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Media Filters for Irrigation — Testing and Performance Reporting

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1 Purpose and scope

1.1 This Standard has the following purposes:

1.1.1 Define a standard procedure to collect irrigation media filter test data.

1.1.2 Provide procedures to classify and characterize media filter test data from manufacturers and independent testing laboratories.

1.2 This Standard establishes a consistent basis to validate and support manufacturer's statements on the performance, reliability, safety, and long-term effectiveness of individual irrigation media filtration systems. Sufficient data are to be developed so irrigation system designers and others can evaluate the suitability of a particular filter system for a specific application.

1.3 This Standard does not establish design criteria for irrigation media filters or specify media. It is not intended for use in ranking different products.

1.4 The scope of this Standard is to describe methods for obtaining sufficient, accurate data to determine performance characteristics of media filters used for irrigation. This Standard pertains only to media filters for irrigation water.

1.5 This Standard addresses the operation and performance of a system of media filter tank vessels, related valves, backwash mechanism, underdrains and manifolds. These components define the containment and processing assemblies associated with media filtration systems that ensure proper hydraulic characteristics, flow balance, and adequate cleaning of the media for a specific product design that has been installed and operated as recommended by a manufacturer.

1.6 The selection of the actual filtration media used inside the filtration system is not part of this Standard, although it is extremely important to overall filtration performance. The ultimate effectiveness of filtration depends on the depth and type of the media bed, velocity of water through the bed, physical composition and characteristics of the media, and equivalent pore-size distributions. Testing of individual media for its efficiency in filtration is likewise not part of this Standard.

1.7 Determinations of particulate composition of the outlet test fluid are used to assess the potential effectiveness of the entire backwash system in cleaning the media after extended use, and are not an evaluation of media performance.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Standards organizations maintain registers of currently valid standards.

ASAE EP405.1 DEC93, Design and Installation of Microirrigation Systems

ASAE EP458 DEC93, Field Evaluation of Microirrigation Systems

ASAE S526, Soil and Water Engineering Terminology

ASA/SSSA monograph, Methods of Soil Analyses, Part 1, ‘‘Particle Size Analysis”

3 Definitions and terminology

3.1 backwash: A procedure that flushes clean water through a filter tank in reverse direction to the normal operating direction so as to remove captured organic and inorganic particulates from the filter media. Filtered water from one or more tanks is used to backwash another tank. Only one tank is usually backwashed at a time. The process is also referred to as backflush and as reverse flushing.

3.2 backwash control mechanism: A mechanism that initiates the backwashing action of the filter as determined by one or a combination of physical quantities, such as pressure differential, duration of filtration interval, or volume of water filtered.

3.3 backwash flow: A recommended rate of water flow through the media to maximize uniformity of backwashing, to maximize effectiveness of the backwashing activity, and to minimize loss of media.

3.4 backwash pressure differential: A pressure differential between two points, one upstream and one downstream of the filter tanks that may initiate the backwashing cycle.

3.5 backwash water volume: A volume of water flushed from the entire media filtration system (two or more tanks) during one backwashing operation.

3.6 duration of filter flushing cycle: A period of time during which water flushes filtered material out of the media filter via the backwash action.

3.7 filtration level: The minimum particle size retained by the filters when operated according to filter manufacturer’s specifications using a given media grade. Particle sizes should be expressed in units of micrometers rather than screen mesh sizes.

3.8 loading rate: The average concentration of suspended particulates in the inlet test fluid, expressed in milligrams (dry mass) per liter of test fluid, mg/L.

3.9 maximum operating flow: The highest inlet flow specified by the manufacturer that insures both proper filtration and proper backwashing. Expressed as flow per unit cross-sectional area of media, $L/(s \cdot m^2)$.

3.10 maximum operating pressure: The highest inlet pressure specified by the manufacturer that insures the proper and safe functioning of the device.

3.11 media: The filtration material used in a media filter. The media generally consists of crushed granite, silica, or quartz sieved to specific particle sizes. Media may also consist of many other materials such as cardboard or synthetic fibers, woven textiles of various types, or synthetic particles.

3.12 media filter: A filtration device that uses a bed of media to remove suspended organic and inorganic particles from the incoming irrigation water. Each media filter is contained within a pressure vessel(s) or tank(s) that contains underlying drains (e.g., PVC plastic, stainless steel, or ceramic materials) with or without a gravel bed to facilitate the backwashing procedure. Media filter is sometimes referred to as a depth filter.

3.13 media filtration system: A system of two or more media filter tanks manifolded together so filtered water from one tank can be used to backwash the other(s) by actuation of valves.

3.14 media grade: The classification of the media with respect to particles and their size distribution (percent of total mass).

3.15 minimum operating flow: The lowest flow into the filter system specified by the manufacturer that insures both proper filtration and proper backwashing functions. Expressed as flow per unit cross-sectional area of media, $L/(s \cdot m^2)$.

3.16 minimum operating pressure: The lowest inlet pressure specified by the manufacturer that insures proper functioning of the device, including backwashing without an additional higher pressure source.

3.17 nominal pressure loss: The normal pressure loss measured through a back-flushed, clean filter for efficient, long-term operation of the filter system.

3.18 outlet test fluid: The suspended organic and inorganic particulates in the test fluid that have passed through a filter and may also include particles from the media. May also be referred to as the filtrate.

3.19 suspended solids: Organic and inorganic particulates suspended in a moving water stream. Total suspended solids, TSS, is a measure of the concentration of suspended solids in the water expressed as mg/L.

3.20 test fluid: The fluid used for testing the filter system.

3.21 test particulates: The solids in the test fluid that enter a media filter under test.

4 Irrigation media filter description

4.1 Number of tests. To establish a set of typical test data, at least one filter set of each model and size should be tested under the same operating and temperature conditions. Each test shall be recorded and reported separately, although tests on identical models may be combined in reports.

4.2 Selection of filters for testing. Filters used for testing and analyses shall be randomly selected from normal production runs. Unless specific conditions or manufacturer's recommendations warrant otherwise, testing of two tanks per tested media filter system set is adequate.

4.3 Selection of media. The specific composition, depth of the media bed, velocity of water through the bed, physical composition, size distribution, and geometric characteristics of the media particles are specified by the manufacturer.

4.4 Tank safety factors. Design safety factor for the tanks should be stated as a ratio of the bursting pressure to the maximum recommended operating pressure (e.g., 4:1).

4.5 Description of filter. Each media filter system shall be described so specific references can be made to each system as tested at later dates. The system description shall include, but not necessarily be limited to, the following:

— name of manufacturer;

— approximate date of manufacture;

— model name and number;