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(First Edition)

AWWA Standard

Manganese Oxide Filter Media

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American Water Works Association

Approved American National Standard ANSI

STANDARD Since 1881

AWWA Standard

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Foreword

This foreword is for information only and is not a part of ANSI/AWWA B103.*

I. Introduction

I.A. *Background.* Manganese oxide filter media refer to granular media that have a manganese oxide surface. Such media include manufactured products consisting of various substrates that are coated with manganese oxide or media composed entirely of manganese dioxide, such as manganese dioxide ore (pyrolusite).

Manganese oxide media are currently used in pressure and gravity filters, and treatment systems may be designed to remove a combination of iron, manganese, radium, arsenic, and hydrogen sulfide in potable water treatment applications.

I.B. *History*. The need for an AWWA standard for manganese oxide filter media was recognized by the AWWA Ion Exchange Committee in 2016. In 2017, the AWWA Standards Council authorized the Ion Exchange Committee to develop a new standard. This first edition of ANSI/AWWA B103 was approved on Oct. 13, 2025.

This new standard is necessary as ANSI/AWWA B102 was specific to manganese greensand filter media, i.e., glauconite, and was not applicable to the other manganese oxide filter media currently in use and being actively marketed in North America. Manganese greensand filter media are no longer commercially available.

The characteristics of nonproprietary media such as filter sand or filter anthracite allow ANSI/AWWA B100 to describe specific media properties that all manufacturers must meet and adhere to. Manganese oxide filter media products can be either proprietary (as in the case of manganese dioxide–coated media) or nonproprietary (as in the case of manganese dioxide ore, commonly known as pyrolusite). Because of a wide range of physical properties such as bulk density and effective size, manganese oxide filter media operational requirements can differ greatly and require strict adherence to the manufacturer's specifications. This standard requires manganese oxide filter media manufacturers to provide all information pertinent to system design, selection, supply, and installation of their product.

I.C. *Acceptance*. In May 1985, the US Environmental Protection Agency (USEPA) entered into a cooperative agreement with a consortium led by NSF International (NSF) to develop voluntary third-party consensus standards and a certification program for direct and indirect drinking water additives. Other

* American National Standards Institute, 1180 Avenue of the Americas, 10th Floor, New York, NY 10036.

members of the original consortium included the Water Research Foundation (formerly AwwaRF) and the Conference of State Health and Environmental Managers (COSHEM). The American Water Works Association (AWWA) and the Association of State Drinking Water Administrators (ASDWA) joined later.

In the United States, authority to regulate products for use in, or in contact with, drinking water rests with individual states.[†] Local agencies may choose to impose requirements more stringent than those required by the state. To evaluate the health effects of products and drinking water additives from such products, state and local agencies may use various references, including

1. Specific policies of the state or local agency.

2. Four standards developed under the direction of NSF:[‡] NSF/ANSI/CAN[§] 60, Drinking Water Treatment Chemicals—Health Effects; NSF/ANSI/CAN 61, Drinking Water System Components—Health Effects; NSF/ANSI/CAN 372, Drinking Water System Components—Lead Content; and NSF/ANSI/CAN 600, Health Effects Evaluation and Criteria for Chemicals in Drinking Water.

3. Other references, including AWWA standards, *Food Chemicals Codex, Water Chemicals Codex,*[¶] and other standards considered appropriate by the state or local agency.

Various certification organizations may be involved in certifying products in accordance with NSF/ANSI/CAN 61. Individual states or local agencies have authority to accept or accredit certification organizations within their jurisdictions. Accreditation of certification organizations may vary from jurisdiction to jurisdiction.

NSF/ANSI/CAN 600 (which formerly appeared in NSF/ANSI/CAN 60 and 61 as Annex A, "Toxicology Review and Evaluation Procedures") does not stipulate a maximum allowable level (MAL) of a contaminant for substances not regulated by a USEPA final maximum contaminant level (MCL). The MALs of an unspecified list of "unregulated contaminants" are based on toxicity testing guidelines (noncarcinogens) and risk characterization methodology (carcinogens). Use of NSF/ANSI/CAN 600 procedures may not always be identical, depending on the certifier.

ANSI/AWWA B103 does not address additives requirements. Users of this standard should consult the appropriate state or local agency having jurisdiction in order to:

1. Determine additives requirements, including applicable standards.

[†] Persons outside the United States should contact the appropriate authority having jurisdiction.

[‡] NSF International, 789 North Dixboro Road, Ann Arbor, MI 48105.

[§] Standards Council of Canada, 55 Metcalfe Street, Suite 600, Ottowa, ON K1P 6L5, Canada.

[¶] Both publications available from National Academies Press, 500 Fifth Street NW, Washington, DC 20001.

2. Determine the status of certifications by parties offering to certify products for contact with, or treatment of, drinking water.

3. Determine current information on product certification.

II. Special Issues

II.A. *Sourcing.* Purchasers and manufacturers have the responsibility to investigate any offshore source of manganese oxide ore to ascertain whether the source is compliant with all applicable laws.

II.B. *Storage and Handling Precautions.* Manganese oxide filter media have a number of storage and handling hazards that may vary for different media types. The safety data sheet (SDS) for the specific type of media should be reviewed prior to purchasing, accepting delivery of, or installing the material.

Work in filter cells must comply with Occupational Safety and Health Administration (OSHA) regulations on confined spaces. OSHA regulations at 29 CFR §1910.146 define confined spaces and related requirements, which may include personnel certifications, entry permits, and equipment.

II.C. *Media Selection.* Selection of an appropriate manganese oxide filter media should be based on confirmation of acceptable performance of a specific media for the source water requiring treatment. Confirmation of manganese oxide filter media performance may be best accomplished by on-site pilot testing.

II.D. *Filter Media.* The term "filter media" commonly refers to the portion(s) of the filter bed that remove particulate matter from the water during the filtration process. This standard covers manganese oxide filter media, which are used to provide catalytic oxidation of iron, manganese, and other constituents. Manganese oxide filter media can also function as a filter media to remove oxidized iron, manganese, and other suspended or precipitated constituents. This standard is not intended to apply to the use of manganese oxide filter media for pathogen removal. Properties of other filter media, such as sand and anthracite coal, and filter media support, such as gravel, are contained in ANSI/AWWA B100.

II.E. *Removal of Fines.* Manganese oxide filter media contain a variety of grain sizes, including very fine particles known as "fines" that may be generated during shipment, installation, and filter use. Fines may accumulate at the surface of the filter bed during operational backwash and may reduce filter performance by blocking openings between larger media particles. This situation is typically indicated by increased clean bed head loss and shortened filter runs.

Scraping media following installation and backwashing of new media is important for removing fines from the media bed. The media manufacturer supplies

recommendations for the specific scraping requirements for its media type as well as a procedure for verifying that the scraping has been completed effectively.

Periodic scraping of the media may be beneficial to sustaining filter performance throughout the life of the media. Data collected as part of a filter surveillance program can indicate when scraping may be beneficial. Such data may include clean bed head loss, unit filter run volumes between backwashes, and percent of surface fines present.

II.F. *Testing and Monitoring Underdrain Condition.* Underdrain testing is recommended to establish baseline data for ongoing monitoring and to confirm that the underdrain system is clean prior to placing media in a new or reused filter cell. The following describes recommended steps for underdrain testing. Depending on the type of underdrain, the underdrain supplier may provide specific procedures for initial testing.

The filter should be backwashed, and the pressure drop across the underdrain during backwash should be recorded. Visual inspection of the underdrain system should be accomplished to confirm even flow distribution during backwash. The filter underdrain supplier should provide the expected differential pressure for the specified backwash flow rate and water temperature when the underdrain system is in a clean condition.

Following the installation of the manganese oxide filter media, the feed pressure during backwash should be measured and recorded. This step provides important filter surveillance baseline data. As an ongoing filter performance test, the filter operator should trend the backwash pressure and water temperature. An increase in backwash pressure at a given temperature may indicate that the underdrain and/or media are becoming plugged or fouled. When the filter is put back into service, the pressure drop across the filter bed should also be monitored. An increase in clean bed head loss over time can also indicate underdrain fouling.

II.G. *Evaluation of Existing Media Condition.* Filter performance improvements such as longer run times, greater capacity, and improved removal efficiencies may be achieved by replenishing or "topping up" lost media.

Before replenishing lost media, a careful inspection and determination of the root cause for the lost media should be made. Once the cause of media loss has been determined and addressed, an evaluation of existing media condition should be completed. The goal of this evaluation is to determine whether the current filter media should be replenished or replaced.

III. Use of This Standard. It is the responsibility of the user of an AWWA standard to determine that the products described in that standard are suitable for use in the particular application being considered.

III.A. *Purchaser Options and Alternatives*. The following information should be provided by the purchaser:

1. Standard used—that is, ANSI/AWWA B103, Standard for Manganese Oxide Filter Media, of latest revision.
2. Details of federal, state, provincial, territorial, and local requirements (Sec. 4.1).
3. Sampling requirements (Sec. 5.1).
4. Testing requirements (Sec. 5.3).
5. Shipping requirements (Section 6).
6. Affidavit of compliance (Sec. 6.3) or certified analyses, if required.

III.B. *Modification to Standard*. Any modification to the provisions, definitions, or terminology in this standard must be provided by the purchaser.

IV. Major Revisions. This is the first edition of this standard.

V. Comments. If you have any comments or questions about this standard, please call AWWA Engineering and Technical Services at 303.794.7711; write to the department at 6666 West Quincy Avenue, Denver, CO 80235-3098; or email standards@awwa.org.

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ANSI/AWWA B103-25
(First Edition)

AWWA Standard

Manganese Oxide Filter Media

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes mined and manufactured manganese oxide filter media used in pressure and gravity filters to remove iron, manganese, radium, arsenic, and hydrogen sulfide in potable water treatment applications. It discusses handling, preparation, placement, sampling, and testing requirements specific to manganese oxide filter media as well as the reporting responsibilities of the manganese oxide filter media manufacturer.

Users of this standard should refer to ANSI/AWWA B100 for basic requirements of placing filter media, preparing filters for service, replenishing media in existing filter beds, sampling and testing media, and packaging and shipping media.

Sec. 1.2 Purpose

The purpose of this standard is to provide the minimum requirements for manganese oxide filter media, including information to be provided by the media manufacturers such as packaging, shipping, testing requirements, installation, and specific product information. This standard is not a guide to filter design.

Sec. 1.3 Application

This standard can be referenced in documents for purchasing and receiving manganese oxide filter media and can be used as a guide for testing the physical