



**American Water Works
Association**

The Authoritative Resource on Safe Water®

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(Revision of ANSI/AWWA B102-04)

AWWA Standard

Manganese Greensand for Filters



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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 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 and manganese in drinking water do not pose a known health threat at concentrations that are palatable, 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, which 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 are actively mined in New Jersey for use in manganese greensand filters.

Glauconitic sand for use in greensand filters is first loaded with a multivalent manganese oxide coating through contact with potassium permanganate solution. This manganese oxide coating has a catalytic effect on the oxidation of iron and 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. When water is passed through this filter media, the dissolved iron and manganese in the water are oxidized. Because the oxidized states of iron and manganese are less soluble in water than the corresponding reduced states, precipitates form, which are trapped by the filter media. As with conventional filters, these filters must be backwashed to remove the filtered particles when the head loss across the filter becomes too great. The manganese oxide coating must be regenerated through either continuous regeneration with a weak potassium permanganate solution or intermittently with a stronger potassium permanganate solution.

Manganese greensand has been found to be successful in removing radium and arsenic from well water supplies. This occurs via adsorption onto the manganese or iron precipitates that are formed. For radium removal, soluble manganese must be present in or added to the raw water for removal to occur. Manganese greensand filters will remove little to no arsenic in the absence of dissolved or particulate iron, therefore

* American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

additional iron must be added to the raw water for removal of arsenic to occur. Pilot plant testing is recommended in either case.

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. This edition was approved on Jan. 17, 2010.

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 American Water Works Association Research Foundation (AwwaRF, now Water Research Foundation) 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. An advisory program formerly administered by USEPA, Office of Drinking Water, discontinued on Apr. 7, 1990.
2. Specific policies of the state or local agency.
3. Two standards developed under the direction of NSF, NSF[†]/ANSI 60, Drinking Water Treatment Chemicals—Health Effects, and NSF/ANSI 61, Drinking Water System Components—Health Effects.
4. 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 61. Individual states or local agencies have authority to accept

* Persons outside the US should contact the appropriate authority having jurisdiction.

† NSF International, 789 N. Dixboro Road, Ann Arbor, MI 48105.

‡ Both publications available from National Academy of Sciences, 500 Fifth Street, NW, Washington DC 20001.

or accredit certification organizations within their jurisdiction. Accreditation of certification organizations may vary from jurisdiction to jurisdiction.

Annex A, "Toxicology Review and Evaluation Procedures," to NSF/ANSI 61 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 Annex A 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.

II.A. *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.

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

1. Standard used—that is, ANSI/AWWA B102, Standard for Manganese Greensand for Filters, of latest revision.
2. Whether compliance with NSF/ANSI 61, Drinking Water System Components—Health Effects, is required.
3. Quantity required.
4. Details of other federal, state or provincial, 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 (Section 6).
9. Affidavit of compliance or certified analyses, if required (Sec. 6.3).

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. A section on proper storage of materials was added in the foreword (Sec. II.A).
2. Modifications were made to conform to AWWA standard style and wording.

V. Comments. If you have any comments or questions about this standard, please call the AWWA Volunteer and Technical Support Group at 303.794.7711, FAX at 303.795.7603, write to the group at 6666 West Quincy Avenue, Denver, CO 80235-3098, or e-mail the group at standards@awwa.org.



**American Water Works
Association**

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. 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, Standard for 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.