



Standard Test Method for Energy Performance of Powered Open Warewashing Sinks¹

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1. Scope

1.1 This test method evaluates the energy consumption of powered open warewashing sinks. The food service operator can use these tests to evaluate and select a suitable washing device and understand its energy consumption.

1.2 This test method applies to powered open warewashing sinks (powered sinks) with the following characteristics: a large main water sink with electrically powered water pump(s) and multiple high flow water nozzles. The unit may include gas or electric heaters to maintain water temperature. These powered sinks are designed to run for predetermined cycle duration and accommodate pots and pans of various shapes and sizes as well as cooking utensils. They are intended for stand alone use and require little supervision. The powered sink will be tested for the following (where applicable):

- 1.2.1 Maximum energy input rate (10.2),
- 1.2.2 Preheat energy consumption and duration (10.3),
- 1.2.3 Idle energy rate (10.4),
- 1.2.4 Pilot energy rate, if applicable (10.5), and
- 1.2.5 Washing cycle energy consumption (10.6).

NOTE 1—This test method applies only to the powered portion of the unit. Other compartments (sanitizing, rinsing, and so forth) are not evaluated.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recom-*

mendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 *ASTM Standards:*²

D3588 Practice for Calculating Heat Value, Compressibility Factor, and Relative Density of Gaseous Fuels

2.2 *ANSI Standard:*

2000 International Fuel Gas Code³

2.3 *ASHRAE Documents:*

ASHRAE Guideline 2 (RA90) Engineering Analysis of Experimental Data⁴

ASHRAE 1993 Fundamentals Handbook⁴

3. Terminology

3.1 *Definitions:*

3.1.1 *powered open warewashing sink, or powered sink, n*—an all-purpose, stainless steel water sink with electrically powered water pump(s) and multiple high flow water nozzles designed for cleaning pots, pans, and utensils. The main washing sink holds 60 to 100 gal of heated water. The unit may or may not feature a scrapper sink, rinse tank, sanitizing tank, scrap table, or a drain table, or both.

3.1.2 *test method, n*—a definitive procedure for the identification, measurement, and evaluation of one or more qualities, characteristics, or properties of a material, product, system, or service that produces test results.

3.1.3 *uncertainty, n*—measure of systematic and precision errors in specified instrumentation or measure of repeatability of a reported test result.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *energy input rate, n*—peak rate at which a powered sink consumes energy (Btu/h or kW (kJ/h)).

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁴ Available from American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE), 1791 Tullie Circle, NE, Atlanta, GA 30329, <http://www.ashrae.org>.

¹ This test method is under the jurisdiction of ASTM Committee F26 on Food Service Equipment and is the direct responsibility of Subcommittee F26.06 on Productivity and Energy Protocol.

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3.2.2 *idle energy rate, n*—the rate of energy consumed (Btu/h or kW (kJ/h)) by the powered sink while holding or maintaining a water-filled wash sink at the 115°F (46°C) setpoint.

3.2.3 *pilot energy rate, n*—average rate of energy consumption (Btu/h) by a powered sink's continuous pilot (if applicable).

3.2.4 *preheat energy, n*—amount of energy consumed by the powered sink while preheating the wash sink water from 70 ± 5°F (21 ± 3°C) to 115°F (46°C), with the control(s) set to a calibrated 115°F (46°C).

3.2.5 *preheat rate, n*—average rate (°F/min) at which the powered sink's water is heated from 70 ± 5°F (21 ± 3°C) to 115°F (46°C), with the control(s) set to a calibrated 115°F (46°C).

3.2.6 *preheat time, n*—time required for the powered sink water to preheat from 70 ± 5°F (21 ± 3°C) to 115°F (46°C), with the control(s) set to a calibrated 115°F (46°C).

3.2.7 *washing energy, n*—amount of energy consumed (Btu or kWh (kJ)) during the powered sink's washing cycle.

3.2.8 *washing energy rate, n*—average rate of energy consumption (Btu/h or kW (kJ/h)) during the powered sink's washing cycle.

4. Summary of Test Method

4.1 The powered sink under test is connected to the appropriate metered energy supply. The measured energy input rate is determined and checked against the rated input before continuing with testing.

4.2 The amount of cold (70 ± 5°F (21 ± 3°C)) water required to fill the main water sink to capacity is measured.

4.3 The amount of energy and time required to preheat the powered sink's wash sink from 70 ± 5°F (21 ± 3°C) to 115°F (46°C) is determined.

4.4 The rate of idle energy consumption is determined with the powered sink set to maintain 115°F (46°C) and the pump motor(s) switched off.

4.5 Pilot energy rate is determined, when applicable, for gas powered sinks.

4.6 Washing cycle energy consumption is characterized for two different starting water temperatures: 70°F (21°C) and 115°F (46°C).

5. Significance and Use

5.1 The energy input rate test is used to confirm that the powered sink is operating properly prior to further testing.

5.2 Preheat energy and time can be useful to food service operators to manage power demands and to know how quickly the powered sink can be ready for operation when filled with cold water.

NOTE 2—It is typically recommended that powered sinks be filled with hot water prior to use. This test is useful for operations that have a limited supply of domestic hot water and would need to use cold water to fill the sink to capacity.

5.3 Idle energy rate and pilot energy rate can be used to estimate energy consumption during standby periods.

5.4 Washing cycle energy consumption can be used by the food service operator to estimate energy consumption during operating periods.

6. Apparatus

6.1 *Barometer*, for measuring absolute atmospheric pressure, to be used for adjustment of measured natural gas volume to standard conditions. Shall have a resolution of 0.2 in. Hg and an uncertainty of 0.2 in. Hg.

6.2 *Calibrated Exposed Junction Thermocouple Probes*, with a range from 50 to 200°F (10 to 93°C), with a resolution of 0.2°F (0.1°C) and an uncertainty of 0.5°F (0.3°C), for measuring the average temperature of the sink water, heating element temperature, and ambient air temperature.

6.3 *Gas Meter*, for measuring the gas consumption of the powered sink (if applicable), shall have a resolution of at least 0.01 ft³ (0.0003 m³) and a maximum uncertainty no greater than 1 % of the measured value for any demand greater than 2.2 ft³/h (0.06 m³/h). If the meter is used for measuring the gas consumed by pilot lights, it shall have a resolution of at least 0.01 ft³ (0.0003 m³) and have a maximum uncertainty no greater than 2 % of the measured value.

6.4 *Pressure Gage*, for monitoring natural gas pressure. Shall have a range of zero to 10 in. H₂O, a resolution of 0.5 in. H₂O, and a maximum uncertainty of 1 % of the measured value.

6.5 *Primary Supply*, water heating system capable of supplying water at 115 ± 5°F (46 ± 3°C), as required by the powered sink.

6.6 *Stop Watch*, with a 1-s resolution.

6.7 *Temperature Sensor*, for measuring natural gas temperature in the range of 50 to 100°F (10 to 37.8°C), with a resolution of 0.5°F (0.3°C) and an uncertainty of ±1°F (0.6°C).

6.8 *Thermocouple Probe*, industry standard type T or type K thermocouples capable of immersion with a range of 50 to 200°F (10 to 93°C) and an uncertainty of ±1°F.

6.9 *Watt-Hour Meter*, for measuring the electrical energy consumption of a powered sink, shall have a resolution of at least 10 Wh and a maximum uncertainty no greater than 1.5 % of the measured value for any demand greater than 100 W. For any demand less than 100 W, the meter shall have a resolution of at least 10 Wh and a maximum uncertainty no greater than 10 %.

7. Reagents and Materials

7.1 *Water*, to fill the water sink shall meet the manufacturer's specifications for quality and hardness.

7.2 *Powered Sink Detergent*, to be added to the water shall meet power washer manufacturer's specifications for type and amount. Otherwise, the detergent shall be a standard liquid