ASME A112.19.7M-1995
(REVISION OF ASME/ANSI A112.19.7M-1987)

Whirlpool Bathtub Appliances

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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The American Society of Mechanical Engineers

345 East 47th Street, New York, N.Y.

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Date of Issuance: December 15, 1995

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FOREWORD

(This Foreword is not part of ASME A112.19.7M-1995.)

In the late 1970s, the whirlpool bathtub appliance was integrated into modern plumbing systems as a new selection for bather comfort in the bathroom. The popularity of this product increased dramatically, and it is now a common option for the modern bath.

The initial work on a safety standard for whirlpool bathtub appliances was undertaken by a committee of the International Association for Plumbing & Mechanical Officials (IAPMO). The committee's activity resulted in the Product Standard PS 32 for Jetted Whirlpool Bathtubs, which was used as a benchmark for performance of such appliances.

At IAPMO's suggestion, the PS 32 standard was offered to ASME for conversion into a national consensus standard. In order to undertake this challenge, a Task Group of A112, Panel 19, was formed to write this Standard.

The original edition of this Standard was approved by the American National Standards Institute (ANSI) on November 23, 1987. This revision was prepared after extensive review by the ASME A112 Main Committee, Panel 19, and the Working Group 7 membership.

The sampling procedure in this revision was developed after lengthy round-robin tests were conducted using whirlpool bathtubs of all shapes and configurations. This research is on file with ASME to support the sampling procedures.

The work on this Standard continues and future revisions may include criteria which reflect new technologies. Task Groups have been formed to assess further study issues, such as cleaning.

Suggestions for improvement of this Standard are welcome. They should be sent to The American Society of Mechanical Engineers, Attn: Secretary, A112 Main Committee, 345 East 47th Street, New York, NY 10017.

This revision was approved as an American National Standard on July 24, 1995.

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Standardization of Plumbing Materials and Equipment

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WHIRLPOOL BATHTUB APPLIANCES

1 PURPOSE

The purpose of this Standard shall be to establish criteria for whirlpool bathtub appliances. It is intended for use by, but not limited to, manufacturers, distributors, retailers, architects, engineers, plumbing contractors, jetters, installers, regulatory agencies, and users.

The provisions of this Standard shall enable identification of specific units that are in compliance with this document.

The provisions of this Standard shall not be construed to prevent the use of any alternate material or method of construction, provided any such alternate meets the intent of this Standard.

2 SCOPE

This Standard shall govern the construction, general requirements, test methods, and marking for whirlpool bathtub appliances that incorporate a bathtub, a circulation pump, and a piping system, with or without the introduction of air, either by integral suction or air pump. Optional accessories for such whirlpool bathtub appliances shall be permitted to be provided in the factory or field, provided that such accessories do not negate the performance of whirlpool bathtub appliances designed to comply with this Standard.

3 DEFINITIONS

accessible — shall mean having access thereto, but which first may require the removal of an access panel, door, or similar obstruction with the use of tools

readily accessible — shall mean direct access without the necessity of removing or moving any panel, door, or similar obstruction with the use of tools

circulation system — shall mean the interconnected system traversed by the circulated water from the whirlpool bathtub appliance, which consists of all circulation inlets and outlets, pumps, air induction systems, valves, pipe or tubing, fittings, and other appurtenances, either factory of field assembled

jet — shall mean a fitting that creates a high velocity stream of water, with or without the induction of air

plumbing appliance — shall mean a plumbing fixture whose operation and/or control shall be dependent upon one or more energized components, such as motors, controls, heating elements, or pressure or temperature sensing elements. Such fixtures shall be permitted to operate automatically through one or more of the following actions: a time cycle, a temperature range, a pressure or temperature control, and/or a measured volume or weight. Such fixture shall be permitted to be mechanical and similar to a plumbing fixture except that it is designed for a specific purpose and not generally indispensable in the operation of the plumbing system.

plumbing appurtenance — shall mean a manufactured device, a prefabricated assembly, or an on-the-job assembly of component parts that is an adjunct to the basic piping system and plumbing fixtures. An appurtenance demands no additional water supply, nor does it add any discharge load to a fixture or the drainage system.

plumbing fixtures — shall mean installed receptors, devices, or appliances that are supplied with water, or receive or discharge liquids or liquid-borne wastes, with or without discharge into the drainage system to which the fixture shall be directly or indirectly connected

whirlpool bathtub appliance — shall mean a plumbing appliance consisting of a bathtub fixture that is equipped and fitted with a circulating piping system designed to accept, circulate, and discharge bathtub water after each use

4 GENERAL REQUIREMENTS

4.1 Materials

4.1.1 Bathtubs. Bathtubs shall conform to the

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standards listed in Table 1. The latest editions of the standards shall apply.

4.1.2 Piping

(*a*) *Copper Assemblies.* Copper tubing shall not be less than Type M and shall conform to the applicable standards listed in Table 1.

(*b*) *Plastic Assemblies*

(*1*) Acrylonitrile Butadiene Styrene (ABS) and Polyvinyl Chloride (PVC) plastic piping shall be rigid or flexible plastic pipe or tubing. Fittings and rigid tubing shall be a minimum of Schedule 40. All pipe, tubing, and fittings shall conform to the applicable standards listed in Table 1.

(*2*) Chlorinated Polyvinyl Chloride (CPVC) plastic piping shall be a minimum of SDR-PR and conform to the dimensional tolerances of the applicable standards listed in Table 1.

(*3*) Polybutylene (PB) plastic tubing shall conform to the dimensional tolerances of the applicable standard listed in Table 1. All joints shall be assembled in accordance with the applicable standard.

(*c*) *Galvanized Steel Assemblies.* Pipe shall be Schedule 40 and shall conform to the applicable standards listed in Table 1.

4.1.3 Joints

(*a*) *Threaded Joints.* Threads on steel pipe shall be standard taper pipe threads in accordance with ASME B1.20.1. Threads on Schedule 40 plastic pipe shall be made with molded threaded adapters. Threads on piping thicker than Schedule 40 shall be molded or cut with dies designed for the specific plastic. Tubing threads shall conform to fine tubing thread standards. When a pipe joint material is used, it shall be applied only to the male threads and such materials shall be approved types, insoluble in water, and nontoxic. Only thread tape or thread lubricant listed specifically for use on plastic threads shall be used. Plugs shall be lubricated with water-soluble, nonhardening material or thread tape.

(*b*) *Soldered Copper Joints.* Soldered copper joints shall conform to the applicable standards listed in Table 1.

(*c*) *Couplings and Rubber Hose.* Couplings used to join the circulating pump to the circulation system assembly shall consist of an elastomeric sleeve with corrosion-resisting tightening bands or shall be of a rubber hose type complying with SAE J20e, SAE 30-R4 Class D-2 for braided cloth, heat-resistant hose. Such grade hose shall be limited to a maximum length of 203 mm (8 in.). Couplings shall be accessible.

(*d*) *Solvent Cement.* Solvent cemented joints shall conform to the applicable standards listed in Table 1.

(*e*) *Mechanical and Heat-Fusion Joints.* Mechanical and heat-fusion joints for polybutylene shall conform to the applicable standard listed in Table 1.

4.1.4 Pumps. Unless part of a listed complete whirlpool bathtub appliance, all air and water pumps shall be listed by a nationally recognized testing agency.

4.1.5 Suction Fittings. Suction fittings shall comply with the standard listed in Table 1, except that the Hair Entrapment Test in Section 7 of this Standard shall be conducted on the whirlpool bathtub in lieu of the Hair Entrapment Test in ASME A112.19.8. Suction ratings shall meet the flow requirements of the whirlpool bathtub appliance circulation systems.

4.2 Circulation Piping and Air Line Installation

(*a*) All piping or tubing, whether rigid or flexible, shall be installed to provide for drainage of the water from the circulation system in accordance with Section 5.

NOTE: Flexible tubing shall be provided with additional support per the tubing manufacturer's instructions to eliminate sagging.

(*b*) Pumps shall be connected to the circulation system by use of fittings, couplings, or other means to provide for removal, repair, or replacement.

(*c*) A minimum of 6.4 mm (1/4 in.) I.D. drain tubing (or other method) shall be provided to drain the pump volute where a self-draining volute is not provided. The volute drain opening in a self-draining pump shall not be less than 4.8 mm (3/16 in.) I.D.

(*d*) The separation between multiple suction fittings, whether in the same or different design plane, shall be 305 mm (12 in.) minimum.

(*e*) The circulation system shall be watertight. Any leakage of the system during testing shall be cause for rejection.

4.3 Installation Instructions

Installation instructions shall be provided with each whirlpool bathtub appliance and shall provide the following information.

4.3.1 Roughing-In Reference. Where applicable, product rough-in dimensions for water supply, drains, and overall dimensions of the whirlpool bathtub appliance shall be provided.

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4.3.2 Service Access. Service access shall be provided for pump/motor removal. Recommended minimum dimensions for access shall be provided.

4.3.3 Electrical. Information shall be provided pertaining to the safe installation of electrical components and/or lighting conforming with Section 680 of the National Electrical Code. The instructions shall include a warning relative to the installation of the ground fault circuit interrupter (GFCI) protection in accordance with the local codes.

4.3.4 Installation Precautions. Precautions shall be provided that will warn of potential danger or damage to the whirlpool bathtub appliance unit during installation.

4.4 Operation, Use, and Care Instructions

4.4.1 Operating and Use Instructions. Instructions and precautionary warnings on the general operation and use of the whirlpool bathtub appliance by the consumer shall be provided.

4.4.2 Flushing Instructions. The operating use and care instructions shall contain a notice to flush the whirlpool bathtub appliance plumbing system periodically (not to exceed 90 days).

(*a*) At a minimum, the flushing shall consist of filling with water, running circulation system, and draining.

(*b*) Sanitizing with chemicals as recommended by the manufacturer.

(*c*) The operating instructions shall have a warning in bold print that informs the user to flush the circulation system.

4.5 Field-Assembled or Retrofitted Units

Field-assembled or retrofitted bathtubs shall comply with the requirements of this Standard.

5 WATER RETENTION

Whirlpool bathtub appliances shall be of such design as to prevent retention of water in excess of 44 mL (1½ fl oz) for each jet and suction fitting. Tests shall be conducted in accordance with this Section and the sampling method cited in Section 9.

NOTE: For example, a whirlpool bathtub appliance with four jets and one suction fitting satisfies this requirement if the residual water is equal to or less than 222 mL (7.5 fl oz).

5.1 Preconditioning (Flexible Circulation Piping Only)

Where flexible piping is used, water at 57 ± 3°C (135 ± 5°F) shall be placed in the unit at a height required to properly operate the whirlpool. The water shall be circulated for 2 h ± 10 min. The water temperature shall be maintained by covering or other means so that the water temperature after the 2-h test shall not be less than 54°C (130°F). After the 2-h test period, the fixture shall be drained and allowed to cool to ambient.

5.2 Procedure[1]

The following test procedure shall be conducted within a 1-h time interval.

(*a*) The whirlpool bathtub appliance shall be positioned in a level and connected position as it would be installed in the field. Directional jets which are not self-adjusting shall be positioned horizontally.

(*b*) The appliance shall be filled with water 24 ± 3°C (75 ± 5°F) until whirlpool jets are completely covered. The chlorine level of the test water shall be recorded.

(*c*) The pump shall be operated for 2 min to 3 min.

(*d*) The appliance shall be allowed to drain completely.

(*e*) Using a graduated container, the tub shall be refilled with enough water to cover the jets, measuring the water in quantities as given below.

(*f*) The quantity of water added to the nearest 1.9 L (½ gal) shall be recorded and 3.8 L per 189.3 L (1 gal per 50 gal) quantity and 7.6 L per 379 L (2 gal per 100 gal) quantity shall be removed to dissolve the chlorine as per Table 2. The appropriate column in Table 2 shall be selected based upon the chlorine concentration to determine the amount of chlorine solution to be added.

(*g*) The measured quantity of chlorine solution shall be dissolved in the removed sample and this solution shall be poured into the appliance.

(*h*) The appliance pump shall be run for 2 min. The pump shall be shut off and the appliance shall be allowed to drain totally. Five minutes after draining, excess water shall be wiped from the appliance's surface.

[1] Water retention shall be evaluated using a chlorine test. Good laboratory technique is critical to prevent inadvertent contamination of samples.

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(*i*) The appliance shall be refilled with the same volume of water as noted in para. (f) above. The pump shall be operated for 2 min.

(*j*) A sample of the water from the bathtub shall be placed into the colorimeter[2] and the instrument shall be adjusted according to the instructions.

(*k*) The free chlorine solution or tablet provided with the colorimeter sample shall be added and this chlorine reading shall be compared with the values stated in Table 3. Not more than 1 min shall be allowed to elapse before taking a reading.

5.3 Performance Requirement

The appliance's cumulative residual water shall not exceed 44 mL ($1^1/_2$ fl oz) for each jet and suction fitting.

6 MARKING AND LABELING

6.1 Factory Assembled Units

For all factory assembled units, an adequately sized label shall be affixed to the exterior and adjacent to the waste and overflow. It shall be printed in 4.8 mm ($^3/_{16}$ in.) high letters in a contrasting color and shall read as follows: TUB SHALL BE TESTED. FILL THE TUB WITH WATER TO OVERFLOW DURING ROUGH INSPECTION AND INSPECT FOR LEAKS.

6.2 Field Assemblies and Retrofitted Units

Piping systems that are field assembled or retrofitted shall be identified with an adequately sized label containing:

(*a*) the circulation system manufacturer's name, address, and telephone number;

(*b*) the certified installer's name, address, and telephone number; and

(*c*) the date of installation.

The label shall be affixed in a location to be visible at any time after installation.

7 HAIR ENTRAPMENT

7.1 Hair Entrapment Test for Suction Fittings

In lieu of the procedures as defined in ASME A112.19.8, the suction fitting in the whirlpool bathtub appliance shall be tested for hair entrapment as defined below. The tests shall be conducted in accordance with the sampling method cited in Section 8. One fitting within the unit shall be selected at random and the hair entrapment procedure shall be conducted with the pump operating at its highest speed. The pulling force to remove the dowel test assembly shall not exceed 22.2 N (5 lbf) when tested ten successive times.

7.1.1 Test Method. The whirlpool bathtub appliance shall be tested for hair entrapment in accordance with the procedures listed below:

(a) The suction fitting to be tested shall be installed in the whirlpool bathtub appliance per the manufacturer's instructions.

(*b*) The whirlpool bathtub appliance shall be filled to 25 mm (1 in.) below the drain overflow with $32 \pm 3°C$ ($90 \pm 5°F$) water.

(*c*) 57 ± 3 g (2 ± 0.11 oz) of natural, medium to fine, straight, light-colored hair, 406 mm (16 in.) in length shall be affixed to a 25 mm (1 in.) diameter wooden dowel. A method for attaching a scale shall be provided on the opposite end of the dowel. When tangles in the wig cannot be removed, a fresh sample of hair shall be used for each appliance tested. Hair shall be trimmed evenly.

(*d*) A scale which is accurate to within +1% −0% of the full scale shall be used to determine pounds of pull against the entanglement.

NOTE: A Chatillon mode number 791-10, or equivalent, shall be used.

(*e*) Prior to use, the hair shall be cleaned in a 10% solution by volume Alpha Olefin Sulfonate (AOS)[3] and water. After cleaning, the hair sample shall be thoroughly rinsed in clear water. This cleaning shall be repeated only if the hair appears dirty or tangled between successive groups of passes.

(*f*) The pump shall be activated and the flow of the jets shall be directed away from the suction fitting.

(*g*) The hair shall be saturated for a minimum of 2 min in testing water. After being saturated, the free end of the hair shall be placed approximately 305 mm (12 in.) in front of the suction fitting, and 51 mm (2 in.) above the face of the fitting.

(*h*) The hair shall be slowly lowered closer to the fitting and the ends of the hair shall be allowed to feed into the fitting in the direction of the intake flow. Continue to slowly feed the hair by moving the dowel from side to side in a sweeping motion, while short-

[2] Examples of colorimeters that shall be permitted to be used for this test are as follows:

DR 100 Colorimeter (Catalog #411-02), available from Hach Chemical, P.O. Box 389, Loveland, CO 80539 [(800) 525-5940]

LaMotte Colorimeter, available from LaMotte Chemical Products, P.O. Box 329, Chestertown, MD 21620 [(410) 778-3100]

[3] Available from P. J. Higgins and Associates, Inc., P.O. Box 3929, Frederick, MD 21705.

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ening each pass of the dowel for a minimum of 2 min. Then, lay the dowel end against the fitting for a minimum of 30 s.

(*i*) If testing a horizontal fitting, start 51 mm (2 in.) above the fitting in a similar sweeping motion.

(*j*) With the pump still operating, test for the amount of pull necessary to free the hair from the fitting. The force of entanglement shall be measured by pulling the scale and dowel vertically. The test shall be repeated ten times.

(*k*) Paras. (h) through (j) shall be repeated ten times.

7.1.2 Performance Requirement. A pull of 22.2 N (5 lbf) or greater on any one of the ten tests, including the weight of the saturated test apparatus, shall be deemed a failure.

8 RANDOM SAMPLING METHOD

Representative samples of whirlpool bathtub appliances shall be tested in accordance with the parameters below in order to verify system compliance with the performance requirements for the test method as defined in Sections 5 and 7.

The random sampling shall represent the following parameters.

Sample Number	Tub Volume [Note (1)]	Number of Jets	Pump Size [Note (2)]
1	Largest	Greatest	Largest
2	Largest	Least	Smallest
3	Smallest	Greatest	Largest
4	Smallest	Least	Smallest

NOTES:
(1) As measured in liters (gallons) to the overflow
(2) As rated in liters per minute (L/min) [gallons per minute (gpm)]

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TABLE 1 LISTING OF ACCEPTABLE MATERIALS FOR WHIRLPOOL BATHTUB APPLIANCES

Materials	Standards [Note (1)]
Bathtub Fixtures	
Plastic	ANSI Z124.1, Plastic Bathtub Units
Enameled Cast Iron	ASME A112.19.1M, Enameled Cast Iron Plumbing Fixtures
Enameled Steel	ASME A112.19.4M, Porcelain Enameled Formed Steel Plumbing Fixtures
Tile	IAPMO IS-2, Tile Lined Roman Bathtubs
Metallic Piping	ASTM B 88, Specification for Seamless Copper Water Tube
Copper Tubing	ASTM B 447, Specification for Welded Copper Tube
Steel Pipe — Galvanized	ASTM A 53, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
Nonmetallic Pipe and Tubing	
ABS	ASTM D 1527, Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80
PVC	ASTM D 1785, Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
PVC Hose	IAPMO PS-33, Flexible Hose for Hot Tubs and Spas
CPVC	ASTM D 2846, Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems
PB	ASTM D 3309, Specification for Polybutylene (PB) Plastic Hot- and Cold-Water Distribution Systems
Joint Standards	
ABS	ASTM D 2235, Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings
PVC	ASTM D 2564, Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
CPVC	ASTM F 493, Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings
Soldered Joints	IAPMO IS-3, Copper Plumbing Tube, Pipe, and Fittings IAPMO IS-21, Welded Copper and Copper Alloy Water Tube Copper Tube Handbook
Threaded Joints	ASME B1.20.1, Pipe Threads, General Purpose (Inch)
Mechanical and Heat Fusion Joints	ASTM D 3309, Specification for Polybutylene (PB) Plastic Hot- and Cold-Water Distribution Systems
Accessories and Components	
Suction Fittings	ASME A112.19.8M, Suction Fittings for Use in Swimming Pools, Wading Pools, Spas, Hot Tubs, and Whirlpool Bathtub Appliances
Couplings or Hose	SAE J20e, Coolant System Hoses

GENERAL NOTES:
(a) ANSI standards are available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.
(b) ASTM standards are available from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.
(c) Copper Tube Handbook is available from the Copper Development Association, Inc., 260 Madison Avenue, 16th Floor, New York, NY 10016-2401.
(d) IAPMO standards are available from the International Association of Plumbing and Mechanical Officials, 20001 South Walnut Drive, Walnut, CA 91789-2625.
(e) SAE standards are available from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.

NOTE:
(1) The current edition shall apply.

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TABLE 2 CHLORINE CONCENTRATION FOR TEST DETERMINATION

Amount of Water		Dilution	Amount of Chlorine Solution, g [Note (1)]		
L	gal	ppm	100%	55%	62%
18.9	5	100	1.9	3.4	3.0
37.9	10	200	7.6	13.8	12.2
56.8	15	300	17.0	31.0	27.5
75.7	20	400	30.3	55.1	48.9
94.6	25	500	47.3	86.0	76.3
113.6	30	600	68.1	123.8	109.9
132.5	35	700	92.7	168.6	149.6
151.4	40	800	121.1	220.2	195.3
170.3	45	900	153.3	278.7	247.2
189.3	50	1000	189.3	344.1	305.2
208.2	55	1100	229.0	416.4	369.0
227.1	60	1200	272.5	495.5	439.6
246	65	1300	319.8	581.5	515.8
265	70	1400	370.9	674.4	598.3
284	75	1500	425.8	774.2	686.8
303	80	1600	484.5	880.9	781.4
322	85	1700	546.9	994.9	882.1
341	90	1800	613.2	1114.9	989.0
360	95	1900	683.2	1242.2	1102.0
379	100	2000	757.0	1376.4	1221.0

NOTE:

(1) Chlorine solutions are usually available in one of three powder concentrations (55%, 62%, and 100%). The following formula shall be used to determine chlorine concentration as measured in grams.

$$\text{Powder(g)} = \frac{0.003785 \times \text{Capacity (gal)} \times \text{Dilution (ppm)}}{\text{Powder Concentration}}$$

Determine the amount of chlorine solution in grams required for a bathtub which has a capacity of 45 gal when using a chlorine at 55% solution.

$$\text{Example: } \frac{0.003785 \times 45 \times 900}{.55} = 278.7 \text{ g}$$

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TABLE 3 RESIDUAL WATER COMPARISON TABLE

Chlorine Reading, ppm	Residual Water	
	L	fl oz
3.0	.568	19.20
2.9	.549	18.56
2.8	.530	17.92
2.7	.511	17.28
2.6	.492	16.64
2.5	.473	16.00
2.4	.454	15.36
2.3	.435	14.72
2.2	.416	14.08
2.1	.397	13.44
2.0	.379	12.80
1.9	.360	12.16
1.8	.341	11.52
1.7	.322	10.88
1.6	.303	10.24
1.5	.284	9.60
1.4	.265	8.96
1.3	.246	8.32
1.2	.227	7.68
1.1	.208	7.04
1.0	.189	6.40
0.9	.170	5.76
0.8	.151	5.12
0.7	.132	4.48
0.6	.114	3.84
0.5	.095	3.20
0.4	.076	2.56
0.3	.057	1.92
0.2	.038	1.28
0.1	.019	0.64

GENERAL NOTE: Where chlorinated tap water is used, the chlorination reading of the water shall be factored out of the test reading.

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ISBN #0-7918-2327-X

J11995

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