

---

---

**Guidelines for treated wastewater use  
for irrigation projects —**

**Part 5:  
Treated wastewater disinfection and  
equivalent treatments**

*Lignes directrices pour l'utilisation des eaux usées traitées dans les  
projets d'irrigation —*

*Partie 5: Désinfection des eaux usées traitées et traitements  
équivalents*

Document Preview

ISO 16075-5:2021

<https://standards.iteh.ai/catalog/standards/iso/5460c1dd-4219-4800-9285-8cc28dc19f93/iso-16075-5-2021>



**iTeh Standards**  
**(<https://standards.iteh.ai>)**  
**Document Preview**

[ISO 16075-5:2021](https://standards.iteh.ai/catalog/standards/iso/5460c1dd-4219-4800-9285-8cc28dc19f93/iso-16075-5-2021)

<https://standards.iteh.ai/catalog/standards/iso/5460c1dd-4219-4800-9285-8cc28dc19f93/iso-16075-5-2021>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2021

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

|   | Page      |
|---|-----------|
| <b>Foreword</b> .....   | <b>v</b>  |
| <b>Introduction</b> .....   | <b>vi</b> |
| <b>1 Scope</b> .....  | <b>1</b>  |
| <b>2 Normative references</b> .....   | <b>1</b>  |
| <b>3 Terms, definitions, and abbreviated terms</b> .....  | <b>1</b>  |
| 3.1 Terms and definitions.....  | 1         |
| 3.2 Abbreviated terms.....  | 3         |
| <b>4 Wastewater pathogenic contaminants and their inactivation or removal</b> .....                                 | <b>4</b>  |
| 4.1 General.....  | 4         |
| 4.2 Type and occurrence of pathogens in wastewater.....   | 4         |
| 4.3 Reduction of pathogenic microorganisms in various stages of wastewater treatment.....                           | 5         |
| 4.4 Reduction of pathogenic microorganisms by different disinfection methods.....                                   | 6         |
| <b>5 Disinfection</b> .....   | <b>7</b>  |
| <b>6 Chemical disinfection</b> .....  | <b>8</b>  |
| 6.1 General.....  | 8         |
| 6.2 Disinfection by chlorine/bromine compounds.....   | 8         |
| 6.2.1 General.....  | 8         |
| 6.2.2 Reactions of chlorine/bromine with ammonia.....   | 9         |
| 6.2.3 Definition of the halogenated disinfection residuals.....   | 10        |
| 6.2.4 Breakpoint reaction.....  | 10        |
| 6.2.5 CT values of chlorine/bromide and their compounds.....  | 12        |
| 6.2.6 Chlorinated compounds for TWW disinfection.....   | 12        |
| 6.2.7 Advantages, disadvantages and technical considerations of chlorine biocides-based disinfection method.....    | 13        |
| 6.2.8 Chlorination process.....   | 15        |
| 6.2.9 Brominated compounds for TWW disinfection.....  | 15        |
| 6.2.10 Advantages, disadvantages and technical considerations of brominated biocides-based disinfection method..... | 17        |
| 6.3 Ozone.....  | 18        |
| 6.3.1 Chemistry of ozone disinfection.....  | 18        |
| 6.3.2 Direct ozone reaction.....  | 18        |
| 6.3.3 Indirect ozone reaction.....  | 19        |
| 6.3.4 Advantages, disadvantages and technical considerations of Ozone disinfection method.....                      | 20        |
| 6.3.5 System configuration.....   | 20        |
| 6.3.6 Monitoring of ozonation.....  | 21        |
| 6.4 Environmental impacts of chemical disinfection.....   | 21        |
| 6.4.1 Environmental impacts of chlorination/bromination disinfection.....   | 21        |
| 6.4.2 Environmental impacts of ozonation disinfection.....  | 22        |
| <b>7 UV disinfection</b> .....  | <b>22</b> |
| 7.1 General.....  | 22        |
| 7.2 UV light technologies and how they work.....  | 23        |
| 7.2.1 General.....  | 23        |
| 7.2.2 UV disinfection system components.....  | 23        |
| 7.3 UV source.....  | 24        |
| 7.3.1 General.....  | 24        |
| 7.3.2 UV source protector.....  | 25        |
| 7.4 Disinfection chamber.....   | 25        |
| 7.5 Sensors.....  | 25        |
| 7.5.1 UV intensity sensors.....   | 25        |
| 7.5.2 UV transmittance sensors.....   | 26        |
| 7.6 Ballasts.....   | 27        |

|                     |   |           |
|---------------------|---|-----------|
| 7.7                 | UV validation .....   | 27        |
| 7.8                 | The effectiveness of a UV disinfection system .....   | 29        |
| 7.9                 | Cleaning.....   | 29        |
| 7.10                | Environmental impacts of UV disinfection .....  | 29        |
| 7.11                | Advantages, disadvantages and technical considerations of UV disinfection method.....                                     | 30        |
| <b>8</b>            | <b>Removal of pathogens by membrane methods.....</b>  | <b>30</b> |
| 8.1                 | General.....  | 30        |
| 8.2                 | Membrane system.....  | 30        |
| 8.3                 | Pathogen removal by membrane filtration.....  | 31        |
| 8.4                 | Considerations for operation and maintenance.....   | 31        |
| 8.5                 | Monitoring.....   | 31        |
| 8.6                 | Environmental impacts of membrane systems.....  | 32        |
| 8.7                 | Advantages, disadvantages and technical considerations of pathogens removal by membrane systems disinfection method ..... | 32        |
| <b>Annex A</b>      | <b>(informative) Infection agents potentially present in untreated (raw) wastewater .....</b>                             | <b>33</b> |
| <b>Annex B</b>      | <b>(Informative) Microbial removal performance by various membrane filtration .....</b>                                   | <b>35</b> |
| <b>Annex C</b>      | <b>(Informative) Bromine further compounds .....</b>  | <b>36</b> |
| <b>Annex D</b>      | <b>(informative) Factors in operation, maintenance and monitoring of membrane system.....</b>                             | <b>37</b> |
| <b>Bibliography</b> | .....   | <b>40</b> |

**iTeh Standards**  
**(<https://standards.iteh.ai>)**  
**Document Preview**

[ISO 16075-5:2021](https://standards.iteh.ai/catalog/standards/iso/5460c1dd-4219-4800-9285-8cc28dc19f93/iso-16075-5-2021)

<https://standards.iteh.ai/catalog/standards/iso/5460c1dd-4219-4800-9285-8cc28dc19f93/iso-16075-5-2021>

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 282, *Water reuse*, Subcommittee SC 1, *Treated wastewater reuse for irrigation*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

<https://standards.iteh.ai/catalog/standards/iso/5460c1dd-4219-4800-9285-8cc28dc19f93/iso-16075-5-2021>

## Introduction

Disinfection of treated wastewater (TWW) is a critical phase in the process of TWW use. Its purpose is to reduce or eliminate major health risks to the wastewater treatment plant's operators and to anybody who may come in contact with TWW or with crops that were irrigated with TWW.

This document provides a guideline for the available methods of disinfection, their effectiveness and the factors impacting those methods, along with their advantages and disadvantages, regarding technical and environmental aspects and effective inactivation or removal of various pathogens in wastewater and TWW for use in irrigation.

# iTeh Standards (<https://standards.iteh.ai>) Document Preview

[ISO 16075-5:2021](https://standards.iteh.ai/catalog/standards/iso/5460c1dd-4219-4800-9285-8cc28dc19f93/iso-16075-5-2021)

<https://standards.iteh.ai/catalog/standards/iso/5460c1dd-4219-4800-9285-8cc28dc19f93/iso-16075-5-2021>