Part B: Product group definition | Electronic bidet seats | Part B #23-005

This Part B conforms to the ACLCA PCR Open Standard version 1.0 (May 2022) at the following level:
☒ 1 – Transparency ☐ 2 – Procurement ☐ 3 – Data source

Initiated by	TOTO USA - https://www.totousa.com/		
Working group members	Jim Mellentine, Thrive ESG (PCR committee chair) Fernando Fernandez, TOTO USA Kyle Thompson, Plumbing Manufacturers International (PMI) Andrea Burr, NSF Danny Gleiberman, Sloan Morgan Keck, Zurn John Watson, International Association of Plumbing and Mechanical Officials (IAPMO) Tanya Kuehl, Kohler Ben Perreault, Bradley Corporation Jim Kendzel, American Supply Association Olivia Tsamparlis, Watts Water Beth Cassese, SCS Global Services		
Public notices of development/ outreach	• Public notice on the Sustainable Minds website announcing the new bidet seat Part B on March 21, 2023: http://www.sustainableminds.com/transparency-report-program/part-b • Email blast on March 24, 2023 to mailing lists of LCA professionals, building and construction industry and trade associations, and manufacturers with published transparency documentation listed in the Transparency Catalog under the plumbing CSI MasterFormat Division (22 00 00), requesting participation on the PCR committee. • Email blast on January 9, 2024 to the same mailing lists requesting public comment.		
Non-participating parties	All interested parties identified participated in the working group.		
New Part B?	Yes	**Part B version number**	1.0
Publication date	March 6, 2024		
Validity period	03/06/2024 – 03/05/2029		
Expected renewal schedule	Sustainable Minds intends to notify the working group and post update/renewal information on its website approximately four months prior to expiration to determine update, extension, or expiration options for this Part B.		

Product group

Name	Electronic bidet seats (Personal hygiene devices for water closets)	**CSI MasterFormat® #**	22 41 13.19
Description	An attachment to an existing toilet, an electronic bidet seat provides potable water through a nozzle for personal cleansing and is controlled electronically. Additional features may include, but are not limited to heated seat, air dryer, temperature adjustment, water pressure adjustment, nozzle position adjustment, deodorizer, wireless control, automatic lid opener/closer, illumination, and audio player.		
Exclusions	This product group does not include: • Complete toilets that are sold with electronic bidet seats (included in the separate Sustainable Minds Residential Toilets Part B) • Non-electronic bidets		
Geographic representativeness	North America		

Program operator responsibilities

Existing PCRs, EPDs, TRs, or LCAs	• This Part B shall be used in conjunction with Sustainable Minds Part A: LCA calculation rules and report requirements, version 2023. • Relevant guidance: Plumbing Manufacturers International, 2018. Product Category Rule (PCR) Guidance for Kitchen and Bath Fixture Fittings v1.0. • Underlying LCA: Rodrigues et al. Environmental Life-Cycle Assessment of an Innovative Multifunctional Toilet. Energies 2021, 14(8), 2307, https://doi.org/10.3390/en14082307
Justification for new Part B if relevant non-expired PCR exists	Not applicable. An existing PCR for electronic bidet seats was not found.
Harmonization activities pursued	Sustainable Minds announced the creation of this product group definition to other program operators via email, posted on its website, and announced through the American Center for Life Cycle Assessment's PCR committee meetings. The only related PCR found was Sustainable Minds' own Part B for Residential Toilets, which might be sold with a built-in electronic bidet seat. Sustainable Minds, in consultation with members of this working group and the Residential Toilets working group, decided that in cases where an electronic bidet is sold with a toilet, it will be covered in the Residential Toilet product group definition. Sustainable Minds updated the Residential Toilet product group definition concurrently to make the distinction clear. No other harmonization activities were identified or conducted.

Functional performance

Standard/certification (most recent edition, conformance not required for PCR conformance)	**URL**
ASME A112.4.2/CSA B45.16 – Personal hygiene devices for water closets	https://www.asme.org/codes-standards/find-codes-standards/asme-a112-4-2-csa-b45-16-personal-hygiene-devices-water-closets/2021/drm-enabled-pdf
UL 1431 – Personal hygiene and health care appliances	https://standardscatalog.ul.com/ProductDetail.aspx?productId=UL1431
CSA C22.2 #68 – Motor operated appliances	https://www.csagroup.org/store/product/C22.2%20NO.%2068-18/
IAPMO cUPC – Compliance with Uniform Plumbing Code	https://www.iapmo.org/rt/certification-services/plumbing/usa

System boundary

System boundary	The type of EPD shall be specified as cradle to grave. The modules considered in the LCA shall be described in brief as per "System boundaries" outlined in SM Part A section 5.1. Module D may be optionally declared. It should be apparent as to what processes are considered in each module per the module descriptions in SM Part A section 6. The underlying LCA included infrastructure in its system boundary and did not identify infrastructure as a hot spot in the production stage. Therefore, capital goods and infrastructure are not expected to be significant to the overall impacts of the products. To reduce possible artificial variation in EPD results across the product group, capital goods and system infrastructure flows shall be excluded from the system boundary by default, with justification required for alternative assumptions. A system boundary diagram is shown in Figure 1.

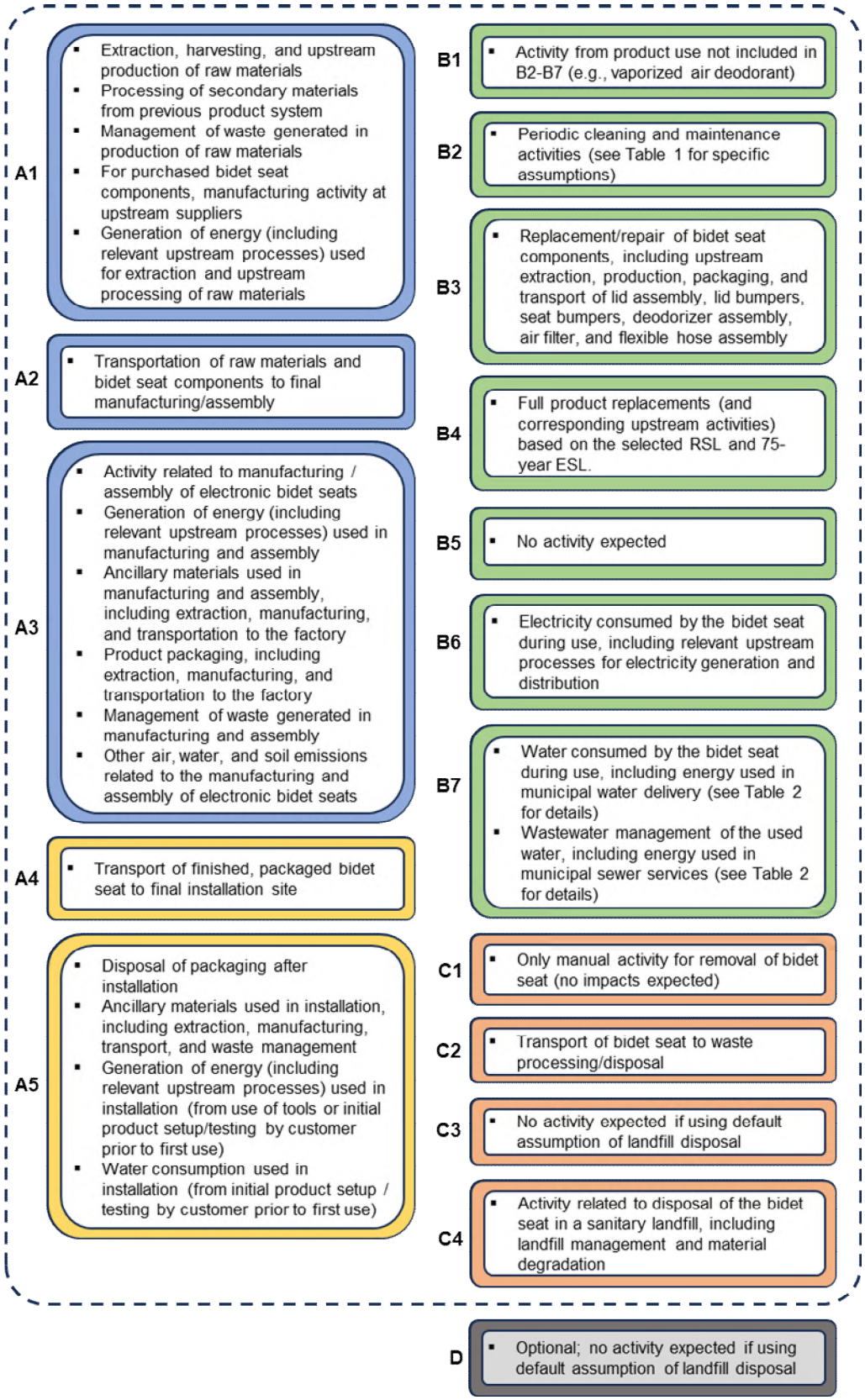

Figure 1. System boundary diagram for electronic bidet seats

Functional unit

Unit	**One electronic bidet seat used in an average residential environment over the estimated service life of the building.**
Rationale	Electronic bidet seats are most commonly used in a residential environment (as opposed to public or commercial restrooms). The Plumbing Manufacturers International PCR guidance document provides use stage assumptions for a residential setting.

Additional rules for comparability

1. Additional rules to Part A	• The construction of water and wastewater infrastructure are excluded • EPDs that use secondary data for any unit process that contributes 5% or more to any disclosed environmental impact category shall disclose the data source (database name and version, software type and version implemented, dataset name, dataset geography, and dataset allocation method). Materials considered confidential may be reported as "proprietary ingredient" along with the database name and version.
2. Default life cycle stage scenario(s)	**Extraction and upstream production (A1)** When materials used in the product are represented by secondary data, the manufacturing activities should reflect the source country or region to the extent possible. The electricity grid profile of the data set should be adapted to the source country or region, if known and possible with the selected data set. Average data sets with "Global" or "Rest of World" average electricity profiles may only be used if the material source location is unknown or adapting the electricity grid is not possible. In cases when the EPD owner purchases manufactured components, the manufacturing process activity at the upstream supplier shall be counted in the extraction and upstream production stage, separate and in addition to the upstream raw material extraction. For example, if a manufacturer purchases a copper heating coil that it fastens to a water heater, the coil cannot simply be represented by copper material alone. Additional manufacturing must be added to represent the manufacturing of raw copper into the coil part. **Transport to factory (A2)** In cases when the EPD owner maintains multiple suppliers for the same material or part, the life cycle inventory and impact assessment results shall reflect a weighted average transportation distance from the multiple suppliers for each mode of transport used. To simplify the calculation for those with many suppliers for the same material or part, suppliers which provide less than 5%, by mass or by volume, of a particular material or part may be excluded from the calculation of weighted average transport distance, subject to existing cut-off requirements in SM Part A. If the location of a material/part supplier is unknown, a default distance of 1,243 miles (2,000 km) must be assumed unless otherwise justified. **Transport to site (A4)** Land transport If primary data are unavailable, assume land transport distance in the destination country is 1,491 miles (2,400 km) by truck with an empty return trip of the same distance (2,982 miles (4,800 km) total). This includes transport to the final installation site if multiple transport legs are included. Warehouse/distribution center and retail Energy consumption in warehouses, distribution centers, and retail facilities during the course of transport to the final customer shall be omitted from the analysis. **Installation (A5)** The LCA may assume that a surge-protected outlet is already installed at the point of use and no additional electrical work is needed. The installation stage shall include, as applicable, any ancillary materials, electricity and/or water consumption (e.g., from tools or initial product testing by customer prior to first use), and disposal of product packaging waste and other waste materials.

Building estimated service life and product reference service life

This Part B uses a building estimated service life (ESL) of 75 years. All use stage activity and impacts shall be counted for the full ESL period.

The default reference service life (RSL) for an electronic bidet seat shall be 15 years unless otherwise justified. Justification for longer RSLs shall include a guarantee by the signature of the most senior officer of the product manufacturer. The default 15-year RSL is considered a conservative estimate based on the ASME A112.4.2 standard, which requires cycle testing of 50,000 operations for front sprayers and 25,000 operations for rear sprayers on electronic bidet seats.

Use or application of the installed product (B1)

Any activity related to the product use and not included in stages B2-B7 shall be included in this stage. For example, if the product emits a vaporized air deodorant as part of its normal operation, such emissions to air and water must be counted in this stage.

Maintenance (B2)

Electronic bidet seats require periodic cleaning of the seat surface and nozzle/wand. Some products may require cleaning of deodorizer filters and water filter parts. Some products may dispense toilet bowl cleanser as part of its normal operation. The following schedule of maintenance and corresponding quantities shall be used unless primary data or product usage guides are available to justify alternative assumptions.

Table 1. Maintenance activities for electronic bidet seats

Activity (as applicable)	Frequency	Assumptions per event
Main unit cleaning (seat and lid)	Twice per month	0.338 fl oz (10 mL) of a 1% sodium lauryl sulfate solution.
Cleaning of electric plug/cord and gap between the toilet tank and seat	Monthly	0.338 fl oz (10 mL) of a 1% sodium lauryl sulfate solution.
Deodorizing filter cleaning	Monthly	0.338 fl oz (10 mL) of a 1% sodium lauryl sulfate solution.
Replacement of deodorizing filter	Per product specification	Per product specification
Nozzle/wand cleaning	Weekly	0.338 fl oz (10 mL) of a 1% sodium lauryl sulfate solution.
Water filter parts cleaning	Every 6 months	0.338 fl oz (10 mL) of a 1% sodium lauryl sulfate solution.
Water filter replacement	Per product specification	Per product specification
Cleanser dispensed as part of normal operation	Per product specification	Per product specification

Repair (B3)

An electronic bidet seat is composed of numerous parts, some of which may require servicing earlier than the expected RSL. Though repair data is not widely available for this product category, manufacturers shall, unless otherwise justified with evidence, assume the following components of the bidet seat are fully replaced once during the RSL if the component is found in the product:

1. Lid assembly
2. Lid bumpers
3. Seat bumpers
4. Deodorizer assembly
5. Air filter
6. Flexible hose assembly

Replacement (B4)

Replacements for the duration of the ESL must be counted proportionally to the nearest tenth of a product. For example, if the default RSL of 10 years is used, then 6.5 replacement products (65 remaining years in the ESL divided by 10-year RSL) must be included. Replacements must include the sum of impacts from stages A1-A5 and C1-C4 multiplied by the number of replacements.

Refurbishment (B5)

Refurbishment is not expected to occur in the normal operation of the product. Zero activity may be assumed for this stage unless otherwise justified.

Operational energy use (B6)

Electricity directly used by the bidet seat shall be included in this stage. Electricity use for water heating, motorized water pump, heated air drying/blowing, stand-by electricity (if any) and other product functions must be counted in the consumption of electricity. Unless otherwise justified, the following use stage assumptions shall be used when calculating the impacts from operational energy use.

- The electricity grid mix used to model the use stage energy shall be a weighted average country-level mix based on the share of sales to one or more countries. The grid mix shall be based on low-voltage consumption and include transmission and distribution losses. The mix shall be based on the latest data available from applicable national government disclosures or the latest version of the Energy Institute's Statistical Review of World Energy[1].
- Though many countries have goals to further decarbonize their electricity grid mix over time, actual implementation rates are uncertain and therefore the use-stage electricity shall not account for anticipated future grid mix changes.
- Water heating consumes 46.63 kWh of electricity per m^3 (0.1765 kWh of electricity per gallon), per PMI's PCR guidance [1].
- The flow rate of water will be defined by each product. The duration of water flow per use shall be 0.58 minutes, per PMI's PCR guidance.
- The number of uses per day shall be 4 (2 users, each twice per day), with 365 days of use per year, per PMI's PCR guidance. This equates to 1,460 uses per year and 109,500 uses over 75 years.

Operational water use (B7)

Water directly used by the bidet seat components shall be included in this stage. Water used to flush the toilet is considered part of the operation of the toilet and outside the system boundary of the bidet seat. Unless otherwise justified, the following use stage assumptions shall be used when calculating the impacts from operational water use.

- Incoming water is unfiltered municipal tap water. If the bidet seat requires incoming water to be pre-filtered, the relevant filtration activity shall be included.
- Pre-misting of the toilet bowl and any other water consumed by the bidet seat shall be included in the water consumption calculations, if relevant.
- The flow rate of water will be defined by each product. The duration of water flow per use shall be 0.58 minutes, per PMI's PCR guidance.
- The number of uses per day shall be 4 (2 users, each twice per day), with 365 days of use per year, per PMI's PCR guidance. This equates to 1,460 uses per year and 109,500 uses over 75 years.
- Municipal water and sewer systems vary in energy consumption. To improve consistent reporting and reduce artificial variation in use stage results, the following values for water distribution and waste water collection and treatment shall be used. The Electric Power Research Institute (EPRI) published this data in a study on water and sustainability. Data from the U.S. Environmental Protection Agency (EPA) were used to establish weighted average composite factors, to obtain an electricity usage per gallon of water consumed. Use the value generated in this table to calculate the electricity used for water supply and treatment. The same electricity grid mix(es) used in B6 shall also be used in B7.

[1] Energy Institute. Statistical Review of World Energy. Electricity generation by fuel, country-level. https://www.energyinst.org/exploring-energy/statistical-review

Table 2. Average national electricity usage factors

Activity	EPRI factors: kWh / MMgal[Note1]	Weighted avg. composite factors: kWh / MMgal
Acquisition, treatment, and distribution of surface water by a Public Water System (PWS)	1,406	1,540[Note 2]
Acquisition, treatment, and distribution of ground water by a PWS	1,824	
Self-supply of drinking water (typically pumping from private wells)	700	700
Collection, conveyance and < secondary treatment of domestic wastewater	661	1,399[Note 3]
Collection, conveyance, and secondary treatment of domestic wastewater	1,212	
Collection, conveyance, and advanced treatment of domestic wastewater	1,726	
Collection, conveyance and zero discharge/other treatment of domestic wastewater	400	
Total electricity per million gallons →		3,639
Total kWh electricity per 1 gallon →		**0.00364**
Total kWh electricity per 1 liter →		**0.000961**

Note 1: Source: EPRI, Water & Sustainability (Volume 4): U.S. Electricity Consumption for Water Supply & Treatment -- The Next Half Century, March 2002.

Note 2: Source: U.S. Environmental Protection Agency (EPA), Office of Water (4606) Drinking Water Treatment, June 2004 https://transparencycatalog.com/assets/uploads/files/2009_08_28_sdwa_fs_30ann_treatment_web.pdf. This document cites 68% of population served by PWSs relies on surface water while 32% relies on ground water.

Note 3: Source: U.S. Environmental Protection Agency (EPA), Clean Watersheds Needs Survey 2012 Report to Congress. https://www.epa.gov/sites/default/files/2015-12/documents/cwns_2012_report_to_congress-508-opt.pdf. This report cites 1.7% of POTW-served population receives < secondary treatment, 38.0% receives secondary treatment, 53.6% receives advanced treatment, and 6.7% receives zero discharge or other treatment.

[1] Plumbing Manufacturers International (PMI), Product Category Rule (PCR) Guidance for Kitchen and Bath Fixture Fittings https://www.safeplumbing.org/files/safeplumbing.org/documents/resources/PMI-Kitchen-and-Bath-Fixture-Fitting-PCR-Guidance-Document.pdf.

Deconstruction/demolition (C1)

In the absence of primary data, the EPD owner may assume that the electronic bidet seat reaches its end of life separately from the building and is manually detached from the toilet using common hand tools. As such, energy or material inputs may be assumed zero for this stage unless otherwise justified.

Transport to waste processing or disposal (C2)

In the absence of primary data, EPD owners shall assume the product is transported 100 km via diesel-powered truck/trailer from the building site to the waste processing/disposal site.

Waste processing (C3)

In the absence of primary data, the default assumption is that 100% of products are disposed in a sanitary landfill at end of life. In that case no waste processing activity is applicable in this stage. Justifications for other end-of-life pathways, such as recycling, refurbishment, or other pathway in a product take-back program require evidence such as documentation of the program and documented number or share of units sold that participate in the program.

	Waste disposal (C4) The EPD owner shall assume 100% disposal in a sanitary landfill unless otherwise justified as described in C3 above. Landfill processes shall be modeled based on the mass of distinct materials in the bidet seat and availability of secondary data to model those materials. **Benefits and loads beyond the system boundary (D), Optional** Since the default end-of-life assumption is 100% landfill, there are no anticipated burdens or benefits beyond the system boundary. However, if alternative end-of-life pathways are justified, such benefits and burdens may be reasonably quantified or qualitatively described in this stage.
3. Additional data quality requirements	No additional data collection specifications or data quality requirements were identified.

Additional LCA calculation rules

N/A	Optional	Required	*Indicate whether conformance is the manufacturer's choice or required for TRs/EPDs.*
		X	ISO 21930: conformance is required by construction product manufacturers

Industry-average EPD requirements

Requirements	Industry-average EPDs shall not be developed using this PCR.

Part B development information

Part B review panel	This Part B was reviewed for conformance to ISO 14025, ISO 21930:2017, and ACLCA PCR Open Standard v1.0 by the following parties: Jack Geibig, Chair Ecoform Jgeibig@ecoform.com Hugues Imbeault-Tétreault, ing., M.Sc.A. Groupe AGÉCO hugues.i-tetreault@groupeageco.ca Rebe Feraldi, LCACP, CLAR Pacific Northwest National Laboratory rebe.feraldi@pnnl.gov
Open consultation	Sustainable Minds solicited public comments on this Part B from January 9, 2024 – February 8, 2024. This consultation period and list of parties to submit comments were made available to the review panel.
Conflict statement	Funding sources used to develop this Part B were disclosed to the working group during the development process. The policies identified in Sustainable Minds' Program Governance were followed to identify and resolve any potential conflicts of interest.
Sustainable Minds information	This Part B was developed by Sustainable Minds and participating interested parties according to the Sustainable Minds Program Governance available at http://www.sustainableminds.com/transparency-report-program/how-it-works. For questions about this or another Part B, to submit comments on this Part B, or to obtain a template for developing a transparency report, contact us using the information on the following page: http://www.sustainableminds.com/contact-us.