INSTANT BOILING AND CHILLED DRINKING WATER DISPENSERS (PERMANENTLY INSTALLED)

PCR 2012:01-SUB-PCR-J

INTRODUCTION

This Sub-PCR acts as a complement to PCR 2012:01 “Construction products and construction services”, version 2.3, available at www.environdec.com, with additional rules and methodological instructions. Please note that this Sub-PCR cannot be used as a PCR on its own, but is intended to be a further specification of and to be used together with PCR 2012:01, the main implementation of EN 15804:2012+A1:2013 in the International EPD System. See Figure 1 for the role of this sub-PCR document.

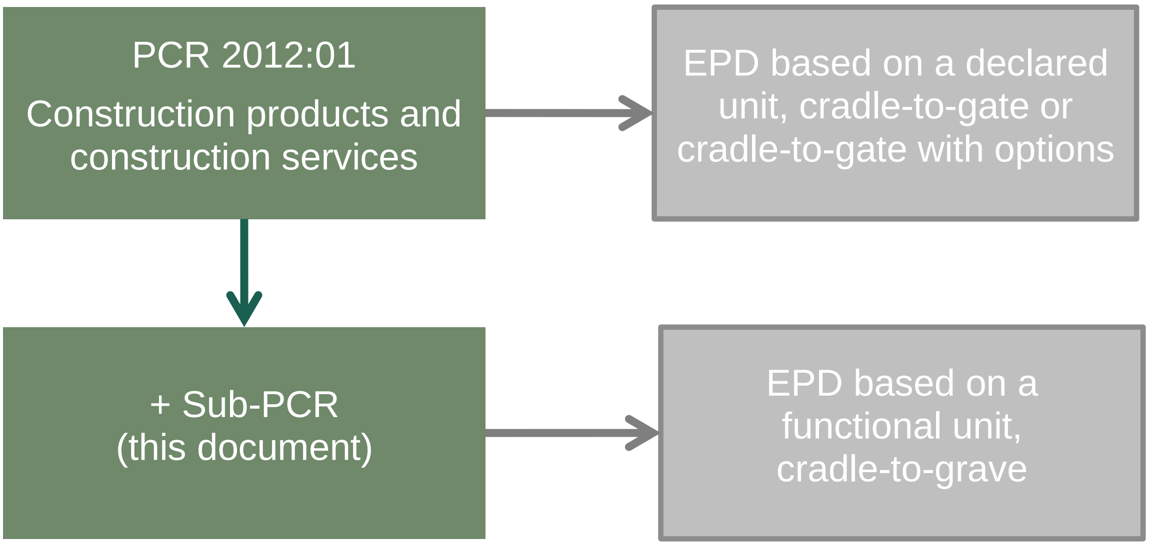

Figure 1 Illustrating the step-wise structure of the PCR basic module for construction products and construction services and the role of this supplementary PCR for an LCA that covers a full lifecycle and a performance-based reference unit, the functional unit, which allows comparisons between products within this category.

This appendix has been developed according to the PCR development procedure of the International EPD® System.

1 GENERAL INFORMATION

Name:	Instant boiling and chilled drinking water dispensers (permanently installed)
Registration number and version:	PCR 2012:01-Sub-PCR-J
Programme:	The International EPD® System
Programme operator:	EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden. Website: www.environdec.com E-mail: info@environdec.com
Appointed PCR moderator:	Daniel Cuthbert, Culligan International Company Daniel.Cuthbert@Culligan.com
PCR Committee:	thinkstep Pty Ltd, Culligan International Company, Zip Industries, IVL Swedish Environmental Research Institute
Date:	2021-11-08
Valid until:	*2022-02-28* The validity of this sub-PCR is dependent on the validity of PCR 2012:01 *Construction products and construction services.*
Open consultation period:	2017-09-01 until 2017-10-27
Review panel for this PCR:	The Technical Committee of the International EPD® System. Full list of TC members available on www.environdec.com/TC
Schedule for renewal:	A PCR document may be revised during its period of validity provided significant and well-justified proposals for changes or amendments are presented.
Sub-PCR to be used together with:	PCR 2012:01 Construction products and construction services version 2.33
Valid within the following geographical representativeness:	Global
PCR language:	English. The English version takes precedence over any translated versions.

This document provides further specification to PCR 2012:01 Construction products and construction services, Version 2.31. It may be used for Environmental Product Declarations that have a cradle-to-grave scope and uses a functional unit for the product group "Instant Boiling and Chilled Drinking Water Dispensers".

The EPD shall refer to a specific PCR version number, as well as this appendix. The production of new PCR versions does not affect the EPD certification period.

2 PCR SCOPE

This sub-oriented Product Category Rules (PCR) document contains the requirements for generating an Environmental Product Declaration (EPD) for construction products and services supplementing the requirements of the overarching PCR 2012:01 published by the International EPD System based on the standards ISO 21930 and EN 15804 respectively.

Existing PCR literature for hot and cold water dispensers was considered in the development of this sub-oriented PCR. PCR 2011:1.0 (Yen Sun Technology Corp. Ltd., 2011) was considered to be the closest existing PCR, but was considered to be not applicable for the following reasons:

- PCR 2011:1.0 applies to floor-standing, bottled water or household water dispensers. This appendix applies to permanently installed point of use (POU) drinking water dispensers connected to the mains water supply.
- Calculation rules provided by PCR 2011:1.0 were considered to be insufficient for the purposes of this appendix.
- PCR 2011:1.0 is past its validity period of 31 March 2013/2014.
- The scope of this appendix is to supplement the requirements of PCR 2012:01, ISO 21930 and EN 15804 respectively, for which PCR 2011:1.0 does not guarantee compliance.

3 DEFINITION OF THE PRODUCT GROUP

This sub-oriented PCR covers permanently installed instant boiling and chilled drinking water dispensers, including one or several of the following functions:

- Boiling drinking water dispensers (near boiling temperature, >90°C);
- Chilled drinking water dispensers (requiring refrigeration);
- Carbonated drinking water dispensers; and
- Dispensers providing any combination of boiling, chilled and carbonated drinking water.

Only permanently installed point of use (POU) drinking water dispensers connected to the mains water supply are covered by this sub-oriented PCR. This document does not apply to drinking water dispensers that are not permanently installed, e.g. freestanding dispensers using bottled water. It also does not apply to drinking water dispensers that are non-instantaneous, e.g. kettles, even if they are permanently installed. Permanently installed units are considered a part of installed building services, contributing to the performance of the construction. They are therefore governed by the core product category rules of PCR 2012:01.

The closest matching UN CPC (v2.1) codes applying to these products are 43913 and 44817:

Group	Class	Subclass	Description
439			Other general-purpose machinery and parts thereof
	4391	**43913**	**Refrigerating and freezing equipment and heat pumps, except household type equipment**

If no relevant CPC code is found for a specific product, this must be stated in the EPD, but will not limit the EPD from being published. More information is available at http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=31

For Australian and New Zealand EPDs, the appropriate ANZSIC 2006 code is C245200:

Level 1	Level 2	Level 3	Level 4	Description
C				Manufacturing
	C24			Machinery and Equipment Manufacturing
		C245	**C245200**	**Fixed Space Heating, Cooling and Ventilation Equipment Manufacturing**

4 FUNCTIONAL UNIT

One (1) litre of average drinking water delivered. All environmental impacts spanning all modules must be pro-rated to deliver the functional unit of 1 litre of average drinking water.

The following mandatory statement shall be included in the EPD: "Only EPDs representing the same appliance size class and region may be compared directly."

As appliances have different capacities, the following shall be declared within the EPD:

- The recommended number of users for which the unit is designed (typically specified as a range, e.g. 1-20 people); and
- The corresponding size class that best fits the appliance's capacity (as identified from the table below).
- The corresponding average number of users (*N*) that best fits the appliance's capacity (as identified from the table below), which shall then also be used in the calculations specified within this document.

Size class	**Number of people served**	***N* (average number of users)**
Small	1-20	10
Medium	21-50	35
Large	51+	75

The service life of these office kitchen appliances is heavily dependent on office refurbishment cycles or 'churn'. The default service life of the product group has therefore been defined as 7 years (Forsythe, 2007) to reflect a typical office refurbishment period. The default service life shall be used unless specific data on the service life is available. The service life shall be declared within the EPD, along with assumptions and data sources if the default value is not used.

The following additional metrics, as defined in later sections, must be declared within the EPD as part of the technical specification of the product:

Declared metric	**Abbreviation**	**Unit**
Energy demand over the reference service life per litre drinking water	E_{RSL}	kWh/l
Water consumption over the reference service life per litre drinking water	W_{RSL}	l/l
Drinking water delivered over the reference service life	W_D	l
Energy efficiency over the reference service life	η_E	%
Water efficiency over the reference service life	η_W	%
Standby power loss	E_L	W
Heating efficiency (if appliance supplies hot water)	η_H	%
Chilling efficiency (COP) (if appliance supplies chilled water)	η_C	%
Temperature control technology: ▪ Electronic (NTC/thermistor) ▪ Hydraulic/mechanical (thermostat)	N/A	N/A
Cooling technology (if appliance supplies chilled water) ▪ Air-cooled refrigeration ▪ Water-cooled refrigeration	N/A	N/A

5 CONTENT DECLARATION

A full material content declaration is optional. At minimum, the content of any substances contained in the product that are listed in the "Candidate List of Substances of Very High Concern (SVHC) for authorisation" must be declared in the EPD when their content exceeds 0.1 % of the mass of the product. SVHC are listed by European Chemicals Agency.

6 LIFE CYCLE STAGES INCLUDED

The following life cycle stages (EN 15804 modules) must be declared within the EPD:

- A1: Raw material extraction.
- A2: Upstream transport.
- A3: Manufacturing.
- A4: Transport of product to installation site.
- A5: Installation, including typical travel distance for the installer and disposal of packaging waste. The energy used during the installation can be neglected. If additional material is required (e.g. an installation kit) such impacts shall be accounted for in A5.
- B1: Releases during use, including leaked refrigerant where applicable. If no measurable releases occur during the use of the unit (e.g. the system is closed and has no direct emissions) this module may be excluded and marked as NR (i.e. not relevant) in the EPD.
- B2: Maintenance (e.g. replacement of filters), including production of consumables, disposal of used consumables and used packaging, and travel for a technician (if required and then described in the EPD).
- B3: Repair, including production of typical replacement parts over the reference service life, travel for the technician, and disposal of scrap parts and used packaging. This module may be declared to have a zero impact if statistical information is available that repair is not needed (or allocated to module B2 Maintenance).
- B6: Operational energy use, including energy for water heating/chilling and standby losses.
- B7: Operational water use, including the drinking water dispensed, losses for heating/chilling (if any) and standby losses (if any).
- C2: Transport of product to waste processing at end-of-life.
- C3: Waste processing.
- C4: Disposal.
- D: Reuse, recovery and recycling potential.

Modules A1-A3 may be defined as one aggregated module. All others must be presented separately.

The following modules are excluded and can be marked in the EPD as “NR” or “not relevant”:

- B4 (replacement) is not expected before the office itself is refurbished and typically a new unit is then installed to match the new décor.
- B5 (refurbishment) is excluded as the reference service life is defined to align with the typical refurbishment cycle for office buildings. Guidance for including module B5 for building LCA with a service life longer than the product service life may be included within the EPD as other environmental information. See section 9.
- C1 (demolition) is not relevant as appliances are typically removed by hand. This is particularly true of chilling appliances which contain refrigerants and must therefore be de-gassed before end-of-life.

7 CALCULATION RULES

Data for all modules (A-D) must be normalised to the declared unit of 1 litre of average drinking water delivered. This shall be done by dividing all values by W_D, as calculated later in this section.

This section sets out the specific calculation methods required for use phase energy demand (module B6), use phase water consumption (module B7) and operational efficiencies. Energy demand is determined by calculating the energy requirement for heating or chilling for the given amount of water and includes any standby heat losses. Water consumption includes the volume of water delivered for drinking, as well as any water used for chilling processes (if needed).

Calculations shall be based on measured data, calculated efficiencies (as described below) and region-specific parameters (provided below). Other verified methods are permissible provided that they are justified within the EPD and accepted by the EPD's verifier. In the case that different methods are used, a statement must be made in the EPD to the effect that "Due to the use of different calculation methods, the use phase of this EPD (modules B6 and B7) may not be comparable to other EPDs produced according to the same Product Category Rules."

7.1 REGION-SPECIFIC PARAMETERS

The region-specific parameters set out below must be applied in the EPD. One use phase scenario is required per region declared within the EPD.

Country	**Water inlet temp. (°C)**	**Daily hot water office consumption per person (l/person per day)***	**Daily chilled water office consumption per person (l/person per day)***	**Service life (days default)**
	T_{IR}	V_H	V_C	L
Australia	16.9	0.134	0.357	2557
UK / Europe	10.0	0.250	0.241	2557

*Factors are the water delivered in an office during a 5-day working week, normalised over 7 days

Australia: Water inlet temperature is determined as a population-weighted average of cold water temperature as stated in AS4234:1994 (Standards Australia, 1994) based on 2013 population data (ABS, 2013). Hot and cold water consumption is based on data from the Australian Bureau of Statistics (ABS, 2014).

UK/Europe: Water inlet temperature is based on German conditions from DIN V 18599-8 (German Institute for Standardization, 2007). Hot and cold water consumption is based data from International Markets Bureau (IMB, 2011) for the UK.

Other countries: These same parameters must be specified and referenced within the EPD. Other countries/regions should specify a region specific water inlet temperature (T_{IR}) where possible. Where no data for daily consumption volumes are available, these may be taken from the above listed countries according to the local climate (UK/Europe for cooler climates and Australia for hotter climates).

7.2 MODULE B6: OPERATIONAL ENERGY

7.2.1 STANDBY POWER LOSS (E_L):

Standby power losses shall be determined by first setting the appliance to a target hot water temperature of 98°C and a target cold water temperature of 5°C (if such settings are available). Energy use shall be measured at the wall for a full 24-hour period at an ambient temperature of 22°C[1] with no water draw-off. During the test, the temperature of hot water must not fall below 95°C and the temperature of cold water must not exceed 10°C.

The standby loss shall be reported in watts (W), calculated as measured energy over the 24-hour period in Wh divided by 24.

[1] 22°C is considered a typical temperature for a climate-controlled office environment.

7.2.2 STANDBY POWER LOSS OVER THE REFERENCE SERVICE LIFE (E_{LL})

The standby power loss shall be determined by calculating the standby losses over the service life of 7 years, as in the equation below:

$$E_{LL} = \frac{24LE_L}{1000}$$

Where:

E_{LL}	Standby power loss over the reference service life in kWh
L	Service life of the unit in days = 2557 days (7 years default)
E_L	Standby power loss in W

7.2.3 HEATING ENERGY DEMAND OVER THE REFERENCE SERVICE LIFE (E_H):

The energy required to heat water over the reference service life shall be determined by the following equation. The heating efficiency of the unit can be assumed to be 1 for units which directly heat water via an electric element. For other heating methods a heating energy efficiency shall be determined by referenced testing methods.

$$E_H = \frac{NLV_H \rho_H C K_T (98 - T_{IR})}{\eta_H}$$

Where:

E_H	Heating energy demand over the reference service life in kWh
N	Number of people served
L	Service life of the unit in days = 2557 days (7 years default)
V_H	Hot water consumption in litres per person per day
ρ_H	Density of hot water = 0.96 kg/l at 98°C
C	Specific heat capacity of water = 1.163×10^{-3} kWh/kg·K
K_T	Heat recovery factor = 1 (unless the energy requirement is reduced by the combined operation of heating and chilling, see “Special cases”)
T_{IR}	Region-specific water inlet temperature in °C
η_H	Heating efficiency (= 1 for electric element type)

7.2.4 CHILLING ENERGY DEMAND OVER THE REFERENCE SERVICE LIFE (E_C):

The energy required to chill water over the reference service life shall be determined by the following equation. The chilling efficiency of the appliance shall be the coefficient of performance (COP) of the refrigeration system, determined according to ANSI/ASHRAE 23.1-2010 (ASHRAE, 2010) or EN 12900:2013 (CECOMAF). The efficiency shall be determined for operating temperatures and conditions representative of the product assembly and function described in this document.

$$E_C = \frac{NLV_C \rho_C C (T_{IR} - 5)}{\eta_C}$$

Where:

E_C	Chilling energy demand over the reference service life in kWh
N	Number of people served
L	Service life of the unit in days = 2557 days (7 years default)
V_C	Chilled water consumption in litres per person per day
ρ_C	Density of cold water = 1 kg/l at 5°C
C	Specific heat capacity of water = 1.163×10^{-3} kWh/kg·K
T_{IR}	Region-specific water inlet temperature in °C
η_C	Chilling unit efficiency (COP) according to ANSI/ASHRAE 23.1-2010 or EN 12900:2013

7.2.5 ENERGY DEMAND OVER REFERENCE FULL SERVICE LIFE (E_{RSL})

The energy demand over the reference service life is calculated as a sum of the energy demand for heating, chilling and standby losses over the reference service life of the product:

$$E_{RSL} = \frac{E_H + E_C + E_{LL}}{W_D}$$

Where:

E_{RSL}	Energy demand over the reference service life in kWh/l
E_H	Heating energy demand over the reference service life in kWh
E_C	Chilling energy demand over the reference service life in kWh
E_{LL}	Standby power loss over the reference service life in kWh
W_D	Drinking water delivered over the reference service life in l

7.3 MODULE B7: OPERATIONAL WATER

7.3.1 DRINKING WATER DELIVERED OVER THE REFERENCE SERVICE LIFE (W_D):

The drinking water delivered over the reference service life shall be determined by the following equation:

$$W_D = NL(V_H + V_C)$$

Where:

W_D	Drinking water delivered over the reference service life in l
N	Number of people served
L	Service life of the unit in days = 2557 days (7 years default)
V_H	Hot water consumption in litres per person per day
V_C	Chilled water consumption in litres per person per day

7.3.2 WATER CONSUMPTION OVER THE REFERENCE SERVICE LIFE (W_{RSL})

The water consumption over the reference service life is calculated as a sum of the water drawn off for drinking, plus standby waste water production (if any), plus heating and chilling waste water production (if any):

$$W_{RSL} = \frac{W_D + W_L + W_H + W_C}{W_D}$$

Where:

W_{RSL} Water consumption over the reference service life in l/l

W_D Drinking water delivered over the reference service life in l

W_L Standby waste water production over the reference service life in l

W_H Waste water production during heating over the reference service life in l

W_C Waste water production during chilling over the reference service life in l

7.3.3 EVALUATION OF DRINKING WATER CONSUMPTON

For purposes of evaluating water consumption as part of the life cycle inventory (LCI) and life cycle impact assessment (LCIA) water shall be treated as follows:

- 36% of drinking water delivered to users is evaporated.
- 64% of drinking water delivered to users requires waste water treatment.

Although daily water intake and output may vary from person to person and between regions, the average water output is approximately 2500 ml for adults. On average 900 ml of this is insensible loss from the skin and lungs, and 1600 ml through urine and faeces (Lewis et al., 2014).

7.4 WATER COOLED/HEATED UNITS

The following calculations are applicable for appliances that discharge waste water during their operation. Such appliances could include water-cooled units or units heated by heat pump, which extract or transfer heat to water not used for drinking purposes.

7.4.1 STANDBY WASTE WATER PRODUCTION OVER THE SERVICE REFERENCE LIFE (W_L):

Standby waste water production shall be determined by first setting the appliance to a target hot water temperature of 98°C and a target cold water temperature of 5°C (if such settings are available). The ambient temperature shall be 22°C throughout the test. Water discharges to the outlet pipe shall be measured for a full 24-hour period with no water being drawn off the appliance. During the test, the temperature of hot water must not fall below 95°C and the temperature of cold water must not exceed 10°C. W_L is the water discharged to the outlet pipe in l, measured over this full 24-hour period multiplied by 2557 (the default service life of the unit in days).

7.4.2 WASTE WATER PRODUCTION DURING HEATING OVER THE REFERENCE SERVICE LIFE (W_H):

W_H defines the volume of water output not consumed as drinking water, resulting from the process of heating water. An example could include heating water via a heat pump process, where heat is extracted from water which is then wasted.

The water wasted during heating over the reference service life shall be determined according to the following equation.

$$W_H = NLW_{WH}V_H$$

Where:

W_H	Waste water production during heating over the reference service life in l
N	Number of people served
L	Service life of the unit in days = 2557 days (7 years default)
W_{WH}	Waste water heating factor in l/l
V_H	Hot water consumption in litres per person per day

Heating water production is the total water discharge at the outlet pipe in litres. If the appliance does not produce waste water during the heating process, the water produced during heating over the reference service life is 0 litres.

7.4.3 WASTE WATER HEATING FACTOR (W_{WH})

The waste water heating factor represents the volumetric ratio of waste water produced to hot water produced for drinking during normal heating operation and temperatures. W_{WH} shall be determined by verified experimental methods and shall account for the effects of standby waste water production.

The test method involves fist setting the appliance to 98°C hot water and 5°C cold water (if such settings exist), no chilled water shall be drawn off during or immediately before the test. Hot water shall then be drawn off in volumes or intervals such that the outlet water temperature does not fall below 95°C. The inlet water temperature shall be equal to the region specific water temperature (T_{IR}). The hot water and waste water volumes shall be measured. The volume of standby water produced, calculated for the duration of the test, shall be determined and subtracted from the volume of waste water produced at the outlet pipe. The volume of hot water drawn of for this test shall be no less than 20L. The waste water heating factor shall be calculated according to the following equation:

$$W_{WH} = \frac{(W_{WO} - \frac{W_L T}{F})}{H_O}$$

Where:

W_{WH}	Waste water heating factor
W_{WO}	Waste water output during test in l
W_L	Standby waste water production over the reference service life in litres
T	Duration of the test in hours
H_O	Hot water output during test in litres
F	Hours per service life = 61368 (7 years default)

7.4.4 WASTE WATER PRODUCTION DURING CHILLING OVER THE REFERENCE SERVICE LIFE (W_C):

W_C defines the volume of water output not consumed as drinking water, resulting from the process of chilling water. An example could include rejecting waste heat to water which is then wasted.

The water wasted during chilling over the reference service life shall be determined according to the following equation.

$$W_C = NLW_{WC}V_CK_W$$

Where:

W_C	Waste water production during chilling over the reference service life in l
N	Number of people served
L	Service life of the unit in days = 2557 days (7 years default)
W_{WC}	Waste water chilling factor in l/l
V_C	Cold water consumption in litres per person per day
K_W	Waste water recovery factor = 1 (unless waste water is reduced from the combined operation of heating and chilling, see "7.6 7.6Special cases")

Chilling water production is the total water discharge at the outlet pipe in litres. If the appliance does not produce waste water during the chilling process, the water produced during chilling over the reference service life is 0 litres.

7.4.5 WASTE WATER CHILLING FACTOR (W_{WC})

The waste water chilling factor represents the volumetric ratio of waste water produced to chilled water produced for drinking during normal chilling operation and temperatures. W_{WC} shall be determined by verified experimental methods and shall neglect the effects of standby waste water production.

The test method involves fist setting the appliance to 98°C hot water and 5°C cold water (if such settings exist). Chilled water shall then be drawn off in volumes or intervals such that the outlet water temperature do not rise above 10°C. The inlet water temperature shall be equal to the region specific water temperature (T_{IR}). The chilled water and waste water volumes shall be measured. The volume of standby water produced, calculated for the duration of the test, shall be determined and subtracted from the volume of waste water produced at the outlet pipe. The volume of chilled water drawn of for this test shall be no less than 20L. The waste water chilling factor shall be calculated according to the following equation:

$$W_{WC} = \frac{(W_{WO} - \frac{W_L T}{F})}{C_O}$$

Where:

W_{WC}	Waste water chilling factor
W_{WO}	Waste water output during test in litres
W_L	Standby waste water production over the reference service life in litres
T	Duration of the test in hours
C_O	Hot water output during test in litres
F	Hours per service life = 61368 (7 years default)

7.5 EFFICIENCY

7.5.1 ENERGY EFFICIENCY OVER THE REFERENCE SERVICE LIFE (H_E)

The energy efficiency over the reference service life shall be determined as the theoretical energy consumption (without any losses) divided by the real energy consumption to produce an identical volume of hot and chilled water.

$$\eta_E = \frac{LCN(V_H \rho_H (98 - T_{IR}) + V_C \rho_C (T_{IR} - 5))}{E_{RSL} W_D} \cdot 100$$

Where:

η_E	Energy efficiency over the reference service life in %
E_{RSL}	Energy demand over the reference service life in kWh/l
W_D	Drinking water delivered over the reference service life in l
ρ_H	Density of hot water = 0.96 kg/l at 98°C
ρ_C	Density of cold water = 1 kg/l at 5°C
L	Service life of the unit in days = 2557 days (7 years default)
C	Specific heat capacity of water = 1.163×10^{-3} kWh/kg·K
N	Number of people served
V_H	Hot water consumption in litres per person per day
V_C	Chilled water consumption in litres per person per day
T_{IR}	Temperature of inlet water during testing in °C

7.5.2 WATER EFFICIENCY OVER THE REFERENCE SERVICE LIFE (H_W)

The water efficiency over the reference service life shall be determined as the theoretical water consumption (without any losses) divided by the real water consumption needed to produce an identical volume of hot and chilled water.

$$\eta_W = \frac{LN(V_H + V_C)}{W_{RSL} W_D} \cdot 100$$

Where:

η_W	Water efficiency over the reference service life in %
W_{RSL}	Water consumption over the reference service life in l/l
W_D	Drinking water delivered over the reference service life in l
L	Service life of the unit in days = 2557 days (7 years default)
N	Number of people served
V_H	Hot water consumption in litres per person per day
V_C	Chilled water consumption in litres per person per day

7.6 SPECIAL CASES:

Due to the many different possibilities in the design of appliances, there is potential for waste water production to be dependent on use specific use conditions.

A hypothetical scenario could be where waste water from the chilling process may be used to displace tap water intake for heating, thereby also raising the average water inlet temperature. In such cases an appropriate heat recovery factor (K_T) or waste water recovery factor (K_W) may be applied in sections 7.2.3 and 7.4.4 respectively.

7.6.1 HEAT RECOVERY FACTOR (K_T)

A heat recovery factor may be determined to better reflect designs dependent on combined hot and chilled use scenarios.

The heat recovery factor shall be calculated as the ratio of the heating temperature difference between the inlet and target temperatures, divided by the temperature difference between the region specific inlet temperature and the target temperature i.e. (98-T_{Avg}) / (98-T_{IR}).

The average water inlet temperature shall be determined as a mass-weighted average, based on normal usage patterns and must be representative of real usage. Consumption volumes must be consistent with the region-specific hot and chilled water consumption volumes. Average values must be based on experimental data and use a system inlet temperature equal to the region-specific inlet temperature.

Weighted average example: 80% water (by mass) at 40°C and 20% water (by mass) at 10 °C.

$$T_{AVG} = 0.8 \times 40 + 0.2 \times 10$$

7.6.2 WASTE WATER RECOVERY FACTOR (K_W)

A waste water recovery factor may be determined to better reflect designs dependent on combined hot and chilled use scenarios.

The waste water recovery factor shall be calculated as: The volume of waste water actually produced for heating under normal usage patterns of heating and chilling, divided by the volume of waste water produced during chilling alone e.g. (Vol real waste / Vol chilling waste)

Consumption volumes must be consistent with the region-specific hot and chilled water consumption volumes. Average values must be based on experimental data and use a system inlet temperature equal to the region-specific inlet temperature.

8 OTHER ENVIRONMENTAL INDICATORS

If emission to surrounding media (through leaking or other) is regulated according to harmonised European standard, i.e. CE labelling, in any European country this result will be mandatory information in the EPD. These emission values or classes for the regulated substances shall then be included in the EPD.

9 OTHER ENVIRONMENTAL INFORMATION

Guidance for including the product within a building LCA may be included optionally within the EPD. This section provides the recommended calculation approach.

Modules A-D shall each be multiplied individually by the total delivered drinking water over the building service life and reported under the same modules within the building life cycle.

For a building with a service life greater than the product service life, replacement of the unit during building refurbishment must be considered and reported within the building LCA under module B5 (refurbishment), with recycling potential reported under module D (benefits and loads beyond the system boundary).

These modules shall be determined as follows:

$$B5 = (A + C) \times W \times \left(\left\lceil \frac{B_L}{P_L} \right\rceil - 1 \right)$$

$$D = D \times W \times \left\lceil \frac{B_L}{P_L} \right\rceil$$

Where:

B5	Impacts reported in module B5
D	Impacts reported in module D
A	Total impacts of the product from modules A1 to A5 (per functional unit)
C	Total impacts of the product from modules C1 to C4 (per functional unit)
W	Delivery of drinking water over the building service life
B_L	Expected building life
P_L	Product service life

Note:

- The calculation for module D above includes the benefits and loads beyond the system boundary for the product(s) originally installed and all replacements over the life of the building.
- The use of half brackets (Quine corners) in $\left\lceil \frac{B_L}{P_L} \right\rceil$ indicates that the fraction should be rounded up to the nearest whole number. For example $\left\lceil \frac{60}{7} \right\rceil$ would be rounded up to 9.

10 REFERENCES

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11 CHANGES IN THIS SUB-PCR DOCUMENT

VERSION 2018-06-19

Original version.

VERSION 2018-11-16

- Updated validity to 2020-03-03 to align with version 2.3 of PCR 2012:01
- Editorial changes

VERSION 2018-11-22

- Replaced reference to standards with a reference to PCR 2012:01.
- Minor editorial changes

VERSION 2020-02-18

- Updated validity to 2020-09-01 to align with version 2.31 of PCR 2012:01.

VERSION 2020-07-02

- Updated validity to 2020-12-31 to align with version 2.32 of PCR 2012:01.

VERSION 2020-09-18

- Updated validity to 2021-12-31 to align with version 2.33 of PCR 2012:01.

VERSION 2020-11-08

- Updated validity to 2022-02-28 to align with version 2.34 of PCR 2012:01.