WAC 173-308-170 Pathogen reduction. This section contains the requirements for biosolids to be classified either Class A or Class B with respect to pathogens.

The Class A pathogen reduction requirements must be met at the same time or before the vector attraction reduction requirements in WAC 173-308-180 (1), (2), or (3).

(1) **Class A - Alternative 1: Time and Temperature.**

(a) ***Fecal coliform or Salmonella sp. bacteria density.*** The density of fecal coliform in the biosolids must be less than 1000 Most Probable Number per gram of total solids (dry weight basis) or the density of *Salmonella* sp. bacteria in the biosolids must be less than three Most Probable Number per four grams of total solids (dry weight basis) at the time the biosolids are used, at the time the biosolids are prepared for sale or give away in a bag or other container for application to the land, or at the time the biosolids or material derived from biosolids is prepared to meet the requirements for exemption in WAC 173-308-200, and one of the requirements in (b) through (e) of this subsection must be met.

(b) When the percent solids of the biosolids is seven percent or higher, the temperature of the biosolids must be 50°C (122°F) or higher, the time period must be twenty minutes or longer, and the temperature and time period must be determined using equation (1), except when small particles of biosolids are heated by either warmed gases or an immiscible liquid.

Equation (1)

$$D = \frac{131{,}700{,}000}{10^{0.1400t}}$$

Where:

D = time in days

t = temperature in degrees Celsius

(c) When the percent solids of the biosolids is seven percent or higher and small particles of biosolids are heated by either warmed gases or an immiscible liquid, the temperature of the biosolids must be 50°C (122°F) or higher, the time period must be fifteen seconds or longer, and the temperature and time period must be determined using equation (1).

(d) When the percent solids of the biosolids is less than seven percent and the time period is at least fifteen seconds, but less than thirty minutes, the temperature and time period must be determined using equation (1).

(e) When the percent solids of the biosolids is less than seven percent, the temperature of the biosolids is 50°C (122°F) or higher, and the time period is thirty minutes or longer, the temperature and time period must be determined using equation (2).

Equation (2)

$$D = \frac{50{,}070{,}000}{10^{0.1400t}}$$

Where:

D = time in days

t = temperature in degrees Celsius

(2) **Class A - Alternative 2: pH, Time, Temperature, and Percent Solids.**

(a) ***Fecal coliform or Salmonella sp. bacteria density.*** The density of fecal coliform in the biosolids must be less than 1000 Most Probable Number per gram of total solids (dry weight basis) or the density of *Salmonella* sp. bacteria in the biosolids must be less than three Most Probable Number per four grams of total solids (dry weight basis) at the time the biosolids are used, at the time the biosolids are prepared for sale or give away in a bag or other container for application to the land, or at the time the biosolids or material derived from biosolids is prepared to meet the requirements for exemption in WAC 173-308-200, and the requirements in (b) of this subsection must be met.

(b) The pH of the biosolids that are used must be raised to above twelve and remain above twelve for seventy-two hours.

(i) The temperature of the biosolids must be above 52°C (126°F) for twelve hours or longer during the period that the pH of the biosolids is above twelve.

(ii) At the end of the seventy-two-hour period during which the pH of the biosolids is above twelve, the biosolids must be air dried to achieve a percent solids in the biosolids greater than fifty percent.

(3) **Class A - Alternative 3: Processes to Further Reduce Pathogens.**

(a) ***Fecal coliform or Salmonella sp. bacteria density.*** The density of fecal coliform in the biosolids must be less than 1000 Most Probable Number per gram of total solids (dry weight basis) or the density of *Salmonella* sp. bacteria in the biosolids must be less than three Most Probable Number per four grams of total solids (dry weight basis) at the time the biosolids are used, at the time the biosolids are prepared for sale or give away in a bag or other container for application to the land, or at the time the biosolids or material derived from biosolids is prepared to meet the requirements for exemption in WAC 173-308-200, and one of the requirements in (b)(i) through (vii) of this subsection must be met.

(b) ***Processes to further reduce pathogens.*** The biosolids must be treated in one of the processes to further reduce pathogens described in this subsection.

(i) *Composting.*

(A) Using either the within-vessel composting method or the static aerated pile composting method, the temperature of the biosolids must be maintained at 55°C (131°F) or higher for three days.

(B) Using the windrow composting method, the temperature of the biosolids must be maintained at 55°C (131°F) or higher for fifteen days or longer. During the period when the compost is maintained at 55°C (131°F) or higher, there must be a minimum of five turnings of the windrow.

(ii) *Heat drying.* Biosolids must be dried by direct or indirect contact with hot gases to reduce the moisture content of the biosolids to ten percent or less and one of the following requirements must be met.

(A) The temperature of the biosolids particles must exceed 80°C (176°F).

(B) The wet bulb temperature of the gas in contact with the biosolids as the biosolids leave the dryer must exceed 80°C (176°F).

(iii) *Heat treatment*. Liquid biosolids must be heated to a temperature of 180°C (356°F) or higher for thirty minutes.

(iv) *Thermophilic aerobic digestion*. Liquid biosolids must be agitated with air or oxygen to maintain aerobic conditions and the mean cell residence time of the biosolids must be at least ten days at 55 to 60°C (131 to 140°F).

(v) *Beta ray irradiation*. Biosolids must be irradiated with beta rays from an accelerator at dosages of at least 1.0 megarad at room temperature (ca. 20°C (68°F)).

(vi) *Gamma ray irradiation*. Biosolids must be irradiated with gamma rays from certain isotopes, such as Cobalt 60 and Cesium 137, at room temperature (ca. 20°C (68°F)).

(vii) *Pasteurization*. The temperature of the biosolids must be maintained at 70°C (158°F) or higher for thirty minutes or longer.

(4) **Class A - Alternative 4: Equivalent Process to Further Reduce Pathogens.**

(a) ***Fecal coliform or Salmonella sp. bacteria density***. The density of fecal coliform in the biosolids must be less than 1000 Most Probable Number per gram of total solids (dry weight basis) or the density of *Salmonella* sp. bacteria in the biosolids must be less than three Most Probable Number per four grams of total solids (dry weight basis) at the time the biosolids are used, at the time the biosolids are prepared for sale or give away in a bag or other container for application to the land, or at the time the biosolids or material derived from biosolids is prepared to meet the requirements for exemption in WAC 173-308-200, and the requirements in (b) of this subsection must be met.

(b) The biosolids must be treated in a process that is equivalent to a process to further reduce pathogens. Pathogen equivalency for biosolids applied to land under jurisdiction of the state of Washington will be determined by the department or by the EPA with the approval and concurrence of the department.

(5) **Class B - Alternative 1: Testing.** A minimum of seven samples of the biosolids must be collected at the time the biosolids are used, and the geometric mean of the density of fecal coliform of the samples must be less than 2,000,000 Most Probable Number per gram of total solids (dry weight basis) or 2,000,000 Colony Forming Units per gram of total solids (dry weight basis).

(6) **Class B - Alternative 2: Process to Significantly Reduce Pathogens.** The biosolids must be treated in one of the processes to significantly reduce pathogens described in (a) through (e) of this subsection.

(a) ***Aerobic digestion***. The biosolids must be 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 must be between forty days at 20°C (68°F) and sixty days at 15°C (59°F).

(b) ***Air drying***. The biosolids must be dried on sand beds or on paved or unpaved basins. The biosolids must dry for a minimum of three months. During two of the three months, the ambient average daily temperature must be above 0°C (32°F). During the air drying period, no additional material may be added.

(c) ***Anaerobic digestion***. The biosolids must be 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 must be between fifteen days at 35 to 55°C (95 to 131°F) and sixty days at 20°C (68°F).

(d) ***Composting.*** Using the within-vessel, static aerated pile, or windrow composting methods, the temperature of the biosolids must be raised to 40°C (104°F) or higher and remain at 40°C (104°F) or higher for five days. For four hours during the five days, the temperature in the compost pile must exceed 55°C (131°F).

(e) ***Lime stabilization.*** Sufficient lime must be added to the biosolids to raise the pH of the biosolids to twelve after two hours of contact.

(7) **Class B - Alternative 3: Equivalent Process to Significantly Reduce Pathogens.** The biosolids must be treated in a process that is equivalent to a process to significantly reduce pathogens. Pathogen equivalency for biosolids applied to land under jurisdiction of the state of Washington will be determined by the department or by the EPA with the approval and concurrence of the department.

[Statutory Authority: Chapters 70.95J and 70.95 RCW. WSR 07-12-010 (Order 06-06), § 173-308-170, filed 5/24/07, effective 6/24/07. Statutory Authority: RCW 70.95J.020 and 70.95.255. WSR 98-05-101 (Order 97-30), § 173-308-170, filed 2/18/98, effective 3/21/98.]