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Guidelines for health risk assessment and management for non-potable water reuse

Lignes directrices pour l'appréciation et la gestion du risque pour la santé relative à la réutilisation de l'eau pour des usages non potables

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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).

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).

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

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 282, *Water Reuse*, Subcommittee SC 3, *Risk and performance evaluation of water reuse systems*.

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Introduction

The reaffirmation of the importance of water along with food security and energy was a significant outcome in the actions and the follow-up framework passed at the United Nations Conference on Sustainable Development (Rio+20). Water is an indispensable resource for sustainable development including the eradication of poverty and hunger, public hygiene, food security, water power, agriculture, and development of farming and remote communities. In the management of water resources, essential actions include: the prevention of water contamination by households, industries, and agriculture; more efficient water usage and the treatment and reuse of wastewater as a water resource, particularly in growing urban areas.

Today, with many regions of the world facing potable water shortages, wastewater reuse can provide an alternative water source that is suitable for satisfying the majority of water demands, with the notable exception of drinking and cooking which require higher water quality. On the other hand, increased water reuse practices are raising concerns regarding potential health implications across the world. This has led to an increasing need to specify water quality parameters that are appropriate to specific water applications and uses, as well as the development of methods to assess and manage health risks from both regulator and user sides. Unless these needs are addressed, opportunities for sustainable development in the form of appropriate use of reclaimed water will be lost.

Direct or indirect contact with reclaimed water may have health implications for individuals, regardless of whether they are the intended users of the reclaimed water or not. Contact with reclaimed water can occur during the collection and treatment of wastewater, treated water storage and distribution, the use of reclaimed water, or after use. Health risks may also be present during the operations and/or maintenance work of the facilities and processes. These health implications can be moderate in some cases and serious in others, and continue for a short, moderate, or long period of time.

This document can be useful for the application of management system standards, such as ISO 9001 and risk management standards, such as ISO 31000.

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Guidelines for health risk assessment and management for non-potable water reuse

1 Scope

This document aims to serve as technical guidelines for the assessment and management of the health risks associated with pathogens contained in reclaimed water, which are expected to be caused by the use of reclaimed water, and/or by the production, storage, and transportation of reclaimed water.

This document is applicable to the use of reclaimed water made from any source water (i.e. raw sanitary sewage; treated municipal wastewater; industrial wastewater; stormwater potentially influenced by sewage) and for non-potable water reuse.

NOTE The approach described in this document can be applied to chemical contaminant, if applicable.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 20670:—[1)], *Water reuse — Terminology*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the terms and definitions given in ISO 20670 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1 Terms and definitions

3.1.1
disability-adjusted life years
population metric of life years lost to disease due to both morbidity and mortality

[SOURCE: WHO (2016) Quantitative Microbial Risk Assessment: Application for Water Safety Management]

3.1.2
dose-response assessment
determination of the relationship between the magnitude of exposure (dose) to a chemical, biological or physical agent and the severity and/or frequency of associated adverse health effects (response)

[SOURCE: WHO (2016) Quantitative Microbial Risk Assessment: Application for Water Safety Management]

1) Under preparation. (Stage at the time of publication ISO/DIS 20670:2017.)

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3.1.3
hazardous event
event in which people are exposed to a hazard within the system

Note 1 to entry: It may be an incident or a situation that introduces or releases the hazard to the environment in which humans are living or working; amplifies the concentration of a hazard; or fails to remove a hazard from the human environment.

[SOURCE: WHO (2016) Quantitative Microbial Risk Assessment: Application for Water Safety Management]

3.1.4
non-potable water reuse
water reuse except reuse requiring drinking water quality according to local jurisdiction

3.1.5
pathogen
microorganism (e.g. bacteria and viruses) and parasite (e.g. protozoa and helminths) that can affect human health and cause disease

3.1.6
performance control point
activity, procedure or process where control of performance can be applied, and that is essential for preventing hazards that represent high risks or reducing them to acceptable levels

Note 1 to entry: See Australian Guidelines for Water Recycling [NRMMC, EPHC, AHMC (2006)].

3.2 Abbreviated terms

BOD biochemical oxygen demand

DALY disability-adjusted life years

MLSS mixed liquor suspended solids

PCP performance control point

QA quality assurance

QC quality control

TSS total suspended solids

UV ultraviolet irradiation

YLD years lived with disability

YLL years of life lost

4 Concepts of health risk assessment and management for non-potable water reuse

4.1 Risk assessment and management framework

There is a possibility that reclaimed water contains hazards that can potentially affect human health. The goal of the risk assessment and management process is to estimate and reduce the risk of adverse outcomes to a level acceptable to society and the local community. A health risk assessment is undertaken to establish standards or performance goals which are used as a basis for the design of the treatment steps. In addition, health risk management is also implemented to ensure that water of a safe

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