ANSI/AWWA **B102-26**

(Revision of ANSI/AWWA B102-15[R20])

AWWA Standard

Manganese Greensand for Filters

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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 B102.*

I. Introduction

I.A. *Background.* Manganese greensand filters may be used in potable water treatment to remove iron, manganese, radium, arsenic, and hydrogen sulfide from supply waters containing excessively high concentrations of any or all of these solutes. Although iron does not pose a known health threat in drinking water and manganese may pose a health threat in drinking water only at high concentrations (the USEPA has a health advisory level of 0.3 mg/L Mn), the presence of these chemicals can restrict the usefulness of the water and diminish its aesthetic quality.

Manganese greensand is produced from a naturally occurring mineral, glauconite. Glauconite is a clay mineral that forms authigenically in the marine environment, forming sand-size pellets in the near-shore marine environment. Glauconitic sands can be found in marine sedimentary deposits and were formerly mined in New Jersey for use in manganese greensand filters. The glauconitic sand is processed by hardening the material. The material is then coated with a manganic coating as part of the manufacturing process. The coated glauconitic sand for use in greensand filters is then oxidized with a strong oxidant. The most common strong oxidants are permanganate, chlorine, and ozone. (It should be noted that hydrogen peroxide is not an effective strong oxidant for use with manganese greensand.) The manganese oxide coating has a catalytic effect on the oxidation of manganese and the oxidation of hydrogen sulfide to sulfate.

The manganese greensand is placed in a gravity or pressure filter vessel, typically in conjunction with anthracite filter media. Free chlorine and/or permanganate are typically used for continuous regeneration of the media. Soluble manganese is removed by adsorption to the manganese oxide coating on the media, and the free chlorine will then oxidize the adsorbed Mn(II) on the media surface. This process is referred to as catalytic oxidation since the manganese oxide coating serves as a catalyst for oxidation of adsorbed Mn(II). Iron is readily oxidized by free chlorine or dissolved oxygen, and the filter bed will physically remove the resulting precipitate. As with conventional filters, these filters must be backwashed to remove the filtered particles and a portion of the manganese oxide coating when the head loss across the filter becomes too great.

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Manganese greensand has been found to be successful in removing radium and arsenic from well water supplies. This removal occurs via adsorption onto the manganese or iron precipitates that are formed. For radium removal, soluble manganese should be present in or added to the raw water for removal to occur and allow a portion of the radium to be backwashed out of the filter bed. Manganese greensand filters will remove little to no arsenic in the absence of dissolved or particulate iron; therefore, additional iron must be added to the raw water for removal of arsenic to occur. Pilot-plant testing is recommended in the cases of both radium and arsenic.

I.B. *History*. The need for standardization of manganese greensand for filters was recognized by the American Water Works Association (AWWA) in 1992. In 1993, the AWWA Standards Council authorized the Ion Exchange Committee to develop a new standard. The first edition of ANSI/AWWA B102 was approved by the AWWA Board of Directors on Jan. 18, 2004. The second edition was approved on Jan. 17, 2010. The third edition was approved on Jan. 24, 2015, and reaffirmed without revision on Jan. 23, 2020. This edition was approved on Apr. 1, 2026.

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 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,

[†] 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, Ottawa, ON K1P 6L5 Canada.

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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 B102 does not address additives requirements. Thus, users of this standard should also consult the appropriate state or local agency having jurisdiction in order to

1. Determine additives requirements, including applicable standards.

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

IIA. *Storage and Handling Precautions*. When a shipment of material must be stored for any length of time prior to placement, the constructor should store the material in such a manner that the material will remain dry and free from contamination by foreign materials.

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.

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

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

1. Standard used—that is, ANSI/AWWA B102, Manganese Greensand for Filters, of latest revision.
2. Whether compliance with NSF/ANSI/CAN 61, Drinking Water System Components—Health Effects, is required.
3. Quantity required.
4. Details of federal, state, provincial, territorial, and local requirements (Sec. 4.1).
5. Sampling requirements (Sec. 5.1).
6. Testing requirements (Sec. 5.3).
7. Basis of rejection (Sec. 5.4).
8. Shipping requirements (Sec. 6.2).
9. 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. Major revisions made to the standard in this edition include the following:

1. Added additional information to Sec. I.A Background in the Foreword.
2. Updated Sec. I.C Acceptance in the Foreword with the latest Standards Council language reflecting the addition of reference to NSF/ANSI/CAN 372 and NSF/ANSI/CAN 600.
3. Added definitions for *bag, filter bed, filter material, filter media, filter media support gravel, particle size,* and *potable water* to Section 3 Definitions.
4. Updated Sec. 4.1 Materials with the latest Standards Council boilerplate language for materials compliance.
5. Revised Sec. 4.3.1.1 Cleaning and added a reference to ANSI/AWWA B100.
6. Revised Sec. 5.4 Rejection to be consistent with ANSI/AWWA B103.

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

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ANSI/AWWA B102-26
(Revision of ANSI/AWWA B102-15[R20])

AWWA Standard

Manganese Greensand for Filters

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes manganese greensand used in pressure and gravity filters to remove dissolved iron, manganese, radium, arsenic, and hydrogen sulfide for water supply service applications. It discusses the placement, handling, preparation, and regeneration of manganese greensand media. Although manganese greensand filters frequently employ gravel and anthracite filter materials, they have been omitted from this standard with reference to the document ANSI/AWWA B100, Granular Filter Material, which covers these materials in detail.

Sec. 1.2 Purpose

The purpose of this standard is to provide the minimum requirements for manganese greensand filter media, including physical, chemical, packaging, shipping, and testing requirements.

Sec. 1.3 Application

This standard can be referenced in documents for purchasing and receiving manganese greensand filter media and can be used as a guide for testing the physical and chemical properties of manganese greensand filter media. The stipulations of this standard apply when this document has been referenced and then only to manganese greensand filter media used in water supply service applications.

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