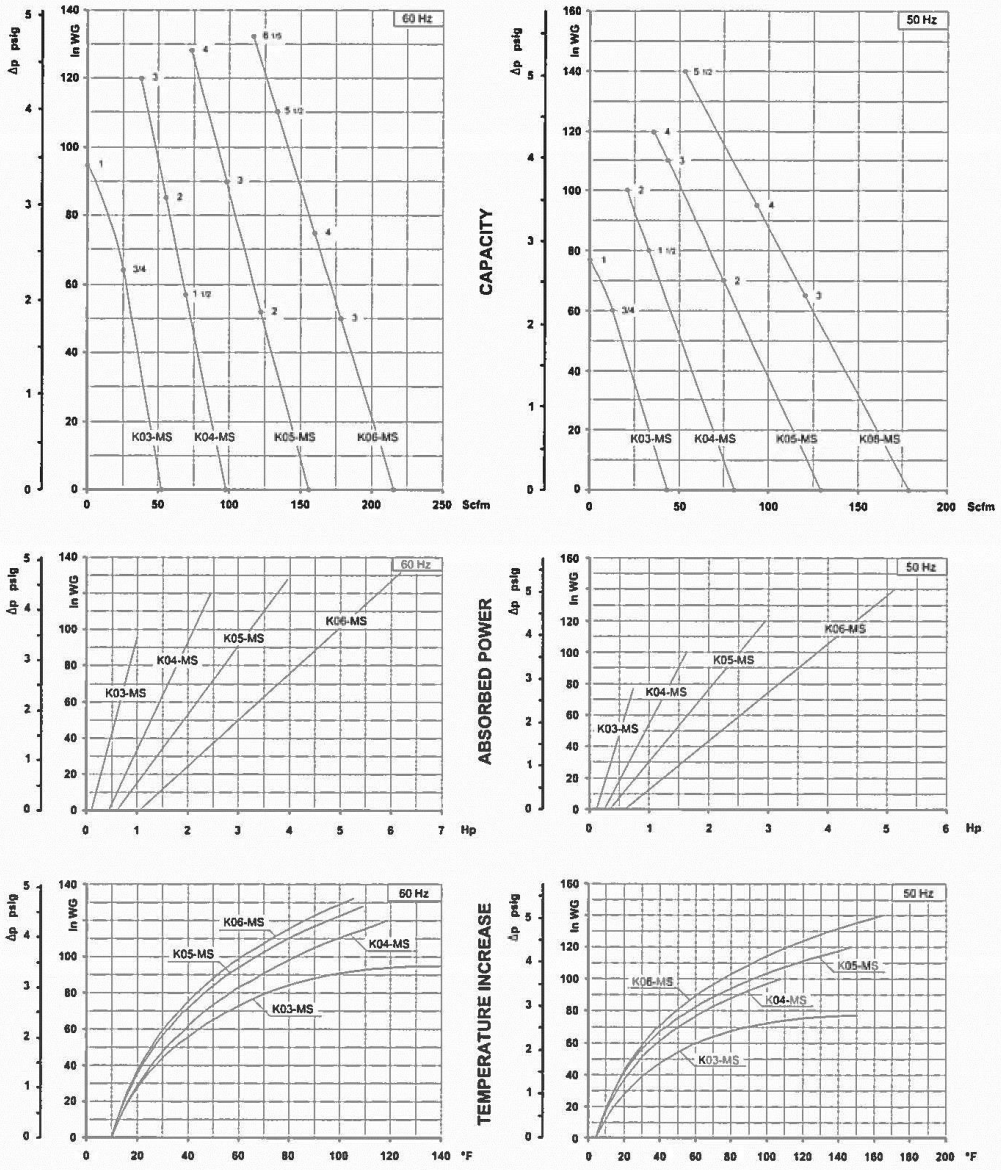
- For proper use, the blower should be equipped with inlet filter and safety valve; other accessories available on request.
- Ambient temperature from +5° to +104°F.
- Specifications subject to change without notice.

REGENERATIVE BLOWERS - **PRESSURE**

SCL K03 / K04 / K05 / K06

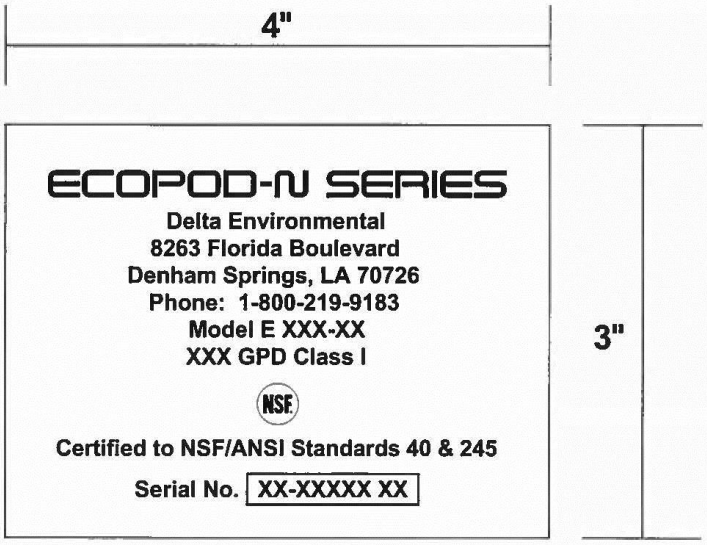
MS SERIES - MOR RANGE

SN 1874-8 2/2



Curves refer to air at 68°F temperature and 29.92 In Hg atmospheric pressure (abs) measured at inlet port.
Values for flow, power consumption and temperature rise: +/-10% tolerance.
Data subject to change without notice.

ECOPOD-N SERIES DATA PLATES



DELTA ENVIRONMENTAL
INDIVIDUAL MECHANICAL WASTEWATER TREATMENT SYSTEM
SERVICE POLICY

INITIAL POLICY:

A two year initial service policy shall be furnished to the user by the manufacturer or the distributor through the dealer. This policy is to be included in the purchase price from the seller of the system and shall provide the following:

1. **An inspection/service call every six months,** which includes inspection, adjustment, and servicing of the mechanical and electrical component parts as necessary to ensure proper function.
2. An effluent quality inspection every six months consisting of a visual check for color, turbidity, scum overflow, and an examination for odors.
3. If any improper operation is observed that cannot be corrected at that time, the user shall be notified immediately in writing of the conditions and the estimated date of correction. **THIS POLICY DOES NOT INCLUDE PUMPING SLUDGE FROM UNIT IF DEEMED NECESSARY.**

CONTINUING SERVICE POLICY:

An annually renewable service policy affording the same coverage as the Initial Service Policy is available. Consult your dealer for pricing information.

PARTS:

Replacement parts or components may be obtained from your local distributor or contact Delta Environmental for information.

COMPLAINTS:

In order for Delta Environmental to properly address complaints, we require that you put in writing the date and nature of the complaint as detailed as possible. This MUST include the serial number of your system.

Send to: Delta Environmental
8263 Florida Blvd.,
Denham Springs, LA 70726

Pentair Water
Flow Technologies
8263 Florida Blvd.
Denham Springs, LA 70726
225.665.6162
225.664.9467 Fax
800.219.9183 Toll Free

Delta Environmental™
Pentair Water

ECOPOD LABOR TIME ESTIMATES FOR OPERATION & MAINTENANCE

Items to be checked for proper mechanical and electrical operation every 6 months

Item	Every Six Months
Visually Inspect Control Panel Operation	**30 Minutes**
Visually Inspect Air Blowers Operation	
Visually Inspect Optional Influent/Effluent Pump Operation	
Check Sludge Levels in Primary Tanks and Dilution Tank	

Estimated Pump-Out Schedule:

Waste total volume, once every three to five years

Power Consumption:

E50N, E60N, E75N – 1/3 HP 24 hours of run time per day
E100N, E150N – 3/4 HP 24 hours of run time per day

Appendix III

Riley County Alternative Private Wastewater Disposal System Inspection Report

Riley County Alternative Private Wastewater Disposal System Inspection Report

Inspection Date #1: _____ Serviced by: _____
Name: _____ _____
Address: _____ Permit # _____

Equipment	***Yes***	***No***	***Results***
Alarm(s) (tested) (*energized and silenced*)			
Blower Filter & Vents (cleaned)			
Blower excessive noise			
Blower Amperage (amp)			
Blower Voltage (120 volts)			
Lift station filter (replaced)			
Elapsed time meter or cycle counter (hours)			
Lateral field pressure (psi)			
Air release valve (operational)			
Biological / Chemical			***Results***
30- Minute Settleability (range 200 to 600 ml)			
Aeration tank color (tan color)			
Odor (normal is musty)			
pH (range 6.0 – 9.0)			
Dissolved Oxygen (above 2.0 mg/l)			
Effluent Discharge from the Aeration Tank (clear and odorless)			
Tank Requires Pumping (Sludge Judge Reading)	***Yes***	***No***	***If Yes, Then Date Pumped***
Primary (18" maximum)			
Secondary (4" maximum)			
Lift station (4" maximum)			
Septic System Overview	***Yes***	***No***	
Inspection Ports Checked			
Lateral Field Surfacing			
Tank Water Tight			
Damage due to excessive weight loading to the system			
Repair Permit Required			

Appendix IV

ORENCO Sand/Shale Alternative Private Wastewater Disposal System Service Manual

Operation & Maintenance

For Standard Intermittent Sand Filter Kits (w/o distributing valves)

Orenco Systems®
Incorporated
1-800-348-9843

Important names and phone numbers

Service Person:_____ Phone: _____

_____

Installer:_____ Phone: _____

_____

Electrician:_____ Phone: _____

_____

Regulating agency:_____ Phone: _____

_____

Designer:_____ Phone: _____

_____

Orenco sand filter kit model #: _____

Residual head (squirt height) at startup: _____

Programmable timer settings: "ON"_____ "OFF"_____

Float settings from top of dosing tank: alarm/timer override _____ inches
timer off _____ inches
red. off/low level alarm_____ inches

Distance from top of sand filter pump basin (SFPB) to "ON" level:_____ inches

Distance from top of SFPB to bottom of treatment sand:_____ inches

NIM-OM-ISF-1
Rev 1.1 © 5/03

O&M Manual: *Standard Intermittent Sand Filter Kits*

Table of Contents

Important: *Attach as-built drawings and pumping equipment component information to back of this manual.*

O&M Manual: *Standard Intermittent Sand Filter Kits*

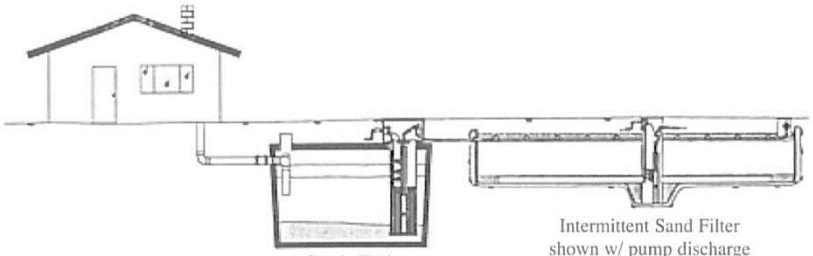
Introduction

Intermittent Sand Filter Systems for Treatment of Residential Sewage

The intermittent sand filter (ISF) system concept

Figure 1 below illustrates the general layout of an intermittent sand filter (ISF) system serving a home. Normally, the entire system is buried except for the fiberglass lids at ground level for maintenance access.

Figure 1: Typical Residential ISF System



The following describes the path the sewage takes through the system.

- Raw sewage from the home flows by gravity into the septic tank where the heavy solids settle to the bottom of the tank and the light solids float to the top of the tank. A relatively clear zone forms between the floating solids (scum) and the settled solids (sludge).
- A pump system suspended in the outlet end of the septic tank pumps liquid effluent from the clear zone of the tank to the sand filter. PVC plastic piping evenly distributes the effluent over the surface of the specially-graded sand. Small particles and other contaminants in the effluent are mechanically, biologically, and chemically reduced as the effluent passes down through the sand.
- The treated effluent is collected at the bottom of the sand filter in an underdrain from which it passes by gravity or is pumped for final treatment and disposal, usually in some type of soil absorption system.

The installer of the system should provide to the user exact drawings of the layout and construction of system. These drawings should be attached at the end of this manual.

Benefits of using an ISF system

An ISF system produces very high quality effluent, much superior to that which is discharged by a septic tank alone. In many localities, this higher degree of treatment is required to protect ground water, surface waters, and public health. Sites that have poor soil conditions, poor drainage, high ground water, or sensitive surface waters are potential candidates for sand filter installations. Because ISF effluent is highly treated, many cities and counties allow substantial reduction in the area they require for disposal. Additionally, some localities allow ISF treated water to be reused for subsurface landscape irrigation.

Operation

Components and automatic operation of the ISF system

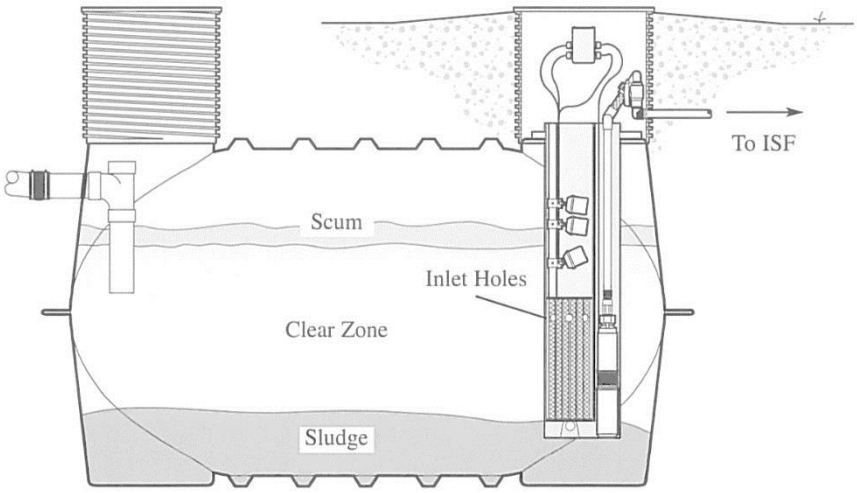
The septic tank

Figure 2 below illustrates a septic tank with a pump system installed. The septic tank is a structurally sound, watertight vessel that accepts raw sewage from a home. In the tank, the heavy solids in the sewage fall to the bottom of the tank to form the sludge layer and the light solids in the sewage float to the top of the tank to form the scum layer. The septic tank is very efficient in digesting the sewage. In fact, more than 40% of the overall sewage treatment takes place in the tank. Solids accumulate slowly in the tank over many years and have to be pumped out periodically. Please refer to the monitoring and maintenance section for further discussion.

The septic tank pump system

Figure 3 on the following page illustrates the pump system. It is installed at the outlet end of the septic tank so that the pump system's inlet holes can draw from the clearest zone in the tank. As effluent enters the PVC vault through the inlet holes, the Biotube® filter cartridge prevents solids larger than 1/8th inch from getting to the pump, thus allowing the discharged effluent to be substantially free of solids.

Figure 2: Single Compartment Dosing Septic Tank



Operation

The pump system consists of 7 main components:

1. **PVC riser with fiberglass lid** — provides ground-level access for servicing equipment and septage pumping.
2. **Electrical splice box** — provides an approved, safe method for wiring the pump and float assembly.
3. **Float assembly** — controls the minimum and maximum liquid levels in the tank and sends alarm signals to the control panel under certain conditions.
4. **Biotube® screened pump vault** — provides the method for filtering the effluent and contains the pump and float assembly.
5. **Discharge assembly** — connects the pump to the piping outside the tank and usually includes a ball valve and union for removal and maintenance.
6. **High-head effluent pump** — pumps the filtered effluent to the sand filter.
7. **Control panel** — provides electrical control of the pump system. Figures 4 and 5 show examples of "single-pump" and "double-pump" sand filter control panels.

The septic tank pump system's operation is automatic, being controlled by the float assembly and by the programmable timer (PT) in the control panel. Under normal operating conditions, the liquid level in the tank is maintained between the top two floats (Figure 3). The PT turns the pump on for short periods of time throughout the day as long as the liquid level is between the top two floats. This allows small volumes of effluent to be dosed to the sand filter, evenly spread out over a 24-hour period.

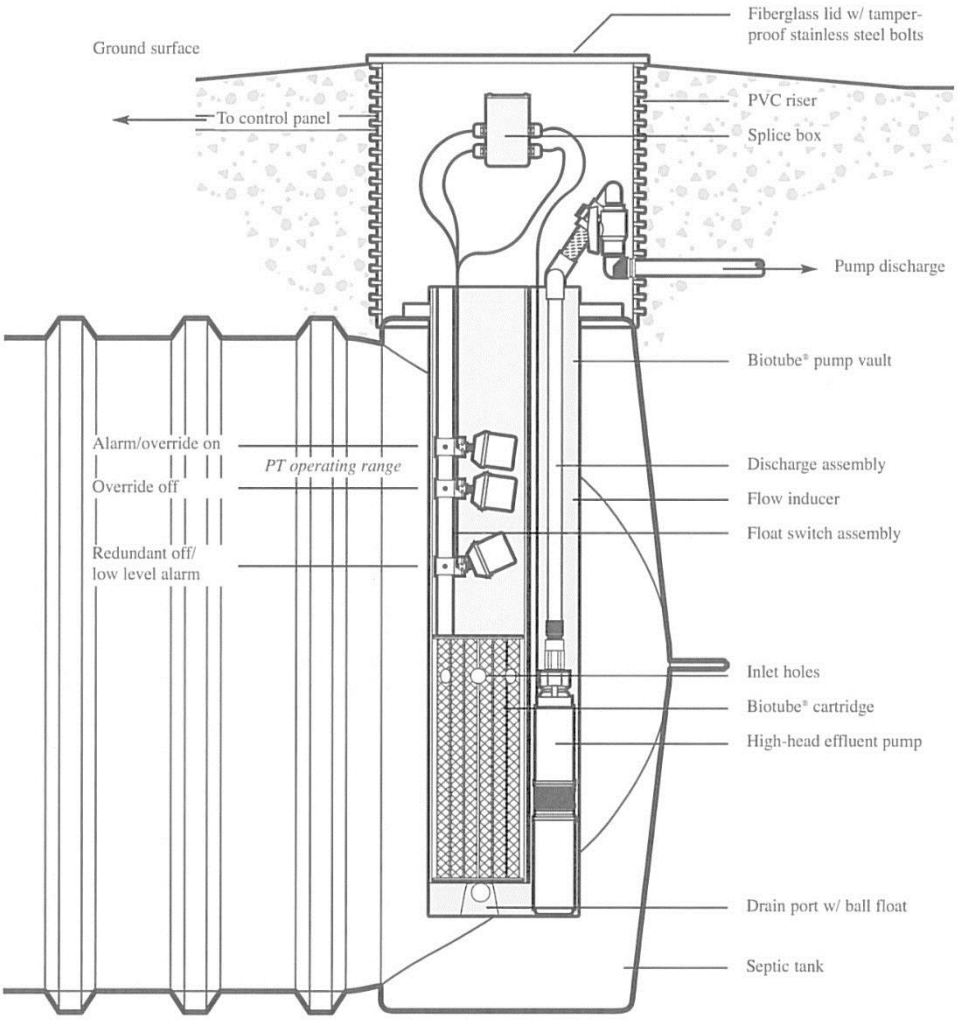
When the liquid level in the tank drops to the second or "timer off" float, the programmable timer is temporarily deactivated, preventing any effluent from being pumped out of the tank until flow into the tank raises the liquid level again. This usually happens once or more each 24-hour period, normally during the middle of the day and at night when little water is being used.

In the event that the liquid level rises to the top or "high level alarm/timer override" float, the pump will come on (overriding the PT) and an alarm on the control panel will sound. The pump runs only for a few minutes, just long enough to drop the liquid level 2.5 to 3 inches. The system then returns to PT operation and the alarm resets itself once the override condition is over. Please refer to page 17 of this manual for troubleshooting alarms.

The bottom float is called the "redundant off/low level alarm" float and is only activated during a problem situation. If the liquid level drops to this bottom float, an alarm will sound on the control panel and the pump will shut off (if it's running). Please refer to page 17 of this manual for troubleshooting alarms.

Operation

Figure 3. Biotube® Septic Tank Pump System



Operation

Figure 4: Single-pump Control Panel (gravity discharge sand filter)

1. Programmable Logic Unit
2. Motor-Start Contactor
3. Toggle Switch
4. Controls Circuit Breaker
5. Pump Circuit Breaker
6. Audio Alarm
7. Visual Alarm
8. Panel Enclosure

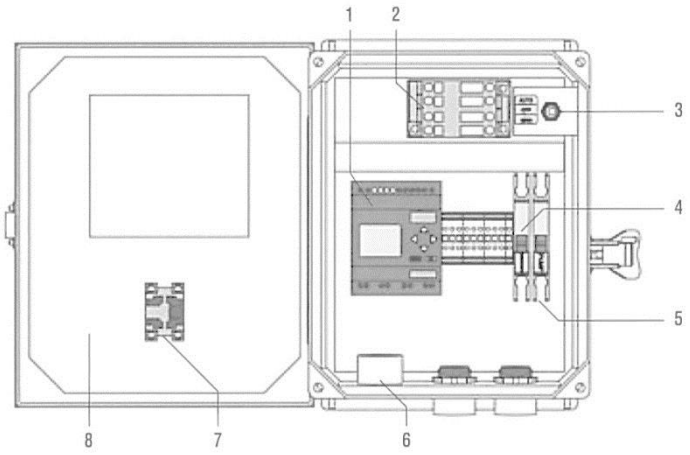
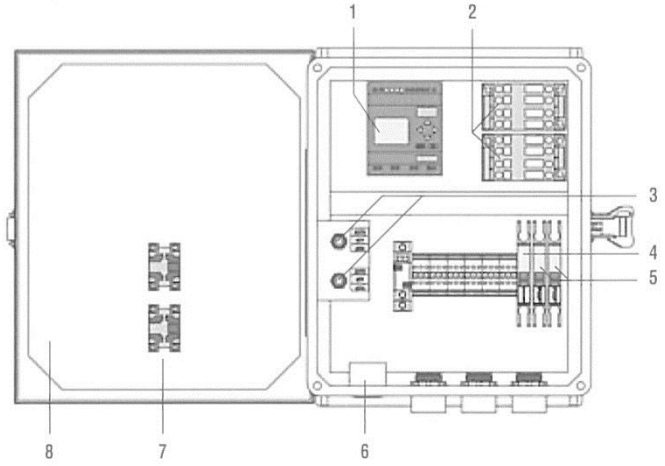


Figure 5: Double-pump Control Panel (pump discharge from sand filter)

1. Programmable Logic Unit
2. Motor-Start Contactor
3. Toggle Switches
4. Controls Circuit Breaker
5. Pump Circuit Breaker
6. Audio Alarm
7. Visual Alarm
8. Panel Enclosure

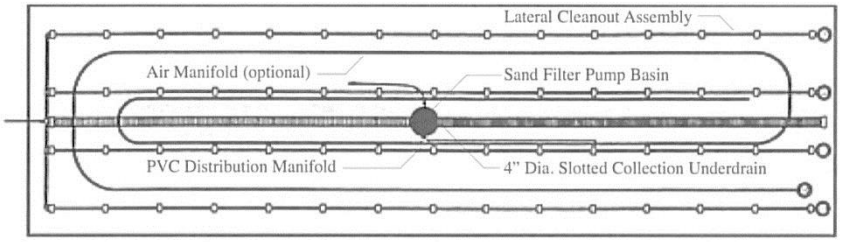


Operation

The ISF

Figures 6 and 7 are top and side views of the intermittent sand filter.

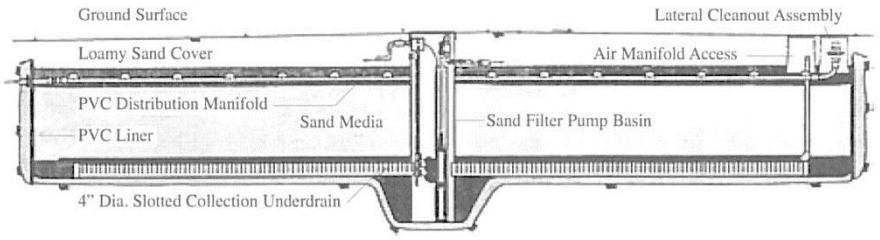
Figure 6: Top View of Standard ISF



The ISF is contained in a 30 mil PVC liner that prevents groundwater from damaging the ISF and permits collection of the treated effluent in the bottom of the ISF. When the pump in the septic tank is running, effluent pressurizes the PVC distribution manifold located on top of the treatment sand and flows out of each lateral through evenly spaced 1/8th inch holes. This spreads the effluent evenly over the sand. Small particles and other contaminants in the effluent are mechanically, biologically, and chemically reduced as the effluent passes down through the approximately 24 inch depth of specially-graded sand.

The sand filter functions optimally when it receives small volumes of effluent, evenly distributed throughout the day. A slotted 4 inch diameter pipe collects the effluent in the bottom of the ISF and conveys the treated effluent to a gravity disposal system or to a sand filter pump basin if final disposal requires the use of a pump. The as-built drawings of the actual installation should be attached at the end of this manual.

Figure 7: Side View of Standard ISF

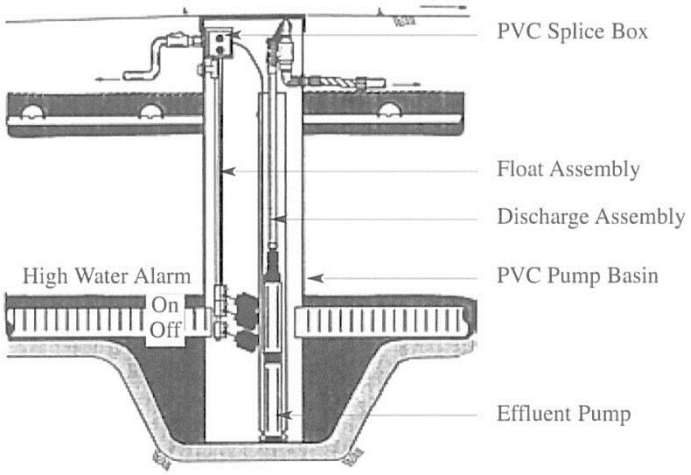


Operation

The sand filter pump basin (when required)

When final disposal cannot be achieved by gravity, e.g. the drainfield is on higher ground than the sand filter, a sand filter pump basin is installed in the ISF as shown in Figure 8.

Figure 8: Side View of Standard ISF Pump Basin



The pump basin package consists of components similar to the septic tank pump system:

1. **PVC pump basin** — contains the pump and related equipment in the ISF.
2. **Electrical splice box** — provides an approved, safe method for wiring the pump and float assembly.
3. **Float assembly** — controls the liquid level in the bottom of the ISF and sends an alarm signal to the control panel when a high water condition exists.
4. **Discharge assembly** — connects the pump to the piping outside the basin and usually includes a ball valve and union for maintenance and removal.
5. **Effluent pump** — pumps the treated effluent to the disposal points.
6. **Control panel** — provides electrical control of the pump system. Figure 5 illustrates the "double pump" control panel required when a sand filter pump basin is used.

Operation

One control panel operates both pumps (one in the septic tank; one in the sand filter pump basin). The pump in the sand filter pump basin is controlled by floats only and does not involve use of a programmable timer. This method of control is often described as "demand" operation since the pump starts "on demand" as soon as the liquid reaches the "on" float. The pump shuts off when the liquid level drops down to the "off" float. A protective interlock in the control panel prevents the septic tank pump from operating if there is a high water condition in the sand filter pump basin. This prevents flooding of the ISF.

User operation of an ISF system

While the physical and biological processes of handling and treating the wastewater in an ISF system occurs automatically, it is important that users exercise discretion in their disposal of waste to the ISF system. As a rule of thumb, it is recommended that nothing be disposed to the septic tank–with the exception of toilet paper and mild detergents–that hasn't first been ingested. Avoid dumping toxic chemicals, grease, water softener backwash, and septic tank additives into the system. The use of a garbage grinder is also not recommended.

Daily use of water should be kept within a reasonable range. Most households use an average of 50 gallon per person per day. Excessive water usage can be detrimental to the septic tank, ISF, and final disposal area. Excessive water usage will usually result in periodic short alarm occurrences (approximately 2 to 3 minutes long). These short-term alarms may be the result of doing too many wash loads in one day, leaking septic tank or plumbing fixtures, improper float or programmable timer settings, or large social gatherings. Please see the troubleshooting section starting on page 17 for more complete information on identifying alarm conditions.

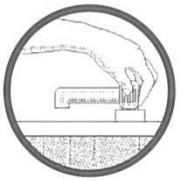
The do's and don'ts lists that follows suggest practices that will help to ensure long life and minimal maintenance for ISF systems.

Operation

Do's

Do feel free to place a bird bath, potted plant, or other yard decoration on the tank riser lid, as long as it can be readily removed for maintenance. Landscaping or permanent structures should be planned prior to installation in order to ensure that the integrity of the system is not jeopardized.

Do keep accurate records of maintenance & service calls. The results will be valuable if system problems occur. Make sure whoever services the system keeps a complete record with this manual.



Do practice water conservation. By reducing the amount of water use, the life of the system may be increased and power consumption reduced. When possible, avoid doing several loads of laundry in one day. Take short showers and don't let water run unnecessarily while washing hands, food, teeth, dishes, etc.

Do be aware that a simple toilet float can hang up and result in over 2000 gallons per day of wasted water. Normal household usage ranges from 100 to 200 gallons per day. Use water-saving devices in the toilet tank and don't flush unnecessarily.

Operation

Don'ts

Don't accidentally dig up an underground utility line. Before digging, telephone the local One Call number to have underground utilities marked.

Don't connect rain gutters or storm drains to the septic tank or allow surface water to drain into it.

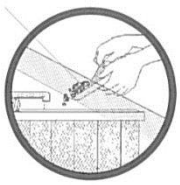
Don't use excessive quantities of water. Repair leaky toilets, faucets or plumbing fixtures. Leaky toilets can waste up to 2000 gallons of water in one day. Take shorter showers and use water saving devices such as low-flow fixtures and low-flush toilets.

Don't dump recreational vehicle (RV) waste into the septic tank because it will increase the the frequency of septage pumping and possibly damage the sand filter. RV waste dumped directly into the screened vault will clog the pump and plug the screen. Some RV waste contains chemicals that are toxic to the biological activity in the septic tank.

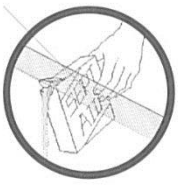
Don't flush undesirable substances into the septic tank. Flushing flammable and toxic products is dangerous. Other materials such as paper towels, rags, newspaper, cigarettes, coffee grounds, egg shells, sanitary napkins, large amounts of hair and cooking grease are a maintenance nuisance. These materials will also increase the frequency of septage pumping and may damage the sand filter.

Operation

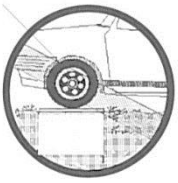
Don'ts



Don't use garbage disposal systems because they also increase the frequency of septage pumping. Compost food scraps or dispose of them in the trash. Collect grease in a container rather than disposing down the drain. Some items (egg shells, coffee grounds, tea bags, etc.) are not biodegradable and should be dispose of in the trash.



Don't use septic tank additives. Additives do not improve the performance of the septic tank and can cause major damage to the sand filter or drainfield. The natural microorganisms that grow in the system are sufficient. These organisms generate their own enzymes for breaking down and digesting nutrients.



Don't drive over the septic system. If the septic tank is in an area subject to possible traffic, consider putting up an attractive barricade or row of shrubs to discourage traffic unless the tank has been equipped with a special traffic lid.

Don't enter the septic tank. Any work to the tank should be done from the outside. Gases that can be generated in the tank or the lack of oxygen can be fatal.

Don't dispose water softener backwash in the septic tank. The backwash brine contains high levels of chlorides that can destroy the microorganisms and inhibit the biological digestion that occurs in the tank. The brine solution also interferes with the solid's sedimentation that occurs in the tank, and may increase the flow through the tank from 25 to 50 percent.

Operation

Substitutes for household hazardous wastes

Although their use is not required, the following substitutes for common house hold chemicals will reduce the stress on a septic system and the environment.

- **Ammonia-based cleaners:** Sprinkle baking soda on a damp sponge. For windows, use a solution of 2 Tbs. white vinegar to 1 qt. water. Place the mixture into the spray bottle.
- **Disinfectants:** Use Borax: 1/2 cup in a gallon of water; deodorizes also.
- **Drain decloggers:** Use a plunger or metal snake, or remove and clean trap.
- **Scouring cleaners and powders:** Sprinkle baking soda on a damp sponge or add 4 Tbs. baking soda to 1 qt. warm water or use Bon Ami. It's cheaper and won't scratch.
- **Carpet/upholstery cleaners:** Sprinkle on dry cornstarch or baking soda, then vacuum. For tougher stains, blot with white vinegar in soapy water.
- **Toilet cleaners:** Sprinkle on baking soda or Bon Ami, then scrub with a toilet brush.
- **Furniture/floor polishes:** To clean, use oil soap and warm water. Dry with soft cloth. Polish with 1 part lemon juice to 2 parts oil (any kind), or use natural products with lemon oil or beeswax in mineral oil.
- **Metal cleaners:** Brass and copper: scrub with a used half of lemon dipped in salt. Stainless steel: scouring pad and soapy water. Silver: rub gently with toothpaste and soft wet cloth.
- **Oven cleaners:** Quickly sprinkle salt on drips, then scrub. Use baking soda and scouring pads on older spills.
- **Laundry cleaners:** Choose one with a zero phosphate content or use soap flakes with 1/3 cup of washing soda. (Before switching, wash clothes in pure washing soda to remove detergent residues.)

Maintenance

ISF system monitoring and maintenance

Even though it is not difficult or time consuming, maintenance of intermittent sand filter systems is frequently neglected. It is recommended, therefore, that users of these systems contract to have routine inspections and maintenance performed. A business that specializes in installation and maintenance of such sewage disposal systems can perform the following maintenance for a nominal fee and ensure proper operation of the system for many years.

CAUTION: *Use proper personal protection equipment such as rubber gloves and clothing that cover parts of the body that will be exposed to sewage or effluent.*

Septic tank

Measurement of the septic tank sludge and scum depths should be done after the first year of installation and approximately every three years thereafter to determine when the septic tank needs pumping.

Septic tank pump system

The pump system should be inspected annually to ensure it's operating properly. Unscrew the two stainless steel bolts that fasten the fiberglass lid over the pumping equipment. Remove the fiberglass lid for an inspection that includes these steps.

1. Verify that there are no obvious holes or leaks in the riser.

2. Verify that the float cords are neatly wrapped in the riser so that they cannot interfere with the operation of the floats.

3. Verify that the high water alarm works by lifting the top float up.

4. Be sure the liquid level is above the middle "timer off" float for the following test. Turn the septic tank pump on by flipping the MOA switch in the control panel (Figure 4 or 5) to manual. Watch the liquid level inside the screened vault as the pump is running for about 30 seconds. Return the MOA switch to auto. If the liquid level inside the screened vault drops very quickly and activates the low level alarm, the Biotube® cartridge may need to be cleaned. Refer to the installation instructions for Screened Pump Vaults in Section 5 if cleaning is necessary.

5. If the control panel has an elapsed time meter (ETM) and/or a cycle counter (CT), read and record these values on the inspection form in Section 3. ETM's and CT's are valuable troubleshooting tools if problems occur with the system.

6. Verify the programmable timer setting is correct. The correct timer setting should be written on the front of this manual.

Maintenance

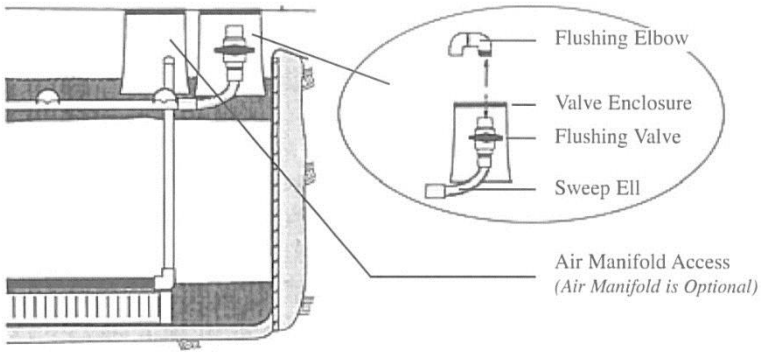
ISF

The key maintenance objective for the ISF is flushing of the manifold laterals. It is important to flush accumulated solids out of the laterals and keep the distribution orifices (holes) in the manifold clear so that the effluent is spread as evenly as possible over the sand media. Failure to perform lateral flushing will eventually lead to clogging at the top of the sand media.

The end of each lateral (Figure 9) has a cleanout assembly for flushing that should be done annually following these steps.

1. Remove the lid on the flushing valve enclosure at the end of each lateral. Locate the flushing elbow that is in the bottom of one of the enclosures.
2. Thread the flushing elbow onto the outlet of the first flushing valve. Open this valve.
3. In the control panel, flip the MOA (manual/off/auto) switch for the septic tank to manual. The pump should now be running.
4. As soon as the effluent flowing out of the flushing elbow appears clear (this should take only a few seconds), turn off the flushing valve.
5. Quickly move the flushing elbow to the next lateral. Open this valve and flush until the effluent is clear.
6. Repeat step 5 for the remaining laterals. If the redundant off/low level alarm (bottom float) is activated during the flushing, it will be necessary to add water to the tank to finish the flushing.
7. Immediately turn the MOA switch back to auto.

Figure 9: Lateral Cleanout Assembly



Maintenance

Next, the residual pressure ("squirt") test that follows should be used to ascertain whether the distribution orifices are clear. A 10 foot long, 3/4 inch diameter, clear PVC pipe with a male adapter glued to one end is necessary to perform these steps accurately.

1. Screw the clear PVC pipe to the end of one of the flushing valves. Maintain the clear pipe in a vertical position. Letting the pipe fall unsupported to the ground may damage the flushing assembly.
2. Open the flushing valve. Have someone turn the pump on. Note: If this test is being done by only one person, turn the pump on before Step 1.
3. Using a tape measure, measure the distance from the bottom of the flushing elbow to the top of the liquid surface in the clear pipe. This measured distance is called the "squirt" height or system residual head.
4. Turn off the pump. Close the flushing valve. Unscrew the clear pipe. Note: If this test is being done by one person, first shut off the flushing valve, then slowly unscrew the clear pipe and allow the effluent in the clear pipe to flow into the flushing valve box before turning off the pump.
5. Compare the measured "squirt" height in Step 3 with the value documented during initial installation of the system. The initial value should be written on the front page of this manual. It might also be found in the control panel or on the underside of the fiberglass lid covering the septic tank pump system.
6. The "squirt" height found in Step 3 should be at least equal to the initial value, but no more than 20% higher.
7. If the "squirt" height is acceptable, be sure all flushing valves are turned off and replace the flushing valve box lids.

If the "squirt" height is found to be excessive, this indicates that too many of the orifices in the distribution manifold are plugged. Clearing of the orifices can be accomplished by one of the following methods:

1. Push a stiff bottle brush (connected to a cleaning snake) down each lateral through its flushing valve assembly.
2. Using a high pressure washer, feed a small diameter "bullet" nozzle through each lateral. The high pressure water coming out of the nozzle will help pull it through the lateral.

The "squirt" test should be performed once more to ensure the cleaning was successful.

Maintenance

Sand filter pump basin

The pump system should be inspected annually to ensure it's operating properly. Unscrew the two stainless steel bolts that fasten the fiberglass lid over the pumping equipment. Remove the fiberglass lid for an inspection that includes these steps.

1. Verify that the float cords are neatly wrapped in the top of the basin so that they cannot interfere with the operation of the floats.
2. Verify that the high water alarm works by lifting the top float up.
3. Check that the maximum normal high water level (noted on the front page of this document) is not exceeded in the basin. This can usually be seen as a water mark on the inside of the basin.

Air manifold kit (optional)

Referring to Figures 7, 8 & 9, an air manifold may have been installed during initial installation for use in renovating a failing ISF or helping the ISF perform during one or more of the following possible problem situations:

1. Clogging due to abuse of the system, resulting in hydraulic or biological overload.
2. Clogging due to poor quality sand. Note: An air manifold should NEVER be used as justification for allowance of poor quality sand.
3. Poor effluent quality due to extremely cold weather.
4. Insufficient oxygen resulting from burying the sand filter too deep, covering the sand filter with dense or otherwise impermeable material, or compaction of the cover material.

A small compressor is attached to the air line under the air manifold access lid. In some cases, it may be necessary to only run the compressor for a few days or few weeks for a successful renovation. If it is necessary to leave a compressor running continuously, a small linear compressor that draws only 2 amps is most cost-effective. Contact Orenco Systems, Inc. or its representative for more information on operating air manifolds. After the sand is renovated, be sure to fix the cause. If poor quality sand was the culprit, removal and replacement of the upper 12" of sand will be required.

Maintenance

Troubleshooting chart

The following troubleshooting chart describes most of the common problems found in ISF systems.

Problem	Cause	Solution
Infrequent short duration alarms	Excessive water usage from too many loads of laundry done at once, large parties, leaving a water fixture running	Spread laundry loads out over the day or several days. Occasional parties will not harm the system–the alarm simply alerts the user that the system is getting more water than it is designed to handle on a regular basis.
Frequent short duration alarms (every day or almost every day)	Water usage beyond what the system is designed to handle	Reduce water usage. Check for leaking plumbing such as faucets and toilets. Check for possible infiltration into septic tank.
	PT not set properly to handle acceptable daily flow.	Reset PT to acceptable range.
	Top two floats set too close to one another.	Reposition floats to correct settings.
	Screened Vault filter clogged	Clean Screened Vault
Short duration alarms only during storms or very wet periods	Infiltration from leaky septic tank, plumbing, or stormwater connections.	Find and fix leaks. Unhook undesirable connections.
Continuous high water alarm		
Continuous low level alarm		

Appendix V

Riley County Sand/Shale Filter Alternative Private Wastewater Disposal System Inspection Report

Riley County Sand / Shale Filter
Alternative Private Wastewater Disposal System
Inspection Report

Inspection Date #1: _____ Serviced by: _____
Name: _____ _____
Address: _____ Permit # _____

Equipment	***Yes***	***No***	***Results (Failure requires a repair permit)***
All float cords are neatly wrapped to prevent float interference			
No holes or leaks in the system			
Alarm and Floats (*Tested*)			
Biotube® (checked)			
Elapsed Time Meter (reading)			
Cycle Timer Functioning (reading)			
Operates on "Auto" & Manual"			
Manifold lines flushed			
Pressure Checks on Filter (not more than 20% increase over start up value)	***Initial (inches)***	***Present (inches)***	***Results (Failure requires a repair permit)***
Inspection Port #1 (inches)			
Inspection Port #2 (inches)			
Inspection Port #3 (inches)			
Inspection Port #4 (inches)			
Inspection Port #5 (inches)			
Inspection Port #6 (inches)			
Tank Requires Pumping (Minimum requirement is once every 5 years)	***Yes***	***No***	***If Yes, Then Date Pumped***
Inspection Ports Checked			
Lateral Field Surfacing			
Damage due to excessive weight loading to the system			
Tank Water Tight			
Repair Permit Required			

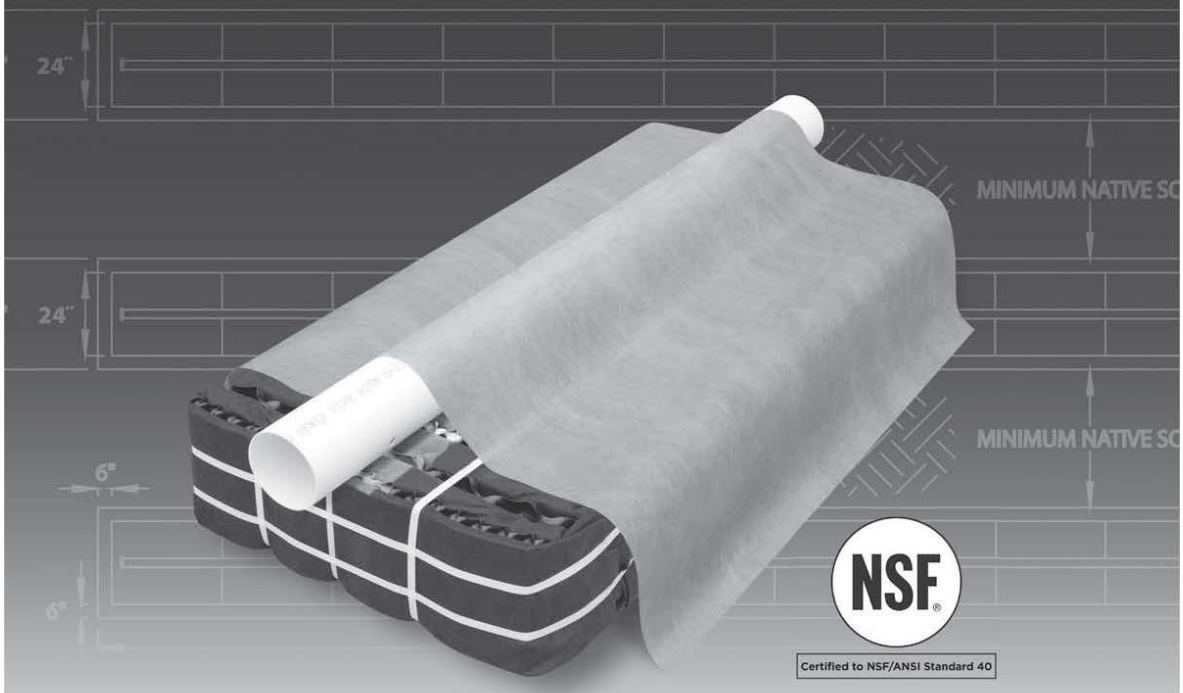
Appendix VI

Eljen Geotextile Sand Filter (GSF) Alternative Private Wastewater Disposal System Kansas Design and Installation Manual

GSF®

Geotextile Sand Filter

Kansas
Design & Installation Manual



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December 2017

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Table of Contents

SUBJECT PAGE

GSF DRAWINGS AND TABLES

DRAWINGS

TABLES

Glossary of Terms

A42 Module 48" x 24" x 7" (L x W x H)

Cover Fabric The geotextile cover fabric (provided by manufacturer) that is placed over the GSF modules.

Design Flow Consult the local regulations to determine the design flow for your project.

GSF The Eljen Geotextile Sand Filter Modules and the 6-inch sand layer at the base and 6 inches along the sides of the modules.

GSF Module The individual module of a GSF system. The module is comprised of a cuspated plastic core and corrugated geotextile fabric.

Specified Sand To ensure proper system operation, the system MUST be installed using ASTM C33 Sand.

ASTM C33 sand will have less than 10% passing the #100 Sieve and less than 5% passing the # 200 sieve. Ask your material supplier for a sieve analysis to verify that your material meets the required specifications.

TABLE 1: SPECIFIED SAND SIEVE REQUIREMENTS

ASTM C33 SAND SPECIFICATION		
Sieve Size	Sieve Square Opening Size	Specification Percent Passing (Wet Sieve)
3/8 inch	9.52 mm	100
No. 4	4.76 mm	95 - 100
No. 8	2.38 mm	80 - 100
No. 16	1.19 mm	50 - 85
No. 30	590 µm	25 - 60
No. 50	297 µm	5 - 30
No. 100	149 µm	0 - 10
No. 200	75 µm	0 - 5

Primary Treatment Zone

- Perforated pipe is centered above the GSF module to distribute septic effluent over and into corrugations created by the cuspated core of the geotextile module.
- Septic effluent is filtered through the Bio-Matt fabric. The module's unique design provides increased surface area for biological treatment that greatly exceeds the module's footprint.
- Open air channels within the module support aerobic bacterial growth on the modules geotextile fabric interface, surpassing the surface area required for traditional absorption systems.
- An anti-siltation geotextile fabric covers the top and sides of the GSF module and protects the Specified Sand and soil from clogging, while maintaining effluent storage within the module.

Secondary Treatment Zone

- Effluent drips into the Specified Sand layer and supports unsaturated flow into the native soil. This Specified Sand/soil interface maintains soil structure, thereby maximizing the available absorption interface in the native soil. The Specified Sand supports nitrification of the effluent, which reduces oxygen demand in the soil, thus minimizing soil clogging from anaerobic bacteria.
- The Specified Sand layer also protects the soil from compaction and helps maintain cracks and crevices in the soil. This preserves the soil's natural infiltration capacity, which is especially important in finer textured soils, where these large channels are critical for long-term performance.
- Native soil provides final filtration and allows for groundwater recharge.

FIGURE 1: GSF SYSTEM OPERATION

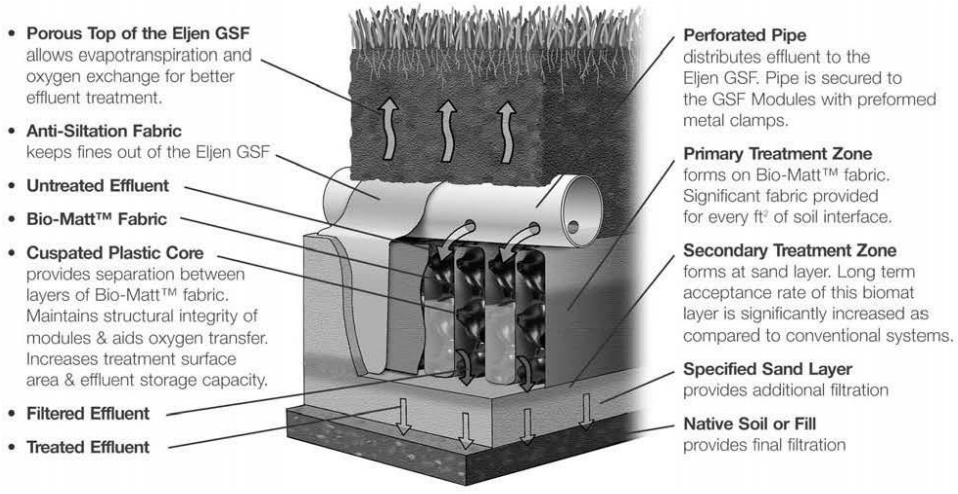
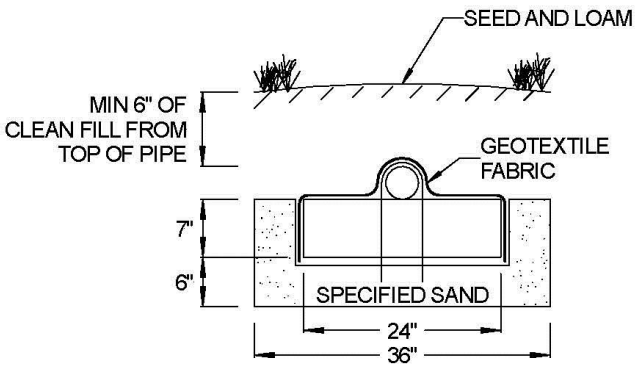


FIGURE 2: TYPICAL A42 GSF CROSS SECTION



A42 MODULE (L x W x H) 48" x 24" x 7"

All systems are required to have a minimum of:

- 6 inches of Specified Sand is at the edges of the GSF module.
- 6 inches of Specified Sand is at the beginning and end of each GSF Row.
- 6 inches of Specified Sand is directly below the GSF module.
- Minimum 6 inches of cover measured from the top of pipe.

1.0 Design and Installation

1.1 REQUIREMENTS: GSF systems must meet the local rules and regulations except as outlined in this manual. The Kanas State regulations, State of Kansas Department of Health and Environment, Bulletin 4-2, March 1997 Minimum Standards for Design and Construction of Onsite Wastewater Systems will be referred to as the *guidelines*.

The sizing charts apply to residential systems only and are found in section 1.16. Please contact Eljen's Technical Resource Department at 1-800-444-1359 for design information on commercial systems.

1.2 SPECIFIED SAND SPECIFICATION FOR GSF SYSTEMS: The sand immediately under, between rows and around the perimeter of the GSF system must meet ***ASTM C33 SPECIFICATIONS, WITH LESS THAN 10% PASSING A #100 SIEVE AND LESS THAN 3% PASSING A #200 SIEVE.*** Please place a prominent note to this effect on each design drawing. See Table 1 for more information on the sand and sieve specifications.

1.3 CONNECTIONS AND FITTINGS: Connections of lines to tanks and distribution boxes must be made using watertight mechanical seals. Use of any grouting material is not permitted.

1.4 PLACING GSF MODULES: The "Painted Stripe" on the GSF modules indicates the top of the module and is not intended to indicate the location of the distribution pipe. With the painted stripe facing up, all rows of GSF modules are set level, end to end on the Specified Sand layer. No mechanical connection is required between modules.

1.5 DISTRIBUTION: Gravity, pump to gravity or pressure distribution are acceptable when using the GSF System. All piping must meet the guidelines. A pressure manifold is placed inside the distribution pipe when using pressure distribution. Refer to section 5.0 and 6.0 of this manual for details of how to construct the distribution network and when pressure distribution is recommended. All piping must meet state and local regulations.

1.6 DISTRIBUTION BOX: The 4 main options for installing a distribution box are 1) Install on top of 16" patio blocks, 2) Install on concrete slab, 3) Install encased in concrete, 4) Install a leveling D-box. The soil below the D-box should always be packed and leveled to stabilize the D-box installation.

1.7 COVER FABRIC: Geotextile cover fabric is provided by Eljen Corporation for all GSF systems. It is placed over the top and sides of the module rows to prevent long term siltation and failure. **Cover fabric substitution is not allowed.** Fabric should drape vertically over the pipe and must *not* block holes in the distribution pipe or be stretched from the top of the pipe to the outside edge of the modules. "Tenting" will cause undue stress on fabric and pipe.

1.8 BACKFILL & FINISH GRADING: Complete backfill with a minimum of 6 inches of cover material measured from the top of the distribution pipe. Use well graded native soil fill that is clean, porous and devoid of large rocks. Do not use wheeled equipment over the system. A light track machine may be used with caution, avoiding crushing or shifting of pipe assembly. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

1.9 ADDITIONAL FACTORS EFFECTING RESIDENTIAL SYSTEM SIZE: It is recommended that homes with expected higher than normal water usage increase the septic tank volume as well as incorporate a multiple compartment septic tank. Consideration for disposal area may be up-sized for expected higher than normal water use.

For example:

- Luxury homes, homes with a Jacuzzi style tubs, and other high use fixtures.
- Homes with known higher than normal occupancy.

1.10 GARBAGE DISPOSALS: The use of a garbage disposal is not recommended as they can cause septic system problems by generating an increased amount of suspended solids, grease and nutrients.

However, if such units are proposed, other measures should be taken to mitigate the increased nutrients to the field. Consult your local and state code for garbage disposal requirements. Eljen recommends a dual compartment tank or tanks in series. Consider upsizing the field for the additional biological load.

NOTE: Eljen requires the use of septic tank outlet effluent filters on all systems. Filters with higher filtration are recommended for systems with garbage disposals.

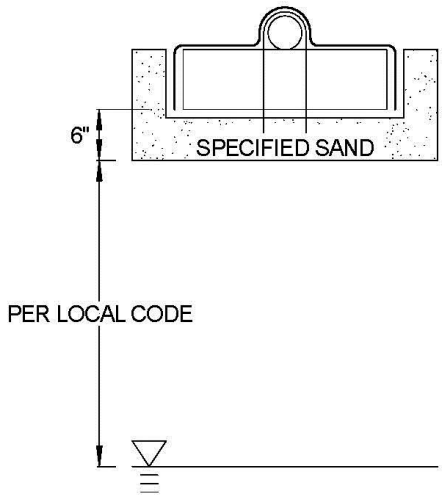
1.11 SEPTIC TANKS: Dual compartment tanks are recommended for all systems. Eljen supports this practice as it helps to promote long system life by reducing TSS and BOD to the effluent disposal area.

1.12 SEPTIC TANK FILTERS: Septic tank effluent filters are ***REQUIRED*** on the outlet end of septic tank. Filter manufactures require that filters be cleaned from time to time. Ask your installer or designer for specific cleaning requirements based on the type or make of the filter installed. Eljen requires the septic tank to be pumped every three years or as needed which would be a good time to check and conduct filter maintenance.

1.13 SYSTEM VENTING: It is required to vent all systems that are over 18 inches below finished grade and systems beneath any surface condition that would not allow for surface air exchange with the system such as patios. See Section 7.0 for a more detailed explanation of venting GSF products.

1.14 VERTICAL SEPARATION TO GROUND WATER OR LIMITING LAYER AND DISTRIBUTION METHOD: Please refer to local health department regulations for vertical separation distances.

FIGURE 3: VERTICAL SEPARATION TO RESTRICTIVE LAYER



1.15 NUMBER OF GSF MODULES REQUIRED: Residential systems use a minimum of six (6) modules per bedroom. See Section 1.16 for more information on systems sizing.

1.16 SIZING GSF SYSTEM FOR TRENCHES, BEDS & SAND MOUNDS:

TABLE 2: SOIL ABSORPTION LOADING RATE BASED ON PERC

Perc Rate (minutes/inch)	Recommended Absorption Area (ft2/bedroom)	Loading Rate (gpd/ft2)	Bed Application Minimum Units per Bedroom
Less than 5	94	1.6	6
5 - 10	116	1.3	7
11 - 15	137	1.1	8
16 - 30	188	0.8	9
31 - 45	215	0.7	10
46 - 60	250	0.6	12
Greater than 60	Not recommended		

TABLE 3: SOIL ABSORPTION LOADING RATE BASED ON SOIL TEXTURE AND STRUCTURE

Group	Soil Characteristics	Wastewater Loading gpd/ft^2	Bed Application Minimum Units per Bedroom
I	Gravelly coarse sand and coarser	2.0	6
II	Coarse sands (not cemented)	1.6	7
III	Medium sand with single grain structure and loose to	1.3	8
IV	Other sands and loamy sands with single grain or weak structure (not extremely firm or cemented consistence) Sandy loams, loams and silt loams with moderate or strong structure (except platy and loose to friable consistence)	0.8	9
V	Sandy loam, silt loams and loams with weak structure (not of extremely firm or cemented consistence) Sandy clay loams, clay loams and silty clay loams with moderate to strong structure (not to platy, of frim, or of cemented consistence)	0.5	10
VI	Sandy clay loams, clay loams and silty clay loams with weak structure (not massive, not of firm, or of cemented consistence) Some sandy clays, clays and silty clays with moderate and strong structure (not platy, not of firm, or of cemented consistence)	0.3	12
VII	Other soils of high clay content with weak or massive structure, extremely firm or cemented consistence or platy, clay pan, fragipan, and caliche soils.	Not Recommended for conventional soil absorption system.	

TABLE 4: RECOMMENDED SOIL ABSORPTION REDUCTIONS

Region	Western Kansas	Central Kansas	Eastern Kansas
Region Multiplier	65%	80%	100%
Recommended reduction	35%	20%	0%

2.0 Trench Installation Sizing and Guidelines

Trench Example:

House size:	3 Bedrooms
Design Flow:	450 gpd
Soil Description:	Sandy Loam, Moderate Structure
Absorption Field Type:	Trench
Region:	Eastern Kansas

Calculate Minimum Absorption Area

Lookup loading rate from Table 3 and determine the loading rate:

Group	Soil Characteristics	Wastewater Loading gpd/ft^2	Bed Application Minimum Units per Bedroom
IV	Other sands and loamy sands with single grain or weak structure (not extremely firm or cemented consistence) Sandy loams, loams and silt loams with moderate or strong structure (except platy and loose to friable consistence)	0.8	9

Lookup loading rate from Table 4 and determine the region multiplier:

Region	Western Kansas	Central Kansas	Eastern Kansas
Region Multiplier	65%	80%	100%

Absorption Area: Design Flow ÷ Loading Rate x Region Multiplier

450 gpd ÷ 0.8 gpd / ft^2 x 100% = 562.5 ft^2

Calculate Number of Modules Required

Number of units required = Absorption Area ÷ 12 Square Foot Per Module

Units required

562.5 ft^2 ÷ 12 ft^2 / module =	46.9 Modules
Round to:	47 Modules

Calculate Minimum Trench Length

47 Units x 4 ft/unit = 188 linear ft

Trench Width

3 ft

Final Dimension Layout

(Note: System layout and number of rows will vary based on site constraints)

Min. Product Length	188 ft
(note: 6 inches of sand required at each end of trench which makes the minimum trench length 189 ft)	
Trench Width	3 ft
Minimum Number of Units	47 Modules
Min. System Area	567 ft^2

FIGURE 4: PLAN VIEW – TRENCH SYSTEM

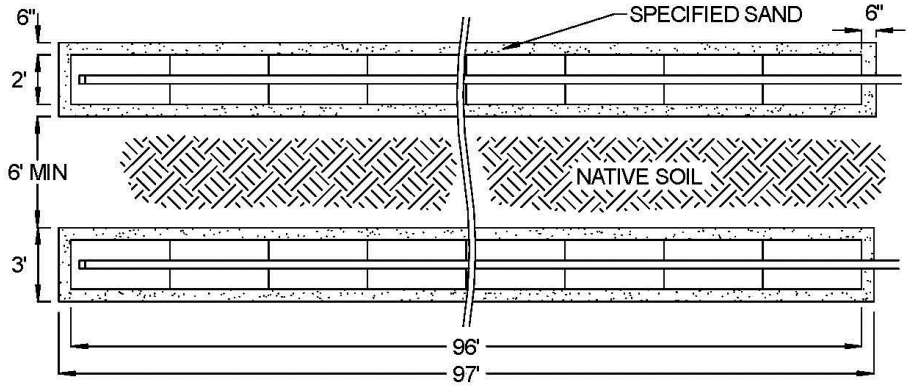


FIGURE 5: SECTION VIEW – TRENCH SYSTEM – LEVEL SITE

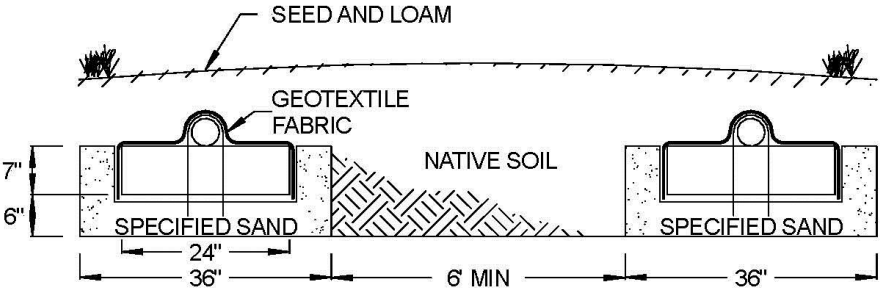
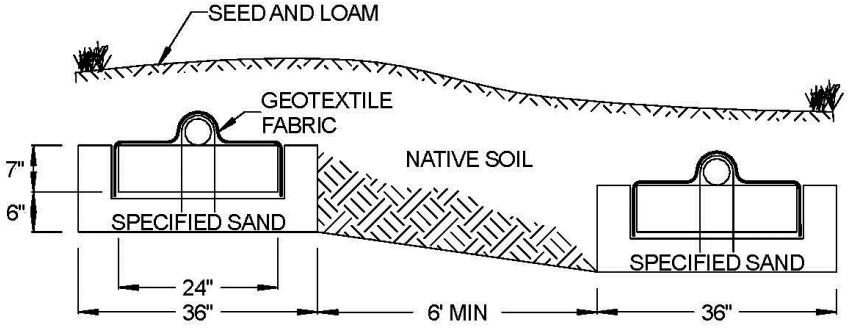


FIGURE 6: SECTION VIEW – TRENCH SYSTEM – SLOPING SITE



2.0 Trench Installation Sizing and Guidelines

1. Ensure all components leading to the GSF system are installed properly. Septic tank effluent filters are required with the GSF system.

2. Determine the number of GSF Modules required using the trench sizing example.

3. Prepare the site. Do not install a system in saturated ground or wet soils that are smeared during excavation. Keep machinery off infiltrative areas.

4. Plan all drainage requirements above (up-slope) of the system. Set soil grades to ensure that storm water drainage and ground water is diverted away from the absorption area once the system is complete.

5. Excavate the trench; scarify the receiving layer to maximize the interface between the native soil and specified sand.

6. Minimize walking in the trench prior to placement of the specified sand to avoid soil compaction.

7. Place specified sand in a 6" lift, stabilize by foot, a hand held tamping tool or a portable vibrating compactor. The stabilized height below the GSF module must be level at 6".

8. Place GSF modules with **PAINTED STRIPE FACING UP**, end to end on top of the specified sand along their 4-foot length.

9. A standard 4-inch perforated pipe, SDR 35 or equivalent, is centered along the modules 4-foot length. Orifices are set at the 4 & 8 o'clock position.

10. All 4-inch pipes are secured with manufacturers supplied wire clamps, one per module.

11. (Pressure Distribution Systems) Insert a pressure pipe (size per design and code) into the standard 4-inch perforated pipe. The pressure pipe orifices are set at the 12 o'clock position as shown in Figure 14. Each pressure lateral will have a drain hole at the 6 o'clock position. Each pressure lateral shall have a clean out at the end of the trench. Refer to Section 6 for guidelines on when to use pressure distribution.

12. ***Cover fabric substitution is not allowed.*** The installer should lay the Eljen provided geotextile cover fabric lengthwise down the trench, with the fabric fitted to the perforated pipe on top of the GSF modules. Fabric should be neither too loose, nor too tight. The correct tension of the cover fabric is set by:
    a. Spreading the cover fabric over the top of the module and down both sides of the module with the cover fabric tented over the top of the perforated distribution pipe.
    b. Place shovelfuls of Specified Sand directly over the pipe area allowing the cover fabric to form a mostly vertical orientation along the sides of the pipe. Repeat this step moving down the pipe.

13. Place 6 inches of Specified Sand along both sides of the modules edge. A minimum of 6 inches of Specified Sand is placed at the beginning and end of each trench.

14. Complete backfill with a minimum of 6 inches of cover material measured from the top of the distribution pipe. Backfill exceeding 18 inches over the top of the unit requires venting at the far end of the trench. Use well graded native soil fill that is clean, porous and devoid of large rocks. Do not use wheeled equipment over the system. A light track machine may be used with caution, avoiding crushing or shifting of pipe assembly. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

15. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

Bed Example:

House size:	3 Bedrooms
Design Flow:	450 gpd
Percolation Rate:	35 Min
Absorption Field Type:	Bed
Region:	Western Kansas

Calculate Minimum Absorption Area

Lookup loading rate from Table 2 and determine the loading rate:

Perc Rate (minutes/inch)	Recommended Absorption Area (ft2/bedroom)	Loading Rate (gpd/ft2)	Bed Application Minimum Units per Bedroom
31 - 45	215	0.7	10

Lookup loading rate from Table 4 and determine the region multiplier:

Region	Western Kansas	Central Kansas	Eastern Kansas
Region Multiplier	65%	80%	100%

Absorption Area: Design Flow ÷ Loading Rate x Region Multiplier

450 gpd ÷ 0.7 gpd / ft^2 x 65% = 417.8 ft^2

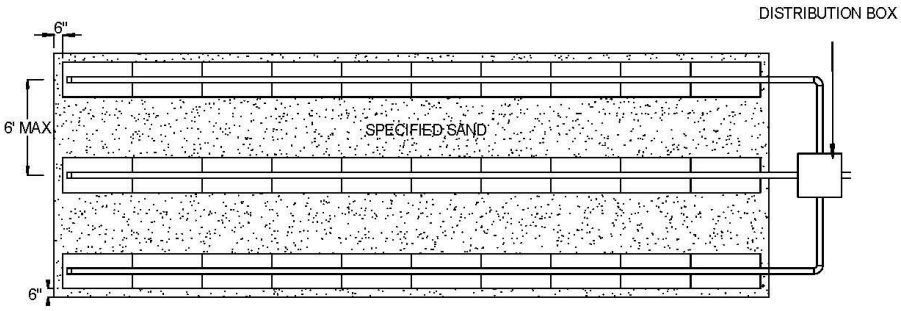
Calculate Number of Modules Required

Lookup units required per bedroom from Table 2:

Perc Rate (minutes/inch)	Recommended Absorption Area (ft2/bedroom)	Loading Rate (gpd/ft2)	Bed Application Minimum Units per Bedroom
31 - 45	215	0.7	10

Units Required: Number of Bedrooms x Units Required per Bedroom

FIGURE 7: PLAN VIEW – BED SYSTEM



SYSTEM CONSTRUCTION WILL VARY PER DESIGN

FIGURE 8: SECTION VIEW – 2 LATTERAL BED SYSTEM

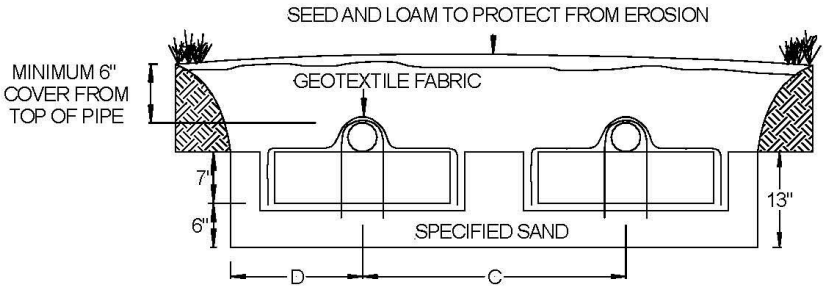


FIGURE 9: SECTION VIEW – 3 LATTERAL BED SYSTEM

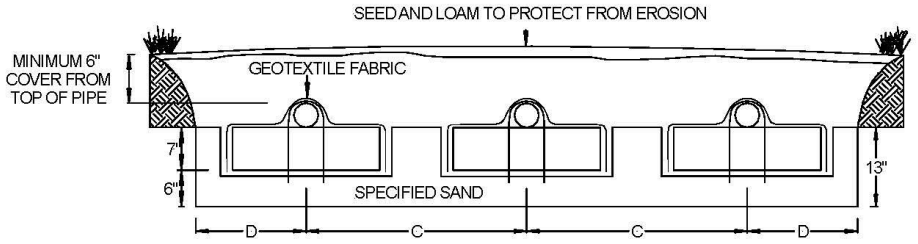


FIGURE 10: SECTION VIEW – 4 LATTERAL BED SYSTEM

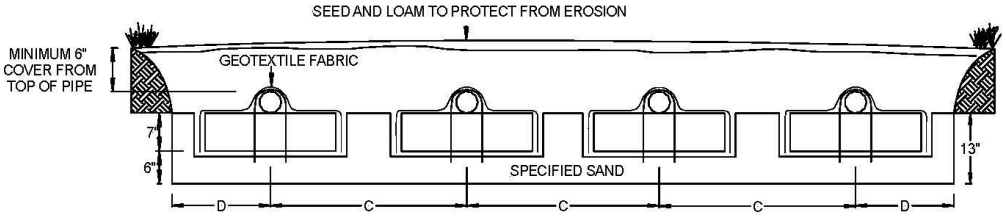


TABLE 5: BED LAYOUT CHART

		Group I		Group II		Group III		Group IV		Group V		Group VI	
		C	D	C	D	C	D	C	D	C	D	C	D
2 Bedroom	2 Laterals	3	1.5	3.25	1.625	3.5	1.75	5.25	2.625	7.5	3.75	10.25	5.125
	3 Laterals	3	1.5	3	1.5	3	1.5	5	2.5	7	3.5	10.16	5.08
	4 Laterals	3	1.5	3	1.5	3.5	1.75	4.5	2.25	7.25	3.625	10	5
3 Bedroom	2 Laterals	3	1.5	3.25	1.625	3.75	1.875	5	2.5	7.5	3.75	10.5	5.25
	3 Laterals	3	1.5	3.3	1.66	3.6	1.8	5.16	2.58	7.3	3.6	10.3	5.16
	4 Laterals	3	1.5	3	1.5	3.5	1.75	4.875	2.437	6.875	3.437	10.25	5.125
4 Bedroom	2 Laterals	3.25	1.625	3.5	1.75	3.75	1.875	5.25	2.65	7.5	3.75	10.5	5.25
	3 Laterals	3.16	1.58	3.16	1.58	3.5	1.75	5.16	2.58	7.1	3.5	10.33	5.16
	4 Laterals	3	1.5	3.25	1.625	3.5	1.75	5.125	2.562	7.375	3.687	10.25	5.125

3.0 Bed Installation Sizing and Guidelines

1. Ensure all components leading to the GSF system are installed properly. Septic tank effluent filters are required with the GSF system.

2. Determine the number of GSF Modules required using the bed sizing example.

3. Prepare the site. Do not install a system in saturated ground or wet soils that are smeared during excavation. Keep machinery off infiltrative areas.

4. Plan all drainage requirements above (up-slope) of the system. Set soil grades to ensure that storm water drainage and ground water is diverted away from the absorption area once the system is complete.

5. Excavate the bed absorption area; scarify the receiving layer to maximize the interface between the native soil and specified sand.

6. Minimize walking in the absorption area prior to placement of the specified sand to avoid soil compaction.

7. Place specified sand in a 6" lift, stabilize by foot, a hand held tamping tool or a portable vibrating compactor. The stabilized height below the GSF module must be level at 6".

8. Place GSF modules with **PAINTED STRIPE FACING UP**, end to end on top of the specified sand along their 4-foot length.

9. A standard 4-inch perforated pipe, SDR 35 or equivalent, is centered along the modules 4-foot length. Orifices are set at the 4 & 8 o'clock position.

10. All 4-inch pipes are secured with manufacturers supplied wire clamps, one per module.

11. (Pressure Distribution Systems) Insert a pressure pipe (size per design and code) into the standard 4-inch perforated pipe. The pressure pipe orifices are set at the 12 o'clock position as shown in Figure 14. Each pressure lateral will have a drain hole at the 6 o'clock position. Each pressure lateral shall have a clean out at the end of each module row. Refer to Section 6 for guidelines on when to use pressure distribution.

12. ***Cover fabric substitution is not allowed.*** The installer should lay the Eljen provided geotextile cover fabric lengthwise down the row, with the fabric fitted to the perforated pipe on top of the GSF modules. Fabric should be neither too loose, nor too tight. The correct tension of the cover fabric is set by:
    a. Spreading the cover fabric over the top of the module and down both sides of the module with the cover fabric tented over the top of the perforated distribution pipe.
    b. Place shovelfuls of Specified Sand directly over the pipe area allowing the cover fabric to form a mostly vertical orientation along the sides of the pipe. Repeat this step moving down the pipe.

13. Place 6 inches of Specified Sand along both sides of the modules edge. A minimum of 6 inches of Specified Sand is placed at the beginning and end of each module row. A minimum of 12 inches of Specified Sand is placed in between module rows.

14. Complete backfill with a minimum of 6 inches of cover material measured from the top of the distribution pipe. Backfill exceeding 18 inches over the top of the unit requires venting at the far end of the trench. Use well graded native soil fill that is clean, porous and devoid of large rocks. Do not use wheeled equipment over the system. A light track machine may be used with caution, avoiding crushing or shifting of pipe assembly. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

15. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

4.0 Mound Installation Guidelines

4.1 MOUND REFERENCE: The following sizing and guidelines provide the dimensions of the dispersal bed for your mound. Consult the local regulations for more information on the construction of the mound system.

4.2 MOUND EXAMPLE:

House size:	4 bedrooms
Slope of site:	4%
Daily Design Flow: 150 gpd x 4 bedrooms =	600 gpd
Nature of Limiting Condition:	High water table at 18 inches
Soil Application Rate (SAR):	0.5 gpd/ft^2

FIGURE 11: CROSS SECTION – MOUND SYSTEM

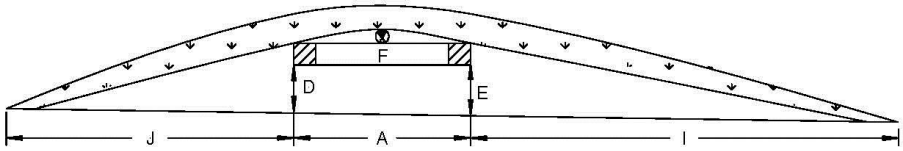
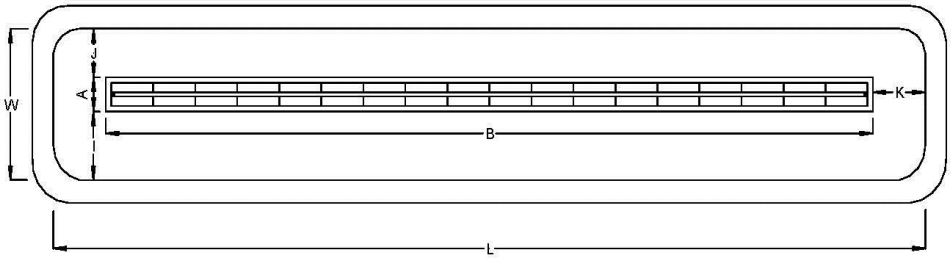


FIGURE 12: PLAN VIEW – MOUND SYSTEM



A – Dispersal bed width (accounts for sand) –**Minimum 3 ft for A42**
B – Dispersal bed length
D – Up slope fill depth under dispersal bed – **Minimum 1 ft**
E – Down slope fill depth under dispersal bed – **Minimum 1 ft**
F – Dispersal bed depth – **Constant 7 in**
I – Distance from edge of dispersal bed to down slope edge of fill
J – Distance from edge of dispersal bed to up slope edge of fill
K– Distance from end of dispersal bed to edge of fill
L – Overall mound fill length
W – Overall mound fill width

4.4 CALCULATE VARIABLES: The following equations are from the Regulation.

A – Maximum Dispersal Bed Width = 0.83 ft/gpd $\sqrt{\frac{\text{DDF (gpd)} \times \text{SAR (gpd/ft}^2\text{)}}{3}}$

Maximum Dispersal Bed Width = 0.83 ft/gpd $\sqrt{\frac{600 \text{ gpd} \times 0.5 \text{ gpd/ft}^2}{3}}$

Maximum Dispersal Bed Width = 8.3 ft

For this example, we will use a 3-foot-wide dispersal width, using A42s.

B – Dispersal Bed Length = Daily Design Flow ÷ Sand Fill Loading Rate 1.6 gpd/ft^2 ÷ Dispersal Bed Width
Dispersal Bed Length = 600 gpd ÷ 1.6 gpd/ft^2 ÷ 3 ft = 125.0 ft. Round to, **125 ft**

D – Upslope fill depth under dispersal bed = **Minimum 1 ft**
(***NOTE:*** For this example, assume the depth of fill at the up-slope edge of the dispersal bed is **1 ft**.)

E – Downslope fill depth under dispersal bed = **Minimum 1 ft**
C + (Slope of site stated as a decimal x Dispersal bed width)
1 ft + (0.04 x 3 ft) = **1.12 ft**

F – Dispersal Bed Depth – Constant 7 in., convert to feet – **0.583 ft**

I – Downslope Width = (Downslope Fill Depth + Dispersal Bed Depth) x 3 x Downslope Correction Factor

Slope %	Downslope (I) Correction Factor	Upslope (J) Correction Factor
0	1	1
2	1.06	0.94
4	1.14	0.89
6	1.22	0.86
8	1.32	0.8
10	1.44	0.77
12	1.57	0.73
14	1.72	0.71
16	1.92	0.68
18	2.17	0.65
20	2.5	0.62

Downslope Width = (1.12 ft + 0.583 ft) x 3 x 1.14 =5.82, round to **6 ft**.

J – Upslope Width = (Upslope Fill Depth + Dispersal Bed Depth) x 3 x Upslope Correction Factor

Slope %	Downslope (I) Correction Factor	Upslope (J) Correction Factor
0	1	1
2	1.06	0.94
4	1.14	0.89
6	1.22	0.86
8	1.32	0.8
10	1.44	0.77
12	1.57	0.73
14	1.72	0.71
16	1.92	0.68
18	2.17	0.65
20	2.5	0.62

Upslope Width = (1 ft + 0.583 ft) x 3 x 0.89 =4.22, round to **4.25 ft**.

K – End Slope Length = (((Downslope Fill Depth + Upslope Fill Depth)/2) + Dispersal Bed Depth) x 3
End Slope Length = (((1.12 ft + 1)/2 + 0.583 ft) x 3 = 4.93 ft, round to **5 ft**.

L – Overall Mound Length = Dispersal Bed Length + 2 x End Slope Length
125 ft + 2 x 5 ft = **135 ft**

W – Overall Mound Width = Dispersal Bed Width + Downslope Width + Upslope Width
3 ft + 6 ft + 4.25 ft = **13.25 ft**

Basal Area Calculation
Level Sites = Overall Mound Length x Overall Mound Width

Sloping Sites = Dispersal Bed Length x (Dispersal Bed Width + Downslope Width)
125 ft x (3 + 6) = 1,125 ft^2

The above calculation must exceed the Basal Area Required = Daily Design Flow ÷ Soil Infiltration Rate
600 gpd ÷ 0.5 gpd/ft^2 = 1,200 ft^2

System does not meet the requirements. Extend downslope width to meet basal area required.
Adjusted Downslope Width = (Basal Area Required ÷ Dispersal Bed Length) – Dispersal Bed Width
(1,200 ft^2 ÷ 125 ft) – 3 ft = 6.6 ft

The downslope extension (I) was 6 ft. To meet the basal requirements, we extended the downslope extension to 6.6 ft.

4.5 DISPERSAL BED CONSTRUCTION –
Width – 3 ft
Length – 100 ft

A42 Modules needed for this system: Length ÷ 4

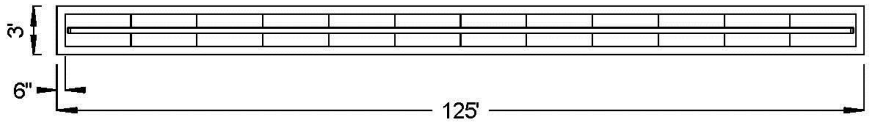
(125 ft – 1) ÷ 4 ft/module = 31, round down to 31 A42 Modules

Determine End Spacing of A42s inside the dispersal bed:

(Dispersal Bed Length – Modules x 4) ÷ 2

(125 ft – 31 Modules x 4) ÷ 2 = 0.5 ft

FIGURE 13: PLAN VIEW – 600 GPD – DISPERSAL BED MOUND SYSTEM



4.0 Mound Installation Guidelines

1. Ensure all components leading to the GSF system are installed properly. Septic tank effluent filters are required with the GSF system.

2. Determine the number of GSF Modules required using the sizing formula.

3. Prepare the site. Do not install a system on saturated ground or wet soils that are smeared during preparation. Keep machinery off infiltrative areas.

4. Plan all drainage requirements above (up-slope) of the system. Set soil grades to ensure that storm water drainage and ground water is diverted away from the absorption area once the system is complete.

5. Remove the organic soil layer. Scarify the receiving layer to maximize the interface between the native soil and Specified Sand. Minimize walking in the absorption area prior to placement of the Specified Sand to avoid soil compaction.

6. Place fill material meeting local requirements (or Specified Sand requirements) onto the soil interface as you move down the excavated area. Place specified sand in a 6" lift, stabilize by foot, a hand held tamping tool or a portable vibrating compactor. The stabilized height below the GSF module must shall meet the mound design requirements.

7. Place GSF modules with **PAINTED STRIPE FACING UP**, end to end on top of the specified sand along their 4-foot length.

8. A standard perforated 4-inch distribution pipe is centered along the modules 4-inch length. Orifices are set at the 4 & 8 o'clock position.

9. All distribution pipes are secured with manufacturers supplied wire clamps, one per module.

10. (Pressure Distribution Systems) Insert a pressure pipe (size per design and code) into the standard perforated distribution pipe. The pressure pipe orifices are set at the 12 o'clock position as shown in Figure 14. Each pressure lateral will have a drain hole at the 6 o'clock position. Each pressure lateral shall have a clean out at the end of each module row. Refer to Section 6 for guidelines on when to use pressure distribution.

11. ***Cover fabric substitution is not allowed.*** The installer should lay the Eljen provided geotextile cover fabric lengthwise down the row, with the fabric fitted to the perforated pipe on top of the GSF modules. Fabric should be neither too loose, nor too tight. The correct tension of the cover fabric is set by:
    a. Spreading the cover fabric over the top of the module and down both sides of the module with the cover fabric tented over the top of the perforated distribution pipe.
    b. Place shovelfuls of Specified Sand directly over the pipe area allowing the cover fabric to form a mostly vertical orientation along the sides of the pipe. Repeat this step moving down the pipe.

12. Ensure there is 6 inches of specified sand surrounding the GSF modules in the mound. Slope the sand away from the mound as described on the plan.

13. Complete backfill with a minimum of 6 inches of cover material measured from the top of the distribution pipe. Use well graded native soil fill that is clean, porous and devoid of large rocks. Do not use wheeled equipment over the system. A light track machine may be used with caution, avoiding crushing or shifting of pipe assembly. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

14. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

5.0 Dosing Distribution Guidance

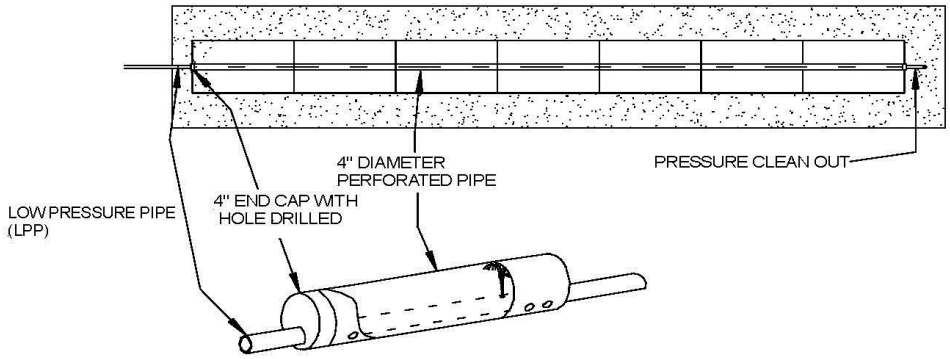
DOSING DESIGN CRITERIA: Dosing volume must be set to deliver a maximum of **3 gallons per Module** per dosing cycle. Head loss and drain back volume must be considered in choosing the pump size and force main diameter.

6.0 Pressure Distribution Guidance

6.1 PRESSURE DISTRIBUTION USE: Pressure distribution systems are typically employed for large scale systems to ensure equalized flows throughout the dispersal area. Pressure distribution systems are also used for laterals that are longer than the maximum allowed gravity run according to the guidelines. Most commercial systems are pressure dosed unless it is servicing a low flow and/or expected low waste strength application like a gas station rest area without food services. Please consult your local regulators for guidelines for additional sites that will require pressure distribution.

6.2 PRESSURE DISTRIBUTION CONSTRUCTION: Standard procedures for design of pressure distribution networks apply to the GSF filter. A minimum orifice size according to the regulations shall be maintained. A drain hole is required at the 6 o'clock position of each pressure lateral for drainage purposes. The lateral pipe network *(size per design and code)* is placed within a standard 4-inch perforated pipe. The perforation in the 4-inch outer pipe are set at the 4 and 8 o'clock position, the drilled orifices on the pressure pipe are set to spray at the 12 o'clock position directly to the top of the 4-inch perforated pipe as shown below.

FIGURE 14: PRESSURE PIPE PLACEMENT



PRESSURE PIPE CROSS SECTION FOR ALL APPLICATIONS

FIGURE 15: PRESSURE CLEAN OUT

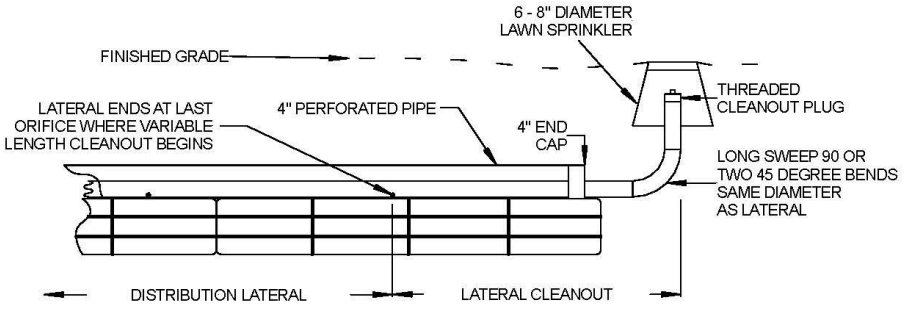
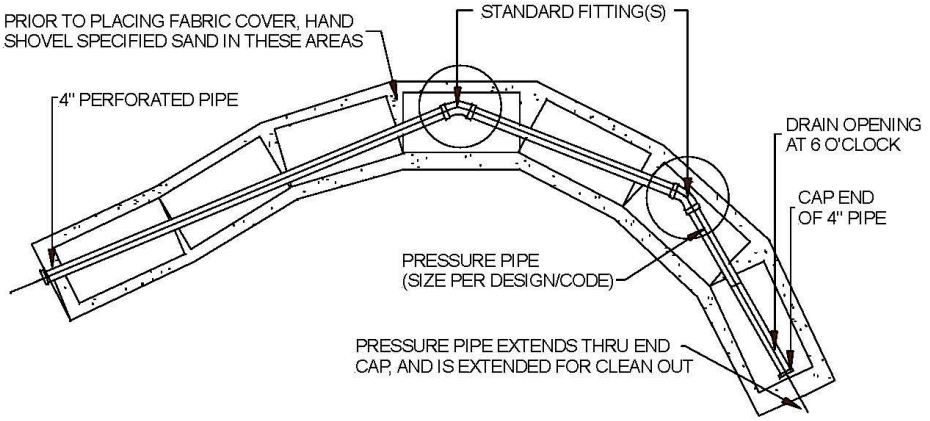


FIGURE 16: CONTOURED TRENCH PRESSURE DISTRIBUTION

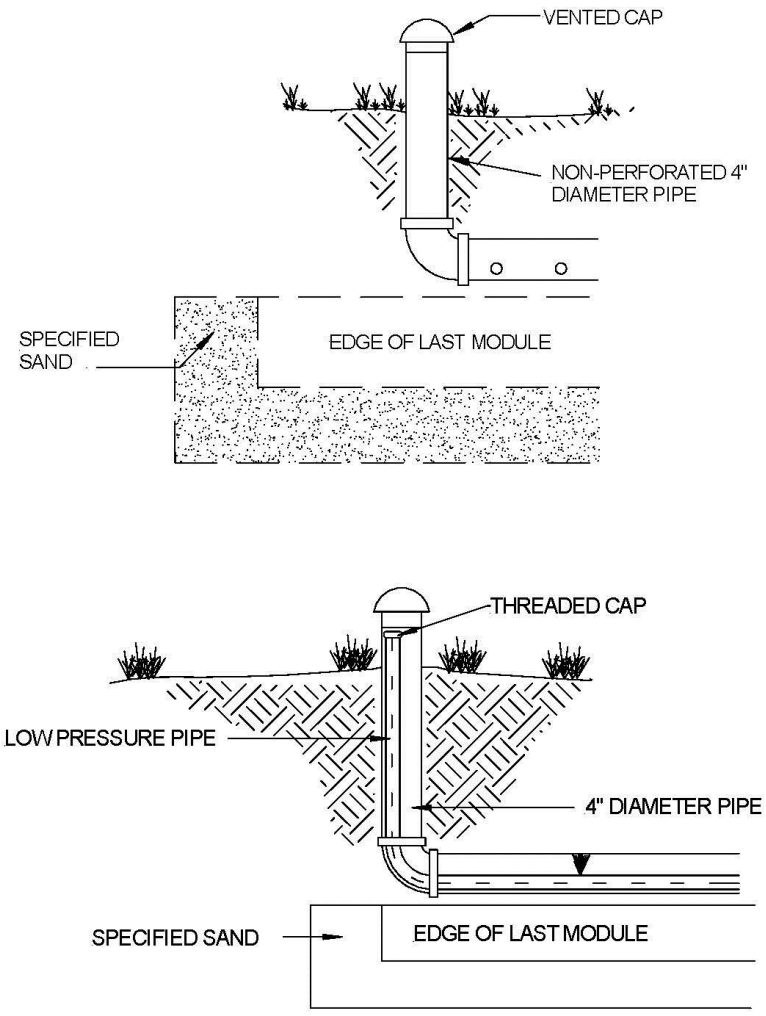


GSF Pressure Distribution trench placed on a contour or winding trenches to maintain horizontal separation distances may also be used in Dosed or Gravity system by removing the pressure pipe and using the 4-inch diameter perforated distribution pipe.

7.0 System Ventilation

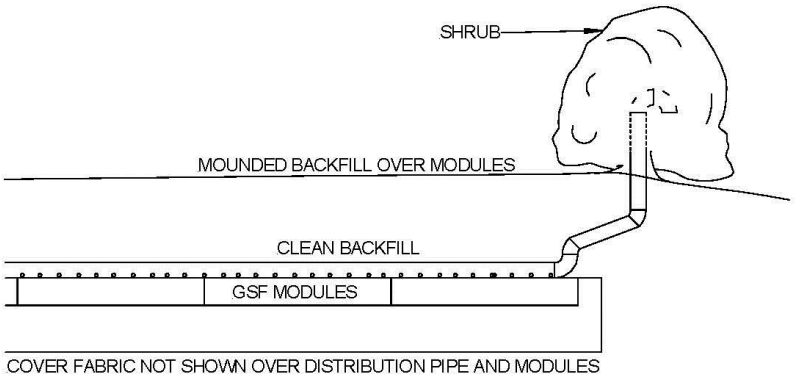
SYSTEM VENTILATION: Air vents may be incorporated with your design. This will ensure proper aeration of the system. The GSF has aeration channels between the rows of GSF modules connecting to cuspations within the GSF modules. Under normal operating conditions, only a fraction of the filter is in use. The unused channels remain open for intermittent peak flows and the transfer of air. All systems with 18" or more of cover material require ventilation. System vents can be at or above grade, check with state and local codes for specific design criteria.

FIGURE 17: VENT LAYOUTS FOR GRAVITY AND LOW-PRESSURE SYSTEMS



7.3 VENTILATION PLACEMENT: In a GSF system, the vent is usually a 4-inch diameter pipe extended to a convenient location behind shrubs, as shown below. Corrugated pipe may be used. If using corrugated pipe, ensure that the pipe does not have any bends that will allow condensation to pond in the pipe. This may close off the vent line. The pipe must have an invert higher than the system so that it does not drain effluent.

FIGURE 18: GSF WITH 4" VENT EXTENDED TO CONVENIENT LOCATION



COMPANY HISTORY

Established in 1970, Eljen Corporation created the world's first prefabricated drainage system for foundation drainage and erosion control applications. In the mid-1980s, we introduced our Geotextile Sand Filter products for the passive advanced treatment of onsite wastewater in both residential and commercial applications. Today, Eljen is a global leader in providing innovative products and solutions for protecting our environment and public health.

COMPANY PHILOSOPHY

Eljen Corporation is committed to advancing the onsite industry through continuous development of innovative new products, delivering high quality products and services to our customers at the best price, and building lasting partnerships with our employees, suppliers, and customers.

eljen CORPORATION

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Riley County Eljen Geotextile Sand Filter (GSF) Alternative Private Wastewater Disposal System Inspection Report

Inspection Date #1: _____ Serviced by: _____
Name: _____ _____
Address: _____ Permit # _____

Equipment	***Yes***	***No***	***Results (Failure requires a repair permit)***
All float cords are neatly wrapped to prevent float interference			
No holes or leaks in the system			
Alarm and Floats (*Tested*)			
Distribution box (D-Box) level			
D-Box lid securely attached			
Equal flow to each line			
Tank Requires Pumping (Minimum requirement is once every 5 years)	***Yes***	***No***	***If Yes, Then Date Pumped***
Effluent Filter Present			
Air Vents Checked			
Lateral Field Surfacing			
Damage due to excessive weight loading to the system			
Tank Water Tight			
Repair Permit Required			