



**ASME A112.3.4-2013/  
CSA B45.9-13**

# Plumbing fixtures with pumped waste and macerating toilet systems



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# Preface

This is the first edition of ASME A112.3.4/CSA B45.9, *Plumbing fixtures with pumped waste and macerating toilet systems*. This Standard supersedes ASME A112.3.4-2000, *Macerating Toilet Systems and Related Components*, and CSA B45.9-2002, *Macerating Systems and Related Components*.

This Standard is considered suitable for use for conformity assessment within the stated scope of the Standard.

This Standard was prepared by the ASME/CSA Joint Harmonization Task Group on Plumbing Fixtures, under the jurisdiction of the ASME Standards Committee on Plumbing Materials and Equipment and the CSA Technical Committee on Plumbing Fixtures. The CSA Technical Committee operates under the jurisdiction of the CSA Strategic Steering Committee on Construction and Civil Infrastructure. This Standard has been formally approved by the ASME Standards Committee and the CSA Technical Committee. This Standard was approved as an American National Standard by the American National Standards Institute on December 30, 2013.

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# ASME A112.3.4-2013/CSA B45.9-13

## ***Plumbing fixtures with pumped waste and macerating toilet systems***

### **1 Scope**

#### **1.1**

This Standard establishes physical, performance, and testing requirements applicable to plumbing fixtures with pumped waste, macerating toilet systems, and related components. Such systems are intended to collect waste from a single fixture such as a water closet, lavatory, shower, or bathtub and pump these wastes to some point in the sanitary drainage system.

#### **1.2**

The purpose of this Standard is to establish a generally acceptable performance standard for pumped waste systems, macerating systems and related components for directly affixed water closets and other fixtures designed for above the-floor or in-floor installations.

#### **1.3**

A water closet connects to a macerating toilet system. Macerating toilet systems collect the waste from a single water closet, plus a lavatory, shower, bathtub, or a combination of these in the same room. Macerating systems grind and pump these macerated wastes to some point in the sanitary drainage system.

#### **1.4**

Pumped waste systems consist of three major components:

- (a) an automatic activation of the pumped waste system;
- (b) a drainage connection to the pump; and
- (c) a pump that pumps the waste to the gravity drainage system.

#### **1.5**

The macerating system comprises three major components:

- (a) a container that houses the operating mechanisms;
- (b) a pressure chamber that automatically or manually activates and deactivates the induction motor; and
- (c) an induction motor that drives the shredder blades and pump assembly, which is permitted to be combined into a single unit.

#### **1.6**

The use of alternate materials or methods is permitted, provided it can be demonstrated that such alternatives comply with the performance requirements of this Standard.

#### **1.7**

In this Standard, “shall” is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the standard; “should” is used to express a recommendation or that which is advised but not required; “may” is used to express an option or that which is permissible within the limits of the standard; and “can” is used to express possibility or capability.

Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material.

Notes to tables and figures are considered part of the table or figure and may be written as requirements.

Annexes are designated normative (mandatory) or informative (non-mandatory) to define their application.

## 1.8 Units of measurement

SI units are the units of record in Canada. In this Standard, the inch/pound units are shown in parentheses.

The values stated in each measurement system are equivalent in application; however, each system is to be used independently. Combining values from the two measurement systems can result in non-conformance with this Standard.

All references to gallons are to U.S. gallons.

## 2 Reference publications

This Standard refers to the following publications, and where such reference is made, it shall be to the edition listed below, including all amendments published thereto.

### **ASTM International (American Society for Testing and Materials)**

C1173-10

*Flexible Transition Couplings for Underground Piping Systems*

### **CSA Group**

CAN/CSA-C22.2 No. 108-01 (R2010)

*Liquid pumps*

CAN/CSA B602-10

*Mechanical couplings for drain, waste, and vent pipe and sewer pipe*

### **CSA Group/IAPMO (International Association of Plumbing and Mechanical Officials)**

CSA B45.5-11/IAPMO Z124-2011

*Plastic plumbing fixtures*

### **ASME (The American Society of Mechanical Engineers)/CSA Group**

ASME A112.19.1-2013/CSA B45.2-13

*Enamelled cast iron and enamelled steel plumbing fixtures*

ASME A112.19.2-2013/CSA B45.1-13

*Ceramic plumbing fixtures*

ASME A112.19.3-2008/CSA B45.4-08

*Stainless steel plumbing fixtures*

### **ASME (The American Society of Mechanical Engineers)**

A112.19.15-2012

*Bathtubs/whirlpool bathtubs with pressure sealed doors*

### **UL (Underwriter's Laboratories)**

UL 778-2010

*Motor operated water pumps*

## 3 Definitions and abbreviations

### 3.1 Definitions

The following definitions shall apply in this Standard:

**Fixture** — a device that receives water, waste matter, or both and directs these substances into a drainage system.

**Integral** — a cast or formed part of a fixture, e.g., a trap, seat, or tank.

**Lavatory** — a washbowl or basin.

**Pressure** —

**Flowing pressure** — the pressure in a water supply pipe at the inlet to an open valve.

**Static pressure** — the pressure in a water supply pipe at the inlet of a closed valve.

**Sanitary** — an aesthetic condition of cleanliness (not the state of being microbiologically clean).

**Water closet** — a fixture with a water-containing receptor that receives liquid and solid body waste and on actuation conveys the waste through an exposed integral trap into a drainage system.

**Dual-flush water closet** — a water closet incorporating a feature that allows the user to flush the water closet with either a reduced or a full volume of water.

**Electro-hydraulic water closet** — a water closet with a non-mechanical trap seal incorporating an electric motor and controller to facilitate flushing.

**High-efficiency water closet (high-efficiency toilet)** — a water closet with an average water consumption of 4.8 Lpf (1.28 gpf) when tested in accordance with ASME A112.19.2/CSA B45.1.

**Note:** *Dual-flush water closets with a maximum average water consumption of 4.8 Lpf (1.28 gpf) when tested in accordance with ASME A112.19.14 are also considered high-efficiency water closets.*

**Low-consumption water closet** — a water closet with an average water consumption of 6.0 Lpf (1.6 gpf) or less when tested in accordance with this Standard.

### 3.2 Abbreviations

The following abbreviations shall apply in this Standard:

gpf — gallons per flush

Lpf — litres per flush

## 4 Material requirements and general requirements

### 4.1 Materials

#### 4.1.1 Pumps

Pumps shall comply with

- (a) CAN/CSA-C22.2 No. 108 or UL 778; and
- (b) [Clause 5](#) of this Standard.

#### 4.1.2 Gaskets

Piping gaskets shall be watertight when tested according to [Clause 5](#).

### 4.1.3 Electrical requirements

The electrical system in the macerating unit shall comply with the applicable CSA Group or UL electrical standards.

### 4.1.4 Water closets

Water closets that connect with the macerating system shall comply with ASME A112.19.2/CSA B45.1, or CSA B45.5-/IAPMO Z124. The performance of the water closet shall be tested accordingly prior to connection to the macerating unit. The drain line carry test shall not be required. Water closets with an integral grinder/pump system shall be tested as a system.

### 4.1.5 Lavatories and sinks

Lavatories or sinks that are a part of a pumped waste system or that connect to a macerating toilet system shall comply with ASME A112.19.1/CSA B45.2, ASME A112.19.2/CSA B45.1, ASME A112.19.3/CSA B45.4, or CSA B45.5-10/IAPMO Z124.10. The lavatory or sink shall not be required to conform to the drainage opening area and drain diameter of these standards.

### 4.1.6 Bathtubs

Bathtubs that are a part of a pumped waste system or that connect to a macerating toilet system shall comply with ASME A112.19.1/CSA B45.2, ASME A112.19.3/CSA B45.4, ASME A112.19.15, or CSA B45.5-10/IAPMO Z124.10. The bathtub shall not be required to conform to the drainage opening area and drain diameter of these standards.

### 4.1.7 Showers

Showers that are a part of a pumped waste system or that connect to a macerating toilet system shall comply with ASME A112.19.1/CSA B45.2, ASME A112.19.2/CSA B45.1, ASME A112.19.3/CSA B45.4, or CSA B45.5-10/IAPMO Z124.10. Showers may also be field fabricated in accordance with the applicable plumbing code. The shower shall not be required to conform to the drainage opening area and drain diameter of these standards.

### 4.1.8 Macerating system housing

The housing tank assembly shall be watertight, leakproof, and protected from backflow of sewage. The housing tank shall be free from cracks, porosity, chips, flash, or other significant defects that affect the performance, appearance, or serviceability of the system. The tank assembly shall be capable of withstanding a hydrostatic pressure as described in [Clause 5.4](#). The tank shall comply with the resistance to staining, the wear and cleanability, and the chemical resistance tests of CSA B45.5-10/IAPMO Z124.10 for plastic sumps.

### 4.1.9 Clamps

Clamps used to connect the fixture with the holding tank shall comply with the band requirements of either ASTM C1173 or CAN/CSA-B602.

## 4.2 General requirements

### 4.2.1 Fastening

A means to fasten the water closet to the holding tank shall be provided.

### 4.2.2 Return of discharged wastes

A check valve shall be provided with the macerating system to prevent the return of discharged wastes to the macerating tank.

### 4.2.3 Accessibility

The holding tank shall allow access to the internal working components.

#### **4.2.4 Function**

The unit shall dispose of the contents of the water closet upon activation of the flushing mechanism. The macerating pump shall be capable of discharging the ground-up waste a distance of 3.7 m (12 ft) in vertical height as covered in [Clause 5.2](#).

#### **4.2.5 Hydrostatic pressure integrity**

The check valve in the holding tank shall be capable of resisting a hydrostatic pressure test as defined in [Clause 5.3](#).

#### **4.2.6 Minimum size**

The minimum size of the pressure portion of the piping shall be 19 mm (0.75 in) inside diameter.

#### **4.2.7 Venting**

The sump shall be vented according to the manufacturer's instructions with a minimum vent size of not less than 32 mm (1.25 in) inside diameter.

**Note:** *This is not considered to be a sewage sump.*

### **4.3 Pumped waste components**

#### **4.3.1 Pump**

The pump for pumped waste systems shall comply with either UL 778 or CSA C22.2 No. 108 and meet the performance requirements for permanently installed pumps.

##### **4.3.1.1 Pump activation and function**

The pump shall automatically activate to discharge the contents of the fixture when the fixture is used. The pump system shall prevent waste from rising in the fixture. The pump shall be capable of discharging the waste to a vertical height of 3.7 m (12 ft) as covered in [Clause 5.2](#).

##### **4.3.2 Discharge pipe**

The discharge pipe from the pump of a pumped waste system shall be a minimum size of 19 mm (0.75 in) nominal.

##### **4.3.3 Backflow prevention**

A check valve shall be provided with the pumped waste system to prevent the return of discharged waste to the plumbing fixture. The check valve shall be capable of resisting a 3.7 m (12 ft) column of water head pressure when tested in accordance with [Clause 5.3](#).

##### **4.3.4 Venting not required**

A vent shall not be required for a pumped waste system.

## **5 Performance tests**

### **5.1 Cycle testing**

#### **5.1.1 Test method**

The macerating pump and pump for a lavatory or sink pumped waste system shall be "on/off" tested 50,000 times. The pump for a shower or bathtub pumped waste shall be cycled tested "on/off" for 5,000 cycles. One cycle shall be "on" for 5 sec and "off" for 5 sec.

### 5.1.2 Acceptance criteria

Upon completion of the “on/off” or cycle testing, macerating systems shall demonstrate the ability to meet the performance requirements as outlined in [Clauses 5.2](#) and [5.3](#); pumped waste systems shall demonstrate the ability to meet the performance requirements outlined in [Clauses 5.3](#) and [5.4](#)

## 5.2 Paper test of the assembled unit

### 5.2.1 Set-up

The paper test shall be conducted as follows:

- (a) The macerating unit and water closet shall be assembled in accordance with the manufacturer’s instructions.
- (b) The discharge piping from the unit shall be installed to the maximum elevation and horizontal run stated by the manufacturer.
- (c) The check valve shall be installed within the discharge line in accordance with the manufacturer’s instructions.
- (d) Discharge pipe size as recommended by the manufacturer shall be installed vertically for 3.7 m (12 ft) of discharge and then directed to a safe place of discharge.
- (e) The water closet shall be filled with water and pressurized to the minimum pressure recommended by the manufacturer.
- (f) Two thousand sheets of single-ply toilet paper shall be weighed, then separated into four sets of 50 ten-sheet lots.

### 5.2.2 Test procedure

- (a) Ten sheets of single-ply toilet paper at a time shall be distributed evenly in the water closet bowl and the unit shall be flushed.
- (b) With each successive flush, there shall be no evidence of paper returning to the bowl.
- (c) After conducting 50 consecutive flush tests, three additional flushes without paper shall be made.
- (d) The water closet shall then be removed from the housing unit and the internal walls and bottom of the housing shall be inspected for any collection of paper.
- (e) The test shall continue to be conducted for an additional 150 cycles, stopping at every 50 paper/three no-paper cycle in order to inspect the internal housing for paper collection.
- (f) After completion of the cycle tests, all paper on the wall and bottom of the housing unit shall be removed, dried, and weighed.

### 5.2.3 Performance requirement

The failure of the unit to meet the following criteria shall be cause for rejection of the unit:

- (a) After each successive flush in [Clause 5.2.2\(a\)](#), (d), and (e), there shall be no evidence of paper returning to the bowl.
- (b) Not more than 5% of the total weight of the 2000 sheets shall remain clinging to the wall and bottom of the housing after testing.
- (c) If a grille is provided, there shall be no more than 50% blockage of the surface area, as determined by visual inspection.

## 5.3 Hydrostatic pressure test of the check valve

### 5.3.1 Test method

The holding tank or pumped waste system shall be installed in accordance with the manufacturer’s instructions. The check or non-return valve for either the tank or pumped waste system shall be subjected to a 3.7 m (12 ft) column of water head pressure.

### 5.3.2 Performance requirement

The check or non-return valve shall not leak.

## 5.4 Hydrostatic pressure test of the holding tank assembly

### 5.4.1 Test method

The holding tank assembly for the macerating toilet system shall be installed in accordance with the manufacturer's instructions.

The inlet connectors shall be installed, with the inlets to the connectors plugged or sealed. All other openings shall be sealed. The complete tank assembly shall be subjected to a hydrostatic pressure equivalent to 35.8 kPa (5.2 psi) or a pressure equal to the maximum discharge elevation recommended by the manufacturer, whichever is greater, at 23 °C (73°F).

### 5.4.2 Performance requirement

The tank assembly shall not leak. Permanent distortion that does not affect the performance and function of the unit is acceptable.

## 5.5 Discharge test

### 5.5.1 Test method

The discharge test shall be conducted as follows:

- (a) The pumped waste system shall be connected to the fixture for which it is designed.
- (b) The pumped waste system shall be installed in accordance with the manufacturer's instructions.
- (c) The discharge pipe shall rise 3.7 m (12 ft) and discharge to a safe place.
- (d) The water supply to the fixture shall be turned on at the maximum flow rate for the fixture.
- (e) Water shall flow into the fixture for 10 min.

**Note:** For bathtubs, the flow rate is based on the overhead shower.

### 5.5.2 Performance

Water shall run continuously down the drain and shall not rise in the fixture during the test.

## 6 Marking and instruction requirements

### 6.1 Marking

The pumped waste or macerating toilet system shall be marked with the following information:

- (a) the manufacturer's name or trademark;
- (b) the model number; and
- (c) "ASME A112.3.4/CSA B45.9".

### 6.2 Instructions

#### 6.2.1 Installation

Installation instructions shall be provided with each unit, including such information as capacities, connections to the unit, electrical needs, other plumbing requirements, and related safety concerns. For macerating toilet systems, the installation instructions shall identify that a full-flow ball gate valve shall be installed downstream of the check valve and that all fixtures shall be on the same floor level.

#### 6.2.2 Owner/operator instructions

Instructions for proper operation of the system shall be provided with the unit. The instructions shall indicate the proper use of the system and prohibited uses and applications of the system. The instructions shall be marked on the cover with instructions to the installer to leave the manual with the owner/operator for future reference.





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