CHAPTER 69
ONSITE WASTEWATER TREATMENT AND DISPOSAL SYSTEMS

[Prior to 7/l/83, Health Dept. Ch 12]
[Prior to 11/19/86, Water, Air and Waste Management[900] Ch 69]

567—69.1(455B) General.

69.1(1) *Applications.* These rules are applicable only to onsite wastewater treatment and disposal systems.

69.1(2) *Definitions.*

"Administrative authority" is the local board of health as authorized by Iowa Code section 455B.172 and 567—Chapter 137.

"Approved" means accepted or acceptable under an applicable specification stated or cited in these rules, or accepted as suitable for the proposed use by the administrative authority.

"Area drain" means a drain installed to collect surface or storm water from an open area of a building or property.

"Building drain" is that part of the lowest horizontal piping of a house drainage system which receives the discharge from soil, waste, and other drainage pipes inside the walls of any building and conveys the same to the building sewer.

"Building sewer" is that part of the horizontal piping from the building wall to its connection with the main sewer or the primary treatment portion of an onsite wastewater treatment and disposal system conveying the drainage of one building site.

"Carbonaceous biochemical oxygen demand (CBOD5)" means a five–day measurement of the amount of oxygen used by microorganisms in the biochemical oxidation of organic matter.

"Chamber system" is a buried structure, typically with a domed or arched top, providing at least a six–inch height of sidewall soil exposure, creating a covered open space above a buried soil infiltrative surface.

"Class 'A1' water," also referred to as a primary contact recreational use water, means waters in which recreational or other uses may result in prolonged and direct contact with the water, involving considerable risk of ingesting water in quantities sufficient to pose a health hazard. Such activities would include, but not be limited to, swimming, diving, water skiing, and water contact recreational canoeing.

"Class 'A2' water," also referred to as a secondary contact recreational use water, means waters in which recreational or other uses may result in contact with the water that is either incidental or accidental. Class A2 uses include fishing, commercial and recreational boating, any limited contact incidental to shoreline activities and activities in which users do not swim or float in the water body while on a boating activity.

"Class 'A3' water," also referred to as a children's recreational use water, means waters in which recreational uses by children are common. Class A3 waters are water bodies having definite banks and bed with visible evidence of the flow or occurrence of water. This type of use would primarily occur in urban or residential areas.

"Class 'C' water" means a "drinking water supply" river or lake, designated by the department for protection as a raw water source for a drinking water supply system.

"Conventional" when used in reference to sewage treatment means a soil absorption system involving a series of two foot wide trenches filled with gravel one foot deep, containing a four–inch diameter rigid pipe to convey the sewage effluent.

"Distribution box" is a structure designed to accomplish the equal distribution of wastewater to two or more soil absorption trenches.

"Drainage ditch" is any watercourse meeting the classification of a "general use segment" under rule 567—61.3(455B) which includes intermittent watercourses and those watercourses which typically flow only for short periods of time following precipitation in the immediate locality and whose channels are normally above the water table.

"Drip irrigation" is a form of subsurface soil absorption using shallow pressure distribution with low–pressure drip emitters.

"Drop box" is a structure to divert wastewater flow into a soil absorption trench until the trench is filled to a set level, then allow any additional waste, which is not absorbed by that trench, to flow to the next drop box or soil absorption trench.

"Dwelling" means any house or place used or intended to be used by humans as a place of residence.

"Fill soil" means clean soil, free of debris or large organic material, which has been mechanically moved onto a site and has been in place for less than one year.

"Foundation drain" means that portion of a building drainage system provided to drain groundwater from the outside of the foundation or over or under the basement floor not including any wastewater and not connected to the building drain.

"Free access filter (open filter)" means an intermittent sand filter constructed within the natural soil or above the ground surface with access to the distributor pipes and top of the filter media for maintenance and media replacement.

"Gravel" means stone screened from river sand or quarried. Concrete aggregate designated as Class II by the department of transportation is acceptable.

"Gravelless pipe system" means an absorption system comprised of large diameter (8 and 10 inches) corrugated plastic pipe, perforated with holes on a 120–degree arc centered on the bottom, wrapped in a sheath of geotextile filter wrap and installed level in a trench without gravel bedding or cover.

"Individual mechanical aerobic wastewater treatment system" means an individual wastewater treatment and disposal system employing bacterial action which is maintained by the utilization of air or oxygen and includes the aeration plant and equipment and the method of final effluent disposal.

"Intermittent sand filters" are beds of granular materials 24 to 36 inches deep underlain by graded gravel and collecting tile. Wastewater is applied intermittently to the surface of the bed through distribution pipes or troughs and the bed is underdrained to collect and discharge the final effluent. Uniform distribution is normally obtained by dosing so as to flood the entire surface of the bed. Filters may be designed to provide free access (open filters), or may be buried in the ground (buried filters or subsurface sand filters).

"Lake" means a natural or man–made impoundment of water with more than one acre of water surface area at the high water level.

"Limiting layer" means bedrock, seasonally high groundwater level, or any layer of soil with a stabilized percolation rate exceeding 60 minutes for the water to fall one inch.

"Mound system" is an alternative aboveground system used to absorb effluents from septic tanks in cases where either seasonally high water table, high bedrock conditions, slowly permeable soils or limited land areas prevent conventional subsurface absorption systems.

"Onsite wastewater treatment and disposal system" means all equipment and devices necessary for proper conduction, collection, storage, treatment, and disposal of wastewater from four or fewer dwelling units or other facility serving the equivalent of 15 persons (1,500 gpd) or less. This includes domestic waste whether residential or nonresidential but does not include industrial waste of any flow rate. Included within the scope of this definition are building sewers, septic tanks, subsurface absorption systems, mound systems, sand filters, constructed wetlands and individual mechanical/aerobic wastewater treatment systems.

"Percolation test" is a falling water level procedure used to determine the ability of soils to absorb primary treated wastewater. (See Appendix B.)

"Pond" means a man–made impoundment of water with a water surface area of one acre or less at the high water level.

"Primary treatment" is a unit or system to separate the floating and settleable solids from the wastewater before the partially treated effluent is discharged for secondary treatment.

"Professional soil analysis" is an alternative to the percolation test which depends upon a knowledgeable person evaluating the soil factors, such as color, texture, and structure, in order to determine an equivalent percolation rate. Demonstrated training and experience in soil morphology

(testing absorption qualities of soil by the physical examination of the soil's color, mottling, texture, structure, topography and hillslope position) shall be required to perform a professional soil analysis.

"Qualified sampler," for the purposes of collecting compliance effluent samples required under NPDES General Permit No. 4, means one of the following persons: a DNR staff person, a county environmental health staff person, an Iowa–certified wastewater treatment operator, or an individual who has received training approved by the department to conduct effluent sampling.

"Roof drain" is a drain installed to receive water collecting on the surface of a roof and discharging into an area or storm drain system.

"Secondary treatment system" is a system which provides biological treatment of the effluent from septic tanks or other primary treatment units to meet minimum effluent standards as required in these rules and NPDES General Permit No. 4. Examples include soil absorption systems, sand filters,mechanical/aerobic systems, or other systems providing equivalent treatment.

"Septage" means the liquid contents (including sludge and scum) of a septic tank normally pumped out periodically and transported to another site for disposal.

"Septic tank" is a watertight structure into which wastewater is discharged for solids separation and digestion, referred to as part of the closed portion of the treatment system.

"Sewage wastewater" is the water–carried waste derived from ordinary living processes.

"Sludge" means the digested or partially digested solid material accumulated in a wastewater treatment facility.

"Stream" means any watercourse listed as being a "designated use segment" in rule 567—61.3(455B) which includes any watercourse which maintains flow throughout the year or contains sufficient pooled areas during intermittent flow periods to maintain a viable aquatic community of significance.

"Subsurface absorption system" is a system of perforated conduits connected to a distribution system, forming a series of subsurface, water–carrying channels into which the primary treated effluent is discharged for direct absorption into the soil (referred to as part of the open portion of the treatment system).

"Subsurface sand filter" is a system in which the effluent from the primary treatment unit is discharged into perforated pipes, filtered through a layer of sand, and collected by lower perforated pipes for discharge to the surface or to a subsurface absorption system. A subsurface sand filter is an intermittent sand filter which is placed within the ground and provided with a natural topsoil cover over the crown of the distribution pipes.

"Wastewater management district" means an entity organized in accordance with permitting legislation to perform various specific functions such as planning, financing, construction, supervision, repair, maintenance, operation and management of onsite wastewater treatment and disposal systems within a designated area.

69.1(3) *General regulations.*

a. Connections to approved sewer system.

(1) No onsite wastewater treatment and disposal system shall be installed, repaired, or rehabilitated where a public sanitary sewer is available or where a local ordinance requires connection to a public system. The public sewer may be considered as not available when such public sewer, or any building or any exterior drainage facility connected thereto, is located more than 200 feet from any proposed building or exterior drainage facility on any lot or premises which abuts and is served by such public sewer. Final determination of availability shall be made by the administrative authority.

(2) When a public sanitary sewer becomes available within 200 feet, any building then served by an onsite wastewater treatment and disposal system shall connect to said public sanitary sewer within a time frame or under conditions set by the administrative authority.

(3) When a public sanitary sewer is not available, every building wherein persons reside, congregate or are employed shall be provided with an approved onsite wastewater treatment and disposal system.

(4) If a building is to be connected to an existing onsite wastewater treatment and disposal system, that existing system shall meet the standards of these rules and be appropriately sized.

b. Discharge restrictions. It is prohibited to discharge any wastewater from onsite wastewater treatment and disposal systems (except under an NPDES permit) to any ditch, stream, pond, lake, natural or artificial waterway, county drain tile, surface water drain tile, land drain tile or to the surface of the ground. Under no conditions shall effluent from onsite wastewater treatment and disposal systems be discharged to any abandoned well, agricultural drainage well or sinkhole. Existing discharges to any of the above–listed locations or structures shall be eliminated by constructing a system which is in compliance with the requirements of these rules.

c. Construction or alteration. All onsite wastewater treatment and disposal systems constructed or altered after the effective date of these rules (May 13, 1998) shall comply with these requirements. Alteration includes any changes that effect the treatment or disposal of the waste. Repair of existing components that does not change the treatment or disposal would be exempt. However, the discharge restrictions in *"b"* above would always apply.

69.1(4) *Permit required.* No onsite wastewater treatment and disposal system shall be installed or altered as described in 69.1(3)*"c,"* until an application for a permit has been submitted and a permit has been issued by the administrative authority. The installation shall be in accordance with these rules.

69.1(5) *Site analysis.*

a. Site evaluation. A site evaluation shall be conducted prior to issuance of a construction permit. Consideration shall be given, but not be limited to, the impact of the following: topography; drainageways; terraces; floodplain; percent of land slope; location of property lines; location of easements; buried utilities; existing and proposed tile lines; existing, proposed and abandoned water wells; amount of available area for the installation of the system; evidence of unstable ground; alteration (cutting, filling, compacting) of existing soil profile; and soil factors determined from a soil analysis, percolation tests and soil survey maps if available.

b. Soil survey reports. During a site analysis and investigation, maximum use should be made of soil survey reports which are available from USDA Natural Resources Conservation Service. A general identification of the percolation potential can be made from soil map units in Iowa. Verification of the soil permeability on the specific site must be performed.

69.1(6) *Minimum distances.* All onsite wastewater treatment and disposal systems shall be located in accordance with the minimum distances shown in Table I.

TABLE I

Minimum Distance in Feet From	Closed Portion of Treatment System[1]	Open Portion of Treatment System[2]
Private water supply well	50	100
Public water supply well	200	200
Groundwater heat pump borehole	50	100
Lake or reservoir	50	100
Stream or pond	25	25
Edge of drainage ditch	10	10
Dwelling or other structure	10	10
Property lines (unless a mutual easement is signed and recorded)	10	10
Other type subsurface treatment system	5	10
Water lines continually under pressure	10	10
Suction water lines	50	100
Foundation drains or subsurface tiles	10	10

[1]Includes septic tanks, mechanical aeration tanks and impervious vault toilets.

[2]Includes subsurface absorption systems, mound systems, intermittent sand filters, constructed wetlands or waste stabilization ponds.

567—69.2(455B) Requirements when effluent is discharged into surface water. All discharges from onsite wastewater treatment and disposal systems which are discharged into any surface water, to the surface of the ground, or into a subsurface drainage tile that discharges to a surface water shall be treated in a manner that will conform with the requirements of NPDES General Permit No. 4 issued by the department of natural resources, as referenced in 567—Chapter 64. Prior to the installation of any system discharging to waters of the state, a notice of intent to be covered by NPDES General Permit No. 4 shall be submitted to the department. Systems covered by this permit must meet all applicable requirements listed in the NPDES permit, including effluent sampling and monitoring.

567—69.3(455B) Requirements when discharged into the soil. No septage or wastewater shall be discharged into the soil except in compliance with the requirements contained in these rules.

567—69.4(455B) Building sewers.

69.4(1) *Location and construction.* The types of construction and distances as shown in Table II shall be maintained for the protection of water supplies. The distances shall be considered minimum and increased where possible to provide better protection.

TABLE II

Sewer Construction	Distance from Well Water Supply	
	Private	Public
1. Schedule 40 plastic pipe (or SDR 26 or stronger) with approved type joints or cast–iron soil pipe (extra heavy or centrifugally cast) with joints of preformed gaskets.	10	25
2. Sewer pipe installed to remain watertight and root–proof.	50	75

Under no circumstances shall a well suction line pass under a building sewer line.

69.4(2) *Requirements for building sewers.*

a. Type. Building sewers used to conduct wastewater from a building to the primary treatment unit of an onsite wastewater treatment and disposal system shall be constructed of Schedule 40 plastic pipe (or SDR 26 or stronger) with solvent–weld or bell–and–gasket type joints, or cast iron with integral bell–and–gasket type joints.

b. Size. Such building sewers shall not be less than 4 inches in diameter.

c. Grade. Such building sewers shall be laid to the following minimum grades:

4–inch sewer..... 12 inches per 100 feet

6–inch sewer..... 8 inches per 100 feet

69.4(3) *Cleanouts.*

a. Spacing. A cleanout shall be provided where the building sewer leaves the house and at least every 100 feet allowing rodding downstream.

b. Change of direction. An accessible cleanout shall be provided at each change in direction or grade, if the change exceeds 45 degrees.

567—69.5(455B) Primary treatment—septic tanks.

69.5(1)... *General requirements.*

a. Septic tank required. Every onsite wastewater treatment and disposal system, exceptmechanical–aerobic systems, shall have as a primary treatment unit a septic tank as described in this rule. All wastewater from the facility serviced shall discharge into the septic tank (except as noted in *"d"* below).

b. Easements. No septic tank shall be located upon property under ownership different from the ownership of that property or lot upon which the wastewater originates unless easements to that effect are legally recorded and approved by the proper administrative authority.

c. Effluent discharge requirements. All septic tank effluent shall discharge into a secondary treatment system in compliance with this rule or other system approved by the administrative authority according to rule 69.18(455B).

d. Prohibited wastes. Septic tanks shall not be used for the disposal of chemical wastes or grease in quantities which might be detrimental to the bacterial action in the tank or for the disposal of drainage from roof drains, foundation drains, or area drains.

69.5(2)... *Capacity.*

a. Minimum capacity. The minimum liquid holding capacity shall be as specified in the following table (capacity may be obtained by using one or more tanks):

up to and including 3–bedroom homes	1,000 gal.
4–bedroom homes	1,250 gal.
5–bedroom homes	1,500 gal.
6–bedroom homes	1,750 gal.

Two hundred fifty gallons of capacity shall be added to each of these tank volumes if a kitchen garbage disposal unit, water softener, or a high volume water use fixture such as a whirlpool bath is to be used.

b. Other domestic waste systems. In the event that any installation serves more than a 6–bedroom home or its equivalent, or serves a facility other than a house and serves the equivalent of 15 persons or less (1,500 gal/day), approval of septic tank capacity and design must be obtained from the administrative authority. Minimum septic tank liquid holding volume shall be two times the estimated daily sewage flow.

c. For wastewater flow rates for nonresidential and commercial domestic waste applications under 1,500 gal/day, refer to Appendix A.

d. Minimum depth. Minimum liquid holding depth in any compartment shall be 40 inches.

e. Maximum depth. Maximum liquid holding depth for calculating capacity of the tank shall not exceed 6½ feet.

f. Dimensions. The interior length of a septic tank should not be less than 5 feet and shall be at least 1½ times the width (larger length–to–width ratios are preferred). No tank or compartment shall have an inside width of less than 2 feet. The minimum inside diameter of a vertical cylindrical septic tank shall be 5 feet.

69.5(3) *Construction details.*

a. Fill soil. Any septic tank placed in fill soil shall be placed upon a level, stable base that will not settle.

b. Compartmentalization. Every septic tank shall be divided into two compartments as follows (compartmentalization may be obtained by using more than one tank):

(1) The capacity of the influent compartment shall not be less than one–half nor more than two–thirds of the total tank capacity.

(2) The capacity of the effluent compartment shall not be less than one–third nor more than one–half of the total tank capacity.

c. Inlet/outlet. The invert of the inlet pipe shall be a minimum of 2 inches and a maximum of 4 inches higher than the invert of the outlet pipe.

d. Baffles. Four–inch diameter schedule 40 plastic pipe tees shall be used as inlet and outlet baffles. Inlet tees shall extend at least 6 inches above and 8 inches below the liquid level of the tank. The inlet tee shall extend below the liquid level no more than 20 percent of the liquid depth. The outlet tee shall extend above the liquid level a distance of at least 6 inches and below the liquid level a distance of at least 10 inches but no more than 25 percent of the liquid depth. A minimum clearance between the top of the

inlet and outlet tees and the bottom of the tank lid of 2 inches shall be provided. A horizontal separation of at least 36 inches shall be provided between the inlet baffle and the outlet baffle in each compartment.

A horizontal slot 4 inches by 6 inches, or two suitably spaced 4–inch diameter holes in the tank partition, may be used instead of a tee or baffle, the top of the slot or holes to be located below the water level a distance of one–third the liquid depth. A ventilation hole or slot shall be provided in the partition, at least 8 inches above the liquid level.

e. Access. Access must be provided to all parts of septic tanks necessary for adequate inspection, operation, and maintenance.

An access opening shall be provided at each end of the tank over the inlet and outlet. These openings shall be at least 18 inches in the smallest dimension if the tank has no other openings. Alternatively, a single opening at least 24 inches in diameter may be provided at the center of the tank allowing access to both compartments, with two smaller openings at least 6 inches in diameter over both inlet and outlet.

If the top of the tank is to be greater than 12 inches below the finished ground surface, a riser at least 24 inches in diameter must be installed over each manhole of 18 inches in diameter or more to bring the top of the manhole lid to within 6 inches of the finished ground surface.

69.5(4) *Construction.*

a. Materials. Tanks shall be constructed of poured concrete or plastic resistant to corrosion or decay and designed so that they will not collapse or rupture when subjected to anticipated earth and hydrostatic pressures when the tanks are either full or empty. Metal tanks are prohibited.

b. Dividers. Tank divider walls and divider wall supports shall be constructed of heavy, durable plastic, fiberglass, concrete or other similar corrosion–resistant materials approved by the administrative authority.

c. Inlet and outlet ports. Inlet and outlet ports of pipe shall be constructed of heavy, durable schedule 40 PVC plastic sanitary tees or other similar approved corrosion–resistant material.

69.5(5) *Wall thickness.* Minimum wall thickness for tanks shall conform to the following specifications:

Poured concrete	6 inches thick
Poured concrete, reinforced	4 inches thick
Special concrete mix, vibrated and reinforced	2.5 inches thick
Fiberglass or plastic	.25 inches thick

69.5(6) *Concrete specifications.* Concrete used in precast septic tank construction shall have a maximum water–to–cement ratio of 0.45. Cement content shall be at least 650 pounds per cubic yard. Minimum compressive strength (f'_c) shall be 4,000 psi (28 Mpa) at 28 days of age. The use of ASTM C150 Type II cement or the addition of silica fume or Class F fly ash is recommended.

69.5(7) *Tank bottoms.* Septic tank bottoms shall conform to the specifications set forth for septic tank walls except special mix concrete shall be at least 3 inches thick.

69.5(8) *Tank tops.* Concrete or masonry septic tank tops shall be a minimum of 4 inches in thickness and reinforced with 3/8–inch reinforcing rods in a 6–inch grid or equivalent. Fiberglass or plastic tank tops shall be a minimum of 1/4 inch in thickness and shall have reinforcing and be of ribbed construction.

69.5(9) *Reinforcing steel placement.* The concrete cover for reinforcing bars, mats, or fabric shall not be less than 1 inch.

69.5(10) *Bedding.* Fiberglass or plastic tanks shall be bedded according to manufacturer's specifications. Provisions should be made to prevent flotation when the tanks are empty.

69.5(11) *Connecting pipes.*

a. Minimum diameter. The pipes connecting septic tanks installed in series and at least the first 5 feet on the effluent side of the last tank shall be a minimum of 4–inch diameter schedule 40 plastic.

b. Tank connections. All inlet and outlet connections at the septic tanks shall be made by self–sealing gaskets cast into the concrete or formed into the plastic or fiberglass.

c. Joints. All joints in connecting schedule 40 plastic pipe shall be approved plastic pipe connections such as solvent–welded or compression–type gaskets.

d. Pipe in unstable ground. Schedule 40 plastic pipe shall be used extending across excavations or unstable ground to at least 2 feet beyond the point where the original ground has not been disturbed in septic tank installations. If the excavation spanned is more than 2 feet, it must be filled with sand or compacted fill to provide a firm bed for the pipe. The first 12 inches of backfill over the pipe shall be applied in thin layers using material free from stones, boulders, large frozen chunks of earth or any similar material that would damage or break the pipe.

567—69.6(455B) Secondary treatment—subsurface absorption systems. Soil absorption systems are the best available treatment technology and shall always be used where possible.

69.6(1) *General requirements.*

a. Locations. All subsurface absorption systems shall be located on the property to maximize the vertical separation distance from the bottom of the absorption trench to the seasonal high groundwater level, bedrock, hardpan or other confining layer, but under no circumstances shall this vertical separation be less than 3 feet.

b. Soil evaluation. A percolation test or professional soil analysis is required before any soil absorption system is installed.

(1) Percolation test. The percolation test procedure is outlined in Appendix B.

(2) Alternative analysis. If a professional soil analysis is performed, soil factors such as soil content, color, texture, and structure shall be used to determine a percolation rate.

(3) *Acceptable percolation rate.* An area is deemed suitable for conventional soil absorption if the average percolation test rate is 60 minutes per inch or less and greater than 1 minute per inch. However, if an alternative type system is proposed (e.g., mound), then the percolation test should be extended to determine whether a percolation rate of 120 minutes per inch is achieved.

(4) *Confining layer determination.* An additional test hole 6 feet in depth or to rock, whichever occurs first, shall be provided in the center of the proposed absorption area to determine the location of groundwater, rock formations or other confining layers. This 6–foot test hole may be augered the same size as the percolation test holes or may be made with a soil probe.

c. Groundwater. If seasonal high groundwater level is present within 3 feet of the trench bottom final grade and cannot be successfully lowered by subsurface tile drainage, the area shall be classified as unsuitable for the installation of a standard subsurface absorption system. Consult the administrative authority for an acceptable alternative method of wastewater treatment.

d. Site limitations. In situations where specific location or site characteristics would appear to prohibit normal installation of a soil absorption system, design modifications may be approved by the administrative authority which could overcome such limitations. Examples of such modifications could be the installation of subsurface drainage, use of shallow or at–grade trenches, use of dual soil treatment areas, mound system or water conservation plans.

e. Prohibited drainage. Roof, foundation and storm drains shall not discharge into or upon subsurface absorption systems. Nothing shall enter the subsurface absorption system which does not first pass through the septic tank.

f. Prohibited construction. There shall be no construction of any kind, including driveways, covering the septic tank, distribution box or absorption field of an on–site wastewater treatment and disposal system. Vehicle access should be infrequent, primarily limited to vegetation maintenance.

g. Driveway crossings. Connecting lines under driveways shall be constructed of schedule 40 plastic pipe or equivalent, and shall be protected from freezing.

h. Easements. No wastewater shall be discharged upon any property under ownership different from the ownership of the property or lot upon which it originates unless easements to that effect are legally recorded and approved by the administrative authority.

69.6(2) *Trench length requirements.*

a. Percolation charts. Table IIIa specifies lineal feet of lateral trenches required in accordance with the results of the standard percolation tests. Tables IIIb and IIIc list optional methods for determining length of lateral trenches or sizing of absorption beds. The alternative option for increased rock usage

(Table IIIb) shall be used only when the size of lots limits the use of trench lengths prescribed in Table IIIa. Absorption beds (Table IIIc) shall not be used except when the lot size limitations preclude the installation of a lateral trench system. Further details concerning limitations of these two alternatives should be obtained from the administrative authority prior to requesting authorization for installation.

b. Unsuitable absorption. Conventional subsurface soil absorption trenches shall not be installed in soils that have a percolation rate less than 1 minute per inch or greater than 60 minutes per inch. Plans for an alternative method of wastewater treatment shall be submitted to the administrative authority for approval prior to construction.

Table IIIa
Soil Absorption System Sizing Chart
(Lineal feet of absorption trench)

Min. Per Inch	Two–Bedroom 300 gal/day[1]	Three–Bedroom 450 gal/day	Four–Bedroom 600 gal/day	Five–Bedroom 750 gal/day	Six–Bedroom 900 gal/day
1–5[2]	160	200	260	340	400
6–15	200	300	400	500	600
16–30	300	400	500	600	700
31–45	400	500	600	800	900
46–60	500	600	700	900	1,100

[1]For domestic, nonhousehold wastewater flow rates, refer to Appendix A.

[2]For soils having more than 50 percent of very fine sand by weight, plus fine sand having a particle size range of 0.05 millimeters (sieve size 270) to 0.25 millimeters (sieve size 60), the 16–30 min. per inch values shall be used when gravelless pipe is installed.

Table IIIb
Alternative Option for Increased Rock Usage
(Only if necessary)

Depth of gravel[1] below distribution line	Reduction in trench lengths as taken from Table IIIa
12″	20%
18″	33%
24″	40%

[1]Total depth of trench must not exceed 36″. Soil profile must be consistent with the percolation rate throughout the depth used. Separation from groundwater and confining layers must be maintained.

Table IIIc
Alternative Option for Use of Absorption Bed[1]

Percolation Rate Min./Inch	Absorption Area/Bedroom Sq. Ft.	Loading Rate/Day Gal./Sq. Ft.
1–5	300	.5
6–15	400	.375
16–30	600	.25

[1]Absorption beds may only be used when site space restrictions require and shall not be used when the soil percolation rate exceeds 30 min./inch.

69.6(3) *Construction details.* (All soil absorption trenches.)

a. Depth. Lateral trenches shall not exceed 36 inches in depth unless authorized by the administrative authority, but a more shallow trench bottom depth of 18 to 24 inches is recommended. Not less than 6 inches of porous soil shall be provided over the laterals. Minimum separation between trench bottom and groundwater, rock formation or other confining layers shall be 36 inches even if extra rock is used under the pipe.

b. Length. No lateral absorption trench shall be greater than 100 feet long.

c. Separation distance. At least 6 feet of undisturbed soil shall be left between each trench edge on level sites. The steeper the slope of the ground, the greater the separation distance should be. Two feet of separation distance should be added for each 5 percent increase in slope from level.

d. Grade. Trench bottom should be constructed level from end to end. On sloping ground, the trench shall follow a uniform land contour to maintain a minimum soil cover of 6 inches while ensuring a level trench bottom.

e. Compaction. There shall be minimum use or traffic of heavy equipment on the area proposed for soil absorption. In addition, it is prohibited to use heavy equipment on the bottom of the trenches in the absorption area.

f. Fill soil. Soil absorption systems shall not be installed in fill soil. Disturbed soils which have stabilized for at least one year would require a recent percolation test.

g. Bearing strength. Soil absorption systems shall be designed to carry loadings to meetAASHTO H–10 standards.

h. Soil smearing. Soils with significant clay content should not be worked when wet. If soil moisture causes sidewall smearing, the trench bottom and sidewalls shall be scarified.

69.6(4) *Gravel systems.*

a. Gravel. A minimum of 6 inches of clean, washed river gravel, free of clay and clay coatings, shall be laid below the distribution pipe, and enough gravel shall be used to cover the pipe. This gravel shall be of such a size that 100 percent will pass a 2½–inch screen and 100 percent will be retained on a ¾–inch screen. Limestone or crushed rock is not recommended for soil absorption systems. If used it shall meet the following criteria:

(1) Abrasion loss. The percent wear, as determined in accordance with the AASHTO T 96, Grading C, shall not exceed 40 percent.

(2) Freeze and thaw loss. When subjected to the freezing and thawing test, Iowa DOT Materials Laboratory Test Method 211, Method A, the percentage loss shall not exceed 10 percent.

(3) Absorption. The percent absorption, determined in accordance with Iowa DOT Materials Laboratory Test Method 202, shall not exceed 3 percent.

(4) Gradation. The aggregate shall have not more than 1.5 percent by weight pass a No. 16 sieve.

b. Trench width. Lateral trenches for gravel systems shall be a minimum of 24 inches and a maximum of 36 inches in width at the bottom of the trench.

c. Grade. The distribution pipes shall be laid with a minimum grade of 2 inches per 100 feet of run and a maximum grade of 6 inches per 100 feet of run, with a preference given to the lesser slope.

d. Pipe. Distribution pipe shall be PVC rigid plastic meeting ASTM Standard 2729, or other suitable material approved by the administrative authority. The inside diameter shall be not less than 4 inches, with perforations at least ½ inch and no more than ¾ inch in diameter spaced no more than 40 inches apart. Two rows of perforations shall be provided located 120 degrees apart along the bottom half of the tubing (each 60 degrees up from the bottom centerline). The end of the pipe in each trench shall be sealed with a watertight cap unless, on a level site, a footer is installed connecting the trenches together. Coiled perforated plastic pipe shall not be used when installing absorption systems.

e. Gravel cover. Unbacked, rolled, 3½–inch–thick fiberglass insulation, untreated building paper, synthetic drainage fabric, or other approved material shall be laid so as to separate the gravel from the soil backfill.

69.6(5) *Gravelless pipe systems.*

a. Application. Gravelless subsurface absorption systems may be used as an alternative to conventional 4–inch pipe placed in gravel–filled trenches. However, they cannot be used in areas where

conventional systems would not be allowed due to poor permeability, high groundwater, or insufficient depth to bedrock.

b. Installation. Manufacturer's specifications and installation procedures shall be adhered to.

c. Material. The 8– and 10–inch I.D. corrugated polyethylene tubing used in gravelless systems shall meet the requirements of ASTM F667, Standard Specification for Large Diameter Corrugated Polyethylene Tubing.

d. Perforations. Two rows of perforations shall be located 120 degrees apart along the bottom half of the tubing (each 60 degrees up from the bottom centerline). Perforations shall be cleanly cut into each inner corrugation along the length of the tubing and should be staggered so that there is only one hole in each corrugation.

e. Top marking. The tubing should be visibly marked to indicate the top of the pipe.

f. Filter wrap. All gravelless drainfield pipe shall be encased, at the point of manufacture, with a geotextile filter wrap specific to this purpose.

g. Trench width. If dug with a backhoe, the minimum trench width for the gravelless system shall be 18 inches in sandy loam soil to ensure proper backfill around the bottom half of the pipe. In clay soils, the minimum trench width shall be 24 inches. If the pipe is laid in with a wheel trencher leaving a curved trench bottom, the trench width may be just 2 inches wider than the outside diameter of the pipe.

h. Length of trench. The total length of absorption trench for a 10–inch gravelless tubing installation shall be the same as given in Table IIIa for a conventional absorption trench, except for fine sandy soils as noted in Table IIIa footnote. An increase of at least 20 percent in total trench length shall be required if 8–inch tubing is used rather than 10–inch.

69.6(6) *Chamber systems.*

a. Application. Chamber systems may be used as an alternative to conventional 4–inch pipe placed in gravel–filled trenches. However, they cannot be used in areas where conventional systems would not be allowed due to poor permeability, high groundwater, or insufficient depth to bedrock.

b. Installation. Manufacturer's specifications and installation procedures shall be closely adhered to.

c. Length of trench. The total length of absorption trench for chambers 24 inches or less in bottom width shall be the same as given in Table IIIa for a conventional absorption trench. For chambers greater than 33 inches in width a reduction of 25 percent from the lengths given in Table IIIa may be used.

d. Sidewall. The chambers shall have at least 6 inches of sidewall effluent soil exposure height.

69.6(7) *Gravity distribution.* Dosing is always recommended and preferred to improve distribution, improve treatment and extend the life of the system.

a. On a hillside, septic tank effluent may be serially loaded to the soil absorption trenches by drop boxes or overflow piping (rigid sewer pipe). Otherwise, effluent shall be distributed evenly to all trenches by use of a distribution box or commercial distribution regulator approved by the administrative authority.

b. Design. When a distribution box is used, it shall be of proper design and installed with separate watertight headers leading from the distribution box to each lateral. Header pipes shall be rigid PVC plastic pipe meeting ASTM Standard 2729 or equivalent.

c. Outlets height. The distribution box shall have outlets at the same level at least 4 inches above the bottom of the box to provide a minimum of 4 inches of water retention in the box.

d. Baffles. There shall be a pipe tee or baffle at the inlet to break the water flow.

e. Unused outlets. All unused outlet holes in the box shall be securely closed.

f. Interior coating. All distribution boxes shall be constructed of corrosion–resistant rigid plastic materials, or other corrosion–resistant material approved by the administrative authority.

g. Outlets level. All outlets of the distribution box shall be made level. A 4–inch cap with an offset hole approximately 2½ inches in diameter shall be installed on each outlet pipe. These caps shall be rotated until all outlets discharge at the same elevation. Equivalent leveling devices may be approved by the local authority.

h. Equal length required. The soil absorption area serviced by each outlet of the distribution box shall be equal.

69.6(8) *Dosing systems.*

a. Pump systems.

(1) Pump and pit requirements. In the event the effluent from the septic tank outlet cannot be discharged by gravity and still maintain proper lateral depths, the effluent shall discharge into a watertight vented pump pit with an inside diameter of not less than 24 inches, equipped with a tight–fitting manhole cover at grade level. The sump vent shall extend a minimum of 6 inches above grade level and shall be a minimum size of 1¼ inches fitted with a return bend. The pump shall be of a submersible type of corrosion–resistant material.

(2) Pump setting. The pump shall be installed in the pump pit in a manner that ensures ease of service and protection from frost and settled sludge. The pump shall be set to provide a dosing frequency of approximately twice a day based on the maximum design flow. No on–site electrical connections shall be made in the pump pit. These connections shall be made in an exterior weatherproof box.

(3) Pressure line size. The pressure line from the pump to the point of discharge shall not be smaller than the outlet of the pump it serves.

(4) Drainage. Pressure lines shall be installed to provide total drainage between dosings to prevent freezing or be buried below frost level up to the distribution box.

(5) High water alarm. Pump pits shall be equipped with a sensor set to detect if the water level rises above the design high water level when the pump fails. This sensor shall activate an auditory or visual alarm to alert the homeowner that repairs are required.

(6) Discharge point. The effluent shall discharge under pressure into a distribution box or may be distributed by small diameter pipes throughout the entire absorption field.

b. Dosing siphons. Dosing siphons may also be used. Manufacturer's specifications shall be adhered to for installation. Similar dosing volumes and frequencies are recommended. Dosing siphons require periodic cleaning to ensure their continued proper operation.

567—69.7(455B) Mound system.

69.7(1) *General requirements.*

a. Mound systems shall be permitted only after a thorough site evaluation has been made and landscaping, dwelling placement, effect on surface drainage and general topography have been considered.

b. Mound systems shall not be utilized on sites which are subject to flooding with a ten–year or greater frequency.

c. Mound systems shall not be utilized on soils where the high groundwater level, impermeable bedrock or soil strata having a percolation rate exceeding 120 minutes per inch occur within 12 inches of natural grade, or where creviced bedrock occurs within 20 inches of natural grade.

d. Mound systems shall be constructed only upon undisturbed naturally occurring soils.

e. Mound systems shall be located in accordance with the distances specified in Table I as measured from the outer edge of the mound.

f. No buildings, driveways or other surface or subsurface obstructions shall be permitted within 50 feet on the down gradient side of the mound when the mound is constructed on a slope greater than 5 percent. No future construction shall be permitted in this effluent disposal area as long as the mound is in use.

g. Specifications given in these rules for mounds are minimal and may not be sufficient for all applications. Technical specifications are changing with experience and research. Other design information beyond the scope of these rules may be necessary to properly design a mound system.

69.7(2) *Material for mound fill.*

a. The mound shall be constructed using clean, medium–textured sand, sometimes referred to as concrete sand. The sand size shall be such that at least 25 percent by weight shall have a diameter between 2.0 and 0.25 mm, less than 35 percent with a diameter between 0.25 and 0.05 mm and less than 5 percent with a diameter between 0.002 and 0.05 mm.

b. Rock fragments larger than 1/16 inch (2.0 mm) shall not exceed 15 percent by weight of the material used for sandy fill.

69.7(3) *Construction details.*

a. There shall be a minimum of 3 feet of fill material and undisturbed naturally occurring soils between the bottom of the washed gravel and the highest elevation of the limiting conditions defined in 69.7(1)*"c."*

b. Gravel shall be washed and shall range in size from ¾ inch to 2½ inches.

c. From 1 to 2 feet of medium–textured sand (depending upon the underlying soil depth, see 69.7(3)*"a"*) must be placed between the bottom of the gravel and the top of the plowed surface of the naturally occurring soil.

d. Mound systems shall utilize absorption bed distribution piping design. The bed shall be installed with the long dimension parallel to the land contour. Systems on steep slopes with slowly permeable soils should be narrow to reduce the possibility of toe seepage.

e. Minimum spacing between distribution pipes shall be 4 feet, and a minimum of 3 feet shall be maintained between any trench and the sidewall of the mound.

f. No soil under or up to 50 feet down gradient of the mound may be removed or disturbed except as specified herein.

g. Construction equipment which would cause undesirable compaction of the soil shall be kept off the base area. Construction or plowing shall not be initiated when the soil moisture content is high. If a sample of soil from approximately 9 inches below the surface can be easily rolled into a 1/8– to 1/4–inch diameter wire, the soil moisture content is too high for construction purposes.

h. Aboveground vegetation shall be closely cut and removed from the ground surface throughout the area to be utilized for the placement of the fill material.

i. The area shall be plowed to a depth of 7 to 8 inches, parallel to the land contour with the plow throwing the soil up slope to provide a proper interface between the fill and the natural soil. Tree stumps should be cut flush with the surface of the ground, and roots should not be pulled.

j. The base area of the mound is to be calculated on the results of percolation rate as indicated in Table IV. The base area of the mound below and down slope from the trenches, excluding the area under the end slopes, must be large enough for the natural soil to absorb the estimated daily wastewater flow.

k. Table IV

Percolation Rate Min/Inch	Application Rate Gal/Square Foot/Day
Less than 1	Not Suitable
1 – 5	1.25
6 – 15	1.00
16 – 30	.75
31 – 45	.50
46 – 60	.40
61 – 90	.20
91 – 120	.10
Over 120	Not Suitable

l. The area of the fill material shall be sufficient to extend 3 feet beyond the edge of the gravel area before the sides are shaped to at least a 4:1 slope (preferably 5:1).

m. Distribution system.

(1) The distribution pipe shall be rigid plastic pipe, schedule 40 or 80 with 1–inch nominal diameter.

(2) The distribution pipe shall be provided with a single row of ¼–inch perforations in a straight line 30 inches on center along the length of the pipe or an equivalent design that ensures uniform distribution. All joints and connections shall be solvent–cemented.

(3) The distribution pipe shall be placed in the clean, washed gravel (or crushed limestone as described in 69.6(4)*"a"*) with holes downward. The gravel shall be a minimum of 9 inches in depth below and 3 inches in depth above the pipe.

(4) No perforations shall be permitted within 3 inches of the outer ends of any distribution pipes.

(5) The outer ends of all pressure distribution lines shall be securely capped.

(6) The central pressure manifold should consist of 1½–inch or 2–inch solid plastic pipe using a tee or cross for connecting the distribution lines.

n. Construction should be initiated immediately after preparation of the soil interface by placing all of the sandy fill material needed for the mound (to the top of the trench) to a minimum depth of 21 inches above the plowed surface. This depth will permit excavation of the trenches to accommodate the 9 inches of washed gravel or crushed stone necessary for the distribution piping.

o. The absorption trench or trenches shall be hand excavated to a depth of 9 inches, the bottoms of the trenches made certain to be level.

p. Twelve inches of gravel shall be placed in the trench and hand leveled, and then 3 inches of the gravel removed with a shovel in the location where the distribution pipe will be placed. After the distribution pipe is placed the pipe shall be covered with 2 inches of gravel.

q. The top of the gravel shall be covered with synthetic drainage fabric. Unbacked, rolled 3½–inch–thick fiberglass insulation, untreated building paper, or other suitable material may be used with approval of the administrative authority. Plastic or treated building paper shall not be used.

r. After installation of the distribution system, gravel and material over the gravel, the entire mound is to be covered with topsoil native to the site or of similar characteristics to support vegetation found in the area. The entire mound shall be crowned by providing 12 inches of topsoil on the side slopes with a minimum of 18 inches over the center of the mound. The entire mound shall be seeded, sodded or otherwise provided with a grass cover to ensure stability of the installation.

s. The area surrounding the mound shall be graded to provide for diversion of surface runoff water.

69.7(4) *Dosing.*

a. Dosing shall be required for mound systems.

b. The dosing volume shall be five to ten times the distribution piping network volume.

c. The size of the dosing pump or siphon shall be capable of maintaining an approximate pressure of one psi at the outer ends of the distribution lines.

567—69.8(455B) Drip irrigation.

69.8(1) *General design.*

a. Pretreatment required. These systems must be preceded by a secondary treatment system discharging a treated, filtered effluent with BOD and TSS values less than 20 mg/L.

b. Separation from groundwater. Drip irrigation systems shall have a minimum vertical separation distance to high groundwater level or bedrock of 20 inches.

c. Maximum hillside slope. Drip irrigation systems shall not be installed on slopes of more than 25 percent.

d. Specifications given in these rules for drip irrigation are minimal and may not be sufficient for all applications. Technical specifications are changing with experience and research. Other design information beyond the scope of these rules may be necessary to properly design a drip irrigation system.

69.8(2) *Emitter layout.*

a. Discharge rate. Systems shall be designed so that emitters discharge approximately 1 gpm at 12 psi or other rates suggested by the manufacturer and approved by the administrative authority.

b. Grid size. Drip lines shall be run in parallel lines 2 feet apart. Emitters shall be placed in the drip lines on 2–foot intervals with emitters offset 1 foot between adjacent lines. Each emitter shall cover 4 square feet of absorption area.

c. Field size. The field shall be sized according to the application rate given in Table V.

d. Depth of drip lines. Drip lines shall be laid on the contour 6 to 12 inches deep with a maximum line length of 100 feet. Lines may be of unequal length.

e. Interconnection. Drip lines shall all be connected to supply and return headers such that the entire system will automatically drain back to the dosing tank or pump pit upon completion of the pumping cycle. Vacuum breakers shall be positioned at the high point of the supply and return headers.

The dosing tank shall have a high water audio/visual alarm.

Table V. Length of Drip Line Required Per Bedroom

Perc. Rate min./in.	Design Hyd. Loading gpd/sq.ft.	Length of Drip Line feet/bedroom
1 – 5	2.0	40
6 – 15	1.3	60
16 – 30	0.9	90
31 – 45	0.6	150
46 – 60	0.4	200
61 – 90	0.2	400
91 – 120	0.1	800

567—69.9(455B) Intermittent sand filters.

69.9(1) *General requirements.*

a. Use. Intermittent sand filters may be used when the administrative authority determines the site is unacceptable for a full–sized soil absorption system.

b. Location. Intermittent sand filters shall be located in accordance with the distances specified in Table I.

c. Sampling. A sampling port shall be available at the discharge point of the filter or shall be installed in the discharge line. Monitoring and effluent sampling of intermittent sand filters must meet the requirements of the NPDES permit as specified in rule 69.2(455B). Such sampling shall be performed annually for a subsurface sand filter as described in 69.9(3) and twice a year, at six–month intervals, for free access sand filters as described in 69.9(4). (Beginning January 1, 2005, such sampling shall be done by a qualified sampler.) Tests shall be run on all samples for carbonaceous biochemical oxygen demand (CBOD5) and *Escherichia coli* (*E. coli*) (testing for *E. coli* is limited to locations noted in the following sentence), and once a year in the spring for total suspended solids (TSS). The maximum CBOD5, TSS, and *E. coli* count limits are as follows. *E. coli* tests shall only be required where effluent is discharged into (directly or within one mile upgradient of the shoreline of) a Class "A1," Class "A2," Class "A3" or Class "C" water.

Effluents Discharging To	*E. coli* cfu/100 mL	CBOD5 mg/L	TSS mg/L
Class "A1," "A2," "A3" and "C" waters*	235	25	25
All other water use classifications	no limit	25	25

*A separation distance of 750 feet shall be maintained between any point of discharge and the shoreline of a Class "A1," "A2," or "A3" water.

d. Prohibited construction. There shall be no construction, such as buildings or concrete driveways, covering any part of an intermittent sand filter.

69.9(2) *Construction.*

a. Number. An intermittent sand filter shall consist of one filtering bed or two or more filtering beds connected in series and separated by a minimum of 6 feet of undisturbed earth.

b. Pipelines. Each bed shall contain a horizontal set of collector lines. The collector lines shall be equivalent to SDR 35 PVC pipe, 8–inch diameter gravelless drainpipe or other suitable materials.

(1) One collector line shall be provided for each 6 feet of width or fraction thereof. A minimum of two collector lines shall be provided.

(2) The collector lines shall be laid to a grade of 1 inch in 10 feet (or 0.5 to 1.0 percent).

(3) Each collector line shall be vented or connected to a common vent. Vents shall extend at least 12 inches above the ground surface with the outlet screened, or provided with a perforated cap.

(4) Gravelless drainfield pipe with fiber wrap may be used for the collector lines. If so, no gravel or pea gravel is required covering the collector lines. The pipe shall be bedded in filter sand.

(5) If 4–inch plastic pipe with perforations is used for the collector lines, they shall be covered as follows:

1. Gravel ¾ inch to 2½ inches in size shall be placed around and over the lower collector lines until there is a minimum of 4 inches of gravel over the pipes.

2. The gravel shall be overlaid with a minimum of 3 inches of washed pea gravel 1/8–inch to 3/8–inch size interfacing with the filter media. A layer of fabric filter may be used in place of the pea gravel. Fabric filters must be 30 by 50 mesh with a percolation rate of at least 5 gal/sq.ft.

(6) A minimum of 24 inches of coarse washed sand shall be placed over the pea gravel or above the gravelless drainfield pipe. The sand shall meet the Iowa DOT standards for concrete sand: 100 percent shall pass a 9.5 mm screen, 90 to 100 percent shall pass a 4.75 mm screen, 70 to 100 percent shall pass a 2.36 mm screen, 10 to 60 percent shall pass a 600Tm screen, and 0 to 1.5 percent shall pass a 75Tm screen.

69.9(3) *Subsurface sand filters.*

a. Distribution system and cover.

(1) Gravel base. Six inches of gravel ¾ inch to 2½ inches in size shall be placed upon the sand in the bed.

(2) Distribution lines. Distribution lines shall be level and shall be horizontally spaced a maximum of 3 feet apart, center to center. Distribution lines shall be rigid perforated PVC pipe.

(3) Venting. Venting shall be placed on the downstream end of the distribution lines with each distribution line being vented or connected to a common vent. Vents shall extend at least 12 inches above the ground surface with the outlet screened, or provided with a perforated cap.

(4) Gravel cover. Enough gravel shall be carefully placed to cover the distributors.

(5) Separation layer. A layer of material such as unbacked, rolled 3½–inch–thick fiberglass insulation, untreated building paper of 40– to 60–pound weight, synthetic drainage fabric or 4 to 6 inches of marsh hay or straw shall be placed upon the top of the upper layer of gravel.

(6) Soil cover. A minimum of 12 inches of soil backfill shall be provided over the beds.

(7) Distribution boxes. A distribution box shall be provided for each filter bed where gravity distribution is used. The distribution boxes shall be placed upon undisturbed earth outside the filter bed. Separate watertight lines shall be provided leading from the distribution boxes to each of the distributor lines in the beds.

b. Sizing of subsurface sand filters.

(1) Gravity flow.

1. For residential systems, single bed subsurface sand filters shall be sized at a rate of 240 square feet of surface area per bedroom.

2. Dual subsurface sand filters, constructed in series, shall be sized at the rate of 160 square feet of surface per bedroom in the first filter and 80 square feet of surface area per bedroom in the second filter in the series.

(2) Pressure dosed.

1. For residential systems, single bed subsurface sand filters dosed by a pump or dosing siphon may be sized at a rate of 180 square feet of surface area per bedroom.

2. Dual subsurface sand filters, constructed in series, may be sized at the rate of 120 square feet of surface per bedroom in the first filter and 60 square feet of surface area per bedroom in the second filter in series.

(3) Nonhousehold. Effluent application rates for commercial systems treating domestic waste shall not exceed the following:

1. 1.5 gallon/square feet/day for double bed sand filters.
2. 1.0 gallon/square feet/day for single bed sand filters.
3. Total surface area for any subsurface sand filter system shall not be less than 200 square feet.

69.9(4) *Free access sand filters.*

a. Description. Media characteristics and underdrain systems for free access filters are similar to those for subsurface filters. Dosing of the filter should provide for flooding the bed to a depth of approximately 2 inches. Dosing frequency is usually greater than two times per day. For coarser media (greater than 0.5 mm) a dosing frequency greater than four times per day is desirable. Higher acceptable loadings on these filters as compared to subsurface filters relate primarily to the accessibility of the filter surface for maintenance. Gravel is not used on top of the sand media, and the distribution pipes are exposed above the surface.

b. Distribution. Distribution to the filter may be by means of troughs laid on the surface, pipelines discharging to splash plates located at the center or corners of the filter, or spray distributors. Care must be taken to ensure that lines discharging directly to the filter surface do not erode the sand surface. The use of curbs around the splash plates or large stones placed around the periphery of the plates will reduce the scour. A layer of washed pea gravel placed over the filter media may also be employed to avoid surface erosion. This practice will create maintenance difficulties, however, when it is time to rake or remove a portion of the media surface.

c. Covers. Free access filters may be covered to protect against severe weather conditions and to avoid encroachment of weeds or animals. The cover also serves to reduce odor conditions. Covers may be constructed of treated wooden planks, galvanized metal, or other suitable material. Screens or hardware cloth mounted on wooden frames may also serve to protect filter surfaces. Where weather conditions dictate, covers should be insulated. A space of 12 to 24 inches should be allowed between the insulated cover and sand surface. Free access filters may not be buried by soil or sod.

d. Loading. The hydraulic loading for free access sand filters should be from 2.0 to 5.0 gpd/sq.ft.

e. Number of filters. Dual filters each sized for the design flow are recommended for loading rates in excess of 3½ gpd/sq.ft. treating septic tank effluent.

69.9(5) *Dosing.* Dosing for sand filters is strongly advised. Without dosing, the entire area of the sand filter is never effectively used. Dosing not only improves treatment effectiveness but also decreases the chance of premature failure.

a. Pumps. A pump shall be installed when adequate elevation is not available for the system to operate by gravity.

(1) The pump shall be of corrosion–resistant material.

(2) The pump shall be installed in a watertight pit.

(3) The dosing system shall be designed to flood the entire filter during the dosing cycle. A dosing frequency of greater than two times per day is recommended.

(4) A high water alarm shall be installed.

b. Dosing siphons. When a dosing siphon is used where elevations permit, such siphon shall be installed as follows:

(1) Dosing siphons shall be installed between the septic tank and the first filter bed.

(2) Dosing siphons shall be installed with strict adherence to the manufacturer's instructions.

c. Dosing tanks. The dosing tank shall be of such size that the siphon will flood the entire filter during the dosing cycle. A dosing frequency of greater than two times per day is recommended.

567—69.10(455B) Individual mechanical aerobic wastewater treatment systems. General requirements for individual mechanical aerobic wastewater treatment systems are as follows:

69.10(1) *Use.* Mechanical/aerobic systems may be used only when the administrative authority determines that the site is unacceptable for a full–sized soil absorption system. Because of the higher

maintenance requirements of mechanical/aerobic systems, preference should be given to sand filters, where conditions allow.

69.10(2) *Certification.* All individual mechanical aerobic wastewater treatment plants shall be certified by an ANSI–accredited third–party certifier to meet National Sanitation Foundation Standard 40, Class I, including appendices (May 1996).

69.10(3) *Installation and operation.* All individual mechanical aerobic wastewater treatment plants shall be installed, operated and maintained in accordance with the manufacturer's instructions and the requirements of the administrative authority. The aerobic plants shall have a minimum treatment capacity of 150 gallons per bedroom per day or 500 gallons, whichever is greater.

69.10(4) *Effluent treatment.* The effluent from individual mechanical aerobic wastewater treatment plants shall receive additional treatment through the use of intermittent sand filters, mound systems or subsurface absorption systems of a magnitude of half that prescribed in rule 69.6(455B), 69.7(455B) or 69.9(455B) or by discharge to a drip irrigation system as sized in 69.8(455B).

69.10(5) *Maintenance contract.* A maintenance contract with a manufacturer–certified technician shall be maintained at all times. Maintenance agreements and responsibility waivers shall be recorded with the county recorder and in the abstract of title for the premises on which mechanical aerobic treatment systems are installed. Mechanical aerobic units shall be inspected for proper operation at least twice a year on six month intervals.

69.10(6) *Effluent sampling.* Any open discharge from systems involving mechanical aeration shall have the effluent sampled twice a year at six–month intervals. (Beginning January 1, 2005, such sampling shall be done by a qualified sampler.) Tests shall be run twice a year on all samples for CBOD5 and *E. coli*, and once a year in the spring for TSS, as prescribed in 69.9(1).

567—69.11(455B) Constructed wetlands.

69.11(1) *General site design.*

a. Application. Constructed wetlands shall only be used where soil percolation rates at the site exceed 120 minutes per inch. Because of the higher maintenance requirements of constructed wetland systems, preference should be given to sand filters, where conditions allow.

b. Effluent treatment. The effluent from a constructed wetland shall receive additional treatment through the use of intermittent sand filters of a magnitude of half that prescribed in rule 69.9(455B).

c. Effluent sampling. Effluent sampling of constructed wetlands shall be performed twice a year at six–month intervals. (Beginning January 1, 2005, such sampling shall be done by a qualified sampler.) Tests shall be run on all parameters as required in 69.9(1).

d. Specifications given in these rules for constructed wetlands are minimal and may not be sufficient for all applications. Technical specifications are changing with experience and research. Other design information beyond the scope of these rules may be necessary to properly design a constructed wetland system.

69.11(2) *Wetland design.*

a. Depth. The wetland shall be of a subsurface flow construction with a rock depth of 18 inches and a liquid depth of 12 inches.

b. Materials. Substrate shall be washed river gravel with a diameter of ¾ inch to 2½ inches. If crushed quarried stone is used, it must meet the criteria listed in 69.6(4)*"a."*

c. Sizing and configuration. Detention time shall be a minimum of seven days.

(1) Dimensions. This may be accomplished with trenches 16 to 18 inches deep (12 inches of liquid), 3 feet wide with 100 feet of length per bedroom. This may also be done with beds 16 to 18 inches deep with at least 300 square feet of surface area per bedroom. The bottom of each trench or bed must be level within ±½ inch.

(2) Configuration. Multiple trenches or beds in series should be used. Beds or trenches in series may be stepped down in elevation to fit a hillside application. If the system is on one elevation, it should still be divided into units by earthen berms at about 50 and 75 percent of the total length.

(3) Unit connections. Each subunit shall be connected to the next with an overflow pipe (rigid sewer pipe) that maintains the water level in the first section. Protection from freezing may be necessary.

d. Liner. Wetlands shall be lined with a synthetic PVC or PE plastic liner 20 to 30 mils thick.

e. Inlet pipe. Effluent shall enter the wetland by a 4–inch pipe sealed into the liner. With beds, a header pipe shall be installed along the inlet side to distribute the waste.

f. Protective berms. Wetland system sites shall be bermed to prevent surface water from entering the trenches or beds.

69.11(3) *Vegetation.*

a. Setting plants. Vegetation shall be established on the wetlands at time of construction. Twelve inches of rock is placed in each unit, the plants are set, then the final 4 to 6 inches of rock is placed.

b. Plant species. Only indigenous plant species shall be used, preferably collected within a 100–mile radius of the site. Multiple species in each system are recommended. Preferred species include, but are not limited to:

(1) Typha latifolia – Common cattail
(2) Typha angustifolia – Narrow leaf cattail
(3) Scirpus spp. – Bullrush
(4) Phragmites communis – Reed

c. Plant establishment. Transplantation is the recommended method of vegetation establishment. For transplanting, the propagule should be transplanted, at a minimum, on a 2–foot grid. The transplants should be fertilized, preferably with a controlled–release fertilizer such as Osmocote 18–5–11 for fall and winter planting, 18–6–12 for spring planting, and 19–6–12 for summer planting. Trenches or beds should be filled with fresh water immediately.

d. Plant management. In the late fall the vegetation shall be mown and the detritus left on the wetland surface as a temperature mulch. In the early spring the mulch shall be removed and disposed of to allow for adequate bed aeration.

567—69.12(455B) Waste stabilization ponds.

69.12(1) *General requirements.* Waste stabilization ponds may be used if designed and constructed in accordance with the following criteria and provided the effluent is discharged in accordance with the requirements of the general NPDES permit listed in rule 69.2(455B). A septic tank sized according to rule 69.5(455B) shall precede a waste stabilization pond.

69.12(2) *Location.* Waste stabilization ponds must meet the following separation distances:

a. 1,000 feet from the nearest inhabitable residence, commercial building, or other inhabitable structure. If the inhabitable or commercial building is the property of the owner of the proposed treatment facility, or there is written agreement with the owner of the building, this separation criterion shall not apply. Any such written agreement shall be filed with the county recorder and recorded for abstract of title purposes, and a copy submitted to the department.

b. 1,000 feet from public shallow wells.

c. 400 feet from public deep wells.

d. 400 feet from private wells.

e. 400 feet from lakes and public impoundments.

f. 25 feet from property lines and rights–of–way.

69.12(3) *Size.*

a. Dimensions. Ponds shall have a length not exceeding three times the width.

b. Capacity. When domestic sewage from a septic tank is to be discharged to a waste stabilization pond, the capacity of the pond shall be equivalent to 180 times the average daily design flow.

c. Depth. The wastewater depth for a waste stabilization pond shall be uniform and 3 feet to 5 feet.

d. Freeboard. A minimum freeboard of 2 feet shall be maintained at all times.

69.12(4) *Embankments.*

a. Seal. Embankments shall be constructed of impermeable materials and shall be compacted. The bottom of the waste stabilization pond shall be cleared and leveled to the required elevation and shall be

lined with an impermeable natural or man–made material. Seepage loss through the sides and bottom shall be less than 1/16 inch per day.

b. Slopes. Inside embankment slopes shall be 3 horizontal to 1 vertical. Outside embankments shall be at least 3:1.

c. Berm top. Berm tops shall be at least 4 feet wide.

d. Cover. Embankments shall be seeded from the outside toe to the inside high water line. From the high water line down the embankment diagonally about 5 feet shall be rip–rapped for erosion and vegetation control.

69.12(5) *Inlet and outlet structures.*

a. Inlet. The inlet shall be placed no higher than 12 inches above the bottom of the pond. It shall discharge near the middle of the pond at a point opposite the overflow structure and onto a concrete splash plate at least 2 feet square.

b. Outlet. The outlet pipe shall withdraw water from a submerged depth of at least 1 foot. The intake for the outlet pipe shall be 3 to 5 feet from the embankment.

c. Separation. The inlet and outlet should be separated to the maximum extent possible, ideally by a berm or baffle constructed in the lagoon to prevent short–circuiting.

69.12(6) *Drainage*. All surface water shall be diverted away from the waste stabilization pond.

69.12(7) *Discharge.*

a. Controlled discharge. If the pond is designed for open discharge, it must be discharged under controlled conditions. The effluent must be tested before discharge, and effluent quality must be less than 25 mg/L of CBOD5 and less than 25 mg/L of TSS. Another test must be taken during discharge with the same results. Pond discharge is permitted only in spring and fall when stream flows are highest.

b. Continuous discharge. If the pond is to have an unlimited continuous discharge, the effluent shall receive additional treatment through the use of intermittent sand filters, mound systems or subsurface absorption systems of a magnitude of half that prescribed in rules 69.6(455B), 69.7(455B) and 69.9(455B). Under continuous discharge, effluent sampling shall be as required for constructed wetlands as outlined in 69.11(1)*"c."*

69.12(8) *Maintenance*.

a. Fencing. All waste stabilization ponds are to be fenced adequately to prevent entrance of livestock and to discourage entrance by people into the area. Signs shall be posted warning of possible health and safety hazards.

b. Vegetation. Vegetation on the top and sides of the berm shall be kept mown. No trees shall be allowed to become established.

567—69.13(455B) Requirements for impervious vault toilets. All impervious vault toilets hereafter constructed or required by the administrative authority to be reconstructed shall comply with the following requirements:

69.13(1) *Location.* Impervious vault toilets shall be located in accordance with the distances given in Table I, rule 69.3(455B) for the closed portion of the treatment system.

69.13(2) *Construction*. The vault shall be constructed of reinforced, impervious concrete at least 4 inches thick. The superstructure including floor slab, seat, seat cover, riser and building shall comply with good design and construction practices to provide permanent safe, sanitary facilities. The vault shall be provided with a cleanout opening fitted with a fly–tight cover.

69.13(3) *Disposal.* Wastewater from impervious vault toilets shall be disposed of at a public sewage treatment facility.

567—69.14(455B) Requirements for portable toilets. All portable toilets shall be designed to receive and retain the wastes deposited in them and shall be located and maintained in a manner that will prevent the creation of any nuisance condition. Disposal of waste from portable toilets shall be at a public sewage treatment facility.

567—69.15(455B) Requirements for chemical toilets. All chemical toilets shall comply with the following requirements:

69.15(1) *Tank.* Chemical toilets for use in isolated residences shall have a receptacle of smooth, impervious material that is resistant to chemicals and easily cleanable.

69.15(2) *Vent.* When vents are required for chemical toilets, they shall be of durable corrosion–resistant material installed in a professional manner.

69.15(3) *Mixing and chemical charge.* The fixture shall be equipped with a mixing device and shall be charged with the proper concentration of bactericidal chemical or chemicals. Chemical recharges shall be added and mixed with the contents when necessary to maintain sufficient solution strength and to suppress odors.

69.15(4) *Toilet rooms.* Chemical toilets shall be located in toilet rooms which are well lighted, ventilated and maintained in a nuisance–free condition.

69.15(5) *Final disposal of receptacle contents.* The receptacle contents shall be disposed of in accordance with the requirements of 567—Chapter 68. The recommended method of disposal is discharging to a municipal sewage treatment facility.

567—69.16(455B) Other methods of wastewater disposal. Other methods or types of private wastewater treatment and disposal systems shall be installed only after plans and specifications for each project have been approved by the administrative authority.

567—69.17(455B) Disposal of septage from onsite wastewater treatment and disposal systems.

69.17(1) The collection, storage, transportation and disposal of all septage shall be carried out in accordance with the requirements in 567—Chapter 68.

69.17(2) Commercial septic tank cleaners. Individual administrative authorities shall enforce the licensing program for commercial septic tank cleaners in accordance with the requirements of 567—Chapter 68.

567—69.18(455B) Alternative or innovative onsite wastewater treatment and disposal systems.

69.18(1) *Design requirements.* Alternative or innovative systems are to be designed and operated in accordance with approved standards and operating procedures established by individual administrative authorities.

a. Plans and specifications, meeting all applicable rule requirements, should be prepared and submitted to the administrative authorities by a licensed professional engineer. Included with the engineering submittal should be adequate supporting data relating to the effectiveness of the proposed system.

b. For systems designed to discharge treated effluent into waters of the state, it will be necessary to obtain a Notice of Intent to fall under the requirements of NPDES General Permit No. 4. The administrative authority is responsible for determining that the requirements of the permit are met including the monitoring program.

c. Administrative authorities should prepare for signature an enforceable agreement to be placed on record which would require that present and future system owners meet all applicable rule requirements. In the event of noncompliance, the administrative authority shall require that adequate steps be taken by the system owner to bring the system into compliance.

d. Wastewater management districts may be formed for the purpose of providing specialized control of on–site wastewater treatment and disposal systems located in certain problem areas or in intensive development areas. Formation of such wastewater management districts shall be coordinated under the guidance of the administrative authority and shall meet all applicable rule requirements.

69.18(2) Reserved.

567—69.19(455B) Variances. Variances to these rules may be granted by the department of natural resources or the administrative authority provided sufficient information is submitted to substantiate the

need and propriety for such action. Applications for variances and justification shall be in writing and copies filed with the department.

These rules are intended to implement Iowa Code chapter 455B, division III, part 1.

Appendix A

Estimates of Nonhousehold Domestic Sewage Flow Rates

Source of use for sewage unit	(units)	Gallons per day per unit: Average (Secondary treatment unit sizing)	Gallons per day per unit: Maximum (Septic tank)
Dwelling units			
Hotels or luxury motels	(Each guest)	50	60
	(Add per employee)	11	13
or	(Per square foot)	0.26	0.3
Discount motels	(Each guest)	30	40
	(Add per employee)	11	13
or	(Per square foot)	0.22	0.46
Rooming house	(Each resident)	40	50
	(Add per nonresident meal)	2.5	4.0
Commercial/Industrial			
Retail stores	(Per square foot of sales area)	0.1	0.15
or	(Each customer)	2.5	5
	(Plus each employee)	11	15
or	(Each toilet room)	530	630
Offices	(Each employee)	15	18
or	(Per square foot)	0.1	0.25
Medical offices	(Per square foot)	0.6	1.6
Industrial buildings	(Each employee) (Does not include process ware or cafeteria)	15	20
Construction camp	(Each employee)	15	20
Visitor center	(Each visitor)	5	20
Laundromat	(Each machine)	580	690
or	(Each load)	50	50
or	(Per square foot)	2.2	2.9
Barber shops	(Per chair)	55	80
Beauty shops	(Per station)	270	300
Car washes	(Per inside square foot) (Does not include car wash water)	5	10

Source of use for sewage unit	(units)	Gallons per day per unit: Average (Secondary treatment unit sizing)	Gallons per day per unit: Maximum (Septic tank)

Source of use for sewage unit	(units)	Gallons per day per unit Average (Secondary treatment unit	Maximum (Septic tank)
Eating and Drinking Establishments			
Restaurant	(Per meal)	2.5	4.0
	(Does not include bar or lounge)		
or	(Each seat)	24	40
	(Plus add for each employee)	11	13
Dining hall	(Per meal)	2.5	4.0
Coffee shop	(Each customer)	2.0	2.5
	(Add per employee)	11	13
Cafeteria	(Each customer)	2.0	2.5
	(Add per employee)	11	13
Drive–in	(Per car stall)	110	145
Bar or lounge	(Each customer)	2.0	5.5
	(Add per employee)	13	16
or	(Per seat)	32	40
Country clubs (no meals)	(Per member)	22	22
or	(Per member) (Meals and showers)	105	130
or	(Per member in residence)	75	100
Resorts			
Housekeeping cabin	(Per person)	42	50
Lodge	(Per person)	53	74
Parks/swimming pools	(Per guest)	10	13
Picnic parks with toilet only	(Per guest)	5	10
Movie theaters	(Per guest)	2.5	4.0
Drive–in theaters	(Per space)	3	5
Skating rink/dance hall	(Per customer)	7	10
Bowling lanes	(Per lane)	133	200
Transportation			
Airport, bus or rail depot	(Per passenger)	2.5	4
or	(Per square foot)	3.33	6.5
or	(Per public restroom)	500	630
Auto service station	(Each vehicle served)	11	13
	(Add per employee)	13	16
or	(Per inside square foot)	0.25	0.6
or	(Per public restroom)	500	630

	sizing)		
Institutional			
Hospitals	(Each medical bed)	175	250
	(Add per employee)	10	16
Mental institution	(Each bed)	105	175
	(Add per employee)	10	16
Prison or jail	(Each inmate)	120	160
	(Add per employee)	10	16
Nursing home	(Each resident)	93	145
	(Add per employee)	10	16
Schools and Churches			
School	(Per student) (No gym, cafeteria or showers)	10	17
	(Per student) (Cafeteria only)	16	17
	(Per student) (Cafeteria, gym & showers)	20	30
Boarding school	(Per student)	75	115
Churches	(Per member)	0.14	0.86
	(Add for each kitchen meal)	1	1
	(Add per Sunday school student)	0.14	0.86
Recreational			
Campground/with hookups	(Per person)	32	40
or	(Per site with central bath)	100	100
	(Per site)	50	75
	(Add for dump station w/ hookup)	13	16
Day camp (no meals)	(Per person)	13	16
Weekly overnight camp	(Per member)	33	33

Appendix B
Percolation Test Procedure

(1) A minimum of three test holes distributed evenly over the proposed lateral field is required.

(2) Percolation test holes shall be 4 to 12 inches in diameter and to the same depth as the proposed absorption trenches (not to exceed 36 inches in depth).

(3) Sides and bottoms of the test holes shall be scratched or roughened to provide a natural surface. All loose material shall be removed from each hole.

(4) The bottoms of the test holes shall be covered with approximately 2 inches of rock to protect the bottom from scouring action when the water is added.

(5) The hole shall be filled with at least 12 inches of clean water and this depth shall be maintained for at least 4 hours and preferably overnight if clay soils are present. It is important that the soil be allowed

to soak for a sufficiently long period of time to allow the soil to swell if accurate results are to be obtained.

(6) In sandy soils with little or no clay, soaking is not necessary. If, after filling the hole twice with 12 inches of water, the water seeps completely away in less than 10 minutes, the test can proceed immediately.

(7) Except for sandy soils, percolation rate measurements should be made at least 4 hours but no more than 24 hours after the soaking period began. Any soil that sloughed into the hole during the soaking period is removed and the water level is adjusted to 6 inches above the gravel (or 8 inches above the bottom of the hole). At no time during the test is the water level allowed to rise more than 6 inches above the gravel.

(8) Immediately after adjustment, the water level is measured from a fixed reference point to the nearest 1/8 inch at 30–minute intervals. The test is continued until two successive water level drops do not vary by more than 1/8 inch. At least three measurements are made.

(9) After each measurement, the water level is readjusted to the 6–inch level. The last water level drop is used to calculate the percolation rate.

(10) In sandy soils or soils in which the first 6 inches of water added after the soaking period seeps away in less than 30 minutes, water level measurements are made at 10–minute intervals for a 1–hour period. The last water level drop is used to calculate percolation rate.

(11) The percolation rate is calculated for each test hole by dividing the time interval used between measurements by the magnitude of the last water level drop. This calculation results in a percolation rate in terms of minutes per inch. To determine the percolation rate for the area, the rates obtained from each hole are averaged. (If tests in the area vary by more than 20 minutes per inch, variations in soil type are indicated. Under these circumstances, percolation rates should not be averaged.) EXAMPLE: If the last measured drop in water level after 30 minutes is 5/8 inch, the percolation rate = (30 minutes)/(5/8 inch) = 48 minutes/inch.

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TITLE V

FLOOD PLAIN DEVELOPMENT