



## Standard Test Method for Performance of Conveyor Broilers<sup>1</sup>

This standard is issued under the fixed designation F 2239; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This test method evaluates the energy consumption and cooking performance of conveyor broilers. The food service operator can use this evaluation to select a conveyor broiler and understand its energy consumption.

1.2 This test method is applicable to gas, electric, and hybrid gas/electric conveyor broilers.

1.3 The conveyor broiler can be evaluated with respect to the following (where applicable):

1.3.1 Energy input rate (see 10.2),

1.3.2 Preheat energy consumption and time (see 10.3),

1.3.3 Idle energy rate and temperature uniformity (see 10.4),

1.3.4 Pilot energy rate (if applicable) (see 10.5), and

1.3.5 Cooking energy efficiency, cooking uniformity and production capacity (see 10.8 and 10.9).

1.4 The values stated in inch-pound units are to be regarded as standard. The SI units given in parentheses are for information only.

1.5 *This test method may involve hazardous materials, operations, and equipment. 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 and health practices and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:

D 3588 Practice for Calculating Heat Value, Compressibility Factor, and Relative Density of Gaseous Fuels<sup>2</sup>

#### 2.2 ANSI Standard:

ANSI Z83 Gas Food Service Equipment<sup>3</sup>

#### 2.3 AOAC Documents:

AOAC Official Action 950.46 Air Drying to Determine Moisture Content of Meat and Meat Products<sup>4</sup>

AOAC Official Action 960.39 Fat (Crude) or Ether Extract in Meat<sup>4</sup>

#### 2.4 ASHRAE Standard:

ASHRAE *Handbook of Fundamentals* "Thermal and Related Properties of Food and Food Materials," Chapter 30, Table 1, 1989<sup>5</sup>

### 3. Terminology

#### 3.1 Definitions:

3.1.1 *broiler cavity, n*—that portion of the conveyor broiler in which food products are heated or cooked.

3.1.2 *conveyor broiler, n*—a device, with a continuous belt and a heat source above and below the belt, for cooking food by high heat, usually by direct or radiant heat. Conveyor broilers are used primarily, but not exclusively, for cooking meats.

3.1.3 *cooking energy efficiency, n*—quantity of energy imparted to the specified food product, expressed as a percentage of energy consumed by the conveyor broiler during the cooking event.

3.1.4 *cooking energy rate, n*—average rate of energy consumption (Btu/h or kW) during the cooking energy efficiency tests. Refers to both loading scenarios (heavy, light).

3.1.5 *cooking lane, n*—segment of broiler that food product passed through as it cooks. Each position on the conveyor where food product is placed represents a cooking lane.

3.1.6 *cooking uniformity, n*—calculated variation in cooked food product.

3.1.7 *energy input rate, n*—peak rate at which a conveyor broiler consumes energy (Btu/h or kW).

3.1.8 *idle energy rate, n*—the conveyor broiler's rate of energy consumption (kW or Btu/h), when empty, required to maintain the broiler's temperature at the specified thermostat set point.

3.1.9 *pilot energy rate, n*—rate of energy consumption (Btu/h) by a conveyor broiler's continuous pilot (if applicable).

3.1.10 *preheat energy, n*—amount of energy consumed (Btu or kWh), by the conveyor broiler while preheating its cavity from ambient temperature to the specified thermostat set point.

3.1.11 *preheat time, n*—time (min.) required for the conveyor broiler cavity to preheat from ambient temperature to the specified thermostat set point.

<sup>1</sup> 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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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 05.06

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

<sup>4</sup> Available from Association of Official Analytical Chemists, 1111 N. 19th Street, Arlington, VA 22209.

<sup>5</sup> Available from American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE), 1791 Tullie Circle, NE, Atlanta, GA 30329.