



Designation: E2635 – 22

Standard Practice for Water Conservation in Buildings Through In-Situ Water Reclamation¹

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1. Scope

1.1 In an effort to help meet growing demands being placed on available water supplies and water treatment facilities, many communities throughout the United States and the world are turning to water reclamation and reuse. Water reclamation and reuse offer an effective means of conserving the Earth's limited high-quality freshwater supplies while helping to meet the ever growing demands for water in residential, commercial, and institutional development. This practice sets forth a practice for water reuse in buildings and related construction, encompassing both graywater and blackwater in-situ reclamation.

1.1.1 This practice specifies parameters for substituting reclaimed water in place of potable water supplies where potable water quality is not required.

1.1.2 This practice specifies limitations for use of reclaimed water in-situ. It is not intended for application to the use of reclaimed water delivered from an offsite municipal wastewater treatment facility.

1.1.3 This practice specifies performance requirements for in-situ reclaimed water systems. It does not specify particular technology(ies) that must be used. A variety of technologies may satisfy the performance requirements.

1.1.4 This practice specifies requirements for water stewardship associated with in-situ water reuse. Consistent with Guide E2432 and for purposes of this practice, water stewardship includes both quantity and quality impacts on water used in buildings.

1.2 Implementation of this practice will require professional judgment. Such judgment should be informed by experience with sustainable development, including environmental, economic, and social issues as appropriate to the building use, type, scale, and location.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical

conversions to SI units that are provided for information only and are not considered standard.

1.3.1 *Exception*—Solely SI units are used in Table 1, Table X3.1, and Table X4.1.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

- D888 Test Methods for Dissolved Oxygen in Water
- D1253 Test Method for Residual Chlorine in Water
- D4188 Practice for Performing Pressure In-Line Coagulation-Flocculation-Filtration Test in Water
- D4840 Guide for Sample Chain-of-Custody Procedures
- D5128 Test Method for On-Line pH Measurement of Water of Low Conductivity
- D5244 Practice for Recovery of Enteroviruses from Waters (Withdrawn 2013)³
- D5464 Test Method for pH Measurement of Water of Low Conductivity
- D5907 Test Methods for Filterable Matter (Total Dissolved Solids) and Nonfilterable Matter (Total Suspended Solids) in Water
- D6238 Test Method for Total Oxygen Demand in Water
- D6569 Test Method for On-Line Measurement of pH
- D6698 Test Method for On-Line Measurement of Turbidity Below 5 NTU in Water

¹ This practice is under the jurisdiction of ASTM Committee E60 on Sustainability and is the direct responsibility of Subcommittee E60.01 on Buildings and Construction.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

D6734 Test Method for Low Levels of Coliphages in Water (Withdrawn 2015)³

E631 Terminology of Building Constructions

E2114 Terminology for Sustainability Relative to the Performance of Buildings

E2432 Guide for General Principles of Sustainability Relative to Buildings

2.2 Other References:

U.S. EPA Protocols, Monitoring and Assessing Water Quality; Section 5.2, Dissolved Oxygen and Biochemical Oxygen Demand⁴

California Health Laws Related to Recycled Water, “The Purple Book”⁵

3. Terminology

3.1 Definitions:

3.1.1 For terms related to building construction, refer to Terminology **E631**.

3.1.2 For terms related to sustainability relative to the performance of buildings, refer to Terminology **E2114**.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *blackwater*, *n*—untreated wastewater from toilets, kitchen sinks, and dishwashers.

3.2.2 *cross-connection*, *n*—a physical connection between any part of a water system used or intended to supply water for drinking purposes and any source or system containing water or substance that is not or cannot be approved as potable water.

3.2.3 *disinfection*, *n*—destruction, inactivation, or removal of pathogenic microorganisms by chemical, physical, or biological means.

3.2.4 *dual distribution system*, *n*—reclaimed water distribution systems that parallels a potable water system.

3.2.5 *filtration*, *n*—the passing of wastewater through natural undisturbed soils or filter media such as sand or anthracite, or both, filter cloth, or the passing of wastewater through microfilters or other membrane processes.

3.2.6 *graywater*, *n*—untreated wastewater from bathtubs, showers, bathroom wash basins, clothes washing machines, and laundry tubs.

3.2.6.1 *Discussion*—Graywater is unlikely to contain significant organic contaminants or chemical contaminants more hazardous than detergents, excluding blackwater.

3.2.7 *groundwater*, *n*—water that is found beneath the surface of the ground, usually in porous rock known as an aquifer.

3.2.7.1 *Discussion*—The top of this groundwater is called the water table.

3.2.8 *nonpotable water*, *n*—water that has not been treated for human consumption in conformance with applicable drinking water quality regulations.

3.2.9 *osmosis*, *n*—the movement of water between two solutions, separated by a membrane that permits the free passage of water but prevents or slows down the passage of dissolved substances.

3.2.9.1 *Discussion*—Water moves more rapidly from the less concentrated solution to the solution of a higher concentration than in the opposite direction.

3.2.10 *persistent organic pollutant (POP)*, *n*—a chemical substance that persists in the environment, bioaccumulates through the food web, and poses a risk of causing adverse effects to human health and the environment.

3.2.10.1 *Discussion*—The United Nations Environment Programme (UNEP) Governing Council, at its 19th session in February 1997, identified 12 POPs: Aldrin, Chlordane, Dieldrin, DDT, Endrin, Heptachlor, Hexachlorobenzene, Mirex, Toxaphene, PCBs, Dioxins, and Furans.

3.2.11 *potable water*, *n*—water that does not endanger the lives or health of human beings and that conforms to applicable regulations for drinking water quality.

3.2.12 *reclaimed water*, *n*—nonpotable water that is highly treated and used for approved purposes other than drinking water.

3.2.13 *reverse osmosis*, *n*—a separation process that uses pressure to force a solvent through a membrane that retains the solute on one side and allows the pure solvent to pass to the other side.

3.2.13.1 *Discussion*—Pressure (usually 725.19 psi to 2900.76 psi (5 MPa to 20 MPa)) is applied on the high concentration side of the membrane, forcing the solvent through a membrane to a solution of lower concentration. Pure solvent is obtained on the other side. The membranes used for reverse osmosis do not have pores: rather, separation takes place in a polymer layer of microscopic thickness.

3.2.14 *water reuse*, *v*—cycling water one or more times for beneficial use as reclaimed water.

3.2.14.1 *Discussion*—All water is cycled in the hydrologic cycle and so in the broadest sense may be considered to be ‘reused.’ The term ‘water reuse’ is utilized in this practice to refer specifically to a man-made intrusion in the hydrologic cycle that diverts water for multiple uses.

4. Significance and Use

4.1 *General*—As the world’s population increases, so does the need for water to meet various needs, as well as the need to manage wastewater. Already accepted and endorsed by the public in many urban and agricultural areas, properly implemented nonpotable water reuse projects can help communities meet water demand and supply challenges without any known significant health risks.

4.1.1 Many communities throughout the world are approaching, or have already reached, the limits of their available water supplies; water reuse has become necessary for conserving and extending available water supplies. Where the availability of water limits development, water reuse can

⁴ Available from United States Environmental Protection Agency (EPA), William Jefferson Clinton Bldg., 1200 Pennsylvania Ave., NW, Washington, DC 20460, <http://www.epa.gov>. Specific reference available as EPA 841-B-97-003, *Volunteer Stream Monitoring: A Methods Manual*, November 1997, Online, <https://www.epa.gov/wetlands/volunteer-stream-monitoring-methods-manual>, 1 September 2008.

⁵ Available from the California Department of Public Health (CDPH), CDHP Headquarters, P.O. Box 997377, MS 0500, Sacramento, CA 95899-7377, <https://www.cdph.ca.gov>. Specific reference available as “The Purple Book,” June 2001, Online, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Lawbook.html, 1 September 2008.