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Water reuse in urban areas — Guidelines for urban reclaimed water for landscaping uses

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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).

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This document was prepared by Technical Committee ISO/TC 282, *Water reuse*, Subcommittee SC 2, *Water reuse in urban areas*.

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.

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Introduction

As population increases and urbanization, industrialization, and climate change are intensifying water scarcity, water reuse presents an effective solution to the pressing issue of severe water shortages. In many regions, reclaimed water has emerged as an important alternative water resource for sustainable socio-economic development. Landscaping use is one of the major applications of water reuse in many regions, because it not only alleviates water shortages, but it can also maintain ecological flow and improve the local aquatic environment and ecosystem.

The landscaping use of reclaimed water includes urban stream flow augmentation (e.g. rivers and lakes), aesthetic impoundments and wetlands replenishment. The benefits include ensuring ecological flow to help protect urban rivers and lakes from drought, recovering natural assets, expanding the size of aquatic habitat, and improving urban aquatic spaces and scenery.

Despite the advantages of landscaping with reclaimed water, challenges can arise if the design, construction, and management of reuse projects are inappropriate. Compared with traditional water sources, reclaimed water can have variations in composition depending on the season, and to some extent it can contain pharmaceutical and personal care products which can pose potential risks to human health and the aquatic environment. Therefore, the risk associated with reclaimed water should be controlled in terms of water quality and quantity. Guidelines for water quality and quantity should be developed to ensure the safe, stable, and efficient use of reclaimed water.

This guideline is developed for the landscaping use of reclaimed water. It provides professional guidance to ensure the safe, stable, and efficient application of reclaimed water for landscaping, addressing water quantity, quality recommendations, supplemental treatments, and management practices. Utilizing reclaimed water for non-potable use, such as landscaping, is a win-win situation.

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Water reuse in urban areas — Guidelines for urban reclaimed water for landscaping uses

1 Scope

This document provides a guideline for good design and practice for urban reclaimed water that recharges into landscape water, including urban stream flow (e.g. rivers and lakes), aesthetic impoundments and wetlands replenishment, to ensure the proper support of the aquatic ecosystem. This document covers urban stream flow and leisure with possible incidental body contact. It does not cover urban irrigation, such as the irrigation of elements of the natural environment, urban public areas, or residential areas. It does not cover the cultivation of aquatic plants or animals for food purposes, including their sale.

This document provides recommendations for reclaimed water for landscaping uses, including those for planning, design, management, and maintenance.

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, *Water reuse — Vocabulary*

3 Terms and definitions

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

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

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

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

3.1
landscaping use of reclaimed water
practice of using reclaimed water for landscaping purposes, including *urban stream flow* (3.7) augmentation (e.g. rivers and lakes), *aesthetic impoundments* (3.2) and *wetlands replenishment* (3.4)

3.2
aesthetic impoundment
landscape water area with facilities where recreation is the primary use and people do not have direct *body contact* (3.6) with water

EXAMPLE Landscape areas in streams, rivers, lakes, and artificial aquatic areas.

3.3
aesthetic wetland
wetland that has been constructed or restored to enhance urban landscapes, and does not include wetlands that treat wastewater from sewage or wastewater treatment plants

3.4
wetlands replenishment
replenishment of aquatic areas to provide landscape use or to provide support for ecosystem life, or both

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3.5
photoreactivation
phenomenon by which UV-inactivated organisms regain their activity via photo repair of UV-induced lesions in the DNA by utilizing the energy of visible light and the enzyme photolyase

3.6
body contact
exposure of human body to reclaimed water via oral digestion, dermal contact, or inhalation

Note 1 to entry: According to the water quality grade for non-potable reuse application, direct body contact usually includes recreational activities, equipment and vehicle washing, dust suppression, etc. Incidental body contact includes landscape water features, landscape impoundments, industrial water applications, etc. (see ISO 20469).

3.7
urban stream flow
designed and engineered rivers, lakes and ponds that receive urban reclaimed water as the primary or supplementary water source

3.8
hydraulic retention time
HRT
average time the reclaimed water spends passing through a specific water area

Note 1 to entry: Adapted from Reference [12].

3.9
supply point
location where the reclaimed water enters the receiving water

4 Abbreviated terms

BOD_5	five-day biochemical oxygen demand
COD	chemical oxygen demand
DO	dissolved oxygen
GHG	greenhouse gas
PAC	polyaluminum chloride
TN	total nitrogen
TOC	total organic carbon
TP	total phosphorus
TSS	total suspended solid
SS	suspended solids
UV	ultraviolet

5 General recommendations

5.1 General

Reclaimed water intended for environmental use and potential human exposure should be safe, stable, ecologically friendly, and publicly acceptable. These characteristics are defined by local guidelines or

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regulations. In landscaping reuse projects, the environmental benefits of reclaimed water should be considered and potential risks to human health and the environment should be evaluated and managed.

Urban stream flows can enhance the visual and sensory qualities of natural or human-made environments that are appreciated for their beauty and appeal. However, direct human contact with reclaimed water should be avoided.

Wetlands, which are either permanently or seasonally saturated with water, support diverse plant and animal species. Aesthetic wetlands are designed to enhance landscapes, provide wildlife habitats, improve water quality, and reduce nutrients. Aesthetic wetlands are characterized by their visual appeal and human-made features, such as boardwalks, observation decks, and interpretive signage.

Incidental body contact of humans and pets with reclaimed water used for landscaping is considered in this document. Signs should be set up to warn people to take care of pets and prevent them from going into the water. Monitoring should be conducted in situations where direct harm to humans can be caused, for example upon contact with pathogenic bacteria.

5.2 Safety

The landscaping uses of reclaimed water should be safe for both the ecological environment and humans, particularly in the case of incidental body contact. Risks to human health via incidental body contact primarily arise from harmful pollutants, pathogens, or parasites in reclaimed water. The possible pollutants in reclaimed water include heavy metals and recalcitrant organics, to which humans can be exposed via environmental contamination such as groundwater contamination. Pathogens in reclaimed water can cause symptoms like diarrhea, vomiting, headaches. Risks to ecological environments include harm to aquatic biota, eutrophication, and landscape degradation.

Water quantity is also a critical safety factor. Insufficient water flow cannot support the functioning of the ecosystem, while excessive flow can destabilize habitat for submerged plants and zoobenthos (organisms that live on or in the bottom of water sediments).

To ensure safety, the quality and quantity of reclaimed water for landscaping uses should be carefully monitored and controlled.

Key considerations include:

— The source of reclaimed water should be domestic wastewater or municipal wastewater without industrial wastewater.

— The quantity should be managed and the quality should be ensured by proper treatment before reclaimed water is recharged into landscapes.

— Regular monitoring of water quality and quantity should be carried out.

— Aesthetic wetlands replenishment should prevent people from contacting reclaimed water. Fences or barriers should be built surrounding deep water. Warning signs indicating reclaimed water use should be installed (see ISO 20469).

— Exposure to reclaimed water should be minimized to prevent humans from potential indirect contact.

5.3 Ecological rationale

Reclaimed water serves as a complementary water source, addressing water shortages and promoting ecological restoration and conservation. However, the ecological impact of reclaimed water recharge should be considered before and after landscape construction.

a) Reclaimed water for landscaping uses should be designed to maintain ecological flow, restore natural assets, and expand ecological habitats.

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