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EDGE USER GUIDE

Part 4

- Water Measures

Version 3

Date of Release: November 27th, 2024

Official Document

Contents

Introduction

EDGE (Excellence in Design for Greater Efficiencies) is a standard, a green building certification and an online app of the International Finance Corporation (IFC). This document is part of a series of documents aimed at the global harmonization of EDGE buildings certification process for version 3.

In these documents, "Must" and "Shall" are used to prescribe obligatory actions. "Should" implies a recommendation, but it is not required. Lastly, "May" grants permission or suggests that an action is permissible, providing flexibility or discretion to the *project team*.

The target group for this document are *Project teams*, EDGE experts, EDGE auditors, EDGE Certifiers and anyone interested in learning more about the certification.

The **Part 4—User Guide Water Measures** document offers detailed instructions on the requirements, intention, and high-level methodology used to calculate the impact of each water measure. Furthermore, it advises on the process for achieving compliance for each water efficiency measure (WEM).

From January 1st, 2025, this document invalidates and substitutes the Water Efficiency Measures section EDGE Version 3.0.a.

Table 1 shows the relative position of this document within the set of EDGE user guides.

Table 1: Position of this document within the EDGE V3 modules.

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To share feedback with the EDGE team, please send suggestions along with relevant documentation to edge@ifc.org.

Glossary

ASHRAE	American Society of Heating Refrigerating and Air-conditioning Engineers
COP	Coefficient of Performance
EDGE	Excellence in Design for Greater Efficiencies
EPA	Environmental Protection Agency
GIA	Gross Internal Area
HVAC	Heating, Ventilation and Air-conditioning
ISO	International Organization for Standardization
PSI	Pounds per square inch
TRY	Test Reference Year

Efficiency Measures Overview

This section provides an overview of the policies related to efficiency measures in EDGE.

Base Case

The Base Case is the standard benchmark against which the proposed design is compared for EDGE certification. The base case values shown in the App are used to calculate the base case performance of a building.

EDGE defines the Base Case or "EDGE Baseline" as the 'standard construction practice currently prevalent in a region (e.g., city, district, state) over the previous 3 years for the specific building type being evaluated'.

- In a region which has mandatory building energy, water, or materials codes, and where these codes are implemented in most of the new buildings being built in last 3 years, the relevant code serves as the Baseline. If the code is sufficiently implemented in a few cities or states, and not the rest, their baselines can be different.
- In a region where no such codes exist, or where they do exist but are not sufficiently enforced, EDGE uses the standard practices followed by the local construction industry as the Baseline. For example, if most low-income homes in a region have walls constructed using concrete blocks, that serves as the EDGE low-income homes baseline. Or, if most hospitals use double-pane windows, that serves as the EDGE baseline for hospitals in that region. These assumptions may be different for different income category homes, and across different building types, such as offices, hotels, and shopping malls.

To maintain the simplicity of EDGE, the Baseline incorporates broad trends and practices and does not delve into the details of a specific building or technology unless that represents the normal/typical practice.

Baseline Types

The base case varies by building type and by location. Each location in EDGE is assigned one of the following four (4) baselines:

1. Country-customized baseline: Countries with distinct building materials or a strong national building energy or water code are reflected in the EDGE baseline.
2. City-Customized baseline: Countries with uneven implementation of building energy code in cities, with some cities more stringent than others; or where cities have distinct building patterns because of weather variation have a baseline customized at the city level.
3. Global EDGE baseline: A global set of baseline parameters is used as the baseline for countries with emerging economies following typical global practices.
4. ASHRAE 90.1-2016: Advanced economies that typically follow a higher standard of construction have been assigned the ASHRAE 90.1-2016 baseline. Distinctions in aspects such as insulation are based on climate zones as per the ASHRAE standards.

Efficiency Measures

The selection of efficiency measures can have a significant impact on the resource demand of a building. When measures are selected, EDGE makes default assumptions on the typical improved performance over the base case. The results are shown in charts that compare the base case building with the improved case.

The default values seen when selecting the measures are purely informative and must be overwritten with actual values by editing the user input fields.

While some measures such as onsite renewable energy and the collection of rainwater are not technically efficiency measures, they reduce the use of grid electricity and treated potable water respectively, contributing to the 20% efficiency savings target required to reach the EDGE standard. Other innovative measures impacting energy or water savings can be reported using a proxy measure and will be evaluated on a case-by-case basis.

The current document focuses on the water efficiency measures.

Water

The water chart shows a breakdown of the end uses that consume water. The units are cubic meters per day. Hovering on the bar graph sections displays more information about each section.

Figure 1. Sample Water Chart from the Apartments typology

The categories in the Water Chart vary depending on the building type. A description of the categories follows.

- Kitchen: This includes dishwashers, pre-rinse spray valves, kitchen sink, and water used for cooking and drinking
- Car Washing: Water required for car washing
- Cleaning and Washing: Water required for general cleaning purposes
- Equipment: Water consumption as indicated in *Process Water* under the Design Tab
- Flushing: Flushing water requirement of water closet and urinals
- Shower: Water requirement for shower
- Washbasin: Water requirement for handwashing in toilet
- HVAC: This includes the water used for cooling when the water-cooled chillers are part of the base case.
- Irrigation: Landscape irrigation water requirement
- Laundry: This includes the water requirement for washing machine except office, retail, education and industrial typologies.
- Swimming Pool: water requirement to maintain a constant pool water volume

Individual Measures in EDGE

The Individual Measures Section in the user guide describes each measure included in EDGE, indicating the intent of the measure, how it is assessed, potential technologies and strategies to incorporate the measure, and what assumptions have been made to calculate the base case and improved case.

Requirement Summary

A summary of the system or level of performance required to claim that a measure has been incorporated into the project.

Intention

What the measure aims to achieve and why it is measured in a certain way in EDGE.

Approach/Methodologies

The approach used to assess the design is provided with an explanation of the calculations and terminology used.

Note that EDGE makes default assumptions for a base case building. The key baseline values are displayed in the EDGE App. The base case is taken from either typical practice or performance levels required by applicable local codes and standards. An assumption is also made for the improved case, so that when a measure is selected the predicted performance of the building is improved.

It is mandatory to override the improved case assumptions in EDGE with actual values representing predicted performance for the actual building design, allowing actual improvements to be recognized.

Potential Technologies/Strategies

The possible solutions and technologies that might be considered by the design team to meet the requirements of the measure.

Relationship to Other Measures

EDGE calculates the impact of user-selected measures by taking a holistic view of the building project and assessing the impact on inter-related aspects of energy, water, and materials (also known as integrated analysis). For example, a higher window-to-wall ratio may increase energy use and increase embodied carbon of the building envelope if the windows have higher embodied carbon compared to the wall material. Another example is hot water; a reduction in hot water use would decrease the consumption of both water and the energy used to heat the water. Such inter-relationships between measures are listed in this section to clarify EDGE calculations and support the overall design process.

Compliance Guidance

The compliance guidance provided for each measure indicates the documentation that will be required to demonstrate compliance for EDGE certification. Documentation requirements vary according to the technology being assessed. The documents required to prove compliance are specified in each individual measure section of this User Guide.

Because available evidence depends on the current stage in the building design process, EDGE provides compliance guidance for each measure at both the design and post-construction stages.

If the required evidence is not available during the design stage, a signed declaration of intent can be provided by the project administrator, except for Core and Shell, refer to ***Part 1 - EDGE Building Certification Guidance*** for more information. Note that at the post-construction stage, this declaration must be signed by the client, or a designated client representative as defined in the certification agreement. During the post-construction stage, more rigorous documentation is required. However, a common-sense approach is recommended to verify that the measure has indeed been installed as per the specifications claimed. For example, some measures require

purchase receipts to demonstrate compliance. If these are not available, similar locally used documents such as drawings, invoices, or other proof of purchase may be used instead to verify the construction details.

In the case of EDGE projects that are going directly into Post-Construction phase, the compliance requirements of both design and post-construction stages are expected to be met, except where a post-construction requirement replaces the design stage requirement.

In most cases, a minimum of 90% of a particular specification must comply for certification, unless specifically stated. If the auditor has reason to believe that a measure should be recognized, then proper justification should be provided for the certifier's review. Approval of such justification is at the discretion of the certifier.

WEM01 – Water-efficient Showerheads

Requirement Summary

To demonstrate water savings in the amount of water consumed through showers, the flow rate or the average flow rate of multiple types of showerheads should be less than the base case flow rate.

In all instances, regardless of whether the flow rate is higher or lower than the base case, the on-site installed flow rate of showerheads shall be entered into EDGE.

Project teams working in Homes or Apartment typologies may refer to the **Part 1 - EDGE Building Certification Guidance** for documenting flow rates in *subprojects* where some fixtures are not installed at the time of audit.

Intention

The intention of this measure is to reduce shower water consumption.

Approach/Methodologies

The flow rate of a shower can be as low as 6 liters per minute or greater than 20 liters per minute. As the flow rate of a showerhead is dependent on the water pressure, manufacturers often provide a chart which plots the flow rate at different pressures. For consistency, the flow rate used for the EDGE assessment in the design (preliminary) phase shall be that quoted for the operating pressure of at least 3 bar (43.5 psi).

At the post-construction stage, actual flow rates measured on site shall be entered in EDGE. If the pressure and flow rates of the showerheads vary across a project after construction, a weighted average at full flow shall be used. Multiple measurements shall be made across a variety of locations and floors to come up with a weighted average.

EDGE App Notes:

- If a building doesn't have shower facilities, *project teams* may select the "No Shower" option for commercial buildings (Typologies include office, retail, education, mixed use / self-defined building). In selected typologies, the entry for the average shower per day per person shall be entered for inclusion of water requirements for shower.
- Hot water provision (yes/no) must be selected from the dropdown option available.
- In selected countries, there is an option for *project teams* to select the use of bucket baths. Selecting bucket bath makes the base case and Improved case shower water requirement equal and will not result in any water savings.
- Bathtub shall be only selected when all the units in the project have at least one installed bathtub.
- The user can disable bathtub water usage by selecting "No" option for Homes and Apartment.

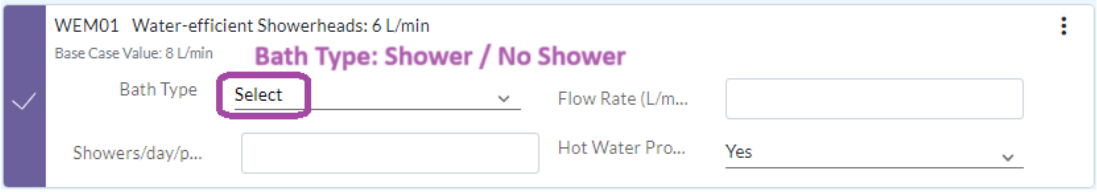

Figure 2. Selection of shower / No Shower Option in selected typologies in EDGE

Potential Technologies/Strategies

Many different showerheads are available that meet the flow rate required. To maintain user satisfaction at the lower flow rates, some manufacturers mix water with air to cause turbulence in the flow; this in turn gives an increased sense of pressure without increasing the flow rate.

Relationship to Other Measures

Showers with higher flow rates consume a substantial amount of hot water. Reducing the flow rate of the shower, not only reduces the amount of water used for showers, but also reduces the energy required to produce hot water. Therefore, water consumption from showers and energy consumption to produce hot water will reduce. In addition, EDGE also recognizes the reduction in energy consumption that is used to pump the water.

Compliance Guidance

Preliminary Stage Certification

- Plumbing drawings/specifications including make, model, and flow rate of the showerhead(s); and
- Manufacturer's data sheets for the specified showerhead(s) confirming the flow rate at a standard pressure of 3 bar.

Post Construction Stage Certification

- Documents from the design stage if not already submitted. Include any updates made to the documents to clearly reflect As-Built conditions; and
- On site test results using actual water pressure on site, which will supersede the standard design flow rate values; with average flow rate sampled from multiple locations, floors, or units, as applicable, measured at the highest flow per minute, using a timer and a measurement container; and
- Date-stamped photographs of the showerhead(s) taken during or after installation showing the make and model; or
- Purchase receipts for the showerheads showing the make and model.

Existing Building Documentation

- The same documentation applicable for *Post Construction Stage Certification* may be presented.

WEM02 – Water-efficient Faucets for all Bathrooms

Requirement Summary

To demonstrate water savings in the amount of water consumed from the use of taps in bathrooms, the flow rate, or the average flow rate of multiple types of faucets should be less than the base case flow rate. If different flow rates have been used in different bathrooms, then a detailed calculator can be used to enter the varying fixture flow rate for different areas. The weighted average is considered for the calculation.

The flow rate may include the use of aerators and auto shut off controls.

In all instances, regardless of whether the flow rate is higher or lower than the base case, the on-site installed flow rate of faucets shall be entered into EDGE.

Project teams working in Homes or Apartment typologies may refer to the **Part 1 - EDGE Building Certification Guidance** for documenting flow rates in *subprojects* where some fixtures are not installed at the time of audit.

Intention

The intention of this measure is to reduce water consumption from faucets.

Approach/Methodologies

As the flow rate of a faucet is dependent on the water pressure, manufacturers often provide a chart which plots the flow rate at different pressures. For consistency, the flow rate / use rate per cycle for the EDGE assessment in the design (preliminary) phase shall be that quoted for the operating pressure of 3 bar (43.5 psi).

At the post-construction stage, actual flow rates / use rate per cycle that is measured on site shall be entered in EDGE. If the pressure and flow rates / use rate per cycle of the faucet vary across a project after construction, a weighted average at full flow shall be used. Multiple measurements shall be made across a variety of locations and floors to come up with a weighted average.

For existing buildings, if this flow rate is not available, physical measurements can be made on site using a bucket of a known size and a timer to record the flow rate.

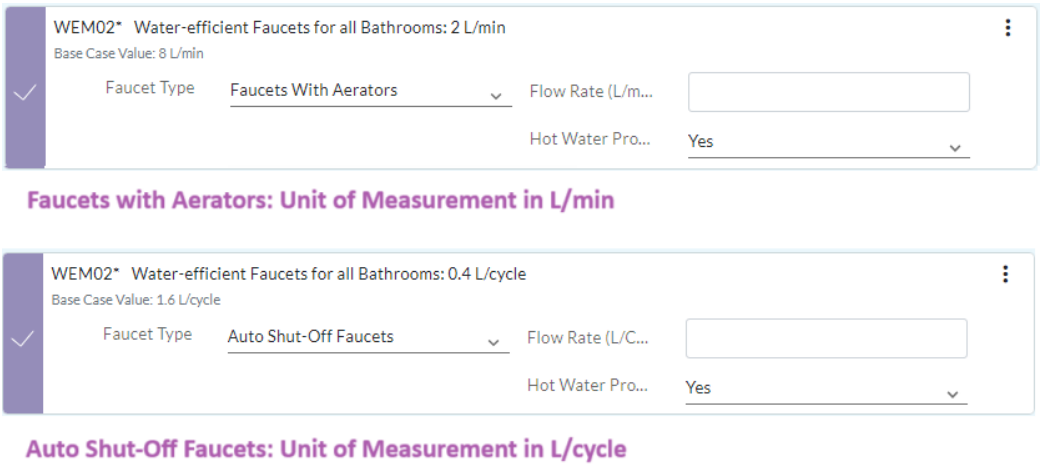

Figure 3. WEM02 Units of Measurement for (1) Aerators; and (2) Auto Shut Offs

Faucets with auto shut-offs are based on a 15-second cycle. Subprojects with both auto shut-offs and aerators shall select *Faucets With Aerators* under the *Faucet Type*. The flow rate shall be the weighted average of both faucet types measured in L/min.

Potential Technologies/Strategies

Aerators are small water-saving devices attached to the faucet that maintain user satisfaction at the lower flow rates. They mix water with air to cause turbulence in the flow; this in turn gives an increased sense of pressure without increasing the flow rate. They are also called flow regulators.

Auto shut-off faucets are activated by a push action or electronic sensors that allow the water flow to last for a programmed length of time, usually 15 seconds. After this period the faucet shuts off automatically, which is ideal for public and unsupervised washing areas.

Flow restrictors or aerators can be added to the specified faucets to reduce the flow rate, which may be a cheaper alternative to purchasing a low-flow faucet.

Relationship to Other Measures

Reducing the flow rate of all the washbasin faucets in the building reduces the water demand and the energy required to produce hot water for the faucets. A reduction in water demand also corresponds to a reduction in the energy used to pump water.

Compliance Guidance

Preliminary Stage Certification

- Plumbing drawings/specifications including make, model, and flow rate of the washbasin faucet(s); and
- Manufacturer's data sheets for the specified faucet(s)/flow aerator(s) confirming the flow rate at a standard pressure of 3 bar.

Post Construction Stage Certification

- Documents from the design stage if not already submitted. Include any updates made to the documents to clearly reflect As-Built conditions; and
- On site test results using actual water pressure on site, which will supersede the standard design flow rate values; with average flow rate sampled from multiple locations, floors, or units, as applicable, measured at the highest flow per minute, using a timer and a measurement container; and
- Date-stamped photographs of the faucet(s) taken during or after installation showing the make and model; or
- Purchase receipts for the faucet(s) showing the make and model.

Existing Building Documentation

- The same documentation applicable for *Post Construction Stage Certification* may be presented.

WEM04 – Efficient Water Closets for All Bathrooms

Requirement Summary

To demonstrate water savings for the water demand from water closets, the project shall demonstrate that the flush volume is less than that in the base case.

This measure applies to all bathrooms in buildings. This measure can be claimed when the water closets in the bathrooms have a dual flush mechanism, or if they have an efficient single flush. It is required that the actual flush rate of water closets be entered in EDGE in all cases, irrespective of the value.

If a project has different types of water closets for different restrooms, the detailed entry calculator may be used for entering the varying flush rate values. The weighted average value will then be considered for calculation.

Project teams working in Homes or Apartment typologies may refer to the **Part 1 - EDGE Building Certification Guidance** for documenting L/flush values in *subprojects* where some water closets are not installed at the time of audit.

Intention

The intention of this measure is to reduce water consumption with the use of efficient water closets.

Approach/Methodologies

Installing dual flush water closets helps to reduce the water used for flushing by providing a reduced flush option when a full flush is not required. Installing a more water efficient single flush water closet or flush valve similarly helps to reduce the water used to flush. In the case of a more efficient single flush system, select the Single flush/flush value choice in EDGE. The actual flush value shall be entered in the field for the volume of the flush.

If bathrooms / restrooms are outside project boundary the fixture flow rate of the restrooms that are expected to be used by the occupants of the project shall be entered. Keep in mind that this may not always be the nearest bathroom to the project, as some bathrooms might be locked for personal use.

Note: In certain countries where "Bucket flush" is an option, the project will not have any savings. In this case, both base and improved case water demand will be same.

Potential Technologies/Strategies

Dual-flush water closets have two flush levers where the smaller volume flush is recommended for liquid waste, and the higher volume flush for solid waste. The design team should be careful to select dual-flush water closets with clear intuitive controls, and a good flush performance rating. In some cases, dual-flush water closets can adversely increase the volume of water used if the method of use is not clear, or if they do not flush the waste adequately, requiring repeat flushes. The Environmental Protection Agency in the U.S. has a label, "WaterSense,"[1] with tests for water efficiency and performance, for high-performance water closets. The EPA website is a useful reference to identify dual flush water closets which have low water use but equivalent flushing performance to water closets with higher flush volumes.

Relationship to Other Measures

This measure is not affected by any other measure. However, this measure impacts the energy consumption of water pumps in the building as the total volume of water pumped changes (this portion of the energy consumption is included within the Energy Use category "Other").

[1] Water Sense, US Environmental Protection Energy. 2014. http://www.epa.gov/WaterSense/index.html

Compliance Guidance

Preliminary Stage Certification

- Plumbing drawings/specifications including make, model and flush volumes of water closet(s); and
- Manufacturer's data sheets for the specified water closet(s) with information on the flush volume of the main and reduced flushes.

Post Construction Stage Certification

- Documents from the design stage if not already submitted. Include any updates made to the documents to clearly reflect As-Built conditions; and
- Date-stamped photographs of the water closet(s) taken during or after installation showing the make and model; or
- Purchase receipts for the water closet(s) showing the make and model.

Existing Building Documentation

- The same documentation applicable for *Post Construction Stage Certification* may be presented.

WEM06 – Water Efficient Bidet

Requirement Summary

This measure can be claimed when the bidets in **all** bathrooms of the building have an efficient flow rate. It is required that the actual flow rate of bidets be entered in EDGE in all cases, irrespective of whether the selected fixture is an improvement or not compared to the base case.

Project teams working in Homes or Apartment typologies may refer to the **Part 1 - EDGE Building Certification Guidance** for documenting flow values in *subprojects* where some bidets are not installed at the time of audit.

Intention

The intention of this measure is to reduce water consumption with the use of water efficient bidets.

Approach/Methodologies

This measure will result in savings from the consumption of water bidets if the flow rate is less than the base case in liters/minute. The default flow rate for the improved case shall be replaced with the actual values provided by the manufacturer.

If the flow rates vary across a project, a weighted average shall be used. Multiple measurements shall be made across a variety of locations and floors to come up with a weighted average.

Potential Technologies/Strategies

Water-efficient bidets have a lower flow rate compared to standard. The design team should be careful to select bidets with a good performance rating. The Environmental Protection Agency in the U.S. has a label, "WaterSense,"[2] a useful reference to identify water fixtures which have low water use.

Relationship to Other Measures

This measure is not affected by any other measure. However, this measure impacts the energy consumption of water pumps in the building as the total volume of water pumped changes (this portion of the energy consumption is included within the Energy Use category "Other").

Compliance Guidance

Preliminary Stage Certification

- Plumbing drawings/specifications including make, model and flush volumes of water closet(s) and bidets; and
- Manufacturer's data sheets for water closet(s) with information on the flush volume of the main and reduced flushes.

Post Construction Stage Certification

- Documents from the design stage if not already submitted. Include any updates made to the documents to clearly reflect As-Built conditions; and
- Date-stamped photographs of the water closet(s) taken during or after installation showing the make and model; or
- Purchase receipts for the water closet(s) showing the make and model.

Existing Building Documentation

- The same documentation applicable for *Post Construction Stage Certification* may be presented.

[2] Water Sense, US Environmental Protection Energy. 2014. http://www.epa.gov/WaterSense/index.html

WEM07 – Water Efficient Urinals

Requirement Summary

This measure can be claimed when urinals in all bathrooms of the building have a flush volume which is lower than the base case. The actual flush rate of urinals shall be entered in the software in all cases, irrespective of the value.

Intention

The intention of this measure is to reduce water demand with the use of water efficient urinals.

Approach/Methodologies

The flush volume is measured in liters/flush. EDGE assumes on average that urinals are used two out of three instances of bathroom use in the male restrooms.

The default flush volumes for the improved case shall be replaced with the actual values provided by the manufacturer. The maximum flush volume of the urinal fixture as per the manufacturer shall be specified. If the flow rates of the urinals vary across a project, a weighted average shall be used. Multiple measurements shall be made across a variety of locations and floors to come up with a weighted average.

Note: For waterless urinals, a value of 0.0 l/min may be entered.

Potential Technologies/Strategies

Urinals are only provided in bathrooms for males and only accept liquid waste. Their water saving potential depends on the number of male users in the building. Urinals that are designed to be non-adjustable above their flush volume and that are provided with drain trap functionality tend to save more water. Pressurized flushing devices and a valve provide controls and therefore water savings.

In some cases, water efficient urinals can result in an increased risk of blockages caused by the reduced volume of water. The Environmental Protection Agency in the U.S. has a label, "WaterSense," with tests for water efficiency and performance[3]. The WaterSense label helps purchasers easily identify high–performing, water–efficient urinals, which can be found on the EPA website.

Table 2. Types of Urinals

Type of Urinal	Description
High efficiency	Urinals that flush 2 liters or less
Waterless or non-water	These urinals eliminate flush valves and water use. They need special maintenance to control odors and blockages with "urine stone" deposits in the drains. This adds operation costs as well as reduced life expectancy, which should be considered.
Wall-mounted urinals with flush valves	These urinals are flushed after each use, either manually or automatically. The automatic controls can be a timer or a valve, which are useful in bathrooms of high use, such as conference areas.

[3] Water Sense, US Environmental Protection Energy. 2014. http://www.epa.gov/WaterSense/index.html or http://www.epa.gov/WaterSense/products/urinals.html

Relationship to Other Measures

This measure is not affected by any other measure. However, this measure impacts building energy consumption due to a change in the energy use of water pumps as the total volume of water pumped changes (this portion of the energy consumption is included within the Energy Use category "Other").

Compliance Guidance

Preliminary Stage Certification

- Plumbing drawings/specifications including make, model and flush volume of the urinal(s); and
- Manufacturer's data sheets for urinal(s) with information on the flush volume.

Post Construction Stage Certification

- Documents from the design stage if not already submitted. Include any updates made to the documents to clearly reflect As-Built conditions; and
- Date-stamped photographs of the urinal(s) taken during or after installation showing the make and model; or
- Purchase receipts for the urinal(s) showing the make and model.

Existing building projects

- The same documentation applicable for *Post Construction Stage Certification* may be presented. If some of the documents required above are not available, other evidence of fixture details, such as existing building drawings or photographs can be submitted.

WEM08 Water-efficient Faucets for Kitchen Sinks

Requirement Summary

To demonstrate water savings in the amount of water consumed from the use of faucets in the kitchen, the flow rate or the weighted average flow rate of multiple types of faucets should be less than the base case flow rate.

In all instances, regardless of whether the *flow rate* is higher or lower than the base case, the on-site installed flow rate of *faucet*s shall be *enter*ed into EDGE.

Project teams working in Homes or Apartment typologies may refer to the **Part 1 - EDGE Building Certification Guidance** for documenting flow values in *subprojects* where some bidets are not installed at the time of audit.

Intention

The intention of this measure is to reduce water consumption with the use of water efficient faucets for kitchen sinks. Hot water demand will also be reduced, thereby reducing energy consumption for heating the water.

Approach/Methodologies

As the flow rate of a faucet is dependent on the water pressure, manufacturers often provide a chart which plots the flow rate at different pressures. For consistency, the flow rate / use rate per cycle for the EDGE assessment in the design (preliminary) phase shall be that quoted for the operating pressure of 3 bar (43.5 psi).

At the post-construction stage, actual flow rates / use rate per cycle that is measured on site shall be entered in EDGE. If the pressure and flow rates / use rate per cycle of the faucet vary across a project after construction, a weighted average at full flow shall be used. Multiple measurements shall be made across a variety of locations and floors to come up with a weighted average.

EDGE App Notes:

- In non-residential buildings, if kitchen area is set to 0m^2, the base case water consumption for kitchen will also be zero, therefore no savings will be applicable regardless of the entry of flow rate of kitchen taps.
- In all buildings, the water demand from kitchen taps includes both water consumption from faucets, as well as consumption for dishwashers, drinking and cooking water needs. The quantity of drinking and cooking water is calculated based on occupancy, not flow rate. In addition, savings from dishwasher would require selection of a water efficient dishwasher in WEM09. Therefore a 50% reduction in flow rate of the kitchen faucet, may not translate into a 50% reduction in kitchen water demand.
- Note that commercial projects that enter 0 m^2 of kitchen area will not have drinking water calculated in the water demand.

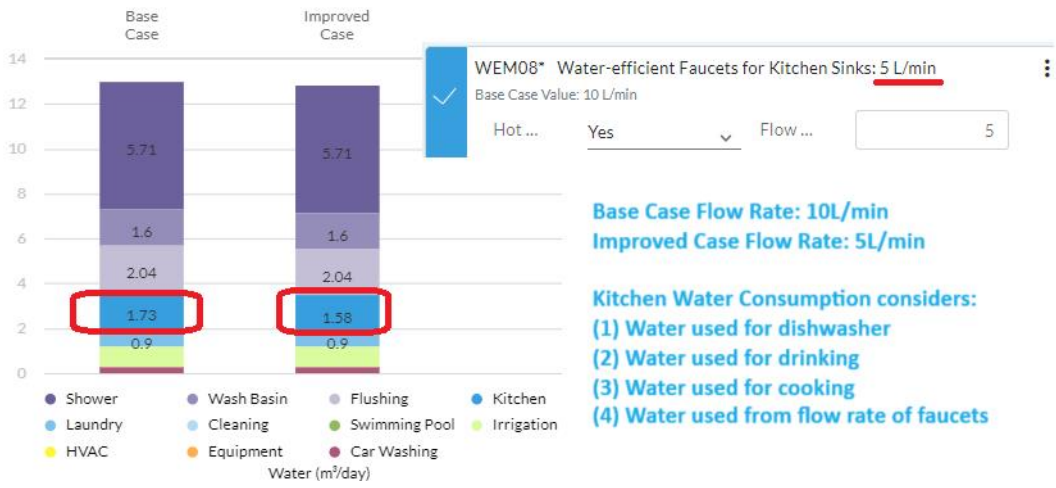

Figure 4. Consumption considered under "Kitchen Water"

Potential Technologies/Strategies

Many different faucets are available that meet the flow rate required. To maintain user satisfaction at the lower flow rates, some manufacturers mix water with air to cause turbulence in the flow; this in turn gives an increased sense of pressure without increasing the flow rate.

Flow restrictors or aerators can be added on to the specified faucets to reduce the flow rate, which may be a cheaper alternative to purchasing a low-flow faucet.

Relationship to Other Measures

Higher flow rate kitchen faucets use a significant quantity of hot water. Reducing the flow rate of the kitchen faucets reduces the energy required to produce hot water.

Compliance Guidance

Preliminary Stage Certification

- Plumbing drawings/specifications including make, model and flow rate of kitchen faucet(s) or flow restrictor(s); and
- Manufacturer's data sheets for faucet(s)/flow restrictor(s) confirming the flow rate at 3 bar.

Post Construction Stage Certification

- Documents from the design stage if not already submitted. Include any updates made to the documents to clearly reflect As-Built conditions; and
- On site test results by the auditor of the flow rate at the highest flow per minute, using a timer and a measurement container; and
- Date-stamped photographs of the faucet(s) or flow restrictor(s) taken during or after installation showing the make and model; or
- Purchase receipts for the faucet(s) or flow restrictor(s) showing the make and model.

Existing Building Documentation

- The same documentation applicable for *Post Construction Stage Certification* may be presented.

WEM09 – Water Efficient Dishwashers

Requirement Summary

This measure can be claimed if all the dishwashers installed in the building are water efficient (low consumption). This can be demonstrated when the purchased dishwasher(s) use less water than the base case.

For projects without dishwashers, the design tab should indicate “no”.

Intention

Minimize the water consumed by the dishwashers installed in the building.

Approach/Methodologies

EDGE measures the water consumption per rack, which is calculated based on the maximum total water consumption in liters divided by the number of racks in the dishwasher. The maximum total water consumption is taken from the manufacture’s datasheet on the cycle of the dishwasher that uses the most water.

Potential Technologies/Strategies

The dishwasher consumption can be as low as 4 liters per load or greater than 21 liters per load. In a load two racks can be filled up.

In terms of dishwashers, the way that occupant use them also influence the water performance. It is important to provide users with guidelines outlining the benefits of these appliances, and the best way to achieve maximum efficiency.

About 60% of the energy used by a dishwasher goes towards water heating; therefore, models that use less water also use less energy. Below are some key features for an efficient dishwasher:

- Be the right size for the building;
- Have several wash cycles;
- Enable pre-rinse to be skipped;
- Have soil sensors, which test how dirty dishes are and adjust the cycle to reduce water and energy use;
- Have more efficient jets, which use less energy to spray detergent and water;
- Have ‘no-heat’ drying feature, which circulates room air through the dishwasher by fans, rather than using electric heating;
- Have improved water filtration.

Relationship to Other Measures

Water reduction in the 'Kitchen' section of the water chart is expected by water efficient dishwashers. Moreover, it shows reductions in energy due to equipment and pumps which is part of 'Others.'

Compliance Guidance

Preliminary Stage Certification

- Summary of the dishwasher(s) to be installed in the building, including quantity and proof of maximum water use; and
- Specifications from manufacturer on water use per dishwashing cycle.

Post Construction Stage Certification

- Documents from the design stage if not already submitted. Include any updates made to the documents to clearly reflect As-Built conditions; and
- Updated summary of dishwasher(s) installed in the building including quantity, manufacturer, and model; or
- Proof of maximum water consumption from manufacturer; and

- Date-stamped photographs of the dishwasher(s) taken during or after installation showing the make and model; or
- Purchase receipts for the dishwashers showing the make and model.

Existing Building Documentation

- The same documentation applicable for *Post Construction Stage Certification* may be presented.

WEM10 – Water Efficient Pre-Rinse Spray Valves for Kitchen

Requirement Summary

This measure can be claimed if the kitchens are fitted with low flow pre-rinse spray valves for rinsing the dishes prior to dishwasher. By specifying low-flow pre-rinse valve, water use is reduced compared to a manual rinse of the dishes. The amount of water saved may be substantial especially in commercial kitchens.

Intention

The intention of this measure is to reduce water consumption with the use of pre-rinse spray valves in kitchens. Pre-rinse spray valves are designed to remove food waste from dishes prior to dishwashing.

Approach/Methodologies

As the flow rate of the pre-rinse spray valve is dependent on the water pressure, manufacturers often provide a chart which plots the flow rate at different pressures. For consistency, the flow rate / use rate per cycle for the EDGE assessment in the design (preliminary) phase shall be that quoted for the operating pressure of 3 bar (43.5 psi).

At the post-construction stage, actual flow rates / use rate per cycle that is measured on site shall be entered in EDGE. If the pressure and flow rates / use rate per cycle of the faucet vary across a project after construction, a weighted average at full flow shall be used. Multiple measurements shall be made across a variety of locations and floors to come up with a weighted average.

For projects without pre-rinse spray valves, this maybe disabled by selecting “no” in the water usage section of the design tab.

Potential Technologies/Strategies

Many different pre-rinse valves are available in the market. As the flow rate required is low, efficient spray valves need to meet 6 liters per minute flow rate. To maintain user satisfaction at the lower flow rates, manufacturers mix water with air to cause turbulence in the flow; this in turn gives an increased sense of pressure without increasing the flow rate. The savings are even more noticeable because pre-rinse valves use hot water, so when water is reduced the use of energy is also dropped.

Relationship to Other Measures

Water reduction in the 'Kitchen' section of the water chart is expected by low flow pre-rinse valves. Moreover, it shows reductions in energy due to 'water heating' and water pumps which is part of 'Others'.

Compliance Guidance

Preliminary Stage Certification

- Plumbing drawings/specifications including make, model, and flow rate of the pre-rinse valve(s); and
- Manufacturer’s data sheets for pre-rinse valve(s) confirming the flow rate at a standard pressure of 3 bar.

Post Construction Stage Certification

- Documents from the design stage if not already submitted. Include any updates made to the documents to clearly reflect As-Built conditions; and
- On site test results by the auditor of the flow rate at the highest flow per minute, using a timer and a measurement container; and
- Date-stamped photographs of the pre-rinse valve(s) taken during or after installation showing the make and model; or
- Purchase receipts for the pre-rinse valve(s) showing the make and model.

Existing Building Documentation

- The same documentation applicable for *Post Construction Stage Certification* may be presented.

WEM11 – Water Efficient Washing Machine

Requirement Summary

This measure can be claimed when all the washing machines have high water efficiency.

The following typologies may pursue this measure: Homes, Apartment, Serviced Apartment, Hotel, Resorts, Healthcare and Mixed Use.

Intention

Using high efficient front-loading washing machines reduces the water used for laundry. Other benefits, of high efficient washing machines, include energy saving due to the reduction of hot water use, better performance in cleaning the clothes, reduce fabric wear, and usually less detergent use.

Approach/Methodologies

The measure should be claimed if all the washing machines in the laundry use less water per kilogram of clothes washed or less compared to the base case.

For Homes and Apartment, the EDGE app considers the water requirement in L/Cycle and for commercial building types like Hotel, Resort, Hospital and Service Apartment the EDGE app considers the water requirement in L/kg.

For projects without laundry requirements, it can be disabled by selecting “no” in the water usage section of design page.

Potential Technologies/Strategies

There are two types of washing machines available in the market, top loading, and front loading. While top loading needs more water in order to cover the clothes inside, the front loading require about a third. The high efficiency washers are high-tech machines that use less water (both hot and cold water) and energy, while are more effective in cleaning the clothes compared to the standard ones. This is because in the front loading the washer moves the clothes through the water using gravity to create more agitation.

Relationship to Other Measures

Using a water-efficient washing machine not only reduces cold water demand but also hot water demand. Therefore, when this measure is selected the energy consumption is decreased due to water heating, as well as miscellaneous equipment, which is included within "Others".

Compliance Guidance

Preliminary Stage Certification

- Plumbing drawings/specifications including make, model, and flow rate of the washing machines; and
- Manufacturer’s data sheets for washing machines confirming the standard water use per cycle.

Post Construction Stage Certification

- Documents from the design stage if not already submitted. Include any updates made to the documents to clearly reflect As-Built conditions; and
- On site verification of the model by the auditor; and
- Date-stamped photographs of the washing machines taken during or after installation showing the make and model; or
- Purchase receipts for the washing machines showing the make and model.

Existing Building Documentation

- The same documentation applicable for *Post Construction Stage Certification* may be presented.

WEM12 – Swimming Pool Covers

Requirement Summary

This measure can be claimed if the building has indoor pool(s), and these are fitted with a cover to prevent water and heat losses through evaporation.

Note: From EDGE Version 3.1, this measure will only consider energy and water savings for indoor swimming pool cover. All outdoor pools will have an impact on energy and water but not claim any savings.

Intention

The intention is to prevent heat and water lost through evaporation from the surface of the pool. The use of a cover for the entire pool(s) can reduce the use of fresh water from the municipal supply as well as heating energy for heating the pool.

A pool cover can also protect the pool from debris contamination, which reduces the use of chemicals and maintenance. For a heated pool in cold climates, a pool cover prevents heat loss during the night or when the pool is not in use.

Approach/Methodologies

This measure can only be claimed if **all** the indoor pools, as indicated in the *Design Tab*, have a suitable cover fitted to the entire pool surface. A suitable cover will include the following characteristics:

- Resistance to pool treatment chemicals,
- Thick and durable material,
- Insulation properties,
- Fully fitted to the pool,
- Easy to store and utilize, and
- Safe for both pool users and staff.

The base case assumption is that pool(s) do not have a fitted cover.

Potential Technologies/Strategies

Most pools lose water due to evaporation from the surface. Heat loss from pools occurs at the surface mostly due to evaporation, but also from radiation to the sky. These issues can easily be addressed with an affordable solution such as a pool cover.

Table 3. Benefits of having a swimming pool cover

Benefits	Description
Reduced water consumption	Surface water from a pool evaporates to the atmosphere. A pool cover for times when the pool is not in use can reduce the evaporation rate up to 98%, thus reducing the use of water to re-fill the pool.
Reduced energy consumption	In heated pools, a pool cover can be used both at daytime and nighttime to save energy, as it can gain heat as well as prevent heat losses. Standard pool temperature can rise by up to 4ºC (especially in dry and cold environments), if short-wave radiation from the sun passes through a transparent cover and heats the surface of the pool. Then at night, when there is no heat gain, the cover retains the heat by reducing long-wave radiant heat losses and the evaporation rate.

Reduced chemicals consumption	When the pool is covered, it is protected from debris (leaves, twigs and litter) contamination and therefore requires less chemical (chlorine) to clean up the pool. In addition, chemicals are not dispersed to the atmosphere due to the reduction of the evaporation rate.
Reduced need of mechanical ventilation (halls)	If evaporation is prevented when the pool cover is in place, then less mechanical ventilation is required in enclosed pool halls. In addition, dehumidifiers can be shut-off during off hours. These two factors reduce the energy consumption from the mechanical ventilation system.
Reduced maintenance	Both building and pool maintenance are reduced. This is because the reduction of humidity and condensation when the pool cover is in place lessens the maintenance to prevent mold on the building structure (especially in pool halls). In addition, pool maintenance is also lessened as chemicals are saved and debris contamination is avoided.

Relationship to Other Measures

This measure does not impact other measures.

Compliance Guidance

Preliminary Stage Certification

- Sizing calculations and manufacturer's data sheets for pool cover(s) to fit the entire pool(s).

Post Construction Stage Certification

- Documents from the design stage if not already submitted. Include any updates made to the documents to clearly reflect As-Built conditions; and
- Date-stamped photographs of the installed pool cover(s); or
- Purchase receipts for the pool cover(s).

Existing Building Documentation

- The same documentation applicable for *Post Construction Stage Certification* may be presented.

WEM13 – Water Efficient Landscape Irrigation

Requirement Summary

This measure can be claimed if water-efficient landscaping, including xeriscaping, is incorporated within the building.

For projects without any irrigation system installed (i.e., Landscaping replies solely on rainfall), this measure may not be claimed.

Intention

Water-efficient outdoor landscaped areas can reduce the use of fresh water from the municipal supply, as well as fertilizers and maintenance cost, while preserving the habitat of plants and wildlife.

Approach/Methodologies

This measure can only be claimed if the outdoor landscaping areas, including lawns, gardens use efficient irrigation system. This can be achieved by replacing the areas planted with water-intensive plants with native and adaptive plants. Detailed guidance for selecting water-efficient plants according to the local climate would normally be carried out by the landscape designer or the supplier of the plants. However, the following can be used as a rough guide:

Outdoor landscaping water consumption, including for lawns, gardens, and ponds, is calculated as:

$$Landscape\ Water\ consumption = \frac{Landscape\ Water\ Requirements - Rainfall\ Volume}{Total\ Outdoor\ Landscaping\ Area}$$

Where**:**

Landscape Water Requirements = Average amount of water needed per day for all the plants within the outdoor landscaping area (in liters)

Rainfall Volume = Daily average annual rainfall (in liters)

Total Outdoor Landscaping Area = Area of outdoor lawns, gardens, and ponds (m^2)

The Landscape Water Requirements may be calculated based on US Department of Energy Guidelines for Estimating Unmetered Landscaping Water Use, or calculation based on Evapotranspiration rate. Similar methodologies may also be pursued.

Potential Technologies/Strategies

According to studies, “up to 50 percent of the water applied to lawns and gardens is not absorbed by the plants. It is lost through evaporation, runoff or being pushed beyond the root zone because it is applied too quickly or more than the plants’ needs.”[4] To offset this, following are the main considerations when designing a water-efficient landscaping area:

- Use native and low water-using plants, as they require very little water beyond the local rainfall.
- Create zones of vegetation according to their water requirements. In this way, less water is wasted in irrigation as each zone is watered differently.
- Use an appropriate irrigation system. For example, a drip irrigation or under surface system can help reduce the water consumption compared to a sprinkler system.

[4] US Environmental Protection Agency. https://19january2017snapshot.epa.gov/www3/watersense/pubs/greener.html

Relationship to Other Measures

Claiming this measure reduces the water demand used for landscaping only.

Compliance Guidance

Preliminary Stage Certification

- A landscape plan showing the zoning for plants and the type of plants used, highlighting native species and the irrigation system selected; and
- Description of the water requirements use in landscaped areas; or
- Calculation of the landscape water consumption in liters/m^2/day.
- Note that protected green areas cannot be counted towards landscaped area.
- Intentionally planted xeriscapes can claim zero water use.

Post Construction Stage Certification

- Documents from the design stage if not already submitted. Include any updates made to the documents to clearly reflect As-Built conditions; and
- Date-stamped photographs of the planted species, landscaping area and irrigation system if applicable; or
- Purchase receipts for the vegetation and irrigation system if applicable.

Existing Building Documentation

- The same documentation applicable for *Post Construction Stage Certification* may be presented.

WEM14 – Rainwater Harvesting System

Requirement Summary

This measure can be claimed if a rainwater collection system is installed to supply water for use within the project. This water shall be re-used on the project site to replace water consumption from the municipal water supply.

Intention

This measure aims to reduce the use of fresh water from the municipal supply.

Approach/Methodologies

To qualify, the collected rainwater shall be re-used on the project site and demonstrate that it replaces municipal water supply. The *project team* shall document both the need for municipal water supply for the end-use being served, and the fact that the collected rainwater is being directed to replace it. For example, the team could submit pictures that show the planned piping system connected to an irrigation system. This would ensure that the system is reducing municipal water use.

Building connected to a centralized rainwater harvesting system, may claim an catchment area based on their weighted average by occupancy for all buildings sharing the system.

EDGE automatically calculates the approximate maximum quantity of water that can be collected by a rainwater harvesting system based on rainfall data from the project location and the size of the roof area, hard paved and softscape area. The improved case assumes that the rainwater harvesting system is adequately sized and that the rainwater collected is used internally for such purposes as flushing toilets and showers.

Detailed guidance for sizing a rainwater collection system is available on the worldwide web and would normally be carried out by the supplier of the system. However, the following can be used as a rough guide:

$$Rainwater\ Harvesting\ (m^3) = \ (Catchment\ Area(m^2) * Rainfall(mm) * Run\ off\ Coefficient/1000)$$

Where: *Catchment* Area = area of rooftop + hardscape +Softscape(m^2).

Rainfall = average annual rainfall (mm),

Run-off coefficient = varies depending on the surface type. some examples are as follows:

Metal roof - 0.95, Concrete/asphalt roof - 0.90, Gravel roof - 0.80

When this measure is claimed, dual stack / piping is required to avoid cross-contamination of water.

The base case assumes no rainwater is harvested.

Potential Technologies/Strategies

The main consideration when designing a rainwater harvesting system is adequate sizing of the storage tank. The supplier/designer of the system may be able to advise on appropriate sizing, but the two key factors to consider when sizing the tank are the rate of supply (local rainfall data and collection area) and the demand (water use per day).

When harvesting the rainwater, a dual piping system shall be used to separate the rain water from the mains and to distribute the collected water for use at the project site (such as flushing toilets, the washing machine or showers).

Collected water shall be in accordance with local or international health and sanitary code requirements (whichever are more stringent).

Relationship to Other Measures

Claiming this measure reduces the water demand for all end uses selected by the user and considered by EDGE.

Compliance Guidance

EDGE assumes that the rainwater is being used within the building.

If the rainwater is being used only to irrigate the landscape, the *project team* shall demonstrate that:

- There is need for irrigation with municipal water (in addition to just natural rainwater); and
- The recycled water will be directed to this use.

This can be done with drawings of the plumbing layout at the design stage, and with pictures that show the planned piping system connected to the irrigation system at the post-construction stage.

Preliminary Stage Certification

- A system schematic showing the collection area, feed pipes and storage tank; and
- Sizing calculations for the rainwater harvesting system.
- EDGE assumes that the rainwater is being used within the building to replace potable water use. If the harvested rainwater is being used only to irrigate the landscape, the *project team* shall demonstrate that (1) there is need for irrigation with municipal water (in addition to just natural rainwater) and (2) that the plumbing layout shows that the recycled water will be directed to this use.

Post Construction Stage Certification

- Documents from the design stage if not already submitted. Include any updates made to the documents to clearly reflect As-Built conditions; and
- Date-stamped photographs of the installed rainwater harvesting system and dual piping; or
- Purchase receipts for the rainwater harvesting/storage system.
- If the harvested rainwater is being used for landscape, provide date-stamped photographs that show the piping system connected to the irrigation system.

Existing Building Documentation

- The same documentation applicable for *Post Construction Stage Certification* may be presented.

WEM15 – Wastewater Treatment and Recycling System

Requirement Summary

This measure can be claimed if there is a black water or gray water recycling system treating the wastewater from the building. This recycled water shall be re-used on the project site to replace potable water consumption from the municipal water supply. End uses may include flushing toilets, supplying the HVAC system, cleaning the building, or irrigation of landscaping.

Intention

By recycling the black or gray water, the use of fresh water from the municipal supply can be reduced. The load on the local water and sewage infrastructure is also reduced.

Approach/Methodologies

When this measure is claimed, EDGE automatically calculates the potential supply of recycled water and reduces the municipal water demand by that amount across the end uses that can benefit from it. These include flushing toilets, cleaning of the building, the HVAC system, and irrigation of landscaping. EDGE assumes that most of the wastewater from the building is collected, treated, and stored properly to meet ongoing demand. If the quantity of treated wastewater is insufficient to meet the building demand, then only a portion of the demand is shown to be met by the treated water.

A water balance model shall be produced by the design team to demonstrate the potential for water recycling.

The recycled water shall be reused for flushing toilets, with the remainder directed towards other uses. Where this water is not used for toilet flushing, the project shall provide additional documentation that the system is indeed replacing municipal water supply. For example, if the recycled water is being used for irrigation only, then the project shall demonstrate that (a) the landscaped area requires municipal water (in addition to just natural rainwater), and (b) the system is designed to serve the landscape, thus replacing water from the municipal supply. This can be done with drawings of the plumbing layout at the design stage, and with pictures that show the planned piping system connected to the irrigation system at the post-construction stage.

EDGE App Calculator definition

- Blackwater: Wastewater from Water closets, Urinals and Kitchen
- Graywater: Wastewater from Shower, Water faucets, Cleaning& Washing machine.
- Black and Graywater: Total Wastewater

Energy savings will be affected based on the type of Sewage Treatment Plant selected.

Sewage Treatment Plant technologies in the EDGE calculator

a) **Membrane Bioreactor (MBR):** A membrane bioreactor (MBR) is an advanced wastewater treatment technology that combines biological treatment with membrane filtration. It uses microorganisms to break down organic matter in a biological reactor, while a membrane filtration system separates treated water from biomass. MBR systems provide high-quality effluent by effectively removing suspended solids, bacteria, and viruses. They have a compact design and can be used in various applications, such as municipal and industrial wastewater treatment. MBR technology offers an efficient and reliable solution for wastewater treatment.

b) **Biological Nutrient Removal (BNR):** Biological Nutrient Removal (BNR) is a wastewater treatment process that focuses on removing nutrients, specifically nitrogen and phosphorus, from wastewater. It utilizes microorganisms to convert and remove these nutrients through denitrification and phosphorus uptake. BNR systems aim to achieve low levels of nitrogen and phosphorus in treated effluent to prevent water pollution and eutrophication. This process is commonly used in wastewater treatment plants to meet regulatory standards and protect ecosystems. BNR is an effective and sustainable approach to improving water quality.

c) **Conventional Activated Sludge (CAS):** Conventional Activated Sludge (CAS) is a widely used wastewater treatment process that utilizes microorganisms to break down organic matter in wastewater. It involves mixing wastewater with activated sludge in an aeration tank, where aerobic bacteria consume organic pollutants. Oxygen is supplied to support the bacteria's growth and metabolism. After aeration, the mixture is settled, separating the treated water from the settled sludge. CAS effectively removes organic matter, suspended solids, and some nutrients from wastewater. It is commonly used in municipal wastewater treatment plants and is a reliable method for producing treated effluent of acceptable quality.

d) **DEWATS (<10 °C):** DEWATS (Decentralized Wastewater Treatment Systems) is a decentralized approach to wastewater treatment. While the recommended temperature range for optimal treatment efficiency is typically above 20 degrees Celsius, DEWATS systems can still operate effectively at temperatures below 10 degrees Celsius. They utilize various treatment units to remove pollutants and improve water quality. DEWATS systems are suitable for areas without centralized treatment infrastructure and provide a sustainable solution for wastewater treatment, even in colder climates.

e) **DEWATS (>20 °C):** DEWATS (Decentralized Wastewater Treatment Systems) is a decentralized approach to wastewater treatment. It utilizes various treatment units to remove pollutants and improve water quality. The recommended temperature range of >20 °C enhances microbial activity and treatment efficiency. DEWATS systems are suitable for areas without centralized treatment infrastructure and provide a sustainable solution for wastewater treatment. They ensure safe disposal or reuse of wastewater while considering temperature requirements for optimal treatment.

f) **Extended Aeration (EA):** Extended aeration is a wastewater treatment process that involves the continuous aeration of wastewater in a treatment tank for an extended period. This process promotes the growth of aerobic microorganisms that break down organic matter and remove pollutants from the water. The extended aeration system typically includes aeration devices, such as diffusers or mechanical aerators, to supply oxygen to the microorganisms. The treated water is then separated from the microorganisms through settling or clarification processes. Extended aeration is commonly used in small to medium-sized wastewater treatment plants and is known for its efficiency in removing organic pollutants and producing high-quality effluent.

g) **Horizontal Wetlands (<10 °C)**: Horizontal wetlands are a type of wastewater treatment system that imitate natural wetlands to purify water. The term "<10 °C" indicates that these wetlands are most effective when the water temperature is maintained below 10 degrees Celsius. In these wetlands, wastewater flows horizontally through beds filled with gravel, sand, and vegetation. The vegetation and filtration layers help remove pollutants from the water. Horizontal wetlands are capable of treating wastewater by removing organic matter, nutrients, and suspended solids. The recommended temperature range of <10 °C suggests that lower temperatures promote optimal treatment efficiency in these wetlands.

h) **Horizontal Wetlands (>20 °C)**: Horizontal wetlands are a type of wastewater treatment system that mimic natural wetlands to purify water. They utilize gravel, sand, and vegetation to remove pollutants from wastewater. The recommended temperature range for their operation is above 20 degrees Celsius, as higher temperatures enhance microbial activity and improve treatment efficiency. Horizontal wetlands effectively remove organic matter, nutrients, and suspended solids from wastewater.

i) **Moving Bed Bioreactor (MBBR):** A moving bed bioreactor (MBBR) is a wastewater treatment technology that uses plastic media to provide a surface area for microorganisms to grow. The media moves within the reactor, allowing the microorganisms to come into contact with the wastewater and break down organic matter and pollutants. MBBR systems are known for their high treatment efficiency, flexibility, and ability to handle varying wastewater loads. They are compact, energy-efficient, and can handle shock loads. MBBR is an effective method for wastewater treatment in various applications.

j) **Sequencing Batch Reactor (SBR):** A sequencing batch reactor (SBR) is a wastewater treatment process that operates in a batch mode, with distinct stages occurring in a single tank. It combines biological treatment, settling, and decanting. Wastewater is added to the reactor, followed by aeration, settling, and decanting of

the treated water. SBR systems offer flexibility, efficient nutrient removal, and can handle variable flow rates. They are commonly used in small to medium-sized wastewater treatment plants. SBR provides effective treatment by optimizing each stage, resulting in high-quality effluent and the removal of organic matter and pollutants.

k) **Up Flow Anaerobic Sludge Blanket (UASB):** The Up Flow Anaerobic Sludge Blanket (UASB) is a wastewater treatment process that utilizes anaerobic bacteria to break down organic matter. Wastewater flows upward through a sludge blanket, where the bacteria convert organic matter into biogas. UASB systems are effective for treating high-strength organic wastewater and offer advantages such as high treatment efficiency and low energy requirements. They are commonly used in wastewater treatment plants, particularly in developing countries, as a cost-effective and sustainable solution for organic matter removal.

l) **Vertical Wetlands (<10 °C):** Vertical wetlands, also known as vertical flow, constructed wetlands, are a type of wastewater treatment system that utilizes natural processes to purify water. They involve the vertical flow of wastewater through beds filled with gravel, sand, and vegetation. While the recommended temperature range for optimal treatment efficiency is typically above 10 degrees Celsius, vertical wetlands can still effectively treat wastewater at lower temperatures. They remove pollutants such as organic matter, nutrients, and suspended solids. Vertical wetlands are a sustainable and environmentally friendly option for wastewater treatment, suitable for various applications.

m) **Vertical Wetlands (>20 °C):** Vertical wetlands, or vertical flow constructed wetlands, are a type of wastewater treatment system that utilizes natural processes to purify water. They involve the vertical flow of wastewater through beds filled with gravel, sand, and vegetation. Vertical wetlands are most effective when the water temperature is above 20 degrees Celsius. They remove pollutants such as organic matter, nutrients, and suspended solids. Vertical wetlands are sustainable and environmentally friendly, providing efficient purification processes. They can be used in various applications to treat wastewater and improve water quality, particularly in areas with temperatures above 20 °C.

n) **Waste Stabilization Ponds (WSP):** A waste stabilization pond, also known as a lagoon or oxidation pond, is a natural wastewater treatment system that utilizes sunlight, algae, and bacteria to decompose organic matter and remove pathogens. Wastewater is directed into shallow ponds where aerobic bacteria break down organic matter through aerobic digestion. Sedimentation helps remove suspended solids, and multiple ponds allow for further treatment and stabilization. Waste stabilization ponds are cost-effective, require minimal energy, and are suitable for warm climates with low population densities. However, they require a large land area and are not suitable for high population densities or cold climates. Overall, waste stabilization ponds provide a sustainable method for wastewater treatment.

Potential Technologies/Strategies

When recycling the water, a dual piping system shall be used to separate the recycled water from the main supply line.

Treated water shall comply with local or international health and sanitary code requirements (whichever is more stringent).

In some cases, the water treatment plant can be centralized for a combination of buildings within the development. In these cases, the central plant must fall within the site boundary of the project or managed by a company within the control of the site owner. This is to ensure continuity of sustainable management and future access to the system for maintenance. However, when the water treatment plant is located off-site, then a contract with the management company in charge of water treatment shall be provided as part of the documentation at the post-construction stage.

Some jurisdictions may not permit the use of gray or black water in buildings for flushing; in such cases this measure cannot be claimed.

Relationship to Other Measures

The quantity of wastewater available depends on the efficiency of water fittings; more water-efficient buildings may have insufficient water available to completely offset the demand for flushing. This measure has an impact on "Other" Energy uses in the energy chart as water pumps required for operation of the system are included in in that category.

Compliance Guidance

Preliminary Stage Certification

- A schematic layout of the system showing the plumbing including the dual plumbing lines; and
- Manufacturer's data sheets of the specified gray water treatment plant; and
- Calculations including the following:
    i. Designed capacity of the gray water treatment system in m3/day.
    ii. Quantity of gray water available daily to recycle in liters/day.
    iii. Efficiency of the gray water system to produce treated water in liters/day.
    iv. Water balance chart.

Post Construction Stage Certification

- Documents from the design stage if not already submitted. Include any updates made to the documents to clearly reflect As-Built conditions; and
- Date-stamped photographs of the installed system; or
- Purchase receipts for the water treatment and storage system; or
- Contract documents with the management company if the system is centralized or off-site.

Existing Building Documentation

- The same documentation applicable for *Post Construction Stage Certification* may be presented.

WEM16 – Condensate Water Recovery

Requirement Summary

This measure can be claimed if a condensate water recovery device with the capacity to collect all condensate water from the cooling system is installed and the condensate water is used in landscaping, toilet flushing or for outdoor uses.

Intention

By recovering the condensate water from HVAC equipment, the use of fresh water from the municipal supply can be reduced.

Approach/Methodologies

Buildings benefit from condensate water recovery, which does not require much treatment and saves water for other purposes within the building and landscaping.

To qualify, the design team shall demonstrate that the HVAC system has a collection device for the condensate water recovered. The collected condensate shall have a piping system and collection tank or can be directed to the rainwater collection tank if present.

The base case assumes there is no condensate water recovery from HVAC.

Potential Technologies/Strategies

In the context of buildings, condensate water recovery aims to re-use the water arising from the dehumidification of the air in HVAC or refrigeration systems. When the air passes through the cold coil of the system, the temperature of the air is decreased and the vapor (humidity) changes from gas to liquid, which can then be removed as condensate. It is essentially distilled water with low mineral content, but it can potentially contain harmful bacteria such as Legionella[5]. This water can potentially be used anywhere in the building except for drinking, if proper treatment to address biological contaminants is considered.

Potential use of condensate water includes:

- **Irrigation**: generally safe to use without treatment, if used as surface irrigation;
- **Cooling towers**: treatment is needed.
- **Water for decorative ponds or fountains**: treatment is needed;
- **Toilet and urinal flushing**: treatment is needed;
- **Rainwater recycle system**: condensate can be a source to feed the system; and
- **Laundry and washing**: biocide treatment required.

Collected water shall be in accordance with local or international health and sanitary code requirements (whichever are more stringent).

Relationship to Other Measures

Claiming this measure reduces the water demand for the kitchen (dishwasher, rinse valve and faucets), bathroom faucets, the HVAC system and “Other” Water use, which is mainly cleaning.

Compliance Guidance

Preliminary Stage Certification

- Calculations for condensate water recovery specifying cooling load and water collected in liters per day; and
- Hydraulic layout showing the location and technology of the recovery, collection, and reuse components.

[5] *Boulware, B.* Environmental leader magazine. *Air Conditioning Condensate Recovery,* January 15, 2013.

Post Construction Stage Certification

- Documents from the design stage if not already submitted. Include any updates made to the documents to clearly reflect As-Built conditions; and
- Date-stamped photographs of installed system; or
- Purchase receipts for the condensate recovery system.

Existing Building Documentation

- The same documentation applicable for *Post Construction Stage Certification* may be presented.

WEM17 – Smart Meters for Water

Requirement Summary

This measure can be claimed when smart water metering is provided for each owner or tenant of the building. The owners may subscribe to an online monitoring system. Note that this measure cannot be claimed when 'prepaid meters' are installed as they are not considered smart meters under EDGE.

The smart meter for water shall present the following capabilities:

- Measure water use, even during offline periods,
- Assist in the detection of leaks, even during offline periods,
- Relatively low price, and
- Display water consumption insights, when the device is online.

This measure is applicable for all typologies and shall be able to measure indoor and outdoor water consumption.

Intention

The intent is to reduce demand through increased awareness of consumption and monitoring. With smart meters, end-users can contribute to responsible use of water in the building and prevent undetected waste. Smart meters shall display measurements and analyze consumption patterns. For commercial buildings, smart meters shall notify building management if water consumption is not within usual consumption.

Approach/Methodologies

The installation of smart meters allows end users to get instant feedback, which can lead to reduced water usage for wash basins, showers, and other indoor water fixtures. This is because smart meters provide more detailed consumption data compared to conventional meters.

The base case assumes conventional meters, while the improved case assumes smart meters to be installed for each tenant or household.

Potential Technologies/Strategies

Smart metering is designed to provide occupants with information on a real-time basis about their water consumption. This may include data on how much water is being consumed during unoccupied periods.

A detection unit (the transmitter) is affixed to an existing utility meter and tracks water use. The display unit receives a wireless signal from the transmitter and displays the consumption information in real time and cost for the end user. Many companies also offer online monitoring systems which require little to no additional equipment installation.

For best results it is recommended that separate smart meters be used for different uses. This will offer better visibility of usage and therefore better management.

Relationship to Other Measures

The contribution made by the measure is reflected in the common amenities portion of the water chart. Although EDGE does not show savings in other areas of water consumption, this measure increases end user awareness, which in the long term can help to significantly reduce water consumption and potentially, the energy required to heat water.

Compliance Guidance

Preliminary Stage Certification

- Plumbing drawings/specifications including the make and model of smart meters and the connection with the water supply system, or an equivalent system online; and
- Manufacturer's specifications of the smart meters.

Post Construction Stage Certification

- Documents from the design stage if not already submitted. Include any updates made to the documents to clearly reflect As-Built conditions; and
- Date-stamped photographs of the installed smart water meters showing the make and model; or
- Purchase receipts for the smart water meters showing the make and model; or
- Purchase receipts of subscription(s) to the equivalent online system.

Existing Building Documentation

- The same documentation applicable for *Post Construction Stage Certification* may be presented.

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