

CHAPTER 67  
STANDARDS FOR THE LAND APPLICATION OF SEWAGE SLUDGE

**567—67.1(455B) Land application of sewage sludge.**

**67.1(1) General.** This chapter establishes standards for the land application of sewage sludge generated during the treatment of domestic sewage in a treatment works. This chapter applies to any person who prepares sewage sludge (generator), to any person who applies sewage sludge to the land (applicator), and to sewage sludge applied to the land. No person shall land apply sewage sludge through any practice for which requirements are established in this chapter except in accordance with such requirements.

In areas that are not specifically addressed in this chapter, but which are addressed in federal regulations at 40 CFR Part 503 as amended through August 4, 1999, the federal regulations shall apply under this rule and are hereby adopted by reference under this chapter.

On a case-by-case basis, this department may impose requirements for the land application of sewage sludge in addition to or more stringent than the requirements in this chapter when necessary to protect public health and the environment from any adverse effect of a pollutant in the sewage sludge.

**67.1(2)** Sewage sludge generators shall ensure that the applicable requirements in this chapter are met when the sewage sludge is applied to the land.

If the sewage sludge generator determines that a person being supplied sewage sludge for land application is not complying with applicable requirements of the land application program, the generator shall work with the applicator to obtain compliance with the requirements. If subsequent compliance cannot be achieved, the generator shall not supply additional sewage sludge to the applicator.

**567—67.2(455B) Exclusions.** This chapter does not establish requirements for the land application of the following solid wastes.

**67.2(1)** Sludge generated at an industrial facility.

**67.2(2)** Hazardous sewage sludge—sewage sludge determined to be hazardous in accordance with 40 CFR Part 261.

**67.2(3)** Sewage sludge with a PCB concentration of 50 mg/kg or higher.

**67.2(4)** Incinerator ash.

**67.2(5)** Grit and screenings.

**67.2(6)** Drinking water treatment sludge.

**567—67.3(455B) Sampling and analysis.** Any sewage sludge generator who intends to land apply sewage sludge shall:

**67.3(1)** Sample and analyze the waste to determine whether it meets the criteria for sewage sludge Class I, II, or III.

**67.3(2)** Analyze the waste to determine if any sources exist which may contribute significant quantities of potentially hazardous chemicals or other toxic substances. If any are found, the generator shall inform the department of their presence and shall analyze the waste for chemicals or substances in accordance with guidelines provided by the department.

**67.3(3)** Unless rules for specific programs under USEPA or department authority provide otherwise, or unless other methods are approved by the department for a specific situation, samples taken and analyses made to document contamination under this chapter shall be conducted in accordance with the methods described in 567—67.10(455B).

**567—67.4(455B) Land application program.** All sewage sludge generators wishing to land apply sewage sludge shall establish and maintain in writing a long-range program for land application of sewage sludge. This program shall be developed for a minimum period of five years and shall be updated annually. A copy of this program shall be available at the facility for inspection by the department. At a minimum this program shall contain the following information in detail for the next calendar year and in general terms for the following four years. The plan shall include but not be limited to the following:

**67.4(1)** An outline of the sewage sludge sampling schedule and procedures which will be followed to ensure that the sewage sludge being applied to land continues to meet the requirements.

**67.4(2)** A determination of the amount of land required to allow land application to be conducted in accordance with the requirements.

**67.4(3)** Identification of the land and application methods which will be used for land application of the sewage sludge. Those areas and application methods shall be selected as necessary to ensure that land application can be conducted in accordance with the requirements.

**67.4(4)** The names of the owners and operators of all land to be used for land application, and identification of any legal arrangements made relative to use of these areas. The programs should also outline any restrictions or special conditions which exist regarding use of these areas for land application of sewage sludge.

**67.4(5)** An overall schedule for the land application of sewage sludge. This schedule should indicate the areas being used, the time of year that land application on each area will be conducted, and the proposed application rates for each area.

**67.4(6)** A determination of the types and capacities of the equipment required for land application of sewage sludge in accordance with the developed application schedule. The program shall also outline how the required application equipment will be made available and who will be responsible for conducting land application operations.

**67.4(7)** A determination of the volumes and types of storage and handling facilities required to allow land application of sewage sludge to be conducted in accordance with the land application schedule. The program shall also outline how any required additional sludge storage or handling facilities will be provided.

**67.4(8)** A plan to construct or obtain any additional sludge storage, handling or application facilities or equipment which are required by the land application program.

**567—67.5(455B) Special definitions.**

*“Agronomic rate”* is the whole sludge application rate designed to provide the amount of nitrogen needed by the crop grown on the land and to minimize the amount of nitrogen that passes to the groundwater.

*“Annual whole sludge application rate”* is the maximum amount of sewage sludge (dry weight basis) that can be applied to a unit area of land during a 365-day period.

*“Bulk sewage sludge”* is sewage sludge that is not sold or given away in a bag or other container for application to the land.

*“Cumulative pollutant loading rate”* is the maximum amount of an inorganic pollutant that can be applied to an area of land.

*“Dry weight basis”* means calculated on the basis of having been dried at 105 degrees Celsius until reaching a constant mass (i.e., essentially 100 percent solids content).

*“Food crops”* are crops consumed by humans. These include, but are not limited to, fruits, vegetables, and tobacco.

*“Land with a high potential for public exposure”* is land that the public uses frequently. This includes, but is not limited to, a public contact site and a reclamation site located in a populated area (e.g., a construction site located in a city).

*“Land with a low potential for public exposure”* is land that the public uses infrequently. This includes, but is not limited to, agricultural land, forest, and a reclamation site located in an unpopulated area (e.g., a strip mine located in a rural area).

*“Person who prepares sewage sludge”* is either the person who generates sewage sludge during the treatment of domestic sewage in a treatment works or the person who derives a material from sewage sludge.

*“Sewage sludge”* is solid, semisolid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge does not include the grit and screenings generated during preliminary treatment.

**567—67.6(455B) Permit requirements.** Prior to any land application of sewage sludge, a permit must be obtained by the sewage sludge generator in accordance with the following requirements:

**67.6(1)** Any treatment facility proposing to land apply sewage sludge shall apply for a permit for land application of sewage sludge on a properly completed form supplied by the department. Application forms may be obtained from:

Environmental Services Division  
Iowa Department of Natural Resources  
Wallace State Office Building  
502 East 9th Street  
Des Moines, Iowa 50319  
<http://www.iowadnr.gov/>

Properly completed forms should be submitted in accordance with the instructions for the form.

*a.* Permit application for land application of sewage sludge from new facilities shall be filed at least 180 days prior to the date operation is scheduled to begin unless a shorter period of time is approved by the department.

*b.* Existing facilities generating sewage sludge shall file an application for land application of sewage sludge within 90 days of September 21, 1994, or at least 180 days prior to the expiration of any state operation or NPDES permit issued to the facility pursuant to 567—64.3(455B) or 567—64.4(455B), whichever date is later.

*c.* Sewage sludge disposal operations which are not regulated under 567—Chapter 64 shall apply for a permit for land application of sewage sludge no later than 90 days after September 21, 1994.

**67.6(2)** The permit for land application of sewage sludge for any sewage sludge generating facility will be issued concurrently and as part of a state operation permit or NPDES permit. The issuance process and permit terms will be the same as that specified for NPDES permits in 567—Chapter 64.

**567—67.7(455B) Land application requirements for Class I sewage sludge.**

**67.7(1) Class I sludge criteria.** Class I sludge is sewage sludge that has excellent quality and has been treated in a process equivalent to processes to further reduce pathogens (PFRP).

*a.* The concentration of each pollutant in the sewage sludge shall not exceed the concentration for the pollutant in Table 1.

TABLE 1—POLLUTANT CONCENTRATIONS

<u>Pollutant</u>	<u>Monthly Average Concentration</u> <u>milligrams per kilogram*</u>
Arsenic	41
Cadmium	39
Copper	1500
Lead	300
Mercury	17
Nickel	420
Selenium	100
Zinc	2800

\*Dry weight basis

*b.* One of the monitoring processes in (1) below and also one of the analytical and treatment processes in (2) below shall be met for a sewage sludge to be classified as Class I sludge.

(1) Monitoring processes.

1. The density of fecal coliform in the sewage sludge shall be less than 1000 Most Probable Number per gram of total solids (dry weight basis).

2. The density of *Salmonella* sp. bacteria in the sewage sludge shall be less than three Most Probable Number per four grams of total solids (dry weight basis).

(2) Analytical and treatment processes.

1. The density of enteric viruses in the sewage sludge shall be less than one Plaque-forming Unit per four grams of total solids (dry weight basis).

2. The density of viable helminth ova in the sewage sludge shall be less than one per four grams of total solids (dry weight basis).

3. Sewage sludge shall be treated in one of the Processes to Further Reduce Pathogens (PFRP) described in 567—67.11(455B).

4. Sewage sludge shall be treated in a process that is equivalent to a Process to Further Reduce Pathogens (PFRP), as determined by the department.

c. One of the vector attraction reduction requirements shall be met for a sewage sludge to be classified as Class I sludge.

(1) The mass of volatile solids in the sewage sludge shall be reduced by a minimum of 38 percent.

(2) The specific oxygen uptake rate (SOUR) for sewage sludge treated in an aerobic process shall be equal to or less than 1.5 milligrams of oxygen per hour per gram of total solids (dry weight basis) at a temperature of 20 degrees Celsius.

(3) Digest a portion of the previously anaerobically digested sewage sludge anaerobically in the laboratory in a bench-scale unit for 40 additional days at a temperature between 30 and 37 degrees Celsius. At the end of the 40 days, the volatile solids in the sewage sludge at the beginning of that period is reduced by less than 17 percent.

(4) Digest a portion of the previously aerobically digested sewage sludge that has a percent solids of 2 percent or less aerobically in the laboratory in a bench-scale unit for 30 additional days at 20 degrees Celsius. At the end of the 30 days, the volatile solids in the sewage sludge at the beginning of that period is reduced by less than 15 percent.

(5) Sewage sludge shall be treated in an aerobic process for 14 days or longer. During that time, the temperature of the sewage sludge shall be higher than 40 degrees Celsius and the average temperature of the sewage sludge shall be higher than 45 degrees Celsius.

(6) The pH of sewage sludge shall be raised to 12 or higher by alkali addition and, without the addition of more alkali, shall remain at 12 or higher for 2 hours and then at 11.5 or higher for an additional 22 hours.

(7) Sewage sludge shall be injected below the surface of the land and no significant amount of the sewage sludge shall be present on the land surface within one hour after the sewage sludge is injected.

(8) Sewage sludge applied to the land surface or placed on a surface disposal site shall be incorporated into the soil within six hours after application to or placement on the land.

**67.7(2) Management practices for Class I sewage sludge.**

a. Only Class I sewage sludge can be applied to a lawn or a home garden.

b. Sewage sludge shall not be applied to land that is 35 feet or less from an open waterway.

c. Sewage sludge shall be applied to the land at an annual whole sludge application rate that is equal to or less than the agronomic nitrogen uptake rate, unless otherwise specified by the department.

d. An information sheet shall be provided to the person who receives sewage sludge sold or given away in a container for application to the land. The label or information sheet shall contain the following information:

(1) The name and address of the sewage sludge generator.

(2) A statement that application of the sewage sludge to the land is prohibited except in accordance with the instructions on the information sheet.

(3) The annual application rate for the sewage sludge.

**67.7(3) Frequency of monitoring for Class I sewage sludge.**

a. The frequency of monitoring for the pollutants listed in Table 1, the pathogen density requirements, and the vector attraction reduction requirements shall be the frequency stated in Table 2.

TABLE 2—FREQUENCY OF MONITORING

Amount of sewage sludge metric tons per 365-day period dry weight basis	Monitoring Frequency
Greater than zero but less than 290 (or 325 English ton)	once per year
Equal to or greater than 290 but less than 1,500 (English ton 325 to 1,680)	once per quarter (4 times per year)
Equal to or greater than 1,500 but less than 15,000 (English ton 1,680 to 16,800)	once per 60 days (6 times per year)
Equal to or greater than 15,000 (or 16,800 English ton)	once per month (12 times per year)

*b.* After the sewage sludge has been monitored for two years, the department may reduce the frequency of monitoring, but in no case shall the frequency of monitoring be less than once per year when sewage sludge is applied to the land.

**67.7(4) Record keeping for Class I sewage sludge.**

*a.* Both the generator and bulk sludge applicator of Class I sewage sludge shall develop the following information and shall retain the information for five years:

- (1) The concentration of each pollutant listed in Table 1 in the sewage sludge.
- (2) The following certification statement: "I certify, under penalty of law, that the Class I sewage sludge requirements have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."
- (3) A description of how the Processes to Further Reduce Pathogens requirements (PFRP) are met.
- (4) A description of how one of the vector attraction reduction requirements is met.
- (5) A description of how the management practices are met for each site.

*b.* Treatment works with a design flow rate of 1 million gallons per day or greater and treatment works that serve 10,000 people or more shall submit the above information to the department by February 19 of each year for the previous calendar year.

**567—67.8(455B) Land application requirements for Class II sewage sludge.**

**67.8(1) Class II sludge criteria.** Class II sludge is sewage sludge that has normal quality and has been treated in a process equivalent to Processes to Significantly Reduce Pathogens (PSRP).

*a.* The concentration of any pollutant in the sewage sludge shall not exceed the ceiling concentration for the pollutant in Table 3.

TABLE 3—CEILING CONCENTRATIONS

<u>Pollutant</u>	<u>Ceiling Concentration milligrams per kilogram*</u>
Arsenic	75
Cadmium	85
Copper	4300
Lead	840

<u>Pollutant</u>	<u>Ceiling Concentration milligrams per kilogram*</u>
Mercury	57
Molybdenum	75
Nickel	420
Selenium	100
Zinc	7500

\*Dry weight basis

*b.* One of the following Processes to Significantly Reduce Pathogens requirements (PSRP) shall be met for a sewage sludge to be classified as Class II sludge.

(1) Seven samples of the sewage sludge shall be collected at the time the sewage sludge is disposed, and the geometric mean of the density of fecal coliform shall be less than 2,000,000 Most Probable Number per gram of total solids (dry weight basis).

(2) Sewage sludge shall be treated in one of the Processes to Significantly Reduce Pathogens (PSRP) described in 567—67.11(455B).

(3) Sewage sludge shall be treated in a process that is equivalent to a Process to Significantly Reduce Pathogens (PSRP), as determined by the department.

*c.* One of the vector attraction reduction requirements shall be met for a sewage sludge to be classified as Class II sludge.

(1) The mass of volatile solids in the sewage sludge shall be reduced by a minimum of 38 percent.

(2) The specific oxygen uptake rate (SOUR) for sewage sludge treated in an aerobic process shall be equal to or less than 1.5 milligrams of oxygen per hour per gram of total solids (dry weight basis) at a temperature of 20 degrees Celsius.

(3) Digest a portion of the previously anaerobically digested sewage sludge anaerobically in the laboratory in a bench-scale unit for 40 additional days at a temperature between 30 and 37 degrees Celsius. At the end of the 40 days, the volatile solids in the sewage sludge at the beginning of that period is reduced by less than 17 percent.

(4) Digest a portion of the previously aerobically digested sewage sludge that has a percent solids of 2 percent or less aerobically in the laboratory in a bench-scale unit for 30 additional days at 20 degrees Celsius. At the end of the 30 days, the volatile solids in the sewage sludge at the beginning of that period is reduced by less than 15 percent.

(5) Sewage sludge shall be treated in an aerobic process for 14 days or longer. During that time, the temperature of the sewage sludge shall be higher than 40 degrees Celsius and the average temperature of the sewage sludge shall be higher than 45 degrees Celsius.

(6) The pH of sewage sludge shall be raised to 12 or higher by alkali addition and, without the addition of more alkali, shall remain at 12 or higher for 2 hours and then at 11.5 or higher for an additional 22 hours.

(7) Sewage sludge shall be injected below the surface of the land and no significant amount of the sewage sludge shall be present on the land surface within one hour after the sewage sludge is injected.

(8) Sewage sludge applied to the land surface or placed on a surface disposal site shall be incorporated into the soil within six hours after application to or placement on the land.

**67.8(2) Management practices for Class II sewage sludge.**

*a.* Class II sewage sludge shall not be applied to a lawn or a home garden.

*b.* Land application sites accepting Class II sewage sludge not meeting pollutant concentrations listed in Table 1 of subrule 67.7(1) are subject to the cumulative pollutant loading rates listed in Table 4.

TABLE 4—CUMULATIVE POLLUTANT LOADING RATES

<u>Pollutant</u>	<u>Cumulative Pollutant kilograms per hectare</u>	<u>Loading Rate pounds per acre</u>
Arsenic	41	36
Cadmium	39	34
Copper	1500	1335
Lead	300	267
Mercury	17	15
Nickel	420	373
Selenium	100	89
Zinc	2800	2490

*c.* Sewage sludge shall not be applied to the land if it is likely to adversely affect a threatened or endangered species listed under section 4 of the Endangered Species Act or its designated critical habitat.

*d.* Sewage sludge shall be applied to the land at an annual whole sludge application rate that is equal to or less than the agronomic nitrogen uptake rate, unless otherwise specified by the department.

*e.* The sewage sludge shall be applied only to soils classified as acceptable throughout the top 5 feet of soil profile. The sewage sludge shall not be applied to soils classified as sand, loamy sand and silt. The acceptability of a soil shall be determined using the USDA soil classifications.

*f.* Land application sites shall have soil pH maintained above 6.0, unless (1) crops prefer soils with lower pH conditions, (2) the sludge meets the pollution concentrations contained in Table 1, or (3) the site does not exceed calcium carbonate equivalent levels according to sound farm management practices. If the soil pH is below 6.0, it is acceptable to use agricultural lime to increase the pH to an acceptable level.

*g.* If the sewage sludge is applied to land on which the soil loss exceeds the soil loss limits established by the county soil conservation district, the sewage sludge shall be injected on the contour or shall be applied to the surface and mechanically incorporated into soil within 48 hours of application. The sewage sludge shall not be applied to ground having greater than 9 percent slope unless approved by the department.

*h.* Sewage sludge application on frozen or snow-covered ground should be avoided, unless special precautions are taken such as proven farm management practices to avoid runoff. If application on frozen or snow-covered ground is necessary, it shall be limited to land areas of less than 5 percent slope unless approved by the department.

*i.* Sewage sludge shall not be applied to the land that is 35 feet or less from an open waterway. If sewage sludge is applied within 200 feet, but no closer than 35 feet, of a stream, lake, sinkhole or tile line surface intake located downgradient of the land application site, it shall be injected or applied to the surface and mechanically incorporated into the soil within 48 hours of application unless approved by the department.

*j.* If the sewage sludge is applied to land subject to flooding more frequently than once in ten years, the sludge shall be injected or shall be applied to the surface and mechanically incorporated into the soil within 48 hours. Information on which land is subject to flooding more frequently than once in ten years is available from the department.

*k.* Sewage sludge shall not be applied within 200 feet of an occupied residence or any well. Distances may be reduced to a minimum of 35 feet with the written agreement of both the owner and occupant and an approved farm management plan which addresses soil erodibility, harvest residuals, buffer strips, and other sound farm management practices. The farm management plan shall be approved by the local soil conservation district commission in accordance with rules implementing Iowa Code sections 161A.42 to 161A.51.

- l.* Food crops with harvested parts that touch the sewage sludge/soil mixture shall not be harvested for 38 months after application of sewage sludge.
- m.* Food crops, feed crops and fiber crops shall not be harvested for 30 days after application of sewage sludge.
- n.* Animals shall not be allowed to graze on the land for 30 days after application of sewage sludge.
- o.* Turf grown on land where sewage sludge is applied shall not be harvested for one year after application of the sewage sludge when the harvested turf is placed on either land with a high potential for public exposure or a lawn, unless otherwise specified by the department.
- p.* Public access to land with a high potential for public exposure shall be restricted for one year after application of sewage sludge.
- q.* Public access to land with a low potential for public exposure shall be restricted for 30 days after application of sewage sludge.
- r.* When required by the director, groundwater monitoring wells and surface monitoring points shall be installed and a monitoring program implemented. Samples must be analyzed by a laboratory which is equipped and competent to perform the tests required by the director. The results shall be forwarded to the department on a stipulated schedule.
- s.* The sewage sludge generator shall provide the notice and necessary information to comply with the requirements to the sewage sludge applicator and landowner.
- t.* The sewage sludge applicator shall provide written notice, prior to the initial application of sewage sludge, to the department. The notice shall include:
- (1) The location, by legal description, of the land application site and the landowner.
  - (2) The name, address, telephone number, and National Pollutant Discharge Elimination System permit number (if appropriate) of the sewage sludge generator and the applicator.
- 67.8(3)** *Frequency of monitoring for Class II sewage sludge.*
- a.* The frequency of monitoring for the pollutants listed in Table 3, the pathogen density requirements, and the vector attraction reduction requirements shall be at the frequency stated in Table 5.

TABLE 5—FREQUENCY OF MONITORING

Amount of sewage sludge metric tons per 365-day period dry weight basis	Monitoring Frequency
Greater than zero but less than 290 (or 325 English ton)	once per year
Equal to or greater than 290 but less than 1,500 (English ton 325 to 1,680)	once per quarter (4 times per year)
Equal to or greater than 1,500 but less than 15,000 (English ton 1,680 to 16,800)	once per 60 days (6 times per year)
Equal to or greater than 15,000 (or 16,800 English ton)	once per month (12 times per year)

- b.* After the sewage sludge has been monitored for two years, the department may reduce the frequency of monitoring, but in no case shall the frequency of monitoring be less than once per year when sewage sludge is applied to the land.



**67.8(4) Record keeping for Class II sewage sludge.**

a. Both the generator and applicator of Class II sewage sludge shall develop the following information and shall retain the information for five years:

- (1) The concentration of each pollutant listed in Table 3 in the sewage sludge.
- (2) The following certification statement: "I certify, under penalty of law, that the Class II sewage sludge requirements have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."
- (3) A description of how the Processes to Significantly Reduce Pathogens (PSRP) requirements are met.
- (4) A description of how the vector attraction reduction requirements are met.
- (5) A description of how the management practices for Class II sewage sludge are met for each site.
- (6) The location and area of each site.
- (7) The date and time and amount of sewage sludge applied to each site.
- (8) If subjected to cumulative loading limits, the amount and cumulative amount of each pollutant listed in Table 4 of paragraph 67.8(2) "b" in the sewage sludge applied to each site.
- (9) The amount of sewage sludge (i.e., metric tons) applied to each site.

b. Treatment works with a design flow rate of 1 million gallons per day or greater and treatment works that serve 10,000 people or more shall submit the above information to the department by February 19 of each year for the previous calendar year.

**567—67.9(455B) Class III sewage sludge.**

**67.9(1)** Class III sewage sludge is any sewage sludge that cannot meet either Class I sewage sludge criteria or Class II sewage sludge criteria.

**67.9(2)** Class III sewage sludge shall not be utilized for beneficial use for land application as specified in the chapter.

**67.9(3)** Class III sewage sludge shall be disposed according to the surface disposal subpart of the 40 CFR Part 503 regulation and 567—103.6(455B) or the incineration subpart of the 40 CFR Part 503 regulation.

**567—67.10(455B) Sampling and analytical methods.**

**67.10(1) General.** Representative samples of sewage sludge that are applied to the land shall be collected and analyzed. Methods listed below shall be used to analyze samples of sewage sludge and calculation procedures shall be used to calculate the percent of volatile solids reduction for sewage sludge.

**67.10(2) Enteric viruses.** ASTM Designation: D 4994-89, "Standard Practice for Recovery of Viruses From Wastewater Sludges," Annual Book of ASTM Standards: Section 11 - Water and Environmental Technology, ASTM, Philadelphia, PA, 1992.

**67.10(3) Fecal coliform.** Part 9221 E. or Part 9222 D., "Standard Methods for the Examination of Water and Wastewater," 18th Edition, American Public Health Association, Washington, D.C., 1992.

**67.10(4) Helminth ova.** Yanko, W.A., "Occurrence of Pathogens in Distribution and Marketing Municipal Sludges," EPA 600/1-87-014, 1987. PB 88-154273/AS, National Technical Information Service, Springfield, Virginia.

**67.10(5) Inorganic pollutants.** "Test Methods for Evaluating Solid Waste, Physical/ Chemical Methods," EPA Publication SW-846, Second Edition (1982) with Updates I and II and Third Edition (1986) with Revision I. Second Edition - PB87-120-291, National Technical Information Service, Springfield, Virginia. Third Edition-Document number 955-001-00000-1, Superintendent of Documents, Government Printing Office, Washington, D.C.

**67.10(6) Salmonella sp. bacteria.** Part 9260 D., "Standard Methods for the Examination of Water and Wastewater," 18th Edition, American Public Health Association, Washington, D.C., 1992; or Kenner, B.A. and H.P. Clark, "Detection and Enumeration of Salmonella and Pseudomonas aeruginosa," J. Water Pollution Control Federation, 46(9):2163-2171, 1974.

**67.10(7)** *Specific oxygen uptake rate.* Part 2710 B., “Standard Methods for the Examination of Water and Wastewater,” 18th Edition, American Public Health Association, Washington, D.C. 1992.

**67.10(8)** *Total, fixed, and volatile solids.* Part 2540 G., “Standard Methods for the Examination of Water and Wastewater,” 18th Edition, American Public Health Association, Washington, D.C., 1992.

**67.10(9)** *Percent volatile solids reduction calculation.* “Environmental Regulations and Technology - Control of Pathogens and Vectors in Sewage Sludge,” EPA-625/R-92/013, U.S. Environmental Protection Agency, Cincinnati, Ohio, 1992.

**567—67.11(455B) Pathogen treatment processes.**

**67.11(1)** *Processes to significantly reduce pathogens (PSRP).*

*a. Aerobic digestion.* Sewage sludge is agitated with air or oxygen to maintain aerobic conditions for a specific mean cell residence time at a specific temperature. Values for the mean cell residence time and temperature shall be between 40 days at 20 degrees Celsius and 60 days at 15 degrees Celsius.

*b. Air drying.* Sewage sludge is dried on sand beds or on paved or unpaved basins. The sewage sludge dries for a minimum of three months. During two of the three months, the ambient average daily temperature is above zero degrees Celsius.

*c. Anaerobic digestion.* Sewage sludge is treated in the absence of air for a specific mean cell residence time at a specific temperature. Values for the mean cell residence time and temperature shall be between 15 days at 35 to 55 degrees Celsius and 60 days at 20 degrees Celsius.

*d. Composting.* Using either the within-vessel, static aerated pile, or windrow composting methods, the temperature of the sewage sludge is raised to 40 degrees Celsius or higher and remains at 40 degrees Celsius or higher for five days. For four hours during the five days, the temperature in the compost pile exceeds 55 degrees Celsius.

*e. Lime stabilization.* Sufficient lime is added to the sewage sludge to raise the pH of the sewage sludge to 12 after two hours of contact.

**67.11(2)** *Processes to further reduce pathogens (PFRP).*

*a. Composting.* Using either the within-vessel composting method or the static aerated pile composting method, the temperature of the sewage sludge is maintained at 55 degrees Celsius or higher for three days.

Using the windrow composting method, the temperature of the sewage sludge is maintained at 55 degrees Celsius or higher for 15 days or longer. During the period when the compost is maintained at 55 degrees Celsius or higher, there shall be a minimum of five turnings of the windrow.

*b. Heat drying.* Sewage sludge is dried by direct or indirect contact with hot gases to reduce the moisture content of the sewage sludge to 10 percent or lower. Either the temperature of the sewage sludge particles exceeds 80 degrees Celsius or the wet bulb temperature of the gas in contact with the sewage sludge as the sewage sludge leaves the dryer exceeds 80 degrees Celsius.

*c. Heat treatment.* Liquid sewage sludge is heated to a temperature of 180 degrees Celsius or higher for 30 minutes.

*d. Thermophilic aerobic digestion.* Liquid sewage sludge is agitated with air or oxygen to maintain aerobic conditions and the mean cell residence time of the sewage sludge is ten days at 55 to 60 degrees Celsius.

*e. Beta ray irradiation.* Sewage sludge is irradiated with beta rays from an accelerator at dosages of at least 1.0 megarad at room temperature (ca. 20 degrees Celsius).

*f. Gamma ray irradiation.* Sewage sludge is irradiated with gamma rays from certain isotopes, such as Cobalt 60 and Cesium 137, at room temperature (ca. 20 degrees Celsius).

*g. Pasteurization.* The temperature of the sewage sludge is maintained at 70 degrees Celsius or higher for 30 minutes or longer.

*h. Lime treatment.*

(1) The pH of the sewage that is used or disposed shall be raised to above 12 and shall remain above 12 for 72 hours.

(2) The temperature of the sewage sludge shall be above 52 degrees Celsius for 12 hours or longer during the period that the pH of the sewage sludge is above 12.

(3) At the end of the 72-hour period during which the pH of the sewage sludge is above 12, the sewage sludge shall be air dried to achieve a percent solids in the sewage sludge greater than 50 percent.

These rules are intended to implement Iowa Code section 455B.174.

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