

STANDARDS FOR MANURE MANAGEMENT SYSTEMS

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HEALTH AND SAFETY

Manure management systems have the potential to expose owners, employees, and the public with safety hazards that include: drowning, asphyxiation, mechanical hazards, electric shock, explosions, etc.. A properly designed system following standards from a number of different organizations can reduce the potential for harm. At times safety issues are ignored because the operator has successfully practiced unsafe acts in the past with no repercussions. The cause of many accidents is from ignoring known safety practices. The result of an accident is often tragic for the victims and their families. The safety and health protection of following standards should motivate us all.

COMPATIBILITY

Manure Management can be an extremely complex combination of systems. These systems need to not only be compatible but also to meet the expectations of the design, that is they need to function to the satisfaction of the owner operator as well as protect the health and safety of the public (including the employees). Standards are needed to make this happen so that systems can communicate their output characteristics as well as their expectations of the inputs from other components and ultimately function as a whole with each other. Standards are needed so that compatibility can be determined prior to purchase and installation.

LAW

Legally many standards have to be followed as a matter of law. Governments have set up a range of laws to protect the health and Safety of the public. These include Building Codes, Fire Codes, Electric Codes, Zoning Codes, Professional Engineering requirements, OSHA Codes, even Traffic Codes. Any sustainable operation will need to comply with CAFO regulations. The owner and designer have an legal obligation to conform to regulations.

FINANCIAL ASSISTANCE

Most sources of financial assistance including loans and grants require that the appropriate standards are followed to protect not only the operators and the public but also the funders. Cost estimates for manure management systems should include following the needed standards.

STANDARDS

Natural Resources Conservation Service (NRCS) standards can be found for each state at: http://efotg.sc.egov.usda.gov/efotg_locator.aspx . The website explains that:

The conservation practice standard contains information on why and where the practice is applied, and it sets forth the minimum quality criteria that must be met during the application of that practice in order for it to achieve its intended purpose(s).

National Conservation Practice standards should not be used to plan, design or install a conservation practice. You must have the conservation practice standard developed by the state in which you are working to insure that you meet all state and local criteria, which may be more restrictive than national criteria. State conservation practice standards are available through the Field Office Technical Guide (FOTG). If no state conservation practice standard is available in the FOTG, you should contact the appropriate State Office or your local USDA Service Center.

In FOTG Section IV — Practice Standards and Specifications you will find the NRCS Conservation Practices. Practice Standards define the practice and where it applies. Practice specifications are detailed requirements for installing the practice in the state. The following standards are useful in designing manure management systems:

- Above Ground, Multi-Outlet Pipeline Standard (FT) (431)
- Air Filtration and Scrubbing Standard (NO) (371)
- Amendments for the Treatment of Agricultural Waste Standard (AU) (591)
- Anaerobic Digester Controlled Temperature Standard (366)
- Animal Mortality Facility Standard (316)
- Atmospheric Resource Quality Management Standard (370)
- Composting Facility Standard (NO) (317)
- Constructed Wetland Standard (AC) (656)
- Critical Area Planting Standard (AC) (342)
- Fence Standard (FT) (382)
- Field Border Standard (FT) (386)
- Heavy Use Area Protection Standard (AC) (561)
- Irrigation Pipeline Standard (FT) (430)
- Irrigation System, Sprinkler Standard (NO AND AC) (442)
- Monitoring Well Standard (353)
- Nutrient Management Standard (590)
- Pathogen Management Standard (NO) (783)
- Pipeline Standard (FT) (516)
- Pumping Plant Standard (NO) (533)
- Roof Runoff Structure Standard (NO) (558)
- Roofs and Covers Standard (367)
- Solid/Liquid Waste Separation Facility Standard (NO) (632)
- Vegetated Treatment Area Standard (AC) (635)

- Waste Facility Closure Standard (NO) (360)
- Waste Management System Standard (NO) (312)
- Waste Storage Facility Standard (NO) (313)
- Waste Transfer Standard (NO) (634)
- Waste Treatment Lagoon Standard (NO) (359)
- Waste Treatment Standard (NO) (629)
- Waste Utilization Standard (AC) (633)
- Water Well Decommissioning Standard (NO) (351)
- Well Water Testing Standard (355)

The American Society for Agricultural and Biological Engineering (ASABE) Standards Program states that it “is the recognized standards developer for engineering in agricultural, food, and biological systems. The Program is accredited by the American National Standards Institute (ANSI) and is the U.S. Technical Advisory Group (US TAG) Administrator for several ISO technical committees and subcommittees, and one IEC committee”.

"Standards are essential for all human activity, but most people take them for granted. Only when products fail to work, or mishaps occur, does the average person think about standards. Even in business, where money is at stake, standards are often given a low priority. There is a clear need in the United States for greater attention to standards."

"Global Standards: Building Blocks for the Future" Congress of the United States, Office of Technology Assessment (March 1992) Standards, Engineering Practices, and Data (hereafter referred to collectively as standards) are normally generated for one or more of the following reasons:

- To provide interchangeability between similarly functional products and systems manufactured by two or more organizations, thus improving compatibility, safety and performance for users;
- To reduce the variety of components required to serve an industry, thus improving availability and economy;
- To improve personal safety during operation of equipment and application of products and materials;
- To establish performance criteria for products, materials, or systems;
- To provide a common basis for testing, analyzing, describing, or informing regarding the performance and characteristics of products, methods, materials, or systems;
- To provide design data in readily available form;
- To develop a sound basis for codes, education, and legislation; and to promote uniformity of practice;
- To provide a technical basis for international standardization;
- To increase efficiency of engineering effort in design, development, and production.

“Standards are engineering requirements (specifications) prepared to define materials, products, processes, tests, testing procedures and performance criteria in an effort to achieve certain specified purposes. They are developed and adopted because of a need for action on a common problem. Their effectiveness is dependent upon voluntary compliance with the standards adopted. Standards must accurately and specifically define the properties required without unnecessary, restrictive specifications that thwart originality or progress”.

Some ASABE Standards that are used in manure management systems include:

- Nomenclature/Terminology for Livestock Manure Handling Equipment ASAE S466.1 December 1998
- Management of Manure Odors ASAE EP379.4 January 2007
- Volumetric Capacity of Box Type Manure Spreaders--Dual Rating Method ASAE S324.1 April 1986
- Manure Storage Safety ASAE EP470.1 October 2011
- Uniform Terminology for Rural Waste Management ASAE S292.5 October 1994
- Volumetric Capacity of Closed Tank Type Manure Spreaders ASAE S326.1 January 1989
- Volumetric Capacity of Open Tank Type Manure Spreaders ASAE S325.1 January 1989
- Manure Production and Characteristics ASAE D384.2 March 2005
- Manure Storages ASAE EP393.3 December 1998
- Design of Anaerobic Lagoons for Animal Waste Management ANSI/ASAE EP403.4 February 2011

A one-stop resource for online education and distance-learning resources provided by American National Standards Institute (ANSI) who are accredited standards developers, includes a partial listing of the organizations that have standards that might impact a manure management system (including Anaerobic Digestion):

- A2LA (American Association for Laboratory Accreditation)
- ACI International (American Concrete Institute)
- Air Movement and Control Association International
- American Institute of Steel Construction
- American National Standards Institute
- American Society of Agricultural and Biological Engineers (ASABE)
- American Society of Civil Engineers
- American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc.
- American Society of Mechanical Engineers (ASME)
- American Society of Safety Engineers
- American Society of Sanitary Engineering
- American Water Works Association

- American Welding Society
- ASTM International
- Building Owners and Manufacturers Association
- Compressed Gas Association
- Electrical Apparatus Service Association
- Electrical Generating Systems Association
- Environmental Industry Associations
- Fertilizer Institute
- Hydraulic Institute
- ICC International Code Council
- Independent Electrical Contractors
- Institute of Electrical and Electronics Engineers
- Institute of Environmental Science & Technology
- International Association of Electrical Inspectors (IAEI)
- International Association of Plumbing and Mechanical Officials
- IPC Association Connecting Electronics Industries
- ISA - The Instrumentation, Systems, and Automation Society
- National Board of Boiler and Pressure Vessel Inspectors
- National Concrete Masonry Association
- National Electrical Contractors Association
- National Electrical Manufacturers Association
- National Fire Protection Association
- National Pork Producers Council
- National Propane Gas Association
- National Safety Council
- NIST - US Department of Commerce
- North American Energy Standards Board
- SAE International (Society of Automotive Engineers)
- Sheet Metal and Air Conditioning Contractors National Association
- Society for Biomolecular Sciences
- Standards Engineering Society
- Underwriters Laboratories
- Uniform Code Council
- US Department of Energy
- US Fuel Cell Council
- Water Quality Association

Most states and many funding organizations require the use a professional engineer registered in the state to complete designs that impact the health and safety of the public. Manure management systems often fall into this category. Professional Engineers are familiar with standards and specifications that make manure management systems safe. They are also more aware of the characteristics of individual pieces of equipment or components of systems that need to fit together in order to make a manure management system work. Although not exclusive professional engineers that are familiar with manure management systems in each state

can be found on the NRCS technical Registration site:
<http://techreg.usda.gov/CustLocateTSP.aspx> This site is a useful beginning point for a search for qualified professional engineers working in your location.

REFERENCES

American National Standards Institute, education:
<http://www.standardslearn.org/trainingcourse.aspx>

ASABE Standards: <http://www.asabe.org/standards.aspx>

Natural Resources Conservation Service, standards:
<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/home>

Natural Resources Conservation Service, technical service providers:
<http://techreg.usda.gov/CustLocateTSP.aspx>