



**American Water Works  
Association**

The Authoritative Resource for Safe Drinking Water<sup>SM</sup>

American Water Works Association  
ANSI/AWWA B602-02  
(Revision of ANSI/AWWA B602-R97)

---

---

*AWWA Standard*

---

---

# Copper Sulfate



Effective date: Aug. 1, 2002.  
First edition approved by AWWA Board of Directors January 26, 1959.  
This edition approved Jan. 20, 2002.  
Approved by American National Standards Institute May 21, 2002.

---

---

6666 West Quincy Avenue  
Denver, CO 80235-3098

[www.awwa.org](http://www.awwa.org)

Advocacy  
Communications  
Conferences  
Education and Training  
► **Science and Technology**  
Sections

**AVA** Documents  
Document Sharing Hub

## **AWWA Standard**

This document is an American Water Works Association (AWWA) standard. It is not a specification. AWWA standards describe minimum requirements and do not contain all of the engineering and administrative information normally contained in specifications. The AWWA standards usually contain options that must be evaluated by the user of the standard. Until each optional feature is specified by the user, the product or service is not fully defined. AWWA publication of a standard does not constitute endorsement of any product or product type, nor does AWWA test, certify, or approve any product. The use of AWWA standards is entirely voluntary. AWWA standards are intended to represent a consensus of the water supply industry that the product described will provide satisfactory service. When AWWA revises or withdraws this standard, an official notice of action will be placed on the first page of the classified advertising section of *Journal AWWA*. The action becomes effective on the first day of the month following the month of *Journal AWWA* publication of the official notice.

## **American National Standard**

An American National Standard implies a consensus of those substantially concerned with its scope and provisions. An American National Standard is intended as a guide to aid the manufacturer, the consumer, and the general public. The existence of an American National Standard does not in any respect preclude anyone, whether that person has approved the standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standard. American National Standards are subject to periodic review, and users are cautioned to obtain the latest editions. Producers of goods made in conformity with an American National Standard are encouraged to state on their own responsibility in advertising and promotional materials or on tags or labels that the goods are produced in conformity with particular American National Standards.

CAUTION NOTICE: The American National Standards Institute (ANSI) approval date on the front cover of this standard indicates completion of the ANSI approval process. This American National Standard may be revised or withdrawn at any time. ANSI procedures require that action be taken to reaffirm, revise, or withdraw this standard no later than five years from the date of publication. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute, 25 W. 43rd St., Fourth Floor, New York, NY 10036; (212) 642-4900.

---

## **Science and Technology**

---

AWWA unites the drinking water community by developing and distributing authoritative scientific and technological knowledge. Through its members, AWWA develops industry standards for products and processes that advance public health and safety. AWWA also provides quality improvement programs for water and wastewater utilities.

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information or retrieval system, except in the form of brief excerpts or quotations for review purposes, without the written permission of the publisher.

Copyright © 2002 by American Water Works Association  
Printed in USA

## Committee Personnel

The AWWA Standards Committee on Taste and Odor Control Chemicals, which reviewed and approved this standard, had the following personnel at the time of approval:

Clarence A. Blanck, *Chair*

Kenneth J. Ficek, *Secretary*

### *Consumer Members*

H.R. Hall, Corpus Christi, Texas (AWWA)

J.T. Harvey, Little Rock Municipal Water Works, Little Rock, Ark. (AWWA)

Jeff Robinson, Indiana–American Water Company, Greenwood, Ind. (AWWA)

T.M. Vandiver, New Orleans, La. (AWWA)

B.H. Wilder,\* Daytona Beach, Fla. (AWWA)

### *General Interest Members*

C.A. Blanck, Richmond, Ind. (AWWA)

J.S. Kippen, Town of Ipswich Water, Ipswich, Mass. (NEWWA)

N.E. Otto, Consultant, Denver, Colo. (BUREC)

S.J. Posavec,† Standards Group Liaison, AWWA, Denver, Colo. (AWWA)

L.C. Rodman,† Black & Veatch, Kansas City, Mo. (AWWA)

W.C. Westgarth, H&W Westgarth Engineering, Beaverton, Ore. (AWWA)

### *Producer Members*

I.P. Fairchild, Chemical Specialty Group Inc., Cartersville, Ga. (AWWA)

K.J. Ficek, Carus Chemical, Peru, Ill. (AWWA)

C.B. Lind, General Chemical Corporation, Parsippany, N.J. (AWWA)

T.R. Walton, Stuart, Fla. (AWWA)

---

\* Alternate

† Liaison, nonvoting

This page intentionally blank.

# Contents

*All AWWA standards follow the general format indicated subsequently. Some variations from this format may be found in a particular standard.*

| SEC.                   | PAGE                                     | SEC.         | PAGE                                                            |
|------------------------|------------------------------------------|--------------|-----------------------------------------------------------------|
| <b><i>Foreword</i></b> |                                          | <b>3</b>     | <b>Definitions .....</b> 1                                      |
| I                      | Introduction..... vii                    | <b>4</b>     | <b>Requirements</b>                                             |
| I.A                    | Background..... vii                      | 4.1          | Physical Requirements ..... 3                                   |
| I.B                    | History..... viii                        | 4.2          | Chemical Requirements..... 4                                    |
| I.C                    | Acceptance..... viii                     | 4.3          | Impurities ..... 4                                              |
| II                     | Special Issues..... ix                   | <b>5</b>     | <b>Verification</b>                                             |
| II.A                   | Storage and Handling Precautions.... ix  | 5.1          | Sampling and Inspection ..... 5                                 |
| II.B                   | Disposal..... x                          | 5.2          | Laboratory Examination—General .... 6                           |
| III                    | Use of This Standard..... x              | 5.3          | Size Determination ..... 6                                      |
| III.A                  | Purchaser Options and Alternatives ... x | 5.4          | Determination of Water-Insoluble<br>Matter..... 7               |
| IV                     | Modification to Standard..... x          | 5.5          | Determination of Copper Content.... 7                           |
| V                      | Major Revisions ..... x                  | 5.6          | Other Tests..... 9                                              |
| VI                     | Comments ..... x                         | 5.7          | Basis for Rejection .....9                                      |
| <b><i>Standard</i></b> |                                          | <b>6</b>     | <b>Delivery</b>                                                 |
| <b>1</b>               | <b>General</b>                           | 6.1          | Marking..... 9                                                  |
| 1.1                    | Scope ..... 1                            | 6.2          | Packaging and Shipping..... 10                                  |
| 1.2                    | Purpose ..... 1                          | 6.3          | Affidavit of Compliance..... 10                                 |
| 1.3                    | Application ..... 1                      |              |                                                                 |
| <b>2</b>               | <b>References..... 1</b>                 | <b>Table</b> |                                                                 |
|                        |                                          | 1            | Solubility of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ..... 2 |

This page intentionally blank.

# Foreword

*This foreword is for information only and is not a part of AWWA B602.*

## I. Introduction.

I.A. *Background.* Copper sulfate primarily is used as an algicide in potable water. It is available both as a commercial product and as a by-product of the printed-circuit-board industry.

The commercial product is produced by reacting a solution of sulfuric acid with copper metal, cupric oxide, or basic cupric copper salts. Copper sulfate crystals form in the concentrated solution and grow in size in a characteristic crystalline shape. A broad range of crystal sizes is produced by controlling the length of crystallization time or by fracturing the larger crystals and screening to the desired sizes.

The by-product copper sulfate is generally produced in printed-circuit-board shops, where proprietary etchant solutions are used to dissolve copper from printed-circuit boards. If a sulfuric acid based etchant solution is used, it becomes saturated with copper ions and sulfate ions. Small crystals of copper sulfate form and are mechanically removed.

The presence of various impurities and their amounts in the copper sulfate depend on the impurities present in the starting materials or the solution in which the crystals grow.

The selection of crystal size for use in algae control depends on a number of factors, including algae type and growth habits as well as application method and equipment to be used. The application rate will depend on algae type and species as well as water characteristics, including pH, alkalinity and hardness, presence of suspended solids, density of algae growth, and water temperature. For potable water, the US Environmental Protection Agency (USEPA) has set a tolerance for the maximum residue of copper at 1 ppm, or equal to 4 ppm as copper sulfate pentahydrate ( $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ) (40 CFR\* 185.1200), which also is the secondary standard under the US National Drinking Water Regulations. USEPA, Office of Drinking Water, has set the Action Level at 1.3 mg/L copper (Cu) as the Primary

---

\*Code of Federal Regulations, US Government Printing Office, Superintendent of Documents, Washington, DC 20402.

Drinking Water Standard. Under most use conditions, the effective dose is considerably less than the established residue tolerance.

I.B. *History.* This standard was first approved as tentative on Sept. 15, 1957. It was developed by the AWWA Water Purification Division and also was submitted for review to producers and consumers whose comments were then considered by a referee. It was approved as a standard without revision on Jan. 26, 1959, and published as AWWA B602-59.

This standard was revised by the AWWA Standards Committee on Taste and Odor Control Chemicals. The dates of approval and numerical designation of all past editions of AWWA B602 are listed below.

| <i>Designation</i> | <i>Date of Approval</i> |
|--------------------|-------------------------|
| B602-57T           | Sept. 15, 1957          |
| B602-59            | Jan. 26, 1959           |
| B602-80            | Jan. 28, 1980           |
| B602-86            | Jan. 27, 1986           |
| B602-91            | Jan. 27, 1991           |
| B602-97            | Feb. 2, 1997            |

This edition was approved by the AWWA Board of Directors on Jan. 20, 2002.

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 all direct and indirect drinking water additives. Other members of the original consortium included the American Water Works Association Research Foundation (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 two standards developed under the

---

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