ANSI/ASAE EP403.4 FEB2011 (R2015)
Design of Anaerobic Lagoons for Animal Waste Management

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Revision approved February 2011 as an American National Standard

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Developed by the ASAE Agricultural Sanitation and Waste Management Committee; approved by the ASAE Structures and Environment Division Standards Committee; adopted by ASAE March 1981; reconfirmed December 1985, December 1986, December 1987, December 1988; revised editorially February 1989; revised March 1990; revised December 1992; approved as an American National Standard August 1993; revised editorially March 1995; reaffirmed by ASAE December 1997; revised December 1998; revision approved by ANSI and revised editorially July 1999; reaffirmed by ASAE February 2004; reaffirmed by ANSI March 2004; reaffirmed by ASABE February 2009; reaffirmed by ANSI March 2009; revised February 2011; revision approved by ANSI February 2011, reaffirmed by ASABE December 2015; reaffirmed by ANSI December 2015.

Keywords: Anaerobic, Design, Lagoons, Manure, Waste

1 Purpose and Scope

1.1 This Engineering Practice describes the minimum criteria for design and operation of anaerobic animal waste lagoons located in predominantly rural or agricultural areas.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies unless noted. For undated references, the latest approved edition of the referenced document (including any amendments) applies.

Natural Resources Conservation Service Conservation Practice Standard Fence (Feet), 382-1

ASAE EP379, *Management of Manure Odors*

ASAE D384, *Manure Production and Characteristics*

ASAE EP470, *Manure Storage Safety*

ANSI Z535.2, *Environmental and Facility Safety Signs*

3 Definitions

3.1 anaerobic lagoons: Waste treatment impoundments made by constructing an excavated pit, dam, embankment, levee, or by a combination of these procedures. Livestock waste is mixed with sufficient water to provide a high degree of dilution in anaerobic lagoons for the primary purpose of treatment to reduce pollution potential through biological activity. Anaerobic treatment lagoons are not drawn down below their treatment volume elevation except for maintenance purposes.

3.2 waste storage ponds: Similar to anaerobic lagoons but are used to store livestock waste for limited periods. They are then normally emptied at least annually and are not designed to provide treatment. Because ponds do not require a treatment volume they are normally smaller than anaerobic lagoons.

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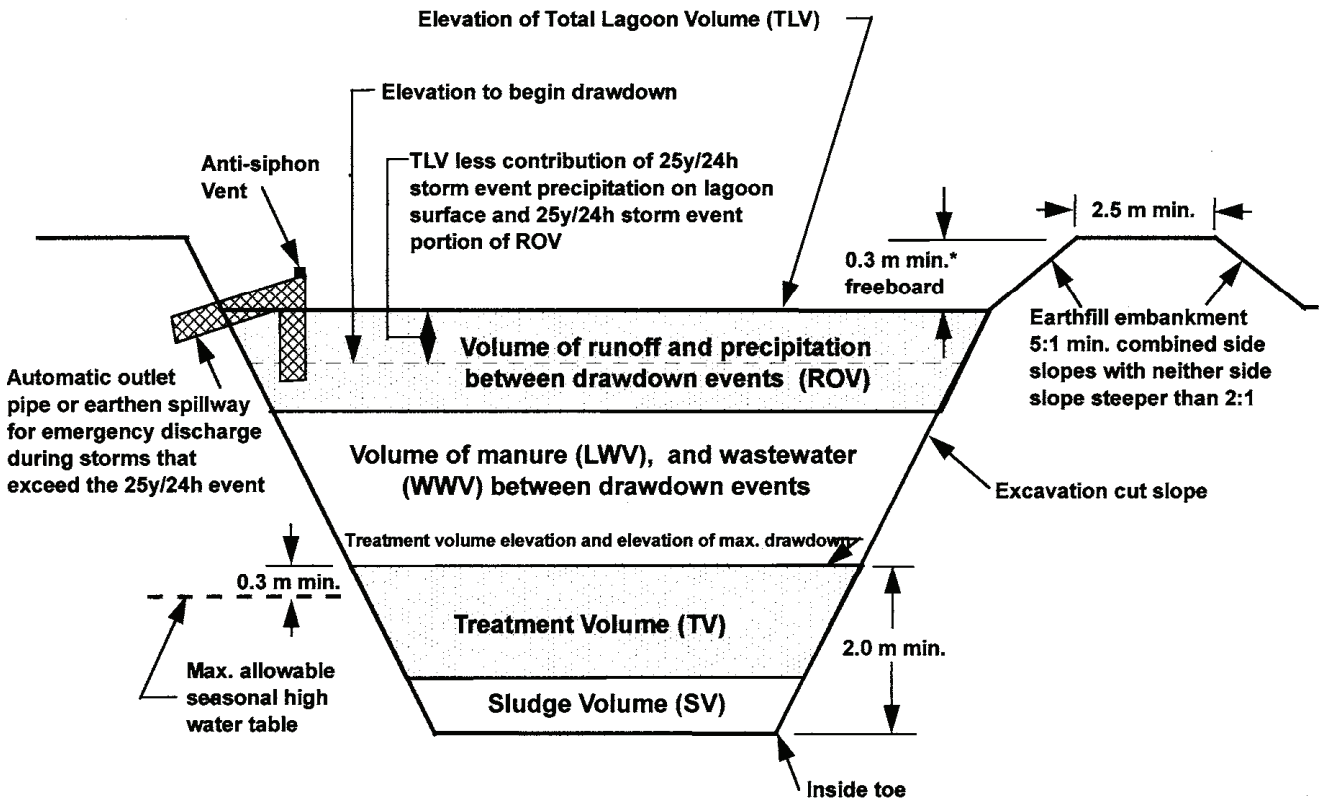
4 Laws and Regulations

4.1 All federal, state, and local laws, rules, and regulations governing the use of animal waste management lagoons shall be followed. Necessary approvals and permits for location, design, construction, and operation shall be secured from accountable authorities. Federal regulations require a permit to make routine intentional point releases of pollutants from an animal waste management system to a water body. However, unintentional releases that may occur during a catastrophic storm (those exceeding the 25y/24h storm event) do not require a permit. Anaerobic animal waste lagoons are customarily designed to preclude the need for a permit for a point discharge by recycling the residual of the treated waste through land application for final aerobic treatment and crop uptake of nutrients rather than discharge to a water body.

5 Design Criteria

5.1 The design required for an anaerobic lagoon to operate successfully varies widely because of differences in climatic and site conditions. Design requirements may also vary because of the operational objective being stressed, such as maximizing pollutant reduction, reducing odors, or minimizing sludge production. In addition, there are differences in opinion as to what constitutes acceptable design criteria. For these reasons, the criteria of this should be considered as recommendations and should be compared with locally accepted design criteria. Figure 1 illustrates the various features of an anaerobic lagoon.



* Freeboard is 0.3 meters for lagoons without a drainage area, and 0.6 meters with a drainage area.

Figure 1 – Anaerobic lagoon cross section

5.2 Siting. Siting of an anaerobic lagoon shall give consideration to its potential for producing undesirable odors, and for contamination of ground water. Siting shall also give consideration to operational aspects of the lagoon.

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